FINAL

Focused Feasibility Study Report

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

Volume 3

Appendices A through D



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Acronyms and Abbreviations

bgs	below ground surface
Box	Bunker Hill Box
cfs	cubic feet per second
CIA	Central Impoundment Area
CTP	Central Treatment Plant
feet/day	feet per day
FFS	Focused Feasibility Study
ft/ft	foot per foot
lb/day	pound(s) per day
mg/L	milligram(s) per liter
msl	mean sea level
NM	not measured
O&M	operation and maintenance
OU	Operable Unit
PEST	parameter estimation
REF	remedial effectiveness factor
RMS	root mean squared error
ROD	Record of Decision
SFCDR	South Fork of the Coeur d'Alene River
SVNRT	Silver Valley Natural Resource Trust
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey

APPENDIX A

Groundwater Modeling Analysis

A.1 Introduction

From 2002 to 2005, the National Academy of Sciences (NAS) performed an independent evaluation of the Record of Decision (ROD) for Operable Unit 3 (OU 3) at the Bunker Hill Mining and Metallurgical Complex Superfund Site (NAS, 2005). The study concluded that although adequate characterization of the extent of metals contamination in soil, sediments, and surface water was presented, the major source of dissolved metals to the surface water system—groundwater discharge—was not adequately characterized or fully addressed. In response to these concerns, it was determined by the U.S. Environmental Protection Agency (USEPA) that it was necessary to develop a quantitative tool that could be used to evaluate the spatially varying components of the water budget and dissolved metals loading budget. Two numerical groundwater flow models were developed for the Canyon Creek Watershed (CH2M HILL, 2007) and the South Fork of the Coeur d'Alene River (SFCDR) Watershed (CH2M HILL, 2009b) to better characterize the distribution of dissolved metals loading from the groundwater system under current conditions, and to evaluate various potential remedial actions. Specific objectives of the groundwater modeling efforts included the following:

- Characterize the hydrogeology of the SFCDR and Canyon Creek Watersheds.
- Develop a quantitative representation of stratigraphy and aquifer properties throughout the SFCDR and Canyon Creek Watersheds.
- Quantify the distribution and extent of groundwater-surface water interaction.
- Develop water budgets for selected areas of the SFCDR and Canyon Creek Watersheds.
- Develop dissolved metals loading budgets for selected areas of concern within the SFCDR and Canyon Creek Watersheds.

Development of the Canyon Creek Watershed groundwater flow model (hereafter referred to as the Canyon Creek Model) began in 2006 as part of the Canyon Creek Hydrologic Study (CH2M HILL, 2007). The purpose of this study was to better understand the hydrologic system within the Canyon Creek Watershed, as Canyon Creek represents one of the largest point discharges of dissolved metals contamination to the greater Coeur d'Alene River system. The Canyon Creek Model was developed using MicroFEM©, an integrated groundwater modeling software program (Hemker and Nijsten, 2003). The finite-element grid consists of 42,086 surface nodes and 83,785 elements in each of the five model layers (Figure A-1). (The figures referenced in the text of this appendix are provided following Section A.9) Nodal spacing was varied from as little as 2 feet near groundwater monitoring well clusters and 20 feet in the Woodland Park area to as much as approximately 850 feet near the model boundary. The lateral extent of the model grid represents the approximate extent of the Canyon Creek Watershed, roughly 22 square miles, as defined by the topographic divide (the ridgeline). The five model layers were discretized to simulate

aquifer systems in the alluvium, the weathered bedrock horizon, and the bedrock system. Full documentation of the Canyon Creek Model development is presented in the *Canyon Creek Hydrologic Study Report* (CH2M HILL, 2007).

The grid for the SFCDR Watershed groundwater flow model (hereafter referred to as the SFCDR Model) consists of 134,535 surface nodes and 268,631 elements in each of the seven model layers (Figure A-2). Nodal spacing was refined to as little as 25 feet in areas where analysis of remedial actions was anticipated. The lateral extent of the model grid represents the approximate extent of the SFCDR Watershed, roughly 300 square miles, as defined by the topographic divide (the ridgeline). The seven model layers were discretized to simulate the alluvial aquifer systems of the SFCDR and major tributary valleys, the weathered bedrock horizon, and the underlying bedrock system. Full groundwater flow model documentation is presented in *South Fork of the Coeur d'Alene River Watershed: Basinwide Groundwater Flow Model Documentation* (CH2M HILL, 2009b).

The purpose of this appendix is to document updates to the SFCDR Model that have taken place since the documentation was published (no updates have been made to the Canyon Creek Model), and to describe the application of the two groundwater flow models to the evaluation of remedial alternatives for OUs 2 and 3 that are developed and described in this Focused Feasibility Study (FFS) Report for the Upper Basin of the Coeur d'Alene River. The remedial actions evaluated by the groundwater flow models and documented in this appendix constitute all substantive groundwater actions evaluated in the FFS. There are three main alluvial areas in the Upper Basin for which groundwater actions are evaluated: (1) the Mainstem SFCDR Watershed, Segment 01, which includes the alluvial floodplain of the SFCDR between Wallace and Elizabeth Park; (2) the Woodland Park area of Canyon Creek; and (3) the segment of the SFCDR that passes through OU 2 between Elizabeth Park and Pinehurst.

A.2 Model Updates

The calibrated SFCDR Model, as documented in *South Fork of the Coeur d'Alene River Watershed: Basinwide Groundwater Flow Model Documentation* (CH2M HILL, 2009b), was refined to improve both the characterization of the groundwater-surface water interaction within Government Gulch and the overall calibration of the model in general.

Table A-1 presents measured baseflow surface water and groundwater elevations and stream discharges from locations within Government Gulch. (The tables referenced in this appendix are provided after the figures that follow Section A.9.) Although the data obtained during both the fall 2007 and fall 2008 measurement events are variable from point to point, there was an overall gain in surface water flow within Government Gulch (between staff gauging stations BH-GG-0002 and BH-GG-0001). The calibrated model (CH2M HILL, 2009b) simulated Government Creek as a losing stream throughout the "gulch" portion. To better evaluate remedial actions within Government Gulch, the following updates were made to the SFCDR Model:

- The horizontal hydraulic conductivity in model layers 1 and 2 was adjusted from 60 to 20 and 5 feet per day (feet/day), respectively.

- The thickness of model layer 3 was decreased near the mouth of Government Gulch so that the total aquifer thickness near monitoring well pairs BH-GG-GW-0005/ BH-GG-GW-0006 and BH-GG-GW-0007/BH-GG-GW-0008 more closely matched measured data.
- The horizontal hydraulic conductivity of model layer 3 in the confining unit "window" at the mouth of Government Gulch was decreased from 28.35 to 2.835 feet/day.
- The deep percolation of precipitation within Government Gulch was doubled.

These modifications to the model resulted in improved calibration within the Government Gulch drainage area. The measured stream discharge, as defined by the difference in fall 2008 stream discharge between stream gauging stations BH-GG-0001 and BH-GG-0002 (Table A-1), increased by 0.27 cubic foot per second (cfs) in fall 2008. The revised model simulation predicts that 0.24 cfs of groundwater discharge to Government Creek occurs over that same reach. In comparison, the previous version of the SFCDR Model (CH2M HILL, 2009b) simulated this portion of Government Creek as a losing stream.

As part of the updated baseflow calibration, the SFCDR Model underwent an auto-calibration process using PEST, a nonlinear parameter estimation software package (Dougherty, 2004 and 2007). PEST adjusts user-defined model parameters (e.g., hydraulic conductivity and recharge) to minimize the sum of squared differences between calibration targets and simulated values (e.g., groundwater elevations and groundwater discharge to streams). PEST runs a model for each adjustable parameter in which the value of that parameter is slightly increased or decreased. PEST then identifies how each parameter change affected each calibration target. These changes are combined in a multidimensional system of equations that solves for a new set of parameter values that better match the calibration targets. This is repeated until no further improvement is gained. In the course of a typical calibration exercise with PEST, thousands to tens of thousands of model runs are completed. PEST uses a process of parameter modification and calibration target-matching that is similar to the manual interactive technique used by a groundwater modeler, but PEST has the advantage of being able to perform and analyze tens (or even hundreds) of model runs over a short time period. Although PEST cannot exercise professional judgment on its own, it can be guided by a professional who is familiar with the site and the software.

Targets used in the PEST process included the following:

- Groundwater elevations measured during fall 2008
- Vertical head differences measured during fall 2008
- Groundwater discharge to the SFCDR within the Bunker Hill "Box" (the Box) and Osburn Flats as measured during the 2008 groundwater-surface water interaction studies (CH2M HILL, 2009a and 2009c)
- The total baseflow groundwater discharge to the SFCDR, as measured at the U.S. Geological Survey (USGS) stream gauge at Pinehurst

- The total dissolved zinc load from groundwater to the SFCDR within the eastern gaining stream reach along the northern side of the Central Impoundment Area (CIA)
- The total dissolved zinc load from groundwater to Government Creek within the "gulch" portion

During the auto-calibration process, PEST was able to adjust the horizontal and vertical hydraulic conductivity of model layers 1 though 4 and the streambed conductance parameters for reaches of the SFCDR in the Box and Osburn Flats. Additionally, because the PEST process involved numerous model runs, model layer 7 was deleted in order to decrease the number of nodes in the SFCDR Model and improve simulation run-times. Table A-2 lists the multiplier factors for these parameters retained in the final calibration. Figure A-3 presents the updated alluvial transmissivity distribution for the upper aquifer in the Box, while Figure A-4 presents the updated total alluvial aquifer transmissivity for Osburn Flats. Results of the auto-calibration process are discussed in Section A.3.

No updates or modifications were made to the Canyon Creek Model.

A.3 Additional Model Calibrations

During development of the remedial alternatives to be evaluated in the FFS, it was recognized that it would be advantageous to evaluate the effectiveness of potential actions under a variety of hydrologic conditions, not solely the baseflow conditions that were assumed for the initial calibrations. To accommodate these additional analyses, both the SFCDR and Canyon Creek Models were calibrated to four hydrologic conditions:

- Steady-state calibration to fall baseflow conditions
- Steady-state calibration to critical low-flow conditions, 7Q10
- Steady-state calibration to higher flow conditions, 90th percentile flow
- Transient calibration to an annual hydrologic condition (July 1, 2008 through June 30, 2009)

These additional model calibrations are discussed in Sections A.3.1 through A.3.4, respectively.

A.3.1 Steady-State Baseflow Calibration

The fall 2008 flow conditions that correspond to the baseflow calibration represent an approximately 25th percentile flow condition, as defined by the USGS period of recorded streamflow at the USGS stream gauge at Pinehurst (SF-271). Targets used in the 2008 baseflow calibration included the following:

- Groundwater elevations measured in the fall of 2008
- Vertical head differences measured in the fall of 2008
- Groundwater discharge to the SFCDR within the Box and Osburn Flats, as measured during the 2008 groundwater-surface water interaction studies (CH2M HILL, 2009a and 2009c)

Figure A-5 presents an updated "scattergram" of simulated versus measured groundwater elevations. Figures A-6a, A-6b, and A-6c present residuals between measured and simulated groundwater elevations for the Box and Osburn Flats in map view. Tables A-3 and A-4 present the measured and simulated vertical hydraulic gradients for the Box and Osburn Flats, respectively. Table A-5 presents the measured and simulated groundwater discharge to the SFCDR in the Box and Osburn Flats.

A.3.2 Steady-State 7Q10 Calibration

To evaluate the effectiveness of potential groundwater remedial actions under critical low-flow conditions, the Canyon Creek and SFCDR Models were calibrated to a steady-state 7Q10 flow condition. "7Q10" is defined as the lowest 7-day average daily flow that occurs with a 10-year return period. For the SFCDR at the USGS Pinehurst gauge, the 7Q10 flow has been estimated at 68 cfs (USEPA, 1999). The most recent 7Q10 at this location was recorded in mid-September 2001. Data used as targets for the 7Q10 calibration included groundwater elevations measured in monitoring wells and measured discharge of the SFCDR at Pinehurst. It was assumed that under extreme low-flow conditions, all surface water flow was supplied by groundwater discharge.

To calibrate the SFCDR Model to the 7Q10 flow at Pinehurst, several modifications were made to the boundary conditions to reflect the drier hydrologic conditions. It was assumed that all smaller streams within the model domain were dry during the 7Q10 flow condition. These smaller streams (i.e., all streams except the SFCDR, Canyon Creek, Ninemile Creek, Pine Creek, Government Creek, Milo Creek, Montgomery Creek, Big Creek, Terror Gulch, Twomile Creek, and Placer Creek) were converted from the two-way head-dependent boundary condition to a one-way head-dependent boundary condition. As the result of this conversion, these streams could function as a sink for groundwater, but not a source. The East and West Page Swamps were also converted to one-way head-dependent boundary conditions.

The next change was to lower the stream stage elevations consistent with those measured during fall 2001. The differences in gauge height between mid-September 2001 and fall 2008 (the baseflow calibration period) at the USGS gauges on the SFCDR at Pinehurst and Elizabeth Park, on Canyon Creek at the mouth, on Ninemile Creek at the mouth, and on Pine Creek below Amy Gulch were estimated. Of these gauge locations, those along the tributary streams showed larger gauge heights during the 7Q10 flow condition than during the fall 2008 flow period. As a result, the baseflow stream elevations were used for the tributaries. The difference in gauge height between mid-September 2001 and fall 2008 on the SFCDR was approximately 0.25 foot at Elizabeth Park and 0.50 foot at Pinehurst. The calibrated baseflow stream stage elevation of the SFCDR was decreased by 0.50 foot between the western model boundary and Pinehurst and by 0.25 foot from Pinehurst to the SFCDR headwaters.

The final modification to the SFCDR Model was to adjust the deep percolation of precipitation to reflect the drier hydrologic conditions. This was accomplished by an iterative process of applying a multiplier to the deep percolation distribution, running the model to steady-state solution, and then comparing evaluating the calibration against measured groundwater elevations (at 28 monitoring wells in the Box) and the total ground-water discharge to streams at the western model boundary. The final multiplier used in the

7Q10 simulations was 0.37 (i.e., the final deep percolation values were 37 percent of the baseflow values). Figure A-7 presents a scattergram of simulated versus measured groundwater elevations, while Figures A-8a and A-8b present the distribution of residuals between simulated and measured groundwater elevations in map view. The simulated total groundwater discharge to surface water in the calibrated 7Q10 SFCDR Model was approximately 67 cfs.

Similar changes were made to calibrate the Canyon Creek Model to 7Q10 conditions. The calibrated baseflow stage of Canyon Creek was decreased by 0.25 foot because of the measured gauge height differences between fall 2001 and fall 2006 (the baseflow calibration period for the Canyon Creek Model). The multiplier on the distribution of deep percolation of precipitation from the calibrated 7Q10 version of the SFCDR Model (0.37) was applied to the Canyon Creek Model. No measured groundwater elevations were available in the Canyon Creek Watershed for the 7Q10 calibration period; therefore, the only calibration target used was the total groundwater discharge to surface water during fall 2001 (measured at approximately 11 cfs and simulated at approximately 10 cfs).

A.3.3 Steady-State 90th Percentile Flow Tier Calibration

To evaluate the effectiveness of potential groundwater remedial actions under higher flow conditions, the Canyon Creek and SFCDR Models were calibrated to a steady-state 90th percentile flow condition. The 90th percentile flow at the USGS stream gauge at Pinehurst (SF-271) has been estimated at 1,290 cfs (USEPA, 1999). The most recently available data that were obtained during the spring runoff period of Water Year 2009 were used during the calibration. The first occurrence of a 1,290 cfs flow on the rising limb of the SFCDR spring runoff hydrograph occurred on April 20, 2009. Calibration targets for the 90th percentile flow simulations included groundwater elevations measured by transducers in monitoring wells and piezometers on April 20, 2009. As groundwater discharge to streams is not the sole component of streamflow during spring runoff, it was not possible to calculate the quantity of groundwater discharge contributing to surface flow, and therefore no flow targets were used in these calibration simulations.

To calibrate the SFCDR Model to the 90th percentile flow at Pinehurst, modifications were made to boundary conditions to reflect the wetter hydrologic conditions. The stream stage elevations for all streams in the model were modified to be consistent with measured data. For all streams where data-logging pressure transducers were installed, the difference between the stage during fall 2008 and the stage on April 20, 2009, was estimated. This difference was then added to or subtracted from the stream stage in the calibrated baseflow model. Although many stilling wells on tributary streams are instrumented with transducers, it was necessary to work in stage differences because reference point elevations are not available for the stream gauges on the SFCDR. Table A-6 lists the stage changes implemented for all streams in the SFCDR Model. Where there was more than one stream gauge on a particular stream, the water-level change was applied to reaches defined by the half-distance between gauge locations (i.e., there was no interpolation of stream stage change between gauges). Larger, non-instrumented streams were assigned stream stage changes observed at the mouth of Government Gulch, while smaller streams were assigned stage changes consistent with that observed at the mouth of Deadwood Gulch.

Modification of the deep percolation of precipitation to reflect the wetter hydrologic conditions was accomplished in a similar manner to that used in the 7Q10 calibration. A multiplier was applied to the baseflow deep percolation distribution, the model was run to steady-state solution, and the simulated groundwater elevations were compared to the measured values at 73 monitoring wells and piezometers in the Box and Osburn Flats. This process was repeated until a reasonable calibration was achieved. The final multiplier used in the 90th percentile flow simulations was 3 (i.e., the final deep percolation values were three times greater than the baseflow values). Figure A-9 presents a scattergram of simulated versus measured groundwater elevations, while Figures A-10a, A-10b, and A-10c present the distribution of residuals between simulated and measured groundwater elevations in map view.

Calibration of the Canyon Creek Model to the 90th percentile flow condition involved modifications to boundary conditions similar to those previously discussed. The stream stage elevations were modified based on data recorded at stilling wells A2-SSD, A4E-SSD, and A6-SSD and the USGS stream gauge CC-288. Because the three stilling wells have surveyed reference point elevations, actual stream stage values measured on April 20, 2009, were incorporated into the calibration of the Canyon Creek Model, as opposed to the gauge height differences used in the SFCDR Model calibration. A stream stage value for stream gauge CC-288 was calculated using the gauge height difference between April 20, 2009, and the fall of 2006. New stream stage elevations were then applied to all stream nodes in the model by interpolating stream stage values, as a function of distance, between the four stilling well/gauge locations. From stilling well A2-SSD to the Canyon Creek headwaters, the baseflow stream stage elevation was decreased by 0.055 feet, the difference between the baseflow and 90th percentile stream stages at this stilling well. A multiplier was applied to the calibrated baseflow distribution of deep percolation of precipitation in order to simulate the wetter hydrologic conditions. The final multiplier used in the 90th percentile flow simulations was 5.45 (i.e., the final deep percolation values were 5.45 times greater than the baseflow values). Figure A-11 presents a scattergram of simulated versus measured groundwater elevations, and Figure A-12 presents the distribution of residuals between simulated and measured groundwater elevations in map view.

A.3.4 Transient Annual Calibration

The primary methodology used to evaluate the potential benefit of various remedial actions on downgradient surface water quality for this FFS was the Predictive Analysis Tool, discussed in Appendix B of the FFS Report. Because the inputs and outputs to and from this tool are average annual data, it was necessary to calibrate both the SFCDR and Canyon Creek Models to a transient annual condition. It was determined that using the most recent data would provide the largest dataset for these calibrations. At the time of the calibration, the fall 2009 transducer download had not occurred; therefore, it was not possible to calibrate to Water Year 2009. Both groundwater flow models were calibrated to the most recently available data, from July 1, 2008 through June 30, 2009. The output from these model simulations represent the average flows for the 365-day annual period, so they do not represent a long-term average or "typical" conditions.

A.3.4.1 SFCDR Model

Similar to the steady-state calibrations previously listed, modifications to the head-dependent boundary conditions were made to reflect varying hydrologic conditions observed over the course of the year. Streams included in the SFCDR Model are listed in Table A-5. For the stream reaches with stage monitoring equipment and a continuous dataset between July 1, 2008 and June 30, 2009, a new baseline stream state distribution was calculated. This was accomplished by calculating the gauge height difference between July 1, 2008 and September 20 through October 20, 2009 (the baseflow calibration period). This gauge height difference was then applied to the baseflow stream stage distribution for each reach (reaches are defined as the half-distance between the monitoring locations listed in Table A-5). Unmonitored streams were assigned changes in baseflow stream stages consistent with that described for the 90th percentile flow calibration (i.e., small streams were assigned the values from Deadwood Gulch and large streams were assigned the values of the mouth of Government Gulch). For each stilling well and stream gauge location, the average daily deviation from the July 1, 2008 gauge height/stream stage was calculated. These daily deviations were applied to the July 1, 2008 baseline stream stage distribution throughout the transient simulation. Exceptions included the following:

- The Osburn Flats stilling wells were installed in fall 2008; therefore, continuous transducer data for these locations prior to November 2, 2008, were not available. Regressions between available gauge height data at each Osburn Flats stilling wells and data from the Elizabeth Park gauge (SF-268) were developed. These regressions were used to populate the missing gauge height data back to July 1, 2008, for the three Osburn Flats stilling wells. Daily deviations from the July 1, 2008, gauge height were estimated from the entire dataset.
- The new USGS stream gauge at Smelterville Flats (at the western end of the Bunker Hill Box) began recording data on September 23, 2008. A regression was developed between the available gage height data at this gauge and SF-268. This relationship was used to populate the missing gauge height data for the Smelterville Flats gauge. Daily deviations from the July 1, 2008, gauge height were estimated from the entire dataset.
- Where there were gaps in the daily data, the last estimated deviation from the baseline stage prior to the missing data was applied to the entire data gap.
- Transducers in stilling wells BH-BC-0005 and BH-BC-0006 were not submerged over a large portion of the dataset. The estimated deviations from the baseline stream stage distribution for BH-BC-0004 were applied to all Bunker Creek stream reaches.

The second modification that was made to boundary conditions within the SFCDR Model was to vary the quantity of deep percolation of precipitation over the course of the year-long transient simulation. Developing a recharge runoff relationship for the SFCDR Watershed was beyond the scope of this effort; therefore, the deep percolation of precipitation was varied, according to an average unit groundwater hydrograph. Multipliers were applied to the calibrated baseflow distribution of deep percolation of precipitation on a monthly basis. Table A-7 lists the monthly factors. Deep percolation was modified so that the total annual deep percolation within the major alluvial areas equals the average annual deep percolation of precipitation estimated using the Turner approximation (Turner, 1986).

The transient annual simulation was set up such that the model was first run to steady-state under baseflow conditions. At the start of the transient simulation, a specific yield of 6 percent was assigned to alluvial areas of model layers 1 and 2, and a specific storage of 2×10^{-6} x model layer thickness was assigned to bedrock areas of model layers 1 and 2 and all of model layers 3 through 6. The baseline July 1, 2008 stream elevation distribution was loaded, and the July 2008 multiplier was applied to the deep percolation distribution. The transient simulation then proceeded with stream stage varying on daily time steps and deep percolation of precipitation varying on monthly time steps. Targets for the transient average annual simulation consisted of average daily measured groundwater elevations at 69 monitoring wells and piezometers within the Box and Osburn Flats. Simulated heads for each of these locations and simulated groundwater discharge to surface water were output on a daily basis. At the end of each simulation, the calibration to measured groundwater elevations was evaluated and additional modifications were made as necessary. During the calibration process many parameters were varied to test the improvement to the overall calibration, including: varying the streambed resistance terms, modifying the stream stage elevations, varying the vertical resistance terms between model layers, decreasing the specific yield, and globally decreasing the initial heads. Of the parameter variations previously listed, the following modifications were retained in the final transient calibration:

- Reduction of the baseline July 1, 2008 stream stage in the SFCDR reach defined by the Elizabeth Park stream gauge by 1 foot
- Re-interpolation of the baseline July 1, 2008 stream stage distribution of the SFCDR reach between monitoring wells BH-SF-E-101-U and BH-SF-E-0314-U
- Re-interpolation of the baseline July 1, 2008 stream stage distribution of the SFCDR reach between monitoring locations BH-SF-W-PZ-05 and BH-SF-W-0201-U

Because the groundwater hydrographs in monitoring wells and piezometers near the SFCDR showed similar magnitude of responses to the SFCDR hydrograph, it was assumed that the SFCDR was in hydraulic connection with the groundwater system. Although there were no stream gauges in the reaches listed above, groundwater elevations measured on July 1, 2008, at monitoring wells adjacent to the SFCDR were used as data points for the re-interpolation of the baseline stream stage distribution. Plots showing simulated versus measured groundwater elevations from the final transient calibration targets are presented on Figures A-13a through A-13i.

A.3.4.2 Canyon Creek Model

The transient average annual calibration for the Canyon Creek Model followed a similar methodology as described for the SFCDR Model. Rather than establishing a baseline stream stage for the July 1, 2008 initial condition and then applying changes in stream stage from this distribution based on gauge height deviations, average daily stream stage distributions were developed. Daily stream stage distributions were based on linear interpolation, as a function of distance between gauges, of pressure transducer data recorded at stilling wells A2-SSD, A4E-SSD, and A6-SSD and the USGS stream gauge at the mouth of Canyon Creek (CC-288). Because no reference point elevation was available for the USGS stream gauge at the mouth of Canyon Creek, it was necessary to estimate an initial stream stage for interpolation based on the difference in gauge height between July 1, 2008 and the fall 2006

baseflow calibration period. Daily stream stages were calculated based on gauge height deviations from this starting condition. Additionally, it was necessary to develop "soft" data points for nodes representing the headwaters of Canyon Creek and the southwestern model boundary at the confluence with the SFCDR. A constant stream stage of 5,856 feet mean sea level (msl) was used in the daily interpolation of the headwaters node. The node representing the confluence with the SFCDR was assumed to have a stage 3 feet lower than that at stream gauge CC-288. Daily stream stages were interpolated between:

- The southwestern model boundary (confluence with the SFCDR) and gauge CC-288
- Gauge CC-288 and stilling well A6-SSD
- Stilling wells A6-SSD and A4E-SSD
- Stilling wells A4E-SSD and A2-SSD
- Stilling well A2-SSD and the headwaters of Canyon Creek

An annual average deep percolation of precipitation distribution (based on the Turner approximation [Turner, 1986]) was developed for the Canyon Creek Watershed. The annual distribution was apportioned monthly, by applying multipliers to the distribution based on the approximate trend of an average annual groundwater hydrograph. This approach differed from the approach used in the SFCDR Model calibration; the multipliers were applied to an average annual distribution rather than the calibrated baseflow distribution of deep percolation of precipitation. Table A-8 provides the values of the monthly multipliers applied to the deep percolation of precipitation distribution. Multipliers were calculated such that the total deep percolation applied during the average annual simulation was consistent with that estimated using the Turner approximation (Turner, 1986).

The model simulation consisted of loading an initial set of heads (the calibrated baseflow heads), assigning the storage values, and applying the changes to the boundary conditions discussed above. A specific yield of 5 percent was assigned to model layer 1, and a specific storage of 2×10^{-6} x model layer thickness was assigned to model layers 2 through 5. The transient simulation was calculated with stream stage varying on daily time steps and deep percolation of precipitation varying on monthly time steps. Targets for the transient average annual simulation consisted of average daily measured groundwater elevations at eight monitoring wells within the Woodland Park area of the Canyon Creek Watershed. Simulated heads for each of these locations and simulated groundwater discharge to surface water were output on a daily basis. The match between simulated and measured groundwater elevations from the initial transient simulation was acceptable; therefore, no model parameters were changed. Plots showing simulated versus measured groundwater elevations from the final transient calibration are presented on Figure A-14.

A.4 Methodology for Development of Metals Loading Budget

The calibrated groundwater flow models provide improved estimates of the magnitude of groundwater-surface water interaction within the Box, Osburn Flats, and the Canyon Creek Watershed. This information was used to identify the location and magnitude of groundwater discharge to streams within the watershed. By combining the groundwater discharge estimates with dissolved metals concentrations in groundwater, the groundwater flow data can be converted into estimates of metals flux from groundwater to surface water.

The SFCDR and Canyon Creek Models are groundwater flow models; therefore, metals transport and geochemical reactions are not simulated. As an alternative, dissolved metals loadings to the surface water were estimated by dividing the gaining portions of the SFCDR and Canyon Creek into reaches, and selecting representative monitoring wells that are assumed to reflect the dissolved metals concentrations in groundwater entering the stream over a given reach. The average dissolved metals concentrations within a particular reach can then be multiplied by the simulated groundwater flow to the stream reach predicted by the groundwater flow model to yield estimates of metals loadings. These values can then be compared with more traditional loading calculations, derived from comparing calculated upstream and downstream loads based on surface water flows and surface water metals concentrations, to evaluate consistency in the independent loading estimates. If the estimates agree reasonably well, confidence is gained that the independent predictions of metals loadings to the stream over certain reaches are reasonably accurate. This methodology assumes that (a) dissolved zinc can be used as a surrogate for other metals (i.e., the reaches with the greatest zinc loads are also areas with the highest cadmium loads), and (b) there is no change in dissolved metals concentrations in groundwater between the location of the groundwater monitoring well and the discharge area into the stream (i.e., metals transport in the groundwater system is conservative between the monitoring well and the stream discharge area). The most recent dissolved zinc concentration data (collected in fall 2008) were used in this analysis.

A.4.1 Baseline Metals Loadings—SFCDR Model

Dissolved zinc loadings to the SFCDR were estimated by combining the simulated groundwater discharge rates to the stream with the dissolved zinc concentrations measured in nearby groundwater monitoring wells. Figure A-15 presents the distribution of dissolved zinc in the groundwater system measured during the fall 2008 and spring 2009 sampling events in the Bunker Hill Box. To estimate the metals loadings from groundwater discharge within the Box, the SFCDR and major tributaries were subdivided into 29 reaches. The streams were subdivided so that there was one monitoring well or piezometer associated with each reach. The geographic locations of these reaches are shown on Figure A-15. For a given simulation, the simulated groundwater discharge to the stream was multiplied by the dissolved zinc concentration in groundwater measured at the associated monitoring well or piezometer, and the simulated flow from the stream to the groundwater system was multiplied by the dissolved zinc concentration in surface water measured during the 2008 OU 2 groundwater-surface water interaction study (CH2M HILL, 2009a). The net dissolved zinc load for each reach was calculated as the difference between the stream load gained and lost. The calculated net loads for all 29 reaches were then added together to estimate a total load gained through the Box under a particular hydrologic condition. Dissolved zinc concentrations for the hydrologic conditions described in Section A.3.4 were used as follows:

- Baseflow—fall 2008 dissolved zinc concentration
- 7Q10—fall 2008 dissolved zinc concentration
- 90th percentile flow—spring 2009 dissolved zinc concentration

- Transient annual—fall 2008 dissolved zinc concentrations were applied to the time frame from August 1, 2008 through March 15, 2009; spring 2009 dissolved zinc concentrations were applied to the time frames from July 1, 2008 through July 31, 2008 and from March 16, 2009 through June 30, 2009.

Dissolved zinc loading for the remedial action simulations followed a similar methodology as discussed above to estimate total loading to the surface water system. Estimates of dissolved zinc loading to groundwater collection systems were calculating by multiplying the simulated load to the French drains included in the remedial alternatives for OU 2 by the average groundwater concentration in adjacent monitoring wells and piezometers. It was assumed that the French drain systems simulated in the OU 2 alternatives were set far enough away from streams that any induced flow from streams would flow through contaminated sediments before discharging to the drain systems.

For groundwater actions proposed for the Mainstem SFCDR Watershed, Segment 01, the dissolved zinc load was calculated as previously described. For all hydrologic conditions, the dissolved zinc concentration was assumed to be equal to the average concentration measured in Osburn Flats monitoring wells in fall 2008 (1.8 milligram per liter [mg/L]), and the surface water concentration was assumed to be the average measured during the 2008 Osburn Flats groundwater-surface water interaction study (0.75 mg/L) (CH2M HILL, 2009c).

Discussions of how each of the above remedial alternatives was simulated and the results are provided in Sections A.5 and A.6.

A.4.2 Baseline Metals Loadings—Canyon Creek Model

The zinc loading to Canyon Creek was estimated using a similar methodology as described above for the SFCDR Model. The model-simulated groundwater discharge rates were multiplied by the observed zinc concentrations measured in monitoring wells in the Woodland Park area of the Canyon Creek Watershed. The dissolved zinc loading estimates focused on this area of the watershed because this is where groundwater components of various remedial actions were evaluated. To estimate the metals loading from groundwater discharge, the Woodland Park area was subdivided into 12 reaches. The geographic location of each reach and the distribution of dissolved zinc in groundwater, as measured during fall 2006, are shown on Figure A-16. For the purposes of this FFS, the average dissolved zinc concentration within each reach was calculated; these data are provided in Table A-9. Dissolved zinc loading to the surface water system was estimated by multiplying the simulated total groundwater discharge to Canyon Creek and to land surface by the average dissolved zinc concentration within each reach. This methodology assumes that ground-water discharge to low-lying areas adjacent to Canyon Creek eventually flows into the stream. The total dissolved zinc load to Canyon Creek through Woodland Park was estimated as the sum of all 12 reaches. Because the fall 2006 sampling event represents the most recent synoptic dissolved zinc dataset for the Canyon Creek Watershed, these data were used for estimating dissolved zinc loading under all hydrologic conditions described Section A.3.

Remedial actions proposed for the Woodland Park area include various source control and sediment removal actions. It was assumed that these actions would reduce the dissolved

zinc concentrations in groundwater. The magnitude of these reductions within each of the 12 Woodland Park reaches was assumed to be a function of the percent of material removed, the remedial effectiveness factor (REF) from the Simplified Tool for Predictive Analysis[1], and the fraction of the total area of each reach represented by a given source. The estimation of the reduction in dissolved zinc concentrations in groundwater resulting from source removal actions was as follows:

- The percentage of total volume of each contaminant source proposed to be removed was estimated (Table A-10, column 3).
- The REF for each type of source removal action was taken from the Simplified Tool (Table A-10, column 4).
- The effective REF for each type of source removal action was calculated by multiplying the proposed percentage of material to be removed by the REF (Table A-10, column 5).
- For each Woodland Park reach, the area of contaminant source within the reach was estimated (Table A-10, column 6).
- For each Woodland Park reach, the fraction of the total area represented by each contaminant source was calculated (Table A-10, column 7).
- For each Woodland Park reach, the fraction of the total area for each contaminant source was multiplied by effective REF (Table A-10, column 8).
- The total REF for each reach was the sum of all the fractions of effective REFs for all contaminant sources within the reach (Table A-10, column 9).

The total REFs for the reaches were used to reduce the average dissolved zinc concentration in groundwater by assuming that for a given reach, the concentration would be reduced by a percentage equal to the total REF. For example, for Reach 01, the total REF for the reach was estimated to be 69 percent; this means that the average dissolved zinc concentration after the source removal actions are completed would be 31 percent of the initial concentrations. The pre-removal action and estimated post-source-removal-action dissolved zinc concentrations in groundwater are presented in Table A-9. A complete discussion of the simulation results is presented in Section A.6.

A.5 Application of Groundwater Flow Models to Remedial Alternatives for OUs 2 and 3

This section describes how the groundwater components of each of the remedial actions included in the applicable remedial alternatives described in Sections 6.0 and 7.0 of the FFS Report were implemented in the SFCDR and Canyon Creek Models. These components were consistently implemented in the models for all steady-state and transient hydrologic

[1]The Simplified Tool was developed in 2008 to provide a simplified version of the Predictive Analysis that was used in the Remedial Investigation/Feasibility Study for the Coeur d'Alene Basin (USEPA, 2001a, 2001b, and 2007) and is also used in this FFS Report. The Simplified Tool allows for the evaluation of source sites and the potential benefits of specific remedial actions for smaller segments of a stream, as opposed to the aggregated source sites and remedial actions evaluated using the Predictive Analysis. The *Working Draft Technical Memorandum: Overview of the Simplified Predictive Analysis for Estimating Post-Remediation Water Quality* (CH2M HILL, 2008) presents the details of how the Simplified Tool was developed.

flow conditions discussed in Section A.3. The results of the simulations are presented in Section A.6.

A.5.1 OU 2 Alternative (a)

OU 2 Alternative (a) consists of limited stream-lining actions in losing reaches of OU 2 streams to reduce recharge to the shallow alluvial groundwater system. The overall goal of this alternative is to reduce the mobilization, transport, and mass flux of dissolved metals in the groundwater system by reducing stream leakage from losing portions of the SFCDR and tributaries, which would ultimately protect surface water downstream. This alternative was developed to provide a limited passive action alternative without water treatment. The locations of stream liners included in this alternative are based on the low operation and maintenance (O&M) and minimal water management option identified during the OU 2 remedial alternative screening process, and were optimized during this process. Figure A-17 shows the locations of the stream liners that comprise this alternative, which include the following:

- Lining the SFCDR from the eastern portion of the Box to the I-90 underpass at the northeast corner of the CIA
- Lining Bunker Creek from the Central Treatment Plant (CTP) to the I-90 culvert
- Lining Magnet Gulch from McKinley Avenue to the confluence with Bunker Creek
- Lining Deadwood Gulch from McKinley Avenue to the confluence with Bunker Creek

For all the steady-state and transient simulations discussed in Section A.3, these stream liners were simulated in the SFCDR Model by assigning a streambed conductance term of zero where liners will be installed. This effectively removes the boundary condition from these nodes, eliminating groundwater and surface water exchange.

A.5.2 OU 2 Alternative (b)

OU 2 Alternative (b) consists of extensive stream lining actions in OU 2 streams to reduce recharge to the shallow alluvial groundwater system. Groundwater cutoff walls would be installed at select locations as part of this alternative. The overall goal of OU 2 Alternative (b) is to (more extensively than OU 2 Alternative (a)) reduce the mobilization, transport, and mass flux of dissolved metals in the groundwater system to the extent practicable, with no groundwater treatment, by reducing stream leakage from losing portions of tributaries to the SFCDR, which would ultimately protect surface water downstream. To achieve this goal, losing stream reaches were selected for lining. Similar to OU 2 Alternative (a), the locations of stream liners included in this alternative are based on the objective of low O&M and minimal water management as identified during the OU 2 remedial alternative screening process, and were optimized during this process. Figure A-18 shows the locations of the components of this alternative, which include the following:

- Lining Bunker Creek from the CTP to the confluence with Bunker Creek
- Lining Magnet Gulch from the point in the SFCDR Watershed where surface water has elevated metals concentrations (approximately half the distance to the headwaters) to the confluence with Bunker Creek

- Lining Deadwood Gulch from where surface water has elevated metals concentrations (approximately half the distance to the headwaters) to the confluence with Bunker Creek
- Lining Government Creek from the upstream point of Government Gulch to the confluence with Bunker Creek
- Installing groundwater cut-off walls at the upstream end of all stream liner segments except those on Bunker Creek
- Installing clean groundwater collection sumps on the upstream side of the groundwater cut-off walls
- Installing sub-liner collection systems below stream liners, except those on Bunker Creek, to prevent floating the liners in gaining stream reaches

For the steady-state and transient simulations discussed in Section A.3, stream liners were simulated in the SFCDR Model by assigning a streambed conductance term of zero where liners will be installed. This effectively removes the boundary condition from these nodes, eliminating groundwater and surface water exchange. Groundwater cut-off walls were simulated by assigning anisotropy to the horizontal hydraulic conductivity field. Anisotropy was assigned to alluvial layers in the location of cut-off walls such that the hydraulic conductivity in the direction of groundwater flow was 1 percent of the hydraulic conductivity perpendicular to flow. For example, the horizontal hydraulic conductivity in the alluvial valley of Deadwood Gulch is 10 feet/day. In the location of the groundwater cut-off wall, the hydraulic conductivity in the downgradient flow direction is 0.1 foot/day, while the hydraulic conductivity perpendicular to flow remains at 10 feet/day. This methodology allowed the assignment of a barrier to flow without having extremely large contrasts in model properties in adjacent nodes, thereby increasing the numerical stability of the model simulation. Groundwater sumps on the upstream side of cut-off walls and sub-liner collection systems were simulated using the MicroFEM drain package. These one-way head-dependent boundary conditions act as sinks when simulated groundwater elevations exceed the drain elevations, but do not act as sources of water when the simulated groundwater elevations are lower than drain elevations. Drain elevations were set at 2.5 feet below the calibrated baseflow groundwater elevation for all steady-state and transient model simulations. This means that during simulations of "wetter" and "drier" hydrologic conditions, the drain elevation did not fluctuate with the simulated water table.

A.5.3 OU 2 Alternative (c)

OU 2 Alternative (c) consists of a French drain system located in the central portion of OU 2 in the area with the highest dissolved metal load gains observed in the SFCDR. This French drain system would intercept dissolved-metals-contaminated groundwater prior to discharging to the SFCDR. Figure A-19 shows the locations of the components of this alternative, which include the following:

- Piping the CTP effluent directly to the SFCDR along the eastern side of the CIA instead of conveying the discharge down Bunker Creek.
- Installing a French drain parallel to the SFCDR in the highest dissolved metals loading reach between the CIA and I-90.

- Installing a French drain perpendicular to the SFCDR alluvial valley in the narrows between the eastern and western portions of the Box. This drain would be keyed in to the bedrock on the western side of the mouth of Government Gulch.

The piping of the CTP discharge directly to the SFCDR was simulated in the SFCDR Model using the same methodology as used for the stream liners discussed in previous sections. A streambed conductance term of zero was assigned to the entire length of Bunker Creek, eliminating groundwater and surface water exchange. The French drains were simulated using the MicroFEM drain package. French drain elevations were set at either the geological contact between the upper aquifer and the confining unit or at 25 feet below ground surface, whichever was shallower. Additionally, drain elevations were assigned such that there was a slope towards the pump station near Bunker Creek. The same drain elevations were used for model simulations under all hydrologic conditions. A hydraulic conductivity of 1,500 feet/day was assigned along the French drains to simulate coarse backfill material.

A.5.4 OU 2 Alternative (d)

OU 2 Alternative (d) consists of French drains, stream linings, cutoff walls, and extraction wells located in the central portion of OU 2, primarily in the area with the highest dissolved metal load gains observed in the SFCDR. Similar to OU 2 Alternatives (a) and (b), the overall goal of stream lining is to reduce the mobilization, transport, and mass flux of dissolved metals in the groundwater system to the extent practicable by reducing stream leakage from Government Creek. This alternative would reduce groundwater recharge and intercept dissolved-metals-contaminated groundwater for treatment prior to discharging to the SFCDR. Figure A-20 shows the locations of the components of this alternative, which include the following:

- Lining Government Creek from the upstream point of Government Gulch to the I-90 culvert
- Installing a groundwater cut-off wall at the upstream end of the stream liner
- Installing clean groundwater collection sumps on the upstream side of the groundwater cut-off wall
- Installing a line of contaminated groundwater collection wells at the mouth of Government Gulch
- Installing sub-liner collection systems below stream liners to prevent the liners from floating where Government Creek is gaining
- Piping the CTP effluent directly to the SFCDR along the eastern side of the CIA instead of conveying the discharge down Bunker Creek
- Installing a French drain parallel to the SFCDR in the highest dissolved metals loading reach between the CIA and I-90
- Installing a French drain perpendicular to the SFCDR alluvial valley in the narrows between the eastern and western portions of the Box. This drain would be keyed in to the bedrock on the eastern side of the mouth of Government Gulch

Stream lining and piping the CTP effluent directly to the SFCDR, rather than conveyance via Bunker Creek, were simulated in the SFCDR Model as discussed above, by assigning a streambed conductance term of zero to affected stream nodes. The groundwater cut-off wall at the head of Government Gulch was simulated, as discussed for OU 2 Alternative (b), by assigning anisotropy to the horizontal hydraulic conductivity field. The groundwater sumps on the upstream side of the cut-off wall, the sub-liner collection system, the French drains in the SFCDR valley, and the line of extraction wells at the mouth of Government Gulch were simulated using the MicroFEM drain package. The drain elevations of the sumps and the sub-liner collection system were set at 2.5 feet below the calibrated baseflow groundwater elevation for all steady-state and transient model simulations. The elevations of the French drains in the SFCDR valley were set at either the geological contact between the upper aquifer and the confining unit or at 25 feet bgs, whichever was shallower. Additionally, drain elevations were assigned so that there was a slope towards the pump station near Bunker Creek. The drain elevation of the line of extraction wells at the mouth of Government Gulch was set at the geological contact between the alluvium and bedrock. The same drain elevations were used for model simulations under all hydrologic conditions. A hydraulic conductivity of 1,500 feet/day was assigned along the French drains and the line of extraction wells to simulate coarse backfill material.

A.5.5 OU 2 Alternative (e)

OU 2 Alternative (e) is the most extensive water collection and management alternative, incorporating extensive stream lining of the SFCDR and its tributaries, as well as French drain systems. The goal of OU 2 Alternative (e) is "no-net gain in dissolved metals through the Bunker Hill Box". Figure A-21 shows the locations of the components of this alternative, which include the following:

- Lining Government Creek from the upstream point of Government Gulch to the confluence with the SFCDR, the SFCDR throughout the Bunker Hill Box, the entire length of Bunker Creek, Deadwood Gulch and Magnet Gulch from where surface water has elevated metals concentrations to the confluence with Bunker Creek, and Humboldt Creek and Grouse Creek from where they enter the SFCDR valley to the confluence with the SFCDR
- Installing groundwater cut-off walls at the upstream end of the stream liners
- Installing a groundwater cut-off wall at the western end of the Box (installed to the top of the confining unit)
- Installing a clean groundwater cut-off wall at the eastern end of the Box (installed to bedrock)
- Installing clean groundwater collection sumps on the upstream sides of the groundwater cut-off walls
- Installing sub-liner collection systems below stream liners to prevent the liners from floating where Government Creek, Magnet Gulch, and Deadwood Gulch are gaining
- Installing a French drain in the eastern portion of the Box (between the CIA and I-90) to prevent the liner from floating where the SFCDR is gaining

- Installing a French drain in the western portion of the Box (in Smelterville Flats) to prevent the liner from floating where the SFCDR is gaining
- Removing the weirs in the Page Swamps

Stream liners were simulated in the SFCDR Model as discussed above, by assigning a streambed conductance term of zero to affected stream nodes. Groundwater cut-off walls were simulated, as discussed for OU 2 Alternative (b), by assigning anisotropy to the horizontal hydraulic conductivity field. The groundwater sumps on the upstream sides of cut-off walls, the sub-liner collection systems, and French drains in the SFCDR valley were simulated using the MicroFEM drain package. The drain elevations of the sumps and sub-liner collection systems were set at 2.5 feet below the calibrated baseflow groundwater elevation for all steady-state and transient model simulations. The elevations of the French drain north of the CIA were set at either the geological contact between the upper aquifer and the confining unit or 25 feet below ground surface, whichever was shallower. Additionally, drain elevations were assigned such that there was a slope towards the pump station near Bunker Creek. The drain elevation of the French drain in Smelterville Flats was set at 5 feet below the calibrated baseflow water table. The same drain elevations were used for model simulations under all hydrologic conditions. A hydraulic conductivity of 1,500 feet/day was assigned along the French drains north of the CIA and in Smelterville Flats to simulate coarse backfill materials. Weir removal was simulated by converting the Page Swamps from a two-way head-dependent boundary condition to a one-way head-dependent boundary condition. Because ponding no longer occurs within the swamps, these could function as sinks for groundwater but not as a source of groundwater recharge.

A.5.6 Groundwater Components of OU 3 Remedial Alternatives for the Mainstem SFCDR Watershed, Segment 01

Figure A-22 shows the groundwater components of all the OU 3 remedial alternatives for the Mainstem SFCDR Watershed Segment 01. The objective of this remedial alternative was to hydraulically isolate this reach of the SFCDR via stream lining and collection and treatment of dissolved-metals-contaminated groundwater that would otherwise discharge to the SFCDR. The components of this alternative include the following:

- Lining the SFCDR from approximately Wallace to Elizabeth Park
- Installing a French drain adjacent to the stream liner to prevent floating the liner in gaining stream reaches
- Capping tailings piles at the Silver Dollar Mine (site KLE034), the Silver Crescent Mine (site KLE011), the Osburn Rock Pit along I-90 (site WAL035), and the Caladay Mine (site WAL020). These actions were included in the model simulations as they reduce groundwater recharge due to deep percolation of precipitation

Lining the SFCDR was simulated in the SFCDR Model, as discussed for the OU 2 alternatives, by assigning a streambed conductance term of zero to lined stream nodes. The French drain along the SFCDR was simulated using the MicroFEM drain package. The drain elevation was set at 5 feet below the calibrated baseflow groundwater elevation for all steady-state and transient model simulations. A hydraulic conductivity of 1,500 feet/day was assigned along the French drain to simulate coarse backfill materials. Capping the

tailings piles was simulated by assigning a deep percolation of precipitation of zero to model nodes representing the capped areas.

A.5.7 Groundwater Components of OU 3 Remedial Alternatives for Woodland Park

The updated groundwater components of the actions for the Woodland Park area included in the OU 3 remedial alternatives were simulated using the Canyon Creek Model. These components include a combination of stream liners and French drains that would be installed along Canyon Creek to reduce dissolved metals loading to the creek and to collect metals-contaminated water. The stream liners and French drains would be placed at locations that would maximize dissolved metals load reduction in the creek and minimize cost by (a) intercepting metals-contaminated groundwater that would otherwise discharge to Canyon Creek, and (b) reducing the mobilization, transport, and mass flux of dissolved metals in the groundwater system by reducing stream leakage from losing portions of Canyon Creek. The locations of stream liners and French drains included in this alternative were optimized during the remedial alternative screening process. Figure A-23 shows these components, which include the following:

- Lining the losing reach Canyon Creek from approximately Site A2 to Site A4E
- Installing a French drain adjacent to Canyon Creek from approximately Site A2 to A6
- Installing a French drain cut-off system perpendicular to the Canyon Creek alluvial valley near Site A-6
- Installing a French drain along the base of the Silver Valley Natural Resource Trust tailings repository
- Piping the Gem portal discharge directly to Canyon Creek instead of discharging the effluent to Hecla Star Pond 6

Lining Canyon Creek was simulated, as discussed for the OU 2 alternatives, by assigning a streambed conductance term of zero to lined stream nodes. All of the French drain systems were simulated using the MicroFEM drain package. The drain elevations were set at 5 feet below the calibrated baseflow groundwater elevation for all steady-state and transient model simulations. Piping of the Gem portal discharge was simulated by removing the specified flux for all nodes representing Hecla Star Pond 6.

A.6 Simulation Results

Groundwater components of the remedial alternatives described in the previous section were simulated using the SFCDR and Canyon Creek groundwater flow models. The modeling simulations were performed to obtain an estimate of the relative effectiveness of each of the alternatives at reducing the dissolved metals loading to the SFCDR or Canyon Creek. The effectiveness of each alternative was estimated by running a model simulation with a remedy-in-place, and comparing the results with a baseline no-action simulation. The difference in metal loading between the two simulations was assumed to be the benefit of implementation of that particular alternative. Other information obtained from the model

simulations were estimated drain flows and CTP loads for the various remedial alternatives evaluated. The sole metric used in this analysis to quantify alternative effectiveness was the reduction in dissolved metals load to the SFCDR or Canyon Creek. While other benefits, such as minimizing treatment loading or keeping clean water clean, could also be considered, the assessment herein uses metal load reduction as the primary differentiator of remedy effectiveness for the purposes of comparing alternatives.

A.6.1 Baseflow Conditions

Groundwater components of the remedial alternatives were simulated under steady-state baseflow conditions observed during fall 2008 (the SFCDR Model) and fall 2006 (the Canyon Creek Model). This time period represents an approximate 25th percentile flow as defined by the SFCDR flow at the USGS stream gauge at Pinehurst (SF-271). Figure A-24 presents upstream flowlines from gaining portions of the SFCDR under these conditions. This figure also presents the simulated gaining and losing reaches of the SFCDR and tributaries for which stream lining is proposed in the alternatives described above. These flowlines suggest that under no-action baseline conditions, the primary sources of water to gaining portions of the SFCDR in the eastern portion of the Box include the losing reaches of the SFCDR and Bunker Creek, the groundwater underflow from the SFCDR alluvial system upstream of the Box, and underflow from the Milo Creek Watershed. The primary sources of water to the gaining reaches of the SFCDR in the western portion of the Box include the Page Swamps and losing reaches of the SFCDR and Government Creek. (Flowline figures are only presented for the baseflow conditions; flowlines for other hydrologic conditions show similar patterns).

Figure A-25 presents upstream flowlines from the same gaining reaches of the SFCDR with the components of OU 2 Alternative (a) in place. These flowlines are similar to the no-action baseline conditions, except that they do not track back to losing reaches of the SFCDR and Bunker Creek, as these stream reaches would be lined. Rather, a larger portion of the groundwater that discharged to these gaining reaches would originate as groundwater underflow from the SFCDR alluvial system upstream from the Box and underflow from the Milo Creek Watershed.

Figure A-26 presents upstream flowlines from the same gaining reaches of the SFCDR with the components of OU 2 Alternative (b) in place. These flowlines are similar to the no-action and OU 2 Alternative (a) conditions, except that flowlines do not track back to the tributary valleys of Bunker Creek due to the more extensive stream lining and groundwater cut-off walls in these gulches.

Figure A-27a presents upstream flowlines from the same gaining reaches of the SFCDR with the components of OU 2 Alternative (c) in place. This figure shows that a majority of the reach of the SFCDR north of the CIA would no longer be gaining. Flowlines from the portion of this reach that would still be gaining sweep north of the SFCDR under Kellogg. Figure A-27b presents upstream flowlines from the French drain system. This figure illustrates that a majority of the contaminated groundwater flowing beneath the CIA that once discharged to the SFCDR would be captured by the French drains.

Figures A-28a and A-28b present upstream flowlines from the gaining reaches of the SFCDR and the French drain systems with the components of OU 2 Alternative (d) in place. These

figures indicate that groundwater flow patterns would be similar to those discussed for OU 2 Alternative (c).

Figure A-29 presents upstream flowlines from French drains with the components of OU 2 Alternative (e) in place. No flowlines from gaining reaches of the SFCDR are presented because all streams would be lined within the Box under this alternative. This figure shows that with such extensive stream lining coupled with a cut-off wall at Elizabeth Park, the majority of water entering the French drains would be from groundwater underflow from the Milo Creek Watershed.

Figures A-30 and A-31 show upstream flowlines from gaining portions of the SFCDR under no-action conditions (Figure A-30), and with the French drain system proposed for Mainstem SFCDR Watershed Segment 01 actions implemented (Figure A-31). These figures show that the sources of water to either the SFCDR or the French drain system would be the same: losing portions of the SFCDR, or tributaries and groundwater underflow from the alluvial system upstream. Under the no-action scenario, this water is discharged to the SFCDR; when the stream was lined, however, the water would be discharged to the French drain system.

Figures A-32 and A-33 present upstream flowlines from gaining portions of Canyon Creek under no-action conditions (Figure A-32), and with the French drain system proposed for the updated remedial components for Woodland Park (Figure A-33). Figure A-32 also presents simulated gaining and losing reaches of Canyon Creek under baseflow conditions. These figures show a similar pattern to the pattern for Mainstem SFCDR Watershed Segment 01. Under no-action conditions, water discharging to gaining reaches of Canyon Creek originates from leakage from losing portions of Canyon Creek, groundwater underflow from upstream portions of the alluvial valley, and groundwater underflow from beneath the Silver Valley Natural Resource Trust (SVNRT) repository. With the remedial actions in place, this water would discharge to the French drain systems instead of to Canyon Creek.

Table A-11 presents summaries of simulated flows for the no-action and remedial alternative simulations under baseflow conditions. Under no-action baseline conditions, the SFCDR Model suggests that the SFCDR gain through the Box is approximately 8 cfs, while the loss is approximately 3 cfs. Model results suggest that the stream-lining-only options would not significantly reduce the gain to the SFCDR. Because the eastern losing reach of the SFCDR would be lined, OU 2 Alternative (a) would reduce the leakage from the SFCDR by approximately 2 cfs. OU 2 Alternative (b) would induce more seepage from the SFCDR than the no-action baseline conditions, likely the result of the lining of Government Creek. OU 2 Alternatives (c) and (d) would both reduce the groundwater discharge to the SFCDR by more than 50 percent; however, the French drains would induce stream leakage doubling the SFCDR leakage. Additionally, both alternatives would have a treatment flow of approximately 8.5 cfs. Under OU 2 Alternative (e), the streams would be lined; therefore, no stream loss or gain is simulated. The simulated treatment flow to the French drain and sub-liner collection systems is approximately 5.5. cfs. Within the Mainstem SFCDR Watershed Segment 01, between Wallace and Elizabeth Park in OU 3, the SFCDR Model suggests that the SFCDR would gain approximately 10 cfs and loses 8 cfs. With the remedial actions in place, there would be no groundwater-surface water interaction along the SFCDR as a result of stream lining, and the French drain inflow would be approximately 7.5 cfs. The results of

baseflow simulations from the Canyon Creek Model suggest that under no-action baseline conditions, Canyon Creek gains approximately 2 cfs and loses approximately 1 cfs. With the Woodland Park components of the OU 3 remedial alternatives in place, stream gain would be decreased by 0.5 cfs; however, Canyon Creek stream loss would increase by 0.3 cfs, and there would be an inflow of 1 cfs to the French drains.

Table A-12 presents summaries of the estimated dissolved zinc loading under baseflow conditions for the OU 2 and OU 3 baseflow simulations. These data suggest that under no-action baseline conditions, the total dissolved zinc load to the SFCDR through the Box is approximately 600 pounds per day (lb/day). This value is consistent with historical measurements from baseflow groundwater-surface water interaction studies. The stream-lining-only options would reduce the dissolved zinc load to the SFCDR by approximately 100 lb/day. OU 2 Alternative (a) would be more effective at reducing direct load to the SFCDR and the A-4 drain, while OU 2 Alternative (b) would reduce loading to Government Creek. OU 2 Alternatives (c) and (d) would reduce the direct dissolved zinc loading to the SFCDR by approximately 460 lb/day; however, OU 2 Alternative (d) would be more effective overall because it would reduce dissolved zinc loading to Government Creek. Both of these alternatives would have a treatment load of more than 1,000 lb/day. OU 2 Alternative (e) would be 100 percent effective in reducing dissolved zinc loading to the surface water system and would carry a treatment burden of approximately 550 lb/day. The net dissolved zinc loading to Mainstem SFCDR Watershed Segment 01 in OU 3 would be approximately 65 lb/day. As shown in Table A-12, the remedial actions would remove this zinc load from the system; however, the treatment load would be approximately 75 lb/day. Results from the Canyon Creek Model suggest that under no-action baseline conditions, the total dissolved zinc load to the Woodland Park reach of Canyon Creek is approximately 125 lb/day. The Woodland Park components of the remedial alternatives for OU 3 would reduce this loading by approximately 85 lb/day and have a treatment load of approximately 80 lb/day.

A.6.2 7Q10 Conditions

Tables A-13 and A-14 present the model-simulated flows and dissolved zinc load summaries, respectively, for no-action and remedial alternative simulations from the SFCDR and Canyon Creek Models under critical low-flow, 7Q10, conditions. A comparison of Tables A-11 and A-13 shows that the relative trends in simulated flows would be similar between baseflow and 7Q10 conditions. In general, streams would gain slightly less and lose slightly more under 7Q10 conditions than under baseflow conditions. This would be the result of lower groundwater elevations during drier periods.

Table A-14 shows that the estimated dissolved zinc load to the SFCDR under 7Q10 conditions would be approximately 550 lb/day, 50 lb/day less than under baseflow conditions. The five OU 2 alternatives show similar relative effectiveness under 7Q10 conditions as under baseflow conditions. Table A-14 shows that of the two stream-lining-only options, OU 2 Alternative (a) would be more effective under extreme low-flow conditions, probably because of the inclusion of lining the eastern losing reach of the SFCDR. The lining-only alternatives would be less effective than the actions involving the installation of French drains; however, there would be little or no treatment load. The estimated dissolved zinc load to Mainstem SFCDR Watershed Segment 01 in OU 3 would be approximately

60 lb/day under 7Q10 conditions. This load would be eliminated with the remedial actions in place; however, the estimated dissolved zinc load to the French drain would be 60 lb/day. Table A-14 shows that under 7Q10 conditions, the Woodland Park components of the OU 3 remedial alternatives would reduce the dissolved zinc loading to Canyon Creek by 75 lb/day and carry a treatment burden of approximately 50 lb/day.

A.6.3 90th Percentile Flow Conditions

Tables A-15 and A-16 present the model-simulated flows and dissolved zinc load summaries, respectively, for no-action and remedial alternative simulations from the SFCDR Watershed and Canyon Creek models under 90th percentile flow conditions, as defined at the USGS stream gauge at Pinehurst (SF-271). Simulated flows presented in Table A-15 suggest that for the SFCDR and tributaries within OU 2, the stream gains would be lower and stream losses higher during the higher flow conditions than under baseflow and 7Q10 conditions. This is likely because the stages in the surface water system would increase quicker than the groundwater elevations. The larger differential in elevations between the two systems would result in more stream loss and less stream gain. Simulated groundwater discharge to Canyon Creek is higher under 90th percentile flow than the drier hydrologic conditions. Simulated flows also show that in all cases, the French drain inflows would be higher under the wetter hydrologic conditions than during 7Q10 or baseflow periods.

Table A-16 presents the estimated dissolved zinc load to the surface water system within OU 2 and OU 3 under 90th percentile flow conditions. Under the no-action scenario, the estimated dissolved zinc loading to the SFCDR within the Box is 715 lb/day. Results from the SFCDR Model suggest that the relative effectiveness of the OU 2 alternatives would be similar under the wetter hydrologic conditions as under 7Q10 and baseflow conditions. The stream-lining-only options would reduce dissolved zinc loading by approximately 100 lb/day, while the alternatives including French drains would reduce loading by approximately 550 lb/day. The OU 2 Alternative (e) simulation shows some dissolved zinc loading to the surface water system, as the A-4 drain would be active under the wetter hydrologic conditions. The results for Mainstem SFCDR Watershed Segment 01 in OU 3 are similar to those for the other hydrologic conditions. Table A-16 shows that under 90th percentile flow conditions, the estimated dissolved zinc loading to Canyon Creek would be higher under 90th percentile flow conditions than under baseflow and 7Q10 conditions, approximately 260 lb/day. The Woodland Park components of the OU 3 remedial alternatives would reduce dissolved zinc loading to Canyon Creek by nearly 150 lb/day; however, the treatment load would be approximately 180 lb/day.

A.6.4 Average Annual Conditions

Tables A-17 and A-18 present the model-simulated flows and dissolved zinc load summaries, respectively, for the transient annual simulations for the SFCDR and Canyon Creek Models. A comparison of Tables A-11 and A-17 shows that the simulated flows are very similar under baseflow and the average annual conditions. Consistent with the 90th percentile simulation results, the simulated flows for the SFCDR and tributaries within OU 2 show that the stream gains would be lower and stream losses higher during the average annual conditions than under baseflow conditions. The simulated groundwater discharge to Canyon Creek is slightly higher under average annual than baseflow

conditions. Simulated flows also show that in all cases, the French drain inflows would be higher under the average annual hydrologic conditions than during baseflow periods.

Table A-18 presents the estimated dissolved zinc load to the surface water system within OU 2 and OU 3 under average annual flow conditions. A comparison of Tables A-12 and A-18 shows that the estimated dissolved zinc loading to the surface water system would be nearly identical under average annual and baseflow conditions. Although the simulated flows between the baseflow and annual simulations differ, the use of variable concentration distributions to estimate the average annual dissolved zinc loading for the transient simulations yields similar results to the steady-state baseflow simulations. The primary differences between the two hydrologic conditions are that OU 2 Alternative (a) would be slightly more effective than OU 2 Alternative (b), and the treatment loads would be slightly higher under average annual conditions. The results from the average annual simulations were used as input to the Predictive Analysis Tool, as discussed in Appendix B of the FFS Report.

A.7 OU 2 Sensitivity Analysis

Numerical models contain inherent uncertainty. Groundwater models are constructed using available field data and professional judgment to develop an accurate numerical representation of the physical features of a given site of interest, as well as of the physical processes that operate at that site. Additionally, the calibration process allows the modeler to further evaluate and modify the model input parameters in order improve the match between selected calibration targets and model predictions. The larger the number of individual calibration targets, and the greater the variety in the types of calibration targets used (e.g., groundwater elevations, simulated flows, vertical hydraulic gradients, and transient aquifer test data), the higher the degree of confidence is gained that the model is able to provide accurate forecasts of future site conditions. There is, however, error associated with measured field data, and numerical model solutions are non-unique, meaning that there are a large number of parameter configurations that can provide an equal level of calibration. To better quantify the potential range of uncertainty in the estimates of dissolved zinc loading to the SFCDR for the five OU 2 alternatives, an uncertainty analysis was undertaken using the SFCDR Model.

The sensitivity analysis performed on the SFCDR Model involved varying one model parameter at a time, within a specified range, and running numerous simulations to yield independent estimates of zinc loading to the SFCDR. The quality of model calibration was evaluated for each of these sensitivity simulations to ensure that the parameter change made in that run did not result in a model that no longer provides acceptable agreement between simulated and observed calibration targets.

Seven model input parameters were selected for modification during the SFCDR Model sensitivity analysis. Each parameter was increased and decreased by two factors, resulting in 28 model simulations for the no-action alternative and each of the five OU 2 alternatives, resulting in a total of 168 simulations. All of the sensitivity simulations were run using the steady-state, baseflow condition. It was assumed that the other hydrologic conditions would result in similar relative uncertainty. The model input parameters that were evaluated

during the sensitivity analysis, along with the range of values tested, are summarized as follows:

- **Horizontal hydraulic conductivity in the alluvial aquifer system—**The horizontal hydraulic conductivity of the alluvium in model layers 1 through 4 was multiplied and divided by factors of 5 and 10.
- **Horizontal hydraulic conductivity in the confining unit—**The horizontal hydraulic conductivity of the confining unit in model layer 3 was multiplied and divided by factors of 10 and 100.
- **Horizontal hydraulic conductivity in the bedrock aquifer system—**The horizontal hydraulic conductivity of the bedrock in model layers 1 through 4 was multiplied and divided by factors of 10 and 100.
- **Distribution of deep percolation of precipitation—**The calibrated baseflow distribution of deep percolation of precipitation was increased and decreased by 25 and 50 percent throughout the model domain.
- **The vertical resistance between model layers—**The vertical resistance terms at the interface between model layers 1 and 2, 2 and 3, and 3 and 4 were increased and decreased by factors of 10 and 100 throughout the model domain.
- **The streambed resistance term—**The streambed conductance term for the SFCDR was increased and decreased by factors of 5 and 10.
- **The wadi elevation term—**The baseflow stream stage distribution of the SFCDR was increased and decreased by 1 and 2 feet.

All of these parameter variations, with the exception of the deep percolation of precipitation, were applied prior to assigning properties for the simulation of the various remedial actions. Table A-19 summarizes the estimated dissolved zinc loading to the SFCDR within the Bunker Hill Box for all of the sensitivity analysis simulations. These data are presented graphically on Figure A-34. The baseflow estimates of residual dissolved zinc loading to the SFCDR from the calibrated model are shown as yellow triangles, while the black "x" symbols represent the results of all of the individual sensitivity analysis simulations. These data show that the simulations of the no-action and liner-only alternatives yielded a wider range of dissolved zinc loading estimates than did the simulations of the other alternatives. For example, the alternatives involving French drains show much less overall deviation from the baseflow dissolved zinc loading estimate obtained from the calibrated model, while the simulations of OU 2 Alternative (e) show even less.

In all cases, the highest estimates of dissolved zinc loading to the SFCDR for each alternative are from the simulations with increased horizontal hydraulic conductivity of the alluvial aquifer system. Increases in the hydraulic conductivity by factors of 5 and 10 over the currently assumed values result in extremely high values (up to 10,000 feet/day), greater than would be expected for the aquifer materials present at the site. Therefore, these results are not considered representative of site conditions. The lowest estimated values of dissolved zinc load for each alternative result from a variety of parameter modifications depending on the alternative being evaluated. But all of the parameter changes that resulted

in these low estimates involve parameters that make it more difficult for groundwater to discharge upward to the surface water system. These include increases in vertical resistance between layers (reducing vertical flow), increasing the streambed conductance terms, and increasing stream stage.

Overall, these results suggest that given the uncertainty in the model input parameters, it is not possible to predict whether OU 2 Alternative (a) or (b) would be more effective at reducing metals loading to the SFCDR. However, these results also clearly indicate that OU 2 Alternatives (c) and (d) would be more effective than the liner-only alternatives, and it appears that Alternative (d) would be the more effective of the French drain alternatives. Finally, results suggest that OU 2 Alternative (e) appears to be the most effective under all of the parameter variations considered in this analysis.

A.8 Additional Model Uncertainty

In addition to uncertainty in model forecasts associated with the assumed model input parameters, uncertainty is also associated with the methodology used to estimate dissolved metals loading to streams from groundwater flow model estimates. As discussed in Section A.4, simulated flow estimates of groundwater discharge to streams, and surface water leakage to underlying groundwater, are paired with analytical data from surface water sampling and groundwater monitoring well sampling. This methodology assumes that (a) dissolved zinc concentrations measured in monitoring wells and piezometers near streams are representative of the concentrations actually being discharged to the stream, and (b) a given set of samples collected during a discrete quarterly sampling event are representative of dissolved zinc concentrations over some range of time (e.g., over the baseflow or spring runoff period). Insufficient data are available with which to quantify the magnitude of uncertainty that these assumptions may introduce into model forecasts.

One final area of uncertainty in the modeling results originates from site characteristics that may be changed by remedial activities that are not explicitly included in the modeling assumptions. One example is that extensive remedial activities, such as surface water collection and treatment in the Upper Coeur d'Alene River Basin, may have significant effects on the magnitude and timing of stream flow in the SFCDR within OU 2. Changes to surface water flows and associated changes to river stage will affect groundwater conditions to some degree. These types of changes to site conditions have not been evaluated during the SFCDR Watershed modeling effort; they would likely have a relatively minor effect on remedy effectiveness.

A.9 References

CH2M HILL. August 2007. *Canyon Creek Hydrologic Study Report*. Prepared for U.S. Environmental Protection Agency Region 10.

CH2M HILL. October 24, 2008. *Working Draft Technical Memorandum: Overview of the Simplified Predictive Analysis for Estimating Post-Remediation Water Quality.* Prepared for the U.S. Environmental Protection Agency Coeur d'Alene Basin Eco-Planning Team.

CH2M HILL. March 31, 2009 (2009a). *Technical Memorandum: OU2 2008 Groundwater/Surface Water Interaction Monitoring Data Summary*. Prepared for U.S. Environmental Protection Agency Region 10.

CH2M HILL. April 2009 (2009b). *South Fork of the Coeur d'Alene River Watershed: Basinwide Groundwater Flow Model Documentation*. Prepared for U.S. Environmental Protection Agency Region 10.

CH2M HILL. July 2009 (2009c). *Technical Report, Osburn Flats Groundwater-Surface Water Interaction Study, Upper Coeur d'Alene Basin, Osburn, Idaho*. Prepared for U.S. Environmental Protection Agency Region 10.

Dougherty, J. July 2004. *PEST Model-Independent Parameter Estimation User Manual*. 5th Edition.

Dougherty, J. January 2007. *Addendum to the PEST Manual*.

Hemker, C.J., and G.J. Nijsten. 2003. *Groundwater Flow Modeling Using MicroFEM©*.

National Academy of Sciences (NAS). 2005. *Superfund and Mining Megasites: Lessons Learned from the Coeur d'Alene River Basin*. National Academies Press. Washington, D.C.

Turner, K.M. May 1986. *Water Loss from Forest and Range Lands in California*. Presented at the Chaparral Ecosystems Conference, Santa Barbara, California.

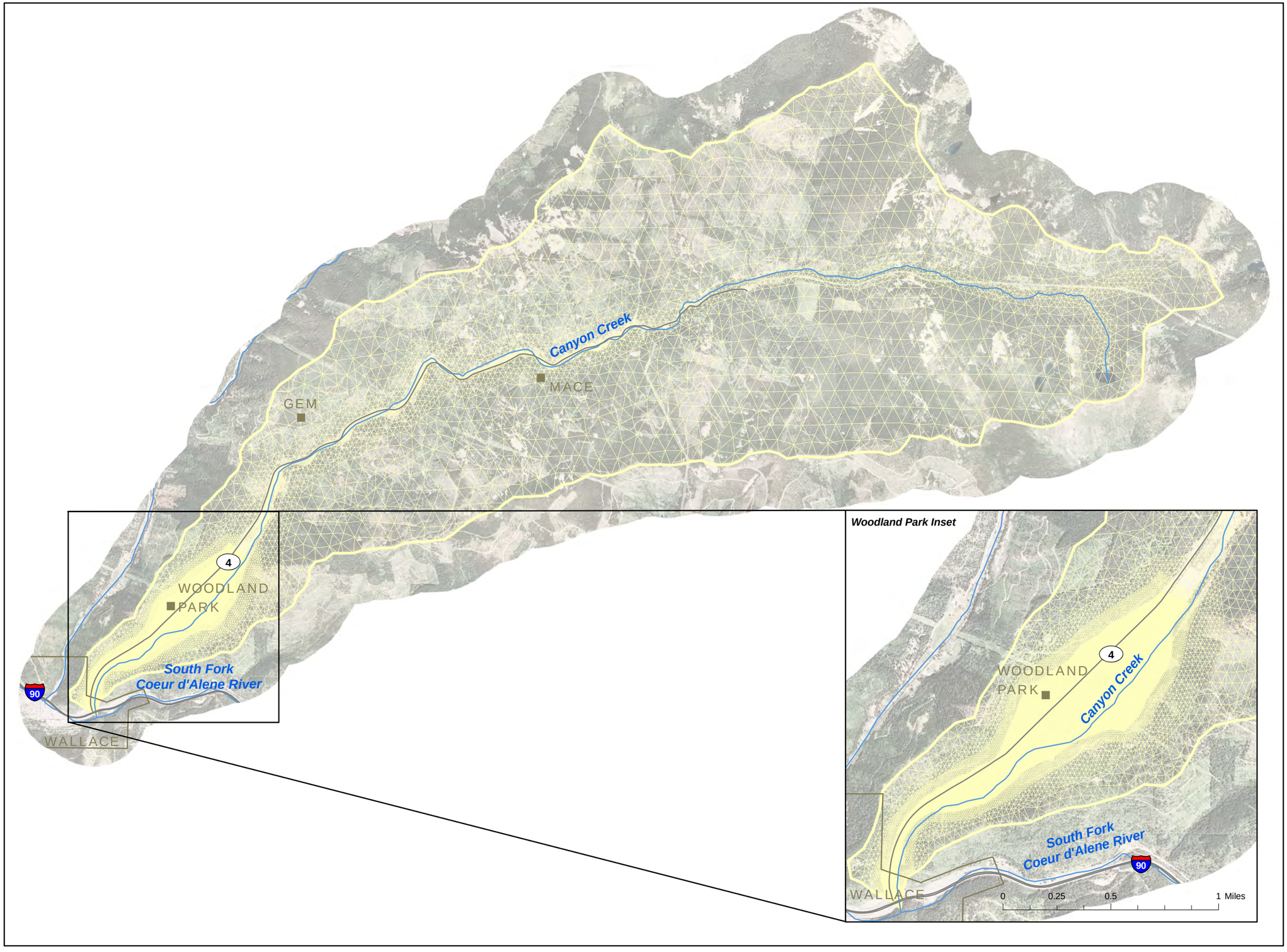
U.S. Environmental Protection Agency (USEPA). April 1999. *Total Maximum Daily Load for Dissolved Cadmium, Dissolved Lead, and Dissolved Zinc in Surface Waters of the Coeur d'Alene Basin.*

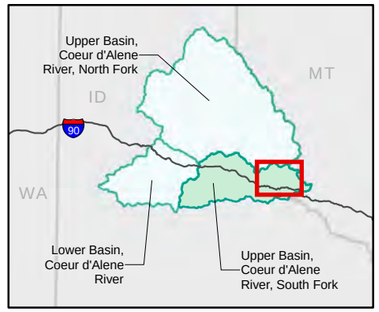
U. S. Environmental Protection Agency (USEPA). September 2001 (2001a). *Final (Revision 2) Feasibility Study Report, Coeur d'Alene Basin Remedial Investigation/Feasibility Study.* Prepared by URS Greiner and CH2M HILL for EPA Region 10.

U. S. Environmental Protection Agency (USEPA). October 2001 (2001b). *Final (Revision 2) Feasibility Study Report, Coeur d'Alene Basin Remedial Investigation/Feasibility Study.* Prepared by URS Greiner and CH2M HILL for EPA Region 10.

U. S. Environmental Protection Agency (USEPA). October 1, 2007. *A Predictive Analysis of Post-Remediation Metals Loading.*

Figures





Model Grid
River/Creek
Major Highway
City Limit

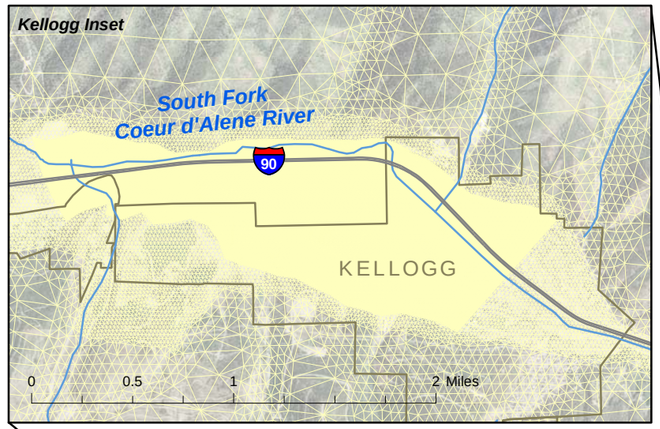
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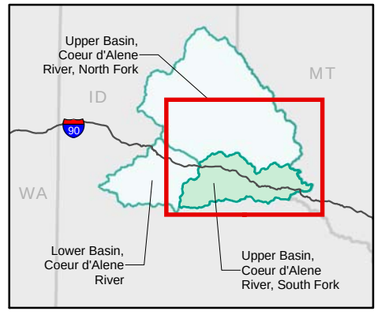
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Base Map Data:
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Figure A-1
Canyon Creek Model Grid
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

EPA





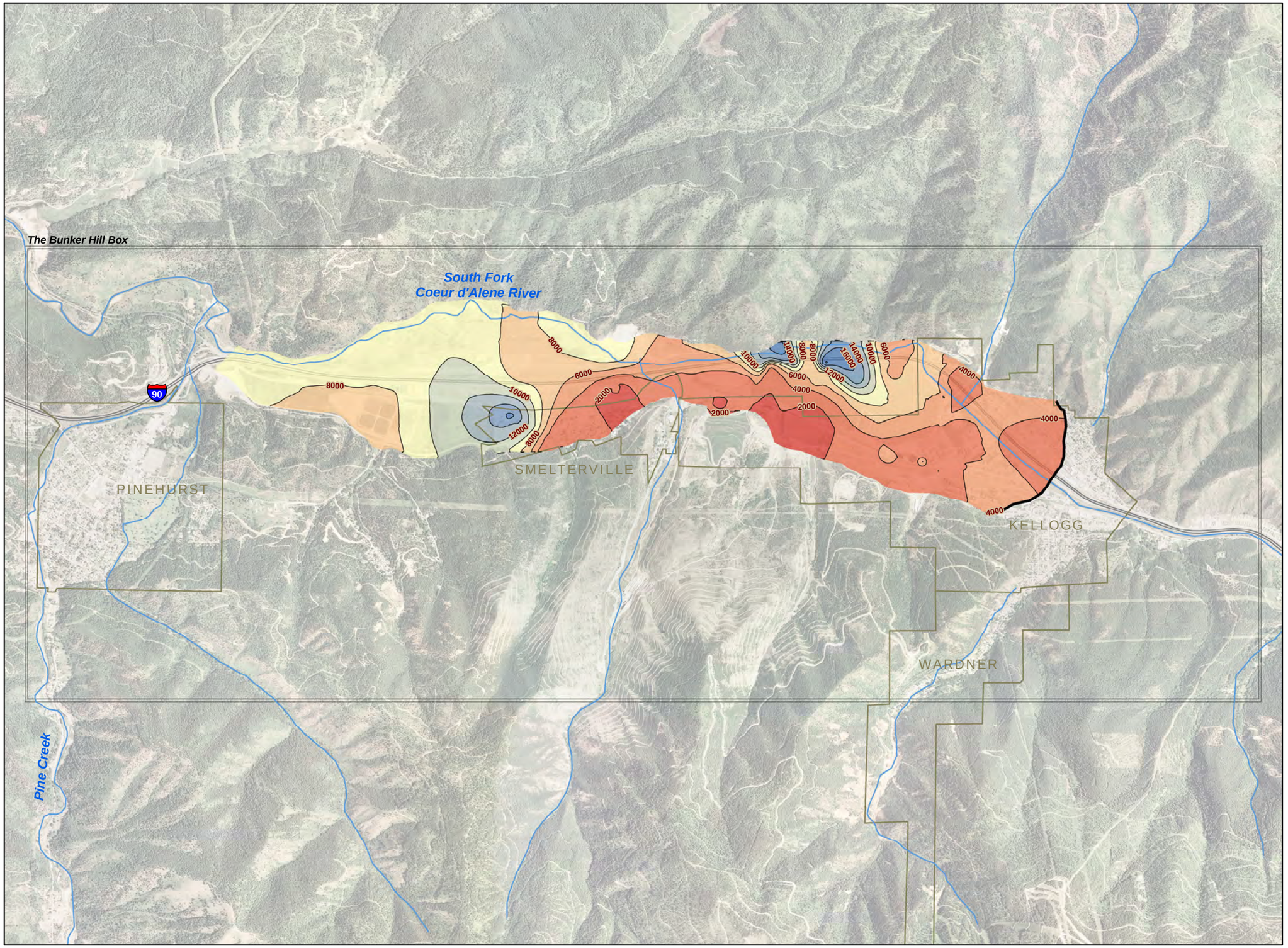
Model Grid
River/Creek
Canyon Creek Watershed
City Limit
State Boundary

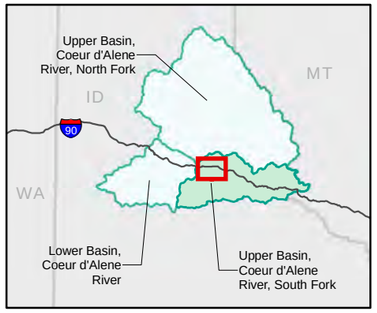
SMELTERVILLE
KELLOGG
PINEHURST
WARDNER
OSBURN
South Fork,
Coeur d'Alene River,
Upper Basin
Canyon Creek
Pine Creek
Big Creek
WALLACE
MULLAN
90
South Fork
Coeur d'Alene River

N
0 1 2 4 Miles

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

Figure A-2
SFCDR Model Grid
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





Approximate Extent of Confining Unit

Transmissivity Contour (2000-ft^2/day interval)

Transmissivity (feet^2/day)

- < 2,000
- 2,000 to 4,000
- 4,000 to 6,000
- 6,000 to 8,000
- 8,000 to 10,000
- 10,000 to 12,000
- 12,000 to 14,000
- 14,000 to 16,000
- > 16,000
- River/Creek
- City Limit

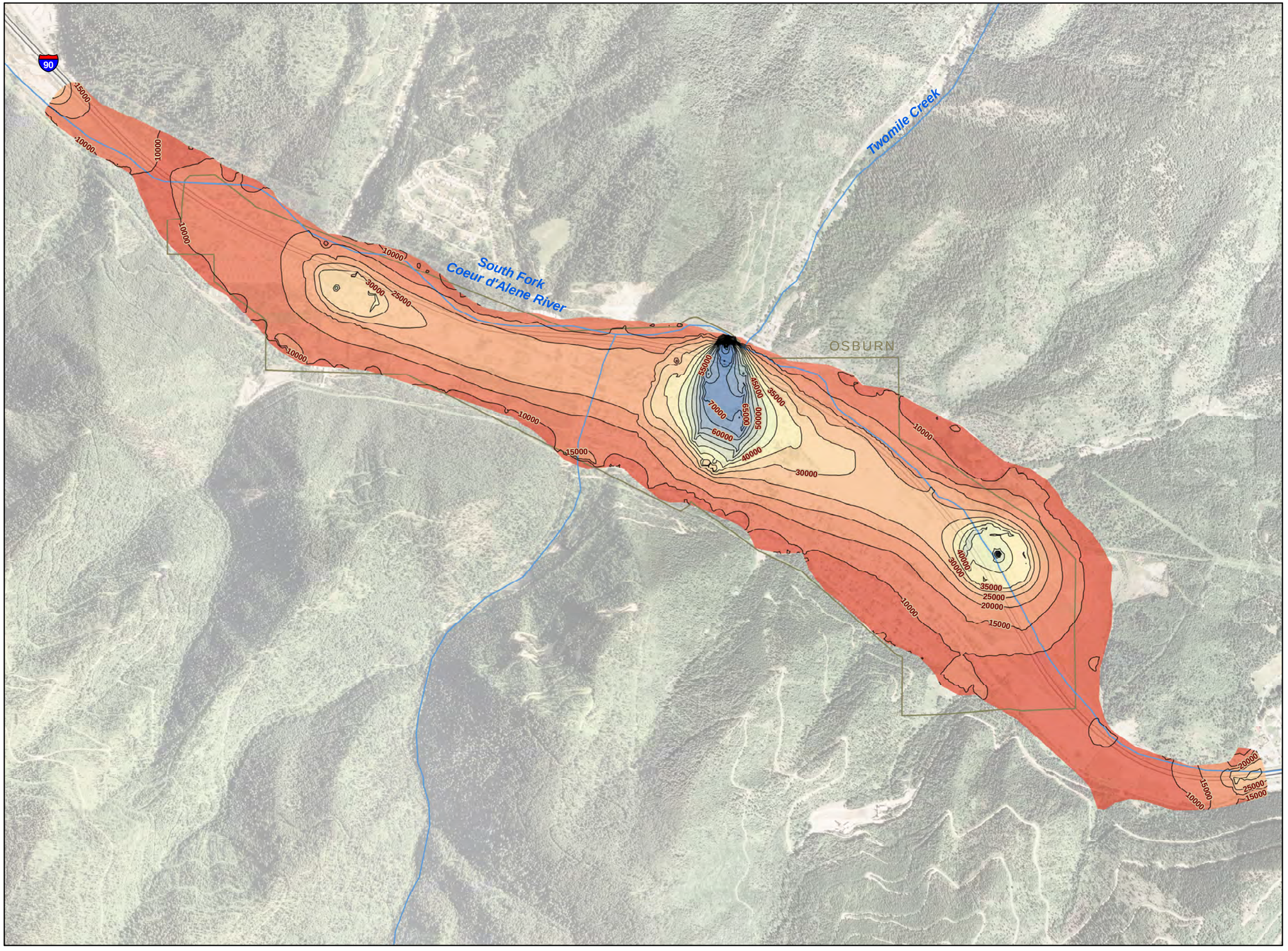
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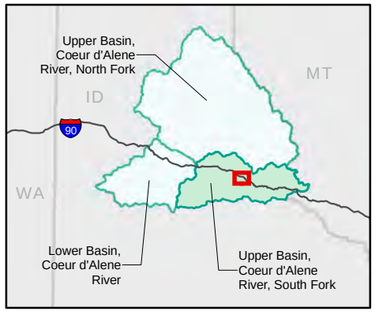
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Base Map Data:
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ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Figure A-3
Upper Aquifer Transmissivity, Bunker Hill Box
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

EPA





Transmissivity Contour
(5000-ft^2/day interval)

Transmissivity (feet^2/day)

- > 5,000
- 5,000 to 10,000
- 10,000 to 15,000
- 15,000 to 20,000
- 20,000 to 25,000
- 25,000 to 30,000
- 30,000 to 35,000
- 35,000 to 40,000
- 40,000 to 45,000
- 45,000 to 50,000
- 50,000 to 55,000
- 55,000 to 60,000
- 60,000 to 65,000
- 65,000 to 70,000
- 70,000 to 75,000
- > 75,000
- River/Creek
- City Limit

N

0 500 1,000 2,000 Feet

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

Figure A-4
Total Aquifer Transmissivity, Osburn Flats
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

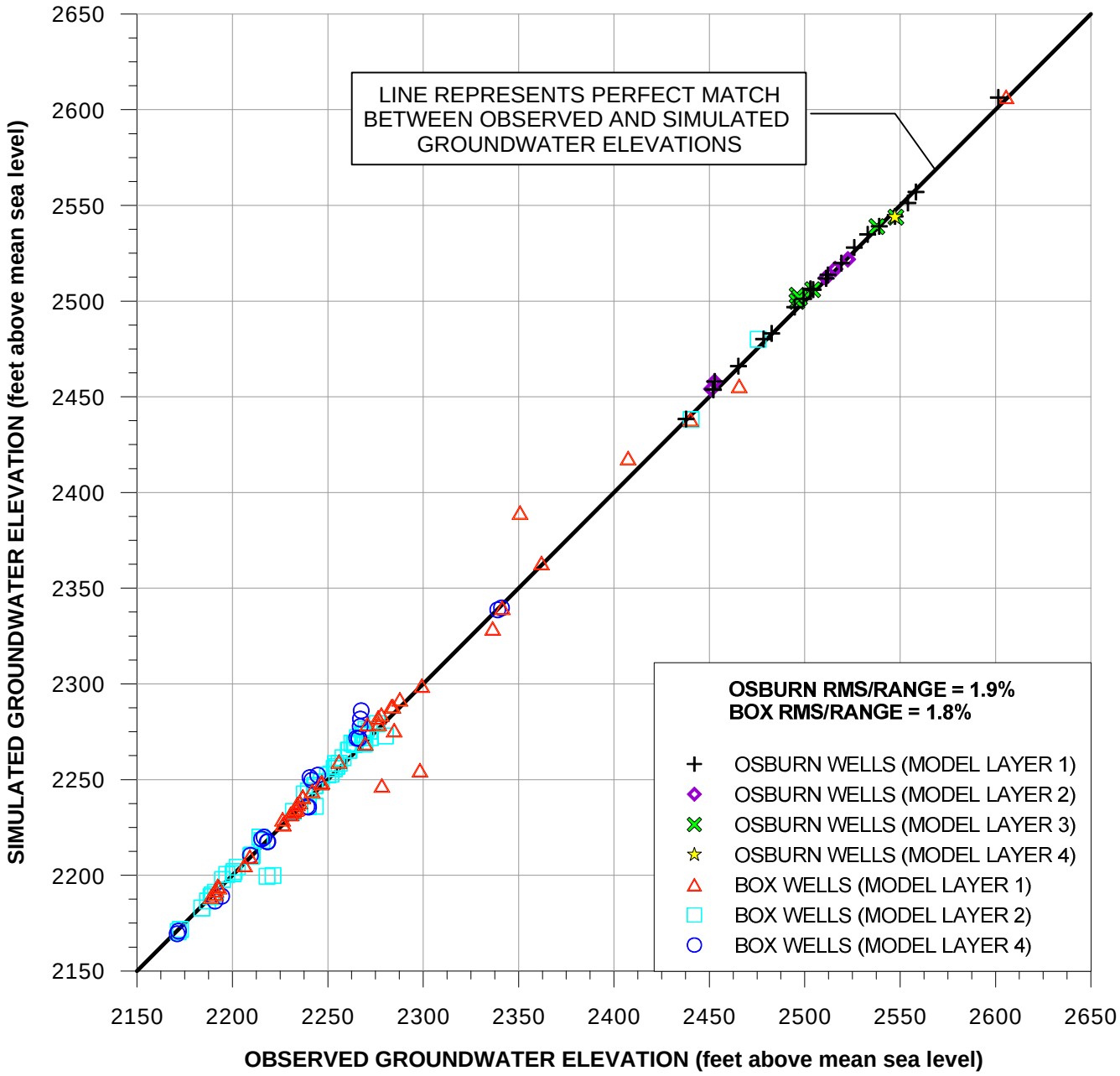
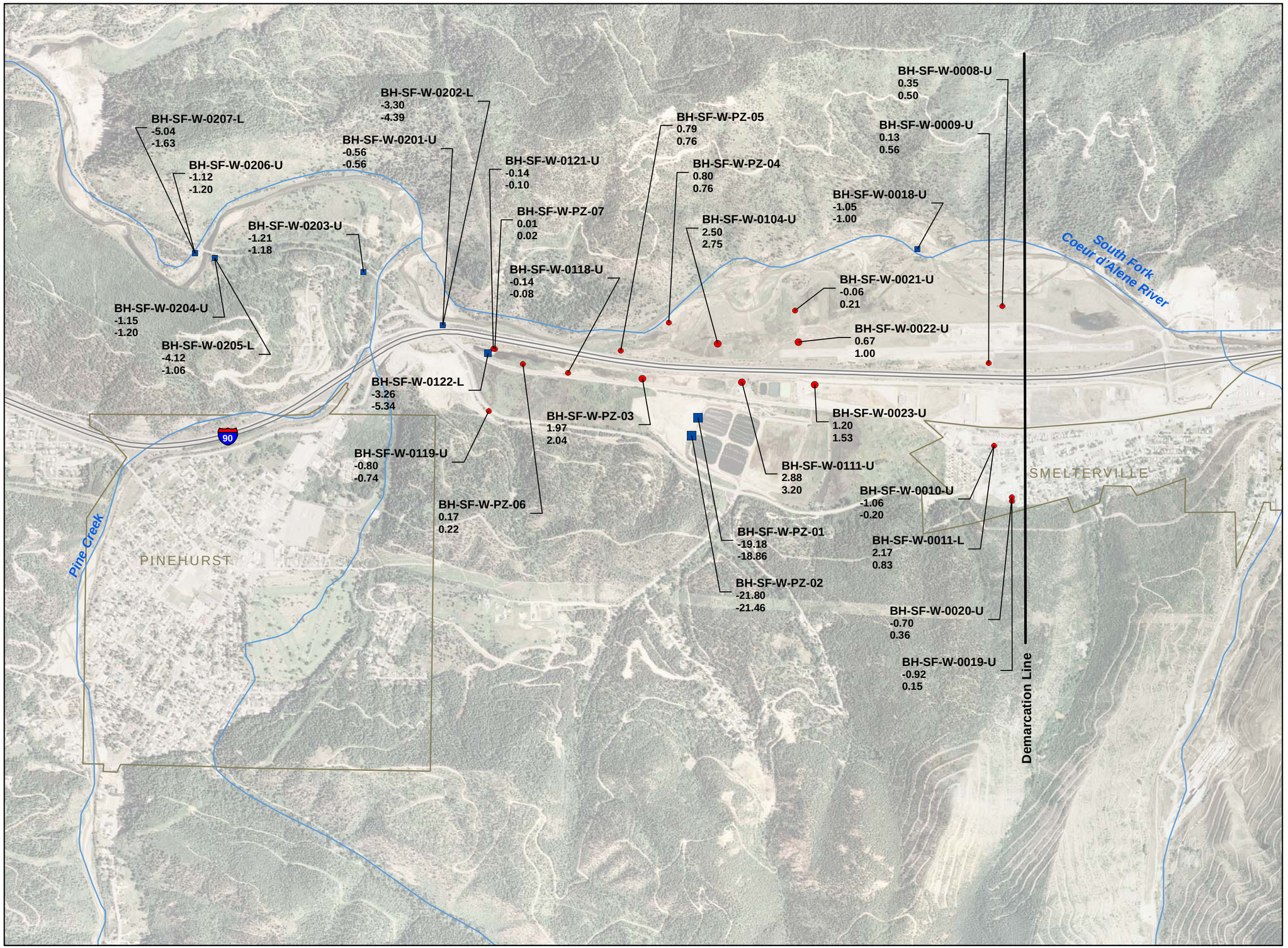
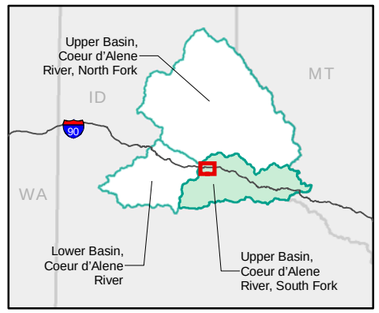


Figure A-5
Simulated versus Observed Groundwater Elevations – Baseflow Conditions
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

Note:
RMS/Range is a measure of model calibration and is equal to the root mean squared error divided by the range in measured groundwater elevation.





Residual (feet)

- -51 to -25
- -25 to -10
- -10 to -5
- -5 to -1
- -1 to 1
- 1 to 5
- 5 to 10
- 10 to 25
- 25 to 40
- River/Creek
- City Limit

BH-SF-W-0021-U (Site ID)
-0.06 (Previous Residual)
0.21 (Current Residual[1])

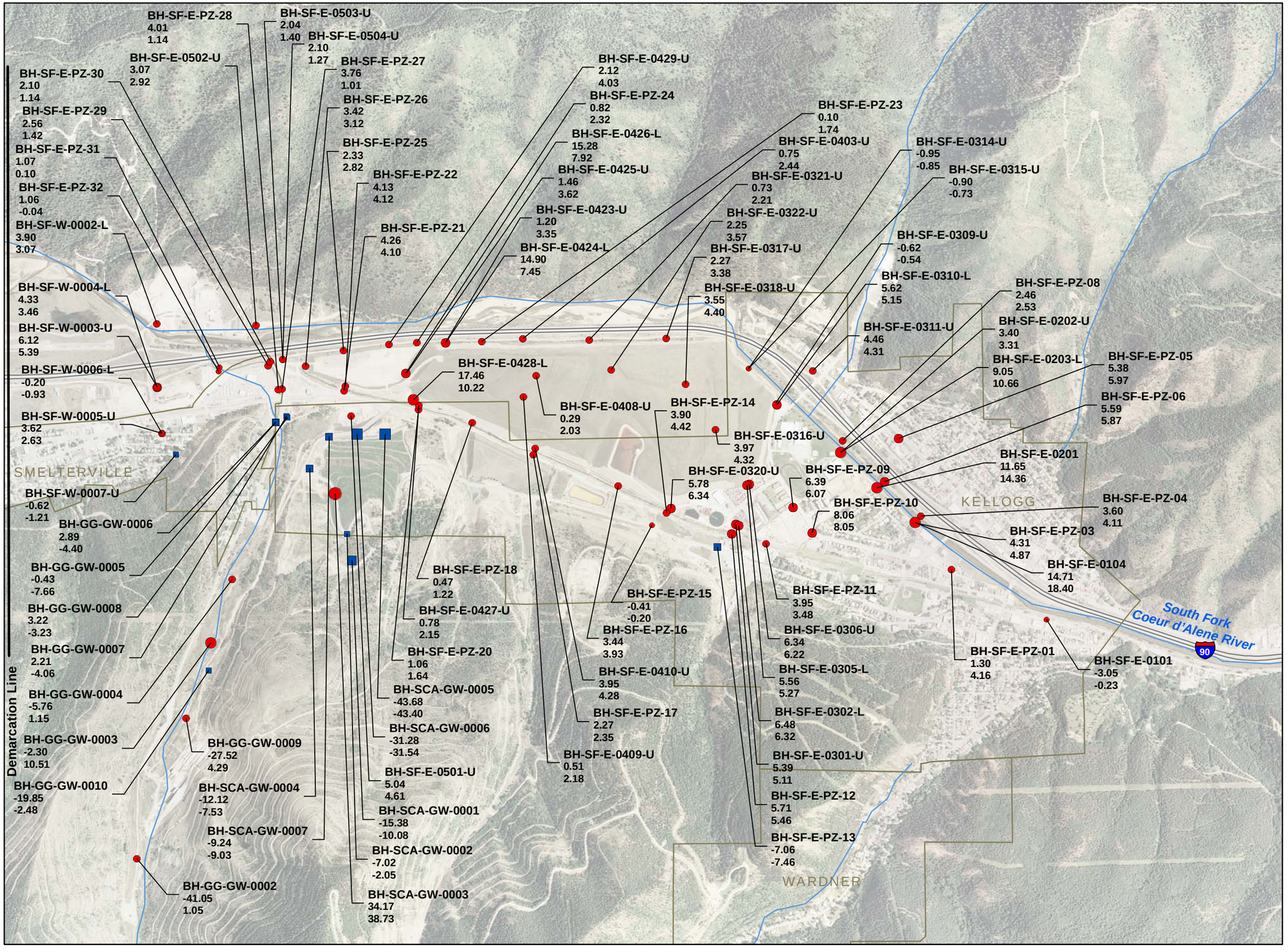
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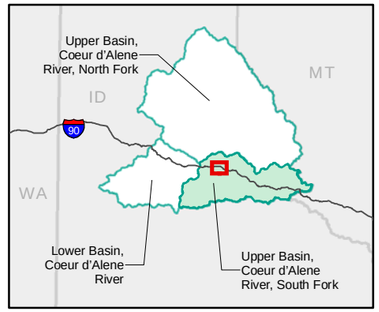
0 500 1,000 2,000 Feet

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

Notes:
1. Residual is equal to simulated groundwater elevation minus measured groundwater elevation.
2. The demarcation line represents the area of overlap between two connected figures such that data for the previous/subsequent figure are not displayed on the current figure.

Figure A-6a
Residuals between Measured and Simulated Groundwater Elevations, Western Bunker Hill Box, Baseflow Conditions
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





Residual (feet)

- -51 to -25
- -25 to -10
- -10 to -5
- -5 to -1
- -1 to 1
- 1 to 5
- 5 to 10
- 10 to 25
- 25 to 40
- River/Creek
- City Limit

BH-SF-E-0101 (Site ID)
-3.05 (Previous Residual)
-0.23 (Current Residual[1])

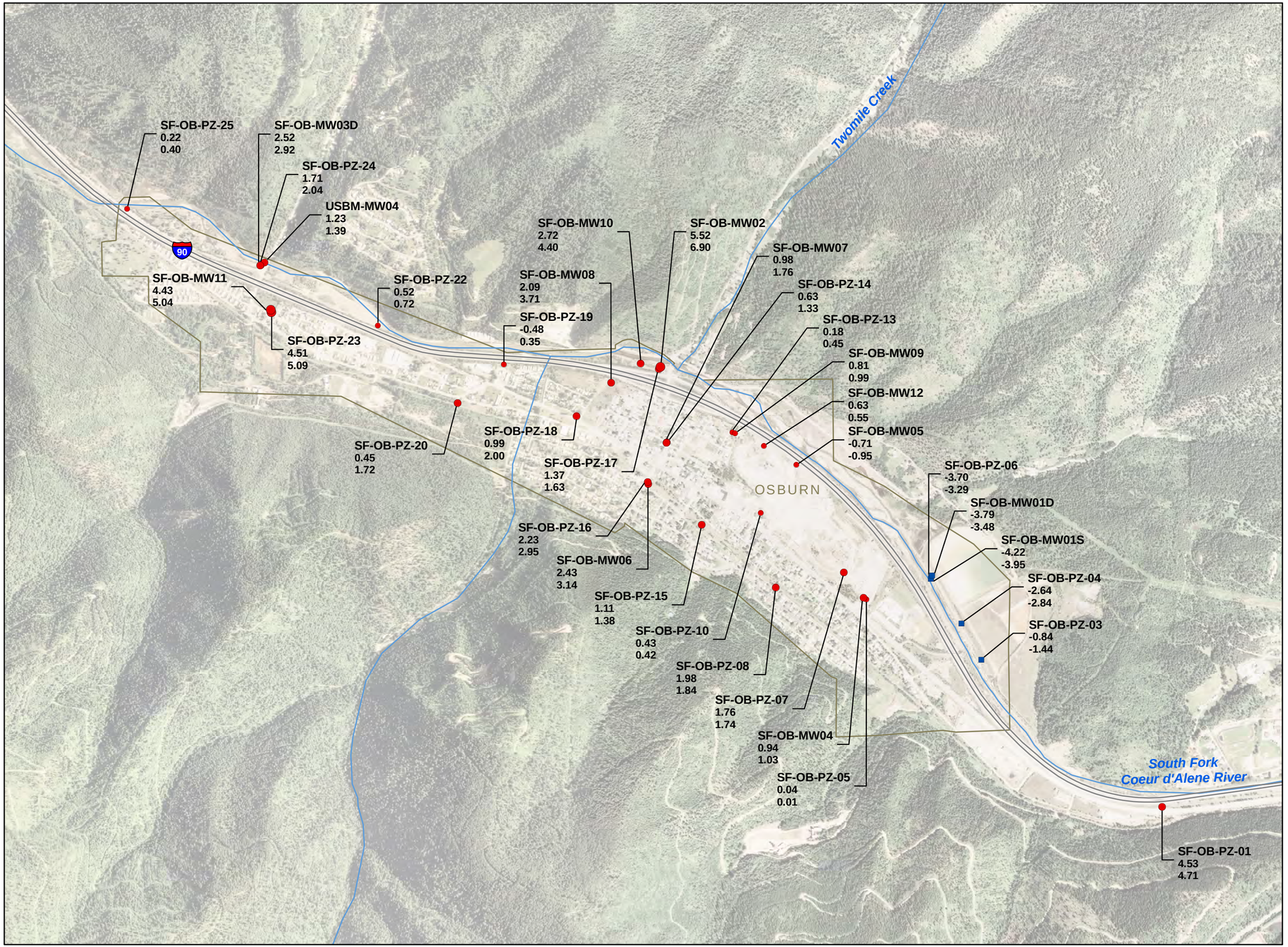
N
0 500 1,000 2,000 Feet

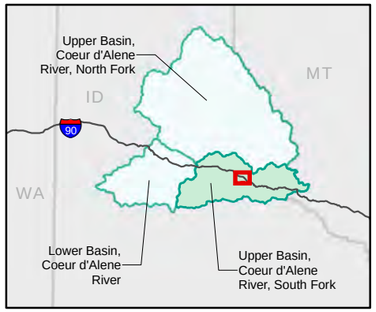
Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Notes:
1. Residual is equal to simulated groundwater elevation minus measured groundwater elevation.
2. The demarcation line represents the area of overlap between two connected figures such that data for the previous/subsequent figure are not displayed on the current figure.

Figure A-6b
Residuals between Measured and Simulated Groundwater Elevations, Eastern Bunker Hill Box, Baseflow Conditions
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

EPA





Residual (feet)

- -51 to -25
- -25 to -10
- -10 to -5
- -5 to -1
- -1 to 1
- 1 to 5
- 5 to 10
- 10 to 25
- 25 to 40
- River/Creek
- City Limit

SF-OB-PZ-04 (Site ID)
-2.64 (Previous Residual)
-2.84 (Current Residual[1])

N

0 500 1,000 2,000 Feet

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

Note:
Residual is equal to simulated groundwater elevation minus measured groundwater elevation.

Figure A-6c
Residuals between Measured and Simulated Groundwater Elevations, Osburn Flats, Baseflow Conditions
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

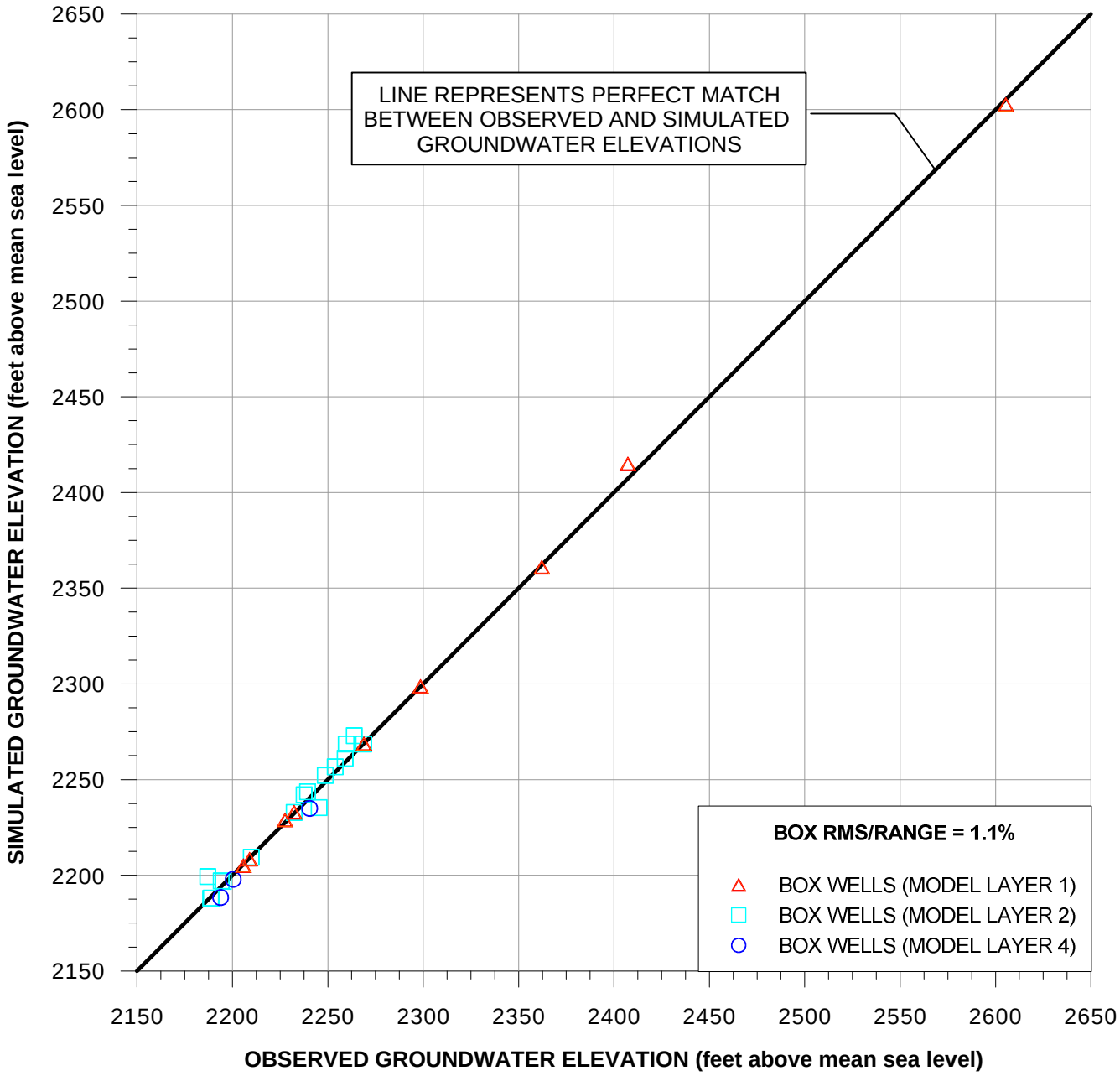
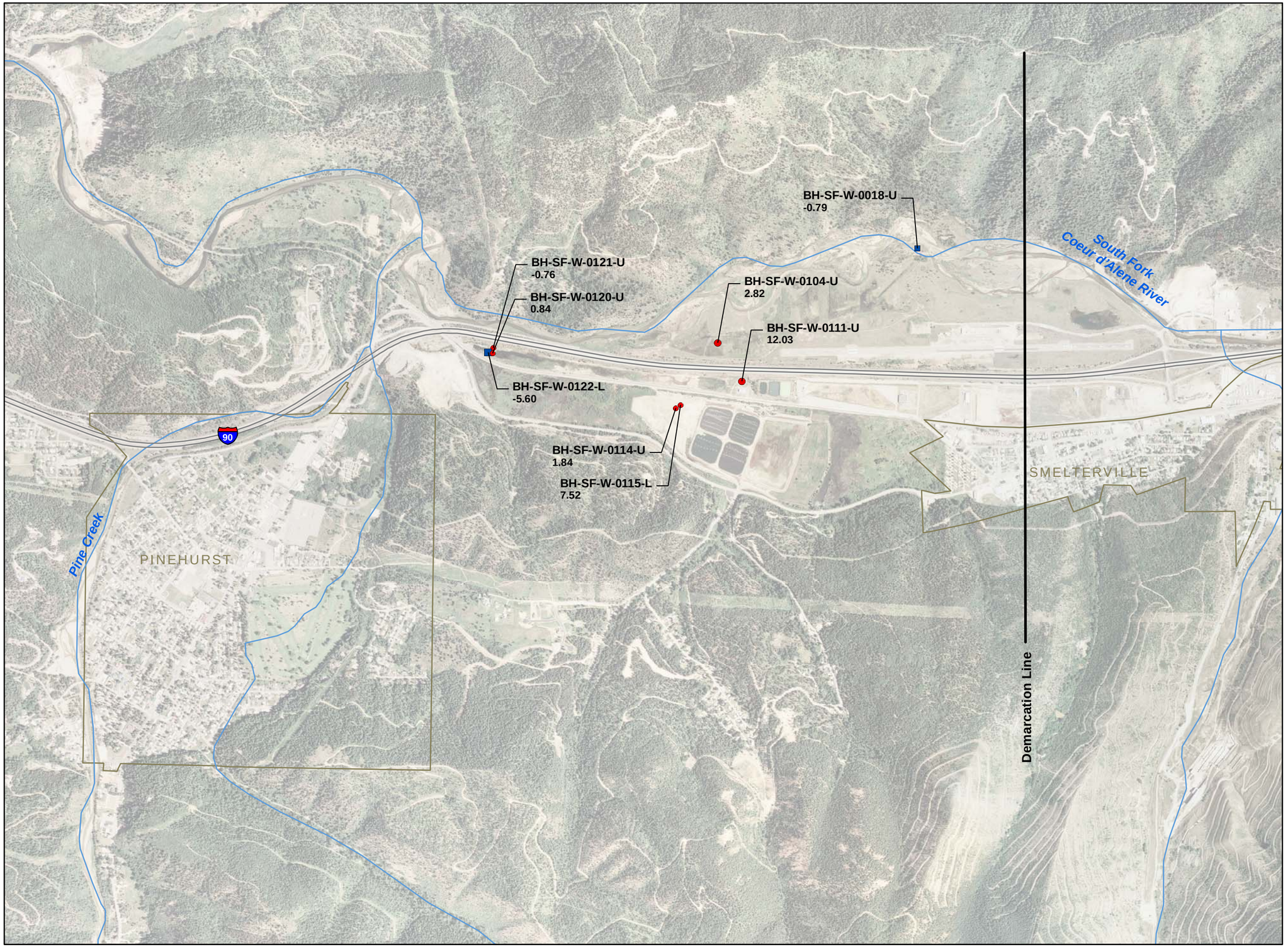
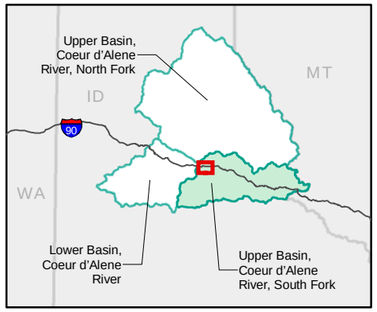


Figure A-7
Simulated versus Observed Groundwater Elevations – 7Q10 Conditions
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

Note:
RMS/Range is a measure of model calibration and is equal to the root mean squared error divided by the range in measured groundwater elevation.





Residual (feet)

- -51 to -25
- -25 to -10
- -10 to -5
- -5 to -1
- -1 to 1
- 1 to 5
- 5 to 10
- 10 to 25
- 25 to 40
- River/Creek
- City Limit

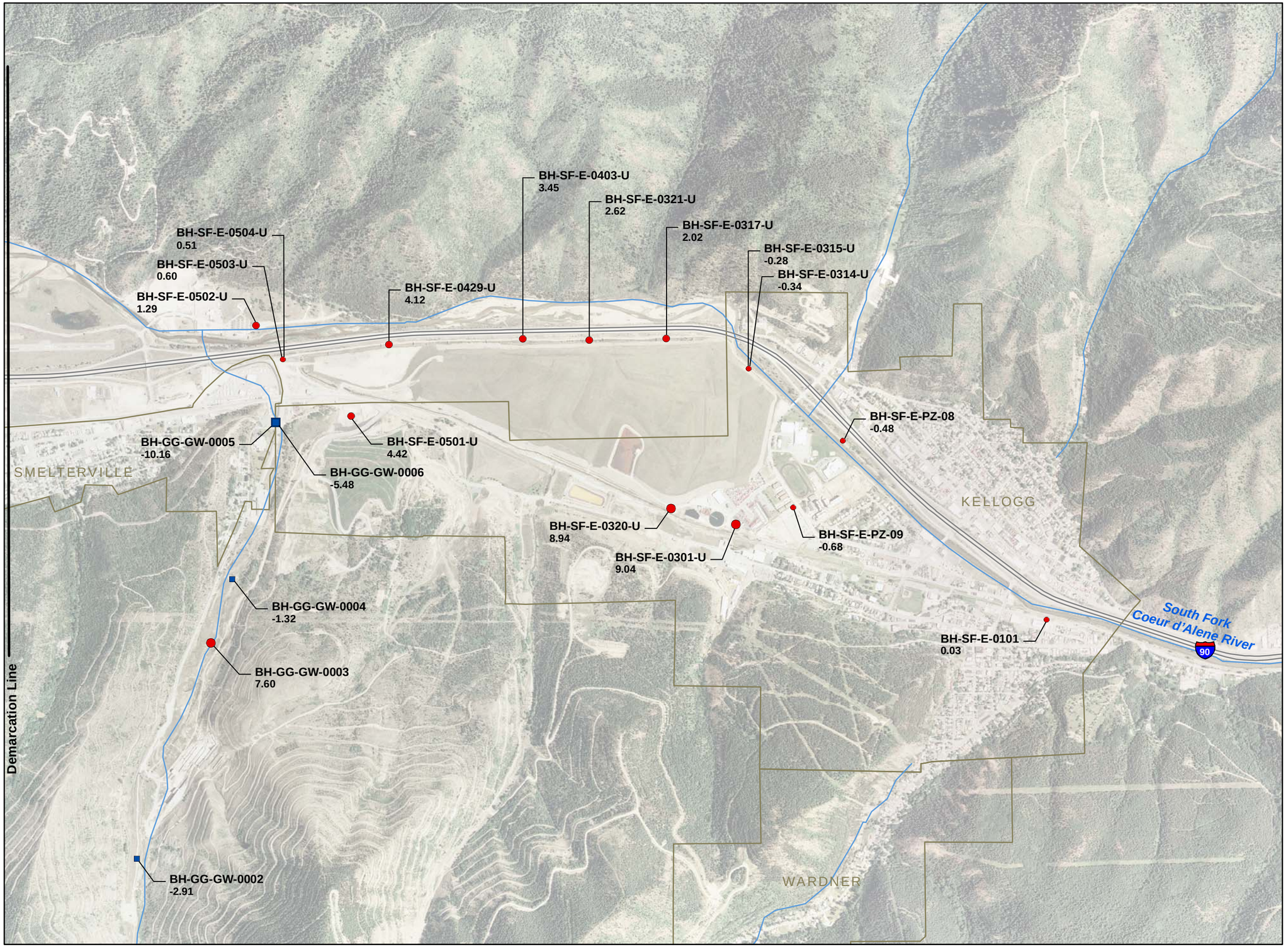
BH-SF-W-0018-U (Site ID)
-0.79 (7Q10 Residual[1])

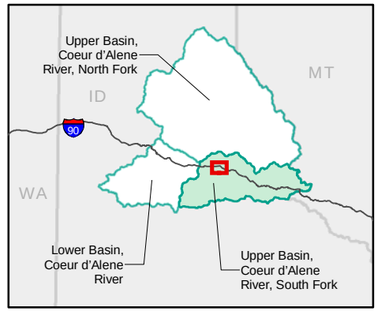
N
0 500 1,000 2,000 Feet

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

Notes:
1. Residual is equal to simulated groundwater elevation minus measured groundwater elevation.
2. The demarcation line represents the area of overlap between two connected figures such that data for the previous/subsequent figure are not displayed on the current figure.

Figure A-8a
Residuals between Measured and Simulated Groundwater Elevations, Western Bunker Hill Box, 7Q10 Conditions
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





Residual (feet)

- -51 to -25
- -25 to -10
- -10 to -5
- -5 to -1
- -1 to 1
- 1 to 5
- 5 to 10
- 10 to 25
- 25 to 40
- River/Creek
- City Limit

BH-SF-E-0101 (Site ID)
0.03 (7Q10 Residual[1])

N
0 500 1,000 2,000 Feet

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

Notes:
1. Residual is equal to simulated groundwater elevation minus measured groundwater elevation.
2. The demarcation line represents the area of overlap between two connected figures such that data for the previous/subsequent figure are not displayed on the current figure.

Figure A-8b
Residuals between Measured and Simulated Groundwater Elevations, Eastern Bunker Hill Box, 7Q10 Conditions
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

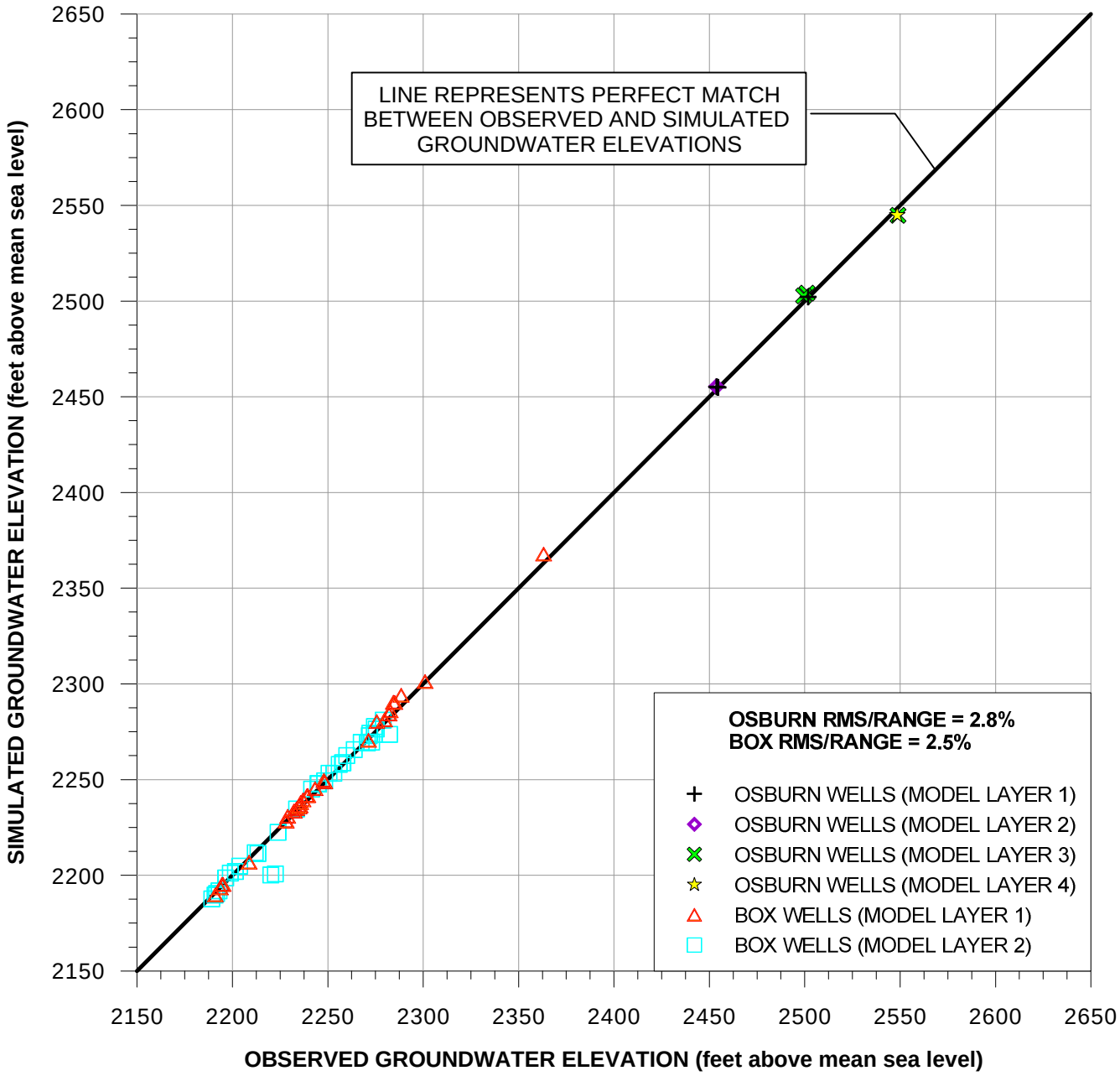
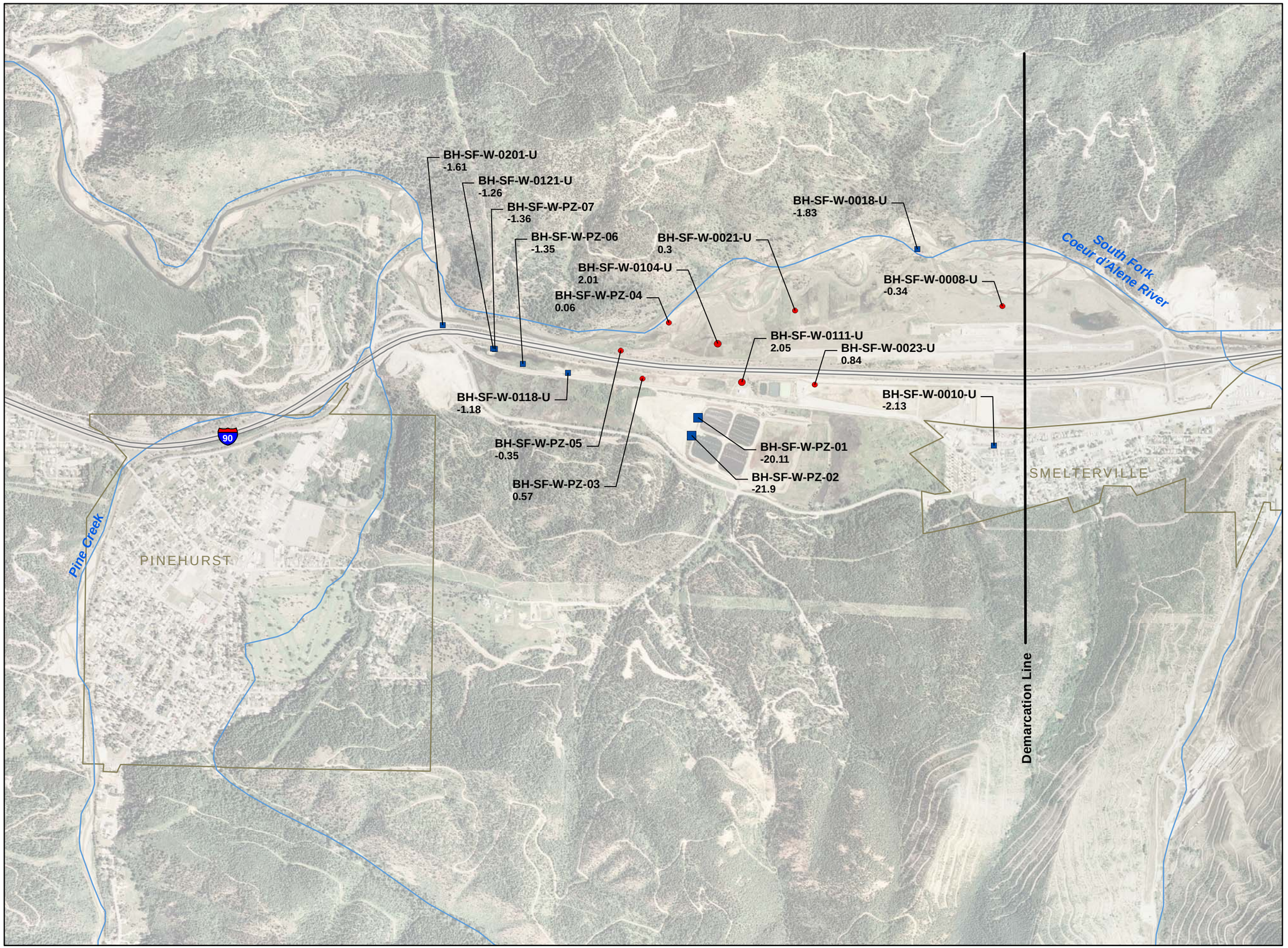
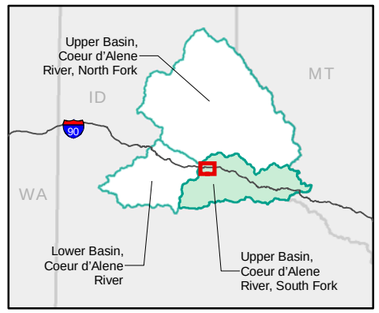


Figure A-9
Simulated versus Observed Groundwater Elevations – 90th Percentile Flow Conditions
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

Note:
RMS/Range is a measure of model calibration and is equal to the root mean squared error divided by the range in measured groundwater elevation.





Residual (feet)

- -51 to -25
- -25 to -10
- -10 to -5
- -5 to -1
- -1 to 1
- 1 to 5
- 5 to 10
- 10 to 25
- 25 to 40
- River/Creek
- City Limit

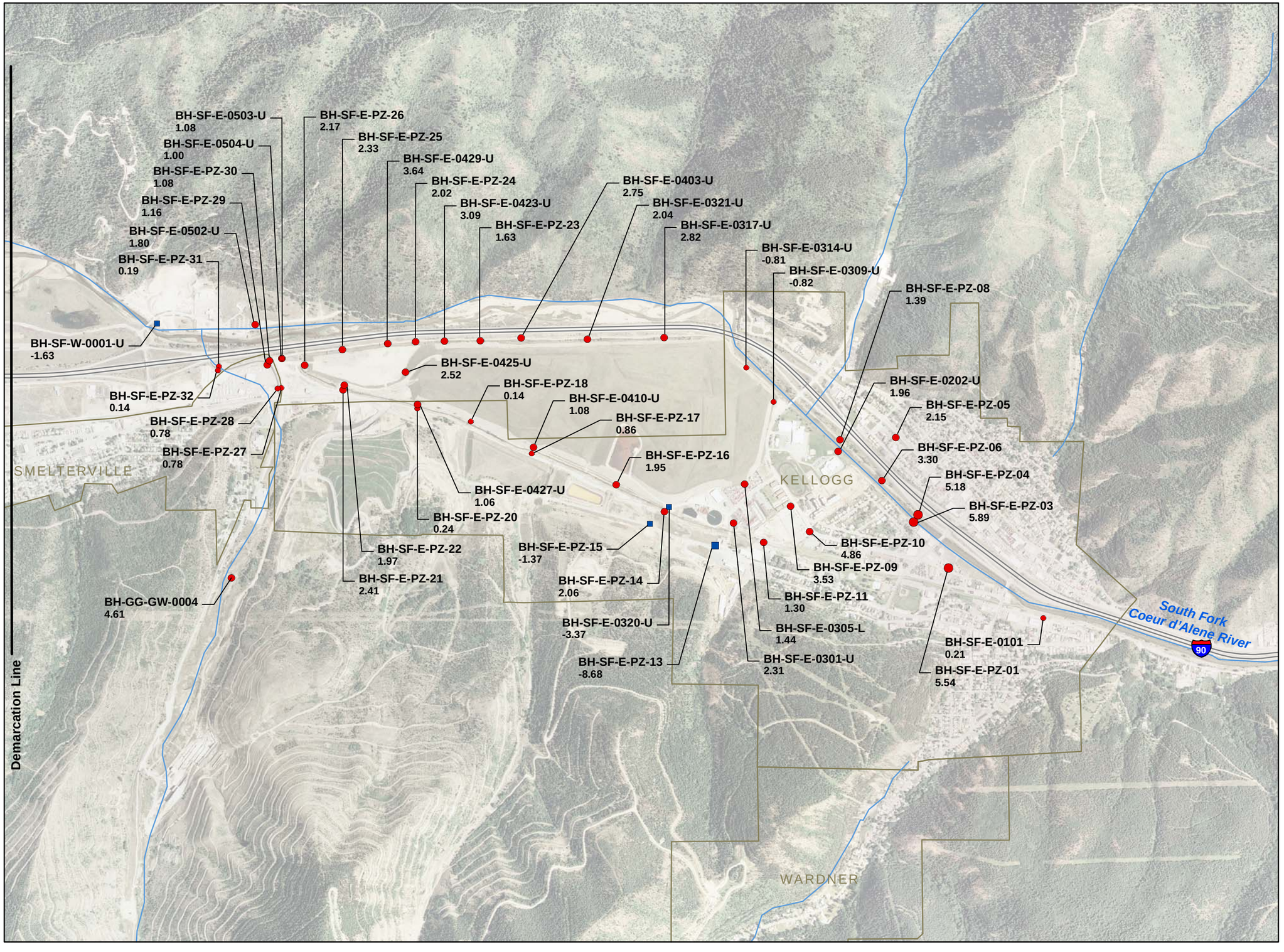
BH-SF-W-0010-U (Site ID)
-2.13 (90th Percentile Flow Residual[1])

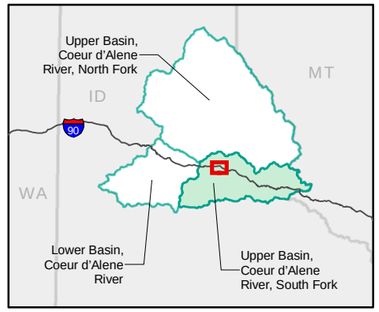
N
0 500 1,000 2,000 Feet

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

Notes:
1. Residual is equal to simulated groundwater elevation minus measured groundwater elevation.
2. The demarcation line represents the area of overlap between two connected figures such that data for the previous/subsequent figure are not displayed on the current figure.

Figure A-10a
Residuals between Measured and Simulated Groundwater Elevations, Western Bunker Hill Box, 90th Percentile Flow Conditions
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





Residual (feet)

- -51 to -25
- -25 to -10
- -10 to -5
- -5 to -1
- -1 to 1
- 1 to 5
- 5 to 10
- 10 to 25
- 25 to 40
- River/Creek
- City Limit

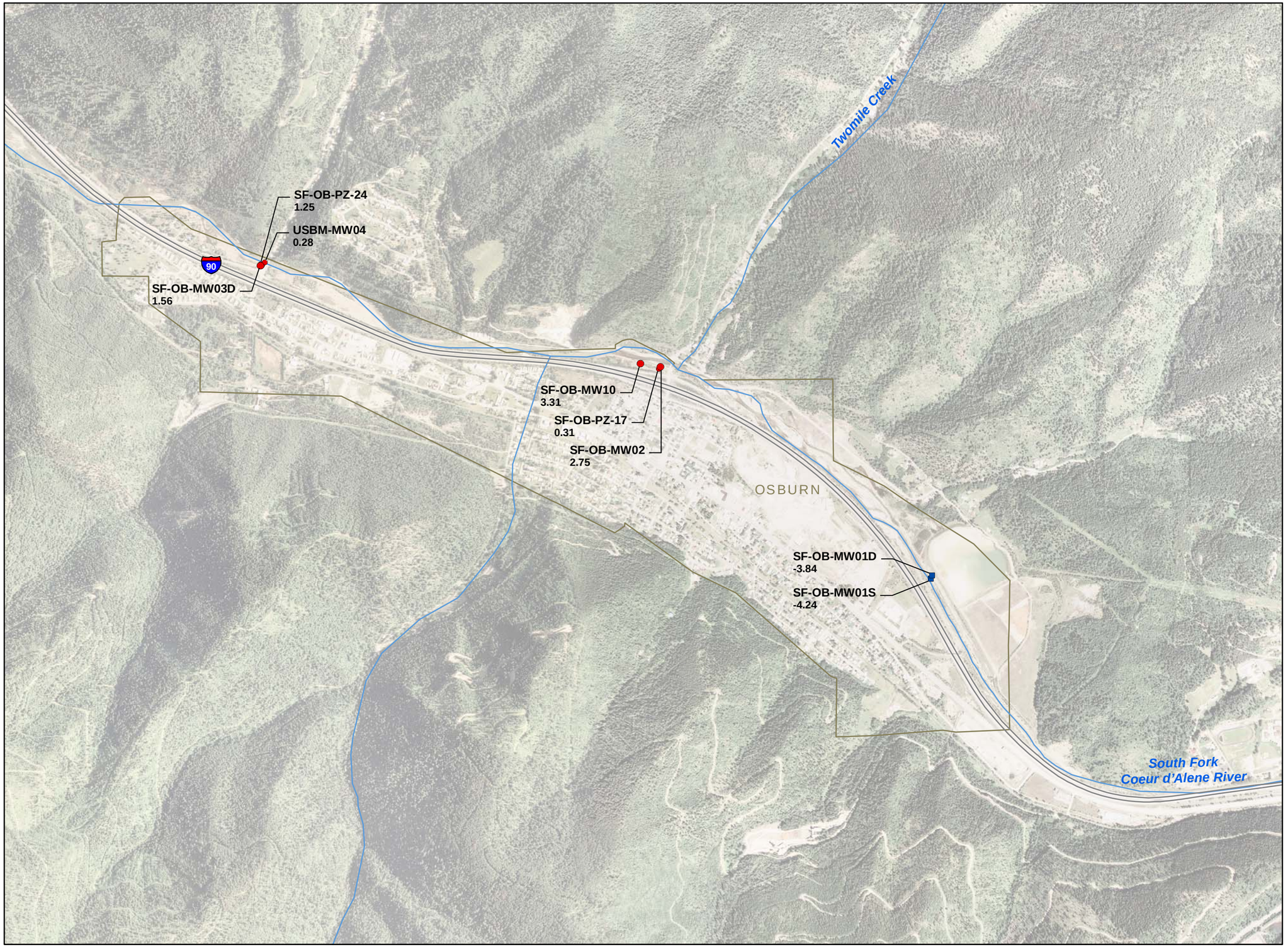
BH-SF-E-0101 (Site ID)
0.21 (90th Percentile Flow Residual[1])

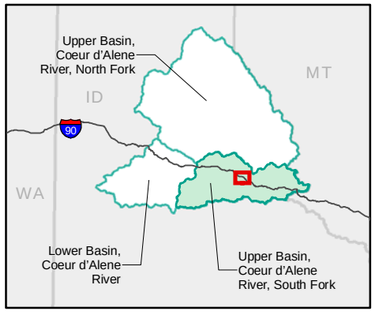
N
0 500 1,000 2,000 Feet

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

Notes:
1. Residual is equal to simulated groundwater elevation minus measured groundwater elevation.
2. The demarcation line represents the area of overlap between two connected figures such that data for the previous/subsequent figure are not displayed on the current figure.

Figure A-10b
Residuals between Measured and Simulated Groundwater Elevations, Eastern Bunker Hill Box, 90th Percentile Flow Conditions
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





Residual (feet)

- -51 to -25
- -25 to -10
- -10 to -5
- -5 to -1
- -1 to 1
- 1 to 5
- 5 to 10
- 10 to 25
- 25 to 40
- River/Creek
- City Limit

SF-OB-MW01D (Site ID)
-3.84 (90th Percentile Flow Residual[1])

N

0 500 1,000 2,000 Feet

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

Note:
1. Residual is equal to simulated groundwater elevation minus measured groundwater elevation.

Figure A-10c
Residuals between Measured and Simulated Groundwater Elevations, Osburn Flats, 90th Percentile Flow Conditions
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

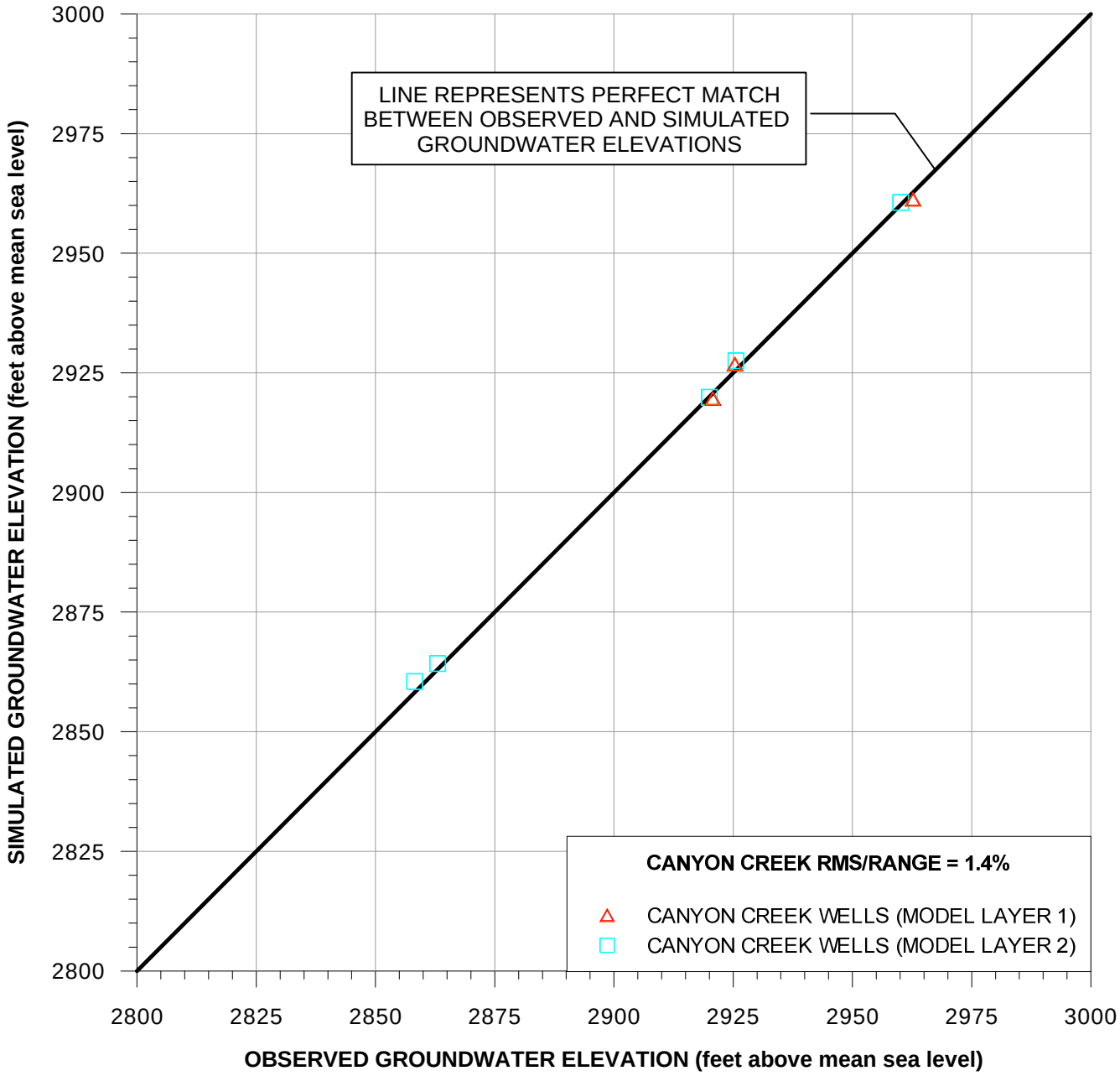
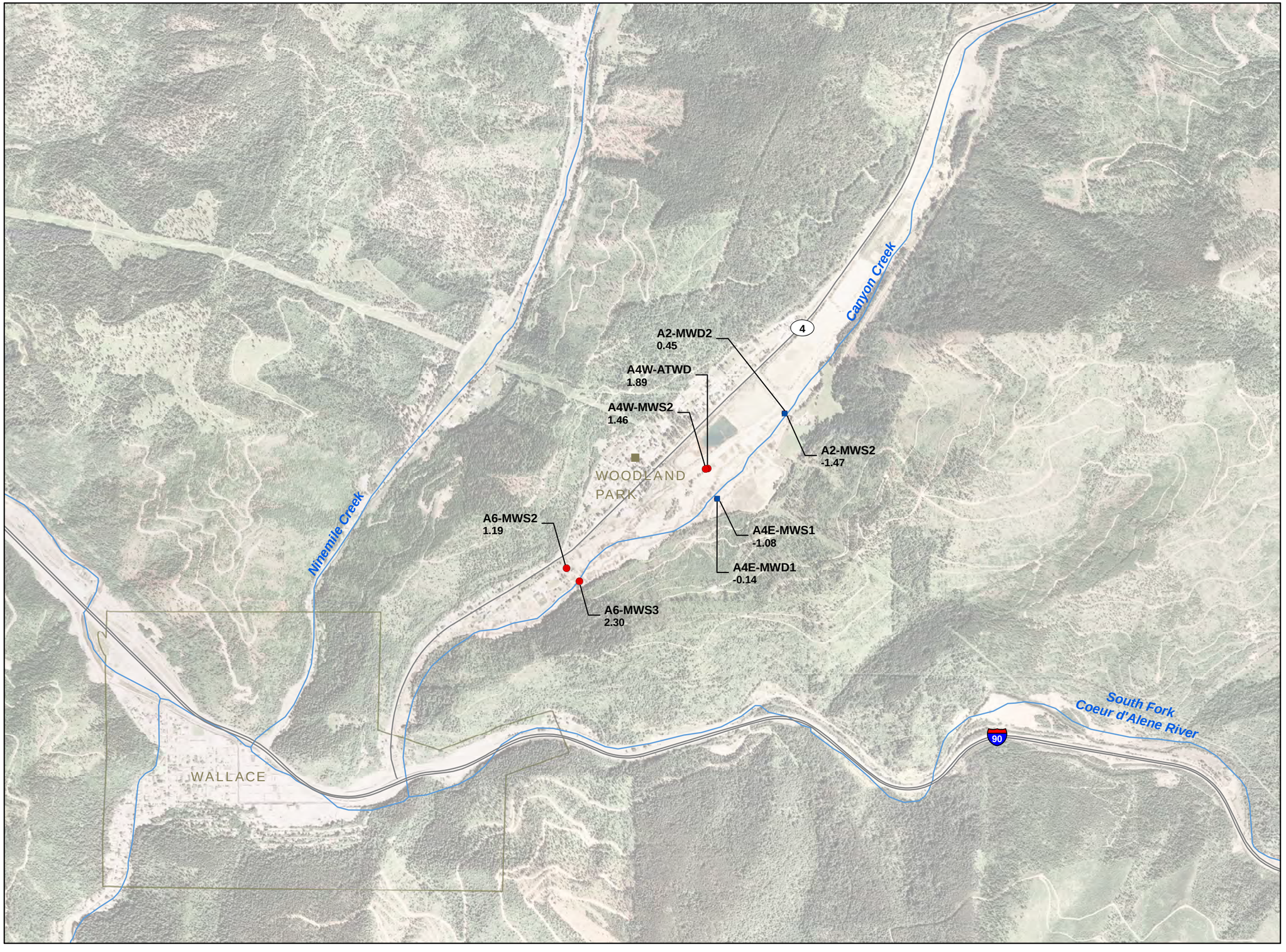
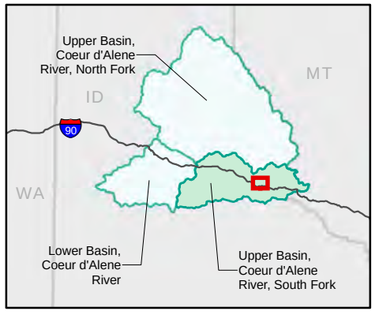


Figure A-11
Simulated versus Observed Groundwater Elevations – Canyon Creek, 90th Percentile Flow Conditions
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

Note:
RMS/Range is a measure of model calibration and is equal to the root mean squared error divided by the range in measured groundwater elevation.





Residual (feet)

- -51 to -25
- -25 to -10
- -10 to -5
- -5 to -1
- -1 to 1
- 1 to 5
- 5 to 10
- 10 to 25
- 25 to 40
- River/Creek
- City Limit

A2-MWD2 (Site ID)
0.45 (90th Percentile Flow Residual[1])

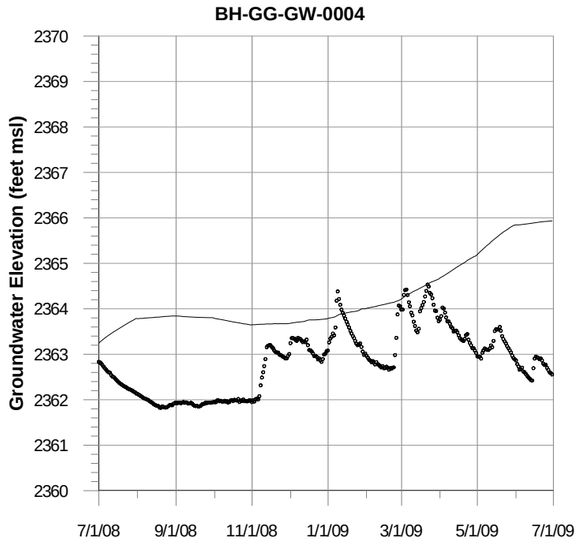
N

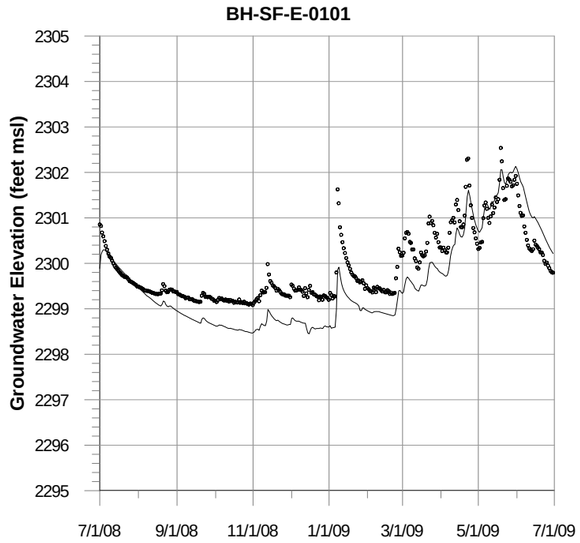
0 500 1,000 2,000 Feet

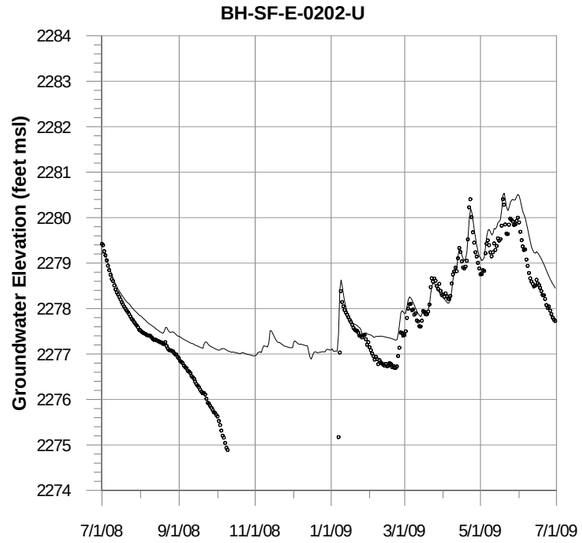
Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

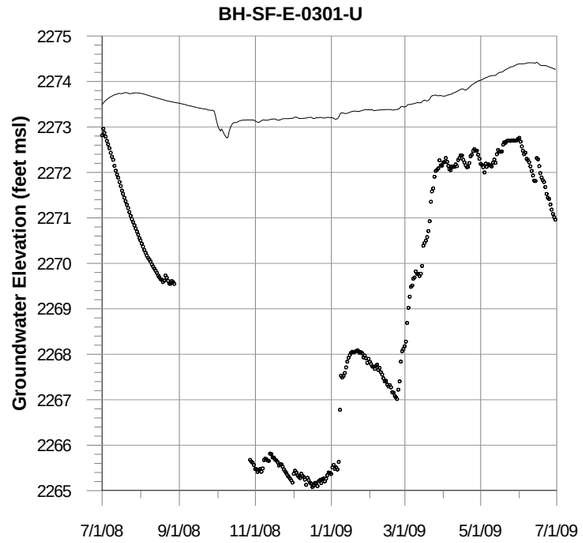
Note:
Residual is equal to simulated groundwater elevation minus measured groundwater elevation.

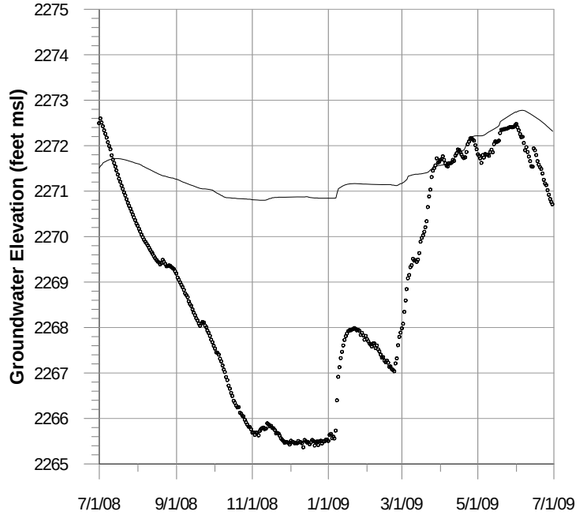
Figure A-12
Residuals between Measured and Simulated Groundwater Elevations, Canyon Creek, 90th Percentile Flow Conditions
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

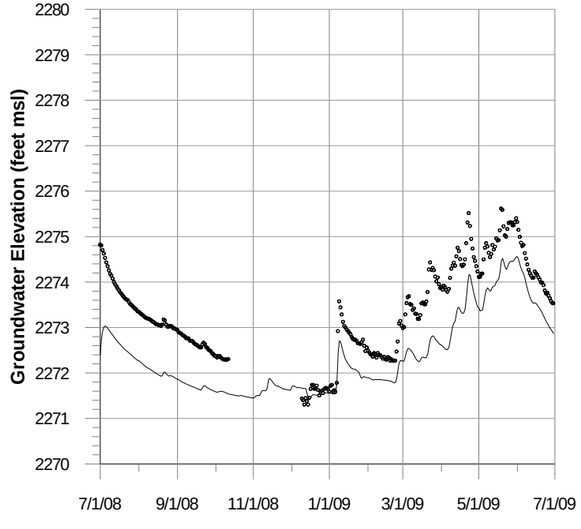


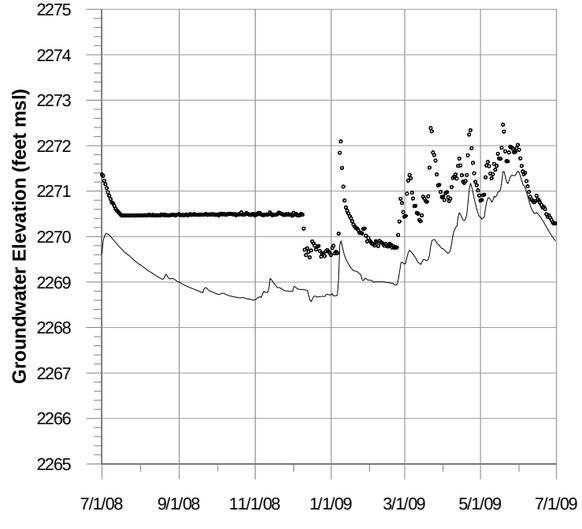


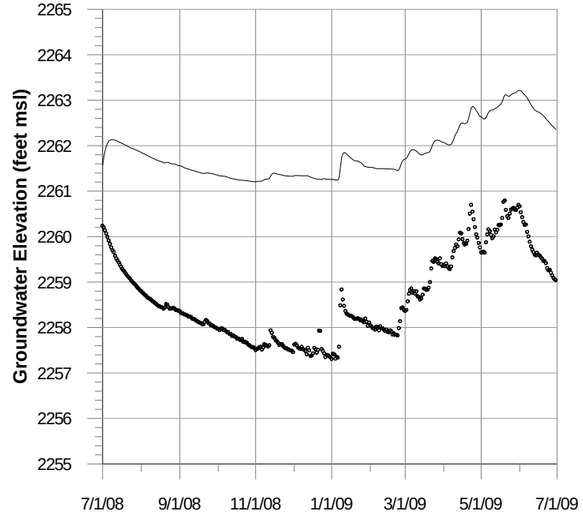












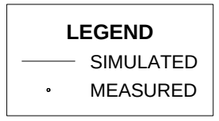
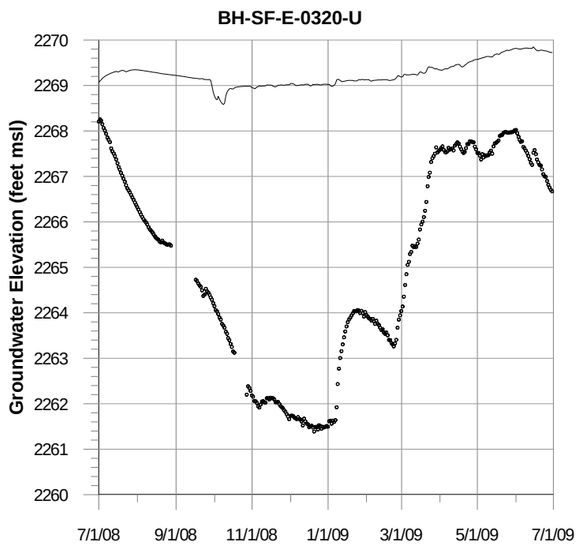
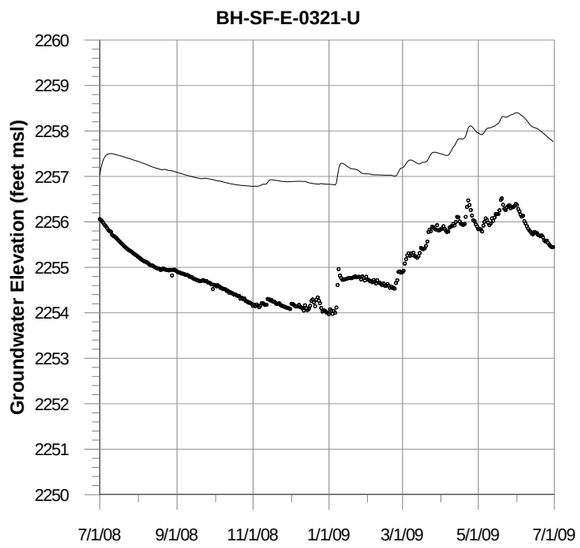
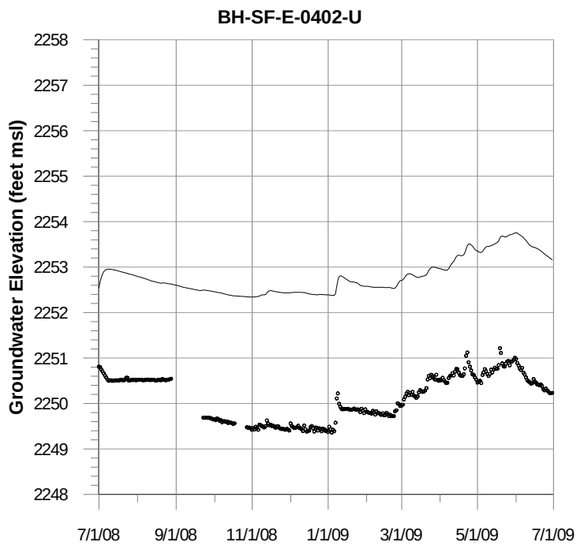


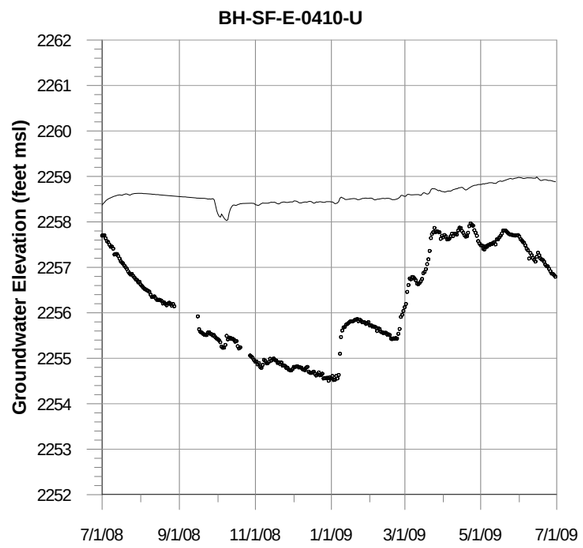
Figure A-13a
Simulated versus Measured Groundwater Elevations – Bunker Hill Box

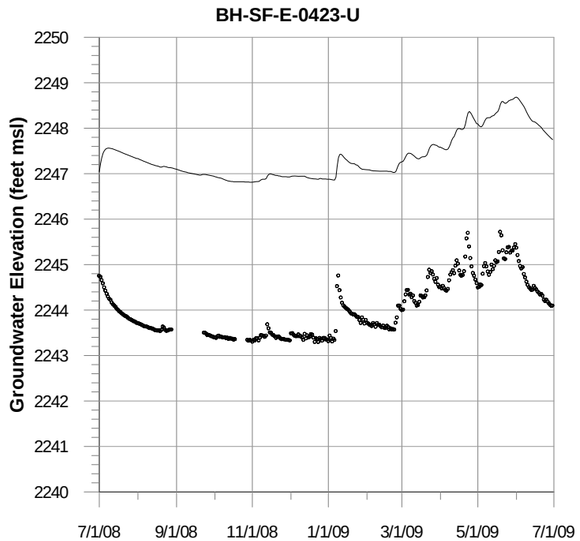
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

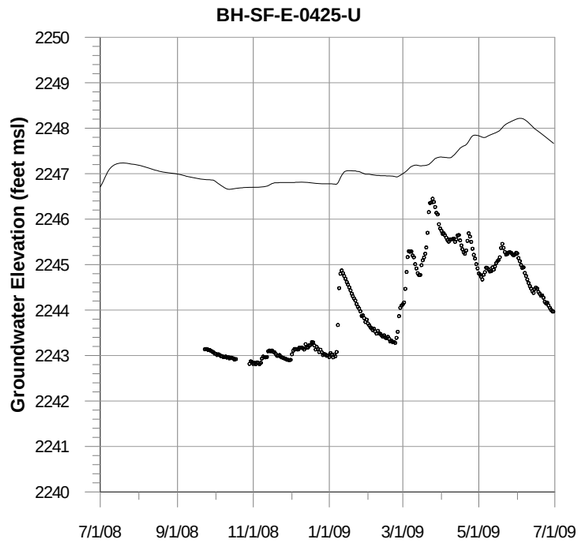


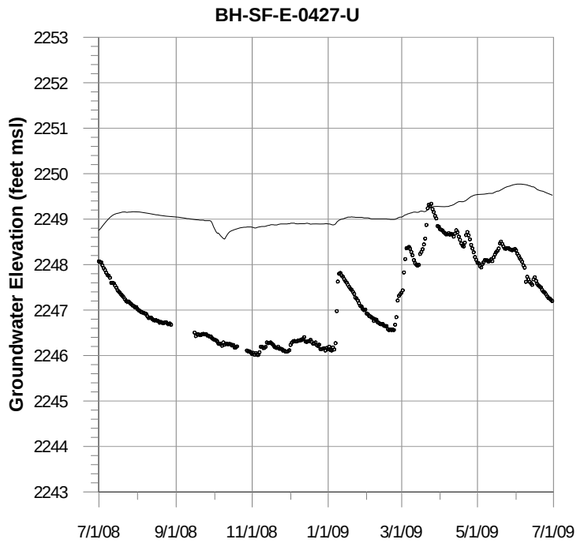


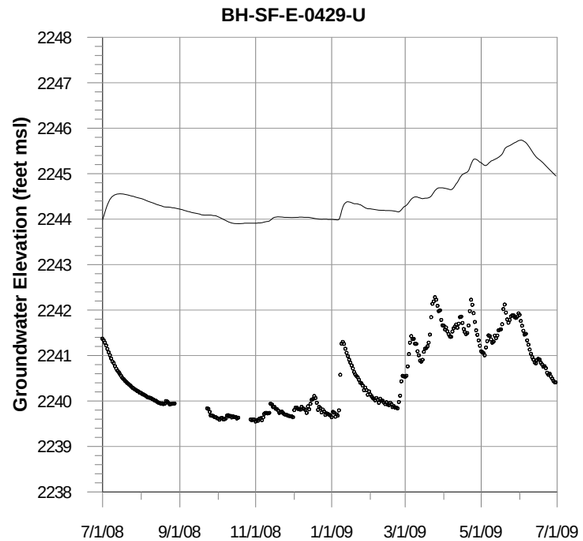












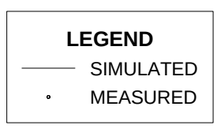
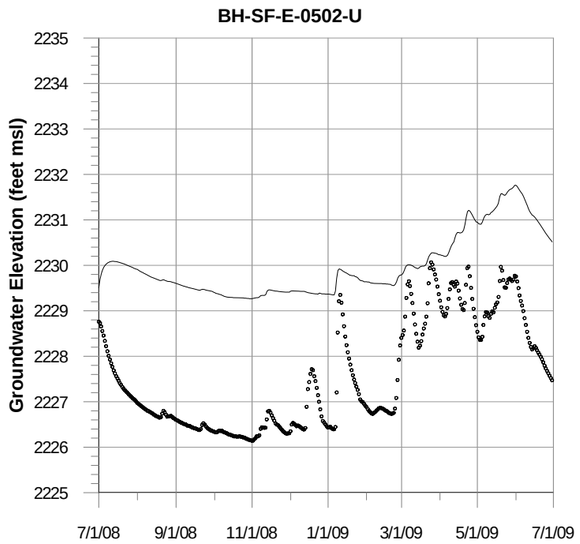
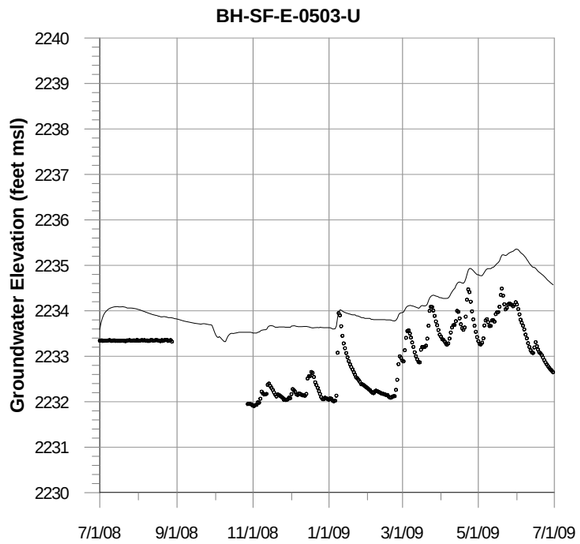
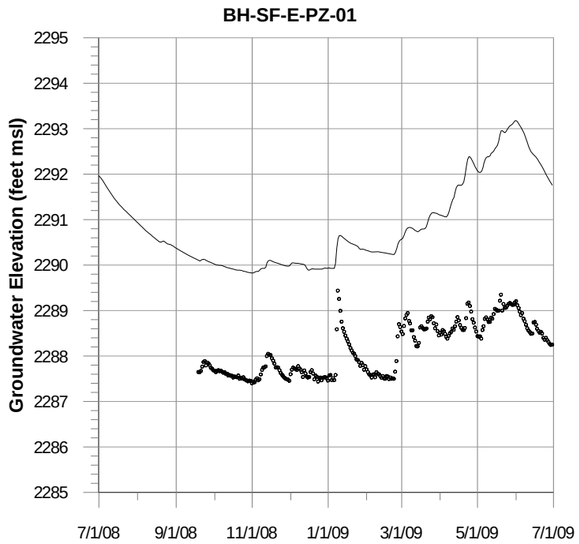
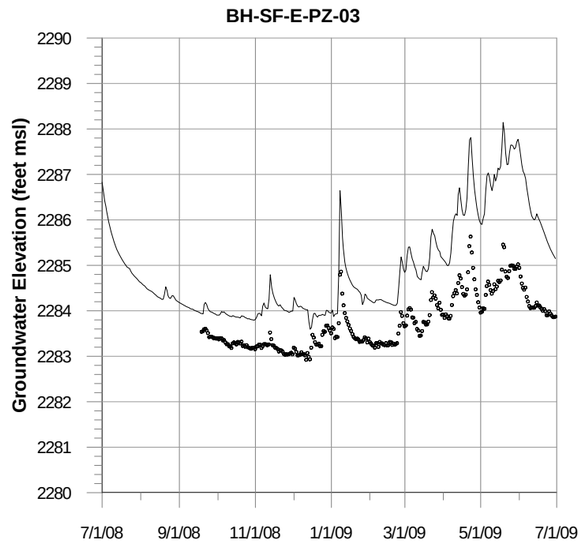


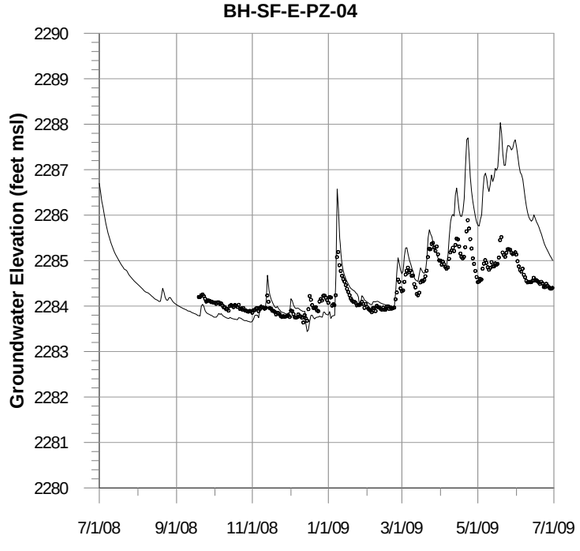
Figure A-13b
Simulated versus Measured Groundwater Elevations – Bunker Hill Box
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

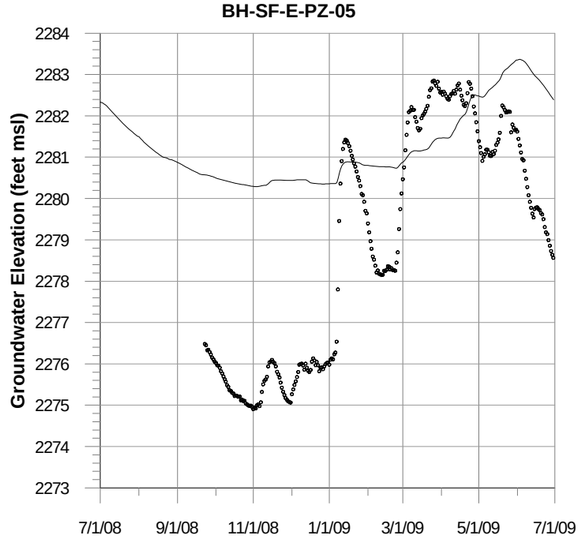


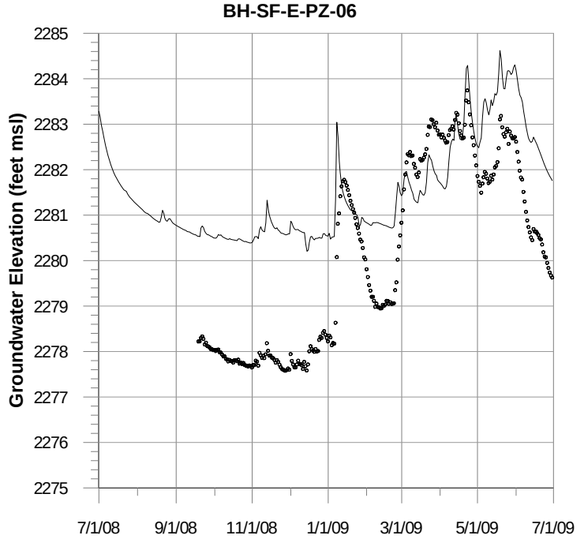


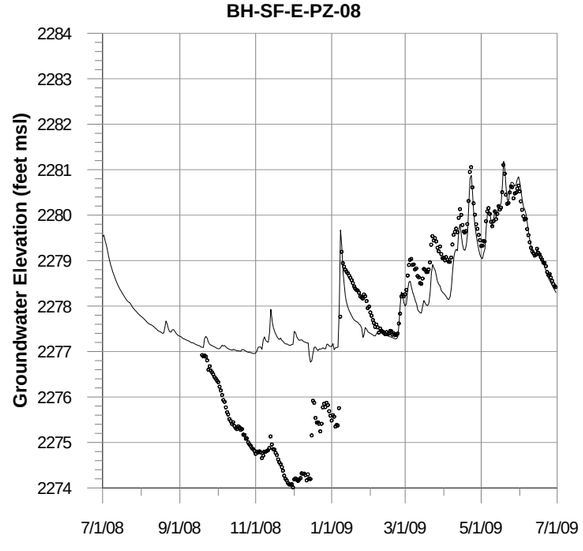












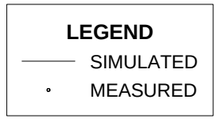
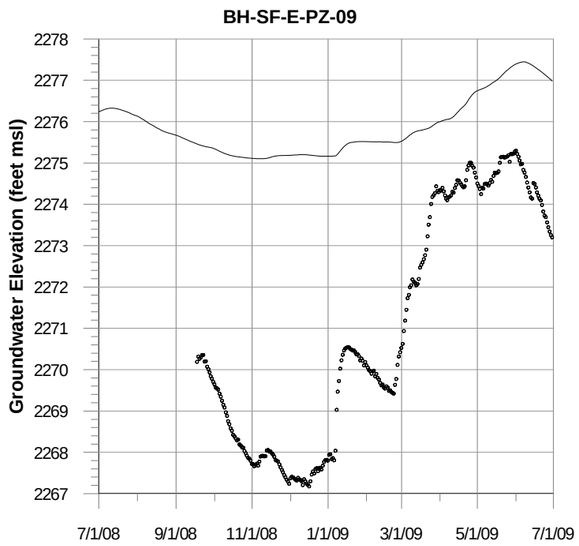
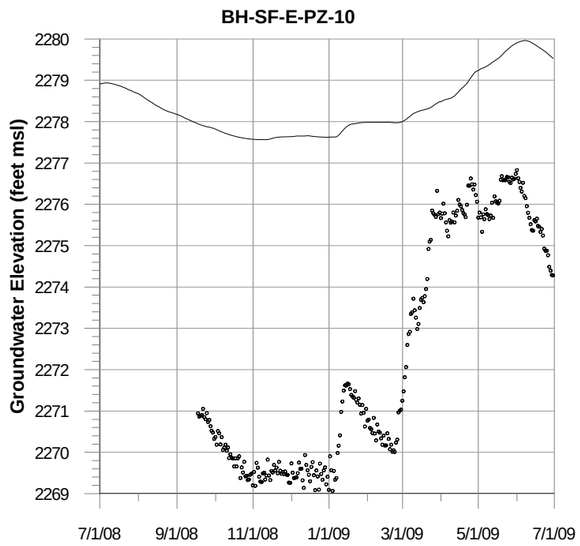
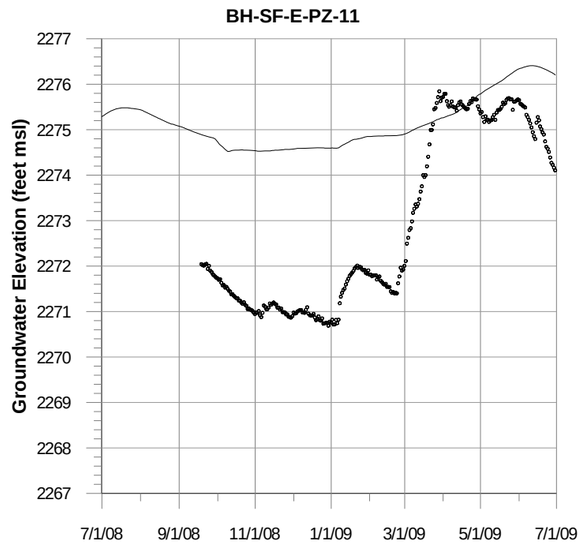


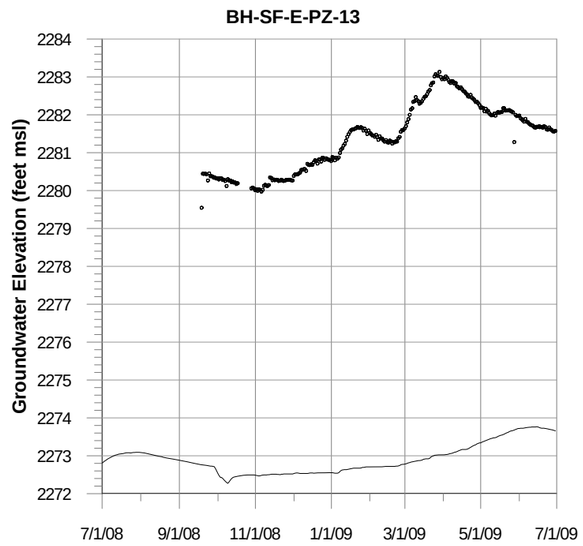
Figure A-13c
Simulated versus Measured Groundwater Elevations – Bunker Hill Box

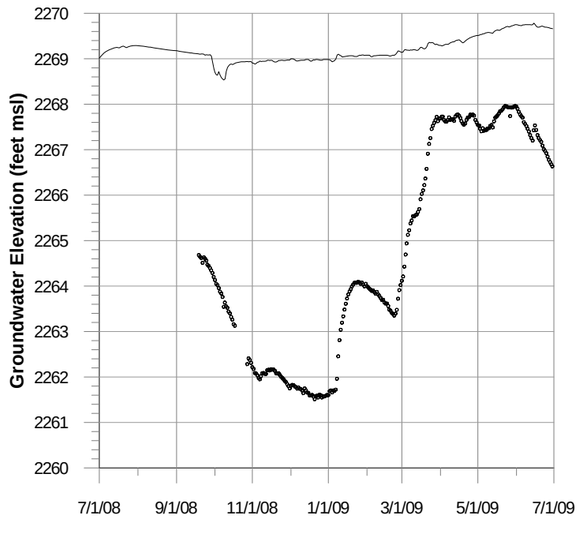
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

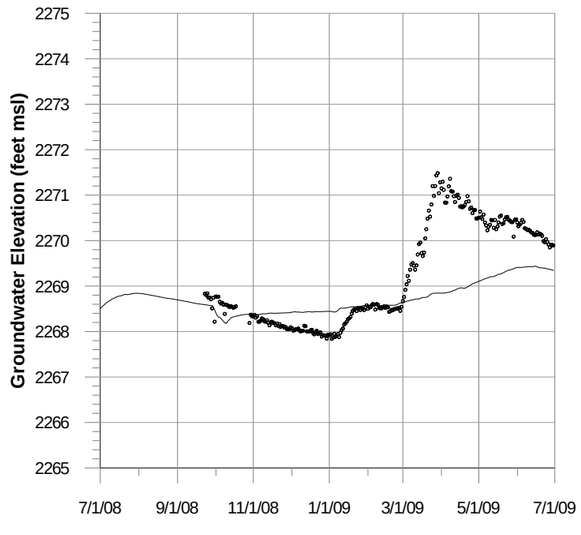


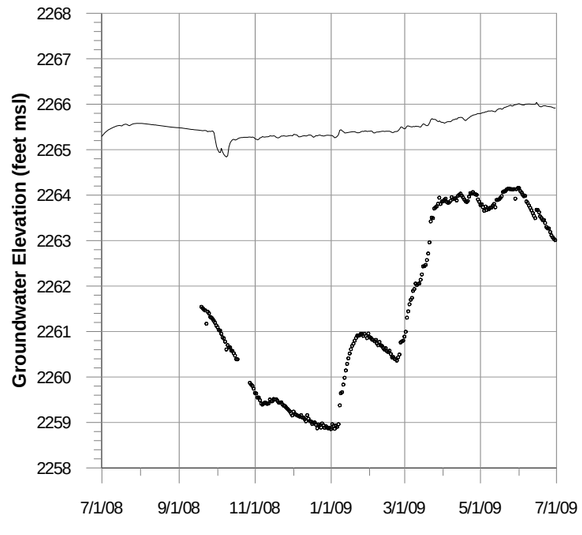


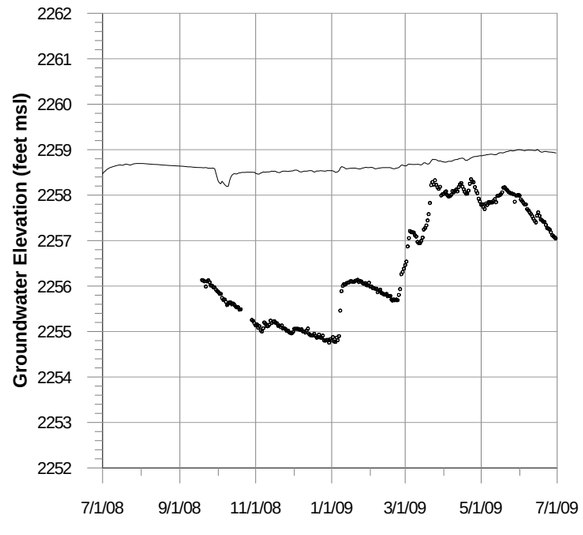












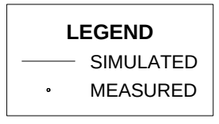
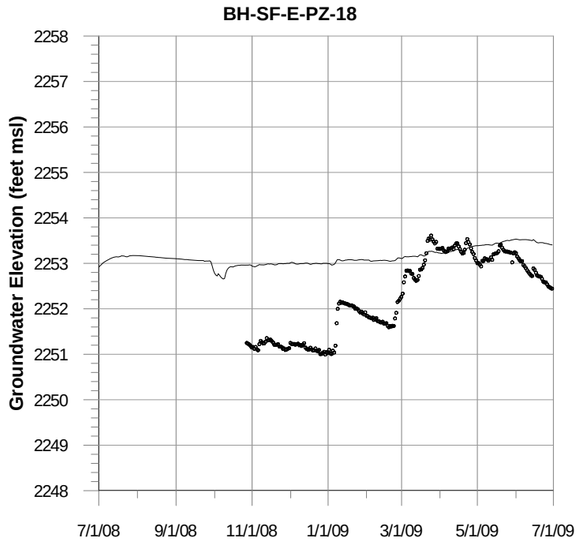
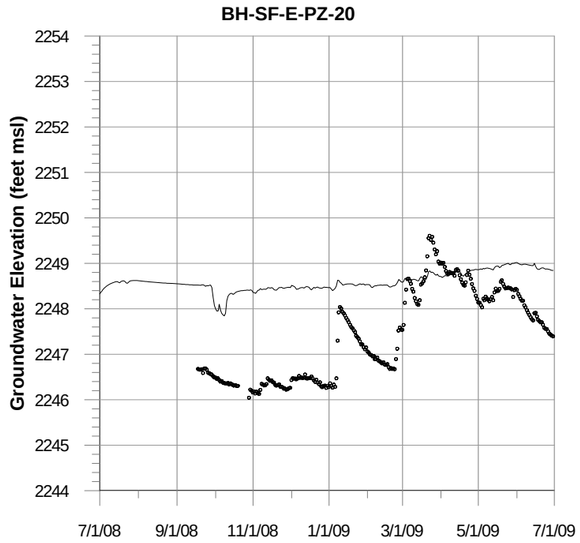
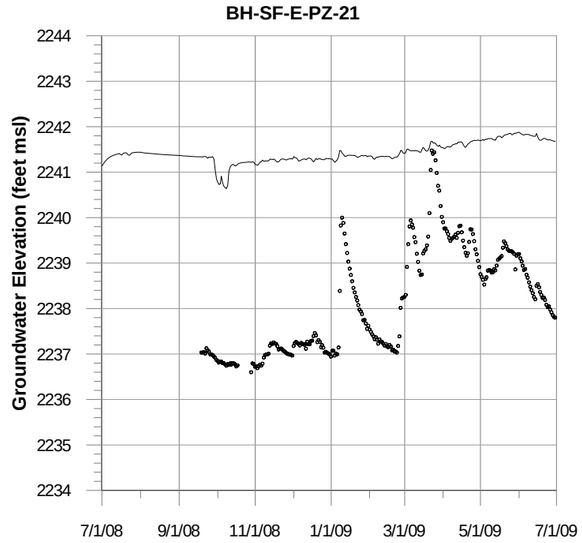
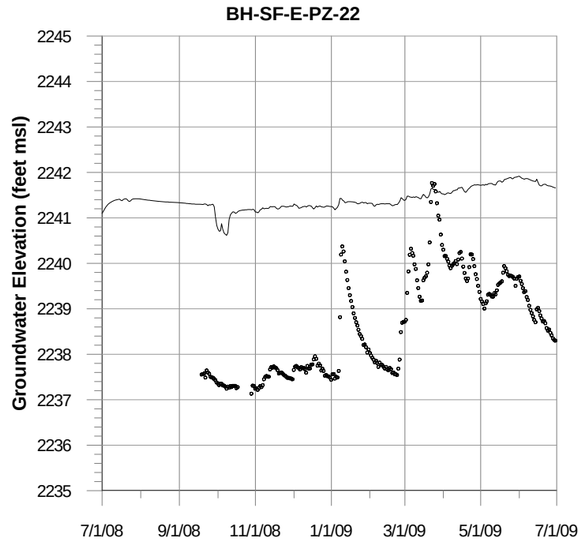


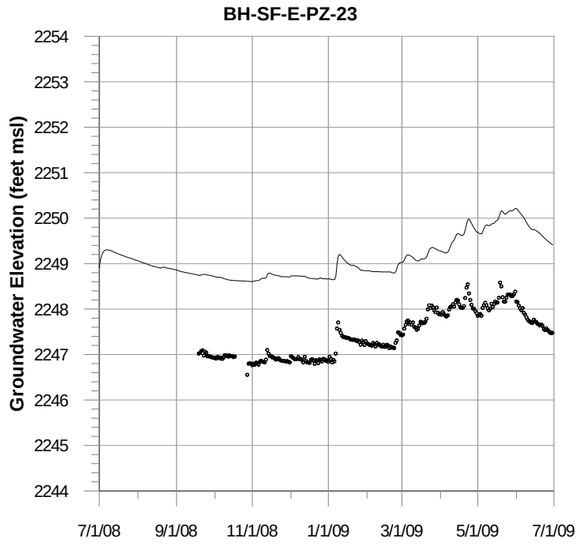
Figure A-13d
Simulated versus Measured Groundwater Elevations – Bunker Hill Box
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

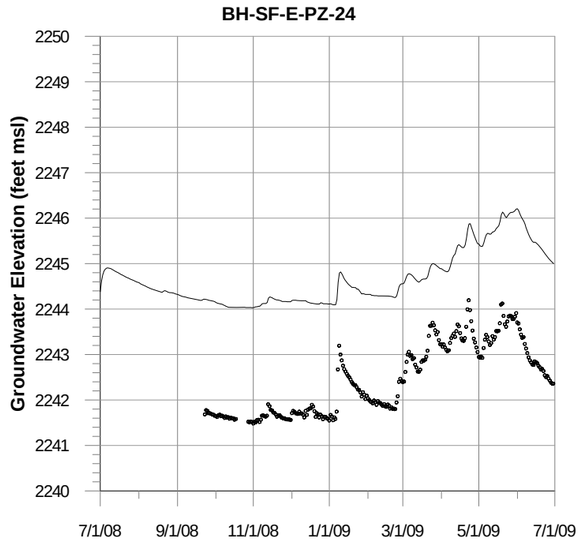


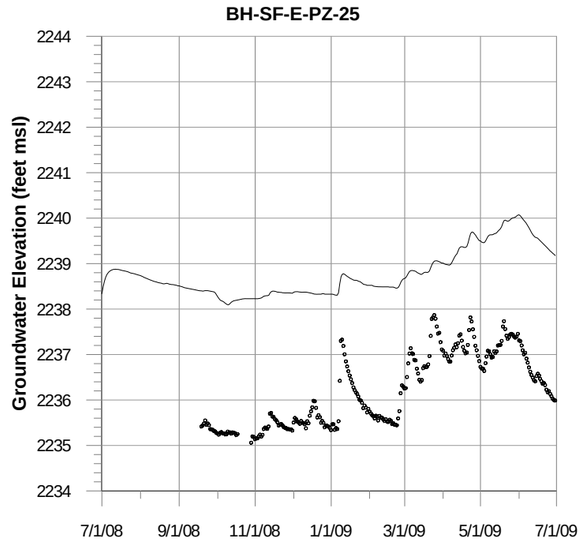


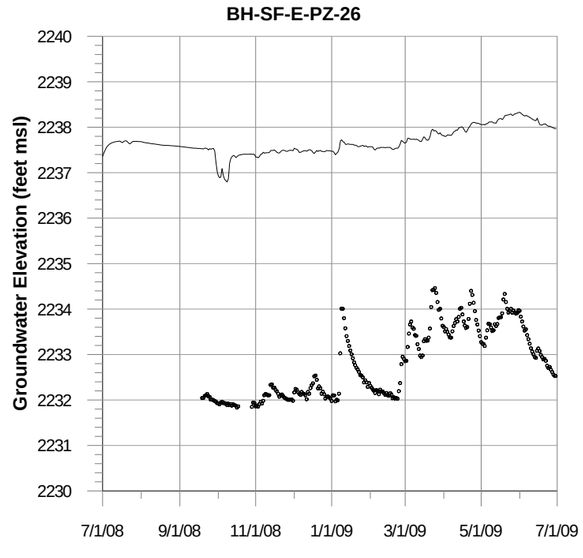












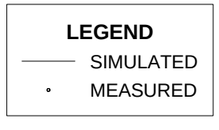


Figure A-13e
Simulated versus Measured Groundwater Elevations – Bunker Hill Box

Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

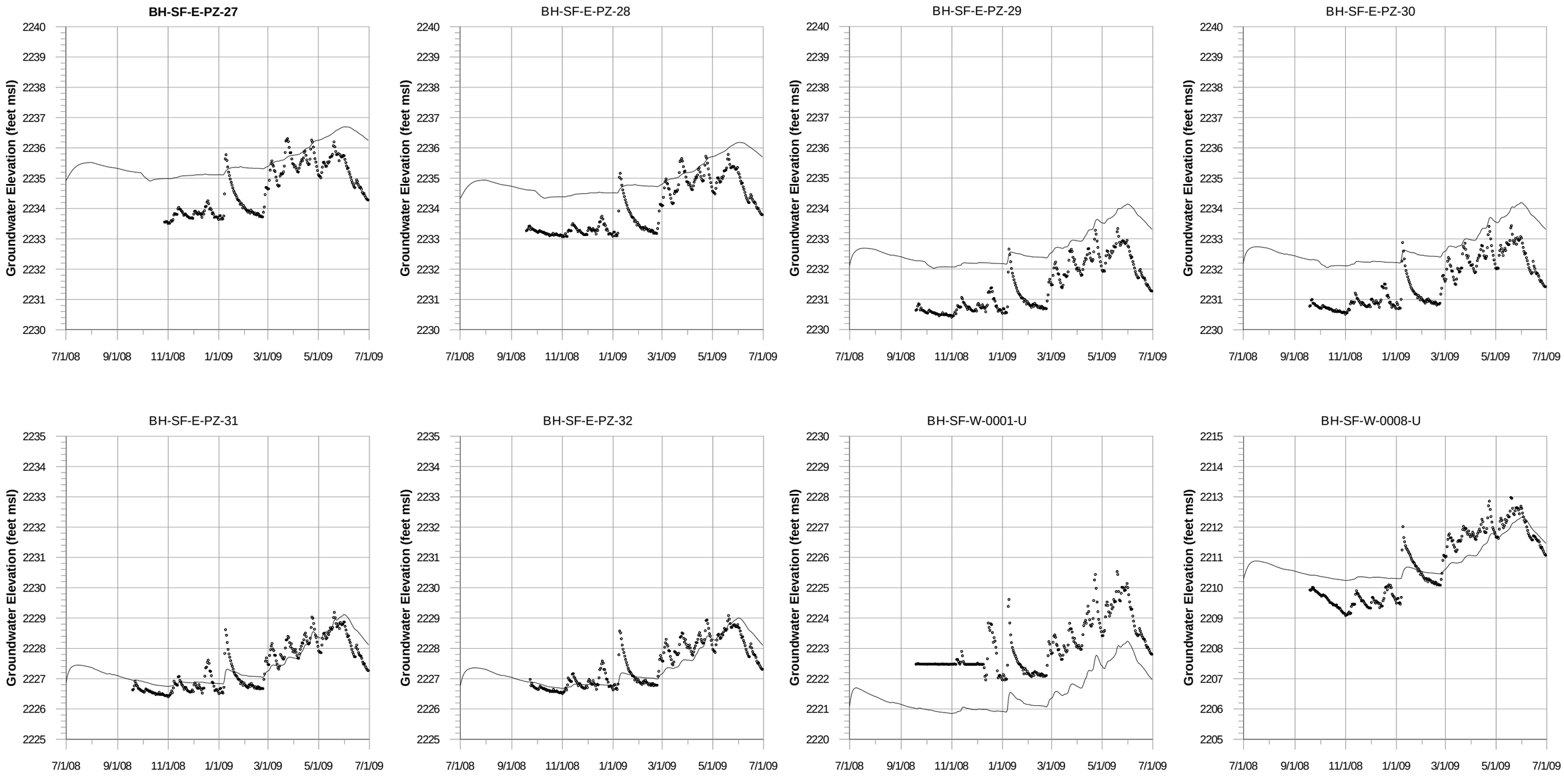
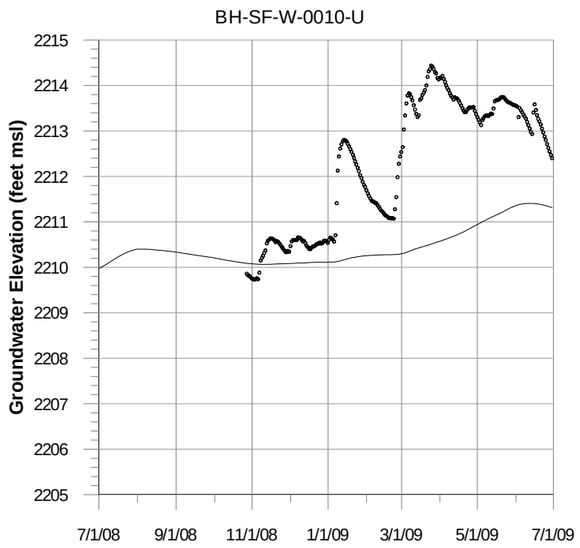
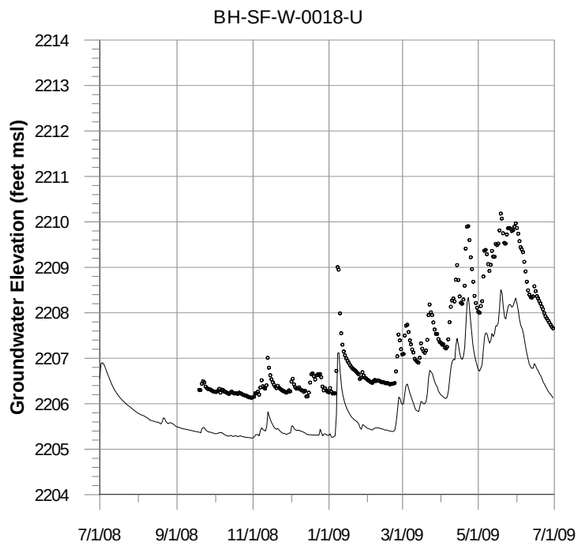
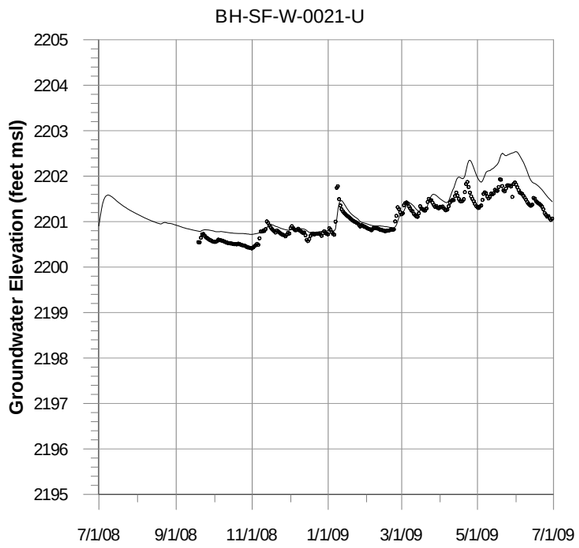


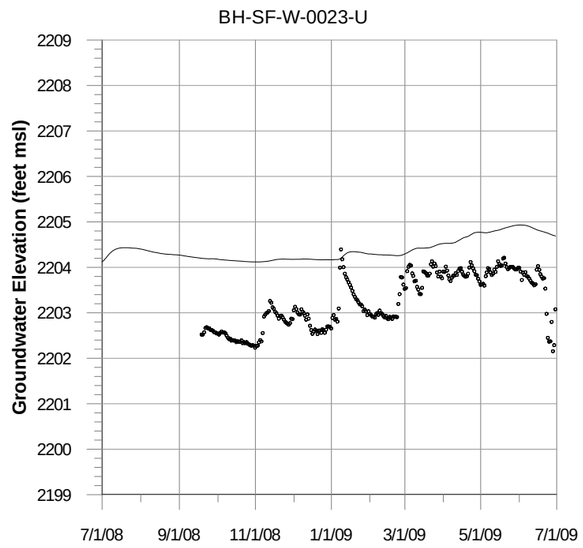
Figure A-13f
Simulated versus Measured Groundwater Elevations – Bunker Hill Box

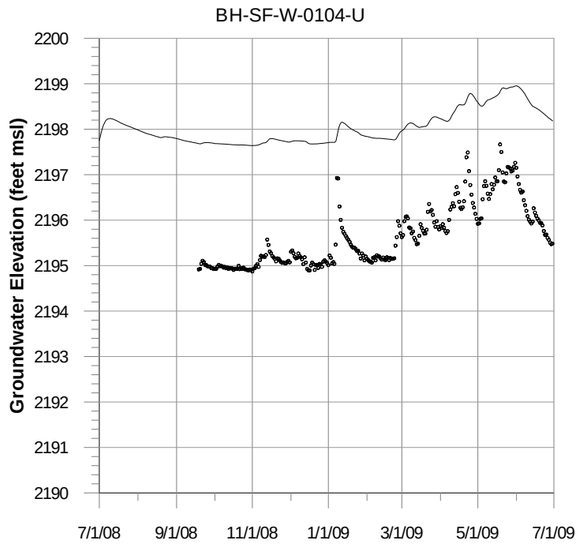
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

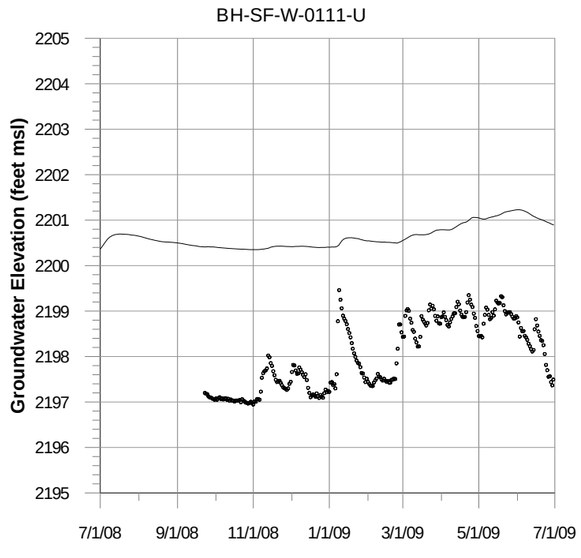


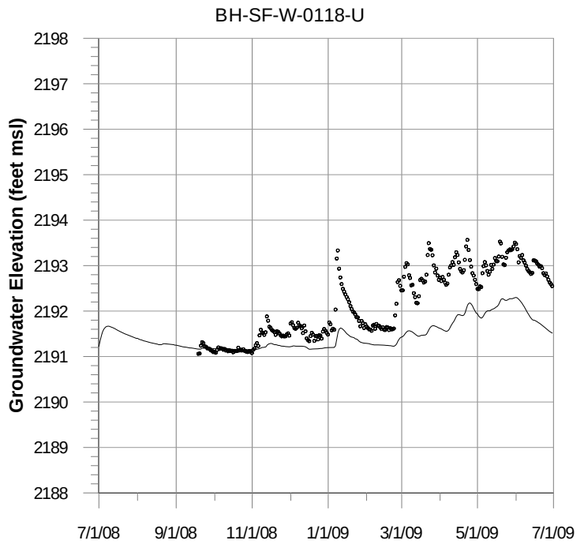


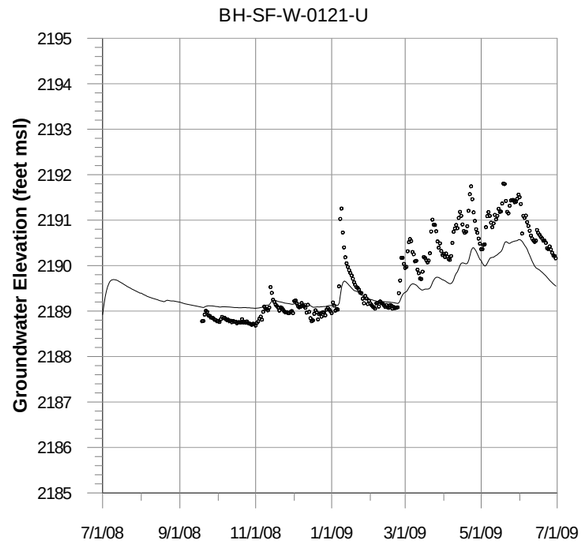












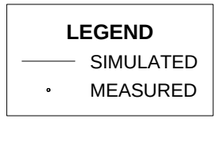
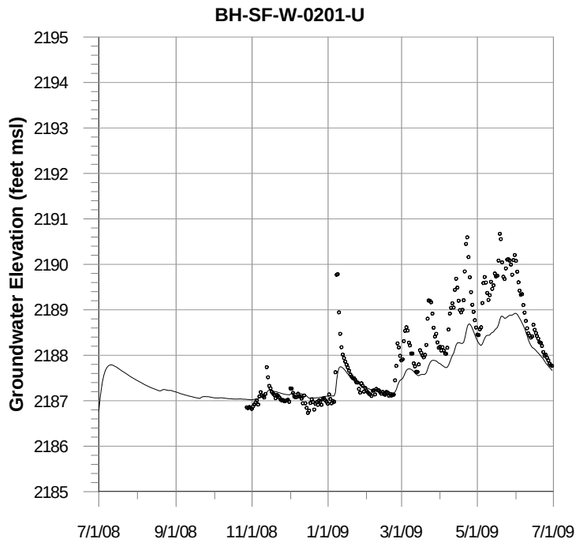
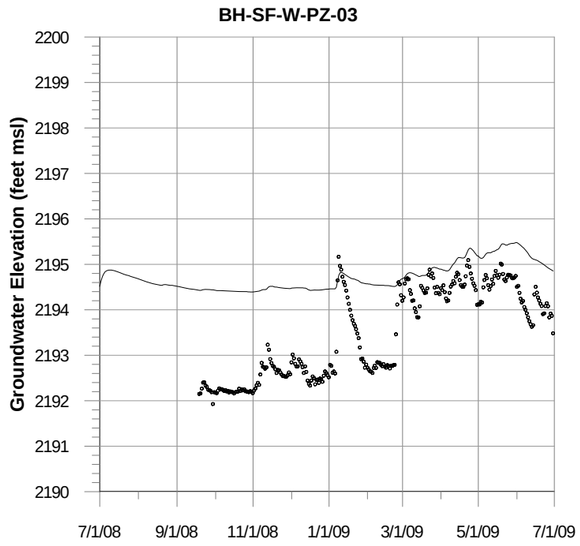
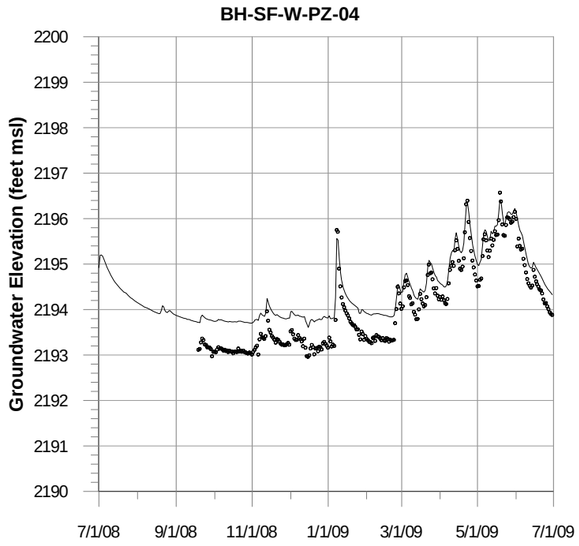


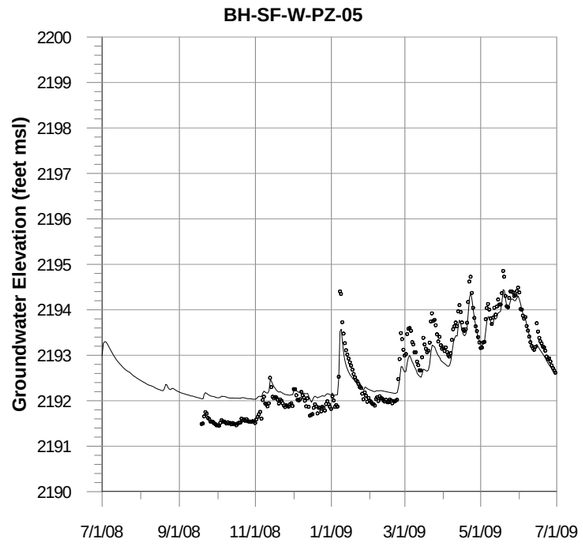
Figure A-13g
Simulated versus Measured Groundwater Elevations – Bunker Hill Box

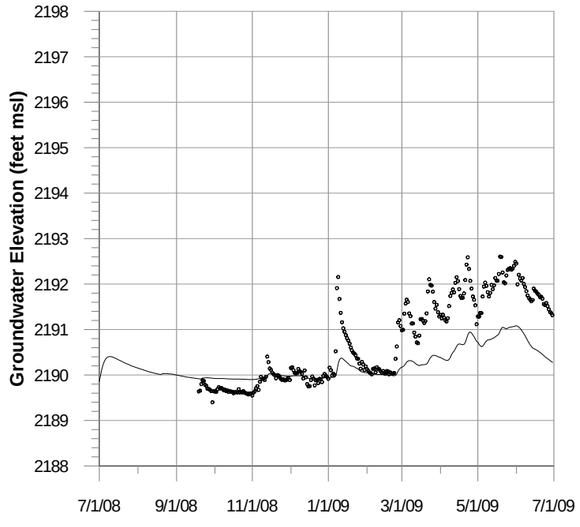
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

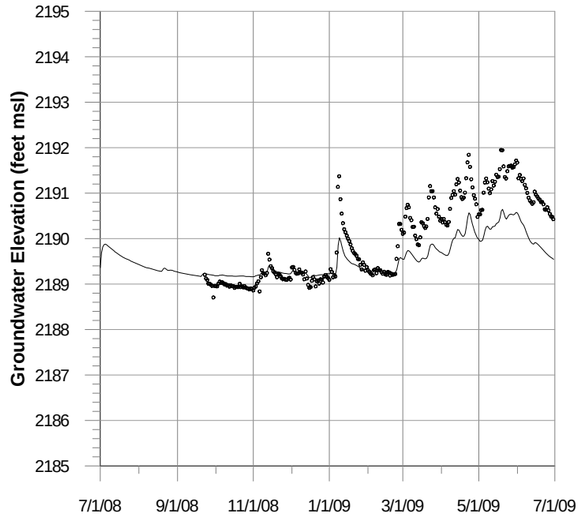


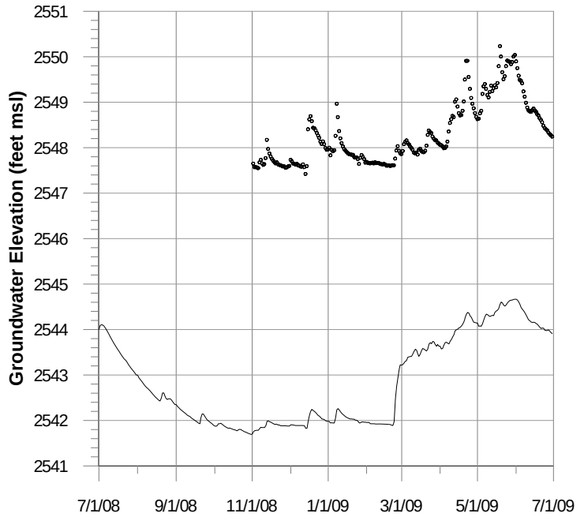


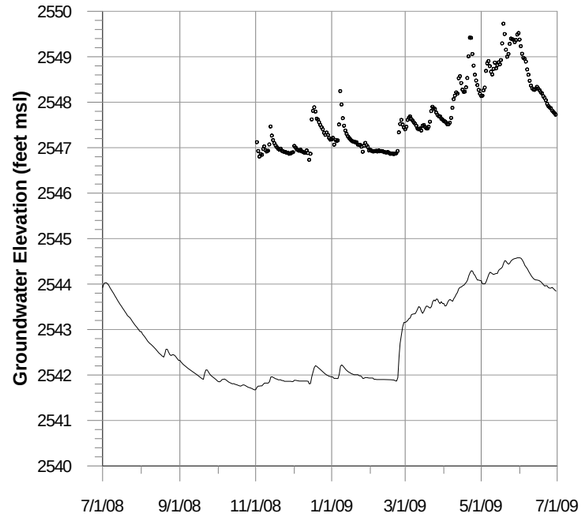












LEGEND

SIMULATED

MEASURED

Figure A-13h
Simulated versus Measured Groundwater Elevations – Bunker Hill Box/Osburn Flats

Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

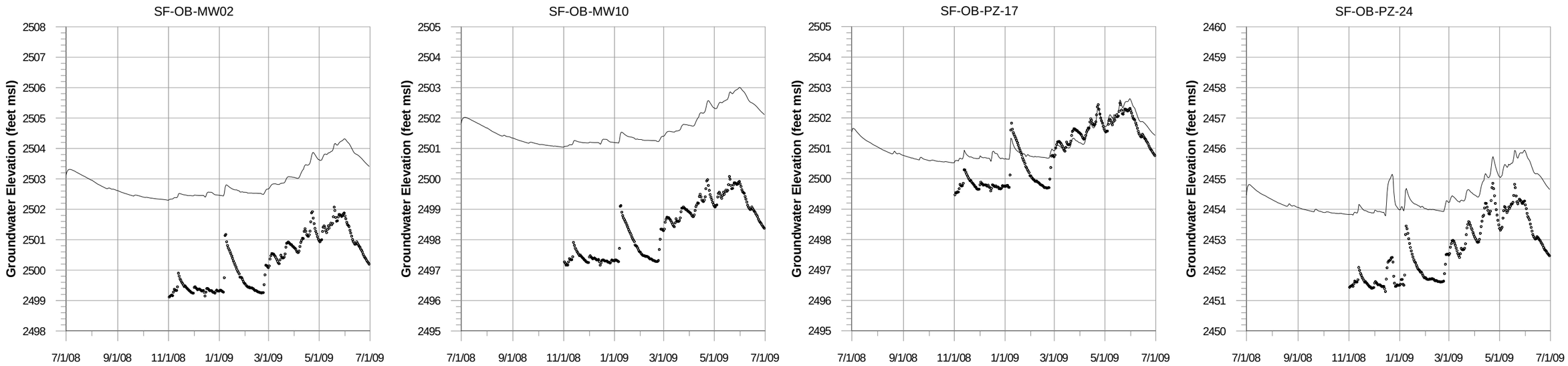


Figure A-13i
Simulated versus Measured Groundwater Elevations – Osburn Flats
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

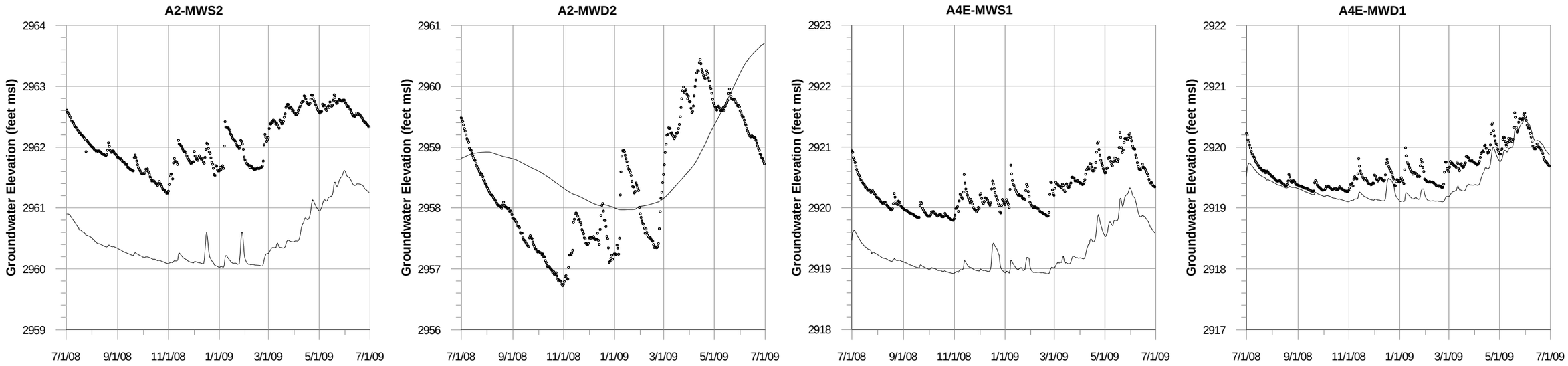
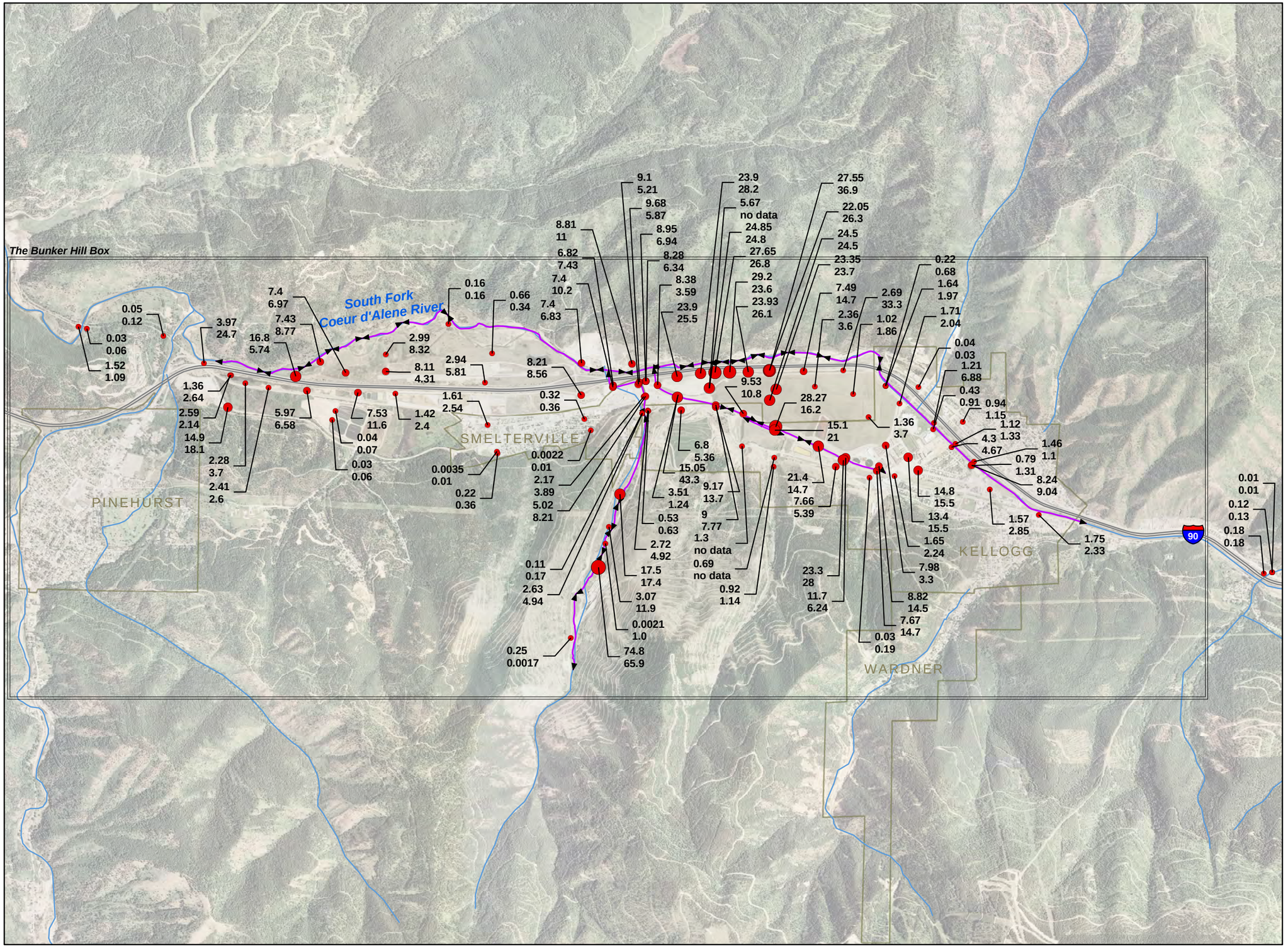
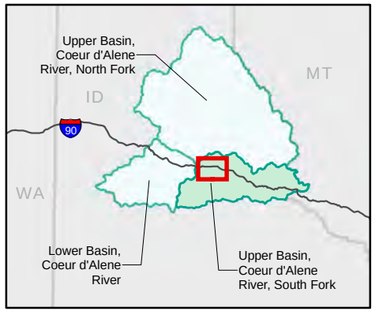


Figure A-14
Simulated versus Measured Groundwater Elevations – Canyon Creek Watershed
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





Dissolved Zinc (mg/L) (4Q08)

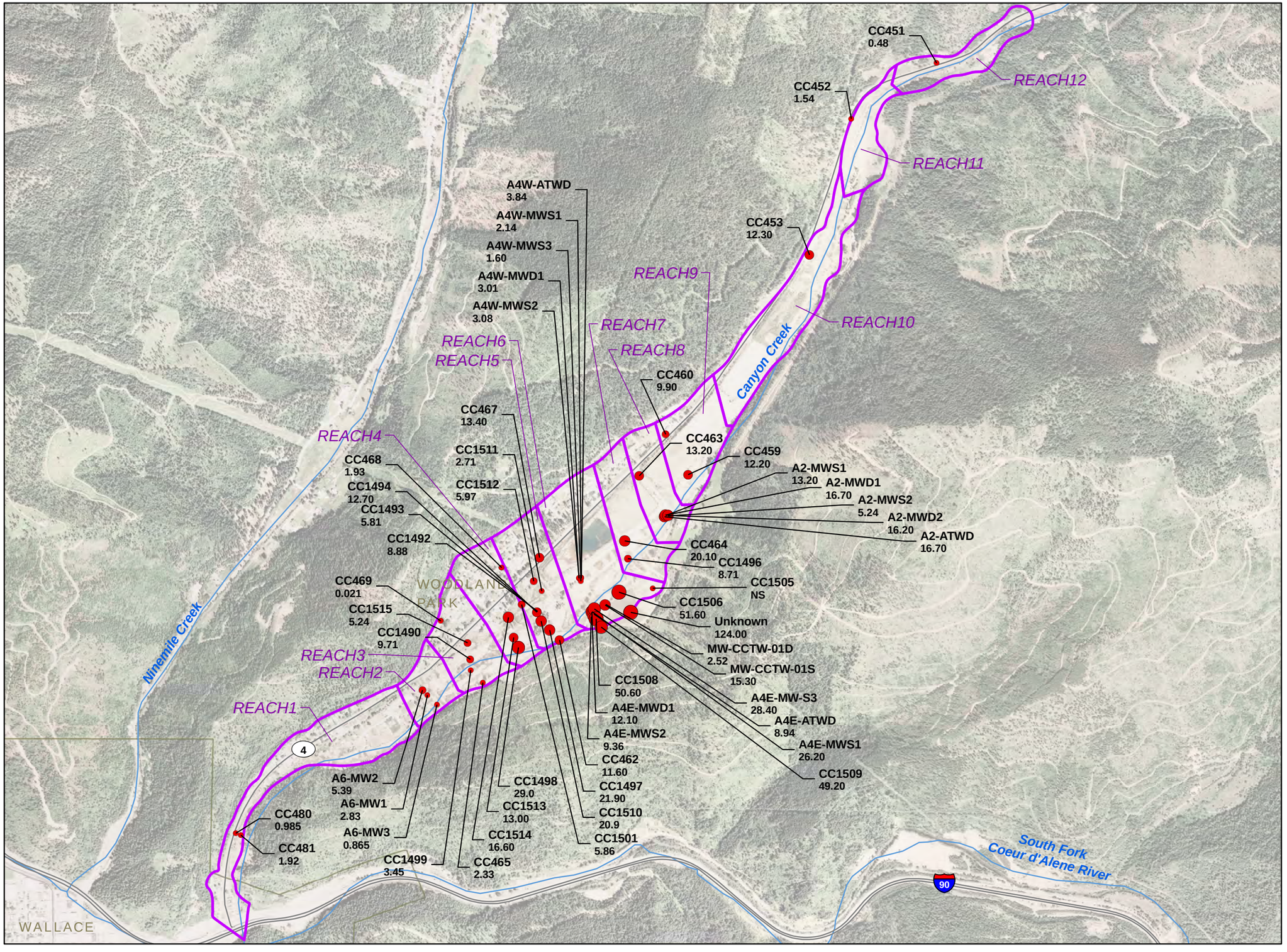
- 0 to 5
- 5 to 10
- 10 to 15
- 15 to 25
- 25 to 50
- 50 to 75
- Mass Loading Reach
- River/Creek
- City Limit

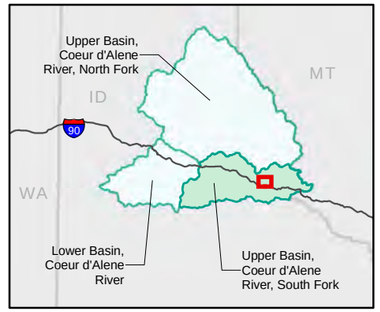
0.12 (4Q08 Dissolved Zinc Concentration [mg/L])
0.13 (2Q09 Dissolved Zinc Concentration [mg/L])
mg/L = milligrams per liter

N
0 1,000 2,000 4,000 Feet

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

Figure A-15
OU 2 Mass Loading Reaches
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





Dissolved Zinc (mg/L)

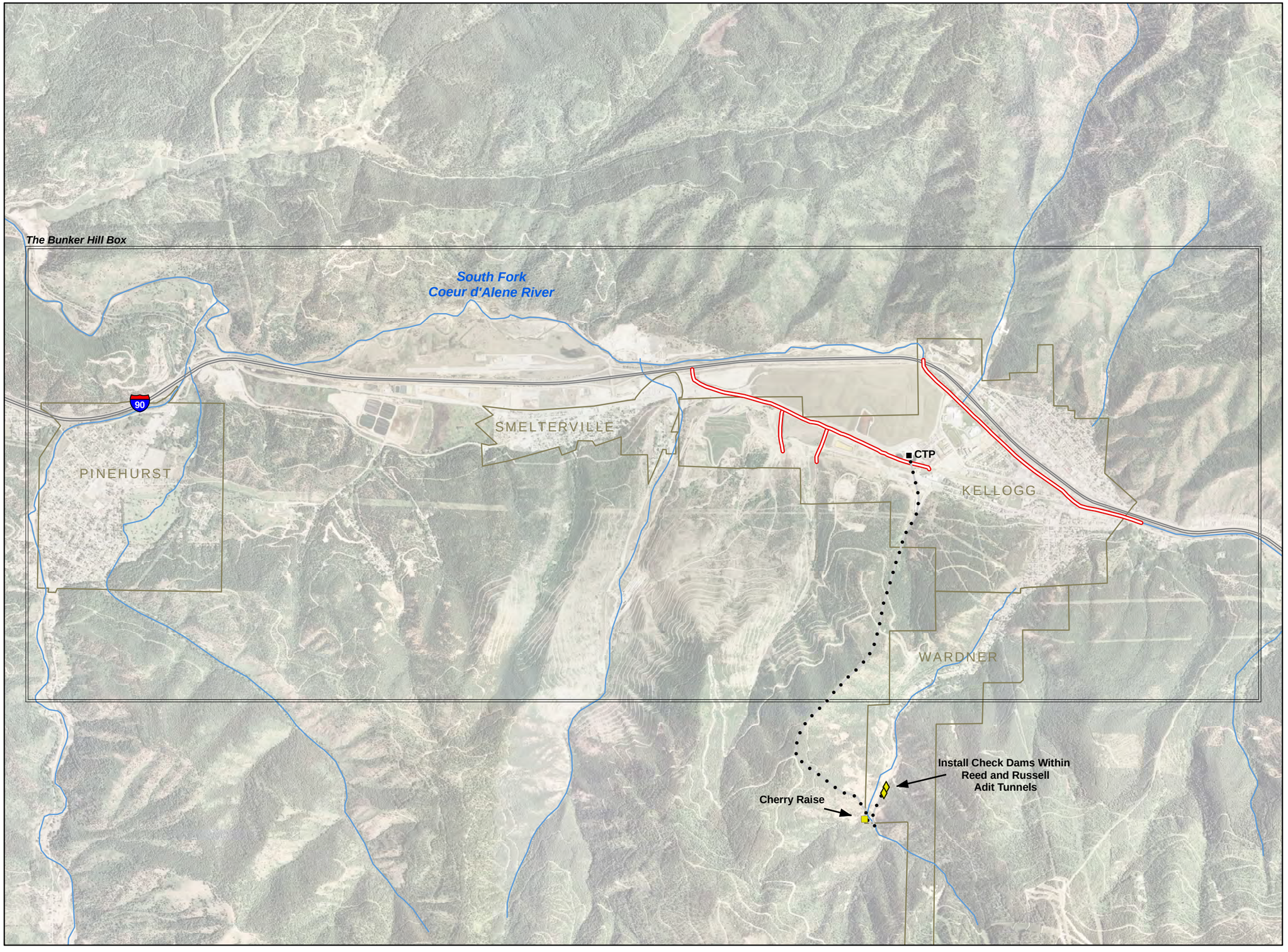
- 0 to 5
- 5 to 10
- 10 to 15
- 15 to 25
- 25 to 50
- 50 to 124
- Canyon Creek Reaches
- River/Creek
- City Limit

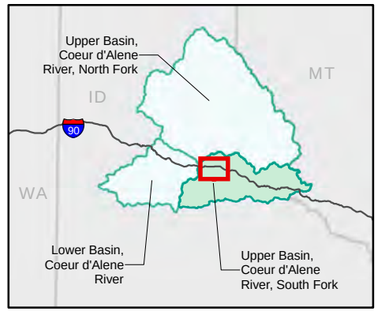
CC453 (Site ID)
12.30 (Dissolved Zinc Concentration [mg/L])
mg/L = milligrams per liter

N
0 500 1,000 2,000 Feet

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

Figure A-16
Woodland Park Mass Loading Reaches
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





- Central Treatment Plant (CTP)
- Adit
- Raise
- Conveyance of Reed and Russell adit discharge through the Bunker Hill Mine via the Cherry Raise and the Kellogg Tunnel to the CTP
- Stream Liner
- River/Creek
- City Limit

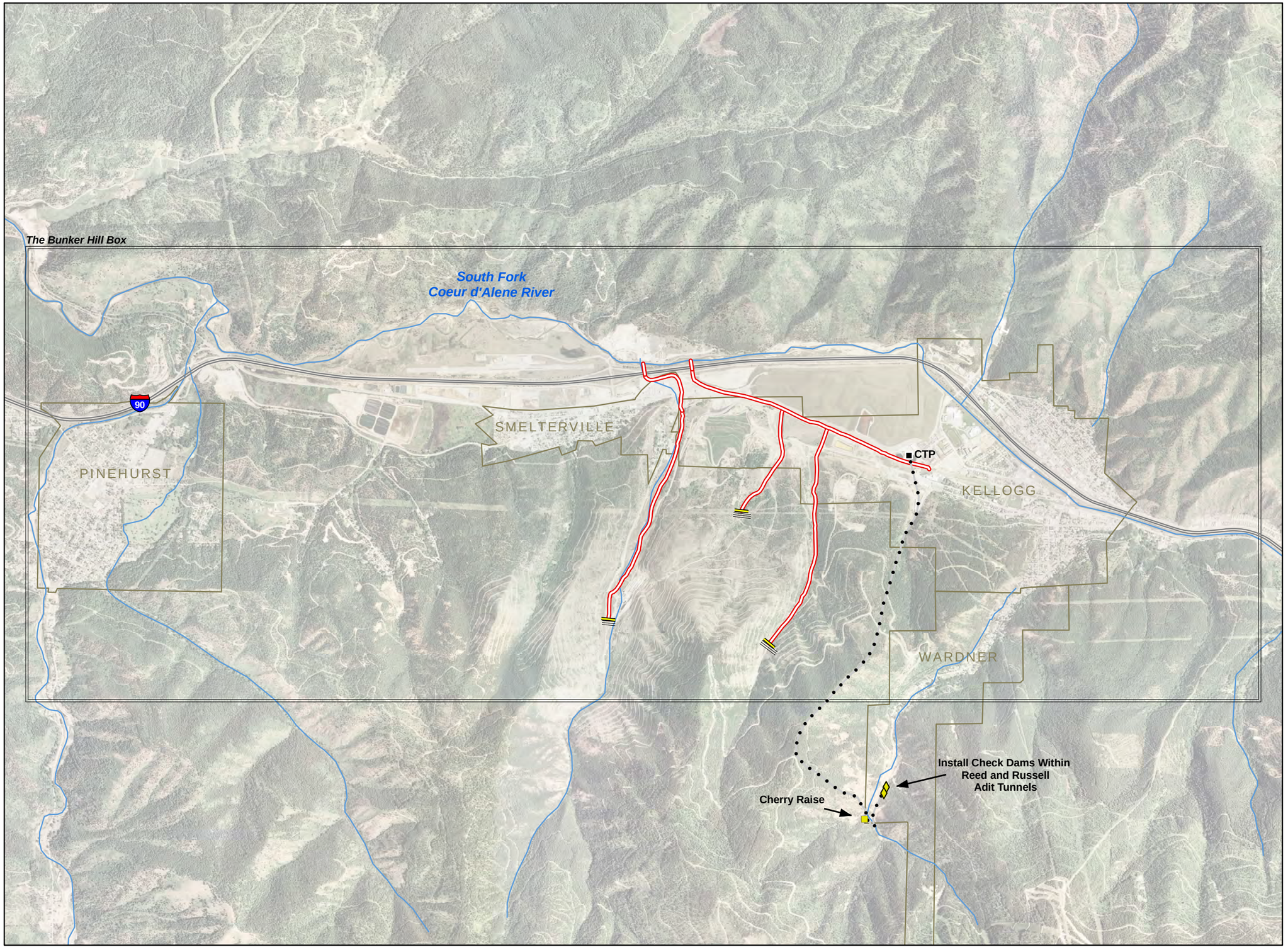
Note: Conveyance and treatment of Reed and Russell adit discharge is a contingency action that will be implemented only if check dams do not eliminate the flow of contaminated water from the adits.

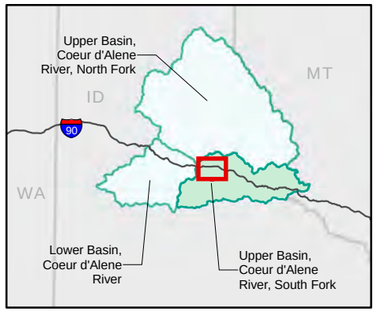
N

0 1,000 2,000 4,000 Feet

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

Figure A-17
OU 2 Alternative (a):
Minimal Stream Lining
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





- Central Treatment Plant (CTP)
- Adit
- Raise
- Conveyance of Reed and Russell adit discharge through the Bunker Hill Mine via the Cherry Raise and the Kellogg Tunnel to the CTP
- Slurry Wall
- Stream Liner
- Extraction Wells
- River/Creek
- City Limit

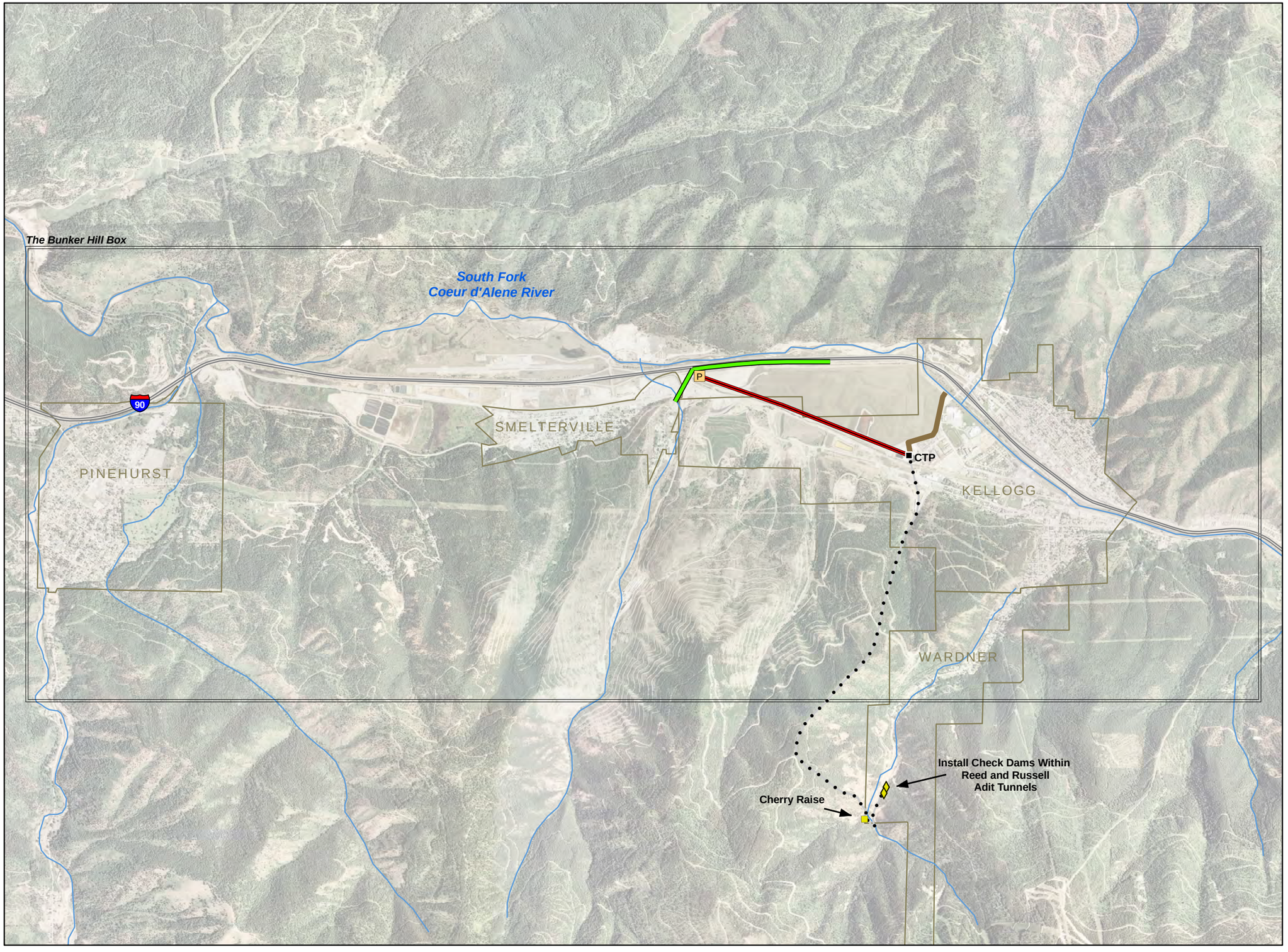
Note: Conveyance and treatment of Reed and Russell adit discharge is a contingency action that will be implemented only if check dams do not eliminate the flow of contaminated water from the adits.

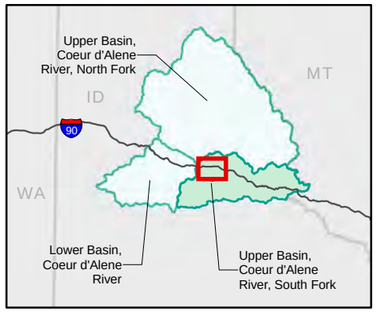
N

0 1,000 2,000 4,000 Feet

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

Figure A-18
OU 2 Alternative (b):
Extensive Stream Lining
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





- Central Treatment Plant (CTP)
- Pump Station
- Adit
- Raise
- Conveyance of Reed and Russell adit discharge through the Bunker Hill Mine via the Cherry Raise and the Kellogg Tunnel to the CTP
- Conveyance Pipeline
- CTP Effluent Discharge Pipeline
- French Drain
- River/Creek
- City Limit

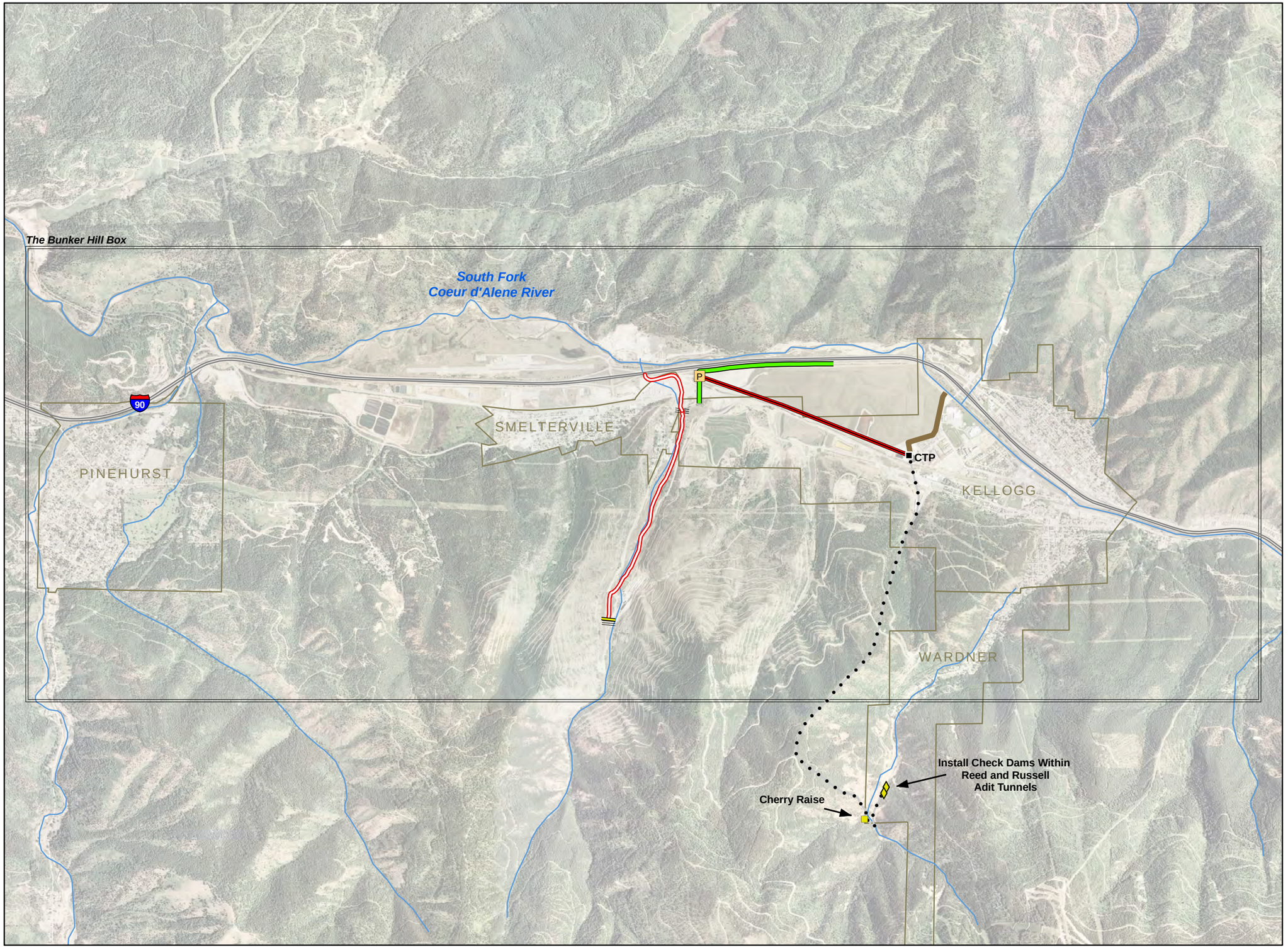
Note: Conveyance and treatment of Reed and Russell adit discharge is a contingency action that will be implemented only if check dams do not eliminate the flow of contaminated water from the adits.

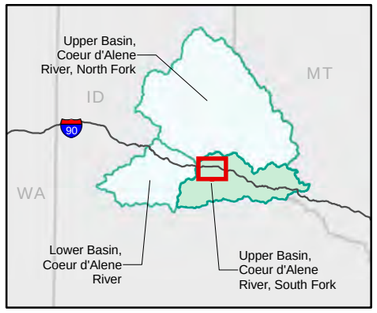
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0 1,000 2,000 4,000 Feet

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

Figure A-19
OU 2 Alternative (c):
French Drains
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





- Central Treatment Plant (CTP)
- Pump Station
- Adit
- Raise
- Conveyance of Reed and Russell adit discharge through the Bunker Hill Mine via the Cherry Raise and the Kellogg Tunnel to the CTP
- Conveyance Pipeline
- CTP Effluent Discharge Pipeline
- French Drain
- Slurry Wall
- Stream Liner
- Extraction Wells
- River/Creek
- City Limit

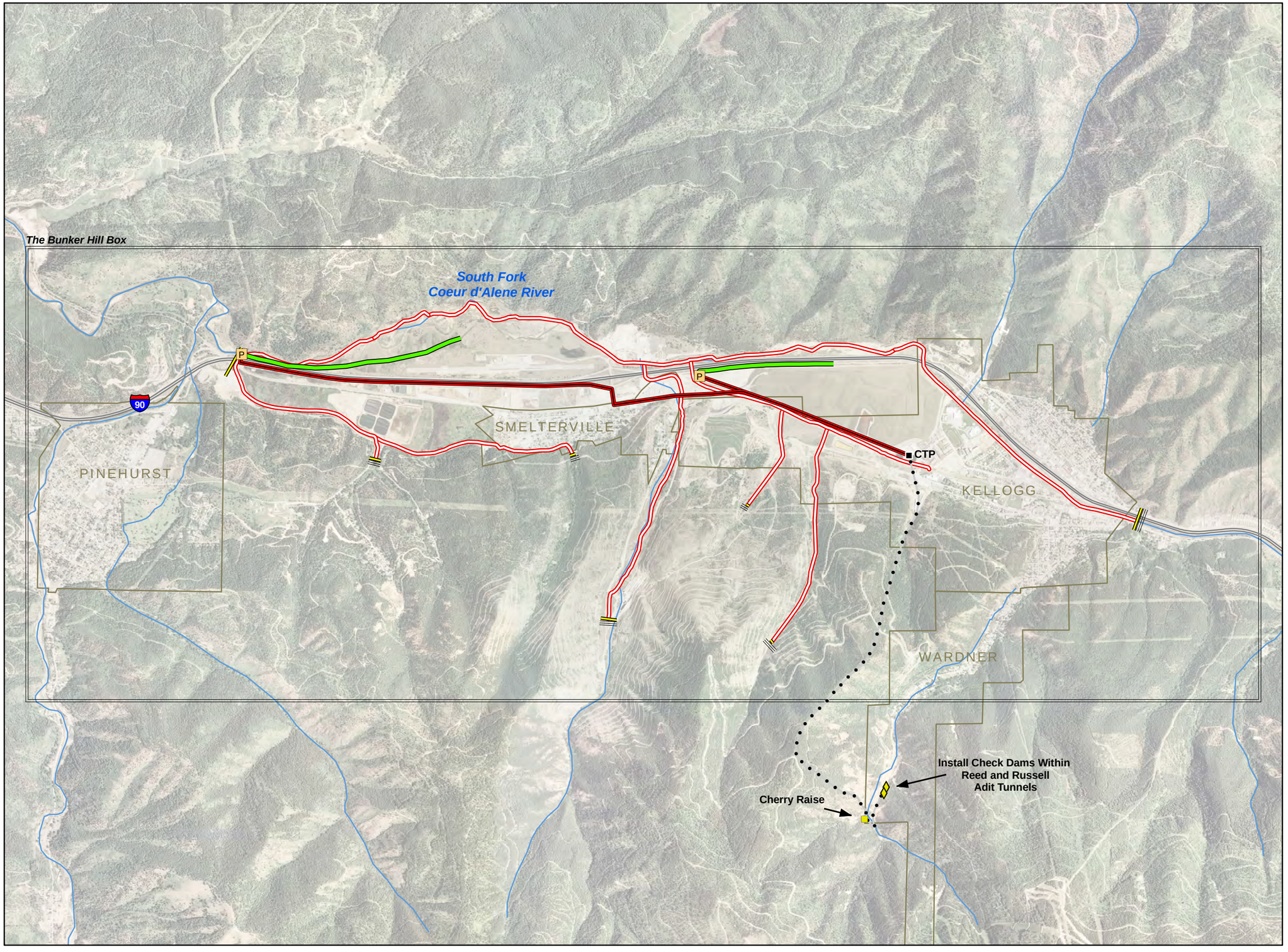
Note: Conveyance and treatment of Reed and Russell adit discharge is a contingency action that will be implemented only if check dams do not eliminate the flow of contaminated water from the adits.

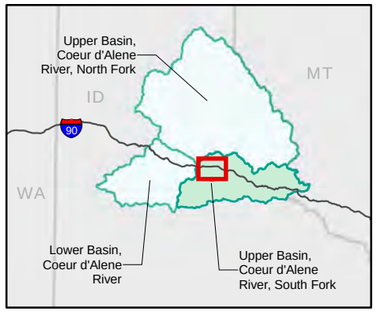
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Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Figure A-20
OU 2 Alternative (d):
Stream Lining/French Drain Combination
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





- Central Treatment Plant (CTP)
- Pump Station
- Adit
- Raise
- Conveyance of Reed and Russell adit discharge through the Bunker Hill Mine via the Cherry Raise and the Kellogg Tunnel to the CTP
- Conveyance Pipeline
- French Drain
- Slurry Wall
- Stream Liner
- Extraction Wells
- River/Creek
- City Limit

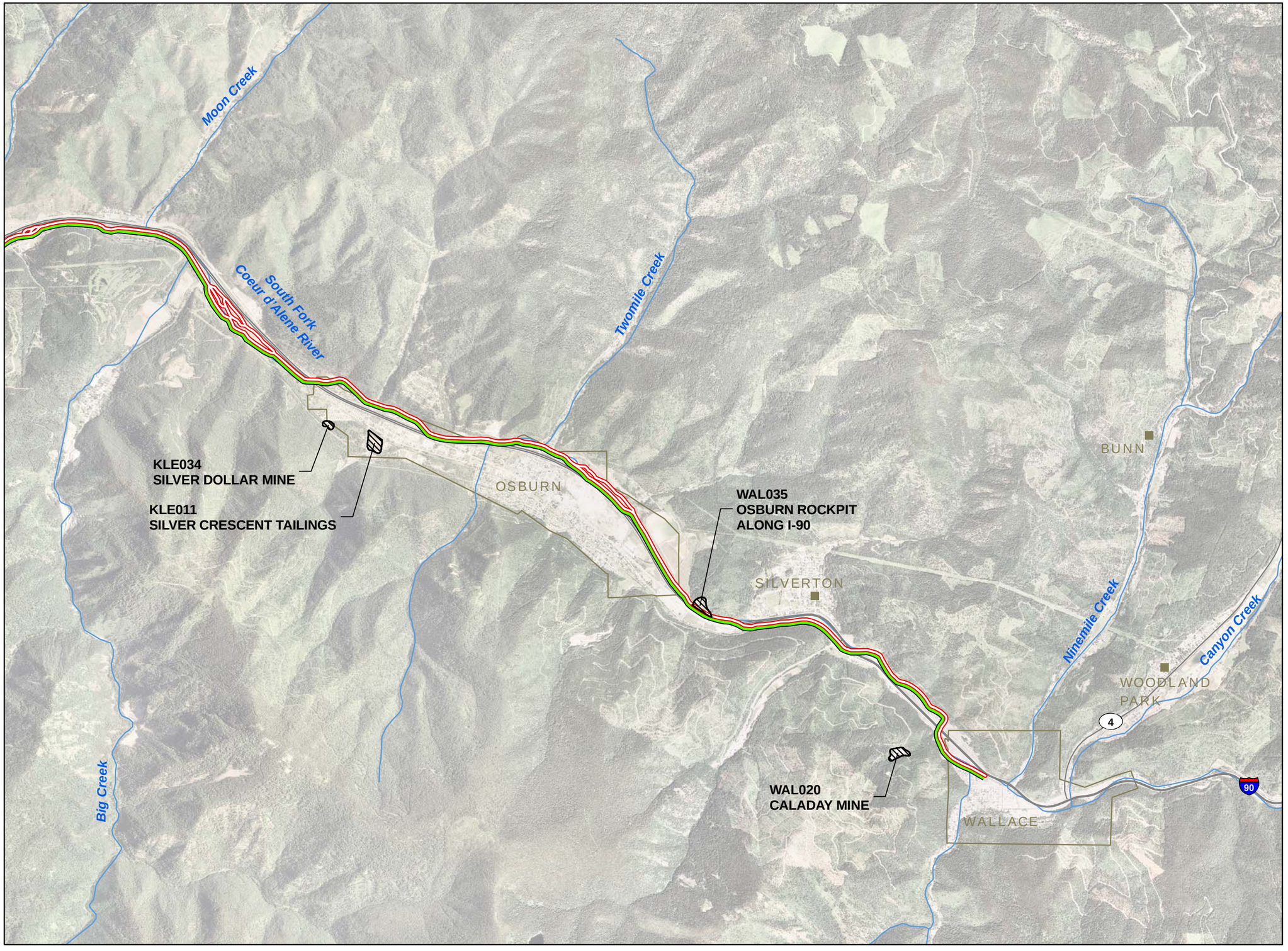
Note: Conveyance and treatment of Reed and Russell adit discharge is a contingency action that will be implemented only if check dams do not eliminate the flow of contaminated water from the adits.

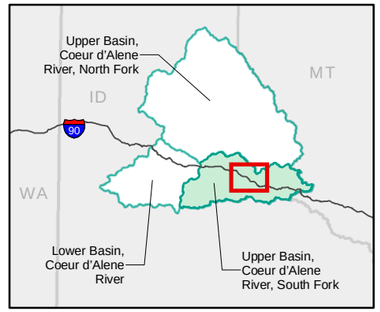
N

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

Figure A-21
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





French Drain
Stream Liner
River/Creek
Capped Tailings Pile
City Limit

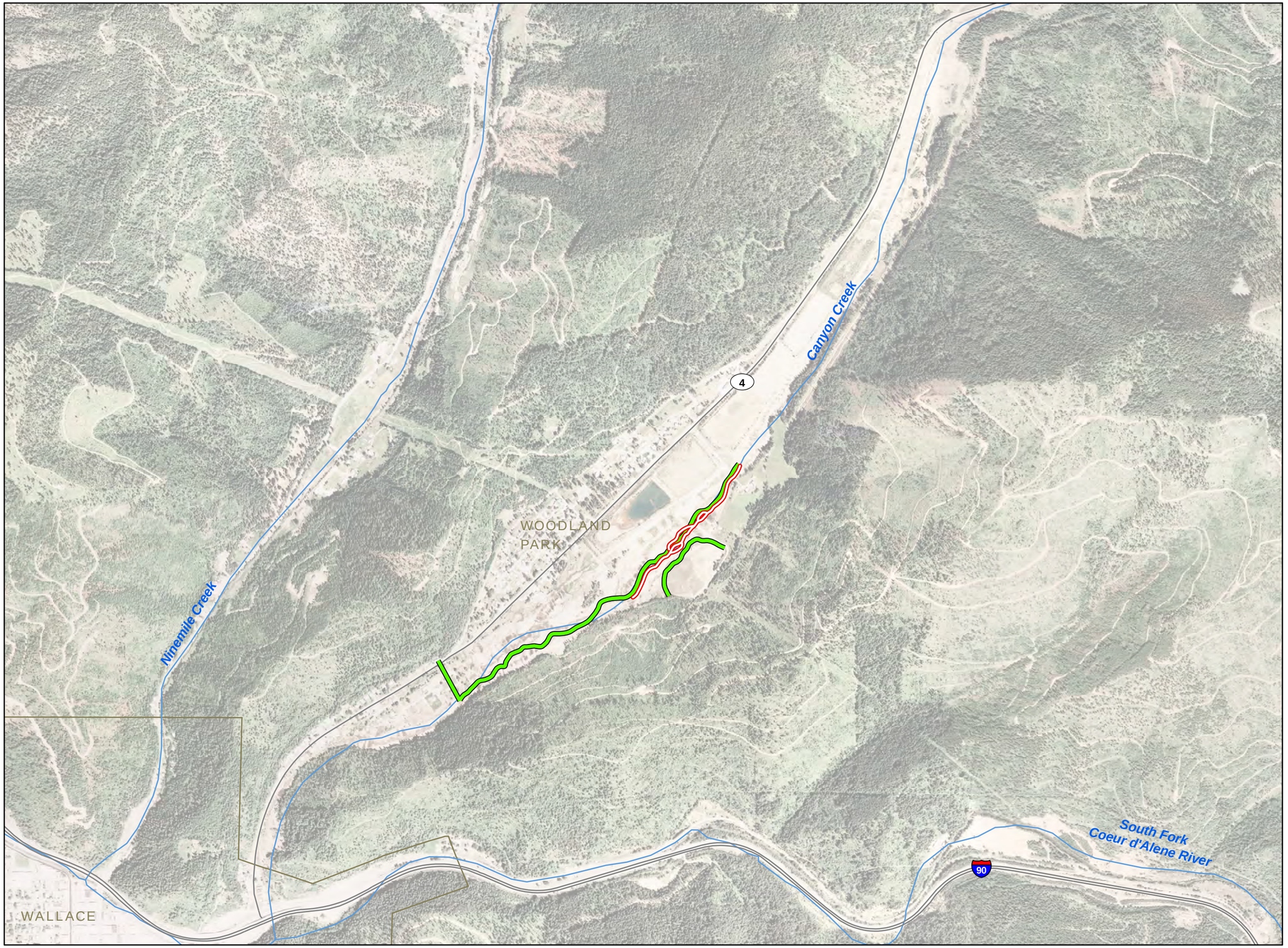
WAL020 (Site ID)
CALADAY MINE (Site Name)

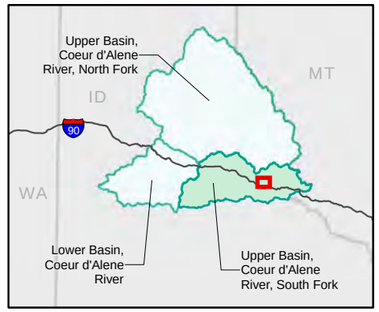
N
0 1,000 2,000 4,000 Feet

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

Figure A-22
Groundwater Components of OU 3 Remedial Alternatives for the Mainstem SFCDR Watershed, Segment 01
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

EPA





French Drain

Stream Liner

River/Creek

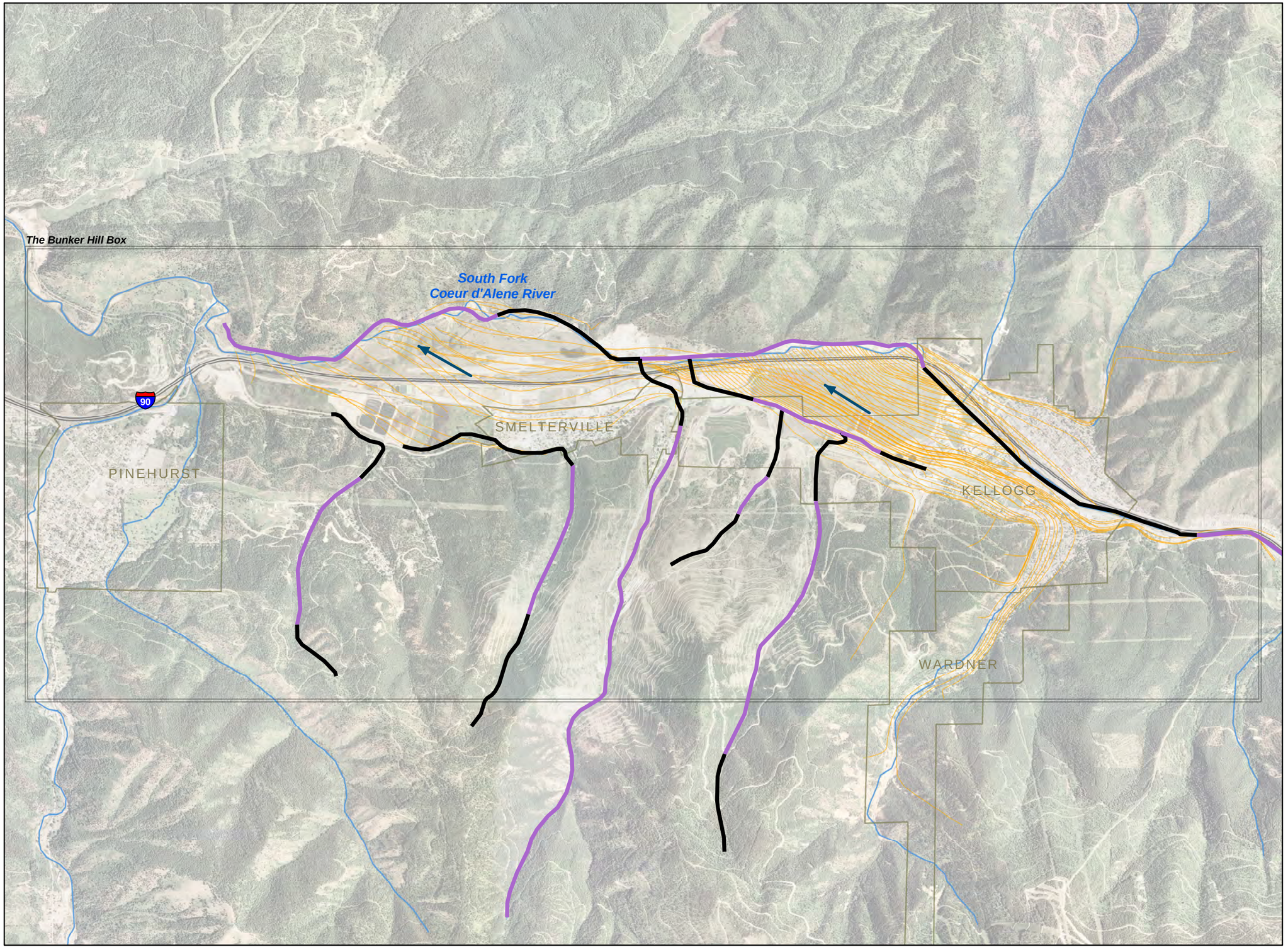
City Limit

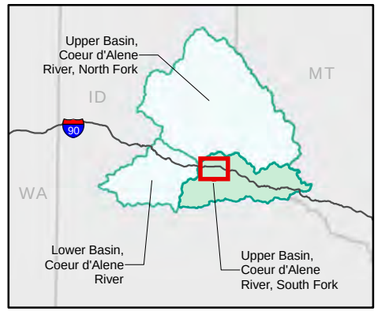
N

0 500 1,000 2,000 Feet

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

Figure A-23
Groundwater Components of Updated Remedial Actions for Woodland Park
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE



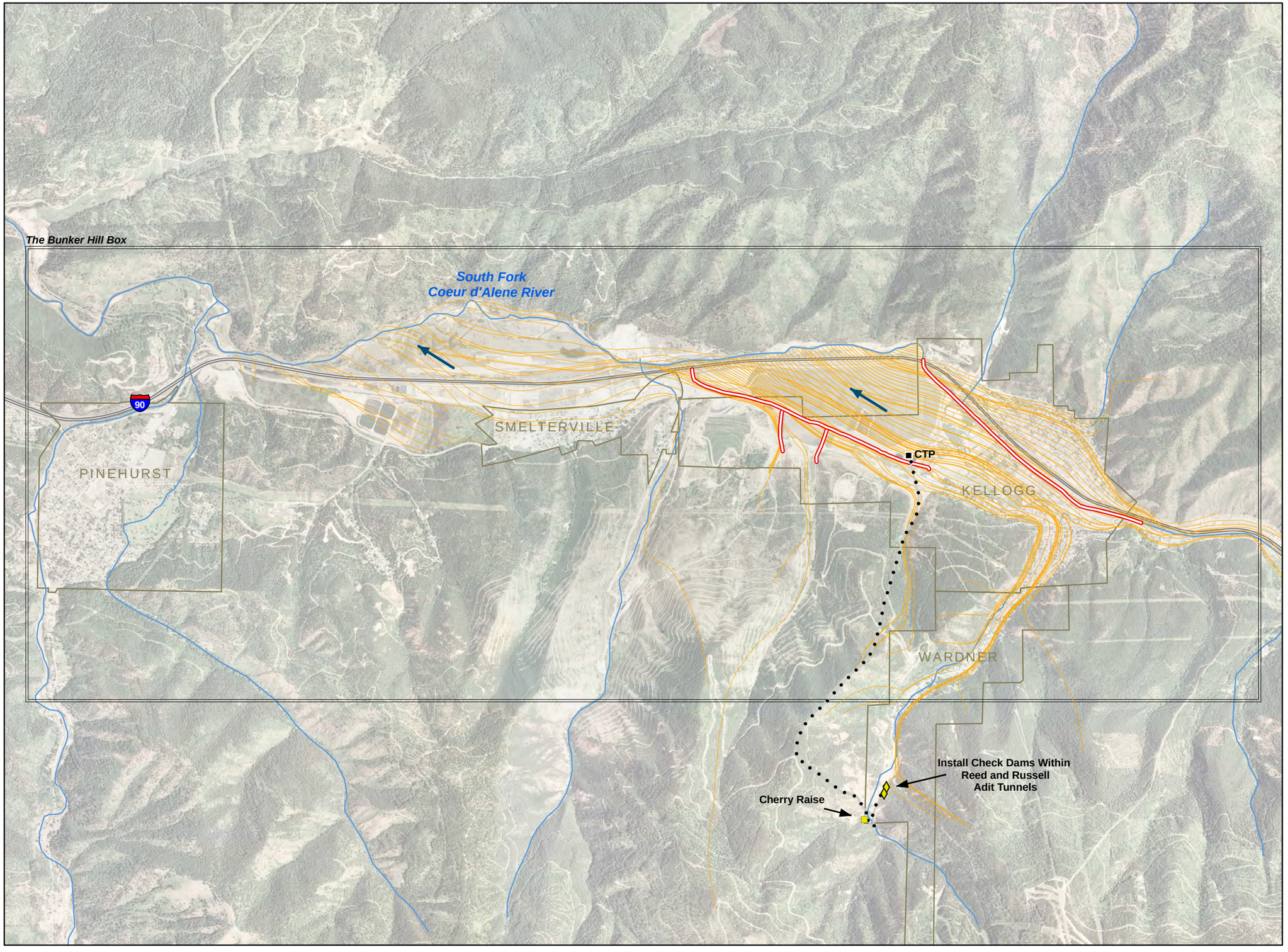


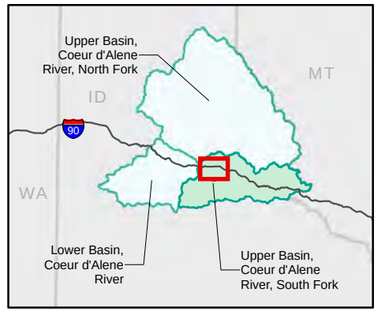
Simulated Groundwater Flowpath
Simulated Gaining Stream Reach
Simulated Losing Stream Reach
Simulated Groundwater Flow Direction
River/Creek
City Limit

N
0 1,000 2,000 4,000 Feet

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

Figure A-24
Simulated Upstream Groundwater Flowlines from the SFCDR, No Action, Baseflow Conditions
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





- Central Treatment Plant (CTP)
- Adit
- Raise
- Conveyance of Reed and Russell adit discharge through the Bunker Hill Mine via the Cherry Raise and the Kellogg Tunnel to the CTP
- Stream Liner
- Simulated Groundwater Flowpath
- Simulated Groundwater Flow Direction
- River/Creek
- City Limit

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.

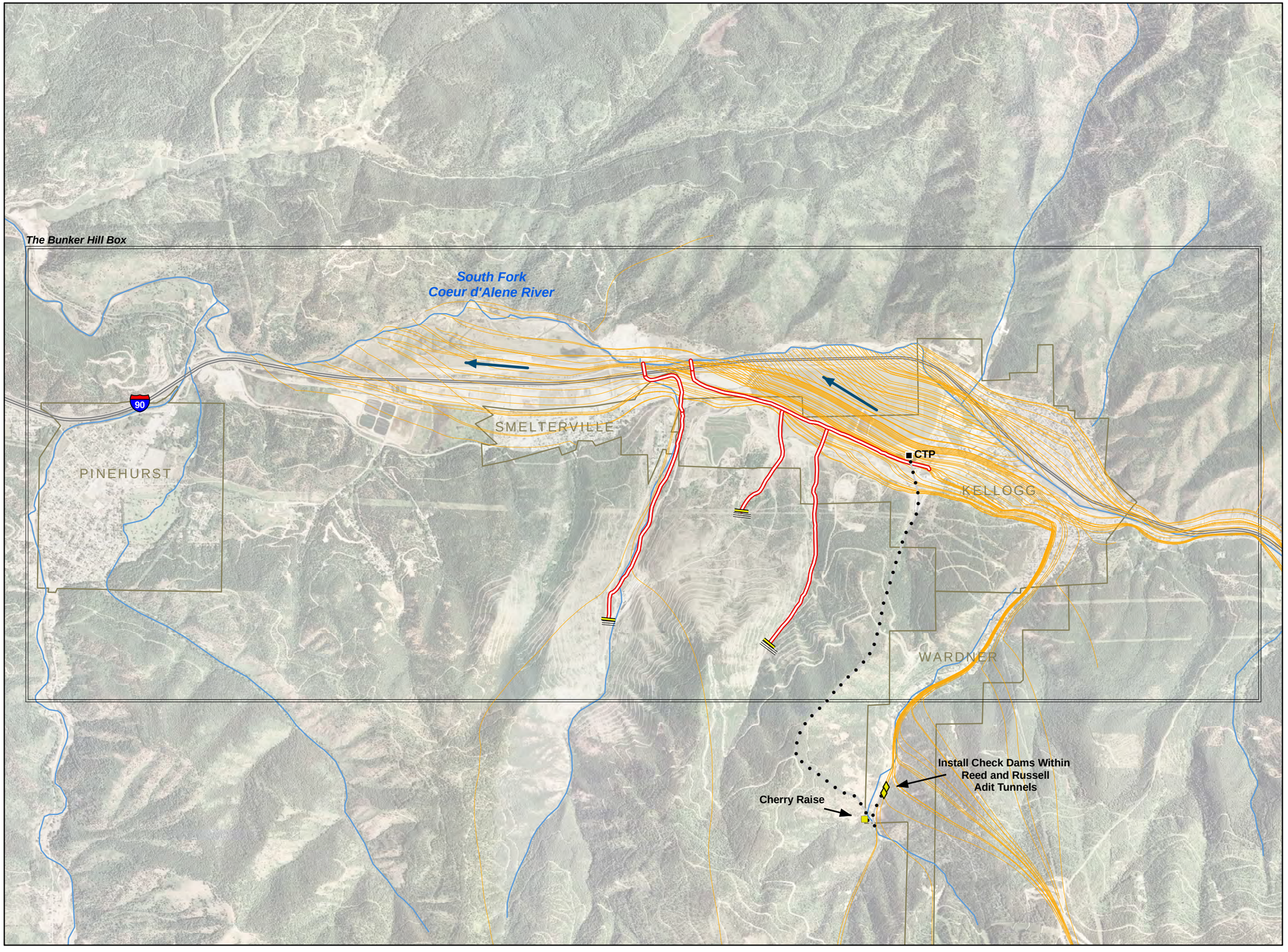
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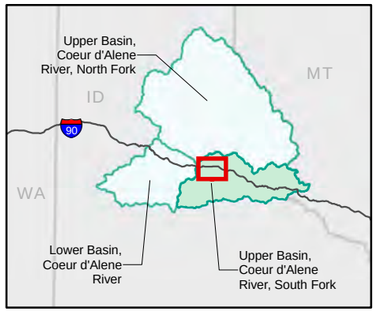
0 1,000 2,000 4,000 Feet

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

Figure A-25
Simulated Upstream Groundwater Flowlines from the SFCDR, OU 2 Alternative (a), Baseflow Conditions
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

EPA





- Central Treatment Plant (CTP)
- Adit
- Raise
- Conveyance of Reed and Russell adit discharge through the Bunker Hill Mine via the Cherry Raise and the Kellogg Tunnel to the CTP
- Slurry Wall
- Stream Liner
- Extraction Wells
- Simulated Groundwater Flowpath
- Simulated Groundwater Flow Direction
- River/Creek
- City Limit

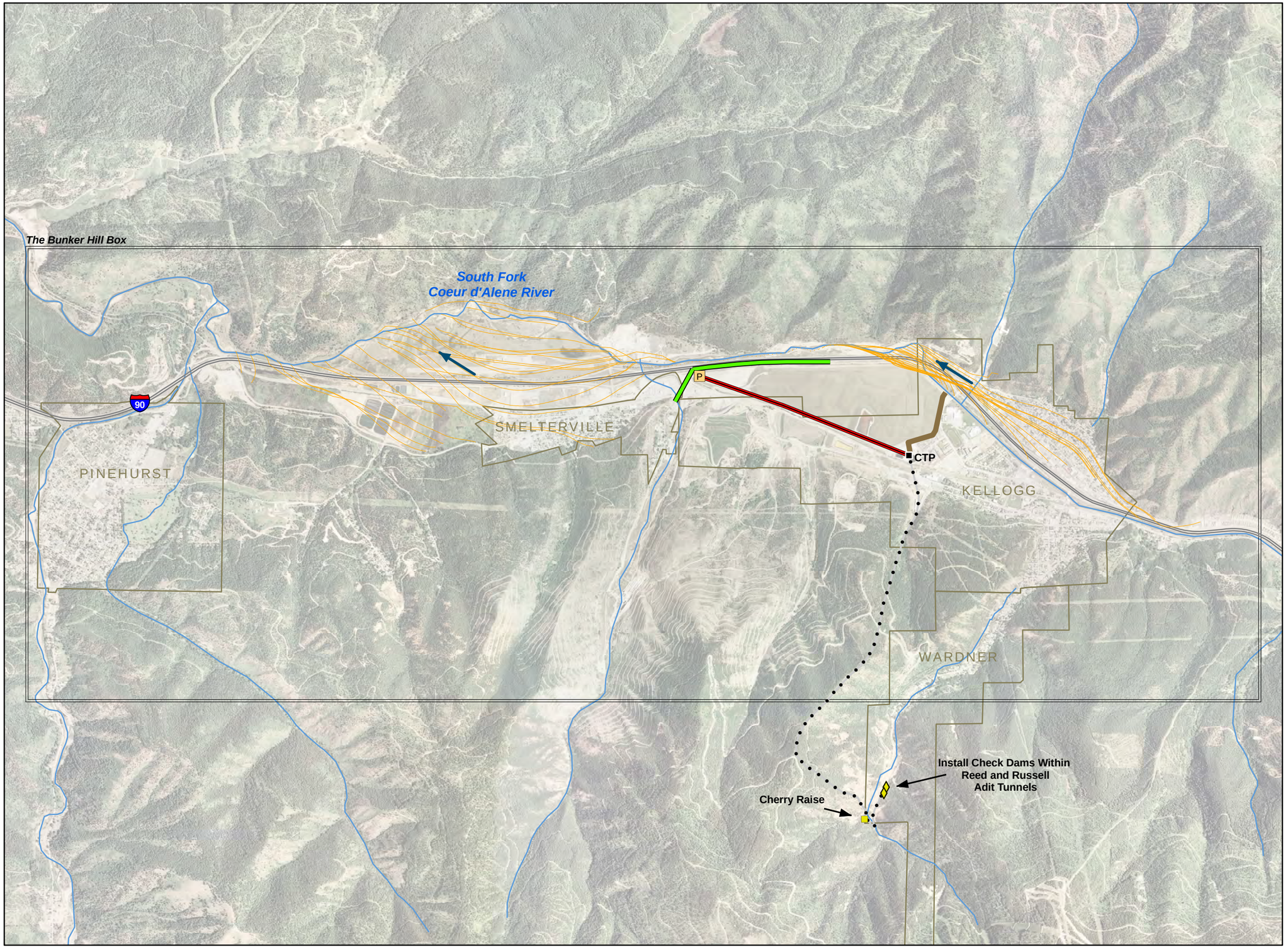
Note: Conveyance and treatment of Reed and Russell adit discharge is a contingency action that will be implemented only if check dams do not eliminate the flow of contaminated water from the adits.

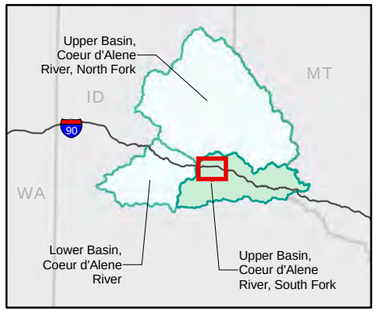
N

0 1,000 2,000 4,000 Feet

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

Figure A-26
Simulated Upstream Groundwater Flowlines from the SFCDR, OU 2 Alternative (b), Baseflow Conditions
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





- Central Treatment Plant (CTP)
- Pump Station
- Adit
- Raise
- Conveyance of Reed and Russell adit discharge through the Bunker Hill Mine via the Cherry Raise and the Kellogg Tunnel to the CTP
- Conveyance Pipeline
- CTP Effluent Discharge Pipeline
- French Drain
- Simulated Groundwater Flowpath
- Simulated Groundwater Flow Direction
- River/Creek
- City Limit

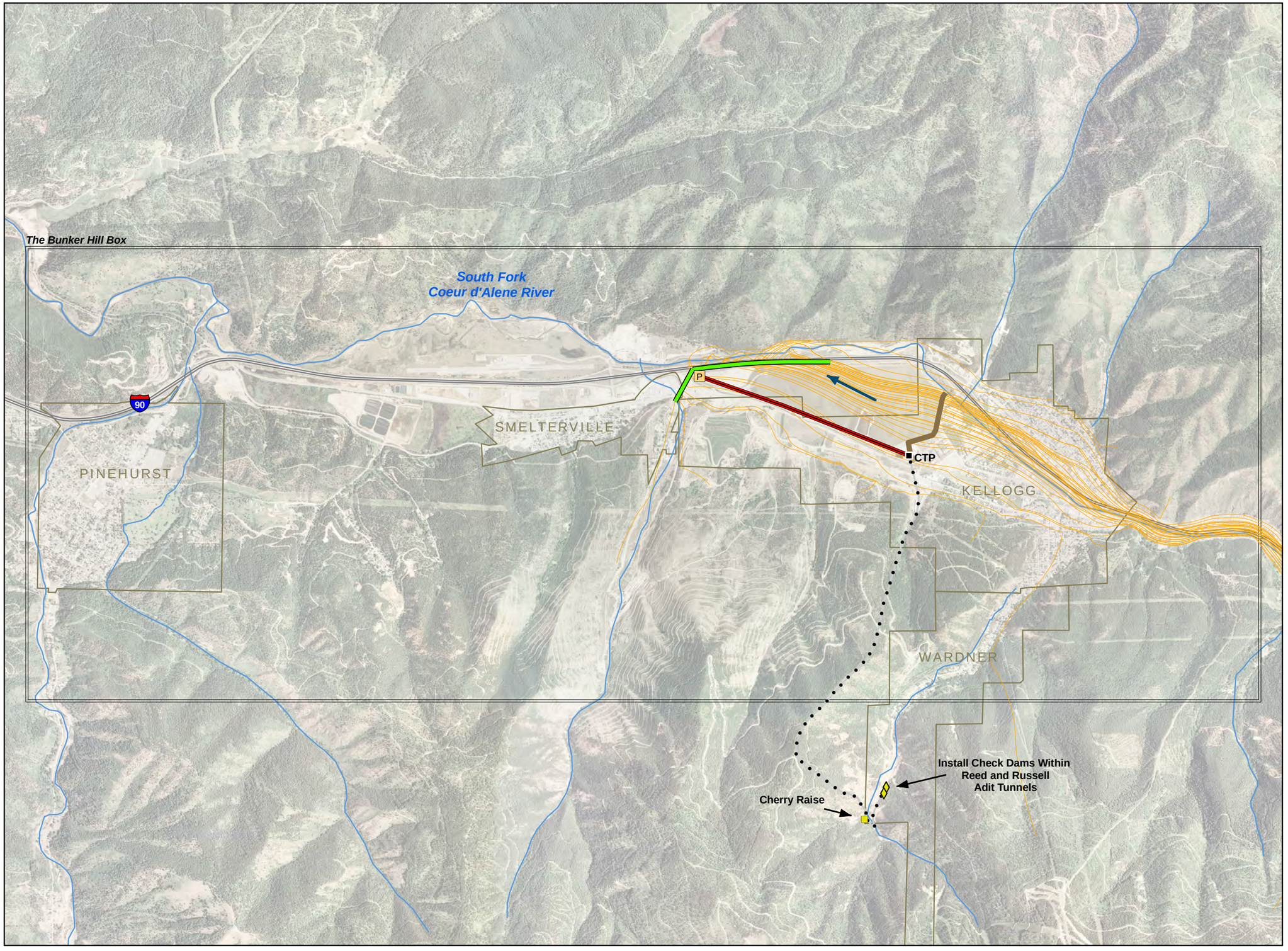
Note: Conveyance and treatment of Reed and Russell adit discharge is a contingency action that will be implemented only if check dams do not eliminate the flow of contaminated water from the adits.

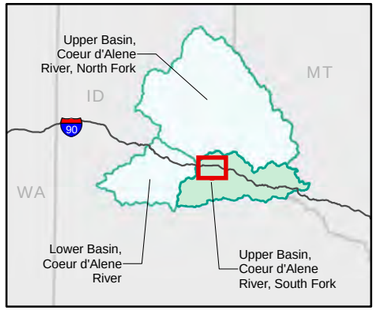
N

0 1,000 2,000 4,000 Feet

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

Figure A-27a
Simulated Upstream Groundwater Flowlines from the SFCDR, OU 2 Alternative (c), Baseflow Conditions
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





- Central Treatment Plant (CTP)
- P — Pump Station
- Adit
- Raise
- Conveyance of Reed and Russell adit discharge through the Bunker Hill Mine via the Cherry Raise and the Kellogg Tunnel to the CTP
- Conveyance Pipeline
- CTP Effluent Discharge Pipeline
- French Drain
- Simulated Groundwater Flowpath
- Simulated Groundwater Flow Direction
- River/Creek
- City Limit

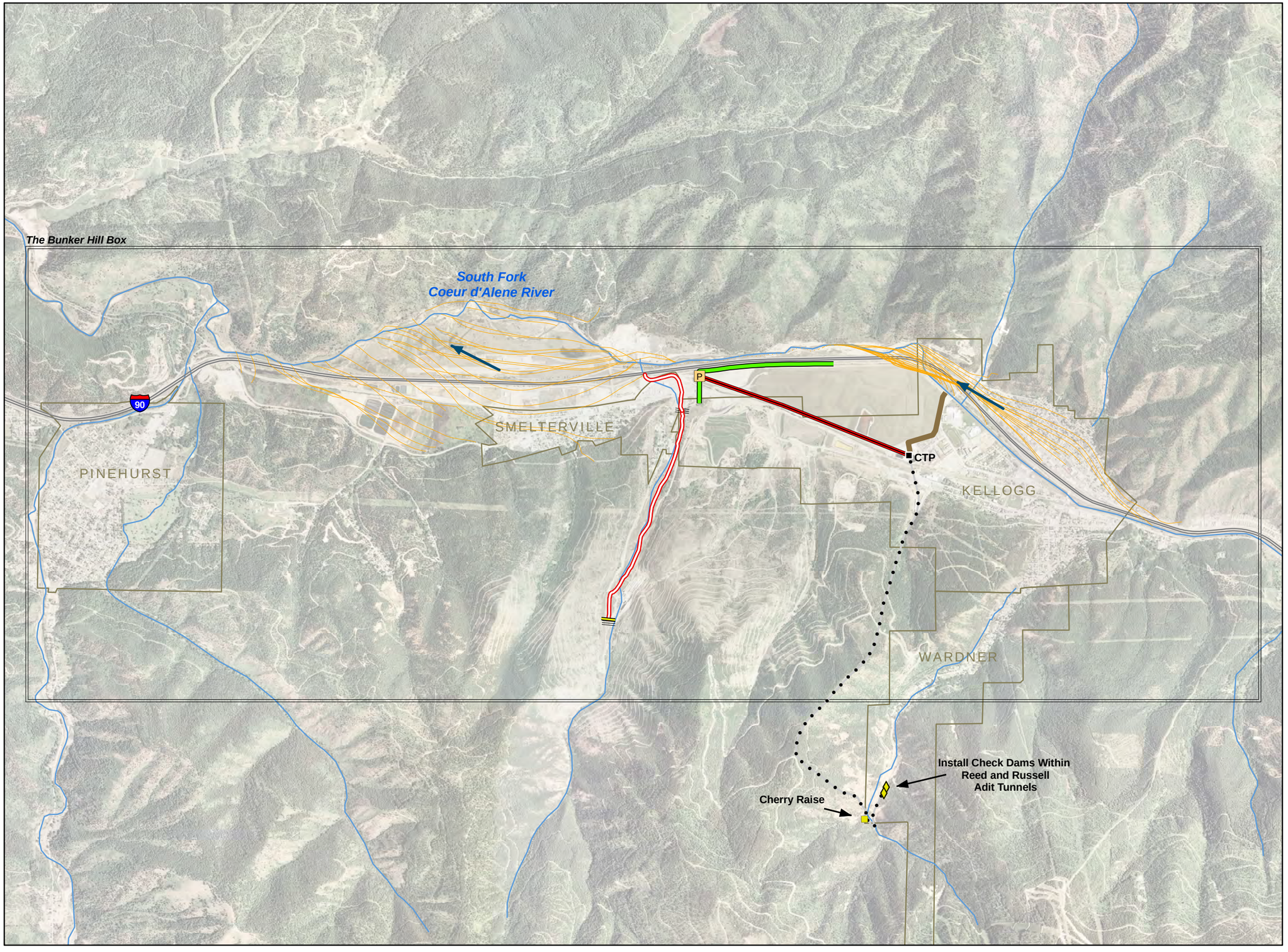
Note: Conveyance and treatment of Reed and Russell adit discharge is a contingency action that will be implemented only if check dams do not eliminate the flow of contaminated water from the adits.

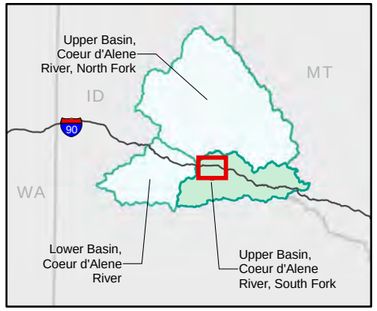
N

0 1,000 2,000 4,000 Feet

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

Figure A-27b
Simulated Upstream Groundwater Flowlines from French Drains, OU 2 Alternative (c), Baseflow Conditions
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





- Central Treatment Plant (CTP)
- P — Pump Station
- Adit
- Raise
- Conveyance of Reed and Russell adit discharge through the Bunker Hill Mine via the Cherry Raise and the Kellogg Tunnel to the CTP
- Conveyance Pipeline
- CTP Effluent Discharge Pipeline
- French Drain
- Slurry Wall
- Stream Liner
- Extraction Wells
- Simulated Groundwater Flowpath
- Simulated Groundwater Flow Direction
- River/Creek
- City Limit

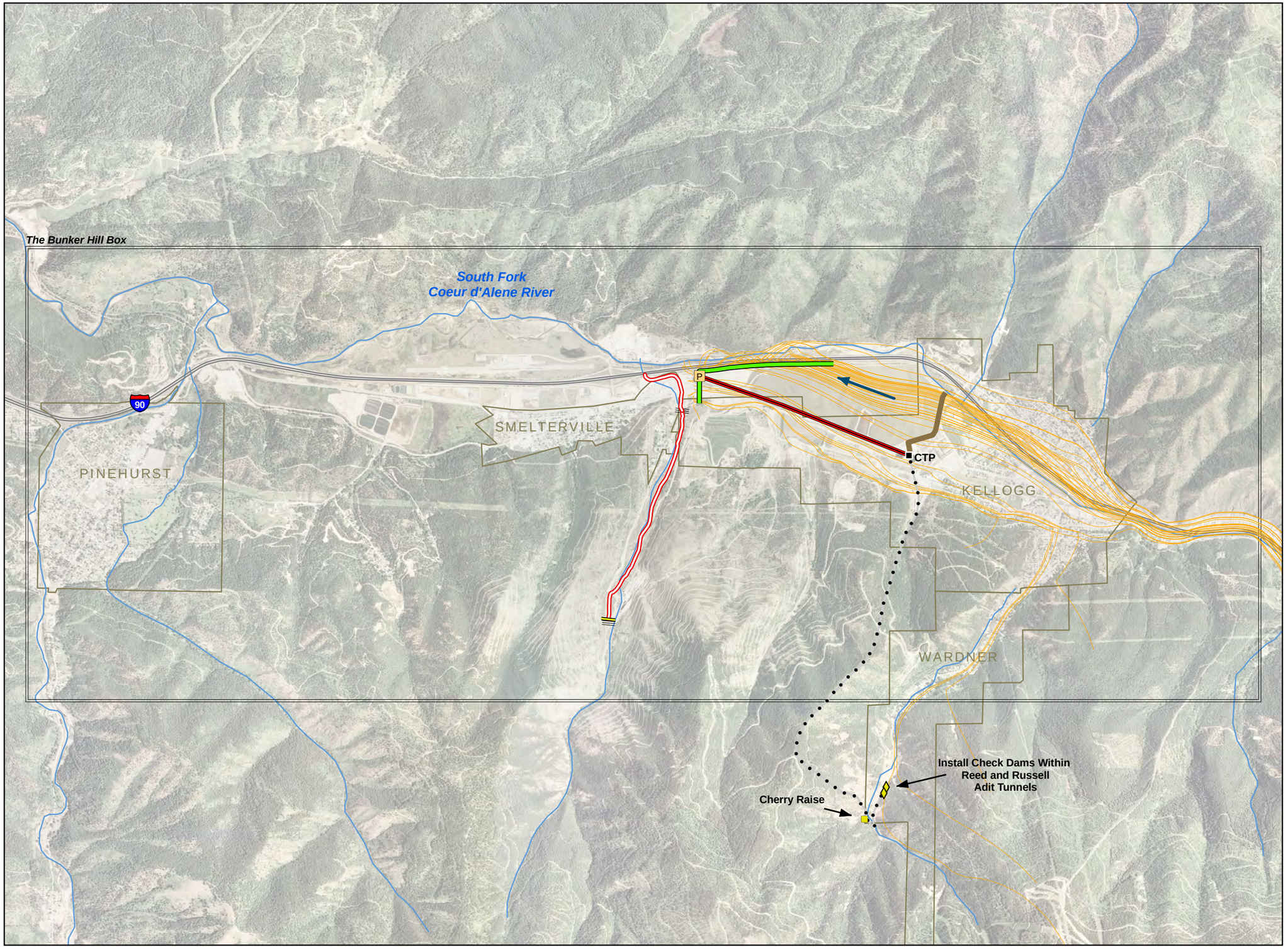
Note: Conveyance and treatment of Reed and Russell adit discharge is a contingency action that will be implemented only if check dams do not eliminate the flow of contaminated water from the adits.

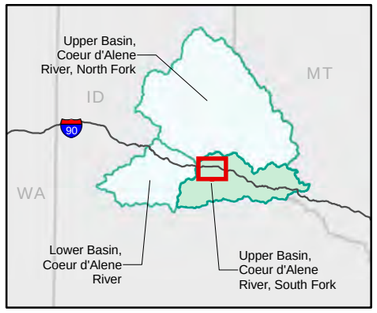
N

0 1,000 2,000 4,000 Feet

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

Figure A-28a
Simulated Upstream Groundwater Flowlines from the SFCDR, OU 2 Alternative (d), Baseflow Conditions
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





- Central Treatment Plant (CTP)
- Pump Station
- Adit
- Raise
- Conveyance of Reed and Russell adit discharge through the Bunker Hill Mine via the Cherry Raise and the Kellogg Tunnel to the CTP
- Conveyance Pipeline
- CTP Effluent Discharge Pipeline
- French Drain
- Slurry Wall
- Stream Liner
- Extraction Wells
- Simulated Groundwater Flowpath
- Simulated Groundwater Flow Direction
- River/Creek
- City Limit

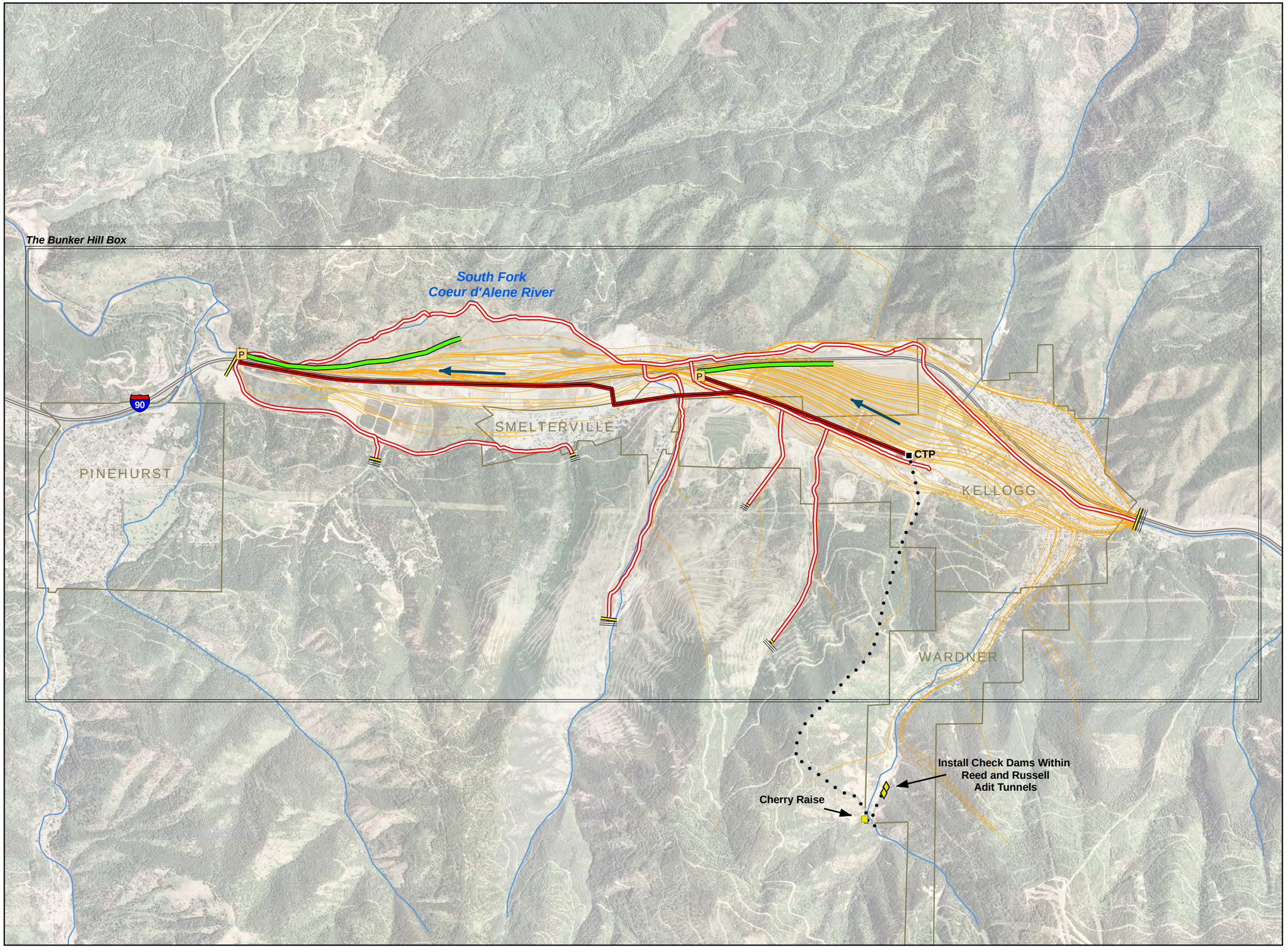
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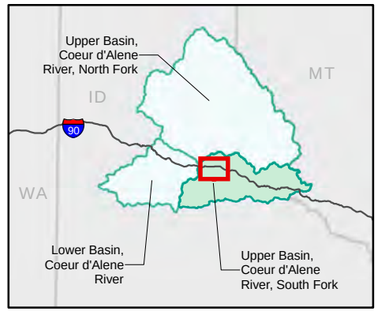
N

0 1,000 2,000 4,000 Feet

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

Figure A-28b
Simulated Upstream Groundwater Flowlines from French Drains, OU 2 Alternative (d), Baseflow Conditions
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





- Central Treatment Plant (CTP)
- Pump Station
- Adit
- Raise
- Conveyance of Reed and Russell adit discharge through the Bunker Hill Mine via the Cherry Raise and the Kellogg Tunnel to the CTP
- Conveyance Pipeline
- French Drain
- Slurry Wall
- Stream Liner
- Extraction Wells
- Simulated Groundwater Flowpath
- Simulated Groundwater Flow Direction
- River/Creek
- City Limit

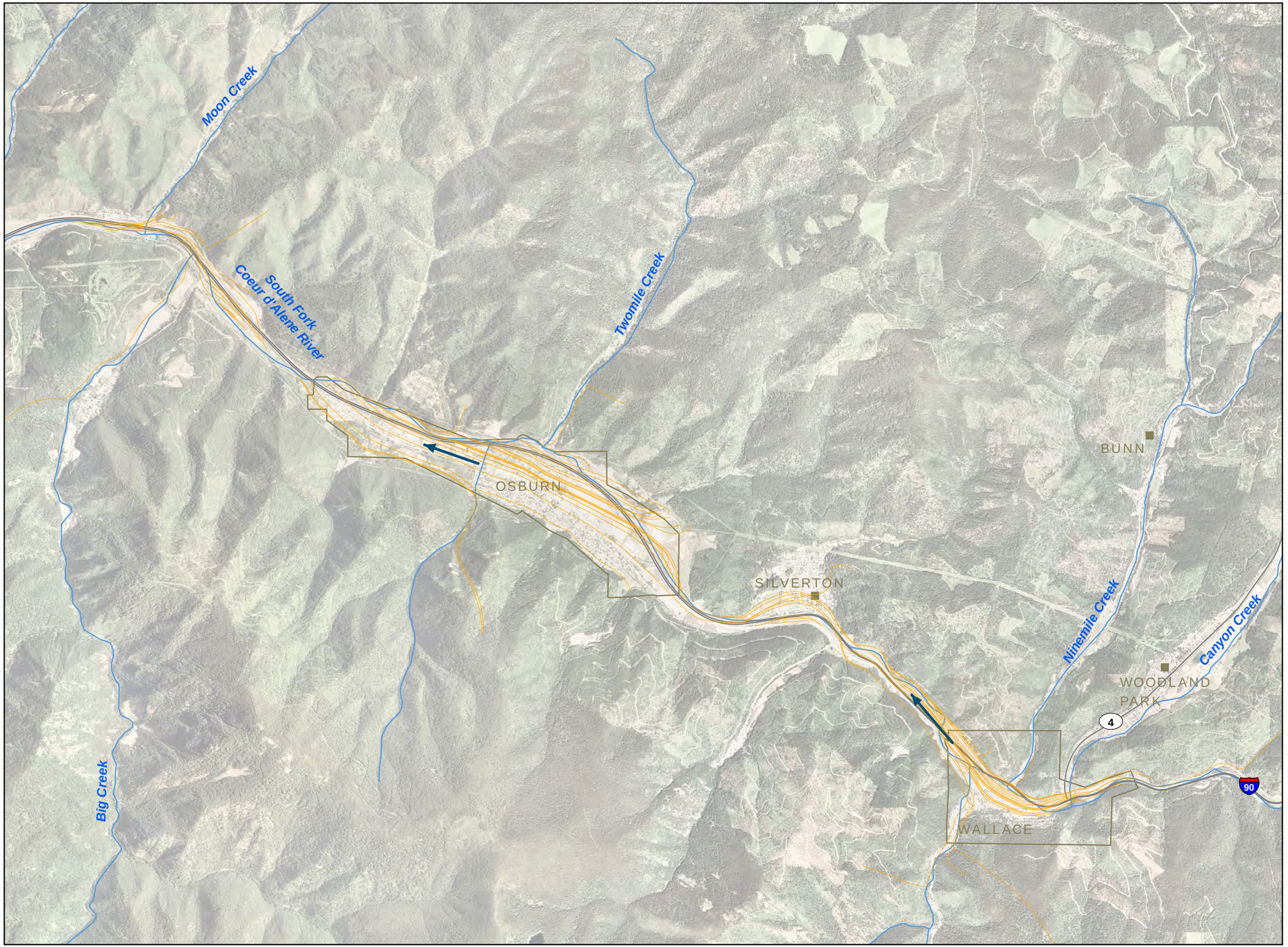
Note: Conveyance and treatment of Reed and Russell adit discharge is a contingency action that will be implemented only if check dams do not eliminate the flow of contaminated water from the adits.

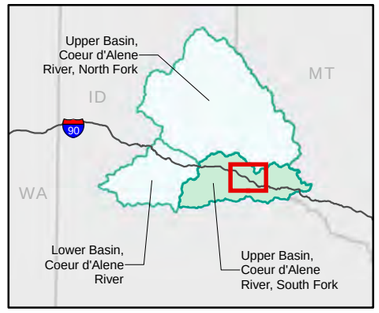
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0 1,000 2,000 4,000 Feet

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

Figure A-29
Simulated Upstream Groundwater Flowlines from French Drains, OU 2 Alternative (e), Baseflow Conditions
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





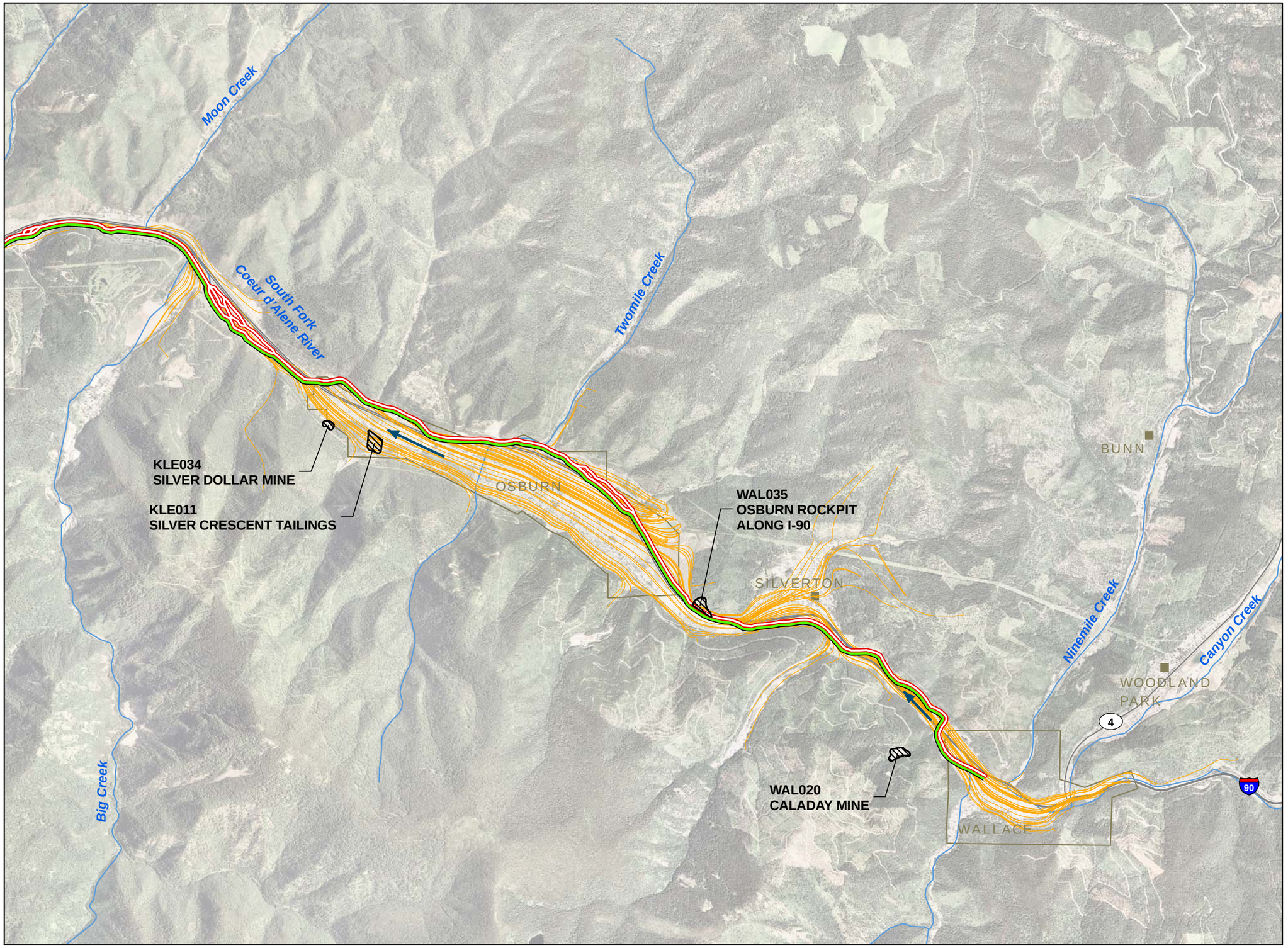
Simulated Groundwater Flowpath
Simulated Groundwater Flow Direction
River/Creek
City Limit

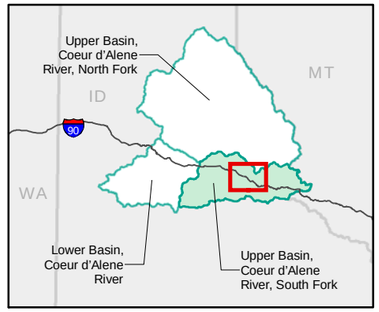
N

0 1,000 2,000 4,000 Feet

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

Figure A-30
Simulated Upstream Groundwater Flowlines from the SFCDR, Mainstem SFCDR Watershed, Segment 01, No Action, Baseflow Conditions
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





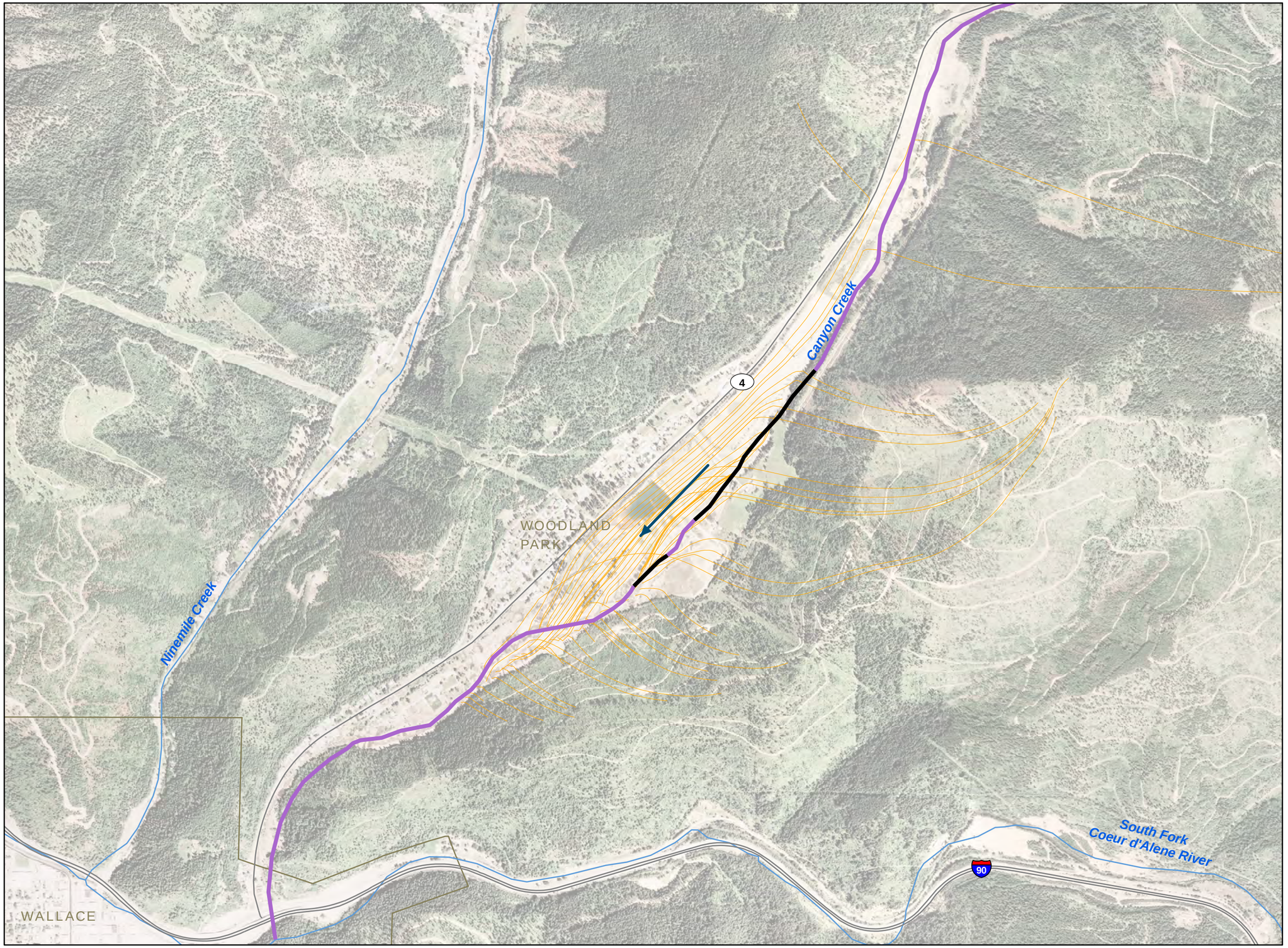
Simulated Groundwater Flowpath
Simulated Groundwater Flow Direction
French Drain
Stream Liner
River/Creek
Capped Tailings Pile
City Limit

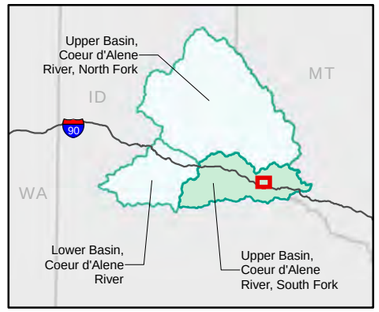
WAL020 (Site ID)
CALADAY MINE (Site Name)

N
0 1,000 2,000 4,000 Feet

Source: NHDPlus (Rivers, Waterbodies); ESRI base data (Interstates 2006, Major Highways 2008); IDWR (Aerial Imagery 2006).

Figure A-31
Simulated Upstream Groundwater Flowlines from French Drains, Mainstem SFCDR Watershed, Segment 01, Baseflow Conditions
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE



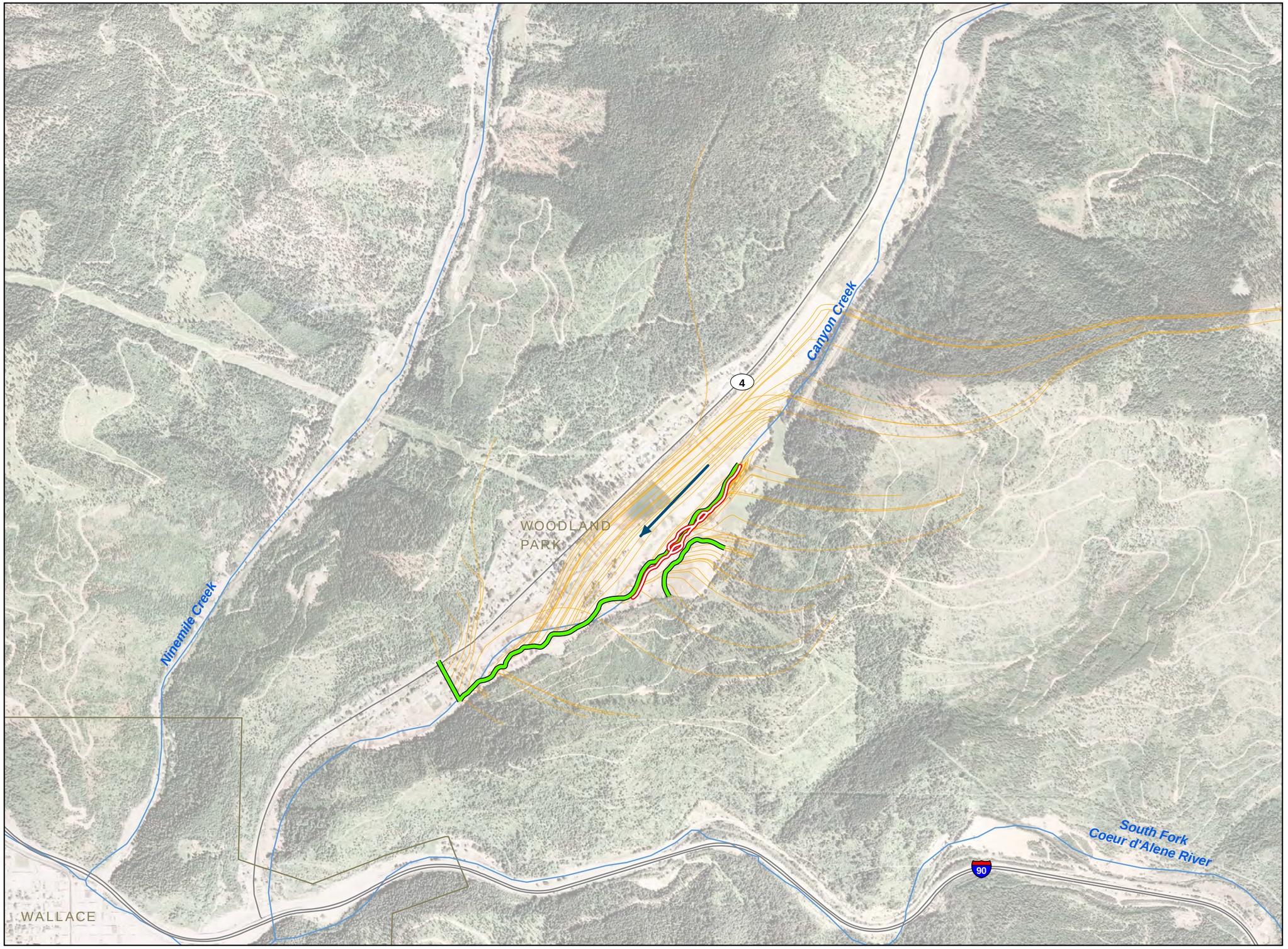


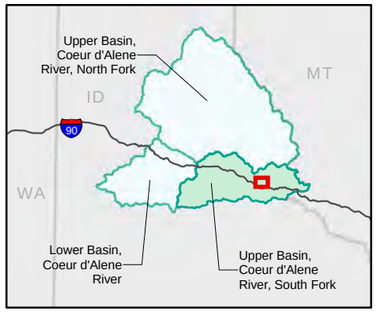
Simulated Groundwater Flowpath
Simulated Gaining Stream Reach
Simulated Losing Stream Reach
Simulated Groundwater Flow Direction
River/Creek
City Limit

N
0 500 1,000 2,000 Feet

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

Figure A-32
Simulated Upstream Groundwater Flowlines from Canyon Creek, No Action, Baseflow Conditions
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





French Drain
Stream Liner
Simulated Groundwater Flowpath
River/Creek
City Limit

N
0 500 1,000 2,000 Feet

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

Figure A-33
Simulated Upstream Groundwater Flowlines from French Drains, Groundwater Components of Updated Remedial Actions for Woodland Park, Baseflow Conditions
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

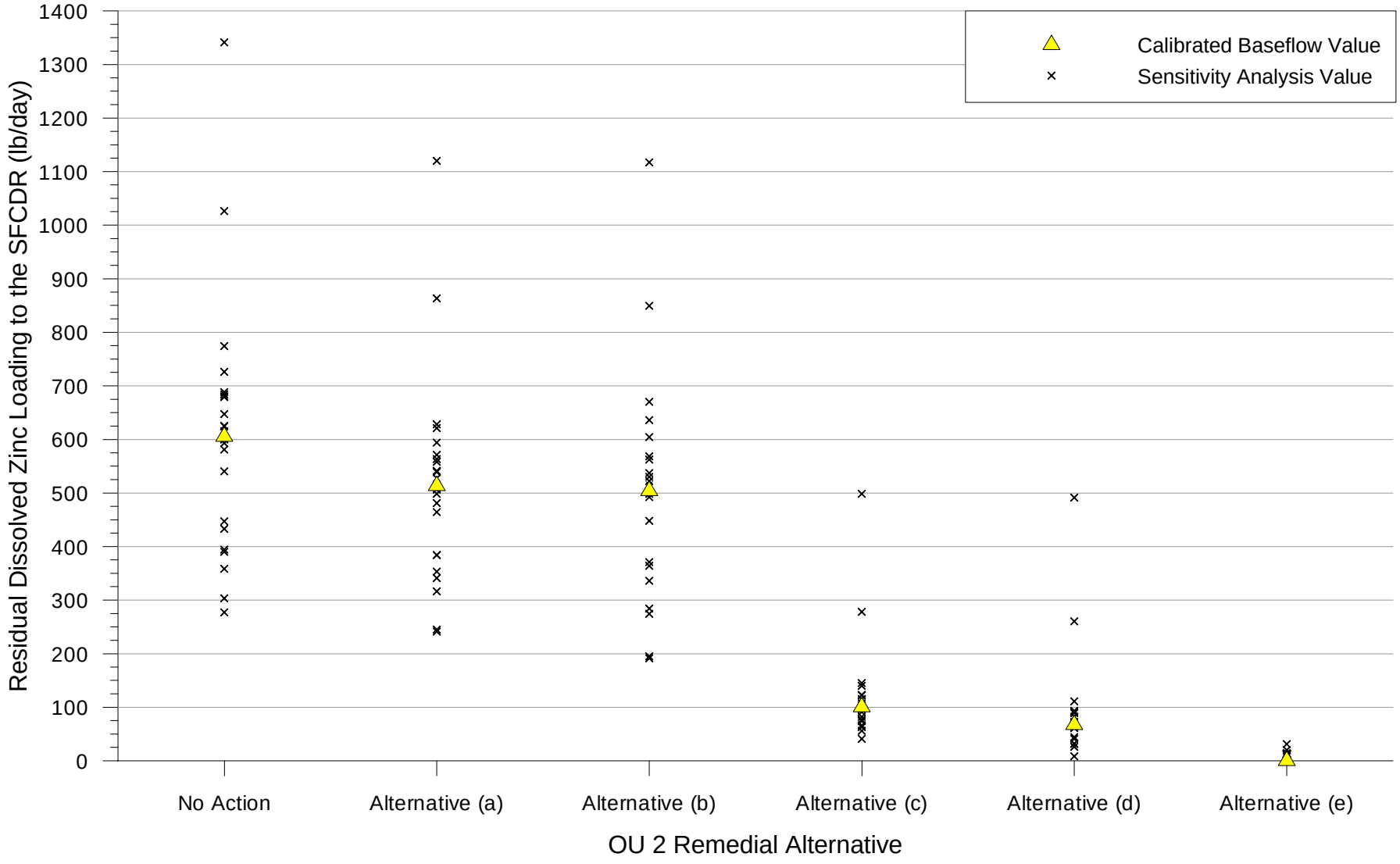


Figure A-34
Results of the OU 2 SensitivityAnalysis
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

Notes:
1. lb/day = pounds per day
2. SFCDR = South Fork of the Coeur d'Alene River
3. OU 2 = Operable Unit 2

\\Odin\proj\usepa\323031\BunkerHill\Figures\GRAPHER\2009_12_FEFS_ModelingAppendix\Figure_A-34_SensitivitySummary.grf

Tables

TABLE A-1

Measured Baseflow Groundwater and Surface Water Elevations in Monitoring Pairs – Government Gulch

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

Monitoring Well and Stream Gauging Station Pair	Fall 2007 Elevations (feet msl)	Elevation Difference (feet)	Fall 2007 Discharge (ft^3/s)	Fall 2008 Elevations (feet msl)	Elevation Difference (feet)	Fall 2008 Discharge (cfs)
BH-GG-GW-0002	2605.455			2605.645		
BH-GG-0002	2604.582	0.873	0.83	2604.622	1.023	1.18
BH-GG-GW-0009	2475.735			2475.615		
BH-GG-0005	2476.726	-0.991	2.41	NM		NM
BH-GG-GW-0010	2440.778			2440.498		
BH-GG-0006	2436.515	4.263	1.24	2436.465	4.033	1.52
BH-GG-GW-0003	2407.657			2407.427		
BH-GG-0007	2409.55	-1.893	1.25	2409.57	-2.143	0.99
BH-GG-GW-0004	2362.222			2362.062		
BH-GG-0008	2363.702	-1.48	1.38	2363.742	-1.68	1.29
BH-GG-GW-0005	2243.52			2243.58		
BH-GG-GW-0007	2239.8			2239.91		
BH-GG-0001	NM		NM	2253.339	-11.594	1.45

Notes:

Monitoring pairs listed from upstream to downstream.
A positive elevation difference indicates an upward hydraulic gradient (gaining stream).
Surface water and groundwater measurements not collected on the same date.
NM = not measured
msl = mean sea level
cfs = cubic feet per second

TABLE A-2

Final PEST Parameter Multipliers

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

Parameter	Multiplier
Horizontal Hydraulic Conductivity - Layer 1 Alluvium	1.04
Horizontal Hydraulic Conductivity - Layer 1 Bedrock	1.00
Vertical Hydraulic Conductivity - Layer 1 Alluvium	1.00
Vertical Hydraulic Conductivity - Layer 1 Bedrock	1.00
Horizontal Hydraulic Conductivity - Layer 2 Alluvium	0.49
Horizontal Hydraulic Conductivity - Layer 2 Bedrock	1.00
Vertical Hydraulic Conductivity - Layer 2 Alluvium	1.00
Vertical Hydraulic Conductivity - Layer 2 Bedrock	1.00
Horizontal Hydraulic Conductivity - Layer 3 Alluvium	5.53
Horizontal Hydraulic Conductivity - Layer 3 Bedrock	1.00
Vertical Hydraulic Conductivity - Layer 3 Alluvium	1.00
Vertical Hydraulic Conductivity - Layer 3 Bedrock	1.00
Horizontal Hydraulic Conductivity - Layer 4 Alluvium	0.66
Horizontal Hydraulic Conductivity - Layer 4 Bedrock	1.00
Vertical Hydraulic Conductivity - Layer 4 Bedrock	1.00
Wadi Conductance - Osburn Flats Reach 1	0.26
Wadi Conductance - Osburn Flats Reach 2	0.60
Wadi Conductance - Osburn Flats Reach 3	1.14
Wadi Conductance - Osburn Flats Reach 4	0.88
Wadi Conductance - Bunker Hill Box Reach 1	0.30
Wadi Conductance - Bunker Hill Box Reach 2	2.14
Wadi Conductance - Bunker Hill Box Reach 3	0.79
Wadi Conductance - Bunker Hill Box Reach 4	0.84
Wadi Conductance - Bunker Hill Box Reach 5	1.00

Note:

PEST = parameter estimation

TABLE A-3

Simulated versus Observed Vertical Head Gradients in Well Pairs – Bunker Hill Box

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

Well Name	Difference in Well Screen Mid-Points (feet)	Observed Groundwater Elevation (feet msl)	Observed Vertical Gradient (ft/ft)	Simulated Groundwater Elevation Previous Calibration (feet msl)	Simulated Vertical Gradient Previous Calibration (ft/ft)	Simulated Groundwater Elevation Updated Calibration (feet msl)	Simulated Vertical Gradient Updated Calibration (ft/ft)
BH-SF-E-0002	35	2,341.60	0.012	2,340.03	0.002	2,339.71	0.003
BH-SF-E-0003		2,341.10		2,339.94		2,339.60	
BH-SF-E-PZ-03	50.5	2,283.40	0.315	2,287.15	0.08	2,288.30	0.05
BH-SF-E-0104		2,267.50		2,283.11		2,285.95	
BH-SF-E-0202-U	50.5	2,275.80	0.175	2,277.97	0.042	2,279.11	0.03
BH-SF-E-0203-L		2,267.00		2,275.87		2,277.63	
BH-SF-E-0301-U	53	2,268.30	0.059	2,271.41	0.028	2,273.45	0.04
BH-SF-E-0302-L		2,265.20		2,269.92		2,271.54	
BH-SF-E-0306-U	42.5	2,266.20	0.014	2,270.25	0.007	2,271.85	0.008
BH-SF-E-0305-L		2,265.60		2,269.95		2,271.50	
BH-SF-E-0309-U	45.5	2,272.40	0.133	2,271.06	0.02	2,271.86	0.008
BH-SF-E-0310-L		2,266.40		2,270.16		2,271.50	
BH-SF-E-0314-U	6	2,269.70	0.027	2,268.49	0.037	2,268.88	0.006
BH-SF-E-0315-U		2,269.60		2,268.27		2,268.84	
BH-SF-E-0423-U	62	2,243.50	-0.021	2,246.01	-0.079	2,246.87	-0.09
BH-SF-E-0424-L		2,244.80		2,250.91		2,252.25	
BH-SF-E-0425-U	51	2,243.10	0.027	2,246.00	-0.049	2,246.70	-0.06
BH-SF-E-0426-L		2,241.70		2,248.52		2,249.62	
BH-SF-E-0427-U	58.5	2,246.60	0.1	2,248.31	-0.026	2,248.73	-0.04
BH-SF-E-0428-L		2,240.70		2,249.85		2,250.93	
BH-SF-W-0003-U	66.5	2,214.40	-0.014	2,219.39	0.013	2,219.82	0.015
BH-SF-W-0004-L		2,215.40		2,218.53		2,218.83	
BH-SF-W-0005-U	75	2,215.60	-0.037	2,217.72	0.01	2,218.22	0.011
BH-SF-W-0006-L		,2218.4		2,216.98		2,217.43	
BH-SF-W-0010-U	59	2,210.20	0.012	2,208.91	-0.01	2,209.97	-0.006
BH-SF-W-0011-L		2,209.50		2,209.51		2,210.32	
BH-SF-W-0121-U	72.5	2,188.80	-0.077	2,188.57	-0.002	2,188.74	-0.005
BH-SF-W-0122-L		2,194.40		2,188.71		2,189.08	
BH-SF-W-0201-U	92.5	2,187.00	-0.042	2,186.12	0.001	2,186.46	-0.001
BH-SF-W-0202-L		2,190.90		2,186.07		2,186.55	
BH-SF-W-0204-U	100.5	2,172.90	0.011	2,171.25	0.008	2,171.65	0.009
BH-SF-W-0205-L		2,171.80		2,170.44		2,170.71	
BH-SF-W-0206-U	119	2,171.70	0.006	2,170.07	0.008	2170.496	0.009
BH-SF-W-0207-L		2,171.00		2,169.17		2169.404	

Notes:

A positive value indicates a downward vertical gradient.

ft/ft = foot per foot

msl = mean sea level

TABLE A-4

Simulated versus Observed Vertical Head Gradients in Well Pairs – Osburn Flats

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

Well Name	Difference in Well Screen Mid-Points (feet)	Observed Groundwater Elevation (feet msl)	Observed Vertical Gradient (ft/ft)	Simulated Groundwater Elevation Previous Calibration (feet msl)	Simulated Vertical Gradient Previous Calibration (ft/ft)	Simulated Groundwater Elevation Updated Calibration (feet msl)	Simulated Vertical Gradient Updated Calibration (ft/ft)
SF-OB-MW-01S	9.6	2,547.80	0.055	2,543.70	-0.005	2,543.82	0.007
SF-OB-MW-01D		2,547.20		2,543.80		2,543.76	
SF-OB-PZ-17	11.3	2,499.50	0.304	2,500.50	-0.067	2,501.13	-0.162
SF-OB-MW-02		2,496.10		2,501.30		2,502.96	
SF-OB-PZ-24	17.8	2,451.90	0.041	2,451.80	-0.023	2,453.92	-0.008
SF-OB-MW-03		2,451.10		2,452.30		2,454.06	
SF-OB-MW-06	1.8	2,503.20	-0.003	2,505.30	0.12	2,506.29	0.102
SF-OB-PZ-16		2,503.20		2,505.10		2,506.10	
SF-OB-PZ-14	15.4	2,504.50	0.023	2,504.90	0.002	2,505.85	-0.006
SF-OB-MW-07		2,504.20		2,504.90		2,505.93	
SF-OB-PZ-13	8.1	2,511.30	0.028	2,511.70	-0.042	2,511.77	-0.039
SF-OB-MW-09		2,511.10		2,512.00		2,512.08	
SF-OB-PZ-23	5.4	2,452.90	0.015	2,455.10	0.03	2,457.99	0.024
SF-OB-MW-11		2,452.80		2,455.00		2,457.86	

Notes:

A positive value indicates a downward vertical gradient.

ft/ft = foot per foot

msl = mean sea level

TABLE A-5

Comparison of Simulated Stream Gains and Losses to Data Measured During the 2008 Groundwater-Surface Water Interaction Studies

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

		SFCDR Discharge Gain/Loss (cfs)					
SFCDR Reaches[a]	**Gain/Loss Condition**	**9/23/2008**	**9/24/2008**	**9/25/2008**	**3-day Average**	**Model-simulated Previous Calibration**	**Model-simulated Previous Calibration**
BH-SF-LF-0001 to BH-SF-LF-0003	Losing	-6	-10	-7	-7.7	-2.7	-1.8
BH-SF-LF-0003 to BH-SF-LF-0006	Gaining	5	-1	6	3.3	4.8	4.5
BH-SF-LF-0006 to BH-SF-LF-0008	Losing	-5	3	-11	-4.3	-0.4	0.1
BH-SF-LF-0008 to BH-SF-LF-0010	Gaining	23	9	15	15.7	3.1	2.2
BH-SF-LF-0010 to BH-SF-LF-0011	Gaining	32	41	28	33.7	NA[b]	NA[b]
		9/9/2008	**9/10/2008**	**9/11/2008**	**3-day Average**	**Model-simulated Previous Calibration**	**Model-simulated Previous Calibration**
Site B-1 ALT to Site B-2 ALT	Losing	-12.7	-14.5	-7.9	-11.7	-3.0	-4.1
Site B-2 ALT to Site B-5 ALT	Gaining	9.1	12.1	8.6	9.9	2.4	3.4
Site B-5 ALT to Site B-7	Losing	-5.5	-9.2	-6.2	-7.0	0.25	0.9
Site B-7 to Site B-8	Gaining	14.9	17.9	15.8	16.2	0.5	0.5

[a]Although the reaches are the same approximate geographic location between the field-measured and simulated data, the exact locations of the transitions between gaining and losing vary slightly.

[b]The change in flow for this reach was not evaluated due to anomalous surface water flow measurements in the western portion of the Box, as noted in the *Technical Report, Osburn Flats Groundwater-Surface Water Interaction Study, Upper Coeur d'Alene Basin, Osburn, Idaho* (CH2M HILL, 2009c).

Notes:

cfs = cubic feet per second

SFCDR = South Fork Coeur d'Alene River

TABLE A-6

Simulated Stream Stage Differences for the 90th Percentile Flow Calibration -- SFCDR Model

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

Stream	Stream Gauge	Stream Stage Difference[a] (feet)
Boulder Creek	None	0.2
Bear Creek	None	0.2
Big Creek	None	0.3
Blackcloud Creek	None	0.2
Bunker Creek	BH-BC-0004	0
Bunker Creek	BH-BC-0005	0.1
Bunker Creek	BH-BC-0006	0.2
Canyon Creek	None	0.3
Cook Creek	None	0.2
Deadman Gulch	None	0.2
Deadwood Gulch	BH-DW-0001	0.2
Dexter Gulch	None	0.2
East Fork Big Creek	None	0.2
East Fork Deadman Gulch	None	0.2
Notes:	None	0.2
East Fork Ninemile Creek	None	0.2
East Fork Pine Creek	None	0.3
East Fork Twomile Creek	None	0.2
East Fork Willow Creek	None	0.2
Elk Creek	None	0.3
Gold Creek	None	0.2
Government Creek	BH-GG-0001	0.3
Government Creek	BH-GG-0002	0.3
Government Creek	BH-GG-0004	0.3
Grouse Creek	BH-GC-0001	0.15
Grouse Gulch	None	0.2
Humboldt Creek	BH-HC-0001	0.3
Italian Gulch	None	0.2
Jackass Creek	None	0.2
Lake Creek	None	0.2
Little North Fork of the South Fork Coeur d'Alene River	None	0.2
Little Pine Creek	None	0.3
Magnet Gulch	BH-MG-0001	0.15
McFarren Culch	None	0.2
Middle Fork Pine Creek	None	0.2
Mill Creek	None	0.2
Milo Creek	None	0.3
Montgomery Creek	None	0.3
Moon Creek	None	0.3
Ninemile Creek	None	0.3
Nuckols Gulch	None	0.2
Pine Creek	None	0.3
Placer Creek	None	0.3
Portal Gulch	None	0.2
Railroad Gulch	None	0.2
Revenue Gulch	None	0.2
Rock Creek	None	0.2
Rosebud Gulch	None	0.2
Ruddy Gulch	None	0.2
SFCDR	SF-268 (Elizabeth Park)	2.1
SFCDR	SF-271 (Pinehurst)	1.6
SFCDR	SF-OB-SG01	1.7
SFCDR	SF-OB-SG02	1.2

TABLE A-6

Simulated Stream Stage Differences for the 90th Percentile Flow Calibration -- SFCDR Model

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

Stream	Stream Gauge	Stream Stage Difference[a] (feet)
SFCDR	SF-OB-SG03	1.3
SFCDR	Smelterville	1.6
SFCDR	Theater Bridge	1.6
Shields Gulch	None	0.2
St. Joe Creek	None	0.2
Terror Gulch	None	0.3
Trowbridge Gulch	None	0.2
Twomile Creek	None	0.3
Upper SFCDR Unnamed Tributary	None	0.2
West Fork	None	0.2
West Fork Big Creek	None	0.2
West Fork Deadman Gulch	None	0.2
West Fork Elk Creek	None	0.2
West Fork Montgomery Creek	None	0.2
West Fork Moon Creek	None	0.2
West Fork Pine Creek	None	0.2
West Fork Placer Creek	None	0.2
West Fork Willow Creek	None	0.2
Willow Creek	None	0.2

[a]Stream stage difference is equal to the value measured on April 20, 2009, minus the average value measured between September 22 and October 20, 2008 (the baseflow calibration period).

Note:

SFCDR = South Fork Coeur d'Alene River

TABLE A-7

Monthly Multipliers for Deep Percolation of Precipitation – SFCDR Model

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

Simulation Month	Multiplier
July 2008	2.3
August 2008	1.5
September 2008	1.3
October 2008	1
November 2008	1.3
December 2008	1.5
January 2009	1.7
February 2009	1.9
March 2009	2.5
April 2009	2.9
May 2009	3.6
June 2009	2.9

Note:

SFCDR = South Fork Coeur d'Alene River

TABLE A-8

Monthly Multipliers for Deep Percolation of Precipitation – Canyon Creek Model

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

Simulation Month	Multiplier
July 2008	0.1
August 2008	0.02
September 2008	0.01
October 2008	0.01
November 2008	0.02
December 2008	0.025
January 2009	0.05
February 2009	0.05
March 2009	0.1
April 2009	0.15
May 2009	0.2
June 2009	0.15

TABLE A-9

Average Dissolved Zinc Concentrations in Groundwater in Woodland Park, Fall 2006

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

Woodland Park Reach	No Action Average Dissolved Zinc Concentration (mg/L)	Post-Source-Control Average Dissolved Zinc Concentration (mg/L)
Reach 01	1.5	0.4
Reach 02	3.0	2.5
Reach 03	5.2	4.8
Reach 04	19.5	18.3
Reach 05	13.6	13.0
Reach 06	44.3	42.7
Reach 07	14.4	13.9
Reach 08	13.5	13.1
Reach 09	11.1	10.7
Reach 10	12.3	11.3
Reach 11	1.5	1.2
Reach 12	0.5	0.5
SVNRT	124.0	124.0

Notes:

mg/L = milligram(s) per liter

SVNRT = Silver Valley Natural Resource Trust

TABLE A-10

Net Remedial Effectiveness Factors for Woodland Park Source Control Actions

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

Woodland Park Reach	Contaminant Source ID	Proposed Percentage of Total Volume of Material to be Removed	REF from Simplified Tool for Complete Removal	Effective REF Based on Limited Source Removal[a]	Area of Source within Reach (feet^2)	Fraction of Total Source Area within Reach	Fraction of Effective REF	Total REF for Reach
Reach 01	WAL040	72%	99%	71%	1,073,000	0.90	71%	
Reach 01	WAL081	50%	99%	50%	115,270	0.10	50%	69%
Reach 02	WAL040	72%	99%	71%	67,083	0.17	71%	
Reach 02	WAL041	7%	99%	6%	334,300	0.83	6%	17%
Reach 03	WAL041	7%	99%	6%	572,600	1.00	6%	6%
Reach 04	WAL041	7%	99%	6%	450,200	1.00	6%	6%
Reach 05	WAL041	7%	99%	6%	569,400	0.78	6%	
Reach 05	WAL009	0%	0%	0%	165,300	0.22	0%	5%
Reach 06	WAL041	7%	99%	6%	784,500	0.57	6%	
Reach 06	WAL009	0%	0%	0%	506,900	0.37	0%	
Reach 06	WAL042	50%	0%	0%	73,860	0.05	0%	4%
Reach 07	WAL009	0%	0%	0%	332,300	0.45	0%	
Reach 07	WAL041	7%	99%	6%	413,100	0.55	6%	4%
Reach 08	WAL009	0%	0%	0%	344,400	0.55	0%	
Notes:	WAL041	7%	99%	6%	192,900	0.31	6%	
Reach 08	WAL010	7%	99%	7%	92,610	0.15	7%	3%
Reach 09	WAL009	0%	0%	0%	510,900	0.58	0%	
Reach 09	WAL010	7%	99%	7%	364,900	0.42	7%	3%
Reach 10	WAL009	0%	0%	0%	822,800	0.48	0%	
Reach 10	WAL010	7%	99%	7%	392,500	0.23	7%	
Reach 10	OSB047/cc05	21%	99%	20%	411,600	0.24	20%	
Reach 10	WAL011	25%	99%	25%	93,650	0.05	25%	8%
Reach 11	OSB047/cc05	21%	99%	20%	411,600	1.00	20%	20%
Reach 12	None	NA	NA	NA	NA	NA	NA	NA

[a]Effective remedial effectiveness factor (REF) is calculated as the proposed percentage of material to be removed multiplied by the REF from the Simplified Tool.

TABLE A-11
Model-Simulated Flows – Baseflow Conditions
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Simulation	Total SFCDR Gain (cfs)	Total SFCDR Loss (cfs)	Total Bunker Creek Gain (cfs)	Total Bunker Creek Loss (cfs)	Total Government Creek Gain (cfs)	Total Government Creek Loss (cfs)	Total A-4 Drain Gain (cfs)	Total Canyon Creek Gain[a,b] (cfs)	Total Canyon Creek Loss[b] (cfs)	Total Remedial Drain Gain (cfs)
OU 2 No Action	7.8	2.9	0.2	0.8	0.2	0.1	0.4	NA	NA	NA
Alternative (a)	6.6	1.0	0.0	0.1	0.2	0.1	0.2	NA	NA	NA
Alternative (b)	6.8	3.3	0.0	0.0	0.0	0.0	0.4	NA	NA	NA
Alternative (c)	3.5	6.9	0.0	0.0	0.2	0.1	0.1	NA	NA	8.4
Alternative (d)	3.5	6.9	0.0	0.0	0.0	0.0	0.1	NA	NA	8.3
Alternative (e)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	NA	5.2
OU 3 Mainstem SFCDR Watershed Segment 01 - No Action	10.1	8.0	NA	NA	NA	NA	NA	NA	NA	NA
OU 3 Mainstem SFCDR Watershed Segment 01 - Groundwater Actions	0.0	0.0	NA	NA	NA	NA	NA	NA	NA	7.6
OU 3 Woodland Park - No Action	NA	NA	NA	NA	NA	NA	NA	2.1	0.8	NA
OU 3 Updated Remedial Components for Woodland Park	NA	NA	NA	NA	NA	NA	NA	1.6	1.1	1.0

[a]Includes groundwater discharge to Canyon Creek and land surface
[b]Woodland Park Reaches 1 though 12

Notes:
cfs = cubic feet per second
NA = not applicable
OU = Operable Unit
SFCDR = South Fork Coeur d'Alene River

TABLE A-12

Simulated Dissolved Zinc Load – Baseflow Conditions

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

Simulation	Net Load to SFCDR lb/day	Net Load to Bunker Creek lb/day	Net Load to Government Creek lb/day	Net Load to A-4 Drain lb/day	Load to Canyon Creek lb/day	Total Load lb/day	Reduction in Load from No Action lb/day	Load to RA-Drains lb/day
OU 2 No Action	526	15	33	31	NA	605	0	NA
Alternative (a)	462	0	33	18	NA	513	92	NA
Alternative (b)	475	0	0	29	NA	504	101	NA
Alternative (c)	63	0	33	4	NA	100	505	1,073
Alternative (d)	63	0	0	4	NA	67	538	1,065
Alternative (e)	0	0	0	0	NA	0	605	510
OU 3 Mainstem SFCDR Watershed Segment 01 - No Action	66	NA	NA	NA	NA	66	0	NA
OU 3 Mainstem SFCDR Watershed Segment 01 - Groundwater Actions	0	NA	NA	NA	NA	0	66	74
OU 3 Woodland Park - No Action	NA	NA	NA	NA	125	125	0	NA
OU 3 Updated Remedial Components for Woodland Park	NA	NA	NA	NA	41	41	84	82

Notes:

lb/day = pound(s) per day
NA = not applicable
OU = Operable Unit
SFCDR = South Fork Coeur d'Alene River

TABLE A-13
Model-Simulated Flows – 7Q10 Conditions
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Simulation	Total SFCDR Gain (cfs)	Total SFCDR Loss (cfs)	Total Bunker Creek Gain (cfs)	Total Bunker Creek Loss (cfs)	Total Government Creek Gain (cfs)	Total Government Creek Loss (cfs)	Total A-4 Drain Gain (cfs)	Total Canyon Creek Gain[a,b] (cfs)	Total Canyon Creek Loss[b] (cfs)	Total Remedial Drain Gain (cfs)
OU 2 No Action	7.1	3.5	0.2	0.9	0.1	0.2	0.3	NA	NA	NA
Alternative (a)	5.7	1.4	0.0	0.1	0.1	0.2	0.1	NA	NA	NA
Alternative (b)	6.7	3.6	0.0	0.0	0.0	0.0	0.3	NA	NA	NA
Alternative (c)	2.8	7.6	0.0	0.0	0.1	0.2	0.0	NA	NA	8.2
Alternative (d)	3.3	6.5	0.0	0.0	0.0	0.0	0.1	NA	NA	8.6
Alternative (e)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	NA	4.0
OU 3 Mainstem SFCDR Watershed Segment 01 - No Action	9.4	8.4	NA	NA	NA	NA	NA	NA	NA	NA
OU 3 Mainstem SFCDR Watershed Segment 01 - Groundwater Actions	0.0	0.0	NA	NA	NA	NA	NA	NA	NA	6.3
OU 3 Woodland Park - No Action	NA	NA	NA	NA	NA	NA	NA	1.7	1.1	NA
OU 3 Updated Remedial Components for Woodland Park	NA	NA	NA	NA	NA	NA	NA	1.1	1.2	0.8

[a]Includes groundwater discharge to Canyon Creek and land surface.
[b]Woodland Park Reaches 1 though 12

Notes:
cfs = cubic feet per second
NA = not applicable
OU = Operable Unit
SFCDR = South Fork Coeur d'Alene River

TABLE A-14

Simulated Dissolved Zinc Load – 7Q10 Conditions

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

Simulation	Net Load to SFCDR lb/day	Net Load to Bunker Creek lb/day	Net Load to Government Creek lb/day	Net Load to A-4 Drain lb/day	Load to Canyon Creek lb/day	Total Load lb/day	Reduction in Load from No Action lb/day	Load to RA-Drains lb/day
OU 2 No Action	502	11	14	25	NA	553	0	NA
Alternative (a)	425	0	14	12	NA	450	103	NA
Alternative (b)	477	0	0	28	NA	505	48	NA
Alternative (c)	43	0	14	1	NA	58	495	1,045
Alternative (d)	61	0	0	11	NA	72	481	1,095
Alternative (e)	0	0	0	0	NA	0	553	398
OU 3 Mainstem SFCDR Watershed Segment 01 - No Action	58	NA	NA	NA	NA	58	0	NA
OU 3 Mainstem SFCDR Watershed Segment 01 - Groundwater Actions	0	NA	NA	NA	NA	0	58	61
OU 3 Woodland Park - No Action	NA	NA	NA	NA	101	101	0	NA
OU 3 Updated Remedial Components for Woodland Park	NA	NA	NA	NA	26	26	75	53

Notes:

lb/day = pound(s) per day

NA = not applicable

OU = Operable Unit

SFCDR = South Fork Coeur d'Alene River

TABLE A-15
Model-Simulated Flows – 90th Percentile Flow Conditions
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Simulation	Total SFCDR Gain (cfs)	Total SFCDR Loss (cfs)	Total Bunker Creek Gain (cfs)	Total Bunker Creek Loss (cfs)	Total Government Creek Gain (cfs)	Total Government Creek Loss (cfs)	Total A-4 Drain Gain (cfs)	Total Canyon Creek Gain[a,b] (cfs)	Total Canyon Creek Loss[b] (cfs)	Total Remedial Drain Gain (cfs)
OU 2 No Action	6.0	3.7	0.5	0.4	0.5	0.1	0.5	NA	NA	NA
Alternative (a)	5.6	1.2	0.0	0.1	0.5	0.1	0.5	NA	NA	NA
Alternative (b)	5.7	3.8	0.0	0.0	0.0	0.0	0.5	NA	NA	NA
Alternative (c)	2.6	8.0	0.0	0.0	0.5	0.1	0.2	NA	NA	9.4
Alternative (d)	2.9	7.2	0.0	0.0	0.0	0.0	0.4	NA	NA	9.8
Alternative (e)	0.0	0.0	0.0	0.0	0.0	0.0	0.3	NA	NA	10.8
OU 3 Mainstem SFCDR Watershed Segment 01 - No Action	9.9	9.5	NA	NA	NA	NA	NA	NA	NA	NA
OU 3 Mainstem SFCDR Watershed Segment 01 - Groundwater Actions	0.0	0.0	NA	NA	NA	NA	NA	NA	NA	8.0
OU 3 Woodland Park - No Action	NA	NA	NA	NA	NA	NA	NA	4.5	0.4	NA
OU 3 Updated Remedial Components for Woodland Park	NA	NA	NA	NA	NA	NA	NA	3.7	0.7	1.5

[a]Includes groundwater discharge to Canyon Creek and land surface.
[b]Woodland Park Reaches 1 though 12

Notes:
cfs = cubic feet per second
NA = not applicable
OU = Operable Unit
SFCDR = South Fork Coeur d'Alene River

TABLE A-16

Simulated Dissolved Zinc Load – 90th Percentile Flow Conditions

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

Simulation	Net Load to SFCDR lb/day	Net Load to Bunker Creek lb/day	Net Load to Government Creek lb/day	Net Load to A-4 Drain lb/day	Load to Canyon Creek lb/day	Total Load lb/day	Reduction in Load from No Action lb/day	Load to RA-Drains lb/day
OU 2 No Action	561	42	57	54	NA	715	0	NA
Alternative (a)	516	0	57	52	NA	625	90	NA
Alternative (b)	545	0	0	60	NA	605	110	NA
Alternative (c)	86	0	57	22	NA	165	550	1,303
Alternative (d)	123	0	0	40	NA	163	552	1,350
Alternative (e)	0	0	0	30	NA	30	685	1,213
OU 3 Mainstem SFCDR Watershed Segment 01 - No Action	58	NA	NA	NA	NA	58	0	NA
OU 3 Mainstem SFCDR Watershed Segment 01 - Groundwater Actions	0	NA	NA	NA	NA	0	58	77
OU 3 Woodland Park - No Action	NA	NA	NA	NA	258	258	0	NA
OU 3 Updated Remedial Components for Woodland Park	NA	NA	NA	NA	112	112	146	182

Notes:

lb/day = pound(s) per day

NA = not applicable

OU = Operable Unit

SFCDR = South Fork Coeur d'Alene River

TABLE A-17
Model-Simulated Flows – Average Annual Conditions
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Simulation	Total SFCDR Gain (cfs)	Total SFCDR Loss (cfs)	Total Bunker Creek Gain (cfs)	Total Bunker Creek Loss (cfs)	Total Government Creek Gain (cfs)	Total Government Creek Loss (cfs)	Total A-4 Drain Gain (cfs)	Total Canyon Creek Gain[a,b] (cfs)	Total Canyon Creek Loss[b] (cfs)	Total Remedial Drain Gain (cfs)
OU 2 No Action	7.2	2.9	0.2	0.9	0.3	0.1	0.4	NA	NA	NA
Alternative (a)	6.0	1.5	0.0	0.1	0.3	0.1	0.3	NA	NA	NA
Alternative (b)	6.4	3.3	0.0	0.0	0.0	0.0	0.4	NA	NA	NA
Alternative (c)	3.2	7.3	0.0	0.0	0.3	0.2	0.1	NA	NA	8.8
Alternative (d)	3.2	7.3	0.0	0.0	0.0	0.01	0.1	NA	NA	8.7
Alternative (e)	0	0	0	0	0	0	0.0	NA	NA	5.3
OU 3 Mainstem SFCDR Watershed Segment 01 - No Action	10.8	7.0	NA	NA	NA	NA	NA	NA	NA	NA
OU 3 Mainstem SFCDR Watershed Segment 01 - Groundwater Actions	0.0	0.0	NA	NA	NA	NA	NA	NA	NA	8.0
OU 3 Woodland Park - No Action	NA	NA	NA	NA	NA	NA	NA	2.8	0.6	NA
OU 3 Updated Remedial Components for Woodland Park	NA	NA	NA	NA	NA	NA	NA	2.1	0.9	1.2

[a]Includes groundwater discharge to Canyon Creek and land surface.
[b]Woodland Park Reaches 1 though 12

Notes:
cfs = cubic feet per second
NA = not applicable
OU = Operable Unit
SFCDR = South Fork Coeur d'Alene River

TABLE A-18

Simulated Dissolved Zinc Load – Average Annual Conditions

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

Simulation	Net Load to SFCDR lb/day	Net Load to Bunker Creek lb/day	Net Load to Government Creek lb/day	Net Load to A-4 Drain lb/day	Load to Canyon Creek lb/day	Total Load lb/day	Reduction in Load from No Action lb/day	Load to RA-Drains lb/day
OU 2 No Action	524	14	38	42	NA	617	0	NA
Alternative (a)	447	-0.5	37	26	NA	509	108	NA
Alternative (b)	480	0	0	37	NA	517	100	NA
Alternative (c)	64	0	36	7	NA	107	510	1,163
Alternative (d)	64	0	0	6	NA	70	547	1,146
Alternative (e)	0	0	0	0	NA	0	617	531
OU 3 Mainstem SFCDR Watershed Segment 01 - No Action	77	NA	NA	NA	NA	77	0	NA
OU 3 Mainstem SFCDR Watershed Segment 01 - Groundwater Actions	0	NA	NA	NA	NA	0	77	77
OU 3 Woodland Park - No Action	NA	NA	NA	NA	141	141	0	NA
OU 3 Updated Remedial Components for Woodland Park	NA	NA	NA	NA	53	53	87	117

Notes:

lb/day = pound(s) per day

NA = not applicable

OU = Operable Unit

SFCDR = South Fork Coeur d'Alene River

TABLE A-19

Results of the OU 2 Sensitivity Analysis

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

	Estimated Dissolved Zinc Load to the Surface Water System within the Bunker Hill Box (lb/day)					
Input Parameter Modification	**No Action**	**Alternative (a)**	**Alternative (b)**	**Alternative (c)**	**Alternative (d)**	**Alternative (e)**
Calibrated Baseflow Model	605	513	504	100	67	0
Kx Bedrock x 10	625	541	514	115	70	11
Kx Bedrock x 100	684	628	568	140	93	14
Kx Bedrock ÷ 10	600	507	502	97	66	11
Kx Bedrock ÷ 100	600	506	502	96	66	11
Kx CU x 10	605	513	504	100	67	12
Kx CU x 100	605	511	503	101	67	11
Kx CU ÷ 10	605	513	504	100	67	13
Kx CU ÷ 100	605	513	504	100	67	13
Kx Alluvium x 5	1,026	863	849	278	260	20
Kx Alluvium x 10	1,341	1,120	1,117	498	491	31
Kx Alluvium ÷ 5	433	384	371	63	32	8
Kx Alluvium ÷ 10	394	353	336	56	26	7
PPN x 25%	615	527	522	107	69	13
PPN x 50%	624	539	515	114	72	13
PPN ÷ 25%	593	498	498	91	64	12
PPN ÷ 50%	581	481	492	82	61	12
Vertical Resistance x 10	390	341	284	77	44	2
Vertical Resistance x 100	303	245	191	66	31	0
Vertical Resistance ÷ 10	726	594	604	115	82	7
Vertical Resistance ÷ 100	774	621	636	123	91	11
SFCDR wc1 x 5	358	316.0	274	100	66	13
SFCDR wc1 x 10	277	241	195	101	65	13
SFCDR wc1 ÷ 5	679	563	562	100	66	11
SFCDR wc1 ÷ 10	688	571	670	101	68	13
SFCDR Stream Stage - 1 foot	647	540	530	122	89	13
SFCDR Stream Stage - 2 feet	680	558	537	145	111	13
SFCDR Stream Stage + 1 foot	540	464	448	74	41	13
SFCDR Stream Stage + 2 feet	447	384	364	41	8	13

Notes:

CU = confining unit

Kx = horizontal hydraulic conductivity

PPN = calibrated deep percolation of precipitation distribution

wc1 = streambed conductance term

APPENDIX B

Predictive Analysis Methodology and Results

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Abbreviations and Acronyms

ARAR	applicable or relevant and appropriate requirement
AWQC	ambient water quality criterion/criteria
$AWQC_r$	AWQC ratio
BEMP	Basin Environmental Monitoring Program
cfs	cubic foot/feet per second
CV	coefficient of variation
cy	cubic yard(s)
EOF	Error of Fact
FFS	Focused Feasibility Study
lb/day	pound(s) per day
LCL	lower confidence level
L_r	load ratio
µg/L	microgram(s) per liter
mg/L	milligram(s) per liter
NA	not applicable
NAS	National Academy of Sciences
NE	nonexceedance
OU	Operable Unit
PAT	Predictive Analysis Tool
PI	probability interval
RF	remediation factor
RI	Remedial Investigation
RLP	relative loading potential
ROD	Record of Decision
SFCDR	South Fork of the Coeur d'Alene River
UCL	upper confidence level
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey

APPENDIX B

Predictive Analysis Methodology and Results

A comparison of the potential relative effectiveness of the remedial alternatives in this Focused Feasibility Study (FFS) has been developed using an approach called the Predictive Analysis. The Predictive Analysis, in turn, relies on an analytical model called "the Predictive Analysis Tool" (PAT). The PAT was initially developed to support the evaluation of alternatives in the 2001 Feasibility Study (FS) Report for Operable Unit 3 (OU 3) (U.S. Environmental Protection Agency [USEPA], 2001a) and was subsequently used to support evaluations in the Proposed Plan (USEPA, 2001b) and the Record of Decision (ROD) for OU 3 (often referred to as "the Interim ROD"; USEPA, 2002). The analyses included two modeled locations, Pinehurst and Harrison, and did not account for dissolved metals sources in OU 2, which is located in the Bunker Hill "Box" (often referred to as "the Box").

The theory underlying the PAT, its mathematical and statistical bases, and the parameter estimates assumed in the 2001 predictive modeling were formally documented in the *Technical Memorandum (Revision 1): Probabilistic Analysis of Post-Remediation Metal Loading Technical Memorandum* (URS Greiner, 2001).[1] The PAT was evaluated as part of the program review conducted by the National Academy of Sciences (NAS) in *Superfund and Mining Megasites: Lessons from the Coeur d'Alene River Basin* (NAS, 2005). When the pre-publication NAS review report was released, a response to both the review and criticism of the PAT contained in Appendix F of the NAS report was prepared. This response document, NAS Appendix F Errors of Fact (EOF) (URS, 2005), includes a point-by-point discussion of the issues raised by the NAS and identifies substantive errors in the NAS review that were not corrected in the subsequent final NAS report. Further, USEPA sought an independent review of the PAT by a well-known leader in the field of probabilistic modeling, Dr. Gregory B. Baecher, University of Maryland, A.J. Clark School of Engineering (College Park, Maryland). The independent review validated the approach used by USEPA and its use in the evaluation and comparison of alternatives. This review culminated in a second technical memorandum, *A Predictive Analysis for Post-Remediation Metal Loading, Coeur d'Alene Basin RI/FS* (URS, 2007), which provided clarification and additional documentation of the approach used by USEPA. The fundamentals of the original analysis have remained unchanged since its initial development for the 2001 FS. The 2007 technical memorandum included a cover letter prepared by Dr. Baecher describing the conclusions of his review.

It has been necessary to make a number of modifications to the Predictive Analysis to support the evaluation of alternatives in this FFS. These modifications have included:

- Adding Elizabeth Park as a modeled location;
- Updating current water quality conditions (i.e., pre-remediation loads);
- Adding pre-remediation loading from the Box (mathematical updates to the PAT to support this modification are detailed in Attachment B-1);

[1] The Predictive Analysis was referred to as the Probabilistic Analysis at that time.

- Updating source types, volumes, and remedial actions to reflect the updated remedial alternatives; and
- Integrating more accurate estimates of load reduction from the groundwater model (groundwater modeling is described in Appendix A of this FFS Report, and mathematical updates to the Predictive Analysis to support the integration of these results into the PAT are detailed in Attachment B-1 to this Appendix B).

This appendix summarizes the methodology and results from the updated Predictive Analyses for the remedial alternatives described in this FFS Report. The appendix consists of the following five sections:

- Section B.1 provides an overview of the PAT model, describes the steps in the probabilistic Predictive Analysis, and identifies uncertainties inherent in the modeling process;
- Section B.2 describes the updates to the PAT model specific to the integration of the groundwater model results, as well as changes in input data that document current conditions in the watershed;
- Section B.3 describes how the uncertainty associated with the expected performance of remedial alternatives was quantified by mathematically propagating the uncertainty of the input variables;
- Section B.4 summarizes results from the updated Predictive Analysis modeling applicable to the alternatives evaluated in this FFS Report; and
- Section B.5 provides full references for documents cited.

B.1 Predictive Analysis Tool Overview

B.1.1 Model Components

The PAT is a simple analytical tool whose underlying concepts are shown schematically in Figure B-1. The figure is a generic description of the modeling process that was applied at two locations within the Upper Basin of the Coeur D'Alene River: Elizabeth Park on the South Fork of the Coeur d'Alene River (SCFDR), representing water quality in OU 3 upstream from (above) OU 2, and Pinehurst, which is downstream from OU 2, representing the combined water quality of OU 2 and the rest of the Upper Basin. The surface water monitoring locations in Elizabeth Park (SF-268) and Pinehurst (SF-271) are depicted in Figure 3-1 in this FFS Report. The modeling process is the same at the two locations, differing with respect to input values unique to each location. In both cases, the modeling process draws upon observed loading of dissolved metals (in this case, dissolved zinc) in surface water at the modeled location, allocates the observed loading between known upstream dissolved metal contaminant sources, and then estimates load reductions resulting from implementation of the remedial actions specific to each of the remedial alternatives evaluated in this FFS Report.

The PAT also includes a component that can be used to estimate residual post-remediation loads over time, due to source depletion. The natural source depletion component of the

PAT has not been used in the FFS analysis because the prediction of long-term water quality trends and specific water quality in the SFCDR watershed in the distant future is subject to considerable uncertainty, stemming from the complex weathering rates and the changes in these rates for the numerous mine waste types and source sites in the watershed. A description of natural source depletion processes is provided in Section 3.0 of this FFS Report. Site-specific exposure to seasonal wetting and water flux, as well as variations in particle surface area, iron sulfide content, trace metal content, air diffusion, and other factors, control the release of contaminants from mine wastes. The effect of cleanup actions further complicates these predictions.

Knowledge gained from other heavily contaminated mine sites suggests that water quality in the SFCDR watershed could be adversely impacted for long periods of time, particularly when significant waste volumes are left in place. A long-term monitoring program coupled with adaptively managed cleanup actions is likely the best approach for assessing long-term water quality and improvements resulting from cleanup. The PAT time-dependent source depletion estimates will be considered in remedy implementation, including adaptive management, and updated as new information becomes available from Basin Environmental Monitoring Program (BEMP) monitoring.

B.1.2 Model Outputs

The primary PAT output estimates residual load. Calculated residual loads can be used to establish the percent dissolved zinc load reduction by each alternative. Percent load reduction is defined as the alternative-specific ratio of the predicted dissolved zinc load reduction to the existing pre-remediation loading. The PAT also provides estimates of the post-remediation ambient water quality criteria (AWQC) ratios. AWQC ratios are the main output estimates used for evaluating compliance with applicable or relevant and appropriate requirements (ARARs), and the effectiveness of the remedial alternatives presented in this FFS. The AWQC ratios are calculated by comparing the dissolved zinc loads to loading capacity values that are equal to the AWQC multiplied by discharge.

B.1.3 Analytical Steps, Input Values, and Uncertainties

Each analytical step in the modeling procedure (see Figure B-1) requires model input values that derive from either available empirical data or engineering estimates based on experience and expert opinion. All of the input values, regardless of source (empirical data or engineering-based estimated factors), are subject to uncertainties. The input values and the uncertainties for each analytical step are as follows:

- **Step 1, Estimate Surface Water Loading.** This step requires input of the cumulative pre-remediation loading of dissolved zinc in surface water. The pre-remediation loading estimates are location-specific and based on empirical environmental monitoring to estimate flow and concentrations of dissolved metals in surface water within the Upper Basin. Both flow rate and concentrations of dissolved metals are subject to real variations over time and space on the scale of "events" (e.g., pre-remediation conditions vs. conditions during remedial actions vs. conditions following remedy completion) as well as temporal variations within and across water years.

- **Step 2, Allocate Loading to Upstream Sources.** Step 2 includes quantification of both the volume of contaminant source materials and estimation of the leaching characteristics of those materials. The load attributed to direct discharge of adit drainages, seeps, and groundwater is first subtracted from the total load, and then the remaining load is apportioned to specific waste types and volumes represented at each location. During preparation of the 2001 FS Report, an inventory of contaminant sources was developed based on extensive data accumulated through previous studies conducted by multiple state and federal agencies. This inventory includes volume estimates for each source type identified in the Coeur d'Alene Basin. The volume estimates are considered to carry a significant degree of uncertainty, primarily related to limitations in knowledge about the extent of both known and unknown contamination sources. Notwithstanding these uncertainties, the primary objective is to assess the potential relative effectiveness of the FFS alternatives, and not to quantify specific predictions of future water quality.

  The apportioning of load is based on the total volumes of waste types and their respective relative load potential (RLP) estimates. Each waste type is assigned a different RLP based on professional judgment estimates of its proportional "loading strength". The RLP values used for different waste types were first defined in the 2001 FS Report and remain unchanged in this analysis. The RLP of a given source type is an index of the average contribution of metal (zinc) load from that source type to the SFCDR per cubic yard (cy) of source material per year. The RLP expresses the relative propensity of a source type to contribute metal load to the river. That source judged to have the highest propensity is assigned an RLP of 1.0, and other source types are scaled proportionately, with values ranging from 0.0 to 1.0. At the end of Step 2, the difference in load between the two points is apportioned to specific waste types and volumes located between those two points, such that the sum of all waste type-specific loads is equal to the measured load between the two locations.

- **Step 3, Estimate Residual Loading for Remedial Alternatives.** Step 3 applies remediation factors (RFs) to the source-specific pre-remediation loads to estimate post-remediation residual loads, depending upon the specific actions identified in the remedial alternatives. The effectiveness of specific remedial actions is based largely on engineering experience and expert opinion, which is subject to uncertainty. Inclusion of groundwater-based actions in this FFS has added another level of uncertainty because estimates of load reduction resulting from groundwater-based actions are based on groundwater modeling, a methodology that is also subject to uncertainties due to both spatial and temporal conditions of groundwater within the watershed and inherent limitations of empirical data upon which the modeling is based.

- **Step 4, Sum Residual Loading Across Sources.** Step 4 aggregates the post-remediation loadings from each contamination source into a cumulative summation. Estimation uncertainty in that sum also combines the estimation error propagated at each step of the modeling process.

Throughout the analytical process, the PAT mathematically assigns uncertainties to the required model component inputs (empirically-based variables, model-based metrics, and engineering-based parameters). Input estimates for all input variables and parameters

applied in the model incorporate both a best estimate and an estimate of the uncertainty in the best estimate. The best estimate used in the model is the expected value of the variable or parameter. The uncertainty is measured by the coefficient of variation (CV), which includes both natural variability and estimation error. By definition, the CV is the ratio of the standard deviation divided by the expected value, resulting in a unitless estimate. As such, the CV gives insight into the relative variability of different variables over different scales. For example, an input variable with a CV of 0.30 is substantively less variable than a variable with a CV of 0.97, independent of where on the measurement scale the expected value lies.

Expected values and CVs are the inputs into the PAT for all measures and parameter estimates described in this appendix.

B.2 FFS Predictive Analysis Tool Model Components

Although the PAT is conceptually simple, its successful implementation requires use of an involved modeling procedure. As shown in Figure B-1, the modeling consists of five analytical steps (only Steps 1 through 4 are used in this FFS), beginning with estimation of pre-remediation input loading of dissolved metals into system surface waters. Those loads are then allocated to known upstream sources, each of which was assigned a RLP. Source-specific pre-remediation loads are then reduced based on the remedial actions identified for each of the remedial alternatives, resulting in source-specific post-remediation residual loads that would be expected to remain after successful remedy implementation. Source-specific post-remedial loads are then re-aggregated to a cumulative, location-specific residual post-remediation load. The analytical steps are the same at Elizabeth Park and Pinehurst, differing only in terms of input metrics given location-specific conditions and remedial alternatives.

The remainder of this section details the expected values and CVs used in each of the analytical steps in the PAT conceptual schematic shown in Figure B-1 (with the exception of the source depletion component). Each model component (empirically-based value or estimated engineering parameter) is first described, followed by the strategy and methods used to update specific model components and tailor the model to the FFS alternatives.

B.2.1 Pre-Remediation Dissolved Metal Loads

The development of estimates for pre-remediation surface water loading in pounds per day (lb/day) of dissolved zinc at Elizabeth Park and Pinehurst is based on monitoring records from Stations SF-268 and SF-271, respectively, which are stream gauging and water quality sampling stations maintained by the U.S. Geological Survey (USGS) for USEPA.

Load estimates used in the 2001 FS were developed using data collected from 1987 through 1999. Since the FS, remedial actions have been taken in the Box that were expected to reduce post-remediation loadings at Pinehurst. For the current FFS, surface water monitoring data were accessed and updated through August 2009 and evaluated to determine the extent to which conditions have changed with respect to surface water loadings at Elizabeth Park and Pinehurst over the period 1987 through 2009.

Potential changes in loading over time were evaluated by examining the relationships between dissolved zinc concentration and discharge (the two components used to calculate load) over three periods: pre-remediation (1987 through September 1995), active remediation (October 1995 through September 2002), and post-remediation (October 2002 through August 2009). Figures B-2 and B-3 show the relationships at Elizabeth Park and Pinehurst, respectively, plotting the natural log (ln) of the discharge (cfs) on the x-axis and dissolved zinc concentration (milligrams per liter [mg/L]) on the y-axis. Synoptic observations from the three periods use different symbols, as noted in the legend. Regression equations that estimate dissolved zinc concentration using a power equation relationship (concentration equaling a constant times discharge taken to a power, estimated from the data by regression) are also noted in the figures. Best-fit curves are indicated as curved lines passing through the period-specific points.

Dissolved zinc loads calculated from synoptic concentration and discharge data within the three periods were compared at the two sites, applying a nonparametric analysis of variance to observed loadings. Load comparisons are graphically displayed in box plots found in the left panels of Figures B-4 and B-5, for Elizabeth Park and Pinehurst, respectively. Apparent lack of significant difference across monitoring periods for Elizabeth Park is indicated by the overlap of box plot loads and corroborated with the insignificant test statistic ($p = 0.32$). Although the best fit power functions across years in Figure B-2 suggest a decreasing trend, differences in load are not sufficient at Elizabeth Park to exceed "noise" within the metric. Figure B-5 suggests statistically significant differences in the pre-remediation, active remediation, and post-remediation periods for Pinehurst loads; these differences are supported by the significant test statistic ($p = 0.002$). Apparent differences at Pinehurst indicate that samples from both pre-remediation and active remediation events are significantly elevated over loads observed following the remedial activities.

Based on the Pinehurst results and in the interest of using data representative of current conditions within the Basin, monitoring data used to develop estimates for the PAT input were limited to results from sampling events following October 2002. Although loadings at Elizabeth Park exhibit no statistically significant differences over pre-remediation, active remediation, and post-remediation conditions, synoptic observations are needed to estimate OU 2 loadings; therefore, the data used were limited to the same period. Limiting sampling events to the post-October 2002 period resulted in approximately 50 observations per location, which gives sample sizes considered sufficient to develop reasonable expected values and CVs.

Pre-remediation dissolved zinc load estimates are based on lognormal distributions that are supported by the probability plots of loading in the right panels of Figures B-4 and B-5.[2] Table B-1 lists model input estimates of Elizabeth Park and Pinehurst loading (along with other variable expected values used as input for the current model runs). Results for both Elizabeth Park and Pinehurst are summarized in the following bullets. In these bullets, the current estimates at Pinehurst are compared to the 2001 FS input estimates. This comparison was done only for changes observed at Pinehurst because Predictive Analysis modeling at Elizabeth Park was not conducted during the 2001 FS, precluding comparison.

[2] Pre-remediation load estimates for the 2001 FS modeling effort were also based on lognormal distributions.

- Elizabeth Park dissolved zinc load inputs (expected value and coefficients of variation) for the current Predictive Analysis modeling are 1,260 pounds per day (lb/day) and CV=0.94.
- Dissolved zinc load inputs at Pinehurst for the 2001 FS and the current Predictive Analysis modeling exhibit statistically significant differences, with expected value and coefficients of variation of 2,921 lb/day (CV=0.60) and 2,285 (CV = 1.21), respectively. The comparatively lower expected value with higher CV for the current data indicates an overall reduction in dissolved metal loading at Pinehurst with a somewhat increased relative variability. These results are consistent with remedial activities having been initiated in OU 2 in 1995 and completed in 2002.

B.2.2 Pre-Remediation Load Allocation

As noted above, an inventory of contaminant sources was developed for the 2001 FS Report based on information accumulated by multiple state and federal agencies. In the development of that inventory, each source was designated as a specific source type (e.g., sediments within the floodplain or upland tailings). On-going source documentation since the 2001 FS Report was completed has resulted in changes in the original inventory of contaminant sources within the Upper Basin. The current inventory was developed by adjusting the original inventory to reflect updated source and volume information. Table B-2 lists updated total volumes of materials for each source waste type for both Elizabeth Park and Pinehurst, including sediments; impounded tailings at both inactive and active facilities; unimpounded tailings; waste rock with loading potential, upland waste rock with little potential loading, and waste rock with loading potential at active facilities; and adit drainages.

Allocation of pre-remediation cumulative loads to individual sources draws upon both empirical data documenting upstream contaminant sources and source volumes as well as professional judgment as to the RLP associated with individual sources. Table B-2 lists RLPs for each waste type. For this FFS modeling, the RLP for each source was assigned, based on professional judgment, as documented in the 2001 FS Predictive Analysis modeling efforts. The RLPs as originally defined in the 2001 FS Predictive Analysis have been retained without change. RLPs range between 0 and 1, with 1 meaning that the full source volume is included in the adjusted volume cumulative sum.

The resulting cumulative pre-remediation load was then allocated among the individual sources, based on the relative loading potential and volume per source, normalized by the sum of relative loading and volume products across all sources. The ultimate result of this step of the modeling is the attribution of the cumulative pre-remediation load to the individual upstream contaminant sources. In reality, loading will be heavily influenced also by the concentration of metals in the waste (which can vary considerably by site) and site characteristics such as drainage (i.e. poorly drained sites yield relatively higher loading). However, accounting for this variability would require a degree of site characterization that is not yet available.

B.2.3 Post-Remediation Load Reduction

Changes in focus between the 2001 FS and the current FFS have required modifications to the original PAT algorithm. First, the spatial coverage of the remedial alternatives in the two feasibility studies differs in that the 2001 FS considered sources in the Upper and Lower Basins, intentionally excluding sources within OU 2. Second, although groundwater collection and treatment was considered for OU 3 in the 2001 FS, the original PAT did not account for dissolved metals sources in OU 2, including groundwater. For this FFS, contaminated groundwater from OU 2 and upstream from Elizabeth Park is being considered in addition to the source contamination outside OU 2 that was considered in the 2001 FS.

In summary, adaptation of the PAT to account for differences between the 2001 FS and this FFS represents not only a spatial expansion of where contaminant sources are found (to include sources both outside and within OU 2), but also changes in the method of accounting for the sources and their remediation when groundwater is a treatment option for the remedial alternative. How these changes affect the current modeling effort is described for non-groundwater sources and groundwater sources in Sections B.2.3.1 and B.2.3.2., respectively.

B.2.3.1 Non-Groundwater Source Remedial Factors

Post-remediation load reductions of non-groundwater source loads depend upon relative effectiveness of the remedial treatment proposed. Remediation factors (RFs) have been developed for each of the remedial technologies in Alternatives 3+ and 4+ described in Section 7.0 of this FFS Report. RFs for the various treatment technologies in each alternative to be applied to the different waste types estimate how much of the pre-remediation loading would remain following successful implementation of the alternative for each waste type. That quantity, designated the post-remediation or residual load, is specific for each waste type for each remedial alternative. RFs are, therefore, specific to both waste type and remedial technology. RFs range in value from zero to one, with higher RFs corresponding to reduced remedial effectiveness. Thus, for example, a no-action technology for a portion of a source material volume would carry an RF value of 1.00. RFs for waste types and treatment technologies that were previously defined as alternative options in the original FS modeling have been retained in the current application of the PAT to the FFS alternatives.

Tables B-3 and B-4 list the Alternative 3+ and 4+ remedial actions for Elizabeth Park and Pinehurst, respectively, including the volumes by type of action and alternative. Cumulative volumes for the individual source types sum to the entries in Table B-2. Table B-5 lists RFs for each of the remedial actions included in the alternatives. These RFs are applied consistently across alternatives and modeled locations.

B.2.3.2 Groundwater Residual Load

The PAT algorithm was updated to account for groundwater-based actions in the post-remediation load calculations in a manner that parallels other treatment technologies. Load reduction estimates are based on expected value and variability in load reductions from water-year transient model groundwater results specific to each OU 2 alternative and to the actions identified for the Woodland Park area of Canyon Creek and the SFCDR French drain and stream liner system between Wallace and Elizabeth Park.

Expected values and CVs for the five OU 2 alternatives and the two groundwater actions upstream from Elizabeth Park (Woodland Park and the SFCDR drain/liner system) are based on groundwater modeling, and the results are documented in Appendix A of this FFS Report. Table B-6 summarizes modeled load reductions for these groundwater components, including summary statistics used for model input estimates.

B.2.4 Post-Remediation Residual Load Aggregation

Re-aggregation of the post-remediation residual loads results in cumulative post-remediation loads specific to each of the alternatives. The analytical methods used for the summation are identical to the methods used in the original PAT developed in 2001, requiring no changes in the original algorithm.

B.2.5 Post-Remediation AWQC

As described in Section B.1.2, Predictive Analysis outputs include post-remediation residual loads that estimate the extent to which remedial actions are effective. Residual loads normalized by load capacity are numerically comparable to AWQC ratios, and an AWQC ratio equal to one means that residual loading equals loading capacity. To develop AWQC ratios from the modeled residual loads requires an additional model parameter, load capacity. Load capacity calculations applied in the 2001 Predictive Analysis have changed based on a new site-wide AWQC values as described in Section B.2.5.1.

As described in Section B.1, load capacities depend on sample-specific AWQC and surface water discharge. They are, therefore, sample-specific calculated values that are calculated from empirical data. The AWQC that are applicable to the SFCDR have changed since the 2001 FS Report was completed. Since that time, site-specific AWQC for ecological protection for the SFCDR basin have been developed by the State of Idaho and adopted by USEPA. Therefore, the surface water AWQC applicable to the Upper Basin are SFCDR Subbasin-Specific Criteria (Idaho Administrative Procedures Act [IDAPA] 58.01.02.284). Reference to AWQC in this appendix refers to these standards.

The SFCDR-specific dissolved-zinc AWQC calculation is based on the following equation:

$$AWQC_{SFCDR\text{-}specific} = e^{(0.6624 * \ln(hardness) + 2.2235)} \text{ (micrograms per liter [µg/L])}$$

The dissolved-zinc AWQC calculation that was applicable to the SFCDR in the 2001 FS (based on State of Idaho regulations in place at that time)is provided as follows for comparison:

$$AWQC_{2001} = 0.986 * e^{(0.8473 * \ln(hardness) + 0.7614)} (\mu g/L)$$

For fixed water hardness, the calculated SFCDR-specific AWQC is greater than the Idaho criterion, resulting in a higher load capacity for the same discharge. For example, the range of hardness observed at Elizabeth Park over the period 1987-2009 is between 12 and 146 mg/L. The corresponding Idaho AWQC ranges are between 17.3 and 47.9, whereas the SFCDR AWQC range is between 108 and 200. The relationship between the two calculated values is not linear, but over the range of hardness observed at Elizabeth Park, the SFCDR AWQC is between 1.7 and 2.8 times greater than the original AWQC applied in 2001.

As shown under Load Capacity in Table B-1 (bottom row), the dissolved zinc load capacity expected values and CVs input for the Elizabeth Park and Pinehurst modeling are 287 lb/day (CV = 1.22) and 449 mg/L (CV = 1.08), respectively. As apparent in the table, differences in loading capacity between the two locations are attributable to the reduced discharge at Elizabeth Park as opposed to differences in surface water hardness that are comparable over the post-remediation period.

B.3 Model Uncertainty Estimates

The Predictive Analysis quantified the uncertainty associated with the expected performance of remedial alternatives in terms of post-remediation dissolved zinc loading, F(t), and load ratios, Lr(t), which are numerically identical to AWQC ratios. The uncertainty stems from unavoidably imperfect knowledge and includes both inherent natural variability (aleatory uncertainty) of basin conditions and limited information (epistemic uncertainty) on both Coeur d'Alene Basin conditions and future remedial performance.

The uncertainty was quantified by mathematically propagating the uncertainty of the input variables, as measured by their coefficients of variation, through the Predictive Analysis model (the PAT) to the output variables, F(t) and Lr(t) (URS Greiner, 2001, and URS, 2007). The PAT output included both the expected value and coefficients of variation of each F(t) and Lr(t) estimate (one estimate for each alternative and time step).

Based on statistical analysis and interpretation of historical (pre-remediation) loadings and load ratios measured at BEMP monitoring locations , the uncertainty in the post-remediation F(t) and Lr(t) estimates was assumed to following lognormal probability distributions, consistent with historical BEMP data. A lognormal probability distribution was thus associated with the expected value and coefficients of variation of each F(t) and Lr(t) estimate.

For each estimate, its lognormal probability distribution (which includes the expected value and coefficient of variation) represents a complete quantitative description of the uncertainty of the estimate. The probability distribution can then be used to quantify the expected accuracy and precision of the estimate using "probability intervals", or PIs, as discussed in the following paragraphs. PIs are used for probabilistic estimates in the same way as confidence intervals are used for estimates of statistical parameters.[3]

The accuracy of the F(t) and Lr(t) estimates was quantified by PIs, with the precision quantified by the range of the interval. The higher the probability associated with the PI (e.g., 80 percent or 90 percent), the more accurate the estimate, but the wider the interval, meaning less precision. Conversely, higher precision means lower accuracy. For this analysis, an 80% PI was calculated for each F(t) and Lr(t) estimate, consistent with the range used for the 2001 FS (URS Greiner, 2001, URS, 2007). Each 80% PI is bounded on the high end by the 90% nonexceedance (90% NE) estimate, and on the low end by the 10% NE

[3] For example, for an 80 percent confidence interval (80% CI) on a statistical estimate for a population average, the 80% CI would be bounded by the 90 percent upper confidence level (90% UCL) and 90 percent lower confidence level (90% LCL). Because Predictive Analysis estimates are probabilistic, not statistical, "confidence intervals" are replaced by "probability intervals" with UCLs and LCLs replaced by "nonexceedance" (NE) estimates.

estimate. There is thus a nominal or estimated 80 percent probability (90% – 10%) that the uncertain true value of the variable being estimated, F(t) or Lr(t), will lie within the 80% PI of the estimate. There is a 10 percent probability that the true value will not exceed the 10% NE and a 10 percent probability it will exceed the 90% NE.

B.4 Predictive Analysis Modeling Results

Results from the Predictive Analysis modeling at Elizabeth Park and Pinehurst with implementation of the remedial alternatives evaluated in this FFS Report are presented in Table B-7. Elizabeth Park results (found in the upper panel of the table) are limited to the No Action Alternative, Alternative 3+ including groundwater treatment-based actions at Woodland Park and along the Mainstem SFCDR segment between Elizabeth Park and Wallace, and Alternative 4+ with groundwater-based actions limited to the SFCDR segment. The Pinehurst results include the No Action Alternative and Alternatives 3+ and 4+, both with and without OU 2 groundwater-based actions, Alternatives (a) through (e).

Table B-7 summarizes, for Alternatives 3+ (a) to (e) and 4+ (a) to (e), the remaining post-remediation load (lb/day) with 80% PI intervals; the load reduction (lb/day) and percent load reduction given initial cumulative load; and the resulting AWQC ratio for the residual load, calculated based on remedy completion. As noted above, the results of the Predictive Analysis have been used in this FFS Report to assist in the comparison of the potential relative effectiveness among the remedial alternatives evaluated. Actual post-implementation performance of remedial alternatives may deviate significantly from predictions due to the inherent uncertainties in modeling, as reflected in the 80% PI intervals presented along with the results.

B.5 References

National Academy of Sciences (NAS). 2005. *Superfund and Mining Megasites: Lessons from the Coeur d'Alene River Basin*.

URS. July 25, 2005. *NAS Appendix F Error of Fact (EOF) Document*. Prepared for U.S. Environmental Protection Agency Region 10.

URS. October 2007. *Technical Memorandum: A Predictive Analysis for Post-Remediation Metal Loading, Coeur d'Alene Basin RI/FS*. Prepared for U.S. Environmental Protection Agency Region 10.

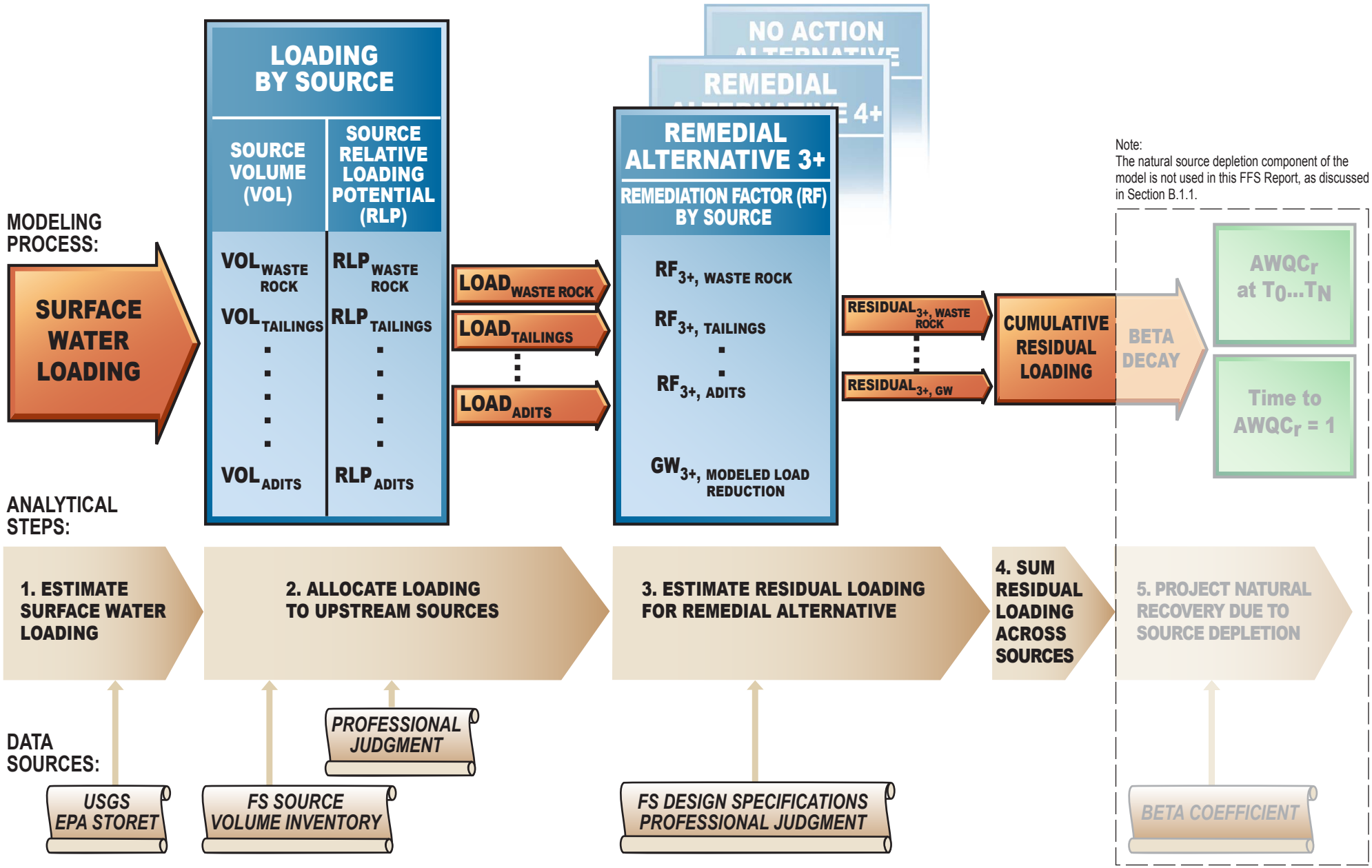
URS Greiner. September 2001. *Technical Memorandum (Revision 1): Probabilistic Analysis of Post-Remediation Metal Loading*. Prepared for U.S. Environmental Protection Agency Region 10.

U.S. Environmental Protection Agency (USEPA). October 2001 (2001a). *Final (Revision 2) Feasibility Study Report, Coeur d'Alene Basin Remedial Investigation/Feasibility Study*. Prepared by URS Greiner and CH2M HILL for EPA Region 10.

U.S. Environmental Protection Agency (USEPA). October 29, 2001 (2001b). *Coeur d'Alene Basin Proposed Plan*.

U.S. Environmental Protection Agency (USEPA). September 2002. *Record of Decision, The Bunker Hill Mining and Metallurgical Complex Operable Unit 3.*

Figures



DEFINITIONS			
LOAD	Surface water dissolved metal loading [lb/day]	RF	Remedial Factor
VOL	Waste Volume [cy]	RESIDUAL	Load Remaining Post-Remedy
RLP	Relative Leaching Potential	$AWQC_r$	Ambient Water Quality Criterion Ratio

Figure B-1
Predictive Analysis Model Schematic
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

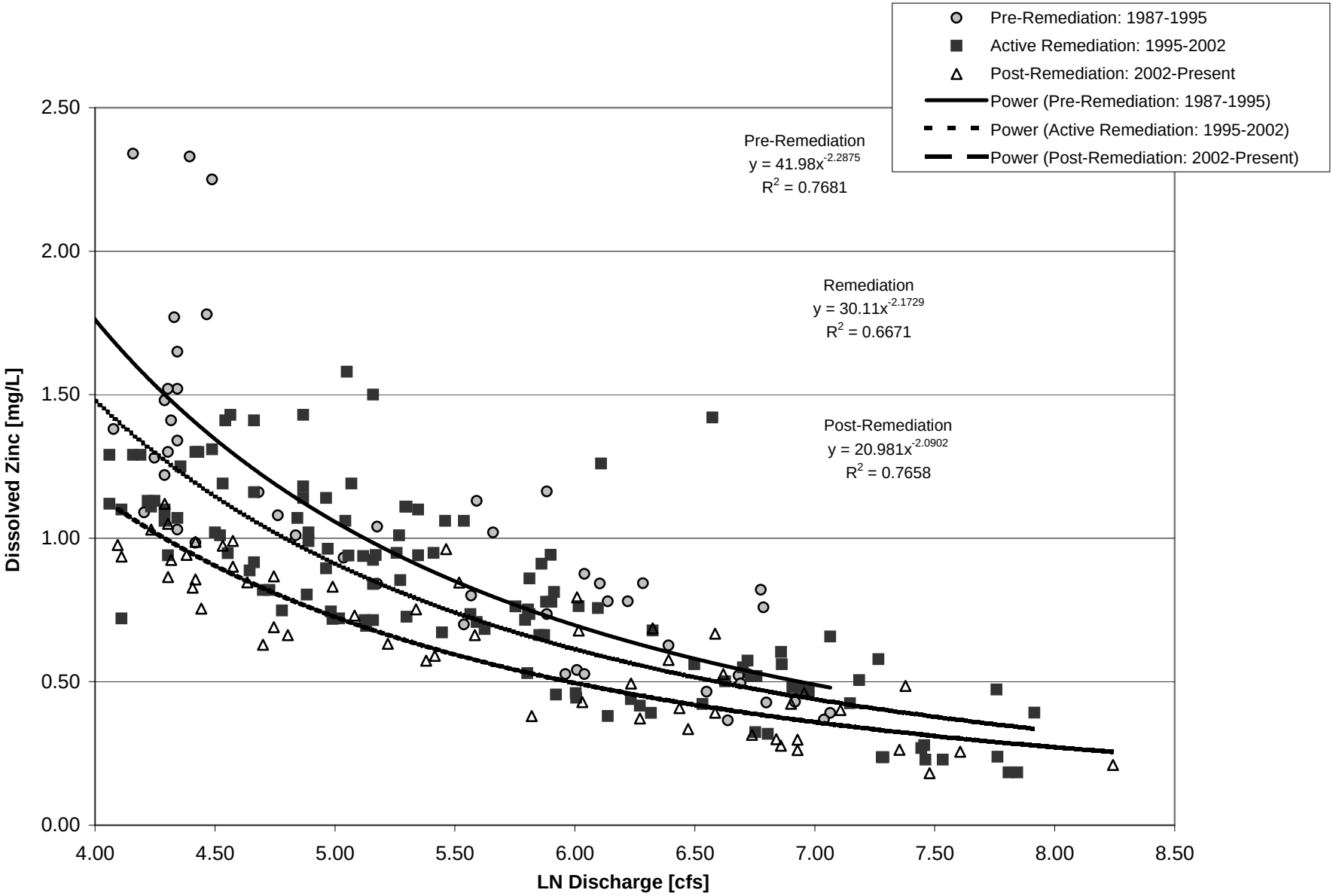


Figure B-2
Elizabeth Park Dissolved Zinc vs. Discharge Over Time
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

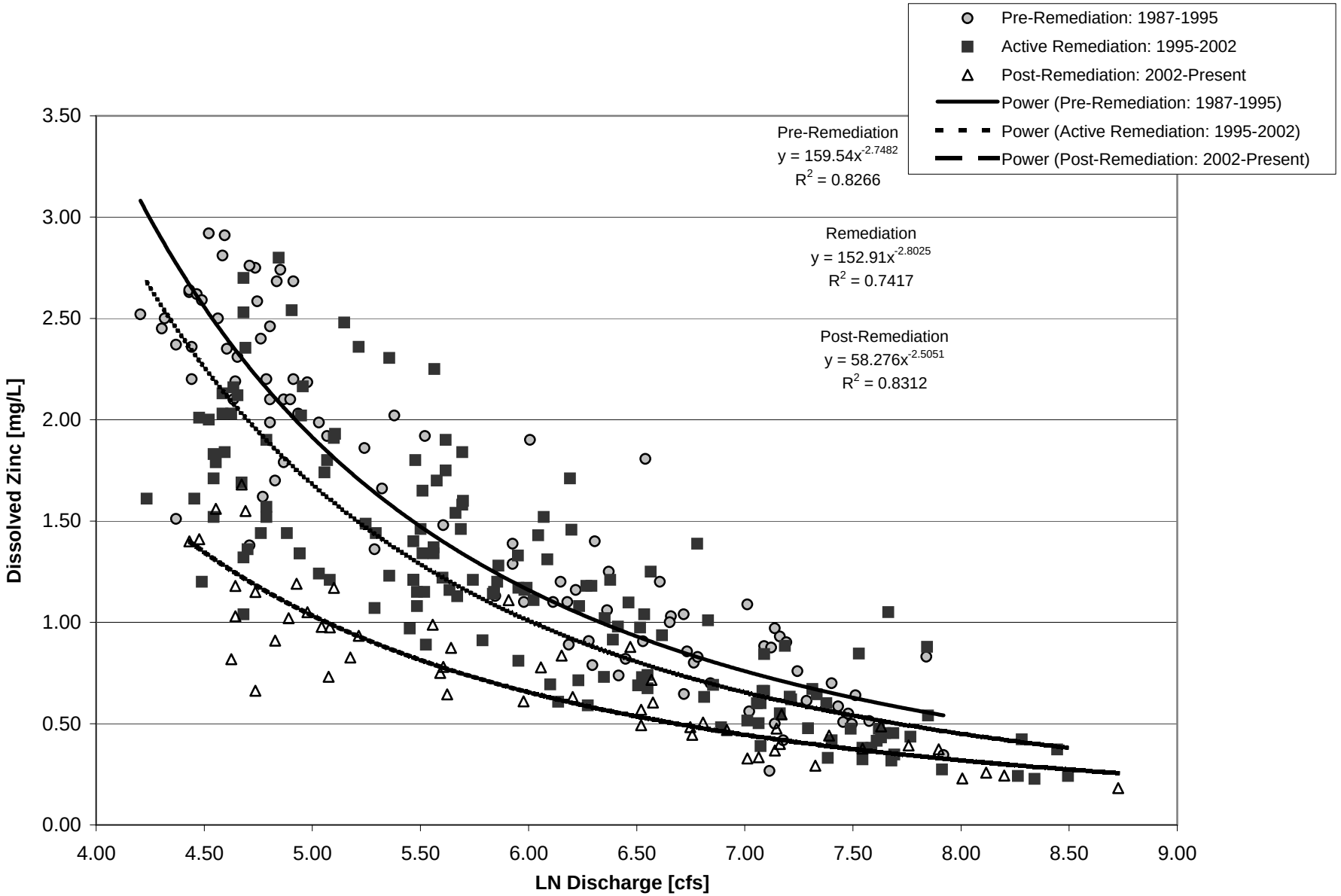


Figure B-3
Pinehurst Dissolved Zinc vs. Discharge Over Time
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

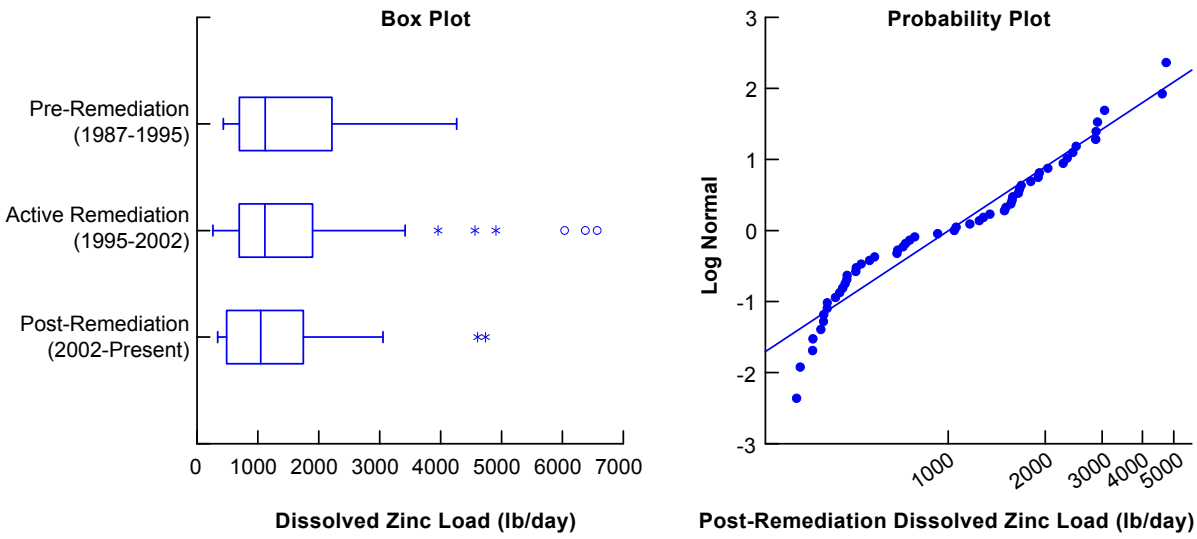


Figure B-4
Elizabeth Park Loading: Comparison of Pre-Remediation, Remediation, and Post-Remediation Distribution
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

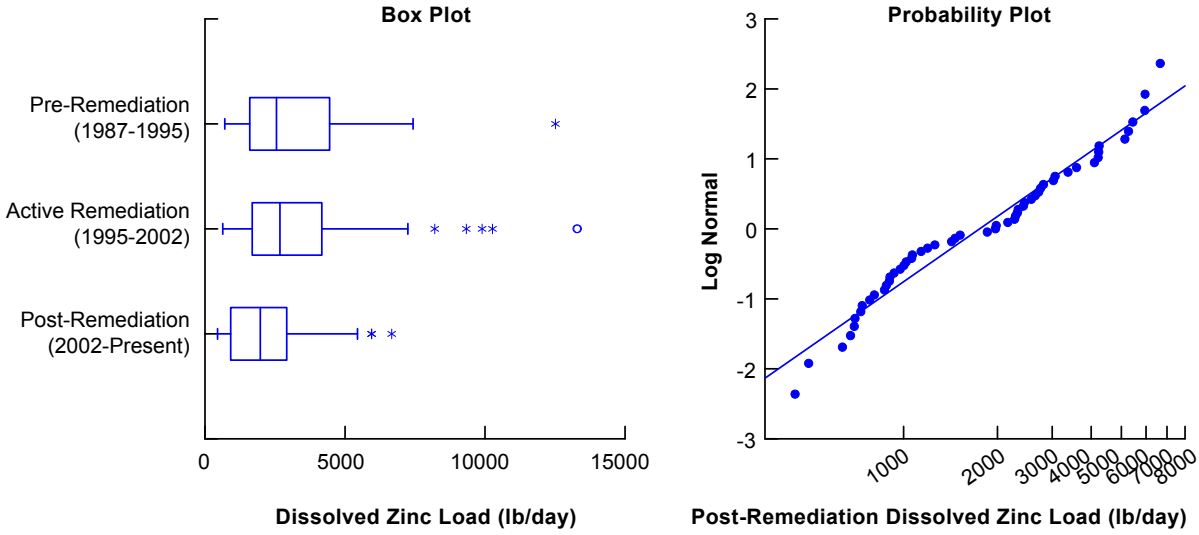


Figure B-5
Pinehurst Loading: Comparison of Pre-Remediation, Remediation, and Post-Remediation Distribution
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

Tables

TABLE B-1

Elizabeth Park and Pinehurst Predictive Analysis Tool Modeling Inputs

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

	Elizabeth Park				Pinehurst			
Parameter Inputs	**Record Count**	**Expected Value**	**Coefficient of Variation**	**Model Estimation Error**	**Record Count**	**Expected Value**	**Coefficient of Variation**	**Model Estimation Error**
Pre-Remediation Load (lb/day)	50	1,260	0.94	--	51	2,285	1.21	--
OU 3 Upper Basin Load (lb/day)	--	--	--	--	50	1,424	1.50	--
OU 2 Groundwater Load (lb/day)	--	--	--	--	50	1,025	0.78	--
Groundwater Load Reduction (lb/day)								
OU 2(a)	--	--	--	--	365	108	0.27	0.26
OU 2(b)	--	--	--	--	365	100	0.07	0.29
OU 2(c)	--	--	--	--	365	510	0.13	0.71
OU 2(d)	--	--	--	--	365	547	0.12	1.04
OU 2(e)	--	--	--	--	365	617	0.19	0.49
OU 3 (Woodland Park)	365	157	0.33	0.25	365	157	0.33	0.25
OU 3 (SFCDR Mainstem)	365	76	0.42	0.25	365	76	0.42	0.25
Load Capacity (lb/day)	50	287	1.22	--	51	449	1.08	--

Notes:

lb/day = pounds of dissolved zinc per day
OU = Operable Unit
SCFDR = South Fork Coeur d'Alene River

TABLE B-2

Total Source Volumes and Relative Loading Potential by Waste Type

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

	Pre-Adjusted Source Volume (cy)		Estimated Relative Loading Potential (RLP)
Waste Type	**Elizabeth Park**	**Pinehurst**	
Floodplain Sediments	6,500,000	6,800,000	1.000
Tailings, Impounded in Inactive Facilites	3,600,000	3,700,000	0.143
Tailings, Impounded in Active Facilites	6,000,000	6,000,000	0.143
Tailings, Unimpounded	1,100,000	1,300,000	0.404
Waste Rock with Loading Potential	6,400,000	7,100,000	0.059
Waste Rock, Upland (with Little Loading Potential)	3,200,000	4,400,000	0.003
Waste rock, with loading potential at active facilities	1,000,000	1,000,000	--
Adits (Equivalent to Floodplain Sediments)[a]	108	133	1.000

Notes:

[a]Estimated adits drainage (pounds of zinc per day) has been adjusted to cubic yards of sediment, based on a common RLP of 1.

cy = cubic yards
RLP = relative loading potential

TABLE B-3

Elizabeth Park Source Volume Inputs by Waste Type and Remedial Action

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

Remedial Actions	Units	Alternative 3+	Alternative 4+
Floodplain Sediments			
Total Materials	cy	6,500,000	6,500,000
Excavation/Disposal	cy	2,100,000	3,500,000
Hydraulic Isolation at Discrete Facilities	cy	1,200,000	920,000
Hydraulic Isolation of Stream Reaches	cy	0	150,000
No Action	cy	3,200,000	1,930,000
Potential Deeper Affected Sediment	cy	10,081,363	10,081,363
Tailings, Impounded at Inactive Facilities			
Total Materials	cy	3,600,000	3,600,000
Cap or Regrade/Consolidate/Revegetate	cy	910,000	0
Excavation/Disposal	cy	13,000	3,600,000
No Action	cy	2,677,000	0
Tailings, Impounded at Active Facilities			
Total Materials	cy	6,000,000	6,000,000
Hydraulic Isolation	cy	4,000,000	4,700,000
No Action	cy	2,000,000	1,300,000
No Action (Materials with Loading Potential)	cy	700,000	0
Tailings, Unimpounded			
Total Materials	cy	1,100,000	1,100,000
Excavation/Disposal	cy	670,000	700,000
No Action	cy	430,000	400,000
Waste Rock with Loading Potential			
Total Materials	cy	6,400,000	6,400,000
Regrade/Consolidate/Revegetate	cy	770,000	290,000
Cap	cy	3,900,000	0
Excavation/Disposal	cy	1,300,000	5,800,000
No Action	cy	430,000	310,000
Waste Rock, Upland (with Little Loading Potential)			
Total Materials	cy	3,200,000	3,200,000
Regrade/Consolidate/Revegetate	cy	144,000	2,545,000
No Action	cy	3,056,000	655,000
Waste Rock with Loading Potential (at Active Facilities)			
Total Materials	cy	1,000,000	1,000,000
No Action	cy	1,000,000	1,000,000
Adit Drainage			
Total Load	lb/day	108	108

Notes:

cy = cubic yards; lb/day = pounds of dissolved zinc per day

TABLE B-4

Pinehurst Source Volume Inputs by Waste Type and Remedial Action

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

Remedial Actions	Units	Alternative 3+	Alternative 4+
Floodplain Sediments			
Total Materials	cy	6,800,000	6,800,000
Excavation/Disposal	cy	2,200,000	3,600,000
Hydraulic Isolation at Discrete Facilities	cy	1,200,000	920,000
Hydraulic Isolation of Stream Reaches	cy	0	150,000
No Action	cy	3,400,000	2,130,000
Potential Deeper Affected Sediment	cy	10,081,363	10,081,363
Tailings, Impounded at Inactive Facilities			
Total Materials	cy	3,700,000	3,700,000
Cap or Regrade/Consolidate/Revegetate	cy	950,000	0
Hydraulic Isolation	cy	42,000	0
Excavation/Disposal	cy	13,000	3,700,000
No Action	cy	2,695,000	0
Tailings, Impounded at Active facilities			
Total Materials	cy	6,000,000	6,000,000
Hydraulic Isolation	cy	4,000,000	4,700,000
No Action	cy	2,000,000	1,300,000
No Action (Materials with Loading Potential)	cy	700,000	0
Tailings, Unimpounded			
Total Materials	cy	1,300,000	1,300,000
Cap	cy	56,000	0
Excavation/Disposal	cy	770,000	850,000
No Action	cy	474,000	450,000
Waste Rock with Loading Potential			
Total Materials	cy	7,100,000	7,100,000
Regrade/Consolidate/Revegetate	cy	860,000	380,000
Cap	cy	4,000,000	20,000
Excavation/Disposal	cy	1,600,000	6,100,000
No Action	cy	640,000	600,000
Waste Rock, Upland (with Little Loading Potential)			
Total Materials	cy	4,400,000	4,400,000
Regrade/Consolidate/Revegetate	cy	667,900	3,680,000
No Action	cy	3,732,100	720,000
Waste Rock with Loading Potential (at Active Facilities)			
Total Materials	cy	1,000,000	1,000,000
No Action	cy	1,000,000	1,000,000
Adit Drainage			
Total Load	lb/day	133	133

Notes:

cy = cubic yards
lb/day = pounds of dissolved zinc per day

TABLE B-5

Remediation Factor by Waste Type and Remedial Action

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

Remedial Action	Estimated Remediation Factor
Floodplain Sediments	
Excavation/Disposal	0.01
Hydraulic Isolation at Discrete Facilities	0.18
Hydraulic Isolation of Stream Reaches	0.25
No Action	1.00
No Action (Potential Deeper Affected Sediment)	1.00
Tailings, Impounded at Inactive Facilities	
Cap + Hydraulic Isolation	0.03
Cap Only	0.05
Excavation/Disposal	0.01
Hydraulic Isolation	0.05
No Action	1.00
Tailings, Unimpounded	
Cap	0.05
Excavation/Disposal	0.01
No Action	1.00
Waste Rock with Loading Potential	
Cap	0.05
Excavation/Disposal	0.01
Regrade/Consolidate/Revegetate	0.46
No Action	1.00
Waste Rock, Upland (with Little Loading Potential)	
Regrade/Consolidate/Revegetate	0.46
No Action	1.00
Waste Rock with Loading Potential (at Active Facilities)	
No Action	1.00
Adit Drainage	
Passive Load Treatment	0.11
Active Load Treatment	0.01
Load No Treatment	1.00

TABLE B-6

Groundwater Load Reductions for Treatment Alternatives with Groundwater Components

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

Alternatives	Dissolved Zinc Load Reduction (lb/day)			Coefficient of Variation	Standard Deviation
	Minimum	Maximum	Expected Value		
OU 3 Alternatives					
OU 3 Woodland Park	62.24	118.55	87	0.23	20
OU 3 SFCDR Drains - Wallace to Elizabeth Park	-24.93	114.78	77	0.42	32
OU 2 Alternatives					
OU 2 (a)	62.95	186.96	108	0.27	30
OU 2 (b)	60.77	138.36	100	0.07	7
OU 2 (c)	189.89	633.16	510	0.13	67
OU 2 (d)	219.33	668.78	547	0.12	64
OU 2 (e)	34.39	855.02	617	0.19	117

Notes:

lb/day = pounds of dissolved zinc per day
OU = Operable Unit
SFCDR = South Fork Coeur d'Alene River

TABLE B-7

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		Dissolved Zinc Load Reduction		AWQC Ratio	80% Probability Interval on AWQC Estimate	
Modeled Location/Alternative	Expected Value	Lower	Upper	Pounds/Day	Percent	Expected Value	Lower	Upper
Elizabeth Park								
No Action Alternative[a]	1,260	330	2,540	--	--	5.5	2.9	8.6
Alt. 3+ (OU 3 Only)	513	90	1,120	744	59	1.9	1	3
Alt. 4+ (OU 3 Only)	432	75	940	825	66	1.6	0.8	2.6
Pinehurst								
No Action Alternative[a]	2,290	433	4,910	--	--	5.2	2.8	8.1
Alt. 3+ (OU 3 Only)	1,450	267	3,140	833	36	3.3	1.8	5.1
Alt. 3+(a)	1,340	225	2,940	941	41	2.9	1.5	4.7
Alt. 3+(b)	1,350	227	2,960	933	41	3.0	1.5	4.7
Alt. 3+(c)	942	97	2,140	1,340	59	1.8	0.7	3.1
Alt. 3+(d)	905	84	2,060	1,380	60	1.7	0.6	2.9
Alt. 3+(e)	835	71	1,900	1,450	63	1.5	0.5	2.7
Alt. 4+ (OU 3 Only)	1,350	268	2,890	931	41	3.1	1.7	4.9
Alt. 4+(a)	1,250	223	2,700	1,040	45	2.8	1.5	4.4
Alt. 4+(b)	1,250	226	2,720	1,030	45	2.8	1.5	4.4
Alt. 4+(c)	844	90	1,910	1,440	63	1.6	0.7	2.8
Alt. 4+(d)	807	76	1,830	1,480	65	1.5	0.6	2.6
Alt. 4+(e)	737	63	1,680	1,550	68	1.3	0.5	2.4

Notes:

[a] The dissolved zinc load and AWQC ratio for the No Action Alternative at each location are reflective of current conditions.

AWQC = ambient water quality criteria
OU = Operable Unit
lb/day = pounds of dissolved zinc per day

Attachment B-1
Mathematical Updates to Predictive Analysis Implemented in PAT1

Mathematical Updates to Predictive Analysis Implemented in PAT1

TO: Rebecca Maco, PE, and Alta Turner, MS; CH2MHill

FROM: Chuck Vita, PhD, PE, GE; URS

DATE: March 8, 2010

The mathematical updates to the Predictive Analysis (PA) that were implemented in the Predictive Analysis Tool spreadsheet PAT1 are documented in this memorandum. PAT1 was used to estimate the performance of remedial alternatives, as discussed in the Draft FFS Report (CH2MHill 2010). This memo supplements the FFS Report and builds on previous PA documents (URS 2007, 2002, 2001) that provide the basis and detailed description of the PA. Some opportunities for improvements to the PA and PAT1 are also noted in this memo.

The PAT1 updates included the addition of pre-remediation loadings in the Box and load reductions (LR) due to groundwater treatment (GWT) elements that were part of the remedial alternatives. Also, a source depletion empirical beta calibration factor (beta factor) was added to the PA natural recovery model. FFS Report Section 7 can be consulted for an overview and discussion of the PAT1 updates and the analysis results.

The mathematical updates have treated post-remediation loads and AWQC ratios at time t=0 as occurring immediately after the completion of active remediation and without explicit consideration of the time associated with remedy implementation and any concurrent source depletion that would occur during that implementation period. The current pre-remediation load and load capacity inputs to PAT1 have been based on statistical analysis of historic monitoring data that do not account for source depletion during a potential future period of remedy implementation. Correction for the period of implementation would entail including a corresponding element of load reduction (by source depletion) either as part of the remedy in effect at t=0 or by a corresponding reduction in the pre-remediation load inputs. Absent correction, PAT1 results will be biased to higher loads and AWQC ratios at time t=0 than would be expected in consideration of concurrent source depletion during the period of remedy implementation.

Memo Structure and Organization

This memorandum is structured as follows. Table 1 lists and briefly describes the PA and PAT1 input variables. The input variables are estimated outside the PA and PAT1 based on analysis and evaluation of available data and professional judgment. Table 2 lists and briefly describes the output variables calculated by PAT1. The PA mathematical development follows Tables 1 and 2, starting with post-remediation loading at time t=0, F, followed by the AWQC Ratio, Lr, and non-exceedance estimates. Natural recovery by source depletion including the empirical calibration beta factor completes the PA and PAT1 mathematical updates discussed in this memo.

Table 1.--PAT1 Input Variables

Variables Used in Mathematical Formulation		
PAT1 Input Variables	**Symbol**	**Description**
	Expected Values E[-] and Coefficients of Variation CV[-]	
	L_{UNGWT}	Pre-remediation Load from Upper Basin (SF268+PC) not including GWT. Estimates based on statistical analysis of available historical monitoring data.
	LR_{UGWT}	GWT Load Reduction in Upper Basin; varies with remedial alternative. Estimates are based on GWM output.
	L_{BX}	Pre-remediation Load from Box; independent of remedial alternative. Estimates based on statistical analysis of available historical monitoring data.
	LR_{BXGWT}	GWT Load Reduction in Box; varies with remedial alternative. Estimates are based on GWM output.
	C_L	Loading capacity (C_L= AWQC*Q) over water year. Estimates based on statistical analysis of available historical monitoring data.
	$GWME_U$	Groundwater model random estimation error (error) for LR estimates in the Upper Basin. Measured by CV[$GWME_U$] with E[$GWME_U$]=1.0. Assumed independent of remedial alternative. Estimates based on professional judgment.
	$GWME_{BX}$	Groundwater model random estimation error (error) for LR estimates in the Box. Measured by CV[$GWME_{BX}$] with E[$GWME_{BX}$]=1.0. Assumed independent of remedial alternative. Estimates based on professional judgment.
	BF	Beta Factor used to calibrate β to empirical β estimates from statistical analysis of available historic monitoring data.
	Correlation Coefficients, p	
	$p_{lnL,lnRo}$	p between the natural log (ln) of Upper Basin pre-remediation loading, lnL, and the natural log of the aggregate remediation factor for upper basin remedial action, lnR_0. In PAT1, $p_{lnL,lnRo}$ = "plnL,lnRo (t=0 only)" and is treated independent of remedial alternative.
	$p_{FU,FBX}$	p between Upper Basin post-remediation loading F_U and post-remediation Box loading F_{BX}. In PAT1, $p_{FU,FBX}$ = "pBox Load, UB Load" (the same as "pUB Load, Box Load" = $p_{FBX,FU}$) and is treated independent of remedial alternative.
	$p_{Fungwt,LRugwt}$	p between Upper Basin post-remediation loading without (no) groundwater treatment, F_{UNGWT}, and Upper Basin load reduction due to groundwater treatment, LR_{UGWT}. In PAT1, $p_{Fungwt,LRugwt}$ = "pAlt3+ Load, 3+ GW LR" for Alternative 3+ and "pAlt4+ Load, 4+ GW LR" for Alternative 4+.
	$p_{LBX,LRBXgwt}$	p between pre-remediation Box loading, L_{BX}, and Box load reduction due to groundwater treatment, LR_{BXgwt}. In PAT1, $p_{LBX,LRBXgwt}$ = "pBox Load, Box GW LR" and is treated independent of remedial alternative.
	$p_{lnF,lnCL}$	p between natural log of post-remediation loading, F, and load capacity C_L. In PAT1, $p_{lnF,lnCL}$ = "plnF,lnCL" and is treated independent of remedial alternative.
	$p_{lnFo,B}$	p between the natural log of the post-remediation loading, F_0, and decay factor "beta" β. In PAT1, $p_{lnFo,B}$ = "plnFo,exp{-Bt}." PAT1 treats $p_{lnFo,B}$ as independent of remedial alternative. See URS 2002 for further discussion.

Table 1 Notes. LR is used for load reductions due to GWT; the "GWT" and "gwt" subscripts could be deleted, but are included for clarity. GWT = Groundwater Treatment. GWM = Groundwater Mode. PAT 1 could be modified to make $p_{lnL,lnRo}$, $p_{FU,FBX}$, $p_{LBX,LRBXgwt}$, or $p_{lnFo,B}$ dependent on remedial alternative. In PAT1, $p_{lnL,lnRo}$ = "plnL,lnRo (t=0 only)"; $p_{FU,FBX}$ = "pBox Load, UB Load"; $p_{Fungwt,LRugwt}$ = "pAlt3+ Load, 3+ GW LR" and "pAlt4+ Load, 4+ GW LR"; $p_{LBX,LRBXgwt}$ = "pBox Load, Box GW LR"; $p_{lnF,lnCL}$ = "plnF,lnCL"; and $p_{lnFo,B}$ = "plnFo,exp{-Bt}."

Table 2.--PAT1 Calculated Variables

Variables Used in Mathematical Formulation		
	Symbol	**Description**
PAT1 Calculated Variables	**Expected Values E[-] and Coefficients of Variation CV[-]**	
	R_{UNGWT}	Remediation factor of Upper Basin remedial actions. Estimates calculated from PAT1 inputs for source type remediated volumes (including no action), Vij, and corresponding remediation factors, Rij.
	LR’	CV[LR’] only. CV[LR’] combines LR variability over the water year, $CV[LR_{UGWT}]$ or $CV[LR_{BXGWT}]$, and GWM model error, $CV[GWME_U]$ or $CV[GWME_{BX}]$.
	F_U	Post-remediation load into the Box from the Upper Basin at SF268 plus Pine Creek.
	F_{BX}	Post-remediation load from the Box, between SF268 and SF271, not including Pine Creek.
	F	Post-remediation load at SF271 or at SF268 by not including (1) Box loading or groundwater treatment, and (2) Pine Creek loading or remedial actions.
	L_R	Post-remediation AWQC (Load) Ratio.
	Non-Exceedance Estimates at Probability of Non-Exceedance “Pn”	
	F_{Pn}	Post-remediation loading F having probability of non-exceedance “Pn.” Pn=90% and 10% is used in PAT1.
	L_{RPn}	Post-remediation AWQC Ratio L_R having probability of non-exceedance “Pn.” Pn=90% and 10% is used in PAT1.
	Natural Recovery by Source Depletion: Loading and AWQC Ratio at Times t>0	
	F(t)	Post-remediation load at times t>0 that include natural recovery by source depletion.
	$L_R(t)$	Post-remediation AWQC (Load) Ratio at times t>0 that include natural recovery by source depletion.
	$F(t)_{Pn}$	Post-remediation loading F(t) having probability of non-exceedance “Pn.” Pn=90% and 10% is used in PAT1.
	$L_R(t)_{Pn}$	Post-remediation AWQC Ratio having probability of non-exceedance “Pn.” Pn=90% and 10% is used in PAT1.

POST REMEDIATION LOAD AT SF271 AT TIME t=0

In this section all post-remediation loads are at time t=0. Time t=0 occurs immediately after the completion of active remediation without explicit consideration of the time associated with remedy implementation. The pre-remediation load inputs to PAT1 have been based on statistical analysis of historic monitoring data that do not account for source depletion during a future period of remedy implementation. While this simplification does not directly affect the mathematical development, it would affect the meaning, and thus interpretation, of numerical results. A relatively simple correction for the period of implementation would entail including a corresponding element of load reduction (by source depletion) either as part of the remedy in effect at t=0 or by a corresponding reduction in the pre-remediation load inputs. Absent correction, PAT1 results will be biased to higher loads, and thus AWQC ratios, at time t=0 than would be expected in consideration of concurrent source depletion during the period of remedy implementation.

L represents pre-remediation loads; F represents post-remediation loads. The subscript on F_0 for time t=0 has been suppressed to reduce notational complexity. Subscript "U" represents Upper Basin (inflow to the Box) at SFCDR station SF268 plus Pine Creek inflow to the Box. Subscript "BX" represents the Box between SF268 and SF271. Load reductions (LR) due to groundwater treatment (GWT) were estimated using the groundwater model (GWM) documented in the FFS. Symbol LR is used for load reductions that are due only to GWT. Subscript "UNGWT" represents Upper Basin without (no) GWT; "UGWT" represents Upper Basin loadings with GWT.

$E[LR_{UGWT}]$ and $CV[LR_{UGWT}]$ are from the GWM. $CV[LR_{UGWT}]$ represents natural variability of the load reduction over the water year. CV[GWME] represents GWM model uncertainty. $E[LR_{UGWT}]$ and $E[LR_{BXGWT}]$ vary with each GWT alternative. GWT = Groundwater Treatment; GWM = Groundwater Model.

Based on the math model for the post-remediation loading F expressed in the following Eq 1, the expected value E[F] and variance V[F] and coefficient of variation CV[F], of post-remediation loading were calculated as follows.

MATH MODEL

[1] $F = F_U + F_{BX}$
$= F_U + (L_{BX} - LR_{BXGWT})$
$= (L_{UNGWT} * R_{UNGWT} - LR_{UGWT}) + (L_{BX} - LR_{BXGWT})$
$= (F_{UNGWT} - LR_{UGWT}) + (L_{BX} - LR_{BXGWT})$
$= F_{UNGWT} - LR_{UGWT} + L_{BX} - LR_{BXGWT}$

EXPECTED VALUES, E[-]

[2] $E[F] = E[F_U + F_{BX}]$
$= E[F_U + (L_{BX} - LR_{BXGWT})]$
$= E[(L_{UNGWT} * R_{UNGWT} - LR_{UGWT}) + (L_{BX} - LR_{BXGWT})]$

$= E[(F_{UNGWT} - LR_{UGWT}) + (L_{BX} - LR_{BXGWT})]$
$= E[F_{UNGWT} - LR_{UGWT} + L_{BX} - LR_{BXGWT}]$

$= E[F_U] + E[F_{BX}]$
$= E[F_U] + (E[L_{BX}] - E[LR_{BXGWT}])$
$= (E[L_{UNGWT}]*E[R_{UNGWT}]*\Omega_{lnL,lnRo} - E[LR_{UGWT}]) + (E[L_{BX}] - E[LR_{BXGWT}])$
$= E[L_{UNGWT}]*E[R_{UNGWT}]*\Omega_{lnL,lnRo} - E[LR_{UGWT}] + E[L_{BX}] - E[LR_{BXGWT}]$
$= E[F_{UNGWT}] - E[LR_{UGWT}] + E[L_{BX}] - E[LR_{BXGWT}]$

Where: $E[F_{UNGWT}] = E[L_{UNGWT}]*E[R_{UNGWT}]*\Omega_{lnL,lnRo}$
$\Omega_{lnL,lnRo} = \exp\{p_{lnL,lnRo}*[\ln(CV[L_{UNGWT}]^2 + 1)(\ln(CV[R_{UNGWT}]^2 + 1)]^{½}\}$

Note that the variable "exp" in PAT1 is Ω^2.
$\Omega_{lnL,lnRo}^2 = \exp\{2*p_{lnL,lnRo}*[\ln(CV[L_{UNGWT}]^2 + 1)(\ln(CV[R_{UNGWT}]^2 + 1)]^{½}\}$;
$\Omega_{lnL,lnRo} = \exp\{p_{lnL,lnRo}*[\ln(CV[L_{UNGWT}]^2 + 1)(\ln(CV[R_{UNGWT}]^2 + 1)]^{½}\}$.

E[F] using only PAT1 Inputs:

$E[F] = E[L_{UNGWT}]*E[R_{UNGWT}]*\Omega_{lnL,lnRo} - E[LR_{UGWT}] + E[L_{BX}] - E[LR_{BXGWT}]$

Expected Value for Upper Basin Loading before (no) GWT, F_{UNGWT}

$E[F_{UNGWT}] = E[L_{UNGWT}]*E[R_{UNGWT}]*\Omega_{lnL,lnRo}$

Where: $\Omega_{lnL,lnRo} = \exp\{p_{lnL,lnRo}*[\ln(CV[L_{UNGWT}]^2 + 1)(\ln(CV[R_{UNGWT}]^2 + 1)]^{½}\}$
$CV[F_{UNGWT}] = Sqrt\{(CV[L_{UNGWT}]^2 + 1)(CV[R_{UNGWT}]^2 + 1)]*\Omega_{lnL,lnRo}^2 - 1\}$
$V[F_{UNGWT}] = (CV[F_{UNGWT}]*E[F_{UNGWT}])^2$
$= \{(CV[L_{UNGWT}]^2 + 1)(CV[R_{UNGWT}]^2 + 1)]*\Omega_{lnL,lnRo}^2 - 1\}*E[F_{UNGWT}]^2$

Expected Value for Upper Basin Loading, F_U

$E[F_U] = E[F_{UNGWT}] - E[LR_{UGWT}]$

Expected Value for Box Loading, F_{BX}

$E[F_{BX}] = E[L_{BX}] - E[LR_{BXGWT}]$

VARIANCE, V[-], AND COEFFICIENT OF VARIATION, CV[-]

[3] $V[F] = V[F_U + F_{BX}]$
$= V[F_U + (L_{BX} - LR_{BXGWT})]$
$= V[(L_{UNGWT}*R_{UNGWT} - LR_{UGWT}) + (L_{BX} - LR_{BXGWT})]$
$= V[(F_{UNGWT} - LR_{UGWT}) + (L_{BX} - LR_{BXGWT})]$
$= V[F_{UNGWT} - LR_{UGWT} + L_{BX} - LR_{BXGWT}]$
$= V[F_U] + V[F_{BX}] + 2p_{Fu,FBX}(V[F_U]*V[F_{BX}])^{½}$

[4] $CV[F] = V[F]^{½}/E[F]$
$= Sqrt\{V[F_U] + V[F_{BX}] + 2p_{Fu,FBX}(V[F_U]*V[F_{BX}])^{½}\}/ E[F]$

Variance for Upper Basin Loading before (no) GWT, F_{UNGWT}

$V[F_{UNGWT}] = (CV[F_{UNGWT}]*E[F_{UNGWT}])^2$
$= \{(CV[L_{UNGWT}]^2 + 1)(CV[R_{UNGWT}]^2 + 1)]*\Omega_{lnL,lnRo}^2 - 1\}*E[F_{UNGWT}]^2$

Where: $CV[F_{UNGWT}] = Sqrt\{(CV[L_{UNGWT}]^2 + 1)(CV[R_{UNGWT}]^2 + 1)]*\Omega_{lnL,lnRo}^2 - 1\}$

Variances for Upper Basin Loading, F_U

$V[F_U] = V[F_{UNGWT}] + V[LR_{UGWT}'] - 2p_{Fungwt,LRugwt}(V[F_{UNGWT}]*V[LR_{UGWT}])^{½}$

$V[F_{UNGWT}] = \{(CV[L_{UNGWT}]^2 + 1)(CV[R_{UNGWT}]^2 + 1)]*\Omega_{lnL,lnRo}^2 - 1\}*E[F_{UNGWT}]^2$

Where: $\Omega_{lnL,lnRo} = \exp\{p_{lnL,lnRo}*[\ln(CV[L_{UNGWT}]^2 + 1)(\ln(CV[R_{UNGWT}]^2 + 1)]^{½}\}$

$V[LR_{UGWT}'] = \{(CV[LR_{UGWT}]^2 + 1)(CV[GWME_U]^2 + 1) - 1\}*E[LR_{UGWT}]^2$

Where: $\Omega = 1.0$ for Upper Basin LR and GWM assumed uncorrelated, $p_{LR,GWM} = 0.0$

$CV[LR_{UGWT}'] = \{(CV[LR_{UGWT}]^2 + 1)(CV[GWME_U]^2 + 1) - 1\}^{½}$

$CV[LR_{UGWT}']$ combines LR water-year variability, $CV[LR_{UGWT}]$, and GWM model error, $CV[GWME_U]$.

Coefficient of Variation for Upper Basin Loading, F_U

$CV[F_U] = Sqrt\{V[F_U]\}/ E[F_U]$
$= Sqrt\{V[F_{UNGWT}] + V[LR_{UGWT}] - 2p_{Fungwt,LRugwt}(V[F_{UNGWT}]*V[LR_{UGWT}])^{½}\}/E[F_U]$

Variances for Box Loading, F_{BX}

$V[F_{BX}] = V[L_{BX}] + V[LR_{BXGWT}'] - 2p_{LBX,LRBXgwt}(V[L_{BX}]*V[LR_{BXGWT}'])^{½}$

$= (CV[L_{BX}]*E[L_{BX}])^2 + (CV[LR_{BXGWT}']*E[LR_{BXGWT}])^2$
$- 2p_{LBX,LRBXgwt}(CV[L_{BX}]*E[L_{BX}]*CV[LR_{BXGWT}']*E[LR_{BXGWT}])$

Where: $\Omega = 1.0$ for Box LR and GWM assumed uncorrelated, $p_{LR,GWM} = 0.0$

$CV[LR_{BXGWT}'] = \{(CV[LR_{BXGWT}]^2 + 1)(CV[GWME_{BX}]^2 + 1) - 1\}^{½}$

$CV[LR_{BXGWT}']$ combines LR water-year variability, $CV[LR_{BXGWT}]$, and GWM model error, $CV[GWME_{BX}]$.

Coefficient of Variation for Box Loading, F_{BX}

$$CV[F_{BX}] = Sqrt\{V[F_{BX}]\}/ E[F_{BX}]$$
$$= Sqrt\{V[L_{BX}] + V[LR_{BXGWT}'] - 2p_{LBX,LRBXgwt}(V[L_{BX}]*V[LR_{BXGWT}'])^{½}\}/E[F_{BX}]$$

As stated, the pre-remediation load inputs to PAT1 have been based on statistical analysis of historic monitoring data that do not account for source depletion during a potential future period of remedy implementation. A relatively simple to implement correction for the period of implementation would be to include a corresponding element of load reduction (by source depletion) either as part of the remedy in effect at t=0 or by a corresponding reduction in the pre-remediation load inputs. Absent correction, PAT1 results will be biased to higher loads and AWQC ratios at time t=0 than would be expected in consideration of concurrent source depletion during the period of remedy implementation.

AWQC (LOAD) RATIO, Lr

Based on the relationship for the AWQC (or load) ratio, Lr, expressed in the following Eq 1, where C_L is the load capacity, the expected value and coefficient of variation of the load ratio, E[Lr] and CV[Lr], were calculated as follows:

[1] $Lr = F / C_L$

[2] $E[Lr] = E[F](1+CV[C_L]^2)\Omega_{lnF,lnCL} / E[C_L]$

[3] $CV[Lr] = \{(CV[F]^2+1)(CV[C_L]^2+1)\Omega_{lnF,lnCL}^2 - 1\}^{1/2}$

where: $\Omega_{lnF,lnCL} = \exp\{- p_{lnF,lnCL}\{\ln(CV[F]^2+1)\ln(CV[C_L]^2+1)\}^{1/2}\}$

Because F varies with remedial alternative, so does Lr. Load capacity C_L is treated as independent of remedial alternative and estimated from available historic monitoring data.

NON-EXCEEDANCE ESTIMATES

Non-exceedance estimates are denoted with subscript "Pn" the non-exceedance probability. Pn is the nominal probability that the uncertain true value of the variable (say, loading F) does not exceed the non-exceedance estimate (say F_{Pn}). Equivalently, Pn is the probability that the non-exceedance estimate overestimates the true value, and is thus not an underestimate. The complement of the

non-exceedance probability, 1-Pn, is the probability that the uncertain true value of the variable does exceed the non-exceedance estimate or, equivalently, that non-exceedance estimate is an underestimate of the true value.

The non-exceedance estimate are given by the following equations, where u_{Pn} is the standardized normal variate corresponding to Pn. The values calculated in PAT1 are the 10% and 90% non-exceedance values, for which $u_{Pn} = 1.28$.

Non-Exceedance Estimates of Post-Remediation Loading

[1] $F_{Pn} = E[F] \exp\{u_{Pn} \ln(CV[F]^2+1)^{1/2}\} / (CV[F]^2+1)^{1/2}$

[2] $F_{90\%} = E[F] \exp\{1.28 \ln(CV[F]^2+1)^{1/2}\} / (CV[F]^2+1)^{1/2}$

[3] $F_{10\%} = E[F] \exp\{-1.28 \ln(CV[F]^2+1)^{1/2}\} / (CV[F]^2+1)^{1/2}$

Non-Exceedance Estimates of the Load Ratio

[4] $Lr_{Pn} = E[Lr] \exp\{u_{Pn} \ln(CV[Lr]^2+1)^{1/2}\} / (CV[Lr]^2+1)^{1/2}$

[5] $Lr_{90\%} = E[Lr] \exp\{1.28 \ln(CV[Lr]^2+1)^{1/2}\} / (CV[Lr]^2+1)^{1/2}$

[6] $Lr_{10\%} = E[Lr] \exp\{-1.28 \ln(CV[Lr]^2+1)^{1/2}\} / (CV[Lr]^2+1)^{1/2}$

LOADS & AWQC RATIO AT TIME t>0
NATURAL RECOVER BY SOURCE DEPLETION

Post-remediation loading at SF271 for time t>0, F(t), was estimated from the post-remediation loading at t=0, F, by decaying that loading over time using the source depletion model developed in URS 2001. Two aggregate decay rates "β" are needed: one for the Upper Basin, β_U, and one for the Box, β_{BX}. To simplify the analysis, and to a tractable first approximation, β_{BX} was set to β_U with the composite beta symbolized as "β." The mathematics implemented in PAT1 is as follows.

[1] $F(t) = F_U(t) + F_{BX}(t)$
$= F_U * \exp\{-\beta_U t\} + F_{BX}(t) * \exp\{-\beta_{BX} t\}$
$= F * \exp\{-\beta t\}$

[2] $E[F(t)] = E[F * \exp\{-\beta t\}]$
$= E[F] * E[\exp\{-\beta t\}] * \Omega_{lnFo,\beta}$

[3] $CV[F(t)] = \{(CV[F]^2 + 1) * (CV[\exp\{-\beta t\}]^2 + 1\} * \Omega_{lnFo,\beta}^2 - 1\}^{1/2}$

$\Omega_{lnFo,\beta} = \exp\{-p_{lnFo,\beta}\{\ln(CV[F]^2 + 1) * \ln(CV[\exp\{-\beta t\}]^2 + 1\}^{1/2}\}$

The greatest single source of uncertainty for the composite β is β_{BX}, the "Box beta," which could also vary with Box GWT alternative. It is recommended that any future update to the PA make the uncertainty in β_{BX} explicit and separate from the uncertainty in β_U. Relevant discussion on this issue can be found in Section B.3.5.2. of URS 2001 and 2007, which should be updated if β_{BX} is made explicit from β_U in PAT1. Updating PAT1 for separate β_{BX} and β_U is an easy modification.

AWQCR at Time t>0, Lr(t)

Mathematically, the AWQC Ratio over time, Lr(t), follows from F(t); that is:

[4] $E[Lr(t)] = E[F(t)](1+CV[C_L]^2)\Omega_{nF,lnCL} / E[C_L]$

[5] $CV[Lr(t)] = \{(CV[F(t)]^2+1)(CV[C_L]^2+1)\Omega_{lnF,lnCL}{}^2 - 1\}^{1/2}$

Non-exceedance estimates use the previous equations with F(t) substituted for F and Lr(t) substituted for Lr.

Source Depletion Factor and Decay Rate

Source depletion factors exp{-βt}, needed to estimate F(t), were estimated at selected times "t" based on the following relationships, where PDF[β] is the (lognormal) probability density function of the natural recovery decay rate β. PDF[β] represents both parameter uncertainty in β and model uncertainty in the source depletion factor exp{-βt} as they affect F(t), including effects of natural variability.

[6] $E[\exp\{-\beta t\}] = \int_{0 \text{ to } \infty} \exp\{-\beta t\} * PDF[\beta] * d\beta$

[7] $CV[\exp\{-\beta t\}] = V[\exp\{-\beta t\}]^{1/2} / E[\exp\{-\beta t\}]$

$= \left\{\int_{0 \text{ to } \infty} (\exp\{-\beta t\})^2 * PDF[\beta] * d\beta - E[\exp\{-\beta t\}]^2\right\}^{1/2} / E[\exp\{-\beta t\}]$

For a given time, t, the integrals on the right sides of Eqs 6 and 7 were numerically approximated as detailed in URS 2001 and 2007. PDF[β] depends on E[β] and CV[β], calculated as follows, where estimates for E[*L*] and CV[*L*] and E[TEM'] and CV[TEM'] are detailed in URS 2007 Section B.2.2.2. The (model-based) decay rate β is updated to β" by the empirical "Beta Factor, BF."

[8] $\beta" = BF*(L/(TEM')$

[9] $E[\beta"] = BF*(E[L](1+CV[TEM']^2)\Omega / E[TEM'])$

[10] $CV[\beta"] = \{(CV[L]^2+1)(CV[TEM']^2+1)\Omega^2(CV[M]^2+1) - 1\}^{1/2}$

	=	CV[β]
Ω	=	$\exp\{-p\{\ln(CV[L]^2+1)\ln(CV[TEM']^2+1)\}^{1/2}\}$
	=	1.00 for $p = p_{\ln L,\ln TEM'} = 0.0$
CV[M]	=	Source Depletion model uncertainty, CV[M]=0.5 was used in the analysis
BF	=	Beta Factor.

Note: In PAT1, BF operates through the "B update factor" which is the reciprocal of BF, 1/BF, that multiplies TEM' to reduce the "total effective metal mass available for leaching" and thus increase the effective "updated" beta, β", as represented in these equations. The PAT1 "B update factor" = 1/BF as represented here. The physical meaning of BF is that it reduces TEM' by the factor 1/BF, consistent with empirical beta. TEM' is a very uncertain variable that cannot be measured directly, unlike the yearly average load *L*. The BF is therefore meant to modify TEM', not *L*, to effect an empirically updated estimate of β, β".

The beta factor "BF" was used to calibrate β, and thus E[β] and PDF[β], to empirical β estimates from statistical analysis of available historic monitoring data. Empirically, β appears to vary to some extent with the discharge level and time period, although there is significant measurement noise and natural variability in the data. Nevertheless, with judgment, the BF can be used (as a tool) to investigate potential discharge effects and their implications, including natural recovery trends and projections for load and AWQC ratio at lower and higher discharge levels.

To reiterate, the greatest single source of uncertainty for t>0 projections at SF271 is β_{BX}, the "Box beta." It is recommended that any future update to the PA make the uncertainty in β_{BX} explicit and separate from the uncertainty in β_U. (Some relevant discussion on this issue can be found in Section B.3.5.2. of URS 2001 and 2007). Updating PAT1 for separate β_{BX} and β_U is an easy modification.

CITED REFERENCES

CH2MHill 2010. *Focused Feasibility Study Report, Upper Basin of the Coeur d'Alene River, Bunker Hill Mining and Metallurgical Complex Superfund Site*. Draft Report prepared for U.S. EPA. February 2010.

URS 2007. *A Predictive Analysis for Post-Remediation Metal Loading, Coeur d'Alene Basin RI/FS Technical Memorandum.* Prepared for U.S. EPA. October 2007.

URS 2002. "Draft Selected Remedy and Ecological Alternatives 1 through 6, Updated Probabilistic Estimates for the SFCDR at Pinehurst (SF271) and the CDR at Harrison (LC60)," Memo to Coeur d'Alene Project File. May 29, 2002.

URS 2001. *Probabilistic Analysis of Post-Remediation Metal Loading, Technical Memorandum (Revision 1).* Prepared for U.S. EPA. September 2001.

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APPENDIX C

Typical Conceptual Design (TCD) Schematics

APPENDIX C

Typical Conceptual Design (TCD) Schematics

This appendix provides schematics of the typical conceptual designs (TCDs) that were used to develop the remedial alternatives for the Upper Basin of the Coeur d'Alene River during the Focused Feasibility Study (FFS). Detailed descriptions of each TCD can be found in Section 5.0 of the FFS Report. The schematics are listed below and organized by Source Control TCDs (Figures C-1 through C-10); Water Collection, Conveyance, and Management TCDs (Figures C-11 through C-20); Water Treatment TCDs (Figures C-21 through C-24); and Stream and Riparian Cleanup Action TCDs (Figures C-25 through C-31). No separate schematics are provided for Human Health TCDs because existing TCD schematics visually represent these TCDs; details are provided in Section 5.4.1.

Source Control TCDs

C-1 Excavation, TCDs C01 and C01b

C-2 Regrade/Consolidate/Revegetate, TCDs C02a through C02c

C-3 Low-Permeability Cap, TCD C03

C-4 Low-Permeability Cap with Seepage Collection, TCD C04

C-5 Low-Permeability Cap with Erosion Protection, TCD C05

C-6 Waste Consolidation Area with Erosion Protection, TCD C06

C-7 Waste Consolidation Area Above Flood Level, TCD C07

C-8 Repository, TCD C08a

C-9 Impoundment Closure, TCD C09

C-10 Haul to Repository, TCD HAUL-2

Water Collection, Conveyance, and Management TCDs

C-11 Adit Drainage Collection, TCD C10

C-12 Hydraulic Isolation Using Slurry Wall, TCDs C11a through C11j

C-13 Stream Lining, TCDs C14a through C14c

C-14 French Drain, TCDs C15a through C15d

C-15 Extraction Well, TCDs C17a through C17e

C-16 SFCDR Diversion, TCD C18

C-17 I-90 Crossing, TCD C19

C-18 Check Dam, TCD C20

C-19 Gravity Pipeline and Pressurized Pipeline, TCDs PIPE-1 through -4 and PRESSURE-PIPE-1 through -4

C-20 Pump Station, TCDs PUMP-1 through PUMP-5

Water Treatment TCDs

C-21 Centralized High-Density Sludge (HDS) Treatment at Central Treatment Plant (CTP), TCD WT01

C-22 Onsite Semi-Passive Water Treatment Using Lime Addition and Settling Pond(s), TCD WT02

C-23 Onsite Semi-Passive Water Treatment Using Sulfate-Reducing Bioreactor (SRB) System, TCD WT03

C-24 *In Situ* Semi-Passive Groundwater Treatment Using Sulfate-Reducing Permeable Reactive Barrier (SR-PRB), TCDs WT04a and WT04b

Stream and Riparian Cleanup Action TCDs

C-25 Current Deflectors, TCD CD-AVG

C-26 Current Deflectors, Sediment Traps, TCD CD-SED

C-27 Vegetative Bank Stabilization, TCD VBS-AVG

C-28 Bioengineered Revetments, TCD BSBR-AVG

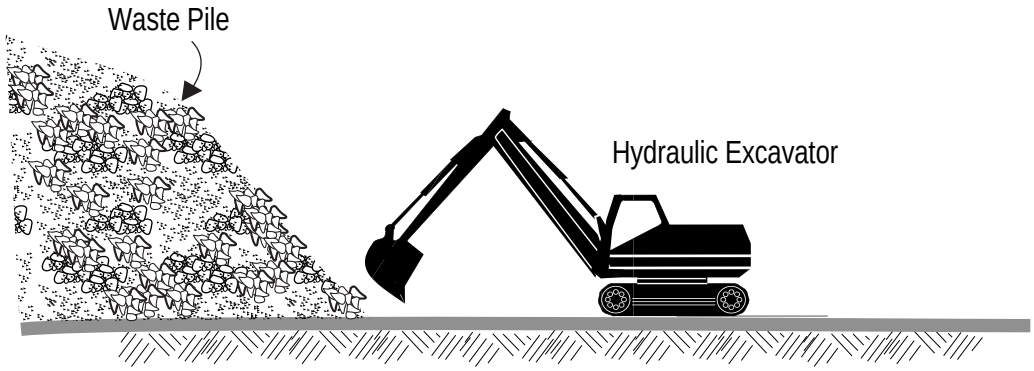
C-29 Floodplain and Riparian Replanting, TCD FP/RP-AVG

C-30 Off-Channel Hydrologic Features, TCD OFFCH-AVG

C-31 Channel Realignment, TCD CH-REAL-1

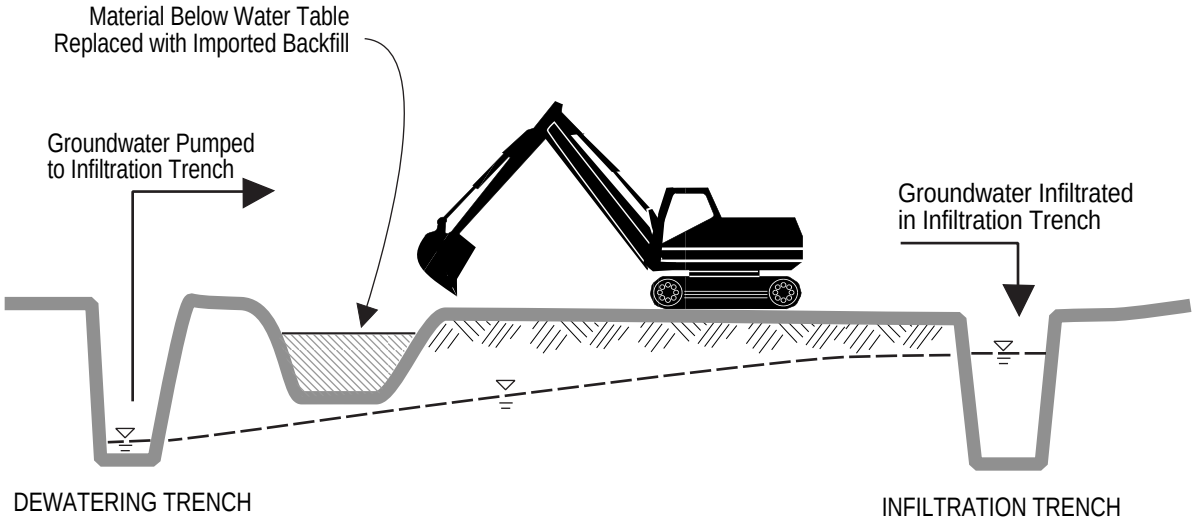
Figures

TCD C01. Excavation (Dry)



TCD C01b. Excavation (60% Dry/40% Wet)

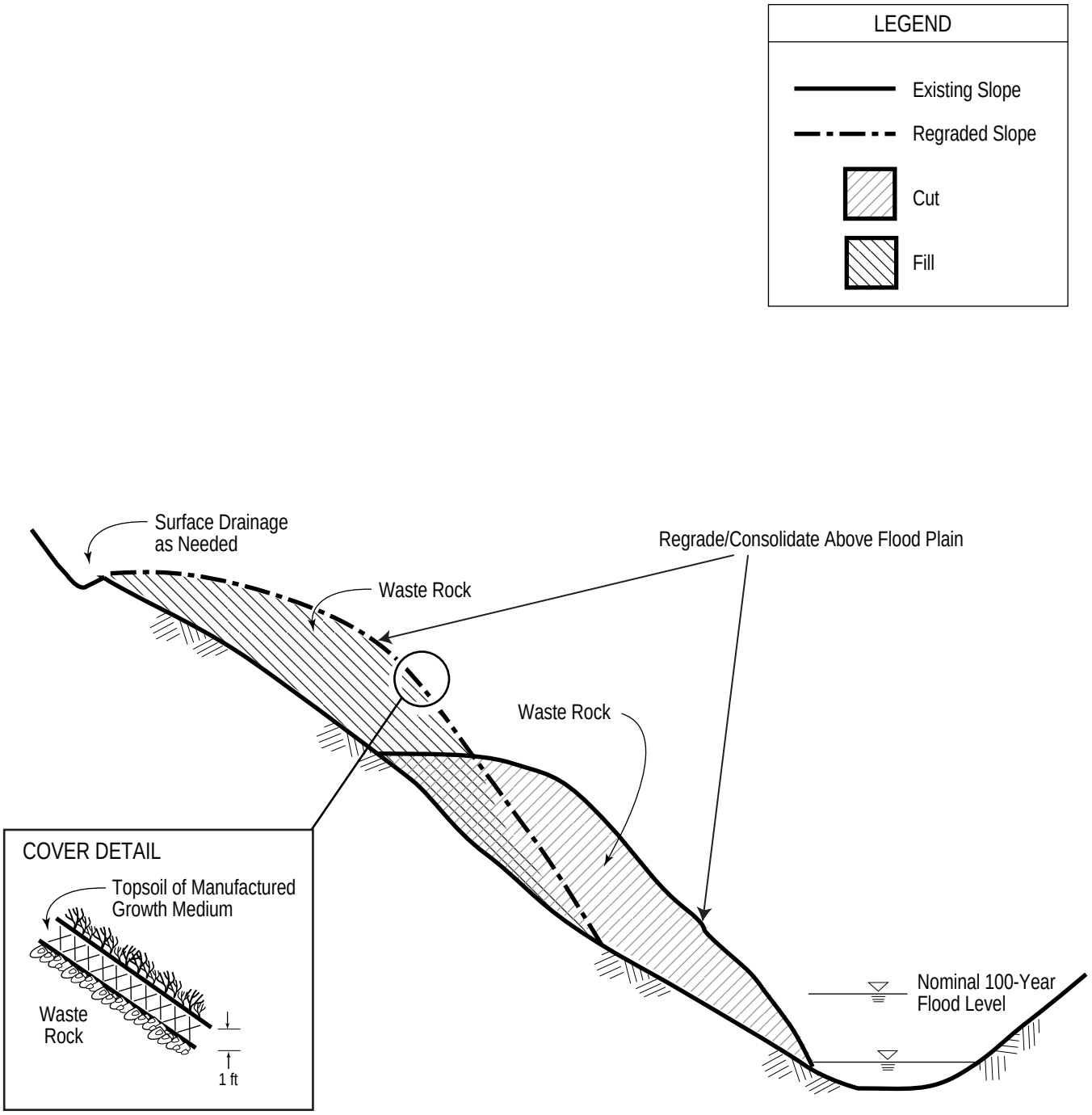
This figure shows the 40% wet excavation (below the water table). The figure for TCD C01 shows the 60% dry excavation (above the water table).



Note: These typical conceptual designs (TCDs) were developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

Figure C-1
Excavation, TCDs C01 and C01b
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

NOT TO SCALE



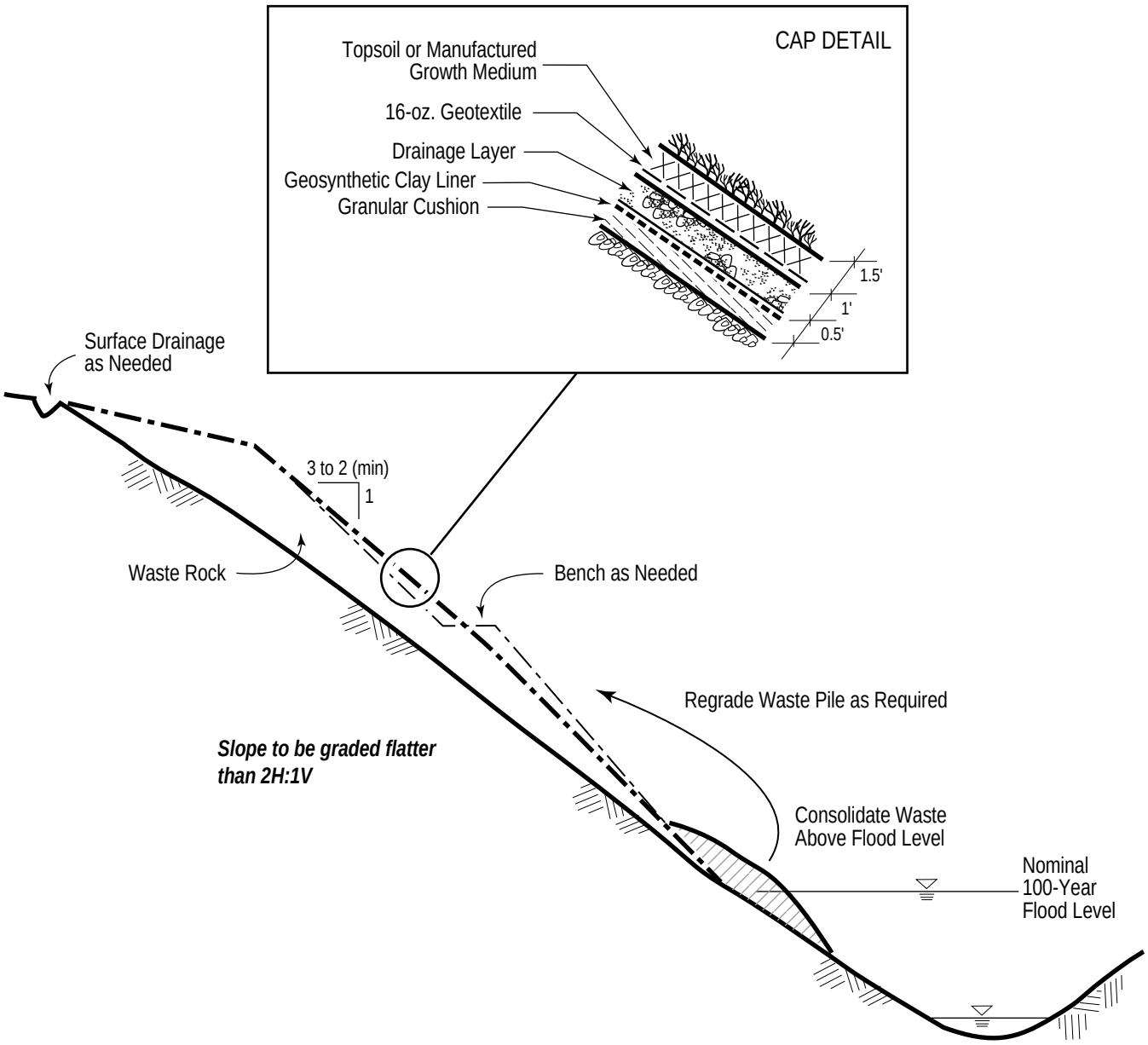
Notes:

1. CO2a assumes waste rock piles are on slopes.
2. CO2b assumes waste rock pile has filled stream valley.
3. CO2c assumes slope too steep and requires regrade. Riprap placed below floodplain to limit erosion.

This typical conceptual design (TCD) was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

NOT TO SCALE

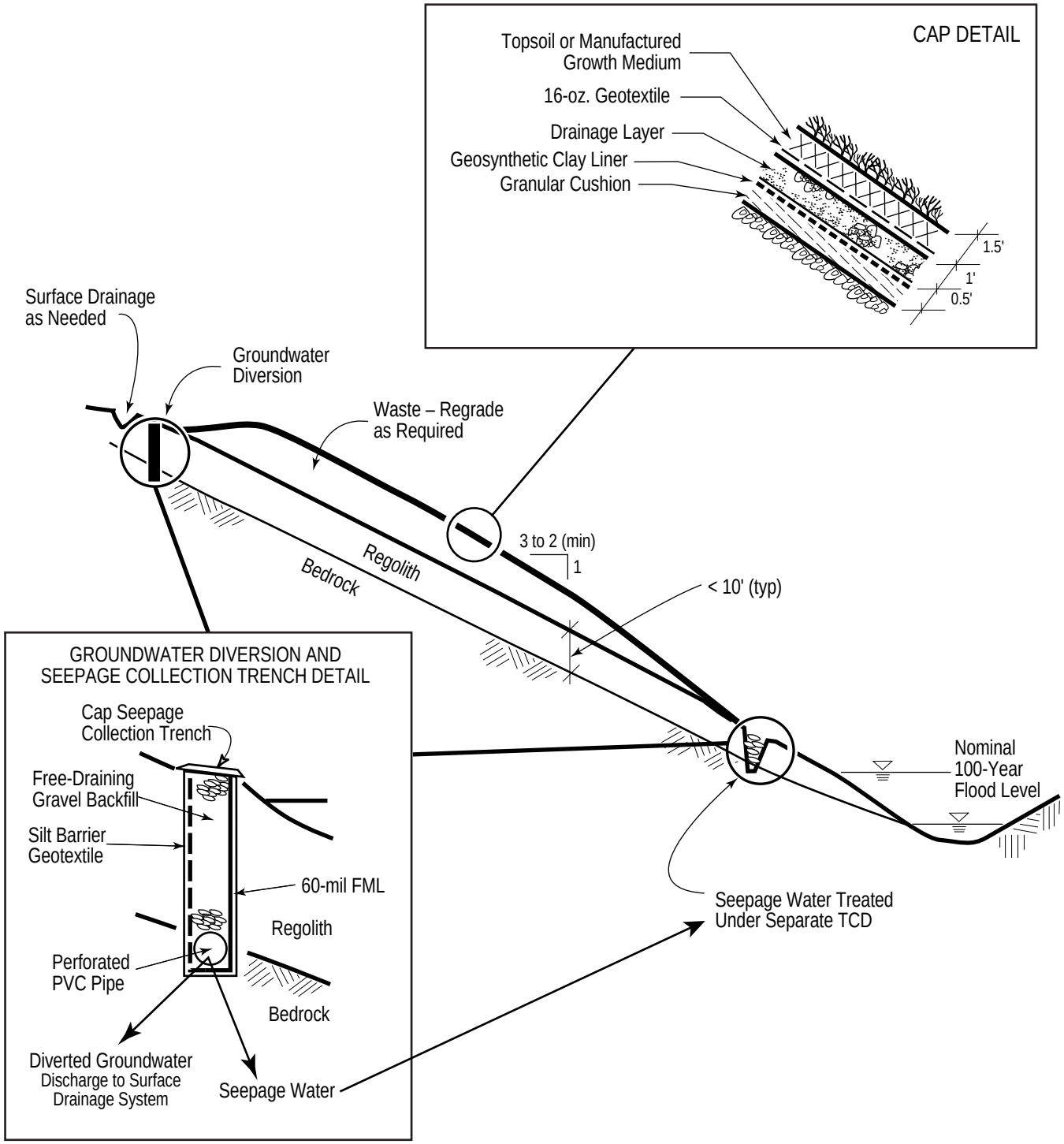
Figure C-2
Regrade/Consolidate/Revegetate, TCDs C02a through C02c
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE



Note: This typical conceptual design (TCD) was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

Figure C-3
Low-Permeability Cap, TCD C03
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

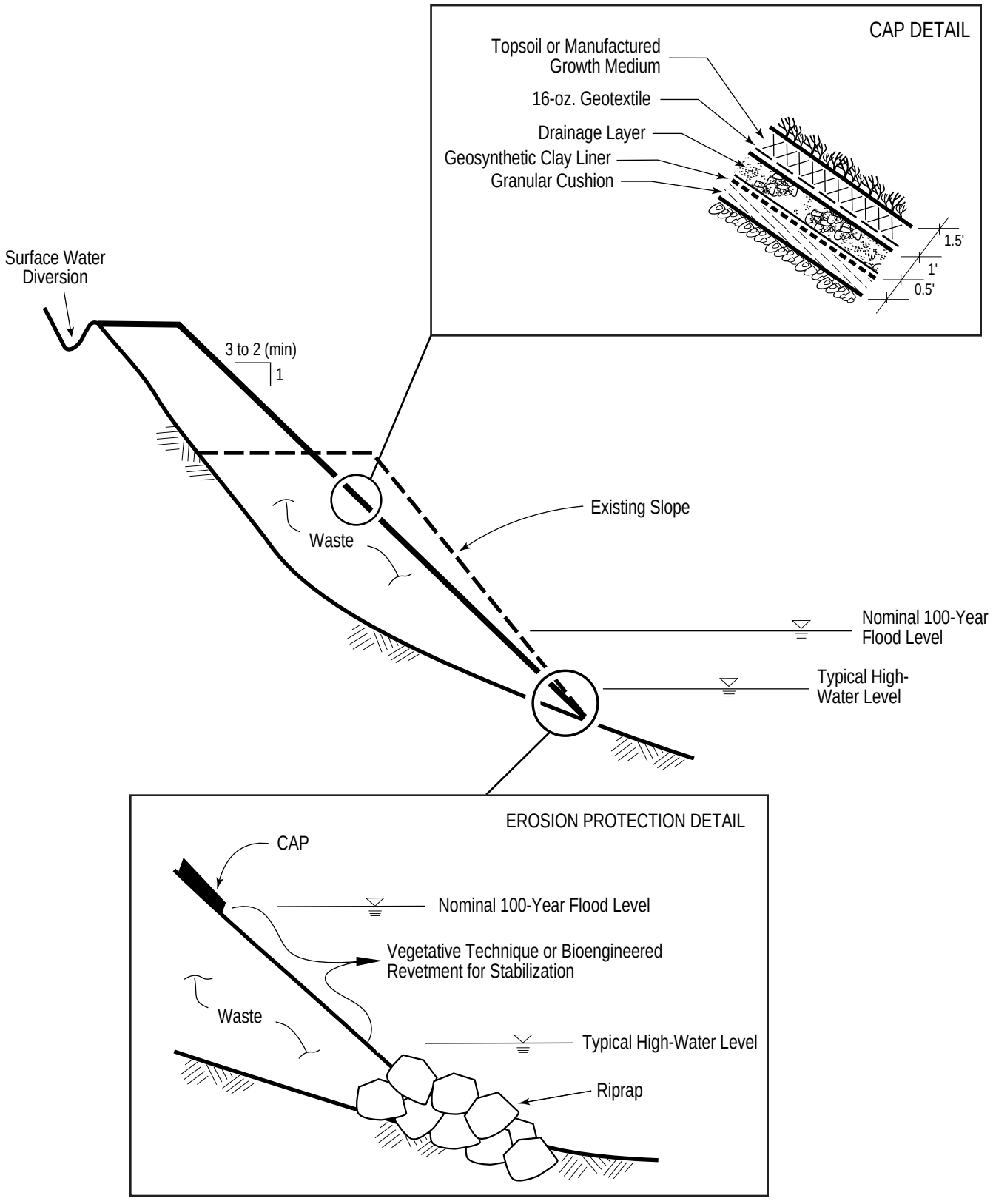
NOT TO SCALE



Note: This typical conceptual design (TCD) was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

Figure C-4
Low-Permeability Cap with Seepage Collection, TCD C04
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

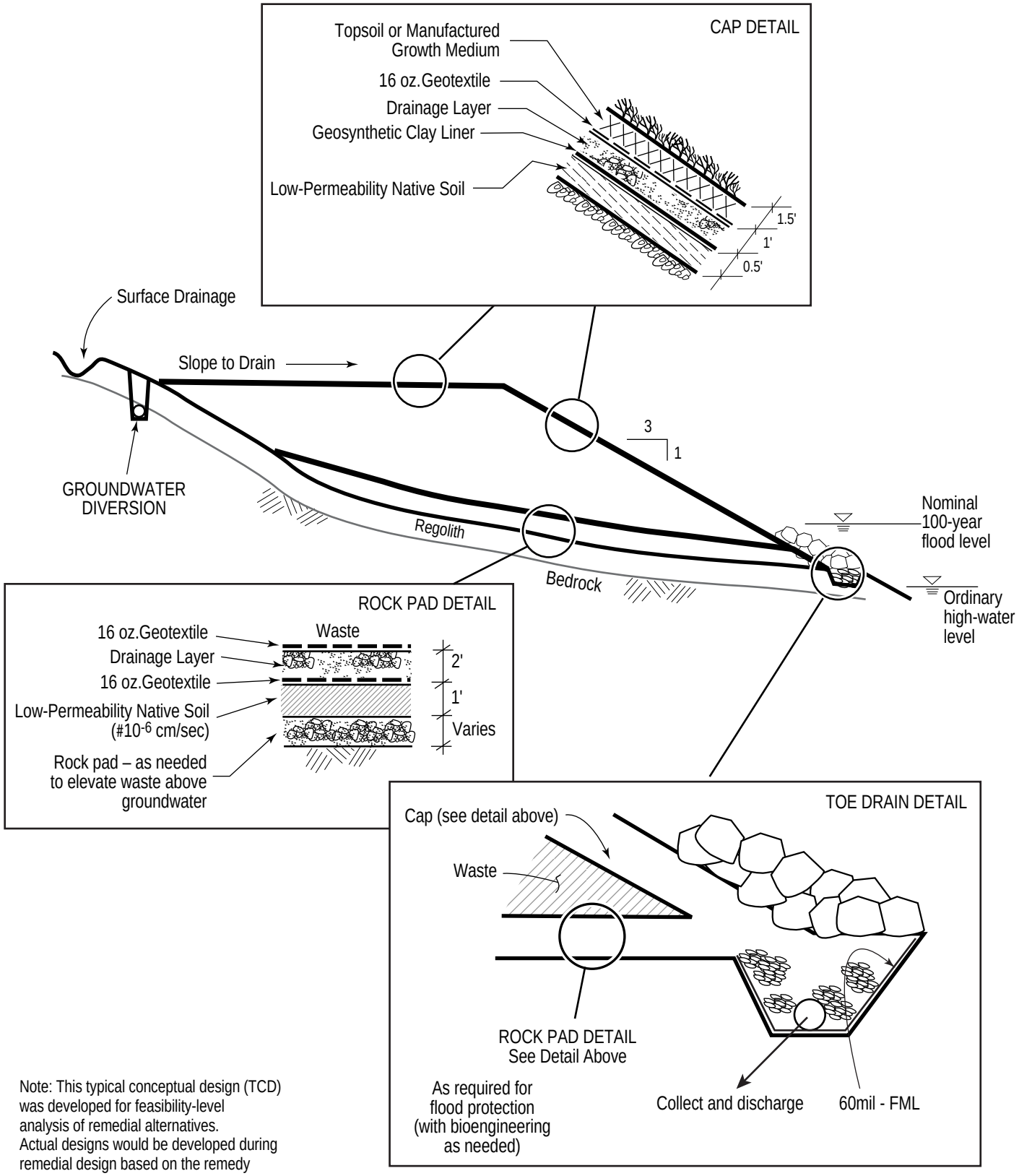
NOT TO SCALE



Note: This typical conceptual design (TCD) was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

Figure C-5
Low-Permeability Cap with Erosion Protection, TCD C05
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

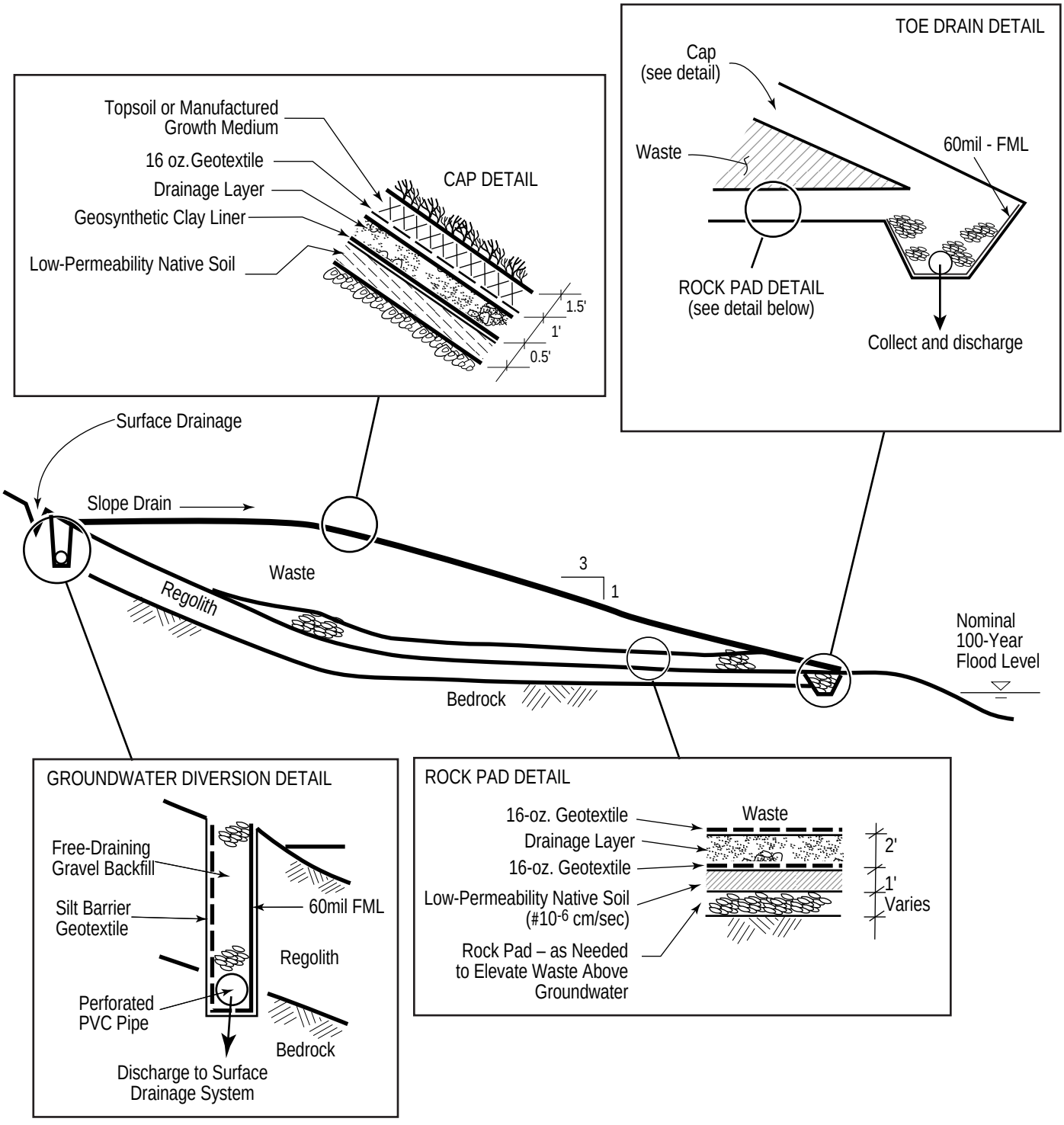
NOT TO SCALE



Note: This typical conceptual design (TCD) was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the remedy selected in the ROD and site-specific conditions and requirements.

Figure C-6
Waste Consolidation Area with Erosion Protection, TCD C06
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

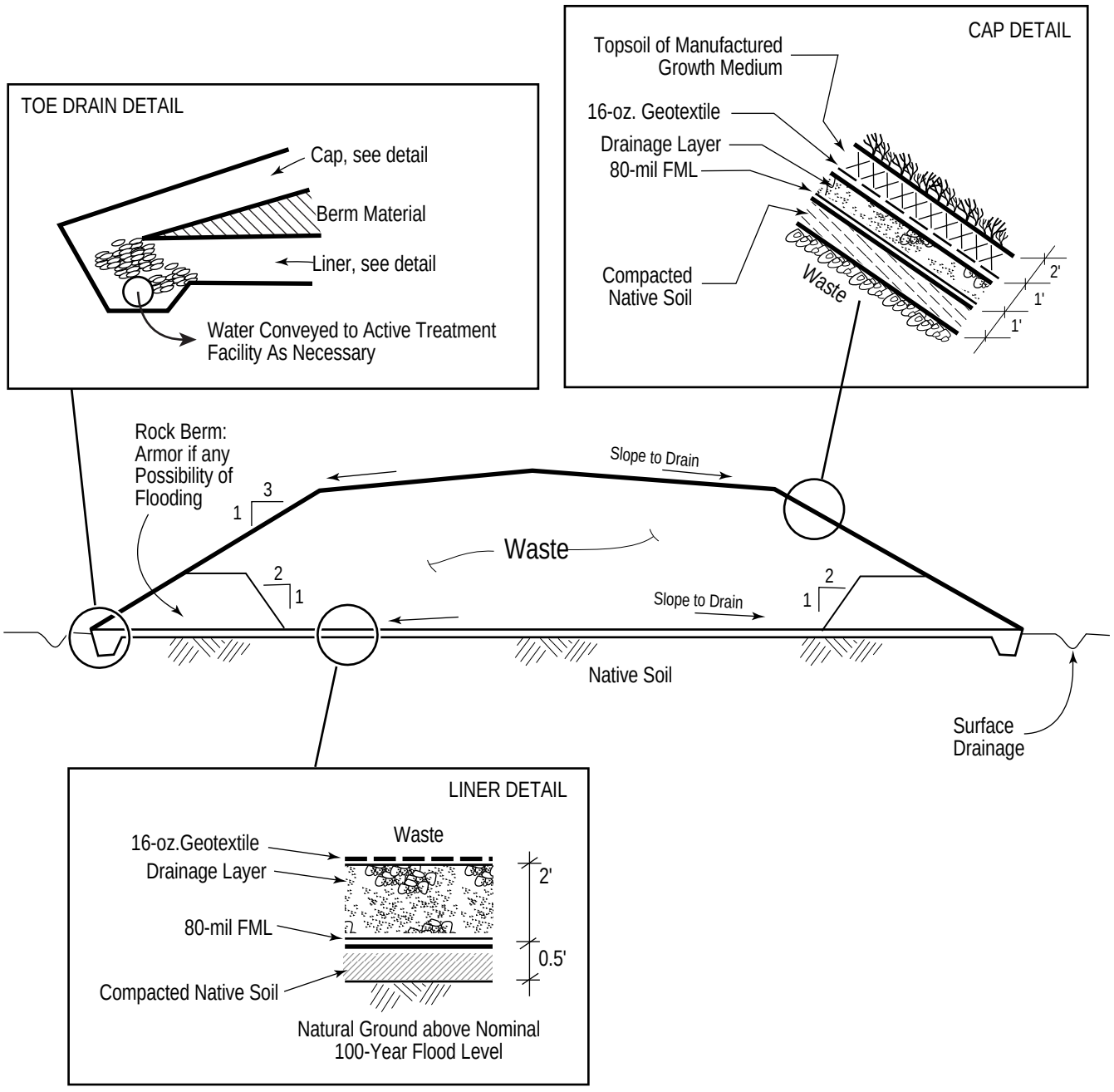
NOT TO SCALE



Note: This typical conceptual design (TCD) was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

Figure C-7
Waste Consolidation Area Above Flood Level, TCD C07
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

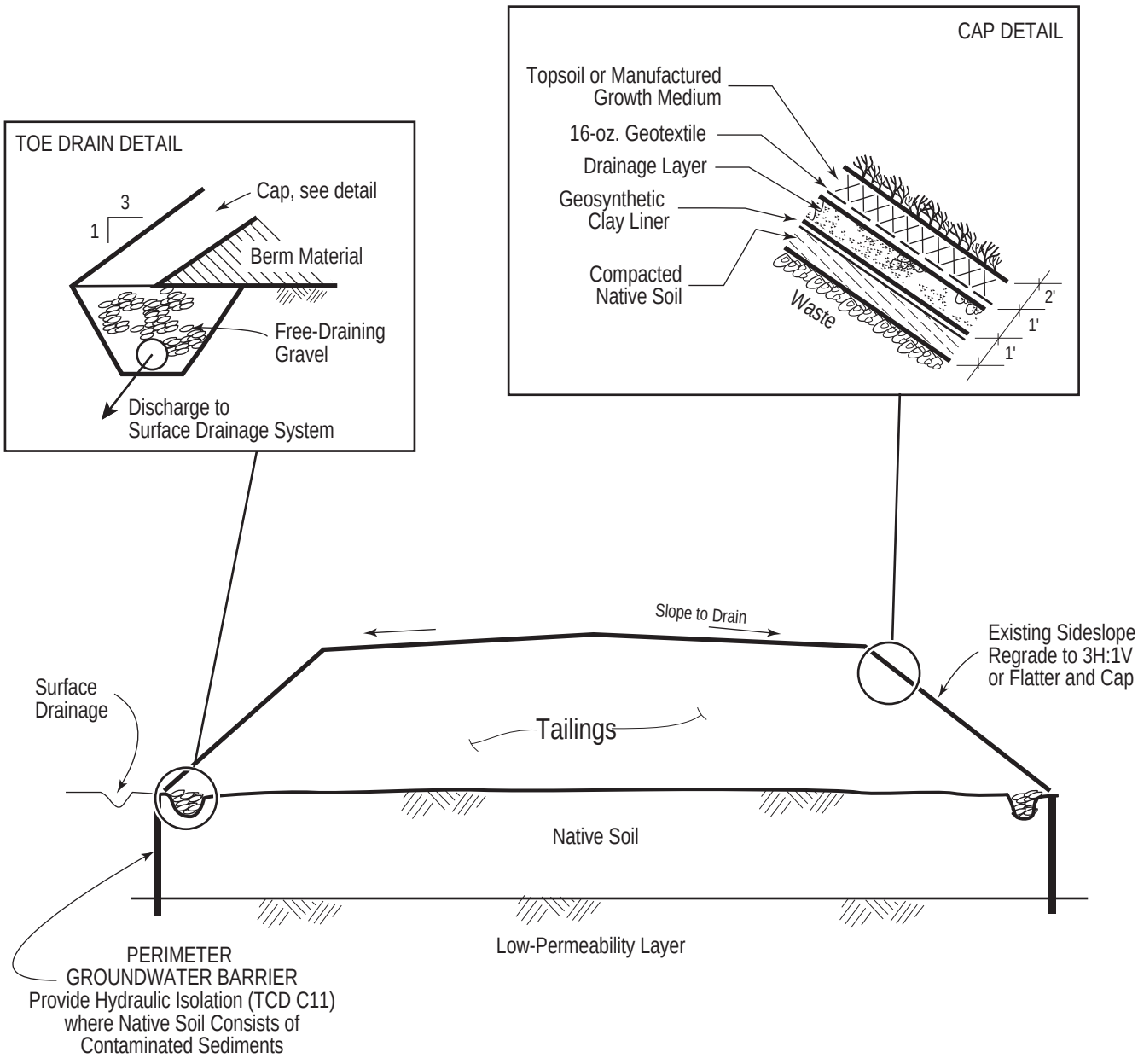
NOT TO SCALE



Note: This typical conceptual design (TCD) was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

NOT TO SCALE

Figure C-8
Repository, TCD C08a
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE



Note: This typical conceptual design (TCD) was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

NOT TO SCALE

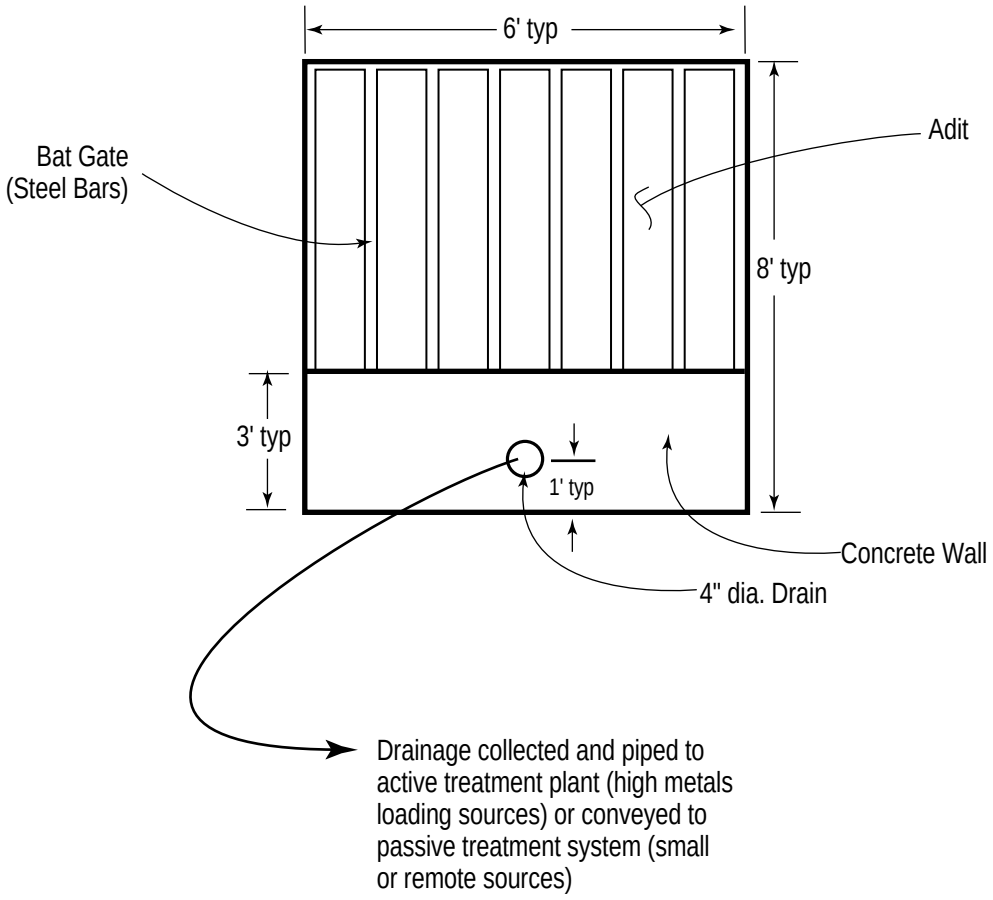
Figure C-9
Impoundment Closure, TCD C09
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE



Figure C-10
Haul to Repository,
TCD HAUL-2
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

NOT TO SCALE

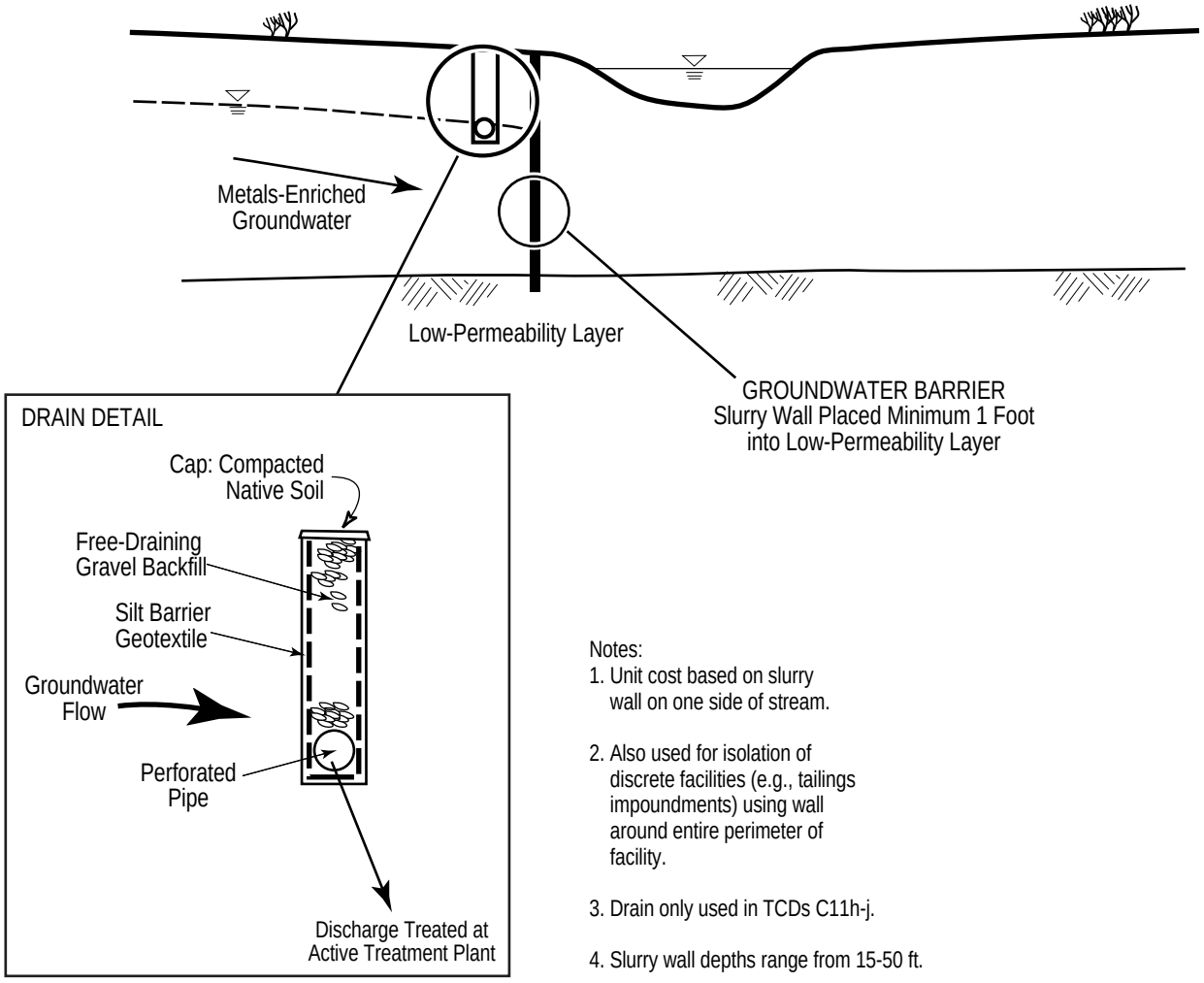
EPA



Note: This typical conceptual design (TCD) was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

NOT TO SCALE

Figure C-11
Adit Drainage Collection, TCD C10
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

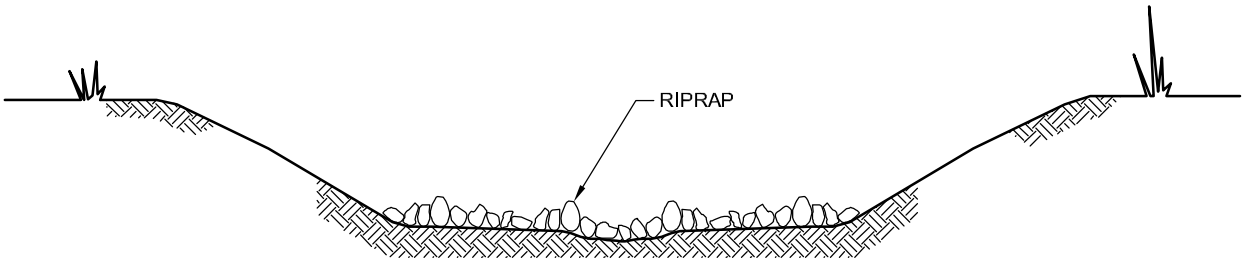


Notes:
1. Unit cost based on slurry wall on one side of stream.
2. Also used for isolation of discrete facilities (e.g., tailings impoundments) using wall around entire perimeter of facility.
3. Drain only used in TCDs C11h-j.
4. Slurry wall depths range from 15-50 ft.

Note: This typical conceptual design (TCD) was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

Figure C-12
Hydraulic Isolation Using Slurry Wall, TCDs C11a through C11j
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

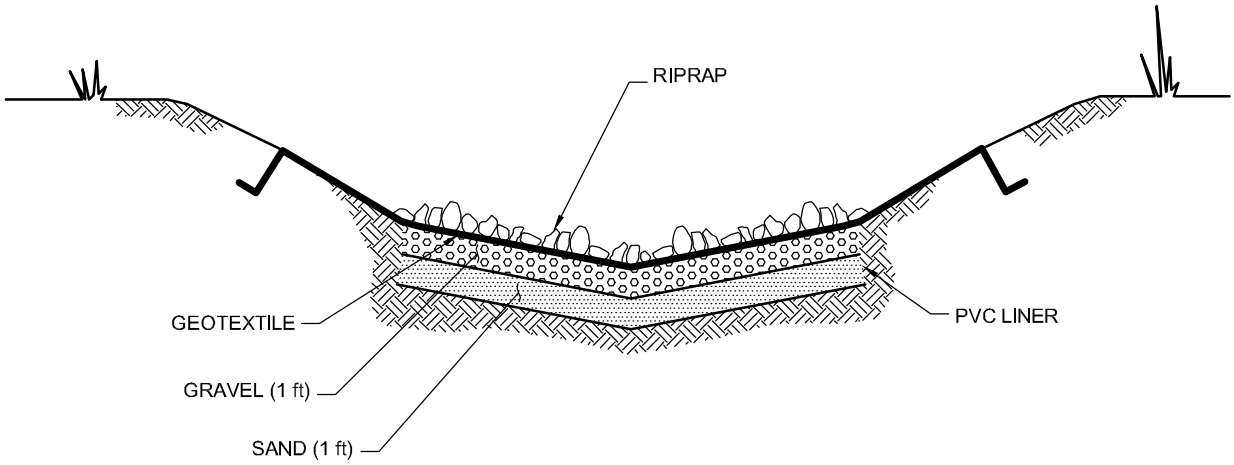
NOT TO SCALE



EXISTING CHANNEL
NOT TO SCALE

Notes:

1. Remove and stage existing riprap.
2. Excavate 2 ft below existing channel bottom.



CONSTRUCTED CHANNEL
NOT TO SCALE

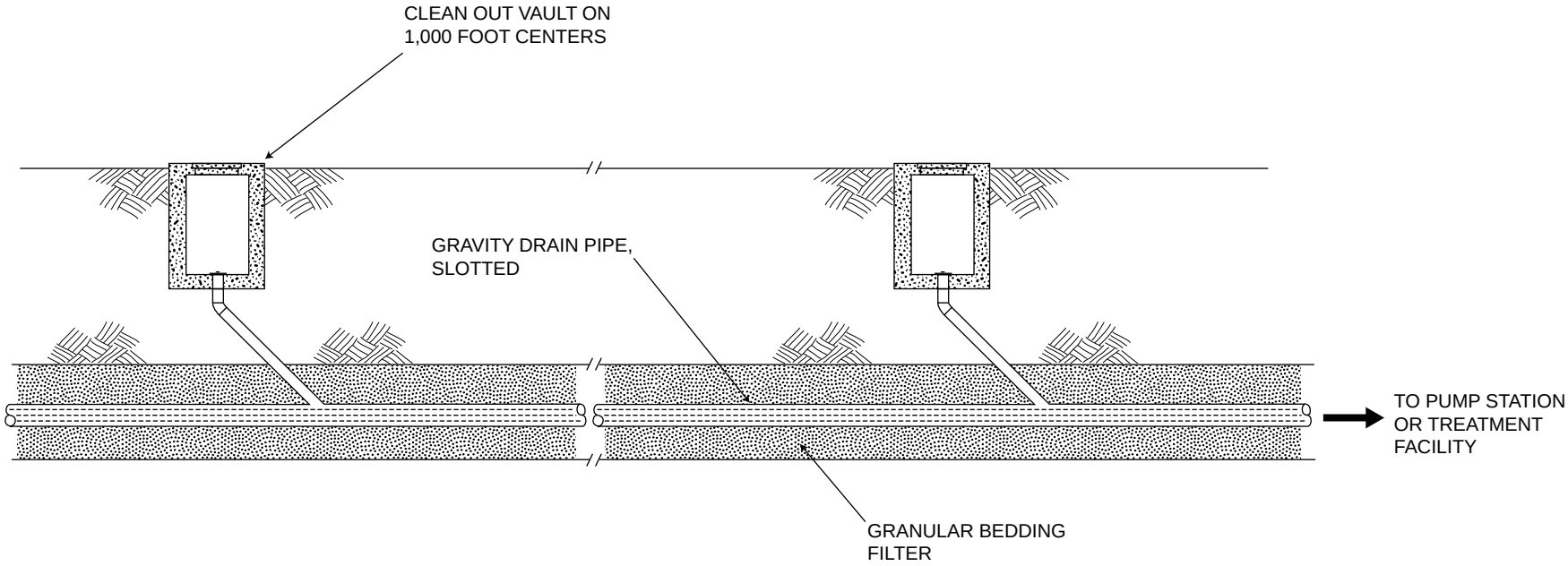
Notes:

1. Sand layer 1 ft placed over native materials.
2. PVC liner placed over sand and keyed into anchor trench.
3. Gravel placed over PVC liner.
4. Geotextile placed over gravel layer and keyed into anchor trench.
5. Staged riprap placed over geotextile.
6. Channel width:

   C14a: 10 ft
   C14b: 20 ft
   C14c: 100 ft

This typical conceptual design (TCD) was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

Figure C-13
Stream Lining,
TCDs C14a through C14c
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

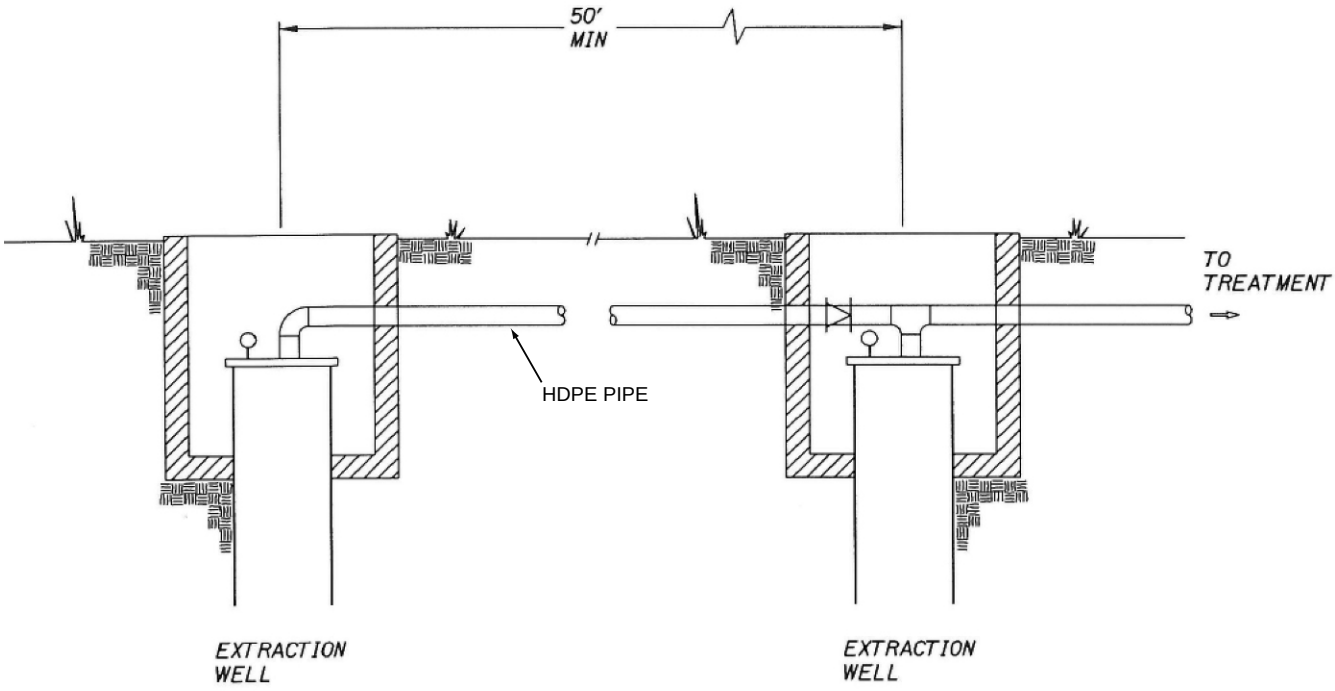


Notes:

1. TCD assumes drains are installed to a depth of 5 feet below the water table.
2. Drain depths range from 10-25 ft below ground surface.

This typical conceptual design (TCD) was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

Figure C-14
French Drain,
TCDs C15a through C15d
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE



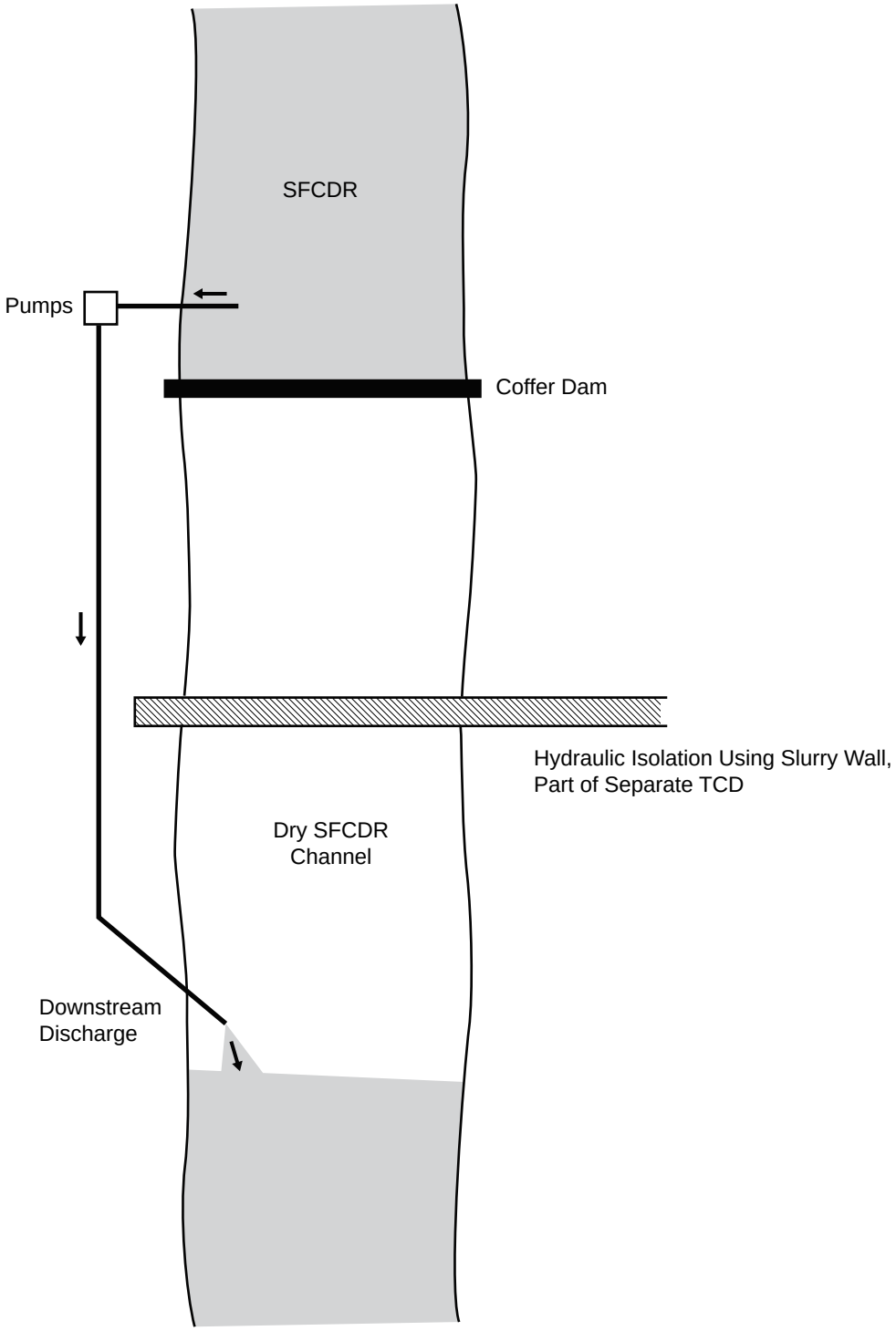
Notes:

1. Well depths range from 20-70 ft.

2. 15 ft screen intervals.

This typical conceptual design (TCD) was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

Figure C-15
Extraction Well,
TCDs C17a through C17e
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

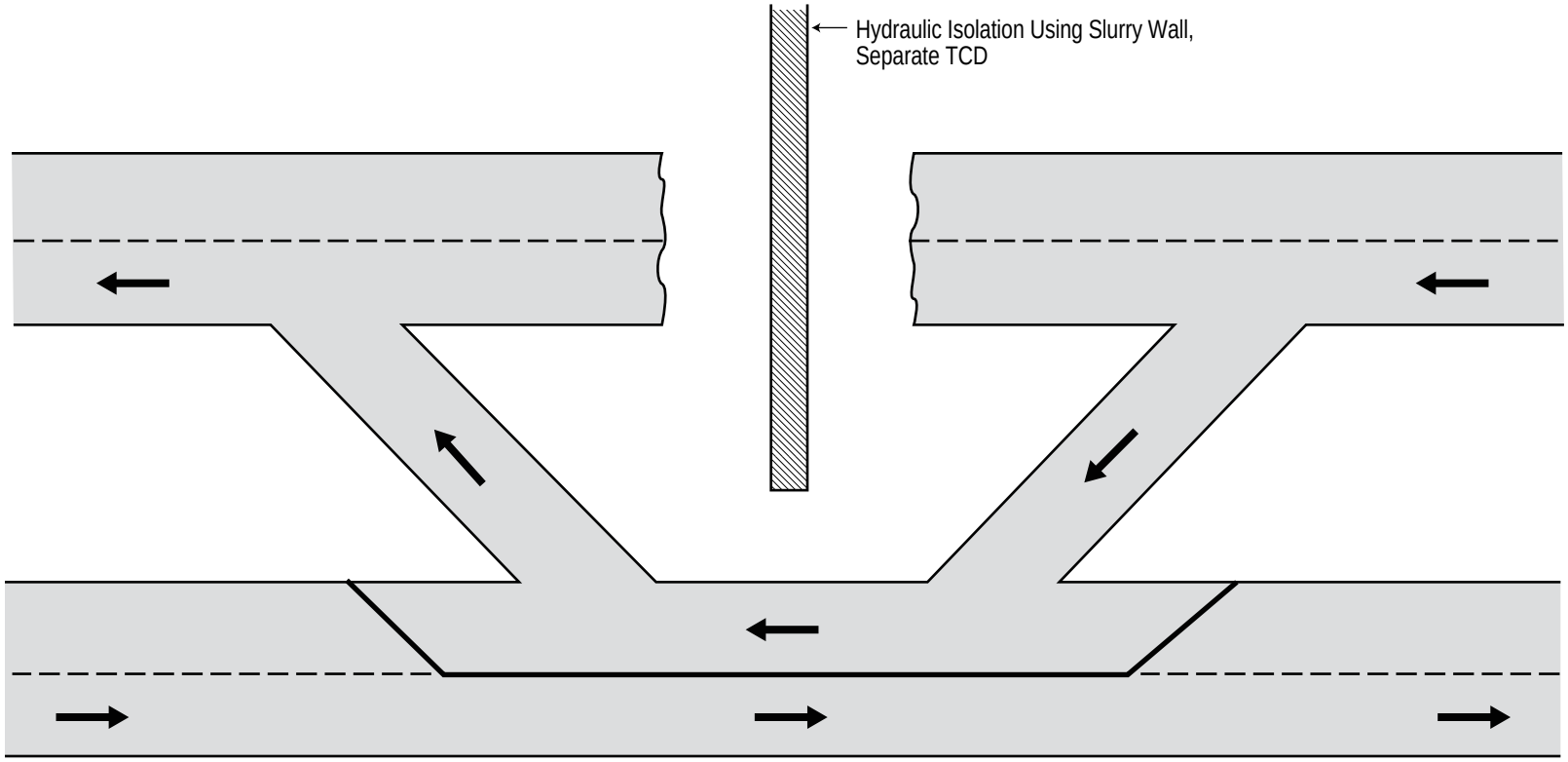


SFCDR = South Fork Coeur d'Alene River

Note: This typical conceptual design (TCD) was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

NOT TO SCALE

Figure C-16
SFCDR Diversion, TCD C18
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE



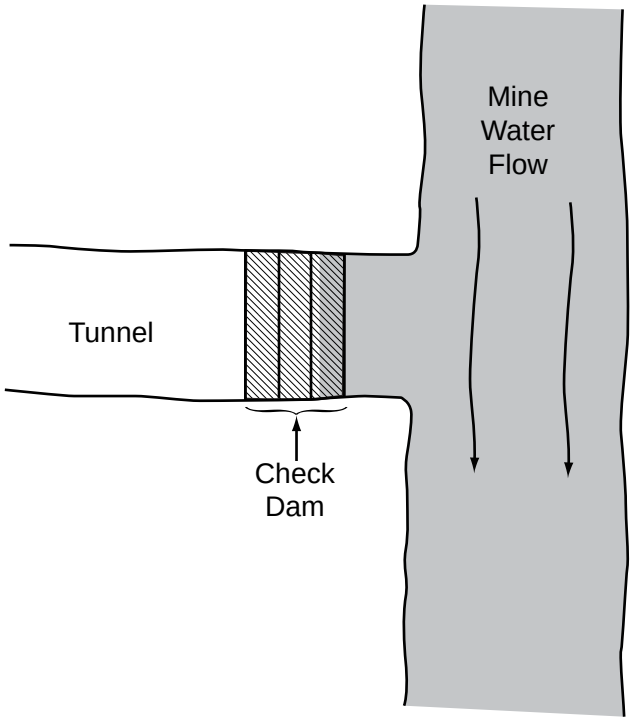
Notes:

I-90 would be compromised for hydraulic isolation using slurry wall installation. Two lanes of I-90 (eastbound or westbound) would be compromised at one time.

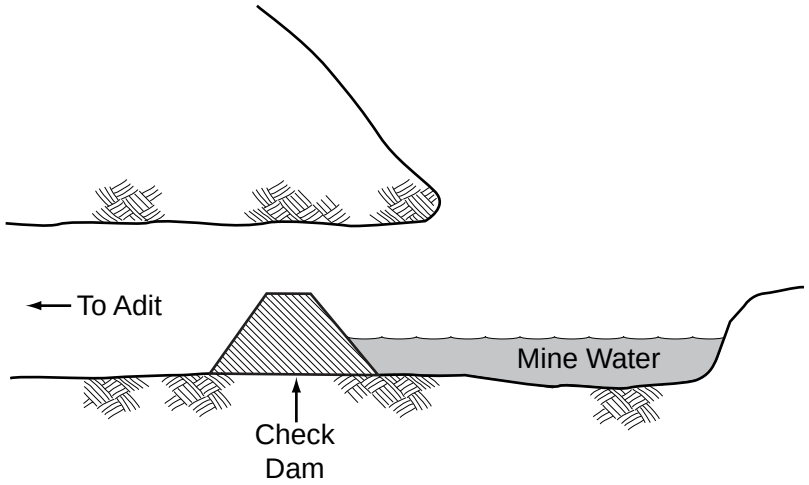
This typical conceptual design (TCD) was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

NOT TO SCALE

Figure C-17
I-90 Crossing, TCD C19
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE



PLAN VIEW

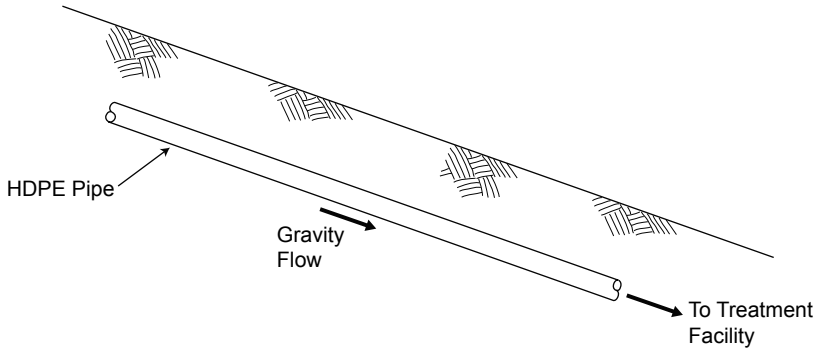


SECTION VIEW

Note: This typical conceptual design (TCD) was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

Figure C-18
Check Dam, TCD C20
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

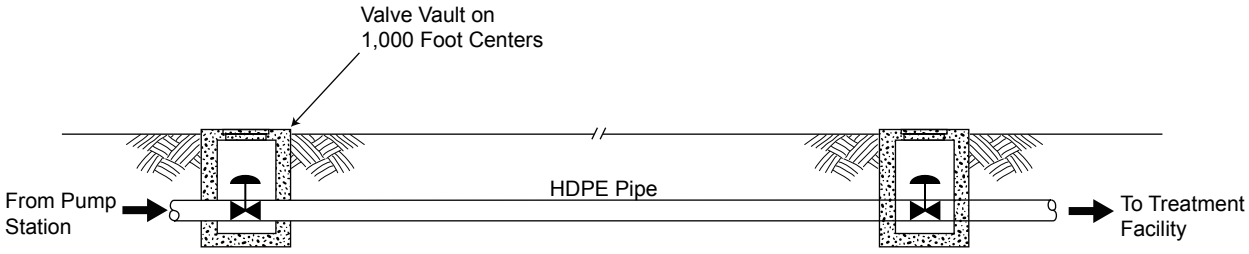
TCDs PIPE-1 through PIPE-4



Notes:

Pipe-1: 6-inch diameter pipe
Pipe-2: 12-inch diameter pipe
Pipe-3: 24-inch diameter pipe
Pipe-4: 36-inch diameter pipe

TCDs PRESSURE-PIPE-1 through PRESSURE-PIPE-4



Notes:

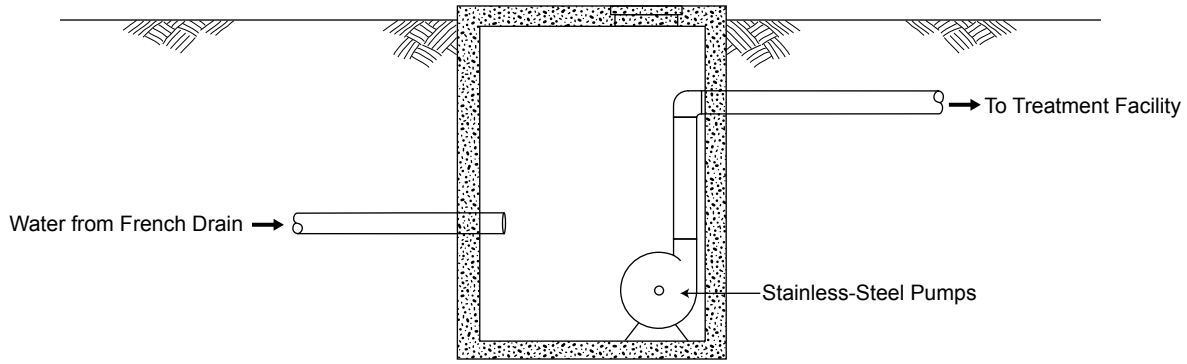
Pressure-Pipe-1: <6-inch diameter pipe
Pressure-Pipe-2: 6-14 inch diameter pipe
Pressure-Pipe-3: >14-inch diameter pipe
Pressure-Pipe-4: 3-inch diameter vertical pipe

These typical conceptual designs (TCDs) were developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

NOT TO SCALE

Figure C-19
Gravity Pipeline and Pressurized Pipeline, TCDs PIPE-1 through -4 and PRESSURE-PIPE-1 through -4
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

TCD PUMP-1

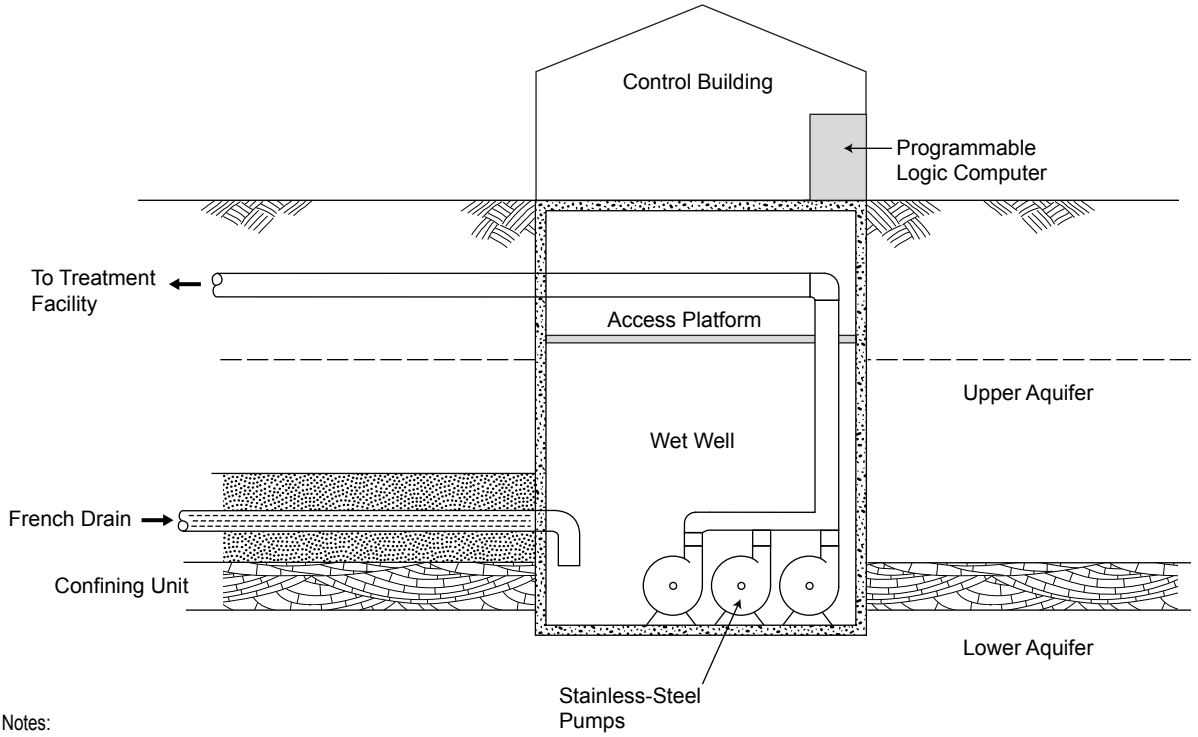


Note:

Pump station capacity is 0.14 MGD.

Pump to be submersible pump (constant speed or float controlled).
The pump should be able to handle some grit, sand, and debris

TCDs PUMP-2 through PUMP-5



Notes:

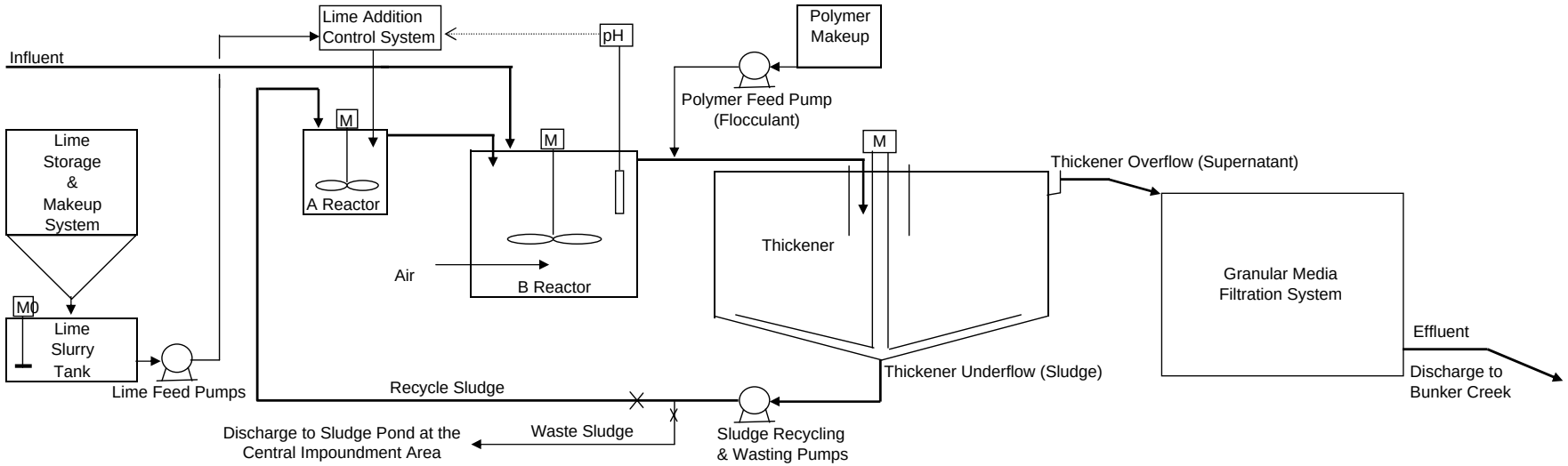
Pump station capacity ranges from 1.4 to 6.5 MGD.

These typical conceptual designs (TCDs) were developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

Pump to be submersible pump (constant speed or float controlled).
The pump should be able to handle some grit, sand, and debris

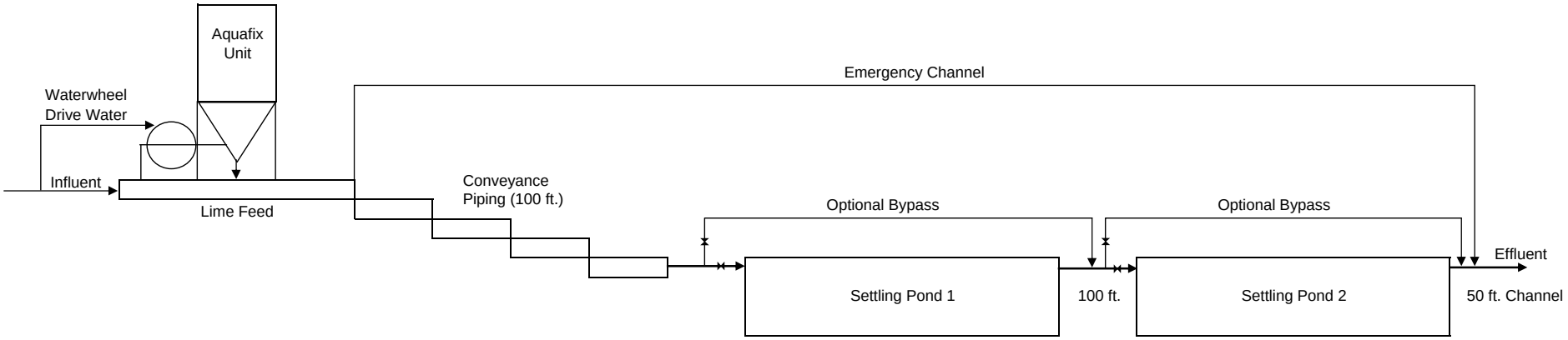
NOT TO SCALE

Figure C-20
Pump Station, TCDs PUMP-1 through PUMP-5
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE



Note: This typical conceptual design (TCD) was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

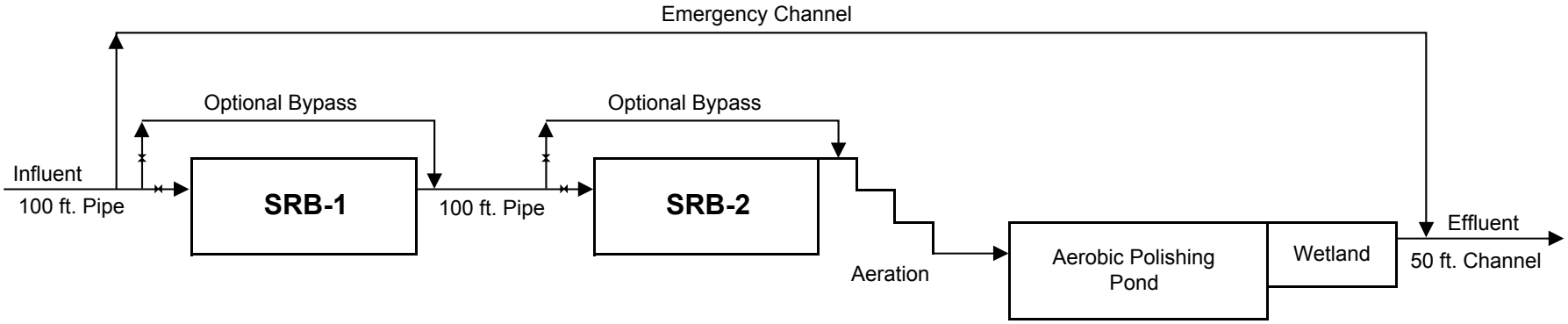
Figure C-21
Centralized High-Density Sludge (HDS) Treatment at Central Treatment Plant (CTP), TCD WT01
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE



⋈ = Valve

Note: This typical conceptual design (TCD) was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

Figure C-22
Onsite Semi-Passive Water Treatment Using Lime Addition, TCD WT02
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE



⋈ = Valve

Note: This typical conceptual design (TCD) was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

Figure C-23
Onsite Semi-Passive Water Treatment Using Sulfate-Reducing Bioreactor (SRB) System, TCD WT03
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

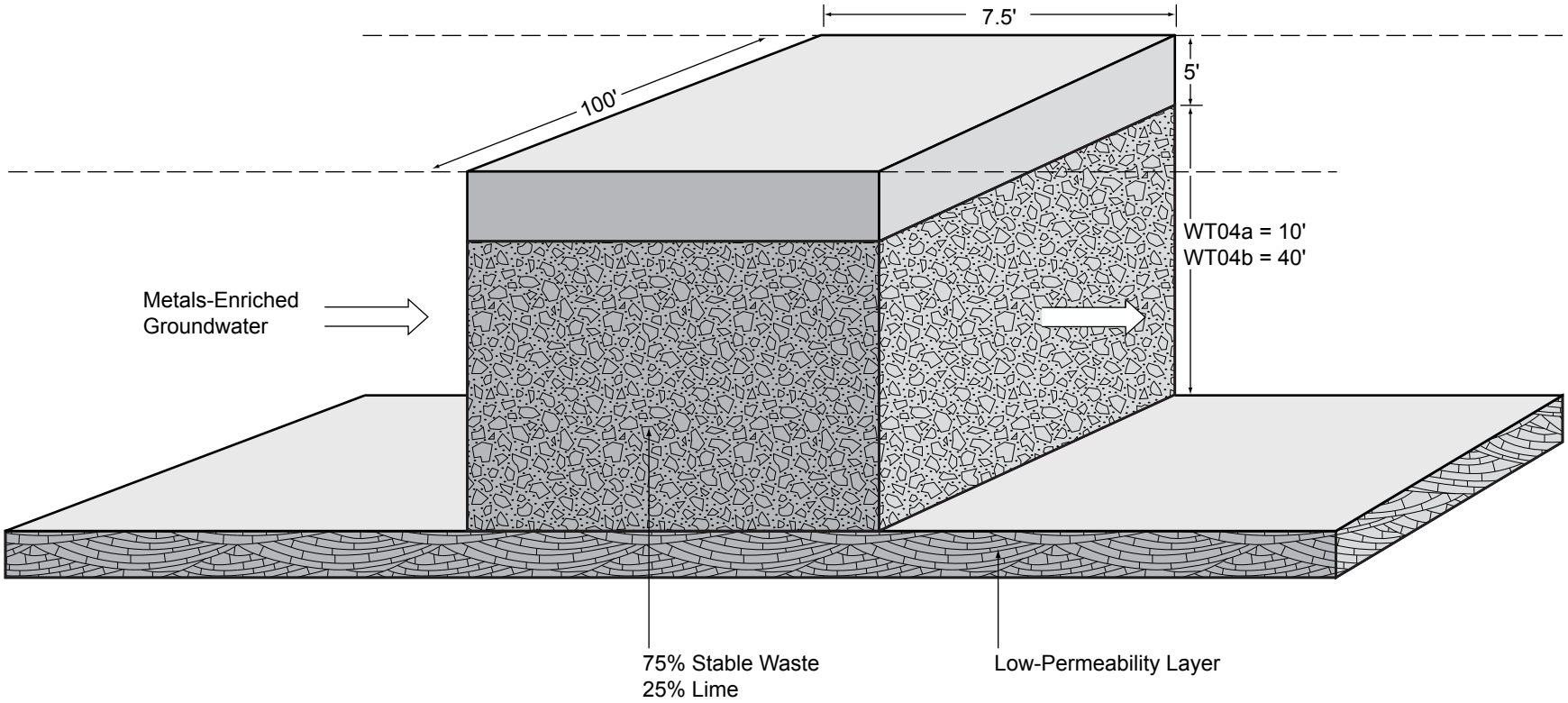
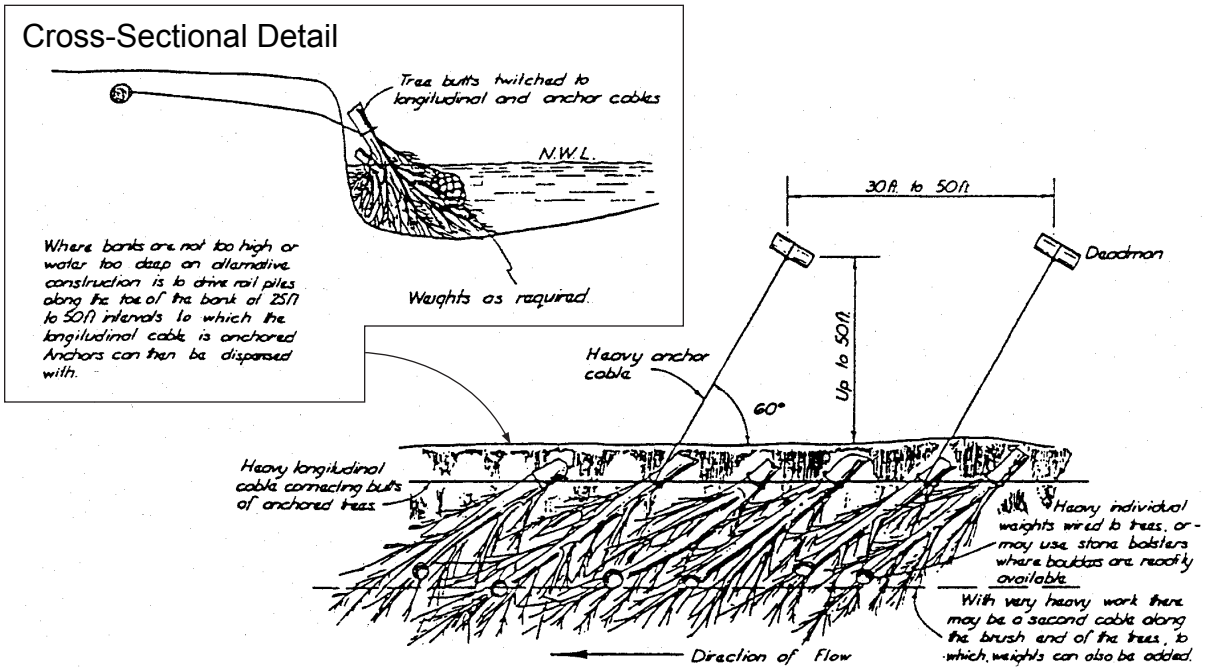
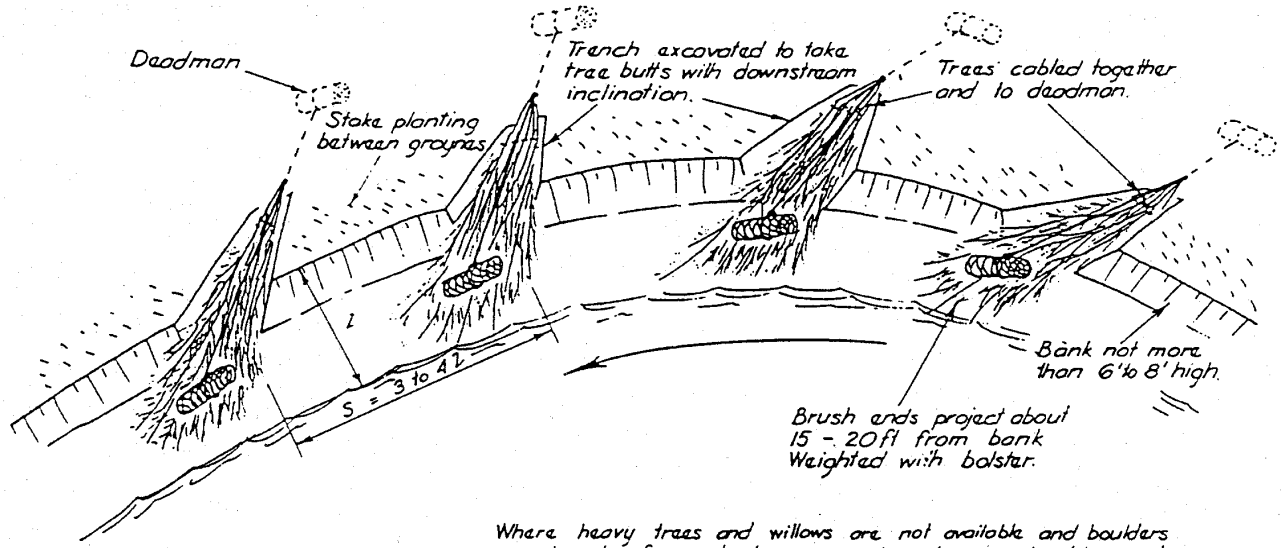


Figure C-24
***In Situ* Semi-Passive Groundwater Treatment Using Sulfate-Reducing Permeable Reactive Barrier (SR-PRB), TCDs WT04a and WT04b**
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

Note: This typical conceptual design (TCD) was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.



PLAN VIEW

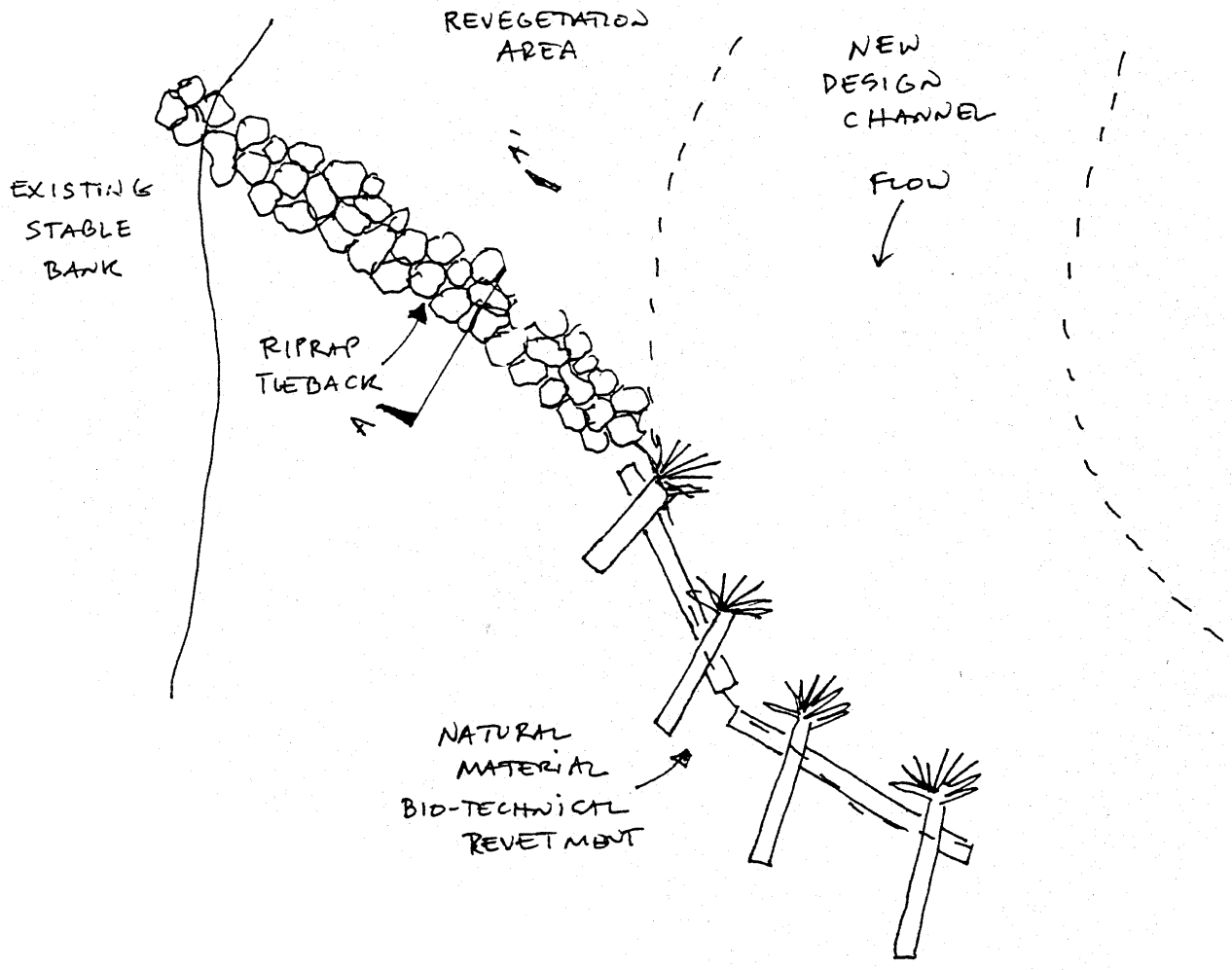


Where heavy trees and willows are not available and boulders are handy, form short groynes by dumping boulders at intervals along the bank with willow stakes laid on the bank first. This type of work is only suitable for easy curves and will not stand severe attack.

Note: This typical conceptual design (TCD) was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

Figure C-25
Current Deflectors, TCD CD-AVG
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

NOT TO SCALE



PLAN VIEW

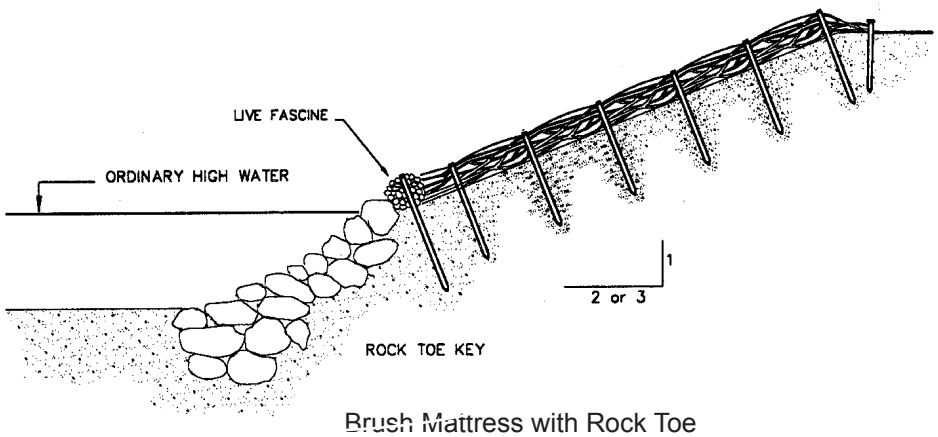
Notes:

CD-SED includes addition of sediment traps.

This typical conceptual design (TCD) was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

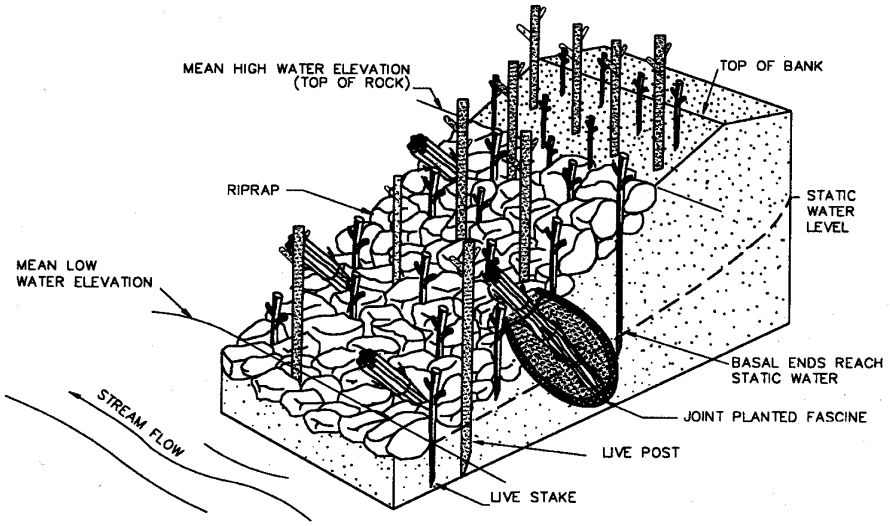
NOT TO SCALE

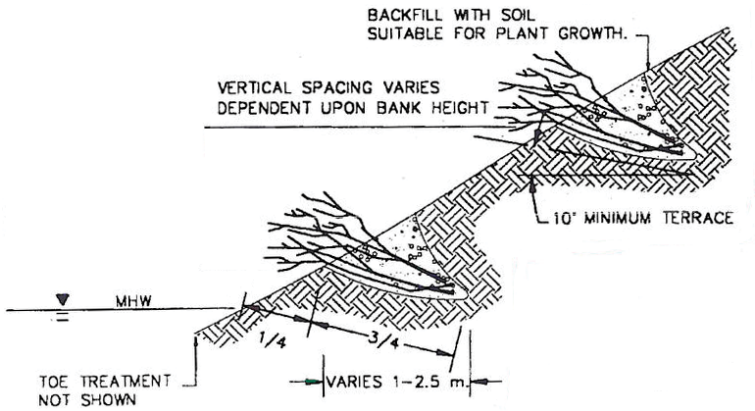
Figure C-26
Current Deflectors, Sediment Traps, TCD CD-SED
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE



Brush Mattress with Rock Toe

CROSS SECTION

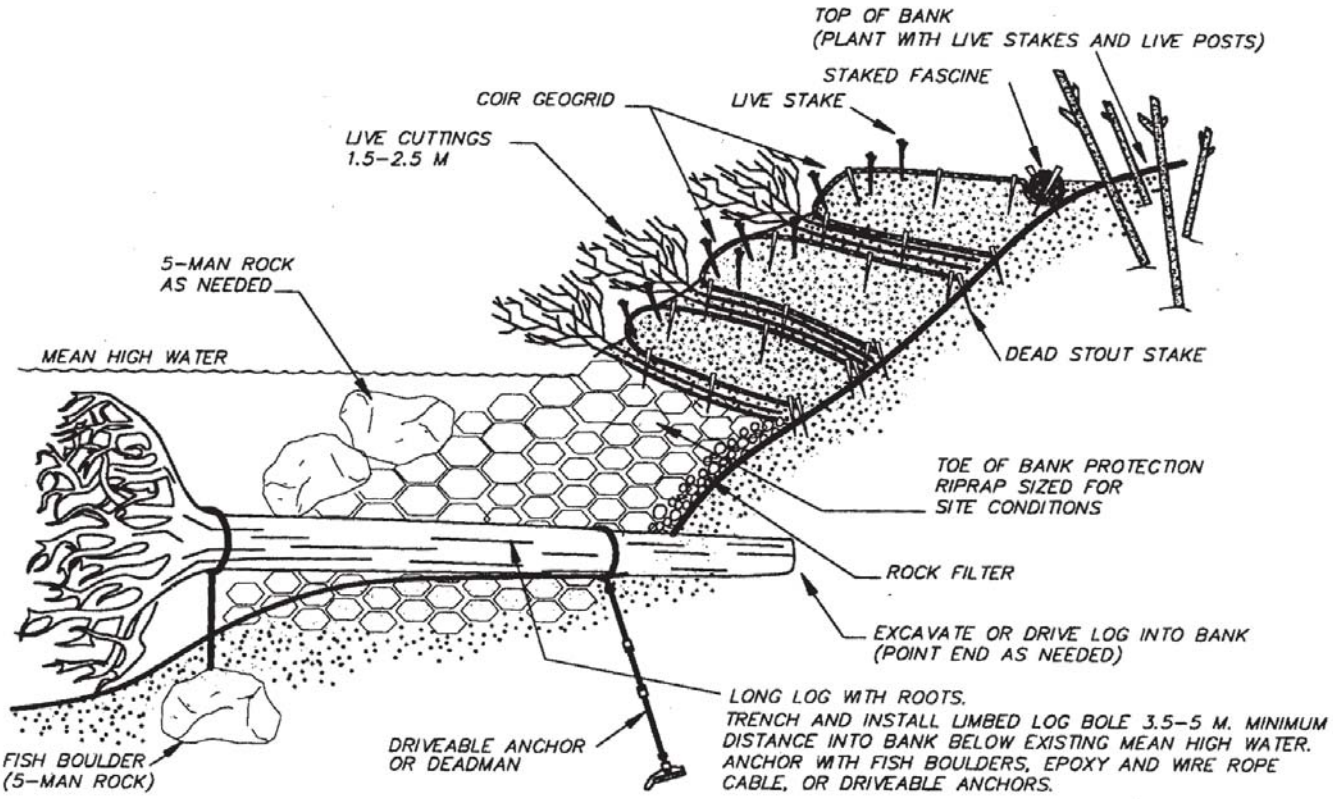




Note: This typical conceptual design (TCD) was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

NOT TO SCALE

Figure C-27
Vegetative Bank Stabilization, TCD VBS-AVG
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

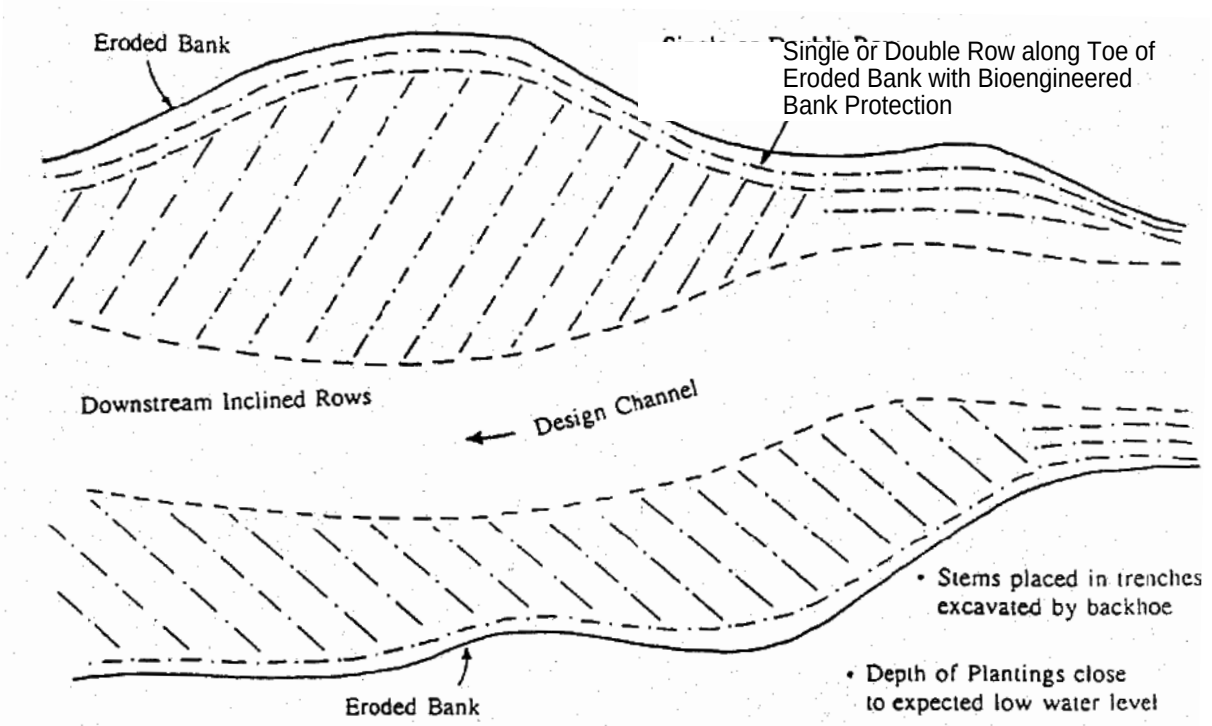


CROSS-SECTION

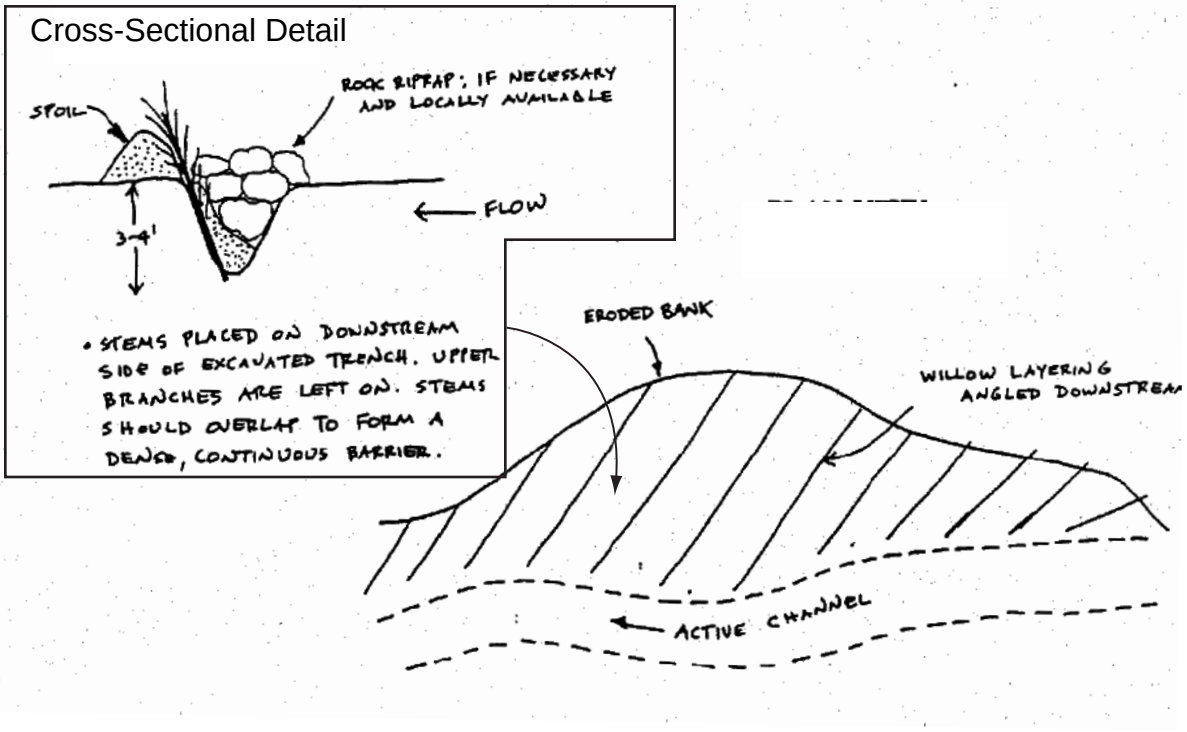
Note: This typical conceptual design (TCD) was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

NOT TO SCALE

Figure C-28
Bioengineered Revetments, TCD BSBR-AVG
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE



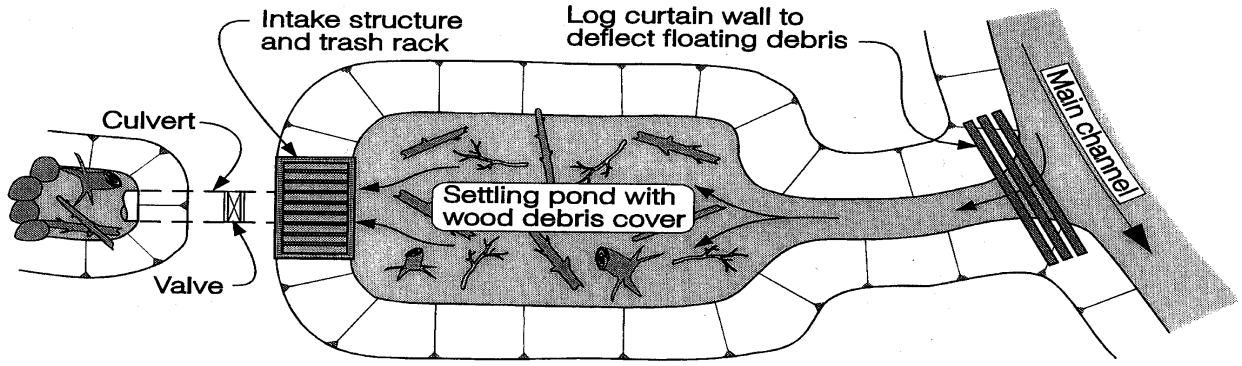
PLAN VIEW



Note: This typical conceptual design (TCD) was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

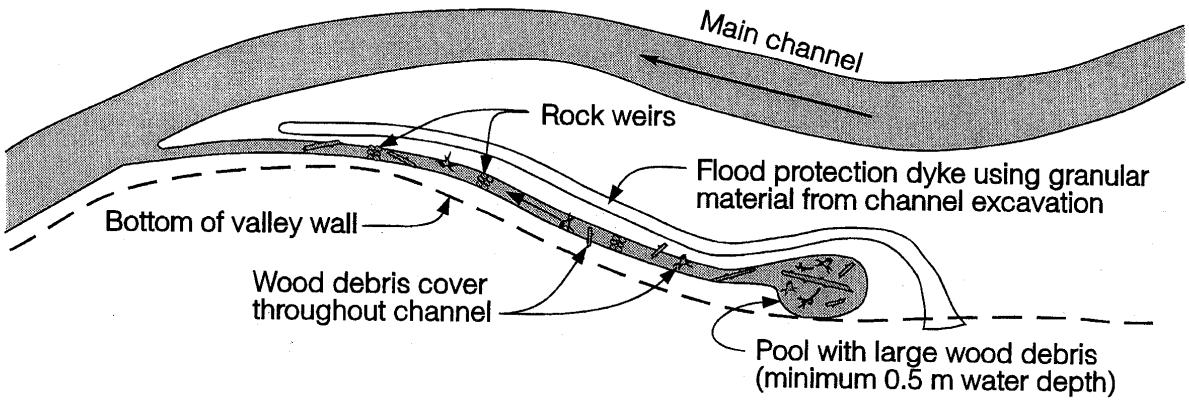
NOT TO SCALE

Figure C-29
Floodplain and Riparian Replanting, TCD FP/RP-AVG
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE



OFF-CHANNEL POND

PLAN VIEW



SIDE CHANNEL

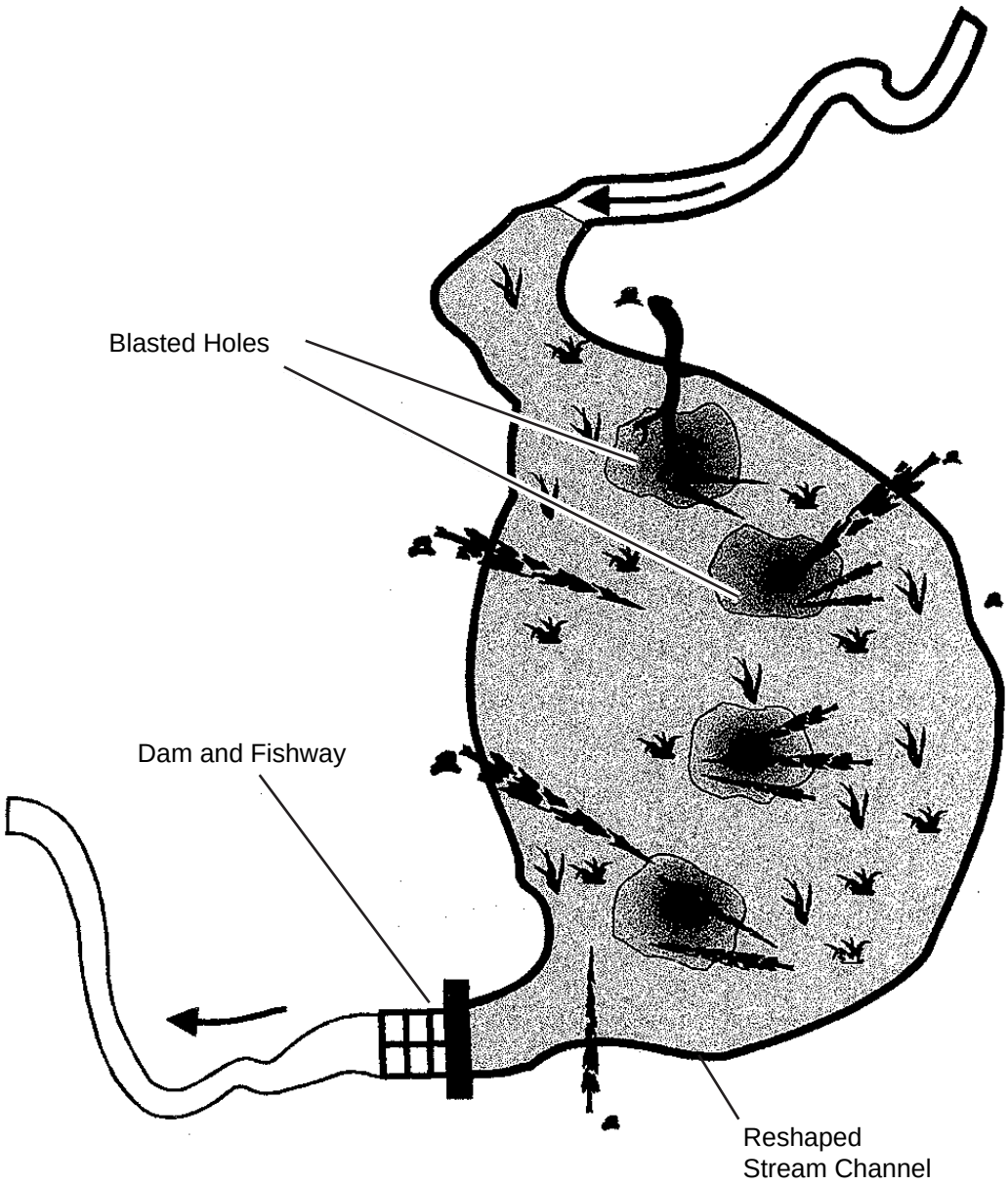
Notes:

Combination of side channels and off-channel ponds.

This typical conceptual design (TCD) was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

Figure C-30
Off-Channel Hydrologic Features, TCD OFFCH-AVG
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

NOT TO SCALE



PLAN VIEW

Note: This typical conceptual design (TCD) was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the selected remedy and site-specific conditions and requirements.

Figure C-31
Channel Realignment,
TCD CH-REAL-1
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

NOT TO SCALE

APPENDIX D

Cost Analysis Documentation

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D-41 Summary of Total Estimated Costs by Watershed

Attachment

D-1 Technical Memorandum: CTP Expansion for Treatment of Other OU 2 and OU 3 Waters

Acronyms and Abbreviations

bgs	below ground surface
BLM	Bureau of Land Management
cfs	cubic foot/feet per second
CPES	CH2M HILL Parametric Cost Estimating System
CTP	Central Treatment Plant
CY	cubic yards
FML	flexible membrane liner
FS	Feasibility Study
FFS	Focused Feasibility Study
gpm	gallons per minute
NPV	net present value
O&M	operation and maintenance
PVC	polyvinyl chloride
TCD	typical conceptual design
USEPA	U.S. Environmental Protection Agency Region 10

APPENDIX D

Cost Analysis Documentation

This appendix provides a detailed description of the processes used to develop cost estimates for the Focused Feasibility Study (FFS) for the Coeur d'Alene Basin. The text of this appendix is organized by typical conceptual design (TCD) costs (Section D.1), remedy protection costs (Section D.2), and site-by-site costs for Alternatives 3+ and 4+ (Section D.3). References cited in the text are listed in Section D.4, and are followed by Tables D-1 through D-41.

D.1 TCD Cost Estimation and Application

This section presents the methodology and assumptions used to develop the cost estimates for the TCDs included in Alternatives 3+ and 4+. The development of these TCDs is described in Section 5.0 of the FFS Report. Costs were developed based upon principles outlined in U.S. Environmental Protection Agency's (USEPA's) *A Guide to Developing and Documenting Cost Estimates during the Feasibility Study* (2000).

Detailed unit cost estimates are summarized by TCD in Tables D-1 through D-5. Direct capital costs were calculated for each individual action, characterized by a TCD, on a source material. The direct capital cost was calculated using the TCD unit cost and the appropriate measurement, which is specific to the site and source material. The indirect capital costs were assumed to be 70 percent of the direct capital costs for all TCDs except for WT01, active treatment at the Central Treatment Plant (CTP) discussed in Attachment D-1 (which follows the tables in this appendix). This assumption was based on information provided in USEPA's cost estimating guide (USEPA, 2000). Operation and maintenance (O&M) costs were assumed to be a percentage of the direct capital costs and varied for each TCD.

The O&M costs were calculated as the net present value (NPV) of 30 years of O&M at a discount rate of 7 percent (USEPA, 2000). The total cost is the sum of direct capital, indirect capital, and O&M costs. The nominal accuracy of these estimates is –30 percent to +50 percent. Assumptions and limitations used in the development of the unit costs are summarized in Tables D-6 through D-10.

For TCDs retained from the *Final (Revision 2) Feasibility Study Report, Coeur d'Alene Basin Remedial Investigation/Feasibility Study* (2001 FS Report; USEPA, 2001), costs were escalated to 2009 values assuming an escalation factor of 1.358. This escalation factor was developed from the Engineering News Record *Construction and Building Cost Index* (2008). For new TCDs, costs were developed by calculating unit costs for materials, labor, and equipment. These values were then summed to determine the direct capital unit cost for each TCD.

D.1.1 Source Control TCDs

All of the Source Control TCDs were retained from the 2001 FS Report, and the costs were escalated as described above with the exception of C01, C01b, and C02c. Revegetation was added to TCDs C01 and C01b for areas disturbed during excavation. TCD C02c was developed in 2007, and no detailed cost breakdown is available (URS, 2007).

A number of assumptions were used when applying these TCDs:

- The unit costs for C02a, C02b, C02c, C03, C04, C05, and C09 are on a per-acre basis. The acreage used to calculate the cost for a given source was assumed to be the acreage associated with the source material in the Bureau of Land Management (BLM) polygon.
- The costs for treatment of leachate (TCDs C04, C06, C07, C08a, and C09) were assumed to be negligible. Infiltration would be minimized with the cap design, and little leachate would be anticipated. Therefore, the cost of leachate treatment should be negligible in comparison to the cost of the waste consolidation area or repository.
- Hauling costs were calculated on a site-by-site basis. For the waste consolidation area above flood level (TCD C07), hauling costs are included in the TCD and assume a haul distance of one half-mile. For the repository (TCD C08a), hauling costs are not included in the TCD. A hauling TCD, HAUL-2, was developed for the 2001 FS and was applied along with TCD C08a assuming a haul distance of 5 miles for all sites.
- The costs for the disposal of waste at the repository were developed for various repository sizes. Based on work conducted by the repository siting team, the costs for the smallest repository, TCD C08a, of 1 million cubic yards (CY) were used. Costs from the 2001 FS Report were adjusted to remove the geosynthetic clay liner and increase the drainage layer flexible membrane liner (FML) from 60 to 80 mils.
- Road costs were applied as 15 percent of the total direct capital cost for each alternative.

D.1.2 Water Collection, Conveyance, and Management TCDs

TCDs C10, PIPE-1, PIPE-2, and PIPE-3 were retained from the 2001 FS Report, and the costs were escalated as described above. Additional TCDs were developed for actions that the TCDs retained from the 2001 FS Report did not address or needed modifications to address site needs. These included TCDs PIPE-4, C11a through C11j, PRESSURE-PIPE-1 through PRESSURE-PIPE-4, C14a through C14c, C15a through C15d, C17a through C17e, C18, C19, C20, and PUMP-1 through PUMP-5. Detailed descriptions of these TCDs can be found in Section 5.2.2 and Table 5-1 in the FFS Report.

Piping TCD design was based on maximum flow, which increased pipe size from the 2001 FS Report. In addition, several sites designated for passive water treatment in the 2001 FS Report were included in active treatment for this FFS Report.

The costs for Hydraulic Isolation Using Slurry Wall TCDs (C11a through C11j) are based on the length of the wall required for hydraulic isolation. If the slurry wall is required for both sides of the river/stream, then the length of the river/stream must be doubled to calculate the cost.

The costs for Stream Lining TCDs (C14a through C14e) are based on the average width of the river/stream over the application length of each liner. The costs currently include some measures to prevent liner lift. These include anchoring the polyvinyl chloride (PVC) liner and the geotextile into the trench and placing staged riprap over the geotextile. Care should be taken during the design of the stream liners for the gaining reaches to ensure that the design will prevent lift given site-specific conditions.

The costs for French Drain TCDs (C15a through C15d) are based on the flows developed by groundwater modeling.

Pump station TCD costs were developed based on a CH2M HILL Parametric Cost Estimating System (CPES) model. Direct unit costs based on varying flow rates are presented in Table D-2b.

D.1.3 Water Treatment TCDs

Attachment D-1 describes the active treatment TCD WT01. The capital costs are based on maximum flow to the CTP, and O&M costs are based on average flow to the CTP for each alternative. An additional sludge pond cost was developed to support TCD WT01 and applied on an alternative basis.

Detailed sludge pond costs were developed based on sludge capacities of Alternatives 3+ (c1) and (d1), which both have a storage capacity of 414,000 cubic yards. Capital cost, annual O&M, and 30-year NPV O&M were scaled for the remaining alternatives based the sludge production rate. The costs were scaled depending on the required size of the sludge pond for each alternative. The capital cost includes the closure cost of the existing pond once it reaches capacity and the capital cost of the new sludge pond. Section 5.3 of the FFS Report describes the pond design.

All of the semi-passive treatment TCDs (WT02, WT03, WT04a, and WT04b) were newly developed for the FFS.

The costs for WT02 (Onsite Semi-Passive Water Treatment Using Lime Addition and Settling Pond[s]) and WT03 (Onsite Semi-Passive Water Treatment Using Sulfate-Reducing Bioreactor [SRB] System) are based on flow (gallons per minute [gpm]). Detailed direct capital and O&M costs were developed for flows of 5 gpm, 50 gpm, and 1,000 gpm. These costs were then graphed and linearized. The linear equations were then used to calculate both direct capital and O&M costs for the site flows.

A bypass and emergency channel system was put in place for WT02 and WT03 to prevent flooding of the systems.

For WT02, the lime feed storage system cost was based on a quote by Aquafix. There are multiple options for the size of the lime feed storage and dispenser. The appropriate size of equipment was chosen based on the lime demand for that size flow. Winter weather was accounted for by adding a propane tank to heat the building containing the lime feed system. It is assumed that the settling ponds would be dredged every 10 years.

For WT03, the SRB ponds were assumed to include 75 percent stable waste and 25 percent lime. It is assumed that the media would be replaced every 15 years.

TCDs WT04a and WT04b (*In Situ* Semi-Passive Groundwater Treatment Using Sulfate-Reducing Permeable Reactive Barrier [SR-PRB]) were designed based on the depth of the media. WT04a assumes a media depth of 10 feet, which begins at 5 feet below ground surface (bgs). WT04b assumes a media depth of 40 feet, which begins at 5 feet bgs. These depths were chosen in order to apply these TCDs to different depths of confining layers. The media are assumed to be 75 percent stable waste and 25 percent lime. It is assumed that the media would be replaced every 15 years. Both TCDs assume a length of 100 feet and a width of 7.5 feet.

For both semi-passive and active water treatment, cost calculations for direct capital cost were based on maximum flow, while the O&M costs were based on average flow. If the average flow at a site was known, but the maximum flow was unknown, the maximum flow was assumed to be twice the average flow. In cases where no flow data were available, the average flow was assumed to be 0.1 cubic foot per second (cfs) and the maximum flow was assumed to be 0.2 cfs.

D.1.4 Human Health TCDs

All of the Human Health TCDs were retained from the 2001 FS Report, and the costs were escalated to 2009 values as described above.

D.1.5 Stream and Riparian Cleanup Action TCDs

All of the Stream and Riparian Cleanup Action TCDs were retained from the 2001 FS Report, with the exception of CD-SED. Retained TCD costs were escalated to 2009 values as described above. TCD CD-SED was developed in 2007, and no detailed cost breakdown is available (URS, 2007).

D.2 Remedy Protection Costs

This section discusses the assumptions used for developing costs for the remedy protection alternatives evaluated in Section 9.0 of the FFS Report. The remedy protection alternatives include RP-1: No Further Action (Post-Event Response) and RP-2: Modifications to Selected Remedies to Enhance Protectiveness (Remedy Protection Projects). The scope of costs that were developed for these alternatives includes eight communities within the Upper Coeur d'Alene Basin (Pinehurst, Smelterville, Kellogg, Wardner, Osburn, Silverton, Wallace and Mullan) in addition to a less detailed estimate developed for the side gulches.

The approach used to develop costs for these alternatives differed from the TCD approach described above. Detailed hydrologic and hydraulic modeling was conducted, as documented in Appendix G of the FFS Report, to determine (1) the expected damage to the Selected Remedies and subsequent post-event costs for Alternative RP-1, and (2) the capital project costs necessary to mitigate the potential risks posed by flood events for Alternative RP-2. The cost analyses conducted for Section 9.0 are also more detailed than the TCD approach. This detailed approach for Alternatives RP-1 and RP-2 was determined to be more appropriate for developing costs for the remedy protection alternatives because (1) only eight communities were evaluated in detail, and (2) hydrologic and hydraulic modeling allowed sufficient data to create more detailed cost estimates.

D.2.1 Alternative RP-1

The costs for Alternative RP-1 were developed based on the methodology described in Section 9.6.1.1 of the FFS Report (CH2M HILL, 2009). This methodology uses the hydrologic and hydraulic analyses documented in Appendix G to apply costs for the expected annual damage to the Selected Remedies. The 30-year NPV cost was then calculated as the present value of the expected annual damage. Tables D-11 through D-18 include the expected annual damage and 30-year NPV costs for each community.

Although detailed analyses were not conducted for the side gulches, it would be expected that hydrologic and hydraulic trends within the eight Upper Basin communities would be applicable to the side gulches. Table D-19 presents the calculations used to determine the approximate RP-1 costs for the side gulches.

Alternative RP-1 includes costs for post-event response (or "re-remediation") of the protective barriers. These are considered O&M costs. No capital costs are associated with Alternative RP-1.

D.2.2 Alternative RP-2

Alternative RP-2 was developed to enhance the protectiveness of existing Selected Remedies within the eight communities. These enhancements were developed from the list of technologies and process options applicable to remedy protection included in Table 9-4 accompanying Section 9.0 in the FFS Report. Multiple technologies and/or process options were combined and applied to expected impact areas in each of the communities. The impact areas were developed based on the results of the hydrologic and hydraulic analyses documented in Appendix G. These analyses were also used to determine approximate sizes, lengths, and other quantity measurements to apply to the process options to mitigate the existing risks posed to Selected Remedies during flood and storm events. Detailed descriptions (including figures) of the process options applied for each community are included in Attachment G-3 of Appendix G.

Based on the information included in Attachment G-3, cost estimates were developed for each community. Tables D-20 through D-35 present the detailed unit costs for the process options applied to each community, and a summary by community of the costs to mitigate damage to the Selected Remedies. Based on existing conditions, assumptions were made to support development of the detailed unit costs. It was assumed that the remedy protection projects would be implemented during the dry season and minimal dewatering would be necessary during construction. Unit costs assume that all excavated material would be disposed of at a repository (similar to TCD C08a).

O&M costs were also included for Alternative RP-2 on a community basis. Costs for O&M include inspections, repairs, and documentation. These costs were assumed to be 2 percent of the capital costs for Alternative RP-2 annually.

As discussed in Section 9.0, an approximate cost for Upper Basin side gulches was developed for Alternative RP-2. This cost is approximate because detailed hydrologic and hydraulic modeling was not conducted for the side gulches. This cost is based on a typical side gulch, which assumes average characteristics based on the side gulches included in Table 9 in Appendix G. Table D-36 presents the methods used to develop the total approximate Alternative RP-2 cost for the side gulches.

D.3 Site-by-Site Costs for Alternatives 3+ and 4+

Because of the large number of sites involved, a relational database was developed to compile quantity and unit cost data, identify TCDs, and calculate costs on a site-by-site and alternative-by-alternative basis. For each waste type at each source, quantity data including the volume, acreage, linear feet, volumetric flow rate, and metals concentration, were input into the database. The TCD(s) identified to remediate each waste type at each source were input for each

alternative. The unit cost data for the TCDs were input into the database. The quantity and unit cost data were used by the database to calculate the direct capital, indirect capital, and net present value costs.

Costs were calculated for Alternative 3+ and Alternative 4+. Tables D-37 and D-38 present the estimated costs for each site included in Alternatives 3+ and 4+, respectively, broken out by waste type (trait) and TCD. Tables D-39 and D-40 present the total estimated costs by site for Alternatives 3+ and 4+, respectively. Table D-41 presents the total estimated costs for each watershed under the two alternatives. Rolled-up costs for each alternative are presented in Table 8-3 in the FFS Report.

D.4 References

Engineering News Record. December 2008. *Construction and Building Cost Index.*

CH2M HILL. September 16, 2009. *Memorandum: Methodology for Estimating Expected Loss from Damage to Remedies*. Prepared for U.S. Environmental Protection Agency Region 10.

CH2M HILL. March 21, 2010. *Technical Memorandum: Side Gulch Costs for Remedy Protection Alternatives.* Prepared for U.S. Environmental Protection Agency Region 10.

TerraGraphics Environmental Engineering. March 30, 2010. *Side Gulch Costing Memorandum.* Prepared for U.S. Environmental Protection Agency Region 10.

URS. June 8, 2007. *Memorandum: Estimated Cleanup Costs for the Coeur d'Alene Basin, Costs Escalated to December 2006 and Pine Creek Costs Excluded.* Prepared for U.S. Environmental Protection Agency Region 10.

U.S. Environmental Protection Agency (USEPA). July 2000. *A Guide to Developing and Documenting Cost Estimates during the Feasibility Study.*

U.S. Environmental Protection Agency (USEPA). October 2001. *Final (Revision 2) Feasibility Study Report, Coeur d'Alene Basin Remedial Investigation/Feasibility Study.* Prepared by URS Greiner and CH2M HILL for USEPA Region 10.

Tables

TABLE D-1

Detailed Unit Cost Estimates for Source Control TCDs

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

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
C01	**Excavation**	**1**	**CY**	**$4.28**	
	Excavate	1	CY	$4.20	hydraulic excavator @ 100cy/hr
	Hydroseed	2%	LS	$0.08	assume 2% of direct unit cost
C01b	**Excavation (60% Dry/40% Wet)**	**1**	**CY**	**$13.49**	Assumes 60% excavation above and 40% below water table, backfill 25% of excavated sediment; NEW
	Excavate in dry	1	CY	$2.19	60%; cost by others
	Excavate below water table	1	CY	$5.99	40%; cost by others, with excavator or dredge?
	Replace excavated sediment	1	CY	$5.05	25%; cost by others
	Hydroseed	2%	LS	$0.26	assume 2% of direct unit cost
C02a	**Regrade/Consolidate/Revegetate**	**1**	**AC**	**$84,281.47**	per Draft Tech Memo 1 dated 1/00
	Regrade Waste Rock	8,067	CY	$5.98	assume 5' deep
	Vegetative Cover	1,613	CY	$16.66	based on CIA estimate
	Grade Surface Drainage Ditch	400	CY	$4.15	assume 400' & 1cy/LF
	Hydroseed	4,840	SY	$0.41	from Bunker Hill estimates
	Miscellaneous	1	LS	$5,513.74	slope protection, erosion control, etc
C02b	**Regrade/Consolidate/Revegetate**	**1**	**AC**	**$166,906.76**	per Draft Tech Memo 1 dated 1/00
	Regrade Waste Rock	20,973	CY	$5.98	assume 13' deep
	Vegetative Cover	1,613	CY	$16.66	based on CIA estimate
	Grade Surface Drainage Ditch	400	CY	$4.15	assume 400' & 1cy/LF
	Hydroseed	4,840	SY	$0.41	from Bunker Hill estimates
	Miscellaneous	1	LS	$10,919.13	slope protection, erosion control, etc
C02c	**Regrade/Consolidate/Revegetate**	**1**	**AC**	**$14,900.00**	per 2007 Cost Update Memo; No detail available
C03	**Low-Permeability Cap**	**1**	**AC**	**$224,826.10**	per Draft Tech Memo 1 dated 1/00
	Regrade Waste Rock	8,067	CY	$5.98	assume 5' deep
	Vegetative Cover	2,420	CY	$19.55	over geotextile
	Grade Surface Drainage Ditch	400	CY	$4.15	assume 400' & 1cy/LF
	Hydroseed	4,840	SY	$0.41	from Bunker Hill estimates
	Native Soil Leveling Layer Placement	807	CY	$11.59	50cy/hr production, depth of 0.5'; description & quantity change only, same cost
	Drainage Layer Placement	1,613	CY	$11.59	50cy/hr production
	Haul Above Material	2,420	CY	$13.73	this & following item, Sue Alvarez information, based on 10mi one way
	Develop & Close Pit for Material Above	2,420	CY	$3.43	allowance per CY for mining development & closure
	GCL	4,840	SY	$5.86	Bunker Hill estimates; added line item, previous cost
	16oz Geotextile	4,840	SY	$2.68	quote for CIA plus installation
	Miscellaneous	1	LS	$14,708.25	slope protection, erosion control, etc
C04	**Low-Permeability Cap w/Seepage Collection**	**1**	**AC**	**$254,029.64**	per Draft Tech Memo 1 dated 1/00
	Regrade Waste Rock	8,067	CY	$5.98	assume 5' deep
	Vegetative Cover	2,420	CY	$19.55	over geotextile
	Grade Surface Drainage Ditch	400	CY	$4.15	assume 400' & 1cy/LF

TABLE D-1

Detailed Unit Cost Estimates for Source Control TCDs

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

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Hydroseed	4,840	SY	$0.41	from Bunker Hill estimates
	Native Soil Leveling Layer Placement	807	CY	$11.59	50cy/hr production, depth of 0.5'
	Drainage Layer Placement	1,613	CY	$11.59	50cy/hr production
	Haul Above Material	2,420	CY	$13.73	this & following item, Sue Alvarez information, based on 10mi one way
	Develop & Close Pit for Material Above	2,420	CY	$3.43	allowance per CY for mining development & closure
	GCL	4,840	SY	$5.86	Bunker Hill estimates
	16oz Geotextile	4,840	SY	$2.68	quote for CIA plus installation
	Groundwater Collection & Diversion Trench	**2,500**	**SF**	**$10.92**	**Size: 3'w x 10'd Length Variable=**
	Soil Excavation	241	CY	$8.40	boulders, cobbles, etc
	Rock Excavation	56	CY	$41.99	earthwork crew @ 10cy/hr-assume can be excavated w/backhoe
	Shoring (trench box)	250	LF	$2.72	trench box
	Waste	296	CY	$6.86	dispose on tailings pile
	Dewatering	250	LF	$6.79	allowance for sumps & pumps
	4" CPE Pipe	250	LF	$4.15	
	Drain Rock	296	CY	$44.67	quote for Bunker Hill projects, 20cy/hour
	Geotextile	333	SY	$2.68	quote for CIA plus installation
	60mil FML	333	SY	$10.08	100sy/hr
	Miscellaneous	1	LS	$16,618.76	slope protection, erosion control, etc
C05	**Low-Permeability Cap w/Erosion Protection**	**1**	**AC**	**$252,170.08**	per Draft Tech Memo 1 dated 1/00
	Site Preparation	1	AC	$3,324.79	clearing, grubbing
	Regrade Waste Rock	8,067	CY	$5.98	assume 5' deep
	Vegetative Cover	2,420	CY	$19.55	over geotextile
	Grade Surface Drainage Ditch	400	CY	$4.15	assume 400' & 1cy/LF
	Hydroseed	4,840	SY	$0.41	from Bunker Hill estimates
	Native Soil Leveling Layer Placement	807	CY	$11.59	50cy/hr production, depth of 0.5'
	Drainage Layer Placement	1,613	CY	$11.59	50cy/hr production
	Haul Above Material	2,420	CY	$13.73	this & following item, Sue Alvarez information, based on 10mi one way
	Develop & Close Pit for Material Above	2,420	CY	$3.43	allowance per CY for mining development & closure
	GCL	4,840	SY	$5.86	Bunker Hill estimates
	16oz Geotextile	4,840	SY	$2.41	
	Riprap Toe	296	CY	$43.96	assume 10'w x 2' d
	Miscellaneous	1	LS	$27,018.22	slope protection, erosion control, etc
C06	**Waste Consolidation Area w/Erosion Protection**	**40,333**	**CY**	**$15.72**	per Draft Tech Memo 1 dated 1/00
	Haul to On-site Containment	40,333	CY	$1.56	loader to nearby repository, assume 25' deep
	Site Preparation	1	AC	$3,324.79	clearing, grubbing
	Grade at Repository	40,333	CY	$2.07	1-dozer @ 100cy/hr
	Grade Surface Drainage Ditch	400	CY	$4.15	assume 400' & 1cy/LF
	Groundwater Collection & Diversion Trench	**3,000**	**SF**		**Size: 3'w x 10'd Variable=**

TABLE D-1

Detailed Unit Cost Estimates for Source Control TCDs

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

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Soil Excavation	289	CY	$8.40	boulders, cobbles, etc
	Rock Excavation	67	CY	$41.99	earthwork crew @ 10cy/hr-assume can be excavated w/backhoe
	Shoring (trench box)	300	LF	$2.72	trench box
	Waste	356	CY	$6.86	dispose on tailings pile
	Dewatering	300	LF	$6.79	allowance for sumps & pumps
	4" CPE Pipe	300	LF	$4.15	
	Drain Rock	356	CY	$44.67	quote for Bunker Hill projects, 20cy/hour
	Geotextile	400	SY	$2.68	quote for CIA plus installation
	60mil FML	400	SY	$10.08	100sy/hr
	Rock Pad	**0.8**	**AC**		assume 80% of cap area
	Geotextile	7,744	SY	$2.41	
	Low Permeability Native Soil Placement	1,291	CY	$11.59	50cy/hr production
	Drainage Layer Placement	2,581	CY	$11.59	50cy/hr production
	Haul Above Material	3,872	CY	$13.73	this & following item, Sue Alvarez information, based on 10mi one way
	Develop & Close Pit for Material Above	3,872	CY	$3.43	allowance per CY for mining development & closure
	Toe Drain for Rock Pad	**300**	**LF**		
	Excavation	267	CY	$4.20	earthwork crew @ 100cy/hr
	Waste	4,172	CY	$6.86	dispose on tailings pile
	4" CPE Pipe	300	LF	$4.15	
	Drain Rock	267	CY	$44.67	quote for Bunker Hill projects, 20cy/hour
	60mil FML	333	SY	$10.08	100sy/hr
	Cap	**1.20**	**AC**		assumed acreage=
	GCL Liner	5,808	SY	$5.97	Bunker Hill estimates
	Vegetative Cover	2,904	CY	$19.55	over geotextile
	Hydroseed	5,808	SY	$0.41	from Bunker Hill estimates
	Low Permeability Native Soil Placement	968	CY	$11.59	50cy/hr production
	Drainage Layer Placement	1,936	CY	$11.59	50cy/hr production
	Haul Above Material	2,904	CY	$13.73	this & following item, Sue Alvarez information, based on 10mi one way
	Develop & Close Pit for Material Above	2,904	CY	$3.43	allowance per CY for mining development & closure
	16oz Geotextile	5,808	SY	$2.68	quote for CIA plus installation
	Riprap Toe	296	CY	$43.96	assume 10'w x 2' d
	Miscellaneous	1	LS	$67,953.46	anchor trenches, slope protection, erosion control, etc
C07	**Waste Consolidation Area Above Flood Level**	**40,333**	**CY**	**$14.68**	per Draft Tech Memo 1 dated 1/00
	Haul to On-site Containment	40,333	CY	$1.56	loader to nearby repository, assume 25' deep
	Site Preparation	1	AC	$3,324.79	clearing, grubbing
	Grade at Repository	40,333	CY	$2.07	1-dozer @ 100cy/hr
	Grade Surface Drainage Ditch	400	CY	$4.15	assume 400' & 1cy/LF
	Groundwater Collection & Diversion Trench	**3,000**	**SF**	**$10.92**	**Size: 3'w x 10'd Variable=**

TABLE D-1

Detailed Unit Cost Estimates for Source Control TCDs

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

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Soil Excavation	289	CY	$8.40	boulders, cobbles, etc
	Rock Excavation	67	CY	$41.99	earthwork crew @ 10cy/hr-assume can be excavated w/backhoe
	Shoring (trench box)	300	LF	$2.72	trench box
	Waste	356	CY	$6.86	dispose on tailings pile
	Dewatering	300	LF	$6.79	allowance for sumps & pumps
	4" CPE Pipe	300	LF	$4.15	
	Drain Rock	356	CY	$44.67	quote for Bunker Hill projects, 20cy/hour
	Geotextile	400	SY	$2.68	quote for CIA plus installation
	60mil FML	400	SY	$10.08	100sy/hr
	Rock Pad	**0.8**	**AC**		assume 80% of cap area
	Geotextile	7,744	SY	$2.68	quote for CIA plus installation
	Low Permeability Native Soil Placement	1,291	CY	$11.59	50cy/hr production
	Drainage Layer Placement	2,581	CY	$11.59	50cy/hr production
	Haul Above Material	3,872	CY	$13.73	this & following item, Sue Alvarez information, based on 10mi one way
	Develop & Close Pit for Material Above	3,872	CY	$3.43	allowance per CY for mining development & closure
	Toe Drain for Rock Pad	**300**	**LF**		
	Excavation	266.67	CY	$4.20	earthwork crew @ 100cy/hr
	Haul Above Material	266.67	CY	$6.86	assume 5 mile one way - 5 trucks
	4" CPE Pipe	300	LF	$4.15	
	Drain Rock	266.67	CY	$44.67	quote for Bunker Hill projects, 20cy/hour
	60mil FML	333.33	SY	$10.08	100sy/hr
	Cap	**1.2**	**AC**	**$160,721.13**	assumed size w/area adjustment for slopes
	GCL Liner	5,808	SY	$5.97	Bunker Hill estimates
	Vegetative Cover	2,904	CY	$19.55	over geotextile
	Hydroseed	5,808	SY	$0.41	from Bunker Hill estimates
	Low Permeability Native Soil Placement	968	CY	$11.59	50cy/hr production
	Drainage Layer Placement	1,936	CY	$11.59	50cy/hr production
	Haul Above Material	2,904	CY	$13.73	this & following item, Sue Alvarez information, based on 10mi one way
	Develop & Close Pit for Material Above	2,904	CY	$3.43	allowance per CY for mining development & closure
	16oz Geotextile	5,808	SY	$2.68	quote for CIA plus installation
	Miscellaneous	1	LS	$63,426.69	anchor trenches, slope protection, erosion control, etc
C08a	**Repository, 1 million cy**	**1,000,000**	**CY**	**$17.68**	**assume 900' sq & 75' high**
	Transfer at Repository	1,000,000		$1.36	
	Grade & Compact at Repository	1,000,000	CY	$2.07	1-dozer @ 100cy/hr
	Access Road	1	MI	$679,000.00	
	Liner	**19**	**AC**	**$3,618,745.71**	
	Site Preparation	19	AC	$3,324.79	clearing, grubbing
	Grade base for drainage (CNS)	45,093	CY	$5.08	

TABLE D-1

Detailed Unit Cost Estimates for Source Control TCDs

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

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Drainage Layer	60,000	CY	$11.59	hauled in from elsewhere, over geotextile
	Haul Above Material	60,000	CY	$13.73	recent site information, based on 10 mi one way
	Develop & Close Pit for Material Above	60,000	CY	$3.43	allowance per CY for mining development & closure
	80mil FML	90,000	SY	$8.63	CHANGED ON 12/01/09
	Geotextile	90,000	SY	$2.68	quote for CIA plus installation
	Drain Rock	1,100	CY	$44.67	Every 300 ft
	Drain Pipe	3,600	LF	$4.15	
	Strip drains	810,000	SF	$0.48	100% of area
	Leachage Collection System	1	LS	$100,000.00	ALLOWANCE ADDED ON 12/01/09
	Perimeter Drain & Rock Berm	**3,600**	**LF**		
	Drain Pipe	3,600	LF	$4.15	
	Drain Rock	5,333	CY	$44.67	quote for Bunker Hill projects, 20cy/hour
	Trench Liner	5,200	SY	$7.42	Bunker Hill estimates
	Rock Berm	43,333	CY	$43.96	assume full perimeter, 10' high x 32.5' average width
	Collection Sump & Gravity Pipeline	1	LS	$45,516.42	ALLOWANCE ADDED ON 12/01/09, ASSUMES 1000' OF 6" HDPE
	Cap	**22.31**	**AC**	**$6,082,768.64**	slope area increase factor of 1.2
	Subgrade Preparation	108,000	SY	$0.21	top of existing pile or site of new pile
	80mil FML	108,000	SY	$8.63	CHANGED ON 12/01/09
	Geotextile	108,000	SY	$2.68	quote for CIA plus installation
	Strip drains	81,000	SF	$0.48	10% of area
	Drainage Layer	36,000	CY	$11.59	hauled in from elsewhere, over geotextile
	Compacted Native Soil	36,000	CY	$5.79	
	Interim cover	100,000	CY	$5.79	10% of volume
	Haul Above Material	172,000	CY	$13.73	this & following item, Sue Alvarez information, based on 10mi one way
	Develop & Close Pit for Material Above	172,000	CY	$3.43	allowance per CY for mining development & closure
	Vegetative Cover	36,000	CY	$16.66	based on CIA estimate, REVISED TO 1' ON 12/01/09
	Hydroseed	108,000	SY	$0.41	from Bunker Hill estimates
	Misc Work	1	LS	$1,607,085.73	anchor trenches, slope protection, erosion control, etc
C09	**Impoundment Closure**	**67**	**AC**	**$245,945.54**	**based on Hecla-Star 5800'x 500' x 35' high**
	Perimeter Drain	**12,600**	**LF**	**$32.25**	
	Excavation	16,333	CY	$8.40	assume added volume for boulders, cobbles, etc
	Waste	16,333	CY	$6.86	assume 20% volume of bentonite
	Trench Liner	16,800	SY	$5.97	Bunker Hill estimates
	Drain Pipe	12,600	LF	$4.15	
	Drain Rock	2,800	CY	$44.67	quote for Bunker Hill projects, 20cy/hour
	Cap	**73.23**	**AC**	**$216,393.23**	**x 1.1 area increase factor for slopes**
	Regrade Tailings Pile Top	107,407	CY	$2.07	1-dozer @ 100cy/hr, assume 1' average depth
	Regrade Tailings Side Slopes	425,000	CY	$2.07	1-dozer @ 100cy/hr, from 1.5:1 slope to 3:1 slopes

TABLE D-1

Detailed Unit Cost Estimates for Source Control TCDs

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

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	GCL Liner	354,444	SY	$5.97	Bunker Hill estimates
	Geotextile	354,444	SY	$2.68	quote for CIA plus installation
	Drainage Layer	118,148	CY	$11.59	hauled in from elsewhere, over geotextile
	Compacted Native Soil	118,148	CY	$5.79	
	Haul Above Material	236,296	CY	$13.73	this & following item, Sue Alvarez information, based on 10mi one way
	Develop & Close Pit for Material Above	236,296	CY	$3.43	allowance per CY for mining development & closure
	Vegetative Cover	236,296	CY	$16.66	based on CIA estimate
	Hydroseed	354,444	SY	$0.41	Bunker Hill estimates
	Misc Work	1	LS	$1,488,525.89	anchor trenches, slope protection, erosion control, etc
HAUL-2	**Haul to Repository**	**1**	**CY-MI**	**$1.10**	1 - 10cy truck, at 25mph average, plus return trip
	Haul to Repository	1	CY	$1.10	25x10=250, 1/250=.004 x 2=.008

Notes:

AC = acre(s)
CIA = Central Impoundment Area
CPE = polyethylene
CY = cubic yards
FML = flexible membrane liner
GCL = geosynthetic clay liner
HDPE = high density polyethylene
LF = linear feet
LS = lump sum
SY = square yards
TCD = typical conceptual design

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 D-2a

Detailed Unit Cost Estimates for Water Collection, Conveyance, and Management TCDs

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

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
C10	**Adit Drainage Collection**	**1**	**LS**	**$9,684.18**	per DTM 1 dated 1/00, conveyance pipe included elsewhere
	Steel Bars	12	EA	$414.74	assume 6" spacing & 1" dia x 7'long drilled & grouted
	Concrete Wall	1	CY	$1,872.29	incl forms, rebar & concrete
	Drain pipe, stainless	5	LF	$119.94	4" diameter
	Misc Work	1	LS	$2,235.27	flanges, grout, waste, pipe penetration, temporary drainage, etc
C11a	**Hydraulic Isolation Using Slurry Wall, 15'd x 3'w**	**1**	**LF**	**$195.60**	
	Soil Bentonite Mix (10%), 20'd x 3'w	15	SF	$144.60	for 1 slurry wall only from C11 retained TCD cost
	Waste all Excavated Material to Repository	15	SF	$51.00	
C11b	**Hydraulic Isolation Using Slurry Wall, 20'd x 3'w**	**1**	**LF**	**$260.80**	
	Soil Bentonite Mix (10%), 20'd x 3'w	20	SF	$192.80	for 1 slurry wall only from C11 retained TCD cost
	Waste all Excavated Material to Repository	20	SF	$68.00	
C11c	**Hydraulic Isolation Using Slurry Wall, 30'd x 3'w**	**1**	**LF**	**$391.20**	
	Soil Bentonite Mix (10%), 20'd x 3'w	30	SF	$289.20	for 1 slurry wall only from C11 retained TCD cost
	Waste all Excavated Material to Repository	30	SF	$102.00	
C11d	**Hydraulic Isolation Using Slurry Wall, 40'd x 3'w**	**1**	**LF**	**$521.60**	
	Soil Bentonite Mix (10%), 20'd x 3'w	40	SF	$385.60	for 1 slurry wall only from C11 retained TCD cost
	Waste all Excavated Material to Repository	40	SF	$136.00	
C11e	**Hydraulic Isolation Using Slurry Wall, 45'd x 3'w**	**1**	**LF**	**$594.90**	
	Soil Bentonite Mix (10%), 45'd x 3'w	45	SF	$441.90	for 1 slurry wall only from C11 retained TCD cost
	Waste all Excavated Material to Repository	45	SF	$153.00	
C11f	**Hydraulic Isolation Using Slurry Wall, 50'd x 3'w**	**1**	**LF**	**$652.00**	
	Soil Bentonite Mix (10%), 50'd x 3'w	50	SF	$482.00	for 1 slurry wall only from C11 retained TCD cost
	Waste all Excavated Material to Repository	50	SF	$170.00	
C11g	**Hydraulic Isolation Using Slurry Wall, 50'd x 10'wide**	**1**	**LF**	**$4,175.00**	
	Soil Cement Mix (10%), 50'd x 10'wide	50	SF	$4,005.00	revised to cement w/clamshell, 8/11/09 - revised to 10' thick 9/23/09
	Waste all Excavated Material to Repository	50	SF	$170.00	
C11h	**Hydraulic Isolation Using Slurry Wall, w/Drain**	**1**	**LF**	**$1,116.29**	**per Draft Tech Memo 1 dated 1/00**
	GW Barrier (Soil/Bentonite Slurry)	**1**	**LF**	$173.86	
		15	**SF**	$11.59	per Draft Tech Memo #1 dated 1/17/00 - 30'd x 3'thick x variable=
	Excavation	2.22	CY	$8.40	assume added volume for boulders, cobbles, etc
	Rock Excavation	0.22	CY	$41.99	rock will be waste
	Haul & Dispose at Repository	2.22	CY	$5.49	assume all wasted, 5 mile, use HAUL-2 cost
	Repository Cost	2.22	CY	$17.70	use C8a cost
	Bentonite Material	0.24	TN	$203.70	1 ton/cy
	Mix & Place Bentonite/Soil	2.44	CY	$11.11	add $2 for mixing
	Miscellaneous	1	LS	$17.37	
	French Drain	**1**	**LF**		
	15' Deep French Drain	1	LF	$942.43	see detail for C15b
C11i	**Hydraulic Isolation Using Slurry Wall, w/Drain**	**1**	**LF**	**$1,210.81**	**per Draft Tech Memo 1 dated 1/00**
	GW Barrier (Soil/Bentonite Slurry)	**1**	**LF**	$225.70	
		20	**SF**	$11.29	per Draft Tech Memo #1 dated 1/17/00 - 30'd x 3'thick x variable=
	Excavation	2.96	CY	$8.40	assume added volume for boulders, cobbles, etc
	Rock Excavation	0.22	CY	$41.99	rock will be waste
	Haul & Dispose at Repository	2.96	CY	$5.49	assume all wasted, 5 mile, use HAUL-2 cost

TABLE D-2a

Detailed Unit Cost Estimates for Water Collection, Conveyance, and Management TCDs

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

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Repository Cost	2.96	CY	$17.70	use C8a cost
	Bentonite Material	0.32	TN	$203.70	1 ton/cy
	Mix & Place Bentonite/Soil	3.19	CY	$11.11	add $2 for mixing
	Miscellaneous	1	LS	$22.51	
	French Drain	**1**	**LF**		
	20' Deep French Drain	1	LF	$985.10	see detail for C15c
C11j	**Hydraulic Isolation Using Slurry Wall, w/Drain**	**1**	**LF**	**$1,586.14**	**per Draft Tech Memo 1 dated 1/00**
	GW Barrier (Soil/Bentonite Slurry)	**1**	**LF**	$329.41	
		30	**SF**	$10.98	per Draft Tech Memo #1 dated 1/17/00 - 30'd x 3'thick x variable=
	Excavation	4.44	CY	$8.40	assume added volume for boulders, cobbles, etc
	Rock Excavation	0.22	CY	$41.99	rock will be waste
	Haul & Dispose at Repository	4.44	CY	$5.49	assume all wasted, 5 mile, use HAUL-2 cost
	Repository Cost	4.44	CY	$17.70	use C8a cost
	Bentonite Material	0.47	TN	$203.70	1 ton/cy
	Mix & Place Bentonite/Soil	4.67	CY	$11.11	add $2 for mixing
	Miscellaneous	1	LS	$32.79	
	French Drain				
	30' Deep French Drain	1	LF	$1,256.73	see detail for C15d
C14a	**Stream Lining - 10' wide**	**1**	**LF**	**$318.46**	**10' wide bottom width channel**
	Diversion/Care of Water	1	LF	$20.00	allowance for temp dikes/facilities & bypass pumping
	Diversion Piping - Temporary: 36" dia Equiv	1	LF	$37.41	Temporary piping allowance; may be in segments
	Excavate & Prep Channel	2	CY	$20.49	50cy/hr
	Haul & Dispose at Repository	2	CY	$13.42	assume all but rock is wasted, 5 mile, use HAUL-2 cost
	Repository Cost	2	CY	$43.27	use C8a cost
	12" Quarry Spalls	1	CY	$29.95	native, include loading & hauling
	Pea Gravel	1	CY	$45.15	imported
	Sand	1	CY	$45.15	imported
	Liner/Geotextile System	5	SY	$39.82	incl anchor trench
	Misc Detail Allowance	10%	LS	$23.80	road maint & repair, testing, detection tape, etc
C14b	**Stream Lining - 20' wide**	**1**	**LF**	**$505.10**	**20' wide bottom width channel**
	Diversion/Care of Water	1	LF	$10.00	allowance for temp dikes/facilities & bypass pumping
	Diversion Piping - Temporary: 36" dia Equiv	1	LF	$26.73	Temporary piping allowance; may be in segments
	Excavate & Stockpile Riprap	3	CY	$49.67	25cy/hr
	Excavate & Prep Channel	3	CY	$24.84	50cy/hr
	Haul & Dispose at Repository	3	CY	$16.27	assume all but rock is wasted, 5 mile, use HAUL-2 cost
	Repository Cost	3	CY	$52.44	use C8a cost
	Replace Stockpiled Riprap	3	CY	$73.87	native, include loading & hauling
	Pea Gravel	1	CY	$82.10	imported
	Sand	1	CY	$82.10	imported
	Liner/Geotextile System	6	SY	$47.41	incl anchor trench
	Misc Detail Allowance	10%	LS	$39.67	road maint & repair, testing, detection tape, etc
C14c	**Stream Lining - 100' wide**	**1**	**LF**	**$2,969.53**	**100' wide bottom width channel**
	Diversion/Care of Water	1	LF	$50.00	allowance for temp dikes/facilities & bypass pumping
	Diversion Piping	1	LF	$58.58	Temporary piping allowance; may be in segments

TABLE D-2a

Detailed Unit Cost Estimates for Water Collection, Conveyance, and Management TCDs

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

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Excavate & Prep Channel	24	CY	$198.68	50cy/hr, 6' deep
	Excavate & Sort Existing Rock	9	CY	$99.86	50cy/hr + screening allowance
	Haul & Dispose at Repository	19	CY	$104.11	assume all but rock is wasted, 5 mile, use HAUL-2 cost
	Repository Cost	19	CY	$335.64	use C8a cost
	Riprap	19	CY	$778.53	48" thick
	Pea Gravel	5	CY	$262.72	imported
	Sand	5	CY	$262.72	imported
	Native Rock, Screened	5	CY	$94.56	excavated material
	Liner/Geotextile System	15	SY	$261.69	incl anchor trench, 80mil PVC & 16oz geotex, allowance
	Additional Mob & Demob Required	5	EA	$250.71	
	Misc Detail Allowance	10%	LS	$211.75	TESC etc.
C15a	**French Drain, 10' bgs**	**1**	**LF**	**$545.41**	**10' deep avg depth, valve vault @1000'**
	Clear, Grub & Dispose	0.001	AC	$0.65	
	Excavate Trench	2	CY	$6.31	
	Bed & Zone	0.3	CY	$14.87	1/2 mile one way average
	Locally Obtained Backfill Material	1	CY	$17.38	allow for material loading & preparation
	Imported Backfill - Drain Rock Material (Cobble)	0	CY	$7.18	
	Haul & Dispose at Repository	2	CY	$8.27	assume all wasted, 5 mile, use HAUL-2 cost
	Repository Cost	2	CY	$26.66	use C8a cost
	Filter Fabric Wrap	21	SF	$24.76	
	Trench Shoring - 25' avg depth	20	SF	$288.50	Solid shoring
	Dewatering: Two Sump Pmps	0.1	HR	$2.08	24 hr operation plus redundantt pump, pump to PS drain & to CTP
	Temporary Pipeline to PS Drain & Removal	1	LF	$41.82	allow for 8" above grade HDPE pipe & appurtenances
	Pipe, 14" HDPE, SDR 26 - Perforated	1	LF	$54.39	200'/day
	Cleanouts	0.002	EA	$4.37	allowance
	Restoration - Seeding	0.001	AC	$1.75	subcontract
	Misc Detail Allowance	10%	LS	$46.41	road maint & repair, testing, detection tape, etc
C15b	**French Drain, 15' bgs**	**1**	**LF**	**$907.04**	**10' deep avg depth, valve vault @1000'**
	Clear, Grub & Dispose	0.001	AC	$0.65	
	Excavate Trench	2	CY	$9.31	
	Bed & Zone	0.3	CY	$16.01	1/2 mile one way average
	Locally Obtained Backfill Material	1	CY	$27.37	allow for material loading & preparation
	Imported Backfill - Drain Rock Material (Cobble)	0.46	CY	$11.31	
	Haul & Dispose at Repository	2	CY	$12.20	assume all wasted, 5 mile, use HAUL-2 cost
	Repository Cost	2	CY	$39.33	use C8a cost
	Filter Fabric Wrap	24	SF	$27.60	
	Trench Shoring - 25' avg depth	40	SF	$567.55	Solid shoring
	Dewatering: Two Sump Pmps	0.1	HR	$3.07	24 hr operation plus redundantt pump, pump to PS drain & to CTP
	Temporary Pipeline to PS Drain & Removal	1	LF	$41.82	allow for 8" above grade HDPE pipe & appurtenances
	Pipe, 18" HDPE, SDR 26 - Perforated	1	LF	$66.92	180'/day
	Cleanouts	0.002	EA	$4.37	allowance
	Restoration - Seeding	0.001	AC	$1.75	subcontract
	Misc Detail Allowance	10%	LS	$77.77	road maint & repair, testing, detection tape, etc

TABLE D-2a

Detailed Unit Cost Estimates for Water Collection, Conveyance, and Management TCDs

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

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
C15c	**French Drain, 20' bgs**	**1**	**LF**	**$949.24**	**10' deep avg depth, valve vault @1000'**
	Clear, Grub & Dispose	0.001	AC	$0.65	
	Excavate Trench	3	CY	$12.42	
	Bed & Zone	0.3	CY	$16.01	1/2 mile one way average
	Locally Obtained Backfill Material	2	CY	$38.47	allow for material loading & preparation
	Imported Backfill - Drain Rock Material (Cobble)	1	CY	$15.89	
	Haul & Dispose at Repository	3	CY	$16.27	assume all wasted, 5 mile, use HAUL-2 cost
	Repository Cost	3	CY	$52.44	use C8a cost
	Filter Fabric Wrap	26	SF	$30.54	
	Trench Shoring - 25' avg depth	40	SF	$567.55	Solid shoring
	Dewatering: Two Sump Pmps	0.2	HR	$4.09	24 hr operation plus redundantt pump, pump to PS drain & to CTP
	Temporary Pipeline to PS Drain & Removal	1	LF	$41.82	allow for 8" above grade HDPE pipe & appurtenances
	Pipe, 18" HDPE, SDR 26 - Perforated	1	LF	$66.92	180'/day
	Cleanouts	0.002	EA	$4.37	allowance
	Restoration - Seeding	0.001	AC	$1.75	subcontract
	Misc Detail Allowance	10%	LS	$80.05	road maint & repair, testing, detection tape, etc
C15d	**French Drain, 25' bgs**	**1**	**LF**	**$1,210.16**	**25' deep avg depth, valve vault @1000'**
	Clear, Grub & Dispose	0.001	AC	$0.65	
	Excavate Trench	4	CY	$16.14	
	Bed & Zone	0.4	CY	$17.14	1/2 mile one way average
	Locally Obtained Backfill Material	3	CY	$50.67	allow for material loading & preparation
	Imported Backfill - Drain Rock Material (Cobble)	1	CY	$20.93	
	Haul & Dispose at Repository	4	CY	$21.15	assume all wasted, 5 mile, use HAUL-2 cost
	Repository Cost	4	CY	$68.18	use C8a cost
	Filter Fabric Wrap	29	SF	$34.06	
	Trench Shoring - 25' avg depth	52	SF	$737.81	Solid shoring
	Dewatering: Two Sump Pmps	0.2	HR	$5.32	24 hr operation plus redundantt pump, pump to PS drain & to CTP
	Temporary Pipeline to PS Drain & Removal	1	LF	$41.82	allow for 8" above grade HDPE pipe & appurtenances
	Pipe, 24" HDPE, SDR 26 - Perforated	1	LF	$88.27	150'/day,
	Cleanouts	0.002	EA	$4.37	allowance
	Restoration - Seeding	0.001	AC	$1.75	subcontract
	Misc Detail Allowance	10%	LS	$101.89	road maint & repair, testing, detection tape, etc
C17a	**Extraction Well - 20' deep**	**1**	**EA**	**$65,722.66**	**6" dia, 20' deep, sst screen 15', sch 80 pvc casing**
	Well Drilling and Development - Subcontract	1	EA	$4,729.56	Quote plus mark-up
	Pumps - Subcontracted	1	EA	$3,547.17	allow
	Discharge Piping				
	Pipe at Pump				
	Pipe - 2" SDR 11 HDPE	30	LF	$251.52	
	Bend- 90 deg	2	EA	$214.11	
	Check Valve	1	EA	$463.97	
	Globe Valve	1	EA	$617.68	
	Gate Valve	1	EA	$411.94	
	Insulation Allowance	1	LS	$17,276.03	
	Clear & Grub Disposal Site	0.15	AC	$127.00	

TABLE D-2a

Detailed Unit Cost Estimates for Water Collection, Conveyance, and Management TCDs

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

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Pipe - 6" SDR 21 HDPE	200	LF	$7,080.05	
	Tee - Reducing	1	EA	$628.55	
	Bend- 45 deg - allow	2.0	EA	$1,322.85	
	Excavate Trench	89	CY	$372.53	
	Bed & Zone	36	CY	$1,728.58	
	Native Backfill	52	CY	$517.10	
	Haul Waste Material	37	CY	$203.70	within 5 mile radius, clean material
	Restoration - Seeding	0.15	AC	$339.58	subcontract
	Electrical Service & Controls Allowance	50%	LS	$19,915.96	allow
	Misc Detail Allowance	10%	LS	$5,974.79	road maint & repair, testing, detection tape, etc
C17b	**Extraction Well - 40' deep**	**1**	**EA**	**$68,649.07**	**6" dia, 40' deep, sst screen 15', sch 80 pvc casing**
	Well Drilling and Development - Subcontract	1	EA	$6,503.15	Quote plus mark-up
	Pumps - Subcontracted	1	EA	$3,547.17	allow
	Discharge Piping				
	Pipe at Pump				
	Pipe - 2" SDR 11 HDPE	30	LF	$251.52	
	Bend- 90 deg	2	EA	$214.11	
	Check Valve	1	EA	$463.97	
	Globe Valve	1	EA	$617.68	
	Gate Valve	1	EA	$411.94	
	Insulation Allowance	1	LS	$17,276.03	
	Clear & Grub Disposal Site	0.15	AC	$127.00	
	Pipe - 6" SDR 21 HDPE	200	LF	$7,080.05	
	Tee - Reducing	1	EA	$628.55	
	Bend- 45 deg - allow	2.0	EA	$1,322.85	
	Excavate Trench	89	CY	$372.53	
	Bed & Zone	36	CY	$1,728.58	
	Native Backfill	52	CY	$517.10	
	Haul Waste Material	37	CY	$203.70	within 5 mile radius, clean material
	Restoration - Seeding	0.15	AC	$339.58	subcontract
	Electrical Service & Controls Allowance	50%	LS	$20,802.75	allow
	Misc Detail Allowance	10%	LS	$6,240.82	road maint & repair, testing, detection tape, etc
C17c	**Extraction Well - 50' deep**	**1**	**EA**	**$72,876.48**	**6" dia, 50' deep, sst screen 15', sch 80 pvc casing**
	Well Drilling and Development - Subcontract	1	EA	$8,276.73	Quote plus mark-up
	Pumps - Subcontracted	1	EA	$5,911.95	allow
	Discharge Piping				
	Pipe at Pump				
	Pipe - 2" SDR 11 HDPE	30	LF	$251.52	
	Bend- 90 deg	2	EA	$214.11	
	Check Valve	1	EA	$463.97	
	Globe Valve	1	EA	$617.68	
	Gate Valve	1	EA	$411.94	
	Insulation Allowance	1	LS	$17,276.03	
	Clear & Grub Disposal Site	0.15	AC	$127.00	

TABLE D-2a

Detailed Unit Cost Estimates for Water Collection, Conveyance, and Management TCDs

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

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Pipe - 6" SDR 21 HDPE	200	LF	$5,738.51	
	Tee - Reducing	1	EA	$527.94	
	Bend- 45 deg - allow	2.0	EA	$1,188.69	
	Excavate Trench	89	CY	$372.53	
	Bed & Zone	36	CY	$1,728.58	
	Native Backfill	52	CY	$517.10	
	Haul Waste Material	37	CY	$203.70	within 5 mile radius, clean material
	Restoration - Seeding	0.15	AC	$339.58	subcontract
	Electrical Service & Controls Allowance	50%	LS	$22,083.78	allow
	Misc Detail Allowance	10%	LS	$6,625.13	road maint & repair, testing, detection tape, etc
C17d	**Extraction Well - 50' deep**	**1**	**EA**	**$80,354.73**	**10" dia, 55' deep, sst screen 15', sch 80 pvc casing** (Note while this was developed for 55' foot deep well it is being applied in a 50' deep scenario as the values are similar)
	Well Drilling and Development - Subcontract	1	EA	$11,232.71	Quote plus mark-up
	Pumps - Subcontracted	1	EA	$5,911.95	allow
	Discharge Piping				
	Pipe at Pump				
	Pipe - 2" SDR 11 HDPE	30	LF	$251.52	
	Bend- 90 deg	2	EA	$214.11	
	Check Valve	1	EA	$463.97	
	Globe Valve	1	EA	$617.68	
	Gate Valve	1	EA	$411.94	
	Insulation Allowance	1	LS	$17,276.03	
	Clear & Grub Disposal Site	0.15	AC	$127.00	
	Pipe - 6" SDR 21 HDPE	200	LF	$7,080.05	
	Tee - Reducing	1	EA	$628.55	
	Bend- 45 deg - allow	2.0	EA	$1,322.85	
	Excavate Trench	89	CY	$372.53	
	Bed & Zone	36	CY	$1,728.58	
	Native Backfill	52	CY	$517.10	
	Haul Waste Material	37	CY	$203.70	within 5 mile radius, clean material
	Restoration - Seeding	0.15	AC	$339.58	subcontract
	Electrical Service & Controls Allowance	50%	LS	$24,349.92	allow
	Misc Detail Allowance	10%	LS	$7,304.98	road maint & repair, testing, detection tape, etc
C17e	**Extraction Well - 70' deep**	**1**	**EA**	**$83,281.15**	**10" dia, 70' deep, sst screen 15', sch 80 pvc casing**
	Well Drilling and Development - Subcontract	1	EA	$13,006.29	interp from above
	Pumps - Subcontracted	1	EA	$5,911.95	allow
	Discharge Piping				
	Pipe at Pump				
	Pipe - 2" SDR 11 HDPE	30	LF	$251.52	
	Bend- 90 deg	2	EA	$214.11	
	Check Valve	1	EA	$463.97	
	Globe Valve	1	EA	$617.68	
	Gate Valve	1	EA	$411.94	

TABLE D-2a

Detailed Unit Cost Estimates for Water Collection, Conveyance, and Management TCDs

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

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Insulation Allowance	1	LS	$17,276.03	
	Clear & Grub Disposal Site	0.15	AC	$127.00	
	Pipe - 6" SDR 21 HDPE	200	LF	$7,080.05	
	Tee - Reducing	1	EA	$628.55	
	Bend- 45 deg - allow	2.0	EA	$1,322.85	
	Excavate Trench	89	CY	$372.53	
	Bed & Zone	36	CY	$1,728.58	
	Native Backfill	52	CY	$517.10	
	Haul Waste Material	37	CY	$203.70	within 5 mile radius, clean material
	Restoration - Seeding	0.15	AC	$339.58	subcontract
	Electrical Service & Controls Allowance	50%	LS	$25,236.71	allow
	Misc Detail Allowance	10%	LS	$7,571.01	road maint & repair, testing, detection tape, etc
C18	**SFCDR Diversion**	**1**	**EA**	**$881,812.79**	
	Cofferdam Both Sides of Cutoff Wall Excavation	300	LF	$270,000.00	
	Pump Intake Structure	2	EA	$50,000.00	allowance
	Diversion Pump	4	EA	$243,748.27	2 active, 2 standby
	30" HDPE Pipe	200	LF	$24,126.93	asm SDR 17
	Misc Detail Allowance	50%	LS	$293,937.60	TESC, maintenance, etc
C19	**I-90 Crossing**	**1**	**EA**	**$276,096.45**	
	Remove Pavement	433	SY	$9,080.37	sawct, remove, dispose
	Night Work Premium	1	LS	$52,000.00	assume 10%
	Production Loss Adjustment	1	LS	$104,000.00	130LF, % of cutoff wall cost
	Replace Pavement, Striping, etc	433	SY	$21,666.67	assume concrete/ACP
	Traffic Control	1	LS	$52,000.00	
	Misc Detail Allowance	20%	LS	$37,349.41	road maint & repair, lights, plates, patch, etc
C20	**Check Dam**	**1**	**EA**	**$47,897.66**	**assume pyramid 10ft base and 5 ft tall**
	Prepare Location for Check Dam Structure	1	LS	$14,601.84	potential shoring & bracing replacements, etc
	Prep & Clean Surfaces for Mix	1	LS	$5,840.73	remove dirt & debris
	Controlled Density Fill (CDF)	11	CY	$2,251.85	allow for special mix in small quantity, transport, 1:1 slope
	Transport, Setup, Prep Operation	1	LS	$9,000.00	RSM 07/21/29.10, assume $3000/day & 3 days for bulkhead
	Setup & Install CDF	11	CY	$8,220.29	assume hand mix at site
	Misc Detail Allowance	20%	LS	$7,982.94	lighting, ventilation, etc
PIPE-1	**Gravity Pipeline - 6"**	**1**	**LF**	**$58.74**	
	Clear & Grub	3.6	SY	$0.84	
	Excavation	0.43	CY	$20.99	
	Bed & Zone	0.14	CY	$43.31	
	Native Backfill	0.28	CY	$11.59	
	Waste	0.15	CY	$6.86	
	HDPE Pipe	1	LF	$24.12	assume SDR 26 HDPE, 400'/day
	Restoration	3.6	SY	$0.68	road gravel/seeding
	Misc Work	1	LS	$9.79	fittings, valves, testing, startup

TABLE D-2a

Detailed Unit Cost Estimates for Water Collection, Conveyance, and Management TCDs

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

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
PIPE-2	**Gravity Pipeline - 12"**	**1**	**LF**	**$86.16**	
	Clear & Grub	3.8	SY	$0.84	
	Excavation	0.59	CY	$20.99	
	Bed & Zone	0.23	CY	$43.31	
	Native Backfill	0.33	CY	$11.59	
	Waste	0.26	CY	$6.86	
	HDPE Pipe	1	LF	$38.07	assume SDR 26 HDPE, 350'/day
	Restoration	3.8	SY	$0.68	road gravel/seeding
	Misc Work	1	LS	$14.36	fittings, valves, testing, startup
PIPE-3	**Gravity Pipeline - 24"**	**1**	**LF**	**$138.85**	
	Clear & Grub	4.2	SY	$0.84	
	Excavation	1	CY	$20.99	
	Bed & Zone	0.38	CY	$43.31	
	Native Backfill	0.5	CY	$11.59	
	Waste	0.5	CY	$6.86	
	HDPE Pipe	1	LF	$62.65	assume SDR 26 HDPE, 300'/day
	Restoration	4.2	SY	$0.68	road gravel/seeding
	Misc Work	1	LS	$23.14	fittings, valves, testing, startup
PIPE-4	**Gravity Pipeline - 36"**	**1**	**LF**	**$180.00**	Assume 6/10ths rule based on PIPE-3
PRESSURE-PIPE-1	**Pressurized Pipeline - 3"**	**1**	**LF**	**$44.06**	**3' cover**
	Clear, Grub & Dispose	0.001	AC	$2.96	
	Excavate Trench	0.52	CY	$2.17	
	Bed & Zone	0.16	CY	$7.77	
	Native Backfill	0.36	CY	$3.56	
	Haul Waste Material	0.16	CY	$0.89	within 5 mile radius, clean material
	Trench Safety	1.00	LF	$5.00	trench box
	Dewatering: Two Sump Pmps	0.00	HR	$0.00	NA
	Pipe, 3" HDPE, SDR 17	1.00	LF	$15.80	500'/day
	Restoration - Seeding	0.0009	AC	$1.98	subcontract
	Misc Detail Allowance	10%	LS	$3.92	fittings, valves, location detection, etc
PRESSURE-PIPE-2	**Pressurized Pipeline - 6"**	**1**	**LF**	**$82.03**	**single pipe, 30' deep avg depth, valve vault @1000'**
	Clear, Grub & Dispose	0.001	AC	$2.54	
	Excavate Trench	0.444	CY	$1.86	
	Bed & Zone	0.178	CY	$8.64	
	Native Backfill	0.259	CY	$2.59	
	Haul Waste Material	0.185	CY	$1.02	within 5 mile radius, clean material
	Trench Safety	1.000	LF	$5.00	trench box
	Dewatering: Two Sump Pmps	0.027	HR	$0.32	24 hr operaton x 4 for in stream
	Pipe, 6" HDPE, SDR 17	1.000	LF	$34.07	300'/day
	Pipe, 6" Tee Assembly	0.001	EA	$1.31	
	Pipe, 6" Flange Adapter	0.001	EA	$1.64	
	Pipe, 6" Valve w/ Stem/Box	0.001	EA	$7.12	
	Pipe, 8" Cap	0.001	EA	$0.53	

TABLE D-2a

Detailed Unit Cost Estimates for Water Collection, Conveyance, and Management TCDs

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

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Valve Vault Structure	0.001	EA	$6.33	
	Restoration - Seeding	0.001	AC	$1.70	subcontract
	Misc Detail Allowance	10%	LS	$7.37	road maint & repair, testing, detection tape, etc
PRESSURE-PIPE-2	**Pressurized Pipeline - 8"**	**1**	**LF**	**$86.72**	**single pipe, 30' deep avg depth, valve vault @1000'**
	Clear, Grub & Dispose	0.001	AC	$2.55	
	Excavate Trench	0.463	CY	$1.94	
	Bed & Zone	0.191	CY	$9.27	
	Native Backfill	0.260	CY	$2.59	
	Haul Waste Material	0.204	CY	$1.12	within 5 mile radius, clean material
	Trench Safety	1.000	LF	$5.00	trench box
	Dewatering: Two Sump Pmps	0.028	HR	$0.33	24 hr operaton x 4 for in stream
	Pipe, 8" HDPE, SDR 17	1.000	LF	$36.44	300'/day
	Pipe, 8" Tee Assembly	0.001	EA	$1.28	
	Pipe, 8" Flange Adapter	0.001	EA	$1.73	
	Pipe, 8" Valve w/ Stem/Box	0.001	EA	$8.06	
	Pipe, 8" Cap	0.001	EA	$0.59	
	Valve Vault Structure	0.001	EA	$6.33	
	Restoration - Seeding	0.001	AC	$1.71	subcontract
	Misc Detail Allowance	10%	LS	$7.78	road maint & repair, testing, detection tape, etc
PRESSURE-PIPE-2	**Pressurized Pipeline - 12"**	**1**	**LF**	**$91.46**	**single pipe, 30' deep avg depth, valve vault @1000'**
	Clear, Grub & Dispose	0.001	AC	$2.58	
	Excavate Trench	0.505	CY	$2.11	
	Bed & Zone	0.212	CY	$10.28	
	Native Backfill	0.264	CY	$2.63	
	Haul Waste Material	0.241	CY	$1.32	within 5 mile radius, clean material
	Trench Safety	1.000	LF	$5.00	trench box
	Dewatering: Two Sump Pmps	0.030	HR	$0.36	24 hr operaton x 4 for in stream
	Pipe, 12" HDPE, SDR 17	1.000	LF	$38.21	300'/day
	Pipe, 12" Tee Assembly	0.001	EA	$1.37	
	Pipe, 12" Flange Adapter	0.001	EA	$1.80	
	Pipe, 12" Valve w/ Stem/Box	0.001	EA	$8.89	
	Pipe, 12" Cap	0.001	EA	$0.65	
	Valve Vault Structure	0.001	EA	$6.33	
	Restoration - Seeding	0.001	AC	$1.72	subcontract
	Misc Detail Allowance	10%	LS	$8.19	road maint & repair, testing, detection tape, etc
PRESSURE-PIPE-2	**Pressurized Pipeline - 14"**	**1**	**LF**	**$105.48**	**single pipe, 30' deep avg depth, valve vault @1000'**
	Clear, Grub & Dispose	0.001	AC	$2.60	
	Excavate Trench	0.556	CY	$2.33	
	Bed & Zone	0.234	CY	$11.37	
	Native Backfill	0.282	CY	$2.81	
	Haul Waste Material	0.274	CY	$1.51	within 5 mile radius, clean material

TABLE D-2a

Detailed Unit Cost Estimates for Water Collection, Conveyance, and Management TCDs

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

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Trench Safety	1.000	LF	$5.00	trench box
	Dewatering: Two Sump Pmps	0.033	HR	$0.40	24 hr operaton x 4 for in stream
	Pipe, 14" HDPE, SDR 17	1.000	LF	$47.56	250'/day
	Pipe, 14" Tee Assembly	0.001	EA	$1.52	
	Pipe, 14" Flange Adapter	0.001	EA	$1.92	
	Pipe, 14" Valve w/ Stem/Box	0.001	EA	$10.19	
	Pipe, 14" Cap	0.001	EA	$0.74	
	Valve Vault Structure	0.001	EA	$6.33	Seventeen structures assumed
	Restoration - Seeding	0.001	AC	$1.74	subcontract
	Misc Detail Allowance	10%	LS	$9.45	road maint & repair, testing, detection tape, etc
PRESSURE-PIPE-3	**Pressurized Pipeline - 18"**	**1**	**LF**	**$176.44**	**single pipe, 30' deep avg depth, valve vault @1000'**
	Clear, Grub & Dispose	0.001	AC	$2.66	
	Excavate Trench	0.667	CY	$2.79	
	Bed & Zone	0.280	CY	$13.61	
	Native Backfill	0.321	CY	$3.20	
	Haul Waste Material	0.346	CY	$1.90	within 5 mile radius, clean material
	Trench Safety	1.000	LF	$5.00	trench box
	Dewatering: Two Sump Pmps	0.040	HR	$0.92	24 hr operation plus redundantt pump, pump to PS drain & to CTP
	Temporary Pipeline to PS Drain & Removal	1.000	LF	$42.57	allow for 8" above grade HDPE pipe & appurtenances
	Pipe, 18" HDPE, SDR 17	1.000	LF	$62.47	factored from 20"
	Pipe, 18" Tee Assembly	0.001	EA	$1.85	factored from 20"
	Pipe, 18" Flange Adapter	0.001	EA	$2.42	factored from 20"
	Pipe, 18" Valve w/ Stem/Box	0.001	EA	$12.11	factored from 20"
	Pipe, 18" Cap	0.001	EA	$0.97	factored from 20"
	Valve Vault Structure	0.001	EA	$6.33	Seventeen structures assumed
	Restoration - Seeding	0.001	AC	$1.78	subcontract
	Misc Detail Allowance	10%	LS	$15.87	road maint & repair, testing, detection tape, etc
PRESSURE-PIPE-3	**Pressurized Pipeline - 21"**	**1**	**LF**	**$183.12**	**5' cover, valve vault @1000'**
	Clear, Grub & Dispose	0.001	AC	$2.85	
	Excavate Trench	1.203	CY	$5.04	
	Bed & Zone	0.316	CY	$15.35	
	Native Backfill	0.797	CY	$7.95	
	Haul Waste Material	0.405	CY	$2.23	within 5 mile radius, clean material
	Trench Safety	1.000	LF	$5.00	trench box
	Dewatering: Two Sump Pmps	0.072	HR	$1.66	24 hr operation plus redundantt pump, pump to PS drain & to CTP
	Temporary Pipeline to PS Drain & Removal	1.000	LF	$42.57	allow for 8" above grade HDPE pipe & appurtenances
	Pipe, 21" HDPE, SDR 17	1.000	LF	$58.86	300'/day
	Pipe, 21" Tee Assembly	0.001	EA	$1.76	
	Pipe, 21" Flange Adapter	0.001	EA	$2.10	
	Pipe, 21" Valve w/ Stem/Box	0.001	EA	$12.21	
	Pipe, 21" Cap	0.001	EA	$0.86	
	Valve Vault Structure	0.001	EA	$6.33	Seventeen structures assumed

TABLE D-2a

Detailed Unit Cost Estimates for Water Collection, Conveyance, and Management TCDs

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

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Restoration - Seeding	0.001	AC	$1.90	subcontract
	Misc Detail Allowance	10%	LS	$16.44	road maint & repair, testing, detection tape, etc
PRESSURE-PIPE-4	**Pressurized Pipeline - 3"**	**1**	**LF**	**$154.69**	
	3" HDPE Vertical in Cherry Raise	1	LF	$85.62	SDR 15.5, 80'/day
	Supports & Hangers	1	LF	$5.00	asm 1/5', installation above
	Pipe Chase Improvements	1	LF	$50.00	allowance to replace rotted timbers, etc
	Misc Work	1	LS	$14,062.32	lights, acess, fittings, valves, etc

Notes:

AC = acre(s)
ACP = asphalt concrete paving
CDF = control density fill
CTP = central treatment plant
CY = cubic yards
EA = each
HDPE = high density polyethylene
HR = hour
LF = linear feet
LS = lump sum
PVC = polyvinyl chloride
SDR = standard dimension ratio
SF = square foot
SST = stainless steel
SY = square yards
TCD = typical conceptual design

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 D-2b

Detailed Unit Cost Estimates for Pump Station TCDs

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

TCD Code	Description	Unit	2009 Direct Capital Unit Cost	O&M %
PUMP-1	Pump Station - 0.14 MGD	EA	$29,300.00	100%
PUMP-2	Pump Station - 1.4 MGD	EA	$959,000.00	100%
PUMP-3	Pump Station - 3.9 MGD	EA	$1,025,000.00	100%
PUMP-4	Pump Station - 6.3 MGD	EA	$1,188,000.00	100%
PUMP-5	Pump Station - 6.5 MGD	EA	$1,208,000.00	100%

Notes:

EA = each

MGD = million gallons per day

TCD = typical conceptual design

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 D-3

Detailed Unit Cost Estimates for Water Treatment TCDs

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

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
WT01	**Centralized High-Denisty Sludge Treatment at CTP**				Costs for WT01 are included in Attachment D-1
WT02	**Semi-Passive Lime Treatment (Lineraized Cost)**		gpm	y = 2613x + 258722	O&M %: y = (4254.9x + 997357)/(2613x + 258722)
WT02	**Semi-Passive Lime Treatment**	**5**	**GPM**	**$233,951**	
5	**Lime Feed System**				
	Clear & Grub	0.50	AC	$2,748	entire area allowance
	Lime Feed/Storage System	1	LS	$21,133	quote + frt & markup [Aquafix]
	Lime	0.25	Ton	$109	quote + frt & markup [Aquafix] This system holds 500 lbs of lime.
	Concrete Pad	6	CY	$3,972	assume 10' sq
	Building over Equipment	100	SF	$20,000	3-sided metal shed, foundation, no lighting
	500-gallon propane tank for heating	1	LS	$2,200	lump sum estimate by Aquafix
	Conveyance Channel	**100**	**LF**		
	Excavation	122	CY	$2,080	assume 100' long, 2'w @ bottom, 3:1 slopes, 3'd
	Waste	122	CY	$293	2 trucks, dispose nearby
	Riprap	85	CY	$4,255	assume 12" thick
	Settling Ponds and Bypass	**2**	**EA**		
	Cut & Fill	1,180	CY	$24,318	assume balance cut & fill, From design spreadsheet: Volume pond = 2612 cf, Liquid depth = 10 ft., Area (avg) = 261 sf
	Liner Fill	380	CY	$18,042	6" under & over, prorated quantity
	Lining	1,120	SY	$12,661	single 60mil HDPE, prorated quantity
	Site Fencing, Gates & Signage	480	LF	$12,000	subcontract
	Bird Deterrent	1,120	SY	$5,600	subcontract
	6" HDPE Pipeline	230	LF	$15,901	5' cover; This assumes 100 ft of pipe to the ponds, 100 ft. of pipe between the 2 ponds, and 30 ft of pipe for the bypass. The bypass was determined to be 150% of the diameter of the two ponds.
	6" Knife Gate Valve & Vault	4	EA	$24,727	
	Effluent and Emergency Channel	**310**	**LF**		This assumes a 50' effluent channel and a 260' (100' conveyance, 60' diameter of ponds, 100' in between ponds - see figure) emergency channel to protect the ponds.
	Excavation	379	CY	$6,449	assume 310' long, 2'w @ bottom, 3:1 slopes, 3'd
	Waste	379	CY	$908	2 trucks, dispose nearby
	Riprap	264	CY	$13,189	assume 12" thick
	Misc Detail Allowance	20%	LS	$38,117	testing, startup, other TESC, etc

TABLE D-3

Detailed Unit Cost Estimates for Water Treatment TCDs

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

TCD Code		Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
WT02		**Semi-Passive Lime Treatment**	**50**	**GPM**	**$428,994**	
	50	**Lime Feed System**				
		Clear & Grub	0.50	AC	$2,748	entire area allowance
		Lime Feed/Storage System	1	LS	$29,933	quote + frt & markup
		Lime	2	Ton	$875	quote + frt & markup; This system holds 2 tons of lime.
		Concrete Pad	6	CY	$3,972	assume 10' sq
		Building over Equipment	100	SF	$20,000	3-sided metal shed, foundation, no lighting
		500-gallon propane tank for heating	1	LS	$2,200	lump sum estimate by Aquafix
		Conveyance Channel	**100**	**LF**		
		Excavation	122	CY	$2,080	assume 100' long, 2'w @ bottom, 3:1 slopes, 3'd
		Waste	122	CY	$293	2 trucks, dispose nearby
		Riprap	85	CY	$4,255	assume 12" thick
		Settling Ponds and Bypass	**2**	**EA**		
		Cut & Fill	4,960	CY	$102,220	assume balance cut & fill
		Liner Fill	840	CY	$39,882	6" under & over
		Lining	2,520	SY	$28,487	single 60mil HDPE
		Site Fencing, Gates & Signage	1,120	LF	$28,000	subcontract
		Bird Deterrent	2,520	SY	$12,600	subcontract
		6" HDPE Pipeline	290	LF	$20,049	5' cover; This assumes 100 ft of pipe to the ponds, 100 ft. of pipe between the 2 ponds, and 90 ft of pipe for the bypass. The bypass was determined to be 150% of the diameter of the two ponds.
		6" Knife Gate Valve & Vault	4	EA	$24,727	
		Effluent and Emergency Channel	**430**	**LF**		This assumes a 50' effluent channel and a 380' (100' conveyance, 180' diameter of ponds, 100' in between ponds - see figure) emergency channel to protect the ponds.
		Excavation	526	CY	$8,953	assume 380' long, 2'w @ bottom, 3:1 slopes, 3'd
		Waste	526	CY	$1,261	2 trucks, dispose nearby
		Riprap	366	CY	$18,280	assume 12" thick
		Misc Detail Allowance	20%	LS	$70,163	testing, startup, other TESC, etc
WT02		**Semi-Passive Lime Treatment**	**1,000**	**GPM**	**$2,869,940**	
	1000	**Lime Feed System**				
		Clear & Grub	1.00	AC	$5,496	entire area allowance
		Lime Feed/Storage System	1	LS	$117,933	quote + frt & markup
		Lime	18	Ton	$7,878	quote + frt & markup

TABLE D-3

Detailed Unit Cost Estimates for Water Treatment TCDs

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

TCD Code		Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
		Concrete Pad	13	CY	$8,938	assume 15' sq
		Building over Equipment	100	SF	$20,000	3-sided metal shed, foundation, no lighting
		500-gallon propane tank for heating	1	LS	$2,200	lump sum estimate by Aquafix
		Conveyance Channel	**100**	**LF**		
		Excavation	122	CY	$2,080	assume 100' long, 2'w @ bottom, 3:1 slopes, 3'd
		Waste	122	CY	$293	2 trucks, dispose nearby
		Riprap	85	CY	$4,255	assume 12" thick
		Settling Ponds and Bypass	**2**	**EA**		
		Cut & Fill	63,000	CY	$1,298,359	assume balance cut & fill; Volume pond = 522,413 cf, Liquid depth = 10 ft., Area (avg) = 52,241 sf
		Liner Fill	6,000	CY	$284,871	6" under & over
		Lining	17,900	SY	$202,349	single 60mil HDPE
		Site Fencing, Gates & Signage	4,320	LF	$108,000	subcontract
		Bird Deterrent	17,900	SY	$89,500	subcontract
		12" HDPE Pipeline	590	LF	$86,299	5' cover; This assumes 100 ft of pipe to the ponds, 100 ft. of pipe between the 2 ponds, and 390 ft of pipe for the bypass. The bypass was determined to be 150% of the diameter of the two ponds.
		12" Knife Gate Valve & Vault	4	EA	$43,090	allowance
		Bypass System	1	LS	$14,727	pipe, fittings, valves, vaults, etc
		Effluent and Emergency Channel	**1,030**	**LF**		This assumes a 50' effluent channel and a 980' (100' conveyance, 780' diameter of ponds, 100' in between ponds) emergency channel to protect the ponds.
		Excavation	1,259	CY	$21,428	assume 1030' long, 2'w @ bottom, 3:1 slopes, 3'd
		Waste	1,259	CY	$3,017	2 trucks, dispose nearby
		Riprap	877	CY	$43,822	assume 12" thick
		Misc Detail Allowance	20%	LS	$472,907	testing, startup, other TESC, etc
WT03		**Semi-Passive SRB Treatment (Linearized Cost)**		gpm	y = 6482.4x + 132414	O&M %: y = (3012.9x + 526116)/(6482.4x + 132414)
WT03		**Semi-Passive SRB Treatment**	**5**	**GPM**	**$164,753**	
	5	**SRB Ponds**	**2**	**EA**		
		Clear & Grub	0.25	AC	$1,374	entire area allowance
		Cut & Fill	264	CY	$5,441	assume balance earthwork;SRB depth = 10 ft, SRB Area = 361 sf
		Liner Fill	170	CY	$8,071	6" under & over

TABLE D-3

Detailed Unit Cost Estimates for Water Treatment TCDs

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

TCD Code		Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
		Lining	560	SY	$6,330	60mil HDPE
		Stable Waste	203	CY	$7,953	75% of excavation, 0.5TN/CY, quote + markup
		Lime	68	CY	$5,479	25% of excavation, 1.25TN/CY, quote + markup, mix in-place
		Flow Distribution Piping	2	EA	$7,496	allowance
		Passive Aeration Channel	**100**	**LF**		
		Excavation	122	CY	$2,080	assume 100' long, 2'w @ bottom, 3:1 slopes, 3'd
		Waste	122	CY	$293	2 trucks, dispose nearby
		Riprap	85	CY	$4,255	assume 12" thick
		Aerobic Polishing Pond	**1**	**EA**		
		Cut & Fill	60	CY	$1,237	assume balance earthwork
		Wetland	**1**	**EA**		
		Cut & Fill	10	CY	$2,748	assume balance earthwork
		Wetland Planting	11	SY	$111	cattails, allowance
		Other including bypass				
		Site Fencing, Gates & Signage	600	LF	$15,000	subcontract, assume 1/2 acre
		Bird Deterrent	1,200	SY	$6,000	subcontract, assume 1/4 acre
		6" HDPE Pipeline	270	LF	$18,666	5' cover; This assumes 100 ft of pipe to the ponds, 100 ft. of pipe between the 2 ponds, and 70 ft of pipe for the bypass. The bypass was determined to be 150% of the diameter of the two SRB ponds.
		6" Knife Gate Valve & Vault	4	EA	$24,727	
		Effluent and Emergency Channel	**370**	**LF**		assumes a 50' effluent and 320' emergency channel
		Excavation	452	CY	$7,698	assume 320' long, 2'w @ bottom, 3:1 slopes, 3'd
		Waste	452	CY	$1,084	2 trucks, dispose nearby
		Riprap	315	CY	$15,742	assume 12" thick
		Misc Detail Allowance	20%	LS	$19,362	testing, startup, other TESC, etc
WT03		**Semi-Passive SRB Treatment**	**50**	**GPM**	**$456,608**	
	50	**SRB Ponds**	**2**	**EA**		
		Clear & Grub	0.50	AC	$2,748	entire area allowance
		Cut & Fill	1,970	CY	$40,599	assume balance earthwork
		Liner Fill	400	CY	$18,991	6" under & over
		Lining	2,200	SY	$24,870	60mil HDPE
		Stable Waste	2,006	CY	$78,767	75% of excavation, 0.5TN/CY, quote + markup
		Lime	669	CY	$54,264	25% of excavation, 1.25TN/CY, quote + markup, mix in-place
		Flow Distribution Piping	2	EA	$7,496	allowance

TABLE D-3

Detailed Unit Cost Estimates for Water Treatment TCDs

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

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Passive Aeration Channel	**100**	**LF**		
	Excavation	122	CY	$2,080	assume 100' long, 2'w @ bottom, 3:1 slopes, 3'd
	Waste	122	CY	$293	2 trucks, dispose nearby
	Riprap	85	CY	$4,255	assume 12" thick
	Aerobic Polishing Pond	**1**	**EA**		
	Cut & Fill	400	CY	$8,244	assume balance earthwork
	Wetland	**1**	**EA**		
	Cut & Fill	50	CY	$13,739	assume balance earthwork
	Wetland Planting	278	SY	$2,778	cattails, allowance
	Other including bypass				
	Site Fencing, Gates & Signage	800	LF	$20,000	subcontract, assume 1 acre
	Bird Deterrent	2,400	SY	$12,000	subcontract, assume 1/2 acre
	6" HDPE Pipeline	410	LF	$28,345	5' cover; This assumes 100 ft of pipe to the ponds, 100 ft. of pipe between the 2 ponds, and 210 ft of pipe for the bypass. The bypass was determined to be 150% of the diameter of the two SRB ponds, polishing pond, and wetland.
	6" Knife Gate Valve & Vault	4	EA	$24,727	
	Effluent and Emergency Channel	**590**	**LF**		assumes a 50' effluent and a 540' emergency channel
	Excavation	721	CY	$12,275	assume 590' long, 2'w @ bottom, 3:1 slopes, 3'd
	Waste	721	CY	$1,728	2 trucks, dispose nearby
	Riprap	503	CY	$25,102	assume 12" thick
	Misc Detail Allowance	20%	LS	$64,091	testing, startup, other TESC, etc
WT03	**Semi-Passive SRB Treatment**	**1,000**	**GPM**	**$6,614,763**	
1000	**SRB Ponds**	**2**	**EA**		
	Clear & Grub	4.55	AC	$24,980	entire area allowance
	Cut & Fill	60,000	CY	$1,236,532	assume balance earthwork
	Liner Fill	8,000	CY	$379,828	6" under & over
	Lining	22,000	SY	$248,698	60mil HDPE
	Stable Waste	40,101	CY	$1,574,990	75% of excavation, 0.5TN/CY, quote + markup
	Lime	13,367	CY	$1,085,046	25% of excavation, 1.25TN/CY, quote + markup, mix in-place
	Flow Distribution Piping	2	EA	$7,496	allowance
	Passive Aeration Channel	**100**	**LF**		
	Excavation	122	CY	$2,080	assume 100' long, 2'w @ bottom, 3:1 slopes, 3'd
	Waste	122	CY	$293	2 trucks, dispose nearby
	Riprap	85	CY	$4,255	assume 12" thick

TABLE D-3

Detailed Unit Cost Estimates for Water Treatment TCDs

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

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Aerobic Polishing Pond	**1**	**EA**		
	Cut & Fill	10,800	CY	$222,576	assume balance earthwork
	Wetland	**1**	**EA**		
	Cut & Fill	600	CY	$164,871	assume balance earthwork
	Wetland Planting	1,202	SY	$12,018	cattails, allowance
	Other including bypass				
	Site Fencing, Gates & Signage	2,000	LF	$50,000	subcontract, assume 6 acre
	Bird Deterrent	24,000	SY	$120,000	subcontract, assume 5 acre
	12" HDPE Pipeline	1,110	LF	$162,359	5' cover; This assumes 100 ft of pipe to the ponds, 100 ft. of pipe between the 2 ponds, and 910 ft of pipe for the bypass. The bypass was determined to be 150% of the diameter of the two SRB ponds.
	12" Knife Gate Valve & Vault	4	EA	$43,090	allowance
	Effluent and Emergency Channel	**1,720**	**LF**		assumes a 50' effluent and a 1670' emergency channel
	Excavation	2,102	CY	$35,784	assume 1720' long, 2'w @ bottom, 3:1 slopes, 3'd
	Waste	2,102	CY	$5,038	2 trucks, dispose nearby
	Riprap	1,465	CY	$73,179	assume 12" thick
	Misc Detail Allowance	20%	LS	$1,044,542	testing, startup, other TESC, etc
WT04a	**Semi-Passive SR-PRB Treatment**	**11,250**	**CF**	**$19,522**	
10' Deep	Clear & Grub	0.07	AC	$378	150'x20'
	Excavation	417	CY	$3,546	100'Lx7.5'Wx15'D;PRB will be 10' deep, 5' of excavation on top
	Waste	278	CY	$666	2 trucks, dispose nearby
	Stable Waste	208	CY	$5,066	75% of excavation, 0.5TN/CY, quote + markup
	Lime	69	CY	$6,931	25% of excavation, 1.25TN/CY, quote + markup, mix in-place
	Misc Detail Allowance	15%	LS	$2,488	testing, startup, other TESC, etc
		7,500			100'Lx7.5'Wx10'D This accounts for only the PRB. See 'P11" for entire excavation.

TABLE D-3

Detailed Unit Cost Estimates for Water Treatment TCDs

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

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
WT04b	**Semi-Passive SR-PRB Treatment**	**33,750**	**CF**	**$117,985**	
40' Deep	Clear & Grub	0.17	AC	$946	150'x50'
	Excavation	1,250	CY	$24,300	100'Lx7.5'Wx45'D; PRB will be 40' deep, 5' of excavation on top
	Waste	1,111	CY	$2,663	2 trucks, dispose nearby
	Stable Waste	833	CY	$28,574	75% of excavation, 0.5TN/CY, quote + markup
	Lime	278	CY	$36,352	25% of excavation, 1.25TN/CY, quote + markup, mix in-place
	Misc Detail Allowance	25%	LS	$23,209	testing, startup, other TESC, safety, dewatering, rock issure etc
		30,000			100'Lx7.5'Wx40'D This accounts for only the PRB. See 'P11" for entire excavation.

Notes:

AC = acre(s)
CTP = central treatment plant
CY = cubic yards
EA = each
HDPE = high density polyethylene
LS = lump sum
SRB = sulfate reducing bioreactor
SR-PRB = sulfate reducing permeable reactive barrier
SY = square yards
TESC = temporary erosion and sediment control

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 D-4

Detailed Unit Cost Estimates for Human Health TCDs

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

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
HH-2	**Upland Waste Pile Soil Cover**	**1**	**AC**	**$58,443.08**	
	Regrade Waste Rock	4,840	CY	$5.25	assume 5' deep
	Vegetative Cover	1,613	CY	$15.94	based on CIA estimate
	Grade Surface Drainage Ditch	400	CY	$3.78	assume 400' & 1cy/LF
	Hydroseed	4840	SY	$0.41	Bunker Hill estimates
	Miscellaneous	1	LS	$3,823.73	
HH-3	**Millsite Decontamination**	1	EA	**$135,800.00**	
HH-4	**Millsite Demolition/Disposal**	**100**	**CY**	**$168.60**	
	Demolish and Dispose in Solid Waste Landfill	75	CY	$67.90	
	Disposal of Hazardous Waste	25	TN	$407.40	
	Miscellaneous	1	LS	$1,582.07	

Notes:

AC = acre(s)
CIA = central impoundment area
CY = cubic yards
EA = each
LS = lump sum
SY = square yards
TCD = typical conceptual design

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 D-5

Detailed Unit Cost Estimates for Stream and Riparian Cleanup Action TCDs

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

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
CD-1	**Current Deflector-Groynes (Spur Dikes, Spurs)**	**1**	**EA**	**$2,005.22**	high end of cost range
	Rock	3	EA	$135.80	
	Log	3	EA	$108.64	
	Installation	1	LS	$1,089.61	assume 2 hours
	Misc Work	1	LS	$182.29	stream diversion, eros/sed control, etc
CD-2	**Current Deflector-Bank Deflector with Root Wad**	**1**	**EA**	**$1,674.82**	
	Riprap	20	CY	$27.16	allow 20cy
	Orientation Log	4	EA	$108.64	
	Installation	1	LS	$544.80	assume 1 hour
	Misc Work	1	LS	$152.26	stream diversion, eros/sed control, etc
CD-3	**Current Deflector-Riprap Groynes & Orientation Effect**	**1**	**EA**	**$1,915.59**	
	Riprap	20	CY	$27.16	allow 20cy
	Log	1	EA	$108.64	
	Installation	1	LS	$1,089.61	assume 2 hours
	Misc Work	1	LS	$174.14	stream diversion, eros/sed control, etc
CD-4	**Current Deflector-Log Weir & Dam Structure**	**1**	**EA**	**$2,806.17**	
	Riprap	10	CY	$27.16	allow 10cy
	Streambed Gravel	10	CY	$33.95	allow 10cy
	Logs, Posts & Braces	1	LS	$271.60	
	Filter Cloth	1	LS	$33.95	
	Installation	1	LS	$1,634.41	assume 3 hours
	Misc Work	1	LS	$255.11	stream diversion, eros/sed control, etc
CD-5	**Current Deflector-Angled Vortex Rock Weir w/Rootwads**	**1**	**EA**	**$1,915.59**	
	Riprap	20	CY	$27.16	allow 10cy
	Rootwad & Anchor	1	EA	$108.64	
	Installation	1	LS	$1,089.61	assume 2 hours
	Misc Work	1	LS	$174.14	stream diversion, eros/sed control, etc
CD-6	**Current Deflector-Riprap Turning Rock Wall**	**1**	**EA**	**$2,093.09**	
	Riprap	50	CY	$27.16	allow 50cy
	Installation	1	LS	$544.80	assume 1 hour
	Misc Work	1	LS	$190.28	stream diversion, eros/sed control, etc
CD-7	**Current Deflector-Riprap Tieback**	**1**	**EA**	**$2,035.10**	
	Riprap	20	CY	$27.16	allow 20cy
	Log	2	EA	$108.64	
	Installation	1	LS	$1,089.61	assume 2 hours
	Misc Work	1	LS	$185.01	stream diversion, eros/sed control, etc
CD-AVG	**Current Deflector, Average Cost**	**1**	**EA**	**$2,063.65**	average cost from above
CD-SED	**Current Deflectors, Sediment Traps**	**1**	**EA**	**$1,870.00**	from 2007 URS Cost Update Memo

TABLE D-5

Detailed Unit Cost Estimates for Stream and Riparian Cleanup Action TCDs

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

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
VBS-1	**Brush Mattress w/Rock Toe**	**1**	**LF**	**$52.05**	
	Rock Toe	0.5	CY	$38.06	excavate & place
	Wire or Jute Rope & Stakes	10	SF	$1.36	
	Topsoil	0.2	CY	$16.66	6"th
	Fascines	1	LS	$6.79	allowance
	Installation	1	LF	$4.59	assume 500'/day
	Misc Work	1	LS	$4.73	stream diversion, eros/sed control, etc
VBS-2	**Brush Layer**	**1**	**LF**	**$27.69**	
	Wire or Jute Rope & Stakes	10	SF	$1.36	
	Topsoil	0.1	CY	$16.66	
	Fascines	1	LS	$6.79	allowance
	Installation	1	LF	$4.59	assume 500'/day
	Misc Work	1	LS	$1.07	eros/sed control, etc
VBS-3	**Live Stake, Live Post & Joint Planted Fascines**	**1**	**LF**	**$76.25**	
	Riprap	1	CY	$27.16	
	Joint Planted Fascine	2	EA	$2.72	
	Live Stake	5	EA	$1.36	6"th
	Live Post	3	EA	$2.72	
	Installation	1	LS	$21.79	assume 200'/day
	Misc Work	1	LS	$6.93	stream diversion, eros/sed control, etc
VBS-AVG	**Vegetative Bank Stabilization, Average Cost**	**1**	**LF**	**$52.00**	average cost from above
BSBR-1	**Vegetated Geogrid**	**1**	**LF**	**$112.24**	
	Soil Excavation	2	CY	$5.45	assume 2cy/LF
	Waste	2	CY	$2.72	dispose on tailings pile
	Filter Layer	0.09	CY	$1.36	assume 5' x 6"th
	Rock Blanket	0.44	CY	$44.67	quote for Bunker Hill projects, 20cy/hour
	Topsoil	1.11	CY	$16.66	assume 6' x 5'th
	Coir Geotextile	3	SY	$1.36	assume 3sy/LF
	Live Branches	5	EA	$0.68	
	Live Stakes	5	EA	$1.36	
	Straw Matting	2	SY	$2.04	assume 2sy/LF
	Installation	1	LS	$28.87	assume 150'/day
	Misc Work	1	LS	$10.20	stream diversion, eros/sed control, etc
BSBR-2	**Live Cribwall**	**1**	**LF**	**$206.54**	
	Soil Excavation	2	CY	$5.45	assume 2cy/LF
	Waste	2	CY	$2.72	dispose on tailings pile
	Timbers	36	BF	$1.36	assume 6x6 timbers & 36BF/LF
	Rock Fill	0.44	CY	$26.32	quote for Bunker Hill projects
	Topsoil	1.11	CY	$16.66	assume 6' x 5'th
	Anchor	0.01	EA	$67.90	assume 100'oc allow cost
	Live Branches	5	EA	$0.68	
	Drain Rock	1	CY	$44.67	quote for Bunker Hill projects, 20cy/hour

TABLE D-5

Detailed Unit Cost Estimates for Stream and Riparian Cleanup Action TCDs

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

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Installation	1	LS	$43.58	assume 100'/day
	Misc Work	1	LS	$18.78	stream diversion, eros/sed control, etc
BSBR-3	**Low Energy Tree Revetment**	**1**	**LF**	**$61.35**	
	Soil Excavation	1	CY	$5.45	assume 1cy/LF
	Backfill	1	CY	$5.45	assume excavated material backfill & compact around logs
	Logs	0.20	EA	$108.64	assume 5' spacing, allow cost
	Revegetate Bank	1.00	SY	$1.36	1sy/LF
	Installation	1	LS	$21.79	assume 200'/day
	Misc Work	1	LS	$5.58	stream diversion, eros/sed control, etc
BSBR-4	**Moderate Energy Tree Revetment**	**1**	**LF**	**$104.27**	
	Soil Excavation	2	CY	$5.45	assume 1cy/LF
	Waste	1	CY	$2.72	dispose on tailings pile
	Backfill	1	CY	$5.45	assume excavated material backfill & compact around logs
	Logs	0.20	EA	$108.64	assume 10' spacing, allow cost for footer, header & rootwad
	5-man Rock	0.07	EA	$135.80	assume 15' spacing, allow cost
	Deadman	0.01	EA	$67.90	assume 100' spacing, allow cost
	Live Stakes & Posts	10.00	EA	$1.36	assume 10/LF
	Revegetate Bank	1.00	SY	$1.36	1sy/LF
	Installation	1	LS	$28.87	assume 150'/day
	Misc Work	1	LS	$9.48	stream diversion, eros/sed control, etc
BSBR-5	**Tree Deflector**	**1**	**LF**	**$90.48**	
	Soil Excavation	1	CY	$5.45	assume 1cy/LF
	Backfill	1	CY	$5.45	assume excavated material backfill & compact around logs
	Trees	0.10	EA	$108.64	assume 10' spacing, allow cost
	Connector Cable	1.00	LF	$2.72	
	Deadman & Cable	0.03	EA	$67.90	assume 40' spacing, allow cost
	Rock Anchor & Leash	0.10	EA	$203.70	assume 10' spacing, allow cost
	Live Stakes & Posts	10.00	EA	$1.36	assume 10/LF
	Installation	1	LS	$21.79	assume 200'/day
	Misc Work	1	LS	$8.23	stream diversion, eros/sed control, etc
BSBR-6	**Woody Debris & Vegetated Geogrid System**	**1**	**LF**	**$156.70**	
	Soil Excavation	1	CY	$5.45	assume 2cy/LF
	Backfill	1	CY	$5.45	assume excavated material backfill & compact around logs
	Logs	0.10	EA	$108.64	assume 10' spacing, allow cost
	Rock Filter Layer	0.09	CY	$21.73	assume 5' x 6"th
	Riprap	1.00	CY	$27.16	assume 1cy/LF
	Rock Anchor & Leash	0.10	EA	$203.70	assume 10' spacing, allow cost

TABLE D-5

Detailed Unit Cost Estimates for Stream and Riparian Cleanup Action TCDs

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

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	5-man Rock	0.07	EA	$135.80	assume 15' spacing, allow cost
	Topsoil	1.11	CY	$16.66	assume 6' x 5'th
	Coir Geotextile	3	SY	$1.36	assume 3sy/LF
	Live Branches	5	EA	$0.68	
	Live Stakes & Posts	5	EA	$1.36	
	Installation Cost	1	LS	$28.87	assume 150'/day
	Misc Work	1	LS	$14.25	stream diversion, eros/sed control, etc
BSBR-Avg	**Bioengineered Revetments, Average Cost**	**1**	**LF**	**$121.93**	average cost from above
FP/RP-1a	**Floodplain and Riparian Planting**	**1**	**SF**	**$0.54**	bank width/LF of river variable
	Site Prep	0.01	CY	$2.72	assume 4" deep average grading
	Soil Ammendments	0.01	CY	$1.73	
	Live Planting	0.1	EA	$1.36	assume 1cy/LF
	Tree Planting	0.1	EA	$2.72	allow cost
	Hydroseeding	0.1	SY	$0.41	Bunker Hill estimates
	Misc Work	1	LS	$0.05	stream diversion, eros/sed control, etc
FP/RP-1b	**Floodplain Planting**	**1**	**SF**	**$2.14**	
	Soil Excavation	0.01	CY	$5.45	assume trenches 5' apart & 10'long each side, 1cy/LF
	Backfill	0.01	CY	$5.45	assume excavated material backfill & compact around logs
	Riprap	0.01	CY	$54.40	assume 1cy/LF
	Live Branches	2	EA	$0.70	allow cost
	Installation Cost	0.01	LS	$9.19	assume 500'/day
	Misc Work	0.01	LS	$0.21	stream diversion, eros/sed control, etc
FP/RP-Avg	**Floodplain and Riparian Planting, Average Cost**	**1**	**SF**	**$1.34**	
OFFCH-1	**Groundwater-Fed Side Channel**	**6,050**	**SY**	**$23.76**	assume 1/2 hectare as typical size = approx 1.25 acre
	Cut & Fill	2,017	CY	$5.45	assume 1' deep over entire area
	Stream Gravel	2,017	CY	$39.40	assume 1' deep
	Riprap	100	CY	$54.40	allow quantity
	LWD etc	50	EA	$135.80	assume 2' spacing, allow cost
	Misc Work	1	LS	$41,067.86	stream diversion, eros/sed control, etc
OFFCH2-3	**Surface-Fed Side Channel**	**167**	**SY**	**$41.64**	assume 15'w, sloped 3h:1v, 5'd
	Cut & Fill	56	CY	$5.45	assume 1' deep over entire area
	Stream Gravel	56	CY	$39.40	assume 1' deep
	Riprap	20	CY	$54.40	assume quantity
	LWD etc	10	EA	$135.80	assume quantity
	Misc Work	1	LS	$1,982.95	stream diversion, eros/sed control, etc

TABLE D-5

Detailed Unit Cost Estimates for Stream and Riparian Cleanup Action TCDs

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

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
OFFCH-3	**Off-Channel Pond**	**556**	**SY**	**$62.56**	assume 50'w, sloped 3h:1v, 5'd
	Soil Excavation	1,204	CY	$5.45	assume 5' deep & slope allowance
	Waste	1,204	CY	$6.86	
	Stream Gravel	185	CY	$39.40	assume 1' deep
	LWD etc	20	EA	$135.80	assume quantity
	Misc Work	1	LS	$9,930.88	
OFFCH-Avg	**Off-Channel Hydrologic Features, Average Cost**	**2,257**	**SY**	**$42.65**	
CH REAL-1	**Channel Realignment**	**100**	**SY**	**$42.19**	
	Soil Excavation	133	CY	$5.45	assume 3' deep including slope allowance
	Waste	133	CY	$6.86	
	Stream Gravel	44	CY	$39.40	assume 1' deep
	Misc Work	1	LS	$843.75	bank stabilization & restoration

Notes:

BF = board foot
CY = cubic yards
EA = each
LF = linear feet
LS = lump sum
SF = square foot
SY = square yards
TCD = typical conceptual design

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 D-6

Summary of Cost Assumptions and Limitations for Source Control TCDs

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

TCD Code	Description	Assumptions/Limitations	
		2009 Direct Capital Unit Cost	O&M Costs
C01	Excavation	Assumes excavator (trackhoe), excavation above water table. Does not include hauling and dewatering, if needed.	Assumes complete removal.
C01b	Sediment Excavation	Assumes 60% excavation above water table, 40% below water table, with replacement of 25% of excavated sediment with imported backfill.	Assumes complete removal.
C02a	Regrade/Consolidate/Revegetate	Waste pile on hillside. Assumes average regrading depth of 5 ft.	Repair of damaged cap components potentially largest O&M element: assumed 5% of cap area repaired at year 2, 2.5% at year 5, and 1% every 5 years thereafter. O&M would also include inspections and monitoring.
C02b	Regrade/Consolidate/Revegetate	Waste pile in drainage. Assumes average regrading depth of 13 ft.	
C02c	Regrade/Consolidate/Revegetate	For slopes steeper than 1.5H:1V. Riprap used for erosion protection below nominal 100-year flood elevation.	
C03	Low-Permeability Cap	Uses GCL for low permeability layer. Low-permeability native soil or native soil amended with bentonite are other options.	
C04	Low-Permeability Cap with Seepage Collection	Same as C03, with groundwater collection and diversion trench.	
C05	Low-Permeability Cap with Erosion Protection	Same as C03, with addition of riprap toe.	
C06	Waste Consolidation Area with Erosion Protection	Assumes 25 ft waste thickness. Assumes GCL and 1 acre cap.	
C07	Waste Consolidation Area Above Flood Level	Cost does include a 1/2 mile haul. Assumes 25 ft waste thickness. Assumes GCL and 1 acre cap.	
C08a	Repository, 1 million cy	Cost does not include hauling. Assumes bottom liner and leachate collection system. Land acquisition costs are not included.	Includes two 16 hr inspections/year (1 spring and 1 winter) and two storm event inspections/year; Assumes 2% of capital cost for annual repairs and maintenance; Quarterly sampling and analysis
C09	Impoundment Closure	Includes regrading to 3H:1V sideslope and placement of GCL cap.	Repair of damaged cap components potentially largest O&M element: assumed 5% of cap area repaired at year 2, 2.5% at year 5, and 1% every 5 years thereafter. O&M would also include inspections and monitoring.
HAUL-2	Haul to Repository	Cost is in units of CY-MI.	No O&M costs.

Notes:

CY = cubic yards
GCL = geosynthetic clay liner
O&M = operation and maintenance
TCD = typical conceptual design

TABLE D-7

Summary of Cost Assumptions and Limitations for Water Collection, Conveyance, and Management TCDs

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

		Assumptions/Limitations	
TCD Code	**Description**	**2009 Direct Capital Unit Cost**	**O&M Costs**
C10	Adit Drainage Collection	Costs for water treatment not included. Does not incorporate full adit seal, infiltration control, or management of water levels inside mine.	Inspections and sediment removal.
C11a	Slurry Wall (no drain) - 15 feet deep	Used for hydraulic isolation of stream reaches or discrete facilities. When used for stream reaches, cost is per linear foot of stream, one side of stream. Assumes excavated with excavator (track hoe). Assumed no excavated material reusable as backfill.	No O&M costs.
C11b	Slurry Wall (no drain) - 20 feet deep		
C11c	Slurry Wall (no drain) - 30 feet deep		
C11d	Slurry Wall (no drain) - 40 feet deep		
C11e	Slurry Wall (no drain) - 45 feet deep		
C11f	Slurry Wall (no drain) - 50 feet deep		
C11g	Slurry Wall (no drain, soil cement) - 50 feet deep		
C11h	Slurry Wall (with drain) - 15 feet deep		Inspections and drain cleanout.
C11i	Slurry Wall (with drain) - 20 feet deep		
C11j	Slurry Wall (with drain) - 30 feet deep		
C14a	Stream Lining - 10 feet wide	Assumes average bottom width of channel over entire length of application.	Routine inspection and maintenance.
C14b	Stream Lining - 20 feet wide		
C14c	Stream Lining - 100 feet wide		
C15a	French Drain - 10 feet deep	Water treatment not included in drain cost.	Inspections and drain cleanout.
C15b	French Drain - 15 feet deep		
C15c	French Drain - 20 feet deep		
C15d	French Drain - 25 feet deep		
C17a	Extraction Well - 20 feet deep (6" wide)	Costs do not include effluent piping.	Inspection, maintenance. Replacement of pumps.
C17b	Extraction Well - 40 feet deep (6" wide)		
C17c	Extraction Well - 50 feet deep (6" wide)		
C17d	Extraction Well - 50 feet deep (10" wide)		
C17e	Extraction Well - 70 feet deep (10" wide)		
C18	SFCDR Diversion	Includes coffer dam on both sides of cutoff wall.	No O&M costs.
C19	I-90 Crossing	Assumes 130' cutoff wall beneath I-90.	No O&M costs.
C20	Check Dam	Dam height and material dependent upon water flowrate and chemistry.	No O&M costs.
PIPE-1	Gravity Pipeline - 6"	All pipelines trenched and buried. No unusual geographic, soils, or groundwater conditions. Land acquisition costs not included.	Assumed 2% replacement every 5 years.
PIPE-2	Gravity Pipeline - 12"		
PIPE-3	Gravity Pipeline - 24"		
PIPE-4	Gravity Pipeline - 36"		
PRESSURE-PIPE-1	Pressurized Pipeline - < 6" diameter	All pipelines trenched and buried. No unusual geographic, soils, or groundwater conditions. Land acquisition costs not included.	Assumed 2% replacement every 5 years.
PRESSURE-PIPE-2	Pressurized Pipeline - < 6"-14" diameter		
PRESSURE-PIPE-3	Pressurized Pipeline - >14" diameter		
PRESSURE-PIPE-4	Pressurized Pipeline - 3" diameter		
PUMP-1	Pump Station - 0.14 MGD	Costs developed using CPES assuming maximum flow.	Inspection, maintenance. Replacement of pumps.
PUMP-2	Pump Station - 1.4 MGD		
PUMP-3	Pump Station - 3.9 MGD		
PUMP-4	Pump Station - 6.3 MGD		
PUMP-5	Pump Station - 6.5 MGD		

Notes:

MGD = million gallons per day

O&M = operation and maintenance

TCD = typical conceptual design

TABLE D-8

Summary of Cost Assumptions and Limitations for Water Treatment TCDs

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

		Assumptions/Limitations	
TCD Code	**Description**	**2009 Direct Capital Unit Cost**	**O&M Costs**
WT02	Onsite Semi-Passive Water Treatment Using Lime Addition and Settling Pond(s)	Includes a Lime feed system, conveyance channel, 2 settling ponds with bypass functionality, and an effluent and emergency channel	Includes cleaning of ponds (with a 50% liner replacement) at years 10 and 20. Includes lime replacement based on usage determined by design criteria. Includes monitoring 4 times/year Includes miscellaneous O&M at 8% of direct capital cost
WT03	Onsite Semi-Passive Water Treatment Using SRB System	Includes 2 SRB ponds, a passive aeration channel, an aerobic polishing pond, a wetland, and an effluent and emergency channel	Includes media replacement every 15 years Includes monitoring 4 times/year Includes miscellaneous O&M at 4% of direct capital cost
WT04a	*In Situ* Onsite Semi-Passive Groundwater Treatment Using SR-PRB	Includes a 10 ft. deep PRB with 5 feet excavation on top of that. Therefore the total excavation is 15 ft bgs.	Includes media replacement every 15 years Includes monitoring 4 times/year Includes miscellaneous O&M at a lump sum of $3500/year
WT04b	*In Situ* Onsite Semi-Passive Groundwater Treatment Using SR-PRB	Includes a 40 ft. deep PRB with 5 feet excavation on top of that. Therefore the total excavation is 45 ft bgs.	Includes media replacement every 15 years Includes monitoring 4 times/year Includes miscellaneous O&M at a lump sum of $10,000/year

Notes:

O&M = operation and maintenance
SRB = sulfate reducing bioreactor
PRB = permeable reactive barrier
TCD = typical conceptual design

TABLE D-9

Summary of Cost Assumptions and Limitations for Human Health TCDs

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

		Assumptions/Limitations	
TCD Code	**Description**	**2009 Direct Capital Unit Cost**	**O&M Costs**
HH-2	Upland Waste Pile Soil Cover	Assumed depth of regrading = 5 ft.	Routine inspection and maintenance.
HH-3	Millsite Decontamination	Removal and offsite disposal of hazardous substances, decontamination of building surfaces.	Routine inspection and maintenance.
HH-4	Millsite Demolition/Disposal	Assume 25% of material to hazardous waste landfill; 75% to solid waste landfill or disposed of onsite.	Routine inspection and maintenance.

Notes:

O&M = operation and maintenance

TCD = typical conceptual design

TABLE D-10

Summary of Cost Assumptions and Limitations for Stream and Riparian Cleanup Action TCDs

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

		Assumptions/Limitations	
TCD Code	**Description**	**2009 Direct Capital Unit Cost**	**O&M Costs**
CD-AVG	Current Deflector, Average Cost	Placement requires use of heavy machinery, riprap toe protection. Site access may also be a significant cost consideration in some cases. However, most streams in the project are paralleled by roads on one or both sides, minimizing access difficulties.	Assumes periodic (annual) inspection for evidence of outflanking or undermining. Repair or redesign and replacement may be required if damaged by high flow events or channel migration.
CD-SED	Current Deflectors, Sediment Traps	Detailed cost breakdown unavailable.	
VBS-AVG	Vegetative Bank Stabilization, Average Cost	Site preparation with heavy machinery and toe protection with riprap, live facines, or other material required. Banks may be stabilized with live cuttings or rooted stock, rooted stock being generally more expensive.	All plantings are vulnerable to high stream flows and desiccation until roots are established. Frequent monitoring may be required initially until the root mass is established, followed by seasonal and then annual monitoring. Protection from browsing animals, irrigation, and some replanting may be required.
BSBR-AVG	Bioengineered Revetments, Average Cost	Assumes site preparation and toe protection with heavy machinery. Placement of rocks, crib, logs, and other large heavy materials also require heavy machinery.	Requires annual monitoring for evidence of undermining or outflanking at head. Repair or additional reinforcement may be required to prevent structure failure. Occasional repair or redesign and replacement of some areas may be required if large scale failure occurs.
FP/RP-AVG	Floodplain/Riparian Planting, Average Cost	Assumes areas subject to regular overbank flows during high flow events require use of heavy machinery to create trenches for protection of live plantings. Areas less subject to overbank flow will not require heavy machinery and may follow the "dig and drop" approach to planting.	Live plantings are vulnerable to desiccation, overbank flows, and browsing animals. Protection from browsing animals and irrigation may be required initially. Assumes regular monitoring will be conducted until root mass is established, and seasonal monitoring thereafter, with site preparation and replanting conducted as required.
OFFCH-AVG	Off-Channel Hydrologic Feature, Average Cost	Off-channel hydrologic features will be sited in areas where excavation of contaminants is planned. Unit cost estimates do not include site excavation requirements assumed to be represented by the costs of contaminant removal, but do include "cut and fill" costs using heavy machinery for additional site preparation as needed.	O&M rates for off-channel hydrologic features can vary considerably. Properly constructed groundwater fed features will require minimal maintenance, whereas surface water fed features may require an active O&M plan to maintain connectivity to the mainstem, hydrologic performance, and ensuring fish access and other habitat considerations as desired. Accordingly, monitoring requirements will vary with the type of feature.
CH REAL-1	Channel Realignment	Channel realignment may be required as part of an integrated approach to streambank and substrate stabilization. This approach assumes use of heavy machinery and possibly temporary flow diversion.	Assuming proper design and implementation, channel realignment is directed towards creating a self-maintaining structural change requiring minimal O&M. However, realignment failure and subsequent channel migration can result in failure of bank stabilization and other remedial measures, requiring extensive replacement.

Notes:

O&M = operation and maintenance

TCD = typical conceptual design

TABLE D-11

Alternative RP-1 - Pinehurst Cost Analysis

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	Estimated Damage[2]	Frequency Interval	Average Damage for Frequency Interval	Expected Annual Damage
50	2.00%	$11,127,000			
			2.00%	$8,958,000	$179,200
25	4.00%	$6,788,000			
			16.00%	$5,166,000	$826,600
5	20.00%	$3,544,000			
Total					**$1,005,800**
Real Discount Rate					7%
Target Number of Years for Remedy Protection					30
Present Value of Expected Annual Damage Over 30-year period					**$12,480,000**

Notes:

[1] Calculation of expected annual damage based on method described in Memorandum: *Methodology for Estimating Expected Loss from Damage to Remedies* (CH2M HILL, September 16, 2009).

[2] Estimated damage values are from Appendix G in this Focused Feasibility Study Report. Based on modeling results and remediation costs of $5.17 per square foot.

TABLE D-12

Alternative RP-1: Smelterville Cost Analysis

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	Estimated Damage[2]	Frequency Interval	Average Damage for Frequency Interval	Expected Annual Damage
50	2.00%	$6,468,000			
			2.00%	$4,887,000	$97,700
25	4.00%	$3,306,000			
			16.00%	$2,071,000	$331,400
5	20.00%	$835,000			
Total					**$429,100**
Real Discount Rate					7%
Target Number of Years for Remedy Protection					30
Present Value of Expected Annual Damage Over 30-year period					**$5,320,000**

Notes:

[1] Calculation of expected annual damage based on method described in Memorandum: *Methodology for Estimating Expected Loss from Damage to Remedies* (CH2M HILL, September 16, 2009).

[2] Estimated damage values are from Appendix G in this Focused Feasibility Study Report. Based on modeling results and remediation costs of $5.17 per square foot.

TABLE D-13

Alternative RP-1: Kellogg Cost Analysis

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	Estimated Damage[2]	Frequency Interval	Average Damage for Frequency Interval	Expected Annual Damage
50	2.00%	$867,000			
			2.00%	$806,000	$16,100
25	4.00%	$745,000			
			16.00%	$610,000	$97,600
5	20.00%	$474,000			
Total					**$113,700**
Real Discount Rate					7%
Target Number of Years for Remedy Protection					30
Present Value of Expected Annual Damage Over 30-year period					**$1,410,000**

Notes:

[1] Calculation of expected annual damage based on method described in Memorandum: *Methodology for Estimating Expected Loss from Damage to Remedies* (CH2M HILL, September 16, 2009).

[2] Estimated damage values are from Appendix G in this Focused Feasibility Study Report. Based on modeling results and remediation costs of $5.17 per square foot.

TABLE D-14

Alternative RP-1: Wardner Cost Analysis

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	Estimated Damage[2]	Frequency Interval	Average Damage for Frequency Interval	Expected Annual Damage
50	2.00%	$696,000			
			2.00%	$696,000	$13,900
25	4.00%	$696,000			
			16.00%	$696,000	$111,400
5	20.00%	$696,000			
Total					**$125,300**
Real Discount Rate					7%
Target Number of Years for Remedy Protection					30
Present Value of Expected Annual Damage Over 30-year period					**$1,550,000**

Notes:

[1] Calculation of expected annual damage based on method described in Memorandum: *Methodology for Estimating Expected Loss from Damage to Remedies* (CH2M HILL, September 16, 2009).

[2] Estimated damage values are from Appendix G in this Focused Feasibility Study Report. Based on modeling results and remediation costs of $5.17 per square foot.

TABLE D-15

Alternative RP-1: Osburn Cost Analysis

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	Estimated Damage[2]	Frequency Interval	Average Damage for Frequency Interval	Expected Annual Damage
50	2.00%	$4,440,000			
			2.00%	$4,032,000	$80,600
25	4.00%	$3,623,000			
			16.00%	$2,473,000	$395,700
5	20.00%	$1,322,000			
Total					**$476,300**
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 Memorandum: *Methodology for Estimating Expected Loss from Damage to Remedies* (CH2M HILL, September 16, 2009).

[2] Estimated damage values are from Appendix G in this Focused Feasibility Study Report. Based on modeling results and remediation costs of $5.17 per square foot.

TABLE D-16

Alternative RP-1: Silverton Cost Analysis

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	Estimated Damage[2]	Frequency Interval	Average Damage for Frequency Interval	Expected Annual Damage
50	2.00%	$3,192,000			
			2.00%	$2,401,000	$48,000
25	4.00%	$1,610,000			
			16.00%	$1,282,000	$205,100
5	20.00%	$954,000			
Total					**$253,100**
Real Discount Rate					7%
Target Number of Years for Remedy Protection					30
Present Value of Expected Annual Damage Over 30-year period					**$3,140,000**

Notes:

[1] Calculation of expected annual damage based on method described in Memorandum: *Methodology for Estimating Expected Loss from Damage to Remedies* (CH2M HILL, September 16, 2009).

[2] Estimated damage values are from Appendix G in this Focused Feasibility Study Report. Based on modeling results and remediation costs of $5.17 per square foot.

TABLE D-17

Alternative RP-1: Wallace Cost Analysis

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	Estimated Damage[2]	Frequency Interval	Average Damage for Frequency Interval	Expected Annual Damage
50	2.00%	$534,000			
			2.00%	$392,000	$7,800
25	4.00%	$249,000			
			16.00%	$169,000	$27,000
5	20.00%	$88,000			
Total					**$34,800**
Real Discount Rate					7%
Target Number of Years for Remedy Protection					30
Present Value of Expected Annual Damage Over 30-year period					**$430,000**

Notes:

[1] Calculation of expected annual damage based on method described in Memorandum: *Methodology for Estimating Expected Loss from Damage to Remedies* (CH2M HILL, September 16, 2009).

[2] Estimated damage values are from Appendix G in this Focused Feasibility Study Report. Based on modeling results and remediation costs of $5.17 per square foot.

TABLE D-18

Alternative RP-1: Mullan Cost Analysis

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	Estimated Damage[2]	Frequency Interval	Average Damage for Frequency Interval	Expected Annual Damage
50	2.00%	$2,889,000			
			2.00%	$2,477,000	$49,500
25	4.00%	$2,065,000			
			16.00%	$1,457,000	$233,100
5	20.00%	$848,000			
Total					**$282,600**
Real Discount Rate					7%
Target Number of Years for Remedy Protection					30
Present Value of Expected Annual Damage Over 30-year period					**$3,510,000**

Notes:

[1] Calculation of expected annual damage based on method described in Memorandum: *Methodology for Estimating Expected Loss from Damage to Remedies* (CH2M HILL, September 16, 2009).

[2] Estimated damage values are from Appendix G in this Focused Feasibility Study Report. Based on modeling results and remediation costs of $5.17 per square foot.

TABLE D-19

Alternative RP-1: Approximate Cost for Side Gulches

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

Total Area of Existing Selected Remedies in Side Gulches[1] 11,320,000 SF

Unit Cost to Re-remediate (or Repair) Selected Remedies[2] $ 5.17 per SF

Estimated Area of Remedy at Risk for 5-, 25-, and 50-year Storm Events

Storm Event (Years)	Estimated Percent of Remedy at Risk[3] (%)	Estimated Area of Remedy at Risk[4] (SF)	Estimated Cost to Re-Remediate[5] ($)
50	25%	2,830,000	$ 14,600,000
25	16%	1,810,000	$ 9,400,000
5	7%	790,000	$ 4,080,000

Calculation of Expected Annual Damage[6]
30-Year Life Cycle Cost

Storm Event (Years)	Probability of Occurrence[7]	Estimated Damage[8]	Frequency Interval[9]	Average Damage for Frequency Interval	Expected Annual Damage
50	2.00%	$ 14,600,000			
			2.00%	$12,000,000	$240,000
25	4.00%	$ 9,400,000			
			16.00%	$6,700,000	$1,070,000
5	20.00%	$ 4,080,000			
				Total	**$1,310,000**

Real Discount Rate	7%
Target Number of Years for Remedy Protection	30
Present Value of Expected Annual Damage Over 30-year period	**$16,300,000**

TOTAL APPROXIMATE COST (30-year NPV) for Side Gulches	**$16,300,000**

Notes:

SF = square feet

NPV = net present value

[1] Total area of existing Selected Remedies in side gulches calculated by GIS analysis as documented in *Side Gulch Costing Memorandum* (TerraGraphics, 2010).

[2] This cost was developed by TerraGraphics and is documented in Appendix G of the FFS Report.

[3] The estimated percent of remedy at risk is based on the average remedy at risk for the eight communities where hydrologic and hydraulic modeling analyses were conducted. This is documented in Table 9-3 in the FFS Report.

[4] The estimated area of remedy at risk multiplies the estimated percent of remedy at risk by the total existing remedy in the side gulches.

[5] The estimated cost to re-remediate multiplies the estimated area of remedy at risk by the unit costs to re-remediate (or repair) Selected Remedies

[6] Calculation of expected annual damage based on method described in *Methodology for Estimating Expected Loss from Damage to Remedies Memorandum* (CH2M HILL, 2009).

[7] 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.

[8] Estimated damage values are from modeling outputs and unit cost assumptions discussed in Section 9.6.1.1 and documented in Appendix G of the FFS Report.

[9] The frequency interval is the difference between the probability of occurrence for two storm events.

TABLE D-20

Alternative RP-2: Pinehurst Cost Summary

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	2009 Total Direct and Indirect Capital Cost
Little Pine Creek						
1	Channel Modification-Increase Left Bank Height To 4 ft With A 1 ft Tall Berm (XS 1)	165	LF	$110	$18,150	$30,855
2	Reconstruct Existing Earthen Channel To 10' X 3' Channel W/ 3' Vert Concrete Wall Along Left Side Of Channel (XS 2)	80	LF	$340	$27,200	$46,240
3	Reconstruct Existing Earthen Channel To 12' X 3' (L) X 6' (R) Concrete Channel (XS 3A)	50	LF	$928	$46,400	$78,880
4	Reconstruct Existing Earthen Channel To 12' X 3' (L) X 6' (R) Concrete Channel (XS 3B)	100	LF	$933	$93,300	$158,610
5	Reconstruct Existing Earthen Channel To 12' X 3.5' (L) X 4' (R) Concrete Channel (XS 4)	125	LF	$780	$97,500	$165,750
6	Reconstruct Existing Earthen Channel To 12' X 3' (L) Concrete Channel (XS 6A)	105	LF	$697	$73,185	$124,415
7	Reconstruct Existing Earthen Channel To 12' X 3' (L) Concrete Channel (XS 6B)	105	LF	$697	$73,185	$124,415
8	Reconstruct Existing Earthen Channel To 12' X 3' (L) Concrete Channel (XS 6C)	180	LF	$711	$127,980	$217,566
9	Channel Modification-Increase Left Bank Height To 3 ft With A 1.4 ft Tall Berm (XS 10)	330	LF	$37	$12,210	$20,757
10	Reconstruct Existing Channel By Widening To 28'X18'X2.5' Earthen Channel W/ 0.8 ft Tall Berm On Right And Left Bank (XS 11)	270	LF	$56	$15,120	$25,704
11	Channel Modifications-Construct 0.5 ft Tall Berm On Left Bank And Increase Channel Bottom By 0.1 ft To Account For Slope Alterations (XS 13)	170	LF	$22	$3,740	$6,358
12	Channel Modifications-Construct 0.5 ft Tall Berm On Left Bank And Decrease Channel Bottom By 0.5 ft To Account For Slope Alterations (XS 14)	120	LF	$28	$3,360	$5,712
13	Channel Modifications-Decrease Channel Depth By 0.7 ft To Account For Slope Alterations (XS 15)	55	LF	$28	$1,540	$2,618
14	Reconstruct Existing Channel To 25.2'X11'X3.1' (L) X 4' (R) Earthen Channel And Decrease Channel Depth By 0.7 ft To Account For Slope Alterations (XS 16)	55	LF	$65	$3,575	$6,078
15	Replace Existing Wood Driveway Bridge With 14'X26' Single Span Bridge W/ A Clear Height Of 2.5 ft (Bridge 1, Xs 5)	1	EA	$169,000	$169,000	$287,300
16	Replace Existing Steel Driveway Bridge With 14'X15' Single Span Bridge W/ A Clear Height Of 2.5 ft (Bridge 2, Xs 7)	1	EA	$103,000	$103,000	$175,100
17	Replace Existing Wood Driveway Bridge With 14'X18' Single Span Bridge W/ A Clear Height Of 2.5 ft (Bridge 3, Xs 8)	1	EA	$118,000	$118,000	$200,600
18	Replace Existing Driveway Bridge With 14'X16' Single Span Bridge W/ A Clear Height Of 2.5 ft (Bridge 4, Xs 9)	1	EA	$110,000	$110,000	$187,000
19	Replace Existing Concrete Box Culvert (3'X8'X28') With 18'X28' Single Span Bridge W/ A Clear Height Of 3 ft (Bridge 5, Xs 12)	1	EA	$224,000	$224,000	$380,800
20	Replace Existing Wood Bridge (12'X4') With 14'X4' Single Span Bridge W/ A Clear Height Of 3.6 ft (Bridge 6)	1	EA	$34,000	$34,000	$57,800
					Subtotal Rounded	**$2,300,000**
	NPV for 30-year O&M Cost					**$844,000**
	Total NPV cost at 30 years					**$3,144,000**

Notes:

NPV = Net Present Value
EA = each
LF = linear feet
O&M = operation and maintenance

Assumptions:

All excavated material is hauled to repository and replaced with imported material.
Pipe cover is 3' over pipe
All work will be performed in the summer and therefore no water issues exist.
See estimate details for additional assumptions
Total indirect cost assumes 70% of Total Direct Capital Cost

TABLE D-21

Alternative RP-2: Pinehurst Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
Little Pine Creek						
1	**Increase Left Bank Height to 4 ft w/ 1 ft Berm (1)**	**165**	**LF**			see detail
	Prep Channel Bank	165	LF	$86.03	$14,194	difficult operation, assume 10 dys
	Imported Fill Material	34.8	CY	$62.91	$2,191	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$1,639	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$29**	
	Total Direct Unit Cost			**$110.00**	**$18,053**	
2	**Reconstruct Existing Channel to 10' wide/ 3' Wall (2)**	**80**	**LF**			
	Clear, Grub & Dispose	0.1	AC	$6,514.75	$479	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	26.7	CY	$14.80	$395	
	Prep & Grade Channel	80	LF	$7.84	$627	
	Haul & Dispose at Repository	26.7	CY	$5.49	$146	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	26.7	CY	$11.38	$303	use C08a cost
	Imported Fill Material	17.8	CY	$53.33	$948	imported, difficult operation
	CIP Wall, 12" thk, 3' tall + 1 foot below grade	11.9	CY	$737.64	$8,742	
	Wall Rebar @ 200 #/cy	2370.4	LB	$1.79	$4,231	
	CIP Wall Footing, 2.5 wide x 1.5' tall	11.1	CY	$496.76	$5,520	
	Footing Rebar @ 150 #/cy	1666.7	LB	$1.79	$2,975	
	Misc Detail Allowance	10%	LS	$0.00	$2,392	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$375**	
	Total Direct Unit Cost			**$340.00**	**$27,134**	
3	**Reconstruct Channel w/ 3' L wall, 6' R wall, 12' Channel (3A)**	**50**	**LF**			
	Clear, Grub & Dispose	0.0	AC	$6,514.75	$299	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Demo existing RR Tie and Debris	50	LF	$62.74	$3,137	
	Excavate Channel	55.6	CY	$14.80	$822	
	Prep & Grade Channel	50	LF	$7.84	$392	
	Haul & Dispose at Repository	55.6	CY	$5.49	$305	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	55.6	CY	$11.38	$632	use C08a cost
	Imported Fill Material	20.4	CY	$53.33	$1,086	imported, difficult operation
	CIP Wall, 12" thk, 3' tall	5.6	CY	$737.64	$4,098	
	Wall Rebar @ 200 #/cy	1111.1	LB	$1.79	$1,983	
	CIP Wall, 12" thk, 6' tall	11.1	CY	$737.64	$8,196	

TABLE D-21

Alternative RP-2: Pinehurst Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Wall Rebar @ 200 #/cy	2222.2	LB	$1.79	$3,967	
	CIP Slab, 12" thk, 16' wide	30	CY	$295.88	$8,767	
	Footing Rebar @ 150 #/cy	4,444	LB	$1.79	$7,934	
	Misc Detail Allowance	10%	LS	$0.00	$4,068	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$682**	
	Total Direct Unit Cost			**$928.00**	**$46,369**	
4	**Reconstruct Channel w/ 3' L wall, 6' R wall, 12' Channel (3B)**	**100**	**LF**			
	Clear, Grub & Dispose	0.1	AC	$6,514.75	$598	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Demo existing RR Tie and Debris	100	LF	$62.74	$6,274	
	Excavate Channel	127.8	CY	$14.80	$1,891	
	Prep & Grade Channel	100	LF	$7.84	$784	
	Haul & Dispose at Repository	127.8	CY	$5.49	$702	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	127.8	CY	$11.38	$1,454	use C08a cost
	Imported Fill Material	40.7	CY	$53.33	$2,173	imported, difficult operation
	CIP Wall, 12" thk, 3' tall	11.1	CY	$737.64	$8,196	
	Wall Rebar @ 200 #/cy	2222.2	LB	$1.79	$3,967	
	CIP Wall, 12" thk, 6' tall	22.2	CY	$737.64	$16,392	
	Wall Rebar @ 200 #/cy	4444.4	LB	$1.79	$7,934	
	CIP Slab, 12" thk, 16' wide	59	CY	$295.88	$17,534	
	Footing Rebar @ 150 #/cy	8,889	LB	$1.79	$15,868	
	Misc Detail Allowance	10%	LS	$0.00	$8,161	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$1,364**	
	Total Direct Unit Cost			**$933.00**	**$93,290**	
5	**Reconstruct Channel w/ 3.5' L wall, 4' R wall, 12' Channel (4)**	**125**	**LF**			
	Clear, Grub & Dispose	0.1	AC	$6,514.75	$748	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	125.0	CY	$14.80	$1,850	
	Prep & Grade Channel	125	LF	$7.84	$980	
	Haul & Dispose at Repository	125.0	CY	$5.49	$686	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	125.0	CY	$11.38	$1,423	use C08a cost
	Imported Fill Material	34.7	CY	$53.33	$1,852	imported, difficult operation
	CIP Wall, 12" thk, 3.5' tall	16.2	CY	$737.64	$11,953	
	Wall Rebar @ 200 #/cy	3240.7	LB	$1.79	$5,785	

TABLE D-21

Alternative RP-2: Pinehurst Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	CIP Wall, 12" thk, 4' tall	18.5	CY	$737.64	$13,660	
	Wall Rebar @ 200 #/cy	3703.7	LB	$1.79	$6,611	
	CIP Slab, 12" thk, 16' wide	74	CY	$295.88	$21,917	
	Footing Rebar @ 150 #/cy	11,111	LB	$1.79	$19,834	
	Misc Detail Allowance	10%	LS	$0.00	$8,519	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$1,565**	
	Total Direct Unit Cost			**$780.00**	**$97,383**	
6	**Reconstruct Channel w/ 3' L & R wall, 12' Channel (6A)**	**105**	**LF**			
	Clear, Grub & Dispose	0.1	AC	$6,514.75	$628	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	68.4	CY	$14.80	$1,013	
	Prep & Grade Channel	105	LF	$7.84	$823	
	Haul & Dispose at Repository	68.4	CY	$5.49	$376	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	68.4	CY	$11.38	$779	use C08a cost
	Imported Fill Material	23.3	CY	$53.33	$1,244	imported, difficult operation
	CIP Wall, 12" thk, 3' tall	11.7	CY	$737.64	$8,606	
	Wall Rebar @ 200 #/cy	2333.3	LB	$1.79	$4,165	
	CIP Wall, 12" thk, 3' tall	11.7	CY	$737.64	$8,606	
	Wall Rebar @ 200 #/cy	2333.3	LB	$1.79	$4,165	
	CIP Slab, 12" thk, 16' wide	62	CY	$295.88	$18,410	
	Footing Rebar @ 150 #/cy	9,333	LB	$1.79	$16,661	
	Misc Detail Allowance	10%	LS	$0.00	$6,432	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$1,204**	
	Total Direct Unit Cost			**$697.00**	**$73,113**	
7	**Reconstruct Channel w/ 3' L & R wall, 12' Channel (6B)**	**105**	**LF**			
	Clear, Grub & Dispose	0.1	AC	$6,514.75	$628	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	70.0	CY	$14.80	$1,036	
	Prep & Grade Channel	105	LF	$7.84	$823	
	Haul & Dispose at Repository	70.0	CY	$5.49	$384	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	70.0	CY	$11.38	$797	use C08a cost
	Imported Fill Material	23.3	CY	$53.33	$1,244	imported, difficult operation
	CIP Wall, 12" thk, 3' tall	11.7	CY	$737.64	$8,606	
	Wall Rebar @ 200 #/cy	2333.3	LB	$1.79	$4,165	

TABLE D-21

Alternative RP-2: Pinehurst Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	CIP Wall, 12" thk, 3' tall	11.7	CY	$737.64	$8,606	
	Wall Rebar @ 200 #/cy	2333.3	LB	$1.79	$4,165	
	CIP Slab, 12" thk, 16' wide	62	CY	$295.88	$18,410	
	Footing Rebar @ 150 #/cy	9,333	LB	$1.79	$16,661	
	Misc Detail Allowance	10%	LS	$0.00	$6,435	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$1,204**	
	Total Direct Unit Cost			**$697.00**	**$73,165**	
8	**Reconstruct Channel w/ 3' L & R wall, 12' Channel (6C)**	**180**	**LF**			
	Clear, Grub & Dispose	0.2	AC	$6,514.75	$1,077	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	53.3	CY	$14.80	$789	
	Prep & Grade Channel	180	LF	$7.84	$1,412	
	Haul & Dispose at Repository	53.3	CY	$5.49	$293	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	53.3	CY	$11.38	$607	use C08a cost
	Imported Fill Material	120.0	CY	$53.33	$6,399	imported, difficult operation
	CIP Wall, 12" thk, 3' tall	20.0	CY	$737.64	$14,753	
	Wall Rebar @ 200 #/cy	4000.0	LB	$1.79	$7,140	
	CIP Wall, 12" thk, 3' tall	20.0	CY	$737.64	$14,753	
	Wall Rebar @ 200 #/cy	4000.0	LB	$1.79	$7,140	
	CIP Slab, 12" thk, 16' wide	107	CY	$295.88	$31,561	
	Footing Rebar @ 150 #/cy	16,000	LB	$1.79	$28,562	
	Misc Detail Allowance	10%	LS	$0.00	$11,359	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$2,130**	
	Total Direct Unit Cost			**$711.00**	**$127,974**	
9	**Increase L Bank to 3' with 1.4' Berm (10)**	**330**	**LF**			
	Clear, Grub & Dispose	0.3	AC	$6,514.75	$1,974	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	58.7	CY	$14.80	$868	
	Prep & Grade Channel	330	LF	$7.84	$2,588	
	Haul & Dispose at Repository	58.7	CY	$5.49	$322	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	58.7	CY	$11.38	$668	use C8a cost
	Imported Fill Material	85.6	CY	$53.33	$4,563	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$999	access.TESC, restoration, etc

TABLE D-21

Alternative RP-2: Pinehurst Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Sales Tax on Materials	**5%**			**$71**	
	Total Direct Unit Cost			**$37.00**	**$12,052**	
10	**Increase Channel Height to 2.5' and 18' wide (11)**	**270**	**LF**			
	Clear, Grub & Dispose	0.2	AC	$6,514.75	$1,615	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	229.5	CY	$14.80	$3,396	
	Prep & Grade Channel	270	LF	$7.84	$2,117	
	Haul & Dispose at Repository	229.5	CY	$5.49	$1,260	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	229.5	CY	$11.38	$2,612	use C08a cost
	Imported Fill Material	52.8	CY	$53.33	$2,816	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$994	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$44**	
	Total Direct Unit Cost			**$56.00**	**$14,854**	
11	**Construct 6" Berm on Left Bank, Increase Bottom 0.1' (13)**	**170**	**LF**			
	Clear, Grub & Dispose	0.2	AC	$6,514.75	$1,017	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	0.0	CY	$14.80	$0	
	Prep & Grade Channel	170	LF	$7.84	$1,333	
	Haul & Dispose at Repository	0.0	CY	$5.49	$0	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.0	CY	$11.38	$0	use C08a cost
	Imported Fill Material	18.6	CY	$53.33	$994	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$334	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$15**	
	Total Direct Unit Cost			**$22.00**	**$3,694**	
12	**Construct 6" Berm on Left Bank, Lower Bottom 0.5' (14)**	**120**	**LF**			
	Clear, Grub & Dispose	0.1	AC	$6,514.75	$718	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	31.1	CY	$14.80	$460	
	Prep & Grade Channel	120	LF	$7.84	$941	
	Haul & Dispose at Repository	31.1	CY	$5.49	$171	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	31.1	CY	$11.38	$354	use C08a cost

TABLE D-21

Alternative RP-2: Pinehurst Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Imported Fill Material	6.7	CY	$53.33	$356	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$247	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$6**	
	Total Direct Unit Cost			**$28.00**	**$3,253**	
13	**Lower Channel Bottom By 0.7' (15)**	**55**	**LF**			
	Clear, Grub & Dispose	0.1	AC	$6,514.75	$329	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	20.0	CY	$14.80	$295	
	Prep & Grade Channel	55	LF	$7.84	$431	
	Haul & Dispose at Repository	20.0	CY	$5.49	$110	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	20.0	CY	$11.38	$227	use C08a cost
	Imported Fill Material	0.0	CY	$53.33	$0	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$106	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$0**	
	Total Direct Unit Cost			**$28.00**	**$1,498**	
14	**Reconstruct Channel: 25.2'x11'x3.1'(L)x4'(R), Lower Bottom 0.7'**	**55**	**LF**			
	Clear, Grub & Dispose	0.1	AC	$6,514.75	$329	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	81.1	CY	$14.80	$1,200	
	Prep & Grade Channel	55	LF	$7.84	$431	
	Haul & Dispose at Repository	81.1	CY	$5.49	$445	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	81.1	CY	$11.38	$923	use C08a cost
	Imported Fill Material	0.0	CY	$53.33	$0	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$196	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$0**	
	Total Direct Unit Cost			**$65.00**	**$3,525**	
15	**Replace Existing Bridge w/ New 14'x26' Span Bridge**	**1**	**EA**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	77.8	SY	$12.55	$976	
	Remove & Dispose Existing Wooden Bridge, 14'x26'	364	SF	$30.00	$10,920	
	Excavate Trench	0.0	CY	$7.84	$0	account for pipe removal & loading, less pipe

TABLE D-21

Alternative RP-2: Pinehurst Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	0.0	CY	$9.94	$0	assume all wasted to repository
	Haul & Dispose at Repository	0.0	CY	$5.49	$0	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.0	CY	$11.38	$0	use C08a cost
	Trench Safety	0	LF	$5.00	$0	trench box
	CIP Wall, 12" thk, 2.5' tall	2.4	CY	$737.64	$1,776	
	Wall Rebar @ 200 #/cy	481.5	LB	$1.79	$859	
	CIP Wall, 12" thk, 2.5' tall	2.4	CY	$737.64	$1,776	
	Wall Rebar @ 200 #/cy	481.5	LB	$1.79	$859	
	CIP Slab, 12" thk, 16' wide	15	CY	$295.88	$4,559	
	Footing Rebar @ 150 #/cy	2,311	LB	$1.79	$4,126	
	New Bridge & Abutments - Steel	364	SF	$300.00	$109,200	based on road & bridge file
	Misc Detail Allowance	20%	LS	$0.00	$27,010	minor traffic control, TESC, etc
	SUBTOTAL				**$162,061**	
	Total Direct Unit Cost			**$169,000.00**	**$168,914**	
16	**Replace Existing Bridge w/ New 14'x15' Span Bridge**	**1**	**EA**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	77.8	SY	$12.55	$976	
	Remove & Dispose Existing Steel Bridge, 14'x15'	210	SF	$50.00	$10,500	
	Excavate Trench	0.0	CY	$7.84	$0	account for pipe removal & loading, less pipe
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	0.0	CY	$9.94	$0	assume all wasted to repository
	Haul & Dispose at Repository	0.0	CY	$5.49	$0	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.0	CY	$11.38	$0	use C08a cost
	Trench Safety	0	LF	$5.00	$0	trench box
	CIP Wall, 12" thk, 2.5' tall	1.4	CY	$737.64	$1,025	
	Wall Rebar @ 200 #/cy	277.8	LB	$1.79	$496	
	CIP Wall, 12" thk, 2.5' tall	1.4	CY	$737.64	$1,025	
	Wall Rebar @ 200 #/cy	277.8	LB	$1.79	$496	
	CIP Slab, 12" thk, 16' wide	9	CY	$295.88	$2,630	
	Footing Rebar @ 150 #/cy	1,333	LB	$1.79	$2,380	
	New Bridge & Abutments - Steel	210	SF	$300.00	$63,000	based on road & bridge file
	Misc Detail Allowance	20%	LS	$0.00	$16,505	minor traffic control, TESC, etc
	Sales Tax on Materials	**5%**			**$3,954**	
	Total Direct Unit Cost			**$103,000.00**	**$102,986**	

TABLE D-21

Alternative RP-2: Pinehurst Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
17	**Replace Existing Bridge w/ New 14'x18' Span Bridge**	**1**	**EA**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	77.8	SY	$12.55	$976	
	Remove & Dispose Existing Wooden Bridge, 14'x18'	252	SF	$30.00	$7,560	
	Excavate Trench	0.0	CY	$7.84	$0	account for pipe removal & loading, less pipe
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	0.0	CY	$9.94	$0	assume all wasted to repository
	Haul & Dispose at Repository	0.0	CY	$5.49	$0	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.0	CY	$11.38	$0	use C08a cost
	Trench Safety	0	LF	$5.00	$0	trench box
	CIP Wall, 12" thk, 2.5' tall	1.7	CY	$737.64	$1,229	
	Wall Rebar @ 200 #/cy	333.3	LB	$1.79	$595	
	CIP Wall, 12" thk, 2.5' tall	1.7	CY	$737.64	$1,229	
	Wall Rebar @ 200 #/cy	333.3	LB	$1.79	$595	
	CIP Slab, 12" thk, 16' wide	11	CY	$295.88	$3,156	
	Footing Rebar @ 150 #/cy	1,600	LB	$1.79	$2,856	
	New Bridge & Abutments - Steel	252	SF	$300.00	$75,600	based on road & bridge file
	Misc Detail Allowance	20%	LS	$0.00	$18,759	minor traffic control, TESC, etc
	Sales Tax on Materials	**5%**			**$4,744**	
	Total Direct Unit Cost			**$118,000.00**	**$117,301**	
18	**Replace Existing Bridge w/ New 14'x16' Span Bridge**	**1**	**EA**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	77.8	SY	$12.55	$976	
	Remove & Dispose Existing Wooden Bridge, 14'x18'	224	SF	$50.00	$11,200	
	Excavate Trench	0.0	CY	$7.84	$0	account for pipe removal & loading, less pipe
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	0.0	CY	$9.94	$0	assume all wasted to repository
	Haul & Dispose at Repository	0.0	CY	$5.49	$0	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.0	CY	$11.38	$0	use C08a cost
	Trench Safety	0	LF	$5.00	$0	trench box
	CIP Wall, 12" thk, 2.5' tall	1.5	CY	$737.64	$1,093	
	Wall Rebar @ 200 #/cy	296.3	LB	$1.79	$529	
	CIP Wall, 12" thk, 2.5' tall	1.5	CY	$737.64	$1,093	
	Wall Rebar @ 200 #/cy	296.3	LB	$1.79	$529	
	CIP Slab, 12" thk, 16' wide	9	CY	$295.88	$2,805	
	Footing Rebar @ 150 #/cy	1,422	LB	$1.79	$2,539	
	New Bridge & Abutments - Steel	224	SF	$300.00	$67,200	based on road & bridge file

TABLE D-21

Alternative RP-2: Pinehurst Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Misc Detail Allowance	20%	LS	$0.00	$17,593	minor traffic control, TESC, etc
	Sales Tax on Materials	**5%**			**$4,217**	
	Total Direct Unit Cost			**$110,000.00**	**$109,773**	
19	**Replace Existing Culvert w/ New 18'x28' Span Bridge**	**1**	**EA**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	77.8	SY	$12.55	$976	
	Remove & Dispose Exist Culvert, 8'x28'	224	SF	$50.00	$11,200	
	Excavate Trench	8.3	CY	$7.84	$65	account for pipe removal & loading, less pipe
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	20.7	CY	$9.94	$206	assume all wasted to repository
	Haul & Dispose at Repository	8.3	CY	$5.49	$46	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	8.3	CY	$11.38	$94	use C08a cost
	Trench Safety	0	LF	$5.00	$0	trench box
	CIP Wall, 12" thk, 3.0' tall +1 bury	4.1	CY	$737.64	$3,060	
	Wall Rebar @ 200 #/cy	829.6	LB	$1.79	$1,481	
	CIP Wall, 12" thk, 3.0' tall +1 bury	4.1	CY	$737.64	$3,060	
	Wall Rebar @ 200 #/cy	829.6	LB	$1.79	$1,481	
	CIP Wall Footing, 2.5 wide x 1.5' tall	7.8	CY	$496.76	$3,864	
	Footing Rebar @ 150 #/cy	1166.7	LB	$1.79	$2,083	
	New Bridge & Abutments - Steel	504	SF	$300.00	$151,200	based on road & bridge file
	Misc Detail Allowance	20%	LS	$0.00	$35,735	minor traffic control, TESC, etc
	Sales Tax on Materials	**5%**			**$9,347**	
	Total Direct Unit Cost			**$224,000.00**	**$223,897**	
20	**Replace Existing Bridge w/ New 14'x4' Span Bridge**	**1**	**EA**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	77.8	SY	$12.55	$976	
	Remove & Dispose Existing Wooden Bridge, 12'x14'	48	SF	$50.00	$2,400	
	Excavate Trench	0.0	CY	$7.84	$0	account for pipe removal & loading, less pipe
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	0.0	CY	$9.94	$0	assume all wasted to repository
	Haul & Dispose at Repository	0.0	CY	$5.49	$0	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.0	CY	$11.38	$0	use C08a cost
	Trench Safety	0	LF	$5.00	$0	trench box
	CIP Wall, 12" thk, 3.6' tall	1.9	CY	$737.64	$1,377	
	Wall Rebar @ 200 #/cy	373.3	LB	$1.79	$666	

TABLE D-21

Alternative RP-2: Pinehurst Detailed Unit Cost

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

Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
CIP Wall, 12" thk, 3.6' tall	1.9	CY	$737.64	$1,377	
Wall Rebar @ 200 #/cy	373.3	LB	$1.79	$666	
CIP Slab, 12" thk, 16' wide	4	CY	$295.88	$1,227	
Footing Rebar @ 150 #/cy	622	LB	$1.79	$1,111	
New Bridge & Abutments - Steel	56	SF	$300.00	$16,800	based on road & bridge file
Misc Detail Allowance	20%	LS	$0.00	$5,320	minor traffic control, TESC, etc
Sales Tax on Materials	**5%**			**$1,137**	
Total Direct Unit Cost			**$34,000.00**	**$33,058**	

Notes:

CIP = cast-in-place
CY = cubic yards
EA = each
LB = pound(s)
LS = lump sum
SF = square feet
SY = square yards
TESC = temporary erosion and sediment control

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 D-22

Alternative RP-2: Smelterville Cost Summary

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	2009 Total Direct and Indirect Capital Cost
Grouse Creek						
1	Abandon Existing 36" Dia Concrete Culvert (Culvert 1)	60	LF	$59	$3,540	$6,018
2	Abandon Existing 36" Dia Concrete Culvert (Culvert 2)	50	LF	$59	$2,950	$5,015
3	Install/Construct New 4.5' X 8' Concrete Box Culvert (Culvert 3)	105	LF	$1,359	$142,695	$242,582
4	Reconstruct Existing Channel - Install 4.5' Tall Vertical Concrete Wall Along N Side Of Creek (Xs 1)	335	LF	$433	$145,055	$246,594
5	Reconstruct Existing Channel - Install 4.5' Tall Vertical Concrete Wall Along N Side Of Creek (Xs 2)	620	LF	$433	$268,460	$456,382
6	Reconstruct Existing Channel - Install 4.5' Tall Vertical Concrete Wall Along N Side Of Creek (Xs 3)	880	LF	$420	$369,600	$628,320
7	Reconstruct Existing Channel - Install 4.5' Tall Vertical Concrete Wall Along N Side Of Creek And 0.7' Berm On S Side Of Creek (Xs 4)	160	LF	$432	$69,120	$117,504
					Subtotal Rounded	**$1,700,000**
	NPV for 30-year O&M Cost					**$620,000**
	Total NPV cost at 30 years					**$2,320,000**

Notes:

NPV = Net Present Value
LF = linear feet
O&M = operation and maintenance

Assumptions:

All excavated material is hauled to repository and replaced with imported material.
Pipe cover is 3' over pipe
All work will be performed in the summer and therefore no water issues exist.
See estimate details for additional assumptions
Total indirect cost assumes 70% of Total Direct Capital Cost

TABLE D-23

Alternative RP-2: Smelterville Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
Grouse Creek						
1,2	**Abandon Existing 36" Dia Concrete Culvert**	**50**	**LF**			
	Fill with CDF	13	CY	$100.00	$1,309	leave open, use as overflow storage
	Pumping Costs	13	CY	$80.82	$1,058	
	Misc Detail Allowance	20%	LS	$0.00	$473	
	Sales Tax on Materials	**5%**			**$79**	
	Total Direct Unit Cost			**$59.00**	**$2,919**	
3	**Construct New 4.5'x8" Concrete Box Culvert**	**105**	**LF**			
	Total Direct Unit Cost	180.0	SY	$12.55	$2,258	
	Excavate Channel	368.5	CY	$5.92	$2,181	25cy/hr to remove & load
	Imported Fill Material	177.4	CY	$24.94	$4,426	imported
	Haul & Dispose at Repository	368.5	CY	$5.57	$2,054	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	368.5	CY	$11.38	$4,193	use C08a cost
	CIP Wall, 8" thk, 105 lf x 4.5 ft tall	23.5	CY	$737.64	$17,298	
	Wall Rebar @ 200 #/cy	4690.0	LB	$1.79	$8,372	
	CIP Elv Slab, 8' wide x 8" Thk	41.7	CY	$664.70	$27,711	
	Elv Slab Rebar @ 200 #/cy	8337.8	LB	$1.79	$14,884	
	CIP Slab, 8' wide x 8" thk	41.7	CY	$295.88	$12,335	
	Footing Rebar @ 150 #/cy	6253.3	LB	$1.79	$11,163	
	ACP Pavement, 4" thk	41	TON	$70.00	$2,873	
	CSBC, 6" thk	30	CY	$31.26	$938	
	Flagger	200	HR	$60.14	$12,028	
	Misc Detail Allowance	15%	LS	$0.00	$17,778	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$2,167**	
	Total Direct Unit Cost			**$1,359.00**	**$142,657**	
4,5	**Reconstruct Exist Channel w/ 4.5' wall, 15' bottom, XS1&2**	**335**	**LF**			
	Clear, Grub & Dispose	0.3	AC	$6,514.75	$2,004	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	375.3	CY	$14.80	$5,554	
	Prep & Grade Channel	335	LF	$7.84	$2,627	
	Haul & Dispose at Repository	375.3	CY	$5.49	$2,061	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	375.3	CY	$11.38	$4,271	use C08a cost
	Imported Fill Material	68.2	CY	$53.33	$3,639	imported, difficult operation
	CIP Wall, 12" thk, 4.5' tall + 1 foot below grade	68.2	CY	$737.64	$50,337	
	Wall Rebar @ 200 #/cy	13648.1	LB	$1.79	$24,363	

TABLE D-23

Alternative RP-2: Smelterville Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	CIP Wall Footing, 2.5 wide x 1.5' tall	46.5	CY	$496.76	$23,113	
	Footing Rebar @ 150 #/cy	6979.2	LB	$1.79	$12,459	
	Misc Detail Allowance	10%	LS	$0.00	$12,410	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$1,903**	
	Total Direct Unit Cost			**$433.00**	**$144,741**	
6	**Reconstruct Exist Channel w/ 4.5' wall, 13.7' bottom, XS3**	**880**	**LF**			
	Clear, Grub & Dispose	0.8	AC	$6,514.75	$5,264	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	490.5	CY	$14.80	$7,259	
	Prep & Grade Channel	880	LF	$7.84	$6,901	
	Haul & Dispose at Repository	490.5	CY	$5.49	$2,693	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	490.5	CY	$11.38	$5,582	use C08a cost
	Imported Fill Material	268.9	CY	$53.33	$14,340	imported, difficult operation
	CIP Wall, 12" thk, 4.5' tall + 1 foot below grade	179.3	CY	$737.64	$132,229	
	Wall Rebar @ 200 #/cy	35851.9	LB	$1.79	$63,999	
	CIP Wall Footing, 2.5 wide x 1.5' tall	122.2	CY	$496.76	$60,715	
	Footing Rebar @ 150 #/cy	18333.3	LB	$1.79	$32,727	
	Misc Detail Allowance	10%	LS	$0.00	$32,343	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$5,072**	
	Total Direct Unit Cost			**$420.00**	**$369,124**	
7	**Reconstr Exist Channel w/ 4.5' wall, 10.5' bottom, & berm, XS4**	**880**	**LF**			
	Clear, Grub & Dispose	0.8	AC	$6,514.75	$5,264	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	824.6	CY	$14.80	$12,202	
	Prep & Grade Channel	880	LF	$7.84	$6,901	
	Haul & Dispose at Repository	824.6	CY	$5.49	$4,527	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	824.6	CY	$11.38	$9,384	use C08a cost
	Imported Fill Material behind wall	179.3	CY	$53.33	$9,560	imported, difficult operation
	Imported Fill Material for berm	88.0	CY	$53.33	$4,693	imported, difficult operation
	CIP Wall, 12" thk, 4.5' tall + 1 foot below grade	179.3	CY	$737.64	$132,229	
	Wall Rebar @ 200 #/cy	35851.9	LB	$1.79	$63,999	
	CIP Wall Footing, 2.5 wide x 1.5' tall	122.2	CY	$496.76	$60,715	
	Footing Rebar @ 150 #/cy	18333.3	LB	$1.79	$32,727	
	Misc Detail Allowance	10%	LS	$0.00	$32,829	access.TESC, restoration, etc

TABLE D-23

Alternative RP-2: Smelterville Detailed Unit Cost

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

Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
Sales Tax on Materials	**5%**			**$5,071**	
Total Direct Unit Cost			**$432.00**	**$380,101**	

Notes:

ACP = asphalt concrete paving
CIP = cast-in-place
CY = cubic yards
EA = each
LB = pound(s)
LS = lump sum
SF = square feet
SY = square yards
TESC = temporary erosion and sediment control

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 D-24

Alternative RP- 2: Kellogg Cost Summary

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	2009 Total Direct and Indirect Capital Cost
Jackass Creek						
1	Reconstruct Existing Channel To 15' X 12' X 5' Channel (Xs 1)	260	LF	$34	$8,840	$15,028
2	Line Side Of Channel With Riprap (5.00 Cf/Lf)	260	LF	$25	$6,500	$11,050
3	Line Culvert Entrance With 15 Cy Of Rip Rap	2	EA	$830	$1,660	$2,822
Portland Road						
1	Construct 4'X0.5'X2' Rock-Lined Ditch Along South Side Of Portland Road. Must First Remove Existing Wooden 1'X1'X1' Flume	1070	LF	$50	$53,500	$90,950
2	Install 300 Lf Of 36" Dia Cpe Pipe In Place Of Existing Pipe	300	LF	$240	$72,000	$122,400
3	Remove And Replace Existing Concrete Vault With 4'X4'X4' Concrete Inlet	1	EA	$6,004	$6,004	$10,207
4	Install 2' W X 1' H X 12' L Rock Water Bars At 250 Lf Spacings Along Portland Road (4 To 5 Rock Bars Total)	1	LS	$325	$325	$553
5	Re-Grade Gravel Road (Portland Road) To Drain South Towards New Ditch	1070	LF	$13	$13,910	$23,647
					Subtotal Rounded	**$280,000**
	NPV for 30-year O&M Cost					**$149,000**
	Total NPV cost at 30 years					**$429,000**

Notes:

NPV = Net Present Value
EA = each
LF = linear feet
LS = lump sum
O&M = operation and maintenance

Assumptions:

All excavated material is hauled to repository and replaced with imported material.
Pipe cover is 3' over pipe
All work will be performed in the summer and therefore no water issues exist.
See estimate details for additional assumptions
Total indirect cost assumes 70% of Total Direct Capital Cost

TABLE D-25

Alternative RP-2: Kellogg Detailed Unit Cost

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

	Description		Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
Jackass Creek							
1	**Reconstruct Existing Channel to 15'x12'x5' -XS1**		**260**	**LF**			
	Clear, Grub & Dispose		50.0	AC	$6,514.75	$1,555	
	Excavate Channel		145.6	CY	$14.80	$2,155	
	Prep & Grade Channel		260	LF	$7.84	$2,039	
	Haul & Dispose at Repository		145.6	CY	$5.49	$799	assume all but rock is wasted, 5 mile 1 way
	Repository Cost		145.6	CY	$11.38	$1,657	use C08a cost
	Misc Detail Allowance		10%	LS	$0.00	$575	access.TESC, restoration, etc
	Sales Tax on Materials		**5%**			**$0**	
		Total Direct Unit Cost			**$34.00**	**$8,780**	
2	**Line Side of Channel with Riprap**		**260**	**LF**			
	Riprap		52	CY	$72.91	$3,791	imported, difficult operation
	Prep & Grade Channel		260	LF	$7.84	$2,039	
	Misc Detail Allowance		10%	LS	$0.00	$583	access.TESC, restoration, etc
	Sales Tax on Materials		**5%**			**$72**	
		Total Direct Unit Cost			**$25.00**	**$6,485**	
3	**Line Culvert Entrance with Riprap**		**1**	**EA**			
	Riprap		15	CY	$48.96	$734	imported, difficult operation
	Misc Detail Allowance		10%	LS	$0.00	$73	access.TESC, restoration, etc
	Sales Tax on Materials		**5%**			**$21**	
		Total Direct Unit Cost			**$830.00**	**$828**	
Portland Road							
1	**Construct 4'x0.5'x2' rock lined ditch**		**1,070**	**LF**			
	Clear, Grub & Dispose		0.7	AC	$6,514.75	$4,801	
	Diversion/Care of Water		0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv		0	LF	$10.39	$0	
	Excavate Channel		713.3	CY	$14.80	$10,556	
	Prep & Grade Channel		1,070	LF	$7.84	$8,391	
	Haul & Dispose at Repository		713.3	CY	$5.49	$3,916	assume all but rock is wasted, 5 mile 1 way
	Repository Cost		713.3	CY	$11.38	$8,118	use C08a cost
	Imported Fill Material		257.6	CY	$53.33	$13,737	imported, difficult operation
	Misc Detail Allowance		10%	LS	$0.00	$3,748	access.TESC, restoration, etc
	Sales Tax on Materials		**5%**			**$213**	
		Total Direct Unit Cost			**$50.00**	**$53,480**	

TABLE D-25

Alternative RP-2: Kellogg Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
2	**Pipeline - 36" CHDPE, 6' to Invert**	**1**	**LF**			3' cover
	Demo ACP Roadway	1.6	SY	$12.55	$20	
	Excavate Trench	1.4	CY	$3.92	$6	
	Bed & Zone	0.5	CY	$46.86	$24	1/2 mile one way average
	Imported Backfill	0.7	CY	$29.94	$20	
	Haul & Dispose at Repository	1.4	CY	$5.49	$8	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	1.4	CY	$11.38	$16	use C08a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 36" CPE Pipe	1	LF	$80.83	$81	200'/day
	ACP Pavement, 4" thk	0.4	TON	$70.00	$25	
	CSBC, 6" thk	0.3	CY	$31.26	$8	
	Flagger	0.08	HR	$60.14	$5	
	Misc Detail Allowance	10%	LS	$0.00	$19	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$6**	
	Total Direct Unit Cost			**$240.00**	**$242**	
3	**Install new 4' x 4' x 4' concrete inlet**	**1**	**EA**			
	Sawcut & Remove Pavement	16.0	SY	$12.55	$201	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Catch Basin	26.7	CY	$14.80	$395	
	Prep & Grade Channel	0	LF	$7.84	$0	
	Haul & Dispose at Repository	26.7	CY	$5.49	$146	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	26.7	CY	$11.38	$303	use C08a cost
	Imported Fill Material	22.0	CY	$53.33	$1,175	imported, difficult operation
	Grate	1.0	EA	$250.00	$250	
	CIP Wall, 6" thk, 4' tall	1.2	CY	$737.64	$874	
	Wall Rebar @ 200 #/cy	237.0	LB	$1.79	$423	
	CIP Elevated Slab, 10" thk	0.8	CY	$737.64	$567	
	Wall Rebar @ 200 #/cy	153.7	LB	$1.79	$274	
	CIP Slab, 10" thk, 7' x 7' wide	0.8	CY	$295.88	$227	
	Footing Rebar @ 150 #/cy	115.3	LB	$1.79	$206	
	Misc Detail Allowance	10%	LS	$0.00	$459	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$502**	
	Total Direct Unit Cost			**$6,004.00**	**$6,003**	

TABLE D-25

Alternative RP-2: Kellogg Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
4	**Install 2' w x 1' h x 12' l rock water bars**	**5**	**EA**			4'w x 1'th
	Prep Channel Bank	0	LF	$86.03	$0	assume 2 days
	Imported Fill Material	4.44	CY	$62.91	$280	imported, difficult operation
	Misc Detail Allowance	15%	LS	$0.00	$42	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$4**	
	Total Direct Unit Cost			**$65.00**	**$325**	
5	**Regrade Gravel Road**	**1,070**	**LS**			5' cover
	Re-Grade Roadway	1426.7	SY	$3.10	$4,416	
	CSBC, 6" thk	237.8	CY	$31.26	$7,432	
	Flagger	8.00	HR	$60.14	$481	
	Misc Detail Allowance	10%	LS	$0.00	$1,233	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$235**	
	Total Direct Unit Cost			**$13.00**	**$13,797**	

Notes:

ACP = asphalt concrete paving
CIP = cast-in-place
CPE = polyethylene
CY = cubic yards
EA = each
LB = pound(s)
LS = lump sum
SF = square feet
SY = square yards
TESC = temporary erosion and sediment control

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 D-26

Alternative RP-2: Wardner Cost Summary

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	2009 Total Direct and Indirect Capital Cost
Wardner/Sierra Nevada Road						
1	Construct 40' Of 36 Dia Cpe Pipe With 1' Of Cover	40	LF	$150	$6,000	$10,200
2	Construct 50' Of 36 Dia Cpe Pipe With 1' Of Cover	50	EA	$150	$7,500	$12,750
3	Install 12'X6.5' Cattle Guard W/ 10'X6'X4' Cast-In-Place Concrete Vault	2	EA	$25,100	$50,200	$85,340
					Subtotal Rounded	**$110,000**
	Npv For 30-Year O&M Cost					**$99,000**
	Total NPV cost at 30 years					**$209,000**

Notes:

NPV = Net Present Value
CPE = polyethylene
EA = each
LF = linear feet
O&M = operation and maintenance

Assumptions:

All excavated material is hauled to repository and replaced with imported material.
Pipe cover is 3' over pipe
All work will be performed in the summer and therefore no water issues exist.
See estimate details for additional assumptions

TABLE D-27

Alternative RP-2: Wardner Detailed Unit Cost

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

	Description		Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
Wardner/Sierra Nevada Road							
1,2	**Pipeline - 36" CHDPE, 1' Cover**		**1**	**LF**			3' cover
	Clear, Grub & Dispose		50.0	AC	$6,514.75	$1	
	Excavate Trench		0.8	CY	$3.92	$3	
	Bed & Zone		0.5	CY	$46.86	$24	1/2 mile one way average
	Imported Backfill		0.1	CY	$29.94	$2	
	Haul & Dispose at Repository		0.8	CY	$5.49	$5	assume all but rock is wasted, 5 mile 1 way
	Repository Cost		0.8	CY	$11.38	$10	use C08a cost
	Trench Safety		1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps		0	HR	$12.00	$0	NA
	Pipe, 36" CPE Pipe		1	LF	$80.83	$81	200'/day
	Misc Detail Allowance		10%	LS	$0.00	$12	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials		**5%**			**$3**	
		Total Direct Unit Cost			**$150.00**	**$146**	
3	**12'X6' Cattle Guard with CIP Vault**		**1**	**EA**			
	10'x6' Cattle Guard		1.0	EA	$10,305.31	$10,305	Use $100/SF cost
	Grade existing pond bottom		140.0	SF	$3.14	$439	
	Excavate for walls		25.9	CY	$3.92	$102	
	Imported Backfill		8.1	CY	$29.94	$244	
	Haul & Dispose at Repository		25.9	CY	$5.49	$142	assume all but rock is wasted, 5 mile 1 way
	Repository Cost		25.9	CY	$11.38	$295	use C08a cost
	CIP Wall, 12" thk, 4 ft tall		5.3	CY	$737.64	$3,934	
	Wall Rebar @ 200 #/cy		1066.7	LB	$1.79	$1,904	
	CIP Slab, 12" thk, 14'x10' including 1 foot beyond wall		5.2	CY	$295.88	$1,534	
	Footing Rebar @ 150 #/cy		777.8	LB	$1.79	$1,388	
	Misc Detail Allowance		20%	LS	$0.00	$4,058	
	Sales Tax on Materials		**5%**			**$717**	
		Total Direct Unit Cost			**$25,100.00**	**$25,063**	

TABLE D-27

Alternative RP-2: Wardner Detailed Unit Cost

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

Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments

Notes:

CPE = polyethylene
CIP = cast-in-place
CY = cubic yards
EA = each
LB = pound(s)
LS = lump sum
SF = square feet
TESC = temporary erosion and sediment control

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 D-28

Alternative RP-2: Osburn Cost Summary

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	2009 Total Direct and Indirect Capital Cost
Shields Gulch						
1	Replace Existing 32"∅ Cmp Culvert With 4'X6' Cmp Arch (Culvert 1)	14	LF	$780	$10,920	$18,564
2	Replace Existing 36"∅ Concrete Culvert With 4'X6' Cmp Arch (Culvert 2)	25	LF	$780	$19,500	$33,150
3	Replace Existing 36"∅ Cmp Culvert With 4'X6' Cmp Arch (Culvert 3)	50	LF	$780	$39,000	$66,300
4	Install New 4'X6' Cmp Arch Culvert (Culvert 4)	35	LF	$570	$19,950	$33,915
5	Reconstruct Right Channel Bank With 1' Berm (Xs 1)	65	LF	$411	$26,715	$45,416
6	Construct 12' X 4' X 4' Earthen Channel (Xs 2)	1890	LF	$57	$107,730	$183,141
7	Construct 25' X 15' X 5' Earthen Channel (Xs 3)	155	LF	$260	$40,300	$68,510
Rosebud Gulch						
1	Replace Existing Culverts (One 24"∅ Cmp And Two 20"∅ Cmp) With One 48"∅ Cmp (Culvert 1)	130	LF	$620	$80,600	$137,020
2	Replace Existing Park Culvert With A 10.5' X 16' Single Span Bridge With A Clear Height Of 2' (Bridge 1)	1	EA	$95,000	$95,000	$161,500
3	Reconstruct Right Channel Bank With 1' Berm (Xs 1)	310	LF	$110	$34,100	$57,970
4	Reconstruct Existing Channel To 11' X 4' X 4' Earthen Channel (Xs 2 - A & B)	90	LF	$32	$2,880	$4,896
5	Reconstruct Existing Channel To 8.5' X 5.5' X 2' Earthen Channel (Xs 4)	1330	LF	$21	$27,930	$47,481
Meyer Creek						
1-10	Construct 24"∅ hdpe Pipe At An Average Depth Of 7 Ft	2835	LF	$210	$595,350	$1,012,095
11	Furnish And Install New 48"∅ Manhole	9	EA	$4,600	$41,400	$70,380
12	Abandon 360 Lf Of Existing Meyer Creek Pipe-Leave Open For Storage	1	LS	$0	$0	$0
13	Modify Inlet Structure	1	LS	$97,874	$97,874	$166,386
					Subtotal Rounded	**$2,110,000**
	NPV for 30-year O&M Cost					**$745,000**
	Total NPV cost at 30 years					**$2,855,000**

Notes:

NPV = Net Present Value
EA = each
LF = linear feet
LS = lump sum
O&M = operation and maintenance

Assumptions:

All excavated material is hauled to repository and replaced with imported material.
Pipe cover is 3' over pipe
All work will be performed in the summer and therefore no water issues exist.
See estimate details for additional assumptions
Total indirect cost assumes 70% of Total Direct Capital Cost

TABLE D-29

Alternative RP-2: Osburn Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
Shields Gulch						
1,2,3	**Replace Culvert with 4'X6' CMP Arch**	**50**	**LF**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	40	SY	$12.55	$502	
	Remove & Dispose Existing Culvert	30	LF	$7.84	$235	32 to 36" CMP or RCP
	Excavate Trench	83.2	CY	$7.84	$653	account for pipe removal & loading, less pipe
	Bed & Zone	44.2	CY	$46.86	$2,071	1/2 mile one way average
	Imported Backfill	32.0	CY	$24.94	$798	assume all wasted to repository
	Haul & Dispose at Repository	83.2	CY	$5.49	$457	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	83.2	CY	$11.38	$947	use C08a cost
	Trench Safety	30	LF	$5.00	$150	trench box
	Dewatering: Two Sump Pmps		HR	$12.00	$0	none requred
	4'x6' CMP Arch	30	LF	$360.72	$10,822	75'/day
	Headwall/Miter	1	EA	$1,500.00	$1,500	allowance
	Restoration - Base Course & Pavement Patch	40	SY	$22.00	$880	subcontract
	Misc Detail Allowance	20%	LS	$0.00	$3,522	minor traffic control, TESC, etc
	Sales Tax on Materials	**5%**			**$672**	
	Total Direct Unit Cost			**$780.00**	**$23,208**	
4	**New 4'X6' CMP Arch Culvert**	**35**	**LF**			3' cover
	Sawcut & Remove Pavement	46.7	SY	$12.55	$586	
	Remove & Dispose Existing Culvert	0	LF	$7.84	$0	not required
	Excavate Trench	105.2	CY	$3.92	$412	account for pipe removal & loading
	Bed & Zone	51.6	CY	$46.86	$2,416	1/2 mile one way average
	Imported Backfill	37.3	CY	$24.94	$930	assume all wasted to repository
	Haul & Dispose at Repository	105.2	CY	$5.49	$577	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	105.2	CY	$11.38	$1,197	use C08a cost
	Trench Safety	35	LF	$5.00	$175	trench box
	Dewatering: Two Sump Pmps		HR	$12.00	$0	none requred
	4'x6' CMP Arch	35	LF	$215.32	$7,536	75'/day, Material cost per The Guide
	Headwall/Miter	1	EA	$1,500.00	$1,500	allowance
	Restoration - Base Course & Pavement Patch	46.7	SY	$22.00	$1,027	subcontract
	Misc Detail Allowance	20%	LS	$0.00	$2,916	minor traffic control, TESC, etc
	Sales Tax on Materials	**5%**			**$464**	
	Total Direct Unit Cost			**$570.00**	**$19,737**	

TABLE D-29

Alternative RP-2: Osburn Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
5	**Reconstruct Right Channel Bank with 1' Berm**	**65**	**LF**			4'w x 1'th
	Prep Channel Bank	65	LF	$86.03	$5,592	assume 2 days
	Imported Fill Material	9.63	CY	$62.91	$606	imported, difficult operation
	Misc Detail Allowance	15%	LS	$0.00	$20,255	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$231**	
	Total Direct Unit Cost			**$411.00**	**$26,683**	
6	**Construct 12'x4'x4' Earthen Channel**	**1,890**	**LF**			
	Clear, Grub & Dispose	1.7	AC	$6,514.75	$11,307	
	Diversion/Care of Water	0	LF	$10.00	$0	allowance for temp dikes/facilities & bypass pumping
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	2268	CY	$14.80	$33,562	25cy/hr to remove & load, small area
	Prep & Grade Channel	1890	LF	$7.84	$14,821	
	Haul & Dispose at Repository	2268	CY	$5.49	$12,451	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	2268	CY	$11.38	$25,810	use C08a cost
	Pea Gravel	0	CY	$19.88	$0	
	Sand	0	CY	$19.88	$0	
	Liner/Geotextile System	0	SY	$4.97	$0	
	Misc Detail Allowance	15%	LS	$0.00	$8,954	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$0**	
	Total Direct Unit Cost			**$57.00**	**$106,905**	
7	**Construct 25'x15'x5' Earthen Channel**	**155**	**LF**			
	Clear, Grub & Dispose	0.1	AC	$6,514.75	$927	
	Diversion/Care of Water	0	LF	$10.00	$0	allowance for temp dikes/facilities & bypass pumping
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	655.7	CY	$15.68	$10,283	25cy/hr to remove & load
	Prep & Grade Channel	155	LF	$7.84	$1,216	
	Haul & Dispose at Repository	655.7	CY	$5.49	$3,600	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	655.7	CY	$11.38	$7,461	use C08a cost
	Imported Fill Material	52.7	CY	$62.91	$3,312	imported, difficult operation
	Sand	0	CY	$19.88	$0	
	Liner/Geotextile System	0	SY	$4.97	$0	
	Imported Fill Material	181.35	CY	$49.41	$8,961	imported, small operation
	Misc Detail Allowance	15%	LS	$0.00	$3,705	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$202**	
	Total Direct Unit Cost			**$260.00**	**$39,666**	

TABLE D-29

Alternative RP-2: Osburn Detailed Unit Cost

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

	Description		Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
Rosebud Gulch							
1	**Replace Multiple Culverts w/1-48" CMP Culvert**		**130**	**LF**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement		642.8	SY	$12.55	$8,065	
	Remove & Dispose Existing Culvert, 1-24" & 2-20" CMP		390	LF	$3.92	$1,529	
	Excavate Trench		294.8	CY	$7.84	$2,312	account for pipe removal & loading, less pipe
	Bed & Zone		132.6	CY	$46.86	$6,214	1/2 mile one way average
	Imported Backfill		136.7	CY	$24.94	$3,409	assume all wasted to repository
	Haul & Dispose at Repository		294.8	CY	$5.49	$1,619	assume all but rock is wasted, 5 mile 1 way
	Repository Cost		294.8	CY	$11.38	$3,355	use C08a cost
	Trench Safety		130	LF	$5.00	$650	trench box
	Dewatering: Two Sump Pmps		0	HR	$12.00	$0	none requred
	48" CMP Pipe		130	LF	$182.34	$23,704	100'/day
	Headwall/Miter		1	EA	$1,500.00	$1,500	allowance
	Restoration - Base Course & Pavement Patch		642.8	SY	$22.00	$14,141	subcontract
	Misc Detail Allowance		20%	LS	$0.00	$12,305	minor traffic control, TESC, etc
	Sales Tax on Materials		**5%**			**$1,324**	
		Total Direct Unit Cost			**$620.00**	**$80,127**	
2	**Replace Multiple Culverts w/Single Span Bridge**		**1**	**LF**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement		642.8	SY	$12.55	$8,065	
	Remove & Dispose Existing Culvert, 1-24" & 2-20" CMP		390	LF	$3.92	$1,529	
	Excavate Trench		294.8	CY	$7.84	$2,312	account for pipe removal & loading, less pipe
	Bed & Zone		132.6	CY	$46.86	$6,214	1/2 mile one way average
	Imported Backfill		136.7	CY	$24.94	$3,409	assume all wasted to repository
	Haul & Dispose at Repository		294.8	CY	$5.49	$1,619	assume all but rock is wasted, 5 mile 1 way
	Repository Cost		294.8	CY	$11.38	$3,355	use C08a cost
	Trench Safety		1	LF	$5.00	$5	trench box
	New Bridge & Abutments - Steel		168	SF	$300.00	$50,400	based on road & bridge file
	Misc Detail Allowance		20%	LS	$0.00	$14,387	minor traffic control, TESC, etc
	Sales Tax on Materials		**5%**			**$3,322**	
		Total Direct Unit Cost			**$95,000.00**	**$94,617**	
3	**Reconstruct Right Channel Bank**		**310**	**LF**			see detail
	Prep Channel Bank		310	LF	$86.03	$26,668	difficult operation, assume 10 dys
	Imported Fill Material		62	CY	$62.91	$3,900	imported, difficult operation
	Misc Detail Allowance		10%	LS	$0.00	$3,057	access.TESC, restoration, etc
	Sales Tax on Materials		**5%**			**$51**	
		Total Direct Unit Cost			**$110.00**	**$33,676**	

TABLE D-29

Alternative RP-2: Osburn Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
4	**Reconstruct Existing Channel to 11'x4'x4' Earthen Channel**	**90**	**LF**			
	Clear, Grub & Dispose	0.1	AC	$6,514.75	$538	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	4.5	CY	$15.68	$71	25cy/hr to remove & load
	Prep & Grade Channel	90	LF	$7.84	$706	
	Haul & Dispose at Repository	4.5	CY	$5.49	$25	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	4.5	CY	$11.38	$51	use C08a cost
	Imported Fill Material	19.4	CY	$62.91	$1,217	imported, difficult operation
	Sand	0	CY	$19.88	$0	
	Liner/Geotextile System	0	SY	$4.97	$0	
	Misc Detail Allowance	10%	LS	$0.00	$253	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$16**	
	Total Direct Unit Cost			**$32.00**	**$2,877**	
5	**Reconstruct Existing Channel to 8.5'x5.5'x2' Earthen Channel**	**1,330**	**LF**			
	Clear, Grub & Dispose	1.2	AC	$6,514.75	$7,956	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	199.5	CY	$14.80	$2,952	
	Prep & Grade Channel	1330	LF	$7.84	$10,430	
	Haul & Dispose at Repository	199.5	CY	$5.49	$1,095	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	199.5	CY	$11.38	$2,270	use C08a cost
	Imported Fill Material	0	CY	$62.91	$0	imported, difficult operation
	Sand	0	CY	$19.88	$0	
	Liner/Geotextile System	0	SY	$4.97	$0	
	Misc Detail Allowance	10%	LS	$0.00	$2,134	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$0**	
	Total Direct Unit Cost			**$21.00**	**$26,838**	
Meyer Creek						
1-10	**Pipeline - 24"**	**1**	**LF**			5' cover
	Sawcut & Remove Pavement	1.3	SY	$12.55	$17	
	Excavate Trench	1.6	CY	$3.92	$6	
	Bed & Zone	0.4	CY	$46.86	$17	1/2 mile one way average
	Imported Backfill	1.1	CY	$29.94	$33	
	Haul & Dispose at Repository	1.6	CY	$5.49	$9	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	1.6	CY	$11.38	$18	use C08a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA

TABLE D-29

Alternative RP-2: Osburn Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments	
	Pipe, 24" Corrugated HDPE	1	LF	$58.67	$59	200'/day	
	Restoration - Base Course & Pavement Patch	1.3	SY	$22.00	$29	subcontract	
	Misc Detail Allowance	10%	LS	$0.00	$17	road maint & repair, testing, detection tape, etc	
	Sales Tax on Materials	**5%**			**$3**		
	Total Direct Unit Cost			**$210.00**	**$211**		
11	**Manhole, 48" Dia X 8'**	**1**	**EA**				
	Purchase & Install Manhole, Frame, Ring, Cover	1	EA	$4,068.40	$4,068		
	Misc Detail Allowance	10%	LS	$0.00	$407	invert	
	Sales Tax on Materials	**5%**			**$138**		
	Total Direct Unit Cost			**$4,600.00**	**$4,613**		
12	**Abandon Meyer Creek Pipe**	**360**	**LF**				
	Plug Ends with Concrete	0	EA	$250.00	$0	leave open, use as overflow storage	
	Misc Detail Allowance	20%	LS	$0.00	$0		
	Sales Tax on Materials	**5%**			**$0**		
	Total Direct Unit Cost			**$0.00**	**$0**		
13	**Modify Inlet Structure**	**1**	**EA**				**$95,214**
	Riprap	40	CY	$72.91	$2,916	imported, difficult operation	
	12'x15' Steel Trash Rack at outlet	1	EA	$21,105.31	$21,105	Use $100/SF cost	
	Grade existing pond bottom	2000	SF	$3.14	$6,274		
	CIP Wall, 8" thk, 50 lf x 6 ft tall	7.4	CY	$737.64	$5,491		
	Wall Rebar @ 200 #/cy	1488.9	LB	$1.79	$2,658		
	CIP Wall Footing, 2.5 wide x 1.5' tall	6.9	CY	$496.76	$3,450		
	Footing Rebar @ 150 #/cy	1041.7	LB	$1.79	$1,859		
	CIP Slab and sump, 10" thk	61.5	CY	$295.88	$18,191		
	Footing Rebar @ 150 #/cy	9222.2	LB	$1.79	$16,463		
	Crushed Gravel Driveway	30	CY	$31.26	$938		
	Misc Detail Allowance	20%	LS	$0.00	$15,869		
	Sales Tax on Materials	**5%**			**$2,660**		
	Total Direct Unit Cost				**$97,874**		

TABLE D-29

Alternative RP-2: Osburn Detailed Unit Cost

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

Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments

Notes:

CIP = cast-in-place
CMP = corrugated metal pipe
CY = cubic yards
EA = each
HDPE = high density polyethylene
HR = hour
LB = pound(s)
LS = lump sum
SF = square feet
SY = square yards
TESC = temporary erosion and sediment control

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
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 D-30

Alternative RP-2: Silverton Cost Summary

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	2009 Total Direct and Indirect Capital Cost
Revenue Gultch Alternative 2						
1	Replace Existing Culvert (48" Dia Cmp) With 56" Dia Cmp (Culvert 1)	38	LF	$540	$20,520	$34,884
2	Replace Existing Culvert (15 Lf Of 48" Dia Cmp) With 15'X32' Single Span Bridge W/ A Clear Height Of 5' (Bridge 1)	1	LS	$184,000	$184,000	$312,800
3	Replace Existing Culvert (48" Dia Cmp) W/ One 5.6'X7.9' Pipe Arch Cmp (Culvert 2)	32	LF	$810	$25,920	$44,064
4	Replace Existing Culvert (48" Dia Cmp) W/ One 6.1'X8.8' Pipe Arch Cmp (Culvert 3)	22	LF	$1,350	$29,700	$50,490
5	Replace Existing Culvert (Box Culvert) With One 3'X7.5' Box Culvert (Culvert 4)	550	LF	$1,054	$579,700	$985,490
6	Install/Construct Overflow Structure	1	LS	$72,500	$72,500	$123,250
7	Construct 235 Lf Of 18" Dia Chdpe At An Avg Depth Of 6' To Invert (Pipe 1)	235	LF	$160	$37,600	$63,920
8	Construct 210 Lf Of 18" Dia Chdpe At An Avg Depth Of 6' To Invert (Pipe 2)	210	LF	$160	$33,600	$57,120
9	Construct 210 Lf Of 18" Dia Chdpe At An Avg Depth Of 6' To Invert (Pipe 3)	210	LF	$160	$33,600	$57,120
10	Construct 200 Lf Of 18" Dia Chdpe At An Avg Depth Of 6' To Invert (Pipe 4)	200	LF	$160	$32,000	$54,400
11	Construct 80 Lf Of 36" Dia Chdpe At An Avg Depth Of 6' To Invert (Pipe 5)	80	LF	$240	$19,200	$32,640
12	Construct 290 Lf Of 36" Dia Chdpe At An Avg Depth Of 7.5' To Invert (Pipe 6)	290	LF	$290	$84,100	$142,970
13	Construct 225 Lf Of 36" Dia Chdpe At An Avg Depth Of 7.5' To Invert (Pipe 7)	225	LF	$290	$65,250	$110,925
14	Construct 190 Lf Of 36" Dia Chdpe At An Avg Depth Of 7.5' To Invert (Pipe 8)	190	LF	$290	$55,100	$93,670
15	Construct 190 Lf Of 36" Dia Chdpe At An Avg Depth Of 7.5' To Invert (Pipe 9)	190	LF	$290	$55,100	$93,670
16	Construct 205 Lf Of 36" Dia Chdpe At An Avg Depth Of 7.5' To Invert (Pipe 10)	205	LF	$290	$59,450	$101,065
17	Construct 185 Lf Of 36" Dia Chdpe At An Avg Depth Of 7.5' To Invert (Pipe 11)	185	LF	$290	$53,650	$91,205
18	Construct 190 Lf Of 36" Dia Chdpe At An Avg Depth Of 7.5' To Invert (Pipe 12)	190	LF	$290	$55,100	$93,670
19	Construct 265 Lf Of 36" Dia Chdpe At An Avg Depth Of 6' To Invert (Pipe 13)	265	LF	$240	$63,600	$108,120
20	Construct 265 Lf Of 36" Dia Chdpe At An Avg Depth Of 6' To Invert (Pipe 14)	265	LF	$240	$63,600	$108,120
21	Construct 70 Lf Of 42" Dia Chdpe At An Avg Depth Of 5.5' To Invert (Pipe 15)	70	LF	$280	$19,600	$33,320
22	Furnish And Install New 48" Dia Manhole At A Depth Of 6' To 8'	14	EA	$4,890	$68,460	$116,382
23	Furnish And Install New Storm Drain	8	EA	$6,130	$49,040	$83,368
West of Western Avenue						
1	Construct 206 Lf Of 16" Dia Chdpe At An Avg Depth Of 6' To Invert (Pipe 1)	206	LF	$150	$30,900	$52,530
2	Construct 220 Lf Of 16" Dia Chdpe At An Avg Depth Of 6' To Invert (Pipe 2)	220	LF	$150	$33,000	$56,100
3	Construct 229 Lf Of 16" Dia Chdpe At An Avg Depth Of 6' To Invert (Pipe 3)	229	LF	$150	$34,350	$58,395
4	Construct 192 Lf Of 18" Dia Chdpe At An Avg Depth Of 6' To Invert (Pipe 4)	192	LF	$160	$30,720	$52,224
5	Construct 196 Lf Of 20" Dia Chdpe At An Avg Depth Of 6.5' To Invert (Pipe 5)	196	LF	$180	$35,280	$59,976
6	Construct 183 Lf Of 20" Dia Chdpe At An Avg Depth Of 6.5' To Invert (Pipe 6)	183	LF	$180	$32,940	$55,998
7	Construct 192 Lf Of 20" Dia Chdpe At An Avg Depth Of 6.5' To Invert (Pipe 7)	192	LF	$180	$34,560	$58,752
8	Construct 181 Lf Of 20" Dia Chdpe At An Avg Depth Of 6.5' To Invert (Pipe 8)	181	LF	$180	$32,580	$55,386
9	Construct 200 Lf Of 22" Dia Chdpe At An Avg Depth Of 6.5' To Invert (Pipe 9)	200	LF	$200	$40,000	$68,000
10	Construct 544 Lf Of 22" Dia Chdpe At An Avg Depth Of 5' To Invert (Pipe 10)	544	LF	$150	$81,600	$138,720
11	Furnish And Install New 48" Dia Manhole At A Depth Of 6' To 8'	10	EA	$4,890	$48,900	$83,130
12	Furnish And Install New Storm Drain	20	EA	$6,130	$122,600	$208,420
Unnamed Creek						
1	Replace Existing Culvert (12" Cmp) With 22" Dia Cmp (Culvert 1)	24	LF	$290	$6,960	$11,832
2	Reconstruct Existing Channel To 12'X3'X3' Earthen Channel (Xs 1)	1115	LS	$43	$47,945	$81,507
					Subtotal Rounded	**$4,030,000**
	NPV for 30-year O&M Cost					**$1,340,000**
	Total NPV cost at 30 years					**$5,370,000**

Notes:

NPV = Net Present Value
CMP = corrugated metal pipe
EA = each
LF = linear feet
LS = lump sum
O&M = operation and maintenance

Assumptions:

All excavated material is hauled to repository and replaced with imported material.
Pipe cover is 3' over pipe
All work will be performed in the summer and therefore no water issues exist.
See estimate details for additional assumptions

TABLE D-31

Alternative RP- 2: Silverton Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
Revenue Gulch						
1	**Replace 48" Culverst w/ 56" CMP Culvert**	**38**	**LF**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	50.0	SY	$12.55	$0	
	Remove & Dispose Existing Culvert, 1-48" CMP	38	LF	$15.68	$596	
	Excavate Trench	101.1	CY	$7.84	$793	account for pipe removal & loading, less pipe
	Bed & Zone	35.4	CY	$46.86	$1,658	1/2 mile one way average
	Imported Backfill	41.6	CY	$24.94	$1,038	assume all wasted to repository
	Haul & Dispose at Repository	101.1	CY	$5.49	$555	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	101.1	CY	$11.38	$1,150	use C08a cost
	Trench Safety	38	LF	$5.00	$190	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	none requred
	56" CMP Pipe	38	LF	$241.52	$9,178	75'/day
	Headwall/Miter	1	EA	$1,500.00	$1,500	allowance
	Restoration - Base Course & Pavement Patch	0.0	SY	$22.00	$0	subcontract
	Misc Detail Allowance	20%	LS	$0.00	$2,990	minor traffic control, TESC, etc
	Sales Tax on Materials	**5%**			**$535**	
	Total Direct Unit Cost			**$540.00**	**$20,183**	
2	**Replace Multiple Culverts w/ 15'x32' Single Span Bridge**	**1**	**EA**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	53.3	SY	$12.55	$669	
	Remove & Dispose Existing Culvert, 1-48" CMP	15	LF	$15.68	$235	
	Excavate Trench	45.1	CY	$7.84	$353	account for pipe removal & loading, less pipe
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	0.0	CY	$9.94	$0	assume all wasted to repository
	Haul & Dispose at Repository	45.1	CY	$5.49	$247	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	45.1	CY	$11.38	$513	use C08a cost
	Trench Safety	0	LF	$5.00	$0	trench box
	New Bridge & Abutments - Steel	480	SF	$300.00	$144,000	based on road & bridge file
	Misc Detail Allowance	20%	LS	$0.00	$29,052	minor traffic control, TESC, etc
	Sales Tax on Materials	**5%**			**$8,640**	
	Total Direct Unit Cost			**$184,000.00**	**$183,710**	

TABLE D-31

Alternative RP- 2: Silverton Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
3	**Replace 48" Culverts w/ 5.6'x7.9' Arch Culvert**	**32**	**LF**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	0.0	SY	$12.55	$0	
	Remove & Dispose Existing Culvert, 1-48" CMP	32	LF	$15.68	$502	
	Excavate Trench	147.2	CY	$7.84	$1,154	account for pipe removal & loading, less pipe
	Bed & Zone	62.1	CY	$46.86	$2,909	1/2 mile one way average
	Imported Backfill	54.4	CY	$24.94	$1,357	assume all wasted to repository
	Haul & Dispose at Repository	147.2	CY	$5.49	$808	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	147.2	CY	$11.38	$1,675	use C08a cost
	Trench Safety	32	LF	$5.00	$160	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	none requred
	95"x67" Arch CMP Culert	32	LF	$335.88	$10,748	50'/day, Material cost per The Guide
	Headwall/Miter	1	EA	$2,000.00	$2,000	allowance
	Restoration - Base Course & Pavement Patch	0.0	SY	$22.00	$0	subcontract
	Misc Detail Allowance	20%	LS	$0.00	$3,766	minor traffic control, TESC, etc
	Sales Tax on Materials	**5%**			**$656**	
	Total Direct Unit Cost			**$810.00**	**$25,735**	
4	**Replace 48" Culverts/ 6.1'x8.8' Arch Culvert**	**22**	**LF**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	0.0	SY	$12.55	$0	
	Remove & Dispose Existing Culvert, 1-48" CMP	22	LF	$15.68	$345	
	Excavate Trench	214.9	CY	$7.84	$1,686	account for pipe removal & loading, less pipe
	Bed & Zone	91.1	CY	$46.86	$4,269	1/2 mile one way average
	Imported Backfill	66.8	CY	$24.94	$1,667	assume all wasted to repository
	Haul & Dispose at Repository	214.9	CY	$5.49	$1,180	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	214.9	CY	$11.38	$2,446	use C08a cost
	Trench Safety	22	LF	$5.00	$110	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	none requred
	112"x75" Arch CMP Culert	22	LF	$497.76	$10,951	25'/day, Material cost per The Guide
	Headwall/Miter	1	EA	$2,000.00	$2,000	allowance
	Restoration - Base Course & Pavement Patch	0.0	SY	$22.00	$0	subcontract
	Misc Detail Allowance	20%	LS	$0.00	$4,205	minor traffic control, TESC, etc
	Sales Tax on Materials	**5%**			**$628**	
	Total Direct Unit Cost			**$1,350.00**	**$29,487**	

TABLE D-31

Alternative RP- 2: Silverton Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments	
5	**Replace Existing Box Culvert w/3'x7.5' Box Culvert**	**550**	**LF**				
	Demo ACP Roadway	305.6	SY	$12.55	$3,834	275' of length under roadway	
	Remove & Dispose Existing Box Culvert	550	LF	$31.37	$17,252		
	Excavate Channel	1161.1	CY	$5.92	$6,873		
	Imported Fill Material	702.8	CY	$24.94	$17,529	imported	
	Haul & Dispose at Repository	1161.1	CY	$5.57	$6,472	assume all but rock is wasted, 5 mile 1 way	
	Repository Cost	1161.1	CY	$11.38	$13,213	use C08a cost	
	CIP Wall, 8" thk, 3 ft tall	81.9	CY	$737.64	$60,405		
	Wall Rebar @ 200 #/cy	16378	LB	$1.79	$29,236		
	CIP Elv Slab, 7.5' wide x 8" Thk	204.7	CY	$664.70	$136,079		
	Elv Slab Rebar @ 200 #/cy	40944	LB	$1.79	$73,090		
	CIP Slab, 7.5' wide x 10" thk	204.7	CY	$295.88	$60,573		
	Footing Rebar @ 150 #/cy	30708	LB	$1.79	$54,818		
	ACP Pavement, 4" thk	70	TON	$70.00	$4,877		
	CSBC, 6" thk	51	CY	$31.26	$1,592		
	Flagger	200	HR	$60.14	$12,028		
	Misc Detail Allowance	15%	LS	$0.00	$72,698	access.TESC, restoration, etc	
	Sales Tax on Materials	**5%**			**$9,232**		
	Total Direct Unit Cost			**$1,054.00**	**$579,801**		
6	**Overflow Structure**	**1**	**EA**				**$70,211**
	Riprap	18.5	CY	$72.91	$1,350	imported, difficult operation	
	20'x6' Steel Trash Rack at outlet	1.0	EA	$15,105.31	$15,105	Use $100/SF cost	
	Grade existing pond bottom	950.0	SF	$3.14	$2,980		
	Excavate for walls	44.6	CY	$3.92	$175		
	Imported Backfill	25.5	CY	$29.94	$763		
	Haul & Dispose at Repository	44.6	CY	$5.49	$245	assume all but rock is wasted, 5 mile 1 way	
	Repository Cost	44.6	CY	$11.38	$507	use C08a cost	
	Sluice Gate, 36"x36"	1.0	EA	$17,217.04	$17,217		
	CIP Wall, 12" thk, 6 ft tall	9.6	CY	$737.64	$7,049		
	Wall Rebar @ 200 #/cy	1911.1	LB	$1.79	$3,412		
	CIP Wall Footing, 3 wide x 2' tall	9.6	CY	$496.76	$4,747		
	Footing Rebar @ 150 #/cy	1433.3	LB	$1.79	$2,559		
	CIP Slab, 12" thk	4.3	CY	$295.88	$1,260		
	Footing Rebar @ 150 #/cy	638.9	LB	$1.79	$1,140		
	Misc Detail Allowance	20%	LS	$0.00	$11,702		
	Sales Tax on Materials	**5%**			**$2,339**		
	Total Direct Unit Cost			**$72,500.00**	**$72,549**		

TABLE D-31

Alternative RP- 2: Silverton Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
7-10	**Pipeline - 18" CHDPE, 6' to Invert**	**1**	**LF**			4.5' cover
	Demo ACP Roadway	1.4	SY	$12.55	$17	
	Excavate Trench	1.1	CY	$3.92	$4	
	Bed & Zone	0.3	CY	$46.86	$13	1/2 mile one way average
	Imported Backfill	0.7	CY	$29.94	$22	
	Haul & Dispose at Repository	1.1	CY	$5.49	$6	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	1.1	CY	$11.38	$12	use C08a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 18" CPE Pipe	1	LF	$30.71	$31	350'/day
	ACP Pavement, 4" thk	0.3	TON	$70.00	$22	
	CSBC, 6" thk	0.2	CY	$31.26	$7	
	Flagger	0.05	HR	$60.14	$3	
	Misc Detail Allowance	10%	LS	$0.00	$12	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$3**	
	Total Direct Unit Cost			**$160.00**	**$158**	
11,19,20	**Pipeline - 36" CHDPE, 6' to Invert**	**1**	**LF**			3' cover
	Demo ACP Roadway	1.6	SY	$12.55	$20	
	Excavate Trench	1.4	CY	$3.92	$6	
	Bed & Zone	0.5	CY	$46.86	$24	1/2 mile one way average
	Imported Backfill	0.7	CY	$29.94	$20	
	Haul & Dispose at Repository	1.4	CY	$5.49	$8	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	1.4	CY	$11.38	$16	use C08a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 36" CPE Pipe	1	LF	$80.83	$81	200'/day
	ACP Pavement, 4" thk	0.4	TON	$70.00	$25	
	CSBC, 6" thk	0.3	CY	$31.26	$8	
	Flagger	0.08	HR	$60.14	$5	
	Misc Detail Allowance	10%	LS	$0.00	$19	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$6**	
	Total Direct Unit Cost			**$240.00**	**$242**	

TABLE D-31

Alternative RP- 2: Silverton Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
12-18	**Pipeline - 36" CHDPE, 7.5' to Invert**	**1**	**LF**			4.5' cover
	Demo ACP Roadway	1.9	SY	$12.55	$24	
	Excavate Trench	2.1	CY	$3.92	$8	
	Bed & Zone	0.5	CY	$46.86	$24	1/2 mile one way average
	Imported Backfill	1.3	CY	$29.94	$39	
	Haul & Dispose at Repository	2.1	CY	$5.49	$11	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	2.1	CY	$11.38	$24	use C08a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 36" CPE Pipe	1	LF	$80.83	$81	200'/day
	ACP Pavement, 4" thk	0.4	TON	$70.00	$30	
	CSBC, 6" thk	0.3	CY	$31.26	$10	
	Flagger	0.08	HR	$60.14	$5	
	Misc Detail Allowance	10%	LS	$0.00	$23	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$7**	
	Total Direct Unit Cost			**$290.00**	**$290**	
21	**Pipeline - 42" CHDPE, 5.5' to Invert**	**1**	**LF**			2' cover
	Demo ACP Roadway	1.5	SY	$12.55	$19	
	Excavate Trench	1.4	CY	$3.92	$5	
	Bed & Zone	0.6	CY	$46.86	$29	1/2 mile one way average
	Imported Backfill	0.4	CY	$29.94	$12	
	Haul & Dispose at Repository	1.4	CY	$5.49	$8	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	1.4	CY	$11.38	$16	use C08a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 42" CPE Pipe	1	LF	$118.68	$119	150'/day
	ACP Pavement, 4" thk	0.3	TON	$70.00	$24	
	CSBC, 6" thk	0.3	CY	$31.26	$8	
	Flagger	0.11	HR	$60.14	$6	
	Misc Detail Allowance	10%	LS	$0.00	$23	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$7**	
	Total Direct Unit Cost			**$280.00**	**$280**	

TABLE D-31

Alternative RP- 2: Silverton Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
22	**Manhole 48" 6 to 8 ft Depth**	**1**	**EA**			
	Demo ACP Roadway	7.1	SY	$12.55	$89	
	Excavate Trench	19.0	CY	$3.92	$74	
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	15.2	CY	$29.94	$456	
	Haul & Dispose at Repository	19.0	CY	$5.49	$104	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	19.0	CY	$11.38	$216	use C08a cost
	Trench Safety	1	EA	$25.00	$25	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	48" Manhole	1	EA	$2,776.78	$2,777	
	ACP Pavement, 4" thk	1.6	TON	$70.00	$113	
	CSBC, 6" thk	1.2	CY	$31.26	$37	
	Flagger	8.00	HR	$60.14	$481	
	Misc Detail Allowance	10%	LS	$0.00	$405	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$112**	
	Total Direct Unit Cost			**$4,890.00**	**$4,890**	
23	**Furnish and Install Storm Drain and Inlet**	**1**	**EA**			3' cover, 25 ft long
	Demo ACP Roadway	26.4	SY	$12.55	$331	
	Excavate Trench	17.1	CY	$3.92	$67	
	Bed & Zone	7.0	CY	$46.86	$328	1/2 mile one way average
	Imported Backfill	8.5	CY	$29.94	$254	
	Haul & Dispose at Repository	17.1	CY	$5.49	$94	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	17.1	CY	$11.38	$195	use C08a cost
	Trench Safety	25	LF	$5.00	$125	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 18" CPE Pipe	25	LF	$30.71	$768	350'/day
	Grated concrete inlet structure	1	EA	$2,758.50	$2,759	
	ACP Pavement, 4" thk	6.0	TON	$70.00	$421	
	CSBC, 6" thk	4.4	CY	$31.26	$137	
	Flagger	0.05	HR	$60.14	$3	
	Misc Detail Allowance	10%	LS	$0.00	$519	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$129**	
	Total Direct Unit Cost			**$6,130.00**	**$6,131**	

TABLE D-31

Alternative RP- 2: Silverton Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
West of Western Avenue						
1-3	**Pipeline - 16" CHDPE, 6' to Invert**	**1**	**LF**			4.5' cover
	Demo ACP Roadway	1.4	SY	$12.55	$17	
	Excavate Trench	1.0	CY	$3.92	$4	
	Bed & Zone	0.3	CY	$46.86	$12	1/2 mile one way average
	Imported Backfill	0.7	CY	$29.94	$22	
	Haul & Dispose at Repository	1.0	CY	$5.49	$6	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	1.0	CY	$11.38	$12	use C08a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 16" CPE Pipe (Price as 15" CPE)	1	LF	$26.63	$27	350'/day
	ACP Pavement, 4" thk	0.3	TON	$70.00	$22	
	CSBC, 6" thk	0.2	CY	$31.26	$7	
	Flagger	0.05	HR	$60.14	$3	
	Misc Detail Allowance	10%	LS	$0.00	$12	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$3**	
	Total Direct Unit Cost			**$150.00**	**$151**	
4	**Pipeline - 18" CHDPE, 6' to Invert**	**1**	**LF**			4.5' cover
	Demo ACP Roadway	1.4	SY	$12.55	$17	
	Excavate Trench	1.1	CY	$3.92	$4	
	Bed & Zone	0.3	CY	$46.86	$13	1/2 mile one way average
	Imported Backfill	0.7	CY	$29.94	$22	
	Haul & Dispose at Repository	1.1	CY	$5.49	$6	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	1.1	CY	$11.38	$12	use C08a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 18" CPE Pipe	1	LF	$30.71	$31	350'/day
	ACP Pavement, 4" thk	0.3	TON	$70.00	$22	
	CSBC, 6" thk	0.2	CY	$31.26	$7	
	Flagger	0.05	HR	$60.14	$3	
	Misc Detail Allowance	10%	LS	$0.00	$12	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$3**	
	Total Direct Unit Cost			**$160.00**	**$158**	

TABLE D-31

Alternative RP- 2: Silverton Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
5-9	**Pipeline - 20" CHDPE, 6.5' to Invert**	**1**	**LF**			4.83' cover
	Demo ACP Roadway	1.5	SY	$12.55	$19	
	Excavate Trench	1.3	CY	$3.92	$5	
	Bed & Zone	0.3	CY	$46.86	$14	1/2 mile one way average
	Imported Backfill	0.9	CY	$29.94	$27	
	Haul & Dispose at Repository	1.3	CY	$5.49	$7	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	1.3	CY	$11.38	$15	use C08a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 20" CPE Pipe	1	LF	$36.41	$36	330'/day
	ACP Pavement, 4" thk	0.3	TON	$70.00	$24	
	CSBC, 6" thk	0.3	CY	$31.26	$8	
	Flagger	0.05	HR	$60.14	$3	
	Misc Detail Allowance	10%	LS	$0.00	$14	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$4**	
	Total Direct Unit Cost			**$180.00**	**$181**	
10	**Pipeline - 22" CHDPE, 5' to Invert**	**1**	**LF**			4.83' cover
	Demo ACP Roadway	1.1	SY	$12.55	$14	
	Excavate Trench	0.8	CY	$3.92	$3	
	Bed & Zone	0.3	CY	$46.86	$14	1/2 mile one way average
	Imported Backfill	0.4	CY	$29.94	$11	
	Haul & Dispose at Repository	0.8	CY	$5.49	$4	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.8	CY	$11.38	$9	use C08a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 22" CPE Pipe (Price as 24" CPE)	1	LF	$45.65	$46	330'/day
	ACP Pavement, 4" thk	0.3	TON	$70.00	$18	
	CSBC, 6" thk	0.2	CY	$31.26	$6	
	Flagger	0.05	HR	$60.14	$3	
	Misc Detail Allowance	10%	LS	$0.00	$12	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$3**	
	Total Direct Unit Cost			**$150.00**	**$147**	

TABLE D-31

Alternative RP- 2: Silverton Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
11	**Manhole 48" 6 to 8 ft Depth**	**1**	**EA**			
	Demo ACP Roadway	7.1	SY	$12.55	$89	
	Excavate Trench	19.0	CY	$3.92	$74	
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	15.2	CY	$29.94	$456	
	Haul & Dispose at Repository	19.0	CY	$5.49	$104	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	19.0	CY	$11.38	$216	use C08a cost
	Trench Safety	1	EA	$25.00	$25	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	48" Manhole	1	EA	$2,776.78	$2,777	
	ACP Pavement, 4" thk	1.6	TON	$70.00	$113	
	CSBC, 6" thk	1.2	CY	$31.26	$37	
	Flagger	8.00	HR	$60.14	$481	
	Misc Detail Allowance	10%	LS	$0.00	$405	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$112**	
	Total Direct Unit Cost			**$4,890.00**	**$4,890**	
12	**Furnish and Install Storm Drain and Inlet**	**1**	**EA**			3' cover, 25 ft long
	Demo ACP Roadway	26.4	SY	$12.55	$331	
	Excavate Trench	17.1	CY	$3.92	$67	
	Bed & Zone	7.0	CY	$46.86	$328	1/2 mile one way average
	Imported Backfill	8.5	CY	$29.94	$254	
	Haul & Dispose at Repository	17.1	CY	$5.49	$94	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	17.1	CY	$11.38	$195	use C08a cost
	Trench Safety	25	LF	$5.00	$125	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 18" CPE Pipe	25	LF	$30.71	$768	350'/day
	Grated concrete inlet structure	1	EA	$2,758.50	$2,759	
	ACP Pavement, 4" thk	6.0	TON	$70.00	$421	
	CSBC, 6" thk	4.4	CY	$31.26	$137	
	Flagger	0.05	HR	$60.14	$3	
	Misc Detail Allowance	10%	LS	$0.00	$519	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$129**	
	Total Direct Unit Cost			**$6,130.00**	**$6,131**	

TABLE D-31

Alternative RP- 2: Silverton Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
Unnamed Creek						
1	**Replace 12" Culverts w/ 22" CMP Culvert**	**24**	**LF**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	0.0	SY	$12.55	$0	
	Remove & Dispose Existing Culvert, 1-18" CMP	24	LF	$10.46	$251	
	Excavate Trench	19.8	CY	$7.84	$155	account for pipe removal & loading, less pipe
	Bed & Zone	7.9	CY	$46.86	$369	1/2 mile one way average
	Imported Backfill	9.5	CY	$24.94	$238	assume all wasted to repository
	Haul & Dispose at Repository	19.8	CY	$5.49	$108	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	19.8	CY	$11.38	$225	use C08a cost
	Trench Safety	24	LF	$5.00	$120	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	none requred
	56" CMP Pipe	24	LF	$124.52	$2,988	75'/day
	Headwall/Miter	1	EA	$1,200.00	$1,200	allowance
	Restoration - Base Course & Pavement Patch	0.0	SY	$22.00	$0	subcontract
	Misc Detail Allowance	20%	LS	$0.00	$1,064	minor traffic control, TESC, etc
	Sales Tax on Materials	**5%**			**$151**	
	Total Direct Unit Cost			**$290.00**	**$6,869**	
2	**Reconstruct Exist Channel w/ 12' w x 3' d, XS 1**	**1,115**	**LF**			
	Clear, Grub & Dispose	1.0	AC	$6,514.75	$6,670	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	929.2	CY	$14.80	$13,750	
	Prep & Grade Channel	1,115	LF	$7.84	$8,744	
	Haul & Dispose at Repository	929.2	CY	$5.49	$5,101	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	929.2	CY	$11.38	$10,574	use C08a cost
	Imported Fill Material	0.0	CY	$53.33	$0	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$2,916	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$0**	
	Total Direct Unit Cost			**$43.00**	**$47,755**	

TABLE D-31

Alternative RP- 2: Silverton Detailed Unit Cost

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

Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments

Notes:

ACP = asphalt concrete paving
CIP = cast-in-place
CMP = corrugated metal pipe
CPE = polyethylene
CY = cubic yards
EA = each
HR = hour
LB = pound(s)
LS = lump sum
SF = square feet
SY = square yards
TESC = temporary erosion and sediment control

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
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 D-32

Alternative RP-2: Wallace Cost Summary

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	2009 Total Direct and Indirect Capital Cost
Printer's Creek						
1	Furnish And Install New 10' Deep, 5' Diameter Precast Manhole	1	EA	$7,630	$7,630	$12,971
2	Remove Existing Inlet Structure	1	LS	$9,900	$9,900	$16,830
3	Construct New Inlet Structure	1	LS	$41,000	$41,000	$69,700
					Subtotal Rounded	**$100,000**
	Npv For 30-Year O&M Cost					**$99,000**
	Total NPV cost at 30 years					**$199,000**

Notes:

NPV = Net Present Value
EA = each
LS = lump sum
O&M = operation and maintenance

Assumptions:

All excavated material is hauled to repository and replaced with imported material.
Pipe cover is 3' over pipe
All work will be performed in the summer and therefore no water issues exist.
See estimate details for additional assumptions
Total indirect cost assumes 70% of Total Direct Capital Cost

TABLE D-33

Alternative RP-2: Wallace Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
Printer's Creek						
1	**Manhole 5' Diameter, 10' Depth**	**50**	**EA**			
	Demo ACP Roadway	9.0	SY	$12.55	$113	
	Excavate Trench	30.0	CY	$3.92	$118	
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	22.7	CY	$29.94	$681	
	Haul & Dispose at Repository	30.0	CY	$5.49	$165	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	30.0	CY	$11.38	$341	use C08a cost
	Trench Safety	1	EA	$25.00	$25	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	60" Manhole, 10 feet deep	1	EA	$4,718.35	$4,718	
	ACP Pavement, 4" thk	2.1	TON	$70.00	$144	
	CSBC, 6" thk	1.5	CY	$31.26	$47	
	Flagger	8.00	HR	$60.14	$481	
	Misc Detail Allowance	10%	LS	$0.00	$633	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$163**	
	Total Direct Unit Cost			**$7,630.00**	**$7,628**	
2	**Remove Existing Inlet Structure**	**1**	**EA**			
	Demo Existing inlet structure	1	LS	$6,273.60	$6,274	
	Haul & Dispose	1	LS	$1,891.84	$1,892	assume all is wasted, 5 mile 1 way
	Misc Detail Allowance	20%	LS	$0.00	$1,633	
	Sales Tax on Materials	**5%**			**$132**	
	Total Direct Unit Cost			**$9,900.00**	**$9,930**	
3	**New Inlet Structure at Printer's Creek**	**1**	**EA**			
	Riprap	15	CY	$72.91	$1,080	imported, difficult operation
	20'x6' Steel Trash Rack at outlet	1	EA	$15,105.31	$15,105	Use $100/SF cost
	Grade existing pond bottom	400	SF	$3.14	$1,255	
	Excavate for walls	30	CY	$3.92	$116	
	Imported Backfill	16	CY	$29.94	$466	
	Haul & Dispose at Repository	30	CY	$5.49	$163	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	30	CY	$11.38	$337	use C08a cost
	CIP Wall, 12" thk, 8 ft tall	7	CY	$737.64	$5,464	
	Wall Rebar @ 200 #/cy	1481	LB	$1.79	$2,645	
	CIP Wall Footing, 2' wide x 2' tall	7	CY	$496.76	$3,312	
	Footing Rebar @ 150 #/cy	1000	LB	$1.79	$1,785	

TABLE D-33

Alternative RP-2: Wallace Detailed Unit Cost

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

Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
CIP Slab, 12" thk	3	CY	$295.88	$767	
Footing Rebar @ 150 #/cy	389	LB	$1.79	$694	
Misc Detail Allowance	20%	LS	$0.00	$6,638	
Sales Tax on Materials	**5%**			**$1,196**	
Total Direct Unit Cost			**$41,000.00**	**$41,023**	

Notes:

ACP = asphalt concrete paving
CIP = cast-in-place
CY = cubic yards
EA = each
LB = pound(s)
LS = lump sum
SY = square yards

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 D-34

Alternative RP-2: Mullan Cost Summary

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	2009 Total Direct and Indirect Capital Cost
3rd Street Neighborhood						
1	Construct Asphalt Lined Ditch (2.5' Deep With 1:1 Side Slopes)	3400	LF	$25	$85,000	$144,500
2	Install 55 Lf Of 24" Dia Rcp Pipe, 2' Cover With Asphalt Reconstruction	55	LF	$160	$8,800	$14,960
3	Remove Existing Culvert And Install 40 Lf Of 24" Dia Rcp (Culvert 1), 1 Ft Cover With Pavement Restoration	40	LF	$150	$6,000	$10,200
4	Remove Existing Culvert And Install 40 Lf Of 24" Dia Rcp (Culvert 2), 1 Ft Cover With Pavement Restoration	40	LF	$150	$6,000	$10,200
5	Remove Existing Culvert And Install 25 Lf Of 24" Dia Rcp (Culvert 3), 1 Ft Cover With Pavement Restoration	25	LF	$150	$3,750	$6,375
6	Remove Existing Culvert And Install 40 Lf Of 24" Dia Rcp (Culvert 4), 1 Ft Cover With Pavement Restoration	40	LF	$150	$6,000	$10,200
7	Furnish And Install New 48" Dia Manhole At 6 Ft Depth	1	LF	$4,890	$4,890	$8,313
8	Furnish And Install New 48" Catch Basin With Sump	2	LF	$4,890	$9,780	$16,626
Tiger Creek						
1	Construct Concrete Inlet Structure (See Plan 316-1, Case A With 8' Long X 4' Tall Wingwalls And 3' Long X 4' Tall Headwalls)	1	EA	$24,600	$24,600	$41,820
2	Install 175 Lf Of 24" Cmp. 1 Ft Cover With Sod Surface Restoration	175	LF	$130	$22,750	$38,675
3	Construct Asphalt Lined Ditch (2.5' Deep With 1:1 Side Slopes)	750	LF	$25	$18,750	$31,875
4	Install 30 Lf Of 24" Rcp (Culvert 1). 1 Ft Cover With Pavement Restoration	30	LF	$150	$4,500	$7,650
5	Install 30 Lf Of 24" Rcp (Culvert 2). 1 Ft Cover With Pavement Restoration	30	LF	$150	$4,500	$7,650
6	Install Rip Rap At Outfall	10	CY	$82	$820	$1,394
Mill Creek						
1	Regrade And Vegetate 140 Lf Of Stream Banks	140	LF	$33	$4,620	$7,854
2	Construct 4' High X 4' Long Concrete Wingwalls At Culvert Enterance	2	EA	$4,510	$9,020	$15,334
3	Reconstruct Existing Concrete Open Channel (2.5' H X 4.33' W) To 3' H X 6' W Concrete Channel	175	LF	$574	$100,450	$170,765
4	Construct 325 Lf Of 3.5' H X 6' W Concrete Box Culvert Along New Alignment (Culvert 1). Remove 80 Lf Of Existing 3' H X 6' W Concrete Box	325	LF	$624	$202,800	$344,760
5	Plug And Fill Existing Culvert (80 Lf Of 3' X 6' Concrete Box Culvert And 100 Lf Of 58" Dia Cmp) With Cdf	1	LS	$27,025	$27,025	$45,943
6	Install Rip Rap At Culvert 1 Outfall	10	CY	$82	$820	$1,394
7	Replace Two Existing 32" Cpe Culvert In Parallel With 15' W X 25' L Precast Concrete Bridge With Footings And Clear Hieght Of 2.5 Ft (Bridge 1)	1	EA	$160,000	$160,000	$272,000
8	Replace Two Existing 36" Cpe Culvert In Parallel With 15' W X 20' L Precast Concrete Bridge With Footings And Clear Hieght Of 2.5 Ft (Bridge 2)	2	EA	$128,000	$256,000	$435,200
9	Excavate And Regrade 50 Lf Of Existing Gravel Road To Provide 1.5 Ft Rolling Dip	1	LS	$1,880	$1,880	$3,196
Mill Street						
1	Construct Asphalt Lined Ditch (2.5 Ft Deep With 1:1 Side Slopes) Along South Side Of Mill Street	960	LF	$25	$24,000	$40,800
2	Construct Asphalt Lined Ditch (2.5 Ft Deep With 1:1 Side Slopes) Along North Side Of Mill Street	925	LF	$25	$23,125	$39,313
3	Construct 10' X 2' X 3 Rock Lined Ditch (Xs 1)	390	LF	$101	$39,390	$66,963
4	Install 60 Lf Of 15" Dia Rcp Pipe With 2 Ft Of Cover (Culvert 1)	60	LF	$110	$6,600	$11,220
5	Install 80 Lf Of 15" Dia Rcp Pipe With 2 Ft Of Cover (Culvert 2)	80	LF	$110	$8,800	$14,960
6	Install 30 Lf Of 15" Dia Rcp Pipe With 2 Ft Of Cover (Culvert 3)	30	CY	$110	$3,300	$5,610
7	Install 50 Lf Of 15" Dia Rcp Pipe With 2 Ft Of Cover (Culvert 4)	50	EA	$110	$5,500	$9,350
8	Install Two (2) 25 Lf 15" Rcp Culverts With 2 Ft Of Cover (Culvert 5 & 6)	1	LS	$5,500	$5,500	$9,350
9	Install Two (2) 50 Lf 18" Rcp Culverts With 1.5 Ft Of Cover (Culvert 7 & 9)	1	LS	$12,000	$12,000	$20,400
10	Install 25 Lf Of 18" Dia Cpe Culvert With 1.5 Ft Cover (Culvert 8)	25	LF	$120	$3,000	$5,100
11	Install 25 Lf Of 30" Dia Cpe Culvert Under Trail Of Coeur D'Alenes (Culvert 10). 3 Ft Cover With Pavement Surface Restoration	25	LF	$210	$5,250	$8,925
12	Install New Dual Inlet Catch Basin (Itd Catch Basin Type 6) With 4' Sump	1	EA	$5,367	$5,367	$9,124
13	Install 15 Cy Rip Rap At Outfall To South Fork Coeur D'Alene River	15	CY	$82	$1,230	$2,091
Dewey Street Area						
1	Construct Asphalt Lined Ditch (2.5' Deep With 1:1 Side Slopes) Along N Side Of Lower Dewey St	100	LF	$25	$2,500	$4,250
2	Construct Asphalt Lined Ditch (2.5' Deep With 1:1 Side Slopes) Along E Side Of Lower Dewey St (Daylight To Hunter St)	280	LF	$25	$7,000	$11,900
3	Construct Asphalt Lined Ditch (2.5' Deep With 1:1 Side Slopes) Along E Side Of Lower Dewey St (Daylight To Mill St)	365	LF	$25	$9,125	$15,513

TABLE D-34

Alternative RP-2: Mullan Cost Summary

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	2009 Total Direct and Indirect Capital Cost
4	Install 25 Lf Of 18" Rcp (Culvert 1). 1.5 Ft Cover With Pavement Restoration	25	LF	$120	$3,000	$5,100
5	Install 25 Lf Of 18" Rcp (Culvert 2). 1.5 Ft Cover With Pavement Restoration	25	LF	$120	$3,000	$5,100
6	Install 25 Lf Of 18" Rcp (Culvert 3). 1.5 Ft Cover With Gravel Restoration	25	LF	$100	$2,500	$4,250
7	Replace Existing Catch Basin New 4' Deep Inlet With Sump	6	EA	$4,890	$29,340	$49,878
8	Replace 12" Dia Storm Sewer With 18" Dia Cpe Pipe With 3 Ft Of Cover	650	LF	$120	$78,000	$132,600
	Copper Street Neighborhood					
1	Construct Asphalt Lined Ditch (2.5 Ft Deep With 1:1 Side Slopes) Along South Side Of Idaho Street	400	LF	$25	$10,000	$17,000
2	Construct Asphalt Lined Ditch (2.5 Ft Deep With 1:1 Side Slopes) Along Idaho Street East And West Sides Of Eighth Street	1100	LF	$25	$27,500	$46,750
3	Construct Asphalt Lined Ditch (2.5 Ft Deep With 1:1 Side Slopes) Along North Side Of Oregon Street	205	LF	$25	$5,125	$8,713
4	Construct Asphalt Lined Ditch (2.5 Ft Deep With 1:1 Side Slopes) Along Montana Street	305	LF	$25	$7,625	$12,963
5	Install Six (6) 25 Lf 18" Rcp Culverts With 1.5 Ft Of Cover (Culvert 1 Through 6)	1	LS	$18,000	$18,000	$30,600
6	Install Seven (7) 20 Lf 18" Rcp Culverts With 1.5 Ft Of Cover (Culvert 7 Through 13)	1	LS	$16,800	$16,800	$28,560
7	Install 310 Lf Of 48" Cmp Culvert With 3.5 Ft Of Cover (Culvert 14 And 15)	310	LF	$400	$124,000	$210,800
8	Install 915 Lf Of New 24" Cpe Storm Pipe With 4 Ft Of Cover	915	LF	$210	$192,150	$326,655
9	Remove Existing Drywell, 4 Exsiting Catch Basins, And 285 Lf Of Existing Storm Drain Pipe Along Idaho Street	1	LS	$17,680	$17,680	$30,056
10	Furnish And Install New 6' X 6' Concrete Manhole At A Depth Of 8 Ft	1	EA	$11,676	$11,676	$19,849
11	Furnish And Install New 48" Dia Storm Manhole At A Depth Of 6 Ft	4	EA	$4,890	$19,560	$33,252
12	Furnish And Install New Catch Basin With 4' Sump	6	EA	$4,890	$29,340	$49,878
13	Install 15 Cy Rip Rap At Culvert/Pipe Outfall	30	CY	$82	$2,460	$4,182
	South End Of 2nd Street					
1	Construct 10'X4'X3' Rock Lined Ditch Along West Side Of Second Street (Xs 1)	110	LF	$108	$11,880	$20,196
2	Construct 10'X4'X3' Rock Lined Ditch Along South Side Of The Trail Of The Coeur D'Alenes (Xs 1)	655	LF	$108	$70,740	$120,258
3	Install 60 Lf Of New 18" Dia Cpe Pipe With 3 Ft Of Cover	60	LF	$120	$7,200	$12,240
4	Install 20 Lf Of New 18" Dia Cpe Pipe Under Trail Of Coeur D'Alenes (Culvert 1). 3 Ft Of Cover With Pavement Surface Restoration.	20	LF	$120	$2,400	$4,080
5	Install New Dual Inlet Catch Basin (Itd Cathc Basin Type 6) With 4 Ft Sump.	1	EA	$5,367	$5,367	$9,124
6	Install Rip Rap At Outfall To Mill Creek	15	CY	$82	$1,230	$2,091
					Subtotal Rounded	**$3,110,000**
	NPV for 30-year O&M Cost					**$1,080,000**
	Total NPV cost at 30 years					**$4,190,000**

Notes:

NPV = Net Present Value
CY = cubic yards
EA = each
LF = linear feet
LS = lump sum
O&M = operation and maintenance

Assumptions:

All excavated material is hauled to repository and replaced with imported material.
Pipe cover is 3' over pipe
All work will be performed in the summer and therefore no water issues exist.
See estimate details for additional assumptions
Total indirect cost assumes 70% of Total Direct Capital Cost

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
3rd Street Neighborhood						
1	**Construct Asphalt Lined Ditch (2.5 deep w/ 1:1 slopes)**	**3,400**	**LF**			
	Clear, Grub & Dispose	50.0	AC	$6,514.75	$15,255	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	787.0	CY	$14.80	$11,647	
	Prep & Grade Ditch	3,400	LF	$3.92	$13,331	
	Haul & Dispose at Repository	787.0	CY	$5.49	$4,321	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	787.0	CY	$11.38	$8,956	use C08a cost
	ACP Pavement, 2" thk	301.5	TON	$70.00	$21,103	
	Imported Fill Material	0.0	CY	$53.33	$0	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$6,134	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$1,161**	
	Total Direct Unit Cost			**$25.00**	**$81,907**	
2	**Pipeline - 24" RCP, 2' Cover Pavement Restoration**	**1**	**LF**			2' cover
	Demo ACP Roadway	1.0	SY	$12.55	$13	
	Excavate Trench	0.7	CY	$3.92	$3	
	Bed & Zone	0.4	CY	$46.86	$17	1/2 mile one way average
	Imported Backfill	0.2	CY	$29.94	$6	
	Haul & Dispose at Repository	0.7	CY	$5.49	$4	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.7	CY	$11.38	$8	use C08a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 24" RCP Pipe	1	LF	$65.97	$66	RS Means 334113502040
	ACP Pavement, 4" thk	0.2	TON	$70.00	$16	
	CSBC, 6" thk	0.2	CY	$31.26	$5	
	Flagger	0.08	HR	$60.14	$5	
	Misc Detail Allowance	10%	LS	$0.00	$13	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$4**	
	Total Direct Unit Cost			**$160.00**	**$163**	

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Alternative RP-2: Mullan Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
3-6	**Pipeline - 24" RCP, 1' Cover Pavement Restoration**	**1**	**LF**			1' cover
	Demo ACP Roadway	0.8	SY	$12.55	$10	
	Excavate Trench	0.5	CY	$3.92	$2	
	Bed & Zone	0.4	CY	$46.86	$17	1/2 mile one way average
	Imported Backfill	0.1	CY	$29.94	$2	
	Haul & Dispose at Repository	0.5	CY	$5.49	$3	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.5	CY	$11.38	$6	use C08a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 24" RCP Pipe	1	LF	$65.97	$66	RS Means 334113502040
	ACP Pavement, 4" thk	0.2	TON	$70.00	$12	
	CSBC, 6" thk	0.1	CY	$31.26	$4	
	Flagger	0.08	HR	$60.14	$5	
	Misc Detail Allowance	10%	LS	$0.00	$12	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$3**	
	Total Direct Unit Cost			**$150.00**	**$147**	
7,8	**Manhole 48" 6 to 8 ft Depth**	**1**	**EA**			
	Demo ACP Roadway	7.1	SY	$12.55	$89	
	Excavate Trench	19.0	CY	$3.92	$74	
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	15.2	CY	$29.94	$456	
	Haul & Dispose at Repository	19.0	CY	$5.49	$104	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	19.0	CY	$11.38	$216	use C08a cost
	Trench Safety	1	EA	$25.00	$25	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	48" Manhole	1	EA	$2,776.78	$2,777	
	ACP Pavement, 4" thk	1.6	TON	$70.00	$113	
	CSBC, 6" thk	1.2	CY	$31.26	$37	
	Flagger	8.00	HR	$60.14	$481	
	Misc Detail Allowance	10%	LS	$0.00	$405	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$112**	
	Total Direct Unit Cost			**$4,890.00**	**$4,890**	

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
Tiger Creek						
1	**New Inlet Structure at Tiger Creek**	**1**	**EA**			
	Riprap	14.8	CY	$72.91	$1,080	imported, difficult operation
	20'x6' Steel Trash Rack at outlet	1.0	EA	$9,105.31	$9,105	Use $100/SF cost
	Grade existing pond bottom	400.0	SF	$3.14	$1,255	
	Excavate for walls	14.1	CY	$3.92	$55	
	Imported Backfill	6.2	CY	$29.94	$186	
	Haul & Dispose at Repository	14.1	CY	$5.49	$77	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	14.1	CY	$11.38	$160	use C08a cost
	CIP Wall, 12" thk, 4 ft tall	2.8	CY	$737.64	$2,076	
	Wall Rebar @ 200 #/cy	563.0	LB	$1.79	$1,005	
	CIP Wall Footing, 2' wide x 2' tall	5.0	CY	$496.76	$2,502	
	Footing Rebar @ 150 #/cy	755.6	LB	$1.79	$1,349	
	CIP Slab, 12" thk	2.0	CY	$295.88	$592	
	Footing Rebar @ 150 #/cy	300.0	LB	$1.79	$536	
	Misc Detail Allowance	20%	LS	$0.00	$3,996	
	Sales Tax on Materials	**5%**			**$653**	
	Total Direct Unit Cost			**$24,600.00**	**$24,627**	
2	**Pipeline - 24" RCP, 1' Cover Sod Restoration**	**1**	**LF**			1' cover
	Clear, Grub & Dispose	0.0	AC	$6,514.75	$4	
	Excavate Trench	0.5	CY	$3.92	$2	
	Bed & Zone	0.4	CY	$46.86	$17	1/2 mile one way average
	Imported Backfill	0.1	CY	$29.94	$2	
	Haul & Dispose at Repository	0.5	CY	$5.49	$3	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.5	CY	$11.38	$6	use C08a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 24" RCP Pipe	1	LF	$65.97	$66	RS Means 334113502040
	SOD	1.6	SY	$4.50	$7	
	Topsoil, 6" thk	0.3	CY	$27.94	$7	
	Flagger	0.00	HR	$60.14	$0	
	Misc Detail Allowance	10%	LS	$0.00	$11	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$3**	
	Total Direct Unit Cost			**$130.00**	**$133**	

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
3	**Construct Asphalt Lined Ditch (2.5 deep w/ 1:1 slopes)**	**3,400**	**LF**			
	Clear, Grub & Dispose	2.3	AC	$6,514.75	$15,255	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	787.0	CY	$14.80	$11,647	
	Prep & Grade Ditch	3,400	LF	$3.92	$13,331	
	Haul & Dispose at Repository	787.0	CY	$5.49	$4,321	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	787.0	CY	$11.38	$8,956	use C08a cost
	ACP Pavement, 2" thk	301.5	TON	$70.00	$21,103	
	Imported Fill Material	0.0	CY	$53.33	$0	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$6,134	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$1,161**	
	Total Direct Unit Cost			**$25.00**	**$81,907**	
4,5	**Pipeline - 24" RCP, 1' Cover Pavement Restoration**	**1**	**LF**			1' cover
	Demo ACP Roadway	0.8	SY	$12.55	$10	
	Excavate Trench	0.5	CY	$3.92	$2	
	Bed & Zone	0.4	CY	$46.86	$17	1/2 mile one way average
	Imported Backfill	0.1	CY	$29.94	$2	
	Haul & Dispose at Repository	0.5	CY	$5.49	$3	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.5	CY	$11.38	$6	use C08a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 24" RCP Pipe	1	LF	$65.97	$66	RS Means 334113502040
	ACP Pavement, 4" thk	0.2	TON	$70.00	$12	
	CSBC, 6" thk	0.1	CY	$31.26	$4	
	Flagger	0.08	HR	$60.14	$5	
	Misc Detail Allowance	10%	LS	$0.00	$12	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$3**	
	Total Direct Unit Cost			**$150.00**	**$147**	
6	**Rip Rap**	**1**	**EA**			
	Riprap	1	CY	$72.91	$73	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$7	
	Sales Tax on Materials	**5%**			**$2**	
	Total Direct Unit Cost			**$82.00**	**$82**	

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
Mill Creek						
1	**Regrade and Revegetate Stream Banks**	**140**	**LF**			
	Clear, Grub & Dispose	0.1	AC	$6,514.75	$838	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	0.0	CY	$14.80	$0	
	Prep & Grade Channel	140	LF	$7.84	$1,098	
	Haul & Dispose at Repository	0.0	CY	$5.49	$0	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.0	CY	$11.38	$0	use C08a cost
	Planting along stream banks	140	LF	$15.00	$2,100	allowance
	Misc Detail Allowance	10%	LS	$0.00	$404	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$116**	
	Total Direct Unit Cost			**$33.00**	**$4,554**	
2	**Construct 4' H x 4' L Wingwalls at Culvert**	**1**	**EA**			
	Riprap	8	CY	$72.91	$608	imported, difficult operation
	Grade existing pond bottom	225	SF	$3.14	$706	
	Excavate for walls	5	CY	$3.92	$19	
	Imported Backfill	2	CY	$29.94	$71	
	Haul & Dispose at Repository	5	CY	$5.49	$26	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	5	CY	$11.38	$54	use C08a cost
	CIP Wall, 12" thk, 4 ft tall	1	CY	$737.64	$874	
	Wall Rebar @ 200 #/cy	237	LB	$1.79	$423	
	CIP Wall Footing, 2' wide x 2' tall	1	CY	$496.76	$589	
	Footing Rebar @ 150 #/cy	178	LB	$1.79	$317	
	Misc Detail Allowance	20%	LS	$0.00	$737	
	Sales Tax on Materials	**5%**			**$83**	
	Total Direct Unit Cost			**$4,510.00**	**$4,507**	

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
3	**Reconstruct Channel w/ 3' H Wall, 6' W Concrete Channel**	**175**	**LF**			
	Clear, Grub & Dispose	0.2	AC	$6,514.75	$1,047	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Demo existing 2.5' H x 4.33' W	175	LF	$11.84	$2,072	
	Excavate Channel	137.2	CY	$14.80	$2,031	
	Prep & Grade Channel	175	LF	$7.84	$1,372	
	Haul & Dispose at Repository	137.2	CY	$5.49	$753	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	137.2	CY	$11.38	$1,562	use C08a cost
	Imported Fill Material	38.9	CY	$53.33	$2,074	imported, difficult operation
	CIP Wall, 12" thk, 3' tall	38.9	CY	$737.64	$28,686	
	Wall Rebar @ 200 #/cy	7777.8	LB	$1.79	$13,884	
	CIP Slab, 12" thk, 10' wide	65	CY	$295.88	$19,177	
	Footing Rebar @ 150 #/cy	9,722	LB	$1.79	$17,355	
	Misc Detail Allowance	10%	LS	$0.00	$8,770	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$1,531**	
	Total Direct Unit Cost			**$574.00**	**$100,315**	
4	**Construct 3.5' H x 6' W Concrete Box Culvert**	**325**	**LF**			
	Clear, Grub & Dispose	0.3	AC	$6,514.75	$1,944	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Demo existing 3' H x 6' W	80	LF	$11.84	$947	
	Excavate Channel	379.2	CY	$14.80	$5,611	
	Prep & Grade Channel	325	LF	$7.84	$2,549	
	Haul & Dispose at Repository	379.2	CY	$5.49	$2,082	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	379.2	CY	$11.38	$4,315	use C08a cost
	Imported Fill Material	84.3	CY	$53.33	$4,493	imported, difficult operation
	CIP Wall, 12" thk, 3' tall	84.3	CY	$737.64	$62,153	
	Wall Rebar @ 200 #/cy	16851.9	LB	$1.79	$30,082	
	CIP Slab, 12" thk, 10' wide	120	CY	$295.88	$35,615	
	Footing Rebar @ 150 #/cy	18,056	LB	$1.79	$32,231	
	Misc Detail Allowance	10%	LS	$0.00	$17,563	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$3,072**	
	Total Direct Unit Cost			**$624.00**	**$202,657**	

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
5	**Plug and Fill Existing Culvert**	**1**	**LS**			
	Fill 3'x6' culvert with CDF	53	CY	$100.00	$5,333	leave open, use as overflow storage
	Pumping Costs	53	CY	$80.82	$4,310	
	Fill 58" Dia CMP with CDF	68	CY	$100.00	$6,786	leave open, use as overflow storage
	Pumping Costs	68	CY	$80.82	$5,485	
	Misc Detail Allowance	20%	LS	$0.00	$4,383	
	Sales Tax on Materials	**5%**			**$727**	
	Total Direct Unit Cost			**$27,025.00**	**$27,024**	
6	**Rip Rap**	**1**	**EA**			
	Riprap	1	CY	$72.91	$73	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$7	
	Sales Tax on Materials	**5%**			**$2**	
	Total Direct Unit Cost			**$82.00**	**$82**	
7	**Replace Existing Culvert w/ New 15'x25' Span Bridge**	**1**	**EA**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	41.7	SY	$12.55	$523	
	Remove & Dispose Exist Culverts	1	LS	$591.92	$592	
	Excavate Trench	48.6	CY	$7.84	$381	account for pipe removal & loading, less pipe
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	0.0	CY	$9.94	$0	assume all wasted to repository
	Haul & Dispose at Repository	48.6	CY	$5.49	$267	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	48.6	CY	$11.38	$553	use C08a cost
	Trench Safety	0	LF	$5.00	$0	trench box
	CIP Wall, 12" thk, 2.5' tall +1 bury	3.2	CY	$737.64	$2,391	
	Wall Rebar @ 200 #/cy	648.1	LB	$1.79	$1,157	
	CIP Wall, 12" thk, 2.5' tall +1 bury	3.2	CY	$737.64	$2,391	
	Wall Rebar @ 200 #/cy	648.1	LB	$1.79	$1,157	
	CIP Wall Footing, 2.5 wide x 1.5' tall	6.9	CY	$496.76	$3,450	
	Footing Rebar @ 150 #/cy	1041.7	LB	$1.79	$1,859	
	New Bridge & Abutments - Concrete	375	SF	$300.00	$112,500	based on road & bridge file
	Misc Detail Allowance	20%	LS	$0.00	$25,280	minor traffic control, TESC, etc
	Sales Tax on Materials	**5%**			**$6,977**	
	Total Direct Unit Cost			**$160,000.00**	**$159,478**	

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
8	**Replace Existing Culvert w/ New 15'x20' Span Bridge**	**1**	**EA**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	33.3	SY	$12.55	$418	
	Remove & Dispose Exist Culverts	1	LS	$591.92	$592	
	Excavate Trench	38.9	CY	$7.84	$305	account for pipe removal & loading, less pipe
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	0.0	CY	$9.94	$0	assume all wasted to repository
	Haul & Dispose at Repository	38.9	CY	$5.49	$214	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	38.9	CY	$11.38	$443	use C08a cost
	Trench Safety	0	LF	$5.00	$0	trench box
	CIP Wall, 12" thk, 2.5' tall +1 bury	2.6	CY	$737.64	$1,912	
	Wall Rebar @ 200 #/cy	518.5	LB	$1.79	$926	
	CIP Wall, 12" thk, 2.5' tall +1 bury	2.6	CY	$737.64	$1,912	
	Wall Rebar @ 200 #/cy	518.5	LB	$1.79	$926	
	CIP Wall Footing, 2.5 wide x 1.5' tall	5.6	CY	$496.76	$2,760	
	Footing Rebar @ 150 #/cy	833.3	LB	$1.79	$1,488	
	New Bridge & Abutments - Concrete	300	SF	$300.00	$90,000	based on road & bridge file
	Misc Detail Allowance	20%	LS	$0.00	$20,248	minor traffic control, TESC, etc
	Sales Tax on Materials	**5%**			**$5,582**	
	Total Direct Unit Cost			**$128,000.00**	**$127,724**	
9	**Excavate and Regrade Gravel Road**	**1**	**LS**			5' cover
	Excavate Roadway	34.7	CY	$3.92	$136	
	Place Excavated Material Backfill	34.7	CY	$9.94	$345	
	Trench Safety	0	LF	$5.00	$0	trench box
	CSBC, 6" thk	23.1	CY	$31.26	$724	
	Flagger	8.00	HR	$60.14	$481	
	Misc Detail Allowance	10%	LS	$0.00	$169	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$23**	
	Total Direct Unit Cost			**$1,880.00**	**$1,878**	

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

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

	Description		Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
Mill Street							
1,2	**Construct Asphalt Lined Ditch (2.5 deep w/ 1:1 slopes)**		**3,400**	**LF**			
	Clear, Grub & Dispose		2.3	AC	$6,514.75	$15,255	
	Diversion/Care of Water		0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv		0	LF	$10.39	$0	
	Excavate Channel		787.0	CY	$14.80	$11,647	
	Prep & Grade Ditch		3,400	LF	$3.92	$13,331	
	Haul & Dispose at Repository		787.0	CY	$5.49	$4,321	assume all but rock is wasted, 5 mile 1 way
	Repository Cost		787.0	CY	$11.38	$8,956	use C08a cost
	ACP Pavement, 2" thk		301.5	TON	$70.00	$21,103	
	Imported Fill Material		0.0	CY	$53.33	$0	imported, difficult operation
	Misc Detail Allowance		10%	LS	$0.00	$6,134	access.TESC, restoration, etc
	Sales Tax on Materials		**5%**			**$1,161**	
		Total Direct Unit Cost			**$25.00**	**$81,907**	
3	**Construct 10'x2'x3' Rock Lined Ditch**		**390**	**LF**			
	Clear, Grub & Dispose		0.4	AC	$6,514.75	$2,333	
	Diversion/Care of Water		0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv		0	LF	$10.39	$0	
	Excavate Channel		693.3	CY	$14.80	$10,260	
	Prep & Grade Channel		390	LF	$7.84	$3,058	
	Haul & Dispose at Repository		693.3	CY	$5.49	$3,806	assume all but rock is wasted, 5 mile 1 way
	Repository Cost		693.3	CY	$11.38	$7,890	use C08a cost
	Imported Fill Material		173.3	CY	$53.33	$9,244	imported, difficult operation
	Misc Detail Allowance		10%	LS	$0.00	$2,490	access.TESC, restoration, etc
	Sales Tax on Materials		**5%**			**$143**	
		Total Direct Unit Cost			**$101.00**	**$39,224**	

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
4-9	**Pipeline - 15" RCP, 2' Cover**	**1**	**LF**			2' cover
	Demo ACP Roadway	0.8	SY	$12.55	$9	
	Excavate Trench	0.5	CY	$3.92	$2	
	Bed & Zone	0.2	CY	$46.86	$12	1/2 mile one way average
	Imported Backfill	0.2	CY	$29.94	$5	
	Haul & Dispose at Repository	0.5	CY	$5.49	$2	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.5	CY	$11.38	$5	use C08a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 15" RCP Pipe	1	LF	$35.75	$36	350'/day
	ACP Pavement, 4" thk	0.2	TON	$70.00	$12	
	CSBC, 6" thk	0.1	CY	$31.26	$4	
	Flagger	0.05	HR	$60.14	$3	
	Misc Detail Allowance	10%	LS	$0.00	$9	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$2**	
	Total Direct Unit Cost			**$110.00**	**$106**	
10	**Pipeline - 18" RCP, 1.5' Cover Pavement Restoration**	**1**	**LF**			1' cover
	Demo ACP Roadway	0.7	SY	$12.55	$9	
	Excavate Trench	0.5	CY	$3.92	$2	
	Bed & Zone	0.3	CY	$46.86	$13	1/2 mile one way average
	Imported Backfill	0.1	CY	$29.94	$4	
	Haul & Dispose at Repository	0.5	CY	$5.49	$3	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.5	CY	$11.38	$5	use C08a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 18" RCP Pipe	1	LF	$44.92	$45	RS Means 334113502040
	ACP Pavement, 4" thk	0.2	TON	$70.00	$12	
	CSBC, 6" thk	0.1	CY	$31.26	$4	
	Flagger	0.06	HR	$60.14	$4	
	Misc Detail Allowance	10%	LS	$0.00	$10	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$2**	
	Total Direct Unit Cost			**$120.00**	**$116**	

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
11	**Pipeline - 30" CPE, 3' Cover Pavement Restoration**	**1**	**LF**			2' cover
	Demo ACP Roadway	1.4	SY	$12.55	$17	
	Excavate Trench	1.1	CY	$3.92	$5	
	Bed & Zone	0.4	CY	$46.86	$20	1/2 mile one way average
	Imported Backfill	0.5	CY	$29.94	$16	
	Haul & Dispose at Repository	1.1	CY	$5.49	$6	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	1.1	CY	$11.38	$13	use C08a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 30" CPE Pipe	1	LF	$74.25	$74	RS Means 334113502040
	ACP Pavement, 4" thk	0.3	TON	$70.00	$22	
	CSBC, 6" thk	0.2	CY	$31.26	$7	
	Flagger	0.08	HR	$60.14	$5	
	Misc Detail Allowance	10%	LS	$0.00	$17	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$5**	
	Total Direct Unit Cost			**$210.00**	**$213**	
12	**Install New Dual Inlet Catch Basin with 4' Sump**	**1**	**EA**			
	Sawcut & Remove Pavement	8.3	SY	$12.55	$105	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Catch Basin	20.8	CY	$14.80	$308	
	Prep & Grade Channel	0	LF	$7.84	$0	
	Haul & Dispose at Repository	20.8	CY	$5.49	$114	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	20.8	CY	$11.38	$237	use C08a cost
	Imported Fill Material	17.0	CY	$53.33	$907	imported, difficult operation
	Grate	1	EA	$250.00	$250	
	CIP Wall, 6" thk, 7' tall	2.1	CY	$737.64	$1,530	
	Wall Rebar @ 200 #/cy	414.8	LB	$1.79	$740	
	CIP Slab, 6" thk, 5.5' x 2.5' wide	0.5	CY	$295.88	$151	
	Footing Rebar @ 150 #/cy	76.4	LB	$1.79	$136	
	CIP Gutter Slab, 6" thk	0.2	CY	$295.88	$55	
	Footing Rebar @ 150 #/cy	27.8	LB	$1.79	$50	
	Misc Detail Allowance	10%	LS	$0.00	$423	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$360**	
	Total Direct Unit Cost			**$5,367.00**	**$5,367**	

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Alternative RP-2: Mullan Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
13	**Rip Rap**	**1**	**EA**			
	Riprap	1	CY	$72.91	$73	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$7	
	Sales Tax on Materials	**5%**			**$2**	
	Total Direct Unit Cost			**$82.00**	**$82**	
	Dewey Street Area					
1-3	**Construct Asphalt Lined Ditch (2.5 deep w/ 1:1 slopes)**	**3,400**	**LF**			
	Clear, Grub & Dispose	2.3	AC	$6,514.75	$15,255	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	787.0	CY	$14.80	$11,647	
	Prep & Grade Ditch	3,400	LF	$3.92	$13,331	
	Haul & Dispose at Repository	787.0	CY	$5.49	$4,321	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	787.0	CY	$11.38	$8,956	use C08a cost
	ACP Pavement, 2" thk	301.5	TON	$70.00	$21,103	
	Imported Fill Material	0.0	CY	$53.33	$0	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$6,134	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$1,161**	
	Total Direct Unit Cost			**$25.00**	**$81,907**	
4,5	**Pipeline - 18" RCP, 1.5' Cover Pavement Restoration**	**1**	**LF**			1' cover
	Demo ACP Roadway	0.7	SY	$12.55	$9	
	Excavate Trench	0.5	CY	$3.92	$2	
	Bed & Zone	0.3	CY	$46.86	$13	1/2 mile one way average
	Imported Backfill	0.1	CY	$29.94	$4	
	Haul & Dispose at Repository	0.5	CY	$5.49	$3	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.5	CY	$11.38	$5	use C08a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 18" RCP Pipe	1	LF	$44.92	$45	RS Means 334113502040
	ACP Pavement, 4" thk	0.2	TON	$70.00	$12	
	CSBC, 6" thk	0.1	CY	$31.26	$4	
	Flagger	0.06	HR	$60.14	$4	
	Misc Detail Allowance	10%	LS	$0.00	$10	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$2**	
	Total Direct Unit Cost			**$120.00**	**$116**	

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
6	**Pipeline - 18" RCP, 1.5' Cover Gravel Restoration**	**1**	**LF**			1' cover
	Demo ACP Roadway	0.7	SY	$12.55	$9	
	Excavate Trench	0.5	CY	$3.92	$2	
	Bed & Zone	0.3	CY	$46.86	$13	1/2 mile one way average
	Imported Backfill	0.1	CY	$29.94	$4	
	Haul & Dispose at Repository	0.5	CY	$5.49	$3	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.5	CY	$11.38	$5	use C08a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 18" RCP Pipe	1	LF	$44.92	$45	RS Means 334113502040
	CSBC, 6" thk	0.1	CY	$31.26	$4	
	Flagger	0.03	HR	$60.14	$2	
	Misc Detail Allowance	10%	LS	$0.00	$8	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$2**	
	Total Direct Unit Cost			**$100.00**	**$101**	
7	**Manhole 48" 6 to 8 ft Depth**	**1**	**EA**			
	Demo ACP Roadway	7.1	SY	$12.55	$89	
	Excavate Trench	19.0	CY	$3.92	$74	
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	15.2	CY	$29.94	$456	
	Haul & Dispose at Repository	19.0	CY	$5.49	$104	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	19.0	CY	$11.38	$216	use C08a cost
	Trench Safety	1	EA	$25.00	$25	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	48" Manhole	1	EA	$2,776.78	$2,777	
	ACP Pavement, 4" thk	1.6	TON	$70.00	$113	
	CSBC, 6" thk	1.2	CY	$31.26	$37	
	Flagger	8.00	HR	$60.14	$481	
	Misc Detail Allowance	10%	LS	$0.00	$405	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$112**	
	Total Direct Unit Cost			**$4,890.00**	**$4,890**	

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
8	**Pipeline - 18" CHDPE, 3' Cover**	**1**	**LF**			3' cover
	Demo ACP Roadway	1.1	SY	$12.55	$13	
	Excavate Trench	0.7	CY	$3.92	$3	
	Bed & Zone	0.3	CY	$46.86	$13	1/2 mile one way average
	Imported Backfill	0.3	CY	$29.94	$10	
	Haul & Dispose at Repository	0.7	CY	$5.49	$4	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.7	CY	$11.38	$8	use C08a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 18" CPE Pipe	1	LF	$30.71	$31	350'/day
	ACP Pavement, 4" thk	0.2	TON	$70.00	$17	
	CSBC, 6" thk	0.2	CY	$31.26	$5	
	Flagger	0.05	HR	$60.14	$3	
	Misc Detail Allowance	10%	LS	$0.00	$10	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$3**	
	Total Direct Unit Cost			**$120.00**	**$124**	
	Copper Street Neighborhood					
1-4	**Construct Asphalt Lined Ditch (2.5 deep w/ 1:1 slopes)**	**3,400**	**LF**			
	Clear, Grub & Dispose	2.3	AC	$6,514.75	$15,255	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	787.0	CY	$14.80	$11,647	
	Prep & Grade Ditch	3,400	LF	$3.92	$13,331	
	Haul & Dispose at Repository	787.0	CY	$5.49	$4,321	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	787.0	CY	$11.38	$8,956	use C08a cost
	ACP Pavement, 2" thk	301.5	TON	$70.00	$21,103	
	Imported Fill Material	0.0	CY	$53.33	$0	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$6,134	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$1,161**	
	Total Direct Unit Cost			**$25.00**	**$81,907**	

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
5,6	**Pipeline - 18" RCP, 1.5' Cover Pavement Restoration**	**1**	**LF**			1' cover
	Demo ACP Roadway	0.7	SY	$12.55	$9	
	Excavate Trench	0.5	CY	$3.92	$2	
	Bed & Zone	0.3	CY	$46.86	$13	1/2 mile one way average
	Imported Backfill	0.1	CY	$29.94	$4	
	Haul & Dispose at Repository	0.5	CY	$5.49	$3	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.5	CY	$11.38	$5	use C08a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 18" RCP Pipe	1	LF	$44.92	$45	RS Means 334113502040
	ACP Pavement, 4" thk	0.2	TON	$70.00	$12	
	CSBC, 6" thk	0.1	CY	$31.26	$4	
	Flagger	0.06	HR	$60.14	$4	
	Misc Detail Allowance	10%	LS	$0.00	$10	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$2**	
	Total Direct Unit Cost			**$120.00**	**$116**	
7	**Pipeline - 48" CMP, 3.5' Cover Pavement Restoration**	**1**	**LF**			2' cover
	Demo ACP Roadway	2.0	SY	$12.55	$25	
	Excavate Trench	2.4	CY	$3.92	$9	
	Bed & Zone	0.7	CY	$46.86	$34	1/2 mile one way average
	Imported Backfill	1.2	CY	$29.94	$35	
	Haul & Dispose at Repository	2.4	CY	$5.49	$13	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	2.4	CY	$11.38	$27	use C08a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 48" CMP Pipe	1	LF	$161.36	$161	RS Means 334113402200
	ACP Pavement, 4" thk	0.5	TON	$70.00	$32	
	CSBC, 6" thk	0.3	CY	$31.26	$10	
	Flagger	0.10	HR	$60.14	$6	
	Misc Detail Allowance	10%	LS	$0.00	$32	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$11**	
	Total Direct Unit Cost			**$400.00**	**$401**	

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

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

	Description		Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
8	**Pipeline - 24" CPE, 4' Cover Pavement Restoration**		**1**	**LF**			4' cover
	Demo ACP Roadway		1.6	SY	$12.55	$20	
	Excavate Trench		1.5	CY	$3.92	$6	
	Bed & Zone		0.4	CY	$46.86	$20	1/2 mile one way average
	Imported Backfill		0.9	CY	$29.94	$27	
	Haul & Dispose at Repository		1.5	CY	$5.49	$8	assume all but rock is wasted, 5 mile 1 way
	Repository Cost		1.5	CY	$11.38	$17	use C08a cost
	Trench Safety		1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps		0	HR	$12.00	$0	NA
	Pipe, 24" CPE Pipe		1	LF	$47.54	$48	RS Means 334113502040
	ACP Pavement, 4" thk		0.4	TON	$70.00	$26	
	CSBC, 6" thk		0.3	CY	$31.26	$8	
	Flagger		0.05	HR	$60.14	$3	
	Misc Detail Allowance		10%	LS	$0.00	$16	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials		**5%**			**$5**	
		Total Direct Unit Cost			**$210.00**	**$209**	
9	**Remove Drywell, CB's, and Storm Drain along Idaho St.**		**1**	**LF**			2' cover
	Demo Drywell		1	EA	$392.10	$392	
	Demo Catchbasin		4	EA	$784.20	$3,137	
	Demo Existing Storm Drain		285	EA	$9.94	$2,834	
	Imported Backfill to fill in removals		190	CY	$29.94	$5,689	
	Trench Safety		285	LF	$5.00	$1,425	trench box
	Flagger		40	HR	$60.14	$2,406	
	Misc Detail Allowance		10%	LS	$0.00	$1,588	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials		**5%**			**$209**	
		Total Direct Unit Cost			**$17,680.00**	**$17,679**	

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Alternative RP-2: Mullan Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
10	**Install New 6' x 6' Concrete Manhole, 8' Depth**	**1**	**EA**			
	Sawcut & Remove Pavement	16.0	SY	$12.55	$201	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Catch Basin	48.0	CY	$14.80	$710	
	Prep & Grade Channel	0	LF	$7.84	$0	
	Haul & Dispose at Repository	48.0	CY	$5.49	$264	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	48.0	CY	$11.38	$546	use C08a cost
	Imported Fill Material	33.9	CY	$53.33	$1,809	imported, difficult operation
	Grate	1.0	EA	$250.00	$250	
	CIP Wall, 6" thk, 8' tall	3.6	CY	$737.64	$2,623	
	Wall Rebar @ 200 #/cy	711.1	LB	$1.79	$1,269	
	CIP Elevated Slab, 10" thk	1.5	CY	$737.64	$1,111	
	Wall Rebar @ 200 #/cy	301.3	LB	$1.79	$538	
	CIP Slab, 10" thk, 7' x 7' wide	1.5	CY	$295.88	$446	
	Footing Rebar @ 150 #/cy	225.9	LB	$1.79	$403	
	Misc Detail Allowance	10%	LS	$0.00	$936	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$570**	
	Total Direct Unit Cost			**$11,676.00**	**$11,676**	
11,12	**Manhole 48" 6 to 8 ft Depth**	**1**	**EA**			
	Demo ACP Roadway	7.1	SY	$12.55	$89	
	Excavate Trench	19.0	CY	$3.92	$74	
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	15.2	CY	$29.94	$456	
	Haul & Dispose at Repository	19.0	CY	$5.49	$104	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	19.0	CY	$11.38	$216	use C08a cost
	Trench Safety	1	EA	$25.00	$25	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	48" Manhole	1	EA	$2,776.78	$2,777	
	ACP Pavement, 4" thk	1.6	TON	$70.00	$113	
	CSBC, 6" thk	1.2	CY	$31.26	$37	
	Flagger	8.00	HR	$60.14	$481	
	Misc Detail Allowance	10%	LS	$0.00	$405	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$112**	
	Total Direct Unit Cost			**$4,890.00**	**$4,890**	

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
13	**Rip Rap**	**1**	**EA**			
	Riprap	1	CY	$72.91	$73	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$7	
	Sales Tax on Materials	**5%**			**$2**	
	Total Direct Unit Cost			**$82.00**	**$82**	
	South End of 2nd Street					
1,2	**Construct 10'x4'x3' Rock Lined Ditch**	**110**	**LF**			
	Clear, Grub & Dispose	0.1	AC	$6,514.75	$658	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	195.6	CY	$14.80	$2,894	
	Prep & Grade Channel	110	LF	$7.84	$863	
	Haul & Dispose at Repository	195.6	CY	$5.49	$1,074	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	195.6	CY	$11.38	$2,225	use C08a cost
	Imported Fill Material	61.1	CY	$53.33	$3,259	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$767	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$50**	
	Total Direct Unit Cost			**$108.00**	**$11,790**	
3,4	**Pipeline - 18" CHDPE, 3' Cover**	**1**	**LF**			3' cover
	Demo ACP Roadway	1.1	SY	$12.55	$13	
	Excavate Trench	0.7	CY	$3.92	$3	
	Bed & Zone	0.3	CY	$46.86	$13	1/2 mile one way average
	Imported Backfill	0.3	CY	$29.94	$10	
	Haul & Dispose at Repository	0.7	CY	$5.49	$4	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.7	CY	$11.38	$8	use C08a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 18" CPE Pipe	1	LF	$30.71	$31	350'/day
	ACP Pavement, 4" thk	0.2	TON	$70.00	$17	
	CSBC, 6" thk	0.2	CY	$31.26	$5	
	Flagger	0.05	HR	$60.14	$3	
	Misc Detail Allowance	10%	LS	$0.00	$10	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$3**	
	Total Direct Unit Cost			**$120.00**	**$124**	

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

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

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
5	**Install New Dual Inlet Catch Basin with 4' Sump**	**1**	**EA**			
	Sawcut & Remove Pavement	8.3	SY	$12.55	$105	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Catch Basin	20.8	CY	$14.80	$308	
	Prep & Grade Channel	0	LF	$7.84	$0	
	Haul & Dispose at Repository	20.8	CY	$5.49	$114	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	20.8	CY	$11.38	$237	use C08a cost
	Imported Fill Material	17.0	CY	$53.33	$907	imported, difficult operation
	Grate	1.0	EA	$250.00	$250	
	CIP Wall, 6" thk, 7' tall	2.1	CY	$737.64	$1,530	
	Wall Rebar @ 200 #/cy	414.8	LB	$1.79	$740	
	CIP Slab, 6" thk, 5.5' x 2.5' wide	0.5	CY	$295.88	$151	
	Footing Rebar @ 150 #/cy	76.4	LB	$1.79	$136	
	CIP Gutter Slab, 6" thk	0.2	CY	$295.88	$55	
	Footing Rebar @ 150 #/cy	27.8	LB	$1.79	$50	
	Misc Detail Allowance	10%	LS	$0.00	$423	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$360**	
	Total Direct Unit Cost			**$5,367.00**	**$5,367**	
6	**Rip Rap**	**1**	**EA**			
	Riprap	1.0	CY	$72.91	$73	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$7	
	Sales Tax on Materials	**5%**			**$2**	
	Total Direct Unit Cost			**$82.00**	**$82**	

Notes:

CIP = cast-in-place
CPE = polyethylene
CY = cubic yards
EA = each
LB = pound(s)
LS = lump sum
SF = square feet
SY = square yards
TESC = temporary erosion and sediment control

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

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

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

Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
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 D-36

Alternative RP-2: Approximate Cost for Side Gulches

Typical Side Gulch Cost

Length of Stream that Fronts or Flows Through Remediate Areas[1] (LF)	Length of Channel Improvements[2] (LF)	Direct Capital Unit Cost[3]	Direct Capital Cost	Indirect Capital Cost[4]	O&M Cost (30-Year NPV)[5]	Total Cost (30-Year NPV)
2,700	1,200	$ 291	$ 349,000	$ 244,000	$ 228,000	$ 821,000

Approximate Number of Crossings[6]	Length of Culvert Replacement[7] (LF)	Direct Capital Unit Cost[8]	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30-Year NPV)[5]	Total Cost (30-Year NPV)
4	104	$ 682	$ 71,000	$ 50,000	$ 46,000	$ 167,000

Surface Water Improvements[9]	Qty	Direct Capital Unit Cost[10]	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30-Year NPV)[5]	Total Cost (30-Year NPV)
Assume 1 per typcial side gulch	1	$ 181,000	$ 181,000	$ 127,000	$ 118,000	$ 426,000
Total for Typical Side Gulch			$ 601,000	$ 421,000	$ 392,000	$ 1,414,000
TOTAL APPROXIMATE COST for Side Gulches[11]			**$ 6,410,000**	**$ 4,490,000**	**$ 4,180,000**	**$ 15,100,000**

Notes:

LF = linear feet

NPV = net present value

[1] Length of stream that fronts or flows through remediated areas is based on GIS analysis. This value (2,700 LF) is an average length for all side gulches (see Table 9, Appendix G).

[2] Length of expected channel improvements for a typical side gulch assumes 45% of length of stream fronting or flowing through remediated areas would require improvements. This assumption is based on the development of remedy protection projects using hydrologic and hydraulic modeling for Alternative RP-2 in the eight Upper Basin communities. (TerraGraphics, 2010)

[3] Direct unit capital cost for channel improvements is based on average direct capital unit cost for channel hydraulic capacity improvements included in Alternative RP-2 for the eight Upper Basin communities. (CH2M HILL, 2010)

[4] Indirect capital cost assumes 70% of direct capital costs.

[5] O&M Cost (30 Year NPV) assumes 38% of total capital cost. This assumption is based on O&M costs calculated in development of remedy protection projects in eight Upper Basin communities. (CH2M HILL, 2010)

[6] Approximate number of crossing is based on average for side gulches (see Table 9, Appendix G). Assumes all crosssings are culverts.

[7] Typical culvert (or crossing) assumes a two-lane road (24-ft) with shoulders (20-ft) and rip-rap headwalls (8-ft). Assumes 50% of crossings would require culvert replacement. This assumption is based on the development of Alternative RP-2 projects using hydrologic and hydraulic modeling for the eight Upper Basin communities. (TerraGraphics, 2010)

[8] Direct unit cost for culvert replacement is based on average unit cost for culvert replacement technologies included in Alternative RP-2 for the eight Upper Basin communities. (CH2M HILL, 2010)

[9] Surface water improvements assumes that a typical side gulch would need some degree of drainage improvements to reduce scour potential. The typical side gulch cost assumes one surface water improvement project for each side gulch.

[10] Direct unit cost is based on average unit cost for surface water improvement projects included in Alternative RP-2 for the eight Upper Basin communities. These projects include multiple neighborhoods in Mullan, Printer's Creek (Wallace), Portland Road (Kellogg), and Sierra Nevada Road (Wardner). (CH2M HILL, 2010)

[11] The total approximate cost for side gulches assumes 67% of side gulches will actually require remedy protection actions. This assumption is based on the analyses conducted during the characterization of the risk posed to the Selected Remedies in the eight Upper Basin communities. Bunker Creek and Government Creek are not included. (TerraGraphics, 2010)

TABLE D-37

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
BigCrkSeg01	POL044	BLM Polygon	Upland waste rock (erosion potential)	C02c	$4,470	$3,130	$7,600	$1,030	$8,630
	POL052	BLM Polygon	Floodplain waste rock	C01	$19,700	$13,800	$33,500	$0	$33,500
				C07	$67,600	$47,300	$114,900	$14,900	$129,800
BigCrkSeg03	POL001	BLM Polygon	Floodplain waste rock	C02c	$5,070	$3,550	$8,620	$1,170	$9,790
	POL002	BLM Polygon	Floodplain waste rock	C01	$7,280	$5,090	$12,370	$0	$12,370
				C07	$25,000	$17,500	$42,500	$5,500	$48,000
	POL067	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$521,000	$365,000	$886,000	$1,210,000	$2,096,000
	POL068	BLM Polygon	Upland waste rock (erosion potential)	C02a	$16,900	$11,800	$28,700	$2,190	$30,890
BigCrkSeg04	BIG04-2	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$140,000	$97,800	$237,800	$41,900	$279,700
				CD-AVG	$35,000	$24,500	$59,500	$10,500	$70,000
				CD-SED	$3,740	$2,620	$6,360	$22,400	$28,760
				VBS-AVG	$59,500	$41,700	$101,200	$17,900	$119,100
	BIG04-3	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$573,000	$401,000	$974,000	$172,000	$1,146,000
				CD-AVG	$247,000	$173,000	$420,000	$74,200	$494,200
				CD-SED	$26,200	$18,300	$44,500	$157,000	$201,500
				FP/RP-AVG	$432,000	$302,000	$734,000	$77,700	$811,700
				OFFCH-AVG	$832,000	$582,000	$1,414,000	$150,000	$1,564,000
				VBS-AVG	$244,000	$171,000	$415,000	$73,300	$488,300
KLE025	BLM Polygon		Floodplain tailings - inactive Facilities	C09	$5,930,000	$4,150,000	$10,080,000	$1,190,000	$11,270,000
KLE026	BLM Polygon		Floodplain waste rock	C02c	$182,000	$127,000	$309,000	$41,800	$350,800
KLE027	BLM Polygon		Upland waste rock (erosion potential)	C01	$399,000	$279,000	$678,000	$0	$678,000
				C07	$1,370,000	$958,000	$2,328,000	$301,000	$2,629,000
KLE047	BLM Polygon		Floodplain sediments	C01b	$44,900	$31,400	$76,300	$0	$76,300
				C08a	$58,800	$41,200	$100,000	$8,230	$108,230
				HAUL-2	$18,200	$12,800	$31,000	$0	$31,000
KLE053	BLM Polygon		Floodplain waste rock	C01	$842,000	$589,000	$1,431,000	$0	$1,431,000
				C07	$2,890,000	$2,020,000	$4,910,000	$636,000	$5,546,000
KLE054	BLM Polygon		Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$714,000	$500,000	$1,214,000	$661,000	$1,875,000
			Upland waste rock (erosion potential)	C01	$685,000	$480,000	$1,165,000	$0	$1,165,000
				C07	$2,350,000	$1,650,000	$4,000,000	$518,000	$4,518,000
KLE071	BLM Polygon		Floodplain sediments	C01b	$529,000	$370,000	$899,000	$0	$899,000
				C08a	$694,000	$486,000	$1,180,000	$97,100	$1,277,100
				HAUL-2	$215,000	$151,000	$366,000	$0	$366,000
KLE073	BLM Polygon		Floodplain sediments	C01b	$1,350,000	$945,000	$2,295,000	$0	$2,295,000
				C08a	$1,770,000	$1,240,000	$3,010,000	$248,000	$3,258,000
				HAUL-2	$549,000	$384,000	$933,000	$0	$933,000
POL008	BLM Polygon		Floodplain waste rock	C01	$34,900	$24,400	$59,300	$0	$59,300
				C07	$120,000	$84,000	$204,000	$26,400	$230,400
POL010	BLM Polygon		Upland waste rock (erosion potential)	C01	$19,500	$13,700	$33,200	$0	$33,200
				C07	$67,000	$46,900	$113,900	$14,700	$128,600

TABLE D-37

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	POL011	BLM Polygon	Floodplain waste rock	C01	$13,400	$9,350	$22,750	$0	$22,750
				C07	$45,900	$32,100	$78,000	$10,100	$88,100
	POL022	BLM Polygon	Floodplain waste rock	C02c	$12,700	$8,870	$21,570	$2,910	$24,480
	POL066	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C07	$2,940	$2,060	$5,000	$647	$5,647
CCSeg	PIPECC	General Feature	Source General Information	PIPE-1	$1,050,000	$735,000	$1,785,000	$84,000	$1,869,000
				PIPE-2	$54,100	$37,900	$92,000	$4,330	$96,330
				PIPE-3	$2,380,000	$1,670,000	$4,050,000	$191,000	$4,241,000
				PIPE-4	$3,330,000	$2,330,000	$5,660,000	$267,000	$5,927,000
CCSeg01	BUR105	BLM Polygon	Upland waste rock (erosion potential)	C01	$27,800	$19,500	$47,300	$0	$47,300
				C03	$60,800	$42,500	$103,300	$7,290	$110,590
	BUR109	BLM Polygon	Upland waste rock (erosion potential)	C01	$23,500	$16,400	$39,900	$0	$39,900
				C03	$257,000	$180,000	$437,000	$30,800	$467,800
	BUR185	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$69,800	$48,800	$118,600	$8,370	$126,970
	BUR187	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$56,300	$39,400	$95,700	$6,750	$102,450
	THO023	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$42,800	$29,900	$72,700	$5,130	$77,830
CCSeg02	BUR107	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$45,700	$170,500
			Upland waste rock (erosion potential)	C01	$119,000	$83,300	$202,300	$0	$202,300
				C04	$594,000	$416,000	$1,010,000	$137,000	$1,147,000
	BUR130	BLM Polygon	Upland waste rock (erosion potential)	C01	$2,570	$1,800	$4,370	$0	$4,370
				C03	$536,000	$375,000	$911,000	$64,300	$975,300
	BUR132	BLM Polygon	Upland waste rock (erosion potential)	C01	$78,800	$55,100	$133,900	$0	$133,900
				C03	$376,000	$263,000	$639,000	$45,100	$684,100
	BUR133	BLM Polygon	Upland waste rock (erosion potential)	C01	$22,700	$15,900	$38,600	$0	$38,600
				C07	$77,900	$54,500	$132,400	$17,100	$149,500
	BUR134	BLM Polygon	Upland waste rock (erosion potential)	C01	$61,600	$43,100	$104,700	$0	$104,700
				C07	$212,000	$148,000	$360,000	$46,600	$406,600
	BUR135	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$131,000	$91,400	$222,400	$15,700	$238,100
	BUR145	BLM Polygon	Upland waste rock (erosion potential)	C01	$240,000	$168,000	$408,000	$0	$408,000
				C07	$823,000	$576,000	$1,399,000	$181,000	$1,580,000
	BUR150	BLM Polygon	Floodplain waste rock	C01	$27,900	$19,500	$47,400	$0	$47,400
				C03	$306,000	$214,000	$520,000	$36,700	$556,700
	BUR153	BLM Polygon	Floodplain sediments	C01b	$236,000	$165,000	$401,000	$0	$401,000
				C08a	$310,000	$217,000	$527,000	$43,400	$570,400
				HAUL-2	$96,100	$67,300	$163,400	$0	$163,400
	CC02-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$243,000	$170,000	$413,000	$72,800	$485,800
				CD-AVG	$123,000	$86,100	$209,100	$36,900	$246,000

TABLE D-37

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				CD-SED	$12,300	$8,640	$20,940	$74,100	$95,040
				FP/RP-AVG	$889,000	$622,000	$1,511,000	$160,000	$1,671,000
				VBS-AVG	$172,000	$121,000	$293,000	$51,700	$344,700
CCSeg03	BUR087	BLM Polygon	Upland waste rock (erosion potential)	C01	$53,500	$37,500	$91,000	$0	$91,000
				C03	$873,000	$611,000	$1,484,000	$105,000	$1,589,000
	BUR088	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$45,700	$170,500
	BUR089	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$45,000	$31,500	$76,500	$5,400	$81,900
	BUR090	BLM Polygon	Upland tailings	C01	$128,000	$89,900	$217,900	$0	$217,900
				C07	$441,000	$309,000	$750,000	$97,000	$847,000
			Upland waste rock (erosion potential)	C01	$47,100	$33,000	$80,100	$0	$80,100
				C03	$2,360,000	$1,650,000	$4,010,000	$283,000	$4,293,000
	BUR099	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$45,700	$170,500
	BUR146	BLM Polygon	Floodplain sediments	C01b	$344,000	$241,000	$585,000	$0	$585,000
				C08a	$451,000	$316,000	$767,000	$63,200	$830,200
				HAUL-2	$140,000	$98,000	$238,000	$0	$238,000
	BUR149	BLM Polygon	Upland waste rock (erosion potential)	C01	$8,900	$6,230	$15,130	$0	$15,130
				C03	$115,000	$80,300	$195,300	$13,800	$209,100
	BUR166	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$74,300	$52,000	$126,300	$8,910	$135,210
	BUR180	BLM Polygon	Upland waste rock (erosion potential)	C01	$4,710	$3,300	$8,010	$0	$8,010
				C03	$51,800	$36,200	$88,000	$6,210	$94,210
CCSeg04	BUR066	BLM Polygon	Upland waste rock (erosion potential)	C01	$5,990	$4,190	$10,180	$0	$10,180
				C03	$67,500	$47,300	$114,800	$8,100	$122,900
	BUR067	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$950,000	$1,020,000	$1,970,000	$723,000	$2,693,000
			Upland tailings	C01	$10,700	$7,490	$18,190	$0	$18,190
				C07	$36,800	$25,700	$62,500	$8,090	$70,590
			Upland waste rock (potential intermixed tailings)	C01	$749,000	$524,000	$1,273,000	$0	$1,273,000
				C03	$1,070,000	$748,000	$1,818,000	$128,000	$1,946,000
				C07	$2,570,000	$1,800,000	$4,370,000	$566,000	$4,936,000
	BUR068	BLM Polygon	Upland waste rock (erosion potential)	C01	$51,400	$36,000	$87,400	$0	$87,400
				C07	$176,000	$123,000	$299,000	$38,800	$337,800
	BUR072	BLM Polygon	Upland waste rock (erosion potential)	C03	$392,000	$274,000	$666,000	$47,000	$713,000
	BUR073	BLM Polygon	Upland waste rock (erosion potential)	C01	$108,000	$75,500	$183,500	$0	$183,500
				C03	$1,190,000	$830,000	$2,020,000	$142,000	$2,162,000
	BUR075	BLM Polygon	Upland tailings	C01	$15,000	$10,500	$25,500	$0	$25,500
				C07	$51,500	$36,000	$87,500	$11,300	$98,800
	BUR094	BLM Polygon	Upland waste rock (erosion potential)	C02a	$118,000	$82,600	$200,600	$15,300	$215,900
	BUR096	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200

TABLE D-37

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				WT01	$4,890	$5,230	$10,120	$3,700	$13,820
			Upland waste rock	C02a	$120,000	$83,800	$203,800	$15,600	$219,400
	BUR097	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$869,000	$929,000	$1,798,000	$659,000	$2,457,000
			Upland waste rock	C02a	$73,300	$51,300	$124,600	$9,530	$134,130
	BUR098	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$905,000	$968,000	$1,873,000	$896,000	$2,769,000
			Upland waste rock (potential intermixed tailings)	C01	$235,000	$165,000	$400,000	$0	$400,000
				C07	$809,000	$566,000	$1,375,000	$178,000	$1,553,000
	BUR112	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$45,700	$170,500
	BUR117	BLM Polygon	Upland tailings	C01	$7,700	$5,390	$13,090	$0	$13,090
				C07	$26,500	$18,500	$45,000	$5,820	$50,820
			Upland waste rock (potential intermixed tailings)	C03	$250,000	$175,000	$425,000	$30,000	$455,000
	BUR118	BLM Polygon	Upland waste rock (erosion potential)	C01	$141,000	$98,900	$239,900	$0	$239,900
				C07	$485,000	$340,000	$825,000	$107,000	$932,000
	BUR119	BLM Polygon	Upland waste rock	C02a	$175,000	$123,000	$298,000	$22,800	$320,800
	BUR120	BLM Polygon	Upland waste rock (erosion potential)	C02a	$78,400	$54,900	$133,300	$10,200	$143,500
	BUR121	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$682,000	$729,000	$1,411,000	$517,000	$1,928,000
			Upland waste rock (erosion potential)	C01	$88,200	$61,700	$149,900	$0	$149,900
				C03	$452,000	$317,000	$769,000	$54,300	$823,300
	BUR122	BLM Polygon	Upland waste rock (erosion potential)	C01	$23,100	$16,200	$39,300	$0	$39,300
				C03	$252,000	$176,000	$428,000	$30,200	$458,200
	BUR124	BLM Polygon	Upland waste rock (erosion potential)	C02a	$84,300	$59,000	$143,300	$11,000	$154,300
	BUR125	BLM Polygon	Upland waste rock (erosion potential)	C02a	$27,000	$18,900	$45,900	$3,510	$49,410
	BUR128	BLM Polygon	Buildings & structures	HH-3	$136,000	$95,100	$231,100	$6,790	$237,890
			Upland tailings	C01	$186,000	$130,000	$316,000	$0	$316,000
				C07	$638,000	$447,000	$1,085,000	$140,000	$1,225,000
	BUR129	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$45,700	$170,500
			Upland tailings	C01	$22,500	$15,700	$38,200	$0	$38,200
				C07	$77,200	$54,000	$131,200	$17,000	$148,200
	BUR141	BLM Polygon	Floodplain sediments	C01b	$297,000	$208,000	$505,000	$0	$505,000
				C08a	$389,000	$273,000	$662,000	$54,500	$716,500
				HAUL-2	$121,000	$84,500	$205,500	$0	$205,500
	BUR142	BLM Polygon	Upland tailings	C01	$10,500	$7,340	$17,840	$0	$17,840
				C07	$36,000	$25,200	$61,200	$7,920	$69,120
			Upland waste rock (potential intermixed tailings)	C03	$680,000	$476,000	$1,156,000	$81,500	$1,237,500
	BUR143	BLM Polygon	Floodplain sediments	C01b	$432,000	$302,000	$734,000	$0	$734,000
				C08a	$566,000	$396,000	$962,000	$79,300	$1,041,300
				HAUL-2	$176,000	$123,000	$299,000	$0	$299,000

TABLE D-37

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	BUR144	BLM Polygon	Upland waste rock (erosion potential)	C01	$33,400	$23,400	$56,800	$0	$56,800
				C03	$572,000	$400,000	$972,000	$68,600	$1,040,600
	BUR176	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$126,000	$88,200	$214,200	$15,100	$229,300
	BUR177	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$153,000	$107,000	$260,000	$18,400	$278,400
	BUR178	BLM Polygon	Upland waste rock (erosion potential)	C01	$9,420	$6,590	$16,010	$0	$16,010
				C03	$104,000	$72,500	$176,500	$12,400	$188,900
	BUR189	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$45,000	$31,500	$76,500	$5,400	$81,900
	BUR190	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$302,000	$323,000	$625,000	$165,000	$790,000
	BUR191	BLM Polygon	Upland waste rock	C02a	$131,000	$91,500	$222,500	$17,000	$239,500
	BUR192	BLM Polygon	Floodplain tailings (discrete site)	C01	$13,300	$9,290	$22,590	$0	$22,590
				C07	$45,600	$31,900	$77,500	$10,000	$87,500
			Upland waste rock (erosion potential)	C01	$23,100	$16,200	$39,300	$0	$39,300
				C03	$252,000	$176,000	$428,000	$30,200	$458,200
	BUR204	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$42,800	$29,900	$72,700	$5,130	$77,830
	CC04-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$732,000	$512,000	$1,244,000	$220,000	$1,464,000
				CD-AVG	$371,000	$260,000	$631,000	$111,000	$742,000
				CD-SED	$37,400	$26,200	$63,600	$224,000	$287,600
				FP/RP-AVG	$510,000	$357,000	$867,000	$91,900	$958,900
				VBS-AVG	$520,000	$364,000	$884,000	$156,000	$1,040,000
	HHWPCC04-1	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	HHWPCC04-2	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	HHWPCC04-3	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
CCSeg05	CC05-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$81,400	$57,000	$138,400	$24,400	$162,800
				CD-AVG	$20,600	$14,400	$35,000	$6,180	$41,180
				CD-SED	$1,870	$1,310	$3,180	$11,200	$14,380
				FP/RP-AVG	$916,000	$641,000	$1,557,000	$165,000	$1,722,000
				VBS-AVG	$57,800	$40,400	$98,200	$17,300	$115,500
	CC05-2	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$492,000	$344,000	$836,000	$148,000	$984,000
				CD-AVG	$124,000	$86,500	$210,500	$37,100	$247,600
				CD-SED	$13,100	$9,160	$22,260	$78,500	$100,760
				CH REAL-1	$3,780,000	$2,650,000	$6,430,000	$643,000	$7,073,000
				FP/RP-AVG	$1,800,000	$1,260,000	$3,060,000	$324,000	$3,384,000
				VBS-AVG	$350,000	$245,000	$595,000	$105,000	$700,000
	OSB047	BLM Polygon	Floodplain sediments	C01b	$47,000	$32,900	$79,900	$0	$79,900
				C08a	$61,700	$43,200	$104,900	$8,640	$113,540
				HAUL-2	$19,100	$13,400	$32,500	$0	$32,500
	WAL010	BLM Polygon	Floodplain sediments	C01b	$13,800	$9,640	$23,440	$0	$23,440

TABLE D-37

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				C08a	$18,100	$12,600	$30,700	$2,530	$33,230
				HAUL-2	$5,600	$3,920	$9,520	$0	$9,520
	WAL011	BLM Polygon	Adit drainage	WT01	$60,300	$64,500	$124,800	$45,700	$170,500
			Floodplain sediments	C01b	$29,700	$20,800	$50,500	$0	$50,500
				C08a	$38,900	$27,300	$66,200	$5,450	$71,650
				HAUL-2	$12,100	$8,450	$20,550	$0	$20,550
	WAL039	BLM Polygon	Upland tailings	C01	$53,500	$37,500	$91,000	$0	$91,000
				C08a	$221,000	$155,000	$376,000	$31,000	$407,000
				HAUL-2	$68,600	$48,000	$116,600	$0	$116,600
	WAL040	BLM Polygon	Floodplain sediments	C01b	$175,000	$122,000	$297,000	$0	$297,000
				C08a	$229,000	$161,000	$390,000	$32,100	$422,100
				HAUL-2	$71,200	$49,800	$121,000	$0	$121,000
	WAL041	BLM Polygon	Floodplain sediments	C01b	$53,500	$37,500	$91,000	$0	$91,000
				C08a	$70,200	$49,100	$119,300	$9,830	$129,130
				HAUL-2	$21,800	$15,200	$37,000	$0	$37,000
	WAL042	BLM Polygon	Floodplain tailings - inactive Facilities	C03	$579,000	$406,000	$985,000	$69,500	$1,054,500
	WAL081	BLM Polygon	Floodplain artificial fill	C01	$12,200	$8,540	$20,740	$0	$20,740
				C08a	$50,400	$35,300	$85,700	$7,060	$92,760
				HAUL-2	$15,600	$11,000	$26,600	$0	$26,600
	WP-OPTIONC	BLM Polygon	Floodplain sediments	C14b	$1,360,000	$954,000	$2,314,000	$54,500	$2,368,500
				C15b	$7,070,000	$4,950,000	$12,020,000	$141,000	$12,161,000
			Groundwater	WT01	$453,000	$485,000	$938,000	$549,000	$1,487,000
			Source General Information	PIPE-2	$388,000	$272,000	$660,000	$31,000	$691,000
MIDGradSeg	PIPEMG	General Feature	Source General Information	PIPE-1	$417,000	$292,000	$709,000	$33,300	$742,300
				PIPE-2	$40,400	$28,300	$68,700	$3,230	$71,930
				PIPE-4	$12,100,000	$8,480,000	$20,580,000	$969,000	$21,549,000
MIDGradSeg01	HHWPMG01-1	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	HHWPMG01-2	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	HHWPMG01-3	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	HHWPMG01-4	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	HHWPMG01-5	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	KLE011	BLM Polygon	Upland tailings - inactive facilities	C09	$1,940,000	$1,360,000	$3,300,000	$388,000	$3,688,000
	KLE016	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$140,000	$97,700	$237,700	$16,700	$254,400
	KLE020	BLM Polygon	Upland waste rock (erosion potential)	C01	$30,800	$21,600	$52,400	$0	$52,400
				C03	$333,000	$233,000	$566,000	$40,000	$606,000
	KLE021	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$146,000	$102,000	$248,000	$17,600	$265,600
	KLE023	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$259,000	$181,000	$440,000	$31,100	$471,100
	KLE033	BLM Polygon	Upland waste rock (erosion potential)	C01	$21,400	$15,000	$36,400	$0	$36,400
				C03	$360,000	$252,000	$612,000	$43,200	$655,200

TABLE D-37

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	KLE034	BLM Polygon	Floodplain waste rock	C01	$18,800	$13,200	$32,000	$0	$32,000
				C03	$515,000	$361,000	$876,000	$61,800	$937,800
	KLE035	BLM Polygon	Buildings & structures	HH-3	$136,000	$95,100	$231,100	$6,790	$237,890
				C01	$257,000	$180,000	$437,000	$0	$437,000
				C03	$3,030,000	$2,120,000	$5,150,000	$363,000	$5,513,000
	KLE040	BLM Polygon	Floodplain sediments	C14c	$10,400,000	$7,280,000	$17,680,000	$312,000	$17,992,000
				C15b	$3,170,000	$2,220,000	$5,390,000	$63,500	$5,453,500
			Groundwater	WT01	$402,000	$430,000	$832,000	$609,000	$1,441,000
	KLE042	BLM Polygon	Floodplain sediments	C01b	$675,000	$473,000	$1,148,000	$0	$1,148,000
				C08a	$885,000	$620,000	$1,505,000	$124,000	$1,629,000
				HAUL-2	$275,000	$192,000	$467,000	$0	$467,000
			Floodplain tailings	C01	$55,600	$38,900	$94,500	$0	$94,500
				C07	$191,000	$134,000	$325,000	$42,000	$367,000
	KLE048	BLM Polygon	Floodplain sediments	C01b	$744,000	$521,000	$1,265,000	$0	$1,265,000
				C08a	$975,000	$683,000	$1,658,000	$137,000	$1,795,000
				C14c	$8,910,000	$6,240,000	$15,150,000	$267,000	$15,417,000
				C15b	$2,720,000	$1,900,000	$4,620,000	$54,400	$4,674,400
				HAUL-2	$302,000	$212,000	$514,000	$0	$514,000
			Groundwater	WT01	$402,000	$430,000	$832,000	$609,000	$1,441,000
			Floodplain sediments	C01b	$1,760,000	$1,230,000	$2,990,000	$0	$2,990,000
				C08a	$2,300,000	$1,610,000	$3,910,000	$322,000	$4,232,000
				C14c	$7,430,000	$5,200,000	$12,630,000	$223,000	$12,853,000
				C15b	$2,270,000	$1,590,000	$3,860,000	$45,400	$3,905,400
				HAUL-2	$714,000	$500,000	$1,214,000	$0	$1,214,000
			Groundwater	WT01	$402,000	$430,000	$832,000	$609,000	$1,441,000
	KLE051	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$74,300	$52,000	$126,300	$8,910	$135,210
	KLE062	BLM Polygon	Floodplain sediments	C01b	$351,000	$246,000	$597,000	$0	$597,000
				C08a	$460,000	$322,000	$782,000	$64,400	$846,400
				HAUL-2	$143,000	$99,900	$242,900	$0	$242,900
	KLE066	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$85,500	$59,900	$145,400	$10,300	$155,700
	KLE067	BLM Polygon	Upland waste rock (erosion potential)	C01	$23,500	$16,500	$40,000	$0	$40,000
				C03	$45,000	$31,500	$76,500	$5,400	$81,900
	KLE068	BLM Polygon	Upland waste rock (erosion potential)	C01	$59,900	$41,900	$101,800	$0	$101,800
				C07	$206,000	$144,000	$350,000	$45,300	$395,300
	KLE069	BLM Polygon	Upland waste rock (erosion potential)	C01	$2,780	$1,950	$4,730	$0	$4,730
				C03	$94,500	$66,200	$160,700	$11,300	$172,000
	KLE070	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$94,500	$66,200	$160,700	$11,300	$172,000
	KLE074	BLM Polygon	Buildings & structures	HH-3	$136,000	$95,100	$231,100	$6,790	$237,890
			Upland tailings	C01	$59,900	$41,900	$101,800	$0	$101,800

TABLE D-37

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				C07	$206,000	$144,000	$350,000	$45,300	$395,300
	KLE075	BLM Polygon	Upland tailings	C01	$17,100	$12,000	$29,100	$0	$29,100
				C07	$58,800	$41,200	$100,000	$12,900	$112,900
	MG01-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$110,000	$76,900	$186,900	$32,900	$219,800
				CD-AVG	$53,600	$37,500	$91,100	$16,100	$107,200
				CD-SED	$5,610	$3,930	$9,540	$33,700	$43,240
				FP/RP-AVG	$46,800	$32,800	$79,600	$8,430	$88,030
	MG01-2	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$97,600	$68,300	$165,900	$29,300	$195,200
				CD-AVG	$28,800	$20,200	$49,000	$8,650	$57,650
				CD-SED	$3,740	$2,620	$6,360	$22,400	$28,760
				FP/RP-AVG	$131,000	$91,500	$222,500	$23,500	$246,000
	MG01-3	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$134,000	$93,900	$227,900	$40,300	$268,200
				CD-AVG	$18,500	$13,000	$31,500	$5,560	$37,060
				CD-SED	$1,870	$1,310	$3,180	$11,200	$14,380
				FP/RP-AVG	$199,000	$140,000	$339,000	$35,900	$374,900
				VBS-AVG	$57,200	$40,000	$97,200	$17,200	$114,400
	MG01-4	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$305,000	$214,000	$519,000	$91,500	$610,500
				CD-AVG	$53,600	$37,500	$91,100	$16,100	$107,200
				CD-SED	$5,610	$3,930	$9,540	$33,700	$43,240
				FP/RP-AVG	$1,560,000	$1,100,000	$2,660,000	$282,000	$2,942,000
				VBS-AVG	$130,000	$91,000	$221,000	$39,000	$260,000
	MG01-5	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$97,600	$68,300	$165,900	$29,300	$195,200
				CD-AVG	$12,400	$8,650	$21,050	$3,710	$24,760
				CD-SED	$1,870	$1,310	$3,180	$11,200	$14,380
				FP/RP-AVG	$35,000	$24,500	$59,500	$6,310	$65,810
				VBS-AVG	$41,600	$29,100	$70,700	$12,500	$83,200
	MG01-6	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$384,000	$269,000	$653,000	$115,000	$768,000
				CD-AVG	$70,000	$49,000	$119,000	$21,000	$140,000
				CD-SED	$7,480	$5,240	$12,720	$44,900	$57,620
				FP/RP-AVG	$518,000	$363,000	$881,000	$93,300	$974,300
				OFFCH-AVG	$956,000	$669,000	$1,625,000	$172,000	$1,797,000
				VBS-AVG	$164,000	$115,000	$279,000	$49,100	$328,100
	MG01-7	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$433,000	$303,000	$736,000	$130,000	$866,000
				CD-AVG	$18,500	$13,000	$31,500	$5,560	$37,060
				CD-SED	$1,870	$1,310	$3,180	$11,200	$14,380
				FP/RP-AVG	$443,000	$310,000	$753,000	$79,700	$832,700
				OFFCH-AVG	$998,000	$699,000	$1,697,000	$180,000	$1,877,000
				VBS-AVG	$185,000	$129,000	$314,000	$55,400	$369,400
	MG01-8	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$286,000	$200,000	$486,000	$85,900	$571,900
				CD-AVG	$43,300	$30,300	$73,600	$13,000	$86,600
				CD-SED	$3,740	$2,620	$6,360	$22,400	$28,760
				CH REAL-1	$1,320,000	$924,000	$2,244,000	$225,000	$2,469,000

TABLE D-37

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				FP/RP-AVG	$17,900	$12,600	$30,500	$3,230	$33,730
				OFFCH-AVG	$3,640,000	$2,550,000	$6,190,000	$655,000	$6,845,000
				VBS-AVG	$122,000	$85,400	$207,400	$36,600	$244,000
	MG01-9	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$68,000	$47,600	$115,600	$20,400	$136,000
				CD-AVG	$10,300	$7,210	$17,510	$3,090	$20,600
				CD-SED	$1,870	$1,310	$3,180	$11,200	$14,380
				CH REAL-1	$314,000	$219,000	$533,000	$53,300	$586,300
				FP/RP-AVG	$305,000	$214,000	$519,000	$55,000	$574,000
				VBS-AVG	$29,000	$20,300	$49,300	$8,690	$57,990
	MG01-10	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$48,800	$34,200	$83,000	$14,600	$97,600
				CD-AVG	$8,240	$5,770	$14,010	$2,470	$16,480
				CD-SED	$1,870	$1,310	$3,180	$11,200	$14,380
				FP/RP-AVG	$68,700	$48,100	$116,800	$12,400	$129,200
				VBS-AVG	$20,800	$14,600	$35,400	$6,240	$41,640
	MG01-11	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$140,000	$98,200	$238,200	$42,100	$280,300
				CD-AVG	$14,400	$10,100	$24,500	$4,330	$28,830
				CD-SED	$1,870	$1,310	$3,180	$11,200	$14,380
				FP/RP-AVG	$384,000	$269,000	$653,000	$69,100	$722,100
				VBS-AVG	$59,800	$41,900	$101,700	$17,900	$119,600
	MG01-12	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$134,000	$93,900	$227,900	$40,300	$268,200
				CD-AVG	$26,800	$18,700	$45,500	$8,030	$53,530
				CD-SED	$3,740	$2,620	$6,360	$22,400	$28,760
				FP/RP-AVG	$554,000	$388,000	$942,000	$99,700	$1,041,700
				OFFCH-AVG	$2,320,000	$1,620,000	$3,940,000	$417,000	$4,357,000
				VBS-AVG	$57,200	$40,000	$97,200	$17,200	$114,400
	MG01-13	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$305,000	$214,000	$519,000	$91,500	$610,500
				CD-AVG	$43,300	$30,300	$73,600	$13,000	$86,600
				CD-SED	$3,740	$2,620	$6,360	$22,400	$28,760
				CH REAL-1	$1,270,000	$892,000	$2,162,000	$217,000	$2,379,000
				FP/RP-AVG	$342,000	$239,000	$581,000	$61,500	$642,500
				OFFCH-AVG	$3,570,000	$2,500,000	$6,070,000	$642,000	$6,712,000
				VBS-AVG	$130,000	$91,000	$221,000	$39,000	$260,000
	MG01-14	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$92,500	$64,700	$157,200	$27,700	$184,900
				CD-AVG	$14,400	$10,100	$24,500	$4,330	$28,830
				CD-SED	$1,870	$1,310	$3,180	$11,200	$14,380
				CH REAL-1	$426,000	$298,000	$724,000	$72,500	$796,500
				FP/RP-AVG	$203,000	$142,000	$345,000	$36,600	$381,600
				OFFCH-AVG	$179,000	$125,000	$304,000	$32,300	$336,300
				VBS-AVG	$39,400	$27,600	$67,000	$11,800	$78,800
	MG01-15	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$47,100	$33,000	$80,100	$14,100	$94,200
				CD-AVG	$35,000	$24,500	$59,500	$10,500	$70,000
				CD-SED	$3,740	$2,620	$6,360	$22,400	$28,760

TABLE D-37

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				FP/RP-AVG	$51,800	$36,200	$88,000	$9,320	$97,320
				OFFCH-AVG	$2,650,000	$1,850,000	$4,500,000	$476,000	$4,976,000
				VBS-AVG	$20,100	$14,100	$34,200	$6,020	$40,220
	MG01-16	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$13,100	$9,140	$22,240	$3,920	$26,160
				CD-AVG	$20,600	$14,400	$35,000	$6,180	$41,180
				CD-SED	$1,870	$1,310	$3,180	$11,200	$14,380
				FP/RP-AVG	$19,400	$13,600	$33,000	$3,500	$36,500
				OFFCH-AVG	$444,000	$311,000	$755,000	$80,000	$835,000
				VBS-AVG	$5,560	$3,890	$9,450	$1,670	$11,120
	MG01-17	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$334,000	$234,000	$568,000	$100,000	$668,000
				CD-AVG	$49,400	$34,600	$84,000	$14,800	$98,800
				CD-SED	$5,610	$3,930	$9,540	$33,700	$43,240
				CH REAL-1	$1,540,000	$1,080,000	$2,620,000	$262,000	$2,882,000
				FP/RP-AVG	$523,000	$366,000	$889,000	$94,100	$983,100
				OFFCH-AVG	$659,000	$462,000	$1,121,000	$119,000	$1,240,000
				VBS-AVG	$142,000	$99,700	$241,700	$42,700	$284,400
	MG01-18	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$167,000	$117,000	$284,000	$50,000	$334,000
				CD-AVG	$24,700	$17,300	$42,000	$7,420	$49,420
				CD-SED	$3,740	$2,620	$6,360	$22,400	$28,760
				CH REAL-1	$768,000	$538,000	$1,306,000	$131,000	$1,437,000
				FP/RP-AVG	$537,000	$376,000	$913,000	$96,600	$1,009,600
				OFFCH-AVG	$231,000	$162,000	$393,000	$41,500	$434,500
				VBS-AVG	$71,000	$49,700	$120,700	$21,300	$142,000
	MUL085	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C04	$94,000	$65,800	$159,800	$21,600	$181,400
	MUL086	BLM Polygon	Upland waste rock (erosion potential)	C01	$25,700	$18,000	$43,700	$0	$43,700
				C03	$284,000	$198,000	$482,000	$34,000	$516,000
	OSB025	BLM Polygon	Upland waste rock (erosion potential)	C01	$10,300	$7,190	$17,490	$0	$17,490
				C03	$113,000	$78,800	$191,800	$13,500	$205,300
	OSB030	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$101,000	$70,900	$171,900	$12,200	$184,100
	OSB065	BLM Polygon	Floodplain sediments	C01b	$5,860,000	$4,100,000	$9,960,000	$0	$9,960,000
				C08a	$7,680,000	$5,380,000	$13,060,000	$1,080,000	$14,140,000
				C14c	$65,300,000	$45,700,000	$111,000,000	$1,960,000	$112,960,000
				C15b	$20,000,000	$14,000,000	$34,000,000	$399,000	$34,399,000
				HAUL-2	$2,380,000	$1,670,000	$4,050,000	$0	$4,050,000
			Groundwater	WT01	$402,000	$430,000	$832,000	$609,000	$1,441,000
	OSB070	BLM Polygon	Upland waste rock (erosion potential)	C01	$26,500	$18,600	$45,100	$0	$45,100
				C03	$293,000	$205,000	$498,000	$35,100	$533,100
	OSB072	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$51,800	$36,200	$88,000	$6,210	$94,210
	OSB073	BLM Polygon	Upland waste rock (erosion potential)	C01	$18,800	$13,200	$32,000	$0	$32,000

TABLE D-37

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				C03	$131,000	$91,400	$222,400	$15,700	$238,100
	OSB074	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
	OSB075	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$63,000	$44,100	$107,100	$7,560	$114,660
	OSB076	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$45,000	$31,500	$76,500	$5,400	$81,900
	OSB078	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$18,000	$12,600	$30,600	$2,160	$32,760
	OSB117	BLM Polygon	Floodplain tailings	C01	$59,900	$41,900	$101,800	$0	$101,800
				C07	$206,000	$144,000	$350,000	$45,300	$395,300
	OSB118	BLM Polygon	Floodplain sediments	C01b	$810,000	$567,000	$1,377,000	$0	$1,377,000
				C08a	$1,060,000	$743,000	$1,803,000	$149,000	$1,952,000
				HAUL-2	$329,000	$231,000	$560,000	$0	$560,000
	OSB119	BLM Polygon	Floodplain sediments (underlying tailings pond)	C11j	$11,100,000	$7,790,000	$18,890,000	$223,000	$19,113,000
			Groundwater	WT01	$30,200	$32,300	$62,500	$22,900	$85,400
	OSB120	BLM Polygon	Floodplain sediments	C01b	$3,890,000	$2,720,000	$6,610,000	$0	$6,610,000
				C08a	$5,100,000	$3,570,000	$8,670,000	$714,000	$9,384,000
				C14c	$41,600,000	$29,100,000	$70,700,000	$1,250,000	$71,950,000
				C15b	$12,700,000	$8,890,000	$21,590,000	$254,000	$21,844,000
				HAUL-2	$1,580,000	$1,110,000	$2,690,000	$0	$2,690,000
			Groundwater	WT01	$402,000	$430,000	$832,000	$609,000	$1,441,000
	POL018	BLM Polygon	Upland waste rock (erosion potential)	C01	$18,800	$13,200	$32,000	$0	$32,000
				C03	$205,000	$143,000	$348,000	$24,600	$372,600
	POL019	BLM Polygon	Upland waste rock (erosion potential)	C05	$1,880,000	$1,320,000	$3,200,000	$434,000	$3,634,000
	POL021	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$149,000	$104,000	$253,000	$17,800	$270,800
	POL064	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$45,000	$31,500	$76,500	$5,400	$81,900
	WAL001	BLM Polygon	Floodplain sediments (underlying tailings pond)	C11j	$13,400,000	$9,350,000	$22,750,000	$267,000	$23,017,000
			Groundwater	WT01	$60,300	$64,500	$124,800	$18,300	$143,100
			Upland tailings - active facilities	C09	$16,300,000	$11,400,000	$27,700,000	$3,260,000	$30,960,000
	WAL002	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$603	$645	$1,248	$366	$1,614
			Floodplain waste rock	C01	$171	$120	$291	$0	$291
				C03	$196,000	$137,000	$333,000	$23,500	$356,500
	WAL004	BLM Polygon	Floodplain sediments	C01b	$1,470,000	$1,030,000	$2,500,000	$0	$2,500,000
				C08a	$1,930,000	$1,350,000	$3,280,000	$270,000	$3,550,000
				C14c	$25,200,000	$17,700,000	$42,900,000	$757,000	$43,657,000
				C15b	$7,710,000	$5,400,000	$13,110,000	$154,000	$13,264,000
				HAUL-2	$597,000	$418,000	$1,015,000	$0	$1,015,000
			Groundwater	WT01	$402,000	$430,000	$832,000	$609,000	$1,441,000

TABLE D-37

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	WAL014	BLM Polygon	Upland waste rock (erosion potential)	C01	$33,400	$23,400	$56,800	$0	$56,800
				C03	$362,000	$254,000	$616,000	$43,500	$659,500
	WAL016	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C07	$2,940	$2,060	$5,000	$647	$5,647
	WAL020	BLM Polygon	Upland waste rock (erosion potential)	C01	$297,000	$208,000	$505,000	$0	$505,000
				C03	$1,310,000	$914,000	$2,224,000	$157,000	$2,381,000
	WAL024	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$96,800	$67,700	$164,500	$11,600	$176,100
	WAL034	BLM Polygon	Floodplain sediments	C01b	$527,000	$369,000	$896,000	$0	$896,000
				C08a	$690,000	$483,000	$1,173,000	$96,600	$1,269,600
				HAUL-2	$214,000	$150,000	$364,000	$0	$364,000
	WAL035	BLM Polygon	Floodplain waste rock	C01	$120,000	$83,900	$203,900	$0	$203,900
				C03	$1,330,000	$928,000	$2,258,000	$159,000	$2,417,000
	WAL036	BLM Polygon	Floodplain sediments	C01b	$304,000	$213,000	$517,000	$0	$517,000
				C07	$331,000	$232,000	$563,000	$72,800	$635,800
	WAL037	BLM Polygon	Upland tailings	C01	$51,400	$36,000	$87,400	$0	$87,400
				C07	$176,000	$123,000	$299,000	$38,800	$337,800
	WAL046	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$58,500	$41,000	$99,500	$7,020	$106,520
	WAL055	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$38,300	$26,800	$65,100	$4,590	$69,690
	WAL056	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$54,000	$37,800	$91,800	$6,480	$98,280
	WAL057	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$22,500	$15,800	$38,300	$2,700	$41,000
	WAL058	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$20,300	$14,200	$34,500	$2,430	$36,930
	WAL062	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$42,800	$29,900	$72,700	$5,130	$77,830
	WAL064	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$78,800	$55,100	$133,900	$9,450	$143,350
	WAL072	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$18,000	$12,600	$30,600	$2,160	$32,760
	WAL073	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$22,500	$15,800	$38,300	$2,700	$41,000
MIDGradSeg02	KLW061	BLM Polygon	Upland waste rock	C02b	$2,320,000	$1,620,000	$3,940,000	$301,000	$4,241,000
	KLW062	BLM Polygon	Upland waste rock	C02b	$356,000	$249,000	$605,000	$46,200	$651,200
	KLW070	BLM Polygon	Floodplain sediments	C01b	$126,000	$88,400	$214,400	$0	$214,400
				C08a	$165,000	$116,000	$281,000	$23,200	$304,200
				HAUL-2	$51,300	$35,900	$87,200	$0	$87,200
	KLW095	BLM Polygon	Upland waste rock	C02b	$137,000	$95,900	$232,900	$17,800	$250,700
	MG02-10	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$7,540	$5,270	$12,810	$2,260	$15,070

TABLE D-37

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				CD-AVG	$22,700	$15,900	$38,600	$6,800	$45,400
				CD-SED	$1,870	$1,310	$3,180	$11,200	$14,380
				VBS-AVG	$6,420	$4,500	$10,920	$1,930	$12,850
	MG02-11	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$6,660	$4,660	$11,320	$2,000	$13,320
				CD-AVG	$8,240	$5,770	$14,010	$2,470	$16,480
				CD-SED	$1,870	$1,310	$3,180	$11,200	$14,380
				VBS-AVG	$5,680	$3,980	$9,660	$1,700	$11,360
	MG02-12	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$1,830	$1,280	$3,110	$549	$3,659
				CD-AVG	$2,060	$1,440	$3,500	$618	$4,118
				FP/RP-AVG	$2,070	$1,450	$3,520	$372	$3,892
				VBS-AVG	$401	$281	$682	$120	$802
MoonCrkSeg01	KLE061	BLM Polygon	Floodplain waste rock	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	MC01-2	Bioengineering Reach	BioReach Current Deflector Frequency	CD-SED	$7,480	$5,240	$12,720	$44,900	$57,620
			BioReach General Characteristics	BSBR-AVG	$187,000	$131,000	$318,000	$56,000	$374,000
				CD-AVG	$70,000	$49,000	$119,000	$21,000	$140,000
				FP/RP-AVG	$154,000	$108,000	$262,000	$27,700	$289,700
				VBS-AVG	$79,600	$55,700	$135,300	$23,900	$159,200
MoonCrkSeg02	KLE008	BLM Polygon	Upland waste rock (erosion potential)	C02b	$109,000	$76,000	$185,000	$14,100	$199,100
	KLE014	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	KLE041	BLM Polygon	Floodplain sediments	C01b	$44,600	$31,200	$75,800	$0	$75,800
				C08a	$58,400	$40,900	$99,300	$8,180	$107,480
				HAUL-2	$18,100	$12,700	$30,800	$0	$30,800
	KLE063	BLM Polygon	Upland waste rock (erosion potential)	C02b	$25,100	$17,500	$42,600	$3,260	$45,860
	KLE064	BLM Polygon	Upland waste rock (erosion potential)	C02b	$21,700	$15,200	$36,900	$2,820	$39,720
	KLE065	BLM Polygon	Upland waste rock (erosion potential)	C02b	$38,400	$26,900	$65,300	$4,990	$70,290
	MC02-2	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$163,000	$114,000	$277,000	$48,800	$325,800
				CD-AVG	$124,000	$86,500	$210,500	$37,100	$247,600
				CD-SED	$13,100	$9,160	$22,260	$78,500	$100,760
				FP/RP-AVG	$447,000	$313,000	$760,000	$80,500	$840,500
				VBS-AVG	$69,400	$48,600	$118,000	$20,800	$138,800
	MC02-3	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$136,000	$95,400	$231,400	$40,900	$272,300
				CD-AVG	$51,500	$36,100	$87,600	$15,500	$103,100
				CD-SED	$5,610	$3,930	$9,540	$33,700	$43,240
				FP/RP-AVG	$225,000	$157,000	$382,000	$40,400	$422,400
				VBS-AVG	$58,100	$40,700	$98,800	$17,400	$116,200
	MC02-4	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$70,800	$49,500	$120,300	$21,200	$141,500
				CD-AVG	$53,600	$37,500	$91,100	$16,100	$107,200
				CD-SED	$5,610	$3,930	$9,540	$33,700	$43,240

TABLE D-37

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				FP/RP-AVG	$194,000	$136,000	$330,000	$34,900	$364,900
				VBS-AVG	$45,200	$31,600	$76,800	$13,600	$90,400
NMSeg	PIPENM	General Feature	Source General Information	PIPE-1	$1,560,000	$1,090,000	$2,650,000	$125,000	$2,775,000
NMSeg01	BUR051	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
	BUR052	BLM Polygon	Upland waste rock	C01	$3,420	$2,400	$5,820	$0	$5,820
				C03	$36,000	$25,200	$61,200	$4,320	$65,520
	BUR053	BLM Polygon	Upland waste rock (erosion potential)	C01	$2,960,000	$2,070,000	$5,030,000	$0	$5,030,000
				C04	$2,150,000	$1,500,000	$3,650,000	$494,000	$4,144,000
	BUR140	BLM Polygon	Floodplain sediments	C01b	$135,000	$94,500	$229,500	$0	$229,500
				C08a	$177,000	$124,000	$301,000	$24,800	$325,800
				HAUL-2	$54,900	$38,400	$93,300	$0	$93,300
	BUR160	BLM Polygon	Upland waste rock (erosion potential)	C04	$1,070,000	$747,000	$1,817,000	$245,000	$2,062,000
	NM01-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$489,000	$343,000	$832,000	$147,000	$979,000
				CD-AVG	$98,900	$69,200	$168,100	$29,700	$197,800
				CD-SED	$9,350	$6,550	$15,900	$56,100	$72,000
				FP/RP-AVG	$269,000	$188,000	$457,000	$48,400	$505,400
				VBS-AVG	$209,000	$146,000	$355,000	$62,600	$417,600
NMSeg02	BUR054	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$211,000	$148,000	$359,000	$549,000	$908,000
			Upland tailings - inactive facilities	C09	$615,000	$431,000	$1,046,000	$123,000	$1,169,000
			Upland waste rock (potential intermixed tailings)	C03	$4,820,000	$3,370,000	$8,190,000	$578,000	$8,768,000
	BUR055	BLM Polygon	Floodplain sediments	C01b	$74,300	$52,000	$126,300	$0	$126,300
				C08a	$97,400	$68,100	$165,500	$13,600	$179,100
				HAUL-2	$30,200	$21,100	$51,300	$0	$51,300
			Upland tailings	C07	$206,000	$144,000	$350,000	$45,300	$395,300
				C01	$59,900	$41,900	$101,800	$0	$101,800
	BUR056	BLM Polygon	Upland waste rock (potential intermixed tailings)	C02b	$2,230,000	$1,560,000	$3,790,000	$290,000	$4,080,000
	BUR058	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
	BUR139	BLM Polygon	Upland waste rock	C03	$295,000	$206,000	$501,000	$35,400	$536,400
	BUR170	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$453,000	$317,000	$770,000	$1,160,000	$1,930,000
			Upland waste rock (potential intermixed tailings)	C03	$214,000	$150,000	$364,000	$25,700	$389,700
	BUR171	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$330,000	$231,000	$561,000	$1,060,000	$1,621,000
			Upland waste rock (potential intermixed tailings)	C03	$149,000	$104,000	$253,000	$17,800	$270,800
	BUR172	BLM Polygon	Upland waste rock	C03	$96,800	$67,700	$164,500	$11,600	$176,100
	NM02-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$921,000	$645,000	$1,566,000	$276,000	$1,842,000
				CD-AVG	$185,000	$130,000	$315,000	$55,600	$370,600
				CD-SED	$18,700	$13,100	$31,800	$112,000	$143,800
				FP/RP-AVG	$506,000	$354,000	$860,000	$91,100	$951,100

TABLE D-37

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				OFFCH-AVG	$14,800	$10,300	$25,100	$2,660	$27,760
				VBS-AVG	$393,000	$275,000	$668,000	$118,000	$786,000
	OSB040	BLM Polygon	Floodplain sediments	C01b	$228,000	$160,000	$388,000	$0	$388,000
				C08a	$299,000	$210,000	$509,000	$41,900	$550,900
				HAUL-2	$92,800	$65,000	$157,800	$0	$157,800
	OSB044	BLM Polygon	Floodplain sediments	C01b	$135,000	$94,500	$229,500	$0	$229,500
				C08a	$177,000	$124,000	$301,000	$24,800	$325,800
				HAUL-2	$54,900	$38,400	$93,300	$0	$93,300
			Upland tailings (jig tailings)	C01	$1,540,000	$1,080,000	$2,620,000	$0	$2,620,000
				C08a	$6,370,000	$4,460,000	$10,830,000	$892,000	$11,722,000
				HAUL-2	$1,980,000	$1,380,000	$3,360,000	$0	$3,360,000
			Upland waste rock	C02a	$37,900	$26,600	$64,500	$4,930	$69,430
	OSB048	BLM Polygon	Upland waste rock	C02a	$12,600	$8,850	$21,450	$1,640	$23,090
	OSB056	BLM Polygon	Floodplain sediments	C01b	$21,600	$15,100	$36,700	$0	$36,700
				C08a	$28,300	$19,800	$48,100	$3,960	$52,060
				HAUL-2	$8,780	$6,150	$14,930	$0	$14,930
	OSB057	BLM Polygon	Floodplain sediments	C01b	$176,000	$123,000	$299,000	$0	$299,000
				C08a	$230,000	$161,000	$391,000	$32,200	$423,200
				HAUL-2	$71,400	$50,000	$121,400	$0	$121,400
	OSB058	BLM Polygon	Floodplain sediments	C01b	$21,600	$15,100	$36,700	$0	$36,700
				C08a	$28,300	$19,800	$48,100	$3,960	$52,060
				HAUL-2	$8,780	$6,150	$14,930	$0	$14,930
	OSB088	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$3,920	$4,200	$8,120	$2,970	$11,090
	OSB089	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$10,600	$11,300	$21,900	$8,690	$30,590
NMSeg03	NM03-1	Bioengineering Reach	BioReach General Characteristics	CD-AVG	$68,000	$47,600	$115,600	$20,400	$136,000
				CD-SED	$7,480	$5,240	$12,720	$44,900	$57,620
				FP/RP-AVG	$621,000	$434,000	$1,055,000	$112,000	$1,167,000
				OFFCH-AVG	$56,000	$39,200	$95,200	$10,100	$105,300
				VBS-AVG	$169,000	$118,000	$287,000	$50,600	$337,600
NMSeg04	NM04-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$252,000	$177,000	$429,000	$75,700	$504,700
				CD-AVG	$51,500	$36,100	$87,600	$15,500	$103,100
				CD-SED	$5,610	$3,930	$9,540	$33,700	$43,240
				CH REAL-1	$1,160,000	$815,000	$1,975,000	$198,000	$2,173,000
				FP/RP-AVG	$194,000	$136,000	$330,000	$34,900	$364,900
				OFFCH-AVG	$84,000	$58,800	$142,800	$15,100	$157,900
				VBS-AVG	$108,000	$75,300	$183,300	$32,300	$215,600
	NM04-2	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$87,500	$61,200	$148,700	$26,200	$174,900
				CD-AVG	$18,500	$13,000	$31,500	$5,560	$37,060
				CD-SED	$1,870	$1,310	$3,180	$11,200	$14,380
				CH REAL-1	$404,000	$282,000	$686,000	$68,600	$754,600

TABLE D-37

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				FP/RP-AVG	$192,000	$135,000	$327,000	$34,600	$361,600
				VBS-AVG	$37,300	$26,100	$63,400	$11,200	$74,600
	NM04-3	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$677,000	$474,000	$1,151,000	$203,000	$1,354,000
				CD-AVG	$138,000	$96,600	$234,600	$41,400	$276,000
				CD-SED	$13,100	$9,160	$22,260	$78,500	$100,760
				CH REAL-1	$3,120,000	$2,190,000	$5,310,000	$531,000	$5,841,000
				FP/RP-AVG	$893,000	$625,000	$1,518,000	$161,000	$1,679,000
				VBS-AVG	$289,000	$202,000	$491,000	$86,600	$577,600
	OSB032	BLM Polygon	Floodplain waste rock	C01	$17,100	$12,000	$29,100	$0	$29,100
				C03	$189,000	$132,000	$321,000	$22,700	$343,700
	OSB033	BLM Polygon	Upland waste rock (erosion potential)	C01	$13,700	$9,590	$23,290	$0	$23,290
				C03	$153,000	$107,000	$260,000	$18,400	$278,400
	OSB038	BLM Polygon	Floodplain waste rock	C01	$26,500	$18,600	$45,100	$0	$45,100
				C03	$288,000	$202,000	$490,000	$34,600	$524,600
	OSB039	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$4,100	$4,390	$8,490	$3,110	$11,600
			Buildings & structures	HH-3	$136,000	$95,100	$231,100	$6,790	$237,890
			Floodplain sediments	C01b	$149,000	$104,000	$253,000	$0	$253,000
				C08a	$195,000	$136,000	$331,000	$27,300	$358,300
				HAUL-2	$60,400	$42,300	$102,700	$0	$102,700
			Upland tailings	C01	$47,100	$33,000	$80,100	$0	$80,100
				C07	$162,000	$113,000	$275,000	$35,600	$310,600
	OSB052	BLM Polygon	Upland tailings - inactive facilities	C09	$1,370,000	$956,000	$2,326,000	$273,000	$2,599,000
	OSB059	BLM Polygon	Floodplain sediments	C01b	$446,000	$312,000	$758,000	$0	$758,000
				C08a	$584,000	$409,000	$993,000	$81,800	$1,074,800
				HAUL-2	$181,000	$127,000	$308,000	$0	$308,000
	OSB060	BLM Polygon	Floodplain sediments	C01b	$10,800	$7,560	$18,360	$0	$18,360
				C07	$11,800	$8,230	$20,030	$2,590	$22,620
	OSB061	BLM Polygon	Upland tailings	C01	$30,000	$21,000	$51,000	$0	$51,000
				C07	$103,000	$72,000	$175,000	$22,600	$197,600
	OSB082	BLM Polygon	Floodplain waste rock	C01	$11,100	$7,790	$18,890	$0	$18,890
				C03	$122,000	$85,100	$207,100	$14,600	$221,700
	OSB115	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$76,500	$53,600	$130,100	$9,180	$139,280
	WAL006	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$56,300	$39,400	$95,700	$6,750	$102,450
	WAL033	BLM Polygon	Floodplain sediments	C01b	$445,000	$312,000	$757,000	$0	$757,000
				C07	$485,000	$339,000	$824,000	$107,000	$931,000
PineCrkSeg01	HHWPPC01-1	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	HHWPPC01-2	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	MAS006	BLM Polygon	Floodplain tailings - inactive Facilities	C09	$1,010,000	$706,000	$1,716,000	$202,000	$1,918,000
				C11j	$3,180,000	$2,230,000	$5,410,000	$63,600	$5,473,600

TABLE D-37

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	MAS007	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$348,000	$243,000	$591,000	$595,000	$1,186,000
			Upland waste rock	C01	$205,000	$144,000	$349,000	$0	$349,000
				C03	$410,000	$287,000	$697,000	$49,100	$746,100
	MAS008	BLM Polygon	Upland waste rock (erosion potential)	C01	$107,000	$74,900	$181,900	$0	$181,900
				C07	$368,000	$257,000	$625,000	$80,900	$705,900
	MAS009	BLM Polygon	Upland waste rock (erosion potential)	C01	$31,800	$22,300	$54,100	$0	$54,100
				C07	$109,000	$76,600	$185,600	$24,100	$209,700
	MAS011	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$136,000	$95,300	$231,300	$527,000	$758,300
	MAS012	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock (erosion potential)	C01	$2,140	$1,500	$3,640	$0	$3,640
				C07	$7,350	$5,150	$12,500	$1,620	$14,120
	MAS013	BLM Polygon	Upland waste rock (erosion potential)	C01	$20,100	$14,100	$34,200	$0	$34,200
				C07	$69,100	$48,400	$117,500	$15,200	$132,700
	MAS014	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Seep	WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland tailings	C01	$342	$240	$582	$0	$582
				C08a	$1,420	$991	$2,411	$198	$2,609
				HAUL-2	$439	$307	$746	$0	$746
			Upland waste rock	C01	$131,000	$92,000	$223,000	$0	$223,000
				C03	$288,000	$202,000	$490,000	$34,600	$524,600
	MAS015	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$152,000	$106,000	$258,000	$528,000	$786,000
			Upland waste rock (erosion potential)	C01	$4,280	$3,000	$7,280	$0	$7,280
				C07	$14,700	$10,300	$25,000	$3,230	$28,230
	MAS016	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$135,000	$94,400	$229,400	$527,000	$756,400
			Upland waste rock (erosion potential)	C01	$99,600	$69,700	$169,300	$0	$169,300
				C07	$342,000	$240,000	$582,000	$75,300	$657,300
	MAS017	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock (erosion potential)	C01	$268,000	$188,000	$456,000	$0	$456,000
				C07	$921,000	$645,000	$1,566,000	$203,000	$1,769,000
	MAS018	BLM Polygon	Upland waste rock (erosion potential)	C01	$11,600	$8,090	$19,690	$0	$19,690
				C07	$39,700	$27,800	$67,500	$8,730	$76,230
	MAS019	BLM Polygon	Floodplain waste rock	C01	$4,280	$3,000	$7,280	$0	$7,280
				C07	$14,700	$10,300	$25,000	$3,230	$28,230
	MAS020	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$391,000	$274,000	$665,000	$550,000	$1,215,000

TABLE D-37

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	MAS021	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$389,000	$272,000	$661,000	$1,140,000	$1,801,000
			Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C04	$160,000	$112,000	$272,000	$36,800	$308,800
	MAS022	BLM Polygon	Floodplain waste rock	C01	$205,000	$144,000	$349,000	$0	$349,000
				C07	$706,000	$494,000	$1,200,000	$155,000	$1,355,000
	MAS023	BLM Polygon	Upland waste rock (erosion potential)	C01	$4,280	$3,000	$7,280	$0	$7,280
				C07	$14,700	$10,300	$25,000	$3,230	$28,230
	MAS025	BLM Polygon	Floodplain waste rock (intermixed tailings)	C01	$150,000	$105,000	$255,000	$0	$255,000
	MAS027	BLM Polygon	Floodplain waste rock	C01	$30,000	$21,000	$51,000	$0	$51,000
				C03	$545,000	$381,000	$926,000	$65,300	$991,300
	MAS028	BLM Polygon	Upland waste rock (erosion potential)	C01	$46,200	$32,400	$78,600	$0	$78,600
				C07	$159,000	$111,000	$270,000	$34,900	$304,900
	MAS029	BLM Polygon	Upland waste rock (intermixed tailings)	C01	$3,000	$2,100	$5,100	$0	$5,100
				C07	$10,300	$7,200	$17,500	$2,260	$19,760
	MAS030	BLM Polygon	Upland waste rock (erosion potential)	C01	$5,750	$4,030	$9,780	$0	$9,780
				C03	$63,000	$44,100	$107,100	$7,560	$114,660
	MAS031	BLM Polygon	Upland waste rock (erosion potential)	C01	$18,500	$12,900	$31,400	$0	$31,400
				C07	$63,500	$44,500	$108,000	$14,000	$122,000
	MAS032	BLM Polygon	Upland waste rock (erosion potential)	C01	$342	$240	$582	$0	$582
				C07	$1,180	$823	$2,003	$259	$2,262
	MAS033	BLM Polygon	Upland waste rock (erosion potential)	C01	$20,500	$14,400	$34,900	$0	$34,900
				C07	$70,600	$49,400	$120,000	$15,500	$135,500
	MAS035	BLM Polygon	Upland waste rock (erosion potential)	C01	$34,200	$24,000	$58,200	$0	$58,200
				C07	$118,000	$82,300	$200,300	$25,900	$226,200
	MAS036	BLM Polygon	Floodplain tailings	C01	$11,600	$8,090	$19,690	$0	$19,690
				C07	$39,700	$27,800	$67,500	$8,730	$76,230
	MAS040	BLM Polygon	Floodplain sediments	C01b	$18,600	$13,000	$31,600	$0	$31,600
				C08a	$24,400	$17,100	$41,500	$3,420	$44,920
				HAUL-2	$7,580	$5,300	$12,880	$0	$12,880
	MAS041	BLM Polygon	Floodplain sediments	C01b	$31,600	$22,100	$53,700	$0	$53,700
				C08a	$41,400	$29,000	$70,400	$5,800	$76,200
				HAUL-2	$12,800	$8,990	$21,790	$0	$21,790
	MAS042	BLM Polygon	Floodplain sediments	C01b	$14,600	$10,200	$24,800	$0	$24,800
				C08a	$19,100	$13,400	$32,500	$2,680	$35,180
				HAUL-2	$5,930	$4,150	$10,080	$0	$10,080
	MAS043	BLM Polygon	Floodplain sediments	C01b	$40,500	$28,400	$68,900	$0	$68,900
				C08a	$53,100	$37,200	$90,300	$7,430	$97,730
				HAUL-2	$16,500	$11,500	$28,000	$0	$28,000
	MAS045	BLM Polygon	Floodplain sediments	C01b	$40,500	$28,400	$68,900	$0	$68,900
				C08a	$53,100	$37,200	$90,300	$7,430	$97,730
				HAUL-2	$16,500	$11,500	$28,000	$0	$28,000

TABLE D-37

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	MAS046	BLM Polygon	Floodplain sediments	C01b	$322,000	$225,000	$547,000	$0	$547,000
				C08a	$422,000	$296,000	$718,000	$59,100	$777,100
				HAUL-2	$131,000	$91,700	$222,700	$0	$222,700
	MAS048	BLM Polygon	Floodplain tailings	C01	$21,200	$14,800	$36,000	$0	$36,000
				C07	$72,800	$50,900	$123,700	$16,000	$139,700
			Upland tailings	C01	$69,800	$48,900	$118,700	$0	$118,700
				C07	$240,000	$168,000	$408,000	$52,800	$460,800
	MAS049	BLM Polygon	Floodplain tailings	C01	$154,000	$108,000	$262,000	$0	$262,000
				C07	$529,000	$370,000	$899,000	$116,000	$1,015,000
	MAS050	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$374,000	$261,000	$635,000	$1,150,000	$1,785,000
			Floodplain waste rock (intermixed tailings)	C01	$91,600	$64,100	$155,700	$0	$155,700
				C03	$338,000	$236,000	$574,000	$40,500	$614,500
	MAS052	BLM Polygon	Upland waste rock (erosion potential)	C01	$4,520	$3,160	$7,680	$0	$7,680
				C03	$49,500	$34,700	$84,200	$5,940	$90,140
	MAS053	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C07	$2,940	$2,060	$5,000	$647	$5,647
	MAS054	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$184,000	$129,000	$313,000	$538,000	$851,000
			Floodplain waste rock	C01	$45,200	$31,600	$76,800	$0	$76,800
				C07	$155,000	$109,000	$264,000	$34,200	$298,200
	MAS055	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C07	$2,940	$2,060	$5,000	$647	$5,647
	MAS057	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C07	$2,940	$2,060	$5,000	$647	$5,647
	MAS065	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C07	$2,940	$2,060	$5,000	$647	$5,647
	MAS068	BLM Polygon	Upland waste rock (erosion potential)	C01	$171	$120	$291	$0	$291
				C03	$36,000	$25,200	$61,200	$4,320	$65,520
	MAS072	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C07	$2,940	$2,060	$5,000	$647	$5,647
	MAS078	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$354,000	$247,000	$601,000	$578,000	$1,179,000
	MAS079	BLM Polygon	Floodplain waste rock	C01	$160,000	$112,000	$272,000	$0	$272,000
				C03	$428,000	$299,000	$727,000	$51,300	$778,300
	MAS081	BLM Polygon	Floodplain waste rock	C02a	$177,000	$124,000	$301,000	$23,000	$324,000
	MAS083	BLM Polygon	Upland tailings	C01	$34,900	$24,400	$59,300	$0	$59,300
				C07	$120,000	$83,900	$203,900	$26,400	$230,300
			Upland waste rock	C01	$124,000	$86,900	$210,900	$0	$210,900
				C03	$632,000	$443,000	$1,075,000	$75,900	$1,150,900
	MAS084	BLM Polygon	Floodplain tailings	C01	$128,000	$89,900	$217,900	$0	$217,900
				C07	$441,000	$309,000	$750,000	$97,000	$847,000

TABLE D-37

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
PineCrkSeg02	TWI002	BLM Polygon	Floodplain waste rock	C01	$24,700	$17,300	$42,000	$0	$42,000
				C07	$84,700	$59,300	$144,000	$18,600	$162,600
	TWI006	BLM Polygon	Upland waste rock (erosion potential)	C01	$20,500	$14,400	$34,900	$0	$34,900
				C07	$70,600	$49,400	$120,000	$15,500	$135,500
	TWI008	BLM Polygon	Floodplain waste rock	C01	$856	$599	$1,455	$0	$1,455
				C07	$2,940	$2,060	$5,000	$647	$5,647
	TWI009	BLM Polygon	Floodplain waste rock	C01	$27,700	$19,400	$47,100	$0	$47,100
				C07	$95,300	$66,700	$162,000	$21,000	$183,000
	TWI011	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C07	$2,940	$2,060	$5,000	$647	$5,647
	TWI012	BLM Polygon	Floodplain waste rock	C01	$16,400	$11,500	$27,900	$0	$27,900
				C07	$56,400	$39,500	$95,900	$12,400	$108,300
	TWI013	BLM Polygon	Upland waste rock	C01	$32,900	$23,000	$55,900	$0	$55,900
				C07	$113,000	$79,000	$192,000	$24,800	$216,800
	TWI014	BLM Polygon	Floodplain waste rock	C01	$25,700	$18,000	$43,700	$0	$43,700
				C07	$88,200	$61,700	$149,900	$19,400	$169,300
	TWI018	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C07	$2,940	$2,060	$5,000	$647	$5,647
	TWI020	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C07	$2,940	$2,060	$5,000	$647	$5,647
	TWI027	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C07	$2,940	$2,060	$5,000	$647	$5,647
	TWI029	BLM Polygon	Upland waste rock	C01	$856	$599	$1,455	$0	$1,455
				C07	$2,940	$2,060	$5,000	$647	$5,647
	TWI030	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C07	$2,940	$2,060	$5,000	$647	$5,647
PineCrkSeg03	KLW075	BLM Polygon	Floodplain waste rock	C01	$72,900	$51,100	$124,000	$0	$124,000
				C07	$250,000	$175,000	$425,000	$55,100	$480,100
	KLW077	BLM Polygon	Floodplain waste rock	C01	$47,300	$33,100	$80,400	$0	$80,400
				C07	$162,000	$114,000	$276,000	$35,700	$311,700
	KLW079	BLM Polygon	Floodplain waste rock	C01	$41,100	$28,800	$69,900	$0	$69,900
				C07	$141,000	$98,800	$239,800	$31,000	$270,800
	KLW080	BLM Polygon	Upland waste rock	C01	$30,800	$21,600	$52,400	$0	$52,400
				C03	$67,500	$47,300	$114,800	$8,100	$122,900
	KLW082	BLM Polygon	Floodplain waste rock	C01	$34,900	$24,400	$59,300	$0	$59,300
				C07	$120,000	$84,000	$204,000	$26,400	$230,400
	KLW083	BLM Polygon	Floodplain waste rock	C01	$59,600	$41,700	$101,300	$0	$101,300
				C07	$205,000	$143,000	$348,000	$45,000	$393,000
	KLW085	BLM Polygon	Floodplain waste rock	C01	$61,600	$43,100	$104,700	$0	$104,700
				C07	$212,000	$148,000	$360,000	$46,600	$406,600
	MAS003	BLM Polygon	Upland waste rock (intermixed tailings)	C04	$980,000	$686,000	$1,666,000	$226,000	$1,892,000
	PC03-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$248,000	$174,000	$422,000	$74,400	$496,400

TABLE D-37

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				CD-AVG	$76,200	$53,400	$129,600	$22,900	$152,500
				CD-SED	$7,480	$5,240	$12,720	$44,900	$57,620
				FP/RP-AVG	$312,000	$218,000	$530,000	$56,100	$586,100
				OFFCH-AVG	$790,000	$553,000	$1,343,000	$142,000	$1,485,000
				VBS-AVG	$106,000	$74,000	$180,000	$31,700	$211,700
	PC03-2	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$201,000	$141,000	$342,000	$60,400	$402,400
				CD-AVG	$41,200	$28,800	$70,000	$12,400	$82,400
				CD-SED	$3,740	$2,620	$6,360	$22,400	$28,760
				FP/RP-AVG	$243,000	$170,000	$413,000	$43,700	$456,700
				OFFCH-AVG	$763,000	$534,000	$1,297,000	$137,000	$1,434,000
				VBS-AVG	$85,700	$60,000	$145,700	$25,700	$171,400
	PC03-3	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$122,000	$85,400	$207,400	$36,600	$244,000
				CD-AVG	$16,500	$11,500	$28,000	$4,940	$32,940
				CD-SED	$3,740	$2,620	$6,360	$22,400	$28,760
				FP/RP-AVG	$381,000	$267,000	$648,000	$68,600	$716,600
				VBS-AVG	$52,000	$36,400	$88,400	$15,600	$104,000
UpperSFCDRSeg	PIPEUG	General Feature	Source General Information	PIPE-1	$245,000	$172,000	$417,000	$19,600	$436,600
				PIPE-2	$12,900	$9,050	$21,950	$1,030	$22,980
				PIPE-3	$6,420,000	$4,490,000	$10,910,000	$513,000	$11,423,000
				PIPE-4	$5,080,000	$3,560,000	$8,640,000	$406,000	$9,046,000
UpperSFCDRSeg01	HHWPUG01-1	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	HHWPUG01-2	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	HHWPUG01-3	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	HHWPUG01-4	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	HHWPUG01-5	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	LOK001	BLM Polygon	Upland waste rock (erosion potential)	C02a	$109,000	$76,100	$185,100	$14,100	$199,200
	LOK002	BLM Polygon	Upland waste rock (erosion potential)	C02a	$107,000	$74,900	$181,900	$13,900	$195,800
	LOK004	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$521,000	$365,000	$886,000	$1,210,000	$2,096,000
			Floodplain waste rock	C01	$262,000	$183,000	$445,000	$0	$445,000
				C07	$900,000	$630,000	$1,530,000	$198,000	$1,728,000
			Upland waste rock (erosion potential)	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	LOK006	BLM Polygon	Floodplain waste rock	C01	$5,340	$3,740	$9,080	$0	$9,080
				C03	$58,500	$41,000	$99,500	$7,020	$106,520
	LOK007	BLM Polygon	Upland waste rock (erosion potential)	C02a	$22,800	$15,900	$38,700	$2,960	$41,660
	LOK008	BLM Polygon	Floodplain waste rock	C01	$7,810	$5,460	$13,270	$0	$13,270
				C03	$85,500	$59,900	$145,400	$10,300	$155,700
	LOK009	BLM Polygon	Floodplain waste rock	C01	$94,500	$66,200	$160,700	$0	$160,700
				C07	$325,000	$227,000	$552,000	$71,400	$623,400
	LOK010	BLM Polygon	Floodplain waste rock	C01	$2,880	$2,010	$4,890	$0	$4,890
				C03	$31,500	$22,100	$53,600	$3,780	$57,380
	LOK011	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200

TABLE D-37

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				WT01	$3,620,000	$3,870,000	$7,490,000	$2,630,000	$10,120,000
			Floodplain waste rock	C01	$235,000	$165,000	$400,000	$0	$400,000
				C07	$809,000	$566,000	$1,375,000	$178,000	$1,553,000
	LOK017	BLM Polygon	Floodplain waste rock	C01	$26,500	$18,600	$45,100	$0	$45,100
				C03	$817,000	$572,000	$1,389,000	$98,000	$1,487,000
	LOK024	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
	LOK048	BLM Polygon	Floodplain waste rock	C02a	$22,800	$15,900	$38,700	$2,960	$41,660
	LOK050	BLM Polygon	Upland tailings - inactive facilities	C01	$55,600	$38,900	$94,500	$0	$94,500
				C07	$191,000	$134,000	$325,000	$42,000	$367,000
	LOK051	BLM Polygon	Floodplain artificial fill	C02a	$161,000	$113,000	$274,000	$20,900	$294,900
	LOK053	BLM Polygon	Upland waste rock (erosion potential)	C02a	$26,100	$18,300	$44,400	$3,400	$47,800
	MUL001	BLM Polygon	Floodplain waste rock	C01	$323,000	$226,000	$549,000	$0	$549,000
				C07	$1,110,000	$775,000	$1,885,000	$244,000	$2,129,000
	MUL002	BLM Polygon	Upland tailings	C01	$98,400	$68,900	$167,300	$0	$167,300
				C07	$338,000	$237,000	$575,000	$74,400	$649,400
	MUL004	BLM Polygon	Floodplain waste rock	C01	$16,800	$11,800	$28,600	$0	$28,600
				C03	$185,000	$129,000	$314,000	$22,100	$336,100
	MUL006	BLM Polygon	Floodplain waste rock	C01	$15,000	$10,500	$25,500	$0	$25,500
				C03	$164,000	$115,000	$279,000	$19,700	$298,700
	MUL007	BLM Polygon	Upland waste rock (erosion potential)	C02a	$80,100	$56,100	$136,200	$10,400	$146,600
	MUL008	BLM Polygon	Floodplain waste rock	C01	$28,200	$19,800	$48,000	$0	$48,000
				C03	$302,000	$211,000	$513,000	$36,200	$549,200
	MUL009	BLM Polygon	Upland waste rock (erosion potential)	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	MUL012	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$210,000	$224,000	$434,000	$197,000	$631,000
			Floodplain waste rock	C01	$462,000	$324,000	$786,000	$0	$786,000
				C03	$1,520,000	$1,060,000	$2,580,000	$182,000	$2,762,000
	MUL013	BLM Polygon	Upland waste rock (erosion potential)	C02a	$44,700	$31,300	$76,000	$5,810	$81,810
	MUL014	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$1,100,000	$1,170,000	$2,270,000	$832,000	$3,102,000
			Upland waste rock (erosion potential)	C01	$6,780	$4,750	$11,530	$0	$11,530
				C03	$74,300	$52,000	$126,300	$8,910	$135,210
	MUL015	BLM Polygon	Upland waste rock (erosion potential)	C02a	$787,000	$551,000	$1,338,000	$102,000	$1,440,000
	MUL018	BLM Polygon	Floodplain waste rock	C01	$61,600	$43,100	$104,700	$0	$104,700
				C07	$212,000	$148,000	$360,000	$46,600	$406,600
	MUL019	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$558,000	$597,000	$1,155,000	$540,000	$1,695,000
			Buildings & structures	HH-3	$136,000	$95,100	$231,100	$6,790	$237,890
			Floodplain tailings	C01	$364,000	$255,000	$619,000	$0	$619,000
				C07	$1,250,000	$875,000	$2,125,000	$275,000	$2,400,000
			Floodplain waste rock	C01	$288,000	$202,000	$490,000	$0	$490,000

TABLE D-37

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				C03	$3,970,000	$2,780,000	$6,750,000	$477,000	$7,227,000
	MUL020	BLM Polygon	Floodplain sediments (underlying tailings pond)	C11j	$5,090,000	$3,560,000	$8,650,000	$102,000	$8,752,000
			Floodplain tailings - active facilities	C09	$2,710,000	$1,900,000	$4,610,000	$543,000	$5,153,000
			Groundwater	WT01	$30,200	$32,300	$62,500	$9,150	$71,650
	MUL021	BLM Polygon	Floodplain waste rock	C01	$24,900	$17,400	$42,300	$0	$42,300
				C03	$272,000	$191,000	$463,000	$32,700	$495,700
	MUL022	BLM Polygon	Upland waste rock (erosion potential)	C02a	$29,500	$20,700	$50,200	$3,840	$54,040
	MUL023	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Floodplain waste rock	C01	$134,000	$93,500	$227,500	$0	$227,500
				C07	$459,000	$321,000	$780,000	$101,000	$881,000
	MUL027	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$221,000	$155,000	$376,000	$547,000	$923,000
			Upland waste rock	C02b	$165,000	$116,000	$281,000	$21,500	$302,500
	MUL028	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$388,000	$272,000	$660,000	$600,000	$1,260,000
			Floodplain waste rock	C01	$87,300	$61,100	$148,400	$0	$148,400
				C03	$956,000	$669,000	$1,625,000	$115,000	$1,740,000
	MUL029	BLM Polygon	Floodplain waste rock	C01	$87,300	$61,100	$148,400	$0	$148,400
				C07	$300,000	$210,000	$510,000	$66,000	$576,000
	MUL030	BLM Polygon	Floodplain waste rock	C01	$7,400	$5,180	$12,580	$0	$12,580
				C03	$81,000	$56,700	$137,700	$9,720	$147,420
	MUL031	BLM Polygon	Upland waste rock (erosion potential)	C02a	$28,700	$20,100	$48,800	$3,730	$52,530
	MUL033	BLM Polygon	Floodplain waste rock	C01	$67,800	$47,500	$115,300	$0	$115,300
				C07	$233,000	$163,000	$396,000	$51,200	$447,200
	MUL037	BLM Polygon	Floodplain sediments	C01b	$583,000	$408,000	$991,000	$0	$991,000
				C08a	$765,000	$535,000	$1,300,000	$107,000	$1,407,000
				HAUL-2	$237,000	$166,000	$403,000	$0	$403,000
			Floodplain sediments (underlying tailings pond)	C11j	$5,410,000	$3,780,000	$9,190,000	$108,000	$9,298,000
			Floodplain tailings - active facilities	C09	$2,470,000	$1,730,000	$4,200,000	$494,000	$4,694,000
			Groundwater	WT01	$30,200	$32,300	$62,500	$9,150	$71,650
	MUL038	BLM Polygon	Floodplain tailings	C01	$55,600	$38,900	$94,500	$0	$94,500
				C07	$191,000	$134,000	$325,000	$42,000	$367,000
			Floodplain waste rock	C01	$56,900	$39,800	$96,700	$0	$96,700
				C03	$623,000	$436,000	$1,059,000	$74,800	$1,133,800
	MUL042	BLM Polygon	Floodplain waste rock	C01	$59,600	$41,700	$101,300	$0	$101,300
				C07	$205,000	$143,000	$348,000	$45,000	$393,000
	MUL043	BLM Polygon	Floodplain waste rock	C01	$75,000	$52,500	$127,500	$0	$127,500
				C07	$258,000	$180,000	$438,000	$56,700	$494,700
	MUL045	BLM Polygon	Floodplain waste rock	C01	$118,000	$82,700	$200,700	$0	$200,700
				C07	$406,000	$284,000	$690,000	$89,300	$779,300
	MUL047	BLM Polygon	Floodplain waste rock	C01	$4,730	$3,310	$8,040	$0	$8,040

TABLE D-37

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				C03	$51,800	$36,200	$88,000	$6,210	$94,210
	MUL048	BLM Polygon	Floodplain waste rock	C01	$91,400	$64,000	$155,400	$0	$155,400
				C07	$314,000	$220,000	$534,000	$69,100	$603,100
	MUL049	BLM Polygon	Upland waste rock (erosion potential)	C02a	$25,300	$17,700	$43,000	$3,290	$46,290
	MUL051	BLM Polygon	Floodplain waste rock	C01	$24,700	$17,300	$42,000	$0	$42,000
				C03	$270,000	$189,000	$459,000	$32,400	$491,400
	MUL052	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$390,000	$273,000	$663,000	$1,160,000	$1,823,000
			Floodplain waste rock	C01	$12,800	$8,990	$21,790	$0	$21,790
				C03	$299,000	$209,000	$508,000	$35,900	$543,900
	MUL053	BLM Polygon	Upland waste rock (erosion potential)	C02a	$266,000	$186,000	$452,000	$34,600	$486,600
	MUL054	BLM Polygon	Upland waste rock (erosion potential)	C02a	$79,200	$55,500	$134,700	$10,300	$145,000
	MUL056	BLM Polygon	Upland waste rock (erosion potential)	C02a	$29,500	$20,700	$50,200	$3,840	$54,040
	MUL057	BLM Polygon	Upland waste rock (erosion potential)	C02a	$66,600	$46,600	$113,200	$8,660	$121,860
	MUL058	BLM Polygon	Floodplain sediments	C01b	$1,890,000	$1,320,000	$3,210,000	$0	$3,210,000
				C08a	$2,480,000	$1,730,000	$4,210,000	$347,000	$4,557,000
				HAUL-2	$769,000	$538,000	$1,307,000	$0	$1,307,000
			Floodplain sediments (underlying tailings pond)	C11j	$9,700,000	$6,790,000	$16,490,000	$194,000	$16,684,000
			Floodplain tailings - active facilities	C09	$8,540,000	$5,980,000	$14,520,000	$1,710,000	$16,230,000
			Groundwater	WT01	$30,200	$32,300	$62,500	$9,150	$71,650
	MUL059	BLM Polygon	Floodplain waste rock	C01	$96,600	$67,600	$164,200	$0	$164,200
				C07	$332,000	$232,000	$564,000	$73,000	$637,000
	MUL060	BLM Polygon	Floodplain waste rock	C01	$4,310	$3,020	$7,330	$0	$7,330
				C03	$47,300	$33,100	$80,400	$5,670	$86,070
	MUL063	BLM Polygon	Floodplain waste rock	C01	$4,310	$3,020	$7,330	$0	$7,330
				C03	$47,300	$33,100	$80,400	$5,670	$86,070
	MUL065	BLM Polygon	Floodplain waste rock	C01	$6,370	$4,460	$10,830	$0	$10,830
				C03	$69,800	$48,800	$118,600	$8,370	$126,970
	MUL071	BLM Polygon	Floodplain waste rock	C01	$2,140	$1,500	$3,640	$0	$3,640
				C03	$1,830,000	$1,280,000	$3,110,000	$220,000	$3,330,000
	MUL073	BLM Polygon	Upland waste rock	C02a	$174,000	$122,000	$296,000	$22,600	$318,600
	MUL081	BLM Polygon	Floodplain waste rock	C01	$6,850	$4,790	$11,640	$0	$11,640
				C03	$171,000	$120,000	$291,000	$20,500	$311,500
	MUL083	BLM Polygon	Floodplain waste rock	C01	$13,100	$9,200	$22,300	$0	$22,300
				C03	$144,000	$101,000	$245,000	$17,300	$262,300
	MUL103	BLM Polygon	Floodplain waste rock	C01	$5,390	$3,770	$9,160	$0	$9,160
				C03	$212,000	$148,000	$360,000	$25,400	$385,400
	MUL119	BLM Polygon	Upland waste rock (erosion potential)	C02a	$23,600	$16,500	$40,100	$3,070	$43,170
	MUL120	BLM Polygon	Floodplain waste rock	C01	$479	$336	$815	$0	$815
				C03	$76,500	$53,600	$130,100	$9,180	$139,280
	MUL129	BLM Polygon	Floodplain waste rock	C01	$22,800	$16,000	$38,800	$0	$38,800
				C03	$250,000	$175,000	$425,000	$30,000	$455,000

TABLE D-37

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	MUL131	BLM Polygon	Upland tailings	C01	$28,200	$19,800	$48,000	$0	$48,000
				C07	$97,000	$67,900	$164,900	$21,300	$186,200
	MUL132	BLM Polygon	Upland tailings	C01	$7,700	$5,390	$13,090	$0	$13,090
				C07	$26,500	$18,500	$45,000	$5,820	$50,820
	MUL135	BLM Polygon	Upland waste rock (erosion potential)	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	MUL136	BLM Polygon	Upland waste rock (erosion potential)	C02a	$10,100	$7,080	$17,180	$1,320	$18,500
	MUL139	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C07	$2,940	$2,060	$5,000	$647	$5,647
	MUL141	BLM Polygon	Floodplain sediments	C01b	$65,100	$45,600	$110,700	$0	$110,700
				C07	$70,900	$49,600	$120,500	$15,600	$136,100
	MUL142	BLM Polygon	Floodplain sediments	C01b	$232,000	$162,000	$394,000	$0	$394,000
				C07	$252,000	$176,000	$428,000	$55,500	$483,500
	MUL145	BLM Polygon	Floodplain sediments	C01b	$28,400	$19,800	$48,200	$0	$48,200
				C07	$30,900	$21,600	$52,500	$6,790	$59,290
	MUL146	BLM Polygon	Upland waste rock (erosion potential)	C01	$135,000	$94,200	$229,200	$0	$229,200
				C03	$295,000	$206,000	$501,000	$35,400	$536,400
	MUL149	BLM Polygon	Floodplain sediments	C01b	$38,100	$26,700	$64,800	$0	$64,800
				C07	$41,500	$29,100	$70,600	$9,140	$79,740
	MUL150	BLM Polygon	Floodplain sediments	C01b	$102,000	$71,300	$173,300	$0	$173,300
				C07	$111,000	$77,700	$188,700	$24,400	$213,100
	MUL153	BLM Polygon	Floodplain sediments	C01b	$51,300	$35,900	$87,200	$0	$87,200
				C07	$55,900	$39,100	$95,000	$12,300	$107,300
	THO020	BLM Polygon	Floodplain waste rock	C01	$5,960	$4,170	$10,130	$0	$10,130
				C03	$65,300	$45,700	$111,000	$7,830	$118,830
	UG01-4	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$6,220	$4,360	$10,580	$1,870	$12,450
				VBS-AVG	$5,360	$3,750	$9,110	$1,610	$10,720
	UG01-5	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$133,000	$93,100	$226,100	$39,900	$266,000
				CD-AVG	$57,700	$40,400	$98,100	$17,300	$115,400
				CD-SED	$5,800	$4,060	$9,860	$34,800	$44,660
				FP/RP-AVG	$124,000	$87,100	$211,100	$22,400	$233,500
				VBS-AVG	$56,700	$39,700	$96,400	$17,000	$113,400
	UG01-6	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$171,000	$120,000	$291,000	$51,200	$342,200
				CD-AVG	$56,400	$39,500	$95,900	$16,900	$112,800
				CD-SED	$5,610	$3,930	$9,540	$33,700	$43,240
				FP/RP-AVG	$906,000	$634,000	$1,540,000	$163,000	$1,703,000
				OFFCH-AVG	$97,600	$68,300	$165,900	$17,600	$183,500
				VBS-AVG	$135,000	$94,600	$229,600	$40,600	$270,200
	UG01-7	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$98,200	$68,700	$166,900	$29,500	$196,400
				CD-AVG	$48,400	$33,900	$82,300	$14,500	$96,800
				CD-SED	$4,860	$3,400	$8,260	$29,200	$37,460
				FP/RP-AVG	$281,000	$197,000	$478,000	$50,600	$528,600
				VBS-AVG	$77,700	$54,400	$132,100	$23,300	$155,400

TABLE D-37

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	UG01-8	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$39,800	$27,800	$67,600	$11,900	$79,500
				CD-AVG	$15,000	$10,500	$25,500	$4,510	$30,010
				CD-SED	$1,500	$1,050	$2,550	$8,980	$11,530
				VBS-AVG	$14,800	$10,400	$25,200	$4,450	$29,650
	UG01-9	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$175,000	$123,000	$298,000	$52,500	$350,500
				CD-AVG	$73,500	$51,500	$125,000	$22,100	$147,100
				CD-SED	$7,480	$5,240	$12,720	$44,900	$57,620
				FP/RP-AVG	$206,000	$144,000	$350,000	$37,000	$387,000
				VBS-AVG	$139,000	$97,000	$236,000	$41,600	$277,600
	UG01-10	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$150,000	$105,000	$255,000	$45,100	$300,100
				CD-AVG	$57,100	$39,900	$97,000	$17,100	$114,100
				CD-SED	$5,800	$4,060	$9,860	$34,800	$44,660
				FP/RP-AVG	$152,000	$106,000	$258,000	$27,300	$285,300
				VBS-AVG	$80,000	$56,000	$136,000	$24,000	$160,000
	UG01-11	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$42,700	$29,900	$72,600	$12,800	$85,400
				CD-AVG	$17,300	$12,100	$29,400	$5,190	$34,590
				CD-SED	$1,680	$1,180	$2,860	$10,100	$12,960
				FP/RP-AVG	$143,000	$100,000	$243,000	$25,800	$268,800
				VBS-AVG	$33,800	$23,700	$57,500	$10,100	$67,600
	UG01-12	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$541,000	$379,000	$920,000	$162,000	$1,082,000
				CD-AVG	$165,000	$115,000	$280,000	$49,400	$329,400
				CD-SED	$16,800	$11,800	$28,600	$101,000	$129,600
				FP/RP-AVG	$702,000	$491,000	$1,193,000	$126,000	$1,319,000
				VBS-AVG	$231,000	$161,000	$392,000	$69,200	$461,200
	UG01-13	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$297,000	$208,000	$505,000	$89,100	$594,100
				CD-AVG	$90,200	$63,200	$153,400	$27,100	$180,500
				CD-SED	$9,160	$6,410	$15,570	$55,000	$70,570
				FP/RP-AVG	$128,000	$89,900	$217,900	$23,100	$241,000
				VBS-AVG	$127,000	$88,600	$215,600	$38,000	$253,600
	UG01-14	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$57,600	$40,300	$97,900	$17,300	$115,200
				CD-AVG	$17,500	$12,300	$29,800	$5,250	$35,050
				CD-SED	$1,680	$1,180	$2,860	$10,100	$12,960
				FP/RP-AVG	$21,900	$15,400	$37,300	$3,950	$41,250
				VBS-AVG	$24,500	$17,200	$41,700	$7,360	$49,060
	UG01-15	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$207,000	$145,000	$352,000	$62,000	$414,000
				CD-AVG	$62,800	$44,000	$106,800	$18,800	$125,600
				CD-SED	$6,360	$4,450	$10,810	$38,100	$48,910
				FP/RP-AVG	$6,850	$4,800	$11,650	$1,230	$12,880
				VBS-AVG	$88,100	$61,700	$149,800	$26,400	$176,200
	UG01-16	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$190,000	$133,000	$323,000	$57,000	$380,000
				CD-AVG	$55,600	$38,900	$94,500	$16,700	$111,200
				CD-SED	$5,610	$3,930	$9,540	$33,700	$43,240

TABLE D-37

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Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				FP/RP-AVG	$510,000	$357,000	$867,000	$91,800	$958,800
				VBS-AVG	$150,000	$105,000	$255,000	$45,100	$300,100
	UG01-17	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$451,000	$316,000	$767,000	$135,000	$902,000
				CD-AVG	$137,000	$96,000	$233,000	$41,200	$274,200
				CD-SED	$13,800	$9,690	$23,490	$83,000	$106,490
				FP/RP-AVG	$657,000	$460,000	$1,117,000	$118,000	$1,235,000
				OFFCH-AVG	$744,000	$521,000	$1,265,000	$134,000	$1,399,000
				VBS-AVG	$192,000	$135,000	$327,000	$57,700	$384,700
	UG01-18	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$364,000	$255,000	$619,000	$109,000	$728,000
				CD-AVG	$111,000	$77,400	$188,400	$33,200	$221,600
				CD-SED	$11,200	$7,850	$19,050	$67,300	$86,350
				VBS-AVG	$155,000	$109,000	$264,000	$46,500	$310,500
	UG01-19	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$38,400	$26,900	$65,300	$11,500	$76,800
				CD-AVG	$13,400	$9,370	$22,770	$4,020	$26,790
				CD-SED	$1,310	$916	$2,226	$7,850	$10,076
				FP/RP-AVG	$36,800	$25,800	$62,600	$6,630	$69,230
				OFFCH-AVG	$46,300	$32,400	$78,700	$8,340	$87,040
				VBS-AVG	$30,400	$21,300	$51,700	$9,130	$60,830
	WAL013	BLM Polygon	Floodplain waste rock	C01	$6,980	$4,890	$11,870	$0	$11,870
				C03	$76,500	$53,600	$130,100	$9,180	$139,280
	WAL038	BLM Polygon	Floodplain sediments	C01b	$3,760,000	$2,630,000	$6,390,000	$0	$6,390,000
				C08a	$4,930,000	$3,450,000	$8,380,000	$690,000	$9,070,000
				HAUL-2	$1,530,000	$1,070,000	$2,600,000	$0	$2,600,000
	WAL076	BLM Polygon	Floodplain waste rock	C01	$175,000	$122,000	$297,000	$0	$297,000
				C07	$600,000	$420,000	$1,020,000	$132,000	$1,152,000
	WAL077	BLM Polygon	Floodplain sediments	C01b	$567,000	$397,000	$964,000	$0	$964,000
				C08a	$743,000	$520,000	$1,263,000	$104,000	$1,367,000
				HAUL-2	$231,000	$161,000	$392,000	$0	$392,000

Notes:

This Table does not include Central Treatment Plant (CTP) Sludge Pond Closure costs, these costs will be applied to the Total Alternative Cost.
This Table does not include Roads and Bridges costs, these costs will be applied to the Total Alternative Cost.

O&M = Operations and Maintenance
NPV = Net Present Value

Typical Conceptual Design (TCD) Codes

BSBR-AVG = Bank Stabilization via Revetments - Average Cost
C01 = Excavation (dry)
C01b = Excavation (60% dry/40% wet)

TABLE D-37

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)

C02a = Regrade/Consolidate/Vegetative Cover: Lower Part of Pile in 100-Year Floodplain
C02b = Regrade/Consolidate/Vegetative Cover: Waste Rock Pile in Stream Valley
C02c = Regrade/Consolidate/Vegetative Cover: Stabilize Using Erosion Protection
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
C11j = Hydraulic Isolation Using Slurry Wall (with drain, 30 ft deep)
C14b = Stream Lining (20 feet wide)
C14c = Stream Lining (100 feet wide)
C15b = French Drain (15 feet bgs)
CD-AVG = Current Deflector Average Cost
CD-SED = Current Deflector Sediment Traps
CH REAL-1 = Channel Realignment
FP/RP-AVG = Floodplain and Riparian Replanting - Average Cost
HAUL-2 = Haul to Repository
HH-2 = Upland Waste Pile Soil Cover
HH-3 = Millsite Decontamination
OFFCH-AVG = Off-Channel Hydrologic Feature Average Cost
PIPE-1 = Conveyance Pipeline (6-inch)
PIPE-2 = Conveyance Pipeline (12-inch)
PIPE-3 = Conveyance Pipeline (24-inch)
VBS-AVG = Vegetative Bank Stabilization - Average Cost
WT01 = Centralized High-Density Sludge (HDS) Treatment at Central Treatment Plant (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: 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 D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
BigCrkSeg01	POL044	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	POL045	BLM Polygon	Upland waste rock	C02a	$16,000	$11,200	$27,200	$2,080	$29,280
	POL046	BLM Polygon	Upland waste rock	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	POL047	BLM Polygon	Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	POL048	BLM Polygon	Upland waste rock	C02a	$14,300	$10,000	$24,300	$1,860	$26,160
	POL049	BLM Polygon	Upland waste rock	C02a	$11,000	$7,670	$18,670	$1,420	$20,090
	POL050	BLM Polygon	Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	POL051	BLM Polygon	Upland waste rock	C02b	$33,400	$23,400	$56,800	$4,340	$61,140
	POL052	BLM Polygon	Floodplain waste rock	C01	$19,700	$13,800	$33,500	$0	$33,500
				C08a	$81,400	$57,000	$138,400	$11,400	$149,800
				HAUL-2	$25,300	$17,700	$43,000	$0	$43,000
BigCrkSeg02	POL024	BLM Polygon	Upland waste rock	C02a	$16,900	$11,800	$28,700	$2,190	$30,890
	POL025	BLM Polygon	Upland waste rock	C02a	$22,800	$15,900	$38,700	$2,960	$41,660
	POL026	BLM Polygon	Upland waste rock	C02a	$19,400	$13,600	$33,000	$2,520	$35,520
	POL027	BLM Polygon	Upland waste rock	C02a	$39,600	$27,700	$67,300	$5,150	$72,450
	POL028	BLM Polygon	Upland waste rock	C02a	$11,000	$7,670	$18,670	$1,420	$20,090
	POL036	BLM Polygon	Upland waste rock	C02a	$43,000	$30,100	$73,100	$5,590	$78,690
	POL037	BLM Polygon	Upland waste rock	C02a	$23,600	$16,500	$40,100	$3,070	$43,170
	POL038	BLM Polygon	Upland waste rock	C02a	$14,300	$10,000	$24,300	$1,860	$26,160
	POL039	BLM Polygon	Upland waste rock	C02a	$17,700	$12,400	$30,100	$2,300	$32,400
	POL040	BLM Polygon	Upland waste rock	C02b	$78,500	$54,900	$133,400	$10,200	$143,600
	POL041	BLM Polygon	Upland waste rock	C02a	$31,200	$21,800	$53,000	$4,050	$57,050
	POL042	BLM Polygon	Upland waste rock	C02a	$28,700	$20,100	$48,800	$3,730	$52,530
	POL043	BLM Polygon	Upland waste rock	C02a	$29,500	$20,700	$50,200	$3,840	$54,040
	POL053	BLM Polygon	Upland waste rock	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	POL054	BLM Polygon	Upland waste rock	C02a	$25,300	$17,700	$43,000	$3,290	$46,290
	POL056	BLM Polygon	Upland waste rock	C02a	$35,400	$24,800	$60,200	$4,600	$64,800
	POL062	BLM Polygon	Upland waste rock	C02a	$27,000	$18,900	$45,900	$3,510	$49,410
	POL063	BLM Polygon	Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
BigCrkSeg03	POL001	BLM Polygon	Floodplain waste rock	C01	$34,900	$24,400	$59,300	$0	$59,300
				C08a	$144,000	$101,000	$245,000	$20,200	$265,200
				HAUL-2	$44,800	$31,400	$76,200	$0	$76,200
	POL002	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$223,000	$156,000	$379,000	$547,000	$926,000
			Floodplain waste rock	C01	$7,280	$5,090	$12,370	$0	$12,370
				C08a	$30,100	$21,100	$51,200	$4,210	$55,410
				HAUL-2	$9,330	$6,530	$15,860	$0	$15,860
	POL004	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$285,000	$199,000	$484,000	$1,020,000	$1,504,000
			Upland waste rock	C02b	$35,100	$24,500	$59,600	$4,560	$64,160

TABLE D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	POL067	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$521,000	$365,000	$886,000	$1,210,000	$2,096,000
			Upland waste rock	C02a	$41,300	$28,900	$70,200	$5,370	$75,570
	POL068	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	POL069	BLM Polygon	Upland waste rock	C02a	$24,400	$17,100	$41,500	$3,180	$44,680
	POL070	BLM Polygon	Upland waste rock	C02b	$35,100	$24,500	$59,600	$4,560	$64,160
	POL071	BLM Polygon	Upland waste rock	C02b	$23,400	$16,400	$39,800	$3,040	$42,840
BigCrkSeg04	BIG04-2	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$140,000	$97,800	$237,800	$41,900	$279,700
				CD-AVG	$39,100	$27,400	$66,500	$11,700	$78,200
				VBS-AVG	$59,500	$41,700	$101,200	$17,900	$119,100
	BIG04-3	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$573,000	$401,000	$974,000	$172,000	$1,146,000
				CD-AVG	$276,000	$193,000	$469,000	$82,800	$551,800
				FP/RP-AVG	$504,000	$353,000	$857,000	$90,700	$947,700
				OFFCH-AVG	$849,000	$595,000	$1,444,000	$153,000	$1,597,000
				VBS-AVG	$244,000	$171,000	$415,000	$73,300	$488,300
	KLE024	BLM Polygon	Floodplain sediments (underlying tailings pond)	C11j	$8,750,000	$6,120,000	$14,870,000	$175,000	$15,045,000
			Floodplain tailings - active facilities	C09	$10,400,000	$7,280,000	$17,680,000	$2,080,000	$19,760,000
			Groundwater	WT03	$423,000	$296,000	$719,000	$553,000	$1,272,000
	KLE025	BLM Polygon	Floodplain sediments	C01b	$135,000	$94,500	$229,500	$0	$229,500
				C08a	$177,000	$124,000	$301,000	$24,800	$325,800
				HAUL-2	$54,900	$38,400	$93,300	$0	$93,300
			Floodplain tailings - inactive Facilities	C01	$1,730,000	$1,210,000	$2,940,000	$0	$2,940,000
				C08a	$7,150,000	$5,010,000	$12,160,000	$1,000,000	$13,160,000
				HAUL-2	$2,220,000	$1,550,000	$3,770,000	$0	$3,770,000
	KLE026	BLM Polygon	Floodplain waste rock	C01	$377,000	$264,000	$641,000	$0	$641,000
				C08a	$1,560,000	$1,090,000	$2,650,000	$218,000	$2,868,000
				HAUL-2	$483,000	$338,000	$821,000	$0	$821,000
	KLE027	BLM Polygon	Upland waste rock (erosion potential)	C01	$399,000	$279,000	$678,000	$0	$678,000
				C08a	$1,650,000	$1,150,000	$2,800,000	$231,000	$3,031,000
				HAUL-2	$511,000	$358,000	$869,000	$0	$869,000
	KLE029	BLM Polygon	Upland waste rock	C02a	$187,000	$131,000	$318,000	$24,300	$342,300
	KLE047	BLM Polygon	Floodplain sediments	C01b	$44,900	$31,400	$76,300	$0	$76,300
				C08a	$58,800	$41,200	$100,000	$8,230	$108,230
				HAUL-2	$18,200	$12,800	$31,000	$0	$31,000
	KLE053	BLM Polygon	Floodplain waste rock	C01	$842,000	$589,000	$1,431,000	$0	$1,431,000
				C08a	$3,480,000	$2,440,000	$5,920,000	$487,000	$6,407,000
				HAUL-2	$1,080,000	$756,000	$1,836,000	$0	$1,836,000
	KLE054	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$714,000	$500,000	$1,214,000	$661,000	$1,875,000
			Upland waste rock (erosion potential)	C01	$685,000	$480,000	$1,165,000	$0	$1,165,000

TABLE D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				C08a	$2,830,000	$1,980,000	$4,810,000	$397,000	$5,207,000
				HAUL-2	$879,000	$615,000	$1,494,000	$0	$1,494,000
	KLE071	BLM Polygon	Floodplain sediments	C01b	$662,000	$463,000	$1,125,000	$0	$1,125,000
				C08a	$867,000	$607,000	$1,474,000	$121,000	$1,595,000
				HAUL-2	$269,000	$188,000	$457,000	$0	$457,000
	KLE073	BLM Polygon	Floodplain sediments	C01b	$1,350,000	$945,000	$2,295,000	$0	$2,295,000
				C08a	$1,770,000	$1,240,000	$3,010,000	$248,000	$3,258,000
				HAUL-2	$549,000	$384,000	$933,000	$0	$933,000
	POL005	BLM Polygon	Upland waste rock	C02b	$56,800	$39,700	$96,500	$7,380	$103,880
	POL006	BLM Polygon	Upland waste rock	C02b	$31,700	$22,200	$53,900	$4,120	$58,020
	POL008	BLM Polygon	Floodplain waste rock	C01	$34,900	$24,400	$59,300	$0	$59,300
				C08a	$144,000	$101,000	$245,000	$20,200	$265,200
				HAUL-2	$44,800	$31,400	$76,200	$0	$76,200
	POL010	BLM Polygon	Upland waste rock (erosion potential)	C01	$19,500	$13,700	$33,200	$0	$33,200
				C08a	$80,700	$56,500	$137,200	$11,300	$148,500
				HAUL-2	$25,000	$17,500	$42,500	$0	$42,500
	POL011	BLM Polygon	Floodplain waste rock	C01	$13,400	$9,350	$22,750	$0	$22,750
				C08a	$55,200	$38,700	$93,900	$7,730	$101,630
				HAUL-2	$17,100	$12,000	$29,100	$0	$29,100
	POL022	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$138,000	$96,800	$234,800	$527,000	$761,800
			Floodplain waste rock	C01	$19,700	$13,800	$33,500	$0	$33,500
				C08a	$81,400	$57,000	$138,400	$11,400	$149,800
				HAUL-2	$25,300	$17,700	$43,000	$0	$43,000
	POL023	BLM Polygon	Upland waste rock	C02b	$50,100	$35,100	$85,200	$6,510	$91,710
	POL066	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	POL075	BLM Polygon	Upland waste rock	C02b	$33,400	$23,400	$56,800	$4,340	$61,140
CCSeg	PIPECC	General Feature	Source General Information	PIPE-1	$1,430,000	$1,000,000	$2,430,000	$115,000	$2,545,000
				PIPE-2	$76,900	$53,800	$130,700	$6,150	$136,850
				PIPE-3	$1,800,000	$1,260,000	$3,060,000	$144,000	$3,204,000
				PIPE-4	$4,090,000	$2,870,000	$6,960,000	$327,000	$7,287,000
CCSeg01	BUR102	BLM Polygon	Upland waste rock	C02a	$120,000	$83,800	$203,800	$15,600	$219,400
	BUR105	BLM Polygon	Upland waste rock (erosion potential)	C01	$27,800	$19,500	$47,300	$0	$47,300
				C07	$95,600	$66,900	$162,500	$21,000	$183,500
	BUR109	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$45,700	$170,500
			Upland waste rock (erosion potential)	C01	$117,000	$82,100	$199,100	$0	$199,100
				C07	$403,000	$282,000	$685,000	$88,600	$773,600
	BUR110	BLM Polygon	Upland waste rock	C02a	$24,400	$17,100	$41,500	$3,180	$44,680
	BUR182	BLM Polygon	Upland waste rock	C02a	$13,500	$9,440	$22,940	$1,750	$24,690

TABLE D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	BUR183	BLM Polygon	Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	BUR184	BLM Polygon	Upland waste rock	C02a	$17,700	$12,400	$30,100	$2,300	$32,400
	BUR185	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C07	$2,940	$2,060	$5,000	$647	$5,647
	BUR186	BLM Polygon	Upland waste rock	C02a	$20,200	$14,200	$34,400	$2,630	$37,030
	BUR187	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C07	$2,940	$2,060	$5,000	$647	$5,647
	BUR188	BLM Polygon	Upland waste rock	C02a	$36,200	$25,400	$61,600	$4,710	$66,310
	THO012	BLM Polygon	Upland waste rock	C02a	$27,800	$19,500	$47,300	$3,620	$50,920
	THO013	BLM Polygon	Upland waste rock	C02a	$29,500	$20,700	$50,200	$3,840	$54,040
	THO014	BLM Polygon	Upland waste rock	C02a	$23,600	$16,500	$40,100	$3,070	$43,170
	THO015	BLM Polygon	Upland waste rock	C02a	$34,600	$24,200	$58,800	$4,490	$63,290
	THO016	BLM Polygon	Upland waste rock	C02a	$11,000	$7,670	$18,670	$1,420	$20,090
	THO017	BLM Polygon	Upland waste rock	C02a	$45,500	$31,900	$77,400	$5,920	$83,320
	THO018	BLM Polygon	Upland waste rock	C02a	$16,900	$11,800	$28,700	$2,190	$30,890
	THO023	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C07	$2,940	$2,060	$5,000	$647	$5,647
CCSeg02	BUR100	BLM Polygon	Upland waste rock	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	BUR106	BLM Polygon	Upland waste rock	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	BUR107	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$45,700	$170,500
			Upland waste rock (erosion potential)	C01	$595,000	$416,000	$1,011,000	$0	$1,011,000
				C07	$2,040,000	$1,430,000	$3,470,000	$450,000	$3,920,000
	BUR130	BLM Polygon	Upland waste rock (erosion potential)	C01	$12,800	$8,990	$21,790	$0	$21,790
				C07	$44,100	$30,900	$75,000	$9,700	$84,700
	BUR131	BLM Polygon	Upland waste rock	C02a	$37,900	$26,600	$64,500	$4,930	$69,430
	BUR132	BLM Polygon	Upland waste rock (erosion potential)	C01	$394,000	$276,000	$670,000	$0	$670,000
				C07	$1,350,000	$947,000	$2,297,000	$298,000	$2,595,000
	BUR133	BLM Polygon	Upland waste rock (erosion potential)	C01	$22,700	$15,900	$38,600	$0	$38,600
				C07	$77,900	$54,500	$132,400	$17,100	$149,500
	BUR134	BLM Polygon	Upland waste rock (erosion potential)	C01	$61,600	$43,100	$104,700	$0	$104,700
				C07	$212,000	$148,000	$360,000	$46,600	$406,600
	BUR135	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C07	$2,940	$2,060	$5,000	$647	$5,647
	BUR138	BLM Polygon	Upland waste rock	C02a	$48,900	$34,200	$83,100	$6,360	$89,460
	BUR145	BLM Polygon	Upland waste rock (erosion potential)	C01	$240,000	$168,000	$408,000	$0	$408,000
				C07	$823,000	$576,000	$1,399,000	$181,000	$1,580,000
	BUR150	BLM Polygon	Floodplain waste rock	C01	$140,000	$97,700	$237,700	$0	$237,700
				C08a	$577,000	$404,000	$981,000	$80,800	$1,061,800
				HAUL-2	$179,000	$125,000	$304,000	$0	$304,000
	BUR151	BLM Polygon	Upland waste rock	C02a	$148,000	$104,000	$252,000	$19,300	$271,300
	BUR153	BLM Polygon	Floodplain sediments	C01b	$473,000	$331,000	$804,000	$0	$804,000

TABLE D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				C08a	$620,000	$434,000	$1,054,000	$86,700	$1,140,700
				HAUL-2	$192,000	$135,000	$327,000	$0	$327,000
	CC02-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$405,000	$283,000	$688,000	$121,000	$809,000
				CD-AVG	$136,000	$95,200	$231,200	$40,800	$272,000
				FP/RP-AVG	$889,000	$622,000	$1,511,000	$160,000	$1,671,000
				VBS-AVG	$172,000	$121,000	$293,000	$51,700	$344,700
CCSeg03	BUR085	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock	C02a	$34,600	$24,200	$58,800	$4,490	$63,290
	BUR086	BLM Polygon	Upland waste rock	C02a	$141,000	$98,500	$239,500	$18,300	$257,800
	BUR087	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$45,700	$170,500
			Upland waste rock (erosion potential)	C01	$107,000	$74,900	$181,900	$0	$181,900
				C07	$368,000	$257,000	$625,000	$80,900	$705,900
	BUR088	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$45,700	$170,500
	BUR089	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C07	$2,940	$2,060	$5,000	$647	$5,647
	BUR090	BLM Polygon	Upland tailings	C01	$128,000	$89,900	$217,900	$0	$217,900
				C08a	$531,000	$372,000	$903,000	$74,300	$977,300
				HAUL-2	$165,000	$115,000	$280,000	$0	$280,000
			Upland waste rock (erosion potential)	C01	$235,000	$165,000	$400,000	$0	$400,000
				C07	$809,000	$566,000	$1,375,000	$178,000	$1,553,000
	BUR091	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$45,700	$170,500
			Upland waste rock	C02a	$24,400	$17,100	$41,500	$3,180	$44,680
	BUR092	BLM Polygon	Upland waste rock	C02a	$16,000	$11,200	$27,200	$2,080	$29,280
	BUR099	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$45,700	$170,500
			Upland waste rock	C02a	$17,700	$12,400	$30,100	$2,300	$32,400
	BUR101	BLM Polygon	Upland waste rock	C02a	$20,200	$14,200	$34,400	$2,630	$37,030
	BUR146	BLM Polygon	Floodplain sediments	C01b	$689,000	$482,000	$1,171,000	$0	$1,171,000
				C08a	$903,000	$632,000	$1,535,000	$126,000	$1,661,000
				HAUL-2	$280,000	$196,000	$476,000	$0	$476,000
	BUR149	BLM Polygon	Upland waste rock (erosion potential)	C01	$44,500	$31,200	$75,700	$0	$75,700
				C07	$153,000	$107,000	$260,000	$33,600	$293,600
	BUR165	BLM Polygon	Upland waste rock	C02a	$17,700	$12,400	$30,100	$2,300	$32,400
	BUR166	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C07	$2,940	$2,060	$5,000	$647	$5,647
	BUR167	BLM Polygon	Upland waste rock	C02a	$35,400	$24,800	$60,200	$4,600	$64,800
	BUR179	BLM Polygon	Upland waste rock	C02a	$20,200	$14,200	$34,400	$2,630	$37,030
	BUR180	BLM Polygon	Upland waste rock (erosion potential)	C01	$23,500	$16,500	$40,000	$0	$40,000

TABLE D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				C07	$80,900	$56,600	$137,500	$17,800	$155,300
CCSeg04	BUR063	BLM Polygon	Upland waste rock	C02a	$159,000	$112,000	$271,000	$20,700	$291,700
	BUR064	BLM Polygon	Upland waste rock	C02a	$34,600	$24,200	$58,800	$4,490	$63,290
	BUR065	BLM Polygon	Upland waste rock	C02a	$85,100	$59,600	$144,700	$11,100	$155,800
	BUR066	BLM Polygon	Upland waste rock (erosion potential)	C01	$30,000	$21,000	$51,000	$0	$51,000
				C08a	$124,000	$86,700	$210,700	$17,300	$228,000
				HAUL-2	$38,400	$26,900	$65,300	$0	$65,300
	BUR067	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$950,000	$1,020,000	$1,970,000	$723,000	$2,693,000
			Upland tailings	C01	$10,700	$7,490	$18,190	$0	$18,190
				C08a	$44,300	$31,000	$75,300	$6,200	$81,500
				HAUL-2	$13,700	$9,610	$23,310	$0	$23,310
			Upland waste rock (potential intermixed tailings)	C01	$1,500,000	$1,050,000	$2,550,000	$0	$2,550,000
				C08a	$6,200,000	$4,340,000	$10,540,000	$867,000	$11,407,000
				HAUL-2	$1,920,000	$1,350,000	$3,270,000	$0	$3,270,000
	BUR068	BLM Polygon	Upland waste rock (erosion potential)	C01	$51,400	$36,000	$87,400	$0	$87,400
				C08a	$212,000	$149,000	$361,000	$29,700	$390,700
				HAUL-2	$65,900	$46,100	$112,000	$0	$112,000
	BUR069	BLM Polygon	Upland waste rock	C02a	$88,500	$62,000	$150,500	$11,500	$162,000
	BUR070	BLM Polygon	Upland waste rock	C02a	$237,000	$166,000	$403,000	$30,800	$433,800
	BUR071	BLM Polygon	Upland waste rock	C02a	$166,000	$116,000	$282,000	$21,600	$303,600
	BUR072	BLM Polygon	Upland waste rock (erosion potential)	C01	$61,200	$42,800	$104,000	$0	$104,000
				C08a	$253,000	$177,000	$430,000	$35,400	$465,400
				HAUL-2	$78,500	$55,000	$133,500	$0	$133,500
	BUR073	BLM Polygon	Upland waste rock (erosion potential)	C01	$539,000	$377,000	$916,000	$0	$916,000
				C08a	$2,230,000	$1,560,000	$3,790,000	$312,000	$4,102,000
				HAUL-2	$692,000	$484,000	$1,176,000	$0	$1,176,000
	BUR074	BLM Polygon	Upland waste rock	C02a	$145,000	$101,000	$246,000	$18,800	$264,800
	BUR075	BLM Polygon	Upland tailings	C01	$15,000	$10,500	$25,500	$0	$25,500
				C08a	$62,000	$43,400	$105,400	$8,670	$114,070
				HAUL-2	$19,200	$13,500	$32,700	$0	$32,700
			Upland waste rock	C02a	$148,000	$103,000	$251,000	$19,200	$270,200
	BUR076	BLM Polygon	Upland waste rock	C02a	$9,270	$6,490	$15,760	$1,210	$16,970
	BUR093	BLM Polygon	Upland waste rock	C02a	$11,800	$8,260	$20,060	$1,530	$21,590
	BUR094	BLM Polygon	Upland waste rock (erosion potential)	C02a	$118,000	$82,600	$200,600	$15,300	$215,900
	BUR095	BLM Polygon	Upland waste rock (erosion potential)	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	BUR096	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$4,890	$5,230	$10,120	$3,700	$13,820
			Upland waste rock	C02a	$120,000	$83,800	$203,800	$15,600	$219,400
	BUR097	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$869,000	$929,000	$1,798,000	$659,000	$2,457,000
			Upland waste rock	C02a	$73,300	$51,300	$124,600	$9,530	$134,130

TABLE D-38

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	BUR098	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$905,000	$968,000	$1,873,000	$896,000	$2,769,000
			Upland waste rock (potential intermixed tailings)	C01	$235,000	$165,000	$400,000	$0	$400,000
				C08a	$974,000	$681,000	$1,655,000	$136,000	$1,791,000
				HAUL-2	$302,000	$211,000	$513,000	$0	$513,000
	BUR111	BLM Polygon	Upland waste rock	C02a	$20,200	$14,200	$34,400	$2,630	$37,030
	BUR112	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$45,700	$170,500
			Upland waste rock	C02a	$111,000	$77,900	$188,900	$14,500	$203,400
	BUR113	BLM Polygon	Upland waste rock	C02a	$22,800	$15,900	$38,700	$2,960	$41,660
	BUR114	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$45,700	$170,500
			Upland waste rock (erosion potential)	C02a	$98,600	$69,000	$167,600	$12,800	$180,400
	BUR115	BLM Polygon	Upland waste rock	C02a	$49,700	$34,800	$84,500	$6,470	$90,970
	BUR116	BLM Polygon	Upland waste rock (erosion potential)	C02a	$27,800	$19,500	$47,300	$3,620	$50,920
	BUR117	BLM Polygon	Upland tailings	C01	$7,700	$5,390	$13,090	$0	$13,090
				C08a	$31,900	$22,300	$54,200	$4,460	$58,660
				HAUL-2	$9,880	$6,920	$16,800	$0	$16,800
			Upland waste rock (potential intermixed tailings)	C01	$621,000	$434,000	$1,055,000	$0	$1,055,000
				C08a	$2,570,000	$1,800,000	$4,370,000	$359,000	$4,729,000
				HAUL-2	$796,000	$557,000	$1,353,000	$0	$1,353,000
	BUR118	BLM Polygon	Upland waste rock (erosion potential)	C01	$141,000	$98,900	$239,900	$0	$239,900
				C08a	$584,000	$409,000	$993,000	$81,800	$1,074,800
				HAUL-2	$181,000	$127,000	$308,000	$0	$308,000
	BUR119	BLM Polygon	Upland waste rock	C02a	$175,000	$123,000	$298,000	$22,800	$320,800
	BUR120	BLM Polygon	Upland waste rock (erosion potential)	C02a	$78,400	$54,900	$133,300	$10,200	$143,500
	BUR121	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$682,000	$729,000	$1,411,000	$517,000	$1,928,000
			Upland waste rock (erosion potential)	C01	$441,000	$309,000	$750,000	$0	$750,000
				C08a	$1,820,000	$1,280,000	$3,100,000	$255,000	$3,355,000
				HAUL-2	$565,000	$396,000	$961,000	$0	$961,000
	BUR122	BLM Polygon	Upland waste rock (erosion potential)	C01	$116,000	$80,900	$196,900	$0	$196,900
				C08a	$478,000	$335,000	$813,000	$66,900	$879,900
				HAUL-2	$148,000	$104,000	$252,000	$0	$252,000
	BUR123	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$45,700	$170,500
			Upland waste rock (erosion potential)	C02a	$13,500	$9,440	$22,940	$1,750	$24,690
	BUR124	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$45,700	$170,500
			Upland waste rock (erosion potential)	C02a	$84,300	$59,000	$143,300	$11,000	$154,300
	BUR125	BLM Polygon	Upland waste rock (erosion potential)	C02a	$27,000	$18,900	$45,900	$3,510	$49,410
	BUR126	BLM Polygon	Upland waste rock	C02a	$39,600	$27,700	$67,300	$5,150	$72,450

TABLE D-38

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	BUR127	BLM Polygon	Upland waste rock	C02a	$14,300	$10,000	$24,300	$1,860	$26,160
	BUR128	BLM Polygon	Buildings & structures	HH-4	$1,690,000	$1,180,000	$2,870,000	$219,000	$3,089,000
			Upland tailings	C01	$186,000	$130,000	$316,000	$0	$316,000
				C08a	$768,000	$538,000	$1,306,000	$108,000	$1,414,000
				HAUL-2	$238,000	$167,000	$405,000	$0	$405,000
	BUR129	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$45,700	$170,500
			Upland tailings	C01	$22,500	$15,700	$38,200	$0	$38,200
				C08a	$92,900	$65,000	$157,900	$13,000	$170,900
				HAUL-2	$28,800	$20,200	$49,000	$0	$49,000
	BUR141	BLM Polygon	Floodplain sediments	C01b	$297,000	$208,000	$505,000	$0	$505,000
				C08a	$389,000	$273,000	$662,000	$54,500	$716,500
				HAUL-2	$121,000	$84,500	$205,500	$0	$205,500
	BUR142	BLM Polygon	Upland tailings	C01	$21,000	$14,700	$35,700	$0	$35,700
				C08a	$86,700	$60,700	$147,400	$12,100	$159,500
				HAUL-2	$26,900	$18,800	$45,700	$0	$45,700
			Upland waste rock (potential intermixed tailings)	C01	$310,000	$217,000	$527,000	$0	$527,000
				C08a	$1,280,000	$898,000	$2,178,000	$180,000	$2,358,000
				HAUL-2	$398,000	$279,000	$677,000	$0	$677,000
	BUR143	BLM Polygon	Floodplain sediments	C01b	$432,000	$302,000	$734,000	$0	$734,000
				C08a	$566,000	$396,000	$962,000	$79,300	$1,041,300
				HAUL-2	$176,000	$123,000	$299,000	$0	$299,000
	BUR144	BLM Polygon	Upland waste rock (erosion potential)	C01	$167,000	$117,000	$284,000	$0	$284,000
				C08a	$690,000	$483,000	$1,173,000	$96,600	$1,269,600
				HAUL-2	$214,000	$150,000	$364,000	$0	$364,000
	BUR174	BLM Polygon	Upland waste rock	C02a	$427,000	$299,000	$726,000	$55,500	$781,500
	BUR175	BLM Polygon	Upland waste rock	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	BUR176	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	BUR177	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	BUR178	BLM Polygon	Upland waste rock (erosion potential)	C01	$47,100	$33,000	$80,100	$0	$80,100
				C08a	$195,000	$136,000	$331,000	$27,300	$358,300
				HAUL-2	$60,400	$42,300	$102,700	$0	$102,700
	BUR189	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	BUR190	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$302,000	$323,000	$625,000	$165,000	$790,000
	BUR191	BLM Polygon	Upland waste rock	C02a	$131,000	$91,500	$222,500	$17,000	$239,500

TABLE D-38

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	BUR192	BLM Polygon	Floodplain tailings (discrete site)	C01	$13,300	$9,290	$22,590	$0	$22,590
				C08a	$54,900	$38,400	$93,300	$7,680	$100,980
				HAUL-2	$17,000	$11,900	$28,900	$0	$28,900
			Upland waste rock (erosion potential)	C01	$116,000	$80,900	$196,900	$0	$196,900
				C08a	$478,000	$335,000	$813,000	$66,900	$879,900
				HAUL-2	$148,000	$104,000	$252,000	$0	$252,000
	BUR193	BLM Polygon	Upland waste rock	C02a	$63,200	$44,300	$107,500	$8,220	$115,720
	BUR194	BLM Polygon	Upland waste rock	C02a	$58,200	$40,700	$98,900	$7,560	$106,460
	BUR195	BLM Polygon	Upland waste rock	C02a	$35,400	$24,800	$60,200	$4,600	$64,800
	BUR198	BLM Polygon	Upland waste rock	C02a	$114,000	$79,700	$193,700	$14,800	$208,500
	BUR199	BLM Polygon	Upland waste rock	C02a	$27,000	$18,900	$45,900	$3,510	$49,410
	BUR200	BLM Polygon	Upland waste rock	C02a	$19,400	$13,600	$33,000	$2,520	$35,520
	BUR202	BLM Polygon	Upland waste rock	C02a	$9,270	$6,490	$15,760	$1,210	$16,970
	BUR203	BLM Polygon	Upland waste rock	C02a	$10,100	$7,080	$17,180	$1,320	$18,500
	BUR204	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	CC04-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$1,220,000	$854,000	$2,074,000	$366,000	$2,440,000
				CD-AVG	$412,000	$288,000	$700,000	$124,000	$824,000
				FP/RP-AVG	$3,190,000	$2,230,000	$5,420,000	$574,000	$5,994,000
				OFFCH-AVG	$1,800,000	$1,260,000	$3,060,000	$324,000	$3,384,000
				VBS-AVG	$520,000	$364,000	$884,000	$156,000	$1,040,000
CCSeg05	CC05-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$136,000	$94,900	$230,900	$40,700	$271,600
				CD-AVG	$22,700	$15,900	$38,600	$6,800	$45,400
				FP/RP-AVG	$4,810,000	$3,370,000	$8,180,000	$865,000	$9,045,000
				OFFCH-AVG	$16,000,000	$11,200,000	$27,200,000	$2,890,000	$30,090,000
				VBS-AVG	$57,800	$40,400	$98,200	$17,300	$115,500
	CC05-2	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$820,000	$574,000	$1,394,000	$246,000	$1,640,000
				CD-AVG	$138,000	$96,600	$234,600	$41,400	$276,000
				CH REAL-1	$3,780,000	$2,650,000	$6,430,000	$643,000	$7,073,000
				FP/RP-AVG	$1,800,000	$1,260,000	$3,060,000	$324,000	$3,384,000
				VBS-AVG	$350,000	$245,000	$595,000	$105,000	$700,000
	OSB047	BLM Polygon	Floodplain sediments	C01B	$230,000	$161,000	$391,000	$0	$391,000
				C08a	$301,000	$211,000	$512,000	$42,100	$554,100
				HAUL-2	$93,300	$65,300	$158,600	$0	$158,600
	WAL009	BLM Polygon	Floodplain sediments (underlying tailings pond)	C01B	$4,360,000	$3,050,000	$7,410,000	$0	$7,410,000
				C08a	$5,720,000	$4,000,000	$9,720,000	$800,000	$10,520,000
				HAUL-2	$1,770,000	$1,240,000	$3,010,000	$0	$3,010,000
			Floodplain tailings - inactive Facilities	C01	$8,990,000	$6,290,000	$15,280,000	$0	$15,280,000
				C08a	$37,200,000	$26,000,000	$63,200,000	$5,200,000	$68,400,000
				HAUL-2	$11,500,000	$8,070,000	$19,570,000	$0	$19,570,000
	WAL010	BLM Polygon	Floodplain sediments	C01B	$203,000	$142,000	$345,000	$0	$345,000

TABLE D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				C08a	$266,000	$186,000	$452,000	$37,200	$489,200
				HAUL-2	$82,400	$57,600	$140,000	$0	$140,000
	WAL011	BLM Polygon	Adit drainage	WT01	$60,300	$64,500	$124,800	$45,700	$170,500
			Floodplain sediments	C01B	$119,000	$83,200	$202,200	$0	$202,200
				C08a	$156,000	$109,000	$265,000	$21,800	$286,800
				HAUL-2	$48,300	$33,800	$82,100	$0	$82,100
			Upland tailings	C01	$49,600	$34,800	$84,400	$0	$84,400
				C08a	$205,000	$144,000	$349,000	$28,700	$377,700
				HAUL-2	$63,700	$44,600	$108,300	$0	$108,300
	WAL039	BLM Polygon	Upland tailings	C01	$53,500	$37,500	$91,000	$0	$91,000
				C08a	$221,000	$155,000	$376,000	$31,000	$407,000
				HAUL-2	$68,600	$48,000	$116,600	$0	$116,600
	WAL040	BLM Polygon	Floodplain sediments	C01B	$243,000	$170,000	$413,000	$0	$413,000
				C08a	$319,000	$223,000	$542,000	$44,600	$586,600
				HAUL-2	$98,800	$69,200	$168,000	$0	$168,000
	WAL041	BLM Polygon	Floodplain sediments	C01B	$486,000	$340,000	$826,000	$0	$826,000
				C08a	$637,000	$446,000	$1,083,000	$89,200	$1,172,200
				HAUL-2	$198,000	$138,000	$336,000	$0	$336,000
	WAL042	BLM Polygon	Floodplain sediments	C01B	$109,000	$76,500	$185,500	$0	$185,500
				C08a	$143,000	$100,000	$243,000	$20,100	$263,100
				HAUL-2	$44,500	$31,100	$75,600	$0	$75,600
			Floodplain tailings - inactive Facilities	C01	$2,570,000	$1,800,000	$4,370,000	$0	$4,370,000
				C08a	$10,600,000	$7,430,000	$18,030,000	$1,490,000	$19,520,000
				HAUL-2	$3,290,000	$2,310,000	$5,600,000	$0	$5,600,000
	WAL081	BLM Polygon	Floodplain artificial fill	C01	$24,400	$17,100	$41,500	$0	$41,500
				C08a	$101,000	$70,600	$171,600	$14,100	$185,700
				HAUL-2	$31,300	$21,900	$53,200	$0	$53,200
MIDGradSeg	PIPEMG	General Feature	Source General Information	PIPE-1	$417,000	$292,000	$709,000	$33,300	$742,300
				PIPE-2	$40,400	$28,300	$68,700	$3,230	$71,930
				PIPE-4	$12,100,000	$8,480,000	$20,580,000	$969,000	$21,549,000
MIDGradSeg01	KLE004	BLM Polygon	Upland waste rock	C02a	$29,500	$20,700	$50,200	$3,840	$54,040
	KLE005	BLM Polygon	Upland waste rock	C02a	$54,000	$37,800	$91,800	$7,010	$98,810
	KLE006	BLM Polygon	Upland waste rock	C02a	$115,000	$80,800	$195,800	$15,000	$210,800
	KLE011	BLM Polygon	Upland tailings - inactive facilities	C01	$351,000	$246,000	$597,000	$0	$597,000
				C08a	$1,450,000	$1,020,000	$2,470,000	$203,000	$2,673,000
				HAUL-2	$450,000	$315,000	$765,000	$0	$765,000
	KLE016	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	KLE020	BLM Polygon	Upland waste rock (erosion potential)	C01	$154,000	$108,000	$262,000	$0	$262,000
				C08a	$637,000	$446,000	$1,083,000	$89,200	$1,172,200
				HAUL-2	$198,000	$138,000	$336,000	$0	$336,000

TABLE D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	KLE021	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	KLE022	BLM Polygon	Upland waste rock	C02a	$88,500	$62,000	$150,500	$11,500	$162,000
	KLE023	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	KLE032	BLM Polygon	Upland waste rock	C02a	$23,600	$16,500	$40,100	$3,070	$43,170
	KLE033	BLM Polygon	Upland waste rock (erosion potential)	C01	$107,000	$74,900	$181,900	$0	$181,900
				C08a	$443,000	$310,000	$753,000	$62,000	$815,000
				HAUL-2	$137,000	$96,100	$233,100	$0	$233,100
	KLE034	BLM Polygon	Floodplain waste rock	C01	$94,200	$65,900	$160,100	$0	$160,100
				C08a	$389,000	$273,000	$662,000	$54,500	$716,500
				HAUL-2	$121,000	$84,500	$205,500	$0	$205,500
	KLE035	BLM Polygon	Buildings & structures	HH-4	$1,690,000	$1,180,000	$2,870,000	$219,000	$3,089,000
			Floodplain waste rock	C01	$514,000	$360,000	$874,000	$0	$874,000
				C08a	$2,120,000	$1,490,000	$3,610,000	$297,000	$3,907,000
				HAUL-2	$659,000	$461,000	$1,120,000	$0	$1,120,000
	KLE036	BLM Polygon	Upland waste rock	C02a	$58,200	$40,700	$98,900	$7,560	$106,460
	KLE038	BLM Polygon	Upland waste rock	C02a	$307,000	$215,000	$522,000	$39,900	$561,900
	KLE039	BLM Polygon	Upland waste rock (erosion potential)	C01	$150,000	$105,000	$255,000	$0	$255,000
				C08a	$620,000	$434,000	$1,054,000	$86,700	$1,140,700
				HAUL-2	$192,000	$135,000	$327,000	$0	$327,000
	KLE040	BLM Polygon	Floodplain sediments	C01b	$1,510,000	$1,060,000	$2,570,000	$0	$2,570,000
				C08a	$1,980,000	$1,390,000	$3,370,000	$278,000	$3,648,000
				HAUL-2	$615,000	$430,000	$1,045,000	$0	$1,045,000
			Groundwater	WT01	$402,000	$430,000	$832,000	$609,000	$1,441,000
	KLE042	BLM Polygon	Floodplain sediments	C01b	$675,000	$473,000	$1,148,000	$0	$1,148,000
				C08a	$885,000	$620,000	$1,505,000	$124,000	$1,629,000
				HAUL-2	$275,000	$192,000	$467,000	$0	$467,000
			Floodplain tailings	C01	$55,600	$38,900	$94,500	$0	$94,500
				C08a	$230,000	$161,000	$391,000	$32,200	$423,200
				HAUL-2	$71,400	$50,000	$121,400	$0	$121,400
	KLE048	BLM Polygon	Floodplain sediments	C01b	$1,620,000	$1,130,000	$2,750,000	$0	$2,750,000
				C08a	$2,120,000	$1,480,000	$3,600,000	$297,000	$3,897,000
				C14c	$8,910,000	$6,240,000	$15,150,000	$267,000	$15,417,000
				C15b	$2,720,000	$1,900,000	$4,620,000	$54,400	$4,674,400
				HAUL-2	$657,000	$460,000	$1,117,000	$0	$1,117,000
			Groundwater	WT01	$402,000	$430,000	$832,000	$609,000	$1,441,000
	KLE049	BLM Polygon	Floodplain sediments	C01b	$1,760,000	$1,230,000	$2,990,000	$0	$2,990,000
				C08a	$2,300,000	$1,610,000	$3,910,000	$322,000	$4,232,000
				C14c	$7,430,000	$5,200,000	$12,630,000	$223,000	$12,853,000

TABLE D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				C15b	$2,270,000	$1,590,000	$3,860,000	$45,400	$3,905,400
				HAUL-2	$714,000	$500,000	$1,214,000	$0	$1,214,000
			Groundwater	WT01	$402,000	$430,000	$832,000	$609,000	$1,441,000
	KLE051	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	KLE056	BLM Polygon	Upland waste rock	C02a	$30,300	$21,200	$51,500	$3,950	$55,450
	KLE057	BLM Polygon	Upland waste rock	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	KLE058	BLM Polygon	Upland waste rock	C02a	$19,400	$13,600	$33,000	$2,520	$35,520
	KLE059	BLM Polygon	Upland waste rock	C02a	$11,800	$8,260	$20,060	$1,530	$21,590
	KLE060	BLM Polygon	Upland waste rock	C02a	$20,200	$14,200	$34,400	$2,630	$37,030
	KLE062	BLM Polygon	Floodplain sediments	C01b	$351,000	$246,000	$597,000	$0	$597,000
				C08a	$460,000	$322,000	$782,000	$64,400	$846,400
				HAUL-2	$143,000	$99,900	$242,900	$0	$242,900
			Upland waste rock	C02a	$278,000	$195,000	$473,000	$36,200	$509,200
	KLE066	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	KLE067	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$267,000	$187,000	$454,000	$1,010,000	$1,464,000
			Upland waste rock (erosion potential)	C01	$118,000	$82,400	$200,400	$0	$200,400
				C08a	$487,000	$341,000	$828,000	$68,100	$896,100
				HAUL-2	$151,000	$106,000	$257,000	$0	$257,000
	KLE068	BLM Polygon	Upland waste rock (erosion potential)	C01	$59,900	$41,900	$101,800	$0	$101,800
				C08a	$248,000	$173,000	$421,000	$34,700	$455,700
				HAUL-2	$76,900	$53,800	$130,700	$0	$130,700
	KLE069	BLM Polygon	Upland waste rock (erosion potential)	C01	$5,560	$3,890	$9,450	$0	$9,450
				C08a	$23,000	$16,100	$39,100	$3,220	$42,320
				HAUL-2	$7,140	$5,000	$12,140	$0	$12,140
	KLE070	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	KLE074	BLM Polygon	Buildings & structures	HH-4	$1,690,000	$1,180,000	$2,870,000	$219,000	$3,089,000
			Upland tailings	C01	$59,900	$41,900	$101,800	$0	$101,800
				C08a	$248,000	$173,000	$421,000	$34,700	$455,700
				HAUL-2	$76,900	$53,800	$130,700	$0	$130,700
	KLE075	BLM Polygon	Upland tailings	C01	$17,100	$12,000	$29,100	$0	$29,100
				C08a	$70,800	$49,600	$120,400	$9,910	$130,310
				HAUL-2	$22,000	$15,400	$37,400	$0	$37,400
	MG01-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$110,000	$76,900	$186,900	$32,900	$219,800
				CD-AVG	$59,700	$41,800	$101,500	$17,900	$119,400
				FP/RP-AVG	$47,000	$32,900	$79,900	$8,460	$88,360

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	MG01-10	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$104,000	$72,600	$176,600	$31,100	$207,700
				CD-AVG	$10,300	$7,210	$17,510	$3,090	$20,600
				FP/RP-AVG	$409,000	$286,000	$695,000	$73,600	$768,600
				OFFCH-AVG	$2,990,000	$2,090,000	$5,080,000	$538,000	$5,618,000
				VBS-AVG	$44,200	$30,900	$75,100	$13,300	$88,400
	MG01-11	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$140,000	$98,200	$238,200	$42,100	$280,300
				CD-AVG	$16,500	$11,500	$28,000	$4,940	$32,940
				FP/RP-AVG	$173,000	$121,000	$294,000	$31,200	$325,200
				VBS-AVG	$59,800	$41,900	$101,700	$17,900	$119,600
	MG01-12	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$134,000	$93,900	$227,900	$40,300	$268,200
				CD-AVG	$30,900	$21,600	$52,500	$9,270	$61,770
				FP/RP-AVG	$238,000	$166,000	$404,000	$42,800	$446,800
				VBS-AVG	$57,200	$40,000	$97,200	$17,200	$114,400
	MG01-13	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$305,000	$214,000	$519,000	$91,500	$610,500
				CD-AVG	$47,400	$33,200	$80,600	$14,200	$94,800
				CH REAL-1	$1,270,000	$892,000	$2,162,000	$217,000	$2,379,000
				FP/RP-AVG	$715,000	$500,000	$1,215,000	$129,000	$1,344,000
				OFFCH-AVG	$2,710,000	$1,900,000	$4,610,000	$488,000	$5,098,000
				VBS-AVG	$130,000	$91,000	$221,000	$39,000	$260,000
	MG01-14	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$92,500	$64,700	$157,200	$27,700	$184,900
				CD-AVG	$16,500	$11,500	$28,000	$4,940	$32,940
				CH REAL-1	$426,000	$298,000	$724,000	$72,500	$796,500
				FP/RP-AVG	$61,900	$43,300	$105,200	$11,100	$116,300
				OFFCH-AVG	$55,700	$39,000	$94,700	$10,000	$104,700
				VBS-AVG	$39,400	$27,600	$67,000	$11,800	$78,800
	MG01-15	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$236,000	$165,000	$401,000	$70,700	$471,700
				CD-AVG	$39,100	$27,400	$66,500	$11,700	$78,200
				FP/RP-AVG	$966,000	$676,000	$1,642,000	$174,000	$1,816,000
				OFFCH-AVG	$1,800,000	$1,260,000	$3,060,000	$324,000	$3,384,000
				VBS-AVG	$30,200	$21,100	$51,300	$9,050	$60,350
	MG01-16	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$131,000	$91,500	$222,500	$39,200	$261,700
				CD-AVG	$22,700	$15,900	$38,600	$6,800	$45,400
				FP/RP-AVG	$60,300	$42,200	$102,500	$10,900	$113,400
				OFFCH-AVG	$1,400,000	$979,000	$2,379,000	$252,000	$2,631,000
				VBS-AVG	$16,700	$11,700	$28,400	$5,010	$33,410
	MG01-17	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$334,000	$234,000	$568,000	$100,000	$668,000
				CD-AVG	$55,600	$38,900	$94,500	$16,700	$111,200
				CH REAL-1	$1,540,000	$1,080,000	$2,620,000	$262,000	$2,882,000
				FP/RP-AVG	$1,400,000	$981,000	$2,381,000	$252,000	$2,633,000
				OFFCH-AVG	$1,100,000	$772,000	$1,872,000	$198,000	$2,070,000
				VBS-AVG	$142,000	$99,700	$241,700	$42,700	$284,400
	MG01-18	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$167,000	$117,000	$284,000	$50,000	$334,000

TABLE D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				CD-AVG	$28,800	$20,200	$49,000	$8,650	$57,650
				CH REAL-1	$768,000	$538,000	$1,306,000	$131,000	$1,437,000
				FP/RP-AVG	$545,000	$381,000	$926,000	$98,000	$1,024,000
				OFFCH-AVG	$231,000	$162,000	$393,000	$41,500	$434,500
				VBS-AVG	$71,000	$49,700	$120,700	$21,300	$142,000
	MG01-2	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$97,600	$68,300	$165,900	$29,300	$195,200
				CD-AVG	$33,000	$23,100	$56,100	$9,890	$65,990
				FP/RP-AVG	$133,000	$92,900	$225,900	$23,900	$249,800
	MG01-3	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$189,000	$132,000	$321,000	$56,700	$377,700
				CD-AVG	$20,600	$14,400	$35,000	$6,180	$41,180
				FP/RP-AVG	$557,000	$390,000	$947,000	$100,000	$1,047,000
				VBS-AVG	$80,600	$56,400	$137,000	$24,200	$161,200
	MG01-4	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$305,000	$214,000	$519,000	$91,500	$610,500
				CD-AVG	$119,000	$83,600	$202,600	$35,800	$238,400
				FP/RP-AVG	$874,000	$612,000	$1,486,000	$157,000	$1,643,000
				VBS-AVG	$130,000	$91,000	$221,000	$39,000	$260,000
	MG01-5	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$97,600	$68,300	$165,900	$29,300	$195,200
				CD-AVG	$14,400	$10,100	$24,500	$4,330	$28,830
				FP/RP-AVG	$833,000	$583,000	$1,416,000	$150,000	$1,566,000
				VBS-AVG	$41,600	$29,100	$70,700	$12,500	$83,200
	MG01-6	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$384,000	$269,000	$653,000	$115,000	$768,000
				CD-AVG	$78,300	$54,800	$133,100	$23,500	$156,600
				FP/RP-AVG	$1,900,000	$1,330,000	$3,230,000	$342,000	$3,572,000
				OFFCH-AVG	$3,240,000	$2,270,000	$5,510,000	$583,000	$6,093,000
				VBS-AVG	$164,000	$115,000	$279,000	$49,100	$328,100
	MG01-7	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$433,000	$303,000	$736,000	$130,000	$866,000
				CD-AVG	$20,600	$14,400	$35,000	$6,180	$41,180
				FP/RP-AVG	$487,000	$341,000	$828,000	$87,700	$915,700
				OFFCH-AVG	$440,000	$308,000	$748,000	$79,100	$827,100
				VBS-AVG	$185,000	$129,000	$314,000	$55,400	$369,400
	MG01-8	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$286,000	$200,000	$486,000	$85,900	$571,900
				CD-AVG	$47,400	$33,200	$80,600	$14,200	$94,800
				CH REAL-1	$1,320,000	$924,000	$2,244,000	$225,000	$2,469,000
				FP/RP-AVG	$3,150,000	$2,200,000	$5,350,000	$566,000	$5,916,000
				OFFCH-AVG	$2,620,000	$1,830,000	$4,450,000	$471,000	$4,921,000
				VBS-AVG	$122,000	$85,400	$207,400	$36,600	$244,000
	MG01-9	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$68,000	$47,600	$115,600	$20,400	$136,000
				CD-AVG	$12,400	$8,650	$21,050	$3,710	$24,760
				CH REAL-1	$314,000	$219,000	$533,000	$53,300	$586,300
				FP/RP-AVG	$30,600	$21,400	$52,000	$5,520	$57,520
				VBS-AVG	$29,000	$20,300	$49,300	$8,690	$57,990
	MUL085	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200

TABLE D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				WT02	$1,090,000	$766,000	$1,856,000	$1,680,000	$3,536,000
			Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	MUL086	BLM Polygon	Upland waste rock (erosion potential)	C01	$128,000	$89,900	$217,900	$0	$217,900
				C08a	$531,000	$372,000	$903,000	$74,300	$977,300
				HAUL-2	$165,000	$115,000	$280,000	$0	$280,000
	MUL087	BLM Polygon	Upland waste rock	C02a	$31,200	$21,800	$53,000	$4,050	$57,050
	OSB024	BLM Polygon	Upland waste rock	C02a	$54,800	$38,400	$93,200	$7,120	$100,320
	OSB025	BLM Polygon	Upland waste rock (erosion potential)	C01	$51,400	$36,000	$87,400	$0	$87,400
				C08a	$212,000	$149,000	$361,000	$29,700	$390,700
				HAUL-2	$65,900	$46,100	$112,000	$0	$112,000
	OSB026	BLM Polygon	Upland waste rock	C02a	$65,800	$46,000	$111,800	$8,550	$120,350
	OSB027	BLM Polygon	Upland waste rock	C02a	$100,000	$70,200	$170,200	$13,000	$183,200
	OSB028	BLM Polygon	Upland waste rock	C02a	$9,270	$6,490	$15,760	$1,210	$16,970
	OSB030	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	OSB065	BLM Polygon	Floodplain sediments	C01b	$6,240,000	$4,370,000	$10,610,000	$0	$10,610,000
				C08a	$8,180,000	$5,720,000	$13,900,000	$1,140,000	$15,040,000
				C14c	$65,300,000	$45,700,000	$111,000,000	$1,960,000	$112,960,000
				C15b	$20,000,000	$14,000,000	$34,000,000	$399,000	$34,399,000
				HAUL-2	$2,540,000	$1,780,000	$4,320,000	$0	$4,320,000
			Groundwater	WT01	$402,000	$430,000	$832,000	$609,000	$1,441,000
	OSB070	BLM Polygon	Upland waste rock (erosion potential)	C01	$133,000	$92,900	$225,900	$0	$225,900
				C08a	$549,000	$384,000	$933,000	$76,800	$1,009,800
				HAUL-2	$170,000	$119,000	$289,000	$0	$289,000
	OSB071	BLM Polygon	Upland waste rock	C02a	$27,000	$18,900	$45,900	$3,510	$49,410
	OSB072	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	OSB073	BLM Polygon	Upland waste rock (erosion potential)	C01	$94,200	$65,900	$160,100	$0	$160,100
				C08a	$389,000	$273,000	$662,000	$54,500	$716,500
				HAUL-2	$121,000	$84,500	$205,500	$0	$205,500
	OSB074	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	OSB075	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	OSB076	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$139,000	$97,200	$236,200	$528,000	$764,200

TABLE D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
			Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	OSB078	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	OSB079	BLM Polygon	Upland waste rock	C02a	$13,500	$9,440	$22,940	$1,750	$24,690
	OSB080	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$145,000	$102,000	$247,000	$529,000	$776,000
			Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	OSB117	BLM Polygon	Floodplain tailings	C01	$59,900	$41,900	$101,800	$0	$101,800
				C08a	$248,000	$173,000	$421,000	$34,700	$455,700
				HAUL-2	$76,900	$53,800	$130,700	$0	$130,700
	OSB118	BLM Polygon	Floodplain sediments	C01b	$810,000	$567,000	$1,377,000	$0	$1,377,000
				C08a	$1,060,000	$743,000	$1,803,000	$149,000	$1,952,000
				HAUL-2	$329,000	$231,000	$560,000	$0	$560,000
	OSB119	BLM Polygon	Floodplain sediments (underlying tailings pond)	C01b	$4,320,000	$3,020,000	$7,340,000	$0	$7,340,000
				C08a	$5,660,000	$3,960,000	$9,620,000	$792,000	$10,412,000
				C11j	$11,100,000	$7,790,000	$18,890,000	$223,000	$19,113,000
				HAUL-2	$1,760,000	$1,230,000	$2,990,000	$0	$2,990,000
			Groundwater	WT01	$30,200	$32,300	$62,500	$22,900	$85,400
	OSB120	BLM Polygon	Floodplain sediments	C01b	$6,480,000	$4,540,000	$11,020,000	$0	$11,020,000
				C08a	$8,500,000	$5,950,000	$14,450,000	$1,190,000	$15,640,000
				C14c	$41,600,000	$29,100,000	$70,700,000	$1,250,000	$71,950,000
				C15b	$12,700,000	$8,890,000	$21,590,000	$254,000	$21,844,000
				HAUL-2	$2,640,000	$1,840,000	$4,480,000	$0	$4,480,000
			Groundwater	WT01	$402,000	$430,000	$832,000	$609,000	$1,441,000
	POL015	BLM Polygon	Upland waste rock	C02a	$27,000	$18,900	$45,900	$3,510	$49,410
	POL016	BLM Polygon	Upland waste rock	C02a	$25,300	$17,700	$43,000	$3,290	$46,290
	POL017	BLM Polygon	Upland waste rock	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	POL018	BLM Polygon	Upland waste rock (erosion potential)	C01	$94,200	$65,900	$160,100	$0	$160,100
				C08a	$389,000	$273,000	$662,000	$54,500	$716,500
				HAUL-2	$121,000	$84,500	$205,500	$0	$205,500
	POL019	BLM Polygon	Upland waste rock (erosion potential)	C01	$856,000	$599,000	$1,455,000	$0	$1,455,000
				C08a	$3,540,000	$2,480,000	$6,020,000	$496,000	$6,516,000
				HAUL-2	$1,100,000	$769,000	$1,869,000	$0	$1,869,000
	POL020	BLM Polygon	Upland waste rock	C02a	$16,000	$11,200	$27,200	$2,080	$29,280
	POL021	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	POL029	BLM Polygon	Upland waste rock	C02a	$13,500	$9,440	$22,940	$1,750	$24,690
	POL030	BLM Polygon	Upland waste rock	C02a	$40,500	$28,300	$68,800	$5,260	$74,060

TABLE D-38

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	POL031	BLM Polygon	Upland waste rock	C02a	$36,200	$25,400	$61,600	$4,710	$66,310
	POL032	BLM Polygon	Upland waste rock	C02a	$19,400	$13,600	$33,000	$2,520	$35,520
	POL033	BLM Polygon	Upland waste rock	C02a	$19,400	$13,600	$33,000	$2,520	$35,520
	POL034	BLM Polygon	Upland waste rock	C02a	$69,100	$48,400	$117,500	$8,990	$126,490
	POL035	BLM Polygon	Upland waste rock	C02a	$165,000	$116,000	$281,000	$21,500	$302,500
	POL055	BLM Polygon	Upland waste rock	C02a	$37,900	$26,600	$64,500	$4,930	$69,430
	POL057	BLM Polygon	Upland waste rock	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	POL058	BLM Polygon	Upland waste rock	C02a	$19,400	$13,600	$33,000	$2,520	$35,520
	POL059	BLM Polygon	Upland waste rock	C02a	$22,800	$15,900	$38,700	$2,960	$41,660
	POL060	BLM Polygon	Upland waste rock	C02a	$17,700	$12,400	$30,100	$2,300	$32,400
	POL061	BLM Polygon	Upland waste rock	C02a	$32,000	$22,400	$54,400	$4,160	$58,560
	POL064	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	POL065	BLM Polygon	Upland waste rock	C02a	$17,700	$12,400	$30,100	$2,300	$32,400
	POL077	BLM Polygon	Upland waste rock	C02a	$16,900	$11,800	$28,700	$2,190	$30,890
	POL078	BLM Polygon	Upland waste rock	C02a	$13,500	$9,440	$22,940	$1,750	$24,690
	POL079	BLM Polygon	Upland waste rock	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	POL080	BLM Polygon	Upland waste rock	C02a	$13,500	$9,440	$22,940	$1,750	$24,690
	POL081	BLM Polygon	Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	POL082	BLM Polygon	Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	POL083	BLM Polygon	Upland waste rock	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	POL084	BLM Polygon	Upland waste rock	C02a	$13,500	$9,440	$22,940	$1,750	$24,690
	POL085	BLM Polygon	Upland waste rock	C02a	$11,800	$8,260	$20,060	$1,530	$21,590
	POL086	BLM Polygon	Upland waste rock	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	POL087	BLM Polygon	Upland waste rock	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	POL088	BLM Polygon	Upland waste rock	C02a	$27,000	$18,900	$45,900	$3,510	$49,410
	POL089	BLM Polygon	Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	POL090	BLM Polygon	Upland waste rock	C02a	$9,270	$6,490	$15,760	$1,210	$16,970
	POL091	BLM Polygon	Upland waste rock	C02a	$16,000	$11,200	$27,200	$2,080	$29,280
	POL092	BLM Polygon	Upland waste rock	C02a	$23,600	$16,500	$40,100	$3,070	$43,170
	WAL001	BLM Polygon	Floodplain sediments (underlying tailings pond)	C11j	$13,400,000	$9,350,000	$22,750,000	$267,000	$23,017,000
			Groundwater	WT01	$60,300	$64,500	$124,800	$18,300	$143,100
			Upland tailings - active facilities	C09	$16,300,000	$11,400,000	$27,700,000	$3,260,000	$30,960,000
	WAL002	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$603	$645	$1,248	$366	$1,614
			Floodplain waste rock	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	WAL003	BLM Polygon	Upland waste rock	C02a	$277,000	$194,000	$471,000	$36,100	$507,100
	WAL004	BLM Polygon	Floodplain sediments	C01b	$1,600,000	$1,120,000	$2,720,000	$0	$2,720,000
				C08a	$2,100,000	$1,470,000	$3,570,000	$293,000	$3,863,000

TABLE D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				C14c	$25,200,000	$17,700,000	$42,900,000	$757,000	$43,657,000
				C15b	$7,710,000	$5,400,000	$13,110,000	$154,000	$13,264,000
				HAUL-2	$650,000	$455,000	$1,105,000	$0	$1,105,000
			Groundwater	WT01	$402,000	$430,000	$832,000	$609,000	$1,441,000
	WAL005	BLM Polygon	Upland waste rock	C02a	$28,700	$20,100	$48,800	$3,730	$52,530
	WAL014	BLM Polygon	Upland waste rock (erosion potential)	C01	$167,000	$117,000	$284,000	$0	$284,000
				C08a	$690,000	$483,000	$1,173,000	$96,600	$1,269,600
				HAUL-2	$214,000	$150,000	$364,000	$0	$364,000
	WAL016	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	WAL017	BLM Polygon	Upland waste rock	C02a	$175,000	$122,000	$297,000	$22,700	$319,700
	WAL019	BLM Polygon	Upland waste rock	C02a	$24,400	$17,100	$41,500	$3,180	$44,680
	WAL020	BLM Polygon	Upland waste rock (erosion potential)	C01	$595,000	$416,000	$1,011,000	$0	$1,011,000
				C08a	$2,460,000	$1,720,000	$4,180,000	$344,000	$4,524,000
				HAUL-2	$763,000	$534,000	$1,297,000	$0	$1,297,000
	WAL021	BLM Polygon	Upland waste rock	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	WAL022	BLM Polygon	Upland waste rock	C02a	$11,000	$7,670	$18,670	$1,420	$20,090
	WAL023	BLM Polygon	Upland waste rock	C02a	$13,500	$9,440	$22,940	$1,750	$24,690
	WAL024	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	WAL025	BLM Polygon	Upland waste rock	C02a	$16,900	$11,800	$28,700	$2,190	$30,890
	WAL026	BLM Polygon	Upland waste rock	C02a	$7,590	$5,310	$12,900	$986	$13,886
	WAL027	BLM Polygon	Upland waste rock	C02a	$76,700	$53,700	$130,400	$9,970	$140,370
	WAL028	BLM Polygon	Upland waste rock	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	WAL029	BLM Polygon	Upland waste rock	C02a	$30,300	$21,200	$51,500	$3,950	$55,450
	WAL034	BLM Polygon	Floodplain sediments	C01b	$1,050,000	$737,000	$1,787,000	$0	$1,787,000
				C08a	$1,380,000	$966,000	$2,346,000	$193,000	$2,539,000
				HAUL-2	$428,000	$300,000	$728,000	$0	$728,000
	WAL035	BLM Polygon	Floodplain waste rock	C01	$599,000	$419,000	$1,018,000	$0	$1,018,000
				C08a	$2,480,000	$1,730,000	$4,210,000	$347,000	$4,557,000
				HAUL-2	$769,000	$538,000	$1,307,000	$0	$1,307,000
	WAL036	BLM Polygon	Floodplain sediments	C01b	$608,000	$425,000	$1,033,000	$0	$1,033,000
				C08a	$797,000	$558,000	$1,355,000	$112,000	$1,467,000
				HAUL-2	$247,000	$173,000	$420,000	$0	$420,000
	WAL037	BLM Polygon	Upland tailings	C01	$51,400	$36,000	$87,400	$0	$87,400
				C08a	$212,000	$149,000	$361,000	$29,700	$390,700
				HAUL-2	$65,900	$46,100	$112,000	$0	$112,000
	WAL046	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869

TABLE D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	WAL047	BLM Polygon	Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	WAL048	BLM Polygon	Upland waste rock	C02a	$102,000	$71,400	$173,400	$13,300	$186,700
	WAL049	BLM Polygon	Upland waste rock	C02a	$95,300	$66,700	$162,000	$12,400	$174,400
	WAL050	BLM Polygon	Upland waste rock	C02a	$70,800	$49,600	$120,400	$9,210	$129,610
	WAL051	BLM Polygon	Upland waste rock	C02a	$54,000	$37,800	$91,800	$7,010	$98,810
	WAL052	BLM Polygon	Upland waste rock	C02a	$70,800	$49,600	$120,400	$9,210	$129,610
	WAL053	BLM Polygon	Upland waste rock	C02a	$27,000	$18,900	$45,900	$3,510	$49,410
	WAL054	BLM Polygon	Upland waste rock	C02a	$58,200	$40,700	$98,900	$7,560	$106,460
	WAL055	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	WAL056	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	WAL057	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	WAL058	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	WAL059	BLM Polygon	Upland waste rock	C02a	$35,400	$24,800	$60,200	$4,600	$64,800
	WAL060	BLM Polygon	Upland waste rock	C02a	$20,200	$14,200	$34,400	$2,630	$37,030
	WAL061	BLM Polygon	Upland waste rock	C02a	$32,000	$22,400	$54,400	$4,160	$58,560
	WAL062	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	WAL063	BLM Polygon	Upland waste rock	C02a	$24,400	$17,100	$41,500	$3,180	$44,680
	WAL064	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	WAL065	BLM Polygon	Upland waste rock	C02a	$31,200	$21,800	$53,000	$4,050	$57,050
	WAL066	BLM Polygon	Upland waste rock	C02a	$27,800	$19,500	$47,300	$3,620	$50,920
	WAL067	BLM Polygon	Upland waste rock	C02a	$58,200	$40,700	$98,900	$7,560	$106,460
	WAL070	BLM Polygon	Upland waste rock	C02a	$59,900	$41,900	$101,800	$7,780	$109,580
	WAL071	BLM Polygon	Upland waste rock	C02a	$16,900	$11,800	$28,700	$2,190	$30,890
	WAL072	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	WAL073	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	WAL074	BLM Polygon	Upland waste rock	C02a	$21,900	$15,300	$37,200	$2,850	$40,050

TABLE D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
MIDGradSeg02	KLW061	BLM Polygon	Upland waste rock	C02b	$2,320,000	$1,620,000	$3,940,000	$301,000	$4,241,000
	KLW062	BLM Polygon	Upland waste rock	C02b	$356,000	$249,000	$605,000	$46,200	$651,200
	KLW070	BLM Polygon	Floodplain sediments	C01b	$126,000	$88,400	$214,400	$0	$214,400
				C08a	$165,000	$116,000	$281,000	$23,200	$304,200
				HAUL-2	$51,300	$35,900	$87,200	$0	$87,200
	KLW071	BLM Polygon	Upland waste rock	C02b	$576,000	$403,000	$979,000	$74,900	$1,053,900
	KLW095	BLM Polygon	Upland waste rock	C02b	$137,000	$95,900	$232,900	$17,800	$250,700
	KLW123	BLM Polygon	Upland waste rock	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	KLW124	BLM Polygon	Upland waste rock	C02b	$61,800	$43,300	$105,100	$8,030	$113,130
	KLW125	BLM Polygon	Upland waste rock	C02b	$38,400	$26,900	$65,300	$4,990	$70,290
	KLW126	BLM Polygon	Upland waste rock	C02a	$21,900	$15,300	$37,200	$2,850	$40,050
	KLW127	BLM Polygon	Upland waste rock	C02b	$21,700	$15,200	$36,900	$2,820	$39,720
	KLW128	BLM Polygon	Upland waste rock	C02b	$212,000	$148,000	$360,000	$27,600	$387,600
	MAS070	BLM Polygon	Upland waste rock	C02a	$33,700	$23,600	$57,300	$4,380	$61,680
	MG02-10	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$15,100	$10,500	$25,600	$4,520	$30,120
				CD-AVG	$12,400	$8,650	$21,050	$3,710	$24,760
				FP/RP-AVG	$16,600	$11,600	$28,200	$2,980	$31,180
				VBS-AVG	$6,420	$4,500	$10,920	$1,930	$12,850
	MG02-11	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$13,300	$9,330	$22,630	$4,000	$26,630
				CD-AVG	$10,300	$7,210	$17,510	$3,090	$20,600
				FP/RP-AVG	$14,600	$10,200	$24,800	$2,630	$27,430
				VBS-AVG	$5,680	$3,980	$9,660	$1,700	$11,360
	MG02-12	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$9,410	$6,590	$16,000	$2,820	$18,820
				CD-AVG	$2,060	$1,440	$3,500	$618	$4,118
				FP/RP-AVG	$6,200	$4,340	$10,540	$1,120	$11,660
				VBS-AVG	$1,200	$842	$2,042	$361	$2,403
MoonCrkSeg01	KLE007	BLM Polygon	Upland waste rock	C02b	$104,000	$72,500	$176,500	$13,500	$190,000
	KLE061	BLM Polygon	Floodplain waste rock	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	MC01-2	Bioengineering Reach	BioReach Current Deflector Frequency	CD-SED	$7,480	$5,240	$12,720	$44,900	$57,620
			BioReach General Characteristics	BSBR-AVG	$187,000	$131,000	$318,000	$56,000	$374,000
				CD-AVG	$70,000	$49,000	$119,000	$21,000	$140,000
				FP/RP-AVG	$154,000	$108,000	$262,000	$27,700	$289,700
				VBS-AVG	$79,600	$55,700	$135,300	$23,900	$159,200
MoonCrkSeg02	KLE008	BLM Polygon	Upland waste rock (erosion potential)	C02b	$109,000	$76,000	$185,000	$14,100	$199,100
	KLE009	BLM Polygon	Upland waste rock	C02a	$116,000	$81,400	$197,400	$15,100	$212,500
	KLE013	BLM Polygon	Upland waste rock	C02b	$88,500	$62,000	$150,500	$11,500	$162,000
	KLE014	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	KLE041	BLM Polygon	Floodplain sediments	C01b	$44,600	$31,200	$75,800	$0	$75,800

TABLE D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				C08a	$58,400	$40,900	$99,300	$8,180	$107,480
				HAUL-2	$18,100	$12,700	$30,800	$0	$30,800
	KLE063	BLM Polygon	Upland waste rock (erosion potential)	C02b	$25,100	$17,500	$42,600	$3,260	$45,860
	KLE064	BLM Polygon	Upland waste rock (erosion potential)	C02b	$21,700	$15,200	$36,900	$2,820	$39,720
	KLE065	BLM Polygon	Upland waste rock (erosion potential)	C02b	$38,400	$26,900	$65,300	$4,990	$70,290
	MC02-2	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$163,000	$114,000	$277,000	$48,800	$325,800
				CD-AVG	$138,000	$96,600	$234,600	$41,400	$276,000
				FP/RP-AVG	$447,000	$313,000	$760,000	$80,500	$840,500
				VBS-AVG	$69,400	$48,600	$118,000	$20,800	$138,800
	MC02-3	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$136,000	$95,400	$231,400	$40,900	$272,300
				CD-AVG	$57,700	$40,400	$98,100	$17,300	$115,400
				FP/RP-AVG	$225,000	$157,000	$382,000	$40,400	$422,400
				VBS-AVG	$58,100	$40,700	$98,800	$17,400	$116,200
	MC02-4	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$70,800	$49,500	$120,300	$21,200	$141,500
				CD-AVG	$59,700	$41,800	$101,500	$17,900	$119,400
				FP/RP-AVG	$194,000	$136,000	$330,000	$34,900	$364,900
				VBS-AVG	$45,200	$31,600	$76,800	$13,600	$90,400
NMSeg	PIPENM	General Feature	Source General Information	PIPE-1	$1,560,000	$1,090,000	$2,650,000	$125,000	$2,775,000
NMSeg01	BUR051	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock	C02a	$153,000	$107,000	$260,000	$19,800	$279,800
	BUR052	BLM Polygon	Upland waste rock	C01	$17,100	$12,000	$29,100	$0	$29,100
				C07	$58,800	$41,200	$100,000	$12,900	$112,900
	BUR053	BLM Polygon	Upland waste rock (erosion potential)	C01	$2,960,000	$2,070,000	$5,030,000	$0	$5,030,000
				C07	$10,200,000	$7,120,000	$17,320,000	$2,240,000	$19,560,000
	BUR077	BLM Polygon	Upland waste rock	C02a	$96,100	$67,300	$163,400	$12,500	$175,900
	BUR081	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock	C02a	$51,400	$36,000	$87,400	$6,680	$94,080
	BUR082	BLM Polygon	Upland waste rock	C02a	$35,400	$24,800	$60,200	$4,600	$64,800
	BUR083	BLM Polygon	Upland waste rock	C02a	$27,000	$18,900	$45,900	$3,510	$49,410
	BUR084	BLM Polygon	Upland waste rock	C02a	$22,800	$15,900	$38,700	$2,960	$41,660
	BUR140	BLM Polygon	Floodplain sediments	C01b	$135,000	$94,500	$229,500	$0	$229,500
				C08a	$177,000	$124,000	$301,000	$24,800	$325,800
				HAUL-2	$54,900	$38,400	$93,300	$0	$93,300
	NM01-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$489,000	$343,000	$832,000	$147,000	$979,000
				CD-AVG	$82,400	$57,700	$140,100	$24,700	$164,800
				FP/RP-AVG	$269,000	$188,000	$457,000	$48,400	$505,400
				VBS-AVG	$209,000	$146,000	$355,000	$62,600	$417,600
NMSeg02	BUR054	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$211,000	$148,000	$359,000	$549,000	$908,000
			Upland tailings - inactive facilities	C01	$963,000	$674,000	$1,637,000	$0	$1,637,000

TABLE D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				C08a	$3,980,000	$2,790,000	$6,770,000	$558,000	$7,328,000
				HAUL-2	$1,240,000	$865,000	$2,105,000	$0	$2,105,000
			Upland waste rock (potential intermixed tailings)	C01	$321,000	$225,000	$546,000	$0	$546,000
				C08a	$1,330,000	$929,000	$2,259,000	$186,000	$2,445,000
				HAUL-2	$412,000	$288,000	$700,000	$0	$700,000
	BUR055	BLM Polygon	Floodplain sediments	C01b	$74,300	$52,000	$126,300	$0	$126,300
				C08a	$97,400	$68,100	$165,500	$13,600	$179,100
				HAUL-2	$30,200	$21,100	$51,300	$0	$51,300
			Upland tailings	C01	$59,900	$41,900	$101,800	$0	$101,800
				C08a	$248,000	$173,000	$421,000	$34,700	$455,700
				HAUL-2	$76,900	$53,800	$130,700	$0	$130,700
	BUR056	BLM Polygon	Upland waste rock (potential intermixed tailings)	C01	$1,250,000	$878,000	$2,128,000	$0	$2,128,000
				C08a	$5,190,000	$3,630,000	$8,820,000	$726,000	$9,546,000
				HAUL-2	$1,610,000	$1,130,000	$2,740,000	$0	$2,740,000
	BUR057	BLM Polygon	Upland waste rock	C02a	$76,700	$53,700	$130,400	$9,970	$140,370
	BUR058	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock	C02a	$81,800	$57,200	$139,000	$10,600	$149,600
	BUR059	BLM Polygon	Upland waste rock	C02a	$147,000	$103,000	$250,000	$19,100	$269,100
	BUR060	BLM Polygon	Upland waste rock	C02a	$180,000	$126,000	$306,000	$23,500	$329,500
	BUR061	BLM Polygon	Upland waste rock	C02a	$120,000	$83,800	$203,800	$15,600	$219,400
	BUR062	BLM Polygon	Upland waste rock	C02a	$57,300	$40,100	$97,400	$7,450	$104,850
	BUR170	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$453,000	$317,000	$770,000	$1,160,000	$1,930,000
			Upland waste rock (potential intermixed tailings)	C01	$47,100	$33,000	$80,100	$0	$80,100
				C08a	$195,000	$136,000	$331,000	$27,300	$358,300
				HAUL-2	$60,400	$42,300	$102,700	$0	$102,700
	BUR171	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$330,000	$231,000	$561,000	$1,060,000	$1,621,000
	BUR196	BLM Polygon	Upland waste rock	C02a	$26,100	$18,300	$44,400	$3,400	$47,800
	BUR197	BLM Polygon	Upland waste rock	C02a	$38,800	$27,100	$65,900	$5,040	$70,940
	BUR205	BLM Polygon	Upland waste rock	C02a	$54,800	$38,400	$93,200	$7,120	$100,320
	NM02-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$921,000	$645,000	$1,566,000	$276,000	$1,842,000
				CD-AVG	$157,000	$110,000	$267,000	$47,000	$314,000
				FP/RP-AVG	$506,000	$354,000	$860,000	$91,100	$951,100
				OFFCH-AVG	$15,600	$10,900	$26,500	$2,810	$29,310
				VBS-AVG	$393,000	$275,000	$668,000	$118,000	$786,000
	OSB040	BLM Polygon	Floodplain sediments	C01b	$257,000	$180,000	$437,000	$0	$437,000
				C08a	$336,000	$235,000	$571,000	$47,100	$618,100
				HAUL-2	$104,000	$73,000	$177,000	$0	$177,000
	OSB044	BLM Polygon	Floodplain sediments	C01b	$135,000	$94,500	$229,500	$0	$229,500
				C08a	$177,000	$124,000	$301,000	$24,800	$325,800

TABLE D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				HAUL-2	$54,900	$38,400	$93,300	$0	$93,300
			Upland tailings (jig tailings)	C01	$1,540,000	$1,080,000	$2,620,000	$0	$2,620,000
				C08a	$6,370,000	$4,460,000	$10,830,000	$892,000	$11,722,000
				HAUL-2	$1,980,000	$1,380,000	$3,360,000	$0	$3,360,000
			Upland waste rock	C01	$72,800	$50,900	$123,700	$0	$123,700
				C08a	$301,000	$211,000	$512,000	$42,100	$554,100
				HAUL-2	$93,300	$65,300	$158,600	$0	$158,600
	OSB045	BLM Polygon	Upland waste rock	C02a	$70,800	$49,600	$120,400	$9,210	$129,610
	OSB046	BLM Polygon	Upland waste rock	C02a	$29,500	$20,700	$50,200	$3,840	$54,040
	OSB048	BLM Polygon	Upland waste rock	C02a	$12,600	$8,850	$21,450	$1,640	$23,090
	OSB056	BLM Polygon	Floodplain sediments	C01b	$21,600	$15,100	$36,700	$0	$36,700
				C08a	$28,300	$19,800	$48,100	$3,960	$52,060
				HAUL-2	$8,780	$6,150	$14,930	$0	$14,930
	OSB057	BLM Polygon	Floodplain sediments	C01b	$176,000	$123,000	$299,000	$0	$299,000
				C08a	$230,000	$161,000	$391,000	$32,200	$423,200
				HAUL-2	$71,400	$50,000	$121,400	$0	$121,400
	OSB058	BLM Polygon	Floodplain sediments	C01b	$21,600	$15,100	$36,700	$0	$36,700
				C08a	$28,300	$19,800	$48,100	$3,960	$52,060
				HAUL-2	$8,780	$6,150	$14,930	$0	$14,930
	OSB088	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$3,920	$4,200	$8,120	$2,970	$11,090
	OSB089	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$10,600	$11,300	$21,900	$8,690	$30,590
NMSeg03	NM03-1	Bioengineering Reach	BioReach General Characteristics	CD-AVG	$76,200	$53,400	$129,600	$22,900	$152,500
				FP/RP-AVG	$621,000	$434,000	$1,055,000	$112,000	$1,167,000
				OFFCH-AVG	$56,000	$39,200	$95,200	$10,100	$105,300
				VBS-AVG	$241,000	$169,000	$410,000	$72,300	$482,300
	OSB041	BLM Polygon	Upland waste rock	C02a	$69,100	$48,400	$117,500	$8,990	$126,490
	OSB042	BLM Polygon	Upland waste rock	C02a	$16,000	$11,200	$27,200	$2,080	$29,280
	OSB043	BLM Polygon	Upland waste rock	C02a	$113,000	$79,100	$192,100	$14,700	$206,800
	OSB049	BLM Polygon	Upland waste rock	C02a	$46,400	$32,500	$78,900	$6,030	$84,930
	OSB081	BLM Polygon	Upland waste rock	C02a	$11,800	$8,260	$20,060	$1,530	$21,590
	OSB087	BLM Polygon	Upland waste rock	C02a	$8,430	$5,900	$14,330	$1,100	$15,430
NMSeg04	NM04-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$252,000	$177,000	$429,000	$75,700	$504,700
				CD-AVG	$43,300	$30,300	$73,600	$13,000	$86,600
				CH REAL-1	$1,160,000	$815,000	$1,975,000	$198,000	$2,173,000
				FP/RP-AVG	$194,000	$136,000	$330,000	$34,900	$364,900
				OFFCH-AVG	$101,000	$70,800	$171,800	$18,200	$190,000
				VBS-AVG	$108,000	$75,300	$183,300	$32,300	$215,600
	NM04-2	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$87,500	$61,200	$148,700	$26,200	$174,900
				CD-AVG	$14,400	$10,100	$24,500	$4,330	$28,830
				CH REAL-1	$404,000	$282,000	$686,000	$68,600	$754,600

TABLE D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				FP/RP-AVG	$192,000	$135,000	$327,000	$34,600	$361,600
				VBS-AVG	$37,300	$26,100	$63,400	$11,200	$74,600
	NM04-3	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$677,000	$474,000	$1,151,000	$203,000	$1,354,000
				CD-AVG	$115,000	$80,800	$195,800	$34,600	$230,400
				CH REAL-1	$3,120,000	$2,190,000	$5,310,000	$531,000	$5,841,000
				FP/RP-AVG	$893,000	$625,000	$1,518,000	$161,000	$1,679,000
				VBS-AVG	$289,000	$202,000	$491,000	$86,600	$577,600
	OSB031	BLM Polygon	Upland waste rock	C02a	$47,200	$33,000	$80,200	$6,140	$86,340
	OSB032	BLM Polygon	Floodplain waste rock	C01	$85,600	$59,900	$145,500	$0	$145,500
				C08a	$354,000	$248,000	$602,000	$49,600	$651,600
				HAUL-2	$110,000	$76,900	$186,900	$0	$186,900
	OSB033	BLM Polygon	Upland waste rock (erosion potential)	C01	$68,500	$47,900	$116,400	$0	$116,400
				C08a	$283,000	$198,000	$481,000	$39,600	$520,600
				HAUL-2	$87,800	$61,500	$149,300	$0	$149,300
	OSB034	BLM Polygon	Upland waste rock	C02a	$25,300	$17,700	$43,000	$3,290	$46,290
	OSB035	BLM Polygon	Upland waste rock	C02a	$41,300	$28,900	$70,200	$5,370	$75,570
	OSB036	BLM Polygon	Upland waste rock	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	OSB037	BLM Polygon	Upland waste rock	C02a	$59,900	$41,900	$101,800	$7,780	$109,580
	OSB038	BLM Polygon	Floodplain waste rock	C01	$133,000	$92,900	$225,900	$0	$225,900
				C08a	$549,000	$384,000	$933,000	$76,800	$1,009,800
				HAUL-2	$170,000	$119,000	$289,000	$0	$289,000
	OSB039	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$4,100	$4,390	$8,490	$3,110	$11,600
			Buildings & structures	HH-4	$1,690,000	$1,180,000	$2,870,000	$219,000	$3,089,000
			Floodplain sediments	C01b	$297,000	$208,000	$505,000	$0	$505,000
				C08a	$389,000	$273,000	$662,000	$54,500	$716,500
				HAUL-2	$121,000	$84,500	$205,500	$0	$205,500
			Upland tailings	C01	$47,100	$33,000	$80,100	$0	$80,100
				C08a	$195,000	$136,000	$331,000	$27,300	$358,300
				HAUL-2	$60,400	$42,300	$102,700	$0	$102,700
			Upland waste rock	C02a	$991,000	$694,000	$1,685,000	$129,000	$1,814,000
	OSB052	BLM Polygon	Upland tailings - inactive facilities	C01	$856,000	$599,000	$1,455,000	$0	$1,455,000
				C08a	$3,540,000	$2,480,000	$6,020,000	$496,000	$6,516,000
				HAUL-2	$1,100,000	$769,000	$1,869,000	$0	$1,869,000
	OSB055	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$4,040	$4,320	$8,360	$3,060	$11,420
			Upland waste rock	C02a	$30,300	$21,200	$51,500	$3,950	$55,450
	OSB059	BLM Polygon	Floodplain sediments	C01b	$446,000	$312,000	$758,000	$0	$758,000
				C08a	$584,000	$409,000	$993,000	$81,800	$1,074,800
				HAUL-2	$181,000	$127,000	$308,000	$0	$308,000
	OSB060	BLM Polygon	Floodplain sediments	C01b	$10,800	$7,560	$18,360	$0	$18,360
				C08a	$14,200	$9,910	$24,110	$1,980	$26,090

TABLE D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				HAUL-2	$4,390	$3,070	$7,460	$0	$7,460
	OSB061	BLM Polygon	Upland tailings	C01	$30,000	$21,000	$51,000	$0	$51,000
				C08a	$124,000	$86,700	$210,700	$17,300	$228,000
				HAUL-2	$38,400	$26,900	$65,300	$0	$65,300
	OSB082	BLM Polygon	Floodplain waste rock	C01	$55,600	$38,900	$94,500	$0	$94,500
				C08a	$230,000	$161,000	$391,000	$32,200	$423,200
				HAUL-2	$71,400	$50,000	$121,400	$0	$121,400
	OSB083	BLM Polygon	Upland waste rock	C02a	$64,900	$45,400	$110,300	$8,440	$118,740
	OSB114	BLM Polygon	Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	OSB115	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	OSB116	BLM Polygon	Upland waste rock	C02a	$26,100	$18,300	$44,400	$3,400	$47,800
	WAL006	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	WAL033	BLM Polygon	Floodplain sediments	C01b	$459,000	$321,000	$780,000	$0	$780,000
				C08a	$602,000	$421,000	$1,023,000	$84,300	$1,107,300
				HAUL-2	$187,000	$131,000	$318,000	$0	$318,000
	WAL069	BLM Polygon	Upland waste rock	C02a	$20,200	$14,200	$34,400	$2,630	$37,030
	WAL075	BLM Polygon	Upland waste rock	C02a	$7,590	$5,310	$12,900	$986	$13,886
	WAL078	BLM Polygon	Upland waste rock	C02a	$22,800	$15,900	$38,700	$2,960	$41,660
PineCrkSeg01	MAS004	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$322,000	$225,000	$547,000	$1,050,000	$1,597,000
			Upland waste rock	C02a	$71,700	$50,200	$121,900	$9,320	$131,220
	MAS005	BLM Polygon	Upland waste rock	C02a	$24,400	$17,100	$41,500	$3,180	$44,680
	MAS006	BLM Polygon	Floodplain tailings - inactive Facilities	C01	$180,000	$126,000	$306,000	$0	$306,000
				C08a	$743,000	$520,000	$1,263,000	$104,000	$1,367,000
				HAUL-2	$231,000	$161,000	$392,000	$0	$392,000
	MAS007	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$348,000	$243,000	$591,000	$595,000	$1,186,000
			Upland waste rock	C01	$205,000	$144,000	$349,000	$0	$349,000
				C08a	$850,000	$595,000	$1,445,000	$119,000	$1,564,000
				HAUL-2	$264,000	$184,000	$448,000	$0	$448,000
	MAS008	BLM Polygon	Upland waste rock (erosion potential)	C01	$107,000	$74,900	$181,900	$0	$181,900
				C08a	$443,000	$310,000	$753,000	$62,000	$815,000
				HAUL-2	$137,000	$96,100	$233,100	$0	$233,100
	MAS009	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$135,000	$94,400	$229,400	$527,000	$756,400
			Upland waste rock (erosion potential)	C01	$31,800	$22,300	$54,100	$0	$54,100
				C08a	$132,000	$92,200	$224,200	$18,400	$242,600
				HAUL-2	$40,800	$28,600	$69,400	$0	$69,400

TABLE D-38

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	MAS011	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$136,000	$95,300	$231,300	$527,000	$758,300
	MAS012	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock (erosion potential)	C01	$2,140	$1,500	$3,640	$0	$3,640
				C08a	$8,850	$6,200	$15,050	$1,240	$16,290
				HAUL-2	$2,750	$1,920	$4,670	$0	$4,670
	MAS013	BLM Polygon	Upland waste rock (erosion potential)	C01	$20,100	$14,100	$34,200	$0	$34,200
				C08a	$83,200	$58,200	$141,400	$11,600	$153,000
				HAUL-2	$25,800	$18,100	$43,900	$0	$43,900
	MAS014	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Seep	WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland tailings	C01	$342	$240	$582	$0	$582
				C08a	$1,420	$991	$2,411	$198	$2,609
				HAUL-2	$439	$307	$746	$0	$746
			Upland waste rock	C01	$131,000	$92,000	$223,000	$0	$223,000
				C07	$452,000	$316,000	$768,000	$99,300	$867,300
	MAS015	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$152,000	$106,000	$258,000	$528,000	$786,000
			Upland waste rock (erosion potential)	C01	$4,280	$3,000	$7,280	$0	$7,280
				C08a	$17,700	$12,400	$30,100	$2,480	$32,580
				HAUL-2	$5,490	$3,840	$9,330	$0	$9,330
	MAS016	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$135,000	$94,400	$229,400	$527,000	$756,400
			Upland waste rock (erosion potential)	C01	$99,600	$69,700	$169,300	$0	$169,300
				C08a	$412,000	$288,000	$700,000	$57,700	$757,700
				HAUL-2	$128,000	$89,500	$217,500	$0	$217,500
	MAS017	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock (erosion potential)	C01	$268,000	$188,000	$456,000	$0	$456,000
				C08a	$1,110,000	$776,000	$1,886,000	$155,000	$2,041,000
				HAUL-2	$344,000	$241,000	$585,000	$0	$585,000
	MAS018	BLM Polygon	Upland waste rock (erosion potential)	C01	$11,600	$8,090	$19,690	$0	$19,690
				C08a	$47,800	$33,500	$81,300	$6,690	$87,990
				HAUL-2	$14,800	$10,400	$25,200	$0	$25,200
	MAS019	BLM Polygon	Floodplain waste rock	C01	$4,280	$3,000	$7,280	$0	$7,280
				C08a	$17,700	$12,400	$30,100	$2,480	$32,580
				HAUL-2	$5,490	$3,840	$9,330	$0	$9,330
	MAS020	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$391,000	$274,000	$665,000	$550,000	$1,215,000
	MAS021	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200

TABLE D-38

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Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				WT02	$389,000	$272,000	$661,000	$1,140,000	$1,801,000
			Upland waste rock (erosion potential)	C01	$4,280	$3,000	$7,280	$0	$7,280
				C08a	$17,700	$12,400	$30,100	$2,480	$32,580
				HAUL-2	$5,490	$3,840	$9,330	$0	$9,330
	MAS022	BLM Polygon	Floodplain waste rock	C01	$205,000	$144,000	$349,000	$0	$349,000
				C08a	$850,000	$595,000	$1,445,000	$119,000	$1,564,000
				HAUL-2	$264,000	$184,000	$448,000	$0	$448,000
	MAS023	BLM Polygon	Upland waste rock (erosion potential)	C01	$4,280	$3,000	$7,280	$0	$7,280
				C08a	$17,700	$12,400	$30,100	$2,480	$32,580
				HAUL-2	$5,490	$3,840	$9,330	$0	$9,330
	MAS025	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$714,000	$500,000	$1,214,000	$661,000	$1,875,000
	MAS025	BLM Polygon	Floodplain waste rock (intermixed tailings)	C01	$150,000	$105,000	$255,000	$0	$255,000
				C08a	$620,000	$434,000	$1,054,000	$86,700	$1,140,700
				HAUL-2	$192,000	$135,000	$327,000	$0	$327,000
	MAS027	BLM Polygon	Floodplain waste rock	C01	$30,000	$21,000	$51,000	$0	$51,000
				C08a	$124,000	$86,700	$210,700	$17,300	$228,000
				HAUL-2	$38,400	$26,900	$65,300	$0	$65,300
	MAS028	BLM Polygon	Upland waste rock (erosion potential)	C01	$46,200	$32,400	$78,600	$0	$78,600
				C08a	$191,000	$134,000	$325,000	$26,800	$351,800
				HAUL-2	$59,300	$41,500	$100,800	$0	$100,800
			Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$139,000	$97,000	$236,000	$528,000	$764,000
	MAS029	BLM Polygon	Upland waste rock (intermixed tailings)	C01	$3,000	$2,100	$5,100	$0	$5,100
				C08a	$12,400	$8,670	$21,070	$1,730	$22,800
				HAUL-2	$3,840	$2,690	$6,530	$0	$6,530
	MAS030	BLM Polygon	Upland waste rock (erosion potential)	C01	$28,800	$20,100	$48,900	$0	$48,900
				C08a	$119,000	$83,300	$202,300	$16,700	$219,000
				HAUL-2	$36,900	$25,800	$62,700	$0	$62,700
	MAS031	BLM Polygon	Upland waste rock (erosion potential)	C01	$18,500	$12,900	$31,400	$0	$31,400
				C08a	$76,500	$53,500	$130,000	$10,700	$140,700
				HAUL-2	$23,700	$16,600	$40,300	$0	$40,300
	MAS032	BLM Polygon	Upland waste rock (erosion potential)	C01	$342	$240	$582	$0	$582
				C08a	$1,420	$991	$2,411	$198	$2,609
				HAUL-2	$439	$307	$746	$0	$746
	MAS033	BLM Polygon	Upland waste rock (erosion potential)	C01	$20,500	$14,400	$34,900	$0	$34,900
				C08a	$85,000	$59,500	$144,500	$11,900	$156,400
				HAUL-2	$26,400	$18,400	$44,800	$0	$44,800
	MAS034	BLM Polygon	Upland waste rock	C02a	$12,600	$8,850	$21,450	$1,640	$23,090
	MAS035	BLM Polygon	Upland waste rock (erosion potential)	C01	$34,200	$24,000	$58,200	$0	$58,200
				C08a	$142,000	$99,100	$241,100	$19,800	$260,900
				HAUL-2	$43,900	$30,700	$74,600	$0	$74,600

TABLE D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	MAS036	BLM Polygon	Floodplain tailings	C01	$11,600	$8,090	$19,690	$0	$19,690
				C08a	$47,800	$33,500	$81,300	$6,690	$87,990
				HAUL-2	$14,800	$10,400	$25,200	$0	$25,200
	MAS040	BLM Polygon	Floodplain sediments	C01b	$18,600	$13,000	$31,600	$0	$31,600
				C08a	$24,400	$17,100	$41,500	$3,420	$44,920
				HAUL-2	$7,580	$5,300	$12,880	$0	$12,880
	MAS041	BLM Polygon	Floodplain sediments	C01b	$31,600	$22,100	$53,700	$0	$53,700
				C08a	$41,400	$29,000	$70,400	$5,800	$76,200
				HAUL-2	$12,800	$8,990	$21,790	$0	$21,790
	MAS042	BLM Polygon	Floodplain sediments	C01b	$14,600	$10,200	$24,800	$0	$24,800
				C08a	$19,100	$13,400	$32,500	$2,680	$35,180
				HAUL-2	$5,930	$4,150	$10,080	$0	$10,080
	MAS043	BLM Polygon	Floodplain sediments	C01b	$40,500	$28,400	$68,900	$0	$68,900
				C08a	$53,100	$37,200	$90,300	$7,430	$97,730
				HAUL-2	$16,500	$11,500	$28,000	$0	$28,000
	MAS045	BLM Polygon	Floodplain sediments	C01b	$40,500	$28,400	$68,900	$0	$68,900
				C08a	$53,100	$37,200	$90,300	$7,430	$97,730
				HAUL-2	$16,500	$11,500	$28,000	$0	$28,000
	MAS046	BLM Polygon	Floodplain sediments	C01b	$322,000	$225,000	$547,000	$0	$547,000
				C08a	$422,000	$296,000	$718,000	$59,100	$777,100
				HAUL-2	$131,000	$91,700	$222,700	$0	$222,700
	MAS048	BLM Polygon	Floodplain tailings	C01	$21,200	$14,800	$36,000	$0	$36,000
				C08a	$87,600	$61,300	$148,900	$12,300	$161,200
				HAUL-2	$27,200	$19,000	$46,200	$0	$46,200
			Upland tailings	C01	$69,800	$48,900	$118,700	$0	$118,700
				C08a	$289,000	$202,000	$491,000	$40,400	$531,400
				HAUL-2	$89,600	$62,700	$152,300	$0	$152,300
	MAS049	BLM Polygon	Floodplain tailings	C01	$154,000	$108,000	$262,000	$0	$262,000
				C08a	$637,000	$446,000	$1,083,000	$89,200	$1,172,200
				HAUL-2	$198,000	$138,000	$336,000	$0	$336,000
	MAS050	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$374,000	$261,000	$635,000	$1,150,000	$1,785,000
			Floodplain waste rock (intermixed tailings)	C01	$91,600	$64,100	$155,700	$0	$155,700
				C08a	$379,000	$265,000	$644,000	$53,000	$697,000
				HAUL-2	$117,000	$82,200	$199,200	$0	$199,200
	MAS051	BLM Polygon	Upland waste rock	C02b	$38,400	$26,900	$65,300	$4,990	$70,290
	MAS052	BLM Polygon	Upland waste rock (erosion potential)	C01	$22,600	$15,800	$38,400	$0	$38,400
				C08a	$93,500	$65,400	$158,900	$13,100	$172,000
				HAUL-2	$29,000	$20,300	$49,300	$0	$49,300
	MAS053	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869

TABLE D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	MAS054	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$184,000	$129,000	$313,000	$538,000	$851,000
			Floodplain waste rock	C01	$45,200	$31,600	$76,800	$0	$76,800
				C08a	$187,000	$131,000	$318,000	$26,200	$344,200
				HAUL-2	$58,000	$40,600	$98,600	$0	$98,600
	MAS055	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	MAS056	BLM Polygon	Upland waste rock	C02b	$31,700	$22,200	$53,900	$4,120	$58,020
	MAS057	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	MAS058	BLM Polygon	Upland waste rock	C02a	$25,300	$17,700	$43,000	$3,290	$46,290
	MAS059	BLM Polygon	Upland waste rock	C02a	$23,600	$16,500	$40,100	$3,070	$43,170
	MAS060	BLM Polygon	Upland waste rock	C02b	$45,100	$31,600	$76,700	$5,860	$82,560
	MAS061	BLM Polygon	Upland waste rock	C02a	$26,100	$18,300	$44,400	$3,400	$47,800
	MAS062	BLM Polygon	Upland waste rock	C02b	$38,400	$26,900	$65,300	$4,990	$70,290
	MAS063	BLM Polygon	Upland waste rock	C02a	$12,600	$8,850	$21,450	$1,640	$23,090
	MAS065	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	MAS067	BLM Polygon	Upland waste rock	C02a	$30,300	$21,200	$51,500	$3,950	$55,450
	MAS068	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	MAS069	BLM Polygon	Upland waste rock	C02a	$159,000	$112,000	$271,000	$20,700	$291,700
	MAS072	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	MAS075	BLM Polygon	Upland waste rock	C02a	$16,000	$11,200	$27,200	$2,080	$29,280
	MAS076	BLM Polygon	Upland waste rock	C02a	$37,900	$26,600	$64,500	$4,930	$69,430
	MAS077	BLM Polygon	Upland waste rock	C02a	$91,900	$64,300	$156,200	$11,900	$168,100
	MAS078	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$354,000	$247,000	$601,000	$578,000	$1,179,000
	MAS079	BLM Polygon	Floodplain waste rock	C01	$160,000	$112,000	$272,000	$0	$272,000
	MAS079	BLM Polygon	Floodplain waste rock	C08a	$660,000	$462,000	$1,122,000	$92,400	$1,214,400
				HAUL-2	$205,000	$143,000	$348,000	$0	$348,000
	MAS080	BLM Polygon	Upland waste rock	C02a	$36,200	$25,400	$61,600	$4,710	$66,310
	MAS081	BLM Polygon	Floodplain waste rock	C02a	$177,000	$124,000	$301,000	$23,000	$324,000
	MAS082	BLM Polygon	Upland waste rock	C02b	$104,000	$72,500	$176,500	$13,500	$190,000
	MAS083	BLM Polygon	Upland tailings	C01	$34,900	$24,400	$59,300	$0	$59,300
				C08a	$144,000	$101,000	$245,000	$20,200	$265,200

TABLE D-38

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				HAUL-2	$44,700	$31,300	$76,000	$0	$76,000
			Upland waste rock	C01	$124,000	$86,900	$210,900	$0	$210,900
				C08a	$513,000	$359,000	$872,000	$71,900	$943,900
				HAUL-2	$159,000	$111,000	$270,000	$0	$270,000
	MAS084	BLM Polygon	Floodplain tailings	C01	$128,000	$89,900	$217,900	$0	$217,900
				C08a	$531,000	$372,000	$903,000	$74,300	$977,300
				HAUL-2	$165,000	$115,000	$280,000	$0	$280,000
PineCrkSeg02	TWI001	BLM Polygon	Upland waste rock	C02a	$47,200	$33,000	$80,200	$6,140	$86,340
	TWI002	BLM Polygon	Floodplain waste rock	C01	$24,700	$17,300	$42,000	$0	$42,000
				C08a	$102,000	$71,400	$173,400	$14,300	$187,700
				HAUL-2	$31,600	$22,100	$53,700	$0	$53,700
	TWI003	BLM Polygon	Upland waste rock	C02a	$13,500	$9,440	$22,940	$1,750	$24,690
	TWI004	BLM Polygon	Upland waste rock	C02a	$19,400	$13,600	$33,000	$2,520	$35,520
	TWI005	BLM Polygon	Upland waste rock	C02a	$25,300	$17,700	$43,000	$3,290	$46,290
	TWI006	BLM Polygon	Upland waste rock (erosion potential)	C01	$20,500	$14,400	$34,900	$0	$34,900
				C08a	$85,000	$59,500	$144,500	$11,900	$156,400
				HAUL-2	$26,400	$18,400	$44,800	$0	$44,800
	TWI007	BLM Polygon	Upland waste rock	C02b	$41,800	$29,200	$71,000	$5,430	$76,430
	TWI008	BLM Polygon	Floodplain waste rock	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	TWI009	BLM Polygon	Floodplain waste rock	C01	$27,700	$19,400	$47,100	$0	$47,100
				C08a	$115,000	$80,300	$195,300	$16,100	$211,400
				HAUL-2	$35,600	$24,900	$60,500	$0	$60,500
	TWI010	BLM Polygon	Upland waste rock	C02b	$55,100	$38,600	$93,700	$7,160	$100,860
	TWI011	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	TWI012	BLM Polygon	Floodplain waste rock	C01	$16,400	$11,500	$27,900	$0	$27,900
				C08a	$68,000	$47,600	$115,600	$9,520	$125,120
				HAUL-2	$21,100	$14,800	$35,900	$0	$35,900
	TWI013	BLM Polygon	Upland waste rock	C01	$32,900	$23,000	$55,900	$0	$55,900
				C08a	$136,000	$95,200	$231,200	$19,000	$250,200
				HAUL-2	$42,200	$29,500	$71,700	$0	$71,700
	TWI014	BLM Polygon	Floodplain waste rock	C01	$25,700	$18,000	$43,700	$0	$43,700
				C08a	$106,000	$74,300	$180,300	$14,900	$195,200
				HAUL-2	$32,900	$23,100	$56,000	$0	$56,000
	TWI015	BLM Polygon	Upland waste rock	C02b	$53,400	$37,400	$90,800	$6,950	$97,750
	TWI016	BLM Polygon	Upland waste rock	C02b	$41,800	$29,200	$71,000	$5,430	$76,430
	TWI017	BLM Polygon	Upland waste rock	C02a	$22,800	$15,900	$38,700	$2,960	$41,660
	TWI018	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516

TABLE D-38

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	TWI019	BLM Polygon	Upland waste rock	C02b	$55,100	$38,600	$93,700	$7,160	$100,860
	TWI020	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	TWI021	BLM Polygon	Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	TWI022	BLM Polygon	Upland waste rock	C02a	$61,500	$43,100	$104,600	$8,000	$112,600
	TWI023	BLM Polygon	Upland waste rock	C02a	$42,200	$29,500	$71,700	$5,480	$77,180
	TWI024	BLM Polygon	Upland waste rock	C02a	$35,400	$24,800	$60,200	$4,600	$64,800
	TWI025	BLM Polygon	Upland waste rock	C02a	$25,300	$17,700	$43,000	$3,290	$46,290
	TWI026	BLM Polygon	Upland waste rock	C02a	$116,000	$81,400	$197,400	$15,100	$212,500
	TWI027	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	TWI028	BLM Polygon	Upland waste rock	C02b	$30,100	$21,000	$51,100	$3,910	$55,010
	TWI029	BLM Polygon	Upland waste rock	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	TWI030	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
PineCrkSeg03	KLW072	BLM Polygon	Upland waste rock	C02a	$87,700	$61,400	$149,100	$11,400	$160,500
	KLW073	BLM Polygon	Upland waste rock	C01	$36,000	$25,200	$61,200	$0	$61,200
				C08a	$149,000	$104,000	$253,000	$20,800	$273,800
				HAUL-2	$46,100	$32,300	$78,400	$0	$78,400
	KLW075	BLM Polygon	Floodplain waste rock	C01	$72,900	$51,100	$124,000	$0	$124,000
				C08a	$302,000	$211,000	$513,000	$42,200	$555,200
				HAUL-2	$93,500	$65,500	$159,000	$0	$159,000
	KLW077	BLM Polygon	Floodplain waste rock	C01	$47,300	$33,100	$80,400	$0	$80,400
				C08a	$195,000	$137,000	$332,000	$27,400	$359,400
				HAUL-2	$60,600	$42,400	$103,000	$0	$103,000
	KLW079	BLM Polygon	Floodplain waste rock	C01	$41,100	$28,800	$69,900	$0	$69,900
				C08a	$170,000	$119,000	$289,000	$23,800	$312,800
				HAUL-2	$52,700	$36,900	$89,600	$0	$89,600
	KLW080	BLM Polygon	Upland waste rock	C01	$30,800	$21,600	$52,400	$0	$52,400
				C07	$106,000	$74,100	$180,100	$23,300	$203,400
	KLW081	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$156,000	$109,000	$265,000	$532,000	$797,000
	KLW082	BLM Polygon	Floodplain waste rock	C01	$34,900	$24,400	$59,300	$0	$59,300
				C08a	$144,000	$101,000	$245,000	$20,200	$265,200
				HAUL-2	$44,800	$31,400	$76,200	$0	$76,200
	KLW083	BLM Polygon	Floodplain waste rock	C01	$59,600	$41,700	$101,300	$0	$101,300

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Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				C08a	$246,000	$172,000	$418,000	$34,500	$452,500
				HAUL-2	$76,400	$53,500	$129,900	$0	$129,900
	KLW084	BLM Polygon	Upland waste rock	C02a	$28,700	$20,100	$48,800	$3,730	$52,530
	KLW085	BLM Polygon	Floodplain waste rock	C01	$61,600	$43,100	$104,700	$0	$104,700
				C08a	$255,000	$178,000	$433,000	$35,700	$468,700
				HAUL-2	$79,100	$55,300	$134,400	$0	$134,400
	MAS001	BLM Polygon	Upland waste rock	C02a	$91,000	$63,700	$154,700	$11,800	$166,500
	MAS003	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$152,000	$106,000	$258,000	$532,000	$790,000
			Upland waste rock (intermixed tailings)	C06	$314,000	$220,000	$534,000	$72,200	$606,200
	MAS064	BLM Polygon	Upland waste rock	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	MAS066	BLM Polygon	Upland waste rock	C01	$856	$599	$1,455	$0	$1,455
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	PC03-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$248,000	$174,000	$422,000	$74,400	$496,400
				CD-AVG	$84,500	$59,100	$143,600	$25,300	$168,900
				FP/RP-AVG	$313,000	$219,000	$532,000	$56,300	$588,300
				OFFCH-AVG	$792,000	$554,000	$1,346,000	$143,000	$1,489,000
				VBS-AVG	$106,000	$74,000	$180,000	$31,700	$211,700
	PC03-2	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$201,000	$141,000	$342,000	$60,400	$402,400
				CD-AVG	$45,300	$31,700	$77,000	$13,600	$90,600
				FP/RP-AVG	$265,000	$186,000	$451,000	$47,800	$498,800
				OFFCH-AVG	$679,000	$475,000	$1,154,000	$122,000	$1,276,000
				VBS-AVG	$85,700	$60,000	$145,700	$25,700	$171,400
	PC03-3	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$122,000	$85,400	$207,400	$36,600	$244,000
				CD-AVG	$20,600	$14,400	$35,000	$6,180	$41,180
				FP/RP-AVG	$381,000	$267,000	$648,000	$68,600	$716,600
				VBS-AVG	$52,000	$36,400	$88,400	$15,600	$104,000
UpperSFCDRSeg	PIPEUG	General Feature	Source General Information	PIPE-1	$332,000	$232,000	$564,000	$26,600	$590,600
				PIPE-2	$12,900	$9,050	$21,950	$1,030	$22,980
				PIPE-3	$6,420,000	$4,490,000	$10,910,000	$513,000	$11,423,000
				PIPE-4	$5,080,000	$3,560,000	$8,640,000	$406,000	$9,046,000
UpperSFCDRSeg01	BUR136	BLM Polygon	Upland waste rock	C02a	$25,300	$17,700	$43,000	$3,290	$46,290
	BUR137	BLM Polygon	Upland waste rock	C02a	$27,000	$18,900	$45,900	$3,510	$49,410
	LOK001	BLM Polygon	Upland waste rock (erosion potential)	C02a	$109,000	$76,100	$185,100	$14,100	$199,200
	LOK002	BLM Polygon	Upland waste rock (erosion potential)	C02a	$107,000	$74,900	$181,900	$13,900	$195,800
	LOK003	BLM Polygon	Upland waste rock	C02a	$20,200	$14,200	$34,400	$2,630	$37,030
	LOK004	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$521,000	$365,000	$886,000	$1,210,000	$2,096,000
			Floodplain waste rock	C01	$262,000	$183,000	$445,000	$0	$445,000
				C08a	$1,080,000	$758,000	$1,838,000	$152,000	$1,990,000
				HAUL-2	$336,000	$235,000	$571,000	$0	$571,000

TABLE D-38

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	LOK005	BLM Polygon	Upland waste rock (erosion potential)	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	LOK006	BLM Polygon	Floodplain waste rock	C01	$26,700	$18,700	$45,400	$0	$45,400
				C08a	$110,000	$77,300	$187,300	$15,500	$202,800
				HAUL-2	$34,300	$24,000	$58,300	$0	$58,300
	LOK007	BLM Polygon	Upland waste rock (erosion potential)	C01	$27,700	$19,400	$47,100	$0	$47,100
				C07	$95,300	$66,700	$162,000	$21,000	$183,000
	LOK008	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$45,700	$170,500
			Floodplain waste rock	C01	$39,000	$27,300	$66,300	$0	$66,300
				C07	$134,000	$93,800	$227,800	$29,500	$257,300
	LOK009	BLM Polygon	Floodplain waste rock	C01	$94,500	$66,200	$160,700	$0	$160,700
				C07	$325,000	$227,000	$552,000	$71,400	$623,400
	LOK010	BLM Polygon	Floodplain waste rock	C01	$14,400	$10,100	$24,500	$0	$24,500
				C08a	$59,500	$41,600	$101,100	$8,330	$109,430
				HAUL-2	$18,400	$12,900	$31,300	$0	$31,300
	LOK011	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$3,620,000	$3,870,000	$7,490,000	$2,630,000	$10,120,000
			Floodplain waste rock	C01	$235,000	$165,000	$400,000	$0	$400,000
				C07	$809,000	$566,000	$1,375,000	$178,000	$1,553,000
	LOK012	BLM Polygon	Upland waste rock	C02a	$122,000	$85,600	$207,600	$15,900	$223,500
	LOK013	BLM Polygon	Upland waste rock	C02a	$108,000	$75,500	$183,500	$14,000	$197,500
	LOK014	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock	C02a	$40,500	$28,300	$68,800	$5,260	$74,060
	LOK015	BLM Polygon	Upland waste rock	C02a	$10,100	$7,080	$17,180	$1,320	$18,500
	LOK016	BLM Polygon	Upland waste rock	C02a	$69,100	$48,400	$117,500	$8,990	$126,490
	LOK017	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$159,000	$111,000	$270,000	$532,000	$802,000
			Floodplain waste rock	C01	$133,000	$92,900	$225,900	$0	$225,900
				C08a	$549,000	$384,000	$933,000	$76,800	$1,009,800
				HAUL-2	$170,000	$119,000	$289,000	$0	$289,000
	LOK018	BLM Polygon	Upland waste rock	C02a	$47,200	$33,000	$80,200	$6,140	$86,340
	LOK019	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$134,000	$93,900	$227,900	$527,000	$754,900
			Upland waste rock	C02b	$110,000	$77,200	$187,200	$14,300	$201,500
	LOK020	BLM Polygon	Upland waste rock	C02a	$45,500	$31,900	$77,400	$5,920	$83,320
	LOK021	BLM Polygon	Upland waste rock	C02a	$96,100	$67,300	$163,400	$12,500	$175,900
	LOK022	BLM Polygon	Upland waste rock	C02a	$124,000	$86,700	$210,700	$16,100	$226,800
	LOK024	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock	C02a	$111,000	$77,900	$188,900	$14,500	$203,400
	LOK025	BLM Polygon	Upland waste rock	C02a	$32,000	$22,400	$54,400	$4,160	$58,560

TABLE D-38

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	LOK026	BLM Polygon	Upland waste rock	C02a	$28,700	$20,100	$48,800	$3,730	$52,530
	LOK027	BLM Polygon	Upland waste rock	C02a	$16,000	$11,200	$27,200	$2,080	$29,280
	LOK028	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock	C02a	$38,800	$27,100	$65,900	$5,040	$70,940
	LOK041	BLM Polygon	Upland waste rock	C02a	$79,200	$55,500	$134,700	$10,300	$145,000
	LOK044	BLM Polygon	Upland waste rock	C02b	$127,000	$88,800	$215,800	$16,500	$232,300
	LOK045	BLM Polygon	Upland waste rock	C02a	$31,200	$21,800	$53,000	$4,050	$57,050
	LOK047	BLM Polygon	Upland waste rock	C02a	$191,000	$133,000	$324,000	$24,800	$348,800
	LOK048	BLM Polygon	Floodplain waste rock	C01	$27,700	$19,400	$47,100	$0	$47,100
				C07	$95,300	$66,700	$162,000	$21,000	$183,000
	LOK050	BLM Polygon	Upland tailings - inactive facilities	C01	$55,600	$38,900	$94,500	$0	$94,500
				C08a	$230,000	$161,000	$391,000	$32,200	$423,200
				HAUL-2	$71,400	$50,000	$121,400	$0	$121,400
	LOK051	BLM Polygon	Floodplain artificial fill	C01	$196,000	$137,000	$333,000	$0	$333,000
				C08a	$811,000	$568,000	$1,379,000	$114,000	$1,493,000
				HAUL-2	$252,000	$176,000	$428,000	$0	$428,000
	LOK052	BLM Polygon	Upland waste rock	C02a	$26,100	$18,300	$44,400	$3,400	$47,800
	LOK053	BLM Polygon	Upland waste rock (erosion potential)	C02a	$26,100	$18,300	$44,400	$3,400	$47,800
	LOK054	BLM Polygon	Upland waste rock	C02a	$11,000	$7,670	$18,670	$1,420	$20,090
	MUL001	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$18,300	$19,600	$37,900	$13,900	$51,800
			Floodplain waste rock	C01	$323,000	$226,000	$549,000	$0	$549,000
				C08a	$1,330,000	$934,000	$2,264,000	$187,000	$2,451,000
				HAUL-2	$414,000	$290,000	$704,000	$0	$704,000
	MUL002	BLM Polygon	Upland tailings	C01	$98,400	$68,900	$167,300	$0	$167,300
				C08a	$407,000	$285,000	$692,000	$57,000	$749,000
				HAUL-2	$126,000	$88,400	$214,400	$0	$214,400
	MUL003	BLM Polygon	Upland waste rock	C02a	$231,000	$162,000	$393,000	$30,000	$423,000
	MUL004	BLM Polygon	Floodplain waste rock	C01	$84,200	$59,000	$143,200	$0	$143,200
				C08a	$348,000	$244,000	$592,000	$48,800	$640,800
				HAUL-2	$108,000	$75,600	$183,600	$0	$183,600
	MUL005	BLM Polygon	Upland waste rock	C02a	$28,700	$20,100	$48,800	$3,730	$52,530
	MUL006	BLM Polygon	Floodplain waste rock	C01	$75,000	$52,500	$127,500	$0	$127,500
				C08a	$310,000	$217,000	$527,000	$43,400	$570,400
				HAUL-2	$96,200	$67,300	$163,500	$0	$163,500
	MUL007	BLM Polygon	Upland waste rock (erosion potential)	C02a	$80,100	$56,100	$136,200	$10,400	$146,600
	MUL008	BLM Polygon	Floodplain waste rock	C01	$141,000	$98,900	$239,900	$0	$239,900
				C08a	$584,000	$409,000	$993,000	$81,800	$1,074,800
				HAUL-2	$181,000	$127,000	$308,000	$0	$308,000
	MUL009	BLM Polygon	Upland waste rock (erosion potential)	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	MUL010	BLM Polygon	Upland waste rock	C02a	$27,000	$18,900	$45,900	$3,510	$49,410

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	MUL011	BLM Polygon	Upland waste rock	C02a	$12,600	$8,850	$21,450	$1,640	$23,090
	MUL012	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$210,000	$224,000	$434,000	$197,000	$631,000
			Floodplain waste rock	C01	$924,000	$647,000	$1,571,000	$0	$1,571,000
				C07	$3,180,000	$2,220,000	$5,400,000	$699,000	$6,099,000
	MUL013	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$45,700	$170,500
			Upland waste rock (erosion potential)	C02a	$44,700	$31,300	$76,000	$5,810	$81,810
	MUL014	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$1,100,000	$1,170,000	$2,270,000	$832,000	$3,102,000
			Upland waste rock (erosion potential)	C01	$33,900	$23,700	$57,600	$0	$57,600
				C07	$116,000	$81,500	$197,500	$25,600	$223,100
	MUL015	BLM Polygon	Upland waste rock (erosion potential)	C01	$98,400	$68,900	$167,300	$0	$167,300
				C07	$338,000	$237,000	$575,000	$74,400	$649,400
	MUL016	BLM Polygon	Upland waste rock	C02a	$46,400	$32,500	$78,900	$6,030	$84,930
	MUL017	BLM Polygon	Upland waste rock	C02a	$45,500	$31,900	$77,400	$5,920	$83,320
	MUL018	BLM Polygon	Floodplain waste rock	C01	$61,600	$43,100	$104,700	$0	$104,700
				C08a	$255,000	$178,000	$433,000	$35,700	$468,700
				HAUL-2	$79,100	$55,300	$134,400	$0	$134,400
	MUL019	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$558,000	$597,000	$1,155,000	$540,000	$1,695,000
			Buildings & structures	HH-4	$1,690,000	$1,180,000	$2,870,000	$219,000	$3,089,000
			Floodplain tailings	C01	$364,000	$255,000	$619,000	$0	$619,000
				C08a	$1,500,000	$1,050,000	$2,550,000	$211,000	$2,761,000
				HAUL-2	$467,000	$327,000	$794,000	$0	$794,000
			Floodplain waste rock	C01	$1,440,000	$1,010,000	$2,450,000	$0	$2,450,000
				C08a	$5,950,000	$4,170,000	$10,120,000	$833,000	$10,953,000
				HAUL-2	$1,850,000	$1,290,000	$3,140,000	$0	$3,140,000
	MUL020	BLM Polygon	Floodplain sediments (underlying tailings pond)	C11j	$5,090,000	$3,560,000	$8,650,000	$102,000	$8,752,000
			Floodplain tailings - active facilities	C09	$2,710,000	$1,900,000	$4,610,000	$543,000	$5,153,000
			Groundwater	WT01	$30,200	$32,300	$62,500	$9,150	$71,650
	MUL021	BLM Polygon	Floodplain waste rock	C01	$124,000	$87,000	$211,000	$0	$211,000
				C08a	$514,000	$360,000	$874,000	$72,000	$946,000
				HAUL-2	$159,000	$112,000	$271,000	$0	$271,000
	MUL022	BLM Polygon	Upland waste rock (erosion potential)	C02a	$29,500	$20,700	$50,200	$3,840	$54,040
	MUL023	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Floodplain waste rock	C01	$134,000	$93,500	$227,500	$0	$227,500
				C08a	$552,000	$387,000	$939,000	$77,300	$1,016,300
				HAUL-2	$171,000	$120,000	$291,000	$0	$291,000
	MUL024	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000

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			Upland waste rock	C02b	$187,000	$131,000	$318,000	$24,300	$342,300
	MUL025	BLM Polygon	Upland waste rock	C02a	$85,100	$59,600	$144,700	$11,100	$155,800
	MUL026	BLM Polygon	Upland waste rock	C02b	$170,000	$119,000	$289,000	$22,100	$311,100
	MUL027	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$221,000	$155,000	$376,000	$547,000	$923,000
			Upland waste rock	C01	$102,000	$71,200	$173,200	$0	$173,200
				C07	$349,000	$244,000	$593,000	$76,800	$669,800
	MUL028	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$388,000	$272,000	$660,000	$600,000	$1,260,000
			Floodplain waste rock	C01	$437,000	$306,000	$743,000	$0	$743,000
				C07	$1,500,000	$1,050,000	$2,550,000	$330,000	$2,880,000
	MUL029	BLM Polygon	Floodplain waste rock	C01	$87,300	$61,100	$148,400	$0	$148,400
				C07	$300,000	$210,000	$510,000	$66,000	$576,000
	MUL030	BLM Polygon	Floodplain waste rock	C01	$37,000	$25,900	$62,900	$0	$62,900
				C07	$127,000	$88,900	$215,900	$27,900	$243,800
	MUL031	BLM Polygon	Upland waste rock (erosion potential)	C01	$34,900	$24,400	$59,300	$0	$59,300
				C07	$120,000	$84,000	$204,000	$26,400	$230,400
	MUL032	BLM Polygon	Upland waste rock	C02a	$28,700	$20,100	$48,800	$3,730	$52,530
	MUL033	BLM Polygon	Floodplain waste rock	C01	$67,800	$47,500	$115,300	$0	$115,300
				C07	$233,000	$163,000	$396,000	$51,200	$447,200
	MUL034	BLM Polygon	Upland waste rock	C02b	$73,500	$51,400	$124,900	$9,550	$134,450
	MUL035	BLM Polygon	Upland waste rock	C02a	$25,300	$17,700	$43,000	$3,290	$46,290
	MUL036	BLM Polygon	Upland waste rock	C02a	$23,600	$16,500	$40,100	$3,070	$43,170
	MUL037	BLM Polygon	Floodplain sediments	C01b	$595,000	$417,000	$1,012,000	$0	$1,012,000
				C08a	$781,000	$546,000	$1,327,000	$109,000	$1,436,000
				HAUL-2	$242,000	$169,000	$411,000	$0	$411,000
			Floodplain sediments (underlying tailings pond)	C11j	$5,410,000	$3,780,000	$9,190,000	$108,000	$9,298,000
			Floodplain tailings - active facilities	C09	$2,470,000	$1,730,000	$4,200,000	$494,000	$4,694,000
			Groundwater	WT01	$30,200	$32,300	$62,500	$9,150	$71,650
	MUL038	BLM Polygon	Floodplain tailings	C01	$55,600	$38,900	$94,500	$0	$94,500
				C08a	$230,000	$161,000	$391,000	$32,200	$423,200
				HAUL-2	$71,400	$50,000	$121,400	$0	$121,400
			Floodplain waste rock	C01	$285,000	$199,000	$484,000	$0	$484,000
				C08a	$1,180,000	$824,000	$2,004,000	$165,000	$2,169,000
				HAUL-2	$365,000	$255,000	$620,000	$0	$620,000
	MUL040	BLM Polygon	Upland waste rock	C02a	$16,000	$11,200	$27,200	$2,080	$29,280
	MUL041	BLM Polygon	Upland waste rock	C02a	$314,000	$220,000	$534,000	$40,800	$574,800
	MUL042	BLM Polygon	Floodplain waste rock	C01	$59,600	$41,700	$101,300	$0	$101,300
				C07	$205,000	$143,000	$348,000	$45,000	$393,000
	MUL043	BLM Polygon	Floodplain waste rock	C01	$75,000	$52,500	$127,500	$0	$127,500
				C07	$258,000	$180,000	$438,000	$56,700	$494,700
	MUL045	BLM Polygon	Floodplain waste rock	C01	$118,000	$82,700	$200,700	$0	$200,700

TABLE D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				C07	$406,000	$284,000	$690,000	$89,300	$779,300
	MUL046	BLM Polygon	Upland waste rock	C02a	$29,500	$20,700	$50,200	$3,840	$54,040
	MUL047	BLM Polygon	Floodplain waste rock	C01	$23,600	$16,500	$40,100	$0	$40,100
				C07	$81,100	$56,800	$137,900	$17,900	$155,800
	MUL048	BLM Polygon	Floodplain waste rock	C01	$91,400	$64,000	$155,400	$0	$155,400
				C08a	$378,000	$265,000	$643,000	$52,900	$695,900
				HAUL-2	$117,000	$82,100	$199,100	$0	$199,100
	MUL049	BLM Polygon	Upland waste rock (erosion potential)	C02a	$25,300	$17,700	$43,000	$3,290	$46,290
	MUL050	BLM Polygon	Upland waste rock	C02a	$31,200	$21,800	$53,000	$4,050	$57,050
	MUL051	BLM Polygon	Floodplain waste rock	C01	$123,000	$86,300	$209,300	$0	$209,300
				C07	$423,000	$296,000	$719,000	$93,100	$812,100
	MUL052	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$390,000	$273,000	$663,000	$1,160,000	$1,823,000
			Floodplain waste rock	C01	$64,200	$44,900	$109,100	$0	$109,100
				C07	$221,000	$154,000	$375,000	$48,500	$423,500
	MUL053	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$667,000	$467,000	$1,134,000	$1,330,000	$2,464,000
			Upland waste rock (erosion potential)	C01	$312,000	$219,000	$531,000	$0	$531,000
				C07	$1,070,000	$751,000	$1,821,000	$236,000	$2,057,000
	MUL054	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$173,000	$121,000	$294,000	$536,000	$830,000
			Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C07	$2,940	$2,060	$5,000	$647	$5,647
	MUL055	BLM Polygon	Upland waste rock	C02a	$220,000	$154,000	$374,000	$28,600	$402,600
	MUL056	BLM Polygon	Upland waste rock (erosion potential)	C02a	$29,500	$20,700	$50,200	$3,840	$54,040
	MUL057	BLM Polygon	Upland waste rock (erosion potential)	C02a	$66,600	$46,600	$113,200	$8,660	$121,860
	MUL058	BLM Polygon	Floodplain sediments	C01b	$1,890,000	$1,320,000	$3,210,000	$0	$3,210,000
				C08a	$2,480,000	$1,730,000	$4,210,000	$347,000	$4,557,000
				HAUL-2	$769,000	$538,000	$1,307,000	$0	$1,307,000
			Floodplain sediments (underlying tailings pond)	C11j	$9,700,000	$6,790,000	$16,490,000	$194,000	$16,684,000
			Floodplain tailings - active facilities	C09	$8,540,000	$5,980,000	$14,520,000	$1,710,000	$16,230,000
			Groundwater	WT01	$30,200	$32,300	$62,500	$9,150	$71,650
	MUL059	BLM Polygon	Floodplain waste rock	C01	$96,600	$67,600	$164,200	$0	$164,200
				C08a	$399,000	$280,000	$679,000	$55,900	$734,900
				HAUL-2	$124,000	$86,700	$210,700	$0	$210,700
	MUL060	BLM Polygon	Floodplain waste rock	C01	$21,600	$15,100	$36,700	$0	$36,700
				C08a	$89,200	$62,400	$151,600	$12,500	$164,100
				HAUL-2	$27,700	$19,400	$47,100	$0	$47,100
	MUL061	BLM Polygon	Upland waste rock	C02a	$29,500	$20,700	$50,200	$3,840	$54,040
	MUL062	BLM Polygon	Upland waste rock	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	MUL063	BLM Polygon	Floodplain waste rock	C01	$21,600	$15,100	$36,700	$0	$36,700
				C08a	$89,200	$62,400	$151,600	$12,500	$164,100

TABLE D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				HAUL-2	$27,700	$19,400	$47,100	$0	$47,100
	MUL064	BLM Polygon	Upland waste rock	C02a	$47,200	$33,000	$80,200	$6,140	$86,340
	MUL065	BLM Polygon	Floodplain waste rock	C01	$31,800	$22,300	$54,100	$0	$54,100
				C08a	$132,000	$92,200	$224,200	$18,400	$242,600
				HAUL-2	$40,800	$28,600	$69,400	$0	$69,400
	MUL066	BLM Polygon	Upland waste rock	C02a	$79,200	$55,500	$134,700	$10,300	$145,000
	MUL067	BLM Polygon	Upland waste rock	C02a	$113,000	$79,100	$192,100	$14,700	$206,800
	MUL068	BLM Polygon	Upland waste rock	C02a	$30,300	$21,200	$51,500	$3,950	$55,450
	MUL069	BLM Polygon	Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	MUL071	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
			Floodplain waste rock	C01	$10,700	$7,490	$18,190	$0	$18,190
				C08a	$44,300	$31,000	$75,300	$6,200	$81,500
				HAUL-2	$13,700	$9,610	$23,310	$0	$23,310
	MUL072	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$311,000	$218,000	$529,000	$1,040,000	$1,569,000
			Upland waste rock	C02a	$64,900	$45,400	$110,300	$8,440	$118,740
	MUL073	BLM Polygon	Upland waste rock	C02a	$174,000	$122,000	$296,000	$22,600	$318,600
	MUL074	BLM Polygon	Upland waste rock	C02a	$38,800	$27,100	$65,900	$5,040	$70,940
	MUL075	BLM Polygon	Upland waste rock	C02a	$25,300	$17,700	$43,000	$3,290	$46,290
	MUL076	BLM Polygon	Upland waste rock	C02a	$29,500	$20,700	$50,200	$3,840	$54,040
	MUL077	BLM Polygon	Upland waste rock	C02a	$20,200	$14,200	$34,400	$2,630	$37,030
	MUL078	BLM Polygon	Upland waste rock	C02a	$96,100	$67,300	$163,400	$12,500	$175,900
	MUL079	BLM Polygon	Upland waste rock	C02a	$75,000	$52,500	$127,500	$9,750	$137,250
	MUL080	BLM Polygon	Upland waste rock	C02a	$28,700	$20,100	$48,800	$3,730	$52,530
	MUL081	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$164,000	$115,000	$279,000	$536,000	$815,000
			Floodplain waste rock	C01	$34,200	$24,000	$58,200	$0	$58,200
				C08a	$142,000	$99,100	$241,100	$19,800	$260,900
				HAUL-2	$43,900	$30,700	$74,600	$0	$74,600
	MUL082	BLM Polygon	Upland waste rock	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	MUL083	BLM Polygon	Floodplain waste rock	C01	$65,700	$46,000	$111,700	$0	$111,700
				C08a	$272,000	$190,000	$462,000	$38,100	$500,100
				HAUL-2	$84,300	$59,000	$143,300	$0	$143,300
	MUL084	BLM Polygon	Upland waste rock	C02a	$95,300	$66,700	$162,000	$12,400	$174,400
	MUL103	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Floodplain waste rock	C01	$27,000	$18,900	$45,900	$0	$45,900
				C08a	$112,000	$78,100	$190,100	$15,600	$205,700
				HAUL-2	$34,600	$24,200	$58,800	$0	$58,800
	MUL107	BLM Polygon	Upland waste rock	C02a	$11,000	$7,670	$18,670	$1,420	$20,090
	MUL108	BLM Polygon	Upland waste rock	C02a	$11,800	$8,260	$20,060	$1,530	$21,590
	MUL109	BLM Polygon	Upland waste rock	C02a	$14,300	$10,000	$24,300	$1,860	$26,160

TABLE D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	MUL110	BLM Polygon	Upland waste rock	C02a	$11,800	$8,260	$20,060	$1,530	$21,590
	MUL111	BLM Polygon	Upland waste rock	C02a	$16,000	$11,200	$27,200	$2,080	$29,280
	MUL112	BLM Polygon	Upland waste rock	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	MUL113	BLM Polygon	Upland waste rock	C02a	$17,700	$12,400	$30,100	$2,300	$32,400
	MUL114	BLM Polygon	Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	MUL115	BLM Polygon	Upland waste rock	C02a	$20,200	$14,200	$34,400	$2,630	$37,030
	MUL116	BLM Polygon	Upland waste rock	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	MUL117	BLM Polygon	Upland waste rock	C02a	$23,600	$16,500	$40,100	$3,070	$43,170
	MUL118	BLM Polygon	Upland waste rock	C02a	$27,000	$18,900	$45,900	$3,510	$49,410
	MUL119	BLM Polygon	Upland waste rock (erosion potential)	C02a	$23,600	$16,500	$40,100	$3,070	$43,170
	MUL120	BLM Polygon	Floodplain waste rock	C01	$2,400	$1,680	$4,080	$0	$4,080
				C08a	$9,910	$6,940	$16,850	$1,390	$18,240
				HAUL-2	$3,070	$2,150	$5,220	$0	$5,220
	MUL121	BLM Polygon	Upland waste rock	C02a	$13,500	$9,440	$22,940	$1,750	$24,690
	MUL122	BLM Polygon	Upland waste rock	C02a	$17,700	$12,400	$30,100	$2,300	$32,400
	MUL123	BLM Polygon	Upland waste rock	C02a	$12,600	$8,850	$21,450	$1,640	$23,090
	MUL124	BLM Polygon	Upland waste rock	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	MUL125	BLM Polygon	Upland waste rock	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	MUL126	BLM Polygon	Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	MUL127	BLM Polygon	Upland waste rock	C02a	$19,400	$13,600	$33,000	$2,520	$35,520
	MUL128	BLM Polygon	Upland waste rock	C02a	$16,000	$11,200	$27,200	$2,080	$29,280
	MUL129	BLM Polygon	Floodplain waste rock	C01	$114,000	$79,800	$193,800	$0	$193,800
				C08a	$472,000	$330,000	$802,000	$66,000	$868,000
				HAUL-2	$146,000	$102,000	$248,000	$0	$248,000
	MUL130	BLM Polygon	Upland waste rock	C02a	$149,000	$104,000	$253,000	$19,400	$272,400
	MUL131	BLM Polygon	Upland tailings	C01	$28,200	$19,800	$48,000	$0	$48,000
				C08a	$117,000	$81,800	$198,800	$16,400	$215,200
				HAUL-2	$36,200	$25,400	$61,600	$0	$61,600
	MUL132	BLM Polygon	Upland tailings	C01	$7,700	$5,390	$13,090	$0	$13,090
				C08a	$31,900	$22,300	$54,200	$4,460	$58,660
				HAUL-2	$9,880	$6,920	$16,800	$0	$16,800
	MUL133	BLM Polygon	Upland waste rock	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	MUL134	BLM Polygon	Upland waste rock	C02a	$48,900	$34,200	$83,100	$6,360	$89,460
	MUL135	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C07	$2,940	$2,060	$5,000	$647	$5,647
	MUL136	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C07	$2,940	$2,060	$5,000	$647	$5,647
	MUL137	BLM Polygon	Upland waste rock	C02a	$30,300	$21,200	$51,500	$3,950	$55,450
	MUL138	BLM Polygon	Upland waste rock	C02a	$68,300	$47,800	$116,100	$8,880	$124,980
	MUL139	BLM Polygon	Upland waste rock (erosion potential)	C01	$856	$599	$1,455	$0	$1,455
				C07	$2,940	$2,060	$5,000	$647	$5,647
	MUL140	BLM Polygon	Upland waste rock	C02a	$14,300	$10,000	$24,300	$1,860	$26,160

TABLE D-38

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	MUL141	BLM Polygon	Floodplain sediments	C01b	$130,000	$91,200	$221,200	$0	$221,200
				C08a	$171,000	$120,000	$291,000	$23,900	$314,900
				HAUL-2	$53,000	$37,100	$90,100	$0	$90,100
	MUL142	BLM Polygon	Floodplain sediments	C01b	$463,000	$324,000	$787,000	$0	$787,000
				C08a	$607,000	$425,000	$1,032,000	$85,000	$1,117,000
				HAUL-2	$188,000	$132,000	$320,000	$0	$320,000
	MUL143	BLM Polygon	Upland waste rock	C02a	$30,300	$21,200	$51,500	$3,950	$55,450
	MUL144	BLM Polygon	Upland waste rock	C02a	$20,200	$14,200	$34,400	$2,630	$37,030
	MUL145	BLM Polygon	Floodplain sediments	C01b	$56,700	$39,700	$96,400	$0	$96,400
				C08a	$74,300	$52,000	$126,300	$10,400	$136,700
				HAUL-2	$23,100	$16,100	$39,200	$0	$39,200
	MUL146	BLM Polygon	Upland waste rock (erosion potential)	C01	$135,000	$94,200	$229,200	$0	$229,200
				C07	$462,000	$324,000	$786,000	$102,000	$888,000
	MUL147	BLM Polygon	Upland waste rock	C02a	$16,000	$11,200	$27,200	$2,080	$29,280
	MUL148	BLM Polygon	Upland waste rock	C02b	$112,000	$78,300	$190,300	$14,500	$204,800
	MUL149	BLM Polygon	Floodplain sediments	C01b	$76,300	$53,400	$129,700	$0	$129,700
				C08a	$100,000	$70,000	$170,000	$14,000	$184,000
				HAUL-2	$31,000	$21,700	$52,700	$0	$52,700
	MUL150	BLM Polygon	Floodplain sediments	C01b	$204,000	$143,000	$347,000	$0	$347,000
				C08a	$267,000	$187,000	$454,000	$37,400	$491,400
				HAUL-2	$82,900	$58,000	$140,900	$0	$140,900
	MUL151	BLM Polygon	Upland waste rock	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	MUL152	BLM Polygon	Upland waste rock	C02a	$14,300	$10,000	$24,300	$1,860	$26,160
	MUL153	BLM Polygon	Floodplain sediments	C01b	$103,000	$71,800	$174,800	$0	$174,800
				C08a	$135,000	$94,200	$229,200	$18,800	$248,000
				HAUL-2	$41,700	$29,200	$70,900	$0	$70,900
	MUL154	BLM Polygon	Upland waste rock	C02a	$147,000	$103,000	$250,000	$19,100	$269,100
	MUL155	BLM Polygon	Upland waste rock	C02a	$32,000	$22,400	$54,400	$4,160	$58,560
	MUL156	BLM Polygon	Upland waste rock	C02a	$14,300	$10,000	$24,300	$1,860	$26,160
	MUL157	BLM Polygon	Upland waste rock	C02a	$9,270	$6,490	$15,760	$1,210	$16,970
	THO019	BLM Polygon	Upland waste rock	C02a	$28,700	$20,100	$48,800	$3,730	$52,530
	THO020	BLM Polygon	Floodplain waste rock	C01	$29,800	$20,900	$50,700	$0	$50,700
				C08a	$123,000	$86,200	$209,200	$17,200	$226,400
				HAUL-2	$38,200	$26,700	$64,900	$0	$64,900
	THO021	BLM Polygon	Upland waste rock	C02a	$25,300	$17,700	$43,000	$3,290	$46,290
	UG01-1	Bioengineering Reach	BioReach General Characteristics	FP/RP-AVG	$14,200	$9,930	$24,130	$2,550	$26,680
	UG01-4	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$6,220	$4,360	$10,580	$1,870	$12,450
				VBS-AVG	$5,360	$3,750	$9,110	$1,610	$10,720
	UG01-5	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$190,000	$133,000	$323,000	$57,000	$380,000
				CD-AVG	$63,900	$44,700	$108,600	$19,200	$127,800
				FP/RP-AVG	$124,000	$87,100	$211,100	$22,400	$233,500
				VBS-AVG	$81,000	$56,700	$137,700	$24,300	$162,000

TABLE D-38

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	UG01-6	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$171,000	$120,000	$291,000	$51,200	$342,200
				CD-AVG	$61,800	$43,300	$105,100	$18,500	$123,600
				FP/RP-AVG	$485,000	$340,000	$825,000	$87,400	$912,400
				OFFCH-AVG	$1,580,000	$1,110,000	$2,690,000	$285,000	$2,975,000
				VBS-AVG	$135,000	$94,600	$229,600	$40,600	$270,200
	UG01-7	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$98,200	$68,700	$166,900	$29,500	$196,400
				CD-AVG	$53,600	$37,500	$91,100	$16,100	$107,200
				FP/RP-AVG	$281,000	$197,000	$478,000	$50,600	$528,600
				VBS-AVG	$77,700	$54,400	$132,100	$23,300	$155,400
	UG01-8	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$39,800	$27,800	$67,600	$11,900	$79,500
				CD-AVG	$16,500	$11,500	$28,000	$4,940	$32,940
				FP/RP-AVG	$206,000	$144,000	$350,000	$37,000	$387,000
				VBS-AVG	$14,800	$10,400	$25,200	$4,450	$29,650
	UG01-9	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$175,000	$123,000	$298,000	$52,500	$350,500
				CD-AVG	$82,400	$57,700	$140,100	$24,700	$164,800
				FP/RP-AVG	$133,000	$92,900	$225,900	$23,900	$249,800
				VBS-AVG	$139,000	$97,000	$236,000	$41,600	$277,600
	UG01-10	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$150,000	$105,000	$255,000	$45,100	$300,100
				CD-AVG	$63,900	$44,700	$108,600	$19,200	$127,800
				FP/RP-AVG	$156,000	$109,000	$265,000	$28,100	$293,100
				VBS-AVG	$56,000	$39,200	$95,200	$16,800	$112,000
	UG01-11	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$42,700	$29,900	$72,600	$12,800	$85,400
				CD-AVG	$18,500	$13,000	$31,500	$5,560	$37,060
				FP/RP-AVG	$143,000	$100,000	$243,000	$25,800	$268,800
				VBS-AVG	$33,800	$23,700	$57,500	$10,100	$67,600
	UG01-12	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$541,000	$379,000	$920,000	$162,000	$1,082,000
				CD-AVG	$183,000	$128,000	$311,000	$55,000	$366,000
				FP/RP-AVG	$1,160,000	$814,000	$1,974,000	$209,000	$2,183,000
				OFFCH-AVG	$623,000	$436,000	$1,059,000	$112,000	$1,171,000
				VBS-AVG	$231,000	$161,000	$392,000	$69,200	$461,200
	UG01-13	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$297,000	$208,000	$505,000	$89,100	$594,100
				CD-AVG	$101,000	$70,700	$171,700	$30,300	$202,000
				FP/RP-AVG	$65,200	$45,600	$110,800	$11,700	$122,500
				OFFCH-AVG	$503,000	$352,000	$855,000	$90,500	$945,500
				VBS-AVG	$127,000	$88,600	$215,600	$38,000	$253,600
	UG01-14	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$57,600	$40,300	$97,900	$17,300	$115,200
				CD-AVG	$18,500	$13,000	$31,500	$5,560	$37,060
				FP/RP-AVG	$19,000	$13,300	$32,300	$3,410	$35,710
				VBS-AVG	$24,500	$17,200	$41,700	$7,360	$49,060
	UG01-15	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$207,000	$145,000	$352,000	$62,000	$414,000
				CD-AVG	$70,000	$49,000	$119,000	$21,000	$140,000
				FP/RP-AVG	$5,400	$3,780	$9,180	$973	$10,153

TABLE D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
				VBS-AVG	$88,100	$61,700	$149,800	$26,400	$176,200
	UG01-16	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$190,000	$133,000	$323,000	$57,000	$380,000
				CD-AVG	$61,800	$43,300	$105,100	$18,500	$123,600
				FP/RP-AVG	$381,000	$267,000	$648,000	$68,700	$716,700
				VBS-AVG	$150,000	$105,000	$255,000	$45,100	$300,100
	UG01-17	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$386,000	$271,000	$657,000	$116,000	$773,000
				CD-AVG	$152,000	$107,000	$259,000	$45,700	$304,700
				FP/RP-AVG	$1,000,000	$703,000	$1,703,000	$181,000	$1,884,000
				OFFCH-AVG	$831,000	$582,000	$1,413,000	$150,000	$1,563,000
				VBS-AVG	$306,000	$214,000	$520,000	$91,800	$611,800
	UG01-18	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$364,000	$255,000	$619,000	$109,000	$728,000
				CD-AVG	$124,000	$86,500	$210,500	$37,100	$247,600
				FP/RP-AVG	$20,000	$14,000	$34,000	$3,610	$37,610
				VBS-AVG	$155,000	$109,000	$264,000	$46,500	$310,500
	UG01-19	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$59,800	$41,800	$101,600	$17,900	$119,500
				CD-AVG	$14,400	$10,100	$24,500	$4,330	$28,830
				FP/RP-AVG	$37,600	$26,300	$63,900	$6,770	$70,670
				OFFCH-AVG	$46,300	$32,400	$78,700	$8,340	$87,040
				VBS-AVG	$47,300	$33,100	$80,400	$14,200	$94,600
	WAL013	BLM Polygon	Floodplain waste rock	C01	$34,900	$24,400	$59,300	$0	$59,300
				C08a	$144,000	$101,000	$245,000	$20,200	$265,200
				HAUL-2	$44,800	$31,400	$76,200	$0	$76,200
	WAL038	BLM Polygon	Floodplain sediments	C01b	$4,470,000	$3,130,000	$7,600,000	$0	$7,600,000
				C08a	$5,860,000	$4,100,000	$9,960,000	$821,000	$10,781,000
				C11j	$41,300,000	$28,900,000	$70,200,000	$827,000	$71,027,000
				HAUL-2	$1,820,000	$1,270,000	$3,090,000	$0	$3,090,000
	WAL038	BLM Polygon	Groundwater	WT01	$1,820,000	$1,940,000	$3,760,000	$2,750,000	$6,510,000
	WAL068	BLM Polygon	Upland waste rock	C02a	$24,400	$17,100	$41,500	$3,180	$44,680
	WAL076	BLM Polygon	Floodplain waste rock	C01	$175,000	$122,000	$297,000	$0	$297,000
				C08a	$722,000	$506,000	$1,228,000	$101,000	$1,329,000
				HAUL-2	$224,000	$157,000	$381,000	$0	$381,000
	WAL077	BLM Polygon	Floodplain sediments	C01b	$567,000	$397,000	$964,000	$0	$964,000
				C08a	$743,000	$520,000	$1,263,000	$104,000	$1,367,000
				HAUL-2	$231,000	$161,000	$392,000	$0	$392,000

Notes:

This Table does not include Central Treatment Plant (CTP) Sludge Pond Closure costs, these costs will be applied to the Total Alternative Cost.
This Table does not include Roads and Bridges costs, these costs will be applied to the Total Alternative Cost.

O&M = Operations and Maintenance
NPV = Net Present Value

TABLE D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

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

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)

Typical Conceptual Design (TCD) Codes

BSBR-AVG = Bank Stabilization via Revetments - Average Cost
C01 = Excavation (dry)
C01b = Excavation (60% dry/40% wet)
C02a = Regrade/Consolidate/Vegetative Cover: Lower Part of Pile in 100-Year Floodplain
C02b = Regrade/Consolidate/Vegetative Cover: Waste Rock Pile in Stream Valley
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
C11j = Hydraulic Isolation Using Slurry Wall (with drain, 30 ft deep)
C14c = Stream Lining (100 feet wide)
C15b = French Drain (15 feet bgs)
CD-AVG = Current Deflector Average Cost
CD-SED = Current Deflector Sediment Traps
CH REAL-1 = Channel Realignment
FP/RP-AVG = Floodplain and Riparian Replanting - Average Cost
HAUL-2 = Haul to Repository
HH-4 = Millsite Demolition/Disposal
OFFCH-AVG = Off-Channel Hydrologic Feature Average Cost
PIPE-1 = Conveyance Pipeline (6-inch)
PIPE-2 = Conveyance Pipeline (12-inch)
PIPE-3 = Conveyance Pipeline (24-inch)
VBS-AVG = Vegetative Bank Stabilization - Average Cost
WT01 = Centralized High-Density Sludge (HDS) Treatment at Central Treatment Plant (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: 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 D-39

Summary of Total Estimated Costs by Site, Alternative 3+

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

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
BigCrkSeg01	POL044	$4,470	$3,100	$7,600	$1,030	$8,630
	POL052	$87,300	$61,000	$148,000	$14,900	$163,000
BigCrkSeg03	POL001	$5,070	$3,600	$8,620	$1,170	$9,790
	POL002	$32,300	$23,000	$54,900	$5,500	$60,400
	POL067	$531,000	$370,000	$902,000	$1,210,000	$2,110,000
	POL068	$16,900	$12,000	$28,700	$2,190	$30,900
BigCrkSeg04	BIG04-2	$238,000	$170,000	$405,000	$92,700	$498,000
	BIG04-3	$2,350,000	$1,600,000	$4,000,000	$704,000	$4,710,000
	KLE025	$5,930,000	$4,200,000	$10,100,000	$1,190,000	$11,300,000
	KLE026	$182,000	$130,000	$309,000	$41,800	$351,000
	KLE027	$1,770,000	$1,200,000	$3,010,000	$301,000	$3,310,000
	KLE047	$122,000	$85,000	$207,000	$8,230	$216,000
	KLE053	$3,730,000	$2,600,000	$6,340,000	$636,000	$6,980,000
	KLE054	$3,760,000	$2,600,000	$6,400,000	$1,180,000	$7,580,000
	KLE071	$1,440,000	$1,000,000	$2,450,000	$97,100	$2,540,000
	KLE073	$3,670,000	$2,600,000	$6,240,000	$248,000	$6,490,000
	POL008	$155,000	$110,000	$263,000	$26,400	$290,000
	POL010	$86,500	$61,000	$147,000	$14,700	$162,000
	POL011	$59,300	$41,000	$101,000	$10,100	$111,000
	POL022	$12,700	$8,900	$21,600	$2,910	$24,500
	POL066	$3,800	$2,700	$6,460	$647	$7,100
CCSeg	PIPECC	$6,810,000	$4,800,000	$11,600,000	$546,000	$12,100,000
CCSeg01	BUR105	$88,600	$62,000	$151,000	$7,290	$158,000
	BUR109	$281,000	$200,000	$477,000	$30,800	$508,000
	BUR185	$70,000	$49,000	$119,000	$8,370	$127,000
	BUR187	$56,500	$40,000	$96,000	$6,750	$103,000
	THO023	$43,000	$30,000	$73,000	$5,130	$78,100
CCSeg02	BUR107	$783,000	$570,000	$1,350,000	$184,000	$1,540,000
	BUR130	$539,000	$380,000	$915,000	$64,300	$980,000
	BUR132	$455,000	$320,000	$773,000	$45,100	$818,000
	BUR133	$101,000	$70,000	$171,000	$17,100	$188,000
	BUR134	$274,000	$190,000	$465,000	$46,600	$511,000
	BUR135	$131,000	$92,000	$223,000	$15,700	$238,000
	BUR145	$1,060,000	$740,000	$1,810,000	$181,000	$1,990,000
	BUR150	$334,000	$230,000	$567,000	$36,700	$604,000
	BUR153	$642,000	$450,000	$1,090,000	$43,400	$1,130,000
	CC02-1	$1,440,000	$1,000,000	$2,450,000	$396,000	$2,840,000
CCSeg03	BUR087	$927,000	$650,000	$1,580,000	$105,000	$1,680,000
	BUR088	$70,000	$71,000	$141,000	$47,400	$189,000
	BUR089	$45,200	$32,000	$76,800	$5,400	$82,200
	BUR090	$2,980,000	$2,100,000	$5,060,000	$380,000	$5,440,000
	BUR099	$70,000	$71,000	$141,000	$47,400	$189,000
	BUR146	$935,000	$660,000	$1,590,000	$63,200	$1,650,000
	BUR149	$124,000	$87,000	$210,000	$13,800	$224,000
	BUR166	$74,500	$52,000	$127,000	$8,910	$136,000
	BUR180	$56,500	$40,000	$96,000	$6,210	$102,000
CCSeg04	BUR066	$73,500	$51,000	$125,000	$8,100	$133,000
	BUR067	$5,400,000	$4,100,000	$9,530,000	$1,430,000	$11,000,000
	BUR068	$227,000	$160,000	$386,000	$38,800	$425,000
	BUR072	$392,000	$270,000	$666,000	$47,000	$713,000
	BUR073	$1,300,000	$910,000	$2,200,000	$142,000	$2,350,000
	BUR075	$66,500	$47,000	$113,000	$11,300	$124,000
	BUR094	$118,000	$83,000	$201,000	$15,300	$216,000
	BUR096	$135,000	$96,000	$230,000	$21,000	$251,000
	BUR097	$952,000	$990,000	$1,940,000	$670,000	$2,610,000
	BUR098	$1,960,000	$1,700,000	$3,660,000	$1,080,000	$4,740,000

TABLE D-39

Summary of Total Estimated Costs by Site, Alternative 3+

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

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	BUR112	$70,000	$71,000	$141,000	$47,400	$189,000
	BUR117	$284,000	$200,000	$483,000	$35,800	$519,000
	BUR118	$626,000	$440,000	$1,060,000	$107,000	$1,170,000
	BUR119	$175,000	$120,000	$298,000	$22,800	$321,000
	BUR120	$78,400	$55,000	$133,000	$10,200	$144,000
	BUR121	$1,230,000	$1,100,000	$2,350,000	$573,000	$2,920,000
	BUR122	$275,000	$190,000	$467,000	$30,200	$498,000
	BUR124	$84,300	$59,000	$143,000	$11,000	$154,000
	BUR125	$27,000	$19,000	$45,900	$3,510	$49,400
	BUR128	$960,000	$670,000	$1,630,000	$147,000	$1,780,000
	BUR129	$170,000	$140,000	$311,000	$64,400	$375,000
	BUR141	$807,000	$570,000	$1,370,000	$54,500	$1,430,000
	BUR142	$727,000	$510,000	$1,240,000	$89,400	$1,320,000
	BUR143	$1,170,000	$820,000	$2,000,000	$79,300	$2,070,000
	BUR144	$605,000	$420,000	$1,030,000	$68,600	$1,100,000
	BUR176	$126,000	$88,000	$214,000	$15,100	$230,000
	BUR177	$153,000	$110,000	$260,000	$18,400	$279,000
	BUR178	$113,000	$79,000	$193,000	$12,400	$205,000
	BUR189	$45,200	$32,000	$76,800	$5,400	$82,200
	BUR190	$312,000	$330,000	$641,000	$167,000	$808,000
	BUR191	$131,000	$92,000	$223,000	$17,000	$240,000
	BUR192	$334,000	$230,000	$567,000	$40,200	$608,000
	BUR204	$43,000	$30,000	$73,000	$5,130	$78,100
	CC04-1	$2,170,000	$1,500,000	$3,690,000	$803,000	$4,490,000
	HHWPCC04-1	$58,400	$41,000	$99,300	$7,600	$107,000
	HHWPCC04-2	$58,400	$41,000	$99,300	$7,600	$107,000
	HHWPCC04-3	$58,400	$41,000	$99,300	$7,600	$107,000
CCSeg05	CC05-1	$1,080,000	$750,000	$1,830,000	$224,000	$2,060,000
	CC05-2	$6,560,000	$4,600,000	$11,200,000	$1,340,000	$12,500,000
	OSB047	$128,000	$90,000	$217,000	$8,640	$226,000
	WAL010	$37,500	$26,000	$63,700	$2,530	$66,200
	WAL011	$141,000	$120,000	$262,000	$51,200	$313,000
	WAL039	$343,000	$240,000	$584,000	$31,000	$615,000
	WAL040	$475,000	$330,000	$808,000	$32,100	$840,000
	WAL041	$146,000	$100,000	$247,000	$9,830	$257,000
	WAL042	$579,000	$410,000	$985,000	$69,500	$1,050,000
	WAL081	$78,200	$55,000	$133,000	$7,060	$140,000
	WP-OPTIONC	$9,270,000	$6,700,000	$15,900,000	$776,000	$16,700,000
MIDGradSeg	PIPEMG	$12,600,000	$8,800,000	$21,400,000	$1,010,000	$22,400,000
MIDGradSeg01	HHWPMG01-1	$58,400	$41,000	$99,300	$7,600	$107,000
	HHWPMG01-2	$58,400	$41,000	$99,300	$7,600	$107,000
	HHWPMG01-3	$58,400	$41,000	$99,300	$7,600	$107,000
	HHWPMG01-4	$58,400	$41,000	$99,300	$7,600	$107,000
	HHWPMG01-5	$58,400	$41,000	$99,300	$7,600	$107,000
	KLE011	$1,940,000	$1,400,000	$3,300,000	$388,000	$3,690,000
	KLE016	$140,000	$98,000	$238,000	$16,700	$255,000
	KLE020	$364,000	$250,000	$618,000	$40,000	$658,000
	KLE021	$146,000	$100,000	$248,000	$17,600	$266,000
	KLE023	$259,000	$180,000	$440,000	$31,100	$471,000
	KLE033	$381,000	$270,000	$648,000	$43,200	$692,000
	KLE034	$534,000	$370,000	$908,000	$61,800	$970,000
	KLE035	$3,420,000	$2,400,000	$5,820,000	$370,000	$6,190,000
	KLE040	$14,000,000	$9,900,000	$23,900,000	$985,000	$24,900,000
	KLE042	$2,080,000	$1,500,000	$3,540,000	$166,000	$3,710,000
	KLE048	$14,100,000	$10,000,000	$24,000,000	$1,070,000	$25,100,000
	KLE049	$14,900,000	$11,000,000	$25,400,000	$1,200,000	$26,600,000

TABLE D-39

Summary of Total Estimated Costs by Site, Alternative 3+

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

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	KLE051	$74,500	$52,000	$127,000	$8,910	$136,000
	KLE062	$954,000	$670,000	$1,620,000	$64,400	$1,690,000
	KLE066	$85,700	$60,000	$146,000	$10,300	$156,000
	KLE067	$68,500	$48,000	$117,000	$5,400	$122,000
	KLE068	$266,000	$190,000	$452,000	$45,300	$497,000
	KLE069	$97,300	$68,000	$165,000	$11,300	$177,000
	KLE070	$94,700	$66,000	$161,000	$11,300	$172,000
	KLE074	$402,000	$280,000	$683,000	$52,100	$735,000
	KLE075	$75,900	$53,000	$129,000	$12,900	$142,000
	MG01-1	$216,000	$150,000	$367,000	$91,100	$458,000
	MG01-10	$148,000	$100,000	$252,000	$46,900	$299,000
	MG01-11	$600,000	$420,000	$1,020,000	$145,000	$1,170,000
	MG01-12	$3,100,000	$2,200,000	$5,260,000	$605,000	$5,860,000
	MG01-13	$5,660,000	$4,000,000	$9,630,000	$1,090,000	$10,700,000
	MG01-14	$956,000	$670,000	$1,620,000	$196,000	$1,820,000
	MG01-15	$2,810,000	$2,000,000	$4,770,000	$538,000	$5,310,000
	MG01-16	$505,000	$350,000	$858,000	$106,000	$964,000
	MG01-17	$3,250,000	$2,300,000	$5,530,000	$666,000	$6,200,000
	MG01-18	$1,800,000	$1,300,000	$3,070,000	$370,000	$3,440,000
	MG01-2	$261,000	$180,000	$444,000	$83,900	$528,000
	MG01-3	$411,000	$290,000	$699,000	$110,000	$809,000
	MG01-4	$2,050,000	$1,400,000	$3,500,000	$462,000	$3,960,000
	MG01-5	$188,000	$130,000	$320,000	$63,000	$383,000
	MG01-6	$2,100,000	$1,500,000	$3,570,000	$495,000	$4,070,000
	MG01-7	$2,080,000	$1,500,000	$3,530,000	$462,000	$4,000,000
	MG01-8	$5,430,000	$3,800,000	$9,240,000	$1,040,000	$10,300,000
	MG01-9	$728,000	$510,000	$1,240,000	$152,000	$1,390,000
	MUL085	$94,900	$66,000	$161,000	$21,600	$183,000
	MUL086	$310,000	$220,000	$526,000	$34,000	$560,000
	OSB025	$123,000	$86,000	$209,000	$13,500	$223,000
	OSB030	$101,000	$71,000	$172,000	$12,200	$184,000
	OSB065	$102,000,000	$71,000,000	$173,000,000	$4,050,000	$177,000,000
	OSB070	$320,000	$220,000	$543,000	$35,100	$578,000
	OSB072	$52,000	$36,000	$88,300	$6,210	$94,500
	OSB073	$150,000	$100,000	$254,000	$15,700	$270,000
	OSB074	$503,000	$350,000	$854,000	$1,190,000	$2,050,000
	OSB075	$63,200	$44,000	$107,000	$7,560	$115,000
	OSB076	$45,200	$32,000	$76,800	$5,400	$82,200
	OSB078	$18,200	$13,000	$30,900	$2,160	$33,100
	OSB117	$266,000	$190,000	$452,000	$45,300	$497,000
	OSB118	$2,200,000	$1,500,000	$3,740,000	$149,000	$3,890,000
	OSB119	$11,100,000	$7,800,000	$19,000,000	$246,000	$19,200,000
	OSB120	$65,300,000	$46,000,000	$111,000,000	$2,830,000	$114,000,000
	POL018	$224,000	$160,000	$380,000	$24,600	$405,000
	POL019	$1,880,000	$1,300,000	$3,200,000	$434,000	$3,630,000
	POL021	$149,000	$100,000	$253,000	$17,800	$271,000
	POL064	$45,200	$32,000	$76,800	$5,400	$82,200
	WAL001	$29,800,000	$21,000,000	$50,600,000	$3,550,000	$54,100,000
	WAL002	$206,000	$140,000	$351,000	$25,600	$377,000
	WAL004	$37,300,000	$26,000,000	$63,600,000	$1,790,000	$65,400,000
	WAL014	$395,000	$280,000	$673,000	$43,500	$716,000
	WAL016	$3,800	$2,700	$6,460	$647	$7,100
	WAL020	$1,610,000	$1,100,000	$2,730,000	$157,000	$2,890,000
	WAL024	$97,000	$68,000	$165,000	$11,600	$176,000
	WAL034	$1,430,000	$1,000,000	$2,430,000	$96,600	$2,530,000
	WAL035	$1,450,000	$1,000,000	$2,460,000	$159,000	$2,620,000

TABLE D-39

Summary of Total Estimated Costs by Site, Alternative 3+

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

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	WAL036	$635,000	$450,000	$1,080,000	$72,800	$1,150,000
	WAL037	$227,000	$160,000	$386,000	$38,800	$425,000
	WAL046	$58,700	$41,000	$99,800	$7,020	$107,000
	WAL055	$38,500	$27,000	$65,400	$4,590	$70,000
	WAL056	$54,200	$38,000	$92,100	$6,480	$98,600
	WAL057	$22,700	$16,000	$38,600	$2,700	$41,300
	WAL058	$20,500	$14,000	$34,800	$2,430	$37,200
	WAL062	$43,000	$30,000	$73,000	$5,130	$78,100
	WAL064	$79,000	$55,000	$134,000	$9,450	$144,000
	WAL072	$18,200	$13,000	$30,900	$2,160	$33,100
	WAL073	$22,700	$16,000	$38,600	$2,700	$41,300
MIDGradSeg02	KLW061	$2,320,000	$1,600,000	$3,940,000	$301,000	$4,240,000
	KLW062	$356,000	$250,000	$605,000	$46,200	$651,000
	KLW070	$342,000	$240,000	$583,000	$23,200	$606,000
	KLW095	$137,000	$96,000	$233,000	$17,800	$251,000
	MG02-10	$38,500	$27,000	$65,500	$22,200	$87,700
	MG02-11	$22,500	$16,000	$38,200	$17,400	$55,500
	MG02-12	$6,360	$4,500	$10,800	$1,660	$12,500
MoonCrkSeg01	KLE061	$5,500	$3,800	$9,340	$496	$9,840
	MC01-2	$498,000	$350,000	$847,000	$174,000	$1,020,000
MoonCrkSeg02	KLE008	$109,000	$76,000	$185,000	$14,100	$199,000
	KLE014	$5,500	$3,800	$9,340	$496	$9,840
	KLE041	$121,000	$85,000	$206,000	$8,180	$214,000
	KLE063	$25,100	$18,000	$42,600	$3,260	$45,900
	KLE064	$21,700	$15,000	$36,900	$2,820	$39,700
	KLE065	$38,400	$27,000	$65,300	$4,990	$70,300
	MC02-2	$817,000	$570,000	$1,390,000	$266,000	$1,650,000
	MC02-3	$476,000	$330,000	$809,000	$148,000	$957,000
	MC02-4	$369,000	$260,000	$628,000	$120,000	$747,000
NMSeg	PIPENM	$1,560,000	$1,100,000	$2,650,000	$125,000	$2,780,000
NMSeg01	BUR051	$503,000	$350,000	$854,000	$1,190,000	$2,050,000
	BUR052	$39,400	$28,000	$67,000	$4,320	$71,300
	BUR053	$5,110,000	$3,600,000	$8,680,000	$494,000	$9,170,000
	BUR140	$367,000	$260,000	$624,000	$24,800	$649,000
	BUR160	$1,070,000	$750,000	$1,820,000	$245,000	$2,060,000
	NM01-1	$1,080,000	$750,000	$1,830,000	$344,000	$2,170,000
NMSeg02	BUR054	$5,660,000	$4,000,000	$9,610,000	$1,250,000	$10,900,000
	BUR055	$468,000	$330,000	$795,000	$58,900	$854,000
	BUR056	$2,230,000	$1,600,000	$3,790,000	$290,000	$4,080,000
	BUR058	$503,000	$350,000	$854,000	$1,190,000	$2,050,000
	BUR139	$295,000	$210,000	$501,000	$35,400	$536,000
	BUR170	$677,000	$470,000	$1,150,000	$1,190,000	$2,340,000
	BUR171	$489,000	$340,000	$830,000	$1,080,000	$1,910,000
	BUR172	$96,800	$68,000	$165,000	$11,600	$176,000
	NM02-1	$2,040,000	$1,400,000	$3,470,000	$655,000	$4,120,000
	OSB040	$620,000	$440,000	$1,050,000	$41,900	$1,100,000
	OSB044	$10,300,000	$7,200,000	$17,500,000	$922,000	$18,400,000
	OSB048	$12,600	$8,900	$21,500	$1,640	$23,100
	OSB056	$58,700	$41,000	$99,700	$3,960	$104,000
	OSB057	$477,000	$330,000	$811,000	$32,200	$844,000
	OSB058	$58,700	$41,000	$99,700	$3,960	$104,000
	OSB088	$13,600	$11,000	$24,600	$4,710	$29,300
	OSB089	$20,300	$18,000	$38,400	$10,400	$48,800
NMSeg03	NM03-1	$921,000	$640,000	$1,570,000	$238,000	$1,800,000
NMSeg04	NM04-1	$1,860,000	$1,300,000	$3,160,000	$405,000	$3,560,000
	NM04-2	$741,000	$520,000	$1,260,000	$157,000	$1,420,000

TABLE D-39

Summary of Total Estimated Costs by Site, Alternative 3+

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

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	NM04-3	$5,130,000	$3,600,000	$8,730,000	$1,100,000	$9,830,000
	OSB032	$206,000	$140,000	$350,000	$22,700	$373,000
	OSB033	$167,000	$120,000	$283,000	$18,400	$302,000
	OSB038	$315,000	$220,000	$535,000	$34,600	$570,000
	OSB039	$763,000	$530,000	$1,300,000	$74,500	$1,370,000
	OSB052	$1,370,000	$960,000	$2,330,000	$273,000	$2,600,000
	OSB059	$1,210,000	$850,000	$2,060,000	$81,800	$2,140,000
	OSB060	$22,600	$16,000	$38,400	$2,590	$41,000
	OSB061	$133,000	$93,000	$226,000	$22,600	$249,000
	OSB082	$133,000	$93,000	$226,000	$14,600	$241,000
	OSB115	$76,700	$54,000	$130,000	$9,180	$140,000
	WAL006	$56,500	$40,000	$96,000	$6,750	$103,000
	WAL033	$930,000	$650,000	$1,580,000	$107,000	$1,690,000
PineCrkSeg01	HHWPPC01-1	$58,400	$41,000	$99,300	$7,600	$107,000
	HHWPPC01-2	$58,400	$41,000	$99,300	$7,600	$107,000
	MAS006	$4,190,000	$2,900,000	$7,130,000	$266,000	$7,390,000
	MAS007	$973,000	$680,000	$1,650,000	$646,000	$2,300,000
	MAS008	$475,000	$330,000	$807,000	$80,900	$888,000
	MAS009	$141,000	$99,000	$240,000	$24,100	$264,000
	MAS011	$146,000	$100,000	$248,000	$529,000	$777,000
	MAS012	$512,000	$360,000	$871,000	$1,190,000	$2,060,000
	MAS013	$89,200	$63,000	$152,000	$15,200	$167,000
	MAS014	$1,420,000	$990,000	$2,410,000	$2,420,000	$4,830,000
	MAS015	$181,000	$130,000	$307,000	$533,000	$840,000
	MAS016	$586,000	$410,000	$997,000	$604,000	$1,600,000
	MAS017	$1,690,000	$1,200,000	$2,880,000	$1,390,000	$4,270,000
	MAS018	$51,300	$36,000	$87,200	$8,730	$95,900
	MAS019	$19,000	$13,000	$32,300	$3,230	$35,500
	MAS020	$401,000	$280,000	$681,000	$552,000	$1,230,000
	MAS021	$560,000	$390,000	$951,000	$1,180,000	$2,130,000
	MAS022	$911,000	$640,000	$1,550,000	$155,000	$1,700,000
	MAS023	$19,000	$13,000	$32,300	$3,230	$35,500
	MAS025	$150,000	$110,000	$255,000	$0	$255,000
	MAS027	$575,000	$400,000	$977,000	$65,300	$1,040,000
	MAS028	$205,000	$140,000	$349,000	$34,900	$384,000
	MAS029	$13,300	$9,300	$22,600	$2,260	$24,900
	MAS030	$68,800	$48,000	$117,000	$7,560	$124,000
	MAS031	$82,000	$57,000	$139,000	$14,000	$153,000
	MAS032	$1,520	$1,100	$2,590	$259	$2,840
	MAS033	$91,100	$64,000	$155,000	$15,500	$170,000
	MAS035	$152,000	$110,000	$259,000	$25,900	$284,000
	MAS036	$51,300	$36,000	$87,200	$8,730	$95,900
	MAS040	$50,600	$35,000	$86,000	$3,420	$89,400
	MAS041	$85,800	$60,000	$146,000	$5,800	$152,000
	MAS042	$39,600	$28,000	$67,400	$2,680	$70,100
	MAS043	$110,000	$77,000	$187,000	$7,430	$195,000
	MAS045	$110,000	$77,000	$187,000	$7,430	$195,000
	MAS046	$875,000	$610,000	$1,490,000	$59,100	$1,550,000
	MAS048	$404,000	$280,000	$686,000	$68,800	$755,000
	MAS049	$683,000	$480,000	$1,160,000	$116,000	$1,280,000
	MAS050	$813,000	$570,000	$1,380,000	$1,190,000	$2,570,000
	MAS052	$54,000	$38,000	$91,900	$5,940	$97,800
	MAS053	$3,800	$2,700	$6,460	$647	$7,100
	MAS054	$394,000	$280,000	$670,000	$574,000	$1,240,000
	MAS055	$3,800	$2,700	$6,460	$647	$7,100
	MAS057	$3,800	$2,700	$6,460	$647	$7,100

TABLE D-39

Summary of Total Estimated Costs by Site, Alternative 3+

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

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	MAS065	$3,800	$2,700	$6,460	$647	$7,100
	MAS068	$36,200	$25,000	$61,500	$4,320	$65,800
	MAS072	$3,800	$2,700	$6,460	$647	$7,100
	MAS078	$364,000	$250,000	$617,000	$580,000	$1,200,000
	MAS079	$588,000	$410,000	$999,000	$51,300	$1,050,000
	MAS081	$177,000	$120,000	$301,000	$23,000	$324,000
	MAS083	$911,000	$640,000	$1,550,000	$102,000	$1,650,000
	MAS084	$569,000	$400,000	$968,000	$97,000	$1,060,000
PineCrkSeg02	TWI002	$109,000	$77,000	$186,000	$18,600	$205,000
	TWI006	$91,100	$64,000	$155,000	$15,500	$170,000
	TWI008	$3,800	$2,700	$6,460	$647	$7,100
	TWI009	$123,000	$86,000	$209,000	$21,000	$230,000
	TWI011	$3,800	$2,700	$6,460	$647	$7,100
	TWI012	$72,800	$51,000	$124,000	$12,400	$136,000
	TWI013	$146,000	$100,000	$248,000	$24,800	$273,000
	TWI014	$114,000	$80,000	$194,000	$19,400	$213,000
	TWI018	$3,800	$2,700	$6,460	$647	$7,100
	TWI020	$3,800	$2,700	$6,460	$647	$7,100
	TWI027	$3,800	$2,700	$6,460	$647	$7,100
	TWI029	$3,800	$2,700	$6,460	$647	$7,100
	TWI030	$3,800	$2,700	$6,460	$647	$7,100
PineCrkSeg03	KLW075	$323,000	$230,000	$549,000	$55,100	$604,000
	KLW077	$209,000	$150,000	$356,000	$35,700	$392,000
	KLW079	$182,000	$130,000	$310,000	$31,000	$341,000
	KLW080	$98,300	$69,000	$167,000	$8,100	$175,000
	KLW082	$155,000	$110,000	$263,000	$26,400	$290,000
	KLW083	$265,000	$180,000	$449,000	$45,000	$494,000
	KLW085	$274,000	$190,000	$465,000	$46,600	$511,000
	MAS003	$980,000	$690,000	$1,670,000	$226,000	$1,890,000
	PC03-1	$1,540,000	$1,100,000	$2,620,000	$372,000	$2,990,000
	PC03-2	$1,340,000	$940,000	$2,270,000	$302,000	$2,580,000
	PC03-3	$575,000	$400,000	$978,000	$148,000	$1,130,000
UpperSFCDRSeg	PIPEUG	$11,800,000	$8,200,000	$20,000,000	$940,000	$20,900,000
UpperSFCDRSeg01	HHWPUG01-1	$58,400	$41,000	$99,300	$7,600	$107,000
	HHWPUG01-2	$58,400	$41,000	$99,300	$7,600	$107,000
	HHWPUG01-3	$58,400	$41,000	$99,300	$7,600	$107,000
	HHWPUG01-4	$58,400	$41,000	$99,300	$7,600	$107,000
	HHWPUG01-5	$58,400	$41,000	$99,300	$7,600	$107,000
	LOK001	$109,000	$76,000	$185,000	$14,100	$199,000
	LOK002	$107,000	$75,000	$182,000	$13,900	$196,000
	LOK004	$1,690,000	$1,200,000	$2,880,000	$1,410,000	$4,290,000
	LOK005	$15,200	$11,000	$25,800	$1,970	$27,800
	LOK006	$63,800	$45,000	$109,000	$7,020	$116,000
	LOK007	$22,800	$16,000	$38,700	$2,960	$41,700
	LOK008	$93,300	$65,000	$159,000	$10,300	$169,000
	LOK009	$420,000	$290,000	$713,000	$71,400	$784,000
	LOK010	$34,400	$24,000	$58,500	$3,780	$62,300
	LOK011	$4,670,000	$4,600,000	$9,280,000	$2,810,000	$12,100,000
	LOK017	$844,000	$590,000	$1,430,000	$98,000	$1,530,000
	LOK024	$503,000	$350,000	$854,000	$1,190,000	$2,050,000
	LOK048	$22,800	$16,000	$38,700	$2,960	$41,700
	LOK050	$247,000	$170,000	$420,000	$42,000	$462,000
	LOK051	$161,000	$110,000	$274,000	$20,900	$295,000
	LOK053	$26,100	$18,000	$44,400	$3,400	$47,800
	MUL001	$1,430,000	$1,000,000	$2,430,000	$244,000	$2,680,000
	MUL002	$436,000	$310,000	$742,000	$74,400	$817,000

TABLE D-39

Summary of Total Estimated Costs by Site, Alternative 3+

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

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	MUL004	$202,000	$140,000	$343,000	$22,100	$365,000
	MUL006	$179,000	$130,000	$305,000	$19,700	$324,000
	MUL007	$80,100	$56,000	$136,000	$10,400	$147,000
	MUL008	$330,000	$230,000	$561,000	$36,200	$597,000
	MUL009	$21,100	$15,000	$35,900	$2,740	$38,600
	MUL012	$2,200,000	$1,600,000	$3,820,000	$381,000	$4,200,000
	MUL013	$44,700	$31,000	$76,000	$5,810	$81,800
	MUL014	$1,190,000	$1,200,000	$2,420,000	$843,000	$3,270,000
	MUL015	$787,000	$550,000	$1,340,000	$102,000	$1,440,000
	MUL018	$274,000	$190,000	$465,000	$46,600	$511,000
	MUL019	$6,580,000	$4,800,000	$11,400,000	$1,300,000	$12,700,000
	MUL020	$7,830,000	$5,500,000	$13,300,000	$654,000	$14,000,000
	MUL021	$297,000	$210,000	$505,000	$32,700	$538,000
	MUL022	$29,500	$21,000	$50,200	$3,840	$54,000
	MUL023	$1,100,000	$770,000	$1,860,000	$1,290,000	$3,150,000
	MUL027	$396,000	$280,000	$673,000	$570,000	$1,240,000
	MUL028	$1,440,000	$1,000,000	$2,450,000	$717,000	$3,170,000
	MUL029	$387,000	$270,000	$658,000	$66,000	$724,000
	MUL030	$88,400	$62,000	$150,000	$9,720	$160,000
	MUL031	$28,700	$20,000	$48,800	$3,730	$52,500
	MUL033	$301,000	$210,000	$511,000	$51,200	$563,000
	MUL037	$9,500,000	$6,700,000	$16,100,000	$718,000	$16,900,000
	MUL038	$927,000	$650,000	$1,580,000	$117,000	$1,690,000
	MUL042	$265,000	$180,000	$449,000	$45,000	$494,000
	MUL043	$333,000	$230,000	$566,000	$56,700	$622,000
	MUL045	$524,000	$370,000	$891,000	$89,300	$980,000
	MUL047	$56,500	$40,000	$96,000	$6,210	$102,000
	MUL048	$405,000	$280,000	$689,000	$69,100	$759,000
	MUL049	$25,300	$18,000	$43,000	$3,290	$46,300
	MUL051	$295,000	$210,000	$501,000	$32,400	$533,000
	MUL052	$711,000	$500,000	$1,210,000	$1,200,000	$2,410,000
	MUL053	$266,000	$190,000	$452,000	$34,600	$487,000
	MUL054	$79,200	$56,000	$135,000	$10,300	$145,000
	MUL056	$29,500	$21,000	$50,200	$3,840	$54,000
	MUL057	$66,600	$47,000	$113,000	$8,660	$122,000
	MUL058	$23,400,000	$16,000,000	$39,800,000	$2,260,000	$42,100,000
	MUL059	$429,000	$300,000	$728,000	$73,000	$801,000
	MUL060	$51,600	$36,000	$87,700	$5,670	$93,400
	MUL063	$51,600	$36,000	$87,700	$5,670	$93,400
	MUL065	$76,200	$53,000	$129,000	$8,370	$138,000
	MUL071	$1,830,000	$1,300,000	$3,110,000	$220,000	$3,330,000
	MUL073	$174,000	$120,000	$296,000	$22,600	$319,000
	MUL081	$178,000	$120,000	$303,000	$20,500	$323,000
	MUL083	$157,000	$110,000	$267,000	$17,300	$285,000
	MUL103	$217,000	$150,000	$369,000	$25,400	$395,000
	MUL119	$23,600	$17,000	$40,100	$3,070	$43,200
	MUL120	$77,000	$54,000	$131,000	$9,180	$140,000
	MUL129	$273,000	$190,000	$464,000	$30,000	$494,000
	MUL131	$125,000	$88,000	$213,000	$21,300	$234,000
	MUL132	$34,200	$24,000	$58,100	$5,820	$63,900
	MUL135	$15,200	$11,000	$25,800	$1,970	$27,800
	MUL136	$10,100	$7,100	$17,200	$1,320	$18,500
	MUL139	$3,800	$2,700	$6,460	$647	$7,100
	MUL141	$136,000	$95,000	$231,000	$15,600	$247,000
	MUL142	$484,000	$340,000	$822,000	$55,500	$878,000
	MUL145	$59,300	$41,000	$101,000	$6,790	$107,000

TABLE D-39

Summary of Total Estimated Costs by Site, Alternative 3+

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

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	MUL146	$430,000	$300,000	$730,000	$35,400	$766,000
	MUL149	$79,600	$56,000	$135,000	$9,140	$145,000
	MUL150	$213,000	$150,000	$362,000	$24,400	$386,000
	MUL153	$107,000	$75,000	$182,000	$12,300	$195,000
	THO020	$71,300	$50,000	$121,000	$7,830	$129,000
	UG01-10	$445,000	$310,000	$756,000	$148,000	$904,000
	UG01-11	$238,000	$170,000	$405,000	$64,000	$469,000
	UG01-12	$1,660,000	$1,200,000	$2,810,000	$508,000	$3,320,000
	UG01-13	$651,000	$460,000	$1,110,000	$232,000	$1,340,000
	UG01-14	$123,000	$86,000	$210,000	$44,000	$254,000
	UG01-15	$371,000	$260,000	$631,000	$147,000	$778,000
	UG01-16	$911,000	$640,000	$1,550,000	$244,000	$1,790,000
	UG01-17	$2,190,000	$1,500,000	$3,730,000	$569,000	$4,300,000
	UG01-18	$641,000	$450,000	$1,090,000	$256,000	$1,350,000
	UG01-19	$167,000	$120,000	$283,000	$47,500	$331,000
	UG01-4	$11,600	$8,100	$19,700	$3,480	$23,200
	UG01-5	$377,000	$260,000	$642,000	$131,000	$773,000
	UG01-6	$1,370,000	$960,000	$2,330,000	$323,000	$2,650,000
	UG01-7	$510,000	$360,000	$868,000	$147,000	$1,010,000
	UG01-8	$71,100	$50,000	$121,000	$29,800	$151,000
	UG01-9	$601,000	$420,000	$1,020,000	$198,000	$1,220,000
	WAL013	$83,500	$58,000	$142,000	$9,180	$151,000
	WAL038	$10,200,000	$7,200,000	$17,400,000	$690,000	$18,100,000
	WAL076	$775,000	$540,000	$1,320,000	$132,000	$1,450,000
	WAL077	$1,540,000	$1,100,000	$2,620,000	$104,000	$2,720,000

Notes:

This Table does not include Central Treatment Plant (CTP) Sludge Pond Closure costs, these costs will be applied to the Total Alternative Cost.
This Table does not include Roads and Bridges costs, these costs will be applied to the Total Alternative Cost.

O&M = Operations and Maintenance
NPV = Net Present Value

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 D-40

Summary of Total Estimated Costs by Site, Alternative 4+

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

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
BigCrkSeg01	POL044	$5,500	$3,800	$9,340	$496	$9,840
	POL045	$16,000	$11,000	$27,200	$2,080	$29,300
	POL046	$15,200	$11,000	$25,800	$1,970	$27,800
	POL047	$18,500	$13,000	$31,500	$2,410	$33,900
	POL048	$14,300	$10,000	$24,300	$1,860	$26,200
	POL049	$11,000	$7,700	$18,700	$1,420	$20,100
	POL050	$18,500	$13,000	$31,500	$2,410	$33,900
	POL051	$33,400	$23,000	$56,800	$4,340	$61,100
	POL052	$126,000	$89,000	$215,000	$11,400	$226,000
BigCrkSeg02	POL024	$16,900	$12,000	$28,700	$2,190	$30,900
	POL025	$22,800	$16,000	$38,700	$2,960	$41,700
	POL026	$19,400	$14,000	$33,000	$2,520	$35,500
	POL027	$39,600	$28,000	$67,300	$5,150	$72,500
	POL028	$11,000	$7,700	$18,700	$1,420	$20,100
	POL036	$43,000	$30,000	$73,100	$5,590	$78,700
	POL037	$23,600	$17,000	$40,100	$3,070	$43,200
	POL038	$14,300	$10,000	$24,300	$1,860	$26,200
	POL039	$17,700	$12,000	$30,100	$2,300	$32,400
	POL040	$78,500	$55,000	$133,000	$10,200	$144,000
	POL041	$31,200	$22,000	$53,000	$4,050	$57,100
	POL042	$28,700	$20,000	$48,800	$3,730	$52,500
	POL043	$29,500	$21,000	$50,200	$3,840	$54,000
	POL053	$21,100	$15,000	$35,900	$2,740	$38,600
	POL054	$25,300	$18,000	$43,000	$3,290	$46,300
	POL056	$35,400	$25,000	$60,200	$4,600	$64,800
	POL062	$27,000	$19,000	$45,900	$3,510	$49,400
	POL063	$18,500	$13,000	$31,500	$2,410	$33,900
BigCrkSeg03	POL001	$224,000	$160,000	$381,000	$20,200	$401,000
	POL002	$279,000	$200,000	$475,000	$553,000	$1,030,000
	POL004	$330,000	$230,000	$560,000	$1,030,000	$1,590,000
	POL067	$572,000	$400,000	$973,000	$1,220,000	$2,190,000
	POL068	$5,500	$3,800	$9,340	$496	$9,840
	POL069	$24,400	$17,000	$41,500	$3,180	$44,700
	POL070	$35,100	$25,000	$59,600	$4,560	$64,200
	POL071	$23,400	$16,000	$39,800	$3,040	$42,800
BigCrkSeg04	BIG04-2	$239,000	$170,000	$406,000	$71,500	$477,000
	BIG04-3	$2,450,000	$1,700,000	$4,160,000	$572,000	$4,730,000
	KLE024	$19,600,000	$14,000,000	$33,300,000	$2,810,000	$36,100,000
	KLE025	$11,500,000	$8,000,000	$19,500,000	$1,020,000	$20,500,000
	KLE026	$2,420,000	$1,700,000	$4,110,000	$218,000	$4,330,000
	KLE027	$2,560,000	$1,800,000	$4,350,000	$231,000	$4,580,000
	KLE029	$187,000	$130,000	$318,000	$24,300	$342,000
	KLE047	$122,000	$85,000	$207,000	$8,230	$216,000
	KLE053	$5,400,000	$3,800,000	$9,190,000	$487,000	$9,670,000
	KLE054	$5,120,000	$3,600,000	$8,700,000	$1,060,000	$9,760,000
	KLE071	$1,800,000	$1,300,000	$3,060,000	$121,000	$3,180,000
	KLE073	$3,670,000	$2,600,000	$6,240,000	$248,000	$6,490,000
	POL005	$56,800	$40,000	$96,500	$7,380	$104,000
	POL006	$31,700	$22,000	$53,900	$4,120	$58,000
	POL008	$224,000	$160,000	$381,000	$20,200	$401,000
	POL010	$125,000	$88,000	$213,000	$11,300	$224,000
	POL011	$85,700	$60,000	$146,000	$7,730	$153,000
	POL022	$274,000	$190,000	$466,000	$540,000	$1,010,000
	POL023	$50,100	$35,000	$85,200	$6,510	$91,700
	POL066	$5,500	$3,800	$9,340	$496	$9,840
	POL075	$33,400	$23,000	$56,800	$4,340	$61,100

TABLE D-40

Summary of Total Estimated Costs by Site, Alternative 4+

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

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
CCSeg	PIPECC	$7,400,000	$5,200,000	$12,600,000	$592,000	$13,200,000
CCSeg01	BUR102	$120,000	$84,000	$204,000	$15,600	$219,000
	BUR105	$123,000	$86,000	$210,000	$21,000	$231,000
	BUR109	$590,000	$440,000	$1,030,000	$136,000	$1,160,000
	BUR110	$24,400	$17,000	$41,500	$3,180	$44,700
	BUR182	$13,500	$9,400	$22,900	$1,750	$24,700
	BUR183	$18,500	$13,000	$31,500	$2,410	$33,900
	BUR184	$17,700	$12,000	$30,100	$2,300	$32,400
	BUR185	$3,800	$2,700	$6,460	$647	$7,100
	BUR186	$20,200	$14,000	$34,400	$2,630	$37,000
	BUR187	$3,800	$2,700	$6,460	$647	$7,100
	BUR188	$36,200	$25,000	$61,600	$4,710	$66,300
	THO012	$27,800	$20,000	$47,300	$3,620	$50,900
	THO013	$29,500	$21,000	$50,200	$3,840	$54,000
	THO014	$23,600	$17,000	$40,100	$3,070	$43,200
	THO015	$34,600	$24,000	$58,800	$4,490	$63,300
	THO016	$11,000	$7,700	$18,700	$1,420	$20,100
	THO017	$45,500	$32,000	$77,400	$5,920	$83,300
	THO018	$16,900	$12,000	$28,700	$2,190	$30,900
	THO023	$3,800	$2,700	$6,460	$647	$7,100
CCSeg02	BUR100	$21,100	$15,000	$35,900	$2,740	$38,600
	BUR106	$21,100	$15,000	$35,900	$2,740	$38,600
	BUR107	$2,700,000	$1,900,000	$4,620,000	$497,000	$5,120,000
	BUR130	$56,900	$40,000	$96,800	$9,700	$106,000
	BUR131	$37,900	$27,000	$64,500	$4,930	$69,400
	BUR132	$1,740,000	$1,200,000	$2,970,000	$298,000	$3,270,000
	BUR133	$101,000	$70,000	$171,000	$17,100	$188,000
	BUR134	$274,000	$190,000	$465,000	$46,600	$511,000
	BUR135	$3,800	$2,700	$6,460	$647	$7,100
	BUR138	$48,900	$34,000	$83,100	$6,360	$89,500
	BUR145	$1,060,000	$740,000	$1,810,000	$181,000	$1,990,000
	BUR150	$896,000	$630,000	$1,520,000	$80,800	$1,600,000
	BUR151	$148,000	$100,000	$252,000	$19,300	$271,000
	BUR153	$1,290,000	$900,000	$2,190,000	$86,700	$2,270,000
	CC02-1	$1,600,000	$1,100,000	$2,720,000	$374,000	$3,100,000
CCSeg03	BUR085	$537,000	$380,000	$913,000	$1,200,000	$2,110,000
	BUR086	$141,000	$99,000	$240,000	$18,300	$258,000
	BUR087	$545,000	$400,000	$948,000	$128,000	$1,080,000
	BUR088	$70,000	$71,000	$141,000	$47,400	$189,000
	BUR089	$3,800	$2,700	$6,460	$647	$7,100
	BUR090	$1,870,000	$1,300,000	$3,180,000	$252,000	$3,430,000
	BUR091	$94,400	$88,000	$183,000	$50,600	$233,000
	BUR092	$16,000	$11,000	$27,200	$2,080	$29,300
	BUR099	$87,700	$84,000	$171,000	$49,700	$221,000
	BUR101	$20,200	$14,000	$34,400	$2,630	$37,000
	BUR146	$1,870,000	$1,300,000	$3,180,000	$126,000	$3,310,000
	BUR149	$198,000	$140,000	$336,000	$33,600	$369,000
	BUR165	$17,700	$12,000	$30,100	$2,300	$32,400
	BUR166	$3,800	$2,700	$6,460	$647	$7,100
	BUR167	$35,400	$25,000	$60,200	$4,600	$64,800
	BUR179	$20,200	$14,000	$34,400	$2,630	$37,000
	BUR180	$104,000	$73,000	$178,000	$17,800	$195,000
CCSeg04	BUR063	$159,000	$110,000	$271,000	$20,700	$292,000
	BUR064	$34,600	$24,000	$58,800	$4,490	$63,300
	BUR065	$85,100	$60,000	$145,000	$11,100	$156,000
	BUR066	$192,000	$130,000	$327,000	$17,300	$344,000

TABLE D-40

Summary of Total Estimated Costs by Site, Alternative 4+

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

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	BUR067	$10,600,000	$7,800,000	$18,500,000	$1,600,000	$20,100,000
	BUR068	$329,000	$230,000	$560,000	$29,700	$590,000
	BUR069	$88,500	$62,000	$151,000	$11,500	$162,000
	BUR070	$237,000	$170,000	$403,000	$30,800	$434,000
	BUR071	$166,000	$120,000	$282,000	$21,600	$304,000
	BUR072	$393,000	$270,000	$668,000	$35,400	$703,000
	BUR073	$3,460,000	$2,400,000	$5,880,000	$312,000	$6,190,000
	BUR074	$145,000	$100,000	$246,000	$18,800	$265,000
	BUR075	$244,000	$170,000	$415,000	$27,900	$442,000
	BUR076	$9,270	$6,500	$15,800	$1,210	$17,000
	BUR093	$11,800	$8,300	$20,100	$1,530	$21,600
	BUR094	$118,000	$83,000	$201,000	$15,300	$216,000
	BUR095	$18,500	$13,000	$31,500	$2,410	$33,900
	BUR096	$135,000	$96,000	$230,000	$21,000	$251,000
	BUR097	$952,000	$990,000	$1,940,000	$670,000	$2,610,000
	BUR098	$2,430,000	$2,000,000	$4,460,000	$1,030,000	$5,490,000
	BUR111	$20,200	$14,000	$34,400	$2,630	$37,000
	BUR112	$181,000	$150,000	$330,000	$61,900	$392,000
	BUR113	$22,800	$16,000	$38,700	$2,960	$41,700
	BUR114	$169,000	$140,000	$309,000	$60,200	$369,000
	BUR115	$49,700	$35,000	$84,500	$6,470	$91,000
	BUR116	$27,800	$20,000	$47,300	$3,620	$50,900
	BUR117	$4,040,000	$2,800,000	$6,860,000	$363,000	$7,230,000
	BUR118	$906,000	$630,000	$1,540,000	$81,800	$1,620,000
	BUR119	$175,000	$120,000	$298,000	$22,800	$321,000
	BUR120	$78,400	$55,000	$133,000	$10,200	$144,000
	BUR121	$3,520,000	$2,700,000	$6,240,000	$774,000	$7,010,000
	BUR122	$742,000	$520,000	$1,260,000	$66,900	$1,330,000
	BUR123	$83,500	$81,000	$164,000	$49,200	$213,000
	BUR124	$154,000	$130,000	$285,000	$58,400	$343,000
	BUR125	$27,000	$19,000	$45,900	$3,510	$49,400
	BUR126	$39,600	$28,000	$67,300	$5,150	$72,500
	BUR127	$14,300	$10,000	$24,300	$1,860	$26,200
	BUR128	$2,880,000	$2,000,000	$4,900,000	$327,000	$5,220,000
	BUR129	$214,000	$170,000	$386,000	$60,400	$447,000
	BUR141	$807,000	$570,000	$1,370,000	$54,500	$1,430,000
	BUR142	$2,120,000	$1,500,000	$3,610,000	$192,000	$3,800,000
	BUR143	$1,170,000	$820,000	$2,000,000	$79,300	$2,070,000
	BUR144	$1,070,000	$750,000	$1,820,000	$96,600	$1,920,000
	BUR174	$427,000	$300,000	$726,000	$55,500	$782,000
	BUR175	$21,100	$15,000	$35,900	$2,740	$38,600
	BUR176	$5,500	$3,800	$9,340	$496	$9,840
	BUR177	$5,500	$3,800	$9,340	$496	$9,840
	BUR178	$303,000	$210,000	$514,000	$27,300	$541,000
	BUR189	$5,500	$3,800	$9,340	$496	$9,840
	BUR190	$312,000	$330,000	$641,000	$167,000	$808,000
	BUR191	$131,000	$92,000	$223,000	$17,000	$240,000
	BUR192	$827,000	$580,000	$1,410,000	$74,600	$1,480,000
	BUR193	$63,200	$44,000	$108,000	$8,220	$116,000
	BUR194	$58,200	$41,000	$98,900	$7,560	$106,000
	BUR195	$35,400	$25,000	$60,200	$4,600	$64,800
	BUR198	$114,000	$80,000	$194,000	$14,800	$209,000
	BUR199	$27,000	$19,000	$45,900	$3,510	$49,400
	BUR200	$19,400	$14,000	$33,000	$2,520	$35,500
	BUR202	$9,270	$6,500	$15,800	$1,210	$17,000
	BUR203	$10,100	$7,100	$17,200	$1,320	$18,500

TABLE D-40

Summary of Total Estimated Costs by Site, Alternative 4+

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

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	BUR204	$5,500	$3,800	$9,340	$496	$9,840
	CC04-1	$7,140,000	$5,000,000	$12,100,000	$1,540,000	$13,700,000
CCSeg05	CC05-1	$21,000,000	$15,000,000	$35,700,000	$3,820,000	$39,600,000
	CC05-2	$6,890,000	$4,800,000	$11,700,000	$1,360,000	$13,100,000
	OSB047	$624,000	$440,000	$1,060,000	$42,100	$1,100,000
	WAL009	$69,500,000	$49,000,000	$118,000,000	$6,000,000	$124,000,000
	WAL010	$551,000	$390,000	$937,000	$37,200	$974,000
	WAL011	$702,000	$510,000	$1,220,000	$96,200	$1,310,000
	WAL039	$343,000	$240,000	$584,000	$31,000	$615,000
	WAL040	$661,000	$460,000	$1,120,000	$44,600	$1,170,000
	WAL041	$1,320,000	$920,000	$2,250,000	$89,200	$2,330,000
	WAL042	$16,800,000	$12,000,000	$28,500,000	$1,510,000	$30,000,000
	WAL081	$157,000	$110,000	$266,000	$14,100	$280,000
MIDGradSeg	PIPEMG	$12,600,000	$8,800,000	$21,400,000	$1,010,000	$22,400,000
MIDGradSeg01	KLE004	$29,500	$21,000	$50,200	$3,840	$54,000
	KLE005	$54,000	$38,000	$91,800	$7,010	$98,800
	KLE006	$115,000	$81,000	$196,000	$15,000	$211,000
	KLE011	$2,250,000	$1,600,000	$3,830,000	$203,000	$4,040,000
	KLE016	$5,500	$3,800	$9,340	$496	$9,840
	KLE020	$989,000	$690,000	$1,680,000	$89,200	$1,770,000
	KLE021	$5,500	$3,800	$9,340	$496	$9,840
	KLE022	$88,500	$62,000	$151,000	$11,500	$162,000
	KLE023	$5,500	$3,800	$9,340	$496	$9,840
	KLE032	$23,600	$17,000	$40,100	$3,070	$43,200
	KLE033	$687,000	$480,000	$1,170,000	$62,000	$1,230,000
	KLE034	$604,000	$420,000	$1,030,000	$54,500	$1,080,000
	KLE035	$4,980,000	$3,500,000	$8,470,000	$516,000	$8,990,000
	KLE036	$58,200	$41,000	$98,900	$7,560	$106,000
	KLE038	$307,000	$220,000	$522,000	$39,900	$562,000
	KLE039	$962,000	$670,000	$1,640,000	$86,700	$1,720,000
	KLE040	$4,510,000	$3,300,000	$7,820,000	$887,000	$8,700,000
	KLE042	$2,190,000	$1,500,000	$3,730,000	$156,000	$3,880,000
	KLE048	$16,400,000	$12,000,000	$28,100,000	$1,230,000	$29,300,000
	KLE049	$14,900,000	$11,000,000	$25,400,000	$1,200,000	$26,600,000
	KLE051	$5,500	$3,800	$9,340	$496	$9,840
	KLE056	$30,300	$21,000	$51,500	$3,950	$55,500
	KLE057	$15,200	$11,000	$25,800	$1,970	$27,800
	KLE058	$19,400	$14,000	$33,000	$2,520	$35,500
	KLE059	$11,800	$8,300	$20,100	$1,530	$21,600
	KLE060	$20,200	$14,000	$34,400	$2,630	$37,000
	KLE062	$1,230,000	$860,000	$2,090,000	$101,000	$2,200,000
	KLE066	$5,500	$3,800	$9,340	$496	$9,840
	KLE067	$1,030,000	$720,000	$1,760,000	$1,080,000	$2,840,000
	KLE068	$385,000	$270,000	$654,000	$34,700	$688,000
	KLE069	$35,700	$25,000	$60,700	$3,220	$63,900
	KLE070	$5,500	$3,800	$9,340	$496	$9,840
	KLE074	$2,070,000	$1,400,000	$3,520,000	$254,000	$3,780,000
	KLE075	$110,000	$77,000	$187,000	$9,910	$197,000
	MG01-1	$217,000	$150,000	$368,000	$59,300	$428,000
	MG01-10	$3,560,000	$2,500,000	$6,040,000	$659,000	$6,700,000
	MG01-11	$389,000	$270,000	$662,000	$96,100	$758,000
	MG01-12	$460,000	$320,000	$782,000	$110,000	$891,000
	MG01-13	$5,180,000	$3,600,000	$8,810,000	$979,000	$9,790,000
	MG01-14	$692,000	$480,000	$1,180,000	$138,000	$1,310,000
	MG01-15	$3,070,000	$2,100,000	$5,220,000	$589,000	$5,810,000
	MG01-16	$1,630,000	$1,100,000	$2,770,000	$314,000	$3,080,000

TABLE D-40

Summary of Total Estimated Costs by Site, Alternative 4+

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

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	MG01-17	$4,570,000	$3,200,000	$7,780,000	$871,000	$8,650,000
	MG01-18	$1,810,000	$1,300,000	$3,080,000	$350,000	$3,430,000
	MG01-2	$264,000	$180,000	$448,000	$63,100	$511,000
	MG01-3	$847,000	$590,000	$1,440,000	$187,000	$1,630,000
	MG01-4	$1,430,000	$1,000,000	$2,430,000	$323,000	$2,750,000
	MG01-5	$987,000	$690,000	$1,680,000	$196,000	$1,870,000
	MG01-6	$5,770,000	$4,000,000	$9,810,000	$1,110,000	$10,900,000
	MG01-7	$1,570,000	$1,100,000	$2,660,000	$358,000	$3,020,000
	MG01-8	$7,550,000	$5,300,000	$12,800,000	$1,400,000	$14,200,000
	MG01-9	$454,000	$320,000	$771,000	$91,600	$863,000
	MUL085	$1,110,000	$780,000	$1,880,000	$1,680,000	$3,560,000
	MUL086	$824,000	$580,000	$1,400,000	$74,300	$1,480,000
	MUL087	$31,200	$22,000	$53,000	$4,050	$57,100
	OSB024	$54,800	$38,000	$93,200	$7,120	$100,000
	OSB025	$329,000	$230,000	$560,000	$29,700	$590,000
	OSB026	$65,800	$46,000	$112,000	$8,550	$120,000
	OSB027	$100,000	$70,000	$170,000	$13,000	$183,000
	OSB028	$9,270	$6,500	$15,800	$1,210	$17,000
	OSB030	$5,500	$3,800	$9,340	$496	$9,840
	OSB065	$103,000,000	$72,000,000	$175,000,000	$4,110,000	$179,000,000
	OSB070	$852,000	$600,000	$1,450,000	$76,800	$1,520,000
	OSB071	$27,000	$19,000	$45,900	$3,510	$49,400
	OSB072	$5,500	$3,800	$9,340	$496	$9,840
	OSB073	$604,000	$420,000	$1,030,000	$54,500	$1,080,000
	OSB074	$524,000	$370,000	$890,000	$1,190,000	$2,080,000
	OSB075	$5,500	$3,800	$9,340	$496	$9,840
	OSB076	$154,000	$110,000	$262,000	$530,000	$792,000
	OSB078	$5,500	$3,800	$9,340	$496	$9,840
	OSB079	$13,500	$9,400	$22,900	$1,750	$24,700
	OSB080	$173,000	$120,000	$295,000	$533,000	$828,000
	OSB117	$385,000	$270,000	$654,000	$34,700	$688,000
	OSB118	$2,200,000	$1,500,000	$3,740,000	$149,000	$3,890,000
	OSB119	$22,900,000	$16,000,000	$38,900,000	$1,040,000	$39,900,000
	OSB120	$72,300,000	$51,000,000	$123,000,000	$3,300,000	$126,000,000
	POL015	$27,000	$19,000	$45,900	$3,510	$49,400
	POL016	$25,300	$18,000	$43,000	$3,290	$46,300
	POL017	$21,100	$15,000	$35,900	$2,740	$38,600
	POL018	$604,000	$420,000	$1,030,000	$54,500	$1,080,000
	POL019	$5,500,000	$3,800,000	$9,340,000	$496,000	$9,840,000
	POL020	$16,000	$11,000	$27,200	$2,080	$29,300
	POL021	$5,500	$3,800	$9,340	$496	$9,840
	POL029	$13,500	$9,400	$22,900	$1,750	$24,700
	POL030	$40,500	$28,000	$68,800	$5,260	$74,100
	POL031	$36,200	$25,000	$61,600	$4,710	$66,300
	POL032	$19,400	$14,000	$33,000	$2,520	$35,500
	POL033	$19,400	$14,000	$33,000	$2,520	$35,500
	POL034	$69,100	$48,000	$118,000	$8,990	$126,000
	POL035	$165,000	$120,000	$281,000	$21,500	$303,000
	POL055	$37,900	$27,000	$64,500	$4,930	$69,400
	POL057	$15,200	$11,000	$25,800	$1,970	$27,800
	POL058	$19,400	$14,000	$33,000	$2,520	$35,500
	POL059	$22,800	$16,000	$38,700	$2,960	$41,700
	POL060	$17,700	$12,000	$30,100	$2,300	$32,400
	POL061	$32,000	$22,000	$54,400	$4,160	$58,600
	POL064	$5,500	$3,800	$9,340	$496	$9,840
	POL065	$17,700	$12,000	$30,100	$2,300	$32,400

TABLE D-40

Summary of Total Estimated Costs by Site, Alternative 4+

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

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	POL077	$16,900	$12,000	$28,700	$2,190	$30,900
	POL078	$13,500	$9,400	$22,900	$1,750	$24,700
	POL079	$15,200	$11,000	$25,800	$1,970	$27,800
	POL080	$13,500	$9,400	$22,900	$1,750	$24,700
	POL081	$18,500	$13,000	$31,500	$2,410	$33,900
	POL082	$18,500	$13,000	$31,500	$2,410	$33,900
	POL083	$15,200	$11,000	$25,800	$1,970	$27,800
	POL084	$13,500	$9,400	$22,900	$1,750	$24,700
	POL085	$11,800	$8,300	$20,100	$1,530	$21,600
	POL086	$15,200	$11,000	$25,800	$1,970	$27,800
	POL087	$15,200	$11,000	$25,800	$1,970	$27,800
	POL088	$27,000	$19,000	$45,900	$3,510	$49,400
	POL089	$18,500	$13,000	$31,500	$2,410	$33,900
	POL090	$9,270	$6,500	$15,800	$1,210	$17,000
	POL091	$16,000	$11,000	$27,200	$2,080	$29,300
	POL092	$23,600	$17,000	$40,100	$3,070	$43,200
	WAL001	$29,800,000	$21,000,000	$50,600,000	$3,550,000	$54,100,000
	WAL002	$15,800	$11,000	$27,100	$2,600	$29,700
	WAL003	$277,000	$190,000	$471,000	$36,100	$507,000
	WAL004	$37,700,000	$27,000,000	$64,200,000	$1,810,000	$66,100,000
	WAL005	$28,700	$20,000	$48,800	$3,730	$52,500
	WAL014	$1,070,000	$750,000	$1,820,000	$96,600	$1,920,000
	WAL016	$5,500	$3,800	$9,340	$496	$9,840
	WAL017	$175,000	$120,000	$297,000	$22,700	$320,000
	WAL019	$24,400	$17,000	$41,500	$3,180	$44,700
	WAL020	$3,820,000	$2,700,000	$6,490,000	$344,000	$6,830,000
	WAL021	$15,200	$11,000	$25,800	$1,970	$27,800
	WAL022	$11,000	$7,700	$18,700	$1,420	$20,100
	WAL023	$13,500	$9,400	$22,900	$1,750	$24,700
	WAL024	$5,500	$3,800	$9,340	$496	$9,840
	WAL025	$16,900	$12,000	$28,700	$2,190	$30,900
	WAL026	$7,590	$5,300	$12,900	$986	$13,900
	WAL027	$76,700	$54,000	$130,000	$9,970	$140,000
	WAL028	$15,200	$11,000	$25,800	$1,970	$27,800
	WAL029	$30,300	$21,000	$51,500	$3,950	$55,500
	WAL034	$2,860,000	$2,000,000	$4,860,000	$193,000	$5,050,000
	WAL035	$3,850,000	$2,700,000	$6,540,000	$347,000	$6,880,000
	WAL036	$1,650,000	$1,200,000	$2,810,000	$112,000	$2,920,000
	WAL037	$329,000	$230,000	$560,000	$29,700	$590,000
	WAL046	$5,500	$3,800	$9,340	$496	$9,840
	WAL047	$18,500	$13,000	$31,500	$2,410	$33,900
	WAL048	$102,000	$71,000	$173,000	$13,300	$187,000
	WAL049	$95,300	$67,000	$162,000	$12,400	$174,000
	WAL050	$70,800	$50,000	$120,000	$9,210	$130,000
	WAL051	$54,000	$38,000	$91,800	$7,010	$98,800
	WAL052	$70,800	$50,000	$120,000	$9,210	$130,000
	WAL053	$27,000	$19,000	$45,900	$3,510	$49,400
	WAL054	$58,200	$41,000	$98,900	$7,560	$106,000
	WAL055	$5,500	$3,800	$9,340	$496	$9,840
	WAL056	$5,500	$3,800	$9,340	$496	$9,840
	WAL057	$5,500	$3,800	$9,340	$496	$9,840
	WAL058	$5,500	$3,800	$9,340	$496	$9,840
	WAL059	$35,400	$25,000	$60,200	$4,600	$64,800
	WAL060	$20,200	$14,000	$34,400	$2,630	$37,000
	WAL061	$32,000	$22,000	$54,400	$4,160	$58,600
	WAL062	$5,500	$3,800	$9,340	$496	$9,840

TABLE D-40

Summary of Total Estimated Costs by Site, Alternative 4+

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

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	WAL063	$24,400	$17,000	$41,500	$3,180	$44,700
	WAL064	$5,500	$3,800	$9,340	$496	$9,840
	WAL065	$31,200	$22,000	$53,000	$4,050	$57,100
	WAL066	$27,800	$20,000	$47,300	$3,620	$50,900
	WAL067	$58,200	$41,000	$98,900	$7,560	$106,000
	WAL070	$59,900	$42,000	$102,000	$7,780	$110,000
	WAL071	$16,900	$12,000	$28,700	$2,190	$30,900
	WAL072	$5,500	$3,800	$9,340	$496	$9,840
	WAL073	$5,500	$3,800	$9,340	$496	$9,840
	WAL074	$21,900	$15,000	$37,200	$2,850	$40,100
MIDGradSeg02	KLW061	$2,320,000	$1,600,000	$3,940,000	$301,000	$4,240,000
	KLW062	$356,000	$250,000	$605,000	$46,200	$651,000
	KLW070	$342,000	$240,000	$583,000	$23,200	$606,000
	KLW071	$576,000	$400,000	$979,000	$74,900	$1,050,000
	KLW095	$137,000	$96,000	$233,000	$17,800	$251,000
	KLW123	$15,200	$11,000	$25,800	$1,970	$27,800
	KLW124	$61,800	$43,000	$105,000	$8,030	$113,000
	KLW125	$38,400	$27,000	$65,300	$4,990	$70,300
	KLW126	$21,900	$15,000	$37,200	$2,850	$40,100
	KLW127	$21,700	$15,000	$36,900	$2,820	$39,700
	KLW128	$212,000	$150,000	$360,000	$27,600	$388,000
	MAS070	$33,700	$24,000	$57,300	$4,380	$61,700
	MG02-10	$50,500	$35,000	$85,800	$13,100	$98,900
	MG02-11	$43,900	$31,000	$74,600	$11,400	$86,000
	MG02-12	$18,900	$13,000	$32,100	$4,920	$37,000
	KLE007	$104,000	$73,000	$177,000	$13,500	$190,000
	KLE061	$5,500	$3,800	$9,340	$496	$9,840
	MC01-2	$498,000	$350,000	$847,000	$174,000	$1,020,000
	KLE008	$109,000	$76,000	$185,000	$14,100	$199,000
	KLE009	$116,000	$81,000	$197,000	$15,100	$213,000
	KLE013	$88,500	$62,000	$151,000	$11,500	$162,000
	KLE014	$5,500	$3,800	$9,340	$496	$9,840
	KLE041	$121,000	$85,000	$206,000	$8,180	$214,000
	KLE063	$25,100	$18,000	$42,600	$3,260	$45,900
	KLE064	$21,700	$15,000	$36,900	$2,820	$39,700
	KLE065	$38,400	$27,000	$65,300	$4,990	$70,300
	MC02-2	$817,000	$570,000	$1,390,000	$192,000	$1,580,000
	MC02-3	$477,000	$330,000	$810,000	$116,000	$926,000
	MC02-4	$370,000	$260,000	$629,000	$87,600	$716,000
NMSeg	PIPENM	$1,560,000	$1,100,000	$2,650,000	$125,000	$2,780,000
NMSeg01	BUR051	$656,000	$460,000	$1,110,000	$1,210,000	$2,330,000
	BUR052	$75,900	$53,000	$129,000	$12,900	$142,000
	BUR053	$13,200,000	$9,200,000	$22,400,000	$2,240,000	$24,600,000
	BUR077	$96,100	$67,000	$163,000	$12,500	$176,000
	BUR081	$554,000	$390,000	$942,000	$1,200,000	$2,140,000
	BUR082	$35,400	$25,000	$60,200	$4,600	$64,800
	BUR083	$27,000	$19,000	$45,900	$3,510	$49,400
	BUR084	$22,800	$16,000	$38,700	$2,960	$41,700
	BUR140	$367,000	$260,000	$624,000	$24,800	$649,000
	NM01-1	$1,050,000	$730,000	$1,780,000	$283,000	$2,070,000
NMSeg02	BUR054	$8,470,000	$5,900,000	$14,400,000	$1,290,000	$15,700,000
	BUR055	$587,000	$410,000	$997,000	$48,300	$1,040,000
	BUR056	$8,050,000	$5,600,000	$13,700,000	$726,000	$14,400,000
	BUR057	$76,700	$54,000	$130,000	$9,970	$140,000
	BUR058	$584,000	$410,000	$993,000	$1,200,000	$2,200,000
	BUR059	$147,000	$100,000	$250,000	$19,100	$269,000

TABLE D-40

Summary of Total Estimated Costs by Site, Alternative 4+

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

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	BUR060	$180,000	$130,000	$306,000	$23,500	$330,000
	BUR061	$120,000	$84,000	$204,000	$15,600	$219,000
	BUR062	$57,300	$40,000	$97,400	$7,450	$105,000
	BUR170	$765,000	$540,000	$1,300,000	$1,190,000	$2,490,000
	BUR171	$340,000	$240,000	$577,000	$1,060,000	$1,640,000
	BUR196	$26,100	$18,000	$44,400	$3,400	$47,800
	BUR197	$38,800	$27,000	$65,900	$5,040	$70,900
	BUR205	$54,800	$38,000	$93,200	$7,120	$100,000
	NM02-1	$1,990,000	$1,400,000	$3,390,000	$535,000	$3,920,000
	OSB040	$697,000	$490,000	$1,190,000	$47,100	$1,230,000
	OSB044	$10,700,000	$7,500,000	$18,200,000	$959,000	$19,200,000
	OSB045	$70,800	$50,000	$120,000	$9,210	$130,000
	OSB046	$29,500	$21,000	$50,200	$3,840	$54,000
	OSB048	$12,600	$8,900	$21,500	$1,640	$23,100
	OSB056	$58,700	$41,000	$99,700	$3,960	$104,000
	OSB057	$477,000	$330,000	$811,000	$32,200	$844,000
	OSB058	$58,700	$41,000	$99,700	$3,960	$104,000
	OSB088	$13,600	$11,000	$24,600	$4,710	$29,300
	OSB089	$20,300	$18,000	$38,400	$10,400	$48,800
NMSeg03	NM03-1	$994,000	$700,000	$1,690,000	$217,000	$1,910,000
	OSB041	$69,100	$48,000	$118,000	$8,990	$126,000
	OSB042	$16,000	$11,000	$27,200	$2,080	$29,300
	OSB043	$113,000	$79,000	$192,000	$14,700	$207,000
	OSB049	$46,400	$33,000	$78,900	$6,030	$84,900
	OSB081	$11,800	$8,300	$20,100	$1,530	$21,600
	OSB087	$8,430	$5,900	$14,300	$1,100	$15,400
NMSeg04	NM04-1	$1,860,000	$1,300,000	$3,160,000	$372,000	$3,530,000
	NM04-2	$735,000	$510,000	$1,250,000	$145,000	$1,390,000
	NM04-3	$5,090,000	$3,600,000	$8,670,000	$1,020,000	$9,680,000
	OSB031	$47,200	$33,000	$80,200	$6,140	$86,300
	OSB032	$550,000	$380,000	$934,000	$49,600	$984,000
	OSB033	$439,000	$310,000	$747,000	$39,600	$786,000
	OSB034	$25,300	$18,000	$43,000	$3,290	$46,300
	OSB035	$41,300	$29,000	$70,200	$5,370	$75,600
	OSB036	$21,100	$15,000	$35,900	$2,740	$38,600
	OSB037	$59,900	$42,000	$102,000	$7,780	$110,000
	OSB038	$852,000	$600,000	$1,450,000	$76,800	$1,520,000
	OSB039	$3,800,000	$2,700,000	$6,470,000	$435,000	$6,900,000
	OSB052	$5,500,000	$3,800,000	$9,340,000	$496,000	$9,840,000
	OSB055	$44,000	$32,000	$76,300	$8,750	$85,100
	OSB059	$1,210,000	$850,000	$2,060,000	$81,800	$2,140,000
	OSB060	$29,400	$21,000	$49,900	$1,980	$51,900
	OSB061	$192,000	$130,000	$327,000	$17,300	$344,000
	OSB082	$357,000	$250,000	$607,000	$32,200	$639,000
	OSB083	$64,900	$45,000	$110,000	$8,440	$119,000
	OSB114	$18,500	$13,000	$31,500	$2,410	$33,900
	OSB115	$5,500	$3,800	$9,340	$496	$9,840
	OSB116	$26,100	$18,000	$44,400	$3,400	$47,800
	WAL006	$5,500	$3,800	$9,340	$496	$9,840
	WAL033	$1,250,000	$870,000	$2,120,000	$84,300	$2,210,000
	WAL069	$20,200	$14,000	$34,400	$2,630	$37,000
	WAL075	$7,590	$5,300	$12,900	$986	$13,900
	WAL078	$22,800	$16,000	$38,700	$2,960	$41,700
PineCrkSeg01	MAS004	$403,000	$280,000	$685,000	$1,060,000	$1,750,000
	MAS005	$24,400	$17,000	$41,500	$3,180	$44,700
	MAS006	$1,150,000	$810,000	$1,960,000	$104,000	$2,070,000

TABLE D-40

Summary of Total Estimated Costs by Site, Alternative 4+

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

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	MAS007	$1,680,000	$1,200,000	$2,850,000	$716,000	$3,570,000
	MAS008	$687,000	$480,000	$1,170,000	$62,000	$1,230,000
	MAS009	$349,000	$240,000	$594,000	$547,000	$1,140,000
	MAS011	$146,000	$100,000	$248,000	$529,000	$777,000
	MAS012	$516,000	$360,000	$878,000	$1,190,000	$2,070,000
	MAS013	$129,000	$90,000	$220,000	$11,600	$231,000
	MAS014	$1,580,000	$1,100,000	$2,690,000	$2,480,000	$5,170,000
	MAS015	$189,000	$130,000	$321,000	$532,000	$853,000
	MAS016	$784,000	$550,000	$1,330,000	$586,000	$1,920,000
	MAS017	$2,220,000	$1,600,000	$3,780,000	$1,350,000	$5,130,000
	MAS018	$74,200	$52,000	$126,000	$6,690	$133,000
	MAS019	$27,500	$19,000	$46,700	$2,480	$49,200
	MAS020	$401,000	$280,000	$681,000	$552,000	$1,230,000
	MAS021	$426,000	$300,000	$724,000	$1,140,000	$1,870,000
	MAS022	$1,320,000	$920,000	$2,240,000	$119,000	$2,360,000
	MAS023	$27,500	$19,000	$46,700	$2,480	$49,200
	MAS025	$1,690,000	$1,200,000	$2,870,000	$749,000	$3,620,000
	MAS027	$192,000	$130,000	$327,000	$17,300	$344,000
	MAS028	$297,000	$210,000	$504,000	$26,800	$531,000
	MAS029	$168,000	$120,000	$285,000	$531,000	$817,000
	MAS030	$185,000	$130,000	$314,000	$16,700	$331,000
	MAS031	$119,000	$83,000	$202,000	$10,700	$212,000
	MAS032	$2,200	$1,500	$3,740	$198	$3,940
	MAS033	$132,000	$92,000	$224,000	$11,900	$236,000
	MAS034	$12,600	$8,900	$21,500	$1,640	$23,100
	MAS035	$220,000	$150,000	$374,000	$19,800	$394,000
	MAS036	$74,200	$52,000	$126,000	$6,690	$133,000
	MAS040	$50,600	$35,000	$86,000	$3,420	$89,400
	MAS041	$85,800	$60,000	$146,000	$5,800	$152,000
	MAS042	$39,600	$28,000	$67,400	$2,680	$70,100
	MAS043	$110,000	$77,000	$187,000	$7,430	$195,000
	MAS045	$110,000	$77,000	$187,000	$7,430	$195,000
	MAS046	$875,000	$610,000	$1,490,000	$59,100	$1,550,000
	MAS048	$584,000	$410,000	$993,000	$52,700	$1,050,000
	MAS049	$989,000	$690,000	$1,680,000	$89,200	$1,770,000
	MAS050	$971,000	$680,000	$1,650,000	$1,200,000	$2,860,000
	MAS051	$38,400	$27,000	$65,300	$4,990	$70,300
	MAS052	$145,000	$100,000	$247,000	$13,100	$260,000
	MAS053	$5,500	$3,800	$9,340	$496	$9,840
	MAS054	$484,000	$340,000	$823,000	$566,000	$1,390,000
	MAS055	$5,500	$3,800	$9,340	$496	$9,840
	MAS056	$31,700	$22,000	$53,900	$4,120	$58,000
	MAS057	$5,500	$3,800	$9,340	$496	$9,840
	MAS058	$25,300	$18,000	$43,000	$3,290	$46,300
	MAS059	$23,600	$17,000	$40,100	$3,070	$43,200
	MAS060	$45,100	$32,000	$76,700	$5,860	$82,600
	MAS061	$26,100	$18,000	$44,400	$3,400	$47,800
	MAS062	$38,400	$27,000	$65,300	$4,990	$70,300
	MAS063	$12,600	$8,900	$21,500	$1,640	$23,100
	MAS065	$5,500	$3,800	$9,340	$496	$9,840
	MAS067	$30,300	$21,000	$51,500	$3,950	$55,500
	MAS068	$5,500	$3,800	$9,340	$496	$9,840
	MAS069	$159,000	$110,000	$271,000	$20,700	$292,000
	MAS072	$5,500	$3,800	$9,340	$496	$9,840
	MAS075	$16,000	$11,000	$27,200	$2,080	$29,300
	MAS076	$37,900	$27,000	$64,500	$4,930	$69,400

TABLE D-40

Summary of Total Estimated Costs by Site, Alternative 4+

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

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	MAS077	$91,900	$64,000	$156,000	$11,900	$168,000
	MAS078	$364,000	$250,000	$617,000	$580,000	$1,200,000
	MAS079	$1,030,000	$720,000	$1,740,000	$92,400	$1,830,000
	MAS080	$36,200	$25,000	$61,600	$4,710	$66,300
	MAS081	$177,000	$120,000	$301,000	$23,000	$324,000
	MAS082	$104,000	$73,000	$177,000	$13,500	$190,000
	MAS083	$1,020,000	$710,000	$1,730,000	$92,100	$1,830,000
	MAS084	$824,000	$580,000	$1,400,000	$74,300	$1,480,000
PineCrkSeg02	TWI001	$47,200	$33,000	$80,200	$6,140	$86,300
	TWI002	$158,000	$110,000	$269,000	$14,300	$283,000
	TWI003	$13,500	$9,400	$22,900	$1,750	$24,700
	TWI004	$19,400	$14,000	$33,000	$2,520	$35,500
	TWI005	$25,300	$18,000	$43,000	$3,290	$46,300
	TWI006	$132,000	$92,000	$224,000	$11,900	$236,000
	TWI007	$41,800	$29,000	$71,000	$5,430	$76,400
	TWI008	$5,500	$3,800	$9,340	$496	$9,840
	TWI009	$178,000	$120,000	$303,000	$16,100	$319,000
	TWI010	$55,100	$39,000	$93,700	$7,160	$101,000
	TWI011	$5,500	$3,800	$9,340	$496	$9,840
	TWI012	$106,000	$74,000	$179,000	$9,520	$189,000
	TWI013	$211,000	$150,000	$359,000	$19,000	$378,000
	TWI014	$165,000	$120,000	$280,000	$14,900	$295,000
	TWI015	$53,400	$37,000	$90,800	$6,950	$97,800
	TWI016	$41,800	$29,000	$71,000	$5,430	$76,400
	TWI017	$22,800	$16,000	$38,700	$2,960	$41,700
	TWI018	$5,500	$3,800	$9,340	$496	$9,840
	TWI019	$55,100	$39,000	$93,700	$7,160	$101,000
	TWI020	$5,500	$3,800	$9,340	$496	$9,840
	TWI021	$18,500	$13,000	$31,500	$2,410	$33,900
	TWI022	$61,500	$43,000	$105,000	$8,000	$113,000
	TWI023	$42,200	$30,000	$71,700	$5,480	$77,200
	TWI024	$35,400	$25,000	$60,200	$4,600	$64,800
	TWI025	$25,300	$18,000	$43,000	$3,290	$46,300
	TWI026	$116,000	$81,000	$197,000	$15,100	$213,000
	TWI027	$5,500	$3,800	$9,340	$496	$9,840
	TWI028	$30,100	$21,000	$51,100	$3,910	$55,000
	TWI029	$5,500	$3,800	$9,340	$496	$9,840
	TWI030	$5,500	$3,800	$9,340	$496	$9,840
PineCrkSeg03	KLW072	$87,700	$61,000	$149,000	$11,400	$161,000
	KLW073	$231,000	$160,000	$393,000	$20,800	$413,000
	KLW075	$468,000	$330,000	$796,000	$42,200	$838,000
	KLW077	$303,000	$210,000	$515,000	$27,400	$543,000
	KLW079	$264,000	$180,000	$449,000	$23,800	$472,000
	KLW080	$137,000	$96,000	$233,000	$23,300	$256,000
	KLW081	$166,000	$120,000	$281,000	$534,000	$815,000
	KLW082	$224,000	$160,000	$381,000	$20,200	$401,000
	KLW083	$382,000	$270,000	$649,000	$34,500	$684,000
	KLW084	$28,700	$20,000	$48,800	$3,730	$52,500
	KLW085	$396,000	$280,000	$672,000	$35,700	$708,000
	MAS001	$91,000	$64,000	$155,000	$11,800	$167,000
	MAS003	$476,000	$330,000	$808,000	$606,000	$1,410,000
	MAS064	$21,100	$15,000	$35,900	$2,740	$38,600
	MAS066	$5,500	$3,800	$9,340	$496	$9,840
	PC03-1	$1,540,000	$1,100,000	$2,620,000	$331,000	$2,950,000
	PC03-2	$1,280,000	$890,000	$2,170,000	$270,000	$2,440,000
	PC03-3	$576,000	$400,000	$979,000	$127,000	$1,110,000

TABLE D-40

Summary of Total Estimated Costs by Site, Alternative 4+

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

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
UpperSFCDRSeg	PIPEUG	$11,800,000	$8,300,000	$20,100,000	$947,000	$21,100,000
UpperSFCDRSeg01	BUR136	$25,300	$18,000	$43,000	$3,290	$46,300
	BUR137	$27,000	$19,000	$45,900	$3,510	$49,400
	LOK001	$109,000	$76,000	$185,000	$14,100	$199,000
	LOK002	$107,000	$75,000	$182,000	$13,900	$196,000
	LOK003	$20,200	$14,000	$34,400	$2,630	$37,000
	LOK004	$2,210,000	$1,500,000	$3,760,000	$1,360,000	$5,120,000
	LOK005	$15,200	$11,000	$25,800	$1,970	$27,800
	LOK006	$171,000	$120,000	$291,000	$15,500	$307,000
	LOK007	$123,000	$86,000	$209,000	$21,000	$230,000
	LOK008	$243,000	$190,000	$435,000	$76,900	$512,000
	LOK009	$420,000	$290,000	$713,000	$71,400	$784,000
	LOK010	$92,300	$65,000	$157,000	$8,330	$165,000
	LOK011	$4,670,000	$4,600,000	$9,280,000	$2,810,000	$12,100,000
	LOK012	$122,000	$86,000	$208,000	$15,900	$224,000
	LOK013	$108,000	$76,000	$184,000	$14,000	$198,000
	LOK014	$543,000	$380,000	$923,000	$1,200,000	$2,120,000
	LOK015	$10,100	$7,100	$17,200	$1,320	$18,500
	LOK016	$69,100	$48,000	$118,000	$8,990	$126,000
	LOK017	$1,020,000	$710,000	$1,730,000	$611,000	$2,340,000
	LOK018	$47,200	$33,000	$80,200	$6,140	$86,300
	LOK019	$254,000	$180,000	$432,000	$543,000	$975,000
	LOK020	$45,500	$32,000	$77,400	$5,920	$83,300
	LOK021	$96,100	$67,000	$163,000	$12,500	$176,000
	LOK022	$124,000	$87,000	$211,000	$16,100	$227,000
	LOK024	$614,000	$430,000	$1,040,000	$1,210,000	$2,250,000
	LOK025	$32,000	$22,000	$54,400	$4,160	$58,600
	LOK026	$28,700	$20,000	$48,800	$3,730	$52,500
	LOK027	$16,000	$11,000	$27,200	$2,080	$29,300
	LOK028	$541,000	$380,000	$920,000	$1,200,000	$2,120,000
	LOK041	$79,200	$56,000	$135,000	$10,300	$145,000
	LOK044	$127,000	$89,000	$216,000	$16,500	$232,000
	LOK045	$31,200	$22,000	$53,000	$4,050	$57,100
	LOK047	$191,000	$130,000	$324,000	$24,800	$349,000
	LOK048	$123,000	$86,000	$209,000	$21,000	$230,000
	LOK050	$357,000	$250,000	$607,000	$32,200	$639,000
	LOK051	$1,260,000	$880,000	$2,140,000	$114,000	$2,250,000
	LOK052	$26,100	$18,000	$44,400	$3,400	$47,800
	LOK053	$26,100	$18,000	$44,400	$3,400	$47,800
	LOK054	$11,000	$7,700	$18,700	$1,420	$20,100
	MUL001	$2,090,000	$1,500,000	$3,570,000	$203,000	$3,770,000
	MUL002	$631,000	$440,000	$1,070,000	$57,000	$1,130,000
	MUL003	$231,000	$160,000	$393,000	$30,000	$423,000
	MUL004	$540,000	$380,000	$919,000	$48,800	$968,000
	MUL005	$28,700	$20,000	$48,800	$3,730	$52,500
	MUL006	$481,000	$340,000	$818,000	$43,400	$861,000
	MUL007	$80,100	$56,000	$136,000	$10,400	$147,000
	MUL008	$906,000	$630,000	$1,540,000	$81,800	$1,620,000
	MUL009	$21,100	$15,000	$35,900	$2,740	$38,600
	MUL010	$27,000	$19,000	$45,900	$3,510	$49,400
	MUL011	$12,600	$8,900	$21,500	$1,640	$23,100
	MUL012	$4,320,000	$3,100,000	$7,420,000	$898,000	$8,320,000
	MUL013	$115,000	$100,000	$217,000	$53,300	$271,000
	MUL014	$1,260,000	$1,300,000	$2,540,000	$859,000	$3,400,000
	MUL015	$436,000	$310,000	$742,000	$74,400	$817,000
	MUL016	$46,400	$33,000	$78,900	$6,030	$84,900

TABLE D-40

Summary of Total Estimated Costs by Site, Alternative 4+

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

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	MUL017	$45,500	$32,000	$77,400	$5,920	$83,300
	MUL018	$396,000	$280,000	$672,000	$35,700	$708,000
	MUL019	$13,800,000	$9,900,000	$23,700,000	$1,800,000	$25,500,000
	MUL020	$7,830,000	$5,500,000	$13,300,000	$654,000	$14,000,000
	MUL021	$797,000	$560,000	$1,360,000	$72,000	$1,430,000
	MUL022	$29,500	$21,000	$50,200	$3,840	$54,000
	MUL023	$1,360,000	$950,000	$2,310,000	$1,270,000	$3,580,000
	MUL024	$690,000	$480,000	$1,170,000	$1,220,000	$2,390,000
	MUL025	$85,100	$60,000	$145,000	$11,100	$156,000
	MUL026	$170,000	$120,000	$289,000	$22,100	$311,000
	MUL027	$682,000	$480,000	$1,160,000	$626,000	$1,780,000
	MUL028	$2,330,000	$1,600,000	$3,970,000	$932,000	$4,900,000
	MUL029	$387,000	$270,000	$658,000	$66,000	$724,000
	MUL030	$164,000	$110,000	$279,000	$27,900	$307,000
	MUL031	$155,000	$110,000	$263,000	$26,400	$290,000
	MUL032	$28,700	$20,000	$48,800	$3,730	$52,500
	MUL033	$301,000	$210,000	$511,000	$51,200	$563,000
	MUL034	$73,500	$51,000	$125,000	$9,550	$134,000
	MUL035	$25,300	$18,000	$43,000	$3,290	$46,300
	MUL036	$23,600	$17,000	$40,100	$3,070	$43,200
	MUL037	$9,530,000	$6,700,000	$16,200,000	$720,000	$16,900,000
	MUL038	$2,190,000	$1,500,000	$3,710,000	$197,000	$3,910,000
	MUL040	$16,000	$11,000	$27,200	$2,080	$29,300
	MUL041	$314,000	$220,000	$534,000	$40,800	$575,000
	MUL042	$265,000	$180,000	$449,000	$45,000	$494,000
	MUL043	$333,000	$230,000	$566,000	$56,700	$622,000
	MUL045	$524,000	$370,000	$891,000	$89,300	$980,000
	MUL046	$29,500	$21,000	$50,200	$3,840	$54,000
	MUL047	$105,000	$73,000	$178,000	$17,900	$196,000
	MUL048	$586,000	$410,000	$998,000	$52,900	$1,050,000
	MUL049	$25,300	$18,000	$43,000	$3,290	$46,300
	MUL050	$31,200	$22,000	$53,000	$4,050	$57,100
	MUL051	$546,000	$380,000	$928,000	$93,100	$1,020,000
	MUL052	$685,000	$480,000	$1,160,000	$1,210,000	$2,370,000
	MUL053	$2,060,000	$1,400,000	$3,500,000	$1,570,000	$5,070,000
	MUL054	$186,000	$130,000	$317,000	$538,000	$855,000
	MUL055	$220,000	$150,000	$374,000	$28,600	$403,000
	MUL056	$29,500	$21,000	$50,200	$3,840	$54,000
	MUL057	$66,600	$47,000	$113,000	$8,660	$122,000
	MUL058	$23,400,000	$16,000,000	$39,800,000	$2,260,000	$42,100,000
	MUL059	$620,000	$430,000	$1,050,000	$55,900	$1,110,000
	MUL060	$139,000	$97,000	$235,000	$12,500	$248,000
	MUL061	$29,500	$21,000	$50,200	$3,840	$54,000
	MUL062	$21,100	$15,000	$35,900	$2,740	$38,600
	MUL063	$139,000	$97,000	$235,000	$12,500	$248,000
	MUL064	$47,200	$33,000	$80,200	$6,140	$86,300
	MUL065	$205,000	$140,000	$348,000	$18,400	$366,000
	MUL066	$79,200	$56,000	$135,000	$10,300	$145,000
	MUL067	$113,000	$79,000	$192,000	$14,700	$207,000
	MUL068	$30,300	$21,000	$51,500	$3,950	$55,500
	MUL069	$18,500	$13,000	$31,500	$2,410	$33,900
	MUL071	$78,400	$55,000	$133,000	$7,940	$141,000
	MUL072	$386,000	$270,000	$656,000	$1,050,000	$1,710,000
	MUL073	$174,000	$120,000	$296,000	$22,600	$319,000
	MUL074	$38,800	$27,000	$65,900	$5,040	$70,900
	MUL075	$25,300	$18,000	$43,000	$3,290	$46,300

TABLE D-40

Summary of Total Estimated Costs by Site, Alternative 4+

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

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	MUL076	$29,500	$21,000	$50,200	$3,840	$54,000
	MUL077	$20,200	$14,000	$34,400	$2,630	$37,000
	MUL078	$96,100	$67,000	$163,000	$12,500	$176,000
	MUL079	$75,000	$53,000	$128,000	$9,750	$137,000
	MUL080	$28,700	$20,000	$48,800	$3,730	$52,500
	MUL081	$394,000	$280,000	$669,000	$558,000	$1,230,000
	MUL082	$21,100	$15,000	$35,900	$2,740	$38,600
	MUL083	$422,000	$300,000	$717,000	$38,100	$755,000
	MUL084	$95,300	$67,000	$162,000	$12,400	$174,000
	MUL103	$676,000	$470,000	$1,150,000	$1,210,000	$2,360,000
	MUL107	$11,000	$7,700	$18,700	$1,420	$20,100
	MUL108	$11,800	$8,300	$20,100	$1,530	$21,600
	MUL109	$14,300	$10,000	$24,300	$1,860	$26,200
	MUL110	$11,800	$8,300	$20,100	$1,530	$21,600
	MUL111	$16,000	$11,000	$27,200	$2,080	$29,300
	MUL112	$15,200	$11,000	$25,800	$1,970	$27,800
	MUL113	$17,700	$12,000	$30,100	$2,300	$32,400
	MUL114	$18,500	$13,000	$31,500	$2,410	$33,900
	MUL115	$20,200	$14,000	$34,400	$2,630	$37,000
	MUL116	$15,200	$11,000	$25,800	$1,970	$27,800
	MUL117	$23,600	$17,000	$40,100	$3,070	$43,200
	MUL118	$27,000	$19,000	$45,900	$3,510	$49,400
	MUL119	$23,600	$17,000	$40,100	$3,070	$43,200
	MUL120	$15,400	$11,000	$26,200	$1,390	$27,500
	MUL121	$13,500	$9,400	$22,900	$1,750	$24,700
	MUL122	$17,700	$12,000	$30,100	$2,300	$32,400
	MUL123	$12,600	$8,900	$21,500	$1,640	$23,100
	MUL124	$15,200	$11,000	$25,800	$1,970	$27,800
	MUL125	$21,100	$15,000	$35,900	$2,740	$38,600
	MUL126	$18,500	$13,000	$31,500	$2,410	$33,900
	MUL127	$19,400	$14,000	$33,000	$2,520	$35,500
	MUL128	$16,000	$11,000	$27,200	$2,080	$29,300
	MUL129	$732,000	$510,000	$1,240,000	$66,000	$1,310,000
	MUL130	$149,000	$100,000	$253,000	$19,400	$272,000
	MUL131	$181,000	$130,000	$308,000	$16,400	$325,000
	MUL132	$49,500	$35,000	$84,100	$4,460	$88,600
	MUL133	$21,100	$15,000	$35,900	$2,740	$38,600
	MUL134	$48,900	$34,000	$83,100	$6,360	$89,500
	MUL135	$3,800	$2,700	$6,460	$647	$7,100
	MUL136	$3,800	$2,700	$6,460	$647	$7,100
	MUL137	$30,300	$21,000	$51,500	$3,950	$55,500
	MUL138	$68,300	$48,000	$116,000	$8,880	$125,000
	MUL139	$3,800	$2,700	$6,460	$647	$7,100
	MUL140	$14,300	$10,000	$24,300	$1,860	$26,200
	MUL141	$354,000	$250,000	$602,000	$23,900	$626,000
	MUL142	$1,260,000	$880,000	$2,140,000	$85,000	$2,220,000
	MUL143	$30,300	$21,000	$51,500	$3,950	$55,500
	MUL144	$20,200	$14,000	$34,400	$2,630	$37,000
	MUL145	$154,000	$110,000	$262,000	$10,400	$272,000
	MUL146	$597,000	$420,000	$1,020,000	$102,000	$1,120,000
	MUL147	$16,000	$11,000	$27,200	$2,080	$29,300
	MUL148	$112,000	$78,000	$190,000	$14,500	$205,000
	MUL149	$207,000	$150,000	$352,000	$14,000	$366,000
	MUL150	$554,000	$390,000	$942,000	$37,400	$979,000
	MUL151	$21,100	$15,000	$35,900	$2,740	$38,600
	MUL152	$14,300	$10,000	$24,300	$1,860	$26,200

TABLE D-40

Summary of Total Estimated Costs by Site, Alternative 4+

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

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
	MUL153	$280,000	$200,000	$475,000	$18,800	$494,000
	MUL154	$147,000	$100,000	$250,000	$19,100	$269,000
	MUL155	$32,000	$22,000	$54,400	$4,160	$58,600
	MUL156	$14,300	$10,000	$24,300	$1,860	$26,200
	MUL157	$9,270	$6,500	$15,800	$1,210	$17,000
	THO019	$28,700	$20,000	$48,800	$3,730	$52,500
	THO020	$191,000	$130,000	$325,000	$17,200	$342,000
	THO021	$25,300	$18,000	$43,000	$3,290	$46,300
	UG01-1	$14,200	$9,900	$24,100	$2,550	$26,700
	UG01-10	$426,000	$300,000	$724,000	$109,000	$833,000
	UG01-11	$238,000	$170,000	$405,000	$54,300	$459,000
	UG01-12	$2,740,000	$1,900,000	$4,660,000	$607,000	$5,260,000
	UG01-13	$1,090,000	$760,000	$1,860,000	$260,000	$2,120,000
	UG01-14	$120,000	$84,000	$203,000	$33,600	$237,000
	UG01-15	$371,000	$260,000	$630,000	$110,000	$740,000
	UG01-16	$783,000	$550,000	$1,330,000	$189,000	$1,520,000
	UG01-17	$2,680,000	$1,900,000	$4,550,000	$585,000	$5,140,000
	UG01-18	$663,000	$460,000	$1,130,000	$196,000	$1,320,000
	UG01-19	$205,000	$140,000	$349,000	$51,500	$401,000
	UG01-4	$11,600	$8,100	$19,700	$3,480	$23,200
	UG01-5	$459,000	$320,000	$780,000	$123,000	$903,000
	UG01-6	$2,430,000	$1,700,000	$4,140,000	$483,000	$4,620,000
	UG01-7	$511,000	$360,000	$868,000	$120,000	$988,000
	UG01-8	$277,000	$190,000	$471,000	$58,300	$529,000
	UG01-9	$529,000	$370,000	$900,000	$143,000	$1,040,000
	WAL013	$224,000	$160,000	$381,000	$20,200	$401,000
	WAL038	$55,300,000	$39,000,000	$94,600,000	$4,400,000	$99,000,000
	WAL068	$24,400	$17,000	$41,500	$3,180	$44,700
	WAL076	$1,120,000	$790,000	$1,910,000	$101,000	$2,010,000
	WAL077	$1,540,000	$1,100,000	$2,620,000	$104,000	$2,720,000

Notes:

This Table does not include Central Treatment Plant (CTP) Sludge Pond Closure costs, these costs will be applied to the Total Alternative Cost.
This Table does not include Roads and Bridges costs, these costs will be applied to the Total Alternative Cost.

O&M = Operations and Maintenance
NPV = Net Present Value

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 D-41

Summary of Total Estimated Costs by Watershed

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

Alternative	Watershed ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
3+	BIG	$24,200,000	$16,900,000	$41,100,000	$5,790,000	$46,900,000
	CC	$39,900,000	$29,400,000	$69,300,000	$8,220,000	$77,500,000
	CCWP	$18,800,000	$13,400,000	$32,200,000	$2,550,000	$34,800,000
	MGS	$361,000,000	$253,000,000	$614,000,000	$27,900,000	$642,000,000
	MN	$2,490,000	$1,740,000	$4,230,000	$741,000	$4,970,000
	NM	$47,800,000	$33,400,000	$81,200,000	$11,800,000	$93,000,000
	PC	$26,800,000	$18,700,000	$45,500,000	$14,100,000	$59,600,000
	UG	$112,000,000	$80,400,000	$192,000,000	$22,500,000	$215,000,000
4+	BIG	$58,100,000	$40,700,000	$98,800,000	$10,400,000	$109,000,000
	CC	$72,100,000	$52,100,000	$124,000,000	$12,600,000	$137,000,000
	CCWP	$119,000,000	$83,000,000	$202,000,000	$13,000,000	$215,000,000
	MGS	$406,000,000	$285,000,000	$692,000,000	$35,700,000	$727,000,000
	MN	$2,800,000	$1,960,000	$4,750,000	$643,000	$5,400,000
	NM	$74,800,000	$52,300,000	$127,000,000	$15,500,000	$143,000,000
	PC	$32,200,000	$22,500,000	$54,700,000	$17,700,000	$72,400,000
	UG	$189,000,000	$135,000,000	$324,000,000	$38,000,000	$362,000,000

Notes:

This Table does not include Central Treatment Plant (CTP) Sludge Pond Closure costs, these costs will be applied to the Total Alternative Cost.
This Table does not include Roads and Bridges costs, these costs will be applied to the Total Alternative Cost.

O&M = Operations and Maintenance
NPV = Net Present Value

BIG = Big Creek
CC = Canyon Creek
CCWP = Canyon Creek - Woodland Park
MGS = Mainstem, SFCDR
MN = Moon Creek

TABLE D-41

Summary of Total Estimated Costs by Watershed

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

Alternative	Watershed ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)

NM = Ninemile

PC = Pine Creek

UG = Upper South Fork

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.

Attachment D-1
Technical Memorandum: CTP Expansion for Treatment of Other OU 2 and OU 3 Waters

CTP Expansion for Treatment of Other OU 2 and OU 3 Waters

PREPARED FOR: Ed Moreen/USEPA
Bill Adams/USEPA

PREPARED BY: Jim Stefanoff, P.E./CH2M HILL

DATE: January 14, 2010

1.0 Introduction

The purpose of this technical memorandum is to describe expansion of the Bunker Hill Central Treatment Plant (CTP), located in Kellogg, Idaho, for treatment of other Operable Unit 2 (OU 2) and OU 3 waters. The CTP primarily treats acid mine drainage (AMD) from the Bunker Hill mine along with relatively minor amounts of other OU 2 waters consisting of stormwater from the mine yard, drainage from the smelter closure area, vehicle decontamination water, and decontamination water associated with sampling.

The historical background of the CTP (Section 2.0) describes the 2001 Mine Water ROD Amendment (USEPA, 2001a), which selected a final remedy for managing Bunker Hill AMD, including improvements needed at the CTP. This is presented because improvements needed to expand CTP capacity for additional waters must consider interface with the CTP's role of treating its current inflows, and particularly Bunker Hill AMD (Section 3.0). Section 4.0 describes the estimated capital and O&M costs for a range of potential expanded CTP capacities.

This technical memorandum has been developed for the U.S. Environmental Protection Agency (USEPA) Region 10 under the requirements of CH2M HILL's USEPA Region 10 Architect and Engineering Service (AES) Contract 68-57-04-01.

2.0 Background

2.1 CTP Historical Background

Before 1928, liquid and solid waste from the Bunker Hill Mining and Metallurgical Complex was discharged directly into the South Fork of the Coeur d'Alene River (SFCDR) and its tributaries. In 1928 the waste was directed to a nearby floodplain where a Central Impoundment Area (CIA) was developed. AMD and wastewater from the complex were discharged to the CIA, where a pond was constructed to settle solids before discharging the liquids to the river. This primary treatment mechanism was one of the first major pollution control features instituted by the mining industry.

The CTP was constructed in 1974 by the Bunker Hill Mining Company to treat AMD from the mine and various sources of wastewater from their metallurgical complex. Bunker Hill mine AMD is the single strongest source of contaminated water in either OU 2 or OU 3,

having an average zinc concentration of about 170 milligrams per liter (mg/L), and a range of between about 60 and 700 mg/L. The average annual zinc load is about 3,000 pounds per day (lb/day).

The CTP uses the lime neutralization process to increase influent pH and to precipitate dissolved metals as oxy-hydroxide precipitates, which are settled in a clarifier and pumped into a sludge disposal pond located on the top of the adjacent CIA. Polymer is added prior to the clarifier to promote flocculation and settling of the precipitates. The CTP does not have filters to remove precipitates that do not settle in the clarifier.

In 1974, when the CTP was first brought online, AMD and complex waters were stored in an unlined pond on top of the CIA before being decanted to the CTP. When the smelter closed in 1981, the CIA was no longer required to impound wastewater from the complex, although surface runoff from the complex and AMD from the mine were still routed to the CIA before treatment. Sludge formed during the treatment process was also disposed of in unlined ponds on top of the CIA.

Ownership of the mine has passed through a number of companies during the more than 100-year history of the site, finally ending up under the direction of the New Bunker Hill Mining Company (NBHMC). NBHMC did not, however, purchase the CTP. Bunker Limited Partnership (BLP), and then the Gulf and Pintlar corporations as creditors of BLP, continued to operate the treatment plant using money from a trust fund established as part of the BLP bankruptcy. The federal and state governments assumed operation of the CTP in November 1994, following the bankruptcy of the Gulf and Pintlar corporations. In that same year, USEPA issued a Unilateral Administrative Order to NBHMC directing the company to keep the mine pool pumped to an elevation below the level of the SFCDR to prevent discharges to the river, to convey mine water to the CTP for treatment unless an alternative form of treatment was approved, and to provide for emergency mine water storage within the mine. The CTP was operated by the BLP, under the direction of USEPA, from November 1994 to February 1996 using money from the BLP trust fund. At that time, it was determined that the BLP trust fund monies would be better spent on ongoing site cleanup.

Since February 1996, the ongoing treatment of AMD has been conducted and funded by the federal and state governments. The U.S. Army Corps of Engineers currently operates the CTP for USEPA using a contractor. The CTP includes all associated mine water infrastructure components external to the mine (the AMD collection ditch at the Kellogg Tunnel portal [the main entrance to the mine], the AMD conveyance pipelines to the CTP, and the lined pond [a 7 million-gallon lined AMD storage pond]), the CTP, and the sludge disposal pond located on the CIA used for treatment residuals. The NBHMC is currently operating the Bunker Hill mine and maintaining its infrastructure, including the AMD collection ditches within the mine, the mine pool pumping system used to pump the lower workings water to the 9 Level (the main operations level which drains AMD out through the Kellogg Tunnel ditch system), and the Kellogg Tunnel itself.

2.2 Record of Decision Amendment

An amendment to the OU 2 1992 Non-Populated Areas Record of Decision (ROD), which addressed management of AMD from the mine, was issued in December 2001 (USEPA, 2001a). The ROD Amendment was necessary to address shortcomings presented by the

existing mine water control systems that resulted in continued generation and discharge of AMD from the mine and the antiquated state of the CTP. The ROD Amendment identified decreasing water entry to the underground workings as the most viable way to reduce the magnitude of the AMD problem. The selected remedy for managing AMD from the Bunker Hill mine was Alternative 3 - Phased Source Control/Treatment. Each component of the remedy and its current status is described below.

AMD Mitigation

This component of the remedy includes actions to reduce the quantity of surface water entering the mine and AMD created within the mine. This would provide the following benefits:

- Reduced in-mine maintenance associated with drifts and drainage ditches
- Reduced mine water pumping from the lower workings
- Improved reliability of conveying mine water to the portal for collection
- Reduced peak treatment flows at the CTP
- Generation of less sludge
- Reduced CTP operations costs

The mitigations include constructing a stream diversion on the West Fork of Milo Creek, modification of the Phil Sheridan raise system, and plugging in-mine drill holes, as a first phase of source control. These efforts are expected to have the greatest impact on reducing the magnitude of mine water flows and the strength of the flows (in terms of the amount of dissolved metal contaminants) exiting the mine through the Kellogg Tunnel. Other flow reduction measures would be considered in future phases, based on performance monitoring and an evaluation of the ability of additional measures to provide cost-effective water and/or contaminant reductions.

AMD Collection

This component includes collection of AMD within the mine. The ROD Amendment specified use of the existing AMD collection system within the mine and transport through the Kellogg Tunnel using the existing ditch system—given that the mine, at the time of the ROD Amendment and also currently, is an open and operational mine.

AMD Storage

AMD storage is required during those times when the treatment plant is shut down for maintenance or repairs, or when the mine water flow exceeds treatment capacity. Mine water flows in excess of 2,500 gallons per minute (gpm) would be temporarily stored in the existing lined pond or in the mine using a new gravity system to divert water into the mine pool. A new mine pool extraction system would be installed to reduce the time needed to extract the stored water and to increase reliability.

AMD Conveyance

This component of the remedy includes the conveyance of mine water from the Kellogg Tunnel to the CTP. A new section of pipe would be added to allow direct flow of AMD to the CTP rather than to the lined pond, where it requires pumping because its elevation is lower than that of the CTP.

AMD Treatment

The CTP would be upgraded to improve efficiency and increase reliability, to make less sludge, and to achieve lower concentrations of metals in the plant's discharge allowing compliance with the State of Idaho's water quality criteria. The existing CTP cannot consistently meet the criteria because of the lack of media (sand) filters, and operates under an expired National Pollutant Discharge Elimination System (NPDES) permit. Under the ROD Amendment remedy, the CTP was to have an initial treatment capacity using media filters of 2,500 gpm, but an overall treatment capacity of 5,000 gpm. Flows in excess of 2,500 gpm would either be bypassed around the filters or passed through the filters at higher than design-flow rates. Additional filtration capacity could be added if determined to be necessary based on the performance of the AMD mitigations for reducing peak AMD flows.

Sludge Management

USEPA selected sludge disposal Option A (disposal of sludge in beds on top of the CIA). However, because of community concerns about competing disposal needs, preserving developable site land, and potentially developing regional disposal areas as part of the Coeur d'Alene River Basin cleanup efforts, sludge disposal was to be implemented in the following manner:

1. Execute initial upgrades to the CTP. These upgrades will reduce the current amount of sludge produced by about half, thereby doubling the expected life of the current disposal area.

2. Reevaluate whether additional regional sludge disposal capacity has become available as part of the Basin (OU 3) cleanup efforts, which would make offsite disposal more cost-effective. If so, pursue offsite sludge disposal. If not, construct one 10-year disposal bed on the CIA, and close the existing sludge disposal area using a capping system similar to the rest of the CIA.

3. Reconsider Step 2 before the construction of additional sludge beds on the CIA.

Performance Monitoring

Monitoring of the remedy was to include an assessment of untreated mine water within the mine and at the Kellogg Tunnel portal, the quality of water treated at the CTP and measured where effluent is discharged into Bunker Creek, and the performance of source control actions (mitigations) to determine if additional flow reduction measures or treatment capacity are warranted.

2.3 Status of Mine Water Remedy

A number of actions associated with the mine water remedy have been completed since the signing of the ROD Amendment. The completed actions are discussed below by remedy component, as presented in the ROD Amendment. In addition, this section identifies the remedy actions that have yet to be implemented. This information is provided because upgrades to the CTP for treatment of other OU 2 and OU 3 waters need to consider how to integrate required changes with the existing mine water-related treatment infrastructure.

AMD Mitigations/Source Control

The original mitigation actions to be constructed as part of the remedy include diverting West Fork Milo Creek around the Guy Cave area (an area of known infiltration to the worst AMD-forming areas of the mine), modifying the Phil Sheridan Diversion, and plugging various in-mine drill holes that produce water. None of these actions has been constructed. A 95 percent complete design was developed for the West Fork Milo Creek Diversion, which includes modifying the Phil Sheridan Diversion.

AMD Collection

The AMD collection approach presented in the ROD Amendment consisted of gathering the AMD within the mine using the existing collection system. Under the existing system, mine water from the upper portions of the mine flows by gravity to the 9 Level and out the Kellogg Tunnel. A portion of the flow from the upper mine bypasses the 9 Level and discharges to the submerged workings (the mine pool), along with an unknown amount of water coming from the cross-connected Crescent Mine. The mine pool water is pumped from near the 11 Level up to the 9 Level through Shaft No. 2, where it joins the gravity drainage water in the 9 Level ditch system and flows out the Kellogg Tunnel. The current collection system requires that a large portion of the mine infrastructure, including the Kellogg Tunnel, a large portion of 9 Level, Raise No. 2 and the hoist, and the Cherry Raise and hoist, be maintained to allow for maintenance and periodic cleaning. However, these areas must also be maintained this way to support the ongoing mine operations.

This remedy used the existing AMD collection procedure, which is still in use today. Thus, no new AMD collection actions were included in the remedy as the mine was, and still is, open and operational.

AMD Conveyance

This remedy included construction of a new pipeline to allow AMD to drain directly to the CTP rather than to the lined pond, where it was resulting in an accumulation of sediment, and the need to continuously pump the AMD to the CTP because of the pond's lower elevation. This new section of pipeline is known as the Direct Feed pipeline.

The Direct Feed pipeline was installed in 2002. The pipeline is constructed of 20-inch high-density polyethylene (HDPE) and includes valves to allow AMD to flow to either the lined pond or directly to the CTP. A cleaning vault was constructed to allow periodic inspection of the pipeline and cleaning by "pigging."

AMD Storage

Current mine water storage options consist of storing mine water either in the lined pond or the lower portions of the mine itself. The remedy did not change this storage approach but included construction of a new gravity diversion system to increase the flexibility of storing water in the mine pool. The new gravity diversion would route water from the upper workings of the mine into the mine pool for temporary storage when the lined pond did not provide sufficient storage capacity. An evaluation conducted during the Remedial Instruction/Feasibility Study (RI/FS) (USEPA, 2001b) indicated that the water in the mine pool could rise up to the 10 Level with no net gravity head of mine pool water towards the SFCDR. This remedy also included a new mine pool extraction system to reduce the time

needed to extract the stored water. The conceptual design of the new extraction system consisted of two 700 gpm pumps installed below 11 Level and an upgrade of the current mine electrical system to support the pumping operation. The remedy also included continued repair and maintenance of the existing lined pond.

An alternate and simpler approach to the remedy gravity diversion system was proposed and implemented by the mine owner. This system consists of temporarily constructing a sandbag cutoff dam at the back of the Kellogg Tunnel to impound AMD and to back up the AMD into the Barney Vent Raise, where it flows down to 10 Level and subsequently into the mine pool. This system was funded by the mine owner; therefore, no USEPA or state funding was required.

Although not specified in the remedy, the lined pond was cleaned of accumulated sediment in 2003 to improve storage capacity. This was done after the construction of the Direct Feed pipeline.

AMD Treatment

As described previously, the CTP was built in 1974 and had not been updated in any significant way at the time the ROD Amendment was adopted. Much of the equipment was nearly worn out, and many of the automated control systems no longer functioned or had been removed. The plant's sand filters, previously used to remove solids from the discharge, had also been removed. Their removal resulted in the plant being unable to function in high-density sludge (HDS) mode (a mode of lime treatment whereby significantly less sludge is produced) as it had originally; the plant also was unable to consistently meet the discharge standards of its expired NPDES permit. The plant had no backup power and went offline periodically because of electrical interference from lightning storms or localized power surges. All original alarm systems were inoperative. A Radio Shack™ phone auto-dial box was the only alarm system and it was unreliable due in part to leaks in the electrical room roof. Buildup of solids in plant pipes had reduced its capacity from 5,000 gpm to about 3,500 gpm. The lime storage silo was caked with hardened lime, and the lime makeup and feed system was manual requiring significant operator attention. The wall upon which the electrical equipment was mounted leaked, and constant seepage had rusted out the back of many of the electrical panels. In summary, the plant was far below modern operational standards, was prone to failure, and was labor intensive to operate. The CTP Master Plan (Bunker Hill RI/FS, Appendix E) specified needed improvements to address these problems. These improvements were adopted as part of the ROD Amendment.

As mentioned above, the CTP was originally designed to use lime HDS treatment technology. This process uses lime to remove acidity and to precipitate the dissolved metals as hydroxides, which creates solids known as "sludge." The HDS process creates sludge of much higher density than conventional lime treatment. HDS sludge dewaters to a greater extent and requires much less disposal space than conventional lime sludge, thereby significantly reducing cost.

At the time of its construction in 1974, only a few HDS plants were on-line in the world. This technology is still state-of-the-art and used at hundreds of mine and industrial sites. However, while originally designed as an HDS plant, the CTP currently must be operated in a "low-density sludge" mode, which prevents the formation of true HDS. This is because

the sand filters, needed for polishing excess suspended solids from the clarifier overflow, have been removed. Filters are also needed to allow the CTP to not only consistently meet its current discharge standards established by the expired NPDES permit, but also the much more rigorous standards yet to be enacted pursuant to Idaho water quality standards. This is primarily because excess solids periodically overflow into the plant effluent, increasing the concentration of zinc beyond discharge standards. New discharge standards, in conformance with current Idaho water quality standards, were established for the CTP as part of the ROD Amendment. These new standards will be adopted once filters are constructed. Filter construction would also allow the plant to be operated in HDS mode, significantly reducing long-term sludge disposal costs.

Since the ROD Amendment, USEPA and the State of Idaho have moved forward with a number of CTP improvements specified in the CTP Master Plan. The following improvements were performed as part of time critical actions taken to replace the most failure-prone equipment and plant systems:

- Replaced and upgraded the lime storage and feeding system
- Refurbished the thickener
- Updated the plant electrical system
- Constructed a new control building and updated the plant control system including new alarm systems
- Increased the hydraulic capacity to 5,000 gpm by replacing the pipeline between the thickener and the polishing pond
- Installed a backup diesel electrical generator and sound-deadening enclosure
- Installed a new sludge recycle pump and disposal pipeline from the CTP to the sludge disposal cell

The following actions remain to be implemented. Addition of the filters would allow the plant to meet Idaho water quality standards and to operate in the HDS mode, thus significantly reducing sludge disposal volumes. The other items listed below are needed to complete plant modernization.

- Add 2,500 gpm of filters and associated piping and pump stations, and a new building to house the filters
- Replace Reactor A (sludge conditioning tank/rapid mix tank) and agitator
- Replace the Aeration Basin with a new Reactor B, agitator, and air blower
- Replace the manual polymer makeup system with an automated system, and replace the feed pumps and pipes
- Replace the other sludge recycle and wasting pumps
- Add an influent flow meter and replace the effluent Parshall flume

Sludge Management

A new sludge pipeline from the CTP to the existing CIA sludge bed was installed. This was needed because the old pipeline was periodically developing leaks and was in poor

condition. The existing CIA sludge bed is still being used and estimated to have about 12 years of remaining life.

Performance Monitoring

A major aspect of the remedy was the phased approach to implement AMD source control measures (mitigations). Information collected from the monitoring program would be used to help determine if additional mitigations were required beyond those included in the first phase. The remedy includes performance monitoring of:

1. AMD at various locations within the mine (for a 10-year period as part of the phased implementation approach for source control measures/CTP capacity) and at the at the Kellogg Tunnel portal
2. Treated CTP effluent at its discharge
3. Source control actions to determine if additional flow reduction measures or treatment capacity are warranted (for a 10-year period as part of the phased implementation approach for source control measures/CTP capacity)

Treated CTP effluent is monitored at the outfall to Bunker Creek. Periodic samples of the AMD from the Kellogg Tunnel portal are also collected along with flow rate. No in-mine AMD monitoring has been conducted, nor has monitoring associated with source control action areas such as Milo Creek and its tributaries.

3.0 CTP Treatment Capacity Expansion

The CTP could be effectively expanded to treat other metals impacted water from OU 2 or OU 3, such as groundwater or AMD from other mines. The 2005 Canyon Creek treatability study (CH2M HILL, 2006) demonstrated that Canyon Creek groundwater could be successfully co-treated with Bunker Hill mine AMD using the lime HDS treatment process, which is the same process used at the CTP—although the CTP is currently operated in a low-density sludge mode because of lack of media filters as described earlier.

The 2005 Canyon Creek treatability study also demonstrated that the lime HDS process can successfully treat much more dilute streams than the combination of Bunker Hill mine water and Canyon Creek groundwater. A separate test was conducted on just Canyon Creek groundwater. While the effluent quality was as good, the sludge was not as dense as the combined Bunker Hill mine and Canyon Creek groundwater, although it was much denser than what would be produced from traditional lime treatment not employing the HDS approach.

3.1 CTP Capacity

The CTP could be expanded to treat very large inflows. Equipment could be upsized and/or replicated as needed. Constraints on ultimate capacity are primarily limited to availability of land and related infrastructure. The largest single piece of equipment needed is the clarifier. While additional clarifiers could be added, the existing 236-foot-diameter unit has a maximum hydraulic capacity, based on the results of the Canyon Creek treatability testing program, of about 30,000 gpm. Higher flows than this may be effectively treated, but given

available information, this flow is a reasonable upper end limit without addition of a second clarifier.

3.2 Modifications Needed

The following CTP modifications would be needed to treat up to 30,000 gpm and to meet Idaho water quality standards. Below are the required modifications, which are already planned as part of the remaining ROD Amendment upgrades:

- Add 2,500 gpm of media filters, associated piping and pump stations, and a new building to house the filters
- Replace Reactor A (sludge conditioning tank/rapid mix tank) and agitator
- Replace the manual polymer makeup system with an automated system, and replace the feed pumps and pipes
- Replace the existing nearly worn-out sludge recycle and wasting pumps
- Add electrical, instrumentation, and controls associated with the new equipment

The follow modifications are required to treat additional OU 2 and OU 3 waters that are not part of the remaining ROD amendment upgrades:

- Add additional media filters, associated piping and pump stations, and a new building to house the filters if needed
- Replace the Aeration Basin with two new Reactor B tanks, each with an agitator, air blower, and associated inlet and outlet piping
- Increase the hydraulic capacity of the clarifier feed trough, clarifier effluent launder, and perhaps the feedwell
- Add a larger influent flow meter and a larger effluent Parshall flume
- Add electrical, instrumentation, and controls associated with the new equipment
- Install an additional backup diesel generator if needed (the existing one may have sufficient capacity depending on plant configuration and operation)

3.3 Implementation

Increasing the CTP capacity up to 30,000 gpm is implementable. The lime HDS process is a proven treatment technology, whose effectiveness was demonstrated during the Canyon Creek treatability study. The necessary equipment, materials, and labor force to construct the required changes are available. The additional treatment chemicals (lime and polymer) are available from existing suppliers. The additional power requirements are available from the local utility (Avista). The Canyon Creek treatability study demonstrated that Idaho water quality standards could be met.

CTP expansion would likely be conducted in phases to accommodate when additional influent sources would be available. This approach is similar to the two-phased approach described in Appendix E of the mine water RI/FS document (USEPA, 2001b). One approach would be to use two phases, whereby one-half of the maximum needed capacity would be

constructed in Phase 1 and the second half in Phase 2. This would allow capacity to better accommodate the timing of influent demand.

4.0 Capital and O&M Costs

An order-of-magnitude cost opinion was developed to increase the CTP to various maximum capacities. This one done using the capital and O&M cost estimates developed for the mine water RI/FS and updated in 2006, and then modifying them for maximum capacities of either 5,000; 10,000; 15,000; or 20,000 gpm. These costs were escalated to 2009 dollars and used to develop a capital cost curve and an O&M cost curve relating cost to capacity. The cost estimates and curves are attached to the back of this technical memorandum.

The curves are quite linear with respect to capacity, as was expected, because the size of the required upgrades, and particularly the filters, is proportional to flow. The capital costs represent the total cost to upgrade the existing plant to the desired capacity. The annual O&M costs include treatment of the Bunker Hill mine water, and O&M associated with all existing mine water systems consisting of the Kellogg Tunnel portal collection system, the AMD pipelines, the lined pond, and the CIA sludge disposal bed.

The largest single capital cost component is associated with adding the media filters. Media filters are sized based on flow (gpm) per media filter surface area (square feet). Thus, increasing the treatment capacity from 2,500 gpm to 20,000 gpm requires 8 times the area of filters. The next largest capital cost is associated with constructing the neutralization/ aeration reactors. These are sized using treatment residence time, which is also proportional to flow.

While the capital cost required to construct 20,000 gpm of capacity is about 5 times that required to provide 2,500 gpm capacity, the annual O&M cost increases by only about 0.5 times, or about 50 percent. This is because once the plant treatment capacity is available, the incremental cost, on a per-gallon basis, to treat additional water is relatively low. Little additional operations labor is required, and the increased lime and polymer consumption is also relatively low because of the much more dilute nature of the other OU 2/OU 3 waters as compared to Bunker Hill mine water.

The attached cost opinions are considered order-of-magnitude, with an expected accuracy of minus 30 percent to plus 50 percent. Estimated capital and operating costs were derived from vendor quotes, cost estimating manuals, historical operating budgets, and similar projects. Costs are for comparative purposes only. Net present value (NPV) costs are based on 30 years of operation at a 7 percent interest rate. The order-of-magnitude cost opinions are in 2009 dollars. They have been prepared for guidance in project evaluation and should be carefully reviewed before making specific financial decisions or establishing final project budgets. The actual costs are expected to vary from the costs shown here based on actual labor and material costs, competitive market conditions, final project scope, and other variable factors.

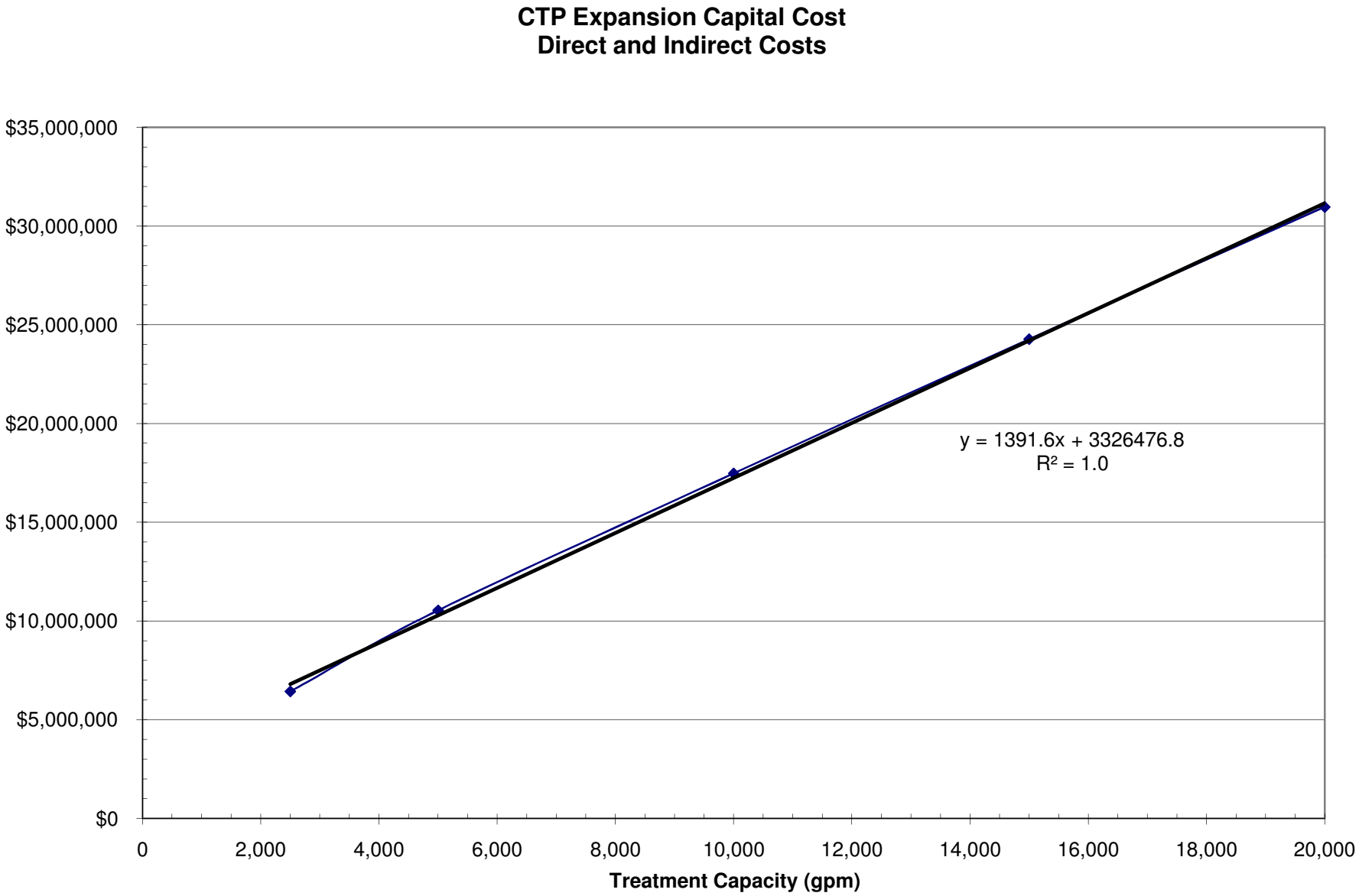
5.0 References

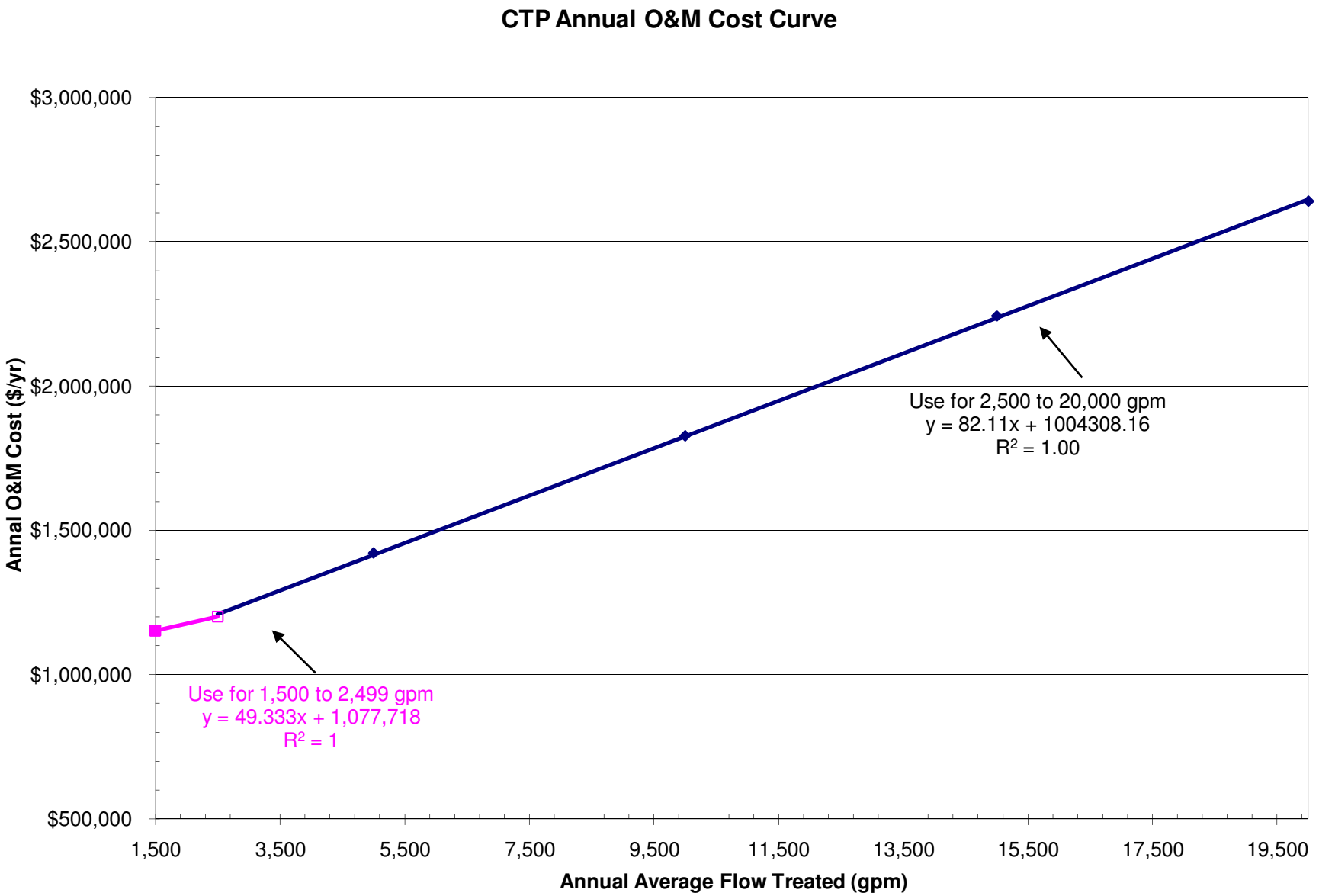
CH2M HILL. 2006. *Canyon Creek Phase II Treatability Study*. Prepared for the United States Environmental Protection Agency. October 2006.

U.S. Environmental Protection Agency (USEPA). 2001a. *Record of Decision Amendment, Non-Populated Areas Operable Unit, Bunker Hill Mining and Metallurgical Complex, Shoshone County, Idaho*. December 2001

U.S. Environmental Protection Agency (USEPA). 2001b. *Bunker Hill Remedial Investigation/Feasibility Study*. April 2001.

Figures and Tables


CTP Expansion Capital Cost
Direct and Indirect Costs
$35,000,000
$30,000,000
$25,000,000
$20,000,000
$15,000,000
$10,000,000
$5,000,000
$0
y = 1391.6x + 3326476.8
R² = 1.0
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
16,000
18,000
20,000
Treatment Capacity (gpm)


CTP Annual O&M Cost Curve
$3,000,000
$2,500,000
$2,000,000
$1,500,000
$1,000,000
$500,000
Annal O&M Cost ($/yr)
1,500
3,500
5,500
7,500
9,500
11,500
13,500
15,500
17,500
19,500
Annual Average Flow Treated (gpm)
Use for 2,500 to 20,000 gpm
y = 82.11x + 1004308.16
R2 = 1.00
Use for 1,500 to 2,499 gpm
y = 49.333x + 1,077,718
R2 = 1

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 2,500 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
HDS (Hydroxide)				**The Following Costs are in Year 2000 Dollars. See Escalation Factor at Bottom.**
Sitework/Yard Piping				
Fencing	1,000	LF	$10,000	allowance
Gravel Surfacing & Misc	1	LS	$25,000	allowance
Connections & Relocations of Existing Piping	1	LS	$30,000	allowance
Reactor A (Sludge Conditioning Tank)				
Earthwork & Concrete for Slab	1	LS	$19,872	apx 50cy @ $400/cy
Elevated Platform for Reactor A&B	1	LS	$60,000	asm 40x20 @ $75/sf high level and to support reactor A
Paint	1	LS	$10,000	allowance for subcontract
Sludge Conditioning Tank, 2500gal FRP	1	EA	$42,695	quote + 5% infla. + 5%frt + 10%mu
Mixer, 3hp	1	EA	$13,803	quote + 5% infla. + 5%frt + 10%mu
Inlet Piping, 24" SDR 15.5	120	LF	$23,242	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Inlet Piping, 18" SDR 15.5	120	LF	$17,634	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Valves, vaults, etc	1	LS	$50,000	allowance
Neutralization/Oxidation System				
Distribution Piping, 24" HDPE	170	LF	$32,926	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Retaining Wall to Accommodate New Tank	450	SF	$11,250	45'x 8'H + 2' below grade, CIP cantelever
Earthwork for Retaining Wall	1	LS	$6,814	
Earthwork & Concrete for Slab	1	LS	$65,578	apx 165cy @ $400/cy
Paint	1	LS	$50,000	allowance for subcontract
Aeration Tank (Reactor B), 75,000gal Steel Tank	1	EA	$56,250	revised to $.75/gal
Submerged Turbine Aerator/Mixer	1	EA	$73,520	use same a 5000gpm estimate
Positive Displacement Blower	1	EA	$13,205	
Pipe Supports, Hangers, etc	1	LS	$2,500	allowance
Automated Polymer Make-up & Feed System				
Earthwork & Concrete for Slab	1	LS	$0	in bldg
Paint	1	LS	$5,000	allowance for subcontract
Polymer Make-up System	2	EA	$20,433	
Polymer Make-up Tank, 2000gal	1	EA	$3,974	
Mixer	2	EA	$4,674	corrected hours
Transfer Pump, 20gpm	2	EA	$6,548	corrected hours
Polymer Feed Tank, 2000gal	1	EA	$3,974	

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 2,500 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
Variable Speed Gear Pump, 1gpm	2	EA	$8,421	
Piping to Feed Point	100	LF	$1,990	
Thickener				
Clean & Decommission Existing Floc System	1	LS	$1,775	
Replace Weir	0	LS	$0	quote + frt & markup=$19/lf & allow for removal & replacement
Groundwater Test & Empty Tank	0	LS	$0	allowance
Replace Thickener Rake System Complete	0	LS	$0	quote + frt & markup
E-DUC Feed & Floc System & Center Well Mods	1	LS	$45,934	quote + frt & markup + add'l parts for mods
Surface Prep & Coat	0	LS	$0	allowance for interior walls & mechanism
Sludge Wasting & Recycle Pumps				
Earthwork & Concrete for Slab	0	LS	$0	apx 200cy @ $400/cy
Remove Existing Pumps	1	LS	$2,474	
Paint	1	LS	$20,000	allowance for subcontract
Sludge Recycle Pump, 400gpm	2	EA	$29,234	new cost for smaller pump
Sludge Recycle Pump, 800gpm	1	EA	$22,048	new cost for smaller pump
Sludge Waste Pump, 400gpm, 200' tdh	1	EA	$26,380	new cost for larger pump
Sludge Recycle Piping, 8" DI	150	LF	$10,271	including ftgs, valves, etc, revised cost
Sludge Wasting Piping, 6" DI	0	LF	$0	including ftgs, valves, etc, revised cost
I&C and Electrical				
Total I&C	1	LS	$41,371	use 5% of above
New Magnetic Flowmeter in Existing Vault	1	EA	$10,269	24"
Parshall Flume @ Effluent	1	EA	$3,037	12"
Electrical	1	LS	$70,568	use 8% of above
Existing Plant Demolition				
Earthwork	1	LS	$7,314	
Concrete Slab & Footings	100	CY	$25,536	assume 18" avg thickness to account for ftgs, etc
Relocate Existing Filtration Bldg, etc	1	LS	$34,071	60' x 30' x 10' eave ht metal bldg-remove contents, dismantle & re-erect
Repairs, Touchup, etc	1	LS	$5,000	allowance for some painting, sealants, doors, etc
Water	1	LS	$4,235	sink, emer. Shower, hose bibbs, piping & service
Sanitary	1	LS	$1,917	toilet, piping & service
Drains	1	LS	$2,117	

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 2,500 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
HVAC	1	LS	$1,617	reinstall unit heaters
Electrical	1	LS	$4,933	reinstall, fixtures, panels, wiring, etc
Tertiary Media Filters				
HDS Pump Station Complete	1	LS	$70,000	cost by DAH
Water Reuse Pump Station Complete	1	LS	$30,000	cost by DAH
Distribution Piping	500	LF	$17,500	4" plastic, below grade
Media Filter System	1	LS	$566,834	quote=430000 + 10% frt + 10% mu & 100hrs to install
Liquid Polymer System	0	LS	$0	Not required per JS 11/28/2000
Backwash Pumping Complete	1	LS	$133,461	Bob York spreadsheet + 10% OH&P, scaled to 2500gpm + escalation to 2(
Dirty Backwash Storage Tank, 30,000gal	1	EA	$22,500	$.75/gal
Dirty Backwash Storage Tank Mixer	1	EA	$3,737	allowance
Dirty Backwash Return Pump	1	EA	$13,885	allowance
Clean Backwash Supply Tank, 30,000gal	1	EA	$22,500	$.75/gal
Clean Backwash Supply Pump	1	EA	$13,885	
Building Complete	1	LS	$318,750	85'x 50 @ $75/sf
Electrical/I&C	1	LS	$0	included
Mechanical	1	LS	$0	included
Backflow Preventer	1	EA	$10,000	allowance
Distribution Piping	1,000	LF	$23,000	2" plastic
Paint	1	LS	$5,000	misc painting allowance
CAPITAL TOTAL (ROUNDED) (Yr 2000 Dollars)			**$4,736,050**	**Year 2000 Dollars**
Escalate from Yr 2000 to Yr 2009 Dollars (factor of 1.358)			**$6,432,827**	**Year 2009 Dollars**

NOTE: The above cost opinion is in October 2000 dollars and does not include escalation. The order of magnitude cost opinion shown has been prepared for guidance in project evaluation 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, final project scope, final 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.

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 5,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
HDS (Hydroxide)				**The Following Costs are in Year 2000 Dollars. See Escalation Factor at Bottom.**
Sitework/Yard Piping				
Fencing	1,000	LF	$10,000	allowance
Gravel Surfacing & Misc	1	LS	$30,000	allowance
Connections & Relocations of Existing Piping	1	LS	$30,000	allowance
Reactor A (Sludge Conditioning Tank)				
Earthwork & Concrete for Slab	1	LS	$19,872	apx 50cy @ $400/cy
Elevated Platform for Reactor A&B	1	LS	$60,000	asm 40x20 @ $75/sf high level and to support reactor A
Paint	1	LS	$10,000	allowance for subcontract
Sludge Conditioning Tank, 2500gal FRP	1	EA	$42,695	quote + 5% infla. + 5%frt + 10%mu
Mixer, 3hp	1	EA	$13,803	quote + 5% infla. + 5%frt + 10%mu
Inlet Piping, 24" SDR 15.5	120	LF	$23,242	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Inlet Piping, 18" SDR 15.5	120	LF	$17,634	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Valves, vaults, etc	1	LS	$50,000	allowance
Neutralization/Oxidation System				
Distribution Piping, 24" HDPE	85	LF	$16,463	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Retaining Wall to Accommodate New Tanks	225	SF	$5,625	90'x 8'H + 2' below grade, CIP cantelever
Earthwork for Retaining Wall	1	LS	$13,629	
Earthwork & Concrete for Slab	1	LS	$95,337	apx 450cy @ $400/cy
Paint	2	LS	$100,000	allowance for subcontract
Aeration Tank (Reactor B), (2) 75000 gal Steel Tank	2	EA	$112,500	$0.75/gal
Submerged Turbine Aerator/Mixer	2	EA	$130,583	
Positive Displacement Blower	2	EA	$23,031	
Pipe Supports, Hangers, etc	1	LS	$5,000	allowance
Automated Polymer Make-up & Feed System				
Earthwork & Concrete for Slab	1	LS	$0	in bldg
Paint	1	LS	$5,000	allowance for subcontract
Polymer Make-up System	2	EA	$20,433	
Polymer Make-up Tank, 2000gal	1	EA	$3,974	
Mixer	2	EA	$4,674	corrected hours
Transfer Pump, 20gpm	2	EA	$6,548	corrected hours

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 5,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
Polymer Feed Tank, 2000gal	1	EA	$3,974	
Variable Speed Gear Pump, 1gpm	2	EA	$8,421	
Piping to Feed Point	100	LF	$1,990	
Thickener				
Clean & Decommission Existing Floc System	1	LS	$1,775	
Replace Weir	1	LS	$28,905	
E-DUC Feed & Floc System & Hydraulic Mods	1	LS	$32,334	
Sludge Wasting & Recycle Pumps				
Earthwork & Concrete for Slab	0	LS	$0	apx 200cy @ $400/cy
Remove Existing Pumps	1	LS	$2,474	
Paint	1	LS	$20,000	
Sludge Recycle Pump, 400gpm	2	EA	$29,234	
Sludge Recycle Pump, 800gpm	1	EA	$22,048	
Sludge Waste Pump, 400gpm, 200' tdh	1	EA	$26,380	
Sludge Recycle Piping, 8" DI	150	LF	$10,271	including ftgs, valves, etc, revised cost
Sludge Wasting Piping, 6" DI	0	LF	$0	including ftgs, valves, etc, revised cost
I&C and Electrical				
Total I&C	1	LS	$51,892	use 5% of above
New Magnetic Flowmeter in Existing Vault	1	EA	$10,269	24"
Parshall Flume @ Effluent	1	EA	$5,537	
Electrical	1	LS	$88,444	use 8% of above
Existing Plant Demolition				
Remove Reactor A	1	LS	$2,810	
Remove Aeration Basin, Ret Wall, Stairs, etc	1	LS	$127,768	6000cy @ 200cy/hr
Remove Flocculation Basin	1	LS	$18,734	allow 40hrs
Remove Associated Piping	1	LS	$1,873	
Remove Associated Electrical	1	LS	$1,873	
Regrade Area	1	LS	$1,704	
Connections & Relocations of Existing Piping	1	LS	$5,000	allowance
Earthwork	1	LS	$7,314	

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 5,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
Concrete Slab & Footings	100	CY	$25,536	assume 18" avg thickness to account for ftgs, etc
Relocate Existing Filtration Bldg, etc	1	LS	$34,071	60' x 30' x 10' eave ht metal bldg-remove contents, dismantle & re-erect
Repairs, Touchup, etc	1	LS	$5,000	allowance for some painting, sealants, doors, etc
Water	1	LS	$4,235	sink, emer. Shower, hose bibbs, piping & service
Drains	1	LS	$2,117	
Electrical	1	LS	$4,933	reinstall, fixtures, panels, wiring, etc
Tertiary Media Filters				
Filter Pump Station Complete	1	LS	$106,100	
Water Reuse Pump Station Complete	1	LS	$30,000	cost by DAH
Distribution Piping	500	LF	$17,500	4" plastic, below grade
Media Filter System	2	LS	$1,133,668	quote=430000 + 10% frt + 10% mu & 100hrs to install
Liquid Polymer System	0	LS	$0	Not required as per JS 11/28/2000
Backwash Pumping Complete	1	LS	$190,677	
Dirty Backwash Storage Tank	1	EA	$45,000	$.75/gal
Dirty Backwash Storage Tank Mixer	1	EA	$5,182	allowance
Dirty Backwash Return Pump	1	EA	$20,080	allowance
Clean Backwash Supply Tank	1	EA	$45,000	$.75/gal
Clean Backwash Supply Pump	1	EA	$20,080	
Building Complete	1	LS	$637,500	$75/sf
Electrical/I&C	1	LS	$0	included
Mechanical	1	LS	$0	included
Backflow Preventer	1	EA	$10,000	allowance
Distribution Piping	2,000	LF	$46,000	2" plastic
Paint	1	LS	$10,000	misc painting allowance
CAPITAL TOTAL (ROUNDED) (Yr 2000 Dollars)			**$7,760,880**	**Year 2000 Dollars**
Escalate from Yr 2000 to Yr 2009 Dollars (factor of 1.358)			**$10,541,358**	**Year 2009 Dollars**

NOTE: The above cost opinion is in October 2000 dollars and does not include escalation. The order of magnitude cost opinion shown has been prepared for guidance in project evaluation 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, final project scope, final schedule and other variable factors. As a result, the final project costs will vary from those

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 5,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.				

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 10,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
HDS (Hydroxide)				**The Following Costs are in Year 2000 Dollars. See Escalation Factor at Bottom.**
Sitework/Yard Piping				
Fencing	1,000	LF	$10,000	allowance
Gravel Surfacing & Misc	1	LS	$35,000	allowance
Connections & Relocations of Existing Piping	1	LS	$30,000	allowance
Reactor A (Sludge Conditioning Tank)				
Earthwork & Concrete for Slab	1	LS	$19,872	apx 50cy @ $400/cy
Elevated Platform for Reactor A&B	1	LS	$60,000	asm 40x20 @ $75/sf high level and to support reactor A
Paint	1	LS	$10,000	allowance for subcontract
Sludge Conditioning Tank, 2500gal FRP	1	EA	$42,695	quote + 5% infla. + 5%frt + 10%mu
Mixer, 3hp	1	EA	$13,803	quote + 5% infla. + 5%frt + 10%mu
Inlet Piping, 24" SDR 15.5	120	LF	$23,242	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Inlet Piping, 18" SDR 15.5	120	LF	$17,634	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Valves, vaults, etc	1	LS	$50,000	allowance
Neutralization/Oxidation System				
Distribution Piping, 24" HDPE	170	LF	$32,926	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Retaining Wall to Accommodate New Tanks	450	SF	$11,250	90'x 8'H + 2' below grade, CIP cantelever
Earthwork for Retaining Wall	1	LS	$13,629	
Earthwork & Concrete for Slab	1	LS	$123,174	apx 450cy @ $400/cy
Paint	2	LS	$151,572	allowance for subcontract
Aeration Tank (Reactor B), 150,000 gal Steel Tank	2	EA	$225,000	$0.75/gal
Submerged Turbine Aerator/Mixer	2	EA	$197,926	
Positive Displacement Blower	2	EA	$32,010	
Pipe Supports, Hangers, etc	1	LS	$10,000	allowance
Automated Polymer Make-up & Feed System				
Earthwork & Concrete for Slab	1	LS	$0	in bldg
Paint	1	LS	$5,000	allowance for subcontract
Polymer Make-up System	2	EA	$20,433	
Polymer Make-up Tank, 2000gal	1	EA	$3,974	
Mixer	2	EA	$4,674	corrected hours
Transfer Pump, 20gpm	2	EA	$6,548	corrected hours
Polymer Feed Tank, 2000gal	1	EA	$3,974	

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 10,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
Variable Speed Gear Pump, 1gpm	2	EA	$8,421	
Piping to Feed Point	100	LF	$1,990	
Thickener				
Clean & Decommission Existing Floc System	1	LS	$1,775	
Replace Weir	1	LS	$43,010	
E-DUC Feed & Floc System & Hydraulic Mods	1	LS	$45,934	
Sludge Wasting & Recycle Pumps				
Remove Existing Pumps	1	LS	$2,474	
Paint	1	LS	$20,000	
Sludge Recycle Pump, 400gpm	2	EA	$29,234	
Sludge Recycle Pump, 800gpm	1	EA	$22,048	
Sludge Waste Pump, 400gpm, 200' tdh	1	EA	$26,380	
Sludge Recycle Piping, 8" DI	150	LF	$10,271	including ftgs, valves, etc, revised cost
Sludge Wasting Piping, 6" DI	0	LF	$0	including ftgs, valves, etc, revised cost
I&C and Electrical				
Total I&C	1	LS	$68,294	use 5% of above
New Magnetic Flowmeter in Existing Vault	1	EA	$10,269	24"
Parshall Flume @ Effluent	1	EA	$5,537	
Electrical	1	LS	$115,998	use 8% of above
Existing Plant Demolition				
Remove Reactor A	1	LS	$2,810	
Remove Aeration Basin, Ret Wall, Stairs, etc	1	LS	$127,768	6000cy @ 200cy/hr
Remove Flocculation Basin	1	LS	$18,734	allow 40hrs
Remove Associated Piping	1	LS	$1,873	
Remove Associated Electrical	1	LS	$1,873	
Regrade Area	1	LS	$1,704	
Connections & Relocations of Existing Piping	1	LS	$5,000	allowance
Earthwork	1	LS	$7,314	
Concrete Slab & Footings	100	CY	$25,536	assume 18" avg thickness to account for ftgs, etc
Relocate Existing Filtration Bldg, etc	1	LS	$34,071	60' x 30' x 10' eave ht metal bldg-remove contents, dismantle & re-erect

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 10,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
Repairs, Touchup, etc	1	LS	$5,000	allowance for some painting, sealants, doors, etc
Water	1	LS	$4,235	sink, emer. Shower, hose bibbs, piping & service
Drains	1	LS	$2,117	
Electrical	1	LS	$4,933	reinstall, fixtures, panels, wiring, etc
Tertiary Media Filters				
Filter Pump Station Complete	1	LS	$160,818	
Water Reuse Pump Station Complete	1	LS	$30,000	cost by DAH
Distribution Piping	500	LF	$17,500	4" plastic, below grade
Media Filter System	4	LS	$2,267,336	quote=430000 + 10% frt + 10% mu & 100hrs to install
Liquid Polymer System	0	LS	$0	Not required as per JS 11/28/2000
Backwash Pumping Complete	1	LS	$289,013	
Dirty Backwash Storage Tank	1	EA	$90,000	$.75/gal
Dirty Backwash Storage Tank Mixer	1	EA	$7,371	allowance
Dirty Backwash Return Pump	1	EA	$29,470	allowance
Clean Backwash Supply Tank	1	EA	$90,000	$.75/gal
Clean Backwash Supply Pump	1	EA	$29,470	
Building Complete	1	LS	$1,275,000	$75/sf
Electrical/I&C	1	LS	$0	included
Mechanical	1	LS	$0	included
Backflow Preventer	1	EA	$10,000	allowance
Distribution Piping	4,000	LF	$92,000	2" plastic
Paint	1	LS	$20,000	misc painting allowance
CAPITAL TOTAL (ROUNDED) (Yr 2000 Dollars)			**$12,862,956**	**Year 2000 Dollars**
Escalate from Yr 2000 to Yr 2009 Dollars (factor of 1.358)			**$17,471,346**	**Year 2009 Dollars**

NOTE: The above cost opinion is in October 2000 dollars and does not include escalation. The order of magnitude cost opinion shown has been prepared for guidance in project evaluation 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, final project scope, final 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.

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 15,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
HDS (Hydroxide)				**The Following Costs are in Year 2000 Dollars. See Escalation Factor at Bottom.**
Sitework/Yard Piping				
Fencing	1,000	LF	$10,000	allowance
Gravel Surfacing & Misc	1	LS	$40,000	allowance
Connections & Relocations of Existing Piping	1	LS	$30,000	allowance
Reactor A (Sludge Conditioning Tank)				
Earthwork & Concrete for Slab	1	LS	$19,872	apx 50cy @ $400/cy
Elevated Platform for Reactor A&B	1	LS	$60,000	asm 40x20 @ $75/sf high level and to support reactor A
Paint	1	LS	$10,000	allowance for subcontract
Sludge Conditioning Tank, 2500gal FRP	1	EA	$42,695	quote + 5% infla. + 5%frt + 10%mu
Mixer, 3hp	1	EA	$13,803	quote + 5% infla. + 5%frt + 10%mu
Inlet Piping, 24" SDR 15.5	120	LF	$23,242	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Inlet Piping, 18" SDR 15.5	120	LF	$17,634	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Valves, vaults, etc	1	LS	$50,000	allowance
Neutralization/Oxidation System				
Distribution Piping, 24" HDPE	261	LF	$50,487	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Retaining Wall to Accommodate New Tanks	690	SF	$17,250	90'x 8'H + 2' below grade, CIP cantelever
Earthwork for Retaining Wall	1	LS	$13,629	
Earthwork & Concrete for Slab	1	LS	$151,011	apx 450cy @ $400/cy
Paint	2	LS	$195,884	allowance for subcontract
Aeration Tank (Reactor B), 230,000 gal Steel Tank	2	EA	$345,000	$0.75/gal
Submerged Turbine Aerator/Mixer	2	EA	$255,791	
Positive Displacement Blower	2	EA	$39,726	
Pipe Supports, Hangers, etc	1	LS	$15,000	allowance
Automated Polymer Make-up & Feed System				
Earthwork & Concrete for Slab	1	LS	$0	in bldg
Paint	1	LS	$5,000	allowance for subcontract
Polymer Make-up System	2	EA	$20,433	
Polymer Make-up Tank, 2000gal	1	EA	$3,974	
Mixer	2	EA	$4,674	corrected hours

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 15,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
Transfer Pump, 20gpm	2	EA	$6,548	corrected hours
Polymer Feed Tank, 2000gal	1	EA	$3,974	
Variable Speed Gear Pump, 1gpm	2	EA	$8,421	
Piping to Feed Point	100	LF	$1,990	
Thickener				
Clean & Decommission Existing Floc System	1	LS	$1,775	
Replace Weir	1	LS	$57,115	
E-DUC Feed & Floc System & Hydraulic Mods	1	LS	$59,534	
Surface Prep & Coat	0	LS	$0	allowance for interior walls & mechanism
Sludge Wasting & Recycle Pumps				
Remove Existing Pumps	1	LS	$2,474	
Paint	1	LS	$20,000	
Sludge Recycle Pump, 400gpm	2	EA	$29,234	
Sludge Recycle Pump, 800gpm	1	EA	$22,048	
Sludge Waste Pump, 400gpm, 200' tdh	1	EA	$26,380	
Sludge Recycle Piping, 8" DI	150	LF	$10,271	including ftgs, valves, etc, revised cost
Sludge Wasting Piping, 6" DI	0	LF	$0	including ftgs, valves, etc, revised cost
I&C and Electrical				
Total I&C	1	LS	$84,243	use 5% of above
New Magnetic Flowmeter in Existing Vault	1	EA	$10,269	24"
Parshall Flume @ Effluent	1	EA	$5,537	
Electrical	1	LS	$142,793	use 8% of above
Existing Plant Demolition				
Remove Reactor A	1	LS	$2,810	
Remove Aeration Basin, Ret Wall, Stairs, etc	1	LS	$127,768	6000cy @ 200cy/hr
Remove Flocculation Basin	1	LS	$18,734	allow 40hrs
Remove Associated Piping	1	LS	$1,873	
Remove Associated Electrical	1	LS	$1,873	
Regrade Area	1	LS	$1,704	
Connections & Relocations of Existing Piping	1	LS	$5,000	allowance

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 15,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
Earthwork	1	LS	$7,314	
Concrete Slab & Footings	100	CY	$25,536	assume 18" avg thickness to account for ftgs, etc
Relocate Existing Filtration Bldg, etc	1	LS	$34,071	60' x 30' x 10' eave ht metal bldg-remove contents, dismantle & re-erect
Repairs, Touchup, etc	1	LS	$5,000	allowance for some painting, sealants, doors, etc
Water	1	LS	$4,235	sink, emer. Shower, hose bibbs, piping & service
Drains	1	LS	$2,117	
Electrical	1	LS	$4,933	reinstall, fixtures, panels, wiring, etc
Tertiary Media Filters				
Filter Pump Station Complete	1	LS	$205,111	
Water Reuse Pump Station Complete	1	LS	$30,000	cost by DAH
Distribution Piping	500	LF	$17,500	4" plastic, below grade
Media Filter System	6	LS	$3,401,004	quote=430000 + 10% frt + 10% mu & 100hrs to install
Liquid Polymer System	0	LS	$0	Not required as per JS 11/28/2000
Backwash Pumping Complete	1	LS	$368,614	
Dirty Backwash Storage Tank	1	EA	$135,000	$.75/gal
Dirty Backwash Storage Tank Mixer	1	EA	$9,143	allowance
Dirty Backwash Return Pump	1	EA	$37,070	allowance
Clean Backwash Supply Tank	1	EA	$135,000	$.75/gal
Clean Backwash Supply Pump	1	EA	$37,070	
Building Complete	1	LS	$1,912,500	$75/sf
Electrical/I&C	1	LS	$0	included
Mechanical	1	LS	$0	included
Backflow Preventer	1	EA	$10,000	allowance
Distribution Piping	6,000	LF	$138,000	2" plastic
Paint	1	LS	$30,000	misc painting allowance
CAPITAL TOTAL (ROUNDED) (Yr 2000 Dollars)			**$17,875,000**	**Year 2000 Dollars**
Escalate from Yr 2000 to Yr 2009 Dollars (factor of 1.358)			**$24,279,000**	**Year 2009 Dollars**

NOTE: The above cost opinion is in October 2000 dollars and does not include escalation.
The order of magnitude cost opinion shown has been prepared for guidance in project evaluation at the time of preparation. The final costs of the project will depend on actual labor and material

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 15,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
costs, actual site conditions, productivity, competitive market conditions, final project scope, final 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.				

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 20,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
HDS (Hydroxide)				**The Following Costs are in Year 2000 Dollars. See Escalation Factor at Bottom.**
Sitework/Yard Piping				
Fencing	1,000	LF	$10,000	allowance
Gravel Surfacing & Misc	1	LS	$45,000	allowance
Connections & Relocations of Existing Piping	1	LS	$30,000	allowance
Reactor A (Sludge Conditioning Tank)				
Earthwork & Concrete for Slab	1	LS	$19,872	apx 50cy @ $400/cy
Elevated Platform for Reactor A&B	1	LS	$60,000	asm 40x20 @ $75/sf high level and to support reactor A
Paint	1	LS	$10,000	allowance for subcontract
Sludge Conditioning Tank, 2500gal FRP	1	EA	$42,695	quote + 5% infla. + 5%frt + 10%mu
Mixer, 3hp	1	EA	$13,803	quote + 5% infla. + 5%frt + 10%mu
Inlet Piping, 24" SDR 15.5	120	LF	$23,242	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Inlet Piping, 18" SDR 15.5	120	LF	$17,634	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Valves, vaults, etc	1	LS	$50,000	allowance
Neutralization/Oxidation System				
Distribution Piping, 24" HDPE	340	LF	$65,853	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Retaining Wall to Accommodate New Tanks	900	SF	$22,500	90'x 8'H + 2' below grade, CIP cantelever
Earthwork for Retaining Wall	1	LS	$13,629	
Earthwork & Concrete for Slab	1	LS	$178,848	apx 450cy @ $400/cy
Paint	2	LS	$229,740	allowance for subcontract
Aeration Tank (Reactor B), 300,000gal Steel Tank	2	EA	$450,000	$0.75/gal
Submerged Turbine Aerator/Mixer	2	EA	$300,000	
Positive Displacement Blower	2	EA	$45,620	
Pipe Supports, Hangers, etc	1	LS	$20,000	allowance
Automated Polymer Make-up & Feed System				
Earthwork & Concrete for Slab	1	LS	$0	in bldg
Paint	1	LS	$5,000	allowance for subcontract
Polymer Make-up System	2	EA	$20,433	
Polymer Make-up Tank, 2000gal	1	EA	$3,974	
Mixer	2	EA	$4,674	corrected hours

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 20,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
Transfer Pump, 20gpm	2	EA	$6,548	corrected hours
Polymer Feed Tank, 2000gal	1	EA	$3,974	
Variable Speed Gear Pump, 1gpm	2	EA	$8,421	
Piping to Feed Point	100	LF	$1,990	
Thickener				
Clean & Decommission Existing Floc System	1	LS	$1,775	
Replace Weir	1	LS	$71,040	
E-DUC Feed & Floc System & Hydraulic Mods	1	LS	$73,134	
Sludge Wasting & Recycle Pumps				
Remove Existing Pumps	1	LS	$2,474	
Paint	1	LS	$20,000	
Sludge Recycle Pump, 400gpm	2	EA	$29,234	
Sludge Recycle Pump, 800gpm	1	EA	$22,048	
Sludge Waste Pump, 400gpm, 200' tdh	1	EA	$26,380	
Sludge Recycle Piping, 8" DI	150	LF	$10,271	including ftgs, valves, etc, revised cost
Sludge Wasting Piping, 6" DI	0	LF	$0	including ftgs, valves, etc, revised cost
I&C and Electrical				
Total I&C	1	LS	$97,990	use 5% of above
New Magnetic Flowmeter in Existing Vault	1	EA	$10,269	24"
Parshall Flume @ Effluent	1	EA	$5,537	
Electrical	1	LS	$165,888	use 8% of above
Existing Plant Demolition				
Remove Reactor A	1	LS	$2,810	
Remove Aeration Basin, Ret Wall, Stairs, etc	1	LS	$127,768	6000cy @ 200cy/hr
Remove Flocculation Basin	1	LS	$18,734	allow 40hrs
Remove Associated Piping	1	LS	$1,873	
Remove Associated Electrical	1	LS	$1,873	
Regrade Area	1	LS	$1,704	
Connections & Relocations of Existing Piping	1	LS	$5,000	allowance
Earthwork	1	LS	$7,314	

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 20,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
Concrete Slab & Footings	100	CY	$25,536	assume 18" avg thickness to account for ftgs, etc
Relocate Existing Filtration Bldg, etc	1	LS	$34,071	60' x 30' x 10' eave ht metal bldg-remove contents, dismantle & re-erect
Repairs, Touchup, etc	1	LS	$5,000	allowance for some painting, sealants, doors, etc
Water	1	LS	$4,235	sink, emer. Shower, hose bibbs, piping & service
Drains	1	LS	$2,117	
Electrical	1	LS	$4,933	reinstall, fixtures, panels, wiring, etc
Tertiary Media Filters				
Filter Pump Station Complete	1	LS	$243,600	
Water Reuse Pump Station Complete	1	LS	$30,000	cost by DAH
Distribution Piping	500	LF	$17,500	4" plastic, below grade
Media Filter System	8	LS	$4,534,673	quote=430000 + 10% frt + 10% mu & 100hrs to install
Liquid Polymer System	0	LS	$0	Not required as per JS 11/28/2000
Backwash Pumping Complete	1	LS	$464,445	
Dirty Backwash Storage Tank	1	EA	$180,000	$.75/gal
Dirty Backwash Storage Tank Mixer	1	EA	$10,683	allowance
Dirty Backwash Return Pump	1	EA	$43,675	allowance
Clean Backwash Supply Tank	1	EA	$180,000	$.75/gal
Clean Backwash Supply Pump	1	EA	$43,675	
Building Complete	1	LS	$2,550,000	$75/sf
Electrical/I&C	1	LS	$0	included
Mechanical	1	LS	$0	included
Backflow Preventer	1	EA	$10,000	allowance
Distribution Piping	8,000	LF	$184,000	2" plastic
Paint	1	LS	$40,000	misc painting allowance
CAPITAL TOTAL (ROUNDED) (Yr 2000 Dollars)			**$22,800,505**	**Year 2000 Dollars**
Escalate from Yr 2000 to Yr 2009 Dollars (factor of 1.358)			**$30,969,204**	**Year 2009 Dollars**

NOTE: The above cost opinion is in October 2000 dollars and does not include escalation.
The order of magnitude cost opinion shown has been prepared for guidance in project evalu
at the time of preparation. The final costs of the project will depend on actual labor and mate
costs, actual site conditions, productivity, competitive market conditions, final project scope, f

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 20,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
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 making specific financial decisions or establishing final budgets.				