Appendix I

Cost Estimate Associated with Confirmation Sampling for Groundwater Protection

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I1 Capital Cost Summary

TOTAL COST OF RESPONSE ACTION			
Site:	**PW 1/3/6 Confirmation Sampling**	**Base Year:**	2010
Location:	**Hanford, WA**	**Date:**	7/16/2010
Phase:	**RI/FS**		

	PW 1/3/6 Confirmation Sampling
Total Project Duration (years)	1
Capital Cost	$33,720,000
Total O&M Cost	$0
Total Periodic Cost	$0
Non-Discounted	**$33,720,000**
Total Present Value of Alternative (Discounted)	**$33,720,000**

This is an executive summary of the Environmental Cost Estimate referencing the document ECE-200PW1/3/610-00007, *PW-1/3/6 Post ROD Sampling Cost Estimate*.

I2 Purpose

The purpose of this Estimate for Present Value Costs is to establish an opinion of probable cost based on planning documents and site information.

I3 Background

This document provides a backup of the cost estimate conducted to support the response action for the PW-1/3/6 confirmation sampling to confirm contaminant levels and associated risk according to Appendix D of this document and evaluates the confirmation sampling response action. This response action requires specific inputs and assumptions as discussed in Section I4.2.1.

I4 Methodology

The cost estimate for the PW-1/3/6 confirmation sampling was developed in accordance with EPA/540/R-00/002, *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*, OSWER 9355.0-75. The Remedial Action Cost Estimate Requirement (RACER) Cost Estimator software was used in conjunction with Microsoft Excel software and the response action site information presented in Appendix D of this document to develop the cost estimate for the response action.

The cost estimates are based on actual pricing information derived from historical experience. The unit costs associated with each one of the quantity estimates may have been factored or adjusted by the estimator and/or task lead, as appropriate, to reflect influences by the contract, work site, or other

identified special conditions. Historical information from similar Hanford Site planning and reverse well decommissioning efforts was applied to this estimate.

Net present value costs were estimated using the real discount rate published in Appendix C of the Office of Management and Budget (OMB) Circular No. A-94, "Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs," effective through January 2010. Programs with durations longer than 30 years use the 30-year interest rate of 2.7 percent. Net present value costs are discussed for each alternative in the following subsections. Typically the period of analysis for the net present value cost is 1,000 years; however, no present value has been calculated for this estimate as all costs are calculated in year one.

The estimate was also prepared in accordance with the guidelines of the Association for the Advancement of Cost Engineering (AACE) International, AACE International Recommended Practice No. 18R-97, *Cost Estimate Classification System—As Applied in engineering, Procurement, and Construction for the Process Industries*. According to the definitions of AACE International, Recommended Practice No. 8R-97, the Class 5 Estimate is defined as the following:

> *"This estimate is prepared based on limited information, where little more than proposed waste site, its location, and remediation alternatives are known, where preliminary engineering is from 0 percent to 2 percent complete. Strategic planning purposes include but are not limited to, market studies, assessment of viability, evaluation of alternate schemes, project screening, location, and evaluation of resource needs and budgeting, and long-range capital planning. Examples of estimating methods used would include cost/capacity curves and factors, scale-up factors, and parametric and modeling techniques. Typically, little time is expended in the development of this estimate. The expected accuracy ranges for this class of estimate are –20 percent to –50 percent for the low range side and +30 percent to +100 percent on the high range side."*

No sensitivity analyses were performed. The following factors might cause the estimate to change significantly:

- Levels of contamination
- Extended time required for sampling crews to work in personal protective equipment (PPE)
- Number of total samples required and number of analytes per sample

The cost estimates provide a discriminator for deciding between similar protective and implemental alternatives for a specific waste site. Therefore, the costs are relational, not absolute, costs for the evaluation of the response action.

I5 Assumptions and Inputs

There are two different types of assumptions and inputs for cost estimation. The first type is general assumptions and inputs. These general inputs can be applied to cost estimating in general such as labor rates and direct and indirect cost factors. The second type of assumptions and inputs are remedial activity specific such as sampling specific criteria.

I5.1 General Assumptions

I5.1.1 Labor

Fixed-price (FP) construction craft labor rates are those listed in Appendix A of the *Site Stabilization Agreement for All Construction Work for the U.S. Department of Energy at the Hanford Site* (commonly

known as the Hanford Site Stabilization Agreement [HSSA]). The HSSA rates include base wage, fringe benefits, and other compensation as negotiated between CH2M HILL Plateau Remediation Company (CHPRC) and the National Building and Construction Trades Department American Federation of Labor-Congress of Industrial Organizations (AFL-CIO). Other factors that account for additional costs (such as, Workman's Compensation, *Federal Insurance Contributions Act* [FICA {*The Social Security Act of 1935*}], and state and federal unemployment insurance) to develop a fully burdened rate by craft, have been incorporated. The labor rates used are for 2010.

Plateau Remediation Contractor (PRC) labor rates for management, engineering, safety oversight, and technical support are based on the PRC-approved planning rates for fiscal year 2010.

I5.1.2 Direct Cost Factors

The direct cost factor in the cost estimates is the Washington State sales tax, which has been applied to all materials and equipment purchases at 8.3 percent.

I5.1.3 Indirect Cost Factors

The following indirect cost factors are included in the cost estimates:

- Contractor overhead, profit, bond, and insurance costs have been applied at a rate of 26.5 percent on FP labor, materials, and equipment.
- PRC general and administrative (G&A) has been applied at a rate of 14.8 percent to all PRC labor, material, and equipment. G&A is also applied to the FP contractor costs.

I5.1.4 Other

The following general pricing assumptions were included in the cost estimates:

- PRC cost estimating templates for site remediation are used as the basis for each waste site cost estimate.
- Construction labor, material, and equipment units were estimated based on standard commercial estimating resources and databases: Means, 2010a, *Building Construction Cost Data*, and Means, 2010b, *Heavy Construction Cost Data*. The units may have been factored or adjusted by the estimator as appropriate to reflect influences by contract, work site, or other identified project or special conditions.
- Quotes from local commercial sources are used for materials that need to be acquired for the construction of temporary improvements.
- Equipment rates are based on 21 working days per month.
- Equipment operation is based on one shift of 8 hours per day.
- One workweek equals 5 days.
- Work stoppages or shutdowns caused by inclement weather are factored into the estimates or planning schedules. It is assumed that there will be 20 days of delays per calendar year. For projects that are less or greater than one year, the delay time is prorated.
- Work delays or stoppages caused by waiting for laboratory results or approval for backfilling waste site excavations are included in the estimates.

- The cost estimates include costs for design, work plan preparation, and any other preparation costs normally associated with activities occurring before field mobilization.
- Remedial design capital costs are based on EPA/540/R-00/002, Exhibit 5-8. The following guide is used in this study:
  - For projects with construction costs less than $100,000, remedial design is planned at 20 percent of the construction cost.
  - For projects with construction costs from $100,000 to $500,000, remedial design is planned at 15 percent of the construction cost.
  - For projects with construction costs from $500,000 to $2 million, remedial design is planned at 12 percent of the construction cost.
  - For projects with construction costs from $2 million to $10 million, remedial design is planned at 8 percent of the construction cost.
  - For projects with construction costs greater than $10 million, remedial design is planned at 6 percent of the construction cost.
- Escalation has not been included in the calculations. All costs are present day (fiscal year 2010).
- Contingency has been applied to the capital costs and the rates are based on EPA/540/R-00/002, Section 5.4.

I5.2 Remedial Activity-Specific Assumptions

The site-specific assumptions for the confirmation sampling activities are summarized below.

I5.2.1 General Assumptions

The general assumptions for the confirmation sampling response action include:

- Thirteen waste sites requiring five sampling boreholes each was assumed for the confirmation sampling cost estimate.
- Hollow stem auger equipment and crews were assumed for the five sampling boreholes required for each site.
- One mobilization, demobilization, and 64 moves of the hollow stem auger equipment were assumed for the project.
- A total depth of 23 m (75 ft) with sampling intervals of every 1.5 m (5 ft) starting at a depth of 4.5 m (15 ft) from existing ground surface was assumed for each sampling borehole.
- The analytical suite of tests assumed nitrate+nitrite as nitrogen, radionuclides (technetium-99, plutonium-239/240, americium-241, and uranium isotopes), volatile organic compounds, semivolatile organic compounds, metals, and polychlorinated biphenyls.
- An additional 5 percent, of the total samples required, were assumed for quality assurance.
- It is assumed 40 percent of the sampling boreholes to be highly contaminated; therefore, additional PPE and lower production rates were assumed for this duration of the sampling activities.

- Remedial design has been excluded as it is assumed this sampling plan will be a design item for the overall project.

I6 Software Applications

I6.1 Approved Software

RACER 2010, Version 10.3, has been accredited in accordance with Department of Defense (DOD) Instruction 5000.61, *DOD Modeling and Simulation (M&S) Verification, Validation and Accreditation (*VV&A*)* (dated July 11, 2001). Each year the RACER software is assessed technically by the RACER DOD technical review group and updated as needed to make sure it complies with the VV&A instruction.

RACER is registered in the Hanford Information System Inventory.

I6.1.1 Description

The software package used in the calculation:

- RACER
- Version 10.3HISI 2440
- CH2M HILL Laptop 31050012

I6.1.2 Software Installation and Checkout

RACER software installation and checkout was performed. Multiple tests were performed on the software comparing a sample project and results provided by Architecture, Engineering, Consulting, Operations, and Maintenance (AECOM) help desk. The test was performed using the RACER 10.3 version software on a government workstation and the results were duplicated.

I6.1.3 Statement of Valid Software Application

RACER is a cost estimating system that was developed under the direction of the U.S. Air Force for estimating environmental investigation and cleanup costs for the annual budgeting and appropriations process. A prime area where RACER is used within the firm is to develop cost estimates for cleanup scenarios on feasibility studies for hazardous waste sites and corrective measures studies under the *Resource Conservation and Recovery Act of 1976* (RCRA). Given the limited data inputs required and the structured estimating process, RACER is an ideal tool for developing cost estimates for multiple cleanup approaches consistent with RCRA, *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*, underground storage tank, and other environmental regulatory programs.

I7 References

AACE International Recommended Practice No. 18R-97, 2005, *Cost Estimate Classification System—As Applied in engineering, Procurement, and Construction for the Process Industries*, AACE, Inc., Morgantown, West Virginia. Available at: http://www.aacei.org/technical/rps/18r-97.pdf.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 USC 9601, et seq. Available at: http://uscode.house.gov/download/pls/42C103.txt.

DOD Instruction 5000.61, 2001, *DOD Modeling and Simulation (M&S) Verification, Validation, and Accreditation (VV&A)*, U.S. Department of Defense, Washington, D.C. Available at: http://www.simval.org/document/DoDI_5000_61/DoDI_5000_61.pdf.

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EPA/540/R-00/002, 2000, *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study***,** OSWER 9355.0-75, U.S. Environmental Protection Agency, Washington, D.C. Available at: http://epa.gov/superfund/policy/remedy/sfremedy/rifs/costest.htm.

Federal Insurance Contributions Act (FICA, *Social Security Act of 1935*), 26 USC 3101, et seq. Available at: http://www.law.cornell.edu/uscode/26/usc_sup_01_26_10_C_20_21.html.

Means, R.S., 2010a, *Building Construction Cost Data*, 68th Annual Edition, R.S. Means, Company Inc., Kingston, Massachusetts.

Means, R.S., 2010b, *Heavy Construction Cost Data*, 24th Annual Edition, R.S. Means Company Inc., Kingston, Massachusetts.

National Environmental Policy Act of 1969, 42 USC 4321, et seq. Available at: http://www.fhwa.dot.gov/environment/nepatxt.htm.

OMB Circular No. A-94, 2009, "Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs" (memorandum for Heads of Executive Departments and Establishments), Appendix C, "Discount Rates for Cost-Effectiveness, Lease Purchase, and Related Analyses," Office of Management and Budget, Washington, D.C., as revised. Available at: http://www.whitehouse.gov/omb/circulars_a094_a94_appx-c/.

Resource Conservation and Recovery Act of 1976, 42 USC 6901, et seq. Available at: http://www4.law.cornell.edu/uscode/42/6901.html.

Site Stabilization Agreement for All Construction Work for the U.S. Department of Energy at the Hanford Site, 1984, as amended, commonly known as the Hanford Site Stabilization Agreement (original title, *Site Stabilization Agreement, Hanford Site, between J. A. Jones Construction Services Company and Morrison-Knudsen Company, Inc., and the Building and Construction Trades Department of the AFL-CIO and its affiliated international unions, and the International Brotherhood of Teamsters, Chauffeurs, Warehousemen, and Helpers of America*), Donald Paul Hodel, Secretary of Energy. Available at: http://www.hanford.gov/pmm/page.cfm/HSSA.