Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

08-AMRC-0033 NOV 14 2007 136812

Mr. Nicholas Ceto, Program Manager
Office of Environmental Cleanup
Hanford Project Office
U.S. Environmental Protection Agency
309 Bradley Blvd, Suite 115
Richland, Washington 99352

Dear Mr. Ceto:

TRANSMITTAL OF THE APPROVED "EXPLANATION OF SIGNIFICANT DIFFERENCE FOR THE INTERIM ACTION RECORD OF DECISION FOR THE 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-2, 100-HR-2, AND 100-KR-2 OPERABLE UNITS (100 AREA BURIAL GROUNDS, OCTOBER 2007"

This letter transmits the approved "Explanation of Significant Difference for the Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-2, 100-HR-2, and 100-KR-2 Operable Units (100 Area Burial Grounds). This Explanation of Significant Difference specifically addressed the 118-B-1 burial ground located in the 100-BC-2 Operable Unit. If you have any questions, please contact me, or contact Stacy Charboneau, Federal Project Director, Office of the Assistant Manager for the River Corridor, on (509)-373-3841.

Sincerely,

David A. Brockman
Manager

AMRC:DCS

Enclosure

cc w/encl:
G. Bohnee, NPT
L. C. Buelow, EPA
J. W. Donnelly, WCH
D. A. Faulk, EPA
S. Harris, CTUIR
J. A. Hedges, Ecology
J. B. Price, Ecology
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K. Niles, ODOE
Administrative Record, H6-08
Environmental Portal, A3-01

EXPLANATION OF SIGNIFICANT DIFFERENCE
FOR THE INTERIM ACTION RECORD OF DECISION FOR THE 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-2, 100-HR-2, AND 100-KR-2 OPERABLE UNITS
(100 Area Burial Grounds)
October 2007

SITE NAME AND LOCATION

USDOE Hanford 100 Area
100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-2, 100-HR-2, 100-KR-2 Operable Units, Hanford Site (100 Area Burial Grounds)
Benton County, Washington

INTRODUCTION TO THE SITE AND STATEMENT OF PURPOSE

The U.S. Environmental Protection Agency (EPA), Washington State Department of Ecology (Ecology), and U.S. Department of Energy, Richland Operations Office (DOE), hereinafter referred to as the Tri-Parties, are issuing this Explanation of Significant Differences (ESD) to provide public notice on significant changes to the *Interim Remedial Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-2, 100-HR-2, and 100-KR-2 Operable Units* (100 Area Burial Grounds ROD) in accordance with Section 117(c) of the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) and 40 *Code of Federal Regulations* (CFR) 300.435(c)(2)(1).

The 100 Area Burial Grounds ROD, hereinafter referred to as the Burial Grounds ROD, addresses solid wastes and contaminated soils associated with forty-five 100 Area burial ground sites throughout the entire 100 Area of the Hanford Site, including the 118-B-1 Burial Ground in the 100-BC-2 Operable Unit (Figure 1). The Tri-Parties approved the Burial Grounds ROD on September 27, 2000. Remediation of burial grounds in the 100 Area started with the 100-B/C Area, for which EPA is the lead regulatory agency. The subject of this ESD is the 118-B-1 Burial Ground.

This ESD is being issued for the following reason: The selected remedy in the Burial Grounds ROD allows for consideration of eight "balancing factors" to determine the extent of additional excavation needed in situations where residual contamination exists below the engineered structure and at a depth greater than 4.6 m (15 ft). These factors are as follows: (1) reduction of risk by decay of short-lived radionuclides (half-life of less than 30.2 years), (2) protection of human health and the environment, (3) remediation costs, (4) sizing of the Environmental Restoration Disposal Facility (ERDF), (5) worker safety, (6) presence of ecological and cultural resources, (7) availability and projected effectiveness of institutional controls, and (8) long-term monitoring costs. The extent of remediation must also ensure that contaminant levels are at or below maximum contaminant levels for protection of groundwater or ambient water quality criteria for protection of the Columbia River. At the 118-B-1 Burial Ground, following extensive removal of the tritium debris sources and removal of the mass of contaminated soil over the past 3 years, a discrete area in the southern portion of the burial ground contains residual tritium contamination in the soil at depths greater than 4.6 m (15 ft), which is above the remedial action objective (RAO). As such, DOE and EPA agreed to evaluate the balancing factors for this area of the 118-B-1 Burial Ground on a site-specific basis as outlined in the Burial Grounds ROD.

Based on the evaluation of the balancing factors, including considerations of existing soil and groundwater data, additional excavation for the residual tritium-contaminated soil in the southern portion of the 118-B-1 Burial Ground waste site, located in the 100-B/C Area (Table 1), is not required, and additional institutional controls shall be required to ensure protection of groundwater and the Columbia River. These additional institutional controls are to be applied at this waste site to ensure protection of human health and the environment, while allowing natural decay of residual tritium soil contamination remaining beneath the burial ground in discrete areas following excavation activities. The institutional controls required are designed to be consistent with the interim action nature of the Burial Grounds ROD. Additional measures may be necessary in final RODs, including additional measures to ensure long-term viability of institutional controls.

The Burial Grounds ROD requires that residual contamination will not exceed maximum contaminant levels (MCLs) for protection of groundwater or ambient water quality criteria (AWQC) for the Columbia River. As stated in the Burial Grounds ROD, the RESidual RADioactivity (RESRAD) model will be used for prediction of radionuclide dose and groundwater concentrations. One standard assumption of the RESRAD model is the application of irrigation water of 76 cm/yr (30 in./yr). This ESD also provides notice of a change to remove the irrigation assumption from the RESRAD modeling at the 118-B-1 Burial Ground, as well as notice that the Burial Grounds ROD is being changed to prohibit irrigation at 118-B-1 to minimize further mobilization of residual tritium-contaminated soil to the groundwater and Columbia River.

Issuance of this ESD is pursuant to Section 117(c) of CERCLA and 40 CFR 300.435(c)(2)(i) and 300.825(a)(2) of the *National Oil and Hazardous Substances Pollution Contingency Plan* (NCP). The ESD describes changes to an approved remedy that do not fundamentally alter the overall cleanup approach, and it is based on the Administrative Record. The purpose is to provide public notice of the significant changes identified herein and the information that led to the changes. Additionally, the Burial Grounds ROD requires a public involvement period of no less than 30 days prior to making any determination to invoke the balancing factors. A 30-day advanced notice announcing the public comment period was published on July 17, 2007. Additionally, a fact sheet was prepared by the Tri-Parties and mailed on August 27, 2007, to interested individuals on the Hanford Site mailing list, also known as the Listserv, which is maintained by Ecology. An advertisement announcing the August 27, 2007 to September 27, 2007 public comment period was published in the *Tri-City Herald*, the local newspaper, on August 27, 2007. A summary of the comments and responses to public comments received during the public comment period are included in the Responsiveness Summary (Attachment A) of this ESD.

The ESD will become part of the Administrative Record for the cleanup decision for the 100-B/C Area of the Hanford Site. The Administrative Record is available for review at the following location:

USDOE, Richland Operations Office
Administrative Record Center
2440 Stevens Center Place, Room 1101
Richland, Washington 99352
(509) 376-2530

EPA and DOE also provided a briefing to members of the Hanford Advisory Board River and Plateau Committee on the 118-B-1 Burial Ground remediation efforts, including development of this ESD, on May 9, 2007 and August 16, 2007.

SITE HISTORY, CONTAMINATION, AND SELECTED REMEDY

The 118-B-1 Burial Ground is a 3.2-hectare (8-acre) site located in the 100-BC-2 Operable Unit of the 100-B/C Area approximately 1,000 m (3,300 ft) southwest of the 105-B Reactor Building and approximately 1,240 m (4,090 ft) south of the Columbia River (Figure 1). Figure 2 shows the conceptual model for the 118-B-1 Burial Ground. This site was the primary burial ground for general wastes from the operation of the 105-B Reactor and 100-N Reactor. The burial ground was in operation between 1944 and 1973 and received the majority of solid wastes from maintenance, repair, and modification of the 105-B Reactor, including aluminum process tubes, aluminum fuel spacers, control rods, reactor hardware, and soft wastes. The burial ground also received the bulk of solid wastes from operation and subsequent demolition of the Tritium Separation Program (P-10 Project). Solid waste and demolition debris from the P-10 Project were the major sources of the tritium contamination found in the 118-B-1 Burial Ground.

Tritium sources from the P-10 Project included items such as tritium tubes, tritium furnaces, tritium pots, and tritium glassware (Figures 3 through 6, respectively). Tritium tubes are small cylinders approximately 7.6 cm (3 in.) in diameter and 36 to 41 cm (14 to 16 in.) in length, with screw-on caps (Figure 3). Tritium furnaces are small open-ended 7.6 cm (3-in.)-diameter cylinders approximately 61 to 76 cm (24 to 30 in.) in length (Figure 4). Tritium pots are small canisters that are approximately 33 cm (13 in.) in diameter and 10 cm (4 in.) in length with small pipes extending from the canister about 20 cm (8 in.) in length (Figure 5). Glassware associated with the P-10 Project varies in size and was contained inside of the tritium tubes (Figure 6).

Remedial action at the 118-B-1 site began on February 2, 2004. A chronology of remediation events follows:

- February 2004 – Overburden removal began.
- March 2004 – Excavation of contaminated soil and debris began and continued to September 2004.
- September 2004 – Suspect spent nuclear fuel (SNF) was discovered; excavation operations were suspended until the nuclear safety documentation (i.e., the Authorization Basis) could be evaluated and revised.
- October to December 2004 – Suspect SNF was confirmed.

- April 2005 – Load-out operations were resumed for previously sorted and segregated material. Excavation in the burial ground remained suspended.
- August 2005 – Full-scale excavation resumed, including waste sorting and disposal.
- July 2006 – Excavation operations were completed and final surveys performed in preparation of final verification sampling.
- July 2006 – Verification sampling began with EPA approval of the site-specific sample design (e.g., contaminants of concern, sample locations).
- November 2006 – Disposal of previously excavated soil was completed.
- November to December 2006 – Verification soil sampling was completed.
- December 2006 – Investigation test pits were excavated and sampled at locations where tritium sample results exceeded cleanup levels or were elevated.
- May 2007 – Installation of a characterization borehole to groundwater was completed to evaluate the tritium profile.

Contaminated soils and debris from the 118-B-1 Burial Ground were removed, treated if necessary, and disposed to the Hanford Site disposal facility, the ERDF, as required by the Burial Grounds ROD. The primary contaminants of concern were carbon-14, nickel-63, cesium-137, cobalt-60, europium-152, europium-154, strontium-90, tritium (H-3), americium-241, plutonium, uranium, chromium VI, mercury, lead, cadmium, total petroleum hydrocarbons, asbestos, polychlorinated biphenyls (PCBs), and volatile organic compounds.

Waste and debris removed from the 118-B-1 Burial Ground and disposed totaled over 111,900 metric tons (123,082 tons). In the Burial Grounds ROD, the estimated volume was approximately 57,270 metric tons (62,995 tons). This represents approximately a 195% increase in waste volume (Figure 7). The remediation excavation was approximately 21,700 m^2 (233,700 ft^2) in area with depths ranging from approximately 6 m (18 ft) to a maximum depth of approximately 10 m (33 ft). According to the Burial Grounds ROD, there were 21 individual trenches that contained waste and debris. During the remediation 23 trenches were discovered; 2 trenches contained no debris and apparently were not used. For purposes of verification sampling the remediated burial ground was divided into seven distinct areas based on grouping of trenches, waste staging areas, and intermediate areas that had similar waste streams and contaminants. Figure 8 shows the seven areas of the 118-B-1 Burial Ground.

The bulk of the tritium debris was discovered in Areas 1 and 2 and the southernmost trench of Area 3. Residual tritium contamination was detected in soil collected during the July-December 2006 verification sampling and correlates well with locations where tritium-contaminated debris was discovered in the burial ground. Verification sampling consisted of a combination of statistical and focused sampling. The statistical sampling was supplemented with 15 focused soil samples collected at locations where large inventories of tritium-contaminated debris were removed, stained soils were observed, or where field radiological surveys identified the need for additional remediation. EPA approved the locations and analytical parameters for the focused samples based on field observations, mapping of debris and quantities discovered during remediation, and a review of the radiological survey results. The remediation activities removed all debris from the burial ground, including several thousand tritium pots and furnaces, along with nearly 1,000 tritium tubes and large quantities of glassware used in tritium production. This tritium-contaminated debris was the primary source of the tritium in the burial ground.

BASIS OF THE DOCUMENT

Verification Sampling

The tritium cleanup level to be protective of groundwater and the Columbia River is 15.8 pCi/g based on a conservative determination using the RESRAD model. Tritium is a mobile contaminant and, as a result, is expected to move rapidly through the soil. Tritium is a gas at ambient conditions of temperature and pressure and is strongly adsorbed by water, producing tritiated water that is both evolved to the atmosphere by evapotranspiration and travels to the groundwater.

Tritium is the only contaminant of concern remaining at the 118-B-1 Burial Ground above the cleanup level, and only in discrete portions of Areas 1, 2, and 3. One verification soil sample collected in the southwest corner of Area 1 had 239 pCi/g tritium; all other Area 1 samples were below 15.8 pCi/g. In the central part of Area 2, tritium was detected at 60 pCi/g; all other verification samples in Area 2 were below 15.8 pCi/g. In Area 3, tritium was detected at 19 pCi/g in the southern portion; all other verification samples in Area 3 were below 15.8 pCi/g. Verification samples for tritium in all other areas were below 15.8 pCi/g.

Potholes (i.e., test pits) were excavated in Areas 1, 2, and 3 in December 2006 to determine a vertical profile of tritium concentrations. Based on the verification sample data and pothole data, DOE and EPA agreed to install one characterization borehole to groundwater in Area 1, where the highest tritium soil data from potholing was discovered, to further evaluate the vertical profile. In May 2007, a borehole was installed to groundwater (Figure 9) with soil samples collected at approximate 1.5 m (5-ft) intervals. Additionally, filtered and unfiltered groundwater samples were collected.

Borehole Sampling

Figure 10 summarizes the result of the borehole sampling. The results indicate that complete remediation of tritium in the soil would require excavation to groundwater because the tritium levels throughout the soil column exceed the soil cleanup criteria of 15.8 pCi/g for protection of groundwater. However, a groundwater sample collected from the characterization borehole beneath the waste site detected tritium at 908 pCi/L unfiltered and 813 pCi/L filtered, well below the MCL for tritium in groundwater of 20,000 pCi/L.

Groundwater Monitoring and Modeling

A down-gradient groundwater monitoring well (199-B8-6) is located approximately 130 m (425 ft) northeast of the 118-B-1 Burial Ground. Groundwater flow in this area is generally north to northeast and has a relatively flat gradient. Figure 11 shows a graph of the tritium concentrations in this well since 1993. Tritium levels in the groundwater peaked in 1998 and 1999, well before remediation began in 2004. Tritium levels in the well have remained relatively stable since 2000, with a slight increase in 2006. This well is not influenced by changes in

Columbia River flow because it is located approximately 1,170 m (3830 ft) from the river. This well is now sampled annually.

Figure 11 shows tritium concentrations in well 199-B8-6 reaching their highest levels in 1998 and 1999. Operations ceased in the 118-B-1 Burial Ground in 1973. Using the MODFLOW groundwater fate and transport model, tritium in groundwater was predicted to peak at the monitoring well approximately 23 years later. The actual tritium peak was seen 25 years later in the well. Additionally, the Hanford Site recorded its highest annual rainfall in 1996 and 1997, with 1996 having 31.27 cm (12.31 in.) and 1997 having 30.96 cm (12.19 in.). This increased rainfall may have contributed to the peak in tritium in 1998 and 1999.

Tritium levels in the groundwater after the year 2000 have remained fairly stable. There is a slight increase in 2007, possibly due to 3 years of remediation activities that required application of water and water sprays to control fugitive dust emissions as specified by regulatory-approved plans for remedial actions.

Tritium is highly mobile in soil/groundwater systems and migrates both as a gas and as tritiated water. Based on evaluation of the historical inventory of tritium waste disposed, reconciliation with the inventory of waste discovered and removed during remediation, review of historical groundwater monitoring results from tritium, and subsequent modeling information, it is expected that the greater part of tritium contamination associated with the 118-B-1 Burial Ground has already been removed or migrated to groundwater.

The rural-residential exposure scenario presented in the Burial Grounds ROD assumes the application of 0.76 m/yr (30 in./yr) of irrigation water from an offsite, uncontaminated source. The RESRAD modeling results show that the modeled tritium discharge to groundwater with or without irrigation does not achieve the RAO and is predicted to continue to exceed the MCL of 20,000 pCi/L for tritium. However, without irrigation, tritium is not predicted to reach the Columbia River at concentrations greater than the MCL. Because there are no AWQC for tritium, the MCL will be used as provided in the Burial Ground ROD. Other contaminants of concern remaining in the soil meet the cleanup objectives. Maximum concentrations of tritium with irrigation are much higher, occur earlier (lessening the effects of radioactive decay, dilution, and attenuation), and occur over a longer time period. Irrigation would be expected to mobilize tritium much more rapidly.

Excavation to Groundwater

The remedy called for in the Burial Ground ROD is remove, treat if necessary, and dispose (RTD). When necessary, implementation of the RTD remedy could involve excavation to groundwater. Costs associated with this action include a variety of factors such as (1) removing overburden soil (soil not contaminated), (2) excavating contaminated soil, (3) transporting and disposing to ERDF, (4) in-process sampling during the remediation, (5) final verification sampling, (6) backfilling, and (7) revegetation. Depth to groundwater from the bottom of the existing excavation at 118-B-1 is approximately 18 to 21 m (60 to 70 ft) and varies depending on the location within the burial ground. Due to the depth of the excavation to reach groundwater, benching would be necessary for excavation equipment and to maintain proper slopes for worker protection and safety.

Costs to remove the remaining residual tritium-contaminated soil to groundwater are estimated at $16 to $17 million. Total excavation volumes are estimated at 688,100 metric tons (758,500 tons); of that total, 169,190 metric tons (186,500 tons) is soil requiring disposal to ERDF and the remaining 518,864 metric tons (571,950 tons) is clean soil that must be excavated to reach the contaminated soil with necessary equipment and to provide proper slopes for worker safety requirements.

Institutional Controls

Institutional controls consist of non-engineered administrative and legal controls identified in the Burial Grounds ROD to prevent unauthorized access or use of a specific site or location. A report is required every 5 years to document effectiveness of the institutional controls, which must include identification of any deficiencies and corrective actions taken or to be taken. Institutional controls are required to be maintained in accordance with both the Burial Ground ROD and the *Sitewide Institutional Controls Plan for Hanford CERCLA Response Actions* (DOE/RL-2001-41, as amended[1]).

Prohibiting irrigation at the 118-B-1 Burial Ground is an institutional control that can be implemented to allow short-lived tritium (half-life of 12.3 years) to dissipate by radioactive decay and eliminate the potential driving force of irrigation water to mobilize the residual tritium in the soil. This action assists in protecting groundwater and the Columbia River. Based on the highest tritium concentration in the soil, the duration of institutional controls required is approximately 140 years. The down-gradient monitoring well 199-B8-6 is monitored annually as required by the *100-BC-5 Operable Unit Sampling and Analysis Plan* (DOE/RL-2003-38, as amended[2]), and the results can be used to assess contamination attenuation over time.

Implementation of institutional controls to prohibit irrigation at the 118-B-1 waste site is consistent with the conservation future land use identified in the *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (CLUP)[3]. The *Record of Decision: Hanford Comprehensive Land-Use Plan Environmental Impact Statement (HCP EIS)*[4] (CLUP ROD) identifies representative future land uses within the geographic area of the Columbia River corridor and recognizes that restrictions on certain activities may continue to be required to prevent the mobilization of contaminants, the most likely example of which is the restriction of activities that discharge water to the soil.

Balancing Factors Evaluation

Table 1 summarizes the balancing factor evaluation for the 118-B-1 Burial Ground. Based on evaluation of the balancing factors as well as the sample data and information listed below, further excavation for residual tritium-contaminated soil at depths greater than 4.6 m (15 ft), in

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[1] DOE/RL-2001-41, *Sitewide Institutional Controls Plan for Hanford CERCLA Response Actions*, current revision, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
[2] DOE/RL-2003-38, *100-BC-5 Operable Unit Sampling and Analysis Plan*, current revision, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
[3] DOE/EIS-0222F, 1999, *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement*, U.S. Department of Energy, Washington, D.C.
[4] 64 FR 61615, 1999, "Hanford Comprehensive Land-Use Plan Environmental Impact Statement (HCP EIS), Hanford Site, Richland, Washington; Record of Decision (ROD)," *Federal Register*, Vol. 64, No. 218, pp. 61615 (November 12).

the discrete area of the southern portion of 118-B-1 Burial Ground, is not necessary: (1) all debris from the burial ground that was the source of tritium has been removed and disposed; (2) cleanup objectives for all contaminants of concern have been met except for tritium in a discrete area in the southern portion of the burial ground; (3) 111,900 metric tons (123,082 tons) of contaminated soil and debris has been removed, which represents the mass of contamination; (3) the groundwater sample from the characterization borehole within the burial ground footprint is well below the MCL for tritium; (4) tritium levels in the down-gradient monitoring well from 118-B-1 are slightly above the MCL for tritium but are stable and have been stable for the last 5 years, and the tritium plume seen at well 199-B8-6 does not appear to reach the Columbia River, as evident by samples from aquifer tubes down-gradient of this well; and (5) the data from the down-gradient monitoring well sampling will continue to be evaluated to assess contamination attenuation over time. Based on the balancing factors evaluation, in conjunction with the existing institutional controls and the additional institutional controls to prohibit irrigation for approximately 140 years, protection of the groundwater and Columbia River has been demonstrated.

DESCRIPTION OF SIGNIFICANT DIFFERENCES

Approval of this ESD shall authorize the following significant changes to the selected remedy of the Burial Grounds ROD:

1. Required RESRAD modeling in the soil may be conducted without accounting for the irrigation rate of 0.76 m/yr (30 in./yr) for tritium at the 118-B-1 waste site.

2. Irrigation is prohibited at the 118-B-1 waste site for 140 years, except as authorized to support revegetation activities as authorized by the Burial Grounds ROD or other EPA-approved documents. This prohibition shall be added to the *Sitewide Institutional Controls Plan for Hanford CERCLA Response Actions* (DOE/RL-2001-41) in the next revision.

SUPPORT AGENCY COMMENTS

Ecology supports this ESD, and has coordinated with EPA regarding this ESD.

STATUTORY DETERMINATIONS

This modified remedy satisfies CERCLA Section 121. The interim remedy selected in the Burial Grounds ROD, as modified by this ESD, remains protective of human health and the environment, complies with Federal and state requirements that are applicable or relevant and appropriate to remedial actions, is cost-effective, and uses permanent solutions and alternative treatment technologies to the maximum extent practicable. Additional data needs will be evaluated during the final soil and groundwater Remedial Investigation/Feasibility Study. Relevant data, including new data if needed, will be used to support final protectiveness determinations of human health and the environment for the 118-B-1 waste site.

PUBLIC PARTICIPATION

The public participation requirements pursuant to Section 117(c) of CERCLA and 40 CFR 300.435(c)(2)(i), 300.825(a)(2) of the NCP, Section 300.435(c)(2)(i) of the NCP, and the Burial Grounds ROD are met through issuance of this ESD and holding a public comment period.

EPA and DOE also provided a briefing to members of the Hanford Advisory Board River and Plateau Committee on the 118-B-1 Burial Ground remediation efforts, including development of this ESD, on May 9, 2007 and August 16, 2007.

A 30-day advanced notice announcing the public comment period was published on July 17, 2007. Additionally, a fact sheet was prepared by the Tri-Parties and mailed on August 27, 2007, to interested individuals on the Hanford Site mailing list, also known as the Listserv, which is maintained by Ecology. An advertisement announcing the August 27, 2007 to September 27, 2007 public comment period was published in the *Tri-City Herald*, the local newspaper, on August 27, 2007. Public comment was mixed on developing an ESD to allow natural attenuation of the residual tritium remaining at the 118-B-1 waste site. Several comments suggested that the fact sheet should have presented the characterization data profile. DOE and EPA believe going forward with the ESD is still appropriate. Based on the public comments received, and application of the balancing factors, excavation is not being required for residual contamination as specified above. Public comments received can be found in the Administrative Record. A summary of the comments and responses to public comments received during the public comment period are included in the Responsiveness Summary (Attachment A) of this ESD.

Figure 2. 118-B-1 Conceptual Model.

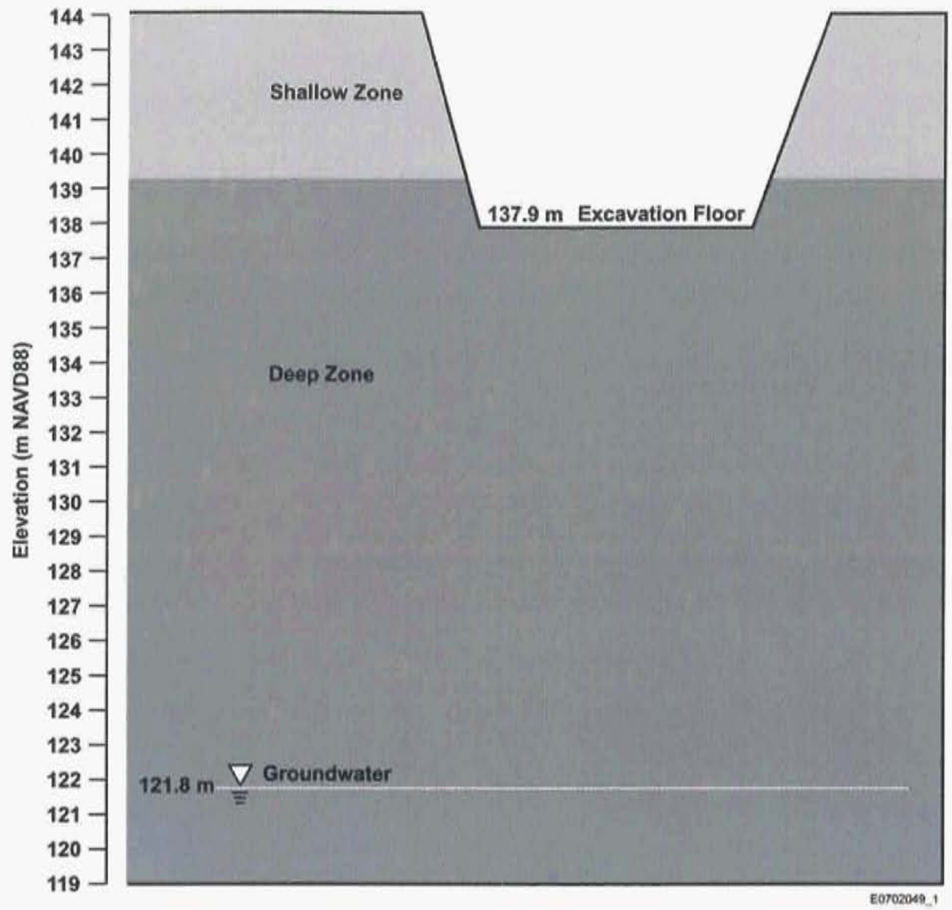


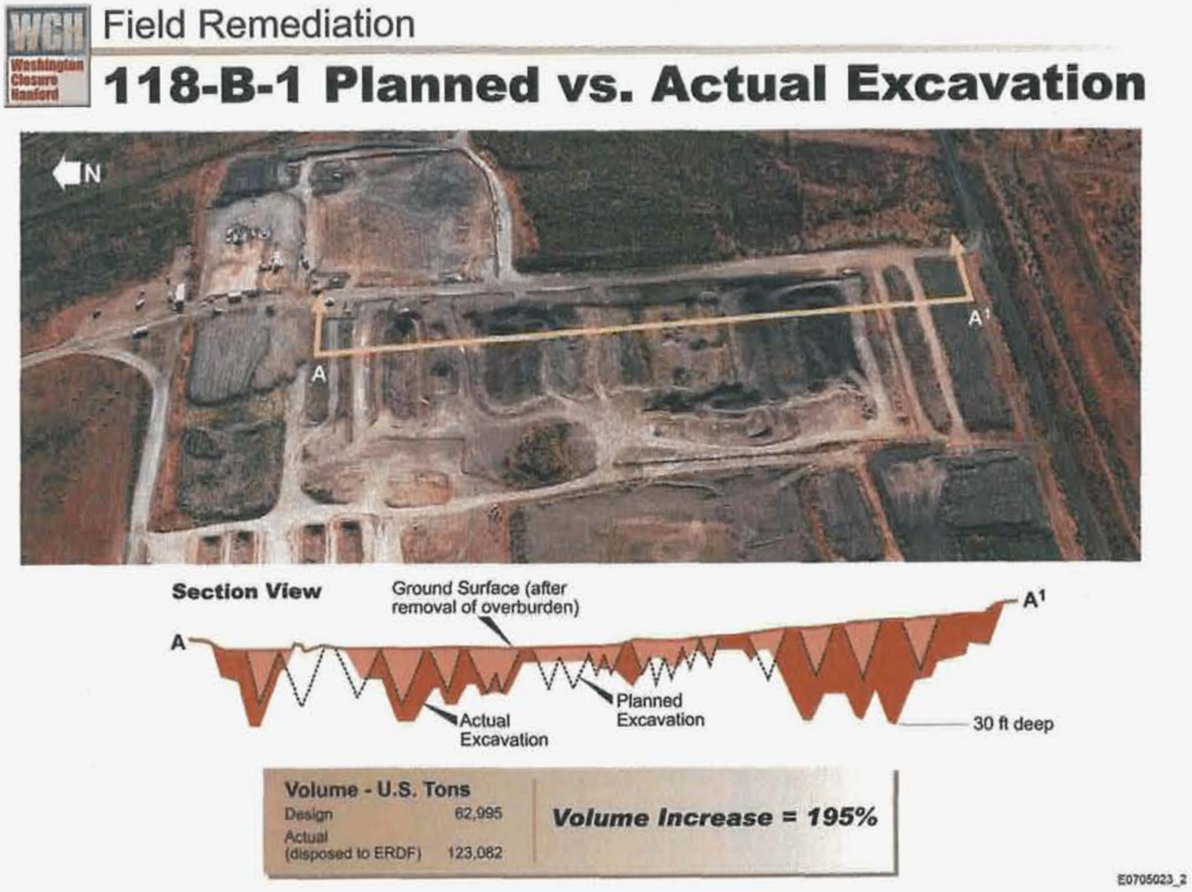
Figure 3. Tritium Tubes.

Figure 4. Tritium Furnaces.

Figure 5. Tritium Pots.

Figure 6. Tritium Glassware.

Figure 7. 118-B-1 Waste Volumes Excavated Versus Design.



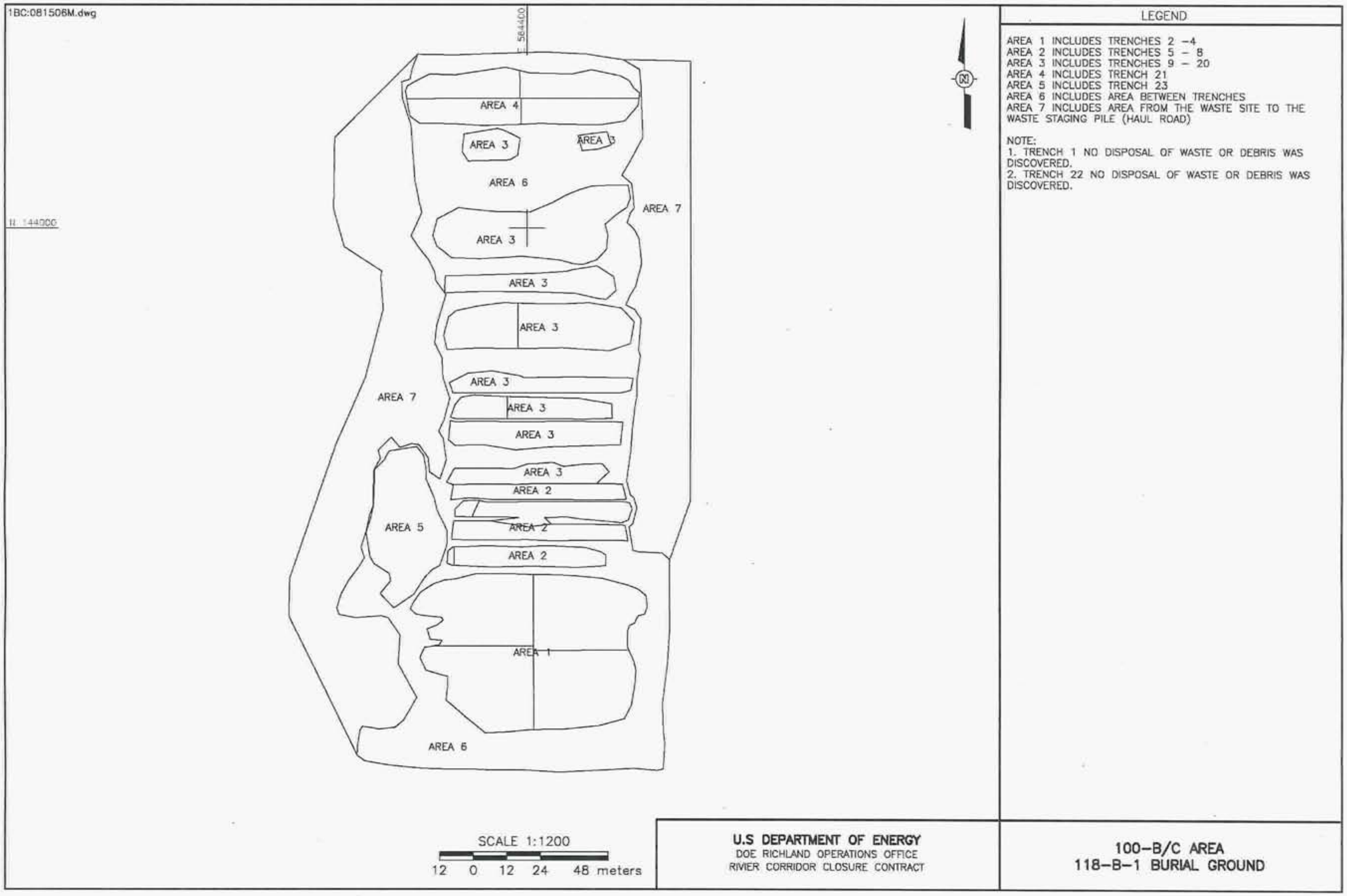


Figure 8. 118-B-1 Areas.

Figure 9. Borehole Location Map.

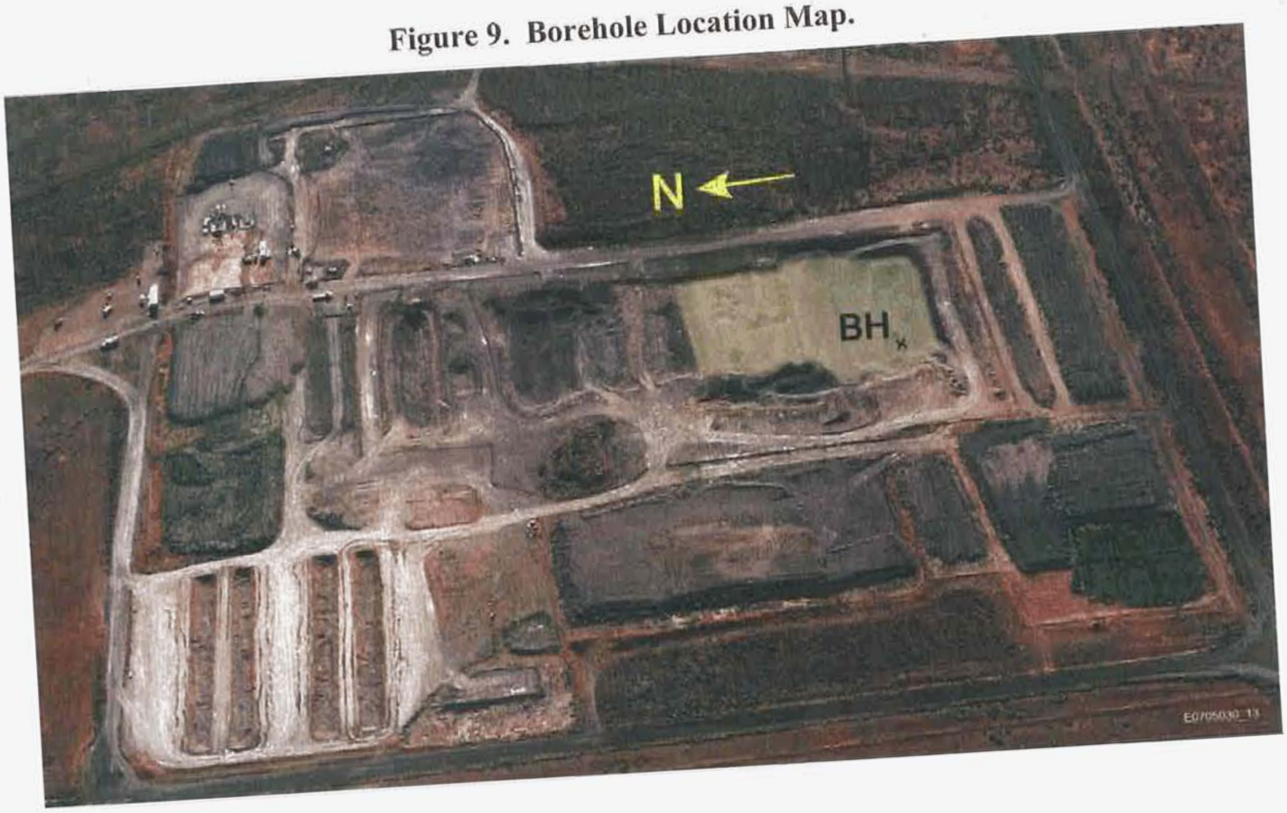


Figure 10. 118-B-1 Borehole Results.

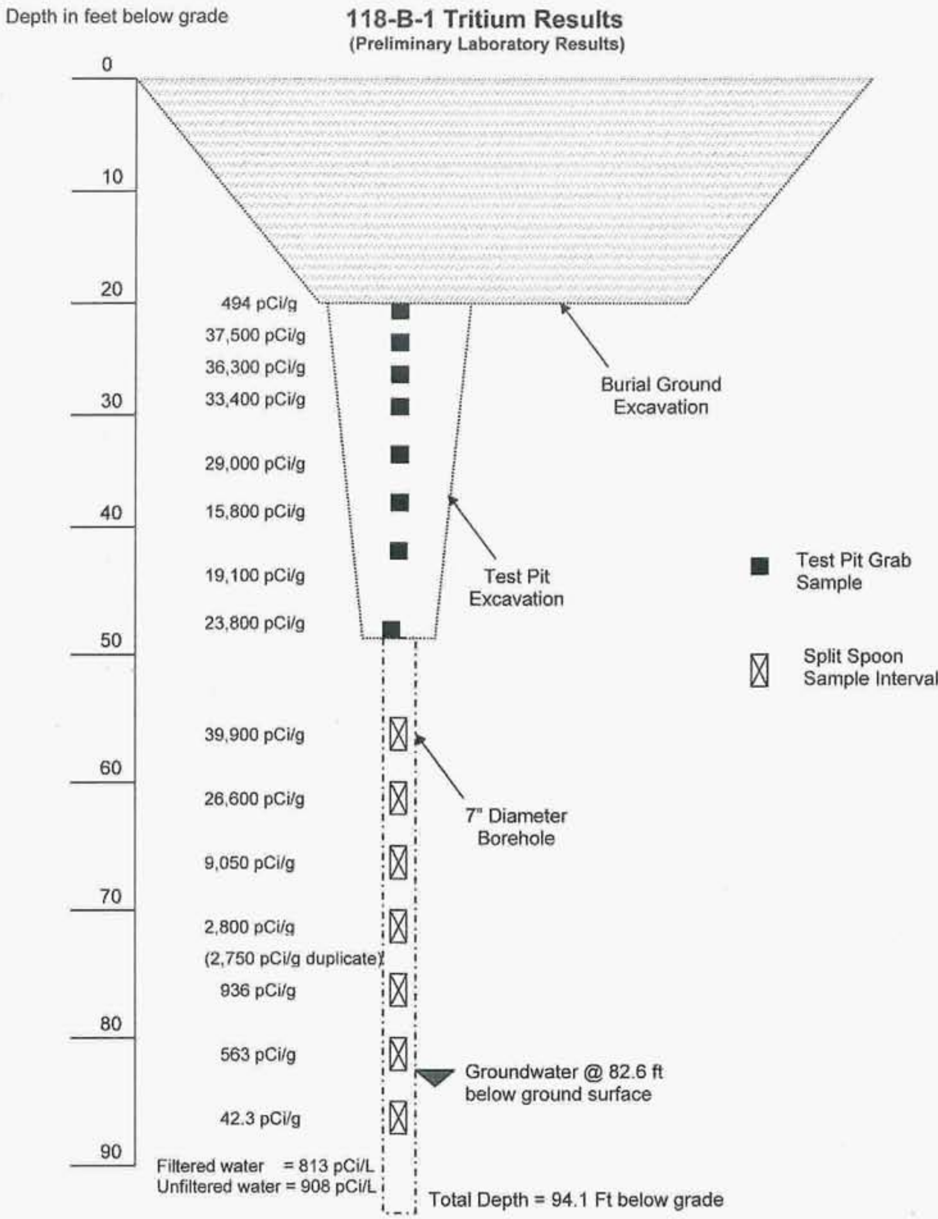


Figure 11. Tritium Concentrations in Well 199-B8-6.

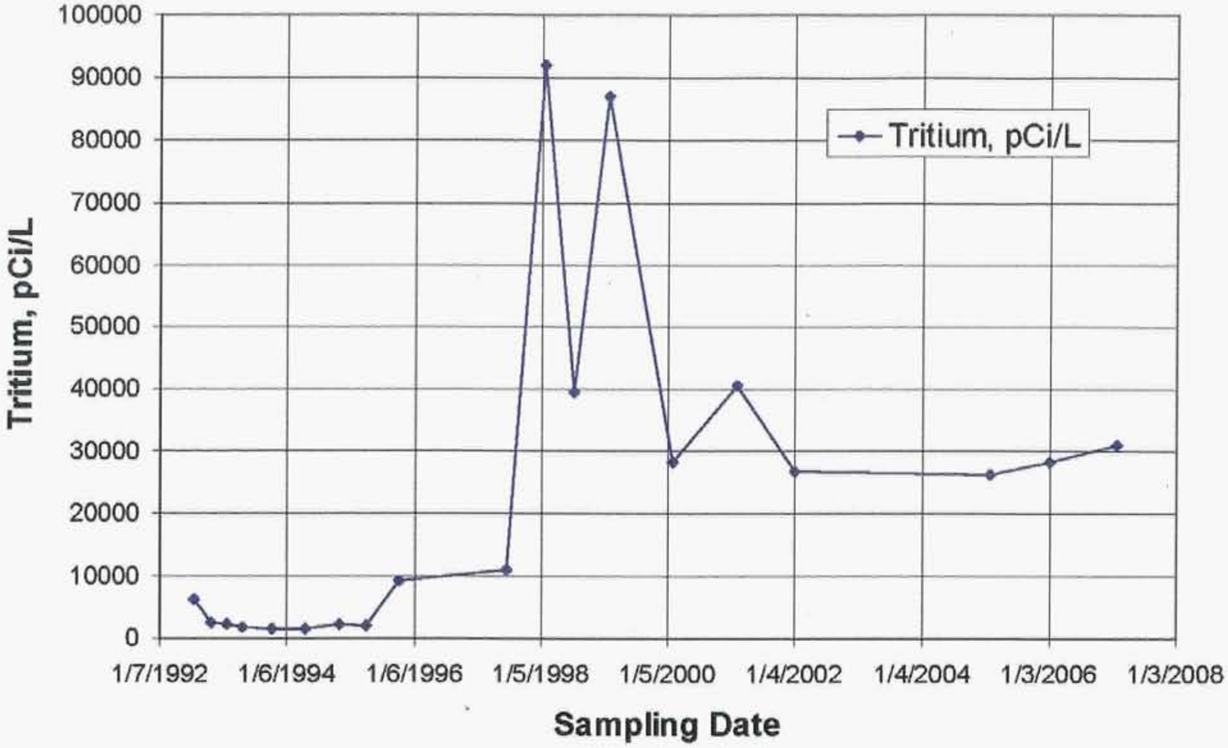


Table 1. Balancing Factors Evaluation. (2 Pages)

Balancing Factor Criteria	Excavation to Groundwater and Maintain Irrigation (30 in./yr)	Prohibit Irrigation (30 in./yr) and Maintain Institutional Controls
1. Reduction in Risk by Decay of Short-Lived Radionuclides (half-life less than 30.2 years)	Tritium has a half-life of 12.3 years. Half-life means half the mass of contamination naturally dissipates every 12.3 years. Complete excavation to groundwater would remove all contaminated material and natural decay is not a factor.	Tritium has a half-life of 12.3 years. Half-life means half the mass of contamination naturally dissipates every 12.3 years. Decay does reduce risk and, based on the highest residual tritium concentration in the soil at depths greater than 4.6 m (15 ft) in a discrete area in the southern portion of the burial ground, the duration of institutional controls required is approximately 140 years. All contaminated debris that contained tritium has been removed and disposed, so there is no continuing source. Prohibiting irrigation water for 140 years will ensure protection of the groundwater and Columbia River by removing the driving force that could expedite the movement of residual tritium in the soil to the groundwater, and will allow sufficient natural decay of tritium to reduce tritium to levels that are protective before it would reach groundwater. Prohibiting irrigation aids the decay process by keeping the residual tritium in the soil longer and allowing natural decay to occur. The combination of natural decay of this short-lived radionuclide and eliminating irrigation reduces risk.
2. Protection of Human Health and the Environment	This method is protective, as all residual tritium-contaminated soil is removed to groundwater. Additional backfill would be necessary and necessitate the expansion of existing borrow sources, which could impact other natural resources and potentially disturb more land in acquired additional borrow material.	This method is protective as described in the column above, and the following: (1) all debris from the burial ground that was the source of tritium has been removed and disposed; (2) cleanup objectives for all contaminants of concern have been met except for tritium in a discrete area in the southern portion of the burial ground; (3) 111,900 metric tons (123,082 tons) of contaminated soil and debris has been removed, which represents the mass of contamination; (3) the groundwater sample from the characterization borehole within the burial ground footprint is well below the MCL for tritium; (4) tritium levels in the down-gradient monitoring well from 118-B-1 are slightly above the MCL for tritium but are stable and have been stable for the last 5 years and the tritium plume seen at well 199-B8-6 does not appear to reach the Columbia River, as evident by samples from aquifer tubes down-gradient of this well; and (5) the data from the down-gradient monitoring well sampling will continue to be evaluated to assess contamination attenuation over time. Furthermore, without irrigation, tritium is not predicted to reach the Columbia River at concentrations greater than the MCL. Because there are no AWQC for tritium, the MCL will be used as required by the Burial Ground ROD. Additionally, the extent of borrow material needed to backfill the site is substantially reduced, and thus preserves existing borrow pits for other remediation activities.

Table 1. Balancing Factors Evaluation. (2 Pages)

Balancing Factor Criteria	Excavation to Groundwater and Maintain Irrigation (30 in./yr)	Prohibit Irrigation (30 in./yr) and Maintain Institutional Controls
3. Remediation Costs (estimated)	$16 to $17 million (24 additional months to complete). Total additional excavation volumes are estimated at 688,100 metric tons (758,500 tons); of that total, 169,190 metric tons (186,500 tons) is soil requiring disposal to ERDF and the remaining 518,864 metric tons (571,950 tons) is clean soil that must be excavated to reach the contaminated soil with necessary equipment and to provide proper slopes for worker safety requirements.	Minimal cost is necessary to maintain and ensure institutional controls. There are no additional remediation costs.
4. Sizing of the ERDF	The additional waste volume would fill nearly 11% of one ERDF cell due to the additional tritium-contaminated soil.	No additional excavation is necessary, so there is no additional waste disposal to ERDF.
5. Worker Safety	Additional excavations and benching in order to excavate soil to groundwater increase the time and duration of workers around heavy equipment, and increases risk. Deep excavations also require sufficient slopes for access of trucks/equipment, and to slope margins within limits for worker safety. Increased time in the excavation area also increases worker risk due to potential exposure to tritium gas.	No additional worker safety concerns would be identified by maintaining institutional controls and prohibiting irrigation.
6. Presence of Ecological and Cultural Resources	There are no known ecological or cultural impacts at the waste site itself due to the excavation already conducted. However, the surface area impacted increases as a result of deep excavations, which would destroy additional natural revegetation in order to maintain proper slopes. Additional borrow material would be necessary from borrow pits, which could impact ecological resources due to the potential expansion of borrow pits.	There are no known ecological or cultural impacts with maintaining institutional controls and prohibiting irrigation.
7. Availability and Effectiveness of Institutional Controls	Institutional controls identified in the Burial Grounds ROD would remain unchanged. A report is required every 5 years to document effectiveness of the institutional controls, including any deficiencies and corrective actions. Institutional controls will be maintained in accordance with both the Burial Grounds ROD and the *Sitewide Institutional Controls Plan for Hanford CERCLA Response Actions* (DOE/RL-2001-41, as amended).	Institutional controls identified in the Burial Grounds ROD would remain unchanged, but one additional institutional control is added to prohibit irrigation at 118-B-1. A report is required every 5 years to document effectiveness of the institutional controls, including any deficiencies and corrective actions. Institutional controls will be maintained in accordance with both the Burial Grounds ROD and the *Sitewide Institutional Controls Plan for Hanford CERCLA Response Actions* (DOE/RL-2001-41, as amended).
8. Long-Term Monitoring Costs	No impact. The down-gradient monitoring well (199-B8-6) is already sampled annually as required by the *100-BC-5 Operable Unit Sampling and Analysis Plan* (DOE/RL-2003-38, as amended), and there is no change in frequency.	No impact. The down-gradient monitoring well (199-B8-6) is already sampled annually as required by the *100-BC-5 Operable Unit Sampling and Analysis Plan* (DOE/RL-2003-38, as amended), and there is no change in frequency.

Signature sheet for the *Explanation of Significant Difference for the Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-2, 100-HR-2, and 100-KR-2 Operable Units* (100 Area Burial Grounds Record of Decision) between the U.S. Department of Energy and the U.S. Environmental Protection Agency.

Daniel D. Opalski, Director Office of Environmental Cleanup U.S. Environmental Protection Agency	10-25-2007 Date

Signature sheet for the *Explanation of Significant Difference for the Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-2, 100-HR-2, and 100-KR-2 Operable Units* (100 Area Burial Grounds Record of Decision) between the U.S. Department of Energy and the U.S. Environmental Protection Agency.

[signature] 11/1/07

David A. Brockman
Manager, Richland Operations
U.S. Department of Energy

Date

ATTACHMENT A

RESPONSIVENESS SUMMARY
118-B-1
OCTOBER 2007

COMMENT 1:

"September 21, 2007

Dennis Faulk
Environmental Protection Agency
309 Bradley, #115
Richland , WA

SUBJECT: ESD-118-B-1

Dear Mr. Faulk,

The CTUIR are providing brief comments on the subject document. The underlying motivation for all our comments is a vital interest in the current and future conditions of Hanford lands. Our endstate vision is of Tribal members safely using the cleaned and restored natural and cultural resources across the Hanford site. Therefore, most of our comments emphasize the need to adequately characterize contamination and evaluate risks to tribal members as they will be using the resources once again after clean-up is complete.

Based on the fact sheet, our comments are as follows:

1. The highest concentration of tritium was found at 24 feet, which is shallow enough to excavate. The amount of soil needed to be excavated in order to locate and remove the vadose source is stated, but without information on the 3-D characterization. For example, if the bulk of the contamination is fairly shallow (e.g., 35 feet or less) then the costs would be substantially less than presented.

2. The residual tritium in deep soil will not be protective of future groundwater drinking water standards. The length of time needed for decay of the soil tritium is not stated. The total mass and spatial distribution must be known in order to estimate this, but it is not clear that the tritium source has been characterized.

3. To the best of our knowledge, the cumulative risk from residual tritium in soil in addition to present and future groundwater exposure pathways has not been evaluated. Since the original ROD did not use the CTUIR scenario, our risks cannot have been estimated. In addition, institutional controls would have to remain in place longer in order to wait longer for tritium to decay to safe levels under our scenario. While the costs of maintaining a restriction on use might be minimal, the cost of lost services may be higher.

To summarize, we recommend additional characterization to determine the mass of tritium and its configuration in the soil, and to determine whether the bulk of the tritium is shallow enough to be excavated in a cost-effective manner. We also recommend re-evaluating risks using the CTUIR scenario so that the recovery curve or risk profile can be estimated and so that the costs of ICs can be compared to the cost of lost services.

If you have any questions, please feel free to contact me or Dr. Harper.

Sincerely,
Stuart Harris"

Response: Although the entire characterization data from the borehole was not presented in the fact sheet, it did summarize some of the data points. Additionally, there was extensive characterization done to support the evaluation of residual tritium which included numerous test pits to verify the lateral extent and a borehole to define vertical extent. This data was used to calculate the amount of excavation needed to remove the waste material. We believe the residual tritium will not adversely impact groundwater provided institutional controls are maintained given that the current concentration was measured at 900 picocuries per liter in the groundwater beneath this site. As you are aware, this is an interim action and the Tri-Parties are evaluating other exposure scenarios as part of the final remedy process inclusive of a tribal scenario.

COMMENT 2:

**"Richard I Smith
09/11/2007 09:20 AM**

Dennis: While I agree that the remaining tritium in the subsoil at this burial ground probably does not represent a significant risk to public health and the environment, the information provided in the Fact Sheet seems insufficient to assure that contention.

- A figure illustrating the activity profile as determined from the characterization borehole would help the reader to understand the magnitude of the problem.
- A fate and transport calculation that showed the rate at which the tritium would enter the groundwater, both with and without the institutional control preventing irrigation would also be reassuring, and might show that the ban on irrigation was not needed.

- The fate and transport calculation would also show the decay of the tritium in the soil column over time, thus perhaps demonstrating that the residual tritium would essentially decay before reaching the water table in any significant amount.
- Is the top of the contaminated soil volume 80 ft above the water table, or is the ground surface 80 ft above the water table? In other words, is the maximum transport distance to groundwater 80 ft or 65 ft? This distance could make a difference in the results of the fate and transport calculation.

The above additional information would significantly strengthen your choice to do no further remediation in this case."

Response: We agree with you that the above cited information would strengthen the case for the evaluation in the ESD. Most of the information is contained within the attached ESD. It should be noted, we tried to strike a balance in using the fact sheet to provide enough summary level information to allow for comment on the proposal to develop an ESD but yet not overwhelm the reader with detailed technical information.

COMMENT 3:

"From: Eric Watson
Sent: Monday, August 27, 2007 10:49 AM
To: Lutz, Karen
Subject: Re: TPA: This is a message from the Tri-Party Agencies

I have a better idea than what you guys are thinking about and I bet that majority of the public would agree to it.

Theory, if waste has a half life of thirty years then the whole life is 60 years. That is a persons 3/4 life span at the date the material is contained and ready for disposal. So, to dispose of it properly it must be buried deep into the earth as where it would cause no harm to our waters or surface areas. There is a very big machine that drills tunnels deep into the earth. So, that machine should be used to drill towards the core of the earth. About 1 mile down. This would allow for many containers to be disposed of and if damage is done to a container at that depth then there would be less chance of surface and water contamination.

I know this idea would be rather expensive. However, I know it would prevent radioactive problems to the publics surface area and water areas. Water contaminated with radioactive materials is not noticeable to the common water well consumer. However, the city water and river waters can be monitored.

Do not bury waste in shallow graves or we will be buried and hospitalized because of your negligence."

Response: Thank you for your interest in Hanford Cleanup. The ideas you describe have been used by the federal government to dispose of long-lived radioactive waste such as plutonium. These wastes are sent to the Waste Isolation Pilot Plant in New Mexico for disposal. The fact sheet outlines the balancing factor information and proposed changes based on tritium, which is short-lived radioactive waste, and does not require deep geologic disposal.

COMMENT 4:

"BRIAN MOORE
09/13/2007 11:38 AM
September 13 2007

EPA Office
Attention: Dennis Faulk

First of all I want to extend my appreciation for allowing the public to comment on this issue. It truly amazes me to see common sense applied in this issue and that you are onboard with supporting this action. I am encouraged to see this level of support from your office.

In reading the paper during the past year, EPA seems to have been eager to impose a large fine on DOE for spilling 30 gallons of chromium into the soil. As I understand it, while removing old and rusted pipes that were buried in the ground is when the chromium spilled out. Was it not the EPA that actually told someone to go clean it up in the first place. It seems to me that the individuals that were originally charged with the responsibility of removing the chromium years ago and were paid to do so should have received the fine.

Currently EPA proposes to leave some soil contamination at its current depth in the 118-B-1 area based on good science and good information. This use of common sense and balancing factors is exactly what the taxpayers want to see applied to issues like this that arise. According to the information provided in your fact sheet on this issue it only makes sense to leave the contamination alone. Disturbing it will only increase the probability of increasing the amount of contamination in the ground water.

It is apparent to me that the risks of removing the tritium in this specific location at the 118-B-1 site are greater than leaving it to decay naturally. I am sure that the large amount of time and money that would be needed to remove tritium at this location could be better utilized at other contamination sites in our area. In the future our taxpayer money would be much better utilized by always applying a good common sense approach to every issue as you have applied it to this issue.

Thank you in advance for your time and consideration in this matter.

Brian K. Moore"

Response: Thank you for taking the time to comment on our proposal. Based on the feedback we received we did prepare the ESD which is enclosed for your information.

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