

Explanation of Significant Differences

for the

Interim Action Record of Decision for the  
200-UP-1 Groundwater Operable Unit

Hanford Site  
Benton County, Washington

February 2009

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## **SITE NAME AND LOCATION**

U.S. Department of Energy Hanford 200 Area  
200-UP-1 Groundwater Operable Unit  
Hanford Site  
Benton County, Washington

## **INTRODUCTION TO THE SITE AND STATEMENT OF PURPOSE**

The Washington State Department of Ecology (Ecology – the lead regulatory agency), the U. S. Environmental Protection Agency (EPA – the support regulatory agency), and the U. S. Department of Energy (DOE – the lead agency), hereafter referred to as the Tri-Parties, are issuing this Explanation of Significant Differences (ESD) to provide notice on changes to the interim action Record of Decision (ROD) issued February 1997 for the 200-UP-1 Groundwater Operable Unit (OU) located on the Hanford Site.

The 200-UP-1 OU is one of the two groundwater OUs located in the 200 West Area. The primary contaminants in the 200-UP-1 Groundwater OU that the interim ROD addresses are uranium and technetium-99. The selected remedy consists of pumping the highest concentration zone of the contaminated groundwater plume at the 200-UP-1 Groundwater OU followed by treatment using the existing Hanford 200 East Area Effluent Treatment Facility (ETF). The ETF is a state permitted dangerous waste management unit, and effluent from the ETF is discharged to a state permitted wastewater discharge facility. The selected remedy is intended to reduce contaminant mass within the plume and minimize migration of uranium and technetium-99 from the 200 West Area.

The ESD documents the following significant changes:

1. The interim ROD required uranium to be treated to the Model Toxic Control Act (MTCA) cleanup value of 48 ppb. Since the issuance of the interim ROD a National Primary Drinking Water Maximum Contamination Level (MCL) of 30 µg/L (ppb) was established for uranium. The parties have agreed for this action that the National Primary Drinking Water Regulation will be added as an applicable or relevant and appropriate requirement (ARAR) for treatment of extracted groundwater.
2. The interim ROD required that the groundwater be pumped from existing extraction well(s) at a rate of 190 liters/min (50 gpm), and provided that the extraction rates and well locations may be modified upon the approval of the lead regulatory agency based on a number of factors. This ESD replaces the requirement to pump 190 liters/min (50 gpm) from existing extraction well(s) with a requirement to pump existing and any new 200-UP-1 Groundwater OU extraction wells in accordance with an approved Remedial Design/Remedial Action work plan until concentrations of both uranium and technetium-99 are less than or equal to 10 times the MCL for four consecutive quarters. The groundwater extraction well locations will be selected and documented within the approved remedial design/remedial action (RD/RA) work plan. The interim ROD management and treatment requirements for the extracted groundwater are unchanged, except that treatment of uranium in extracted groundwater must now meet the new MCL.

3. This ESD adds the requirement to sample well 299-W23-19 on a quarterly basis for technetium-99. After sampling, the well shall be purged at a minimum of 1000 gallons until concentrations of technetium-99, only at well 299-W23-19, are less than or equal to 10 times the MCL for four consecutive quarters. The contaminated groundwater will be subject to the same management, treatment and disposal requirements as those for extracted groundwater.
4. This ESD updates the cost for the interim action. The estimated cost of the interim ROD was \$4.2 million for three fiscal years (FY). This equated to approximately \$1.4 million projected cost per fiscal year for FY 96, 97, and 98. The interim action has been operating for 13 years and has been effective in minimizing migration of technetium-99 and uranium. Costs to date have been approximately \$12.8 million. The estimated annual cost of implementing the remedy as revised by this ESD is approximately \$0.50 million per year and is expected to operate until a final remedy is selected and operating for 200-UP-1. The final remedy is expected to be in place and operating by 2011, which would result in additional costs for the interim remedial action of approximately \$1.5 million.
5. This ESD updates the Institutional Control requirements of the Interim ROD to be more consistent with institutional controls required at other operable units. The Hanford Site-wide Institutional Controls Plan shall be revised to specify the actions to be taken to implement the institutional control requirements and submitted to Ecology and EPA for approval as a primary document. DOE is required to comply with the Site-wide Institutional Controls Plan as revised and approved.

The circumstances, leading to the need for this ESD include: the establishment of a new MCL for uranium; the need to modify the groundwater pumping rate and approach due to a drop in the water table; the need to address significant contamination in well 299-W23-19; and the need to update and incorporate institutional control requirements into the Site Wide Institutional Controls Plan.

The Tri-Parties are issuing this ESD in accordance with Section 117(c) of the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA), as amended, and 40 CFR 300.435(c)(2)(i) of the "National Oil and Hazardous Substances Pollution Contingency Plan" (NCP). The ESD identifies changes to the Interim ROD that do not fundamentally alter the overall cleanup approach. The Interim ROD as changed by the ESD remains protective and continues to meet ARARs. One of the purposes of the ESD is to provide the public with notice of the significant changes identified above along with a summary of the information that prompted and supports the changes. The ESD will become part of the Administrative Record for the 200-UP-1 Groundwater OU Interim Remedial Action ROD in accordance with 40 CFR 300.825(a)(2). The Administrative Record is available for review from 7:00 am to 3:30 pm at the following location:

**Administrative Record**  
2440 Stevens Center Place, Room 1101, Richland, WA  
(509) 376-2530  
Attention: Heather Childers  
<http://www.2.hanford.gov/arpir/>

## **SITE HISTORY, CONTAMINATION, AND SELECTED REMEDY**

The 200-UP-1 Groundwater OU is one of two groundwater OUs located in the 200 West Area of the Hanford site. Contamination in the 200-UP-1 Groundwater OU resulted primarily from historic discharges of process water from the UO3 Plant to five cribs. These five cribs are 216-U-1, 216-U-2, 216-U-8, 216-U-12, and 216-U-16. The predominant contaminants that migrated to groundwater from these cribs are uranium and technetium-99. The major portion of waste discharge to the soil column above the 200-UP-1 Groundwater OU was via two cribs, 216-U-1 and 216-U-2. The majority of the discharges occurred between 1951 and 1968. These discharges facilitated the transport of mobile contaminants (i.e., uranium and technetium-99) to the water table.

During the final years of crib operation (1966 through 1968), small volumes of highly acidic decontamination wastes were discharged, which resulted in the transport of small amounts of uranium phosphate. Concentrations of uranium were seen to significantly increase in a groundwater monitoring well near the 216-U-1 and 216-U-2 cribs during this period. The majority of dissolved uranium was distributed throughout the soil column beneath the crib with the largest concentration deposited above a caliche layer at (50m) (164ft) depth. In 1984, large volumes of cooling water were discharged to the adjacent 216-U-16 crib which resulted in subsurface transport of uranium to a nearby poorly sealed well and then to the groundwater. The uranium concentration increased from 166 to 72,000 pCi/L in 1985.

Another source of contamination into the 200-UP-1 groundwater is the S-SX and U single shell tanks (SST) farms. The S-SX and U Waste Management Area (WMA) are both in assessment groundwater monitoring status under Hazardous Waste Management Act interim status regulations. Assessment monitoring at the S-SX WMA was triggered in 1995 when elevated concentrations of technetium-99 were detected in groundwater. The well 299-W23-19 located in the Southwest corner of the SX tank farm was completed in 1999. A sample from the well in October 1999 indicated elevated technetium at 42,000 pCi/L and additional sampling has shown technetium as high as 188,000 pCi/L.

### Current Status of well 299-W23-19

Since September 2003, one thousand gallons of groundwater have been purged on a quarterly basis from monitoring well 299-W23-19. This well is located within the Waste Management Area S/SX. Past leaks from one or more of these tanks within the WMA is the probable source of Technetium-99 contamination in groundwater. Technetium-99 concentrations in this well showed peak concentrations (188,000 pCi/L) in January 2003, then dropped to as low as 41,400 pCi/L in December 2003. Technetium-99 concentrations have since increased to 130,000 pCi/L based on a June 2005 sampling event. The concentration in this well has subsequently declined to about 50,000 pCi/L. This is over 5 times the 9,000 pCi/L RAO set in the interim action ROD. This plume is migrating to the east-southeast, as indicated by the steady sharp increases in technetium-99 concentrations in downgradient well 299-W-22-83 from 228 pCi/L in May 2001 to 12,400 pCi/L in June 2005 and 18,000 pCi/L in 2008.

## The Interim ROD Remedy

The selected remedy in the Interim ROD for 200-UP-1 uses groundwater pumping by extraction wells to capture the contaminant plume for mass removal and treatment at the ETF in the 200 East Area. The selected remedy is intended to reduce contaminant mass within the plume and minimize migration of uranium and technetium-99 from the 200 West Area. The selected remedy removes and treats these two contaminants of concern, as well as the co-contaminants of nitrate and carbon tetrachloride, which exist within the groundwater.

The original remedy required the groundwater from the 200 West Area to be pumped from the existing extraction well(s) at a rate of 190 liters/min (50gpm). The ROD provided that the extraction rates and the well locations could be modified upon the approval of the lead regulatory agency based on the future behavior of the aquifer, the response of the contaminant plume to further pump and treat activities, the rate of removal of the mass of the contaminants, and other considerations of the long-term operations and maintenance of the extraction and treatment system. The original groundwater extraction rate of 190 liters/min (50gpm) was expected to be sufficient to meet the remedial action objectives. Under the ROD, water from the 200-UP-1 OU groundwater extraction wells is to be pumped directly to the Liquid Effluent Retention Facility (LERF) for temporary storage before treatment at the ETF. The ROD contains requirements for segregating the extracted groundwater from listed hazardous waste at the LERF and ETF facilities. The extracted groundwater is required to be treated to meet the discharge standards contained in the State Waste Discharge Permit ST-4500. Upon verification that treatment standards have been achieved, the treated groundwater is then discharged to the State Approved Land Disposal Site (SALDS) north of the 200 West Area. Secondary solid waste from ETF operations is required to be managed in accordance with state dangerous waste regulations, WAC 173-303, and disposed in ERDF or other approved facilities.

U.S. DOE began pumping groundwater to ETF for treatment on March 30, 1997. The extraction and treatment has continued since it was initiated in 1997, except for a period of one year, starting in January 2005, when the system was turned off to perform a rebound study. The rebound study was a test to determine if sufficient contaminant mass had been removed such that groundwater contaminant concentrations would not rebound to levels above the interim remedial action RAOs. The tests results showed that contaminant concentrations did not sharply increase when the system was turned off. This result supports one of the proposed changes in this document (to change the requirement to pump at 50 gallons per minute).

## **BASIS FOR THE DOCUMENT**

### **Change the Performance Requirements for Uranium**

On December 7, 2000, the EPA published a final Radionuclides Rule in the Federal Register that established a National Primary Drinking Water Regulation MCL of 30µg/L for uranium. This revised rule took effect December 2003. The National Primary Drinking Water MCL of 30 µg/L (ppb) for uranium is more stringent and protective than the MTCA cleanup level of 48 ppb for uranium in the interim ROD. This ESD incorporates the new MCL for uranium as an ARAR for treatment of extracted groundwater. In addition, the pumping of 200-UP-1 groundwater extraction wells must continue until concentrations of both uranium and technetium-99 are less than or equal to 10 times the MCL for four consecutive quarters.

### **Change of Pumping Rates**

As stated above, the original remedy required that groundwater from the 200 West Area be pumped from the existing extraction well(s) at a rate of 190 liters/min (50gpm). The interim action ROD also stated that the extraction rates and the well locations could be modified upon the approval of the lead regulatory agency based on the future behavior of the aquifer, the response of the contaminant plume to further pump and treat activities, the rate of removal of the mass of the contaminants, and other considerations of the long-term operations and maintenance of the extraction and treatment system.

Since the original interim action remedy was adopted, it has been determined that requiring an extraction rate of 190 liters/min (50 gpm), is not practicable for minimizing migration of contaminants in the 200-UP-1 Groundwater OU. The water table in the 200 West Area has steadily declined since 1995, reducing the maximum pumping rate at extraction wells. A more effective way to minimize migration of contaminants is to pump from wells with the highest reported contaminant concentrations. These locations may vary as the plume responds to pumping from specific wells. Contaminant migration may be effectively reduced by installing new wells at points of high contaminant concentrations.

Therefore, the requirement to pump, from existing extraction well(s), at a rate of 190 liters/min (50 gpm) is being replaced with a requirement to pump existing and any new 200-UP-1 groundwater extraction wells in accordance with an approved RD/RA work plan until concentrations of both uranium and technetium-99 are less than or equal to 10 times the MCL for four consecutive quarters. Removing contaminated groundwater until levels are at or below 10 times the MCLs will reduce the mass of contamination and minimize migration until a final action is in place (expected to be by 2011).

### **Sample and Purge Well 299-W23-19**

The 299-W23-19 well was drilled in 1999 to help identify the nature and extent of contamination from past tank leaks from the S-SX and U tank farms. The S tank farm has twelve (12) single shell tanks, each with a capacity of 758,000 gallons. The SX tank farm has fifteen (15) single shell tanks, each with a capacity of 1 million gallons. These tanks store or have stored high-level radioactive and hazardous (mixed) waste. The U tank farm has twelve (12) single shell tanks, each with a capacity of 530,000 gallons and four single shell tanks with a capacity of 55,000 gallons. These tanks currently store high-level mixed waste. The down gradient groundwater monitoring from 299-W23-19 shows elevated specific conductance and high levels of technetium-99. The first sample from the well in October 1999 indicated elevated technetium-99 at 47,500 pCi/L. Based on these groundwater impacts, purging of the 299-W23-19 well was implemented.

A July 31, 2002 Ecology letter concerning well 299-W23-19 directed the DOE to purge contaminated groundwater, following quarterly groundwater sampling, of more than 1000 gallons and treat the purged water at the ETF. DOE conducted a pump test at well 299-W23-19 in 2003 to evaluate possible remedial technologies. The aquifer pump test indicated that the hydraulic conductivity of the uppermost aquifer at that location is very low, such that if the well is pumped at more than ~ 3 gpm, the water is drawn down below the screen in less than 30 minutes.

This ESD includes the requirement to sample well 299-W23-19, for technetium-99 on a quarterly basis. The ESD also requires that after sampling, the well shall be purged at a minimum of 1000 gallons. The well purging requirement will apply until concentrations of technetium-99, only at well 299-W23-19, are less than or equal to 10 times the MCL for four

consecutive quarters. The purged contaminated groundwater is required to be treated at the ETF and is subject to the same management, treatment and disposal requirements as those for extracted groundwater.

### **Cost**

This ESD updates the cost for the interim action. The estimated cost of the interim ROD was \$4.2 million for three fiscal years (FY). This equates to approximately \$1.4 million per fiscal year for FY 96, 97, and 98. The interim action has been operating for 13 years and has been effective in minimizing migration of uranium and technetium-99. Costs to date have been approximately \$12.8 million. The estimated annual cost of implementing the remedy as revised by this ESD is approximately \$0.50 million per year and the interim remedy is expected to operate until a final remedy is selected and operating for 200-UP-1 Groundwater OU. The final action is expected to be in place by 2011, which would result in additional costs of approximately \$1.5 million.

### **Institutional Controls Component**

This ESD updates the institutional control requirements for the 200-UP-1 Groundwater OU. Since issuance of the interim ROD in 1997, DOE has established a Sitewide Institutional Control Plan to manage institutional controls across the Hanford Site. The ESD requires DOE to incorporate 200-UP-1 Groundwater OU institutional control requirements into the Site-Wide Institutional Control Plan within 180 days of issuance of this ESD. In addition, this ESD replaces the current human access institutional control requirements with new requirements that are consistent with controls at other operable units at Hanford where human access needs to be controlled.

### **DESCRIPTION OF SIGNIFICANT DIFFERENCES**

The following are the significant differences between the remedy as presented in the interim ROD and the remedy as revised by this ESD:

- The National Primary Drinking Water Maximum Contamination Level (MCL) of 30 µg/L (ppb) for uranium is added as an applicable or relevant and appropriate requirement (ARAR) for treatment of extracted groundwater.
- This ESD replaces the requirement to pump 190 liters/min (50 gpm) from existing extraction well(s) with a requirement to pump existing and any new 200-UP-1 groundwater extraction wells in accordance with an approved RD/RA work plan until concentrations of both uranium and technetium-99 are less than or equal to 10 times the MCL for four consecutive quarters. The interim ROD management and treatment requirements for the extracted groundwater and secondary wastes are unchanged, except that treatment of uranium must now meet the new MCL.
- This ESD adds the requirement to sample well 299-W23-19 on a quarterly basis for technetium-99, and purge a minimum of 1000 gallons of groundwater until concentrations of technetium-99, only at well 299-W23-19, are less than or equal to 10 times the MCL for four consecutive quarters. The contaminated groundwater will be subject to the same management, treatment and disposal requirements as those for extracted groundwater.
- This ESD replaces the current human access institutional control requirements in the interim ROD with the following requirements:

1. The DOE shall control access to 200-UP-1 OU groundwater to prevent unacceptable exposure of humans to contaminants, except as otherwise authorized in Ecology approved documents.
2. Visitors entering any site areas of the 200-UP-1 Groundwater OU will be required to be badged and escorted at all times.
3. No intrusive work shall be allowed in the 200-UP-1 Groundwater OU unless Ecology has approved the plan for such work and that plan is followed.
4. The DOE shall prohibit well drilling in the 200-UP-1 Groundwater OU, except for monitoring, characterization or remediation wells authorized in Ecology approved documents.
5. Groundwater use in the 200-UP-1 Groundwater OU is prohibited, except for limited research purposes, monitoring, and treatment authorized in Ecology approved documents.
6. The DOE shall post and maintain warning signs along pipelines conveying untreated groundwater that caution site visitors and workers of potential hazards from the 200-UP-1 OU groundwater.
7. In the event of any unauthorized access (e.g., trespassing), DOE shall report such incidents to the Benton County Sheriff's Office for investigation and evaluation of possible prosecution.
8. Activities that would disrupt or lessen the performance of the pump-and-treat component of the remedy are to be prohibited.
9. The DOE shall prohibit activities that would damage the remedy components (e.g., extraction wells, piping, treatment plant, monitoring wells).
10. The DOE will prevent the development and use of property above the 200-UP-1 Groundwater OU for residential housing, elementary and secondary schools, childcare facilities, and playgrounds.
11. The DOE shall report on the effectiveness of institutional controls for the 200-UP-1 Groundwater OU interim remedy in an annual report, or on an alternative reporting frequency specified by Ecology. Such reporting may be for the 200-UP-1 Groundwater OU alone or may be part of the Hanford site-wide report.
12. Measures that are necessary to ensure continuation of institutional controls shall be taken before any lease or transfer of any land above the 200-UP-1 Groundwater OU. The DOE will provide notice to Ecology and EPA at least six months prior to any transfer or sale of 200-UP-1 Groundwater OU or any land above the 200-UP-1 Groundwater OU so that Ecology can be involved in discussions to ensure that appropriate provisions are included in the transfer terms or conveyance documents to maintain effective institutional controls. If it is not possible for DOE to notify Ecology and EPA at least six months prior to any transfer or sale, then the DOE will notify Ecology and EPA as soon as possible but no later than 60 days prior to the transfer or sale of any property subject

to institutional controls. In addition to the land transfer notice and discussion provisions above, the DOE further agrees to provide Ecology and EPA with similar notice, within the same time frames, as to federal-to-federal transfer of property. The DOE shall provide a copy of executed deed or transfer assembly to Ecology and EPA.

The institutional controls specified above shall be maintained until the concentrations of hazardous substances in groundwater are at such levels to allow for unrestricted use and exposure and Ecology authorizes the removal of restrictions. DOE is responsible for implementing, maintaining, reporting on and enforcing the institutional controls.

No later than 180 days after the ESD is signed, DOE shall update the *Sitewide Institutional Controls Plan* to include the institutional controls required by this ESD and specify the implementation and maintenance actions that will be taken, including periodic inspections. The revised *Sitewide Institutional Controls Plan* shall be submitted to EPA and Ecology for review and approval as a Tri-Party Agreement primary document. The DOE shall comply with the *Sitewide Institutional Controls Plan* as updated and approved by EPA and Ecology.

- This ESD also updates the cost estimate for the remedy to add approximately \$0.50 million per year until 2011, when the final remedy is to be selected and in operation.

Within 180 days of the issuance of this ESD, DOE shall submit to Ecology for approval a revised RD/RA work plan, including schedule and a milestone change package, for implementing the interim ROD for 200-UP-1 Groundwater OU as modified by this ESD.

#### **SUPPORT AGENCY COMMENTS**

EPA, Ecology and DOE all have been involved in the development of this ESD and support issuance.

#### **STATUTORY DETERMINATIONS**

This modified remedy satisfies CERCLA Section 121. The interim remedy in the 200-UP-1 Groundwater OU Interim ROD, as modified by this ESD, remains protective of human health and the environment, complies with the Federal and State requirements that are applicable or relevant and appropriate to remedial actions (unless justified by a waiver), is cost effective, and uses permanent solutions and alternative treatment technologies to the maximum extent practicable.

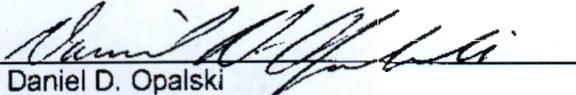
#### **PUBLIC PARTICIPATION**

The public participation requirements set forth in Section 300.435(c)(2)(i) of the NCP will be met. The Tri-Parties will follow the processes described in the Hanford Site Tri-Party Agreement Community Relations Plan (DOE et al. 2002), as detailed below.

The Parties will make the ESD and supporting information available to the public in the Administrative Record established under 40 CFR 300.815. The Parties will develop a fact sheet that briefly summarizes the ESD, including the reasons for such differences. The fact sheet will be sent out electronically to individuals on the Tri-Party Agreement listserve.

A notice of availability will be published in the Tri-City Herald, which is a major local newspaper of general circulation.

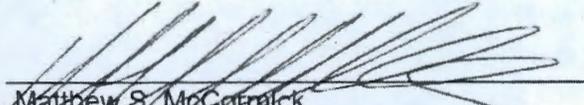
Signature sheet for the Explanation of Significant Differences for the Interim Action Record of Decision for the U.S. Department of Energy Hanford 200-UP-1 Operable Unit between the U.S. Department of Energy, the U.S. Environmental Protection Agency and the Washington State Department of Ecology.



Daniel D. Opalski  
Director, Office of Environmental Cleanup  
U.S. Environmental Protection Agency, Region 10

2/24/09  
Date

Signature sheet for the Explanation of Significant Differences for the Interim Action Record of Decision for the U.S. Department of Energy Hanford 200-UP-1 Operable Unit between the U.S. Department of Energy, the U.S. Environmental Protection Agency and the Washington State Department of Ecology.

  
Matthew S. McCormick  
Assistant Manager for the Central Plateau,  
Richland Operations U.S. Department of Energy

2/20/09  
Date

Signature sheet for the Explanation of Significant Differences for the Interim Action Record of Decision for the U.S. Department of Energy Hanford 200-UP-1 Operable Unit between the U.S. Department of Energy, the U.S. Environmental Protection Agency and the Washington State Department of Ecology.

Jane Hedges, Program Manager  
by J. Hedges  
Jane A. Hedges  
Program Manager, Nuclear Waste Program  
Washington State Department of Ecology

2/24/09  
Date