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Sampling and Analysis Plan for the 200 Area State-Approved Land Disposal Site

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Sampling and Analysis Plan for the 200 Area State-Approved Land Disposal Site

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Abstract: This document provides direction for collecting and analyzing groundwater samples near the 200 Area State-Approved Land Disposal Site for tritium.

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The signatories concur with this document as of the signature dates. Change control shall be conducted as described in Section 9.0 of this document.

C. Sutton
CHPRC Sample Management and Reporting Group

11/11/2015
Date

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LIST OF TERMS

Abbreviations and Acronyms

CHPRC	CH2M Hill Plateau Remediation Company
CCN	characterization change notice
DO	Dissolved oxygen
DOE	U. S. Department of Energy
DRCF	Document Release and Change Form
EB	Equipment blank
Ecology	State of Washington Department of Ecology
ETF	Effluent Treatment Facility
HASQARD	Hanford Analytical Services Quality Assurance Requirements Document
HEIS	Hanford Environmental Information System
LERF	Liquid Effluent Retention Facility
MDA	Minimum detectable activity
N/A	not applicable
POC	point of contact
QA	quality assurance
QC	quality control
QSM	Quality System Manual
RPD	Relative percent difference
SALDS	State-Approved Land Disposal Site
SAP	Sampling and Analysis Plan
WRPS	Washington River Protection Solutions, LLC

List of Units

Ci	Curies
L	liter
NTU	nephelometric turbidity unit
pCi/mL	picocuries per liter
µmhos/cm	micromhos per centimeter
°C	degree Celsius
pCi/L	picocuries per liter
mg/L	milligrams per liter

1.0 SAMPLING AND ANALYSIS OBJECTIVE

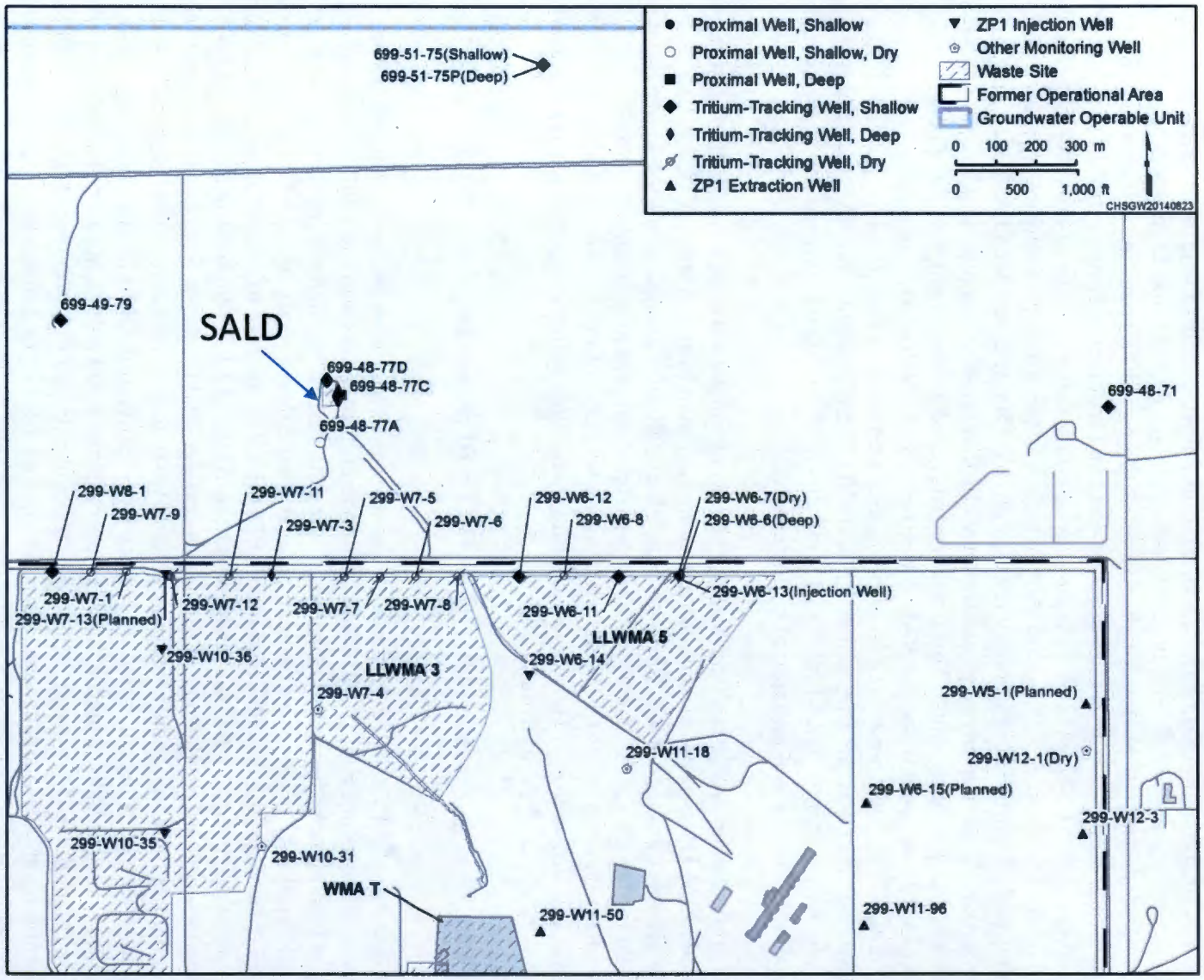
This sampling and analysis plan (SAP) identifies sample collection, laboratory analysis, quality assurance/quality control (QA/QC), and reporting objectives for the groundwater monitoring and tritium tracking associated with the 200 Area State-Approved Land Disposal Site (SALDS). *State Waste Discharge Permit Number ST0004500* (ST 4500) specifies tritium sampling at groundwater wells 699-48-77C and 699-48-77D and requires additional tritium monitoring in accordance with PNNL-13121, *Groundwater Monitoring and Tritium-Tracking Plan for the 200 Area State-Approved Land Disposal Site,* which was submitted previously to the State of Washington Department of Ecology (Ecology). ST 4500 was renewed in 2014 and the revised permit reduced the number of groundwater wells that must be sampled in addition to modifying other sampling requirements. These changes triggered a subsequent need to update PNNL-13121 in general and the SAP in Section 5.3 of PNNL-13121 in particular. RPP-ENV-59215, *Groundwater Monitoring and Tritium-Tracking Plan for the 200 Area State-Approved Land Disposal Site*, replaces PNNL-13121 and refers to this SAP for sampling and analysis requirements. RPP-ENV-59215 and this SAP will be concurrently issued and submitted to Ecology for approval as required by the permit.

This groundwater SAP establishes routine sampling using a network of wells to track tritium from the SALDS as it enters and moves within the groundwater system. CH2M HILL Plateau Remediation Company (CHPRC) is responsible for all groundwater sampling in the 200 Areas of the Hanford Site. CHPRC will collect groundwater samples periodically (quarterly, semiannually, or annually) from the wells in the SALDS tritium-tracking network and send them to the 222-S Laboratory. The 222-S Laboratory will then ship the samples to a designated offsite laboratory for analysis of tritium.

2.0 FACILITY DESCRIPTION

The 200 Area SALDS is a drainfield which receives treated wastewater from the 200 Area Effluent Treatment Facility (ETF) and non-contact, raw water from the ETF cooling tower. The ETF is located near the northeast corner of the 200 East Area. Generating facilities from across the Site produce liquid wastes that can be conveyed either directly to the ETF, or they can be stored in the Liquid Effluent Retention Facility (LERF) for later treatment at the ETF. Examples of generating sources of the wastewaters sent to ETF and LERF for treatment include: 242-A Evaporator process condensate, K-Basin wastewater, and leachates from the Environmental Remediation Disposal Facility and the Mixed Waste Burial Trenches. After treatment in the ETF, the treated effluent is monitored in the ETF verification tanks prior to discharge via a pipeline to the SALDS, which is located approximately 500 meters north of the 200 West Area. Discharge to the SALDS from actual ETF operations began in December 1995. ETF treated effluent typically contains tritium. As of December 2015, approximately 3.18E+08 gallons of treated effluent containing 430 Ci of tritium have been discharged to the SALDS. Movement of tritium is currently tracked by a network of wells, their locations in relation to the SALDS are shown in Figure 2-1.

Figure 2-1. Locations of Wells Relative to the 200 Area SALDS



3.0 SAMPLING REQUIREMENTS

All sampling activities shall be conducted in accordance with this SAP and the appropriate procedures and/or work package(s)/traveler(s). Changes to the specified sampling requirements must be made in accordance with the change control direction provided in Section 9.0.

3.1 SAMPLE COLLECTION

Wells in the monitoring network that are not dry as indicated in Table 3-1 will be sampled. See Section 6.0 for additional information in the event a well goes dry. Water level measurements shall be taken in each well in conjunction with every sampling event. All water level measurements shall be taken and recorded prior to purging and sampling of wells.

Prior to sample collection, each well will be purged with at least one well volume of groundwater. Following purging, a sample may be collected when field parameters (pH, conductivity, temperature, and turbidity) have stabilized. For wells 699-48-77C and 699-48-77D, after the field readings have stabilized, four readings of these parameters shall be taken at approximately one minute intervals to meet the reporting requirements in the permit. The water level and field measurements shall be recorded on a standardized data sheet.

Readings for dissolved oxygen (DO) will also be monitored for stability prior to sampling. Field measurements of DO will be made during each sampling event to ensure that the samples taken represent geochemical conditions of the aquifer. Prior to sampling, DO measurements will be taken in succession until readings stabilize.

Pumping rates for purging and sampling should be sufficiently low to keep turbidity to a minimum (below 10 nephelometric turbidity unit or NTU).

The sampling schedule and the number of samples to be taken are shown in Table 3-1. Certified precleaned sample bottles shall be used for sampling. Two samples are required for each well trip to minimize the impact of a random error or sample bottle breakage/spillage. Unique sample identification numbers shall be obtained from the Hanford Environmental Information System (HEIS) database prior to sampling.

Table 3-1. Sampling Requirements for SALDS Wells (2 sheets)

Well	Sampling Frequency	Month Sampled	Number of Samples per Event[1]	Sample Container	Comment
699-48-77A	None	N/A	N/A	N/A	Well is dry.
699-48-77C	Quarterly	Jan - Mar, Apr - Jun, Jul - Sep, Oct – Dec[3]	2 (primary and duplicate)	1-L glass or plastic	
699-48-77D	Quarterly	Jan - Mar, Apr - Jun, Jul - Sep, Oct – Dec[3]	2 (primary and duplicate)	1-L glass or plastic	

Table 3-1. Sampling Requirements for SALDS Wells (2 sheets)

Well	Sampling Frequency	Month Sampled	Number of Samples per Event[1]	Sample Container	Comment
299-W6-6	Annual	Jan[2]	2 (primary and duplicate)	1-L glass or plastic	
299-W6-7	None	N/A	N/A	N/A	Well is dry.
299-W6-8	None	N/A	N/A	N/A	Well is dry.
299-W6-11	Annual	Jan[2]	2 (primary and duplicate)	1-L glass or plastic	
299-W6-12	Annual	Jan[2]	2 (primary and duplicate)	1-L glass or plastic	
299-W7-1	None	N/A	N/A	N/A	Well is dry.
299-W7-3	Semiannual	Jan, May[2]	2 (primary and duplicate)	1-L glass or plastic	
299-W7-5	None	N/A	N/A	N/A	Well is dry.
299-W7-6	None	N/A	N/A	N/A	Well is dry.
299-W7-7	None	N/A	N/A	N/A	Well is dry.
299-W7-8	None	N/A	N/A	N/A	Well is dry.
299-W7-9	None	N/A	N/A	N/A	Well is dry.
299-W7-11	None	N/A	N/A	N/A	Well is dry.
299-W7-12	None	N/A	N/A	N/A	Well is dry.
299-W8-1	Annual	Jan[2]	2 (primary and duplicate)	1-L glass or plastic	
699-48-71	Annual	Jan[2]	2 (primary and duplicate)	1-L glass or plastic	
699-49-79	Annual	Jan[2]	2 (primary and duplicate)	1-L glass or plastic	
699-51-75	Semiannual	Jan, May[2]	2 (primary and duplicate)	1-L glass or plastic	
699-51-75P	Annual	Jan[2]	2 (primary and duplicate)	1-L glass or plastic	

Abbreviations: N/A = not applicable

Note: [1] Table II in 40CFR136, *Guidelines Establishing Test Procedures for the Analysis of Pollutants*, does not specify preservation or holding time for tritium.

[2] Sampling of these wells may be delayed up to one month for operational or maintenance purposes.

[3]Wells 699-48-77C and 699-48-77D must be sampled within their quarterly time period.

3.2 SAMPLE CUSTODY AND SHIPPING

The sampling team shall initiate a chain-of-custody form for each sample. The chain-of-custody form shall accompany each sample. The following sample custody information is required on the completed chain-of-custody form as a minimum:

- An identification number unique to each sample
- Name and signature of sampler
- Date and time at which the sample was obtained
- Name and signature of individual(s) involved in the chain of possession and date and time of possession (i.e., receipt and relinquishment)

In addition, the project name, the well identification number, and the requested analysis (tritium), shall be identified on the chain-of custody form.

A verbal notification by the CHPRC sampling crew is to be made to the 222-S Laboratory at 373-2435 at least 24 hours in advance of an expected shipment.

4.0 FIELD AND LABORATORY ANALYSIS REQUIREMENTS

In addition to the field analysis discussed in Section 3.1, the only analysis required on the SALDS well water sample is tritium, as shown in Table 4-1. Tritium analyses shall be performed on the groundwater samples and the associated QC samples (See Section 5.0).

Table 4-1. Analysis Requirements

Field Parameters			
Parameter[1]	**Analysis Technique**	**Reporting Unit**	**Report Requirement**
pH	Field instrument	(unitless)	See Section 8.0
Conductivity	Field instrument	µmhos/cm	See Section 8.0
Temperature	Field instrument	°C	See Section 8.0
Turbidity	Field instrument	NTU	See Section 8.0
Dissolved Oxygen	Field instrument	mg/L	See Section 8.0
Well Level	Field instrument	feet or meters	See Section 8.0
Laboratory Parameters			
Analyte	**Analysis Technique**	**Reporting Unit**	**Report Requirement**
^3H	Liquid Scintillation Counting (EPA Method 906.0[2] or lab-specific)	pCi/L	See Section 8.0

Abbreviations:
µmhos/cm = micromhos per centimeter (or microsiemens per centimeter),
°C = degrees Celsius,
NTU = nephelometric turbidity unit,
mg/L = milligram per Liter,
pCi/L = picocurie per Liter

Notes:
[1]Tritium, pH, and conductivity are specified in the ST 4500 discharge permit. Other parameters listed in this table are measured as part of standard or good sampling practice.
[2]EPA Method 906.0, "Tritium in Drinking Water," U. S. Environmental Protection Agency, Washington DC.

5.0 QUALITY ASSURANCE AND QUALITY CONTROL REQUIREMENTS

Applicable quality requirements for sampling and analysis are specified in Sections 5.1 and 5.2 respectively. Quality control acceptance criteria are provided in Section 5.3.

5.1 QUALITY REQUIREMENTS FOR SAMPLING

Typical field QC samples for a characterization project include full trip blank, field transfer blank, equipment blank, duplicate sample, and field split sample. Field transfer blanks are normally used to evaluate contamination due to volatile organic compounds which are not of interest in this case. Split samples are used for inter-laboratory comparison which is not needed. Therefore, field blanks and split samples are not required and the remaining field QC samples are shown in Table 5-1.

Table 5-1. Applicable Requirements for Field Quality Control Samples

Sample Type	Purpose of Sample	Frequency
Full Trip blank	To evaluate potential contamination from containers, preservatives, handling, storage, and transportation	1 in 20 well trips
Equipment blank (EB)	To evaluate potential contamination from nondedicated equipment	For portable Grundfos[1] pumps, EBs are collected 1 per 10 well trips. Whenever a new type of nondedicated equipment is used, an EB shall be collected every time sampling occurs until it can be shown that less frequent collection of equipment blanks is adequate to monitor the decontamination procedure for the nondedicated equipment. Vendor provided borehole equipment is considered dedicated equipment and EBs are not typically performed.
Field duplicate sample	To evaluate sampling precision	One per well trip

Note: [1]Grundfos Pumps Corporation, 2001 Butterfield Road, Suite 1700, Downers Grove, IL 60515.

5.2 QUALITY REQUIREMENTS FOR ANALYSIS

The performance of field analysis in support of the SAP is controlled through calibration of field instruments and monitored by continuing verification of calibration. These calibration activities shall meet the requirement of DOE/RL-96-68, *Hanford Analytical Services Quality Assurance Requirements Documents* (HASQARD) (Note: Revision 3 is the version of HASQARD specified in the Washington River Protection Solutions LLC [WRPS] contract).

Laboratories performing analyses in support of this SAP shall have approved and implemented QA plans. These QA plans shall meet HASQARD, minimum requirements as the baseline for laboratory quality systems. Additionally, the laboratories shall be registered or accredited with

the State of Washington under the provisions of Chapter 173-50 WAC, *Accreditation of Environmental Laboratories*.

Typical laboratory QC samples include method blank, analytical duplicate, matrix spike, surrogate, tracer, and laboratory control sample. Surrogates and tracers are not applicable to tritium analysis. The remaining requirements are shown in Table 5-2.

Table 5-2. Applicable Requirements for Laboratory Quality Control Samples

Sample Type	Purpose of Sample	Frequency
Method blank	To evaluate laboratory contamination	1 per batch
Analytical duplicate	To evaluate analytical precision	Per QA plan and/or analysis procedure
Matrix spike	To evaluate matrix effect on accuracy	Per QA plan and/or analysis procedure
Laboratory control sample	To evaluate accuracy	Per QA plan and/or analysis procedure

There are no action levels or enforcement limit for field or tritium concentrations in the groundwater from these wells. However, for comparing new data to previously collected data, the field and laboratory are required to meet the following sensitivities or minimum detection limits:

- pH: $\pm$ 0.1 units
- Conductivity: $\pm$ 10 µmhos/cm
- Temperature: $\pm$ 0.1 °C
- Turbidity: $\pm$ 0.1 NTU
- Dissolved oxygen: $\pm$ 0.1 mg/L
- Water level: $\pm$ 0.01 feet
- Tritium: $\leq$ 1000 pCi/L for samples from wells 699-48-77C and 699-48-77D and $\leq$ 30 pCi/L for samples from the remaining wells.

5.3 QUALITY CONTROL ACCEPTANCE CRITERIA

Quality control acceptance criteria for this sampling project are provided in Table 5-3.

Table 5-3. Applicable Quality Control Acceptance Criteria

Quality Sample	Acceptance Criteria	Corrective Action
Method blank	<MDA	Flag data with "B"
Laboratory control sample	70-130% recovery	Review and disposition data per laboratory QA plan
Analytical duplicate	≤ 20% RPD	Review and disposition data per laboratory QA plan
Matrix spike	60-140% recovery	Flag data with "N"
Equipment blank, trip blank	< 2X MDA	Flag data with "Q"
Field duplicate sample	≤ 20% RPD	Flag data with "Q"

Abbreviations:
MDA = minimum detectable activity (or concentration)
RPD = relative percent difference
B = possible contamination (analyte was detected in the associated method blank)
N = result may be biased (associated matrix spike result was outside the acceptable limits.
Q = problem with associated field QC sample (blank and/or duplicate results were out of limits.

6.0 EXCEPTIONS AND CLARIFICATIONS

As shown in Table 3-1, a number of wells have become dry over the years and it is possible that additional wells will go dry in the future. CH2M HILL Plateau Remediation Company maintains the groundwater wells and is responsible for determining whether a well has gone dry and documenting the status accordingly. Sampling of a well will cease when it becomes dry.

7.0 ORGANIZATION

The organization and responsibility of key personnel involved with this characterization effort are shown in Table 7-1.

Table 7-1. Project Key Personnel (2 sheets)

Responsibility	Individual
Responsible Characterization Engineer	D. M. Nguyen, 372-3042
222-S Laboratory WRPS Project Coordinator	S. G. McKinney, 372-1945

Table 7-1. Project Key Personnel (2 sheets)

Responsibility	Individual
222-S Laboratory POC (off hours)	222-S Laboratory Leader, 373-2435
Manager, Tank Waste Inventory and Characterization	H. L. Baune, 372-3393
ETF POC	M. W. Bowman, 373-9379
Sampling POC (CHPRC)	H. A. Medley, 373-6909
Manager, Analytical Project Management	J. M. Johnson, 372-9474

Abbreviations: ETF = Effluent Treatment Facility, WRPS = Washington River Protection Solutions LLC, POC = point of contact, CHPRC = CH2M Hill Plateau Remediation Company.

8.0 DELIVERABLES

CHPRC will transmit copies of field readings and field-completed chain-of-custody forms to Mark_W_Bowman@rl.gov and Duc_M_Nguyen@rl.gov. Copies may be scanned and transmitted as Adobe Acrobat® pdf files.

Tritium analysis on the SALDS well samples will likely be performed by an offsite laboratory (e.g., GEL or TestAmerica). Requirements for deliverables are specified in the contract statement-of-work and are summarized below.

The offsite laboratory will notify the 222-S Laboratory WRPS Laboratory Project Coordinator immediately if there are any significant nonconformances with sampling or analytical protocol. The Project Coordinator will consult the Responsible Characterization Engineer and the ETF Point of Contact to determine a resolution.

A 30 calendar day turnaround is requested for all analyses via a data summary report. The laboratory will provide a summary data report provided in electronic format unless available only as a hard copy when the sample analysis is complete.

The report shall include, at the minimum:

- Laboratory name and address
- Sample information (including sample identification numbers and matrix, sample collection date and time, date of sample receipt, date of sample preparation and analysis)
- Sample analytical results with an appropriate number of significant figures
- Analytical methods used
- Minimum detectable activity or concentration (including dilutions, interferences or correction factors) and confidence limits, as appropriate

- QC results (including associated blanks, matrix spikes and duplicates)
- Standard U.S. Environmental Protection Agency (EPA) Data Qualifiers as specified in the laboratory QA plan for all analytical results.
- Any data that does not meet the QA/QC requirements of the laboratory's approved QA plan shall be clearly flagged and a notation shall be attached to the report explaining this deviation.

In addition, an electronic final deliverable in Adobe Acrobat® pdf format will be transmitted to Steve_G_McKinney@rl.gov, Mark_W_Bowman@rl.gov, Duc_M_Nguyen@rl.gov and Jo_M_Johnson@rl.gov. A file that allows analytical results to be uploaded into HEIS will also be provided.

The Responsible Characterization Engineer will distribute the summary data report to the personnel identified in Table 8-1 that are not already in receipt of the report from the laboratory.

Table 8-1. Laboratory Analytical Report Distribution

Recipient	Report Type (see note)
C. P. Allen	E
M. W. Bowman	E
D. L. Halgren	E
B. M. Mauss	E
S. N. Luke	E
D. M. Nguyen	E
H. L. Baune	E
J. A. Voogd	E

Note:
E = Electronic

9.0 CHANGE CONTROL

Changes to the requirements in this SAP shall be documented in a revision to the SAP via a Document Release and Change Form (DRCF) or temporarily on a Characterization Change Notice (CCN). The CCNs will be added to a revision of the SAP following completion of the sampling and analysis. The Responsible Characterization Engineer has the responsibility of exercising technical judgment in modifying the described work and in justifying the level of documentation required when changes to the described work in the SAP are made.

If a change to this SAP is needed during sample collection, sampling may proceed after the change is approved verbally by the Responsible Characterization Engineer and documented by the sampling crew in the sampling logbook, work package, or data sheet. Subsequently, the Responsible Characterization Engineer shall document the change to the SAP via a DCRF or CCN as described above.

10.0 REFERENCES

173-50 WAC, *Accreditation of Environmental Laboratories*, Washington State Administrative Codes, Olympia, Washington.

40CFR136, *Guidelines Establishing Test Procedures for the Analysis of Pollutants*, Codes of Federal Regulations, U. S. Environmental Protection Agency, Washington D. C.

DOE/RL-96-68, 2007, *Hanford Analytical Services Quality Assurance Requirements Documents*, Rev. 3, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

EPA Method 906.0, "Tritium in Drinking Water," U. S. Environmental Protection Agency, Washington DC.

PNNL-13121, 2000, *Groundwater Monitoring and Tritium-Tracking Plan for the 200 Area State-Approved Land Disposal Site*, Pacific Northwest National Laboratory, Richland, Washington.

RPP-ENV-59215, 2016, *Groundwater Monitoring and Tritium-Tracking Plan for the 200 Area State-Approved Land Disposal Site*, Rev. 0, Washington River Protection Solutions LLC, Richland, Washington.

ST 4500, 2014, *State-Waste Discharge Permit Number ST0004500*, State of Washington Department of Ecology, Olympia, Washington.

APPENDIX A

CHARACTERIZATION CHANGE NOTICES

[Reserved for CCNs that will be added to this SAP in a future revision]