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CHPRC-1605278

Meeting Minutes Transmittal/Approval
Project Managers' Meeting
200 Area Groundwater and Source Operable Units
November 17, 2016

APPROVAL: _____ **DATE:** 11/17/2016
Michael Cline, 200 Area Unit Manager, DOE/RL

APPROVAL: _____ for **DATE:** 11/17/2016
Al Farabee, 200 Area Project Manager, DOE/RL

APPROVAL: Craig Cameron for **DATE:** 11/17/2016
Emerald Laija, 200 Area Project Manager, EPA

APPROVAL: Nina M. Menard **DATE:** 11/17/2016
Nina Menard, 200 Area Project Manager, Ecology

HFFACO Action Plan Section 4.1 requires signature of agreements and commitments made during the Project Manager Meeting. Approval of these minutes documents approval of agreements and commitments documented in Attachment 4 and 5 to these minutes. Approval does not apply to any other attachments, which are included in these minutes for informational purposes.

RECEIVED
DEC 12 2016
EDMC

200 AREA PROJECT MANAGERS MEETING

November 17, 2016

AGENDA

- Operational Status and Milestones by OU
  - Deep Vadose Zone
  - 200-EA-1 and 200-IS-1
  - 200-SW-2
  - 200-SW-1
  - 200-BC-1 and 200-WA-1
  - 200-CW-1, 200-CW-3, 200-OA-1
  - 200-BP-5 and 200-PO-1
  - M-015 Milestone Series
  - 200-PW-1/3/6 and 200-CW-5
  - 200-UP-1
  - 200-ZP-1
  - 200 Area Groundwater
  - M-016 Milestone Series
  - M-024 Milestone Series
  - 200 Area RCRA TSD Closures
  - Canyon Facilities

- Approved TPA Change Notices
- Documents for the Administrative Record
- Action Items
- Next Meeting TBD *(January 17, 2017) Need to confirm CY 2017 schedule and location*

Minutes of the 200 Area Project Managers Meeting of November 17, 2016 are attached. Minutes are comprised of the following:

Attachment 1	**Attendance Record**
Attachment 2	**Agreements and Issues List**
Attachment 3	**Action Item List**
Attachment 4	**Operable Units and Facilities Status**
Attachment 5	**Documents for Submittal to the Administrative Record**
Attachment 6	**Groundwater Monitoring Status**
Attachment 7	**TPA-CN-0748**

CHPRC-1605278
Attachment 1

200 Area Project Managers' Status Meeting
November 17, 2016

PRINTED NAME	ORGANIZATION	O.U. ROLE	TELEPHONE
Abenth, Keelan			
Amrhein, Kate	DOE		376-9391
Axtell, Joe			
Balone, Steve			
Beers, Dan	WDOH	regulator	943-6509
Borghese, Jane	PRC-EP	TPA	373-3804
Braswell, Sharon			
Cameron, Craig	EPA	Man.	376-8665
Cimon, Shelley	ODOE		(541) 240-0161
Clements, Lorin			
Cline, Mike	DOE	PM	376-6070
Day, Roberta	CHPRC	EA1, SW2, 151	539.0232
Doornbos, Marty	CHPRC	Support	438-5516
Eberlein, Ellis	Ecology	SW-2	372-7906
Farabee, Al			
Ganwich, Debi			
Goswami, Dib	Ecology	OU-M	372-7902
Hansen, Jim			
Hanson, Gretchen	CHPRC		539.9046
Hanson, Jim			

CHPRC-1605278
Attachment 1

200 Area Project Managers' Status Meeting
November 17, 2016

PRINTED NAME	ORGANIZATION	O.U. ROLE	TELEPHONE
Hildebrand, Doug	DOE-RL		373-9626
Kamal, Mostafa	DOE-RL	closure Plan	376-0289
Laija, Emerald	EPA		376-4919
Lobos, Rob			
Long, Bob			
Menard, Nina	Ecology	PM	372-7941
Mullin, Tim			
Sands, John	RL	WA-1	372-2282
~~Schleif, Stephanie~~ Temple, John	Ecology	M-85	372-7440
~~Singleton, Deborah~~ Luttrell, Stuart	ECY	RCRA	372-7883
Vannah, Benjamin	DOE	OA/EA-1	376-9623
Varljen, Robin			
Welsch, Kim	ECY	CENTRAL PLATEAU OUs	372-7882
Woolery, Wade	DOE RL		372-2829
Shults, Jenne	CHPRC	RL-40	376-7510

200 Area Project Managers' Meeting
Agreements and Issues List
November 17, 2016

Agreement: None

Issue: None

Announcements: None

Delegations for November 17, 2016 PMM Meeting:

EPA

DOE

200 Area Project Managers' Meeting
November 17, 2016

OPEN ACTION ITEM TRACKING

Action #	Action/Subject	Assigned To	Owed To	Assigned Date	Original Due Date	Adjusted Due Date	Status
179	Respond to Ecology justification to add 207A SRB to Appendix C	Ben Vannah/Mostafa Kamal	Ecology	7/21/2016	8/31/2016	10/31/2016	Closed
180	DOE to status PW-1/3/6 progress in 6 months	Al Farabee	EPA	9/15/2016	Mar-17		
181	Send out template for the workbook for the CERCLA process	Marty Doornbos	EPA/Ecology	11/17/2016	11/22/2016		Closed 11-21-16
182	Review the 207A site data to determine the most appropriate path to resolve Rad contamination	Nina Menard/Mostafa K	DOE/EPA/Ecology	11/17/2016	12/31/2016		

200 AREA PROJECT MANAGERS' MEETING

Milestones and Operation September-October 2016 Status by OU
November 17, 2016

Deep Vadose Zone 200-DV-1 Ecology Lead (RL –Jim Hanson, CHPRC – Mark Byrnes)

- Issued the Rev. 0 RI/FS work plan.
- All 22 characterization boreholes drilled in FY16 have been decommissioned, with 15 of these boreholes decommissioned during this reporting period.
- Completed the Statement of Work for drilling the last four deep vadose zone boreholes. An RFP will be issued in the near future with drilling anticipated to begin in January 2017.
- Revising the Sampling and Analysis Plan for 200-DV-1 OU (DOE/RL-2011-104 Rev. 0) to include the sampling methods and analysis for monitored natural attenuation, which is anticipated to be delivered to RL for review mid-November 2016.
- PNNL commenced sample analysis activities to evaluate monitored natural attenuation processes on August 3, 2016.
- Completed the final perched water test [Hydraulic Test 3 monitoring recovery period (no pumping cycle for 60 days)] on September 18, 2016.
- The hookup of the three perched water wells to the 200 West P&T transfer line is progressing. The Construction Acceptance Test (CAT) was completed on October 21, 2016, and the Operations Acceptance Test (OAT) began on November 7, 2016, and is expected to complete by the end of November 2016.

Regulatory Agency Comments: N/A

200-IS-1 Ecology Lead (RL- Doug Hildebrand, CHPRC – Bert Day)

- Provided Ecology with both electronic and paper copy of the 200-IS-1 OU Scoping Package (Rev. 1 SGW-59881) on August 11, 2016.
- Coordinated with Ecology on August 17, 2016, to initiate definition of the specific dispute areas using the issue resolution process being drafted via the process improvement initiative.
- Signed the dispute extension agreement on October 24, 2016, for change control form M-15-13-02 for an end date of March 16, 2017.

M-015-112: Submit Draft B, 200-IS-1 OU Pipeline System Waste Sites RFI/CMS/RI/FS WP to Ecology, including a schedule of completion dates for major tasks and deliverables, 2/28/2014.

- Status: Dispute resolution. The parties are currently working on identifying the Work Plan scope (i.e., change package C-13-01), TSD identification, and associated revised delivery schedule. The dispute resolution is currently extended to March 16, 2017. On 10/20/16 DOE provided to Ecology for their review updated Change Package C-13-01 and four other change packages, better aligning waste sites within the 200-IS-1 OU and several other OUs.

Regulatory Agency Comments: N/A

200-EA-1 Ecology Lead (RL- Doug Hildebrand, CHPRC – Bert Day)

- Continued scoping efforts for preparation of the RFI/CMS & RI/FS work plan.
- Initiated workbook preparation and storyboard.

M-015-92A: Submit a RFI/CMS & RI/FS work plan for the 200-EA-1 OU (200 East Inner Area) to Ecology, 9/30/17

- Status: On Schedule.

Regulatory Agency Comments: N/A

200-SW-2 Ecology Lead (RL- Doug Hildebrand, CHPRC – Bert Day)

- Issued the RFI/CMS & RI/FS Work Plan.
- Continued preparation of the Draft Field Summary Report for the Central Plateau Aerial Radiological Survey.

Regulatory Agency Comments: N/A

200-SW-1 Ecology Lead (RL- Doug Hildebrand)

- No work planned for FY2017.

Regulatory Agency Comments: N/A

200-BC-1 and 200-WA-1 EPA Lead (RL- John Sands, CHPRC – Patrick Baynes)

- A comment resolution meeting for the 200-BC-1 and 200-WA-1 RI/FS Work Plan was held with EPA on November 2, 2016. EPA accepted the proposed resolution for all comments. There remains a question about the schedule that will be included in the Work Plan. RL and EPA to resolve.

Regulatory Agency Comments: DOE and EPA held a management level meeting regarding the description of the cumulative risk evaluation that would be contained in the document. Agreement was reached and the text has been modified accordingly. EPA expectation is that the schedule in the RI/FS workplan will meet the current milestones.

200-BP-5 and 200-PO-1 Ecology Lead (RL – James Hanson, CHPRC – Curt Wittreich)

- Issued the Rev 0, Aquifer Treatability Test Report for the 200-BP-5 Groundwater Operable Unit, DOE/RL-2015-75.
- Continued groundwater extraction at the B Complex continued under the treatability test to further assess contaminant removal.
- Completed the Draft A, Action Memorandum for 200-BP-5 Operable Unit Groundwater Extraction, DOE/RL-2016-41. The document was transmitted to Ecology and EPA on October 13, 2016, for review.
- Transmitted the Draft A 200-BP-5 RI Report and Draft A 200-PO-1 RI Report Addendum to Ecology on August 11, 2015, for review. This review has been held up due to Ecology's concerns over the groundwater model proposed in the RI reports. This issue has been elevated to senior management to resolve.
- Provided draft comment dispositions on the Draft A 200-BP-5 Groundwater Sampling and Analysis Plan to Ecology on October 5, 2016. An Ecology comment resolution meeting was conducted November 2, 2016. Follow up meeting has been scheduled for the first week of December, 2016.
- DOE is drafting a TPA Change Control Form to extend M-015-21A (Submit a 200-BP-5 and 200-PO-1 OU Feasibility Study Report and Proposed Plan(s) to Ecology by 6/30/2018) to accommodate an extended Ecology review period on the supporting Draft A RI reports due to issues with modeling.

Regulatory Agency Comments: N/A

200-PW-1/3/6 and CW-5 EPA Lead (RL- Robert Long, CHPRC – Patrick Baynes)

- Nothing new to report.

Regulatory Agency Comments: action: DOE to status in 6 months

200-UP-1 EPA Lead (RL – Kate Amrhein, CHPRC – Curtis Wittreich, PNNL-D. Wellman [I-129])

- Completed three (699-30-57, 699-29-66, and 699-31-68) and initiated a fourth southeast chromium plume characterization wells.
- DOE is revising the drilling SAP for the additional chrome characterization wells. Expected in early December, 2016 to EPA.

M-016-193: Complete the remedial design investigation of the SE chromium plume, including the installation of new wells and evaluation of the GW monitoring data and install monitoring wells needed for remedy performance monitoring as defined in the UP-1 RD/RA WP, 9/30/2017.

- Status: At risk. Groundwater analytical data from the first three completed southeast chromium investigation wells indicate reducing conditions caused during drilling are impacting groundwater chemistry (lowered chromium concentrations). Groundwater conditions are expected to recover within a year of drilling. Supplemental groundwater samples were collected and analyzed at existing wells. The groundwater data collected to date (from first 3 characterization wells and existing wells) indicate that the chromium plume extends further to the south and east than previously mapped and will require additional characterization wells to define the plume boundary. This additional effort will impact completion of TPA Milestone M-016-193 to complete the remedial design investigation of the SE chromium plume by September 30, 2017. A one year extension is expected to be needed to accommodate the additional effort.
- The rationale for extending M-016-193 to September 30, 2018, was initially discussed with EPA on June 15, 2016.

Regulatory Agency Comments: N/A

200-ZP-1 EPA Lead (RL – James Hanson, CHPRC – Mark Byrnes)

- Preparing a TPA-CN for the "*Sampling and Analysis Plan for Eight Remediation Wells in the 200-ZP-1 OU*", (DOE/RL-2010-72, Rev. 2), to add 4 new injection wells (identifying one alternate well) in support of maximizing flow through the 200 West P&T facility.

Regulatory Agency Comments: N/A

200 Area Groundwater/200 West P&T Facility

- Treated 841.4M gallons of water in FY16, which included the removal of:
  - 80,422 kgs of nitrate
  - 1,897 kgs of carbon tetrachloride
  - 69.5 kgs of chromium
  - 36.5 kgs of uranium
  - 2.9 Ci of Tc-99

M-024 Well Installation Ecology Lead (RL-Ben Vannah, CHPRC-Dave Capelle)

- Nothing new to report.

M-024-68-T01: Conclude discussions of well commitments initiated under M-024-58.

- Status: On Schedule. Due 8/1/2017.

M-024-68: Complete Construction of all wells listed for CY2017 and before identified in TPA Change Package M-024-14-01.

- Status: On Schedule. Due 12/31/2017.

Regulatory Agency Comments: N/A

200 Area RCRA TSD Closures Ecology Lead (RL – Mostafa Kamal, CHPRC – Bert Day)

- 216-A-29 Ditch
  - Initiated planning and preparation activities to update/revise closure plan.
- 216-S-10 Pond and Ditch
  - Initiated planning and preparation activities to update/revise closure plan.

Regulatory Agency Comments: N/A

U Plant Canyon EPA Lead (RL – Wade Woolery, CHPRC – TBD)

- Nothing to report.

Regulatory Agency Comments: N/A

Canyon Facilities EPA/Ecology Lead (RL – Ray Corey, CHPRC –Jennie Stults)

- EECA for REDOX public comment scheduled for December, 2016

M-085-80A: Submit a DQO report to assess the structural integrity of the PUREX storage tunnels 1 and 2, 9/30/2017

- Status: On Schedule.

Regulatory Agency Comments: N/A

Waste Site Removal Ecology Lead (RL- Al Farabee, CHPRC – Darren Corriel)

- Nothing to report.

M-016-250: Submit to Ecology for approval a three year rolling prioritized schedule consistent with site-wide clean-up priorities to implement waste site removal actions per Action Memoranda (DOE/RL-2009-37, DOE/RL-2009-48 and DOE/RL-2009-86), 3/31/2016 and annually thereafter.

- Status: On Schedule.

Regulatory Agency Comments: N/A

Monthly Performance Report Assessment

The DOE project manager agrees with the contractor's (CHPRC) monthly site performance report.

Central Plateau Milestones due post 9/30/2017

MSR	Title	Due Date
M-015-00	Complete RI/FS for non-tank and non-canyon OUs	6/30/2026
M-015-21A	Submit BP-5/PO-1 FS/PP	6/30/2018
M-015-93C	Initiate characterization field work for the 200-SW-2 OU	9/30/2018
M-015-91B	Submit FS/PP for 200-BC-1/200-WA-1 OUs	7/31/2021
M-015-92B	Submit RFI/CMS, RI/FS, and Proposed CA Decision proposed plan for 200-EA-1	11/30/2022
M-015-93B	Submit RFI/CMS & RI/FS Study Report and proposed CAD/PP for 200-SW-2 OU	1/31/2023
M-015-92C	Submit RFI/CMS & RI/FS Study report and proposed CAD/PP for the 200-IS-1 OU to Ecology	3/31/2023
M-015-38B	Submit FS/PP for 200-CW-1, 200-CW-3 and 200-OA-1 OUs	7/31/2023
M-015-110B	Submit CMS & FS and Proposed CAD/PP for 200-DV-1 OU	9/30/2023
M-024-68	Comp Const of All Wells Listed for CY17 and Before Identified in Att 1 of TPA Chg Pkg M-024-14-01	12/31/2017
M-024-58K	Initiate Discussions of Well Commitments	6/1/2018
M-024-69-T01	Conclude discussions of well commitments initiated under M-024-58	8/1/2018
M-024-69	Complete construction of all wells listed for CY18 and before as listed in M-24-15-01	12/31/2018
M-016-00	Complete remedial actions for non-tank and non-canyon OUs	9/30/2042
M-016-86	Complete remedial actions for 618-11 Burial Ground	9/30/2021
M-016-200A	Complete U Plant canyon demolition	9/30/2024
M-016-200B	Complete U Plant barrier construction	9/30/2027
M-085-82	Submit proposals for expedited response actions for one or more of the Tier 1 or Tier 2 facilities in the PUREX geographic area	12/31/2017
M-085-74	Submit proposals for expedited response actions for one or more of the Tier 1 and Tier 2 facilities in the B Plant geographic area	6/30/2018
M-085-70	Submit RI/FS Work Plan for 200-CB-1	9/30/2019
M-085-72	Submit RAWP to implement the approved Action Memorandum for 224-B	9/30/2020
M-085-80	Submit RI/FS Work Plan for 200-CP-1	9/30/2020
M-085-100	Submit a RAWP to implement the approved Action Memorandum for 224-T	9/30/2020
M-085-90	Submit RI/FS Work Plan for 200-CR-1	9/30/2021

PASP	Title	Trial Date
M-085-76	Initiate response actions for the B Plant geographic area	9/30/2025
M-085-84	Initiate response actions for the PUREX geographic work	9/30/2025
M-085-01	Submit change package to establish a date for major milestone M-085-00	6/30/2026
M-037-10	Complete Unit-Specific closure requirements for six TSD units	9/30/2020
M-037-13	Complete unit-specific closure requirements for 241-CX Tank System	9/30/2022
M-037-11	Complete unit-specific closure requirements for 216-B-3 Main Pond System and 216-S-10 Pond and Ditch	9/30/2024

Documents for the Administrative Record

OU/TSD	Number (Published Year)	Title	Referencing Document
200 Area OUs	ECF-200ZP1-16-0076, 2016	Description of Groundwater Calculations and Assessments for the Calendar Year 2015 (CY2015) 200 Areas Pump and Treat Report	GW Annual Report
200-EA-1	SGW-35574, Rev. 0, 2009	Borehole Summary Report for 200-MW-I Operable Unit Boreholes C5515, C5570, and C5571 Drilled in the 216-A-2 and 216-A-21 Cribs	200-EA-1 waste site work plan
200-SW-2	DOE/RL-2014-43, R0, 2014	Mixed Waste Disposed of in the Low-level Burial Grounds	DOE/RL-2014-43 R2
200-SW-2	DOE/RL-2014-43, R1, 2015	Mixed Waste Disposed of in the Low-level Burial Grounds	DOE/RL-2014-43 R2
200-BP-5	DOE/RL-2016-41, DA, 2016	Action Memorandum for the 200-BP-5 Operable Unit Groundwater Extraction	cleared Sept 2016
LLBG WMA 3 and 4	15-AMRP-0362, 2015	REISSUE, October 7, 2015, DOE-RL transmitted "CONTRACT NUMBER DE-AC06-08RL14788 – REISSUE- INTERIM STATUS GROUNDWATER MONITORING PLAN FOR THE 216-B-63 TRENCH, DOE/RL-2008-60, REVISION 1, INTERIM STATUS GROUNDWATER MONITORING PLAN FOR THE LLBG WMA-3, DOE/RL-2009-68, REVISION 2, AND INTERIM STATUS GROUNDWATER MONITORING PLAN FOR THE LLBG WMA-4, DOE/RL-2009-69, REVISION 2", to CHPRC	FY2016 SAP Configuration Status Report Tech Memo
NRDWL	DOE/RL-2015-32, R0, 2016	RCRA Interim Status Groundwater Monitoring Plan for the Nonradioactive Dangerous Waste Landfill	FY2016 SAP Configuration Status Report Tech Memo
200-BP-5	DOE/RL-2015-75, R0, 2016	Aquifer Treatability Test Report for the 200-BP-5 Groundwater Operable Units	Cleared September 2016
200-UP-1	DOE/RL-2014-27, R0	Sampling and Analysis Plan for Remediation Wells in the 200-UP-1 Operable Unit	Cleared July 2014
LERF	SGW-52467, R0, 2012	Integrated Surface Geophysical Investigation Results at Liquid Effluent Retention Facility, 200 East Area, Hanford, Washington	LERF Determination Report, DOE/RL-2016-71 Rev. 0
LERF	HNF-23142, 2004	Engineering Study for the 200 Area Effluent Treatment Facility Secondary Waste 39 Treatment of Projected Future Waste Feeds, Rev. 0	DOE/RL-2013-46 Rev 1

Project Managers Meeting – November 2016 (September and October Data)

Hanford's overall Site groundwater monitoring program managed by CHPRC (River Corridor and Central Plateau) coordinates collection of groundwater samples from wells and aquifer tubes, as well as surface water samples from springs. Sample trips are scheduled by target month and prioritized based on project needs. Target sample dates (months) are chosen to minimize the number of sample trips by temporally aligning requests from multiple activities for a single location into a single trip where practical.

FY 2016 Sample Trip Status by Month Scheduled (September 2016)

For Fiscal Year 2016 Hanford's overall Site groundwater monitoring program has 2,833 sample trips scheduled for collection. During August 2016 (FY 2016, month eleven) the program successfully completed 51 sample trips scheduled for September 2016 ahead of schedule. During September 2016 (FY 2016, month twelve) the program successfully completed 188 sample trips scheduled for September 2016. During October 2016 (FY 2017, month one) the program successfully completed 5 sample trips scheduled for September 2016. This brings the total of September 2016 sample trips completed to 244 of 261 scheduled. In October 2016 an additional 9 Fiscal Year 2016 sample trips scheduled prior to September 2016 were completed bringing the total of Fiscal Year 2016 sample trips completed to 2,798.

FY 2017 Sample Trip Status by Month Scheduled (October 2016)

For Fiscal Year 2017 Hanford's overall Site groundwater monitoring program has 2,630 sample trips scheduled for collection. During September 2016 (FY 2016, month twelve) the program successfully completed 80 sample trips scheduled for October 2016 ahead of schedule. During October 2016 (FY 2017, month one) the program successfully completed 216 sample trips scheduled for October 2016. This brings the total of October 2016 sample trips completed to 296 of 350 scheduled. In October 2016 an additional 55 Fiscal Year 2017 sample trips scheduled for November 2016 and December 2016 were completed. Additionally one sample trip scheduled for November 2016 was marked as completed in February 2016 (data issue) bringing the total of Fiscal Year 2017 sample trips completed to 352.

FY 2016 Sample Trip Status by Month Collected (October 2016)

During October 2016, 14 Fiscal Year 2016 sample trips were successfully completed of which 2 were scheduled for April 2016, 1 was scheduled for May 2016, 1 was scheduled for June, 3 were scheduled for July, 2 were scheduled for August, and 5 were scheduled for September.

FY 2017 Sample Trip Status by Month Collected (October 2016)

During October 2016, 271 Fiscal Year 2017 sample trips were successfully completed of which 216 were scheduled for October 2016, 45 were scheduled for November 2016, and 10 were scheduled for December.

The specific wells, aquifer tubes, and springs sampled in the central plateau during September 2016 are listed in Table 1. The specific wells, aquifer tubes, and springs sampled in the central plateau during October 2016 are listed in Table 2.

Awaiting Sample Trips

Of the Fiscal Year 2016 and 2017 sample trips scheduled for October 2016 and prior, there are 70 that are awaiting collection. Of these, 1 has access restrictions, 6 require maintenance, 7 are being reviewed for cancelation, 1 has an adjusted schedule, 3 are associated with a special study and have an adjusted schedule, 2 are to be decommissioned, 6 were unsuccessful, and 44 are awaiting collection at the month end.

Table 3 presents the sample trips for only the central plateau that were not successfully completed as of October. Sample trips in Table 2 are grouped by fiscal month scheduled and groundwater interest area. This table clearly shows that the number of awaiting well trips decreases with time from the schedule date. Reasons for sample trips to be awaiting include but are not limited to issues such as well maintenance, weather conditions, access restrictions, and resource limitations.

Upcoming Sample Trips

Sample trips for the central plateau only, scheduled for collection in November 2016 and December 2016 (and not collected before the target sample month) are listed in Table 4 and Table 5 respectively.

WMA C Tank Farm

WMA C Tank Farm samples for the third quarter of FY-2016 were collected on September 16, 19, 20, and 21. Well 299-E27-4 is scheduled to be decommissioned as was not sampled. WMA C Tank Farm samples for the first quarter of FY-2017 are scheduled to be collected in December. WMA C Tank Farm monitoring wells are listed in Table 6.

Data Access

The sampling results are available in HEIS and can be accessed from the Environmental Dashboard Application which can be accessed from the HLAN at https://ehs.chprc.rl.gov/eda/ or from the internet at https://ehs.hanford.gov/eda/.

Table 1 Central Plateau Wells, Aquifer Tubes, and Springs Successfully Sampled In September 2016

200-BP	200-PO	200-UP	200-ZP
14-D	299-E24-20	299-W22-115	299-W10-14
299-E26-15	299-E24-22	299-W22-116	299-W10-29
299-E27-12	299-E24-33	299-W22-47	299-W10-30
299-E27-13	299-E25-2	299-W22-93	299-W10-31
299-E27-14	299-E25-237	299-W23-19	299-W9-2
299-E27-15	299-E25-25	699-32-70B	
299-E27-155	299-E25-39	699-35-66A	
299-E27-21	299-E25-40	699-36-66B	
299-E27-22	299-E25-41	699-36-70A	
299-E27-23	299-E25-93	699-37-66	
299-E27-24	299-E25-94		
299-E27-25	699-25-55		
299-E27-26	699-33-56		
299-E27-7	699-34-51		
299-E33-15	699-S24-19P		
299-E33-338	82-M		
299-E33-361	82-S		
299-E33-48	84-D		
C6236	84-M		
C6236	84-S		
C6236	85-D		

200-BP	200-PO	200-UP	200-ZP
C6237	85-M		
C6237	85-S		
C6237	86-D		
C6238	86-M		
C6238	C6353		
C6238	C6356		
	C6383		

Table 2 Central Plateau Wells, Aquifer Tubes, and Springs Successfully Sampled In October 2016

200-BP	200-PO	200-UP	200-ZP
299-E24-25	299-E24-16	299-W18-21	299-W17-1
299-E27-10	299-E24-17	299-W18-260	699-48-77C
299-E27-11	299-E25-2	299-W19-12	699-48-77D
299-E27-16	299-E25-26	299-W19-41	699-49-100C
299-E27-17	299-E25-26	299-W19-42	
299-E27-17	299-E25-28	299-W22-79	
299-E27-18	299-E25-28	699-19-88	
299-E27-19	299-E25-32P	699-25-70	
299-E27-8	299-E25-34		
299-E27-9	299-E25-34		
299-E28-4	299-E25-35		
299-E33-1A	299-E25-35		
299-E33-3	299-E25-43		
299-E33-33	299-E25-43		
299-E33-37	299-E25-48		
299-E34-10	299-E26-12		
299-E34-12	299-E26-12		
299-E34-2	299-E26-13		
299-E34-8	299-E26-13		
299-E34-9	699-22-35		
699-53-55C	699-23-34B		
699-65-72	699-24-33		
699-70-68	699-24-34D		
699-72-73	699-24-34E		
	699-24-35		
	699-24-36		
	699-25-33A		
	699-25-34B		
	699-25-34D		

200-BP	200-PO	200-UP	200-ZP
	699-25-34E		
	699-25-34F		
	699-26-33A		
	699-26-34A		
	699-26-34B		
	699-26-35A		
	699-26-35C		
	699-26-38		
	699-2-6A		
	699-2-7		
	699-28-40P		
	699-28-52A		
	699-31-53B		
	699-32-22A		
	699-43-45		
	699-43-45		
	C6359		
	C6362		

Table 3 Fiscal Year 2016 and 2017 Central Plateau Sample Trips awaiting at end of October 2016

Qtr Sched	GWIA	SAMP SITE_TYPE	SITE_NAME	SCHEDULE DATE	Frequency	Months Remain	Status	Comment
FY 2016 Q2	200-BP	WELL	299-E33-12	3/1/2016	Annual	4		Maintenance Required, Unsuccessful 3-4-2016
	200-PO	WELL	699-34-42	1/1/2016	1 Time Every 3 Years	26		Unsuccessful 1-25-2016
	200-UP	WELL	299-W18-15	2/1/2016	Annual	3		Maintenance Required
FY 2016 Q3	200-BP	WELL	299-E27-26	6/1/2016	Quarterly	0	Late	Review for Cancelation; Sampled 9-20-2016
		WELL	299-E27-4	6/1/2016	Quarterly	0	Late	To be Decommissioned
		WELL	299-E28-32	6/1/2016	Annual	7		
		WELL	299-E33-205	4/1/2016	2 Times Annually	0	Late	Access Restricted
		WELL	699-50-59	4/1/2016	Annual	5		Maintenance Required, Unsuccessful 4/25/2016
	200-PO	WELL	299-E13-16	4/1/2016	Annual	5		
		WELL	299-E13-7	4/1/2016	Annual	5		
		WELL	299-E25-18	4/1/2016	Annual	5		Maintenance Required, Unsuccessful 4-1-2016
FY 2016 Q4	200-BP	WELL	299-E27-4	9/1/2016	Quarterly	1		To be Decommissioned
		WELL	299-E28-15	7/1/2016	Annual	8		Unsuccessful 7-20-2016
		WELL	299-E33-10	8/1/2016	Annual	9		
		WELL	299-E33-21	8/1/2016	Annual	9		Unsuccessful 8-5-2016
		WELL	299-E33-344	8/1/2016	2 Times Annually	3		
		WELL	299-E33-350	8/1/2016	Annual	9		

Qtr Sched	GWIA	SAMP SITE_TYPE	SITE_NAME	SCHEDULE DATE	Frequency	Months Remain	Status	Comment
		WELL	299-E33-351	8/1/2016	Annual	9		
	200-UP	WELL	299-W19-115	8/1/2016	Quarterly	0	Late	Review for Cancelation
		WELL	299-W19-116	8/1/2016	Annual	7		Review for Cancelation
		WELL	299-W19-116	9/1/2016	Quarterly	0	Late	Review for Cancelation
		WELL	299-W19-4	8/1/2016	Annual	9		Unsuccessful 8-2-2016
		WELL	699-17-70	7/1/2016	Annual	8		
FY 2017 Q1	200-BP	WELL	299-E28-5	10/1/2016	2 Times Annually	7		Unsuccessful 10-7-2016
		WELL	299-E33-205	10/1/2016	2 Times Annually	5		
	200-PO	WELL	299-E25-32P	10/25/2016	Other	1		
		WELL	499-S0-7	10/1/2016	Annual	11		
		WELL	499-S0-8	10/1/2016	Annual	11		
		WELL	499-S1-8J	10/1/2016	Annual	11		
		AQUIFER TUBE	C6384	10/1/2016	Annual	11		Unsuccessful 9-27-2016
	200-UP	WELL	699-19-88	10/1/2016	Quarterly	2		
	200-ZP	WELL	699-49-100C	10/1/2016	Quarterly	2		

Table 4 Central Plateau Groundwater Sampling Locations Scheduled to be sampled in November 2016

200-BP	200-PO	200-UP	200-ZP
199-K-183		299-W13-2	299-W10-26
199-K-183		299-W19-115	299-W10-27
199-K-31		299-W19-116	299-W10-28
199-K-31		699-30-66	299-W11-40
299-E33-335			299-W11-41
299-E33-337			299-W14-11
299-E33-339			299-W14-13
299-E33-49			299-W14-14
C6236			299-W14-15
C6237			299-W14-16
C6238			299-W14-17
			299-W14-18
			299-W14-19
			299-W14-21
			299-W15-44
			299-W15-763
			299-W15-765
			299-W18-7
			299-W5-2

Table 5 Central Plateau Groundwater Sampling Locations Scheduled to be sampled in December 2016

200-BP	200-PO	200-UP	200-ZP
199-K-183	299-E24-20	299-W21-3	699-48-96
199-K-31	299-E24-22	299-W22-113	
299-E27-12	299-E24-23	299-W22-114	
299-E27-13	299-E24-33	299-W22-115	
299-E27-14	299-E25-2	299-W22-116	
299-E27-15	299-E25-237	299-W22-47	
299-E27-155	299-E25-40	299-W22-82	
299-E27-21	299-E25-41	299-W22-83	
299-E27-22	299-E25-42	299-W22-85	
299-E27-23	299-E25-93	299-W22-93	
299-E27-24	299-E25-94	299-W22-94	
299-E27-25	699-30-57	299-W22-95	
299-E27-26		299-W22-96	
299-E27-7		299-W23-19	
299-E33-340		699-29-66	
299-E33-343		699-31-68	
299-E33-360		699-36-63B	
299-E33-50			

Table 6. WMA C Quarterly Monitoring Wells

SITE_NAME
299-E27-12
299-E27-13
299-E27-14
299-E27-15
299-E27-155
299-E27-21
299-E27-22
299-E27-23
299-E27-24
299-E27-25
299-E27-4
299-E27-7

TRI-PARTY AGREEMENT

Change Notice Number TPA-CN- 0748	TPA CHANGE NOTICE FORM	Date: September 15, 2016
Document Number, Title, and Revision: DOE/RL-2011-104, Rev. 0, Characterization Sampling and Analysis Plan for the 200-DV-1 Operable Unit		Date Document Last Issued: January 2012
Approved Change Notices Against this Document: TPA-CN-668, TPA-CN-724		
Originator: Mark Bymes		Phone: 509 373-3996

Description of Change:
This change notice for DOE/RL-2011-104 clarifies sample storage times and hold times as they apply to continuous sonic core sampling as well as correcting references within the document.

Michael Cline (DOE) and Dib Goswami/Rod Lobos (Ecology/EPA) agree that the proposed change modifies an approved workplan/document and will be processed in accordance with the Tri-Party Agreement Action Plan, Section 9.0, *Documentation and Records,* and not Chapter 12.0, *Changes to the Agreement.*

Changes include:

- Defining the sample storage times and hold times for continuous sonic core sampling in Section 3.2.5.
- Adding note "e" to Table 3-21 regarding sample storage times and hold times for continuous sonic core sampling.
- The reference to the COPC table in Section 2.1.4.8 needs to be revised to reference Table 1-2 versus Table 2-1.
- Table 3-2 needs to be revised to reference Table 1-2 versus Tables 2-1, 2-2, and 2-3. This global change affects Tables 3-3 through 3-18 and all associated Sample Location and Frequency descriptions in Section 3-1.

All deletions are indicated by ~~strikeout~~ and new text is indicated by double underline.
Copies of the pages affected by the changes are attached.

Note: Include affected page number(s): 2-6, 3-3, 3-6, 3-7, 3-10, 3-11, 3-14, 3-15, 3-18, 3-20, 3-22, 3-25, 3-27, 3-30, 3-31, 3-34, 3-35, 3-38, 3-39, 3-42, 3-43, 3-46, 3-47, 3-50, 3-51, 3-54, 3-55, 3-58, 3-59, 3-62, 3-63, 3-66, 3-67, 3-70, 3-76, and 3-77

Justification and Impacts of Change:

The original SAP (DOE-RL-2011-104) was written to support the use of hydraulic push technology to advance the boreholes and collect the required soil samples. When hydraulic push technology was not able to reach the required sampling depths, it was replaced by Becker-Hammer drilling followed by sonic drilling. Due to operational constraints of performing continuous core sampling during sonic drilling, the following changes to this SAP will be implemented:

Section 3.2.5, page 3-76, will now include text that states "The holding time clock will begin for the continuous core sampling when the laboratory opens the Lexan© sleeve to perform the lithology description and determine the sample collection intervals." Table 3-21, page 3-76, will have the following note "e". For continuous sonic core sampling, the holding time clock will begin when the laboratory opens the Lexan© sleeve to perform the lithology description and determine the sample collection intervals. While refrigeration of the sealed and intact soil cores contained within the Lexan© sleeve (capped at both ends) will prevent the loss of (or degradation of) the chemical analytes, the administrative goal will be to open the Lexan© sleeves within 120 days of the time the sleeves were capped at the drill site. However, some complicating factors (e.g., moderate to high radiation levels being encountered during drilling, boreholes needing to be re-drilled when total depth is not reached on first attempt, etc.) may require a small portion of the samples to be stored for up to 12 months in refrigeration/freezer units."

The project team determined that refrigeration/freezing of the sealed and intact soil cores contained within the Lexan© sleeve (capped at both ends) will prevent the loss of, or degradation of, the chemical analytes. No impacts to the analysis of the analytes are anticipated as a result of this change.

This approach is within the guidelines of DOE/RL-96-68, Rev. 4, *Hanford Analytical Services Quality Assurance Requirements Document Volume 2,* Section 4.4.73; the recommended guidance found in SW-846, Update V Revision 5, July 2014, *Test Methods for Evaluating Solid Waste, Physical/Chemical Method,* Sections 2.1, 3.3.4, and 4.1.2; EPA/600/R-05/124, *Sample Holding Time Reevaluation.*

Supporting information on hold times from SW-846 and EPA/600/R-05/124 is provided in the attachment.

Approvals:

DOE Project Manager	10/12/16 Date	[X] Approved [ ] Disapproved
EPA Project Manager	10/12/16 Date	[X] Approved [ ] Disapproved
Ecology Project Manager	10/11/16 Date	[X] Approved [ ] Disapproved

2.1.4.4 Comparability

Comparability expresses the confidence with which one data set can be compared to another. Data comparability will be maintained by using standard procedures, uniform methods, and consistent units.

2.1.4.5 Completeness

Tables 2-1 and 2-2 identify the sample analytes, field parameters, and analytical performance requirements for samples collected under the scope of this SAP. The analytical data set will be considered 100 percent complete if all target analytes are reported for all samples identified for collection with no rejected data.

2.1.4.6 Sensitivity

Sensitivity is the capability of a method or instrument to discriminate between measurement responses representing different levels of the variable of interest. A measure of sensitivity is the detection limit.

2.1.4.7 Method-Based Analysis

All analyses being performed for total constituent determinations for COPCs against the requirements in Tables 2-1 and 2-2 will include a method-based analysis design. The laboratory will be directed to report all results for all constituents determined through multi-constituent analysis (e.g., IC, ICP, GEA, GC/MS) regardless of whether the reported constituents are designated COPCs. The analytical performance requirements will be applicable only to the COPCs. Poor QC related to non-COPC results would not result in any required corrective action by the laboratory except for the application of proper result qualification flags.

2.1.4.8 Analytical Priority

All of the COPCs listed in Table ~~2-1~~ 1-2 have been identified in Table 2-3 as either high priority, medium priority, or low priority. All of the COPCs will be analyzed in samples collected above 4.6 m (15 ft) depth. For samples collected below 4.6 m (15 ft) depth, the COPCs to be analyzed will be based on the available sample volume according to the highest to lowest priorities as defined in Table 2-3, if sample volume is insufficient to analyze for the entire list of COPCs. High-priority COPCs are critical for supporting waste site decisions and are required to be analyzed. Medium-priority COPCs are important for supporting waste site decisions and attempts will be made to collect at least every other planned sample. Low-priority COPCs are not critical for supporting waste site decisions and will be analyzed only if sufficient sample volumes are collected.

2.1.5 Special Training and Certification

A graded approach is used to ensure that workers receive a level of training commensurate with responsibilities and that complies with applicable DOE orders and government regulations. A job task analysis process is used to determine the type and level of training that personnel need to complete job tasks. The Field Team Lead, in coordination with line management, will ensure special training requirements for field personnel are met.

3.1 Sample Location and Frequency

This section provides the site-specific FSPs for individual waste sites in the 200-DV-1 OU. The approximate locations of planned and existing boreholes described in these FSPs are shown on figures for individual waste sites. The actual locations will be determined based on a field walkdown of current site conditions and ground penetrating radar surveys, as required, to avoid Hanford Site National Historic restrictions, roads, and other obstructions.

3.1.1 B Complex Area

Vadose zone characterization will be conducted at the following 200-DV-1 OU waste sites/groups in the B Complex Area: 216-B-7A&B Cribs; 216-B-8 Crib and Tile Field and 200-E-45 Health Instruments Shaft; 216-B-9 Crib and Tile Field; BX Trenches; and BY Cribs.

3.1.1.1 216-B-7A&B Cribs

The characterization planned for the 216-B-7A&B Cribs includes using DPT to push a drive point to refusal, attempting to reach at least to the CCU, and collecting samples using this same drive point. The location of the drive point is shown on Figure 3-1. The characterization location northeast of the 216-B-7A Crib (the direction that vadose zone strata dip) was selected to confirm the conceptual model that the vadose zone between approximately 15.2 m (50 ft) below ground surface (bgs) and the CCU is relatively uncontaminated, as shown by the existing data from the 216-B-7A Crib (DOE/RL-2002-42). Based on geophysical logging, the thickest zone of cesium-137 contamination is east of the 216-B-7A Crib at well 299-E33-58 (GJO-2002-343-TAR, *Hanford 200 Areas Spectral Gamma Baseline Characterization Report, 216-B-8 Crib and Adjacent Sites Waste Summary Report*).

The sampling intervals for the 216-B-7A&B Cribs were selected to reduce the uncertainty associated with the nature and extent of contamination in the shallow vadose zone above 4.6 m (15 ft) bgs that may pose a risk to human health and the environment, and in the deep vadose zone that may be a source to groundwater. Samples will be collected at the base of the trench and at changes in lithology, as depicted on Figure 3-2. The samples will be analyzed for the COPCs presented in Tables ~~2-1, 2-2, and 2-3~~ 1-2, as indicated in the 216-B-7A&B Cribs Sampling Plan (Table 3-2).

Table 3-2. 216-B-7A&B Cribs Sampling Plan

Sample Collection Methodology	Sample Location	Maximum Depth of Investigation	Sample Interval Depth (ft bgs)[a,d]	Analyte List	Physical Properties	
					Sample Interval	Parameters
Direct push with sample barrel samples.	One direct push northeast of 216-B-7A.	Refusal, attempt to reach and sample the Cold Creek unit.	Sample barrel samples at depths: 14 – 16 ft bgs 22 – 24 ft bgs 36 – 38 ft bgs 100 – 102 ft bgs 163 – 165 ft bgs 216 – 218 ft bgs 224 – 226 ft bgs 235 – 237 ft bgs Approximate depths only.	Analytes are presented in Tables ~~2-1, 2-2, and 2-3~~ 1-2.	N/A	N/A
Approximate number of sample barrel samples				8		
Approximate number of field quality-control samples[b]				2		
Approximate number of physical-property samples				0		
Approximate total number of soil samples collected				10		
Approximate total number of soil samples analyzed[c]				10		
Non-Sample Data Collection				**Maximum Depth of Investigation**		
Downhole gamma-spectroscopy log and neutron moisture log. Passive neutron log may be collected on a case-by-case basis if gamma-spectroscopy log and/or process history indicates the likely presence of plutonium contamination.				Surface to TD in new borehole (approximately 240 ft bgs).		

a. Actual sampling depths may vary depending on the amount of backfill/overburden used in interim-stabilization activities at the waste site, field screening results, and varying subsurface conditions, consistent with the field sampling strategy (Section 3.2.3).

b. One duplicate, one split (optional), and one equipment blank (if possible and plausible).

c. Number of samples analyzed includes eight sample barrel samples, two field quality-control samples, and zero physical-property samples.

d. To convert feet to meters, multiply by 0.3048.

bgs = below ground surface

N/A = not applicable

TD = total depth

3.1.1.2 216-B-8 Crib and Tile Field and 200-E-45 Health Instrument Shaft

The characterization planned for the 216-B-8 Crib and Tile Field and the 200-E-45 Health Instrument (HI) Shaft includes using DPT to push a drive point to refusal, attempting to reach the CCU, and collecting samples using this same drive point. The location of the drive point is shown on Figure 3-3. The location between the 216-B-8 Crib and the 200-E-45 HI Shaft was selected to focus the characterization on the zone of expected highest contamination and to address contaminant release from both waste sites.

The sampling intervals were selected to reduce the uncertainty associated with the nature and extent of contamination in the shallow vadose zone above 4.6 m (15 ft) bgs that may pose a risk to human health and the environment, and in the deep vadose zone that may be a source to groundwater. The samples also will provide information on possible contamination released from the HI Shaft as a result of pump tests conducted following the 216-B-8 Crib operation (Section 2.1). Samples will be collected at depths corresponding to the bases of the two waste sites and at changes in lithology, as depicted on Figure 3-4. The samples will be analyzed for the COPCs presented in Table~~s 2-1, 2-2, and 2-3~~ 1-2, as indicated in the 216-B-8 Crib and Tile FSP (Table 3-3).

Table 3-3. 216-B-8 Crib and Tile Field Sampling Plan

Sample Collection Methodology	Sample Location	Maximum Depth of Investigation	Sample Interval Depth (ft bgs)[a,d]	Analyte List	Physical Properties	
					Sample Interval	Parameters
Direct push with sample barrel samples.	One direct push between 216-B-8 Crib and 200-E-45 HI Shaft.	Refusal, attempt to reach and sample the Cold Creek unit.	Sample barrel sample at depths: 4 – 6 ft bgs 23 – 25 ft bgs 34 – 36 ft bgs 49 – 51 ft bgs 144 – 146 ft bgs 206 – 208 ft bgs Approximate depths only.	Analytes are presented in Tables ~~2-1, 2-2, and 2-3~~ 1-2.	N/A	N/A
Approximate number of sample barrel samples				6		
Approximate number of field quality-control samples[b]				2		
Approximate number of physical-property samples				0		
Approximate total number of soil samples collected				8		
Approximate total number of soil samples analyzed[c]				8		
Non-Sample Data Collection				**Maximum Depth of Investigation**		
Downhole gamma-spectroscopy log and neutron moisture log. Passive neutron log may be collected on a case-by-case basis if gamma-spectroscopy log and/or process history indicates the likely presence of plutonium contamination.				Surface to TD in new borehole (approximately 210 ft bgs).		

a. Actual sampling depths may vary depending on the amount of backfill/overburden used in interim-stabilization activities at the waste site, field screening results, and varying subsurface conditions, consistent with the field sampling strategy (Section 3.2.3).

b. One duplicate, one split (optional), and one equipment blank (if possible and plausible).

c. Number of samples analyzed includes six sample barrel samples, two field quality-control samples, and zero physical-property samples.

d. To convert feet to meters, multiply by 0.3048.

bgs = below ground surface

N/A = not applicable

TD = total depth

3.1.1.3 216-B-9 Crib and Tile Field

The characterization planned for the 216-B-9 Crib and Tile Field includes using DPT to push two drive points to refusal, attempting to reach the CCU and collecting samples using these same drive points. The locations of the drive points are shown on Figure 3-5. The locations were selected to focus the characterization on the zones of expected deepest contamination and to address contaminant release from both the crib and the tile field. The deepest contamination recognized on any of the scintillation probe profiles was 43 m (141 ft) bgs at well 299-E28-57 (GJO-2002-358-TAC, *Hanford 200 Area Spectral Gamma Baseline Characterization Project, 216-B-5 Injection Well and 216-B-9 Crib and Tile Field Waste Site Summary Report*, page 32). However, waste liquids may have migrated deeper than 45.7 m (150 ft) if corroded well 299-E28-53 provided a preferential pathway.

The sampling intervals were selected to reduce the uncertainty associated with the nature and extent of contamination in the shallow vadose zone above 4.6 m (15 ft) bgs that may pose a risk to human health and the environment and in the deep vadose zone that may be a source to groundwater. Samples will be collected at depths corresponding to the bases of the crib and tile field, and at changes in lithology, as depicted on Figure 3-6. The samples will be analyzed for the COPCs presented in Table~~s 2-1, 2-2, and 2-3~~ 1-2, as indicated in the 216-B-9 Crib and Tile FSP (Table 3-4).

Table 3-4. 216-B-9 Crib and Tile Field Sampling Plan

Sample Collection Methodology	Sample Location	Maximum Depth of Investigation	Sample Interval Depth (ft bgs)[a,d]	Analyte List	Physical Properties	
					Sample Interval	Parameters
Two direct pushes with sample barrel samples.	One direct push near well 299-E28-57 and one near well 299-E28-53; the location for sampling will be based on geophysical logging.	Refusal, attempt to reach and sample the Cold Creek unit.	Sample barrel at depth: 13 – 15 ft bgs 52 – 54 ft bgs 100 – 102 ft bgs 160 – 162 ft bgs 214 – 216 ft bgs 243 – 245 ft bgs 248 – 250 ft bgs Approximate depths only.	Analytes are presented in Tables~~ 2-1, 2-2, and 2-3~~ 1-2.	N/A	N/A
Approximate number of sample barrel samples				14		
Approximate number of field quality-control samples[b]				4		
Approximate number of physical-property samples				0		
Approximate total number of soil samples collected				18		
Approximate total number of soil samples analyzed[c]				18		
Non-Sample Data Collection				**Maximum Depth of Investigation**		
Downhole gamma-spectroscopy log and neutron moisture log. Passive neutron log may be collected on a case-by-case basis if gamma-spectroscopy log and/or process history indicates the likely presence of plutonium contamination.				Surface to TD in each new borehole (approximately 250 ft bgs).		

a. Actual sampling depths may vary depending on the amount of backfill/overburden used in interim-stabilization activities at the waste site, field screening results, and varying subsurface conditions, consistent with the field sampling strategy (Section 3.2.3).

b. One duplicate, one split (optional), and one equipment blank (if possible and plausible).

c. Number of samples analyzed includes fourteen sample barrel samples, four field quality-control samples, and zero physical-property samples.

d. To convert feet to meters, multiply by 0.3048.

bgs = below ground surface

N/A = not applicable

TD = total depth

3.1.1.4 BX Trenches (216-B-37 Trench and 216-B-42 Trench)

The characterization planned for the 216-B-37 Trench includes using DPT to push a drive point to refusal, attempting to reach the CCU, and collecting samples using this same drive point. The location of the drive point is shown on Figure 3-7. The 216-B-37 Trench was selected for characterization because it received the largest disposal volume of all the BX Trenches. The location at the east end of the 216-B-37 Trench was selected to focus the characterization on the zone of expected highest and deepest contamination, based on the results of the previous characterization at the 216-B-38 Trench (DOE/RL-2002-42).

The sampling intervals for the 216-B-37 Trench were selected to reduce the uncertainty associated with the nature and extent of contamination in the shallow vadose zone above 4.6 m (15 ft) bgs that may pose a risk to human health and the environment, and in the deep vadose zone that may be a source to groundwater. Samples will be collected at the base of the trench and at changes in lithology, as depicted on Figure 3-8. The samples will be analyzed for the COPCs presented in Table~~s 2-1, 2-2, and 2-3~~ 1-2, as indicated in the 216-B-37 Trench Sampling Plan (Table 3-5).

The characterization planned for the 216-B-42 Trench includes drilling a borehole to groundwater, and collecting samples and geophysical logs using this same borehole. The location of the borehole is shown on Figure 3-7. The 216-B-42 Trench was selected for characterization because it received a higher inventory of technetium-99 than the other BX Trenches. Drilling will ensure that the vertical extent of the technetium-99 contamination in the subsurface at this location is characterized. The location at the east end of the 216-B-42 Trench was selected to focus the characterization on the zone of expected highest contamination, based on the results of the previous characterization at the 216-B-38 Trench (DOE/RL-2002-42). The drilling and logging efforts are planned to reduce the uncertainty associated with the differences in waste streams between the 216-B-42 Trench and the other BX Trenches located within geographical proximity.

The sampling intervals for the 216-B-42 Trench were selected to reduce the uncertainty associated with the nature and extent of contamination in the shallow vadose zone above 4.6 m (15 ft) bgs that may pose a risk to human health and the environment, and in the deep vadose zone that may be a source to groundwater. Split-spoon samples will be collected at the base of the trench and at changes in lithology, as depicted on Figure 3-9. The split-spoon samples will be analyzed for analytes presented in Table~~s~~ 2-1, 2-2, and 2-31, as indicated in the 216-B-42 Trench Sampling Plan (Table 3-6). Grab samples will be collected at 3.0 m (10 ft) intervals throughout the borehole, starting at 10.7 m (35 ft) bgs. Selected grab samples may be analyzed for mobile COPCs as determined by the field geologist and technical lead, using characterization data such as geophysical logs, lithology (geologist logs), and split-spoon sample analytical results, consistent with the field sampling strategy (Section 3.2.3). Groundwater samples or other opportunistic samples may be collected if requested to support integration with other Central Plateau activities.

Table 3-5. 216-B-37 Trench Sampling Plan

Sample Collection Methodology	Sample Location	Maximum Depth of Investigation	Sample Interval Depth (ft bgs)[a,d]	Analyte List	Physical Properties	
					Sample Interval	Parameters
Direct push with sample barrel samples.	One direct push at eastern end of 216-B-37 Trench.	Refusal, attempt to reach and sample the Cold Creek unit.	Sample barrel sample at depths: 13 – 15 ft bgs 42 – 44 ft bgs 98 – 100 ft bgs 149 – 151 ft bgs 206 – 208 ft bgs 220 – 222 ft bgs Approximate depths only.	Analytes are presented in Table~~s 2-1, 2-2, and 2-3~~ 1-2.	N/A	N/A
Approximate number of sample barrel samples				6		
Approximate number of field quality-control samples[b]				2		
Approximate number of physical-property samples				0		
Approximate total number of soil samples collected				8		
Approximate total number of soil samples analyzed[c]				8		
Non-Sample Data Collection				**Maximum Depth of Investigation**		
Downhole gamma-spectroscopy log and neutron moisture log. Passive neutron log may be collected on a case-by-case basis if gamma-spectroscopy log and/or process history indicates the likely presence of plutonium contamination.				Surface to TD in new borehole (approximately 225 ft bgs).		

a. Actual sampling depths may vary depending on the amount of backfill/overburden used in interim-stabilization activities at the waste site, field screening results, and varying subsurface conditions, consistent with the field sampling strategy (Section 3.2.3).

b. One duplicate, one split (optional), and one equipment blank (if possible and plausible).

c. Number of samples analyzed includes six sample barrel samples, two field quality-control samples, and zero physical-property samples.

d. To convert feet to meters, multiply by 0.3048.

bgs = below ground surface

N/A = not applicable

TD = total depth

Table 3-6. 216-B-42 Trench Sampling Plan

Sample Collection Methodology	Sample Location	Maximum Depth of Investigation	Sample Interval Depth (ft bgs)[a,d]	Analyte List	Physical Properties	
					Sample Interval	Parameters
Borehole to groundwater with split-spoon samples.	One deep borehole near eastern end of trench.	To groundwater (approximately 275 ft bgs).	Split-spoon sample at depths: 10 – 12 ft bgs 18 – 20 ft bgs 24 – 26 ft bgs 55 – 57 ft bgs 67 – 69 ft bgs 98 – 100 ft bgs 168 – 170 ft bgs 186 – 188 ft bgs 230 – 232 ft bgs 272 – 274 ft bgs Approximate depths only. Grab samples at 10 ft intervals throughout borehole, starting at 35 ft bgs.	Analytes are presented in Table~~s 2-1, 2-2, and 2-3~~ 1-2.	One sample at each change in lithology or fine-grained intervals (same as split-spoon sample intervals, between 15-200 ft bgs), as indicated on Figure 3-9.	pH, bulk density, moisture, particle size distribution.
Approximate number of split-spoon samples				10		
Approximate number of field quality-control samples[b]				2		
Approximate number of physical-property samples				7		
Approximate number of grab samples				24		
Approximate total number of soil samples collected				43		
Approximate total number of soil samples analyzed[c]				19		
Non-Sample Data Collection				**Maximum Depth of Investigation**		
Downhole gamma-spectroscopy log and neutron moisture log. Passive neutron log may be collected on a case-by-case basis if gamma-spectroscopy log and/or process history indicates the likely presence of plutonium contamination.				Surface to TD in new borehole (approximately 275 ft bgs).		

a. Actual sampling depths may vary depending on the amount of backfill/overburden used in interim-stabilization activities at the waste site, field screening results, and varying subsurface conditions, consistent with the field sampling strategy (Section 3.2.3).

b. One duplicate, one split (optional), and one equipment blank.

c. Number of samples analyzed includes ten split-spoon samples, two field quality-control samples, and seven physical-property samples.

d. To convert feet to meters, multiply by 0.3048.

bgs = below ground surface

TD = total depth

on Figure 3-11. The samples at the northeast corner of the 216-B-46 Crib and in the center of the BY Cribs will be analyzed for analytes presented in Tables 2-1, 2-2, and 2-3, as indicated in the BY Cribs Sampling Plan A (Table 3-7A). The samples to the northeast and northwest of the BY Cribs will be analyzed for the COPCs presented in Table~~s 2-1, 2-2, and 2-3~~ 1-2, as indicated in the BY Cribs Sampling Plan B (Table 3-7B).

Surface geophysical exploration data were collected at the BY Cribs in 2007 (RPP-34690, *Surface Geophysical Exploration of the B, BX, and BY Tank Farm at the Hanford Site*). The existing data will be evaluated during Phase I to determine if application of recent advances in geophysical data interpretation, using the existing data set, would significantly refine the CSM of the lateral distribution of mobile contaminants. If not, a new surface geophysical survey may be conducted using the deep electrodes that will be installed at the four Phase I drive point locations.

Following completion of the Phase I characterization, the results will be evaluated and the preliminary conceptual model will be updated. DOE-RL and Ecology will then concur on the need for and scope of any Phase II target characterization activities.

Table 3-7A. BY Cribs Sampling Plan A

Sample Collection Methodology	Sample Location	Maximum Depth of Investigation	Sample Interval Depth (ft bgs)[a,d]	Analyte List	Physical Properties	
					Sample Interval	Parameters
Two direct pushes with sample barrel samples.	One direct push at the northeast corner of the 216-B-46 Crib and one between the 216-B-45 and 216-B-49 Cribs (locations 1 and 3 on Figure 3-10).	Refusal, attempt to reach and sample the Cold Creek unit.	Sample barrel at depths: 8 – 10 ft bgs 18 – 20 ft bgs 42 – 44 ft bgs 64 – 66 ft bgs 84 – 86 ft bgs 110 – 112 ft bgs 130 – 132 ft bgs 157 – 159 ft bgs 188 – 190 ft bgs 195 – 197 ft bgs Approximate depths only; actual sample depths will be based on geophysical logging.	Analytes for shallowest three sample intervals are presented in Tables ~~2-1, 2-2, and 2-3~~ 1-2. Analytes for deepest seven sample intervals are mobile contaminants technetium-99, uranium, nitrate, and cyanide.	N/A	N/A
Approximate number of sample barrel samples				20		
Approximate number of field quality-control samples[b]				4		
Approximate number of physical-property samples				0		
Approximate total number of soil samples collected				24		
Approximate total number of soil samples analyzed[c]				24		
Non-Sample Data Collection				**Maximum Depth of Investigation**		
Downhole gamma-spectroscopy log and neutron moisture log. Passive neutron log may be collected on a case-by-case basis if gamma-spectroscopy log and/or process history indicates the likely presence of plutonium contamination.				Surface to TD in each new borehole (approximately 200 ft bgs).		

a. Actual sampling depths may vary depending on the amount of backfill/overburden used in interim-stabilization activities at the waste site, field screening results, and varying subsurface conditions, consistent with the field sampling strategy (Section 3.2.3).

b. One duplicate, one split (optional), and one equipment blank (if possible and plausible).

c. Number of samples analyzed includes twenty sample barrel samples, four field quality-control samples, and zero physical-property samples.

d. To convert feet to meters, multiply by 0.3048.

bgs = below ground surface

N/A = not applicable

TD = total depth

3.1.2 T Complex Area

Vadose zone characterization will be conducted at the following 200-DV-1 OU waste sites/groups in the T Complex Area: 216-T-3 Reverse Well; 216-T-5 Trench; 216-T-6 Cribs; 216-T-7 Tile Field; T Trenches; 216-T-18 Crib; 216-T-19 Crib and Tile Field; and TX Trenches.

3.1.2.1 216-T-3 Injection/Reverse Well

The characterization planned for the 216-T-3 Injection/Reverse Well includes drilling a borehole to groundwater and collecting samples and geophysical logs using this same borehole. The location of the borehole is shown on Figure 3-12. The location was selected to be as close as possible to the 216-T-3 Reverse Well to focus on the waste released from this injection/reverse well. Drilling will ensure that the vertical extent of contamination in the subsurface at this location is characterized.

The sampling intervals for the 216-T-3 Reverse Well were selected to reduce the uncertainty associated with the nature and extent of contamination in the deep vadose zone that may be a source to groundwater. The sample intervals also were selected to evaluate (1) the extent of contamination released through the perforations in the well (from 32.3 m [106 ft] bgs to total depth (TD) of 62.8 m [206 ft] bgs), (2) whether shallow waste migrated from another source, and (3) whether possible leaks to the vadose zone occurred at casing changes. Because the perforations in the 216-T-3 Reverse Well begin at 31.85 m (104.5 ft) bgs, contamination release from the 216-T-3 waste site is unlikely in the upper 4.6 m (15 ft) of the subsurface and no samples are planned for the shallow vadose zone.

Samples will be collected at the top and bottom of the perforated zone in the well and at changes in lithology, as depicted on Figure 3-13. The split-spoon samples will be analyzed for the COPCs presented in Table~~s 2-1, 2-2, and 2-3~~ 1-2, as indicated in the 216-T-3 Reverse Well Sampling Plan (Table 3-8). Selected grab samples may be analyzed for mobile COPCs as determined by the field geologist and technical lead using characterization data such as geophysical logs, lithology (geologist logs), and split-spoon sample analytical results, consistent with the field sampling strategy (Section 3.2.3). Groundwater samples or other opportunistic samples may be collected if requested to support integration with other Central Plateau activities.

Table 3-8. 216-T-3 Injection/Reverse Well Sampling Plan

Sample Collection Methodology	Sample Location	Maximum Depth of Investigation	Sample Interval Depth (ft bgs)[a,d]	Analyte List	Physical Properties	
					Sample Interval	Parameters
Borehole to groundwater with split-spoon samples.	One borehole adjacent to the 216-T-3 Well.	To groundwater (approximately 274 ft bgs).	Split-spoon sample at depths: 19 – 21 ft bgs 60 – 62 ft bgs 106 – 108 ft bgs 115 – 117 ft bgs 120 – 122 ft bgs 138 – 140 ft bgs 170 – 172 ft bgs 200 – 202 ft bgs 228 – 230 ft bgs 250 – 252 ft bgs Approximate depths only. Grab samples at 10 ft intervals throughout borehole.	Analytes are presented in Tables ~~2-1, 2-2, and 2-3~~ 1-2.	One sample at each change in lithology within the 216-T-3 perforated zone (between 98 and 206 ft bgs), as shown on Figure 3-13.	pH, bulk density, moisture, particle size distribution.
Approximate number of split-spoon samples				10		
Approximate number of field quality-control samples[b]				2		
Approximate number of physical-property samples				6		
Approximate number of grab samples				27		
Approximate total number of soil samples collected				45		
Approximate total number of soil samples analyzed[c]				18		
Non-Sample Data Collection				**Maximum Depth of Investigation**		
Downhole gamma-spectroscopy log and neutron moisture log. Passive neutron log may be collected on a case-by-case basis if gamma-spectroscopy log and/or process history indicates the likely presence of plutonium contamination.				Surface to TD in new borehole (approximately 275 ft bgs).		

a. Actual sampling depths may vary depending on the amount of backfill/overburden used in interim-stabilization activities at the waste site, field screening results, and varying subsurface conditions, consistent with the field sampling strategy (Section 3.2.3).

b. One duplicate, one split (optional), and one equipment blank.

c. Number of samples analyzed includes ten split-spoon samples, two field quality-control samples, and six physical-property samples.

d. To convert feet to meters, multiply by 0.3048.

bgs = below ground surface

TD = total depth

3.1.2.2 216-T-5 Trench

The characterization planned for the 216-T-5 Trench includes using DPT to push three drive points to refusal, attempting to reach the CCU, with geophysical logging of two of the drive points and sample collection at the third (twin) drive point. The locations of the drive points are shown on Figure 3-14. The locations were selected to characterize both ends of the trench to reduce uncertainty regarding the location of the discharge point. The third drive point will twin the logged drive point at the northeastern location and will be sampled because shallow boreholes drilled there in 1985 encountered contamination.

The sampling intervals were selected to reduce the uncertainty associated with the nature and extent of contamination in the shallow vadose zone above 4.6 m (15 ft) bgs that may pose a risk to human health and the environment, and in the deep vadose zone that may be a source to groundwater. Samples will be collected at the depth corresponding to the base of the trench and at changes in lithology, as depicted on Figure 3-15. The samples will be analyzed for the COPCs presented in Table~~s 2-1, 2-2, and 2-3~~ 1-2, as indicated in the 216-T-5 Trench Sampling Plan (Table 3-9).

Table 3-9. 216-T-5 Trench Sampling Plan

Sample Collection Methodology	Sample Location	Maximum Depth of Investigation	Sample Interval Depth (ft bgs)[a,d]	Analyte List	Physical Properties	
					Sample Interval	Parameters
Three direct pushes, one (twin) with sample barrel samples.	One near northeastern edge of the 216-T-5 Trench and one in southern portion; northeastern location will be sampled.	Refusal, attempt to reach and sample the Cold Creek unit.	Sample barrel sample at depths: 13 – 15 ft bgs 37 – 39 ft bgs 39 – 41 ft bgs 59 – 61 ft bgs 76 – 78 ft bgs 93 – 95 ft bgs Approximate depths only; actual sample depths will be based on geophysical logging.	Analytes are presented in Tables~~ 2-1, 2-2, and 2-3~~ 1-2.	N/A	N/A
Approximate number of sample barrel samples				6		
Approximate number of field quality-control samples[b]				1		
Approximate number of physical-property samples				0		
Approximate total number of soil samples collected				7		
Approximate total number of soil samples analyzed[c]				7		
Non-Sample Data Collection				**Maximum Depth of Investigation**		
Downhole gamma-spectroscopy log and neutron moisture log. Passive neutron log may be collected on a case-by-case basis if gamma-spectroscopy log and/or process history indicates the likely presence of plutonium contamination.				Surface to TD in each new borehole (approximately 100 ft bgs).		

a. Actual sampling depths may vary depending on the amount of backfill/overburden used in interim-stabilization activities at the waste site, field screening results, and varying subsurface conditions, consistent with the field sampling strategy (Section 3.2.3).

b. One duplicate, one split (optional), and one equipment blank (if possible and plausible).

c. Number of samples analyzed includes six sample barrel samples, one field quality-control sample, and zero physical-property samples.

d. To convert feet to meters, multiply by 0.3048.

bgs = below ground surface

N/A = not applicable

TD = total depth

3.1.2.3 216-T-6 Cribs

The characterization planned for the 216-T-6 Cribs includes using DPT to push three drive points to refusal, attempting to reach the CCU, with geophysical logging at two of the drive points and sample collection at the third (twin) drive point. The locations of the drive points are shown on Figure 3-16. The locations were selected to address contaminant release from both cribs. The twin drive point east of the eastern crib (crib #1) will be sampled because the liquid wastes were discharged to the eastern crib, which was designed to overflow to the western crib (crib #2).

The sampling intervals were selected to reduce the uncertainty associated with the nature and extent of contamination in the shallow vadose zone above 4.6 m (15 ft) bgs that may pose a risk to human health and the environment, and in the deep vadose zone that may be a source to groundwater. Samples will be collected at the depth corresponding to the base of the crib and at changes in lithology, as depicted on Figure 3-17. The samples will be analyzed for the COPCs presented in Tables ~~2-1, 2-2, and 2-3~~ 1-2, as indicated in the 216-T-6 Cribs Sampling Plan (Table 3-10).

Table 3-10. 216-T-6 Cribs Sampling Plan

Sample Collection Methodology	Sample Location	Maximum Depth of Investigation	Sample Interval Depth (ft bgs)[a,d]	Analyte List	Physical Properties	
					Sample Interval	Parameters
Three direct pushes, one (twin) with sample barrel samples.	One east of the eastern 216-T-6 Crib (crib #1) and one east of the western 216-T-6 crib (crib #2); the location east of the eastern 216-T-6 Crib (crib #1) will be sampled. The direct push locations will be as close as feasible to the crib but outside of the crib footprint.[e]	Refusal, attempt to reach and sample the Cold Creek unit.	Sample barrel sample at depths: 8 – 10 ft bgs 22 – 24 ft bgs 38 – 40 ft bgs 45 – 47 ft bgs 78 – 80 ft bgs 101 – 103 ft bgs 103 – 105 ft bgs Approximate depths only; actual sample depths will be based on geophysical logging.	Analytes are presented in Tables ~~2-1, 2-2, and 2-3~~ 1-2.	N/A	N/A
Approximate number of sample barrel samples				7		
Approximate number of field quality-control samples[b]				2		
Approximate number of physical-property samples				0		
Approximate total number of soil samples collected				9		
Approximate total number of soil samples analyzed[c]				9		
Non-Sample Data Collection				**Maximum Depth of Investigation**		
Downhole gamma-spectroscopy log and neutron moisture log. Passive neutron log may be collected on a case-by-case basis if gamma-spectroscopy log and/or process history indicates the likely presence of plutonium contamination.				Surface to TD in each new borehole (approximately 105 ft bgs).		

a. Actual sampling depths may vary depending on the amount of backfill/overburden used in interim-stabilization activities at the waste site, field screening results, and varying subsurface conditions, consistent with the field sampling strategy (Section 3.2.3).

b. One duplicate, one split (optional), and one equipment blank (if possible and plausible).

c. Number of samples analyzed includes seven sample barrel samples, two field quality-control samples, and zero physical-property samples.

d. To convert feet to meters, multiply by 0.3048.

e. The crib was constructed using wooden timbers and presents a cave-in potential. For safety purposes, the borehole will be outside of the wood construction footprint.

bgs = below ground surface

N/A = not applicable

TD = total depth

3.1.2.4 200-W-52 Crib and 216-T-7 Tile Field

The characterization planned for the 216-T-7 Tile Field includes drilling a borehole to groundwater and collecting samples and geophysical logs using this same borehole. The location of the borehole is shown on Figure 3-18. The location of the borehole was selected to be near the central distribution pipe and as close to the influent end of the tile field as possible without entering WMA T. Drilling will ensure that the vertical extent of contamination in the subsurface at this location is characterized.

The sampling intervals for the 216-T-7 Tile Field were selected to reduce the uncertainty associated with the nature and extent of contamination in the shallow vadose zone above 4.6 m (15 ft) bgs that may pose a risk to human health and the environment, and in the deep vadose zone that may be a source to groundwater. Samples will be collected at the base of the tile field and at changes in lithology, as depicted on Figure 3-19. The split-spoon samples will be analyzed for the COPCs presented in Table~~s 2-1, 2-2, and 2-3~~ 1-2, as indicated in the 216-T-7 Tile FSP (Table 3-11). Selected grab samples may be analyzed for mobile COPCs as determined by the field geologist and technical lead, using characterization data such as geophysical logs, lithology (geologist logs), and split-spoon sample analytical results, consistent with the field sampling strategy (Section 3.2.3). Groundwater samples or other opportunistic samples may be collected if requested to support integration with other Central Plateau activities.

Waste from the 216-T-32 Crib appears to have migrated southwest and to have commingled with waste discharged to the 200-W-52 Crib and 216-T-7 Tile Field. The 200-W-52 Crib and 216-T-7 Tile Field received a larger volume of waste and inventory of contaminants than the 216-T-32 Crib. Although geophysical logging of the existing boreholes has been completed at the 216-T-32 Crib and shows no contamination below the CCU, soil samples for chemical analysis have not been collected. The analytical data from the new borehole drilled to groundwater at the 216-T-7 Tile Field will be evaluated to identify the potential need for a borehole with soil samples at the 216-T-32 Crib. Based on this evaluation, and pending the opportunity to cost effectively access the 216-T-32 Crib within the T Tank Farm fence, a characterization borehole at the 216-T-32 Crib will be considered by the Tri-Parties.

Table 3-11. 216-T-7 Tile Field Sampling Plan

Sample Collection Methodology	Sample Location	Maximum Depth of Investigation	Sample Interval Depth (ft bgs)[a,d]	Analyte List	Physical Properties	
					Sample Interval	Parameters
Borehole to groundwater with split-spoon samples.	One deep borehole near eastern end of tile field (immediately west of the tank farm fence).	To groundwater (approximately 225 ft bgs).	Split-spoon sample at depths: 13 – 15 ft bgs 25 – 27 ft bgs 39 – 41 ft bgs 48 – 50 ft bgs 78 – 80 ft bgs 85 – 87 ft bgs 97 – 99 ft bgs 112 – 114 ft bgs 119 – 121 ft bgs 128 – 130 ft bgs 221 – 223 ft bgs Approximate depths only. Grab samples at 10 ft intervals throughout borehole.	Analytes are presented in Tables ~~2-1, 2-2, and 2-3~~ 1-2.	One sample at each change in lithology or other fine-grained intervals (same as split-spoon sample intervals between 45 and 130 ft bgs), as shown on Figure 3-19.	pH, bulk density, moisture, particle size distribution.
Approximate number of split-spoon samples				11		
Approximate number of field quality-control samples[b]				2		
Approximate number of physical-property samples				7		
Approximate number of grab samples				22		
Approximate total number of soil samples collected				42		
Approximate total number of soil samples analyzed[c]				20		
Non-Sample Data Collection				**Maximum Depth of Investigation**		
Downhole gamma-spectroscopy log and neutron moisture log. Passive neutron log may be collected on a case-by-case basis if gamma-spectroscopy log and/or process history indicates the likely presence of plutonium contamination.				Surface to TD in new borehole (approximately 225 ft bgs).		

a. Actual sampling depths may vary depending on the amount of backfill/overburden used in interim-stabilization activities at the waste site, field screening results, and varying subsurface conditions, consistent with the field sampling strategy (Section 3.2.3).

b. One duplicate, one split (optional), and one equipment blank.

c. Number of samples analyzed includes eleven split-spoon samples, two field quality-control samples, and seven physical-property samples.

d. To convert feet to meters, multiply by 0.3048.

bgs = below ground surface

TD = total depth

3.1.2.5 T Trenches (216-T-14 Trench and 216-T-15 Trench)

The characterization planned for the 216-T-14 Trench and the 216-T-15 Trench includes using DPT to push four drive points to refusal, attempting to reach the CCU, with geophysical logging of three drive points and sample collection at the fourth (twin) drive point. The locations of the drive points are shown on Figure 3-20. Among the four T Trenches, the 216-T-15 Trench received the largest volume of waste liquid and the largest inventory of contaminants. The 216-T-14 Trench received the highest pore volume because it has a shorter length than the other three trenches. It is likely that the discharge points for the trenches were at their southern ends. Drive point locations were selected at both the southern and northern ends of the centerline of the 216-T-15 Trench to reduce uncertainty regarding the location of the discharge point. The twin drive point at the southern end of the 216-T-15 Trench will be sampled because it is most likely to be at the location where the highest volume and largest inventory was discharged.

The sampling intervals were selected to reduce the uncertainty associated with the nature and extent of contamination in the shallow vadose zone above 4.6 m (15 ft) bgs that may pose a risk to human health and the environment, and in the deep vadose zone that may be a source to groundwater. Samples will be collected at the depth corresponding to the base of the trench and at changes in lithology, as depicted on Figure 3-21. The samples will be analyzed for the COPCs presented in Table~~s 2-1, 2-2, and 2-3~~ 1-2, as indicated in the 216-T-15 Trench Sampling Plan (Table 3-12).

Table 3-12. 216-T-14 Trench and 216-T-15 Trench Sampling Plan

Sample Collection Methodology	Sample Location	Maximum Depth of Investigation	Sample Interval Depth (ft bgs)[a,d]	Analyte List	Physical Properties	
					Sample Interval	Parameters
Four direct pushes, one (twin) with sample barrel samples.	One near southern end of the 216-T-15 Trench, one near northern end of the 216-T-15 Trench, and one near the southern end of the 216-T-14 Trench; the southern 216-T-15 Trench location will be sampled.	Refusal, attempt to reach and sample the Cold Creek unit.	Sample barrel sample at depths: 8 – 10 ft bgs 34 – 36 ft bgs 71 – 73 ft bgs 98 – 100 ft bgs 103 – 105 ft bgs Approximate depths only; actual sample depths will be based on geophysical logging.	Analytes are presented in Tables ~~2-1, 2-2, and 2-3~~ 1-2.	N/A	N/A
Approximate number of sample barrel samples				5		
Approximate number of field quality-control samples[b]				1		
Approximate number of physical-property samples				0		
Approximate total number of soil samples collected				6		
Approximate total number of soil samples analyzed[c]				6		
Non-Sample Data Collection				**Maximum Depth of Investigation**		
Downhole gamma-spectroscopy log and neutron moisture log. Passive neutron log may be collected on a case-by-case basis if gamma-spectroscopy log and/or process history indicates the likely presence of plutonium contamination.				Surface to TD in each new borehole (approximately 105 ft bgs).		

a. Actual sampling depths may vary depending on the amount of backfill/overburden used in interim-stabilization activities at the waste site, field screening results, and varying subsurface conditions, consistent with the field sampling strategy (Section 3.2.3).

b. One duplicate, one split (optional), and one equipment blank (if possible and plausible).

c. Number of samples analyzed includes five sample barrel samples, one field quality-control sample, and zero physical-property samples.

d. To convert feet to meters, multiply by 0.3048.

bgs = below ground surface

N/A = not applicable

TD = total depth

3.1.2.6 216-T-18 Crib

The characterization planned for the 216-T-18 Crib includes using DPT to push one drive point to refusal, attempting to reach at least to 30.5 m (100 ft) bgs. The location of the drive point is shown on Figure 3-22. The drive point location was selected near the center of the 216-T-18 Crib, based on the historical description of the waste site location near well 299-W11-11 (HW-31442, *Removal of Cesium from Uranium Recovery Process Wastes*, p. 28).

In 2008, three drive points were installed at the 216-T-18 Crib and logged in accordance with DOE/RL-2007-02 (C6410, C6411, and C6412 in Figure 3-22). The results of the geophysical logging at the three push boreholes is summarized in the geophysical log data report (HGLP-LDR-309, *Geophysical Investigation Report Small Diameter Logging Results 200-TW-1 Operable Unit Site Characterization*). The logging was performed in these small diameter direct-push boreholes using the small diameter logging systems (SDLS), which are configured to operate inside steel casing with a minimum inner diameter of 4.4 cm (1.75 in.). Bismuth germanate, neutron moisture, and passive neutron logs were run in all three boreholes in the 216-T-18 Crib. Using the SDLS, the detection level for plutonium is at or near 100 nCi/g. There were no apparent detections of plutonium in any of the boreholes. Because of the relatively high detection level for plutonium using the SDLS in the small diameter boreholes, an additional drive point will be pushed at this waste site and sampled for laboratory analyses.

The sampling intervals were selected to reduce the uncertainty associated with the nature and extent of contamination in the shallow vadose zone above 4.6 m (15 ft) bgs that may pose a risk to human health and the environment, and in the deep vadose zone that may be a source to groundwater. Samples will be collected at the depth corresponding to the base of the trench and at changes in lithology, as depicted in Figure 3-23. The samples will be analyzed for the COPCs presented in Table 1-2, as indicated in the 216-T-18 Crib Sampling Plan (Table 3-13).

Table 3-13. 216-T-18 Crib Sampling Plan

Sample Collection Methodology	Sample Location	Maximum Depth of Investigation	Sample Interval Depth (ft bgs)[a,d]	Analyte List	Physical Properties	
					Sample Interval	Parameters
Direct push with sample barrel samples.	One direct push in center of 216-T-18 Crib.	Refusal, attempt to reach 100 ft bgs.	Sample barrel at depths: 13 – 15 ft bgs 28 – 30 ft bgs 60 – 62 ft bgs 70 – 72 ft bgs 85 – 87 ft bgs 98 – 100 ft bgs Approximate depths only.	Analytes are presented in Tables ~~2-1, 2-2, and 2-3~~ 1-2.	N/A	N/A
Approximate number of sample barrel samples				6		
Approximate number of field quality-control samples[b]				2		
Approximate number of physical-property samples				0		
Approximate total number of soil samples collected				8		
Approximate total number of soil samples analyzed[c]				8		
Non-Sample Data Collection				**Maximum Depth of Investigation**		
N/A				Surface to TD in new borehole (approximately 100 ft bgs)		

a. Actual sampling depths may vary depending on the amount of backfill/overburden used in interim-stabilization activities at the waste site, field screening results, and varying subsurface conditions, consistent with the field sampling strategy (Section 3.2.3).

b. One duplicate, one split (optional), and one equipment blank (if possible and plausible).

c. Number of samples analyzed includes six sample barrel samples, two field quality-control samples, and zero physical-property samples.

d. To convert feet to meters, multiply by 0.3048.

bgs = below ground surface

N/A = not applicable

TD = total depth

3.1.2.7 216-T-19 Crib and Tile Field

The characterization planned for the 216-T-19 Crib and Tile Field includes drilling a borehole to groundwater and collecting samples and geophysical logs using this same borehole. Figure 3-24 shows the location of the borehole. The location was selected at the point of discharge to the tile field, near the overflow from the crib, where the highest volume of waste was disposed. Drilling will ensure that the vertical extent of contamination in the subsurface at this location is characterized.

The sampling intervals for the 216-T-19 Crib and Tile Field were selected to reduce the uncertainty associated with the nature and extent of contamination in the deep vadose zone that may be a source to groundwater. Because waste entered the 216-T-19 Crib and Tile Field at approximately 7.0 m (23 ft) bgs, contamination is not anticipated for the upper 4.6 m (15 ft) bgs of the vadose zone and no samples are planned for this interval. Samples will be collected at the bottom of the tile field and at changes in lithology, as depicted on Figure 3-25. The split-spoon samples will be analyzed for the COPCs presented in Table~~s 2-1, 2-2, and 2-3~~ 1-2, as indicated in the 216-T-19 Crib and Tile FSP (Table 3-14). Selected grab samples may be analyzed for mobile COPCs as determined by the field geologist and technical lead, using characterization data such as geophysical logs, lithology (geologist logs), and split-spoon sample analytical results, consistent with the field sampling strategy (Section 3.2.3). Groundwater samples or other opportunistic samples may be collected if requested to support integration with other Central Plateau activities.

Table 3-14. 216-T-19 Crib and Tile Field Sampling Plan

Sample Collection Methodology	Sample Location	Maximum Depth of Investigation	Sample Interval Depth (ft bgs)[a,d]	Analyte List	Physical Properties	
					Sample Interval	Parameters
Borehole to groundwater with split-spoon samples.	One deep borehole near connection between crib and tile field.	To groundwater (approximately 229 ft).	Split-spoon sample at depths: 27 – 29 ft bgs 39 – 41 ft bgs 42 – 44 ft bgs 58 – 60 ft bgs 92 – 94 ft bgs 99 – 101 ft bgs 118 – 120 ft bgs 168 – 170 ft bgs 216 – 218 ft bgs Approximate depths only. Grab samples at 10 ft intervals throughout borehole.	Analytes are presented in Tables ~~2-1, 2-2, and 2-3~~ 1-2.	One sample at each change in lithology or fine-grained interval (same as split-spoon sample intervals between 35 - 200 ft bgs), as shown on Figure 3-25.	pH, bulk density, moisture, particle size distribution.
Approximate number of split-spoon samples				9		
Approximate number of field quality-control samples[b]				2		
Approximate number of physical-property samples				7		
Approximate number of grab samples				23		
Approximate total number of soil samples collected				41		
Approximate total number of soil samples analyzed[c]				18		
Non-Sample Data Collection				**Maximum Depth of Investigation**		
Downhole gamma-spectroscopy log and neutron moisture log. Passive neutron log may be collected on a case-by-case basis if gamma-spectroscopy log and/or process history indicates the likely presence of plutonium contamination.				Surface to TD in new borehole (approximately 230 ft bgs).		

a. Actual sampling depths may vary depending on the amount of backfill/overburden used in interim-stabilization activities at the waste site, field screening results, and varying subsurface conditions, consistent with the field sampling strategy (Section 3.2.3).

b. One duplicate, one split (optional), and one equipment blank. Trip blanks will accompany samples collected for volatile organic analysis, as needed. Full trip blanks and field transfer blanks will accompany samples collected for volatile organic analysis, as needed.

c. Number of samples analyzed includes nine split-spoon samples, two field quality-control samples, and seven physical-property samples.

d. To convert feet to meters, multiply by 0.3048.

bgs = below ground surface

TD = total depth

3.1.2.8 TX Trenches (216-T-23 Trench and 216-T-25 Trench)

The characterization planned for the TX Trenches includes using DPT to push three drive points to refusal, attempting to reach the CCU, with geophysical logging of two drive points and sample collection at the third drive point. The locations of the drive points are shown on Figure 3-26. One location will be at the eastern end of the 216-T-25 Trench. The basis for selecting this location is that among the five TX Trenches, the 216-T-25 Trench received the largest volume of waste liquid and the largest inventory of contaminants. It is likely that the discharge points for the trenches were at their eastern ends.
The second location is at the eastern end of the 216-T-23 Trench. The basis for selecting this location is that geophysical logging suggests that the contamination is deepest at the 216-T-23 Trench. The drive point for collecting samples will be at the location of the deepest contamination, based on the geophysical logging of the first two drive points.

The sampling intervals were selected to reduce the uncertainty associated with the nature and extent of contamination in the shallow vadose zone above 4.6 m (15 ft) bgs that may pose a risk to human health and the environment, and in the deep vadose zone that may be a source to groundwater. Samples will be collected at the depth corresponding to the base of the trench and at changes in lithology, as depicted on Figure 3-27. The samples will be analyzed for the COPCs presented in Table~~s 2-1, 2-2, and 2-3~~ 1-2, as indicated in the 216-T-23 Trench and 216-T-25 Trench Sampling Plan (Table 3-15).

Table 3-15. 216-T-23 Trench and 216-T-25 Trench Sampling Plan

Sample Collection Methodology	Sample Location	Maximum Depth of Investigation	Sample Interval Depth (ft bgs)[a,d]	Analyte List	Physical Properties	
					Sample Interval	Parameters
Three direct pushes, one with sample barrel samples.	One direct push at the eastern end of the 216-T-23 Trench and one at the eastern end of the 216-T-25 Trench, with geophysical logging at both; the location for sampling will be based on geophysical logging.	Refusal, attempt to reach and sample the Cold Creek unit.	Sample barrel at depths: 12 – 14 ft bgs 32 – 34 ft bgs 48 – 50 ft bgs 76 – 78 ft bgs 88 – 90 ft bgs 103 – 105 ft bgs 113 – 115 ft bgs Approximate depths only; actual sample depths will be based on geophysical logging.	Analytes are presented in Tables ~~2-1, 2-2, and 2-3~~ 1-2.	N/A	N/A
Approximate number of sample barrel samples				7		
Approximate number of field quality-control samples[b]				2		
Approximate number of physical-property samples				0		
Approximate total number of soil samples collected				9		
Approximate total number of soil samples analyzed[c]				9		
Non-Sample Data Collection				**Maximum Depth of Investigation**		
Downhole gamma-spectroscopy log and neutron moisture log. Passive neutron log may be collected on a case-by-case basis if gamma-spectroscopy log and/or process history indicates the likely presence of plutonium contamination.				Surface to TD in each new borehole (approximately 115 ft bgs).		

a. Actual sampling depths may vary depending on the amount of backfill/overburden used in interim-stabilization activities at the waste site, field screening results, and varying subsurface conditions, consistent with the field sampling strategy (Section 3.2.3).

b. One duplicate, one split (optional), and one equipment blank (if possible and plausible).

c. Number of samples analyzed includes seven sample barrel samples, two field quality-control samples, and zero physical-property samples.

d. To convert feet to meters, multiply by 0.3048.

bgs = below ground surface

N/A = not applicable

TD = total depth

3.1.3 S Complex Area

Vadose zone characterization will be conducted at the following 200-DV-1 OU waste sites/groups in the S Complex Area: 216-S-9 Crib; 216-S-13 Crib; and 216-S-21 Crib.

3.1.3.1 216-S-9 Crib

The characterization planned for the 216-S-9 Crib includes using DPT to push one drive point to refusal, attempting to reach the CCU, with sample collection using the same drive point. The location of the drive point is shown on Figure 3-28. This location was selected to be near the influent (southern) end of the crib and near the leak of contaminated liquid waste discovered in 1969 at the junction of the pipelines to the 216-S-9 Crib (pipeline 200-W-139-PL) and the 216-S-23 Crib (pipeline 200-W-141-PL) (unplanned release UPR-200-W-108).

The sampling intervals were selected to reduce the uncertainty associated with the nature and extent of contamination in the shallow vadose zone above 4.6 m (15 ft) bgs that may pose a risk to human health and the environment, and in the deep vadose zone that may be a source to groundwater. Samples will be collected at the depth corresponding to the base of the crib and at changes in lithology, as depicted on Figure 3-29. The samples will be analyzed for the COPCs presented in Table~~s 2-1, 2-2, and 2-3~~ 1-2, as indicated in the 216-S-9 Crib Sampling Plan (Table 3-16).

Well 299-W22-95 is planned to be drilled at the northern end of the crib in support of groundwater remediation. Geophysical logging of this well will provide additional characterization for the 216-S-9 Crib.

Table 3-16. 216-S-9 Crib Sampling Plan

Sample Collection Methodology	Sample Location	Maximum Depth of Investigation	Sample Interval Depth (ft bgs)[a,d]	Analyte List	Physical Properties	
					Sample Interval	Parameters
Direct push with sample barrel samples.	One direct push at southern end of 216-S-9 Crib.	Refusal, attempt to reach and sample the Cold Creek unit.	Sample barrel at depths: 13 – 15 ft bgs 28 – 30 ft bgs 60 – 62 ft bgs 80 – 82 ft bgs 99 – 101 ft bgs 118 – 120 ft bgs 132 – 134 ft bgs Approximate depths only.	Analytes are presented in Tables~~ 2-1, 2-2, and 2-3~~ 1-2.	N/A	N/A
Approximate number of sample barrel samples				7		
Approximate number of field quality-control samples[b]				2		
Approximate number of physical-property samples				0		
Approximate total number of soil samples collected				9		
Approximate total number of soil samples analyzed[c]				9		
Non-Sample Data Collection				**Maximum Depth of Investigation**		
Downhole gamma-spectroscopy log and neutron moisture log. Passive neutron log may be collected on a case-by-case basis if gamma-spectroscopy log and/or process history indicates the likely presence of plutonium contamination.				Surface to TD in new borehole (approximately 140 ft bgs).		

a. Actual sampling depths may vary depending on the amount of backfill/overburden used in interim-stabilization activities at the waste site, field screening results, and varying subsurface conditions, consistent with the field sampling strategy (Section 3.2.3).

b. One duplicate, one split (optional), and one equipment blank (if possible and plausible).

c. Number of samples analyzed includes seven sample barrel samples, two field quality-control samples, and zero physical-property samples.

d. To convert feet to meters, multiply by 0.3048.

bgs = below ground surface

N/A = not applicable

TD = total depth

3.1.3.2 216-S-13 Crib

The characterization planned for the 216-S-13 Crib includes drilling a borehole to groundwater and collecting samples and geophysical logs using this same borehole. The location of the borehole is shown on Figure 3-30. The location was selected at the influent side of the crib to address the zone of expected highest contamination. Drilling will ensure that the vertical extent of contamination in the subsurface at this location is characterized.

The sampling intervals for the 216-S-13 Crib were selected to reduce the uncertainty associated with the nature and extent of contamination in the shallow vadose zone above 4.6 m (15 ft) bgs that may pose a risk to human health and the environment, and in the deep vadose zone that may be a source to groundwater. The samples also are planned to reduce the uncertainty associated with differences in the chromium inventory between the current Soil Inventory Model (SIM) and historical estimates (e.g., DOE/RL-91-60, *S Plant Aggregate Area Management Study Report*). Samples will be collected at the bottom of the crib and at changes in lithology, as depicted on Figure 3-31. The split-spoon samples will be analyzed for the COPCs presented in Table~~s 2-1, 2-2, and 2-3~~ 1-2, as indicated in the 216-S-13 Crib Sampling Plan (Table 3-17). Selected grab samples may be analyzed for mobile COPCs as determined by the field geologist and technical lead, using characterization data such as geophysical logs, lithology (geologist logs), and split-spoon sample analytical results, consistent with the field sampling strategy (Section 3.2.3). Groundwater samples or other opportunistic samples may be collected if requested to support integration with other Central Plateau activities.

Table 3-17. 216-S-13 Crib Sampling Plan

Sample Collection Methodology	Sample Location	Maximum Depth of Investigation	Sample Interval Depth (ft bgs)[a,d]	Analyte List	Physical Properties	
					Sample Interval	Parameters
Borehole to groundwater with split-spoon samples.	One deep borehole as close as feasible to the crib, but outside of the crib footprint.[e]	To groundwater (approximately 245 ft).	Split-spoon sample at depths: 13 – 15 ft bgs 29 – 31 ft bgs 33 – 35 ft bgs 75 – 77 ft bgs 98 – 100 ft bgs 124 – 126 ft bgs 158 – 160 ft bgs 172 – 174 ft bgs 193 – 195ft bgs 217 – 219 ft bgs 243 – 245 ft bgs Approximate depths only. Grab samples at 10 ft intervals throughout borehole.	Analytes are presented in Tables ~~2-1, 2-2, and 2-3~~ 1-2.	One sample at each change in lithology or fine-grained interval (same as split-spoon sample intervals below 32 ft bgs), as indicated in Figure 3-31.	pH, bulk density, moisture, particle size distribution.
Approximate number of split-spoon samples				11		
Approximate number of field quality-control samples[b]				3		
Approximate number of physical-property samples				6		
Approximate number of grab samples				24		
Approximate total number of soil samples collected				44		
Approximate total number of soil samples analyzed[c]				20		
Non-Sample Data Collection				**Maximum Depth of Investigation**		
Downhole gamma-spectroscopy log and neutron moisture log. Passive neutron log may be collected on a case-by-case basis if gamma-spectroscopy log and/or process history indicates the likely presence of plutonium contamination.				Surface to TD in new borehole (approximately 245 ft bgs).		

a. Actual sampling depths may vary depending on the amount of backfill/overburden used in interim-stabilization activities at the waste site, field screening results, and varying subsurface conditions, consistent with the field sampling strategy (Section 3.2.3).

b. One duplicate, one split (optional), and one equipment blank. Full trip blanks and field transfer blanks will accompany samples collected for volatile organic analysis, as needed.

c. Number of samples analyzed includes eleven split-spoon samples, three field quality-control samples, and six physical-property samples.

d. To convert feet to meters, multiply by 0.3048.

e. The crib was constructed using wooden timbers and presents a cave-in potential. For safety purposes, the borehole will be outside of the wood construction footprint.

bgs = below ground surface

TD = total depth

3.1.3.3 216-S-21 Crib

The characterization planned for the 216-S-21 Crib includes using DPT to push one drive point to refusal, attempting to reach the CCU, with sample collection using the same drive point. The location of the drive point is shown on Figure 3-32. The location was selected at the influent side of the crib to address the zone of expected highest contamination.

The sampling intervals were selected to reduce the uncertainty associated with the nature and extent of contamination in the shallow vadose zone above 4.6 m (15 ft) bgs that may pose a risk to human health and the environment, and in the deep vadose zone that may be a source to groundwater. Samples will be collected at the depth corresponding to the base of the crib and at changes in lithology, as depicted on Figure 3-33. The samples will be analyzed for COPCs presented in Table~~s 2-1, 2-2, and 2-3~~ 1-2, as indicated in the 216-S-21 Crib Sampling Plan (Table 3-18). The 13.1 to 13.7 m (43 to 45 ft) depth interval will address a zone of high moisture shown in a geophysical log from well 299-W23-63 in December 2006. The 25.9 to 26.8 m (85 to 88 ft) interval will address possible mobile contaminants present in a fine-grained, silt layer.

Table 3-18. 216-S-21 Crib Sampling Plan

Sample Collection Methodology	Sample Location	Maximum Depth of Investigation	Sample Interval Depth (ft bgs)[a]	Analyte List	Physical Properties	
					Sample Interval	Parameters
Direct push with sample barrel samples.	One location as close as feasible to the crib but outside of the crib footprint.[e]	Refusal, attempt to reach and sample the Cold Creek unit.	Sample barrel at depths: 13 – 15 ft bgs 33 – 35 ft bgs 43 – 45 ft bgs 85 – 87 ft bgs 98 – 100 ft bgs 112 – 114 ft bgs 119 – 121 ft bgs Approximate depths only.	Analytes are presented in Tables ~~2-1, 2-2, and 2-3~~ 1-2.	N/A	N/A
Approximate number of sample barrel samples				7		
Approximate number of field quality-control samples[b]				2		
Approximate number of physical-property samples				0		
Approximate total number of soil samples collected				9		
Approximate total number of soil samples analyzed[c]				9		
Non-Sample Data Collection				**Maximum Depth of Investigation**		
Downhole gamma-spectroscopy log and neutron moisture log. Passive neutron log may be collected on a case-by-case basis if gamma-spectroscopy log and/or process history indicates the likely presence of plutonium contamination.				Surface to TD in new borehole (approximately 125 ft bgs).		

a. Actual sampling depths may vary depending on the amount of backfill/overburden used in interim-stabilization activities at the waste site, field screening results, and varying subsurface conditions, consistent with the field sampling strategy (Section 3.2.3).

b. One duplicate, one split (optional), and one equipment blank (if possible and plausible).

c. Number of samples analyzed includes seven sample barrel samples, two field quality-control samples, and zero physical-property samples.

d. To convert feet to meters, multiply by 0.3048.

e. The crib was constructed using wooden timbers and presents a cave-in potential. For safety purposes, the borehole will be outside of the wood construction footprint.

bgs = below ground surface

N/A = not applicable

TD = total depth

3.2.4 Geophysical Logging

The drilled boreholes will be geophysically logged with the high-resolution, spectral gamma-ray logging system to determine the vertical distribution and concentration of gamma-emitting radionuclides. Soil moisture will be determined using a neutron logging tool. Passive neutron logs may be collected on a case-by-case basis if the gamma-spectroscopy log and/or process history indicates the likely presence of plutonium contamination. The boreholes will be logged before the casing is telescoped and before the borehole is decommissioned. The starting point for logging will be recorded; this is usually at the ground surface or the top of the casing. Boreholes will be decommissioned with DOE-RL and EPA approval, in accordance with WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells," after geophysical logging and all sampling are completed.

The direct-push boreholes will be geophysically logged using either a slim-hole spectral gamma-ray logging system or a gross gamma logging system. Soil moisture will be determined using a neutron logging tool. Passive neutron logs may be collected on a case-by-case basis if the gamma log and/or process history indicates the likely presence of plutonium contamination.

3.2.5 Sample Collection and Preservation

Sample collection under this SAP will be performed in accordance with site sampling procedures. Sample preservation, containers, and holding times are presented in Table 3-21. The holding time clock will begin for the continuous core sampling when the laboratory opens the Lexan© sleeve to perform the lithology description and determine the sample collection intervals.

Table 3-21. Sample Preservation, Container, and Holding-Time Guidelines

Analytes*	Matrix	Bottle		Amount[a,b]		Preservation	Packing Requirements	Holding Time[d,e]
		Number	Type	Minimum	Optimal			
Radionuclides								
Americium-241	Soil	1	G/P	8 g	20 g	None	None	6 months
Cesium-137	Soil	1	G/P	60 g	500 g	None	None	6 months
Europium-154	Soil							
Neptunium-237	Soil	1	G/P	8 g	20 g	None	None	6 months
Plutonium-239/240	Soil	1	G/P	8 g	20 g	None	None	6 months
Strontium-90	Soil	1	G/P	5 g	10 g	None	None	6 months
Technetium-99	Soil	1	G/P	18 g	30 g	None	None	6 months
Uranium-238	Soil	1	G/P	5 g	10 g	None	None	6 months
Chemicals								
IC anions – EPA Method 300.0	Soil	1	G/P	30 g	60 g	Cool 4°C	Cool 4°C	28 days/ 48 hours[c]
Metals by ICP, ICP/MS	Soil	1	G/P	10 g	20 g	Cool 4°C	Cool 4°C	6 months

Table 3-21. Sample Preservation, Container, and Holding-Time Guidelines

Analytes*	Matrix	Bottle		Amount[a,b]		Preservation	Packing Requirements	Holding Time[d,e]
		Number	Type	Minimum	Optimal			
Hexavalent chromium – Method 7196	Soil	1	aG	60 g	120 g	Cool 4°C	Cool 4°C	30 days
Mercury – Method 7471 – (CVAA)	Soil	1	G	2 g	5 g	Cool 4°C ± 2°C	Cool 4°C	28 days
Total cyanide – 9010	Soil	1	G	10 g	20 g	Cool 4°C	Cool 4°C	14 days
SVOA – Method 8270A	Soil	1	aG	120 g	250 g	Cool 4°C	Cool 4°C	14/40 days[d]
VOA – low level – Method 5035A/8260	Soil	5	aG	5 g		Freeze -7°C to -20°C	Freeze -7°C to -20°C	14 days
VOA – high level – Method 5035A/8260	Soil	3	aG	5 g		Cool 4°C	Cool 4°C	14 days

Notes:

*4-digit EPA methods are found in SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update IV-B*, as amended. EPA Method 300.0 is found in EPA/600/R-93/100, *Methods for the Determination of Inorganic Substances in Environmental Samples*.

a. Optimal sample amounts, which may be adjusted downward to accommodate the possibility of retrieval of a small amount of sample. Minimum sample size includes material needed for laboratory batch QC.

b. Mixed soil samples (co-located subsamples that are homogenized to ensure that the minimum sample amount requirements are met) may be obtained and submitted to the analytical laboratory for analyses for specific analytes.

c. The EPA Method 300.0 nitrate, nitrite, and phosphate holding time is 48 hours after sample extraction preparation. The holding time of 28 days applies to all other anions quantified by EPA Method 300.0.

d. The first number shown is the number of days to extract and the second number is the number of days to analyze the extract.

e. For continuous sonic core sampling, the holding time clock will begin when the laboratory opens the Lexan© sleeve to perform the lithology description and determine the sample collection intervals. While refrigeration of the sealed and intact soil cores contained within the Lexan© sleeve (capped at both ends) will prevent the loss of (or degradation of) the chemical analytes, the administrative goal will be to open the Lexan© sleeves within 120 days of the time the sleeves were capped at the drill site. However, some complicating factors (e.g., moderate to high radiation levels being encountered during drilling, boreholes needing to be re-drilled when total depth is not reached on first attempt, etc.) may require a small portion of the samples to be stored up to 12 months in refrigeration/freezer units.

aG = amber glass
CVAA = cold vapor atomic absorption
EPA = U.S. Environmental Protection Agency
G = glass
IC = ion chromatography
ICP = inductively coupled plasma
ICP/MS = inductively coupled plasma/mass spectrometry
P = plastic
SVOA = semivolatile organic analyte
VOA = volatile organic analyte

Attachment to TPA-CN-0748

This attachment provides excerpts from EPA's Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, Hanford Analytical Services Quality Assurance Requirements Document Volumes 1 through 4 (HASQARD) and a white paper summarizing the applicability of EPA's Sample Holding Time Reevaluation, 2005 Report.

CHAPTER TWO OF SW-846 - CHOOSING THE CORRECT PROCEDURE

2.1 Guidance Regarding Flexibility Inherent to SW-846 Methods and the Precedence of SW-846 Quality Control Criteria

Section 2.1, 4th paragraph, 1st and 2nd sentence, page TWO-2
"The performance data included in the SW-846 methods are not intended to be used as absolute QC acceptance criteria for method performance. The data are intended to be guidance, by providing typical method performance in typical matrices, to assist the analyst in selection of the appropriate method for the intended application."

2.2.6 Sample preservation and holding times
Section 2.2.6, 1st paragraph, 1st sentence, page TWO-5
"Table 2-40 provides information regarding recommended sample preservation techniques, sample holding times, and other information."

Section 2.2.6, 1st paragraph, 6th sentence, page TWO-6
"However, regarding the information in Table 2-40, a longer holding time may be appropriate if it can be demonstrated that reported concentrations are not adversely affected from preservation, storage and analyses performed outside the recommended holding times."

CHAPTER THREE OF SW-846 - INORGANIC ANALYTES

3.3.4 Sample Handling and Preservation

Section 3.3.4, 1st paragraph, second sentence, Page THREE-6
"Sample holding times, recommended collection volumes or masses and recommended digestion volumes, and preservatives are listed in Table 3-2."
The table included the following information (Page THREE-19 and THREE-20) for; Metals except Hg and Cr^{6+} solids a holding time of 6 months, Hexavalent chromium (solid matrix) a holding time of 30 days to extraction 7 days from extraction to analysis, for Mercury (solid matrix a holding time of 28 days, and for Cyanide (solid matrix) a holding time 14 days

The Holding Time column has this as a footnote: "A longer holding time may be appropriate if it can be demonstrated[1] that the reported analyte concentrations are not adversely affected by preservation, storage and analysis performed outside the recommended holding times."

CHAPTER FOUR OF SW-846 CHAPTER - ORGANIC ANALYTES

1st paragraph of Chapter, page FOUR-1
"Prior to employing the methods in this chapter, analysts are advised to consult the disclaimer statement at the front of this manual and the information in Chapter Two for guidance on the allowed flexibility in the choice of apparatus, reagents, and supplies. In addition, unless specified in a regulation, the use of SW846 methods is not mandatory in response to Federal testing requirements. The information contained in this chapter is provided by EPA as guidance to be used by the analyst and the regulated community in making judgments necessary to meet the data quality objectives (DQOs) or needs for the intended use of the data."

4.1.2 Sample Handling and Preservation: General Considerations

Section 4.1.2, 1st paragraph, 1st sentence, page FOUR-1
"The following sections deal separately with volatile organic chemicals (VOCs) and semivolatile organic chemicals (SVOCs). Refer to Chapter Two and Table 41 of this section for recommended sample containers, sample preservation, and holding time information"

Section 4.1.2, 2nd paragraph, 1st - 3rd sentences, page FOUR-1
"The preservation and holding time information presented in Table 4-1 does not represent EPA requirements, but rather is intended solely as guidance. Selection of preservation techniques and applicable holding times should be based on all available information, including the properties of the analytes of interest for the project, their anticipated concentration levels, the composition of the sample matrix itself, and the stated project specific DQOs. A shorter holding time may be appropriate if the analytes of interest are reactive (e.g., 2-chloroethyl vinyl ether, acrylamide) or the sample matrix is complex (e.g., wastewater)."

DOE/RL-96-68, HASQARD VOLUMES 1 THROUGH 4

Volume 1, Appendix A Glossary, page Vol.1: A-5 "Holding Time – Many analytes require adherence to holding time requirements. Regulatory holding time begins at sample collection. Some regulatory holding times include collection through final analysis; others segregate the time between collection through preparation, and preparation through analysis."

Volume 2, 4.4.7.3 Holding Times and Turn-Around Times, 4th bullet in section, page Vol. 2: 4-13
"• Recommended sample holding times guidelines are provided in Appendix A. These represent the maximum generally accepted lengths of time where, under the specified preservation conditions, significant loss of analytes, or degradation of analytes is not expected to occur. Unless there is reason to believe that unique circumstances could accelerate or delay the loss or degradation of analytes in a given set of samples, the holding times in Appendix A should not be deviated from. A project team may determine the applicability of holding times based on sampling and analysis constraints, data use, or other technical criteria. These determinations shall be documented in the applicable DQO document, SAP, or in project records.

Volume 2, 4.4.7.3 Holding Times and Turn-Around Times, 2nd paragraph, page Vol. 2: 4-13
"The consequences and impacts of missed holding times on data quality shall be taken into account in the sample collection planning process (Section 2.0), and actual missed holding times should be discussed or otherwise noted in the analytical data package or analytical report from the laboratory."

Volume 2, 4.4.8 Holding Times for Highly-Radioactive Samples, page Vol. 2: 4-13
"Short holding times (i.e., on the order of 24 hours to one to two weeks) required for some analyses may not be achievable for highly-radioactive samples because of the increased time required to handle high radiation samples with remote handlers in hot cells. The increased logistics required to survey, transport, and screen highly-radioactive samples before analysis may also contribute to missed holding times."

Note: CHPRC experienced this with borehole C9549 Cores 1 and 2.

Sample Holding Time Reevaluation, EPA/600/R-05/124, October 2005

3.1.4 Cr(VI) Holding Time for Extraction and Extract Stability – Conclusions, page 29 1st Paragraph
"The purpose of this study was to investigate if the extractable Cr(VI) concentration in soils/sediments was effected by the holding time prior to extraction according to SW-846 Method 3060A procedures. Of the six soils studied, five exhibited no or limited influence of holding time prior to extraction for the 224 days of this study regardless of the holding condition (4°C or -20°)."

Section 4 Conclusions
Page 95 2nd Paragraph
"The sixth Cr(VI) contaminated soil exhibited poor recovery (<5%) of the matrix spikes from the outset of the study."

PNNL personal communication, 2016: Thus, results of this sixth sample were determined to be impacted by other factors and it was reasonable to base the conclusions only on the other 5 samples.

Page 97 2nd Paragraph
"Extractable metal concentrations were not affected significantly by a holding time of up to 392 days or by air drying of the soils. Only one pooled data set exhibited a CV>20%, which is the current SW-846 precision metric for hot acid extraction of metals. However, CV>20% was found to be the result of one holding time data set that was well outside the Day 0 mean. The remaining data sets exhibited fairly tight CVs across time ranging from 5.6 to 15.8%. The CV data suggests that no chemically significant change in concentration occurred during the holding time sequence and the pooled data exhibited no clear cut difference between moist or dry sample handling."

Project Team Conclusion

CHPRC and PNNL drafted a "white paper" titled "Options for Hold Times As It Applies to 200-DV-1 Continuous-Core Soil Samples and Attenuation/Transport Study". The "white paper" was based on a review of the EPA guidance that suggested site specific hold times can be established if it can be demonstrated that sample degradation will not occur and the EPA Study of the hold-time effect for metals and redox –sensitive constituents. The review concluded that sample degradation is not expected for the 200-DV-1 samples during the storage and hold times established for the project.

References

DOE/RL-96-68, September 2014 *Hanford Analytical Services Quality Assurance Requirements Document Volumes 1 through 4*:

Volume 1: Administrative Requirements
http://www.hanford.gov/files.cfm/DOE-RL-96-68-VOL1-04.pdf
Volume 2: Sampling and Technical Requirements
http://www.hanford.gov/files.cfm/DOE-RL-96-68-VOL2-04.pdf
Volume 3: Field Analytical Technical Requirements
http://www.hanford.gov/files.cfm/DOE-RL-96-68-VOL3-04.pdf
Volume 4: Laboratory Technical Requirements
http://www.hanford.gov/files.cfm/DOE-RL-96-68-VOL4-04.pdf

EPA, October 2005, *Sample Holding Time Reevaluation*, EPA/600/R-05/124, Prepared by Battelle Memorial Institute, Pacific Northwest Division
http://nepis.epa.gov/Exe/ZyPDF.cgi/P10096LN.PDF?Dockey=P10096LN.PDF

EPA, July 2014, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, SW-846 Update V Revision 8. https://www.epa.gov/hw-sw846

White Paper *"Approach for Hold Times As It Applies to 200-DV-1 Continuous-Core Soil Samples and Attenuation/Transport Study"*, September 7, 2016, PNNL and CHPRC.

APPROACH FOR HOLD TIMES AS IT APPLIES TO 200-DV-1 CONTINUOUS-CORE SOIL SAMPLES AND ATTENUATION/TRANSPORT STUDY

September 7, 2016

A White Paper by PNNL and CHPRC

Due to the unique drilling operations and sampling methods required to support ongoing 200-DV-1 characterization sampling, this white paper was prepared to provide the information needed to support a decision on how long samples may be held in storage prior to analysis, and when the hold time clock starts. Details on the 200-DV-1 sampling operations are outlined in the *Characterization Sampling and Analysis Plan for the 200-DV-1 OU* (hereafter 200-DV-1 SAP) (DOE/RL-2011-104 Rev. 1).

Analyses for the 200-DV-1 operable unit (OU) identified in Table 3-21 of the 200-DV-1 SAP are targeted at characterizing the contaminant distribution. Additional analyses will also be conducted to identify and quantify processes that affect contaminant attenuation and transport. These additional analyses evaluate contaminant mobility using several types of methods. Interpretation of the attenuation and transport results will consider the biogeochemical conditions in the sample. The 200-DV-1 samples are continuous-core samples collected in one- to five-foot Lexan liners that are sealed (capped and taped) at the drill site, stored on ice, and delivered to refrigerated storage within 24 hours of collection. The 200-DV-1 OU sonic drilling process is continuous, therefore the duration from the time the first sample is collected until the time samples can be delivered to the laboratory is approximately 17 days based on the drilling crews working 4 days per week.

The unique operating constraints for 200-DV-1 OU requires an acceptable and technically defensible approach be developed for hold times which includes the establishment of a maximum duration of refrigerated storage for the sealed cores prior to opening. The process CHPRC is implementing is described below.

The approach being implemented assumes the hold time clock begins when a sealed sample liner is opened to extract sample material. Prior to opening, soil sample liners are stored at a temperature less than or equal to 4°C for up to 12 months with an administrative goal of initiating analyses within 120 days. This sample handling approach is based on the data being used to determine contaminant distribution in the deep vadose zone and to study attenuation/transport for assessing contaminant behavior. These data are not for direct exposure calculations in a risk assessment or for waste designation purposes. Furthermore, EPA's guidance suggested that site specific hold times can be established if it can be demonstrated that sample degradation will not occur. An EPA study of the hold-time effect for metals and redox-sensitive constituents was reviewed and used to provide evidence that sample degradation is not expected for the 200-DV-1 samples during the storage and hold times established for the project.

The EPA study results demonstrated that concentrations of extractable metals and redox-sensitive constituents (represented by hexavalent chromium in the study) are not significantly affected or degraded by sample storage for the time period specified for the 200-DV-1 sample storage (EPA/600/R-05/124, *Sample Holding Time Reevaluation*). Concentrations of anions and other biogeochemical analytes are also not expected to be significantly affected based on results for the redox-sensitive analyte hexavalent chromium in EPA/600-R-05/124.

The technical basis for this approach is the information provided in the EPA document, *Sample Holding Time Reevaluation* (EPA/600/R-05/124). This document included an assessment of hold (storage) time prior to acid extraction and analysis of metals and for alkaline extraction and analysis for hexavalent chromium, both for

sediment samples. The following quotes from EPA/600/R-05/124 describe the methods and conclusions of the study. For the metals study, "samples were digested using the acid-leachable digestion detailed in SW-846 Method 3051-Microwave Assisted Acid Digestion of Sediments, Sludges, Soils, and Oils. Digestates were analyzed via SW-846 Method 6020-Inductively Coupled Plasma-Mass Spectrometry." The report summarized conclusions for the metals portion of the study as follows. "Extractable metal concentrations were not affected significantly by a holding time of up to 392 days or by air drying of the soils. Only one pooled data set exhibited a coefficient of variation (CV) >20%, which is the current SW-846 precision metric for hot acid extraction of metals. However, CV >20% was found to be the result of one holding time data set that was well outside the Day 0 mean. The remaining data sets exhibited fairly tight CVs across time ranging from 5.6 to 15.8%. The CV data suggests that no chemically significant change in concentration occurred during the holding time sequence and the pooled data exhibited no clear cut difference between moist or dry sample handling." In addition, "results suggest that it would take a minimum of 709 days before the acid-extractable As, Cu, Pb, or Zn concentration would be reduced by 20%."

For the hexavalent chromium study, "chromate extraction of all soils/sediments was performed strictly according to SW-846 Method 3060A-Alkaline Digestion for Hexavalent Chromium. Analysis of the sediment/soil extracts was conducted according SW-846 Method 7196A-Chromium, Hexavalent (colorimetric)." The study summarized conclusions for the hexavalent chromium portion of the study as follows. "The purpose of this study was to investigate if the extractable Cr(VI) concentration in soils/sediments was effected [sic] by the holding time prior to extraction according to SW-846 Method 3060A procedures. Of the six soils studied, five exhibited no or limited influence of holding time prior to extraction for the 224 days of this study regardless of the holding condition (4°C or -20°). The sixth Cr(VI) contaminated soil exhibited poor recovery (<5%) of the matrix spikes from the outset of the study" (thus, results of this sixth sample were determined to be impacted by other factors and it was reasonable to base the conclusions only on the other 5 samples).

The EPA hold-time study results show that for sediment samples, analysis results are not negatively affected by refrigerated storage of the samples over the storage durations tested in the study, which were significantly longer than the analysis method hold times.

In considering the EPA hold-time study in relation to the 200-DV-1 sampling and analysis campaign, because samples are sealed and in refrigerated storage and the bulk groundwater/pore water from the sampled zone contains oxygen (similar to conditions in the EPA study), the biogeochemical conditions and associated contaminant conditions are expected to remain stable while in storage. Thus, biogeochemical reactions are anticipated to be minimal during this time and analysis results would be suitable for interpreting biogeochemical conditions, contaminant speciation, contaminant distribution among aqueous and sediment phases, and for assessments of contaminant mobility parameters. As with any sample obtained through split-spoon sampling, sediment disturbance with creation of fresh mineral surfaces (e.g., as rocks are abraded) may induce short term biogeochemical reactions. However, these reactions are expected to occur rapidly, are a potential interference even with near-term analysis of samples, and would not be expected to continue at a significant magnitude during refrigerated storage.

No hold time exceedances are expected for this approach.