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SGW-55471
Revision 0

Description of Work for the Installation of Hyporheic Zone Sampling Points Along the 100-BC-5 Shoreline, FY 2013

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
under Contract DE-AC06-08RL14788

CH2MHILL
Plateau Remediation Company
P.O. Box 1600
Richland, Washington 99352

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100-BC-5

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CH2M HILL Plateau Remediation Company

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By Shauna Adams at 2:51 pm, Jul 22, 2013

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Terms

BTR	Buyer's Technical Representative
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	*Code of Federal Regulations*
CHPRC	CH2M Hill Plateau Remediation Company
DOW	description of work
IDW	Investigation Derived Waste
MSW	miscellaneous solid waste
OU	Operable Unit
QA	Quality Assurance
RI/FS	remedial investigation/feasibility study
WAC	*Washington Administrative Code*

1 Introduction and Scope of Work

This description of work (DOW) addresses the design and construction of hyporheic zone sampling points that will be located along the shoreline of the Columbia River near the 100-BC Area of the Hanford Site. The work associated with this DOW is planned for fiscal year 2013. The installation of these hyporheic zone sampling points (HSPs) supports Ecology et al., (1989), *Hanford Federal Facility Agreement and Consent Order*, and will be in compliance with requirements of the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA).

After completion of remedial investigation (RI) studies under the *Integrated 100 Area Remedial Investigation/Feasibility Study Work Plan, Addendum 3: 100-BC-1, 100-BC-2, and 100-BC-5 Operable Units* (DOE/RL-2008-46-ADD3), additional data needs were identified. These pertain to (1) the hyporheic zone where 100-BC-5 groundwater discharges to the Columbia River, and (2) groundwater in the unconfined aquifer in the 100-BC-5 Operable Unit (OU). The installation and sampling of hyporheic zone sampling points addresses data need #1. Other drilling work in FY 2013 will address data need #2.

The primary contaminant of concern for this investigation is hexavalent chromium (Cr[VI]). Other groundwater contaminants of potential concern are strontium-90 and tritium; these will be analyzed to provide supplemental information on their nature and extent, but they are not the focus of this investigation.

Detectable levels of Cr(VI) have been measured in the hyporheic zone adjacent to 100-BC-5 Area (SGW-49368, *Columbia River Pore Water Sampling in 100-BC Area, November 2010*), but it is uncertain whether or not these levels reflect an exposure that poses a risk to aquatic receptors and that warrants remedial action. To characterize this risk a series of shallow sampling points will be screened in the hyporheic zone. Over a period of 2 years the HSPs will be sampled and analyzed for Cr(VI) and other parameters.

A project site map with the locations of existing aquifer tubes and planned new HSPs is shown in Figure 1. A total of 22 new HSPs will be installed at 14 sites. The HSPs will be constructed at 3 different depth intervals at four locations and one depth interval at the other 10 locations. Table 1 lists the HSP identification numbers, initial coordinate locations, and the depth of the installations.

This document follows the requirements of CH2M HILL Plateau Remediation Company (CHPRC) procedure GRP-EE-01-1.4, *Descriptions of Work for Well Drilling and Decommissioning*.

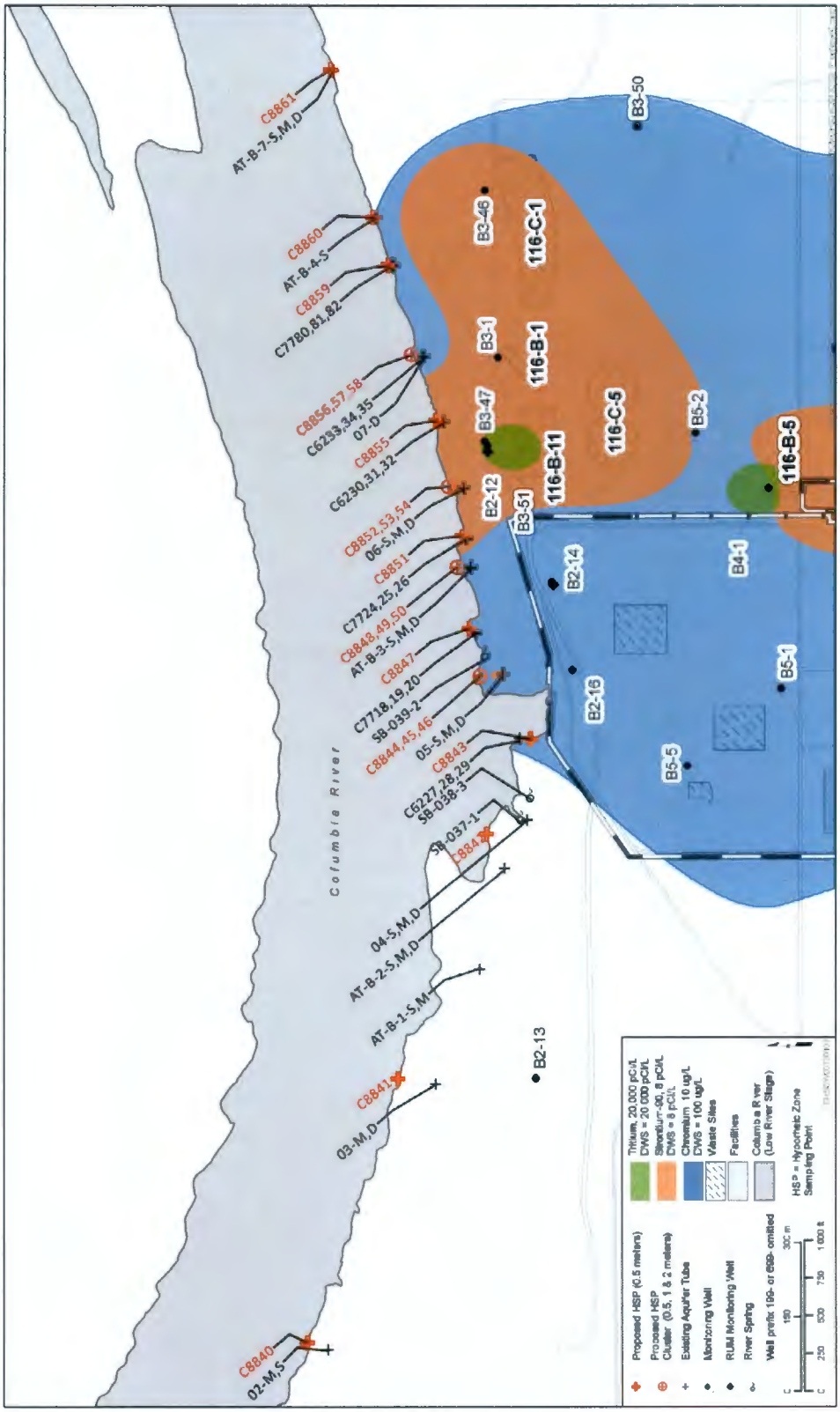

Figure 1 - Location of Existing Aquifer Tubes and Proposed Hyporheic Zone Sampling Points

Table 1 - Planned 100-BC Hyporheic Zone Sampling Points

Well ID	Temp No.	Group	Approximate Coordinates		Depth of Screen Bottom (m)
			Easting	Northing	
C8840	AT-1	Individual	563551	145732	0.5
C8841	AT-2	Individual	564087	145547	0.5
C8842	AT-3	Individual	564582	145364	0.5
C8843	AT-4	Individual	564776	145276	0.5
C8844	AT-5-1	Cluster	564904	145380	0.5
C8845	AT-5-2	Cluster	564904	145380	1
C8846	AT-5-3	Cluster	564904	145380	2
C8847	AT-6	Individual	565001	145402	0.5
C8848	AT-7-1	Cluster	565127	145425	0.5
C8849	AT-7-2	Cluster	565127	145425	1
C8850	AT-7-3	Cluster	565127	145425	2
C8851	AT-8	Individual	565192	145415	0.5
C8852	AT-9-1	Cluster	565295	145443	0.5
C8853	AT-9-2	Cluster	565295	145443	1
C8854	AT-9-3	Cluster	565295	145443	2
C8855	AT-10	Individual	565432	145469	0.5
C8856	AT-11-1	Cluster	565567	145519	0.5
C8857	AT-11-2	Cluster	565567	145519	1
C8858	AT-11-3	Cluster	565567	145519	2
C8859	AT-12	Individual	565746	145563	0.5
C8860	AT-13	Individual	565844	145598	0.5
C8861	AT-14	Individual	566141	145686	0.5

2 Background

This section summarizes the general history, geology, hydrogeology, and contaminants of interest for the 100-BC-5 Groundwater OU.

2.1 Site History and Previous Work Activities

In 1989, the Hanford Site was listed on the National Priorities List pursuant to CERCLA. To address CERCLA groundwater issues associated with 100-BC of the Hanford Site, the 100-BC-5 Groundwater OU was established. The boundaries of the 100-BC-5 Groundwater OU encompass an area of approximately 4.5 square miles, underlying mostly undeveloped land, with industrial buildings and associated structures located primarily within 100-BC.

Soil, groundwater, and hyporheic zone contamination in 100-BC is a result of more than 50 years of storage and disposal of large volumes of radioactive and non-radioactive dangerous wastes associated with the operation of two water-cooled nuclear reactors (105-B and 105-C Reactors). Large volumes of process water discharged to the soil column using cribs, trenches, and ponds. This discharge resulted in significant groundwater recharge and mounding, contamination of the unconfined aquifer, and movement of contamination into the Columbia River. Most of the waste sites in 100-BC have been remediated. One major remediation site, 100-C-7:1, is currently excavated to the water table.

The most widely distributed groundwater contaminants in the 100-BC-5 Groundwater OU are tritium, strontium-90, and Cr(VI). Tritium and strontium-90 concentrations exceeded drinking water standards in several wells in 2012. Hexavalent chromium exceeded the 10 µg/L aquatic standard in a broad plume, and the 48 ug/L groundwater cleanup standard sporadically in several wells in 2012. A final record of decision has not yet been developed for the 100-BC-5 Groundwater OU and no active remediation of groundwater is underway. Groundwater monitoring has continued since the initial RI and while waste site remedial actions are being conducted.

The HSPs described in this document are being installed to better define the level of Cr(VI) in the Columbia River substrate and changes in concentrations under varying river stages, to assess potential effects to aquatic receptors.

2.2 Geology

The stratigraphy of 100-BC consists of unconsolidated sedimentary deposits that overlie the older Columbia River Basalt Group flood basalts and associated sedimentary interbeds. The principal units present in and around 100-BC, from youngest to oldest, are:

- Holocene surficial deposits (primarily anthropogenic and eolian)
- Hanford formation sediments

- Ringold Formation
- Saddle Mountains Basalt, Columbia River Basalt Group

Holocene surficial deposits in the area are limited to fluvial gravels and overbank silty sands. Fluvial deposits only are found in and immediately adjacent to the modern Columbia River while the overbank deposits are found in small topographic depressions adjacent to the river. Eolian deposits are limited to a thin veneer of sediment on the surface.

The Hanford formation is an informal designation used to describe sediments deposited in association with cataclysmic Pleistocene floods. In the vicinity of 100-BC, the Hanford formation varies in thickness from over 100-ft in the southern and southeastern portions of the study area to less than 50-ft near the Columbia River in the northern and northwestern portions of the study area. In this area, the Hanford formation is generally coarser grained (i.e. gravel-dominated) than other 100 Area localities. Boulder gravel is often found in the upper 20 to 50-ft of the Hanford formation, causing difficult drilling conditions. The maximum observed clast size in these gravels is up to 6.6-ft and generally averages 0.8 to 1.6-ft in most of these boulder-rich deposits. The sand-dominated facies occurs locally in a few intervals, but is not thick or extensive enough to correlate. A significant silt-dominated facies within the Hanford formation is not apparent in 100-BC.

The Ringold Formation consists of interbedded, unconsolidated-to-cemented clay, silt, sand, and gravel that disconformably overlies the Columbia River Basalt Group. It was deposited by the ancient Columbia and Snake Rivers as they migrated eastward across the Site from the late Miocene to early Pliocene. The Ringold Formation beneath the study area is up to 590-ft thick and contains most of the Ringold units commonly encountered elsewhere at the Hanford Site. The fluvial gravel and sand units A, B, C, and E (in ascending order) are present and intercalated with lacustrine and fluvial over-bank deposits and paleosols. The units most likely to be observed during drilling will be the uppermost unit of the Ringold Formation (unit E) and the upper paleosols and overbank deposits referred to as the Ringold Formation upper mud unit. Ringold unit E consists of coarse-grained fluvial deposits and can range in thickness from 75 to 98-ft. The upper mud unit in 100-BC consists of clay and silt and is present beneath the entire 100-BC Area (DOE/RL-2010-96, *Remedial Investigation/Feasibility Study for the 100-BC-1, 100-BC-2, and 100-BC-5 Operable Units*). Zones of sand and silty gravel are present within or beneath the upper mud unit. The low permeability sediments of the upper mud unit function as an aquitard that forms the bottom boundary of the unconfined aquifer as described below.

The Elephant Mountain Member of the Columbia River Basalt Group is the uppermost basalt unit beneath 100-BC. The Elephant Mountain Member has a variable elevation throughout this area due to folding and flood erosion.

2.3 Hydrogeology

The uppermost aquifer system is found within the lowermost part of the Hanford formation and the entire Ringold Formation and includes a series of confining and water-producing zones. The upper part of the uppermost aquifer system is an unconfined zone of higher transmissivity, mainly within Ringold Formation unit E, and except in the northern 100-BC the lowest part of the Hanford formation (usually gravel-dominated facies). Below unit E, the system is confined or semi-confined, has lower transmissivity zones, and lies within alternating layers of coarse and fine Ringold Formation sediments (i.e., fluvial gravels and sands, and paleosols or overbank deposits). The uppermost aquifer system is underlain by the various Columbia River Basalt Group aquifers, which consist of alternating confining zones and confined aquifers corresponding with low transmissive basalt flow interiors and higher transmissive flow tops, rubbly and scoriaceous zones, or sedimentary interbeds (WHC-SD-EN-TI-133, *Geology of the 100-B/C Area, Hanford Site, South-Central Washington*).

Groundwater flow at 100-BC-5 near the Columbia River is influenced by river stage, which is directly controlled by the upstream Priest Rapids Dam. The rise and fall of river stage creates a dynamic zone of interaction between groundwater and river water, and influences flow patterns, transport rates, contaminant concentrations, and attenuation rates within the system (PNNL-13674, *Zone of Interaction Between Hanford Site Groundwater and Adjacent Columbia River: Progress Report for the Groundwater/River Interface Task Science and Technology Groundwater/Vadose Zone Integration Project*). The Columbia River discharge and resultant river stage in the Hanford Reach vary substantially on a seasonal basis and even on a daily and hourly basis, depending on the operations of Priest Rapids Dam. Water from the zone of interaction is a mixture of groundwater and river water. Specific conductance of groundwater from the inland portion of 100-BC is greater than 300 µS/cm, while that of river water averages approximately 140 µS/cm. When river stage is low, more groundwater can discharge to the river, causing specific conductance to increase in the zone of interaction. Figure 2 shows the flow regime during periods of low river water.

Physical, chemical, and biological processes that occur within the zone of interaction potentially alter the characteristics of groundwater nearing the Columbia River. Data suggest that physical processes are the primary influences on contaminant concentrations and fluxes where groundwater discharges into the river. Chemical processes may render contaminants less mobile as they adsorb to sediments or precipitate.

Field sampling activities conducted in 2008 through 2010 mapped areas of groundwater upwelling in 100-BC based on specific conductance and temperature (WCH-380, *Field Summary Report for Remedial Investigation of Hanford Site Releases to the Columbia River, Hanford Site, Washington: Collection of Surface Water, Pore Water, and Sediment Samples for Characterization of Groundwater Upwelling*). Specific conductance of pore water was found to decrease when the river stage increased, indicating less groundwater discharge during periods of moderate to high river stage. During periods of low river stage, areas of groundwater upwelling

were found along approximately 3.2 km (2 mi) of the 100-BC shoreline on the Hanford Site side of the river. Upwelling also occurs on the north side of the river where groundwater from Grant County discharges. In some areas, evidence of upwelling also was observed of the middle of the river channel.

A study of the shallow hyporheic zone in November 2010, when river stage was low and groundwater discharge was high, showed that specific conductance of pore water ranged from 159 to 355 µS/, with a mean of 264 µS/cm (SGW-49368). River water conductance ranged from 138 to 152 µS/cm, with a mean of 143 µS/cm.

2.4 Contaminants

Hexavalent chromium, tritium, and strontium-90 contamination has been detected at concentrations above the water quality standards in the upper part of the unconfined aquifer of the 100-BC. Hexavalent chromium forms a large plume at relatively low concentrations (generally less than 50 µg/L) and appears to be declining slowly in most wells. However, two wells in southern 100-BC-5 showed sharp increases in Cr(VI) concentrations in 2011 and early 2012. These changes may have been caused by remediation activities at the 100-C-7 and/or 100-C-7:1 waste sites. Tritium and strontium-90 concentrations have exceeded the drinking water standards in several wells, but have been declining overall (DOE/RL-2011-118, *Hanford Site Groundwater Monitoring Report for 2011*). The extent of contamination has not been defined spatially in all locations of 100-BC, and the vertical distribution of contamination has not been fully characterized throughout the aquifer or in the hyporheic zone in the river.

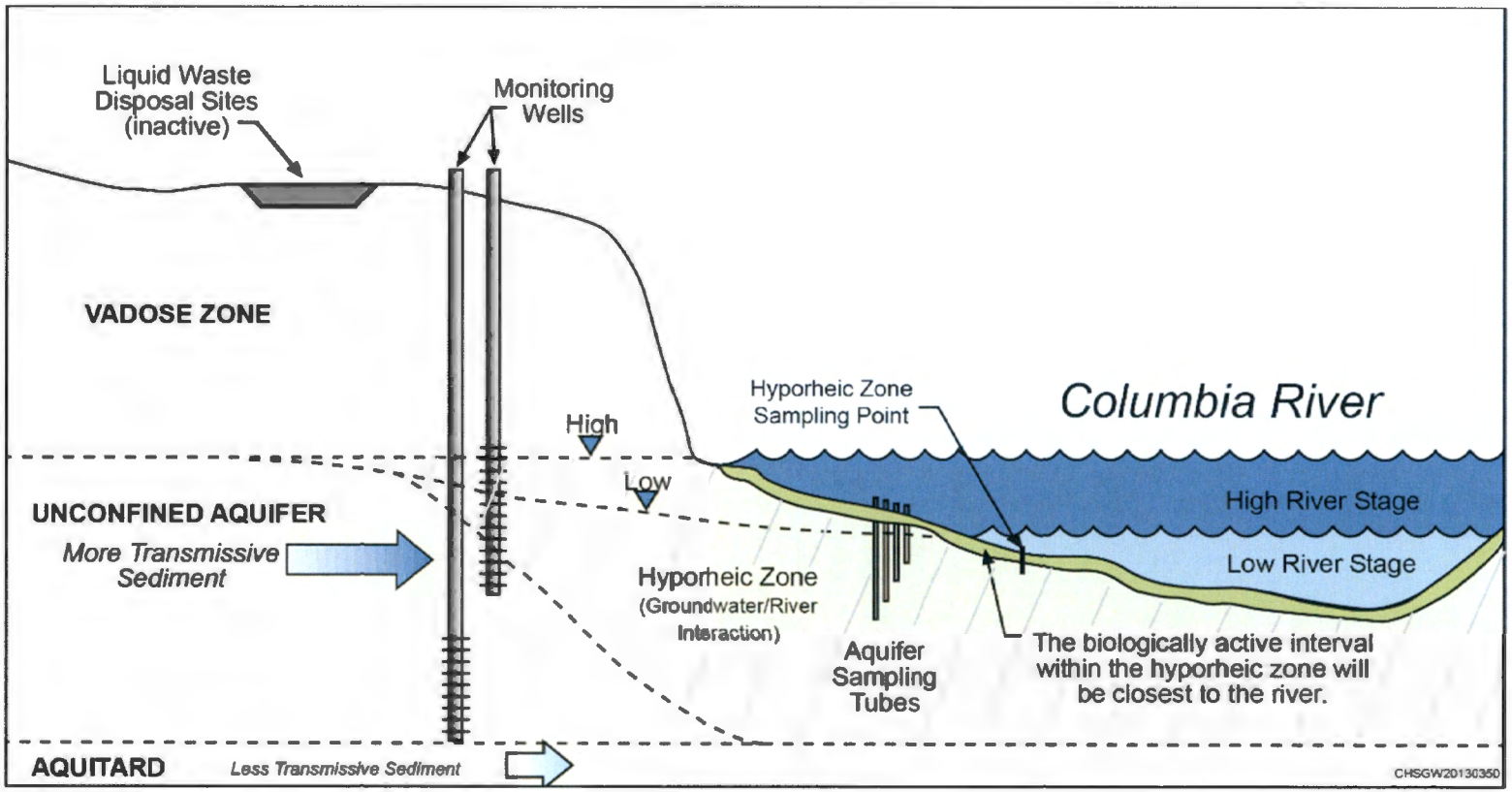

Figure 2 - Groundwater/River Interface

3 Description of Work Activities

The planning and construction of the Hyporheic Sampling Points (HSP) will be conducted under this DOW, and will adhere to CHPRC procedures, guidelines, and requirements. The WDOH (2008), *The Department of Energy Hanford Site Radioactive Air Emissions License #FF-01*, Enclosure 3, "ALARACT Agreements," ALARACT 18, "Environmental Restoration Program ALARACT Demonstration for Drilling," shall also apply. The design and installation activities and specifications for the completed HSPs are included in the following sections.

3.1 Site Preparation

The HSPs will be installed from a boat using specialized equipment. It is anticipated that field activities will begin the middle of August or early September so the HSPs can be built during low river stage, as forecasted by the Northwest River Forecast Center (Figure 3; http://www.nwrfc.noaa.gov/rfc/).

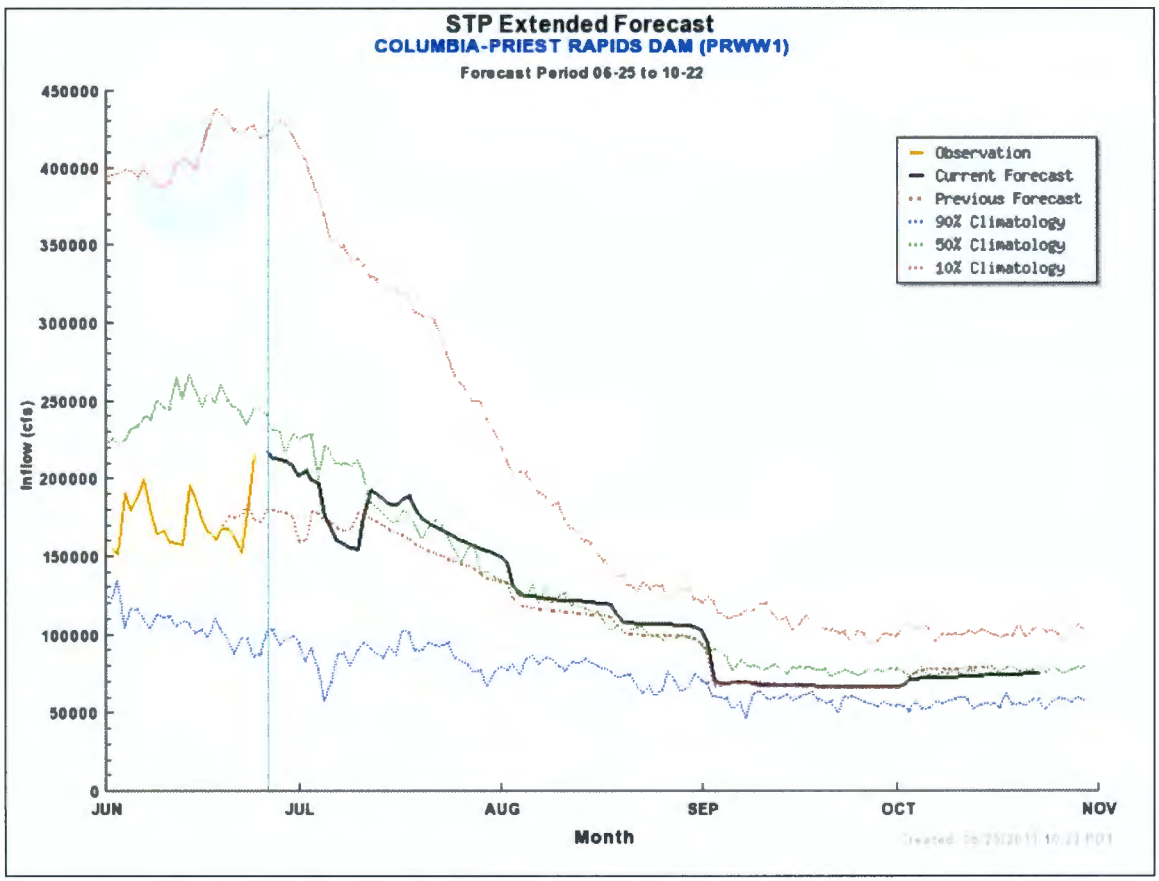

Figure 3 - Forecasted River Levels Below Priest Rapids Dam

Cultural and ecological evaluations have been completed as part of site preparation and prior to the start of field activities. This includes approval from the National Marine Fisheries Service because of potential effects to sensitive aquatic species.

3.2 Installation of Hyporheic Zone Monitoring Points

The Contractor will be responsible for complying with Washington State and Federal boating regulations and safety rules, and applicable CHPRC procedures. A record of site field activities will be maintained by the buyer's representative field geologist and recorded in daily field activity reports. HSPs will be installed and sampled using the Contractors specialized equipment, procedures, and processes. The following information provides the location, elevation, and depths of the HSPs:

- 22 HSPs will be installed in the riverbed at 14 locations (Figure 1; Table 1 with approximate coordinates).
- Each HSP will be installed at an elevation where the river bed is submerged beneath approximately 1 m (3 ft) of water during low river stage
- Each of the 14 sites will have one HSP with bottom of screen at approximately 0.5 m below top of riverbed (excluding large boulders).
- Four sites will also have an HSP with screens at approximately 1 and 2 meters below top of riverbed.
- HSPs and associated tubing will be submerged in the river; no parts above the low water mark.

The design and general installation procedure for the HSPs is as follows:

- Prior to installation: Deploy the liquid tip Trident probe to the riverbed to confirm the presence of groundwater upwelling and determine likelihood of installing HSPs to the target riverbed depths. Monitor the probe for up to 60 minutes to determine/verify that groundwater is upwelling and to assess the pore water pumping rates that do not appear to affect short-circuiting with surface water. If the probe cannot be driven to the desired depth, adjust the boat slightly (no greater than 5 meters from the pre-selected location) and try again. If multiple attempts do not locate an upwelling signal, consult with CHPRC technical staff.
- Installation: Attach the HSP to the Trident driving frame using a quick-release device and drive it into the riverbed to the pre-selected depth(s). If pre-selected riverbed depths are not attained due to refusal, the field team lead will contact the Project Lead to discuss conditions and determine whether to leave the tube as-is or make another attempt to drive the tube deeper at a nearby location. The depth (+/- 5 cm) in which the HSP is left in place will be measured by field observers using an underwater video camera mounted to the driving frame.
- Separate the HSP from the driving frame. Polyethylene sample tubing, data logger cable (if included), and tether rope will be remain connected to the HSP at a length sufficient to facilitate recovery and subsequent sampling from the vessel during any river stage conditions expected to be encountered throughout the year (as high as ~350Kcfs). The sample tubing, data logger cables, and the quick-release tether rope may be covered with

a woven loom to help durability and to keep all the tubes and cables together during each sampling event.

- The HSP must be capable of being sampled at various frequencies (full range of river stage) for a period of 2 years.
- All of the 0.5-meter deep HSPs will be constructed so they can be equipped with dataloggers (i.e., sufficient diameter to accept equipment, with ability to retrieve data and remove or install equipment during the study). Deeper HSPs may use the same or an alternative design.
- The screened portion of each HSP shall be approximately 15 cm (6 in.) long.
- Dataloggers will be installed in 4 of the HSPs as part of the completion: C8844, C8848, C8852, and C8856. These sites will also have a datalogger installed on the river bottom.
- Dataloggers must be capable of recording water level (pressure), conductivity, and temperature. The subcontractor will provide specifications about the type of datalogger and related equipment, and CHPRC will procure the equipment. A barometric datalogger on land is also required and will be installed by CHPRC staff.
- CHPRC will provide a scientist to participate in the installation, make field decisions, and keep notes.

3.3 HSP Sampling

Sampling of the HSPs will not occur during the installation but are planned to be initiated October 1, 2013.

3.4 Final Report

A final report will be prepared after completion of the HSPs by the subcontractor to compile and archive records, observations, and measurements associated with their construction. The report will include at a minimum the following items:

- x-y coordinates of final HSPs
- elevation of river bed and depth of screen at each HSP
- conditions of river substrate
- water quality data (conductivity and temperature) collected during installation
- recommended pumping rates
- use of well IDs (numbers) in documentation

The field notes generated by the CHPRC technical person will be included in the report as applicable, and generally presented in summary form. The scientist notes original notes will be included in the project files.

4 Waste Management

Waste generated from the installation of the HSPs will include decontamination waste, personal protective equipment, and miscellaneous solid waste (MSW). Waste generated in the scope of this project will be managed according to DOE/RL-2004-30, *Waste Control Plan for the 100-BC-5 Operable Unit*. The contractor shall be responsible for packaging and handling all wastes generated during construction, testing, decontamination, and demobilization. All waste will be packaged in accordance with SGRP-PRO-OP-50120, *Waste Packaging and Handling at S&GRP*. The CHPRC Waste Management Representative will provide waste management additional guidance if necessary.

Investigation Derived Waste (IDW), which includes open containers of groundwater-contacted sediment, purgewater, river sediments, etc., will be surveyed by the Industrial Health and Radiation Control technicians in accordance with the site-specific Health and Safety Plan and Scheduled Radiation Survey Task Description (SRSTD).

5 Quality Assurance

CHPRC issued document PRC-MP-QA-599, *Quality Assurance Program*, describes how CHPRC implements the quality assurance (QA) requirements conveyed in U.S. Department of Energy Order 414.1D, *Quality Assurance*, and 10 CFR 830.121, *Nuclear Safety Management*. PRC-MP-QA-599 also shows how Ecology et al. (1989) and DOE/RL-96-68, *Hanford Analytical Services Quality Assurance Requirements Document (HASQARD)*, apply to Environmental QA Program Plans. CHPRC has also issued CHPRC-00189, *Environmental Quality Assurance Plan*.

All CHPRC employees and subcontractors performing environmental cleanup activities are responsible for performing work in accordance with the requirements set forth in CHPRC-00189. All work performed under this DOW will be performed in compliance with Project Hanford Management System overall QA program design (PRC-MP-QA-599). A project specific QA Program plan for the Soil and Groundwater Remediation Project scope is presented in Appendix C of CHPRC-00189.

Technical procedures to be followed are listed in Section 7.2 of this document.

6 Schedule

Construction of the hyporheic zone sampling points is scheduled to begin around the middle of August to early September, after Columbia River flows are at low stage. The installations will be completed no later than September 30, 2013 in preparation for sampling October 1.

7 General Requirements

Field work for the wells will be conducted in accordance with CHPRC procedures and protocols and the specifications set forth in this DOW. The applicable procedures are discussed in the following sections.

7.1 Safety and Health

All personnel working at the drilling sites will have completed, at a minimum:

- Occupational Safety and Health Administration Act 40-hour Hazardous Waste Site Worker training program (29 CFR 1910.120).
- CHPRC General Employee Training (CGET).

Work will be performed in accordance with the following procedures:

- CHPRC-00073, *CHPRC Radiological Control Manual*
- SGRP-PRO-OP-50120, *Waste Packaging and Handling at S&GRP*
- Soil and Groundwater Remediation Project Radiological Control Procedures.
- CHPRC Occupational Safety and Health Procedures
- Site specific plans, as applicable:
  - Health and safety plans
  - Radiological Work Permit, as applicable
  - Activity hazard analysis/job safety analysis

7.2 Procedures

This section identifies technical procedures/specifications applicable to field activities performed under this DOW. 0000X-DC-W0001, Rev. 9, *Supplemental Waste Acceptance Criteria for Disposal at Environmental Restoration Disposal Facility.*

- GRP-EE-01-1.4, *Descriptions of Work for Well Drilling and Decommissioning*
- GRP-EE-01-1.11, *Purgewater Management*
- GRP-EE-02-14.1, *Drilling, Remediating, and Decommissioning Resource Protection Wells and Geotechnical Soil Borings*
- GRP-FS-04-G-029, *Non-VOC Soil Sediment Sampling*
- HNF-EP-0063, *Hanford Site Solid Waste Acceptance Criteria*
- PRC-PRO-EP-15333, *Environmental Protection Processes*
- PRC-PRO-EP-15335, *Environmental Permitting and Documentation Preparation*
- PRC-RD-EP-15332, *Environmental Protection Requirements*
- SGRP-PRO-OP-50120, *Waste Packaging and Handling at S&GRP*

8 Project Documents

Documentation requirements for these activities are separated into scoping documents, field activity documents, and reporting documents. The following documents will be prepared to support the well drilling activity:

Scoping Documents

- DOW (this document)
- Subcontractor scope of work (procurement package)
- Excavation permit (only cultural and ecological reviews)
- Additional waste management documents, as required

Field Documentation

- Well Drilling/Decommissioning Planning form
- Daily Field Activity Reports
- Field Logbook
- Survey Data Report
- Acceptance Report

Reporting Documents

- Field documentation will be transmitted to Drilling Operations for incorporation into the well database
- Installation Summary Report

The records produced for this project will undergo technical and management review in accordance with CHPRC practices and procedures. The required reviewers will be identified prior to document completion, and the review time will be established as soon as practical.

9 References

0000X-DC-W0001, 2008, *Supplemental Waste Acceptance Criteria for Bulk Shipments to the Environmental Restoration Disposal Facility*, Rev. 9, Washington Closure Hanford, Richland, Washington.

10 CFR 830.121, *Nuclear Safety Management, Code of Federal Regulations*, as amended. Available at: http://edocket.access.gpo.gov/cfr_2001/janqtr/pdf/10cfr830.121.pdf

10 CFR 830.122, *Quality Assurance Program, Code of Federal Regulations*, as amended. Available at: http://edocket.access.gpo.gov/cfr_2001/janqtr/pdf/10cfr830.122.pdf

29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response, Code of Federal Regulations,* as amended. Available at: http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=9765

CH2M Hill Plateau Remediation Company Soil and Groundwater Remediation Project Procedures:

GRP-EE-01-1.4, *Descriptions of Work for Well Drilling and Decommissioning*

GRP-EE-01-1.11, *Purgewater Management*

GRP-EE-02-14.1, *Drilling, Remediating, and Decommissioning Resource Protection Wells and Geotechnical Soil Borings*

GRP-FS-04-G-029, *Non-VOC Soil Sediment Sampling*

HNF-EP-0063, *Hanford Site Solid Waste Acceptance Criteria*

PRC-MP-QA-599, Quality Assurance Program, CH2M Hill Plateau Remediation Company, Richland, Washington.

PRC-PRO-EP-15333, *Environmental Protection Processes*

PRC-PRO-EP-15334, *Effluent and Environmental Monitoring*

PRC-PRO-EP-15335, *Environmental Permitting and Documentation Preparation*

PRC-RD-EP-15332, *Environmental Protection Requirements*

SGRP-PRO-OP-50120, *Waste Packaging and Handling at S&GRP*

CHPRC-00073, *CH2M Hill Plateau Remediation Company Radiological Control Program*, CH2M HILL Plateau Remediation Company, Richland, Washington.

CHPRC-00189, 2013, *CH2M HILL Plateau Remediation Company Environmental Quality Assurance Program Plan,* Rev. 10, CH2M Hill Plateau Remediation Company, Richland, Washington.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 USC 9601, et seq.

DOE Order 414.1D, 2005, *Quality Assurance*, U.S. Department of Energy, Office of Environment, Safety, and Health, Washington, D.C. Available online at: http://www.directives.doe.gov/pdfs/doe/doetext/neword/414/o4141c.pdf

DOE/RL-96-68, 2007, *Hanford Analytical Services Quality Assurance Requirements Document (HASQARD),* Rev. 3, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available online at: http://www.osti.gov/bridge/servlets/purl/353246-AYoB3e/webviewable/353246.pdf

DOE/RL-2004-30, 2005, *Waste Control Plan for the 100-BC-5 Operable Unit*, U. S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://www5.hanford.gov/arpir/?content=findpage&AKey=D7584312

DOE/RL-2008-46-ADD3, 2010, *Integrated 100 Area Remedial Investigation/Feasibility Study Work Plan, Addendum 3: 100-BC-1, 100-BC-2, and 100-BC-5 Operable Units*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://www2.hanford.gov/arpir/?content=findpage&AKey=0093542.

DOE/RL-2009-44, 2012, *Sampling and Analysis Plan for the 100-BC-1, 100-BC-2, and 100-BC-5 Operable Units Remedial Investigation/Feasibility Study*, Rev. 0, U.S. Department of Energy, Richland, Washington.

DOE/RL-2010-96, *Remedial Investigation/Feasibility Study for the 100-BC-1, 100-BC-2, and 100-BC-5 Operable Units,* U.S. Department of Energy, Richland, Washington.

DOE/RL-2011-118, *Hanford Site Groundwater Monitoring Report for 2011,* U.S. Department of Energy, Richland, Washington.

Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement), 2 volumes, as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

HNF-EP-0063, 2008, *Hanford Site Solid Waste Acceptance Criteria*, Rev. 14, Fluor Hanford, Inc., Richland, Washington.

Izatt, R. D., 1990, *Strategy* for *Handling and Disposing of Purgewater at the Hanford Site, Washington*, letter 90-ERB-040, to P. T. Day, U.S. Environmental Protection Agency, and T. L. Nord, Washington State Department of Ecology, dated July 19, 1990, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

PNNL-13674, 2001, *Zone of Interaction Between Hanford Site Groundwater and Adjacent Columbia River: Progress Report for the Groundwater/River Interface Task Science and Technology Groundwater/Vadose Zone Integration Project,* Pacific Northwest Nation Laboratory, Richland, Washington

SGW-49368, 2011, *Columbia River Pore Water Sampling in 100-BC Area, November 2010,* CH2M Hill Plateau Remediation Company, Richland, Washington.

TPA-CN-559, 2013, *Change Notice for Modifying Approved Documents/Workplans In Accordance with the Tri-Party Agreement Action Plan, Section 9.0, Documentation and Records: Sampling and Analysis Plan for the 100-BC-1, 100-BC-2, and 100-BC-5 Operable Units Remedial Investigation/Feasibility Study, Rev. 0, DOE/RL-2009-44,* Dated January 2013, U.S. Department of Energy, Richland Operations Office, and U.S. Environmental Protection Agency, Richland, Washington.

WCH-380, *Field Summary Report for Remedial Investigation of Hanford Site Releases to the Columbia River, Hanford Site, Washington: Collection of Surface Water, Pore Water, and Sediment Samples for Characterization of Groundwater Upwelling,* Washington Closure Hanford, Richland, Washington.

WCH-191, 2008, *Environmental Restoration Disposal Facility Waste Acceptance Criteria,* Rev. 0, Washington Closure Hanford, Richland, Washington.

WDOH, 2008, *The Department of Energy Hanford Site Radioactive Air Emissions License #FF-01,* Enclosure 3, "ALARACT Agreements," ALARACT 18, "Environmental Restoration Program ALARACT Demonstration for Drilling," Washington State Department of Health, Office of Radiation Protection, Radioactive Air Emissions Section, Richland, Washington. Available at: http://www.doh.wa.gov/ehp/rp/air/aff02lic.pdf

WHC-SD-EN-TI-133, 1993, *Geology of the 100-B/C Area, Hanford Site, South-Central Washington*, Rev. 0, Westinghouse Hanford Company, Richland, Washington. Available at: http://www5.hanford.gov/arpir/?content=findpage&AKey=D196134620

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