

Table 1-4. 200-UP-1 Operable Unit Well Specifications

Well Name (Well Identification)	Well Type	Parameter Description ^a	Parameter Value ^a
699-30-70 (C9635) (Optional)	Monitoring (Southeast chromium plume characterization)	Surface elevation (m NAVD88)	197.0
		Water table elevation (m NAVD88)	131.1
		Elevation top of Lower Mud unit (m NAVD88)	83.7
		Elevation bottom of Lower Mud unit (m NAVD88)	67.9
		Elevation basalt (m NAVD88)	28.1
		Depth to water (ft bgs)	216
		Depth to top of Lower Mud unit (ft bgs)	372
		Depth to bottom of Lower Mud unit (ft bgs)	424
		Depth to basalt (ft bgs)	554
		Planned screen length (ft)	35
		Planned depth to top of 4 in. SS screen (ft bgs)	216
		Planned depth to bottom of 4 in. SS screen (ft bgs)	251
		Planned total depth (ft bgs)	382
		299-W19-127 (C9605) (Planned 2018)	Dual Use Monitoring-Extraction (U Tank Farm technetium-99 plume)
Water table elevation (m NAVD88)	131.5		
Elevation top of Lower Mud unit (m NAVD88)	76.3		
Elevation bottom of Lower Mud unit (m NAVD88)	63.8		
Elevation basalt (m NAVD88)	42.5		
Depth to water (ft bgs)	260		
Depth to top of Lower Mud unit (ft bgs)	441		
Depth to bottom of Lower Mud unit (ft bgs)	482		
Depth to basalt (ft bgs)	552		
Planned screen length (ft)	301 ¹⁸⁰ ^{bt}		
Planned depth to top of 48 in. SS screen (ft bgs)	260		
Planned depth to bottom of 48 in. SS screen (ft bgs)	290 ⁴⁴⁰		
Planned total depth (ft bgs)	295 ⁴⁵¹		

Table 1-4. 200-UP-1 Operable Unit Well Specifications

Well Name (Well Identification)	Well Type	Parameter Description ^a	Parameter Value ^a
299-W19-128 (C9606) (Planned 2018)	Dual-Use Monitoring/Extraction (U Tank Farm technetium-99 plume)	Surface elevation (m NAVD88)	207.1
		Water table elevation (m NAVD88)	131.8
		Elevation top of Lower Mud unit (m NAVD88)	72.1
		Elevation bottom of Lower Mud unit (m NAVD88)	61.1
		Elevation basalt (m NAVD88)	41.6
		Depth to water (ft bgs)	247
		Depth to top of Lower Mud unit (ft bgs)	443
		Depth to bottom of Lower Mud unit (ft bgs)	479
		Depth to basalt (ft bgs)	543
		Planned screen length (ft)	301 ^{190b,*}
		Planned depth to top of 48 in. SS screen (ft bgs)	247
		Planned depth to bottom of 48 in. SS screen (ft bgs)	277 ⁴³⁷
		Planned total depth (ft bgs)	282 ⁴⁵³
		699-39-68 (C9607) (Planned 2018)	Dual-Use Monitoring/Injection (Nitrate plume and bound iodine-129, and tritium plumes)
Water table elevation (m NAVD88)	129.5		
Elevation top of Lower Mud unit (m NAVD88)	101.8		
Elevation bottom of Lower Mud unit (m NAVD88)	93.2		
Elevation basalt (m NAVD88)	54.2		
Depth to water (ft bgs)	314		
Depth to top of Lower Mud unit (ft bgs)	405		
Depth to bottom of Lower Mud unit (ft bgs)	433		
Depth to basalt (ft bgs)	561		
Planned screen length (ft)	110 ^e		
Planned depth to top of 8 in. SS screen (ft bgs)	290		
Planned depth to bottom of 8 in. SS screen (ft bgs)	400		
Planned total depth (ft bgs)	415		

Table 3-1. Planned Sampling during Drilling of 200-UP-1 Groundwater Wells

Well Name	Sample Matrix	Depth Below Water Table (Borehole Depth) (ft)	Allowable Variation on Depth	Analytes	Comment
	Water (PNNL research)	10 (226) 30 (246) 50 (266) 70 (286) 90 (306) 110 (326) 130 (346) 150 (366)	±5 ft	See Section 3.2.3	A single, 1 L unfiltered sample collected at the specified depths within the unconfined aquifer. If the lower mud unit is not encountered at the estimated depth, water samples will be collected every 20 ft until reaching the mud. Use a polyethylene container, no preservative, and cool to ≤4°C. Samples are to be delivered to the PNNL 331 Building.
299-W19-127 (C9605) Dual-Use Monitoring/ Extraction	Saturated Soil (CHPRC)	0 to 180 <u>35</u> (260 to 440 <u>295</u>)	±1 ft	N/A	Grab samples from the drill cuttings at 5 ft intervals from 0 to 180 <u>35</u> ft below the water table, composited into several samples for sieve analysis. <u>Adjacent grab samples with similar texture may be composited.</u> <u>Results Sieve analysis results from grab and/or composite samples</u> will be used to select well screen slot size <u>and filter pack material.</u>
	Water (CHPRC)	10 (270) <u>20 (280)</u> 30 (290) <u>40 (300)</u> 60 (320) <u>50 (310)</u> 80 (340) <u>70 (330)</u> 100 (360) <u>90 (350)</u> 120 (380) <u>110 (370)</u> 140 (400) <u>130 (390)</u> 160 (420) <u>150 (410)</u> 180 (440) <u>170 (430)</u>	±5 ft	Gross Alpha Gross Beta Iodine-129 Technetium-99 Tritium Uranium Nitrate Carbon Tetrachloride TCE	Water samples to be collected every 20 ft starting at 10 ft below the water table. If the lower mud unit is not encountered at the estimated depth, water samples will be collected every 20 ft until reaching the mud <u>10, 20, 30, and 40 ft below the water table and every 20 ft thereafter until reaching the Ringold lower mud.</u> Filter all samples except carbon tetrachloride and TCE. Purge and pump samples are preferred. Bailed samples can be collected if purging is not practicable, as determined by the technical lead. <u>Submit water samples collected at 10, 20, 30, 40, and 60 ft below the water table for fast-turnaround technetium-99 analysis for potential screen-length adjustment.</u>

Table 3-1. Planned Sampling during Drilling of 200-UP-1 Groundwater Wells

Well Name	Sample Matrix	Depth Below Water Table (Borehole Depth) (ft)	Allowable Variation on Depth	Analytes	Comment
	Unsaturated Soil (200-WA-1)	<u>-129 (131)</u> <u>-127 (133)</u> <u>-125 (135)</u> <u>-123 (137)</u> <u>-121 (139)</u> <u>to continue (as needed) through at least 4 ft into the CCU</u> <u>Additional 200-WA-1 integration sampling to be determined</u>	±1 ft	<u>See Table 3-3</u>	<u>Continuous split-spoon samples to be collected starting at 131 ft bgs (6 ft above the estimated top of the CCU) through at least 4 ft into the CCU. The soil sample collected from the actual top of the CCU (as determined by field observation, e.g., identification of silt-dominant sediment) will be submitted for laboratory analysis.</u> <u>Additional soil samples may be analyzed if contamination is indicated through radiological screening or other field observations.</u> <u>Also see Section 4, 5th paragraph.</u>
	Saturated Soil (PNNL research)	10 (270) 30 (290) 50 (310)	±5 ft	See Section 3.2.3	Split-spoon samples to be collected at 10, 30, and 50 ft below the water table. Samples are to be delivered to the PNNL 331 Building. If samples cannot be delivered the day they are collected, the samples are to be cooled to ≤4°C until they are delivered.

	Water (PNNL research)	10 (270) <u>20 (280)</u> 30 (290) <u>40 (300)</u> <u>60 (320)50 (310)</u> <u>80 (340)70 (330)</u> <u>100 (360)90 (350)</u> <u>120 (380)110 (370)</u> <u>140 (400)130 (390)</u> <u>160 (420)150 (410)</u> <u>180 (440)170 (430)</u>	±5 ft	See Section 3.2.3	A single, 1 L unfiltered sample collected every 20 ft starting at 10 ft below the water table. If the lower mud unit is not encountered at the estimated depth, water samples will be collected every 20 ft until reaching the mud 10, 20, 30, and 40 ft below the water table and every 20 ft thereafter until reaching the Ringold lower mud. Use a polyethylene container, no preservative, and cool to ≤4°C. Samples are to be delivered to the PNNL 331 Building.
299-W19-128 (C9606) Dual-Use Monitoring/Extraction	Saturated Soil (CHPRC)	0 to 190 (247 to 437)	±1 ft	N/A	Grab samples from the drill cuttings at 5 ft intervals from 0 to 190 <u>35</u> ft below the water table, composited into several samples for sieve analysis. <u>Adjacent grab samples with similar texture may be composited.</u> <u>Results Sieve analysis results from grab and/or composite samples</u> will be used to select well screen slot size <u>and filter pack material.</u>
	Water (CHPRC)	10 (257) <u>20 (267)</u> 30 (277) <u>40 (287)</u> <u>60 (307)50 (297)</u> <u>80 (327)70 (317)</u> <u>100 (347)90 (337)</u> <u>120 (367)110 (357)</u> <u>140 (387)130 (377)</u> <u>160 (407)150 (397)</u> <u>180 (427)170 (417)</u> <u>200 (447)190 (437)</u>	±5 ft	Gross Alpha Gross Beta Iodine-129 Technetium-99 Tritium Uranium Nitrate Carbon Tetrachloride TCE	Water samples to be collected every 20 ft starting at 10 ft below the water table. If the lower mud unit is not encountered at the estimated depth, water samples will be collected every 20 ft until reaching the mud 10, 20, 30, and 40 ft below the water table and every 20 ft thereafter until reaching the Ringold lower mud. Filter all samples except carbon tetrachloride and TCE. Purge and pump samples are preferred. Bailed samples can be collected if purging is not practicable, as determined by the technical lead. <u>Submit water samples collected at 10, 20, 30, 40, and 60 ft below the water table for fast-turnaround technetium-99 analysis for potential screen-length adjustment.</u>

	Unsaturated Soil (200-WA-1)	<u>-124 (123)</u> <u>-122 (125)</u> <u>-120 (127)</u> <u>-118 (129)</u> <u>-116 (131)</u> <u>to continue (as needed)</u> <u>through at least 4 ft</u> <u>into the CCU</u> <u>Additional 200-WA-1</u> <u>integration sampling</u> <u>to be determined</u>	± 1 ft	<u>See Table 3-3</u>	<u>Continuous split-spoon samples to be collected starting at 123 ft bgs (6 ft above the estimated top of the CCU) through at least 4 ft into the CCU. The soil sample collected from the actual top of the CCU (as determined by field observation, e.g., identification of silt-dominant sediment) will be submitted for laboratory analysis.</u> <u>Additional soil samples may be analyzed if contamination is indicated through radiological screening or other field observations.</u> <u>Also see Section 4, 5th paragraph.</u>
	Saturated Soil (PNNL research)	10 (257) 30 (277) 50 (297)	± 5 ft	See Section 3.2.3	Split-spoon samples to be collected at 10, 30, and 50 ft below the water table. Samples are to be delivered to the PNNL 331 Building. If samples cannot be delivered the day they are collected, the samples are to be cooled to $\leq 4^{\circ}\text{C}$ until they are delivered.

	Water (PNNL research)	10 (257) <u>20 (267)</u> 30 (277) <u>40 (287)</u> 60 (307) 50 (297) 80 (327) 70 (317) 100 (347) 90 (337) 120 (367) 110 (357) 140 (387) 130 (377) 160 (407) 150 (397) 180 (427) 170 (417) 200 (447) 190 (437)	±5 ft	See Section 3.2.3	A single, 1 L unfiltered sample collected every 20 ft starting at 10 ft below the water table. If the lower mud unit is not encountered at the estimated depth, water samples will be collected every 20 ft until reaching the mud <u>10, 20, 30, and 40 ft below the water table and every 20 ft thereafter until reaching the Ringold lower mud.</u> Use a polyethylene container, no preservative, and cool to ≤4°C. Samples are to be delivered to the PNNL 331 Building.
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Plant Chemical Process Sewer. Well 699-30-57 (C9417) is located adjacent to Isochem Avenue, which transects a UPR site (UPR-200-E-83), commonly referred to as the BC Controlled Area. Wells 699-32-59 (C9603), 699-31-50 (C9737), and 699-29-55 (C9634) are also located within the BC Controlled Area. This is an area of sporadically distributed contamination in biologic vectors (vegetation and wildlife droppings and remains). Well 299-W19-123 (C9567) is located adjacent to the 200-W-136 demolition/remediation area posted as an underground radioactive material area. Wells 699-39-68 (C9607) and 699-38-64B (C9608) are located adjacent to the 600-284-PL cross site transfer pipeline and associated UPR-600-20, which resulted in surface contamination. Although significant contamination is not expected at the locations of these nine wells (299-W19-115 [C9414], 299-W19-126 [C9604], 699-32-59 [C9603], 299-W19-123 [C9567], 699-30-57 [C9417], 699-31-50 [C9737], 699-29-55 [C9634], 699-39-68 [C9607], and 699-38-64B [C9608]), a complete lack of contamination cannot be assumed. Therefore, vadose zone soils will be containerized with saturated zone cuttings at these nine wells for subsequent disposal at ERDF. If elevated readings are detected by routine surveys during drilling, a sample will be collected from the depth of highest readings and analyzed for suite-type analyses (i.e., metals, VOAs, semi-VOAs, and gamma energy analysis, as well as technetium-99, iodine-129, and isotopic uranium). Two other wells (299-W19-127 [C9605] and 299-W19-128 [C9606]) are located near the 216-U-14 Ditch (200-WA-1 OU). When the ditch was operational (from 1944 to 1995), perched water occurred on top of the Cold Creek unit (CCU). For well 299-W19-127 (C9605), which is located approximately 95 m (310 ft) from the ditch, vadose zone soils will be containerized starting at 35.7 m (117 ft) bgs (approximately 6 m (20 ft) above the CCU) (41 m [135 ft] bgs). If elevated readings are detected by surveys during drilling, a sample will be collected and Continuous split-spoon samples will be collected starting at 131 ft bgs (6 ft above the estimated top of the CCU) through at least 4 ft into the CCU. The soil sample collected from the actual top of the CCU (as determined by field observation, e.g., identification of silt-dominant sediment) will be analyzed for the constituents in Table 3-3. Well 299-W19-128 (C9606) is located approximately 11 m (36 ft) from the 216-U-14 Ditch and 20 m (65 ft) from a surface contamination area (UPR-200-W-161). For 299-W19-128 (C9606), all vadose zone soils will be containerized, ~~and a sample will be collected from the top of the CCU (44 m [144 ft] bgs) and~~ Continuous split-spoon samples will be collected starting at 123 ft bgs (6 ft above the estimated top of the CCU) through at least 4 ft into the CCU. The soil sample collected from the actual top of the CCU (as determined by field observation, e.g., identification of silt-dominant sediment) will be analyzed for the constituents listed in Table 3-3.

Installation of wells in the areas surrounding the proposed drilling locations has been relatively common in recent years, including 24 wells drilled between 2004 and 2014. With adequate, cost effective waste characterization as a goal, data generated from sampling and analysis for waste characterization at these previously installed wells were reviewed. Samples less than 30 m (100 ft) bgs, nondetect results, and radioisotopes detected at less than the ERDF reporting limit of 1 pCi/g were excluded. The data set was then reduced to the highest detected result for each remaining analyte. These maximum values were later updated with a revised data set that included all 200-UP-1 soil sample results received from depths greater than 30 m (100 ft) bgs between January 2014 and December 2016. The data are presented in Table 4-1 and will be used to generate a waste profile for saturated zone drill cuttings and MSW for all the wells drilled under this plan. Listed waste codes F001 through F005 will be applied as follows:

- F001: carbon tetrachloride
- F002: methylene chloride
- F003: acetone and methyl isobutyl ketone
- F004: cresols (o, m, and p isomers)
- F005: methyl ethyl ketone