TRI-PARTY AGREEMENT

Change Notice Number TPA-CN- 1103	TPA CHANGE NOTICE FORM	Date: March 30, 2021
Document Number, Title, and Revision: DOE/RL-2009-115, *Performance Monitoring Plan for the 200-ZP-1 Groundwater Operable Unit Remedial Action*, Revision 3		Date Document Last Issued: March 17, 2020
Approved Change Notices Against this Document: TPA-CN-1101		
Originator Mark E. Byrnes		Phone: 509 373-3996

Description of Change:
DOE/RL-2009-115, Revision 3 is revised to update the sampling frequency for groundwater monitoring wells installed in the 200-ZP-1 Operable Unit during fiscal year 2020.

M.W. Cline (**DOE**) and E. Laija (**Lead Regulatory Agency**) 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*.

Figures 18 and G-3 were updated to include wells 299-W10-26, 299-W11-41, 299-W14-16, and 299-W14-18.

Tables A-1, A-2, B-6, and G-4 were revised to add analytical information for total cyanide and free cyanide.

Tables B-14 and C-3 were revised to update the monitoring requirements for several wells. The total chromium, hexavalent chromium, technetium-99, cyanide, and field parameter monitoring requirements for wells 299-W10-27, 299-W11-13, 299-W14-11, and 299-W14-13 were revised. Wells 299-W10-26, 299-W11-41, 299-W14-16, and 299-W14-18 were added to the tables along with monitoring requirements for total chromium, hexavalent chromium, technetium-99, cyanide, and field parameters.

Sections B2.1.4, B3.3, G2.1.4, and G3.4.6 were revised to clarify well purging requirements.

Table F-2 was revised to add well details for the new wells.

Note: Include affected page number(s): 35, A-5, A-6, B-24, B-33, B-55, B-56, B-57, B-58, B-71, C-7, C-8, C-9, C-10, F-2, G-9, G-17, G-31, and G-64

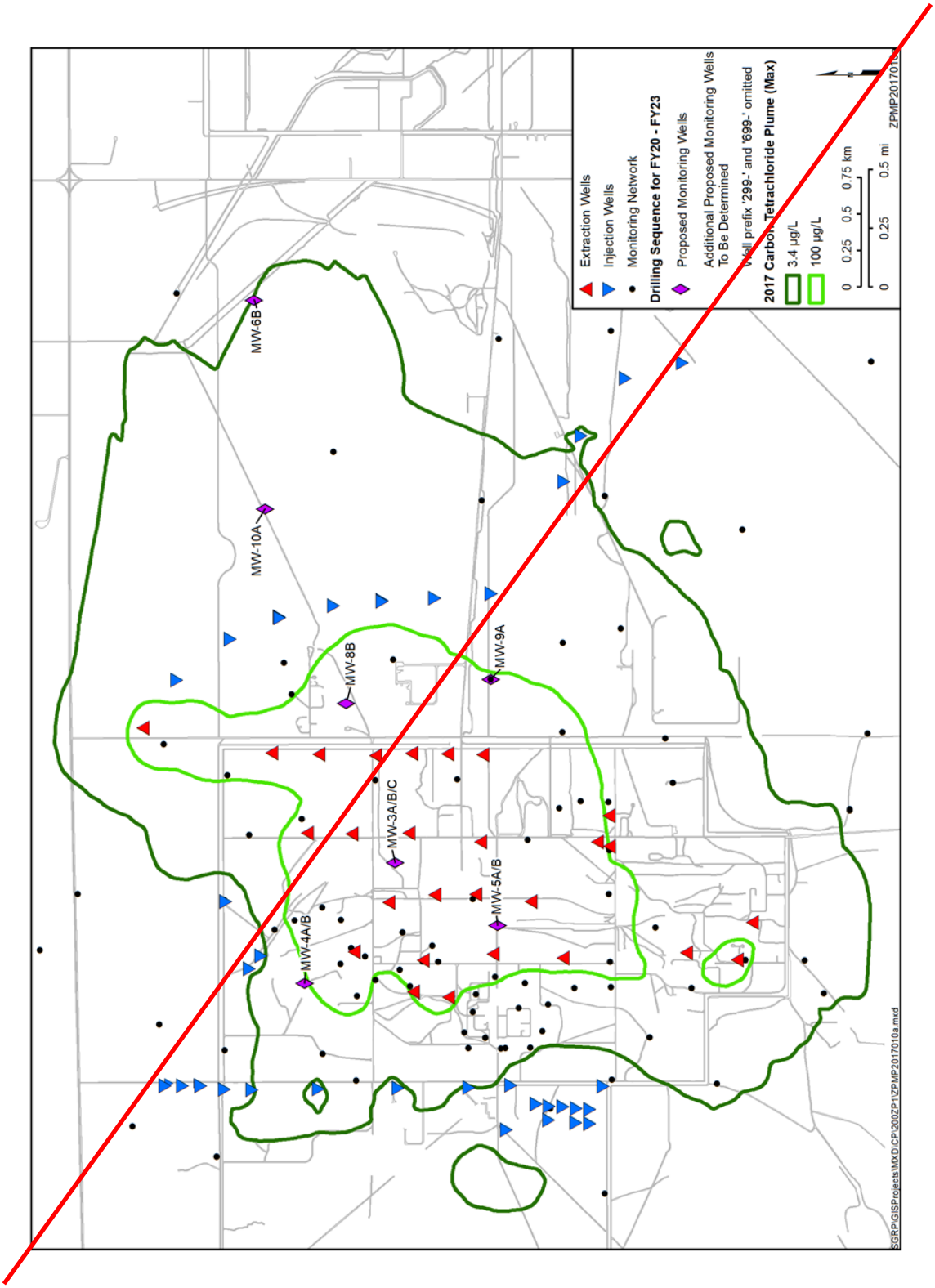
Justification and Impacts of Change:

Monitoring for total chromium, hexavalent chromium, technetium-99, and cyanide is a concern in the groundwater near the T/TY/TX tank farms. Sampling for total chromium, hexavalent chromium, technetium-99, and cyanide is being increased or added to monitoring wells 299-W10-26, 299-W10-27, 299-W11-13, 299-W11-41, 299-W14-11, 299-W14-13, 299-W14-16, and 299-W14-18. These wells are either a newly installed well, an existing well added to the PMP in order to monitor the T/TY/TX tank farms, or an existing PMP well sampling schedule revised to monitor the T/TY/TX tank farms.

Well purging and sampling requirements have been changed from minimum purge volumes to using recommended flow rates to achieve stabile readings for field parameters.

Approvals:

Michael W. Cline Digitally signed by Michael W. Cline Date: 2021.03.31 07:59:48 -07'00'		[X] Approved [ ] Disapproved
DOE Project Manager	Date	
EMERALD LAIJA Digitally signed by EMERALD LAIJA Date: 2021.03.31 12:29:45 -04'00'		[X] Approved [ ] Disapproved
EPA Project Manager	Date	
N/A		[ ] Approved [ ] Disapproved
Ecology Project Manager	Date	


Extraction Wells
Injection Wells
Monitoring Network
Drilling Sequence for FY20 - FY23
Proposed Monitoring Wells
Additional Proposed Monitoring Wells To Be Determined
Well prefix '299-' and '699-' omitted
2017 Carbon Tetrachloride Plume (Max)
3.4 µg/L
100 µg/L
0 0.25 0.5 0.75 km
0 0.25 0.5 mi
ZPMP20170
MW-6B
MW-10A
MW-8B
MW-9A
MW-3A/B/C
MW-5A/B
MW-4A/B
\GRP\GIS\Projects\MXD\CP-2002ZP1\ZPMP20170
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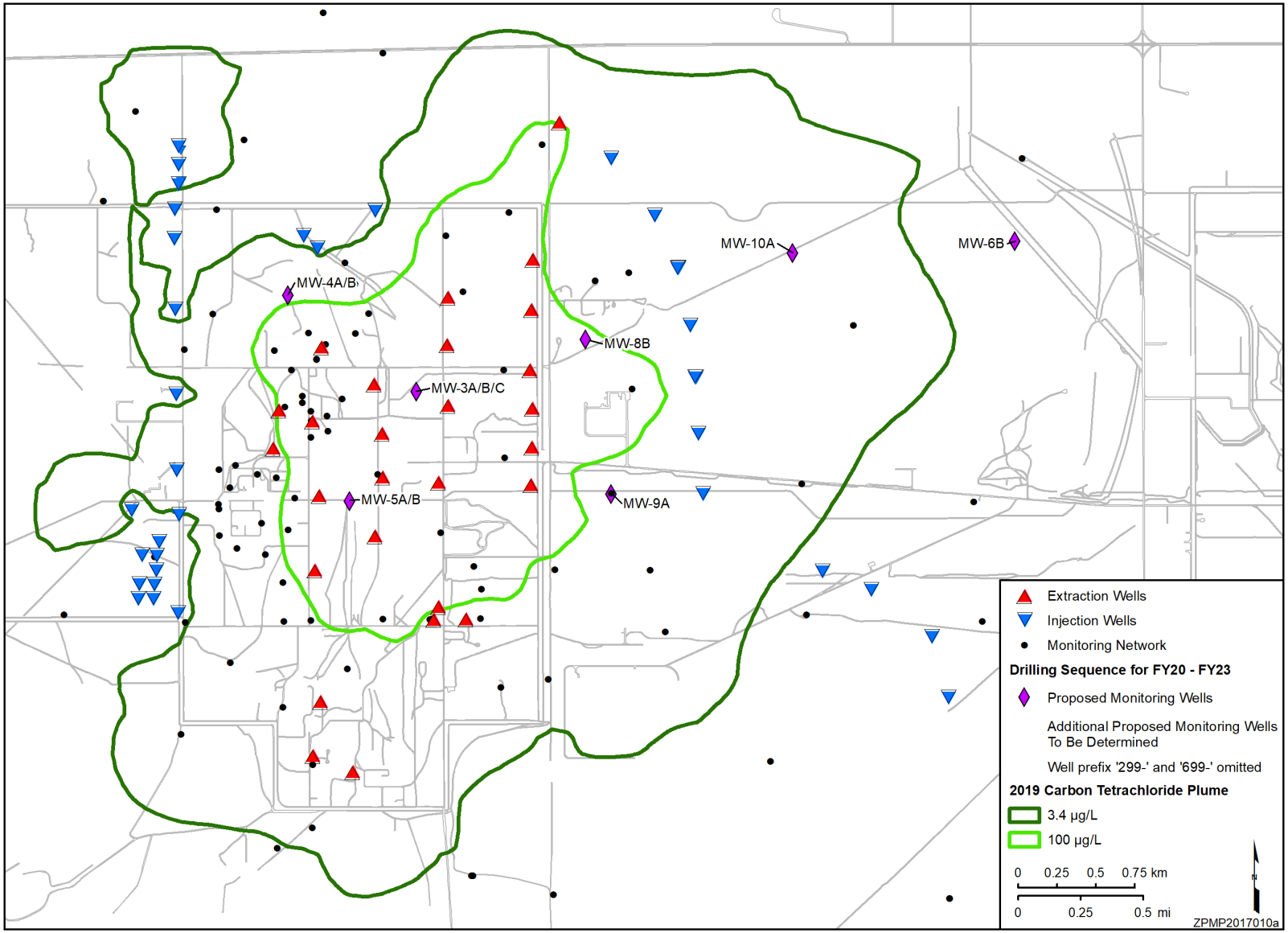


Figure 18. Proposed New 200-ZP-1 OU Monitoring Wells

be separately identified as part of the optimization study plan and/or the associated SAPs. However, any contaminant data collected under the optimization study will be used to support the performance monitoring and evaluation processes described in the PMP.

Table A-1. Contaminant Monitoring Constituents

Constituent	CAS Number	Data Use
Contaminants of Concern		
Carbon tetrachloride	56-23-5	Delineate carbon tetrachloride plume
Chromium (total)[a]	7440-47-3	Delineate chromium plume and evaluate stainless-steel corrosion
Chromium (hexavalent)[a]	18540-29-9	Delineate chromium plume
Iodine-129	15046-84-1	Delineate iodine-129 plume
Nitrate-N	14797-55-8	Delineate nitrate plume
Technetium-99	14133-76-7	Delineate technetium-99 plume
Trichloroethene	79-01-6	Delineate trichloroethene plume
Tritium	10028-17-8	Delineate tritium plume
Other Constituents		
Uranium (from 200-UP-1 OU)[a]	7440-61-1	Evaluate source from another OU treated at 200 West P&T
Alkalinity	ALKALINITY	Evaluate natural attenuation
Carbonate content (bicarbonate and carbonate)	71-52-3 and 471-34-1	Evaluate natural attenuation
Chloroform	67-66-3	Evaluate carbon tetrachloride natural attenuation
Chloride	16887-00-6	Evaluate chlorinated solvent natural attenuation
Chloromethane	74-87-3	Evaluate carbon tetrachloride natural attenuation
Free Cyanide (from 200-BP-5 OU)[a]	FREE-CN	Evaluate source from another OU treated at 200 West P&T
Total Cyanide (from 200-BP-5 OU)[a]	57-12-5	Evaluate source from another OU treated at 200 West P&T
cis-1,2-Dichloroethene	156-59-2	Evaluate trichloroethene natural attenuation
Dichloromethane	75-09-2	Evaluate carbon tetrachloride natural attenuation
Iron[a]	7439-89-6	Evaluate natural attenuation and stainless-steel corrosion
Manganese[a]	7436-96-5	Evaluate natural attenuation
Nickel[a]	7440-02-0	Evaluate stainless-steel corrosion
Nitrite-N	14797-65-0	Evaluate nitrate natural attenuation
Sulfate	14808-79-8	Evaluate natural attenuation
Sulfide	18496-25-8	Evaluate natural attenuation
Total dissolved solids	TDS	Evaluate natural attenuation; identify new releases
Total organic carbon	TOC	Evaluate natural attenuation
Vinyl chloride	75-01-4	Evaluate trichloroethene natural attenuation

Table A-1. Contaminant Monitoring Constituents

Field Screening Parameters[b]		
Dissolved oxygen	N/A	Evaluate natural attenuation and well purge for sampling
Oxidation-reduction potential	N/A	Evaluate natural attenuation
pH	N/A	Evaluate well purge for sampling
Specific conductance	N/A	Evaluate well purge for sampling
Temperature	N/A	Evaluate well purge for sampling
Turbidity	N/A	Evaluate well purge for sampling

a. Collect filtered and unfiltered samples for metals except for hexavalent chromium. A filtered sample will be collected for hexavalent chromium. An unfiltered sample will be collected for total and free cyanide.

b. Field screening parameters are to be collected in accordance with DOE/RL-96-68, *Hanford Analytical Services Quality Assurance Requirements Document, Vol. 3, Field Analytical Technical Requirements*.

CAS = Chemical Abstracts Service
N/A = not applicable
OU = operable unit
P&T = pump and treat
TDS = total dissolved solids
TOC = total organic carbon

Table A-2. Performance Requirements for Groundwater Analysis

CAS Number	Analyte	Survey or Analytical Method	Units	Action Level	Required PQL[a]
56-23-5	Carbon tetrachloride (LL) (COC and OSP)	SW-846, Method 8260	µg/L	3.4[b]	3
67-66-3	Chloroform (TP)	SW-846, Method 8260	µg/L	7.17	5
75-09-2	Dichloromethane (TP)	SW-846, Method 8260	µg/L	5	5.25
74-87-3	Chloromethane (TP)	SW-846, Method 8260	µg/L	N/A	10
79-01-6	Trichloroethene (COC)	SW-846, Method 8260	µg/L	1[b]	2.1
156-59-2	cis-1,2-Dichloroethene (TP)	SW-846, Method 8260	µg/L	70	5
75-01-4	Vinyl chloride (TP-LL)	SW-846, Method 8260	µg/L	2	~~2.1~~10
57-12-5	Cyanide (total) (from 200-BP-5 OU)[a]	SW-846, Method 9012 or 335.4 or Standard Method 4500	µg/L	200	10.5
FREE-CN	Cyanide (free) (from 200-BP-5 OU)[a]	SW-846, Method 9014	µg/L	4.8	4.0
7440-47-3	Chromium (total) (COC and SSC)[c]	SW-846, Method 6020	µg/L	100	10.5
18540-29-9	Hexavalent chromium (COC)[c]	SW-846, Method 7196	µg/L	48	10.5
14697-55-8	Nitrate-N (COC and OSP)	SW-846, Method 9056 or EPA 300.0	mg/L	10	~~525~~ 0.525
14797-65-0	Nitrite-N (TP and OSP)	SW-846, Method 9056 or EPA 300.0	mg/L	1	~~525~~ 0.525
15046-84-1	Iodine-129 (COC)[a]	Low-energy ~~photon~~ gamma spectroscopy ~~(LL)~~ or liquid scintillation counter	pCi/L	1	1
14133-76-7	Technetium-99 (COC)	Liquid scintillation counting	pCi/L	900	50

Table B-1. Analytes for 200-ZP-1 OU Groundwater Monitoring

Constituent	CAS Number	Data Use
Total organic carbon	TOC	Evaluate natural attenuation, optimization study near-term monitoring
Vinyl chloride	75-01-4	Evaluate trichloroethene natural attenuation
Field Screening Parameters[b]		
Dissolved oxygen	N/A	Evaluate natural attenuation and well purge for sampling
Oxidation-reduction potential	N/A	Evaluate natural attenuation
pH	N/A	Evaluate well purge for sampling
Specific conductance	N/A	Evaluate well purge for sampling
Temperature	N/A	Evaluate well purge for sampling
Turbidity	N/A	Evaluate well purge for sampling

a. Collect filtered and unfiltered samples for metals except for hexavalent chromium. A filtered sample will be collected for hexavalent chromium. An unfiltered sample will be collected for total and free cyanide.

b. Field screening parameters to be collected in accordance with DOE/RL-96-68, *Hanford Analytical Services Quality Assurance Requirements Document*, *Vol. 3, Field Analytical Technical Requirements*.

CAS = Chemical Abstracts Service
N/A = not applicable
OU = operable unit
P&T = pump and treat
TDS = total dissolved solids
TOC = total organic carbon
WMA = waste management area

B2 Quality Assurance Project Plan

A QAPjP establishes the quality requirements for environmental data collection. It includes planning; implementing; and assessing sampling tasks, field measurements, laboratory analysis, and data review. This section describes the applicable environmental data collection requirements and controls based on the QA elements found in EPA/240/B-01/003, *EPA Requirements for Quality Assurance Project Plans* (EPA QA/R-5); and DOE/RL-96-68, *Hanford Analytical Services Quality Assurance Requirements Document* (HASQARD). Sections 6.5 and 7.8 of Ecology et al., 1989b, *Hanford Federal Facility Agreement and Consent Order Action Plan* (Tri-Party Agreement Action Plan), require that QA/quality control (QC) and sampling and analysis activities specify the QA requirements for treatment, storage, and disposal units, as well as for past-practice processes. This QAPjP also describes the applicable requirements and controls based on guidance found in Ecology Publication No. 04-03-030, *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies*; and EPA/240/R-02/009, *Guidance for Quality Assurance Project Plans* (EPA QA/G-5). This QAPjP is intended to supplement the contractor's environmental QA program plan.

This QAPjP is divided into the following four sections, which describe the quality requirements and controls applicable to Hanford Site OU groundwater monitoring activities:

- Section B2.1, Project Management
- Section B2.2, Data Generation and Acquisition

B2.1.4 Documents and Records

The OU project manager (or designee) is responsible for ensuring the current version of the SAP is being used and providing any updates to field personnel. Version control is maintained by the administrative document control process. Table B-8 defines the type of changes that may impact the sampling and the associated approvals, notification, and document process.

Regarding minor field changes, the OU technical lead in coordination with the soil and groundwater subject matter expert will approve deviations from the SAP that do not have an adverse effect on the technical integrity or adequacy of the sampling activity. Below are examples of minor field changes:

1. During groundwater sampling, most groundwater samples will be pumped, although use of another method may be authorized by the OU technical lead.
2. The sample depths provided in this SAP are estimated based on known characterization data and geology collected from nearby wells. For this reason, adjustments to the sample depths are anticipated. The sample depths may be altered during drilling in consultation with the OU technical lead.
3. During split-spoon sampling, if insufficient material is recovered or the split spoon is overdriven, then (when feasible) a second split spoon will be collected prior to advancing the borehole. If there is not enough sample volume recovered during split-spoon sampling, laboratory-approved minimum sample volumes will be used to run all required sample analyses. If it is not possible to collect sufficient sample volume and perform all the analyses, then DOE-RL will be consulted to concur on the path forward.
4. Groundwater samples ~~may~~should not be collected before ~~a minimum of three well casing volumes have been purged and~~ water chemistry (e.g., temperature, pH, and conductivity) has stabilized within 10% variance over three consecutive measurements unless approved by the OU technical lead. ~~Note that one borehole volume is acceptable if water chemistry (e.g., temperature, pH, and conductivity) has stabilized within 10% variance over three consecutive measurements for the depth-discrete groundwater samples collected during drilling.~~

Regarding minor changes, the OU technical lead in coordination with the soil and groundwater subject matter experts will consult with DOE-RL and the Regulatory Lead when deviations from the SAP do not affect the overall intent of the plan. Below are examples of minor changes:

1. Changing the type of sample being collected. For example, collecting continuous grab samples instead of continuous cores.
2. Selecting a different well construction material and/or well design.
3. Changing to a different drilling method.

The Project Scientist in coordination with the Soil & Groundwater Subject Matter Expert (SME) will inform~~ation~~ DOE-RL of deviations from the SAP that do affect the overall intent and scheduling that may require revision to the approved plan.

The sampling FWS and SMR are responsible for ensuring that field instructions are maintained and aligned with any revisions or approved changes to the SAP. SMR will ensure that any deviations from the SAP are reflected in revised paperwork for the samplers and the analytical laboratory. The sampling FWS will ensure that deviations from the SAP or problems encountered in the field are documented appropriately (e.g., in the field logbook) in accordance with corrective action protocols.

Table B-2. Sampling and Analysis Schedule for 200-ZP-1 Groundwater OU Well Network

Well Number	Well ID	Co-Sample	Hydrogeologic Unit	WAC Compliant	Carbon Tetrachloride	Total Chromium[a]	Hexavalent Chromium (Filtered) [a]	Iodine-129	Nitrate	Technetium-99	Trichloroethene	Tritium	Uranium	Chloroform	Dichloromethane	Chloromethane	Cyanide (total)	Cyanide (free)	cis-1,2-Dichloroethene	Vinyl Chloride	Chloride	Nitrite	Total Organic Carbon	Total Dissolved Solids	Sulfate	Sulfide	Iron[a]	Manganese[a]	Nickel[a]	Alkalinity	Carbonate Content	Field Parameters
299-W5-2	C9439	—	LU	C/2015	A	A	A	A	A	A	A	A	5	A	A	A	5	=	A	A	A	A	5	5	A	5	A	5	A	5	5	A
299-W6-3[b]	A4998	—	LU	N/1991	A	5	5	5	A/M[c]	2	A	5	5	A	A	A	5	=	A	A	A/M[c]	A/M[c]	5	5	A/M[c]	5	5	5	5	5	5	A/M[c]
299-W6-6	A5001	AEA, Ringold confined, SALDS	LU	N/1991	A	5	5	5	A	2	A	5	5	A	A	A	5	=	A	A	A	A	5	5	A	5	5	5	5	5	5	A
299-W6-11[d]	A5436	AEA, SALDS	NS	C/1992	A	—	—	—	A	—	—	—	—	—	—	—	—	=	—	—	A	A	—	—	A	—	—	—	—	—	—	A
299-W6-12[d]	A6437	SALDS	NS	C/1992	—	—	—	—	A	—	—	—	—	—	—	—	—	=	—	—	A	A	—	—	A	—	—	—	—	—	—	A
299-W6-17	C9738	—	LU	C/2019	A	A	A	A	A	A	A	A	A	A	A	A	5	=	A	A	A	A	5	5	A	5	A	5	A	5	5	A
299-W7-3[b]	A5009	AEA, Ringold confined, SALDS	LU	N/1987	A	5	5	5	A/SA[c]	5	A	5	5	A	A	A	5	=	A	A	A/SA[c]	A/SA[c]	5	5	A/SA[c]	5	5	5/SA[c]	5/SA[c]	5	5	A/SA[c]
299-W10-1	A7136	RCRA, WMA T	U	N/1947	2	2	2	5	—	5	2	—	—	2	2	2	5	=	2	2	2	—	5	5	2	5	2	5	2	5	5	2
299-W10-14	A4891	—	LU	N/1987	A	—	—	5	A	5	A	—	5	A	A	A	5	=	A	A	A	A	5	5	A	5	5	5	—	5	5	A
299-W10-26	B8548	RCRA, WMA TX-TY	TU	C/1998	=	M	M	=	=	M	=	=	=	=	=	=	M	M	=	=	=	=	=	=	=	=	=	=	=	=	=	M
299-W10-27	C3125	RCRA, WMA TX-TY	TU	C/2001	2	—Q	—Q	2	-	2Q	2	—	—	2	2	2	5Q	Q	2	2	2	—	5	5	2	5	5	5	—	5	5	2Q
299-W10-29[d]	C4988	AEA and RCRA, LLWMA-3, LLWMA-4	NS	C/2006	SA	—	—	—	SA	—	—	—	—	—	—	—	—	=	—	—	SA	SA	—	—	SA	—	—	—	—	—	—	SA
299-W10-30[b]	C4989	AEA and RCRA, LLWMA-3	TU	C/2006	2/SA[c]	5	5	—	—/SA[c]	5	2	5	—	2	2	2	5	=	2	2	2/SA[c]	—/SA[c]	5	5	2/SA[c]	5	5	5	5	5	5	2/SA[c]
299-W10-31[b]	C5194	AEA and RCRA, LLWMA-3	TU	C/2006	A/Q[c]	5	5	5	2/Q[c]	5	A	5	—	A	A	A	5	=	A	A	A/Q[c]	2/Q[c]	5	5	A/Q[c]	5	5	5	5	5	5	A/Q[c]
299-W10-33	C5855	—	LU	C/2007	A	2	2	5	A	2	A	2	5	A	A	A	5	=	A	A	A	A	5	5	A	5	2	5	2	5	5	A
299-W11-13	A5465	—	U	N/1961	2	—	—	—	—	—	2	2	—	2	2	2	5A	A	2	2	2	—	5	5	2	5	5	5	—	5	5	2A
299-W11-18[b]	A7284	—	TU	N/1967	A/Q[c]	2	2	—	A/Q[c]	5	A	2	—	A	A	A	5	=	A	A	A/Q[c]	A/Q[c]	5	5	A/Q[c]	5	2	5	2	5	5	A/Q[c]
299-W11-33Q	B2402	—	TU	N/1994	—	A	A	—	—	2	—	A	—	—	—	—	5	=	—	—	A	—	5	5	A	5	A	5	A	5	5	A
299-W11-41	C3119	RCRA, WMA T	TU	C/2000	=	A	A	=	=	A	=	=	=	=	=	=	A	A	=	=	=	=	=	=	=	=	=	=	=	=	=	A
299-W11-43	C4694	—	LU	C/2005	A	2	2	2	A	2	A	2	5	A	A	A	5	=	A	A	A	A	5	5	A	5	2	5	2	5	5	A
299-W11-45	C4948	RCRA, WMA T	UU	C/2005	A	—	—	—	—	A	A	2	5	A	A	A	5	=	A	A	A	—	5	5	A	5	5	5	—	5	5	A
299-W11-47	C4990	RCRA, WMA T	U	C/2006	2	—	—	—	2	2	2	2	—	2	2	2	5	=	2	2	2	2	5	5	2	5	5	5	—	5	5	2
299-W11-48	C5243	—	LU	C/2006	A	2	2	—	A	2	A	2	—	A	A	A	5	=	A	A	A	A	5	5	A	5	2	5	2	5	5	A
299-W11-87	C5407	—	LU	C/2007	A	2	2	5	—	—	A	2	—	A	A	A	5	=	A	A	A	—	5	5	A	5	2	5	2	5	5	A
299-W11-88	C5572	AEA, Ringold confined	LU	C/2007	A	2	2	2	A	5	A	2	5	A	A	A	5	=	A	A	A	A	5	5	A	5	2	5	2	5	5	A
299-W13-1	C4238	—	MU	C/2004	2	5	5	—	—	5	2	5	—	2	2	2	5	=	2	2	2	—	5	5	—	5	5	5	5	5	5	2
299-W13-2	C9440	—	LU	C/2015	A	A	A	A	A	A	A	A	5	A	A	A	5	=	A	A	A	A	5	5	A	5	A	5	A	5	5	A

Table B-2. Sampling and Analysis Schedule for 200-ZP-1 Groundwater OU Well Network

Well Number	Well ID	Co-Sample	Hydrogeologic Unit	WAC Compliant	Carbon Tetrachloride	Total Chromium[a]	Hexavalent Chromium (Filtered) [a]	Iodine-129	Nitrate	Technetium-99	Trichloroethene	Tritium	Uranium	Chloroform	Dichloromethane	Chloromethane	Cyanide (total)	Cyanide (free)	cis-1,2-Dichloroethene	Vinyl Chloride	Chloride	Nitrite	Total Organic Carbon	Total Dissolved Solids	Sulfate	Sulfide	Iron[a]	Manganese[a]	Nickel[a]	Alkalinity	Carbonate Content	Field Parameters
299-W14-11	C4668	RCRA, WMA TX-TY	UU	C/2005	A	—Q	—Q	—	—	—Q	A	2	—	A	A	A	5Q	Q	A	A	A	—	5	5	A	5	5	5	—	5	5	AQ
299-W14-13	B8549	WDOH and RCRA, WMA TX-TY	TU	C/1998	2	2Q	2Q	2	2	AQ	2	—	—	2	2	2	5Q	Q	2	2	A	2	5	5	A	5	2	5	2	5	5	AQ
299-W14-14	B8547	RCRA, WMA TX-TY	TU	C/1998	—	2	2	—	—	—	—	2	—	—	—	—	5	=	—	—	2	—	5	5	2	5	2	5	2	5	5	2
299-W14-16	C3120	AEA, RCRA, WMA T	TU	C/2000	=	A	A	=	=	A	=	=	=	=	=	=	A	A	=	=	=	=	=	=	=	=	=	=	=	=	=	A
299-W14-18	C3396	RCRA, WMA TX-TY	TU	C/2001	=	M	M	=	=	M	=	=	=	=	=	=	M	M	=	=	=	=	=	=	=	=	=	=	=	=	=	M

Table B-3. Sampling and Analysis Schedule for 200-ZP-1 Groundwater OU Well Network

Well Number	Well ID	Co-Sample	Hydrogeologic Unit	WAC Compliant	Carbon Tetrachloride	Total Chromium[a]	Hexavalent Chromium (Filtered)[a]	Iodine-129	Nitrate	Technetium-99	Trichloroethene	Tritium	Uranium	Chloroform	Dichloromethane	Chloromethane	Cyanide (total)	Cyanide (free)	cis-1,2-Dichloroethene	Vinyl Chloride	Chloride	Nitrite	Total Organic Carbon	Total Dissolved Solids	Sulfate	Sulfide	Iron[a]	Manganese[a]	Nickel[a]	Alkalinity	Carbonate Content	Field Parameters
299-W14-71	C5102	—	LU	C/2006	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A
299-W14-72	C5103	—	LU	C/2006	A	—	—	5	—	5	A	5	5	A	A	A	5	≡	A	A	A	—	5	5	A	5	5	5	—	5	5	A
299-W15-7	A5476	—	TU	N/1966	A	—	—	5	A	5	A	—	5	A	A	A	5	≡	A	A	A	A	5	5	A	5	5	5	—	5	5	A
299-W15-11[b]	A5474	—	TU	N/1968	A/Q[c]	5	5	5	A/Q[c]	A	A	—	5	A	A	A	5	≡	A	A	A/Q[c]	A/Q[c]	5	5	A/Q[c]	5	5	5	5	5	5	A/Q[c]
299-W15-17[b]	A4921	AEA and RCRA, LLWMA-4	LU	C/1987	A	—	—	5	A/Q[c]	5	A	5	5	A	A	A	5	≡	A	A	A/Q[c]	A/Q[c]	5	5	A/Q[c]	5	5	5	—	5	5	A/Q[c]
299-W15-30[d]	B2410	AEA and RCRA, LLWMA-4	NS	C/2006	SA	—	—	—	SA	—	—	—	—	—	—	—	—	≡	—	—	SA	SA	—	—	SA	—	—	—	—	—	—	SA
299-W15-33	B2643	—	UU	C/1995	2	5	5	—	2	2	2	5	5	2	2	2	5	≡	2	2	2	2	5	5	2	5	5	5	5	5	5	2
299-W15-37	B2753	200-UP-1	UU	C/1996	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A
299-W15-42	C3803	—	UU	C/2002	A	5	5	2	A	2	A	—	5	A	A	A	5	≡	A	A	A	A	5	5	A	5	5	5	5	5	5	A
299-W15-46	C3426	—	UU	C/2003	—	5	5	—	2	2	—	5	—	—	—	—	5	≡	—	—	—	—	5	5	2	5	5	5	5	5	5	2
299-W15-49[b]	C4301	—	UU	C/2004	—/Q[c]	-	—	—	2/Q[c]	—	—	5	—	—	—	—	5	≡	—	—	2/Q[c]	2/Q[c]	5	5	2/Q[c]	5	5	5	—	5	5	2/Q[c]
299-W15-50	C4302	—	MU	C/2005	A	5	5	5	—	—	A	5	—	A	A	A	5	≡	A	A	A	—	5	5	A	5	5	5	5	5	5	A
299-W15-83[b]	C4683	AEA and RCRA, LLWMA-4	TU	C/2005	2/SA[c]	5	5	—	—/SA[c]	5	2	5	—	2	2	2	5	≡	2	2	2/SA[c]	—/SA[c]	5	5	2/SA[c]	5	5	5/SA[c]	5/SA[c]	5	5	2/SA[c]
299-W15-94[b]	C4684	AEA and RCRA, LLWMA-4	TU	C/2005	2	5	5	—	—/Q[c]	5	2	5	5	2	2	2	5	≡	2	2	2/Q[c]	—/Q[c]	5	5	2/Q[c]	5	5	5	5	5	5	2/Q[c]
299-W15-152[b]	C4685	AEA and RCRA, LLWMA-4	TU	C/2005	2/Q[c]	5	5	—	2/Q[c]	5	2	5	—	2	2	2	5	≡	2	2	2/Q[c]	2/Q[c]	5	5	2/Q[c]	5	5	5/Q[c]	5/Q[c]	5	5	2/Q[c]
299-W15-224[d]	C4986	AEA and RCRA, LLWMA-3	NS	C/2006	SA	—	—	—	SA	—	—	—	—	—	—	—	—	≡	—	—	SA	SA	—	—	SA	—	—	—	—	—	—	SA
299-W15-763	C3339	RCRA, WMA TX-TY	TU	C/2001	A	—	—	5	A	A	A	2	5	A	A	A	5	≡	A	A	A	A	5	5	A	5	5	5	—	5	5	A
299-W15-765	C3397	RCRA, WMA TX-TY	TU	C/2001	2	—	—	—	2	A	2	2	—	2	2	2	5	≡	2	2	2	2	5	5	A	5	5	5	—	5	5	A
299-W18-1	A5481	—	U	N/1959	A	5	5	A	A	A	A	5	5	A	A	A	5	≡	A	A	A	A	5	5	A	5	5	5	5	5	5	A
299-W18-15	A4932	200-UP-1	TU	N/1980	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A
299-W18-16	C4303	—	TU	C/2004	2	5	5	5	2	2	2	5	-	2	2	2	5	≡	2	2	2	2	5	5	2	5	5	5	5	5	5	2
299-W18-21[b]	A4933	AEA and RCRA, LLWMA-4, 200-UP-1	TU	C/1987	A/M[c]	—	—	—	—/M[c]	—	A	—	—	A	A	A	—	≡	A	A	—/M[c]	—/M[c]	—/M[c]	—	—	—	—	—/M[c]	—/M[c]	—	—	A/M[c]
299-W18-22[b]	A4934	AEA and RCRA, LLWMA-4, 200-UP-1	LU	C/1987	A/M[c]	—	—	—	—/M[c]	—	A	—	—	A	A	A	—	≡	A	A	—/M[c]	—/M[c]	—/M[c]	—	—	—	—	—/M[c]	—/M[c]	—	—	A/M[c]
299-W18-40	C3395	AEA and RCRA, WMA U	TU	C/2001	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A
299-W19-4	A4958	200-UP-1	U	N/1960	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A
299-W19-6	A4959	—	MU	N/1968	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A
299-W19-18	A7743	200-UP-1	TU	N/1985	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A
299-W19-34A	A9517	200-UP-1	MU	C/1994	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A

Table B-3. Sampling and Analysis Schedule for 200-ZP-1 Groundwater OU Well Network

Well Number	Well ID	Co-Sample	Hydrogeologic Unit	WAC Compliant	Carbon Tetrachloride	Total Chromium[a]	Hexavalent Chromium (Filtered) [a]	Iodine-129	Nitrate	Technetium-99	Trichloroethene	Tritium	Uranium	Chloroform	Dichloromethane	Chloromethane	Cyanide (total)	Cyanide (free)	cis-1,2-Dichloroethene	Vinyl Chloride	Chloride	Nitrite	Total Organic Carbon	Total Dissolved Solids	Sulfate	Sulfide	Iron[a]	Manganese[a]	Nickel[a]	Alkalinity	Carbonate Content	Field Parameters
299-W19-34B	A9513	—	MU	C/1994	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
299-W19-36	B2461	200-UP-1	UU	C/1995	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
299-W19-41	B8551	AEA and RCRA, WMA U	TU	C/1998	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
299-W19-47	C4258	AEA and RCRA, WMA U	TU	C/2004	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
299-W19-48	C4300	200-UP-1	UU	C/2004	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
299-W19-49	C4695	200-UP-1	TU	C/2005	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
299-W19-105	C4968	200-UP-1	TU	C/2005	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
299-W19-107	C5193	200-UP-1	UU	C/2006	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
299-W21-2	C4639	200-UP-1	TU	C/2004	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
299-W22-47	C4667	AEA, WMA S-SX	UU	C/2005	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
299-W22-72	C4970	AEA, WMA S-SX, 200-UP-1	TU	C/2006	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
299-W22-86	C4971	AEA, WMA S-SX, 200-UP-1	TU	C/2006	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
299-W22-87	C4977	200-UP-1	TU	C/2005	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
299-W22-88	C4978	200-UP-1	TU	C/2008	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
299-W23-4	A4987	200-UP-1	U	N/1957	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
299-W23-19	B8809	AEA, WMA S-SX	TU	C/1999	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
299-W26-13	B8817	RCRA, S-10, 200-UP-1	TU	C/1999	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
299-W27-2	A5410	RCRA, S-10	LU	C/1992	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
699-30-66	C4298	200-UP-1	LU	C/2004	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
699-32-62	A5128	200-UP-1	TU	N/1960	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
699-32-72A	A5130	200-UP-1	U	N/1957	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
699-33-75	C4974	RCRA, S-10, 200-UP-1	TU	C/2008	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
699-34-61	A5463	200-UP-1	TU	C/1993	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
699-35-66A	A5139	200-UP-1, ERDF	TU	N/1957	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
699-35-78A	A5141	200-UP-1	TU	N/1950	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
699-36-61A	A5144	—	TU	N/1948	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
699-36-66B	C6219	ERDF, 200-UP-1	TU	C/2007	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
699-36-70A	A9901	ERDF, WDOH, 200-UP-1	TU	C/1994	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
699-36-70B	C4299	200-UP-1	TU	C/2004	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A
699-37-66	C5704	ERDF, 200-UP-1	TU	C/2007	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A

Table B-4. Sampling and Analysis Schedule for 200-ZP-1 Groundwater OU Well Network

Well Number	Well ID	Co-Sample	Hydrogeologic Unit	WAC Compliant	Carbon Tetrachloride	Total Chromiuma	Hexavalent Chromium (Filtered) a	Iodine-129	Nitrate	Technetium-99	Trichloroethene	Tritium	Uranium	Chloroform	Dichloromethane	Chloromethane	Cyanide (total)[a]	Cyanide (free)[a]	cis-1,2-Dichloroethene	Vinyl Chloride	Chloride	Nitrite	Total Organic Carbon	Total Dissolved Solids	Sulfate	Sulfide	Irona	Manganesea	Nickela	Alkalinity	Carbonate Content	Field Parameters
699-38-61	A5464	200-UP-1	TU	C/1993	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	A
699-38-65	A5148	200-UP-1	TU	N/1959	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	A
699-38-68A	A9516	200-UP-1	TU	C/1994	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	A
699-38-70B	C4236	200-UP-1	MU	C/2004	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	A
699-38-70C	C4256	200-UP-1	LU	C/2004	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	A
699-40-62	A5158	200-UP-1	TU	N/1949	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	A
699-40-65	C4235	200-UP-1	TU	C/2004	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	A
699-43-69	C5573	AEA, Ringold confined	CR	C/2007	A	2	2	5	A	5	A	5	5	A	A	A	5	=	A	A	A	A	5	5	A	5	2	5	2	5	5	A
699-44-64	A5188	—	TU	N/1960	2	5	5	5	2	2	2	5	5	2	2	2	5	=	2	2	2	2	5	5	2	5	5	5	5	5	5	2
699-44-70B	C9740	—	CR	C/2019	A	A	A	A	A	A	A	A	A	A	A	A	5	=	A	A	A	A	5	5	A	5	A	5	A	5	5	A
699-45-69A	A5196	—	TU	N/1948	2	—	—	—	—	5	2	5	—	2	2	2	5	=	2	2	2	—	5	5	2	5	5	5	—	5	5	2
699-45-69C	C5574	AEA, Ringold confined	MU	C/2007	A	5	5	5	A	5	A	5	5	A	A	A	5	=	A	A	A	A	5	5	A	5	5	5	5	5	5	A
699-46-61	C9936	—	LU	C/2019	A	A	A	A	A	A	A	A	A	A	A	A	5	=	A	A	A	A	5	5	A	5	A	5	A	5	5	A
699-47-60	A5202	200-BP-5, AEA, Ringold confined	TU	N/1948	2	5	5	5	2	5	2	5	—	2	2	2	5	=	2	2	2	2	5	5	2	5	5	5	5	5	5	2
699-48-71	A5214	SALDS	TU	N/1956	A	2	2	2	—	2	A	A	—	A	A	A	5	=	A	A	A	—	5	5	A	5	2	5	2	5	5	A
699-50-74	C4697	—	TU	C/2005	A	5	5	5	A	5	A	5	—	A	A	A	5	=	A	A	A	A	5	5	A	5	5	5	5	5	5	A
699-51-63	A5231	—	TU	N/1956	2	5	5	5	2	5	2	5	5	2	2	2	5	=	2	2	2	2	5	5	2	5	5	5	5	5	5	2

Notes:

Field parameters include temperature, dissolved oxygen, pH, turbidity, and oxidation-reduction measurements.

Sampling frequency:

2 = sample biennially (every 2 years, as recommended by SGW-60527, *CR-2016-1543 – Redundancy Analysis for the 200-ZP-1 Groundwater Monitoring Network*)

5 = sample every 5 years (to coincide with preparation of the next *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* 5-year review)

A = sample annually

M = sample monthly

Q = sample quarterly

SA = sample semiannually

a. Collect filtered and unfiltered samples for metals, except for hexavalent chromium. A filtered sample will be collected for hexavalent chromium. An unfiltered sample will be collected for total and free cyanide.

b. Well to be sampled as part of 200-ZP-1 OU optimization study near-term monitoring (FY 2020).

c. Second frequency listed is applicable to 200-ZP-1 OU optimization study near-term monitoring (FY 2020). The first frequency listed applies to the 200-ZP-1 OU monitoring program.

d. Well added for 200-ZP-1 OU optimization study near-term monitoring (FY 2020) and is not considered part of the 200-ZP-1 OU contaminant monitoring well network.

Water samples will be collected according to the current revision of applicable operating methods. Prior to sample collection, purging of the sampling interval will be performed at flow rates of <3.8 L/min (1 gal/min) until field parameters stabilize as indicated below. Samples will be collected from the aquifer at flow rates of <3.8 L/min (1 gal/min). Water samples are collected after field measurements of purged groundwater have stabilized:

- **pH:** Two consecutive measurements agree within 0.2 pH units.
- **Temperature:** Two consecutive measurements agree within 0.2°C (0.4°F).
- **Conductivity:** Two consecutive measurements agree within 10% of each other.
- **Turbidity:** Less than 5 nephelometric turbidity units prior to sampling (or project scientist recommendation).

Field parameters for dissolved oxygen and reduction-oxidation potential may be specified by the project.

For certain types of samples, preservatives are required. While the preservative may be added to the collection bottles before their use in the field, it is allowable to add the preservative at the sampling vehicle immediately after collection. Some samples may also require filtering in the field, as noted on the chain-of-custody forms.

To ensure sample and data usability, the sampling associated with this SAP will be performed in accordance with HASQARD requirements (DOE/RL-96-68) regarding sample collection, collection equipment, and sample handling.

Table B-12 identifies the suggested sample container, preservation, and holding-time requirements for groundwater samples. These requirements are in accordance with the analytical methods specified in Table B-9. The final container types and volumes will be identified on the SAF and chain-of-custody form.

Holding time is the elapsed time period between sample collection and analysis. Exceeding allowed holding times could result in changes in constituent concentrations due to volatilization, decomposition, or other chemical alterations. Holding times depend on the analytical method, as specified in appropriate EPA methods (e.g., EPA/600/4-79-020 or SW-846). This SAP defines a “sample” as a filled sample bottle for starting the clock for holding-time restrictions.

B3.3.1 Decontamination of Sampling Equipment

Sampling equipment will be decontaminated in accordance with approved sampling equipment decontamination methods. To prevent potential contamination of the sample, care should be taken to use decontaminated equipment for each sampling activity. Special care should be taken to avoid the following common ways in which cross-contamination or background contamination may compromise samples:

- Improperly storing or transporting sampling equipment and sample containers
- Contaminating equipment or sample bottles by setting the equipment/sample bottle on or near potential contamination sources (e.g., uncovered ground)
- Handling bottles or equipment with dirty hands or gloves
- Improperly decontaminating equipment before sampling or between sampling events.

Decontamination of sampling equipment is performed using high-purity water in each step. In general, three rinse cycles are performed to decontaminate sampling equipment: detergent, acid, and water. During the detergent rinse, the equipment is washed in a phosphate-free detergent solution, followed by rinsing with high-purity water in three sequential containers. After the third high-purity water rinse,

Table C-1. 200-ZP-1 OU Monitoring Well Schedule for Analyses

Well Name	Well ID	Carbon Tetrachloride	Total Chromium[a]	Hexavalent Chromium (Filtered)	Iodine-129	Nitrate	Technetium-99	Trichloroethene	Tritium	Uranium	Chloroform	Dichloromethane	Chloromethane	Cyanide (total)[a]	Cyanide (free)[a]	cis-1,2-Dichloroethene	Vinyl Chloride	Chloride	Nitrite	Total Organic Carbon	Total Dissolved Solids	Sulfate	Sulfide	Iron[a]	Manganese[a]	Nickel[a]	Alkalinity	Carbonate Content	Temperature	pH	Specific Conductance	Turbidity	Dissolved Oxygen	Redox Potential
299-W5-2	C9439	A	A	A	A	A	A	A	A	5	A	A	A	5	—	A	A	A	A	5	5	A	5	A	5	A	5	5	A	A	A	A	A	A
299-W6-3[b]	A4998	A	5	5	5	A/M[c]	2	A	5	5	A	A	A	5	—	A	A	A/M[c]	A/M[c]	5	5	A/M[c]	5	5	5	5	5	5	A/M[c]	A/M[c]	A/M[c]	A/M[c]	A/M[c]	A/Mc
299-W6-6	A5001	A	5	5	5	A	2	A	5	5	A	A	A	5	—	A	A	A	A	5	5	A	5	5	5	5	5	5	A	A	A	A	A	A
299-W6-11[d]	A5436	A	—	—	—	A	—	—	—	—	—	—	—	—	—	—	—	A	A	—	—	A	—	—	—	—	—	—	A	A	A	A	A	A
299-W6-12[d]	A5437	—	—	—	—	A	—	—	—	—	—	—	—	—	—	—	—	A	A	—	—	A	—	—	—	—	—	—	A	A	A	A	A	A
299-W6-17	C9738	A	A	A	A	A	A	A	A	A	A	A	A	5	—	A	A	A	A	5	5	A	5	A	5	A	5	5	A	A	A	A	A	A
299-W7-3[b]	A5009	A	5	5	5	A/SA[c]	5	A	5	5	A	A	A	5	—	A	A	A/SA[c]	A/SA[c]	5	5	A/SA[c]	5	5	5	5	5	5	A/SA[c]	A/SA[c]	A/SA[c]	A/SA[c]	A/SA[c]	A/SAc
299-W10-1	A7136	2	2	2	5	—	5	2	—	—	2	2	2	5	—	2	2	2	—	5	5	2	5	2	5	2	5	5	2	2	2	2	2	2
299-W10-14	A4891	A	—	—	5	A	5	A	—	5	A	A	A	5	—	A	A	A	A	5	5	A	5	5	5	—	5	5	A	A	A	A	A	A
299-W10-26	B8548	—	M	M	—	—	M	—	—	—	—	—	—	M	M	—	—	—	—	—	—	—	—	—	—	—	—	—	M	M	M	M	M	M
299-W10-27	C3125	2	—Q	—Q	2	—	2Q	2	—	—	2	2	2	5Q	Q	2	2	2	—	5	5	2	5	5	5	—	5	5	2Q	2Q	2Q	2Q	2Q	2
299-W10-29[d]	C4988	SA	—	—	—	SA	—	—	—	—	—	—	—	—	—	—	—	SA	SA	—	—	SA	—	—	—	—	—	—	SA	SA	SA	SA	SA	SA
299-W10-30[b]	C4989	2/SA[c]	5	5	—	—/SA[c]	5	2	5	—	2	2	2	5	—	2	2	2/SA[c]	—/SA[c]	5	5	2/SA[c]	5	5	5	5	5	5	2/SA[c]	2/SA[c]	2/SA[c]	2/SA[c]	2/SA[c]	2/SAc
299-W10-31[b]	C5194	A/Q[c]	5	5	5	2/Q[c]	5	A	5	—	A	A	A	5	—	A	A	A/Q[c]	2/Q[c]	5	5	A/Q[c]	5	5	5	5	5	5	A/Q[c]	A/Q[c]	A/Q[c]	A/Q[c]	A/Q[c]	A/Qc
299-W10-33	C5855	A	2	2	5	A	2	A	2	5	A	A	A	5	—	A	A	A	A	5	5	A	5	2	5	2	5	5	A	A	A	A	A	A
299-W11-13	A5465	2	—	—	—	—	—	2	2	—	2	2	2	5A	A	2	2	2	—	5	5	2	5	5	5	—	5	5	2A	2A	2A	2A	2A	2
299-W11-18[b]	A7284	A/Q[c]	2	2	—	A/Q[c]	5	A	2	—	A	A	A	5	—	A	A	A/Q[c]	A/Q[c]	5	5	A/Q[c]	5	2	5	2	5	5	A/Q[c]	A/Q[c]	A/Q[c]	A/Q[c]	A/Q[c]	A/Qc
299-W11-33Q	B2402	—	A	A	—	—	2	—	A	—	—	—	—	5	—	—	—	A	—	5	5	A	5	A	5	A	5	5	A	A	A	A	A	A
299-W11-41	C3119	—	A	A	—	—	A	—	—	—	—	—	—	A	A	—	—	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
299-W11-43	C4694	A	2	2	2	A	2	A	2	5	A	A	A	5	—	A	A	A	A	5	5	A	5	2	5	2	5	5	A	A	A	A	A	A
299-W11-45	C4948	A	—	—	—	—	A	A	2	5	A	A	A	5	—	A	A	A	—	5	5	A	5	5	5	—	5	5	A	A	A	A	A	A
299-W11-47	C4990	2	—	—	—	2	2	2	2	—	2	2	2	5	—	2	2	2	2	5	5	2	5	5	5	—	5	5	2	2	2	2	2	2
299-W11-48	C5243	A	2	2	—	A	2	A	2	—	A	A	A	5	—	A	A	A	A	5	5	A	5	2	5	2	5	5	A	A	A	A	A	A
299-W11-87	C5407	A	2	2	5	—	—	A	2	—	A	A	A	5	—	A	A	A	—	5	5	A	5	2	5	2	5	5	A	A	A	A	A	A
299-W11-88	C5572	A	2	2	2	A	5	A	2	5	A	A	A	5	—	A	A	A	A	5	5	A	5	2	5	2	5	5	A	A	A	A	A	A
299-W13-1	C4238	2	5	5	—	—	5	2	5	—	2	2	2	5	—	2	2	2	—	5	5	2	5	5	5	5	5	5	2	2	2	2	2	2
299-W13-2	C9440	A	A	A	A	A	A	A	A	5	A	A	A	5	—	A	A	A	A	5	5	A	5	A	5	A	5	5	A	A	A	A	A	A
299-W14-11	C4668	A	—Q	—Q	—	—	—Q	A	2	—	A	A	A	5Q	Q	A	A	A	—	5	5	A	5	5	5	—	5	5	AQ	AQ	AQ	AQ	AQ	A
299-W14-13	B8549	2	2Q	2Q	2	2	AQ	2	—	—	2	2	2	5Q	Q	2	2	A	2	5	5	A	5	2	5	2	5	5	AQ	AQ	AQ	AQ	AQ	A
299-W14-14	C8547	—	2	2	—	—	—	—	2	—	—	—	—	5	—	—	—	2	—	5	5	2	5	2	5	2	5	5	2	2	2	2	2	2

Table C-1. 200-ZP-1 OU Monitoring Well Schedule for Analyses

Well Name	Well ID	Carbon Tetrachloride	Total Chromium[a]	Hexavalent Chromium (Filtered)	Iodine-129	Nitrate	Technetium-99	Trichloroethene	Tritium	Uranium	Chloroform	Dichloromethane	Chloromethane	Cyanide (total)[a]	Cyanide (free)[a]	cis-1,2-Dichloroethene	Vinyl Chloride	Chloride	Nitrite	Total Organic Carbon	Total Dissolved Solids	Sulfate	Sulfide	Iron[a]	Manganese[a]	Nickel[a]	Alkalinity	Carbonate Content	Temperature	pH	Specific Conductance	Turbidity	Dissolved Oxygen	Redox Potential
299-W14-16	C3120	=	M	M	=	=	M	=	=	=	=	=	=	A	A	=	=	=	=	=	=	=	=	=	=	=	=	=	A	A	A	A	A	A
299-W14-18	C3396	=	M	M	=	=	M	=	=	=	=	=	=	M	M	=	=	=	=	=	=	=	=	=	=	=	=	=	M	M	M	M	M	M
299-W14-72	C5103	A	—	—	5	—	5	A	5	5	A	A	A	5	=	A	A	A	—	5	5	A	5	5	5	—	5	5	A	A	A	A	A	A
299-W15-11[b]	A5474	A/Q[c]	5	5	5	A/Q[c]	A	A	—	5	A	A	A	5	=	A	A	A/Q[c]	A/Q[c]	5	5	A/Q[c]	5	5	5	5	5	5	A/Q[c]	A/Q[c]	A/Q[c]	A/Q[c]	A/Q[c]	A/Qc
299-W15-7	A5476	A	—	—	5	A	5	A	—	5	A	A	A	5	=	A	A	A	A	5	5	A	5	5	5	—	5	5	A	A	A	A	A	A
299-W15-17[b]	A4921	A	—	—	5	A/Q[c]	5	A	5	5	A	A	A	5	=	A	A	A/Q[c]	A/Q[c]	5	5	A/Q[c]	5	5	5	—	5	5	A/Q[c]	A/Q[c]	A/Q[c]	A/Q[c]	A/Q[c]	A/Qc

Table C-2. 200-ZP-1 OU Monitoring Well Schedule for Analyses

Well Name	Well ID	Carbon Tetrachloride	Total Chromium[a]	Hexavalent Chromium (Filtered)	Iodine-129	Nitrate	Technetium-99	Trichloroethene	Tritium	Uranium	Chloroform	Dichloromethane	Chloromethane	Cyanide (total)	Cyanide (free)	cis-1,2-Dichloroethene	Vinyl Chloride	Chloride	Nitrite	Total Organic Carbon	Total Dissolved Solids	Sulfate	Sulfide	Iron[a]	Manganese[a]	Nickel[a]	Alkalinity	Carbonate Content	Temperature	pH	Specific Conductance	Turbidity	Dissolved Oxygen	Redox Potential
299-W15-30[d]	B2410	SA	—	—	—	SA	—	—	—	—	—	—	—	—	=	—	—	SA	SA	—	—	SA	—	—	—	—	—	—	SA	SA	SA	SA	SA	SA
299-W15-33	B2643	2	5	5	—	2	2	2	5	5	2	2	2	5	=	2	2	2	2	5	5	2	5	5	5	5	5	5	2	2	2	2	2	2
299-W15-42	C3803	A	5	5	2	A	2	A	—	5	A	A	A	5	=	A	A	A	A	5	5	A	5	5	5	5	5	5	A	A	A	A	A	A
299-W15-46	C3426	—	5	5	—	2	2	—	5	—	—	—	—	5	=	—	—	2	2	5	5	2	5	5	5	5	5	5	2	2	2	2	2	2
299-W15-49[b]	C4301	—/Q[c]	—	—	—	2/Q[c]	—	—	5	—	—	—	—	5	=	—	—	2/Q[c]	2/Q[c]	5	5	2/Q[c]	5	5	5	—	5	5	2/Q[c]	2/Q[c]	2/Q[c]	2/Q[c]	2/Q[c]	2/Qc
299-W15-50	C4302	A	5	5	5	—	—	A	5	—	A	A	A	5	=	A	A	A	—	5	5	A	5	5	5	5	5	5	A	A	A	A	A	A
299-W15-83[b]	C4683	2/SA[c]	5	5	—	—/SA[c]	5	2	5	—	2	2	2	5	=	2	2	2/SA[c]	—/SA[c]	5	5	2/SA[c]	5	5	5/SA[c]	5/SA[c]	5	5	2/SA[c]	2/SA[c]	2/SA[c]	2/SA[c]	2/SA[c]	2/SAc
299-W15-94[b]	C4684	2	5	5	—	—/Q[c]	5	2	5	5	2	2	2	5	=	2	2	2/Q[c]	—/Q[c]	5	5	2/Q[c]	5	5	5	5	5	5	2/Q[c]	2/Q[c]	2/Q[c]	2/Q[c]	2/Q[c]	2/Qc
299-W15-152[b]	C4685	2	5	5	—	2/Q[c]	5	2	5	—	2	2	2	5	=	2	2	2/Q[c]	2/Q[c]	5	5	2/Q[c]	5	5	5/Q[c]	5/Q[c]	5	5	2/Q[c]	2/Q[c]	2/Q[c]	2/Q[c]	2/Q[c]	2/Qc
299-W15-224[d]	C4986	SA	—	—	—	SA	—	—	—	—	—	—	—	—	=	—	—	SA	SA	—	—	SA	—	—	—	—	—	—	SA	SA	SA	SA	SA	SA
299-W15-763	C3339	A	—	—	5	A	A	A	2	5	A	A	A	5	=	A	A	A	A	5	5	A	5	5	5	—	5	5	A	A	A	A	A	A
299-W15-765	C3397	2	—	—	—	2	A	2	2	—	2	2	2	5	=	2	2	2	2	5	5	A	5	5	5	—	5	5	A	A	A	A	A	A
299-W18-1	A5481	A	5	5	A	A	A	A	5	5	A	A	A	5	=	A	A	A	A	5	5	A	5	5	5	5	5	5	A	A	A	A	A	A
299-W18-16	C4303	2	5	5	5	2	2	2	5	—	2	2	2	5	=	2	2	2	2	5	5	2	5	5	5	5	5	5	2	2	2	2	2	2
699-43-69	C5573	A	2	2	5	A	5	A	5	5	A	A	A	5	=	A	A	A	A	5	5	A	5	2	5	2	5	5	A	A	A	A	A	A
699-44-64	A5188	2	5	5	5	2	2	2	5	5	2	2	2	5	=	2	2	2	2	5	5	2	5	5	5	5	5	5	2	2	2	2	2	2
699-44-70B	C9740	A	A	A	A	A	A	A	A	A	A	A	A	5	=	A	A	A	A	5	5	A	5	A	5	A	5	5	A	A	A	A	A	A
699-45-69A	A5196	2	—	—	—	—	5	2	5	—	2	2	2	5	=	2	2	2	—	5	5	2	5	5	5	—	5	5	2	2	2	2	2	2
699-45-69C	C5574	A	5	5	5	A	5	A	5	5	A	A	A	5	=	A	A	A	A	5	5	A	5	5	5	5	5	5	A	A	A	A	A	A
699-46-61	C9936	A	A	A	A	A	A	A	A	A	A	A	A	5	=	A	A	A	A	5	5	A	5	A	5	A	5	5	A	A	A	A	A	A
699-47-60	A5202	2	5	5	5	2	5	2	5	—	2	2	2	5	=	2	2	2	2	5	5	2	5	5	5	5	5	5	2	2	2	2	2	2
699-48-71	A5214	A	2	2	2	—	2	A	A	—	A	A	A	5	=	A	A	A	—	5	5	A	5	2	5	2	5	5	A	A	A	A	A	A
699-50-74	C4697	A	5	5	5	A	5	A	5	—	A	A	A	5	=	A	A	A	A	5	5	A	5	5	5	5	5	5	A	A	A	A	A	A
699-51-63	A5231	2	5	5	5	2	5	2	5	—	2	2	2	5	=	2	2	2	2	5	5	2	5	5	5	5	5	5	2	2	2	2	2	2
200-ZP-1 OU VOC Wells in the 200-UP-1 OU																																		
299-W14-71	C5102	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
299-W15-37	B2753	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
299-W18-15	A4932	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
299-W18-21[b]	A4933	A/M[c]	—	—	—	—/M[c]	—	A	—	—	A	A	A	—	=	A	A	—/M[c]	—/M[c]	—/M[c]	—	—/M[c]	—	—	—	—/M[c]	—/M[c]	—	A/M[c]	A/M[c]	A/M[c]	A/M[c]	A/M[c]	A/Mc
299-W18-22[b]	A4934	A/M[c]	—	—	—	—/M[c]	—	A	—	—	A	A	A	—	=	A	A	—/M[c]	—/M[c]	—/M[c]	—	—/M[c]	—	—	—	—/M[c]	—/M[c]	—	A/M[c]	A/M[c]	A/M[c]	A/M[c]	A/M[c]	A/Mc
299-W18-40	C3395	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A

Table C-3. 200-ZP-1 OU Monitoring Well Schedule for Analyses

Well Name	Well ID	Carbon Tetrachloride	Total Chromium[a]	Hexavalent Chromium (Filtered)	Iodine-129	Nitrate	Technetium-99	Trichloroethene	Tritium	Uranium	Chloroform	Dichloromethane	Chloromethane	Cyanide (total)	Cyanide (free)	cis-1,2-Dichloroethene	Vinyl Chloride	Chloride	Nitrite	Total Organic Carbon	Total Dissolved Solids	Sulfate	Sulfide	Iron[a]	Manganese[a]	Nickel[a]	Alkalinity	Carbonate Content	Temperature	pH	Specific Conductance	Turbidity	Dissolved Oxygen	Redox Potential
299-W19-4	A4958	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
299-W19-6	A4959	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
299-W19-18	A7743	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
299-W19-34A	A9517	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
299-W19-34B	A9513	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
299-W19-36	B2461	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
299-W19-41	B8551	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
299-W19-47	C4258	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
299-W19-48	C4300	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
299-W19-49	C4695	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
299-W19-105	C4968	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
299-W19-107	C5193	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
299-W21-2	C4639	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
299-W22-47	C4667	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
299-W22-72	C4970	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
299-W22-86	C4971	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
299-W22-87	C4977	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
299-W22-88	C4978	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
299-W23-4	A4987	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
299-W23-19	B8809	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
299-W26-13	B8817	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
299-W27-2	A5410	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
699-30-66	C4298	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
699-32-62	A5128	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
699-32-72A	A5130	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
699-33-75	C4974	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
699-34-61	A5463	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
699-35-66A	A5139	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
699-35-78A	A5141	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
699-36-61A	A5144	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
699-36-66B	C6219	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
699-36-70A	A9901	A	—	—	—	—	—	A	—	—	A	A	A	—	≡	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A

Table C-4. 200-ZP-1 OU Monitoring Well Schedule for Analyses

Well Name	Well ID	Carbon Tetrachloride	Total Chromium[a]	Hexavalent Chromium (Filtered)	Iodine-129	Nitrate	Technetium-99	Trichloroethene	Tritium	Uranium	Chloroform	Dichloromethane	Chloromethane	Cyanide (total)	Cyanide (free)	cis-1,2-Dichloroethene	Vinyl Chloride	Chloride	Nitrite	Total Organic Carbon	Total Dissolved Solids	Sulfate	Sulfide	Iron[a]	Manganese[a]	Nickel[a]	Alkalinity	Carbonate Content	Temperature	pH	Specific Conductance	Turbidity	Dissolved Oxygen	Redox Potential
699-36-70B	C4299	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
699-37-66	C5704	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
699-38-61	A5464	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
699-38-65	A5148	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
699-38-68A	A9516	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
699-38-70B	C4236	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
699-38-70C	C4256	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
699-40-62	A5158	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A
699-40-65	C4235	A	—	—	—	—	—	A	—	—	A	A	A	—	=	A	A	—	—	—	—	—	—	—	—	—	—	—	A	A	A	A	A	A

Note:

Sampling frequency:

2 = sample biennially (every 2 years, as recommended by SGW-60527, *CR-2016-1543 – Redundancy Analysis for the 200-ZP-1 Groundwater Monitoring Network*)

5 = sample every 5 years (to coincide with preparation of the next *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* 5-year review)

A = sample annually

M = sample monthly

Q = sample quarterly

SA = sample semiannually

a. Collect filtered and unfiltered samples for metals, except for hexavalent chromium. A filtered sample will be collected for hexavalent chromium. An unfiltered sample will be collected for total and free cyanide.

b. Well to be sampled as part of the 200-ZP-1 OU optimization study near-term monitoring (FY 2020).

c. Second frequency listed is applicable to the 200-ZP-1 OU optimization study near-term monitoring (FY 2020). The first frequency listed applied to the 200-ZP-1 Groundwater OU monitoring program.

d. Well added for the 200-ZP-1 OU optimization study near-term monitoring (FY 2020).

— = not sampled

FY = fiscal year

ID = identification

OU = operable unit

redox = reduction-oxidation

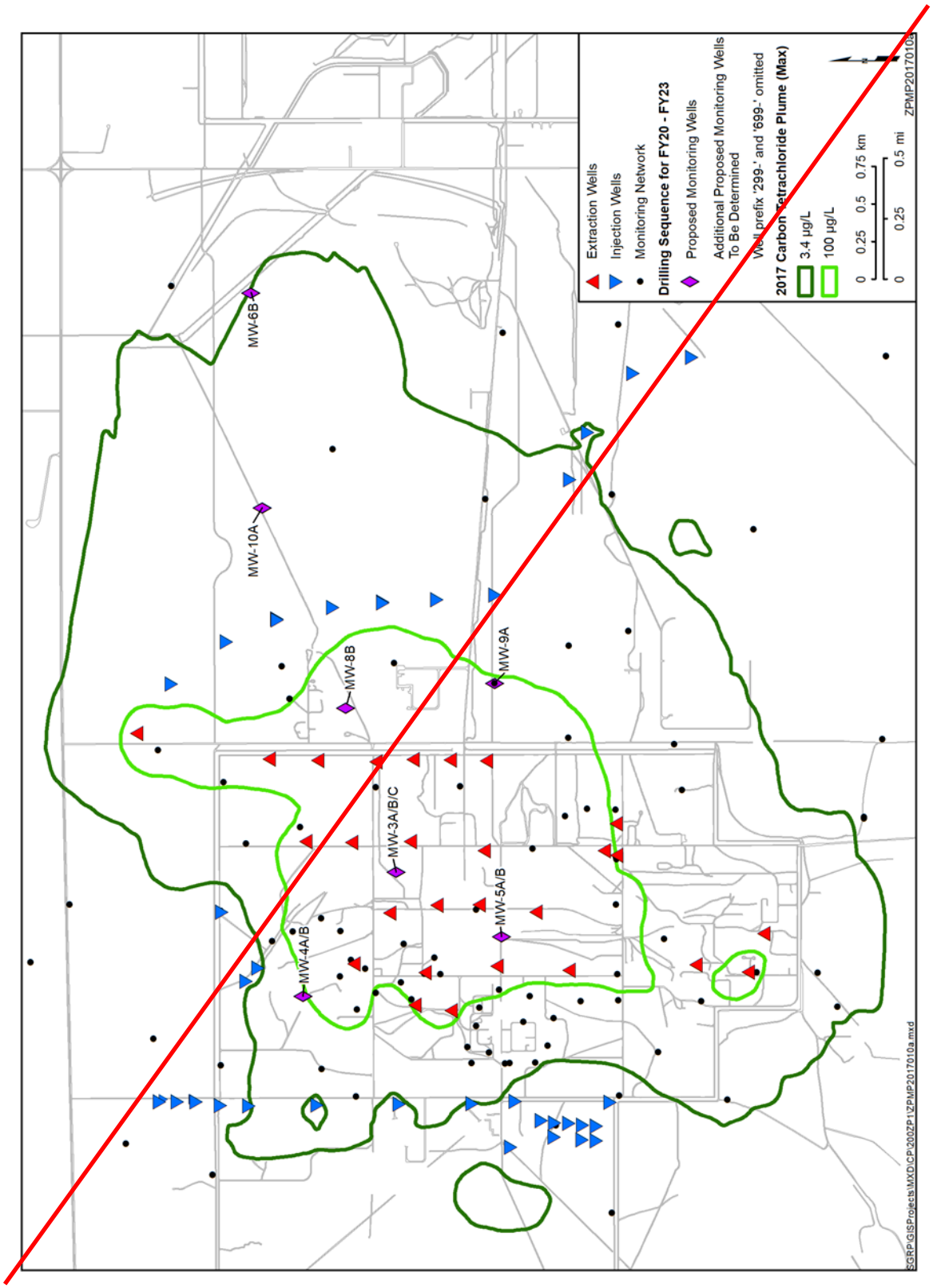
VOC = volatile organic compound

Table F-1. Hydrogeologic Monitoring Unit Classification and Well Network Details

Well Name	Well ID	Hydrogeologic Unit Monitored	Elevation Top of Open Interval (m NAVD88)	Elevation Bottom of Open Interval (m NAVD88)	Open Interval Length (m)
299-W5-2	C9439	LU	111.7	87.4	12.2
299-W6-3	A4998	LU	89.5	86.4	3.1
299-W6-6	A5001	LU	89.9	86.6	3.3
299-W6-17	C9738	LU	92.2	86.1	6.1
299-W7-3	A5009	LU	70.3	61.9	8.4
299-W10-1	A7136	U	149.5	125.2	14.3
299-W10-14	A4891	LU	84.1	78.0	6.1
299-W10-26	B8548	TU	139.3	128.6	10.7
299-W10-27	C3125	TU	138.3	127.6	10.7
299-W10-30	C4989	TU	137.8	127.1	10.7
299-W10-31	C5194	TU	137.3	126.6	10.7
299-W10-33	C5855	LU	87.1	81.0	6.1
299-W11-13	A5465	U	145.5	68.4	77.1
299-W11-18	A7284	TU	147.3	126.6	20.7
299-W11-33Q	B2402	TU	142.8	126.1	16.5
299-W11-41	C3119	TU	138.5	127.8	10.7
299-W11-43	C4694	LU	88.1	83.5	4.6
299-W11-45	C4948	UU	127.9	123.4	4.5
299-W11-47	C4990	U	126.8	117.5	9.3
299-W11-48	C5243	LU	125.1	97.7	27.4
299-W11-87	C5407	LU	107.3	102.7	4.6
299-W11-88	C5572	LU	86.2	74.0	12.2
299-W13-1	C4238	MU	104.4	93.7	10.7
299-W13-2	C9440	LU	128.4	104.3	12.2
299-W14-11	C4668	UU	125.3	122.3	3.0
299-W14-13	B8549	TU	138.7	128.7	10.0
299-W14-14	B8547	TU	139.3	128.6	10.7
299-W14-16	C3120	TU	138.1	127.5	10.7
299-W14-18	C3396	TU	138.6	127.9	10.7
299-W14-71	C5102	LU	94.2	89.7	4.5

Table F-1. Hydrogeologic Monitoring Unit Classification and Well Network Details

Well Name	Well ID	Hydrogeologic Unit Monitored	Elevation Top of Open Interval (m NAVD88)	Elevation Bottom of Open Interval (m NAVD88)	Open Interval Length (m)
299-W14-72	C5103	LU	90.2	85.6	4.6
299-W15-7	A5476	TU	148.8	97.6	51.2
299-W15-11	A5474	TU	152.5	117.8	34.7
299-W15-17	A4921	LU	81.0	78.0	3.0


MW-6B
MW-10A
MW-8B
MW-9A
MW-3A/B/C
MW-5A/B
MW-4A/B
Extraction Wells
Injection Wells
Monitoring Network
Drilling Sequence for FY20 - FY23
Proposed Monitoring Wells
Additional Proposed Monitoring Wells To Be Determined
Well prefix '299-' and '699-' omitted
2017 Carbon Tetrachloride Plume (Max)
3.4 µg/L
100 µg/L
0 0.25 0.5 0.75 km
0 0.25 0.5 mi
ZPMP20170103
GRP\GISProjects\MXD\CP200ZP1\ZPMP2017010a.mxd

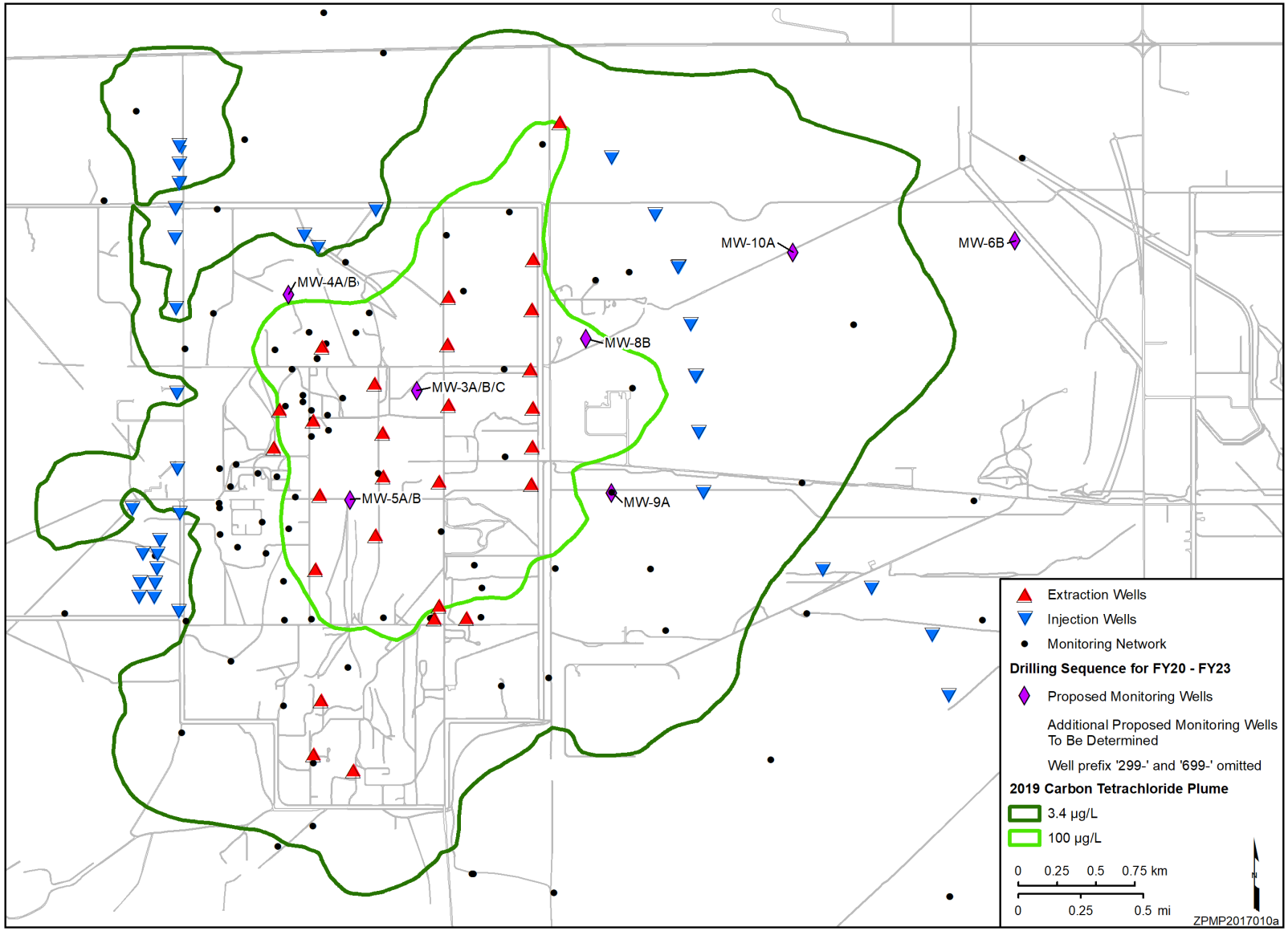


Figure G-1. Approximate Location of Proposed Monitoring Wells

Table G-1. Constituents of Interest in Groundwater and Sediments During Drilling and in Groundwater Post-Development

Constituent of Interest	CAS Number
cis-1,2-Dichloromethene	156-59-2
Cyanide (total)[b]	57-12-5
Cyanide (free)[be]	FREE-CN
Dichloromethane	75-09-2
Iodine-129[a]	15046-84-1
Iron[b]	7439-89-6
Manganese[b]	7439-96-5
Nickel[b]	7440-02-0
Nitrate[a]	14797-55-8
Nitrite	14797-65-0
Sulfate	14808-79-8
Sulfide	18496-25-8
Technetium-99[a]	14133-76-7
Total dissolved solids	TDS
Total organic carbon	TOC
Trichloroethene[a]	79-01-6
Tritium[a]	10028-17-8
Uranium, total[c, b]	7440-61-1
Vinyl chloride	75-01-4
Field Screening Parameters[d]	
Dissolved oxygen	N/A
Oxidation-reduction potential	N/A
pH	N/A
Specific conductance	N/A
Temperature	N/A
Turbidity	N/A

a. The COCs are specified in EPA et al., 2008, *Record of Decision Hanford 200 Area 200-ZP-1 Superfund Site, Benton County, Washington*.

b. Both filtered and unfiltered samples will be collected for all metal constituents, except hexavalent chromium. A filtered sample will be collected for hexavalent chromium. An unfiltered sample will be collected for total and free cyanide.

c. Uranium (total) will also be analyzed as a target constituent. While not a COC specified in the 200-ZP-1 OU Record of Decision (EPA et al., 2008), it is a COC for the 200-UP-1 OU to the south.

d. Field screening parameters to be collected in accordance with DOE/RL-96-68, *Hanford Analytical Services Quality Assurance Requirements Document, Vol. 3, Field Analytical Technical Requirements*.

e. Free cyanide analysis is only applicable to groundwater samples.

Table G-1. Constituents of Interest in Groundwater and Sediments During Drilling and in Groundwater Post-Development

Constituent of Interest	CAS Number

BART = biological activity reaction tests
CAS = Chemical Abstracts Service
COC = contaminant of concern
N/A = not applicable
OU = operable unit
TDS = total dissolved solids
TOC = total organic carbon

3. During split-spoon sampling, if insufficient material is recovered or the split spoon is overdriven, then (when feasible) a second split spoon will be collected prior to advancing the borehole. If there is not enough sample volume recovered during split-spoon sampling, laboratory-approved minimum sample volumes will be used to run all required sample analyses. If it is not possible to collect sufficient sample volume and perform all the analyses, then DOE-RL will be consulted to concur on the path forward.

4. Groundwater samples ~~may~~should not be collected before ~~a minimum of three well casing volumes have been purged and~~ water chemistry (e.g., temperature, pH, and conductivity) has stabilized within 10% variance over three consecutive measurements unless approved by the OU technical lead. ~~Note that one borehole volume is acceptable if water chemistry (e.g., temperature, pH, and conductivity) has stabilized within 10% variance over three consecutive measurements for the depth discrete groundwater samples collected during drilling.~~

Regarding minor changes, the OU technical lead in coordination with the soil and groundwater subject matter expert will consult with DOE-RL and the Regulatory Lead when deviations from the SAP do not affect the overall intent of the plan. Below are examples of minor changes:

1. Changing the type of sample being collected. For example, collecting continuous grab samples instead of continuous cores.

2. Selecting a different well construction material and/or well design.

3. Changing to a different drilling method.

The Project Scientist in coordination with the Soil and Groundwater Subject Matter Expert (SME) will inform DOE and EPA of deviations from the SAP that do affect the overall intent and schedule that may require revision to the approved plan.

Logbooks and data forms required by WAC 173-160 and the master drilling contract are required for field activities. The logbook must be identified with a unique project name and number. Individuals responsible for the logbooks will be identified in the front of the logbook, and only authorized individuals may make entries into the logbooks. Logbooks will be controlled in accordance with internal work requirements and processes.

The FWS and SMR are responsible for ensuring that the field instructions are maintained and aligned with any revisions or approved changes to the SAP. SMR will ensure that any deviations from the SAP are reflected in revised field sampling documents for the samplers and the analytical laboratory. The FWS will ensure that deviations from the SAP or problems encountered in the field are documented appropriately (e.g., in the field logbook).

The OU project manager, FWS, or designee is responsible for communicating field corrective action requirements and ensuring that immediate corrective actions are applied to field activities. The OU project manager is also responsible for ensuring that project files are appropriately set up and maintained. The project files will contain project records or references to their storage locations. Project files may include the following information:

- Forms required by WAC 173-160 and the master drilling contract
- Field drilling and geology data forms
- Borehole summary reports
- Geophysical log data reports

G3.4.5 Sample Containers, Preservatives, and Holding Times

Appropriate sample containers will be used for soil and groundwater samples collected for radiological and chemical analysis. Container sizes may vary, depending on the laboratory-specific volumes needed to meet analytical detection limits. However, if the dose rate on the outside of a sample jar or the specific activity within the sample exceeds levels acceptable for an offsite laboratory, the sample coordinator may send smaller volumes to the laboratory after consultation with SMR to determine acceptable volumes. The final container type and volumes will be provided on the sample authorization form and chain-of-custody form. For the purpose of starting the clock for holding-time restrictions, a "sample" is defined as a filled sample bottle.

G3.4.6 Sampling Procedure

Depth-discrete soil samples from drill cuttings will be collected from the vadose zone and the aquifer. This will enable sieve analyses to be completed to design both the filter pack and the slot size for the screen in the aquifer for all wells and in the vadose zone for injection wells.

Most groundwater samples will be collected from selected intervals using a submersible pump, although collecting samples with a bailer is also acceptable (e.g., near the water table where insufficient head may be available for pumping, or where groundwater turbidity is high enough to interfere with pumping). ~~Prior to sample capture, the pump will be operated for a sufficient period of time to provide stabilized field readings.~~ Prior to sample collection, purging of the sampling interval will be performed at flow rates of <3.8 L/min (1 gal/min) until field parameters stabilize. Samples will be collected from the aquifer at flow rates of <3.8 L/min (1 gal/min).

Samples collected as the boring is advanced will assist in validating the conceptual model for COC distribution and might lead to changes in the screened interval.

G3.4.7 Sample Shipping

Samples may not be transported without authorization from the Soil and Groundwater Remediation Project authorized shipper. If the proposed wells have a medium or high risk of encountering radiological material, RCT surveys will be required. If radiological materials are not anticipated, RCT surveys may not be required if the RCT field readings show no activity above background. As applicable, the RCT will measure the contamination levels on the outside of each sample jar and the dose rates on each sample jar. As applicable, the RCT will also measure the radiological activity on the outside of the sample container (through the container) and will document the highest contact radiological reading in millirem per hour (mrem/hr). This information and other data will be used to select proper packaging, marking, labeling, and shipping paperwork in accordance with U.S. Department of Transportation regulations (49 CFR, "Transportation") and to verify that the sample can be received by the analytical laboratory in accordance with the laboratory's acceptance criteria. The sampler will send copies of the shipping documentation to SMR within 48 hours of shipping.

As a general guideline, samples with activities <5 µSv/hr (0.5 mrem/hr) can be shipped to an appropriate offsite laboratory (e.g., DOE contract laboratory, or a laboratory with a U.S. Nuclear Regulatory Commission or state license for specific radionuclides). Samples with activities between 5 and 100 µSv/hr (0.5 and 10 mrem/hr) may be shipped to an offsite laboratory, although samples with dose rates within this range will be evaluated on a case-by-case basis by SMR. Samples with activities >100 µSv/hr (10 mrem/hr) may be sent to an onsite laboratory, as arranged by SMR.

3.4.8 Radiological Field Data

Alpha and beta/gamma data collection in the field using established Hanford Site procedures will be used as needed to support sampling and analysis efforts. The following information will be distributed to personnel performing work in support of this SAP: