ECF-HANFORD-18-0032
Revision 0

METHODOLOGY FOR SELECTION OF GROUNDWATER CONCENTRATION LIMITS FOR SITE-SPECIFIC CONSTITUENTS IN SINGLE-SHELL TANK WASTE MANAGEMENT AREAS

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

Approved for Public Release;
Further Dissemination Unlimited

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APPROVED
By Janis D. Aardal at 3:19 pm, Jan 21, 2019

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ENVIRONMENTAL CALCULATION COVER PAGE

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RCRA Rev. 9 Groundwater

Date:

Calculation Title and Description:
METHODOLOGY FOR SELECTION OF GROUNDWATER CONCENTRATION LIMITS FOR SITE-SPECIFIC CONSTITUENTS IN SINGLE-SHELL TANK WASTE MANAGEMENT AREAS

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DATE:
Jan 21, 2019
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Professional Licenses: Licensed Geologist (Washington)

Brief Narrative of Experience: Tessa Clark's professional experience has primarily focused on soil and groundwater remediation project support at the U.S. Department of Energy's Hanford Site, with an emphasis in data quality and interpretation relating to multiple regulatory projects. This includes development of drilling project contract statements of work, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sampling and analysis plans, and Resource Conservation and Recovery Act of 1976 (RCRA) engineering evaluation reports and groundwater monitoring plans. Additionally, she has experience in the development and oversight of environmental site assessments, including multi-media sampling throughout Washington and Oregon.

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ENVIRONMENTAL CALCULATION COVER PAGE (Continued)

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SECTION 2 - Completed by Preparer

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ENVIRONMENTAL CALCULATION COVER PAGE (Continued)

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Prior to Initiating Modeling:

Required training for modelers completed:
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Print First and Last Name	Signature	Date

Safety Software Approved:
Integration Lead:

Print First and Last Name	Signature	Date

Calculation Approved:
Risk/Modeling Integration Manager:

Print First and Last Name	Signature	Date

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Terms

DWS	drinking water standard
ECF	environmental calculation file
HAPQL	highest available practical quantitation limit
MDL	method detection limit
MTCA	“Model Toxics Control Act—Cleanup” (WAC 173-340)
OU	operable unit
ROD	record of decision
WMA	waste management area

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1 Purpose

The purpose of this environmental calculation file (ECF) is to identify groundwater contaminant concentration limits or propose alternate concentration limits based on the process described in WAC 173-303-645, "Dangerous Waste Regulations," "Releases from Regulated Units," as part of the groundwater protection standard for the compliance groundwater monitoring program at the Hanford Site single-shell tank farm waste management areas (WMAs) A/AX, B/BX/BY, C, S/SX, T, TX/TY, and U. Alternate concentration limits are established for constituents not included in WAC 173-303-645(5) Table 1, "Maximum Concentration of Constituents for Groundwater Protection." The alternate concentration limits and WAC 173-303-645(5), Table 1 values are used to identify proposed groundwater concentration limits.

The identified concentration limits will be used to determine whether a regulated unit has caused an exceedance in groundwater contamination during compliance monitoring, per WAC 173-303-645(10), "Compliance Monitoring Program," and whether corrective action is required for the regulated unit.

2 Background

This ECF presents a compilation of concentration limits for site-specific constituents, composed of dangerous and nondangerous wastes that are not included in Ecology Publication No. 97-407, *Chemical Test Methods For Designating Dangerous Waste WAC 173-303-090 & -100*, Appendix 5 (hereinafter referred to as Appendix 5), from the following: (1) approved records of decision (RODs) cleanup levels; (2) federal drinking water standards (DWSs); (3) state maximum concentration and contaminant levels; (4) established WAC 173-340-720, "Model Toxics Control Act—Cleanup," "Groundwater Cleanup Standards" (MTCA), calculated Standard Method B groundwater cleanup levels (also known as risk-based concentrations); highest allowable practical quantitation limits (HAPQLs); and 90th percentile Hanford Site groundwater background levels. This information will be used to identify the proposed groundwater concentration limits.

3 Methodology

The following describes the methodology used to identify constituent-specific groundwater DWSs and risk-based criteria. It also describes the process used to identify the proposed groundwater concentration limit for comparison purposes.

The site-specific constituents listed in this ECF are described further in Section 4.1, and their source documents are listed in Table 1 of this ECF.

Table 1. Source Documents for Proposed Site-Specific Final Status Monitoring Constituents

Single-Shell Tank Farm	Engineering Evaluation Report	Site-Specific Monitoring Constituent Selection ECF*
WMA-A-AX	SGW-60586, *Engineering Evaluation Report for Single-Shell Tank Waste Management Area A-AX Groundwater Monitoring*, Rev. 0	ECF-200PO1-17-0223, *Identification of Site-Specific Monitoring Constituents for Waste Management Area A-AX*, pending
WMA-B-BX-BY	SGW-60587, *Engineering Evaluation Report for Single-Shell Tank Waste Management Area B-BX-BY Groundwater Monitoring*, Rev. 0	ECF-200BP5-17-0229, *Identification of Site-Specific Monitoring Constituents for Waste Management Area B-BX-BY*, pending

Table 1. Source Documents for Proposed Site-Specific Final Status Monitoring Constituents

Single-Shell Tank Farm	Engineering Evaluation Report	Site-Specific Monitoring Constituent Selection ECF*
WMA-C	SGW-60588, *Engineering Evaluation Report for Single-Shell Tank Waste Management Area C Groundwater Monitoring*, Rev. 0	ECF-200BP5-17-0230, *Identification of Site-Specific Monitoring Constituents for Waste Management Area C*, pending
WMA S-SX	SGW-60577, *Engineering Evaluation Report for Single-Shell Tank Waste Management Area S-SX Groundwater Monitoring*, Rev. 0	ECF-200UP1-17-0221, *Identification of Site-Specific Monitoring Constituents for Waste Management Area S-SX*, Rev. 0
WMA T	SGW-60575, *Engineering Evaluation Report for Single-Shell Tank Waste Management Area T Groundwater Monitoring*, Rev. 0	ECF-200ZP1-17-0203, *Identification of Site-Specific Monitoring Constituents for Waste Management Area T*, Rev. 0
WMA TX-TY	SGW-60576, *Engineering Evaluation Report for Single-Shell Tank Waste Management Area TX-TY Groundwater Monitoring*, Rev. 0	ECF-200ZP1-17-0204, *Identification of Site-Specific Monitoring Constituents for Waste Management Area TX-TY*, Rev. 0
WMA U	SGW-60578, *Engineering Evaluation Report for Single-Shell Tank Waste Management Area U Groundwater Monitoring*, Rev. 0	ECF-200UP1-17-0123, *Identification of Site-Specific Monitoring Constituents for Waste Management Area U*, Rev. 0

*Included as Appendix B of each engineering evaluation report.

ECF = environmental calculation file

WMA = waste management area

3.1 Background Values, Drinking Water Standards and State Risk-Based Criteria Considered for Proposed Groundwater Concentration Limits

Proposed constituent-specific groundwater concentration limits are selected by compiling the HAPQL, 90th percentile Hanford Site groundwater background levels, federal and state DWSs, and Method B cleanup levels (risk-based concentrations) for each site-specific constituent listed in Table 2 of this ECF.

Table 2. Site-Specific Constituents Proposed for Monitoring at Single-Shell Tank Farms

CAS #	Waste Constituent Common Name	Associated WMAs
Dangerous Waste		
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	All
95-63-6	1,2,4-Trimethylbenzene	A-AX
540-59-0	1,2-Dichloroethene (Total)	T
78-92-2	2-Butanol	TX-TY
79-46-9	2-Nitropropane	All
67-63-0	2-Propanol (isopropyl alcohol)	A-AX, TX-TY
7664-41-7	Ammonia	B-BX-BY, C, S-SX, TX-TY

Table 2. Site-Specific Constituents Proposed for Monitoring at Single-Shell Tank Farms

CAS #	Waste Constituent Common Name	Associated WMAs
Dangerous Waste		
65-85-0	Benzoic acid	A-AX
74-83-9	Bromomethane	C
156-59-2	cis-1,2-Dichloroethylene	S-SX, TX-TY
1319-77-3	Cresols (Total)	A-AX, B-BX-BY, C, S-SX, TX-TY, U
110-82-7	Cyclohexane	A-AX
108-94-1	Cyclohexanone	All
84-74-2	Di-n-butylphthalate	B-BX-BY
141-78-6	Ethyl acetate	All
60-29-7	Ethyl ether	All
18540-29-9	Hexavalent chromium	A-AX, B-BX-BY, C, S-SX, T, TX-TY
302-01-2	Hydrazine	TX-TY
67-56-1	Methanol	All
71-36-3	n-Butyl alcohol (1-Butanol)	All
109-99-9	Tetrahydrofuran	TX-TY
126-73-8	Tributyl phosphate	C, S-SX
Nondangerous Waste		
7429-90-5	Aluminum	All
16887-00-6	Chloride	B-BX-BY, C
16984-48-8	Fluoride	B-BX-BY, T, TX-TY
7439-89-6	Iron	All
7439-96-5	Manganese	All
14797-55-8	Nitrate	All
14797-65-0	Nitrite	B-BX-BY, C, S-SX, T, TX-TY
7723-14-0	Phosphorus	TX-TY
14808-79-8	Sulfate	A-AX, B-BX-BY, C, T, TX-TY

CAS = Chemical Abstracts Service

The following lists the source of each type of groundwater input value, and are documented in Table 3 of this ECF:

1. The HAPQL is based on the practical quantitation limits of contracted commercial laboratories in support of CH2M HILL Plateau Remediation Company work scope, identified in ECF-HANFORD-18-0058, *Practical Quantitation Limits for Groundwater Environmental Samples*.

2. The 90th percentile Hanford Site background value from Table ES-1 in DOE/RL-96-61, *Hanford Site Background: Part 3, Groundwater Background*.

3. The maximum concentration of constituents for groundwater protection listed in WAC 173-303-645(5), Table 1.

4. Final cleanup levels identified in EPA et al., 2012, *Record of Decision for Interim Remedial Action Hanford 200 Area Superfund Site 200-UP-1 Operable Unit* (hereinafter referred to as the 200-UP-1 Operable Unit [OU] ROD) (DOE/RL-2013-07, *200-UP-1 Groundwater Operable Unit Remedial Design/Remedial Action Work Plan*).

5. Final cleanup levels identified in EPA et al., 2008, *Record of Decision Hanford 200 Area 200-ZP-1 Superfund Site Benton County, Washington* (hereinafter referred to as the 200-ZP-1 OU ROD) (DOE/RL-2008-78, *200 West Area 200-ZP-1 Pump-and-Treat Remedial Design/Remedial Action Work Plan).*

6. Federal DWSs (40 CFR 141, "National Primary Drinking Water Regulations") and state DWSs (WAC 246-290-310, "Group A Public Water Supplies," "Maximum Contaminant Levels [MCLs] and Maximum Residual Disinfectant Levels [MRDLs]").

7. Standard Method B groundwater cleanup levels calculated in accordance with 2013 WAC 173-340-720, "Ground Water Cleanup Standards," from ECF-100NPL-10-0462, *Calculation of Standard Method B Groundwater Cleanup Levels for Potable Groundwater for the 100 Areas and 300 Area Remedial Investigation/Feasibility Study Reports*.

3.2 Process Used to Identify Proposed Groundwater Concentration Limit

Groundwater concentration limits are proposed using the following hierarchy of sources:

1. Select the final cleanup level for contaminants of concern listed in the 200-UP-1 ROD (EPA et al., 2012) and the 200-ZP-1 ROD (EPA et al., 2008) as the proposed concentration limit, when greater than the HAPQL and 90th percentile Hanford Site background level. These proposed concentration limits apply only to monitoring wells at WMAs within the 200-UP-1 and 200-ZP-1 OUs. The final cleanup levels of 48 µg/L and 10,000 µg/L for hexavalent chromium and nitrate, respectively, are the proposed concentration limits.

2. Select the maximum concentration of constituents for groundwater protection for analytes listed in WAC 173-303-645(5), Table 1, as the proposed groundwater concentration limit. The Table 1 value is selected as the proposed concentration limit when it is greater than the 90th percentile Hanford Site background level or when the analyte does not have a background value. If the Table 1 value is less than the 90th percentile Hanford Site background value, then select an alternate concentration as proposed in Step 3 of this section. If the Table 1 value is less than the HAPQL, then the HAPQL is the proposed concentration limit.

3. Select another alternate concentration limit as the proposed groundwater concentration limit for analytes that are not included in Steps 1 and 2 of this section. The alternate limit in this step is

identified as the lower of the federal and state DWSs or the Standard Method B risk-based concentration. If the alternate limit is less than the HAPQL, then the HAPQL is the proposed concentration limit.

4. When an analyte does not have a proposed concentration limit identified in Steps 1, 2, or 3 of this section, then a groundwater concentration limit is not proposed.

Figure 1 presents the flowchart for methodology described in this section; the assumptions and inputs are described further in Chapter 4.

4 Assumptions and Inputs

Key assumptions and inputs used to identify proposed concentration limits are described in the following sections.

4.1 Proposed Final Status Groundwater Monitoring Constituents

Table 1 includes the list of documents and associated ECFs (included as Appendix B in the associated engineering evaluation reports listed below) evaluated to construct the list of constituents evaluated in this ECF. Table 2 presents the constituents proposed for final status groundwater monitoring at Hanford Site single-shell tank farms.

Constituents identified in the various engineering evaluation reports (Table 1), not already listed in Appendix 5, are presented in Table 2. Table 2 presents the Chemical Abstracts Service number, waste constituent common name, waste designation (dangerous versus nondangerous waste), and the single-shell WMAs at which each constituent is proposed for compliance groundwater monitoring. Of the 32 constituents listed in Table 2, 22 are classified as dangerous wastes and 10 are nondangerous wastes.

4.2 Highest Available Practical Quantitation Limits

HAPQL values are based upon the practical quantitation limits of contracted commercial laboratories in support of CH2M HILL Plateau Remediation Company work scope. Method detection limits (MDLs) shall be established by the laboratory and are determined in accordance with the most current version of 40 CFR 136, “Guidelines Establishing Test Procedures for the Analysis of Pollutants,” Appendix B, “Definition and Procedure for the Determination of the Method Detection Limit—Revision 2.” HAPQL values are calculated procedurally, and may be affected by MDLs.

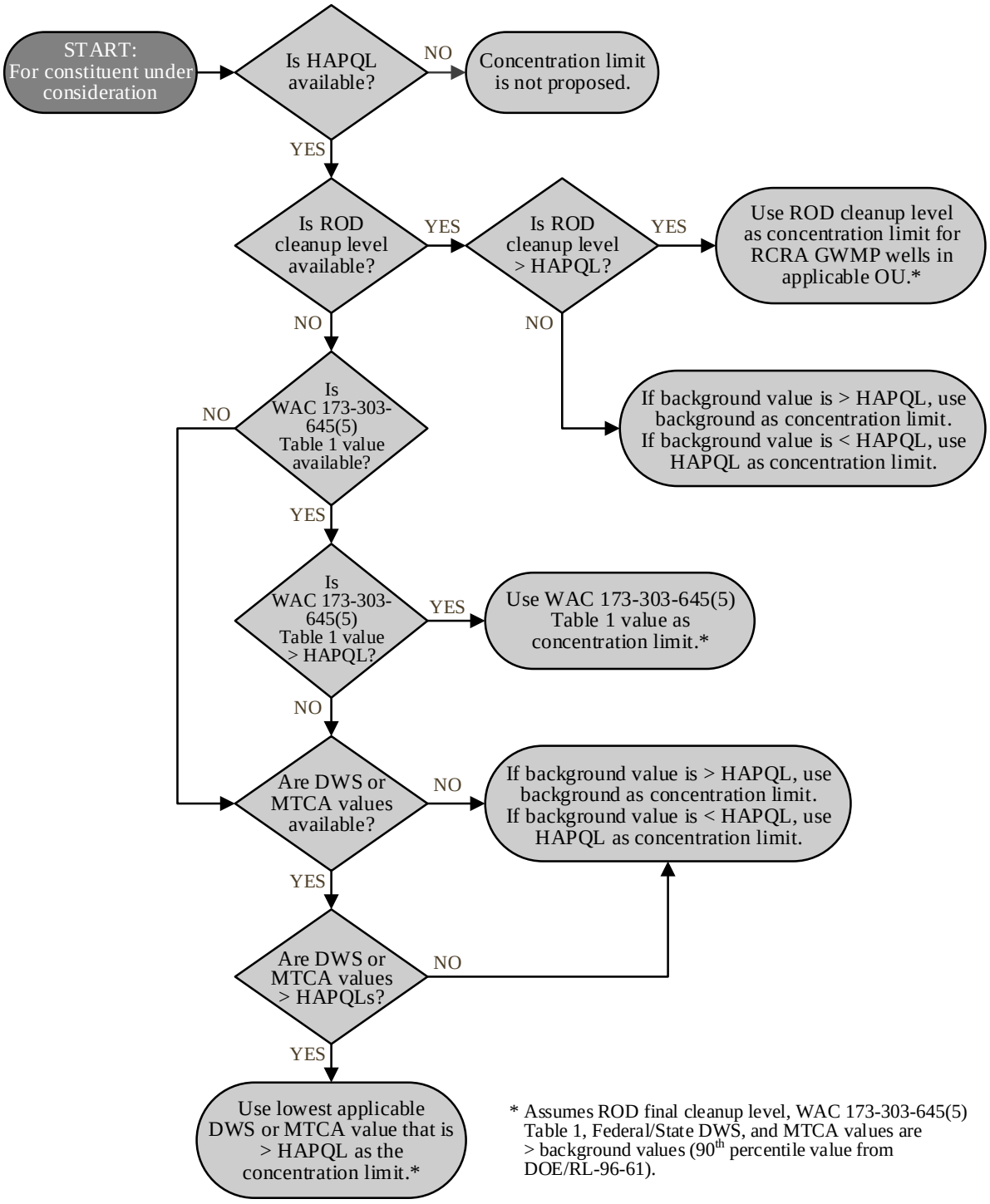
When applicable, low-level HAPQL values assume accredited, contracted laboratories can accept and analyze constituents at the lower levels within contractual time limits. HAPQL values also assume that increased cost can be covered if sample volume increases to satisfy lower HAPQL methodology.

HAPQL values presented in column 3 in Table 3 of this ECF assume no change to current MDLs.

4.3 Hanford Site Background Levels

Hanford Site background levels are established in DOE/RL-96-61 and were developed in accordance with WAC 173-340-709, “Model Toxics Control Act—Cleanup,” “Methods for Defining Background Concentrations.” The 90th percentile background values are evaluated during selection of proposed groundwater concentration limits as described in Chapter 2.

The local, current background levels are assumed to be equal to or not exceed the 90th percentile values presented for the Hanford Site in DOE/RL-96-61. When available, these levels are included in column 4 of Table 3 in this ECF.



* Assumes ROD final cleanup level, WAC 173-303-645(5) Table 1, Federal/State DWS, and MTCA values are > background values (90th percentile value from DOE/RL-96-61).

DWS = drinking water standard
GWMP = groundwater monitoring plan
HAPQL = highest allowable practical quantitation limits
MCTA = Model Toxics Control Act
OU = operable unit
RCRA = Resource Conservation and Recovery Act
ROD = record of decision

Applicable DWS or MTCA values refer to Federal/State DWS or MTCA B cleanup levels.

DOE/RL-96-61, Rev. 0, *Hanford Site Background: Part 3 Groundwater Background.*

WAC 173-303-645, "Dangerous Waste Regulations," "Releases from Regulated Units." *Washington Administrative Code.*

Figure 1. Selection of Concentration Limit Flowchart

Table 3. Proposed Groundwater Concentration Limits

1	2	3	4	5	6	7	8	9	10	11	12	13
CAS #	**Waste Constituent (Alternate Name)**	**HAPQL[a] (µg/L) (Analytical Method, if Specified)**	**Hanford Site 90th Percentile Background[b] (µg/L)**	**Final Cleanup Level 200-UP-1 ROD[c] (µg/L)**	**Final Cleanup Level 200-ZP-1 ROD[d] (µg/L)**	**Maximum Concentration Limit for Groundwater Protection WAC 173-303-645(5) Table 1[e] (µg/L)**	**MTCA Method B Groundwater Cleanup Level[f] (µg/L)**	**Federal DWS 40 CFR 141[g] (µg/L)**	**State DWS WAC 246-290-310[h] (µg/L)**	**Proposed Groundwater Concentration Limit (µg /L)**	**Groundwater Concentration Limit Basis**	**Applicable Single-Shell Tank Farm WMAs**
Volatile Organic Compounds (Analytical Method 8260 VOA, Unless Specified)												
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	10	--	--	--	--	240,000	--	--	240,000	WAC 173-340-720(4)(b)(ii)(A) and (B)	All
95-63-6	1,2,4-Trimethylbenzene	5	--	--	--	--	--	--	--	Limit not proposed[i]	--	A-AX
540-59-0	1,2-Dichloroethene (Total)	10	--	--	--	--	--	--	--	Limit not proposed[i]	--	T
78-92-2	2-Butanol[j]	--	--	--	--	--	16,000	--	--	Limit not proposed[i,j]	--	TX-TY
79-46-9	2-Nitropropane	26.25	--	--	--	--	--	--	--	Limit not proposed[i]	--	All
67-63-0	2-Propanol (isopropyl alcohol)	105	--	--	--	--	16,000	--	--	16,000	WAC 173-340-720(4)(B)(II)(A) and (B)	A-AX, TX-TY
65-85-0	Benzoic acid	52.5 (8270)	--	--	--	--	64,000	--	--	64,000	WAC 173-340-720(4)(B)(II)(A) and (B)	A-AX
74-83-9	Bromomethane	10	--	--	--	--	11	--	--	11	WAC 173-340-720(4)(B)(II)(A) and (B)	C
156-59-2	cis-1,2-Dichloroethylene	5	--	--	--	--	16	70	--	16	WAC 173-340-720(4)(B)(II)(A) and (B)	S-SX, TX-TY
1319-77-3	Cresols (Total)	21 (8270)	--	--	--	--	1,600	--	--	1,600	WAC 173-340-720(4)(B)(II)(A) and (B)	A-AX, B-BX-BY, C, S-SX, TX-TY, U
110-82-7	Cyclohexane	2.1	--	--	--	--	--	--	--	Limit not proposed[i]	--	A-AX
108-94-1	Cyclohexanone	105	--	--	--	--	40,000	--	--	40,000	WAC 173-340-720(4)(B)(II)(A) and (B)	All
84-74-2	Di-n-butylphthalate	10.5 (8270)	--	--	--	--	1,600	--	--	1,600	WAC 173-340-720(4)(B)(II)(A) and (B)	B-BX-BY
141-78-6	Ethyl acetate	5,000	--	--	--	--	7,200	--	--	7,200	WAC 173-340-720(4)(B)(II)(A) and (B)	All
60-29-7	Ethyl ether	5	--	--	--	--	1,600	--	--	1,600	WAC 173-340-720(4)(B)(II)(A) and (B)	All
302-01-2	Hydrazine	4.2 (ASTM D1385)	--	--	--	--	0.15	--	--	5	HAPQL	TX-TY
67-56-1	Methanol	5,250 (8015)	--	--	--	--	16,000	--	--	16,000	WAC 173-340-720(4)(B)(II)(A) and (B)	All
71-36-3	n-Butyl alcohol (1-Butanol)	262.5	--	--	--	--	800	--	--	800	WAC 173-340-720(4)(B)(II)(A) and (B)	All
109-99-9	Tetrahydrofuran	50	--	--	--	--	7,200	--	--	7,200	WAC 173-340-720(4)(B)(II)(A) and (B)	TX-TY

Table 3. Proposed Groundwater Concentration Limits

1	2	3	4	5	6	7	8	9	10	11	12	13
CAS #	**Waste Constituent (Alternate Name)**	**HAPQL[a] (µg/L) (Analytical Method, if Specified)**	**Hanford Site 90th Percentile Background[b] (µg/L)**	**Final Cleanup Level 200-UP-1 ROD[c] (µg/L)**	**Final Cleanup Level 200-ZP-1 ROD[d] (µg/L)**	**Maximum Concentration Limit for Groundwater Protection WAC 173-303-645(5) Table 1[e] (µg/L)**	**MTCA Method B Groundwater Cleanup Level[f] (µg/L)**	**Federal DWS 40 CFR 141[g] (µg/L)**	**State DWS WAC 246-290-310[h] (µg/L)**	**Proposed Groundwater Concentration Limit (µg /L)**	**Groundwater Concentration Limit Basis**	**Applicable Single-Shell Tank Farm WMAs**
126-73-8	Tributyl phosphate	10.5 (8270)	--	--	--	--	97	--	--	97	WAC 173-340-720(4)(B)(II)(A) and (B)	C, S-SX
Inorganic Constituents (Analytical Method 6010, Unless Specified)												
7664-41-7	Ammonia	105 (350.1)	113	--	--	--	--	--	--	113	WAC 173-303-645(5)(a)(i): 90th Percentile Background	B-BX-BY, C, S-SX, TX-TY
7429-90-5	Aluminum	105 (6020)	7.11	--	--	--	16,000	--	--	16,000	WAC 173-340-720(4)(B)(II)(A) and (B)	All
16887-00-6	Chloride	400 (300, 9056)	15,630	--	--	--	--	--	--	15,630	WAC 173-303-645(5)(a)(i): 90th Percentile Background	B-BX-BY, C
16984-48-8	Fluoride	500 (300, 9056)	1,047	--	--	--	960	4,000	4,000	4,000	40 CFR 141- Federal DWS	B-BX-BY, T, TX-TY
18540-29-9	Hexavalent chromium	10.5 (7196)	--	48	48	--	48	--	--	48	200-UP-1 OU ROD 200-ZP-1 OU ROD	T, TX-TY, S-SX
										48	WAC 173-340-720(4)(B)(II)(A) and (B)	A-AX, B-BX-BY, C, S-SX, T, TX-TY
7439-89-6	Iron	105	570	--	--	--	11,200	--	--	11,200	WAC 173-340-720(4)(B)(II)(A) and (B)	All
7439-96-5	Manganese	15.75	38.5	--	--	--	384	--	--	384	WAC 173-340-720(4)(B)(II)(A) and (B)	All
14797-55-8	Nitrate (as N)	56.931[k] (300, 9056)	6065.69[l]	10,000	10,000	--	25,600	10,000	10,000	10,000	200-UP-1 OU ROD 200-ZP-1 OU ROD	All WMAs in the 200-UP-1 and 200-ZP-1 OUs
										10,000	40 CFR 141- Federal DWS	A-AX, B-BX-BY, C
14797-65-0	Nitrite (as N)	76.11[m] (300, 9056)	3.08[n]	--	--	--	1,600	1,000	1,000	1,000	40 CFR 141- Federal DWS	B-BX-BY, C, S-SX, T, TX-TY
7723-14-0	Phosphorus	5,000	--	--	--	--	--	--	--	Limit not proposed[i]	--	TX-TY

Table 3. Proposed Groundwater Concentration Limits

1	2	3	4	5	6	7	8	9	10	11	12	13
CAS #	**Waste Constituent (Alternate Name)**	**HAPQL[a] (µg/L) (Analytical Method, if Specified)**	**Hanford Site 90th Percentile Background[b] (µg/L)**	**Final Cleanup Level 200-UP-1 ROD[c] (µg/L)**	**Final Cleanup Level 200-ZP-1 ROD[d] (µg/L)**	**Maximum Concentration Limit for Groundwater Protection WAC 173-303-645(5) Table 1[e] (µg/L)**	**MTCA Method B Groundwater Cleanup Level[f] (µg/L)**	**Federal DWS 40 CFR 141[g] (µg/L)**	**State DWS WAC 246-290-310[h] (µg/L)**	**Proposed Groundwater Concentration Limit (µg /L)**	**Groundwater Concentration Limit Basis**	**Applicable Single-Shell Tank Farm WMAs**
14808-79-8	Sulfate	1050 (300, 9056)	47,014	--	--	--	--	--	--	47,014	WAC 173-303-645(5)(a)(i): 90th Percentile Background	A-AX, B-BX-BY, C, T, TX-TY

Note: For EPA Methods 300.0 and 350.1, see EPA/600/R 93/100, *Methods for the Determination of Inorganic Substances in Environmental Samples*. For four-digit EPA methods, see SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update V*.

a. HAPQL values are based on the practical quantitation limits of contracted commercial laboratories in support of CH2M HILL Plateau Remediation Company work scope and are documented in ECF-HANFORD-18-0058, *Practical Quantitation Limits for Groundwater Environmental Samples*.

b. Hanford Site background levels of constituents, 90th percentile values, as documented in Table ES-1 in DOE/RL-96-61, *Hanford Site Background: Part 3, Groundwater Background*.

c. 200-UP-1 OU cleanup levels, as documented in Table 2-1 in DOE/RL-2013-07, *200-UP-1 Groundwater Operable Unit Remedial Design/Remedial Action Work Plan*.

d. 200-ZP-1 OU cleanup levels, as documented in Table 2-1 in DOE/RL-2008-78, *200 West Area 200-ZP-1 Pump-and-Treat Remedial Design/Remedial Action Work Plan*.

e. Maximum concentration of constituents for groundwater protection, per WAC 173-303-645(5), Table 1.

f. Standard Method B groundwater cleanup levels calculated for carcinogens and noncarcinogens, per requirements in WAC 173-340-720, "Ground Water Cleanup Standards," as documented in ECF-100NPL-10-0462, *Calculation of Standard Method B Groundwater Cleanup Levels for Potable Groundwater for the 100 Areas and 300 Area Remedial Investigation/Feasibility Study Reports*, Rev. 4. Values listed are the lower of the acceptable cancer risk level of 1 × 10-5 for carcinogens or a hazard quotient of 1 for noncarcinogens.

g. 40 CFR 141.61, "National Primary Drinking Water Regulations," "Maximum Contaminant Levels for Organic Contaminants," and 40 CFR 141.62, "National Primary Drinking Water Regulations," "Maximum Contaminant Levels for Inorganic Contaminants."

h. WAC 246-290-310, "Group A Public Water Supplies," "Maximum Contaminant Levels (MCLs) and Maximum Residual Disinfectant Levels (MRDLs)"; primary MCLs published in Table 5 and secondary MCLs published in Table 6.

i. Background values, WAC 173-303-645(5) Table 1 concentration limits, state and federal standards, Method B and ROD cleanup levels, and groundwater action levels are not available for this constituent at the time of this environmental calculation file. Concentration limit cannot be determined based on HAPQL value.

j. Contracted laboratory analytical capability is unavailable for constituent at the time this environmental calculation file was written.

k. Value reported in source as "Nitrate as NO_3"; converted to "Nitrate as N."

l. Background value reported in Table ES-1 in DOE/RL-96-61 not specified as "Nitrate as NO_3" or "Nitrate as N"; assumed "Nitrate as NO_3" and converted to "Nitrate as N."

m. Value reported in source as "Nitrite as NO_2;" converted to "Nitrite as N."

n. Background value reported in Table ES-1 in DOE/RL-96-61 not specified as "Nitrite as NO_2" or "Nitrite as N"; assumed "Nitrite as NO_2" and converted to "Nitrite as N."

CAS = Chemical Abstracts Service
DWS = drinking water standard
HAPQL = highest available practical quantitation limit
MCL = maximum contaminant level
MTCA = WAC 173-340, "Model Toxics Control Act—Cleanup"
OU = operable unit
ROD = record of decision
SVOA = semivolatile organic analysis
VOA = volatile organic analysis

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4.4 200-UP-1 OU Cleanup Levels

The 200-UP-1 groundwater OU has an approved interim remedy. Table 2-1 in DOE/RL-2013-07 provides final cleanup levels for the 200-UP-1 OU contaminants of concern including hexavalent chromium and nitrate. These levels are included in column 5 in Table 3 in this ECF. Concentration limits for WMAs in the 200-UP-1 OU will follow the processes described in Section 3.2 of this ECF. Final cleanup levels described in this section do not apply to WMAs not associated with the 200-UP-1 OU remedy.

4.5 200-ZP-1 OU Cleanup Levels

The 200-ZP-1 groundwater OU has an approved remedy. Table 2-1 in DOE/RL-2008-78 provides cleanup levels for the 200-ZP-1 OU contaminants of concern including hexavalent chromium and nitrate. When available, these levels are included in column 6 in Table 3. Concentration limits for WMAs in 200-ZP-1 OU will follow the processes described in Section 3.2 of this ECF. Final cleanup levels described in this section do not apply to WMAs not associated with the 200-ZP-1 OU remedy.

4.6 Maximum State Concentrations for Groundwater Protection

Maximum concentrations for groundwater protection are provided in WAC 173-303-645(5), Table 1, and are listed in column 7 of Table 3. None of the constituents evaluated within this ECF are included in WAC 173-303-645(5) Table 1. Information related to the evaluation of WAC 173-303-645(5) Table 1 is included for reference only.

4.7 MTCA Standard Method B Groundwater Cleanup Levels

Standard Method B groundwater cleanup levels for the Hanford Site are calculated in accordance with WAC 173-340-720 and documented in ECF-100NPL-10-0462. The values listed in column 8 of Table 3 are based on the lower of the acceptable cancer risk level of 1×10^{-5} or a hazard quotient of 1.

4.8 Primary Federal Drinking Water Standards

Primary federal DWSs are established in 40 CFR 141.61, “Maximum Contaminant Levels for Organic Contaminants,” and 40 CFR 141.62, “Maximum Contaminant Levels for Inorganic Contaminants.” These values, where available, are listed in column 9 of Table 3.

4.9 State of Washington Water Quality Standards

Primary maximum contaminant levels are published in Table 5, “Inorganic Chemical Characteristics,” under WAC 246-290-310. These values, where available, are included in column 10 in Table 3.

5 Software Applications

Microsoft® Excel® was used to tabulate all data.

6 Calculation

Final cleanup levels from approved RODs, maximum concentration values from Table 1 of WAC 173-303-645(5); federal and state DWSs; WAC 173-340-705, “Use of Method B,” (MTCA) groundwater cleanup level (risk-based concentrations), HAPQLs, and Hanford Site groundwater

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background levels and were compiled using the methodology presented in Chapter 3 and the assumptions and inputs presented in Chapter 4. Conclusions are summarized in Chapter 7.

7 Conclusions

Concentration limits proposed for the identified single-shell tank farm WMA constituents are listed in Column 11 of Table 3. Of the 32 constituents that were evaluated to determine concentration limits for use during final status groundwater monitoring at Hanford Site single-shell WMAs, 3 were selected on the basis of federal DWSs; 3 were selected on the basis of the 90th percentile background value; 18 were selected on the basis of the MTCA Method B risk-based calculation; 1 was selected on the basis of the HAQPL value; and concentration limits were not proposed for 6 constituents. Additionally, concentration limits for two constituents (hexavalent chromium and nitrate) were identified for WMAs within the 200-UP-1 and 200-ZP-1 OUs. The full evaluation results, including all inputs, are provided in Table 3.

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