

# Identification of Site-Specific Monitoring Constituents for Waste Management Area C

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

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

**CH2MHILL**  
Plateau Remediation Company

**P.O. Box 1600  
Richland, Washington 99352**

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**APPROVED**  
*By Julia Raymer at 3:14 pm, May 07, 2019*

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Release Approval

Date

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## ENVIRONMENTAL CALCULATION COVER PAGE

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RCRA Interim to Final Closure Plans

#### RELEASE / ISSUE

Date:

Calculation Title and Description:  
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Waste Management Area C

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HANFORD  
RELEASE



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**ENVIRONMENTAL CALCULATION COVER PAGE (Continued)**

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**ENVIRONMENTAL CALCULATION COVER PAGE** (Continued)

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Integration Lead:

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**Calculation Approved:**

Risk/Modeling Integration Manager:

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## Terms

CAS	Chemical Abstracts Service
HEIS	Hanford Environmental Information System
$K_d$	distribution coefficient
$K_{oc}$	organic carbon-water partition coefficient
PQL	practical quantitation limit
RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
SST	single-shell tank
WMA	waste management area

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## 1 Purpose

This environmental calculation file evaluates the waste constituents associated with Waste Management Area (WMA) C and constituents that were detected in groundwater during interim status monitoring to identify proposed groundwater monitoring constituents.

## 2 Background

WMA C is one of the inactive single-shell tank (SST) farms in the SST System unit group which will be modified into the future Revision 9 of WA7890008967, *Hanford Facility Dangerous Waste Permit (Site-Wide Permit)* as a final status dangerous waste management unit. Site-specific monitoring constituents are required to support final status groundwater monitoring under WAC 173-303-645, “Dangerous Waste Regulations,” “Releases from Regulated Units.”

## 3 Methodology

The dangerous wastes identified in WA7890008967, *Hanford Facility Resource Conservation and Recovery Act (RCRA) Permit, Dangerous Waste Portion for the Treatment, Storage, and Disposal of Dangerous Waste (Revision 8c)* (hereafter referred to as the Hanford Facility RCRA Permit) Part A Permit Application for the SST System and the groundwater sample results collected for WMA C during interim status monitoring were evaluated to identify potential monitoring constituents for the WMA.

The use of the Part A Permit Application information and groundwater sample data are discussed in the following subsections.

### 3.1 Hanford Facility RCRA Permit Part A Application Dangerous Wastes

The Hanford Facility RCRA Permit Part A application for the SST System identifies the dangerous wastes associated with the unit group, which includes the WMA C SSTs. The wastes are identified by waste code in Section 2.3 of SGW-60588, *Engineering Evaluation Report For Single Shell Tank Waste Management Area C Groundwater Monitoring*. A list of specified dangerous wastes and corresponding Chemical Abstracts Service (CAS) numbers was compiled using the waste codes and represents the Part A Permit Application dangerous waste data set (Table 1).

The dangerous wastes were screened to identify mobile constituents by comparing literature reference values for constituent distribution coefficient ( $K_d$ ) to a Hanford site-derived  $K_d$  value of 0.8 ml/g that was developed and applied to hexavalent chromium (a known mobile constituent in Hanford vadose soils) (Section 6.1 in ECF-Hanford-11-0165, *Evaluation of Hexavalent Chromium Leach Test Data Conducted on Vadose Zone Sediment Samples from the 100 Area*). Constituents with a  $K_d \leq 0.8$  ml/g were identified as mobile constituents and further evaluated as potential monitoring constituents (Table 1). If a reference  $K_d$  value was not available for a constituent, the constituent was conservatively retained for further evaluation. If a reference soil organic carbon-water partition coefficient ( $K_{OC}$ ) value was available for a constituent, a  $K_d$  value was derived using the following relationship:

$$K_{OC} = (100 \times K_d) \div (\% OM)$$

where:

% OM = assumed soil organic carbon content of 0.1 weight percent

Solving this equation for  $K_d$ :

$$K_d = (K_{OC} \times \% OM) \div 100$$

**Table 1. Dangerous Wastes Identified on the Single-Shell Tank System Part A Permit Application and Mobility Evaluation**

<b>Dangerous Waste Code</b>	<b>Constituent</b>	<b>CAS Number</b>	<b>K<sub>a</sub> (mL/g)*</b>	<b>K<sub>a</sub> reference</b>	<b>Is K<sub>a</sub> ≤ 0.8 mL/g? (Yes/No/N/A)</b>	<b>Retain as Potential Monitoring Constituent? (Yes/No/Evaluate)</b>
D004	Arsenic	7440-38-2	29	Ecology, 2015	No	No
D005	Barium	7440-39-3	41	Ecology, 2015	No	No
D006	Cadmium	7440-43-9	6.7	Ecology, 2015	No	No
D007	Chromium	7440-47-3	1000	Ecology, 2015	No	No
D008	Lead	7439-92-1	10000	Ecology, 2015	No	No
D009	Mercury	7439-97-6	52	Ecology, 2015	No	No
D010	Selenium	7782-49-2	5	Ecology, 2015	No	No
D011	Silver	7440-22-4	8.3	Ecology, 2015	No	No
D018	Benzene	71-43-2	0.062	Ecology, 2015	Yes	Yes
D019	Carbon tetrachloride	56-23-5	0.152	Ecology, 2015	Yes	Yes
D022	Chloroform	67-66-3	0.053	Ecology, 2015	Yes	Yes
D028	1,2-Dichloroethane	107-06-2	0.038	Ecology, 2015	Yes	Yes
D029	1,1-Dichloroethylene	75-35-4	0.065	Ecology, 2015	Yes	Yes
D030	2,4-Dinitrotoluene	121-14-2	0.0955	Ecology, 2015	Yes	Yes
D033	Hexachlorobutadiene	87-68-3	53.7	Ecology, 2015	No	No
D034	Hexachloroethane	67-72-1	1.78	Ecology, 2015	No	No
D035	Methyl ethyl ketone	78-93-3	0.0045	ECF-HANFORD-12-0023, Rev. 3	Yes	Yes
D036	Nitrobenzene	98-95-3	0.119	Ecology, 2015	Yes	Yes

**Table 1. Dangerous Wastes Identified on the Single-Shell Tank System Part A Permit Application and Mobility Evaluation**

<b>Dangerous Waste Code</b>	<b>Constituent</b>	<b>CAS Number</b>	<b>K<sub>a</sub> (mL/g)*</b>	<b>K<sub>a</sub> reference</b>	<b>Is K<sub>a</sub> ≤ 0.8 mL/g? (Yes/No/N/A)</b>	<b>Retain as Potential Monitoring Constituent? (Yes/No/Evaluate)</b>
D038	Pyridine	110-86-1	Not Available	N/A	N/A	Evaluate
D039	Tetrachloroethylene	127-18-4	0.265	Ecology, 2015	Yes	Yes
D040	Trichloroethylene	79-01-6	0.094	Ecology, 2015	Yes	Yes
D041	2,4,5-Trichlorophenol	95-95-4	1.597	Ecology, 2015	No	No
D043	Vinyl chloride	75-01-4	0.0186	Ecology, 2015	Yes	Yes
F001	1,1,1-Trichloroethane	71-55-6	0.135	Ecology, 2015	Yes	Yes
F001	Methylene chloride	75-09-2	0.01	Ecology, 2015	Yes	Yes
F001	Carbon tetrachloride	56-23-5	0.152	Ecology, 2015	Yes	Yes
F001	Tetrachloroethylene	127-18-4	0.265	Ecology, 2015	Yes	Yes
F001	Trichloroethylene	79-01-6	0.094	Ecology, 2015	Yes	Yes
F002	1,1,1-Trichloroethane	71-55-6	0.135	Ecology, 2015	Yes	Yes
F002	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	Not Available	N/A	N/A	Evaluate
F002	1,1,2-Trichloroethane	79-00-5	0.075	Ecology, 2015	Yes	Yes
F002	Chlorobenzene	108-90-7	0.224	Ecology, 2015	Yes	Yes
F002	Methylene chloride	75-09-2	0.01	Ecology, 2015	Yes	Yes
F002	Ortho-dichlorobenzene	95-50-1	0.379	Ecology, 2015	Yes	Yes
F002	Trichlorofluoromethane	75-69-4	0.044	ECF- HANFORD-12-0023, Rev. 3	Yes	Yes

**Table 1. Dangerous Wastes Identified on the Single-Shell Tank System Part A Permit Application and Mobility Evaluation**

<b>Dangerous Waste Code</b>	<b>Constituent</b>	<b>CAS Number</b>	<b>K<sub>a</sub> (mL/g)*</b>	<b>K<sub>a</sub> reference</b>	<b>Is K<sub>a</sub> ≤ 0.8 mL/g? (Yes/No/N/A)</b>	<b>Retain as Potential Monitoring Constituent? (Yes/No/Evaluate)</b>
F002	Tetrachloroethylene	127-18-4	0.265	Ecology, 2015	Yes	Yes
F002	Trichloroethylene	79-01-6	0.094	Ecology, 2015	Yes	Yes
F003	Acetone	67-64-1	0.0006	Ecology, 2015	Yes	Yes
F003	Cyclohexanone	108-94-1	Not Available	N/A	N/A	Evaluate
F003	Ethyl acetate	141-78-6	0.0056	ECF-HANFORD-12-0023, Rev. 3	Yes	Yes
F003	Ethyl benzene	100-41-4	0.204	Ecology, 2015	Yes	Yes
F003	Ethyl ether	60-29-7	0.0097	ECF-HANFORD-12-0023, Rev. 3	Yes	Yes
F003	Methyl isobutyl ketone	108-10-1	0.013	ECF-HANFORD-12-0023, Rev. 3	Yes	Yes
F003	Methanol	67-56-1	0.0010	ECF-HANFORD-12-0023, Rev. 3	Yes	Yes
F003	N-Butyl alcohol	71-36-3	0.00692	Ecology, 2015	Yes	Yes
F003	Xylene	1330-20-7	0.233	Ecology, 2015	Yes	Yes
F004	Cresols	1319-77-3	N/A	N/A	N/A	Evaluate
F004	Cresylic acid	93-51-6	N/A	N/A	N/A	Evaluate
F004	Nitrobenzene	98-95-3	0.119	Ecology, 2015	Yes	Yes
F005	2-Ethoxyethanol	110-80-5	Not Available	N/A	N/A	Evaluate

**Table 1. Dangerous Wastes Identified on the Single-Shell Tank System Part A Permit Application and Mobility Evaluation**

Dangerous Waste Code	Constituent	CAS Number	K <sub>d</sub> (mL/g)*	K <sub>d</sub> reference	Is K <sub>d</sub> ≤ 0.8 mL/g? (Yes/No/N/A)	Retain as Potential Monitoring Constituent? (Yes/No/Evaluate)
F005	2-Nitropropane	79-46-9	Not Available	N/A	N/A	Evaluate
F005	Benzene	71-43-2	0.062	Ecology, 2015	Yes	Yes
F005	Carbon disulfide	75-15-0	0.0457	Ecology, 2015	Yes	Yes
F005	Isobutanol	78-83-1	Not Available	N/A	N/A	Evaluate
F005	Methyl ethyl ketone	78-93-3	0.0045	ECF-HANFORD-12-0023, Rev. 3	Yes	Yes
F005	Pyridine	110-86-1	Not Available	N/A	N/A	Evaluate
F005	Toluene	108-88-3	0.14	Ecology, 2015	Yes	Yes

Source: WA7890008967, Hanford Facility Resource Conservation and Recovery Act (RCRA) Permit, Dangerous Waste Portion for the Treatment, Storage, and Disposal of Dangerous Waste, Revision 8c.

Notes:

Ecology, 2015, Cleanup Levels and Risk Calculations (CLARC) database.

ECF-HANFORD-12-0023, Rev. 3, *Groundwater and Surface Water Cleanup Levels and Distribution Coefficients for Nonradiological and Radiological Analytes in the 100 Areas and 300 Area.*

The specific dangerous wastes associated with “F”-code wastes were obtained from WAC 173-303-9904, “Dangerous Waste Regulations,” “Dangerous Waste Sources List.”

This table identifies specific dangerous wastes identified from the waste codes included in the SST System Part A Application. Characteristic wastes (D001, D002, and D003) and state-only wastes (WP01, WP02, WT01, and WT02) (waste codes assigned based on waste designation) are included in the SST System Part A Application but are not identified in this table.

\* For organic constituents, the K<sub>d</sub> is calculated from the K<sub>oc</sub> value. The K<sub>d</sub> calculations assume a value of 0.001 g/g for the soil fraction of organic carbon.

CAS = Chemical Abstracts Service

K<sub>d</sub> = distribution coefficient

N/A = not applicable

### 3.2 Interim Status Groundwater Monitoring Results

Appendix A of SGW-60588 includes a summary of the interim status groundwater monitoring history at WMA C through 2016, including the changes to the well network and monitoring constituents. Groundwater sample results collected under interim status monitoring plans are presented for each well. The sample data through December 31, 2016 were retrieved from the Hanford Environmental Information System (HEIS) database and presented in separate Microsoft® Excel® workbooks in SGW-60588, Appendix A.

The non-radiological sample data for each well (excluding wells used for information purposes only) were evaluated to determine the maximum measurement result for each detected chemical constituent. Sample data that were qualified with either “U” or an “R” qualifier were not considered in the evaluation.<sup>1</sup> Field parameters (e.g., dissolved oxygen, pH, specific conductance, temperature, turbidity, etc.), alkalinity measurements, and non analyte-specific measures (e.g., total organic carbon and total organic halides) were not considered in the evaluation. The maximum result for each detected chemical was compared to the Hanford Site 90<sup>th</sup> percentile groundwater background values, as appropriate (Table ES-1 in DOE/RL-96-61, *Hanford Site Background: Part 3, Groundwater Background*) (Table 2). Chemicals detected above background values and chemicals without background values were retained for evaluation as potential monitoring constituents.

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<sup>1</sup> Data flagged with a “U” qualifier are analyzed for but not detected. Data flagged with an “R” qualifier are determined during formal data reviews as not valid for any use.

Table 2. WMA C Interim Status Groundwater Maximum Results and Comparison to Hanford Site Background

Well	Constituent	Sample Date	Sample Result (µg/L)	Filtered (Yes/No)	Lab Qualifier	Review Qualifier	Validation Qualifier	Hanford Site Background Comparison			
								Background Value Available? (Yes/No)	90th Percentile (µg/L)*	Filtered (Yes/No/N/A)	Maximum Value Above Background? (Yes/No)
299-E27-155	2-Hexanone	14-Sep-2010	2	N	J			No	N/A	N/A	Yes
299-E27-14	4,6-Dinitro-2-methylphenol	5-Feb-1998	1.3	N	JB			No	N/A	N/A	Yes
299-E27-13	4-Chloro-3-methylphenol	25-Aug-1992	8	N				No	N/A	N/A	Yes
299-E27-155	Acetone	14-Sep-2010	5.6	N		Y		No	N/A	N/A	Yes
299-E27-14	Aluminum	5-Dec-2016	581	N	D			Yes	7.11	Yes	Yes
299-E27-155	Ammonia	4-Jun-2014	238	N		Z		Yes	113	Yes	Yes
299-E27-13	Ammonium ion	9-Mar-1993	200	N				No	N/A	N/A	Yes
299-E27-14	Antimony	1-Jun-2012	110	Y	B			Yes	55.1	Yes	Yes
299-E27-15	Arsenic	11-Sep-2014	20.1	Y	BC	Y		Yes	7.85	Yes	Yes
299-E27-14	Barium	8-Dec-2015	104	N				Yes	105	Yes	No
299-E27-22	Beryllium	23-Jun-2007	3.1	Y	BD			Yes	2.29	Yes	Yes
299-E27-155	Boron	16-Jun-2016	35.5	N				Yes	36	Yes	No
299-E27-14	Bromide	1-Jun-2011	261	N	BD			Yes	124	No	Yes
299-E27-155	Bromomethane	14-Sep-2010	0.69	N	JB			No	N/A	N/A	Yes
299-E27-24	Cadmium	13-May-2010	7.5	N	B			Yes	0.916	Yes	Yes
299-E27-24	Calcium	8-Dec-2015	155000	Y	D	Y		Yes	52644	No	Yes
299-E27-155	Carbon disulfide	14-Sep-2010	0.12	N	J			No	N/A	N/A	Yes
299-E27-155	Carbon tetrachloride	9-Mar-2009	1.3	N	J			No	N/A	N/A	Yes
299-E27-7	Chloride	16-Feb-2010	297000	N	D			Yes	15630	No	Yes
299-E27-155	Chloroform	4-Dec-2014	0.56	N	J			No	N/A	N/A	Yes
299-E27-155	Chloromethane	14-Sep-2010	0.4	N	JB	Q		No	N/A	N/A	Yes
299-E27-15	Chromium	25-Aug-1992	240	N				Yes	2.4	Yes	Yes
299-E27-14	Cobalt	14-Mar-1994	13	N	LB			Yes	0.916	Yes	Yes
299-E27-14	Copper	3-Sep-2009	1720	N		Y		Yes	0.81	Yes	Yes
299-E27-7	Cyanide	3-Jun-2014	357	N		QY		Yes	8.41	No	Yes
299-E27-15	Di-n-octylphthalate	17-Dec-2009	3.3	N	J			No	N/A	N/A	Yes
299-E27-12	Dinoseb(2-secButyl-4,6-dinitrophenol)	5-Feb-1998	1.1	N	J			No	N/A	N/A	Yes
299-E27-15	Fluoride	16-Mar-1994	700	N				Yes	1047	No	No
299-E27-155	Hexamethylcyclotrisiloxane	2-Dec-2016	3.9	N	NJ			No	N/A	N/A	Yes

Table 2. WMA C Interim Status Groundwater Maximum Results and Comparison to Hanford Site Background

Well	Constituent	Sample Date	Sample Result (µg/L)	Filtered (Yes/No)	Lab Qualifier	Review Qualifier	Validation Qualifier	Hanford Site Background Comparison			
								Background Value Available? (Yes/No)	90th Percentile (µg/L)*	Filtered (Yes/No/N/A)	Maximum Value Above Background? (Yes/No)
299-E27-155	Hexavalent chromium	9-Mar-2009	5.4	N				No	N/A	N/A	Yes
299-E27-23	Iodomethane	14-Sep-2010	0.85	N	JB	Q		No	N/A	N/A	Yes
299-E27-13	Iron	14-Mar-1994	1600	N				Yes	570	Yes	Yes
299-E27-13	Lead	5-Mar-1992	13	N				Yes	0.917	Yes	Yes
299-E27-15	Lithium	26-Mar-2010	26	Y					11,321	Yes	No
299-E27-14	Magnesium	7-Sep-2012	42700	N				Yes	24,816	Yes	Yes
299-E27-21	Manganese	12-Mar-2014	137	N		Q		Yes	38.5	Yes	Yes
299-E27-15	Mercury	26-Feb-90	0.92	N				Yes	0.003	Yes	Yes
299-E27-155	Methyl methacrylate	27-Mar-2011	1.4	N		Y		No	N/A	N/A	Yes
299-E27-22	Methylene chloride	25-Aug-2011	1.8	N	B	Q		No	N/A	N/A	Yes
299-E27-15	Molybdenum	26-Mar-10	8	Y	B			Yes	3.21	Yes	Yes
299-E27-4	Nickel	3-Sep-2009	293	N		Y		Yes	1.56	Yes	Yes
299-E27-4	Nickel	4-Sep-2015	293	N		G		Yes	1.56	Yes	Yes
299-E27-14	Nitrate	7-Sep-2012	118000	N	D			Yes	26,871	No	Yes
299-E27-24	Nitrite	13-May-2010	2300	N	D			Yes	93.7	No	Yes
299-E27-13	Phenol	25-Aug-1992	7	N				No	N/A	N/A	Yes
299-E27-155	Potassium	15-Sep-2011	11800	N				Yes	9,122	No	Yes
299-E27-14	Selenium	5-Dec-16	25.1	Y	D			Yes	10.5	Yes	Yes
299-E27-14	Silicon	26-Feb-90	18500	N				Yes	33,949	Yes	No
299-E27-14	Silicon	26-Feb-90	18500	Y				Yes	33,949	Yes	No
299-E27-14	Silver	16-Sep-07	14.4	Y	C	Q		Yes	5.28	Yes	Yes
299-E27-24	Sodium	14-May-2010	36800	N				Yes	26,998	No	Yes
299-E27-24	Strontium	8-Dec-2015	884	Y		Y		Yes	323	Yes	Yes
299-E27-7	Sulfate	3-Jun-2014	367000	N	D	QY		Yes	47,014	No	Yes
299-E27-4	Sulfide	24-May-2010	400	N	B			Yes	2.19	Yes	Yes
299-E27-155	Tetrachloroethene	27-Mar-2011	0.67	N	JB	Q		No	N/A	N/A	Yes
299-E27-24	Thallium	1-Mar-2016	1.5	N	B			Yes	1.67	Yes	No
299-E27-155	Thorium	19-Sep-2016	1.4	Y	B			Yes	0.5	Yes	Yes
299-E27-12	Tin	15-Mar-94	87	N	LB			Yes	21.6	Yes	Yes
299-E27-12	Toluene	6-Sep-2012	0.17	N	J	Y		No	N/A	N/A	Yes

Table 2. WMA C Interim Status Groundwater Maximum Results and Comparison to Hanford Site Background

Well	Constituent	Sample Date	Sample Result (µg/L)	Filtered (Yes/No)	Lab Qualifier	Review Qualifier	Validation Qualifier	Hanford Site Background Comparison			
								Background Value Available? (Yes/No)	90th Percentile (µg/L)*	Filtered (Yes/No/N/A)	Maximum Value Above Background? (Yes/No)
299-E27-14	Tributyl phosphate	16-Apr-2010	1	N	J			No	N/A	N/A	Yes
299-E27-155	Trichloroethene	27-Mar-2011	0.4	N	JB			No	N/A	N/A	Yes
299-E27-13	Trichlorophenol	25-Aug-1992	5	N				No	N/A	N/A	Yes
299-E27-4	Vanadium	9-Sep-2007	47.6	N	C			Yes	11.5	Yes	Yes
299-E27-25	Zinc	6-Apr-2010	494	N				Yes	21.8	Yes	Yes

\* The 90<sup>th</sup> percentile background values for groundwater were obtained from DOE/RL-96-61, *Hanford Site Background: Part 3, Groundwater Background*, Table ES-1.

Qualifiers:

B = INORGANICS and WETCHEM - The analyte was detected at a value less than the contract required detection limit, but greater than or equal to the instrument detection limit/method detection limit (as appropriate).

B = ORGANICS - The analyte was detected in both the associated QC blank and in the sample.

C = INORGANICS/WETCHEM: The analyte was detected in both the sample and the associated QC blank, and the sample concentration was  $\leq 5X$  the blank concentration.

D = All - Analyte was identified in an analysis at a secondary dilution factor, typically dilution factor  $> 1$  (i.e., the primary preparation required dilution to either bring the analyte within the calibration range or to minimize interference). Required for organics/wetchem if the sample was diluted.

G = Review Qualifier: record has been reviewed and determined to be correct, or the record has been corrected with laboratory confirmation or other supporting information.

J = Lab Qualifier: ORGANICS - estimated value; (1) constituent detected at a level less than the required detection limit or practical quantitation limit and greater than or equal to the method detection limit, (2) estimated concentration for tentatively identified compounds. Note - For Hanford Environmental Information System data generated prior to December 1, 2002, laboratories may have applied a "J" qualifier to non-organic results. When applied, application was based primarily on criteria comparable to statement (1) above. Prior to January, 1998, validation qualifiers (including "J") were recorded in the LAB\_QUALIFIER field without identification as validation qualifiers.

L = Lab Qualifier: method detection limit  $\leq$  value  $<$  contract required quantitation limit [RETIRED].

N = Lab Qualifier: ALL (except GC/MS based analysis) - Spike and/or spike duplicate sample recovery is outside control limits. ORGANICS (GC/MS only) - Presumptive evidence of compound based on mass spectral library search.

Q = Review Qualifier: associated quality control sample is out of limits.

Y = Review Qualifier: Result suspect. Review- insufficient evidence to show result valid or invalid.

Z = Review Qualifier: Miscellaneous circumstances exist. Additional information may be found in the result\_comment field for this record and/or in the samp\_comment field of the parent sample record.

N/A = not applicable

QC = quality control

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### 3.3 Final Monitoring Constituent Evaluation

The constituents retained as potential monitoring constituents in Sections 3.1 and 3.2 were compiled. A final evaluation identified potential monitoring constituents to be included as proposed monitoring constituents to detect and monitor wastes from WMA C that impact groundwater.

The initial step of this evaluation identified those potential monitoring constituents which are also listed in Appendix 5 of Ecology Publication No. 97-407, *Chemical Test Methods For Designating Dangerous Waste WAC 173-303-090 & -100*. Monitoring for the dangerous wastes identified in Appendix 5 of Ecology Publication No. 97-407 is already prescribed for WMA C (Section 9.4 in SGW-60588). Therefore, the potential monitoring constituents that are also listed in Appendix 5 of Ecology Publication No. 97-407 were identified as proposed monitoring constituents.

The remaining potential monitoring constituents were evaluated in two groups:

- The first group comprised the potential monitoring constituents identified from the SST System Part A Permit Application (Section 3.1) that are not identified in Appendix 5 of Ecology Publication No. 97-407. Each of these constituents is a dangerous waste.
- The second group comprised the potential monitoring constituents identified from evaluation of the interim status groundwater results (Section 3.2) that were not identified in Appendix 5 of Ecology Publication No. 97-407 and were not identified from the Part A Permit Application.

The remaining potential monitoring constituents from the first group (Part A Permit Application) were evaluated for availability of analysis. Any constituent that is not routinely analyzed by commercial laboratories was removed from consideration. The potential monitoring constituents in the first group that were not excluded due to unavailability of analysis were identified as proposed monitoring constituents.

The potential monitoring constituents in the second group (interim status groundwater results) that were not already identified as proposed monitoring constituents through the preceding evaluation of the Part A constituents were evaluated as follows:

- Constituents were evaluated to determine if any were dangerous wastes. Any constituent identified as a dangerous waste was identified as a proposed monitoring constituent
- Any remaining constituents were evaluated individually for one or more of the following:
  - Identification of related chemicals (e.g., parent compounds and isomers) that were already identified as proposed monitoring constituents (evaluated on a case by case basis).
  - Identification of any potential monitoring constituent that is not routinely analyzed by commercial laboratories. Any potential monitoring constituent that is not routinely analyzed by commercial laboratories was removed from consideration as a proposed monitoring constituent.
  - Comparison of the maximum groundwater concentration of the potential monitoring constituent to the federal or state action level (evaluated on a case by case basis).
  - Determination if a potential monitoring constituent was identified as present in the waste discharge profile for the WMA C SSTs that have leaked (Table 2-2 in SGW-60588) (evaluated on a case by case basis).

## 4 Assumptions and Inputs

The primary inputs to this calculation were the SST System Part A Permit Application and the HEIS analytical data associated with WMA C interim status groundwater monitoring. The SST System Part A Permit Application is assumed to be descriptive and representative of the known and suspected contents of the WMA C SSTs. It is assumed that the HEIS data are accurate and valid measurements of contaminant conditions in groundwater associated with WMA C.

Non-detected sample data (data with a “U” qualifier) in the interim status groundwater monitoring data set were not further evaluated.

## 5 Software Applications

Microsoft Excel software is an approved and appropriate application for this calculation and was used to perform sorting of data.

## 6 Calculation

The evaluations detailed in this calculation are summarized in the identified tables. Appendix A of SGW-60588 provides the data for interim status groundwater monitoring.

## 7 Results and Conclusions

Based on the evaluations of waste constituents associated with WMA C from the SST System Part A Permit Application and constituents that were detected in groundwater during interim status monitoring (detailed in Chapter 3), proposed groundwater monitoring constituents for WMA C were identified.

### 7.1 Results from Evaluation of Dangerous Wastes from the SST System Part A Application

Forty-six distinct dangerous wastes were identified from the Hanford Facility RCRA Permit Part A Application for the SST System unit group, which includes the WMA C SSTs (Table 1). Further screening for constituent mobility identified 27 mobile constituents with a  $K_d \leq 0.8$  that were retained for further evaluation as potential monitoring constituents (Table 1 and Table 3). Eight constituents did not have associated  $K_d$  values and, therefore, were not evaluated for mobility (Table 1). However, these eight constituents were conservatively retained for further evaluation as potential monitoring constituents (Table 3).

**Table 3. Mobile Dangerous Waste Identified in the SST System Unit Group Retained as Potential Monitoring Constituents**

Dangerous Waste Code	Waste Constituent	CAS Number
D018	Benzene	71-43-2
D019	Carbon tetrachloride	56-23-5
D022	Chloroform	67-66-3
D028	1,2-Dichloroethane	107-06-2
D029	1,1-Dichloroethylene	75-35-4
D030	2,4-Dinitrotoluene	121-14-2

**Table 3. Mobile Dangerous Waste Identified in the SST System Unit Group Retained as Potential Monitoring Constituents**

Dangerous Waste Code	Waste Constituent	CAS Number
D035	Methyl ethyl ketone	78-93-3
D036	Nitrobenzene	98-95-3
D038	Pyridine*	110-86-1
D039	Tetrachloroethylene	127-18-4
D040	Trichloroethylene	79-01-6
D043	Vinyl chloride	75-01-4
F001	1,1,1-Trichloroethane	71-55-6
F001	Carbon tetrachloride	56-23-5
F001	Methylene chloride	75-09-2
F001	Tetrachloroethylene	127-18-4
F001	Trichloroethylene	79-01-6
F002	1,1,1-Trichloroethane	71-55-6
F002	1,1,2-Trichloro-1,2,2-trifluoroethane*	76-13-1
F002	1,1,2-Trichloroethane	79-00-5
F002	Chlorobenzene	108-90-7
F002	Methylene chloride	75-09-2
F002	Ortho-dichlorobenzene	95-50-1
F002	Tetrachloroethylene	127-18-4
F002	Trichloroethylene	79-01-6
F002	Trichlorofluoromethane	75-69-4
F003	Acetone	67-64-1
F003	Cyclohexanone*	108-94-1
F003	Ethyl acetate	141-78-6
F003	Ethyl benzene	100-41-4
F003	Ethyl ether	60-29-7
F003	Methanol	67-56-1
F003	Methyl isobutyl ketone	108-10-1
F003	N-Butyl alcohol	71-36-3

**Table 3. Mobile Dangerous Waste Identified in the SST System Unit Group Retained as Potential Monitoring Constituents**

Dangerous Waste Code	Waste Constituent	CAS Number
F003	Xylene	1330-20-7
F004	Cresols*	1319-77-3
F004	Cresylic acid*	93-51-6
F004	Nitrobenzene	98-95-3
F005	2-Ethoxyethanol*	110-80-5
F005	2-Nitropropane*	79-46-9
F005	Carbon disulfide	75-15-0
F005	Isobutanol*	78-83-1
F005	Toluene	108-88-3

\*No established distribution coefficient is available for constituent; therefore, mobility was not evaluated.

CAS = Chemical Abstracts Service

## 7.2 Results from Evaluation of Groundwater Data Collected under Interim Status Monitoring Plans

The maximum result for each detected chemical in the WMA C interim status groundwater monitoring data set was compiled and compared to the Hanford Site 90<sup>th</sup> percentile groundwater background values (Table 2). Constituents that were detected above background values and non-naturally-occurring constituents that do not have background values (N = 56) were retained as potential monitoring constituents (Table 4).

**Table 4. Constituents Detected Above Background Concentrations in the WMA C Interim Status Groundwater Data Set**

CAS Number	Constituent
591-78-6	2-Hexanone
534-52-1	4,6-Dinitro-2-methylphenol
59-50-7	4-Chloro-3-methylphenol
67-64-1	Acetone
7429-90-5	Aluminum
7664-41-7	Ammonia
14798-03-9	Ammonium ion
7440-36-0	Antimony

**Table 4. Constituents Detected Above Background Concentrations in the WMA C Interim Status Groundwater Data Set**

CAS Number	Constituent
7440-38-2	Arsenic
7440-41-7	Beryllium
24959-67-9	Bromide
74-83-9	Bromomethane
7440-43-9	Cadmium
7440-70-2	Calcium
75-15-0	Carbon disulfide
56-23-5	Carbon tetrachloride
16887-00-6	Chloride
67-66-3	Chloroform
74-87-3	Chloromethane
7440-47-3	Chromium
7440-48-4	Cobalt
7440-50-8	Copper
57-12-5	Cyanide
117-84-0	Di-n-octylphthalate
88-85-7	Dinoseb(2-secButyl-4,6-dinitrophenol)
541-05-9	Hexamethylcyclotrisiloxane
18540-29-9	Hexavalent chromium
74-88-4	Iodomethane
7439-89-6	Iron
7439-92-1	Lead
7439-95-4	Magnesium
7439-96-5	Manganese
7439-97-6	Mercury
80-62-6	Methyl methacrylate
75-09-2	Methylene chloride
7439-98-7	Molybdenum
7440-02-0	Nickel

**Table 4. Constituents Detected Above Background Concentrations in the WMA C Interim Status Groundwater Data Set**

CAS Number	Constituent
14797-55-8	Nitrate
14797-65-0	Nitrite
108-95-2	Phenol
7440-09-7	Potassium
7782-49-2	Selenium
7440-22-4	Silver
7440-23-5	Sodium
7440-24-6	Strontium
14808-79-8	Sulfate
18496-25-8	Sulfide
127-18-4	Tetrachloroethene
7440-29-1	Thorium
7440-31-5	Tin
108-88-3	Toluene
126-73-8	Tributyl phosphate
79-01-6	Trichloroethene
25167-82-2	Trichlorophenol
7440-62-2	Vanadium
7440-66-6	Zinc

CAS = Chemical Abstracts Service

### 7.3 Results from Final Monitoring Constituent Evaluation

Eighty-three distinct constituents were identified as potential monitoring constituents from the evaluations detailed in Sections 7.1 and 7.2. These constituents were identified by CAS number and are compiled in Table 5.

**Table 5. Evaluation of Potential Monitoring Constituents**

<b>CAS Number</b>	<b>Potential Monitoring Constituent</b>	<b>Retained for Evaluation as Monitoring Constituent (Source)<sup>a</sup></b>	<b>Is Constituent Identified in Appendix 5? (Yes/No)<sup>b</sup></b>	<b>Identified as Proposed Monitoring Constituent?<sup>c</sup> (Yes/No)</b>
100-41-4	Ethyl benzene	Yes (SST System Part A)	Yes	Yes
107-06-2	1,2-Dichloroethane	Yes (SST System Part A)	Yes	Yes
108-10-1	Methyl isobutyl ketone	Yes (SST System Part A)	Yes	Yes
108-88-3	Toluene	Yes (SST System Part A)	Yes	Yes
108-88-3	Toluene	Yes (Interim Status Detection)	Yes	Yes
108-90-7	Chlorobenzene	Yes (SST System Part A)	Yes	Yes
108-94-1	Cyclohexanone	Evaluate (SST System Part A)	No	Yes - dangerous waste in SST System Part A
108-95-2	Phenol	Yes (Interim Status Detection)	Yes	Yes
110-80-5	2-Ethoxyethanol	Evaluate (SST System Part A)	No	No - not routinely analyzed by commercial laboratories
110-86-1	Pyridine	Evaluate (SST System Part A)	Yes	Yes
117-84-0	Di-n-octylphthalate	Yes (Interim Status Detection)	Yes	Yes
121-14-2	2,4-Dinitrotoluene	Yes (SST System Part A)	Yes	Yes
126-73-8	Tributyl phosphate	Yes (Interim Status Detection)	No	Yes - detected in groundwater above background value, dangerous waste
127-18-4	Tetrachloroethene	Yes (SST System Part A)	Yes	Yes
127-18-4	Tetrachloroethene	Yes (Interim Status Detection)	Yes	Yes
1319-77-3	Cresols	Evaluate (SST System Part A)	Yes (as isomers) <sup>d</sup>	Yes
1330-20-7	Xylene	Yes (SST System Part A)	Yes	Yes
141-78-6	Ethyl acetate	Yes (SST System Part A)	No	Yes - dangerous waste in SST System Part A

**Table 5. Evaluation of Potential Monitoring Constituents**

<b>CAS Number</b>	<b>Potential Monitoring Constituent</b>	<b>Retained for Evaluation as Monitoring Constituent (Source)<sup>a</sup></b>	<b>Is Constituent Identified in Appendix 5? (Yes/No)<sup>b</sup></b>	<b>Identified as Proposed Monitoring Constituent?<sup>c</sup> (Yes/No)</b>
14797-55-8	Nitrate	Yes (Interim Status Detection)	No	Yes - detected in groundwater above background value; not a dangerous waste; maximum result greater than action level; identified in Table 2-2 <sup>e</sup> as present in WMA C SSTs that have leaked
14797-65-0	Nitrite	Yes (Interim Status Detection)	No	Yes - detected in groundwater above background value; not a dangerous waste; maximum result greater than action level; identified in Table 2-2 <sup>e</sup> as present in WMA C SSTs that have leaked
14798-03-9	Ammonium ion	Yes (Interim Status Detection)	No	No - detected in groundwater above background value; not a dangerous waste, no action level for screening
14808-79-8	Sulfate	Yes (Interim Status Detection)	No	Yes - detected in groundwater above background value; not a dangerous waste; maximum result greater than action level; identified in Table 2-2 <sup>e</sup> as present in WMA C SSTs that have leaked
16887-00-6	Chloride	Yes (Interim Status Detection)	No	Yes - detected in groundwater above background value; not a dangerous waste; maximum result greater than action level; identified in Table 2-2 <sup>e</sup> as

**Table 5. Evaluation of Potential Monitoring Constituents**

CAS Number	Potential Monitoring Constituent	Retained for Evaluation as Monitoring Constituent (Source) <sup>a</sup>	Is Constituent Identified in Appendix 5? (Yes/No) <sup>b</sup>	Identified as Proposed Monitoring Constituent? <sup>c</sup> (Yes/No)
				present in WMA C SSTs that have leaked
18496-25-8	Sulfide	Yes (Interim Status Detection)	Yes	Yes
18540-29-9	Hexavalent chromium	Yes (Interim Status Detection)	No	Yes - detected in groundwater above background value, dangerous waste
24959-67-9	Bromide	Yes (Interim Status Detection)	No	No - detected in groundwater above background value; not a dangerous waste, no action level for screening
25167-82-2	Trichlorophenol	Yes (Interim Status Detection)	No	Yes - detected in groundwater above background value, dangerous waste; not routinely analyzed by commercial laboratories and will be monitored by two isomers <sup>f</sup>
534-52-1	4,6-Dinitro-2-methylphenol	Yes (Interim Status Detection)	Yes	Yes
541-05-9	Hexamethylcyclotrisiloxane	Yes (Interim Status Detection)	No	No - not routinely analyzed by commercial laboratories
56-23-5	Carbon tetrachloride	Yes (Interim Status Detection)	Yes	Yes
56-23-5	Carbon tetrachloride	Yes (SST System Part A)	Yes	Yes
57-12-5	Cyanide	Yes (Interim Status Detection)	Yes	Yes
591-78-6	2-Hexanone	Yes (Interim Status Detection)	Yes	Yes
59-50-7	4-Chloro-3-methylphenol	Yes (Interim Status Detection)	Yes	Yes
60-29-7	Ethyl ether	Yes (SST System Part A)	No	Yes - dangerous waste in SST System Part A

**Table 5. Evaluation of Potential Monitoring Constituents**

<b>CAS Number</b>	<b>Potential Monitoring Constituent</b>	<b>Retained for Evaluation as Monitoring Constituent (Source)<sup>a</sup></b>	<b>Is Constituent Identified in Appendix 5? (Yes/No)<sup>b</sup></b>	<b>Identified as Proposed Monitoring Constituent?<sup>c</sup> (Yes/No)</b>
67-56-1	Methanol	Yes (SST System Part A)	No	Yes - dangerous waste in SST System Part A
67-64-1	Acetone	Yes (Interim Status Detection)	Yes	Yes
67-64-1	Acetone	Yes (SST System Part A)	Yes	Yes
67-66-3	Chloroform	Yes (Interim Status Detection)	Yes	Yes
67-66-3	Chloroform	Yes (SST System Part A)	Yes	Yes
71-36-3	n-Butyl alcohol	Yes (SST System Part A)	No	Yes - dangerous waste in SST System Part A
71-43-2	Benzene	Yes (SST System Part A)	Yes	Yes
71-55-6	1,1,1-Trichloroethane	Yes (SST System Part A)	Yes	Yes
7429-90-5	Aluminum	Yes (Interim Status Detection)	No	Yes - detected in groundwater above background value; not a dangerous waste; maximum result greater than action level; identified in Table 2-2 <sup>e</sup> as present in WMA C SSTs that have leaked
7439-89-6	Iron	Yes (Interim Status Detection)	No	Yes - detected in groundwater above background value; not a dangerous waste; maximum result greater than action level; identified in Table 2-2 <sup>e</sup> as present in WMA C SSTs that have leaked
7439-92-1	Lead	Yes (Interim Status Detection)	Yes	Yes
7439-95-4	Magnesium	Yes (Interim Status Detection)	No	No - detected in groundwater above background value; not a

**Table 5. Evaluation of Potential Monitoring Constituents**

<b>CAS Number</b>	<b>Potential Monitoring Constituent</b>	<b>Retained for Evaluation as Monitoring Constituent (Source)<sup>a</sup></b>	<b>Is Constituent Identified in Appendix 5? (Yes/No)<sup>b</sup></b>	<b>Identified as Proposed Monitoring Constituent?<sup>c</sup> (Yes/No)</b>
				dangerous waste, no action level for screening
7439-96-5	Manganese	Yes (Interim Status Detection)	No	Yes - detected in groundwater above background value; not a dangerous waste; maximum result greater than action level; identified in Table 2-2 <sup>e</sup> as present in WMA C SSTs that have leaked
7439-97-6	Mercury	Yes (Interim Status Detection)	Yes	Yes
7439-98-7	Molybdenum	Yes (Interim Status Detection)	No	No - detected in groundwater above background value; not a dangerous waste; maximum result less than action level
7440-02-0	Nickel	Yes (Interim Status Detection)	Yes	Yes
7440-09-7	Potassium	Yes (Interim Status Detection)	No	No - detected in groundwater above background value; not a dangerous waste, no action level for screening
7440-22-4	Silver	Yes (Interim Status Detection)	Yes	Yes
7440-23-5	Sodium	Yes (Interim Status Detection)	No	No - detected in groundwater above background value; not a dangerous waste, no action level for screening
7440-24-6	Strontium	Yes (Interim Status Detection)	No	No - detected in groundwater above background value; not a dangerous waste; maximum result less than action level

**Table 5. Evaluation of Potential Monitoring Constituents**

<b>CAS Number</b>	<b>Potential Monitoring Constituent</b>	<b>Retained for Evaluation as Monitoring Constituent (Source)<sup>a</sup></b>	<b>Is Constituent Identified in Appendix 5? (Yes/No)<sup>b</sup></b>	<b>Identified as Proposed Monitoring Constituent?<sup>c</sup> (Yes/No)</b>
7440-29-1	Thorium	Yes (Interim Status Detection)	No	No - detected in groundwater above background value; not a dangerous waste, no action level for screening
7440-31-5	Tin	Yes (Interim Status Detection)	Yes	Yes
7440-36-0	Antimony	Yes (Interim Status Detection)	Yes	Yes
7440-38-2	Arsenic	Yes (Interim Status Detection)	Yes	Yes
7440-41-7	Beryllium	Yes (Interim Status Detection)	Yes	Yes
7440-43-9	Cadmium	Yes (Interim Status Detection)	Yes	Yes
7440-47-3	Chromium	Yes (Interim Status Detection)	Yes	Yes
7440-48-4	Cobalt	Yes (Interim Status Detection)	Yes	Yes
7440-50-8	Copper	Yes (Interim Status Detection)	Yes	Yes
7440-62-2	Vanadium	Yes (Interim Status Detection)	Yes	Yes
7440-66-6	Zinc	Yes (Interim Status Detection)	Yes	Yes
7440-70-2	Calcium	Yes (Interim Status Detection)	No	No - detected in groundwater above background value; not a dangerous waste, no action level for screening
74-83-9	Bromomethane	Yes (Interim Status Detection)	Yes	Yes
74-87-3	Chloromethane	Yes (Interim Status Detection)	Yes	Yes
74-88-4	Iodomethane	Yes (Interim Status Detection)	Yes	Yes
75-01-4	Vinyl chloride	Yes (SST System Part A)	Yes	Yes
75-09-2	Methylene chloride	Yes (Interim Status Detection)	Yes	Yes

**Table 5. Evaluation of Potential Monitoring Constituents**

<b>CAS Number</b>	<b>Potential Monitoring Constituent</b>	<b>Retained for Evaluation as Monitoring Constituent (Source)<sup>a</sup></b>	<b>Is Constituent Identified in Appendix 5? (Yes/No)<sup>b</sup></b>	<b>Identified as Proposed Monitoring Constituent?<sup>c</sup> (Yes/No)</b>
75-09-2	Methylene chloride	Yes (SST System Part A)	Yes	Yes
75-15-0	Carbon disulfide	Yes (Interim Status Detection)	Yes	Yes
75-15-0	Carbon disulfide	Yes (SST System Part A)	Yes	Yes
75-35-4	1,1-Dichloroethylene	Yes (SST System Part A)	Yes	Yes
75-69-4	Trichlorofluoromethane	Yes (SST System Part A)	Yes	Yes
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	Evaluate (SST System Part A)	No	Yes - dangerous waste in SST System Part A
7664-41-7	Ammonia	Yes (Interim Status Detection)	No	Yes - detected in groundwater above background value, dangerous waste
7782-49-2	Selenium	Yes (Interim Status Detection)	Yes	Yes
78-83-1	Isobutanol	Evaluate (SST System Part A)	Yes	Yes
78-93-3	Methyl ethyl ketone	Yes (SST System Part A)	Yes	Yes
79-00-5	1,1,2-Trichloroethane	Yes (SST System Part A)	Yes	Yes
79-01-6	Trichloroethene	Yes (Interim Status Detection)	Yes	Yes
79-01-6	Trichloroethylene	Yes (SST System Part A)	Yes	Yes
79-46-9	2-Nitropropane	Evaluate (SST System Part A)	No	Yes - dangerous waste in SST System Part A
80-62-6	Methyl methacrylate	Yes (Interim Status Detection)	Yes	Yes
88-85-7	Dinoseb(2-secButyl-4,6-dinitrophenol)	Yes (Interim Status Detection)	Yes	Yes
93-51-6	Cresylic acid	Evaluate (SST System Part A)	No	No - related compound included; not routinely analyzed by commercial laboratories <sup>g</sup>

**Table 5. Evaluation of Potential Monitoring Constituents**

CAS Number	Potential Monitoring Constituent	Retained for Evaluation as Monitoring Constituent (Source) <sup>a</sup>	Is Constituent Identified in Appendix 5? (Yes/No) <sup>b</sup>	Identified as Proposed Monitoring Constituent? <sup>c</sup> (Yes/No)
95-50-1	Ortho-dichlorobenzene	Yes (SST System Part A)	Yes	Yes
98-95-3	Nitrobenzene	Yes (SST System Part A)	Yes	Yes

a. This column presents constituents that were identified as potential monitoring constituents from the evaluations detailed in Sections 7.1 and 7.2. “Source” identifies the specific data set evaluation from which the constituent was identified as a potential monitoring constituent. “Yes” indicates that the constituent has a  $K_d$  less than or equal to that of hexavalent chromium. “Evaluate” indicates that no  $K_d$  was available for comparison.

b. This column identifies potential monitoring constituents that are also dangerous wastes identified in Appendix 5 of Ecology Publication No. 97-407, *Chemical Test Methods For Designating Dangerous Waste WAC 173-303-090 & -100*. The potential monitoring constituents that are also identified in Appendix 5 of Ecology Publication No. 97-407 are identified as proposed monitoring constituents.

c. Rationale is provided for only those constituents that are not identified in Appendix 5 of Ecology Publication No. 97-407.

d. The isomers of cresol (m-, p-, and o- cresol) are identified in Appendix 5 of Ecology Publication No. 97-407.

e. Table 2-2 in SGW-60588, *Engineering Evaluation Report For Single Shell Tank Waste Management Area C Groundwater Monitoring*, provides the nonradiological waste discharge profiles for the WMA C SSTs that have leaked.

f. The proposed monitoring constituents identified to detect trichlorophenol will be 2,4,5-trichlorophenol (CAS number 95-95-4) and 2,4,6-trichlorophenol (CAS number 88-06-2).

g. Cresylic acid is a mixture of compounds and is characterized by the analysis of m-, o-, and p-cresol (cresols) and 2,6-di-t-butyl-4-methylphenol (CAS number 128-37-0). Cresols is included as a proposed monitoring constituent. 2,6-Di-t-butyl-4-methylphenol is not routinely analyzed by commercial laboratories.

CAS = Chemical Abstracts Service

$K_d$  = distribution coefficient

SST = single-shell tank

WMA = waste management area

As described in Section 3.3, potential monitoring constituents that are also listed in Appendix 5 of Ecology Publication No. 97-407 were identified (Table 5). Monitoring for the dangerous wastes listed in Appendix 5 of Ecology Publication No. 97-407 has already been prescribed for WMA C. Therefore, the 53 potential monitoring constituents that are also included in Appendix 5 of Ecology Publication No. 97-407 were identified as proposed monitoring constituents.

The remaining potential monitoring constituents (N = 30) were evaluated in two groups (Table 5 provides details of the evaluation outcomes for these constituents):

- The first group comprised the potential monitoring constituents identified from the SST System Part A Permit Application (Section 3.1) that are not included in Appendix 5 of Ecology Publication No. 97-407. Each of these constituents is a dangerous waste.
- The second group comprised the potential monitoring constituents identified from the evaluation of the interim status groundwater results (Section 3.2) that are not included in Appendix 5 of Ecology Publication No. 97-407 and were not identified from the Part A Permit Application.

The remaining potential monitoring constituents in the first group (N = 9) were evaluated for availability of analysis (Table 5). Two of the potential monitoring constituents are not routinely analyzed by commercial laboratories and were removed as potential monitoring constituents. Each of the remaining potential monitoring constituents from the first group (N = 7) were identified as proposed monitoring constituents (Table 5).

The remaining potential monitoring constituents in the second group (N = 21) were evaluated as follows:

- Constituents that are also dangerous wastes were identified as proposed monitoring constituents.
- The remaining nondangerous constituents detected in groundwater were evaluated individually for one or more of the following:
  - Identification of related chemicals (e.g., parent compounds and isomers) that were already identified as proposed monitoring constituents
  - Identification of potential monitoring constituents that are not routinely analyzed by commercial laboratories
  - Comparison of the maximum groundwater concentration of the potential monitoring constituent to the federal or state action level (Table 6)
  - Determination if a potential monitoring constituent was identified as present in the waste discharge profile for the WMA C SSTs that have leaked (Table 2-2 in SGW-60588)

Of the remaining 21 potential monitoring constituents, 4 are dangerous wastes and were included as proposed monitoring constituents (Table 5). One of these 4 proposed monitoring constituents (trichlorophenol, detected in 1992) is not routinely analyzed by commercial laboratories and will be monitored using two of the commonly analyzed isomers (2,4,5-trichlorophenol and 2,4,6-trichlorophenol). None of the remaining potential monitoring constituents were already identified for monitoring by related chemicals. One of the remaining constituents is not routinely analyzed by commercial laboratories and was removed from consideration as a potential monitoring constituent.

A comparison of the maximum concentration to the action level showed that 7 of the remaining 16 nondangerous constituents exceeded the action level during the interim status monitoring period and were identified as proposed monitoring constituents (Table 5). Table 6 presents this comparison and identifies the sample date and well from which the sample originated. Each of the 7 constituents that exceeded the action level during the interim status monitoring period were identified in the waste discharge profile for the WMA C SSTs that have leaked (Table 2-2 in SGW-60588). The remaining 9 constituents were removed from consideration as potential monitoring constituents.

In summary, 72 constituents were identified as proposed monitoring constituents to detect and monitor any groundwater impacts from dangerous waste releases at WMA C. Seven of the 72 constituents are nondangerous constituents that were quantified in groundwater above the applicable action level and were identified in the waste discharge profile for the WMA C SSTs that have leaked.

**Table 6. Comparison of Maximum Interim Status Groundwater Monitoring Results of Nondangerous Waste Constituents to Action Levels**

CAS Number	Constituent	Maximum Concentration (µg/L)	Well with Maximum Concentration	Sample Date of Maximum	Action Level (µg/L)	Action Level Basis	Maximum Concentration Exceeds Action Level? (Yes/No/N/A)
7429-90-5	Aluminum	581	299-E27-14	5-Dec-2016	50	40 CFR 143.3	Yes
14798-03-9	Ammonium ion	200	299-E27-13	9-Mar-1993	Not available	N/A	N/A
24959-67-9	Bromide	261	299-E27-14	1-Jun-2011	Not available	N/A	N/A
7440-70-2	Calcium	155000	299-E27-24	8-Dec-2015	Not available	N/A	N/A
16887-00-6	Chloride	297000	299-E27-7	16-Feb-2010	250000	40 CFR 143.3	Yes
7439-89-6	Iron	1600	299-E27-13	14-Mar-1994	11200	WAC 173-340-720(4)(b)(iii)(A) and (B)	Yes
7439-95-4	Magnesium	42700	299-E27-14	7-Sep-2012	Not available	N/A	N/A
7439-96-5	Manganese	137	299-E27-21	12-Mar-2014	50	40 CFR 143.3	Yes
7439-98-7	Molybdenum	8	299-E27-15	26-Mar-10	80	WAC 173-340-720(4)(b)(iii)(A) and (B)	No
14797-55-8	Nitrate	118000	299-E27-14	7-Sep-2012	45000	40 CFR 141.62	Yes
14797-65-0	Nitrite	2300	299-E27-24	13-May-2010	1000	40 CFR 141.62	Yes
7440-09-7	Potassium	11800	299-E27-155	15-Sep-2011	Not available	N/A	N/A
7440-23-5	Sodium	36800	299-E27-24	14-May-2010	Not available	N/A	N/A
7440-24-6	Strontium	884	299-E27-24	8-Dec-2015	9600	WAC 173-340-720(4)(b)(iii)(A) and (B)	No
14808-79-8	Sulfate	367000	299-E27-7	3-Jun-2014	250000	40 CFR 143.3	Yes

**Table 6. Comparison of Maximum Interim Status Groundwater Monitoring Results of Nondangerous Waste Constituents to Action Levels**

CAS Number	Constituent	Maximum Concentration (µg/L)	Well with Maximum Concentration	Sample Date of Maximum	Action Level (µg/L)	Action Level Basis	Maximum Concentration Exceeds Action Level? (Yes/No/N/A)
7440-29-1	Thorium	1.4	299-E27-155	19-Sep-2016	Not available	N/A	N/A

40 CFR 141.62, "National Primary Drinking Water Regulations," "Maximum Contaminant Levels for Inorganic Contaminants"

40 CFR 143.3, "National Secondary Drinking Water Regulations," "Secondary Maximum Contaminant Levels"

WAC 173-340-720, "Model Toxics Control Act—Cleanup," "Groundwater Cleanup Standards"

N/A = not applicable

## 7.4 Conclusions

Based on the evaluation of the dangerous wastes identified from the SST System Part A Permit Application and groundwater data collected for WMA C under interim status monitoring plans, 72 waste constituents are identified as proposed monitoring constituents to detect and monitor any groundwater impacts from dangerous waste releases at WMA C (Table 7). Seven of the 72 are nondangerous waste constituents that were quantified in groundwater above the applicable action level and were identified in the waste discharge profile for the WMA C SSTs that have leaked.

**Table 7. Proposed Groundwater Monitoring Constituents for WMA C**

Waste Constituent	CAS Number
<b>Dangerous Waste Constituents</b>	
1,1,1-Trichloroethane	71-55-6
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1
1,1,2-Trichloroethane	79-00-5
1,1-Dichloroethylene	75-35-4
1,2-Dichloroethane	107-06-2
2,4,5-Trichlorophenol	95-95-4
2,4,6-Trichlorophenol	88-06-2
2,4-Dinitrotoluene	121-14-2
2-Hexanone	591-78-6
2-Nitropropane	79-46-9
4,6-Dinitro-2-methylphenol	534-52-1
4-Chloro-3-methylphenol	59-50-7
Acetone (2-Propanone)	67-64-1
Ammonia	7664-41-7
Antimony	7440-36-0
Arsenic	7440-38-2
Benzene	71-43-2
Beryllium	7440-41-7
Bromomethane	74-83-9
Cadmium	7440-43-9
Carbon disulfide	75-15-0
Carbon tetrachloride	56-23-5

**Table 7. Proposed Groundwater Monitoring Constituents for WMA C**

<b>Waste Constituent</b>	<b>CAS Number</b>
Chlorobenzene	108-90-7
Chloroform	67-66-3
Chloromethane	74-87-3
Chromium	7440-47-3
Cobalt	7440-48-4
Copper	7440-50-8
Cresols	1319-77-3
Cyanide	57-12-5
Cyclohexanone	108-94-1
Di-n-octylphthalate	117-84-0
Dinoseb(2-secButyl-4,6-dinitrophenol)	88-85-7
Ethyl acetate	141-78-6
Ethyl benzene	100-41-4
Ethyl ether	60-29-7
Hexavalent chromium	18540-29-9
Iodomethane	74-88-4
Isobutanol (Isobutyl alcohol)	78-83-1
Lead	7439-92-1
Mercury	7439-97-6
Methanol	67-56-1
Methyl ethyl ketone (2-Butanone)	78-93-3
Methyl isobutyl ketone (4-Methyl-2-pentanone)	108-10-1
Methyl methacrylate	80-62-6
Methylene chloride	75-09-2
n-Butyl alcohol (1-Butanol)	71-36-3
Nickel	7440-02-0
Nitrobenzene	98-95-3
o-Dichlorobenzene (1,2-Dichlorobenzene)	95-50-1

**Table 7. Proposed Groundwater Monitoring Constituents for WMA C**

<b>Waste Constituent</b>	<b>CAS Number</b>
Phenol	108-95-2
Pyridine	110-86-1
Selenium	7782-49-2
Silver	7440-22-4
Sulfide	18496-25-8
Tetrachloroethene	127-18-4
Tin	7440-31-5
Toluene	108-88-3
Tributyl phosphate	126-73-8
Trichloroethene	79-01-6
Trichlorofluoromethane	75-69-4
Vanadium	7440-62-2
Vinyl chloride (Chloroethene)	75-01-4
Xylenes (total)	1330-20-7
Zinc	7440-66-6
<b>Nondangerous Waste Constituents</b>	
Aluminum	7429-90-5
Chloride	16887-00-6
Iron	7439-89-6
Manganese	7439-96-5
Nitrate	14797-55-8
Nitrite	14797-65-0
Sulfate	14808-79-8

CAS = Chemical Abstracts Service

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- 40 CFR 143.3, “National Secondary Drinking Water Regulations,” “Secondary Maximum Contaminant Levels,” *Code of Federal Regulations*. Available at: [https://www.ecfr.gov/cgi-bin/text-idx?SID=4e32f1ae13171430ec577ff46796c27f&mc=true&node=pt40.25.143&rgn=div5#se40.25.143\\_13](https://www.ecfr.gov/cgi-bin/text-idx?SID=4e32f1ae13171430ec577ff46796c27f&mc=true&node=pt40.25.143&rgn=div5#se40.25.143_13).
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- WA7890008967, *Hanford Facility Resource Conservation and Recovery Act (RCRA) Permit, Dangerous Waste Portion for the Treatment, Storage, and Disposal of Dangerous Waste*, Revision 8c, as amended, Washington State Department of Ecology. Available at: <https://fortress.wa.gov/ecy/nwp/permitting/hdwp/rev/8c/index.html>.
- WAC 173-303, “Dangerous Waste Regulations,” *Washington Administrative Code*, Olympia, Washington. Available at: <http://apps.leg.wa.gov/WAC/default.aspx?cite=173-303>.
- 173-303-645, “Releases from Regulated Units.”
- 173-303-090 & -100, “Chemical Test Methods For Designating Dangerous Waste.”
- 173-303-9904, “Dangerous Waste Sources List.”

## **Appendix A**

### **Supplemental Information for the Identification of Site-Specific Monitoring Constituents for Waste Management Area C**

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<b>ENVIRONMENTAL CALCULATION COVER PAGE</b>	
<b>SECTION 1 - Completed by the Responsible Manager</b>	
<b>Project:</b> RCRA Interim to Final Closure Plans	<b>RELEASE / ISSUE</b>  
<b>Date:</b> 03/14/2019	
<b>Calculation Title and Description:</b> Identification of Site-Specific Monitoring Constituents for Waste Management Area C  Appendix A is a supplemental evaluation of the WMA C data included in the environmental calculation file.	
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<b>ENVIRONMENTAL CALCULATION COVER PAGE (Continued)</b>	
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<b>Professional Licenses:</b>	
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<b>ENVIRONMENTAL CALCULATION COVER PAGE (Continued)</b>			
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<b>SECTION 2 - Completed by Preparer</b>			
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<b>Preparer(s):</b>			
Donna Morgans <small>Print First and Last Name</small>	Sr Risk Specialist <small>Position</small>	 <small>Signature</small>	4/2/19 <small>Date</small>

<b>ENVIRONMENTAL CALCULATION COVER PAGE (Continued)</b>			
<b>Checker(s):</b>			
<u>Sara Lindberg</u> <small>Print First and Last Name</small>	<u>Risk Specialist</u> <small>Position</small>	 <small>Signature</small>	<u>4/3/2019</u> <small>Date</small>
<b>Senior Reviewer(s):</b>			
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<b>Responsible Manager(s):</b>			
<u>Alaa Aly WE NICHOLS, ACTWG</u> <small>Print First and Last Name</small>	<u>Risk/Model Int Mgr</u> <small>Position</small>	 <small>Signature</small>	<u>3 APR 2019</u> <small>Date</small>
<b>SECTION 5 - Applicable if Calculation is a Risk Assessment or Uses an Environmental Model</b>			
<b>Prior to Initiating Modeling:</b>			
Required training for modelers completed:			
Integration Lead:			
_____	_____	_____	_____
<small>Print First and Last Name</small>	<small>Signature</small>	<small>Date</small>	
Safety Software Approved:			
Integration Lead:			
_____	_____	_____	_____
<small>Print First and Last Name</small>	<small>Signature</small>	<small>Date</small>	
<b>Calculation Approved:</b>			
Risk/Modeling Integration Manager:			
<u>WICHIUM NICHOLS, ACTWG for AH ACT</u> <small>Print First and Last Name</small>		 <small>Signature</small>	<u>3 APR 2019</u> <small>Date</small>

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## A1 Purpose

This appendix provides additional information and analyses that could be used to further refine the specific monitoring constituents for Waste Management (WMA) C.

## A2 Background

The methodology used to identify the proposed monitoring constituents includes the following steps:

1. Constituents identified as dangerous waste in the Single-Shell Tank Part A Permit (WA7890008967, *Hanford Facility Resource Conservation and Recovery Act (RCRA) Permit, Dangerous Waste Portion for the Treatment, Storage, and Disposal of Dangerous Waste*) were screened depending on their mobility through the vadose zone soil. Mobile constituents were identified by comparing chemical-specific distribution coefficients ( $K_{ds}$ ) to a Hanford Site-derived  $K_d$  value of 0.8 mL/g that was developed and applied to hexavalent chromium (a known mobile constituent in Hanford Site vadose soils) (Section 6.1 in ECF-Hanford-11-0165, *Evaluation of Hexavalent Chromium Leach Test Data Conducted on Vadose Zone Sediment Samples from the 100 Area*). Constituents with a  $K_d \leq 0.8$  mL/g were identified as mobile constituents and further evaluated as potential monitoring constituents (Table A-1).
2. Appendix A of SGW-60588, *Engineering Evaluation Report For Single Shell Tank Waste Management Area C Groundwater Monitoring*, includes a summary of the interim status groundwater monitoring history at WMA C through 2016, including the changes to the well network and monitoring constituents. Groundwater sample results collected under interim status monitoring plans are presented for each well.
3. Maximum concentrations for any constituent detected within the WMA C well network were compiled. These concentrations were compared to the Hanford Site 90<sup>th</sup> percentile background concentration when available. When the maximum detected concentration exceeded the respective background concentration or a background concentration was not available, the detected constituent was maintained for further evaluation as a potential monitoring constituent.
4. Constituents identified in Steps 1 and 2 were compared to constituents that are listed in Appendix 5 of Ecology Publication No. 97-407, *Chemical Test Methods For Designating Dangerous Waste WAC 173-303-090 & -100*. If the constituents identified in Steps 1 and 2 are also included in Appendix 5 of Ecology Publication No. 97-407 they were identified as proposed monitoring constituents.
5. The final step to identify proposed monitoring constituents was to review interim status groundwater detections that were not already identified as proposed monitoring constituents through the preceding evaluation of the Part A constituents.
6. Any remaining constituents were evaluated individually for one or more of the following:
  - Identification of related chemicals (e.g., parent compounds and isomers) that were already identified as proposed monitoring constituents (evaluated on a case-by-case basis).
  - Identification of any potential monitoring constituent that is not routinely analyzed by commercial laboratories. Any potential monitoring constituent that is not routinely analyzed by commercial laboratories was removed from consideration as a proposed monitoring constituent.
  - Comparison of the maximum groundwater concentration of the potential monitoring constituent to the federal or state action level (evaluated on a case-by-case basis).

- Determination if a potential monitoring constituent was identified as present in the waste discharge profile for the WMA C SSTs that have leaked (Table 2-2 in SGW-60588) (evaluated on a case-by-case basis).

**Table A-1. Wells, Sample Date Range, and Class of Constituents Evaluated in ECF-200BP5-17-0230**

Well Name	Sample Date Range	Class of Constituents Evaluated
299-E27-4	12/16/2003 – 3/4/2016	VOCs, SVOCs, inorganic nonmetals, pesticides, and metals
299-E27-7	12/12/2003 – 6/17/2016	VOCs, SVOCs, inorganic nonmetals, pesticides, metals
299-E27-11	4/1/2016 – 10/05/2016	Phenols, inorganic nonmetals, metals,
299-E27-12	2/26/1990 – 12/4/2016	VOCs, SVOCs, inorganic nonmetals, pesticides, herbicides, PCB aroclors, metals
299-E27-13	2/26/1990 – 12/4/2016	VOCs, SVOCs, inorganic nonmetals, pesticides, herbicides, and metals
299-E27-14	2/26/1990 – 12/5/2016	VOCs, SVOCs, inorganic nonmetals, pesticides, herbicides, and metals
299-E27-15	2/26/1990 – 12/4/2016	VOCs, SVOCs, inorganic nonmetals, pesticides, herbicides, and metals
299-E27-21	12/16/2003 – 12/2/2016	VOCs, SVOCs, inorganic nonmetals, pesticides, and metals
299-E27-22	1/14/2004 – 12/5/2016	VOCs, SVOCs, inorganic nonmetals, pesticides, herbicides, and metals
299-E27-23	1/23/2004 – 12/2/2016	VOCs, SVOCs, inorganic nonmetals, pesticides, and metals
299-E27-24	5/13/2010 – 12/2/2016	VOCs, SVOCs, inorganic nonmetals, pesticides, and metals
299-E27-25	4/6/2010 – 12/5/2016	VOCs, SVOCs, inorganic nonmetals, pesticides, metals
299-E27-26	9/20/2016 – 12/02/2016	Inorganic nonmetals, metals
299-E27-155	3/9/2009 – 12/2/2016	VOCs, SVOCs, inorganic nonmetals, pesticides, metals

Note: Metals results include filtered and unfiltered samples.

PCB = polychlorinated biphenyl

SVOC = semivolatile organic compound

VOC = volatile organic compound

### **A3 Uncertainties Identified in Methodology for Final Evaluation of Proposed Monitoring Constituents**

The following additional steps could be performed to further reduce the list of constituents to be monitored. The steps could be implemented to address uncertainties associated with the methodology and provide additional considerations that would supplement the assessment results in the main text of the environmental calculation file.

#### **A3.1 Data Processing and Reduction**

The following additional steps could be applied in data reduction and processing:

1. Use routine sampling results in the evaluation. However, one sample represents characterization, and the characterization results could be eliminated from further consideration.
2. Further evaluate nondetect data to identify constituents that have not been detected over the duration of the sampling period.
3. Reduce parent and field duplicate sample results into a single set of results at a location and time of collection.
4. Identify laboratory contaminants. Sample results assigned a “B” laboratory qualifier for organics or a “C” qualifier for metals are typically laboratory contaminants and were identified, and could be removed as proposed monitoring constituents. The definition of the “B” laboratory qualifier is “The analyte was detected in both the associated QC blank and in the sample.” The definition of the “C” laboratory qualifier is “The analyte was detected in both the sample and the associated QC blank, and the sample concentration was  $\leq 5X$  the blank concentration.”
5. Do not include samples collected for informational purposes only. As a result, the well-specific sampling timeframe was shorter for some wells (see Appendix A of SGW-60588). Sample results from monitoring performed between 1989 and 2016 were included in the evaluation. The actual sampling period, however, varied from well to well depending on the status of the well within the monitoring network. Although the purpose of this evaluation was to consider anything detected for proposed monitoring, several constituents were detected sporadically in the 1990s and results were not reproducible over time.
6. Include filtered and unfiltered metals results in the initial evaluation. Only unfiltered results would be considered when future groundwater samples are compared to groundwater protection standards.

### **A3.2 Evaluation of Mobile Constituents**

Site-specific or Central Plateau-specific  $K_d$  values could be applied. The evaluation of mobile constituents proposed that constituents with a  $K_d < 0.8$  mL/g were identified as mobile constituents and further evaluated as potential monitoring constituents (Table A-1). However, the use of this  $K_d$  is based on a leaching study performed for vadose zone materials in the 100 Areas of the Hanford Site. Soil properties for vadose zone materials in the Central Plateau are different than what was observed in the River Corridor. As a result, it is recommended that future evaluations consider Central Plateau-specific information to determine mobility of contaminants through vadose zone material at WMA C.

This screening step using a  $K_d$  of  $<0.8$  mL/g did not result in the elimination of constituents for proposed monitoring.

### **A3.3 Constituents Recommended for Proposed Monitoring**

All constituents identified for proposed monitoring (listed in Table 5) were individually reviewed to confirm their inclusion for proposed monitoring and included in Table A-2. Constituents were proposed for monitoring because they are either dangerous or listed wastes. Constituents that are not dangerous or listed wastes and were detected during interim status monitoring were compared to the Appendix 5 list.

Potential data quality issues such as laboratory contamination or sporadic detections that could not be associated with a plume or a trend are described in Table A-2. Additionally, constituents that are associated with the SST Part A permit were evaluated to determine their prevalence within the WMA C monitoring network. Contaminants that were not detected or were not analyzed between 1990 and 2016 are identified.

Table A-2. Additional Evaluation of Proposed Monitoring Constituents for WMA C SSTs

Constituent Name	Retained for Evaluation as Monitoring Constituent (Source)	Is Constituent Identified in Appendix 5 of Ecology Publication No. 97-407 ?	Identified as Proposed Monitoring Constituent?	Recommend as Proposed Monitoring Constituent Based on Further Review
Ethyl benzene	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Not detected in groundwater between 1990 and 2016.
1,2-Dichloroethane	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Not detected in groundwater between 1990 and 2016.
Methyl isobutyl ketone	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Not detected in groundwater between 1990 and 2016.
Toluene	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Single detection of toluene measured in 2012 at well 299-E27-12 (1 detect of 11 samples) J flag.
Chlorobenzene	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Not detected in groundwater between 1990 and 2016.
Cyclohexanone	Evaluate (SST System Part A)	No	Yes. Dangerous waste in SST System Part A	Yes. Part A. Not analyzed in groundwater samples collected between 1990 and 2016.
Phenol	Yes (Interim Status Detection)	Yes	Yes	Yes. Included in Appendix 5. Detections of phenol were measured in 1992 and 1993 respectively at well 299-E27-13 (1 detect of 27 samples) and well 299-E27-14 (1 detect of 27 samples) L flag. Not associated with a plume or a trend.
2-Ethoxyethanol	Evaluate (SST System Part A)	No	No. Not routinely analyzed by commercial laboratories	Yes. Part A. Not analyzed in groundwater samples collected between 1990 and 2016
Pyridine	Evaluate (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Not detected in groundwater between 1990 and 2016.
Di-n-octylphthalate	Yes (Interim Status Detection)	Yes	Yes	Yes. Included in Appendix 5. This is a common laboratory contaminant. Single detection measured in 2009 at well 299-E27-15 (1 detect of 2 samples) J flag; not associated with plume or trend.
2,4-Dinitrotoluene	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Not detected in groundwater between 1990 and 2016.
Tributyl phosphate	Yes (Interim Status Detection)	No	Yes. Detected in groundwater above background value, dangerous waste	No. Interim status detection. Detected once in 2010 at well 299-E27-14 (1 detect of 2 samples) J flag
Tetrachloroethene	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. All tetrachloroethene detections are flagged with a "JB" laboratory qualifier indicating its presence is from laboratory contamination. Tetrachloroethene is not associated with plume or trend. 299-E27-15 (1 detect of 10 samples) JB flag 299-E27-22 (2 detects of 9 samples) JB flags 299-E27-23 (2 detects of 11 samples) JB flags 299-E27-155 (1 detect of 20 samples) JB flags
Cresols	Evaluate (SST System Part A)	Yes (as isomers)	Yes	Yes. Part A and identified in Appendix 5. Total cresols, 2-methylphenol, 3-methylphenol, and 4-methylphenol not detected in groundwater between 1990 and 2016.
Xylene	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Xylenes not detected in groundwater between 1990 and 2016.
Ethyl acetate	Yes (SST System Part A)	No	Yes. Dangerous waste in SST System Part A	Yes. Part A. Ethyl acetate not analyzed in groundwater between 1990 and 2016.
Nitrate	Yes (Interim Status Detection)	No	Yes. Detected in groundwater above background value; not a dangerous waste; maximum result greater than action level; identified in Table 2-2e as present in WMA C SSTs that have leaked	Yes. Interim status detections of nitrate but is not included in Part A or Appendix 5. Nitrate is included in the waste discharge profile for WMA C SSTs and is also identified as a contaminant of concern for the 200-BP-5 Groundwater OU.
Nitrite	Yes (Interim Status Detection)	No	Yes. Detected in groundwater above background value; not a dangerous waste; maximum result greater than action level; identified in Table 2-2e as present in WMA C SSTs that have leaked	Yes. Interim status detections of nitrite is but is not included in Part A or Appendix 5. Nitrite is included in the waste discharge profile for WMA C SSTs.
Ammonium ion	Yes (Interim Status Detection)	No	No. Detected in groundwater above background value; not a dangerous waste, no action level for screening	No. Ammonium ion is an interim status detection and a toxicity value is not available.
Sulfate	Yes (Interim Status Detection)	No	Yes. Detected in groundwater above background value; not a dangerous waste; maximum result greater than action level; identified in Table 2-2e as present in WMA C SSTs that have leaked	Yes. Sulfate is included in the waste discharge profile for WMA C SSTs. Sulfate concentrations are above the secondary MCL.
Chloride	Yes (Interim Status Detection)	No	Yes. Detected in groundwater above background value; not a dangerous waste; maximum result greater than action level; identified in Table 2-2e as present in WMA C SSTs that have leaked	Yes. Chloride is included in the waste discharge profile for WMA C SSTs. Chloride concentrations are above the secondary MCL.

Table A-2. Additional Evaluation of Proposed Monitoring Constituents for WMA C SSTs

Constituent Name	Retained for Evaluation as Monitoring Constituent (Source)	Is Constituent Identified in Appendix 5 of Ecology Publication No. 97-407 ?	Identified as Proposed Monitoring Constituent?	Recommend as Proposed Monitoring Constituent Based on Further Review
Sulfide	Yes (Interim Status Detection)	Yes	Yes	Yes. Included in Appendix 5. A toxicity value is not available. Single detection measured in 2010 at well 299-E27-4 (1 detect of 2 samples) B flag. Not associated with plume or trend
Hexavalent chromium	Yes (Interim Status Detection)	No	Yes. Detected in groundwater above background value, dangerous waste	Yes. Identified as a dangerous waste based on chromium. All detections are < 48 µg/L (concentrations range between 1.5 µg/L and 9 µg/L).
Bromide	Yes (Interim Status Detection)	No	No. Detected in groundwater above background value; not a dangerous waste, no action level for screening	No. Interim status detections. Toxicity value is not available.
Trichlorophenol	Yes (Interim Status Detection)	No	Yes. Detected in groundwater above background value, dangerous waste; not routinely analyzed by commercial laboratories and will be monitored by two isomers	No. Not a dangerous waste because associated with dioxin code, dioxins are not applicable at Hanford. Single detection measured in 1992 at well 299-E27-13 (1 detect of 10 samples). No detections of trichlorophenol isomers. Not associated with plume or trend
4,6-Dinitro-2-methylphenol	Yes (Interim Status Detection)	Yes	Yes	Yes. Included in Appendix 5. Single detection measured in 1998 at well 299-E27-14 (1 detect of 24 samples) B flag indicating it is laboratory contamination.
Hexamethylcyclotrisiloxane	Yes (Interim Status Detection)	No	No. Not routinely analyzed by commercial laboratories	No. Not a dangerous waste and not identified in Appendix 5. Single detection in well 299-E27-155; is a tentatively identified compound
Carbon tetrachloride	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Single detections at well 299-E27-13 (1 detect of 10 samples) and well 299-E27-25 (1 detect of 7 samples), two detections on same date at well 299-E27-155 (2 detects of 20 samples) all J flags. Not associated with a plume or a trend.
Cyanide	Yes (Interim Status Detection)	Yes	Yes	Yes. Part A and identified in Appendix 5. Cyanide detected in 13 of 14 wells.
2-Hexanone	Yes (Interim Status Detection)	Yes	Yes	Yes. Included in Appendix 5. Single detection measured in 2010 at 299-E27-155 (1 detect of 13 samples) J flag; not associated with plume or trend.
4-Chloro-3-methylphenol	Yes (Interim Status Detection)	Yes	Yes	Yes. Included in Appendix 5. Single detection measured in 2010 at well 299-E27-13 (1 detect of 25 samples); not associated with a plume or trend.
Ethyl ether	Yes (SST System Part A)	No	Yes. Dangerous waste in SST System Part A	Yes. Part A. Not analyzed in groundwater between 1990 and 2016.
Methanol	Yes (SST System Part A)	No	Yes. Dangerous waste in SST System Part A	Yes. Part A. Not analyzed in groundwater between 1990 and 2016.
Acetone	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Single detections at well 299-E27-12 (1 detect of 10 samples), well 299-E27-21 (1 detect of 9 samples), well 299-E27-23 (1 detect of 11 samples), and well 299-E27-155 (1 detect of 20 samples) three results with J flags. Not associated with a plume or a trend.
Chloroform	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Low-level detections (0.11 µg/L to 0.56 µg/L) at 8 wells, not associated with a plume or a trend.
n-Butyl alcohol	Yes (SST System Part A)	No	Yes. Dangerous waste in SST System Part A	Yes. Part A. Not detected in groundwater between 1990 and 2016.
Benzene	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Not detected in groundwater between 1990 and 2016.
1,1,1-Trichloroethane	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Not detected in groundwater between 1990 and 2016.
Aluminum	Yes (Interim Status Detection)	No	Yes. Detected in groundwater above background value; not a dangerous waste; maximum result greater than action level; identified in Table 2-22e in the 200-BP-5 RI report (DOE/RL-2009-127) as present in WMA C SSTs that have leaked	No. Not a dangerous waste and not identified in Appendix 5. Aluminum concentrations > background but less than risk-based concentration of 16,000 µg/L. Aluminum is not identified as a COC in the 200-BP-5 RI report (DOE/RL-2009-127).

Table A-2. Additional Evaluation of Proposed Monitoring Constituents for WMA C SSTs

Constituent Name	Retained for Evaluation as Monitoring Constituent (Source)	Is Constituent Identified in Appendix 5 of Ecology Publication No. 97-407 ?	Identified as Proposed Monitoring Constituent?	Recommend as Proposed Monitoring Constituent Based on Further Review
Iron	Yes (Interim Status Detection)	No	Yes. Detected in groundwater above background value; not a dangerous waste; maximum result greater than action level; identified in Table 2-2e in the 200-BP-5 RI report (DOE/RL-2009-127) as present in WMA C SSTs that have leaked	No. Not a dangerous waste and not identified in Appendix 5. Iron concentrations > background but less than risk-based concentration of 11,200 µg/L. Iron is not identified as a COC in the 200-BP-5 RI report (DOE/RL-2009-127).
Lead	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Lead concentrations > background but less than MCL of 15 µg/L. Note that lead was not identified as a COC in the 200-BP-5 RI report (DOE/RL-2009-127).
Magnesium	Yes (Interim Status Detection)	No	No. Detected in groundwater above background value; not a dangerous waste, no action level for screening	No. Magnesium is an interim status detection and a toxicity value is not available.
Manganese	Yes (Interim Status Detection)	No	Yes. Detected in groundwater above background value; not a dangerous waste; maximum result greater than action level; identified in Table 2-2e in the 200-BP-5 RI report (DOE/RL-2009-127) as present in WMA C SSTs that have leaked	No. Not a dangerous waste and not identified in Appendix 5. Manganese concentrations > background but less than risk-based concentration of 384 µg/L. Manganese is not identified as a COC in the 200-BP-5 RI report (DOE/RL-2009-127).
Mercury	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Sporadic detections of mercury in 5 wells; concentrations less than risk-based concentration of 2 µg/L that are not associated with a plume or a trend. Mercury is not identified as COC in the 200-BP-5 RI report (DOE/RL-2009-127).
Molybdenum	Yes (Interim Status Detection)	No	No. Detected in groundwater above background value; not a dangerous waste; maximum result less than action level	No. Not a dangerous waste and not identified in Appendix 5. Molybdenum concentrations > background but less than risk-based concentration of 80 µg/L. Molybdenum is not identified as a COC in the 200-BP-5 RI report (DOE/RL-2009-127).
Nickel	Yes (Interim Status Detection)	Yes	Yes	Yes. Included in Appendix 5. Nickel concentrations > background but less than MCL of 100 µg/L. Nickel is not identified as a COC in the 200-BP-5 RI report (DOE/RL-2009-127).
Potassium	Yes (Interim Status Detection)	No	No. Detected in groundwater above background value; not a dangerous waste, no action level for screening	No. Potassium is an interim status detection and a toxicity value is not available.
Silver	Yes (SST System Part A)	Yes	Yes	Yes. Included in Part A and Appendix 5. Silver concentrations > background but less than risk-based concentration of 80 µg/L. Silver is not identified as a COC in the 200-BP-5 RI report (DOE/RL-2009-127).
Sodium	Yes (Interim Status Detection)	No	No. Detected in groundwater above background value; not a dangerous waste, no action level for screening	No. Sodium is an interim status detection and a toxicity value is not available.
Strontium	Yes (Interim Status Detection)	No	No. Detected in groundwater above background value; not a dangerous waste; maximum result less than action level	No. Not a dangerous waste and not identified in Appendix 5. Strontium concentrations > background but less than risk-based concentration of 9,600 µg/L. strontium is not identified as a COC in the 200-BP-5 RI report (DOE/RL-2009-127).
Thorium	Yes (Interim Status Detection)	No	No. Detected in groundwater above background value; not a dangerous waste, no action level for screening	No - thorium is an interim status detection and a toxicity value not available.
Tin	Yes (Interim Status Detection)	Yes	Yes	Yes. Not a dangerous waste but identified in Appendix 5. Tin concentrations > background but less than risk-based concentration of 9,600 µg/L. Tin is not identified as a COC in the 200-BP-5 RI report (DOE/RL-2009-127).
Antimony	Yes (Interim Status Detection)	Yes	Yes	Yes. Identified in Appendix 5. Antimony is not identified as a COC in the 200-BP-5 RI report (DOE/RL-2009-127). Antimony analyzed by Method 6010 have been shown to be false positives. Antimony analyzed by Method 200.8 and Method 6020 are < background and < MCL of 6 µg/L (includes 142 samples).
Arsenic	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Arsenic concentrations > background and 3 results > MCL of 10 µg/L. Note that arsenic is not identified as CO a COC in the 200-BP-5 RI report (DOE/RL-2009-127).
Beryllium	Yes (Interim Status Detection)	Yes	Yes	Yes. Not a dangerous waste but identified in Appendix 5. Beryllium concentrations > background but less than risk-based concentration of 4.0 µg/L. Note that beryllium is not identified as a COC in the 200-BP-5 RI report (DOE/RL-2009-127).

**Table A-2. Additional Evaluation of Proposed Monitoring Constituents for WMA C SSTs**

Constituent Name	Retained for Evaluation as Monitoring Constituent (Source)	Is Constituent Identified in Appendix 5 of Ecology Publication No. 97-407 ?	Identified as Proposed Monitoring Constituent?	Recommend as Proposed Monitoring Constituent Based on Further Review
Cadmium	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Cadmium concentrations > background but less than MCL of 5 µg/L (2 nondetects > MCL). Note that cadmium is not identified as a COC in the 200-BP-5 RI report (DOE/RL-2009-127).
Chromium	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Chromium concentrations > background but less than MCL of 100 µg/L. Note that chromium is not identified as a COC in the 200-BP-5 RI report (DOE/RL-2009-127).
Cobalt	Yes (Interim Status Detection)	Yes	Yes	Yes. Not a dangerous waste but identified in Appendix 5. Cobalt concentrations > background with sporadic detections above the risk-based concentration of 4.8 µg/L that are not associated with a plume or a trend. Numerous cobalt results reported by Method 6010 have method detection limits greater than the risk-based concentration Note that cobalt is not identified as a COC in the 200-BP-5 RI report (DOE/RL-2009-127).
Copper	Yes (Interim Status Detection)	Yes	Yes	Yes. Not a dangerous waste but identified in Appendix 5. Copper concentrations > background but less than risk-based concentration of 640 µg/L. Note that copper is not identified as a COC in the 200-BP-5 RI report (DOE/RL-2009-127).
Vanadium	Yes (Interim Status Detection)	Yes	Yes	Yes. Not a dangerous waste but identified in Appendix 5. Vanadium concentrations > background but less than risk-based concentration of 80 µg/L. Note that vanadium is not identified as a COC in the 200-BP-5 RI report (DOE/RL-2009-127).
Zinc	Yes (Interim Status Detection)	Yes	Yes	Yes. Not a dangerous waste but identified in Appendix 5. Zinc concentrations > background but less than risk-based concentration of 4,800 µg/L. Note that zinc is not identified as a COC in the 200-BP-5 RI report (DOE/RL-2009-127).
Calcium	Yes (Interim Status Detection)	No	No. Detected in groundwater above background value; not a dangerous waste, no action level for screening	No. Calcium is an interim status detection and a toxicity value is not available.
Bromomethane	Yes (Interim Status Detection)	Yes	Yes	Yes. Not a dangerous waste but identified in Appendix 5. All bromomethane detections are flagged with a “B” laboratory qualifier indicating its presence is from laboratory contamination. Bromomethane is not associated with plume or trend. 299-E27-4 (1 detect of 9 samples) B flag 299-E27-12 (1 of 9 samples) B flag 299-E27-13 (1 detect of 9 samples) B flag 299-E27-14 (1 detect of 8 samples) B flag 299-E27-15 (1 detect of 9 samples) B flag 299-E27-155 (2 detects of 13 samples) B flags 299-E27-21 (1 detect of 8 samples) B flag 299-E27-22 (1 detect of 9 samples) B flag 299-E27-23 (2 detects of 10 samples) B flag 299-E27-25 (1 detect of 7 samples) B flag 299-E27-7 (1 detect of 10 samples) B flag
Chloromethane	Yes (Interim Status Detection)	Yes	Yes	Yes. Not a dangerous waste but identified in Appendix 5. All but 4 chloromethane detections are flagged with a “B” laboratory qualifier indicating its presence is from laboratory contamination. Chloromethane results qualified with a “B” flag may also be in combination with a “Y” or “J” flag. Chloromethane is not associated with plume or trend. 299-E27-4 (2 detects of 9 samples) B flag 299-E27-12 (2 of 9 samples) B flag 299-E27-13 (3 detects of 9 samples) B flags 299-E27-14 (2 detects of 8 samples) B flags 299-E27-15 (2 detects of 9 samples) B flags 299-E27-155 (3 detects of 13 samples) 2 B flags/ 1 Y flag 299-E27-21 (3 detects of 8 samples) 2 B flags/ 1 Y flag 299-E27-22 (2 detects of 9 ) B flags 299-E27-23 (3 detects of 10 samples) 2 B flags/ 1 J flag 299-E27-24 (1 detect of 6 samples) J flag 299-E27-25 (1 detect of 7 samples) B flag 299-E27-7 (1 detect of 10 samples) B flag

Table A-2. Additional Evaluation of Proposed Monitoring Constituents for WMA C SSTs

Constituent Name	Retained for Evaluation as Monitoring Constituent (Source)	Is Constituent Identified in Appendix 5 of Ecology Publication No. 97-407 ?	Identified as Proposed Monitoring Constituent?	Recommend as Proposed Monitoring Constituent Based on Further Review
Iodomethane	Yes (Interim Status Detection)	Yes	Yes	Yes. Not a dangerous waste but identified in Appendix 5. All iodomethane detections are flagged with a "B" laboratory qualifier indicating its presence is from laboratory contamination. Iodomethane is not associated with plume or trend. 299-E27-155 (1 detect of 13 samples) B flag 299-E27-23 (2 detects of 10 samples) B flags 299-E27-25 ( 1 detect of 7 samples) B flag
Vinyl chloride	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Vinyl chloride not detected in groundwater between 1990 and 2016.
Methylene chloride	Yes (Interim Status Detection)	Yes	Yes	Yes. Part A and identified in Appendix 5. Common laboratory contaminant. Eight of 11 detects were qualified with a "B" laboratory qualifier indicating its presence is from laboratory contamination.
Carbon disulfide	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Three low-level detections measured in groundwater between 1990 and 2016. 299-E27-13 (1 detect of 10 samples) J flag 299-E27-23(1 detect of 11 samples) J flag 299-E27-155 (1 detect of 20 samples) J flag
1,1-Dichloroethylene	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. 1,1-Dichloroethene was not detected in groundwater between 1990 and 2016.
Trichlorofluoromethane	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Not analyzed in groundwater between 1990 and 2016.
1,1,2-Trichloro-1,2,2-trifluoroethane	Evaluate (SST System Part A)	No	Yes. Dangerous waste in SST System Part A	Yes. Part A. Not analyzed in groundwater between 1990 and 2016.
Ammonia	Yes (Interim Status Detection)	No	Yes. Detected in groundwater above background value, dangerous waste	No. Interim status detection. Single detection in well 299-E27-155 and a toxicity value is not available.
Selenium	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Selenium concentrations > background but less than MCL of 50 µg/L. Note that selenium is not identified as a COC in the 200-BP-5 RI report (DOE/RL-2009-127).
Isobutanol	Evaluate (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Not detected in groundwater between 1990 and 2016.
Methyl ethyl ketone	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Not detected in groundwater between 1990 and 2016.
1,1,2-Trichloroethane	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Not detected in groundwater between 1990 and 2016.
Trichloroethylene	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Single detection measured in 2011 at well 299-E27-155 (1 detect of 20 samples) JB flag. Presence is from laboratory contamination.
2-Nitropropane	Evaluate (SST System Part A)	No	Yes. Dangerous waste in SST System Part A	Yes. Part A. Not analyzed in groundwater between 1990 and 2016.
Methyl methacrylate	Yes (Interim Status Detection)	Yes	Yes	Yes. Part A and identified in Appendix 5. Single detection measured in 2011 at well 299-E27-155 (1 detect of 13 samples) Y flag; not associated with a plume or a trend.
Dinoseb(2-secButyl-4,6-dinitrophenol)	Yes (Interim Status Detection)	Yes	Yes	Yes. Part A and identified in Appendix 5. Single detection measured in 1998 at well 299-E27-12 (1 detect of 36 samples) J flag. Not associated with a plume or a trend.
Cresylic acid	Evaluate (SST System Part A)	No	No. Related compound included; not routinely analyzed by commercial laboratories	Yes. Part A. Not analyzed in groundwater between 1990 and 2016.
Ortho-dichlorobenzene	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. 1,2-Dichlorobenzene was not detected in groundwater between 1990 and 2016.

**Table A-2. Additional Evaluation of Proposed Monitoring Constituents for WMA C SSTs**

Constituent Name	Retained for Evaluation as Monitoring Constituent (Source)	Is Constituent Identified in Appendix 5 of Ecology Publication No. 97-407 ?	Identified as Proposed Monitoring Constituent?	Recommend as Proposed Monitoring Constituent Based on Further Review
Nitrobenzene	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Nitrobenzene was not detected in groundwater between 1990 and 2016.

References: DOE/RL-2009-127, 2018, *Remedial Investigation Report 200-BP-5 Groundwater Operable Unit*.  
 Ecology Publication No. 97-407, *Chemical Test Methods For Designating Dangerous Waste WAC 173-303-090 & -100*.

- COC = contaminant of concern
- EPA = U.S. Environmental Protection Agency
- MCL = maximum contaminant level
- OU = operable unit
- RI = remedial investigation
- SST = single-shell tank
- WMA = waste management area

## A4 Results

A total of 83 constituents were evaluated for proposed for monitoring including metals, inorganic metals, volatile organic compounds, semivolatile organic compounds, and pesticides. Constituents were proposed because they are on the SST Part A list or are identified on the Appendix 5 list in Ecology Publication No. 97-407 and have interim status detections. Constituents were categorized by the findings of the review and are summarized in Table A-3.

**Table A-3. Summary of Constituents Proposed for Monitoring at WMA C SSTs**

<b>Constituents Proposed for Monitoring Because They Are on the SST Part A list</b>	
Constituents proposed for monitoring because they are commonly detected and may be associated with a potential release from WMA C	Lead, mercury, arsenic, silver, cadmium, chromium, selenium, hexavalent chromium
Constituents proposed for monitoring that have not been detected in groundwater between 1990 and 2016	Ethyl benzene, 1,2-dichloroethane, methyl isobutyl ketone, chlorobenzene, pyridine, 2,4-dinitrotoluene, cresols including isomers, xylenes, benzene, 1,1,1-trichloroethane, isobutanol, methyl ethyl ketone, 1,1,2-trichloroethane, 1,2-dichlorobenzene, nitrobenzene, vinyl chloride, 1,1-dichloroethene, n-butyl alcohol
Constituents proposed for monitoring that have not been analyzed in groundwater between 1990 and 2016	Ethyl acetate, ethyl ether, methanol, trichlorofluoromethane, 1,1,2-trichloro-1,2,2-trifluoroethane, 2-nitropropane, cyclohexanone, cresylic acid, 2-ethoxyethanol
Constituents proposed for monitoring that are associated with single sporadic detections between 1990 and 2016 and are not associated with a plume or show a trend	Carbon tetrachloride, acetone, chloroform, toluene, trichloroethene, methyl methacrylate, dinoseb(2-secButyl-4,6-dinitrophenol), carbon disulfide
Constituents proposed for monitoring that are associated with laboratory contamination between 1990 and 2016 and are not associated with a plume or show a trend	Tetrachloroethene, methylene chloride
<b>Constituents Identified in Appendix 5 of Ecology Publication No. 97-407</b>	
Constituents proposed for monitoring because they have an interim status groundwater detections	Nickel, beryllium, tin, antimony, cobalt, copper, cyanide, vanadium, and zinc
Constituents proposed for monitoring that are associated with single sporadic detections between 1990 and 2016 and are not associated with a plume or show a trend	Phenol, di-n-octylphthalate, 2-hexanone, 4-chloro-3-methylphenol,
Constituents proposed for monitoring that are associated with laboratory contamination between 1990 and 2016 and are not associated with a plume or show a trend	4,6-Dinitro-2-methylphenol, bromomethane, chloromethane, iodomethane
Toxicity value not available	Sulfide

**Table A-3. Summary of Constituents Proposed for Monitoring at WMA C SSTs**

<b>Constituents Identified as Present in the Waste Discharge Profile for the WMA C SSTs</b>	
Present in waste discharge profile for the WMA C SSTs	Nitrate, nitrite, sulfate, chloride
<b>Constituents with Interim Status Detection but Are Not Included in SST Part A Permit and Are Not Identified in Appendix 5 of Ecology Publication No. 97-407</b>	
Interim status detection	Aluminum, iron, manganese, molybdenum, strontium
Toxicity value not available	Ammonia, ammonium, ion, bromide, magnesium, potassium, sodium, thorium, calcium
Tentatively identified compound	Hexamethylcyclotrisiloxane
Interim status detection with single sporadic detections between 1990 and 2016 and are not associated with a plume or show a trend	Tributyl phosphate, trichlorophenol (including isomers)

References: Ecology Publication No. 97-407, *Chemical Test Methods For Designating Dangerous Waste WAC 173-303-090 & -100*.

WA7890008967, *Hanford Facility Resource Conservation and Recovery Act (RCRA) Permit, Dangerous Waste Portion for the Treatment, Storage, and Disposal of Dangerous Waste*.

SST = single-shell tank

WMA = waste management area

## A5 Conclusions and Recommendations

A total of 83 constituents were considered for proposed monitoring at WMA C; however, only 17 were frequently detected and included on the SST Part A list or identified in Appendix 5 and have interim status detections without data quality issues. These constituents include the following:

- Lead
- Mercury
- Arsenic
- Beryllium
- Cadmium
- Chromium
- Selenium
- Nickel
- Silver
- Tin
- Antimony
- Cobalt
- Copper
- Cyanide
- Vanadium
- Zinc
- Hexavalent chromium

Nitrate, nitrite, chloride, and sulfate are identified for monitoring because they are included in the waste discharge profile for WMA C SSTs.

The analysis of the data collected during detection monitoring should consider the following: absence of detection, absence of analysis, sporadic detections, or presence of laboratory contamination.

Proposed monitoring is not recommended for any of the constituents based solely on interim status detections. These constituents are not recommended for proposed monitoring because they are not associated with a release, are associated with a sporadic detection, are tentatively identified compounds, or do not have published toxicity values.

Irrespective of the constituents that are selected for short-term or long-term monitoring, a data usability assessment is recommended because of the large number of constituents that were not detected and the number of data quality issues identified. This can be used to form a basis to reduce the number of constituents that require monitoring in the future.

## A6 References

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