

Identification of Site-Specific Monitoring Constituents for Waste Management Area A-AX

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

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Richland, Washington 99352

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Date Published
April 2019

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APPROVED
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Release Approval

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ENVIRONMENTAL CALCULATION COVER PAGE

SECTION 1 - Completed by the Responsible Manager

Project: RCRA Interim to Final Closure Plans	RELEASE / ISSUE <div style="border: 2px solid red; padding: 5px; display: inline-block;"> <p style="margin: 0;">DATE: May 06, 2019</p>  </div>
Date:	
Calculation Title and Description: Identification of Site-Specific Monitoring Constituents for Waste Management Area A-AX	

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ENVIRONMENTAL CALCULATION COVER PAGE (Continued)

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Calculation Number: ECF-200PO1-17-0223

Revision Number: 0

Revision History

Revision No.	Description	Date	Affected Pages
0	Initial Issue		

SECTION 3 - Completed by the Responsible Manager

Document Control:

Is the document intended to be controlled within the Document Management Control System (DMCS)? Yes No

Does document contain scientific and technical information intended for public use? Yes No

Does document contain controlled-use information? Yes No

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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) A-AX and constituents that were detected in groundwater during interim status monitoring to identify proposed groundwater monitoring constituents.

2 Background

WMA A-AX 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 A-AX 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 A-AX SSTs. The wastes are identified by waste code in Section 2.3 of SGW-60586, *Engineering Evaluation Report For Single Shell Tank Waste Management Area A-AX 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

Dangerous Waste Code	Constituent	CAS Number	K_d (mL/g)*	K_d reference	Is K_d ≤ 0.8 mL/g? (Yes/No/N/A)	Retain as Potential Monitoring Constituent? (Yes/No/Evaluate)
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

Dangerous Waste Code	Constituent	CAS Number	K_d (mL/g)*	K_d reference	Is K_d ≤ 0.8 mL/g? (Yes/No/N/A)	Retain as Potential Monitoring Constituent? (Yes/No/Evaluate)
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

Dangerous Waste Code	Constituent	CAS Number	K_d (mL/g)*	K_d reference	Is K_d ≤ 0.8 mL/g? (Yes/No/N/A)	Retain as Potential Monitoring Constituent? (Yes/No/Evaluate)
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 _d (mL/g)*	K _d reference	Is K _d ≤ 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_d is calculated from the K_{oc} value. The K_d calculations assume a value of 0.001 g/g for the soil fraction of organic carbon.

CAS = Chemical Abstracts Service

K_d = distribution coefficient

N/A = not applicable

3.2 Interim Status Groundwater Monitoring Results

Appendix A of SGW-60586 includes a summary of the interim status groundwater monitoring history at WMA A-AX 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-60586, 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.¹ 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 90th 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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¹ 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 A-AX 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-E25-236	1,2,3,4,6,7,8-Heptachlorodibenzodioxin	12-Dec-12	0.00011	N	B			No	N/A	N/A	Yes
299-E25-236	1,2,3,4,6,7,8-Heptachlorodibenzofuran	12-Dec-12	0.000006	N	QBJ			No	N/A	N/A	Yes
299-E25-236	1,2,3,4,7,8,9-Heptachlorodibenzofuran	12-Dec-12	0.0000036	N	BJ			No	N/A	N/A	Yes
299-E25-236	1,2,3,4,7,8-Hexachlorodibenzofuran	12-Dec-12	0.000005	N	QBJ			No	N/A	N/A	Yes
299-E25-236	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	12-Dec-12	0.0000017	N	QJ			No	N/A	N/A	Yes
299-E25-236	1,2,3,6,7,8-Hexachlorodibenzofuran	12-Dec-12	0.0000022	N	QBJ			No	N/A	N/A	Yes
299-E25-236	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	12-Dec-12	0.000013	N	BJ			No	N/A	N/A	Yes
299-E25-236	1,2,3,7,8,9-Hexachlorodibenzofuran	12-Dec-12	0.00000076	N	QBJ			No	N/A	N/A	Yes
299-E25-236	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	12-Dec-12	0.0000078	N	QBJ			No	N/A	N/A	Yes
299-E25-236	1,2,3,7,8-Pentachlorodibenzofuran	12-Dec-12	0.000001	N	QBJ			No	N/A	N/A	Yes
299-E24-20	1,2,4-Trimethylbenzene	15-Sep-2016	2	N	T			No	N/A	N/A	Yes
299-E25-236	2,3,4,6,7,8-Hexachlorodibenzofuran	12-Dec-12	0.00000075	N	QBJ			No	N/A	N/A	Yes
299-E25-41	2,3,4,6-Tetrachlorophenol	15-Jan-2004	7.7	N	B	YH		No	N/A	N/A	Yes
299-E25-236	2,3,4,7,8-Pentachlorodibenzofuran	12-Dec-12	0.00000095	N	QBJ			No	N/A	N/A	Yes
299-E25-94	2,3,7,8-Tetrachlorodibenzofuran	8-Mar-16	0.00000034	N	QJ			No	N/A	N/A	Yes
299-E24-19	2,4-D(2,4-Dichlorophenoxyacetic acid)	3-Mar-93	0.05	N				No	N/A	N/A	Yes
299-E24-19	2,4-Dimethylphenol	27-Aug-1992	7	N				No	N/A	N/A	Yes
299-E24-20	2,4-Dinitrophenol	2-Feb-1998	0.8	N	J			No	N/A	N/A	Yes
299-E24-20	2-Ethyl-1,3-Dimethylbenzene	15-Sep-2016	2.3	N	NJ			No	N/A	N/A	Yes

Table 2. WMA A-AX 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-E24-20	2-Ethyltoluene	15-Sep-2016	2	N	NJ			No	N/A	N/A	Yes
299-E25-94	2-Propanol	19-Sep-2016	140	N				No	N/A	N/A	Yes
299-E25-41	4,4'-DDT (Dichlorodiphenyltrichloroethane)	18-May-92	0.15	N	B			No	N/A	N/A	Yes
299-E24-19	4,6-Dinitro-2-methylphenol	2-Feb-1995	2.2	N	L			No	N/A	N/A	Yes
299-E25-94	Acetone	7-Dec-2016	6.33	N	JT			No	N/A	N/A	Yes
299-E24-19	Aluminum	15-Mar-1994	270	N				Yes	7.11	Yes	Yes
299-E24-33	Ammonia	2-Jun-2014	82.7	N		Z		Yes	113	Yes	No
299-E24-19	Ammonium ion	27-Aug-1992	100	N		Q		No	N/A	N/A	Yes
299-E24-19	Ammonium ion	3-Mar-1993	100	N				No	N/A	N/A	Yes
299-E24-20	Ammonium ion	27-Aug-1992	100	N		Q		No	N/A	N/A	Yes
299-E25-40	Ammonium ion	27-Aug-1992	100	N		Q		No	N/A	N/A	Yes
299-E25-41	Ammonium ion	27-Aug-1992	100	N		Q		No	N/A	N/A	Yes
299-E25-93	Antimony	14-Mar-2012	98.9	N	BC	Y		Yes	55.1	Yes	Yes
299-E25-40	Arsenic	27-Aug-1992	23	N				Yes	7.85	Yes	Yes
299-E25-94	Barium	3-Dec-2014	88.2	N				Yes	105	Yes	No
299-E25-2	Benzo(ghi)perylene	8-Mar-2016	0.358	N	J			No	N/A	N/A	Yes
299-E25-2	Benzoic acid	1-Nov-2016	12	N	JB			No	N/A	N/A	Yes
299-E24-20	Beryllium	4-Jun-1998	1.9	Y	B			Yes	2.29	Yes	No
299-E25-41	Boron	27-Feb-1990	25	Y				Yes	36	Yes	No
299-E25-2	Bromide	4-Apr-2016	250	N	D			Yes	124	No	Yes
299-E25-2	Bromide	18-Oct-2016	250	N	D			Yes	124	No	Yes
299-E25-2	Bromide	1-Nov-2016	250	N	D			Yes	124	No	Yes

Table 2. WMA A-AX 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-E25-94	Butane, 2-methoxy-2-methyl-	19-Sep-2016	260	N	NJ			No	N/A	N/A	Yes
299-E25-93	Cadmium	4-Mar-2013	5.2	N	B			Yes	0.916	Yes	Yes
299-E25-41	Calcium	7-Mar-2016	93000	N				Yes	52644	No	Yes
299-E25-93	Carbon disulfide	15-Sep-2016	3.87	N	J			No	N/A	N/A	Yes
299-E25-93	Chloride	15-Sep-2016	37000	N	D			Yes	15630	No	Yes
299-E25-237	Chloroform	7-Mar-2016	0.49	N	J			No	N/A	N/A	Yes
299-E25-237	Chloroform	16-Sep-2016	0.49	N	J			No	N/A	N/A	Yes
299-E25-46	Chromium	11-Dec-2002	6250	Y		F		Yes	2.4	Yes	Yes
299-E24-19	Cobalt	17-Jul-2001	17.6	Y	B			Yes	0.916	Yes	Yes
299-E25-40	Copper	1-Jun-1999	83.9	Y		Y		Yes	0.81	Yes	Yes
299-E24-33	Cyanide	6-Dec-2016	7	N				Yes	8.41	No	No
299-E25-94	Cyclohexane	19-Sep-2016	19	N	NJ			No	N/A	N/A	Yes
299-E25-2	Cyclotetrasiloxane, Octamethyl	18-Oct-2016	15	N	NJ			No	N/A	N/A	Yes
299-E25-2	Diacetone alcohol	18-Oct-2016	39	N	NJ			No	N/A	N/A	Yes
299-E25-2	Dibenz[a,h]anthracene	8-Mar-2016	0.349	N	J			No	N/A	N/A	Yes
299-E24-20	Dodecane	15-Sep-2016	4.6	N	NJ			No	N/A	N/A	Yes
299-E25-2	Ethyl acetate	1-Nov-2016	5	N	NJ			No	N/A	N/A	Yes
299-E25-40	Fluoride	20-Nov-1991	700	N				Yes	1047	No	No
299-E25-236	Heptachlorodibenzofurans	12-Dec-2012	1.6E-05	N	QJB			No	N/A	N/A	Yes
299-E25-236	Heptachlorodibenzo-p-dioxins	12-Dec-2012	0.00015	N	B			No	N/A	N/A	Yes
299-E25-236	Hexachlorodibenzofurans	12-Dec-2012	1.9E-05	N	QJB			No	N/A	N/A	Yes
299-E25-236	Hexachlorodibenzo-p-dioxin	12-Dec-12	5.3E-05	N	JQB			No	N/A	N/A	Yes
299-E25-2	Hexamethylcyclotrisiloxane	18-Oct-2016	5.8	N	NJ			No	N/A	N/A	Yes
299-E25-236	Hexavalent Chromium	28-Oct-08	191	N				No	N/A	N/A	Yes
299-E25-2	Indeno(1,2,3-cd)pyrene	8-Mar-2016	0.377	N	J			No	N/A	N/A	Yes
299-E24-19	Iron	5-Nov-92	6800	N				Yes	570	Yes	Yes

Table 2. WMA A-AX 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-E24-19	Lead	28-Feb-92	46	N				Yes	0.917	Yes	Yes
299-E25-93	Magnesium	7-Mar-16	26200	N				Yes	24,816	Yes	Yes
299-E24-19	Manganese	5-Nov-92	260	N				Yes	38.5	Yes	Yes
299-E24-19	Manganese	5-Nov-92	260	N				Yes	38.5	Yes	Yes
299-E25-41	Mercury	18-May-92	1.1	N				Yes	0.003	Yes	Yes
299-E24-33	Methylene chloride	16-Sep-2016	7.3	N	NJ			No	N/A	N/A	Yes
299-E24-33	Molybdenum	6-Dec-2016	6	Y	C			Yes	3.21	Yes	Yes
299-E24-19	Nickel	17-Jul-2001	1030	Y				Yes	1.56	Yes	Yes
299-E25-13	Nitrate	22-Mar-1990	370000	N				Yes	26,871	No	Yes
299-E25-41	Nitrite	27-Mar-2006	953	N		F		Yes	93.7	No	Yes
299-E25-236	Octachlorodibenzofuran	12-Dec-2012	3.6E-05	N	BJ			No	N/A	N/A	Yes
299-E25-40	Octachlorodibenzo-p-dioxin	19-Sep-2016	0.00026	N	B			No	N/A	N/A	Yes
299-E25-236	Pentachlorodibenzofurans	12-Dec-2012	1.2E-05	N	QJB			No	N/A	N/A	Yes
299-E25-2	Pentachlorodibenzo-p-dioxins	8-Mar-2016	3.2E-06	N	QJ			No	N/A	N/A	Yes
299-E25-46	Perchlorate anion	29-Sep-1993	400	N	L	QY		No	N/A	N/A	Yes
299-E25-46	Polychlorinated dibenzofurans	18-Jun-1993	0.025	N				No	N/A	N/A	Yes
299-E25-46	Polychlorinated dibenzo-p-dioxins	18-Jun-1993	0.064	N				No	N/A	N/A	Yes
299-E24-33	Potassium	8-Sep-2008	10700	Y	C			Yes	9,122	No	Yes
299-E24-33	Selenium	8-Dec-2015	11	N				Yes	10.5	Yes	Yes
299-E25-40	Silicon	27-Feb-1990	19400	N				Yes	33,949	Yes	No
299-E25-236	Silver	19-May-2011	38	N	C			Yes	5.28	Yes	Yes
299-E25-94	Sodium	30-Mar-2009	39600	N		Y		Yes	26,998	No	Yes
299-E25-41	Strontium	18-Dec-2015	496	N				Yes	323	Yes	Yes
299-E25-13	Sulfate	3/22/1990	306000	N				Yes	47,014	No	Yes

Table 2. WMA A-AX 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-E24-33	Sulfide	8-Mar-2016	8200	N	B			Yes	2.19	Yes	Yes
299-E25-236	Tetrachlorodibenzofurans	12-Dec-2012	7.4E-05	N	Q			No	N/A	N/A	Yes
299-E25-236	Tetrachlorodibenzo-p-dioxins	12-Dec-2012	1.6E-06	N	QJ			No	N/A	N/A	Yes
299-E24-33	Thallium	3-Dec-2014	1.4	N	B			Yes	1.67	Yes	No
299-E25-93	Thorium	7-Mar-2016	0.524	Y	B			Yes	0.5	Yes	Yes
299-E25-40	Tin	1-Feb-1996	120	Y	B			Yes	21.6	Yes	Yes
299-E25-237	Trichloromonofluoromethane	7-Mar-2016	0.25	N	J			No	N/A	N/A	Yes
299-E24-20	Undecane	15-Sep-2016	6	N	NJ			No	N/A	N/A	Yes
299-E24-20	Vanadium	4-Jun-1998	76.9	Y		Q		Yes	11.5	Yes	Yes
299-E24-20	Xylenes (total)	15-Sep-2016	0.51	N	J			No	N/A	N/A	Yes
299-E25-2	Zinc	4-Jan-2011	523	Y		Y		Yes	21.8	Yes	Yes

* The 90th 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 <= 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.

F = Review Qualifier: the result is undergoing further review.

H = Review Qualifier: laboratory holding time exceeded before the sample was analyzed.

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 <= 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.

T = Organics (GC/MS only) - Spike and/or spike duplicate sample recovery is outside control 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.

GC/MS = gas chromatography/mass spectrometry

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 A-AX 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 A-AX (Section 9.4 in SGW-60586). 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 A-AX SSTs that have leaked (Table 2-2 in SGW-60586) (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 A-AX 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 A-AX SSTs. It is assumed that the HEIS data are accurate and valid measurements of contaminant conditions in groundwater associated with WMA A-AX.

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-60586 provides the data for interim status groundwater monitoring.

7 Results and Conclusions

Based on the evaluations of waste constituents associated with WMA A-AX 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 A-AX 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 A-AX 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 A-AX interim status groundwater monitoring data set was compiled and compared to the Hanford Site 90th 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 = 86) were retained as potential monitoring constituents (Table 4).

Table 4. Constituents Detected Above Background Concentrations in the WMA A-AX Interim Status Groundwater Data Set

CAS Number	Constituent
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzodioxin
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin

Table 4. Constituents Detected Above Background Concentrations in the WMA A-AX Interim Status Groundwater Data Set

CAS Number	Constituent
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran
95-63-6	1,2,4-Trimethylbenzene
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran
58-90-2	2,3,4,6-Tetrachlorophenol
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran
94-75-7	2,4-D(2,4-Dichlorophenoxyacetic acid)
105-67-9	2,4-Dimethylphenol
51-28-5	2,4-Dinitrophenol
2870-04-4	2-Ethyl-1,3-Dimethylbenzene
611-14-3	2-Ethyltoluene
67-63-0	2-Propanol
50-29-3	4,4'-DDT (Dichlorodiphenyltrichloroethane)
534-52-1	4,6-Dinitro-2-methylphenol
67-64-1	Acetone
7429-90-5	Aluminum
14798-03-9	Ammonium ion
7440-36-0	Antimony
7440-38-2	Arsenic
191-24-2	Benzo(ghi)perylene
65-85-0	Benzoic acid
24959-67-9	Bromide
994-05-8	Butane, 2-methoxy-2-methyl-
7440-43-9	Cadmium
7440-70-2	Calcium
75-15-0	Carbon disulfide
16887-00-6	Chloride
67-66-3	Chloroform
7440-47-3	Chromium

Table 4. Constituents Detected Above Background Concentrations in the WMA A-AX Interim Status Groundwater Data Set

CAS Number	Constituent
7440-48-4	Cobalt
7440-50-8	Copper
110-82-7	Cyclohexane
556-67-2	Cyclotetrasiloxane, Octamethyl
123-42-2	Diacetone alcohol
53-70-3	Dibenz[a,h]anthracene
112-40-3	Dodecane
141-78-6	Ethyl acetate
38998-75-3	Heptachlorodibenzofurans
37871-00-4	Heptachlorodibenzo-p-dioxins
55684-94-1	Hexachlorodibenzofurans
34465-46-8	Hexachlorodibenzo-p-dioxin
541-05-9	Hexamethylcyclotrisiloxane
18540-29-9	Hexavalent chromium
193-39-5	Indeno(1,2,3-cd)pyrene
7439-89-6	Iron
7439-92-1	Lead
7439-95-4	Magnesium
7439-96-5	Manganese
7439-97-6	Mercury
75-09-2	Methylene chloride
7439-98-7	Molybdenum
7440-02-0	Nickel
14797-55-8	Nitrate
14797-65-0	Nitrite
39001-02-0	Octachlorodibenzofuran
3268-87-9	Octachlorodibenzo-p-dioxin
30402-15-4	Pentachlorodibenzofurans
36088-22-9	Pentachlorodibenzo-p-dioxins

Table 4. Constituents Detected Above Background Concentrations in the WMA A-AX Interim Status Groundwater Data Set

CAS Number	Constituent
14797-73-0	Perchlorate anion
136677-10-6	Polychlorinated dibenzofurans
136677-09-3	Polychlorinated dibenzo-p-dioxins
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
55722-27-5	Tetrachlorodibenzofurans
41903-57-5	Tetrachlorodibenzo-p-dioxins
7440-29-1	Thorium
7440-31-5	Tin
75-69-4	Trichloromonofluoromethane
1120-21-4	Undecane
7440-62-2	Vanadium
1330-20-7	Xylenes (total)
7440-66-6	Zinc

CAS = Chemical Abstracts Service

7.3 Results from Final Monitoring Constituent Evaluation

One-hundred fourteen 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

CAS Number	Potential Monitoring Constituent	Retained for Evaluation as Monitoring Constituent (Source)^a	Is Constituent Identified in Appendix 5? (Yes/No)^b	Identified as Proposed Monitoring Constituent?^c (Yes/No)
100-41-4	Ethyl benzene	Yes (SST System Part A)	Yes	Yes
105-67-9	2,4-Dimethylphenol	Yes (Interim Status Detection)	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
108-90-7	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
110-80-5	2-Ethoxyethanol	Evaluate (SST System Part A)	No	No - not routinely analyzed by commercial laboratories
110-82-7	Cyclohexane	Yes (Interim Status Detection)	No	Yes - detected in groundwater above background value, dangerous waste
110-86-1	Pyridine	Evaluate (SST System Part A)	Yes	Yes
1120-21-4	Undecane	Yes (Interim Status Detection)	No	No - not routinely analyzed by commercial laboratories
112-40-3	Dodecane	Yes (Interim Status Detection)	No	No - not routinely analyzed by commercial laboratories
121-14-2	2,4-Dinitrotoluene	Yes (SST System Part A)	Yes	Yes
123-42-2	Diacetone alcohol	Yes (Interim Status Detection)	No	No - not routinely analyzed by commercial laboratories
127-18-4	Tetrachloroethene	Yes (SST System Part A)	Yes	Yes
1319-77-3	Cresols	Evaluate (SST System Part A)	Yes (as isomers) ^d	Yes
1330-20-7	Xylene	Yes (SST System Part A)	Yes	Yes

Table 5. Evaluation of Potential Monitoring Constituents

CAS Number	Potential Monitoring Constituent	Retained for Evaluation as Monitoring Constituent (Source)^a	Is Constituent Identified in Appendix 5? (Yes/No)^b	Identified as Proposed Monitoring Constituent?^c (Yes/No)
1330-20-7	Xylenes (total)	Yes (Interim Status Detection)	Yes	Yes
136677-09-3	Polychlorinated dibenzo-p-dioxins	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzo-p-dioxins)	No, identified for monitoring by related compounds ^e
136677-10-6	Polychlorinated dibenzofurans	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	No, identified for monitoring by related compounds ^e
141-78-6	Ethyl acetate	Yes (SST System Part A)	No	Yes - dangerous waste in SST System Part A
141-78-6	Ethyl acetate	Yes (Interim Status Detection)	No	Yes - dangerous waste in SST System Part A
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 ^f as present in WMA A-AX SSTs that have leaked
14797-65-0	Nitrite	Yes (Interim Status Detection)	No	No - detected in groundwater above background value; not a dangerous waste; maximum result less than action level
14797-73-0	Perchlorate anion	Yes (Interim Status Detection)	No	No - detected in groundwater above background value; not a dangerous waste, no action level for screening

Table 5. Evaluation of Potential Monitoring Constituents

CAS Number	Potential Monitoring Constituent	Retained for Evaluation as Monitoring Constituent (Source)^a	Is Constituent Identified in Appendix 5? (Yes/No)^b	Identified as Proposed Monitoring Constituent?^c (Yes/No)
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 ^f as present in WMA A-AX SSTs that have leaked
16887-00-6	Chloride	Yes (Interim Status Detection)	No	No - detected in groundwater above background value; not a dangerous waste; maximum result less than action level
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
191-24-2	Benzo(ghi)perylene	Yes (Interim Status Detection)	Yes	Yes
193-39-5	Indeno(1,2,3-cd)pyrene	Yes (Interim Status Detection)	Yes	Yes
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzo-p-dioxins)	Yes
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

Table 5. Evaluation of Potential Monitoring Constituents

CAS Number	Potential Monitoring Constituent	Retained for Evaluation as Monitoring Constituent (Source)^a	Is Constituent Identified in Appendix 5? (Yes/No)^b	Identified as Proposed Monitoring Constituent?^c (Yes/No)
2870-04-4	2-Ethyl-1,3-Dimethylbenzene	Yes (Interim Status Detection)	No	No - not routinely analyzed by commercial laboratories
30402-15-4	Pentachlorodibenzofurans	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	Yes
3268-87-9	Octachlorodibenzo-p-dioxin	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzo-p-dioxins)	Yes
34465-46-8	Hexachlorodibenzo-p-dioxin	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzo-p-dioxins)	Yes
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzodioxin	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzo-p-dioxins)	Yes
36088-22-9	Pentachlorodibenzo-p-dioxins	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzo-p-dioxins)	Yes
37871-00-4	Heptachlorodibenzo-p-dioxins	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzo-p-dioxins)	Yes
38998-75-3	Heptachlorodibenzofurans	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	Yes
39001-02-0	Octachlorodibenzofuran	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	Yes

Table 5. Evaluation of Potential Monitoring Constituents

CAS Number	Potential Monitoring Constituent	Retained for Evaluation as Monitoring Constituent (Source)^a	Is Constituent Identified in Appendix 5? (Yes/No)^b	Identified as Proposed Monitoring Constituent?^c (Yes/No)
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzo-p-dioxins)	Yes
41903-57-5	Tetrachlorodibenzo-p-dioxins	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzo-p-dioxins)	Yes
50-29-3	4,4'-DDT (Dichlorodiphenyltrichloroethane)	Yes (Interim Status Detection)	Yes	Yes
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	Yes
51-28-5	2,4-Dinitrophenol	Yes (Interim Status Detection)	Yes	Yes
534-52-1	4,6-Dinitro-2-methylphenol	Yes (Interim Status Detection)	Yes	Yes
53-70-3	Dibenz[a,h]anthracene	Yes (Interim Status Detection)	Yes	Yes
541-05-9	Hexamethylcyclotrisiloxane	Yes (Interim Status Detection)	No	No - not routinely analyzed by commercial laboratories
556-67-2	Cyclotetrasiloxane, Octamethyl	Yes (Interim Status Detection)	No	No - not routinely analyzed by commercial laboratories
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	Yes
55684-94-1	Hexachlorodibenzofurans	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	Yes

Table 5. Evaluation of Potential Monitoring Constituents

CAS Number	Potential Monitoring Constituent	Retained for Evaluation as Monitoring Constituent (Source) ^a	Is Constituent Identified in Appendix 5? (Yes/No) ^b	Identified as Proposed Monitoring Constituent? ^c (Yes/No)
55722-27-5	Tetrachlorodibenzofurans	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	Yes
56-23-5	Carbon tetrachloride	Yes (SST System Part A)	Yes	Yes
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	Yes
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	Yes
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	Yes
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzo-p-dioxins)	Yes
58-90-2	2,3,4,6-Tetrachlorophenol	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
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	Yes
611-14-3	2-Ethyltoluene	Yes (Interim Status Detection)	No	No - not routinely analyzed by commercial laboratories
65-85-0	Benzoic acid	Yes (Interim Status Detection)	No	Yes - detected in groundwater above background value, dangerous waste

Table 5. Evaluation of Potential Monitoring Constituents

CAS Number	Potential Monitoring Constituent	Retained for Evaluation as Monitoring Constituent (Source)^a	Is Constituent Identified in Appendix 5? (Yes/No)^b	Identified as Proposed Monitoring Constituent?^c (Yes/No)
67-56-1	Methanol	Yes (SST System Part A)	No	Yes - dangerous waste in SST System Part A
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	Yes
67-63-0	2-Propanol	Yes (Interim Status Detection)	No	Yes - detected in groundwater above background value, dangerous waste
67-64-1	Acetone	Yes (SST System Part A)	Yes	Yes
67-64-1	Acetone	Yes (Interim Status Detection)	Yes	Yes
67-66-3	Chloroform	Yes (SST System Part A)	Yes	Yes
67-66-3	Chloroform	Yes (Interim Status Detection)	Yes	Yes
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	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
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	Yes

Table 5. Evaluation of Potential Monitoring Constituents

CAS Number	Potential Monitoring Constituent	Retained for Evaluation as Monitoring Constituent (Source)^a	Is Constituent Identified in Appendix 5? (Yes/No)^b	Identified as Proposed Monitoring Constituent?^c (Yes/No)
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 ^f as present in WMA A-AX 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 ^f as present in WMA A-AX 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 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 ^f as present in WMA A-AX SSTs that have leaked
7439-97-6	Mercury	Yes (Interim Status Detection)	Yes	Yes

Table 5. Evaluation of Potential Monitoring Constituents

CAS Number	Potential Monitoring Constituent	Retained for Evaluation as Monitoring Constituent (Source)^a	Is Constituent Identified in Appendix 5? (Yes/No)^b	Identified as Proposed Monitoring Constituent?^c (Yes/No)
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
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
7440-43-9	Cadmium	Yes (Interim Status Detection)	Yes	Yes

Table 5. Evaluation of Potential Monitoring Constituents

CAS Number	Potential Monitoring Constituent	Retained for Evaluation as Monitoring Constituent (Source)^a	Is Constituent Identified in Appendix 5? (Yes/No)^b	Identified as Proposed Monitoring Constituent?^c (Yes/No)
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
75-01-4	Vinyl chloride	Yes (SST System Part A)	Yes	Yes
75-09-2	Methylene chloride	Yes (SST System Part A)	Yes	Yes
75-09-2	Methylene chloride	Yes (Interim Status Detection)	Yes	Yes
75-15-0	Carbon disulfide	Yes (SST System Part A)	Yes	Yes
75-15-0	Carbon disulfide	Yes (Interim Status Detection)	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
75-69-4	Trichloromonofluoromethane	Yes (Interim Status Detection)	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
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

Table 5. Evaluation of Potential Monitoring Constituents

CAS Number	Potential Monitoring Constituent	Retained for Evaluation as Monitoring Constituent (Source) ^a	Is Constituent Identified in Appendix 5? (Yes/No) ^b	Identified as Proposed Monitoring Constituent? ^c (Yes/No)
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
93-51-6	Cresylic acid	Evaluate (SST System Part A)	No	No - related compound included; not routinely analyzed by commercial laboratories ^e
94-75-7	2,4-D(2,4-Dichlorophenoxyacetic acid)	Yes (Interim Status Detection)	Yes	Yes
95-50-1	Ortho-dichlorobenzene	Yes (SST System Part A)	Yes	Yes
95-63-6	1,2,4-Trimethylbenzene	Yes (Interim Status Detection)	No	Yes - detected in groundwater above background value, dangerous waste
98-95-3	Nitrobenzene	Yes (SST System Part A)	Yes	Yes
994-05-8	Butane, 2-methoxy-2-methyl-	Yes (Interim Status Detection)	No	No - not routinely analyzed by commercial laboratories

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.

Table 5. Evaluation of Potential Monitoring Constituents

CAS Number	Potential Monitoring Constituent	Retained for Evaluation as Monitoring Constituent (Source) ^a	Is Constituent Identified in Appendix 5? (Yes/No) ^b	Identified as Proposed Monitoring Constituent? ^c (Yes/No)
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e. Results for polychlorinated dibenzofurans (CAS number 136677-10-6) and polychlorinated dibenzo-p-dioxins (CAS number 136677-09-3) were reported in groundwater samples collected in 1993. At the time of this evaluation (January 2018), no single result is reported under CAS numbers 136677-10-6 or 136677-09-3 by commercial laboratories. However, the individual chemicals comprising polychlorinated dibenzofurans and polychlorinated dibenzo-p-dioxins will be analyzed and reported by SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, Method 8290.

f. Table 2-2 in SGW-60586, *Engineering Evaluation Report For Single Shell Tank Waste Management Area A-AX Groundwater Monitoring*, provides the nonradiological waste discharge profiles for the WMA A-AX SSTs that have leaked.

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 A-AX. A total of 75 potential monitoring constituents are also included in Appendix 5 of Ecology Publication No. 97-407. Of these 75, 2 potential monitoring constituents (polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans) represent classes of compounds, and are identified for monitoring by the individual compounds within their class. The remaining 73 potential monitoring constituents were identified as proposed monitoring constituents.

The remaining potential monitoring constituents (N = 39) 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 = 30) 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 A-AX SSTs that have leaked (Table 2-2 in SGW-60586)

Of the remaining 30 potential monitoring constituents, 5 are dangerous wastes and were included as proposed monitoring constituents (Table 5). None of the remaining potential monitoring constituents were already identified for monitoring by related chemicals. Eight of the remaining constituents are not routinely analyzed by commercial laboratories were removed from consideration as potential monitoring constituents.

A comparison of the maximum concentration to the action level showed that 5 of the remaining 17 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 5 constituents that exceeded the action level during the interim status monitoring period were identified in the waste discharge profile for the WMA A-AX SSTs that have leaked (Table 2-2 in SGW-60586). The remaining 12 constituents were removed from consideration as potential monitoring constituents.

In summary, 90 constituents were identified as proposed monitoring constituents to detect and monitor any groundwater impacts from dangerous waste releases at WMA A-AX. Five of the 90 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 A-AX 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	270	299-E24-19	15-Mar-1994	50	40 CFR 143.3	Yes
14798-03-9	Ammonium ion	100	299-E24-19	27-Aug-1992	Not available	N/A	N/A
14798-03-9	Ammonium ion	100	299-E24-19	3-Mar-1993	Not available	N/A	N/A
14798-03-9	Ammonium ion	100	299-E24-20	27-Aug-1992	Not available	N/A	N/A
14798-03-9	Ammonium ion	100	299-E25-40	27-Aug-1992	Not available	N/A	N/A
14798-03-9	Ammonium ion	100	299-E25-41	27-Aug-1992	Not available	N/A	N/A
24959-67-9	Bromide	250	299-E25-2	4-Apr-2016	Not available	N/A	N/A
24959-67-9	Bromide	250	299-E25-2	18-Oct-2016	Not available	N/A	N/A
24959-67-9	Bromide	250	299-E25-2	1-Nov-2016	Not available	N/A	N/A
7440-70-2	Calcium	93000	299-E25-41	7-Mar-2016	Not available	N/A	N/A
16887-00-6	Chloride	37000	299-E25-93	15-Sep-2016	250000	40 CFR 143.3	No
7439-89-6	Iron	6800	299-E24-19	5-Nov-1992	300	40 CFR 143.3	Yes
7439-95-4	Magnesium	26200	299-E25-93	7-Mar-2016	Not available	N/A	N/A
7439-96-5	Manganese	260	299-E24-19	5-Nov-1992	50	40 CFR 143.3	Yes
7439-96-5	Manganese	260	299-E24-19	5-Nov-1992	50	40 CFR 143.3	Yes
7439-98-7	Molybdenum	6	299-E24-33	6-Dec-2016	80	WAC 173-340-720(4)(b)(iii)(A) and (B)	No
14797-55-8	Nitrate	370000	299-E25-13	22-Mar-1990	45000	40 CFR 141.62	Yes
14797-65-0	Nitrite	953	299-E25-41	27-Mar-2006	1000	40 CFR 141.62	No
14797-73-0	Perchlorate anion	400	299-E25-46	29-Sep-1993	Not available	N/A	N/A

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)
7440-09-7	Potassium	10700	299-E24-33	8-Sep-2008	Not available	N/A	N/A
7440-23-5	Sodium	39600	299-E25-94	30-Mar-2009	Not available	N/A	N/A
7440-24-6	Strontium	496	299-E25-41	18-Dec-2015	9600	WAC 173-340-720(4)(b)(iii)(A) and (B)	No
14808-79-8	Sulfate	306000	299-E25-13	22-Mar-1990	250000	40 CFR 143.3	Yes
7440-29-1	Thorium	0.524	299-E25-93	7-Mar-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 A-AX under interim status monitoring plans, 90 waste constituents are identified as proposed monitoring constituents to detect and monitor any groundwater impacts from dangerous waste releases at WMA A-AX (Table 7). Five of the 90 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 A-AX SSTs that have leaked.

Table 7. Proposed Groundwater Monitoring Constituents for WMA A-AX

Waste Constituent	CAS Number
Dangerous Waste Constituents	
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
1,2,3,4,6,7,8-Heptachlorodibenzodioxin	35822-46-9
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	39227-28-6
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	57653-85-7
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19408-74-3
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6
1,2,4-Trimethylbenzene	95-63-6
1,2-Dichloroethane	107-06-2
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5
2,3,4,6-Tetrachlorophenol	58-90-2
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9
2,4-D(2,4-Dichlorophenoxyacetic acid)	94-75-7
2,4-Dimethylphenol	105-67-9

Table 7. Proposed Groundwater Monitoring Constituents for WMA A-AX

Waste Constituent	CAS Number
2,4-Dinitrophenol	51-28-5
2,4-Dinitrotoluene	121-14-2
2-Nitropropane	79-46-9
2-Propanol	67-63-0
4,4'-DDT (Dichlorodiphenyltrichloroethane)	50-29-3
4,6-Dinitro-2-methylphenol	534-52-1
Acetone	67-64-1
Antimony	7440-36-0
Arsenic	7440-38-2
Benzene	71-43-2
Benzo(ghi)perylene	191-24-2
Benzoic acid	65-85-0
Cadmium	7440-43-9
Carbon disulfide	75-15-0
Carbon tetrachloride	56-23-5
Chlorobenzene	108-90-7
Chloroform	67-66-3
Chromium	7440-47-3
Cobalt	7440-48-4
Copper	7440-50-8
Cresols	1319-77-3
Cyclohexane	110-82-7
Cyclohexanone	108-94-1
Dibenz[a,h]anthracene	53-70-3
Ethyl acetate	141-78-6
Ethyl benzene	100-41-4
Ethyl ether	60-29-7
Heptachlorodibenzofurans	38998-75-3
Heptachlorodibenzo-p-dioxins	37871-00-4

Table 7. Proposed Groundwater Monitoring Constituents for WMA A-AX

Waste Constituent	CAS Number
Hexachlorodibenzofurans	55684-94-1
Hexachlorodibenzo-p-dioxin	34465-46-8
Hexavalent Chromium	18540-29-9
Indeno(1,2,3-cd)pyrene	193-39-5
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
Methylene chloride	75-09-2
n-Butyl alcohol (1-Butanol)	71-36-3
Nickel	7440-02-0
Nitrobenzene	98-95-3
Octachlorodibenzofuran	39001-02-0
Octachlorodibenzo-p-dioxin	3268-87-9
o-Dichlorobenzene (1,2-Dichlorobenzene)	95-50-1
Pentachlorodibenzofurans	30402-15-4
Pentachlorodibenzo-p-dioxins	36088-22-9
Pyridine	110-86-1
Selenium	7782-49-2
Silver	7440-22-4
Sulfide	18496-25-8
Tetrachlorodibenzofurans	55722-27-5
Tetrachlorodibenzo-p-dioxins	41903-57-5
Tetrachloroethene	127-18-4
Tin	7440-31-5
Toluene	108-88-3

Table 7. Proposed Groundwater Monitoring Constituents for WMA A-AX

Waste Constituent	CAS Number
Trichloroethylene	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
Nondangerous Waste Constituents	
Aluminum	7429-90-5
Iron	7439-89-6
Manganese	7439-96-5
Nitrate	14797-55-8
Sulfate	14808-79-8

CAS = Chemical Abstracts Service

8 References

- 40 CFR 141.62, "National Primary Drinking Water Regulations," "Maximum Contaminant Levels for Inorganic Contaminants," *Code of Federal Regulations*. Available at: https://www.ecfr.gov/cgi-bin/text-idx?SID=f9e1d56f98beea0a22531c076ec27ab6&mc=true&tpl=/ecfrbrowse/Title40/40cfr141_main_02.tpl.
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Appendix A

Supplemental Identification of Site-Specific Monitoring Constituents for Waste Management Area A-AX

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ENVIRONMENTAL CALCULATION COVER PAGE	
SECTION 1 - Completed by the Responsible Manager	
Project: RCRA Interim to Final Closure Plans	RELEASE / ISSUE
Date: 03/14/2019	
Calculation Title and Description: Identification of Site-Specific Monitoring Constituents for Waste Management Area A-AX Appendix A is a supplemental evaluation of the WMA A-AX data included in the environmental calculation file.	
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Professional Licenses:	
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ENVIRONMENTAL CALCULATION COVER PAGE (Continued)
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Degree, Major, Institution, Year: BS, Chemistry, Whitman College, 1986
Professional Licenses:
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ENVIRONMENTAL CALCULATION COVER PAGE (Continued)			
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SECTION 2 - Completed by Preparer			
Calculation Number: ECF-200PO1-17-0223			Revision Number: 0
Revision History			
Revision No.	Description	Date	Affected Pages
0	Initial Issue		
SECTION 3 - Completed by the Responsible Manager			
Document Control:			
Is the document intended to be controlled within the Document Management Control System (DMCS)? <input checked="" type="radio"/> Yes <input type="radio"/> No			
Does document contain scientific and technical information intended for public use? <input checked="" type="radio"/> Yes <input type="radio"/> No			
Does document contain controlled-use information? <input type="radio"/> Yes <input checked="" type="radio"/> No			
SECTION 4 - Document Review and Approval			
Preparer(s):			
Donna Morgans	Sr Risk Specialist		4/2/19
<small>Print First and Last Name</small>	<small>Position</small>	<small>Signature</small>	<small>Date</small>

ENVIRONMENTAL CALCULATION COVER PAGE (Continued)			
Checker(s):			
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Responsible Manager(s):			
Alaa Aly <i>WE NICHOLS, ACTING</i> <small>Print First and Last Name</small>	Risk/Model Int Mgr <small>Position</small>	 <small>Signature</small>	3 APR 2019 <small>Date</small>
SECTION 5 - Applicable if Calculation is a Risk Assessment or Uses an Environmental Model			
Prior to Initiating Modeling:			
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>	
Calculation Approved:			
Risk/Modeling Integration Manager:			
<i>Alaa Aly</i> <small>Print First and Last Name</small>	 <small>Signature</small>	3 APR 2019 <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 Area (WMA) A-AX.

A2 Background

The methodology used to identify the proposed monitoring constituents included 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-60586, *Engineering Evaluation Report For Single Shell Tank Waste Management Area A-AX Groundwater Monitoring*, includes a summary of the interim status groundwater monitoring history at WMA A-AX 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 A-AX well network were compiled. These concentrations were compared to the Hanford Site 90th 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 A-AX SSTs that have leaked (Table 2-2 in SGW-60586) (evaluated on a case-by-case basis).

Table A-1. Wells, Sample Date Range, and Class of Constituents Evaluated in ECF-200PO1-17-0223

Well Name	Sample Date Range	Class of Constituents Evaluated
299-E24-13	2/7/1989 – 6/9/ 1989	Nitrate
299-E24-19	2/26/1990 – 6/5/2003	VOCs, Phenols, inorganic nonmetals, herbicides, pesticides, metals
299-E24-20	11/15/1991 – 12/6/2016	VOCs, SVOCs, inorganic nonmetals, dioxins/furans, herbicides, pesticides, PCB aroclors, metals
299-E24-22	1/29/2004– 12/6/2016	VOCs, SVOCs, inorganic nonmetals, dioxins/furans, herbicides, pesticides, PCB aroclors, metals
299-E24-33	2/28/2005 – 12/6/2016	VOCs, SVOCs, inorganic nonmetals, dioxins/furans, herbicides, pesticides, metals
299-E25-2	3/22/1989– 12/6/2016	VOCs, SVOCs, inorganic nonmetals, dioxins/furans, herbicides, pesticides, PCB aroclors, metals
299-E25-13	2/10/1989 – 3/22/1990	VOCs, inorganic nonmetals
299-E25-40	2/27/1990 – 12/7/2016	VOCs, SVOCs, inorganic nonmetals, dioxins/furans, herbicides, pesticides, PCB aroclors, metals
299-E25-41	2/27/1990 – 12/7/2016	VOCs, SVOCs, inorganic nonmetals, dioxins/furans, herbicides, pesticides, PCB aroclors, metals
299-E25-46	11/5/1992 – 6/3/2003	VOCs, SVOCs, inorganic nonmetals, dioxins, herbicides, pesticides, PCB aroclors, metals
299-E25-93	12/11/2003 – 12/7/2016	VOCs, SVOCs, inorganic nonmetals, dioxins/furans, herbicides, pesticides, PCB aroclors, metals
299-E25-94	12/9/2004 – 12/7/2016	VOCs, SVOCs, inorganic nonmetals, dioxins/furans, herbicides, pesticides, PCB aroclors, metals
299-E25-236	12/28/2008 – 3/4/2013	VOCs, SVOCs, inorganic nonmetals, dioxins/furans, herbicides, pesticides, PCB aroclors, metals
299-E25-237	9/3/2015 – 12/4/2016	VOCs, SVOCs, inorganic nonmetals, dioxins/furans, herbicides, pesticides, PCB aroclors, 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 this 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-60586). 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 A-AX.

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 A-AX monitoring network. Contaminants that were not detected or were not analyzed between 1989 and 2016 are identified.

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

CAS. No	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
100-41-4	Ethyl benzene	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Not detected in groundwater between 1989 and 2016.
105-67-9	2,4-Dimethylphenol	Yes (Interim Status Detection)	Yes	Yes	Yes. Included in Appendix 5. Detections of 2,4-diphenol were measured in 1992 at wells 299-E24-19 (1 detect of 19 samples) and 299-E25-41 (1 detect of 23 samples). Not associated with a plume or a trend.
107-06-2	1,2-Dichloroethane	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Not detected in groundwater between 1989 and 2016.
108-10-1	Methyl isobutyl ketone	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Not detected in groundwater between 1989 and 2016.
108-88-3	Toluene	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Not detected in groundwater between 1989 and 2016.
108-90-7	Chlorobenzene	Yes (SST System Part A)	Yes	Yes	Yes. Part A. Not detected in groundwater between 1989 and 2016.
108-94-1	Cyclohexanone	Yes (SST System Part A)	No	Yes. Dangerous waste in SST System Part A	Yes. Part A. Not analyzed in groundwater between 1989 and 2016.
110-80-5	2-Ethoxyethanol	Yes (SST System Part A)	No	No. Not routinely analyzed by commercial laboratories	Yes. Part A and identified in Appendix 5. Not analyzed in groundwater between 1989 and 2016.
110-82-7	Cyclohexane	Yes (Interim Status Detection)	No	Yes. Detected in groundwater above background value, dangerous waste	No. Not in Part A or in Appendix 5. Cyclohexane may be a U listed waste. Analyzed and detected once in three wells during 2016. Constituent not routinely included in EPA Method 8270.
110-86-1	Pyridine	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Not detected in groundwater between 1989 and 2016.
1120-21-4	Undecane	Yes (Interim Status Detection)	No	No. Not routinely analyzed by commercial laboratories	No. Interim status detection; constituent is a tentatively identified compound and does not have a toxicity value.
112-40-3	Dodecane	Yes (Interim Status Detection)	No	No. Not routinely analyzed by commercial laboratories	No. Interim status detection; constituent is a tentatively identified compound and does not have a toxicity value.
121-14-2	2,4-Dinitrotoluene	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Not detected in groundwater between 1989 and 2016.
123-42-2	Diacetone alcohol	Yes (Interim Status Detection)	No	No. Not routinely analyzed by commercial laboratories	No. not identified in Appendix 5. Analyzed and detected once in three wells and detected twice in one well (299-E25-2) during 2016. Constituent not routinely included in EPA Method 8270.
127-18-4	Tetrachloroethene	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Not detected in groundwater between 1989 and 2016.
1319-77-3	Cresols	Yes (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 1989 and 2016.
1330-20-7	Xylenes (total)	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Detected in well 299-E24-20 (1 detect of 4 samples) collected in 2016.
136677-09-3	Polychlorinated dibenzo-p-dioxins	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzo-p-dioxins)	No. Identified for monitoring by related compounds	No. Interim status detections. Toxicity data available for congeners only; data can be used to evaluate homologues.
136677-10-6	Polychlorinated dibenzofurans	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	No. Identified for monitoring by related compounds	No. Interim status detections. Toxicity data available for congeners only; data can be used to evaluate homologues.
141-78-6	Ethyl acetate	Yes (SST System Part A)	No	Yes. Dangerous waste in SST System Part A	Yes. Part A. One sample analyzed and detected in 2016.
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 2-2f as present in WMA A-AX SSTs that have leaked	Yes. Present in waste discharge profile for WMA A-AX SSTs. Nitrate is included in the waste discharge profile for WMA A-AX SSTs. Detected in groundwater above the MCL. Nitrate is identified as a COC at 200-PO-1 OU.
14797-65-0	Nitrite	Yes (Interim Status Detection)	No	No. Detected in groundwater above background value; not a dangerous waste; maximum result less than action level	No. Interim status detection and is not identified in Appendix 5. Nitrite concentrations are less than the MCL.
14797-73-0	Perchlorate anion	Yes (Interim Status Detection)	No	No. Detected in groundwater above background value; not a dangerous waste, no action level for screening	No. Single detection at well 299-E25-46 (1 detect of 4 samples) and a toxicity value is not available.
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	No. Interim status detections and a toxicity value is not available.

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

CAS. No	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
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 2-2f as present in WMA A-AX SSTs that have leaked	Yes. Present in waste discharge profile for WMA A-AX SSTs. Detections are less than secondary MCL of 250,000 µg/L and is not identified in Appendix 5.
16887-00-6	Chloride	Yes (Interim Status Detection)	No	No. Detected in groundwater above background value; not a dangerous waste; maximum result less than action level	No. Interim status detections. Chloride concentrations are less than the secondary MCL.
18496-25-8	Sulfide	Yes (Interim Status Detection)	Yes	Yes	Yes. Included in Appendix 5. A toxicity value is not available.
18540-29-9	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. Analyzed for only once between 1989 and 2016 and it was detected at a concentration above 48 µg/L.
191-24-2	Benzo(ghi)perylene	Yes (Interim Status Detection)	Yes	Yes	No. Toxicity value not available.
193-39-5	Indeno(1,2,3-cd)pyrene	Yes (Interim Status Detection)	Yes	Yes	Yes. Identified in Appendix 5. Single detection measured in 2016 at well 299-E25-2 (1 detect of 6 samples). Not associated with a plume or a trend.
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzo-p-dioxins)	Yes	Yes. Included in Appendix 5 list. Detections of 1,2,3,7,8,9-hexachlorodibenzo-p-dioxin are flagged with a "B" laboratory qualifier indicating its presence is from laboratory contamination. 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin is not associated with plume or trend. Well 299-E25-236 (2 detects of 2 samples) BJ and QBJ flags
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	No. Not in Part A or Appendix 5. Interim status detections and a toxicity value is not available.
4/4/2870	2-Ethyl-1,3-Dimethylbenzene	Yes (Interim Status Detection)	No	No. Not routinely analyzed by commercial laboratories	No. Not in Part A or Appendix 5. Single detection at well 299-E24-20 and is a tentatively identified compound.
30402-15-4	Pentachlorodibenzofurans	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	Yes	No. Interim status detections. Toxicity data available for congeners only; data can be used to evaluate homologues.
3268-87-9	Octachlorodibenzo-p-dioxin	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzo-p-dioxins)	Yes	Yes. Included in Appendix 5 list. Detections of octachlorodibenzo-p-dioxin are flagged with a "B" laboratory qualifier indicating its presence is from laboratory contamination and flagged with a "J" or "Q" indicating concentrations are estimated. Detections of octachlorodibenzo-p-dioxin are not associated with a plume or trend. Well 299-E24-20 (3 detect of 3 samples) 2 detects QBJ / 1 detect QJ Well 299-E24-22 (3 detects of 3 samples) 2 detects QBJ flag/ 1 detect QJ Well 299-E24-33 (2 detects of 3 samples) both QBJ flag Well 299-E25-2 (3 detects of 3 samples) 1 detect BJ/ 1 detect QBJ/1 detect J 299-E25-236 (2 detects of 2 samples) both BJ flags 299-E25-40 (4 detects of 4 samples) 3 QBJ flags/ 1 B flag 299-E25-93 (3 detects of 3 samples) 1 J flag/ 2 QBJ flags 299-E25-41 (4 detects of 4 samples) 1 QJ flag/ 2 BJ flags/1 QBJ flag 299-E25-94 (3 detects of 4 samples) 1 QBJ flag/ 2 BJ flags 299-E25-237 (2 detects of 3 samples) QBJ flags
34465-46-8	Hexachlorodibenzo-p-dioxin	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzo-p-dioxins)	Yes	No. Interim status detections. Toxicity data available for congeners only; data can be used to evaluate homologues.

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

CAS. No	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
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzodioxin	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzo-p-dioxins)	Yes	Yes. Included in Appendix 5 list. Detections of 1,2,3,4,6,7,8-heptachlorodibenzodioxin are flagged with a "B" laboratory qualifier indicating its presence is from laboratory contamination and flagged with a "J" or "Q" indicating concentrations are estimated. Detections of 1,2,3,4,6,7,8-heptachlorodibenzodioxin are not associated with a plume or trend. Well 299-E24-20 (1 detect of 3 samples) QJ flag Well 299-E25-2 (1 detect of 3 samples) QJ flag Well 299-E25-236 (2 detects of 2 samples) 1 B flag/ 1 BJ flag Well 299-E25-40 (1 detect of 4 samples) QBJ flag Well 299-E25-94 (2 detects of 4 samples) 1 Q*J flag/ 1 QBJ flag
36088-22-9	Pentachlorodibenzo-p-dioxins	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzo-p-dioxins)	Yes	No. Interim status detections. Toxicity data available for congeners only; data can be used to evaluate homologues.
37871-00-4	Heptachlorodibenzo-p-dioxins	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzo-p-dioxins)	Yes	No. Interim status detections. Toxicity data available for congeners only; data can be used to evaluate homologues.
38998-75-3	Heptachlorodibenzofurans	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	Yes	No. Toxicity data available for congeners only; data can be used to evaluate homologues.
39001-02-0	Octachlorodibenzofuran	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	Yes	Yes. Included in Appendix 5 list. Detections of octachlorodibenzofuran are flagged with a "B" laboratory qualifier indicating its presence is from laboratory contamination and flagged with a "J" or "Q" indicating concentrations are estimated. Detections of octachlorodibenzofuran are not associated with a plume or trend. Well 299-E24-20 (2 detect of 3 samples) both QBJ flag Well 299-E24-22 (2 detects of samples) 1 QBJ flag/ 1 BJ flag Well 299-E24-33 (1 detect of 3 samples) QBJ flag Well 299-E25-236 (2 detects of 2 samples) 1 BJ flag/ 1 QBJ flag Well 299-E25-2 (3 detects of 3 samples) 1 BJ flag/ 1 QBJ flag/ 1 QJ flag Well 299-E25-40 (4 detects of 4 samples) 2 QBJ flags/ 2 BJ flags Well 299-E25-41 (3 detects of 4 samples) all QBJ flags Well 299-E25-93 (1 detect of 3 samples) QBJ flag Well 299-E25-94 (3 detects of 4 samples) 2 BJ flags/ 1 QBJ flag Well 299-E25-237 (2 detects of 3 samples) both QBJ flags
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzo-p-dioxins)	Yes	Yes. Included in Appendix 5 list. Detections of 1,2,3,4,7,8-hexachlorodibenzo-p-dioxin are flagged with a "J" or "Q" indicating concentrations are estimated. Detections of 1,2,3,4,7,8-hexachlorodibenzo-p-dioxin are not associated with a plume or trend. Well 299-E25-236 (2 detects of 2 samples) 1 J flag/ 1 QJ flag
41903-57-5	Tetrachlorodibenzo-p-dioxins	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzo-p-dioxins)	Yes	No. Interim status detections. Toxicity data available for congeners only; data can be used to evaluate homologues.
50-29-3	4,4'-DDT (Dichlorodiphenyltrichloroethane)	Yes (Interim Status Detection)	Yes	Yes	Yes. Included in Appendix 5 list. All 4,4'-DDT detections are flagged with a "B" laboratory qualifier indicating its presence is from laboratory contamination. Detections of 4,4'-DDT are not associated with plume or trend. Well 299-E25-40 (1 detect of 14 samples) B flag Well 299-E25-41 (1 detect of 12 samples) B flag

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

CAS. No	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
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	Yes	Yes. Included in Appendix 5 list. Detections of 2,3,7,8-tetrachlorodibenzofuran are flagged with a "J" or "Q" indicating concentrations are estimated.. Detections of 2,3,7,8-Tetrachlorodibenzofuran are not associated with plume or trend. Well 299-E25-94 (2 detects of 4 samples) both QJ flags
51-28-5	2,4-Dinitrophenol	Yes (Interim Status Detection)	Yes	Yes	Yes. Included in Appendix 5 list. Single detection of 24 samples (J flag) measured in 1998 at well 299-E24-20 in 1998. Not associated with a plume or a trend.
534-52-1	4,6-Dinitro-2-methylphenol	Yes (Interim Status Detection)	Yes	Yes	Yes. Included in Appendix 5 list. Two detections of 24 samples (both J flags) measured in 1998 at well 299-E24-20 in 1998-both J flags. One detection measured in 1995 as well 299-E-24-19 (one detect of 19 samples)-L flag. Not associated with a plume or a trend.
53-70-3	Dibenz[a,h]anthracene	Yes (Interim Status Detection)	Yes	Yes	Yes. Included in Appendix 5 list. Single detection measured in 2016 at three wells. Not associated with a plume or a trend. Well 299-E24-22 (1 detect of 3 samples) J flag Well 299-E25-2 (1 detect of 6 samples) J flag Well 299-E25-94 (1 detect of 5 samples) J flag.
541-05-9	Hexamethylcyclotrisiloxane	Yes (Interim Status Detection)	No	No. Not routinely analyzed by commercial laboratories	No. Single detection at well 299-E25-2 (NJ flag) and is a tentatively identified compound.
556-67-2	Cyclotetrasiloxane, Octamethyl	Yes (Interim Status Detection)	No	No. Not routinely analyzed by commercial laboratories	No. Three detections at well 299-E25-2 (all NJ flags) and is a tentatively identified compound.
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	Yes	Yes. Included in Appendix 5 list. Detections of 1,2,3,4,7,8,9-heptachlorodibenzofuran are flagged with a "B" laboratory qualifier indicating its presence is from laboratory contamination and flagged with a "J" or "Q" indicating concentrations are estimated. Detections of 1,2,3,4,7,8,9-heptachlorodibenzofuran are not associated with a plume or trend. Well 299-E25-2 (1 detect of 3 samples) QJ flag Well 299-E25-236 (2 detects of 2 samples) both BJ flags Well 299-E25-94 (1 detect of 4 samples) J flag
55684-94-1	Hexachlorodibenzofurans	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	Yes	No. Interim status detections. Toxicity data available for congeners only; data can be used to evaluate homologues.
55722-27-5	Tetrachlorodibenzofurans	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	Yes	No. Interim status detections. Toxicity data available for congeners only; data can be used to evaluate homologues.
56-23-5	Carbon tetrachloride	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Not detected in groundwater between 1989 and 2016.
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	Yes	Yes. Included in Appendix 5 list. Detections of 2,3,4,7,8-pentachlorodibenzofuran are flagged with a "B" laboratory qualifier indicating its presence is from laboratory contamination and flagged with a "J" or "Q" indicating concentrations are estimated. Detections of 2,3,4,7,8-pentachlorodibenzofuran are not associated with a plume or trend. Well 299-E25-2 (1 detect of 3 samples) QJ flag Well 299-E25-236 (1 detect of 2 samples) QBJ flag Well 299-E25-94 (1 detect of 4 samples) QJ flag

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

CAS. No	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
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	Yes	Yes. Included in Appendix 5 list. Detections of 1,2,3,7,8-pentachlorodibenzofuran are flagged with a "B" laboratory qualifier indicating its presence is from laboratory contamination and flagged with a "J" or "Q" indicating concentrations are estimated. Detections of 1,2,3,7,8-pentachlorodibenzofuran are not associated with a plume or trend. Well 299-E25-236 (2 detects of 2 samples) both QBJ
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	Yes	Yes. Included in Appendix 5 list. Detections of 1,2,3,7,8-pentachlorodibenzofuran are flagged with a "B" laboratory qualifier indicating its presence is from laboratory contamination and flagged with a "J" or "Q" indicating concentrations are estimated. Detections of 1,2,3,7,8-pentachlorodibenzofuran are not associated with a plume or trend. Well 299-E25-236 (2 detects of 2 samples) 1 BJ flag/ 1 QBJ flags
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzo-p-dioxins)	Yes	Yes. Included in Appendix 5 list. Detections of 1,2,3,6,7,8-hexachlorodibenzo-p-dioxin are flagged with a "B" laboratory qualifier indicating its presence is from laboratory contamination and flagged with a "J" or "Q" indicating concentrations are estimated. Detections of 1,2,3,6,7,8-hexachlorodibenzo-p-dioxin are not associated with a plume or trend. Well 299-E25-236 (2 detects of 2 samples) 1 QBJ flag/ 1 BJ flag
58-90-2	2,3,4,6-Tetrachlorophenol	Yes (Interim Status Detection)	Yes	Yes	Yes. Included in Appendix 5 list. Single detection of 2,3,4,6-tetrachlorophenol is flagged with a "B" laboratory qualifier indicating its presence is from laboratory contamination. 2,3,4,6-Tetrachlorophenol is not associated with plume or trend. Well 299-E25-41 (1 detect of 13 samples) B flag
60-29-7	Ethyl ether	Yes (SST System Part A)	No	Yes. Dangerous waste in SST System Part A	Yes. Part A. Not analyzed in groundwater between 1989 and 2016.
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	Yes	Yes. Included in Appendix 5 list. Detections of 2,3,4,6,7,8-hexachlorodibenzofuran are flagged with a "B" laboratory qualifier indicating its presence is from laboratory contamination and flagged with a "J" or "Q" indicating concentrations are estimated. Detections of 2,3,4,6,7,8-hexachlorodibenzofuran are not associated with a plume or trend. Well 299-E25-2 (1 detect of 3 samples) QJ flag Well 299-E25-236 (2 detects of 2 samples) QBJ flags
611-14-3	2-Ethyltoluene	Yes (Interim Status Detection)	No	No. Not routinely analyzed by commercial laboratories	No. Single detection at well 299-E24-20 (NJ flag) and is a tentatively identified compound.
65-85-0	Benzoic acid	Yes (Interim Status Detection)	No	Yes. Detected in groundwater above background value, dangerous waste	No. Would be a dangerous waste if in pure form but not likely in groundwater. Single detection of benzoic acid measured at well 299-E25-2 (1 detect of 1 sample) and flagged with a "JB" laboratory qualifier indicating its presence is from laboratory contamination. Not analyzed for or detected in any other sample.
67-56-1	Methanol	Yes (SST System Part A)	No	Yes. Dangerous waste in SST System Part A	Yes. Part A. Not analyzed in groundwater between 1989 and 2016.
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	Yes	Yes. Included in Appendix 5 list. Detections of 1,2,3,4,6,7,8-heptachlorodibenzofuran are flagged with a "B" laboratory qualifier indicating its presence is from laboratory contamination and flagged with a "J" or "Q" indicating concentrations are estimated. Detections of 1,2,3,4,6,7,8-heptachlorodibenzofuran are not associated with a plume or trend. Well 299-E25-2 (1 detect of 3 samples) J flag Well 299-E25-236 (2 detects of 2 samples) both QBJ flags Well 299-E25-41 (1 detect of 4 samples) J flag Well 299-E25-93 (2 detects of 3 samples) 1 QJ flag/ 1 QBJ flag Well 299-E25-94 (3 detects of 4 samples) 1 J flag/ 2 QJ flags Well 299-E25-237 (1 detect of 3 samples) QBJ flag

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

CAS. No	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
67-63-0	2-Propanol	Yes (Interim Status Detection)	No	Yes. Detected in groundwater above background value, dangerous waste	No. Not identified in Appendix 5, is classified as a dangerous waste. Detections of 2-propanol measured during 2016. Detections are not associated with a plume or trend. Well 299-E24-33 (2 detects of 2 samples) 1 J flag Well 299-E25-237 (2 detects of 2 samples) 1 J flag/ 1 T flag Well 299-E25-94 (1 detects of 1 sample)
67-64-1	Acetone	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Sporadic detections not associated with a plume or a trend. Well 299-E24-19 (1 detect of 1 sample) Well 299-E24-22 (1 detect of 3 samples) JT flag Well 299-E25-93 (1 detect of 4 samples) JT flag Well 299-E25-94 (1 detect of 5 samples) JT flag
67-66-3	Chloroform	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Sporadic detections not associated with a plume or a trend. Well 299-E24-20 (4 detects of 4 samples) J flags Well 299-E24-22 (2 detects of 3 samples) J flags Well 299-E24-237 (4 detects of 4 samples) J flags
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	Yes	Yes. Included in Appendix 5 list. Detections of 1,2,3,4,7,8-hexachlorodibenzofuran are flagged with a "B" laboratory qualifier indicating its presence is from laboratory contamination and flagged with a "J" or "Q" indicating concentrations are estimated. Detections of 1,2,3,4,7,8-hexachlorodibenzofuran are not associated with a plume or trend. Well 299-E25-2 (1 detect of 3 samples) QJ flag Well 299-E25-236 (2 detects of 2 samples) both QBJ flags Well 299-E25-94 (1 detect of 4 samples) QJ flag
71-36-3	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 1989 and 2016.
71-43-2	Benzene	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Not detected in groundwater between 1989 and 2016.
71-55-6	1,1,1-Trichloroethane	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Not detected in groundwater between 1989 and 2016.
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran	Yes (Interim Status Detection)	Yes (as polychlorinated dibenzofurans)	Yes	Yes. Included in Appendix 5 list. Detections of 1,2,3,7,8,9-hexachlorodibenzofuran are flagged with a "B" laboratory qualifier indicating its presence is from laboratory contamination and flagged with a "J" or "Q" indicating concentrations are estimated. Detections of 1,2,3,7,8,9-hexachlorodibenzofuran are not associated with a plume or trend. Well 299-E25-236 (1 detect of 2 samples) QBJ flag
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 2-2f of the 200-PO-1 RI report (DOE/RL-2009-85) as present in WMA A-AX 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-PO1 RI report (DOE/RL-2009-85).
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 2-2f of the 200-PO-1 RI report (DOE/RL-2009-85) as present in WMA A-AX 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-PO1 RI report (DOE/RL-2009-85).
7439-92-1	Lead	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Lead concentrations > background but less than the MCL of 15 µg/L. Note that lead was not identified as a COC in the 200-PO1 RI report (DOE/RL-2009-85).
7439-95-4	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.

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CAS. No	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
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 2-2f of the 200-PO-1 RI report (DOE/RL-2009-85) as present in WMA A-AX SSTs that have leaked	No. 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-PO1 RI report (DOE/RL-2009-85).
7439-97-6	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 a COC in the 200-PO1 RI report (DOE/RL-2009-85).
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	No. 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-PO1 RI report (DOE/RL-2009-85).
7440-02-0	Nickel	Yes (Interim Status Detection)	Yes	Yes	Yes. Included in Appendix 5. Sporadic detections of nickel in 6 wells not associated with a plume or a trend. Nickel concentrations above the MCL at well 299-E24-19 likely associated with well casing. Nickel is not identified as a COC in the 200-PO1 RI report (DOE/RL-2009-85).
9/7/7440	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.
7440-22-4	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-PO1 RI report (DOE/RL-2009-85).
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	No. Sodium is an interim status detection and a toxicity value is not available.
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	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-PO1 RI report (DOE/RL-2009-85).
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	No. Thorium is an interim status detection and a toxicity value is not available.
7440-31-5	Tin	Yes (Interim Status Detection)	Yes	Yes	Yes. Included 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-PO1 RI report (DOE/RL-2009-85).
7440-36-0	Antimony	Yes (Interim Status Detection)	Yes	Yes	Yes. Included in Appendix 5. Antimony is not identified as a COC in the 200-PO1 RI report (DOE/RL-2009-85). Antimony analyzed by Method 6010 have been shown to be false-positives. Antimony analyzed by Method 200.8 and Method 6020 are < background and the MCL of 6 µg/L (includes 258 samples).
7440-38-2	Arsenic	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Sporadic arsenic detections in 4 wells above the MCL; not associated with a plume or a trend. Note that arsenic is not identified as a COC in the 200-PO1 RI report (DOE/RL-2009-85).
7440-43-9	Cadmium	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Note that cadmium is not identified as a COC in the 200-PO1 RI report (DOE/RL-2009-85). Cadmium analyzed by Method 6010 cannot detect concentrations less than the MCL of 5 µg/L. Cadmium analyzed by Method 6020 are > background and the MCL of 5 µg/L.
7440-47-3	Chromium	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Chromium concentrations > background and detections greater than the MCL of 100 µg/L. Note that chromium is not identified as a COC in the 200-PO1 RI report (DOE/RL-2009-85).
7440-48-4	Cobalt	Yes (Interim Status Detection)	Yes	Yes	Yes. Included 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-PO1 RI report (DOE/RL-2009-85).
7440-50-8	Copper	Yes (Interim Status Detection)	Yes	Yes	Yes. Included 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-PO1 RI report (DOE/RL-2009-85).

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7440-62-2	Vanadium	Yes (Interim Status Detection)	Yes	Yes	Yes. Included 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-PO1 RI report (DOE/RL-2009-85).
7440-66-6	Zinc	Yes (Interim Status Detection)	Yes	Yes	Yes. Included 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-PO1 RI report (DOE/RL-2009-85).
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	No. Calcium is an interim status detection and a toxicity value is not available.
75-01-4	Vinyl chloride	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Vinyl chloride not detected in groundwater between 1989 and 2016.
75-09-2	Methylene chloride	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Common laboratory contaminant. Sporadic detections in 4 wells that are not associated with a plume or a trend. Well 299-E24-20 (1 detect of 5 samples) J flag Well 299-E24-33 (1 detect of 4 samples) J flag Well 299-E25-2 (2 detects of 6 samples) both B flags Well 299-E25-41 (1 detect of 6 samples) J flag
75-15-0	Carbon disulfide	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. One low-level detection measured in groundwater between 1989 and 2016. Carbon disulfide is not associated with a plume or a trend. Well 299-E25-93 (1 detect of 4 samples) J flag
75-35-4	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 1989 and 2016.
75-69-4	Trichloromonofluoromethane	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. One low-level detection measured in groundwater between 1989 and 2016. Trichloromonofluoromethane is not associated with a plume or a trend. Well 299-E25-237 (1 detect of 4 samples) J flag
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	Yes (SST System Part A)	No	Yes. Dangerous waste in SST System Part A	Yes. Part A. Not analyzed in groundwater between 1989 and 2016.
7782-49-2	Selenium	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Selenium concentrations > background but less than the MCL of 50 µg/L. Note that selenium is not identified as a COC in the 200-PO1 RI report (DOE/RL-2009-85).
78-83-1	Isobutanol	Evaluate (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Not detected in groundwater between 1989 and 2016.
78-93-3	Methyl ethyl ketone	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Not detected in groundwater between 1989 and 2016.
79-00-5	1,1,2-Trichloroethane	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Not detected in groundwater between 1989 and 2016.
79-01-6	Trichloroethylene	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Not detected in groundwater between 1989 and 2016.
79-46-9	2-Nitropropane	Evaluate (SST System Part A)	No	Yes. Dangerous waste in SST System Part A	Yes. Part A. Not analyzed in groundwater between 1989 and 2016.
93-51-6	Cresylic acid	Evaluate (SST System Part A)	No	No. related compound included; not routinely analyzed by commercial laboratories	Yes. Part A. Cresylic acid was not analyzed in groundwater between 1989 and 2016. Not included in the Method 8270 list of analytes.

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

CAS. No	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
94-75-7	2,4-D(2,4-Dichlorophenoxyacetic acid)	Yes (Interim Status Detection)	Yes	Yes	Yes. Included in Appendix 5. Detections of 2,4-D were measured in 1993 at well 299-E24-19 (2 detects of 11 samples) (parent and field duplicate), well 299-E24-20 (1 detect of 10 samples), well 299-E25-40 (1 detect of 15 samples), and well 299-E25-41 (1 detect of 14 samples), and well 299-E25-46 (1 detect of 4 samples). 2,4-D is not associated with a plume or a trend.
95-50-1	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 1989 and 2016.
95-63-6	1,2,4-Trimethylbenzene	Yes (Interim Status Detection)	No	Yes. Detected in groundwater above background value, dangerous waste	No. Not included in Part A or Appendix 5. 1,2,4-Trimethylbenzene was analyzed once and detected in well 299-E24-20; not associated with a plume or trend.
98-95-3	Nitrobenzene	Yes (SST System Part A)	Yes	Yes	Yes. Part A and identified in Appendix 5. Nitrobenzene was not detected in groundwater between 1989 and 2016.
994-05-8	Butane, 2-methoxy-2-methyl-	Yes (Interim Status Detection)	No	No. Not routinely analyzed by commercial laboratories	No. Interim status detections. Classified as a flammable waste but not likely in groundwater. Analyzed and detected in 4 wells during 2016. Constituent not routinely included in EPA Method 8270 .

References: DOE/RL-2009-85, *Remedial Investigation Report for the 200-PO-1 Groundwater Operable Unit*.

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

*Q flag represents a review qualifier.

CAS = Chemical Abstracts Service
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

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A4 Results

A total of 115 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 A-AX SST

Constituents Proposed for Monitoring Because They Are on the SST Part A List	
Constituents proposed for monitoring because they are commonly detected and may be associated with a potential release from WMA C	Lead, mercury, silver, arsenic, cadmium, chromium, hexavalent chromium, selenium
Constituents proposed for monitoring that have not been detected in groundwater between 1989 and 2016	Ethyl benzene, 1,2-dichloroethane, methyl isobutyl ketone, toluene, chlorobenzene, pyridine, 2,4-dinitrotoluene, tetrachloroethene, cresols, carbon tetrachloride, n-butyl alcohol, benzene, 1,1,1-trichloroethane, vinyl chloride, 1,1-dichloroethene, methyl ethyl ketone, 1,1,2-trichloroethane, trichloroethylene, 1,2-dichlorobenzene, nitrobenzene, isobutanol,
Constituents proposed for monitoring that have not been analyzed in groundwater between 1989 and 2016	Cyclohexanone, 2-ethoxyethanol, ethyl ether, methanol, 1,1,2-trichloro-1,2,2-trifluoroethane, 2-Nitropropane, Cresylic acid
Constituents proposed for monitoring that are associated with single sporadic detections between 1989 and 2016 and are not associated with a plume or show a trend	Acetone, chloroform, xylenes, ethyl acetate, carbon disulfide, trichloromonofluoromethane
Constituents proposed for monitoring that are associated with laboratory contamination between 1989 and 2016 and are not associated with a plume or show a trend	Methylene chloride
Constituents Identified in Appendix 5 of Ecology Publication No. 97-407	
Constituents proposed for monitoring because they have interim status groundwater detections	Nickel, tin, antimony, cobalt, copper, vanadium, zinc
Constituents proposed for monitoring that are associated with single sporadic detections between 1989 and 2016 and are not associated with a plume or show a trend	2,4-Dimethylphenol, indeno(1,2,3-cd)pyrene, 2,3,7,8-tetrachlorodibenzofuran, 2,4-dinitrophenol, 4,6-dinitro-2-methylphenol, dibenz[a,h]anthracene, carbon disulfide, 2,4-D(2,4-Dichlorophenoxyacetic acid)

Table A-3. Summary of Constituents Proposed for Monitoring at WMA A-AX SST

Constituents Identified in Appendix 5 of Ecology Publication No. 97-407 (continued)	
Constituents proposed for monitoring that are associated with laboratory contamination between 1989 and 2016 and are not associated with a plume or show a trend	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin, octachlorodibenzo-p-dioxin, 1,2,3,4,6,7,8-heptachlorodibenzodioxin, octachlorodibenzofuran, 1,2,3,4,7,8-hexachlorodibenzo-p-dioxin, 4,4'-DDT, 1,2,3,4,7,8,9-Heptachlorodibenzofuran, 2,3,4,7,8-pentachlorodibenzofuran, 1,2,3,7,8-pentachlorodibenzofuran, 1,2,3,6,7,8-hexachlorodibenzofuran, 1,2,3,6,7,8-hexachlorodibenzo-p-dioxin, 2,3,4,6-tetrachlorophenol, 2,3,4,6,7,8-hexachlorodibenzofuran, 1,2,3,4,6,7,8-heptachlorodibenzofuran, 1,2,3,4,7,8-hexachlorodibenzofuran, 1,2,3,7,8,9-Hexachlorodibenzofuran
Toxicity values not available	Polychlorinated dibenzo-p-dioxins, polychlorinated dibenzofurans, sulfide, benzo(ghi)perylene, pentachlorodibenzofurans, hexachlorodibenzo-p-dioxin, pentachlorodibenzo-p-dioxins, heptachlorodibenzo-p-dioxins, heptachlorodibenzofurans, tetrachlorodibenzo-p-dioxins, hexachlorodibenzofurans, tetrachlorodibenzofurans
Constituents Identified as Present in the Waste Discharge Profile for the WMA A-AX SSTs	
Interim status detection	Nitrate, sulfate
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	
Interim status detection	Diacetone alcohol, aluminum, iron, manganese, molybdenum, strontium, nitrite, 1,2,4-trimethylbenzene, chloride
Tentatively identified compound	Undecane, dodecane, 2-Ethyl-1,3-dimethylbenzene, hexamethylcyclotrisiloxane, cyclotetrasiloxane, Octamethyl, 2-ethyltoluene
May be a characteristic, dangerous, or listed waste	Cyclohexane, benzoic acid, 2-propanol, butane, 2-methoxy-2-methyl-
Toxicity values not available	Perchlorate anion, ammonium ion, bromide, magnesium, potassium, sodium, thorium, calcium,

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 115 constituents were considered for proposed monitoring at WMA A-AX; however, only 15 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
- Silver
- Arsenic
- Cadmium
- Chromium
- Selenium
- Hexavalent chromium
- Nickel
- Tin
- Antimony
- Cobalt
- Copper
- Vanadium
- Zinc

Nitrate and sulfate are identified for monitoring because they are included in the waste discharge profile for WMA A-AX SSTs.

Monitoring of the remaining constituents that are on the Part A Permit or are listed in Appendix 5 of Ecology Publication No. 97-407 require additional consideration because of their 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.

Although dioxins and furans are included in Appendix 5 of Ecology Publication No. 97-407, these constituents are not identified as dangerous or listed wastes at the Hanford Site.

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

- DOE/RL-2009-85, 2008, *Remedial Investigation Report for the 200-PO-1 Groundwater Operable Unit*, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: <https://pdw.hanford.gov/arpir/pdf.cfm?accession=0091415>.
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- Ecology Publication No. 97-407, 2014, *Chemical Test Methods For Designating Dangerous Waste WAC 173-303-090 & -100*, Hazardous Waste and Toxics Reduction Program, Washington State Department of Ecology, Olympia, Washington. Available at: <https://fortress.wa.gov/ecy/publications/documents/97407.pdf>.
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