

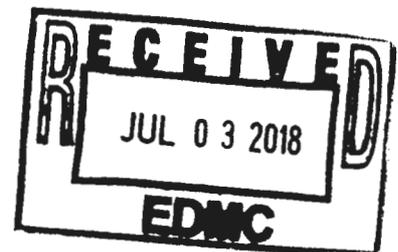
IDENTIFICATION OF SITE-SPECIFIC MONITORING CONSTITUENTS FOR WASTE MANAGEMENT AREA S-SX

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



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Richland, Washington 99352



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

2 Background

WMA S-SX 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 S-SX 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 S-SX SSTs. The wastes are identified by waste code in Section 2.3 of SGW-60577, Regulator Review Draft, *Engineering Evaluation Report For Single Shell Tank Waste Management Area S-SX 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:

$$K_{oc} = (100 \times K_d) + (\% OM)$$

where:

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

Solving this equation for K_d :

$$K_d = (K_{oc} \times \% OM) + 100$$

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

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ECF-200UP1-17-0221, REV. 0

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 _a (mL/g)*	K _a reference	Is K _a ≤ 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_a (mL/g)*	K_a reference	Is K_a ≤ 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-60577 includes a summary of the interim status groundwater monitoring history at WMA S-SX 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-60577, 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 S-SX 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-W22-46	1,1,1-Trichloroethane	26-Feb-1996	0.12	N	L			No	N/A	N/A	Yes
299-W23-15	1,4-Dichlorobenzene	2-Mar-2005	0.25	N	J			No	N/A	N/A	Yes
299-W22-48	2-Butanone	26-Oct-1999	20	N				No	N/A	N/A	Yes
299-W22-48	4-Methyl-2-pentanone	26-Oct-1999	0.5	N	J			No	N/A	N/A	Yes
299-W22-48	Acetone	26-Oct-1999	43	N	D			No	N/A	N/A	Yes
299-W22-44	Acetonitrile	3-Jun-2011	3.1	N	J			No	N/A	N/A	Yes
299-W22-44	Aluminum	13-May-1997	18300	Y		Y		Yes	7.11	Yes	Yes
299-W23-19	Ammonia	30-Jun-2014	381	N	CN	Z		Yes	113	Yes	Yes
299-W22-45	Ammonium ion	24-Nov-1992	400	N				No	N/A	N/A	Yes
299-W22-50	Antimony	29-Nov-1999	88.6	Y				Yes	55.1	Yes	Yes
299-W23-13	Arsenic	3-Oct-1991	17	N				Yes	7.85	Yes	Yes
299-W23-13	Arsenic	3-Oct-1991	17	Y				Yes	7.85	Yes	Yes
299-W23-13	Arsenic	23-Nov-1992	17	Y				Yes	7.85	Yes	Yes
299-W23-19	Barium	16-Jan-2003	344	Y				Yes	105	Yes	Yes
299-W22-47	Benzene	8-Jun-2005	0.38	N	J			No	N/A	N/A	Yes
299-W23-14	Beryllium	11-May-1998	2	Y	B			Yes	2.29	Yes	No
299-W22-83	Bis(2-ethylhexyl) phthalate	1-Mar-2004	7.4	N	JB			No	N/A	N/A	Yes
299-W22-93	Boron	2-Mar-2016	30.1	N	B			Yes	36	Yes	No
299-W23-19	Bromide	27-Sep-2005	320	N	C			Yes	124	No	Yes
299-W22-50	Bromodichloromethane	18-Jun-2012	0.13	N	J	A		No	N/A	N/A	Yes
299-W22-44	Cadmium	13-May-1997	50	Y		Y		Yes	0.916	Yes	Yes
299-W23-19	Calcium	16-Jan-2003	290000	Y				Yes	52644	No	Yes
299-W23-21	Carbon disulfide	26-Feb-2004	0.5	N	J			No	N/A	N/A	Yes
299-W23-15	Carbon tetrachloride	2-Mar-2005	230	N	D	Q		No	N/A	N/A	Yes
299-W22-45	Chloride	19-Jun-2015	36000	N	D			Yes	15630	No	Yes
299-W23-15	Chloroform	5-Apr-2000	7.4	N				No	N/A	N/A	Yes
299-W23-21	Chloromethane	21-Jun-2011	0.078	N	J			No	N/A	N/A	Yes
299-W23-19	Chromium	21-Dec-2005	1750	Y				Yes	2.4	Yes	Yes
299-W23-19	Chromium	7-Apr-2011	1300	N				Yes	2.4	Yes	Yes
299-W22-47	cis-1,2-Dichloroethylene	8-Jun-2005	1.1	N				No	N/A	N/A	Yes

Table 2. WMA S-SX 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-W22-45	cis-1,2-Dichloroethylene	14-Sep-2004	0.28	N	J			No	N/A	N/A	Yes
299-W23-21	cis-1,2-Dichloroethylene	8-Jun-2005	0.28	N	JB			No	N/A	N/A	Yes
299-W23-21	Cobalt	28-Jul-2010	68	N		Y		Yes	0.916	Yes	Yes
299-W23-7	Copper	19-Jun-1996	63	N				Yes	0.81	Yes	Yes
299-W23-19	Cyanide	7-Mar-2001	3.4	N	BCN			Yes	8.41	No	No
299-W22-48	Diethylphthalate	19-Dec-2010	62	N		Q		No	N/A	N/A	Yes
299-W23-7	Fluoride	19-Jun-1996	990	N				Yes	1047	No	No
299-W23-19	Hexavalent Chromium	13-Dec-2012	988	N				No	N/A	N/A	Yes
299-W22-50	Iron	30-Aug-2011	22200	N		Y		Yes	570	Yes	Yes
299-W22-26	Lead	12/9/2011	16.2	N		Q		Yes	0.917	Yes	Yes
299-W22-69	Lithium	17-Dec-2008	8.7	N	B			Yes	11,321	No	No
299-W23-19	Magnesium	16-Jan-2003	94600	Y				Yes	24,816	Yes	Yes
299-W22-44	Manganese	18-Mar-1994	920	N				Yes	38.5	Yes	Yes
299-W22-83	Mercury	3-Mar-2005	0.17	Y	BC		J	Yes	0.003	Yes	Yes
299-W22-83	Methylene chloride	20-Jun-2008	8.6	N	B	QY		No	N/A	N/A	Yes
299-W22-93	Molybdenum	19-Dec-2016	18	N				Yes	3.21	Yes	Yes
299-W22-48	Nickel	18-Jun-2012	306	N		Y		Yes	1.56	Yes	Yes
299-W23-19	Nitrate	16-Jan-2003	1680000	N	CD			Yes	26,871	No	Yes
299-W22-48	Nitrite	8-Mar-2001	3020	N		Y		Yes	93.7	No	Yes
299-W23-21	n-Nitrosodimethylamine	21-Jun-2011	4.3	N	J			No	N/A	N/A	Yes
299-W23-21	n-Nitrosomorpholine	21-Jun-2011	2	N	J			No	N/A	N/A	Yes
299-W22-44	Perchlorate anion	29-Sep-1993	400	N	L	QY		No	N/A	N/A	Yes
299-W22-45	Perchlorate anion	29-Sep-1993	400	N	L	QY		No	N/A	N/A	Yes
299-W22-45	Perchlorate anion	29-Sep-1993	400	N	L	QY		No	N/A	N/A	Yes
299-W23-15	Phosphate	8-May-1997	414	N				Yes	162	No	Yes
299-W22-44	Potassium	13-May-1997	950000	Y		Y		Yes	9,122	No	Yes
299-W22-85	Selenium	28-Jun-2011	23.1	N	D			Yes	10.5	Yes	Yes
299-W22-44	Silver	13-May-1997	35.5	Y		Y		Yes	5.28	Yes	Yes
299-W22-44	Sodium	13-May-1997	388000	Y		Y		Yes	26,998	No	Yes
299-W23-19	Strontium	16-Jan-2003	1220	Y				Yes	323	Yes	Yes

Table 2. WMA S-SX 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-W22-45	Sulfate	19-Jun-2015	62800	N	D			Yes	47,014	No	Yes
299-W22-72	Sulfide	5-Jun-2013	245000	N		YQ		Yes	2.19	Yes	Yes
299-W23-21	Tetrachloroethene	13-Sep-2004	1.3	N				No	N/A	N/A	Yes
299-W22-116	Thallium	2-Mar-2016	0.6	N	B			Yes	1.67	Yes	No
299-W22-39	Tin	8-Feb-1996	88	Y	BL			Yes	21.6	Yes	Yes
299-W23-4	Toluene	18-Jan-2000	3.1	N	JD			No	N/A	N/A	Yes
299-W22-72	Tributyl phosphate	14-Jun-2007	1.6	N	J			No	N/A	N/A	Yes
299-W22-47	Trichloroethene	13-Jan-2005	2.2	N				No	N/A	N/A	Yes
299-W22-39	Trichlorophenol	14-Nov-1991	5	N				No	N/A	N/A	Yes
299-W22-44	Vanadium	18-Mar-1994	71	N				Yes	11.5	Yes	Yes
299-W23-15	Xylenes (total)	2-Mar-2005	0.33	N	J			No	N/A	N/A	Yes
299-W23-7	Zinc	19-Jun-1996	8400	N				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:

A = Review Qualifier: Administrative Technical Issue. An issue was identified with the chain of custody or other administrative documents during the administrative technical verification process that may potentially affect the data quality/defensibility

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

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

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

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

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.

J = Validation Qualifier: Estimated value, the associated result value may not reflect quantitation/detection levels (if assigned with an associated "U" qualifier) or actual concentrations with the precision/accuracy typically associated with results by this methodology. Result precision/accuracy may have been impacted due to minor quality control deficiency/s or sample matrix interferences identified during data validation. L = Lab Qualifier: method detection limit \leq value $<$ contract required quantitation limit [RETIRED]

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

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

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

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

N/A = not applicable

QC = quality control

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3.3 Final Monitoring Constituent Evaluation

The constituents retained as potential monitoring constituents in Sections 3.1 and 3.2 were compiled. A final evaluation identified potential monitoring constituents to be included as proposed monitoring constituents to detect and monitor wastes from WMA S-SX 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 S-SX (Section 9.4 in SGW-60577). 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 WMA S-SX SSTs during leak events (Table 2-1 in SGW-60577) (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 S-SX 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 S-SX SSTs. It is assumed that the HEIS data are accurate and valid measurements of contaminant conditions in groundwater associated with WMA S-SX.

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-60577 provides the data for interim status groundwater monitoring.

7 Results and Conclusions

Based on the evaluations of waste constituents associated with WMA S-SX 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 S-SX 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 S-SX 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 S-SX 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 = 59) were retained as potential monitoring constituents (Table 4).

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

CAS Number	Constituent
71-55-6	1,1,1-Trichloroethane
106-46-7	1,4-Dichlorobenzene
78-93-3	2-Butanone
108-10-1	4-Methyl-2-pentanone
67-64-1	Acetone
75-05-8	Acetonitrile
7429-90-5	Aluminum
7664-41-7	Ammonia

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

CAS Number	Constituent
14798-03-9	Ammonium ion
7440-36-0	Antimony
7440-38-2	Arsenic
7440-39-3	Barium
71-43-2	Benzene
117-81-7	Bis(2-ethylhexyl) phthalate
24959-67-9	Bromide
75-27-4	Bromodichloromethane
7440-43-9	Cadmium
7440-70-2	Calcium
75-15-0	Carbon disulfide
56-23-5	Carbon tetrachloride
16887-00-6	Chloride
67-66-3	Chloroform
74-87-3	Chloromethane
7440-47-3	Chromium
156-59-2	cis-1,2-Dichloroethylene
7440-48-4	Cobalt
7440-50-8	Copper
84-66-2	Diethylphthalate
18540-29-9	Hexavalent Chromium
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

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

CAS Number	Constituent
14797-55-8	Nitrate
14797-65-0	Nitrite
10595-95-6	n-Nitrosodimethylamine
59-89-2	n-Nitrosomorpholine
14797-73-0	Perchlorate anion
14265-44-2	Phosphate
7440-09-7	Potassium
7782-49-2	Selenium
7440-22-4	Silver
7440-23-5	Sodium
7440-24-6	Strontium
14808-79-8	Sulfate
18496-25-8	Sulfide
127-18-4	Tetrachloroethene
7440-31-5	Tin
108-88-3	Toluene
126-73-8	Tributyl phosphate
79-01-6	Trichloroethene
25167-82-2	Trichlorophenol
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

Sixty-eight 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
10595-95-6	n-Nitrosodimethylamine	Yes (Interim Status Detection)	Yes	Yes
106-46-7	1,4-Dichlorobenzene	Yes (Interim Status Detection)	Yes	Yes
107-06-2	1,2-Dichloroethane	Yes (SST System Part A)	Yes	Yes
108-10-1	4-Methyl-2-pentanone	Yes (Interim Status Detection)	Yes	Yes
108-10-1	Methyl isobutyl ketone	Yes (SST System Part A)	Yes	Yes
108-88-3	Toluene	Yes (SST System Part A)	Yes	Yes
108-88-3	Toluene	Yes (Interim Status Detection)	Yes	Yes
108-90-7	Chlorobenzene	Yes (SST System Part A)	Yes	Yes
108-94-1	Cyclohexanone	Evaluate (SST System Part A)	No	Yes - dangerous waste in SST System Part A
110-80-5	2-Ethoxyethanol	Evaluate (SST System Part A)	No	No - not routinely analyzed by commercial laboratories
110-86-1	Pyridine	Evaluate (SST System Part A)	Yes	Yes
117-81-7	Bis(2-ethylhexyl) phthalate	Yes (Interim Status Detection)	Yes	Yes
121-14-2	2,4-Dinitrotoluene	Yes (SST System Part A)	Yes	Yes
126-73-8	Tributyl phosphate	Yes (Interim Status Detection)	No	Yes - detected in groundwater above background value, dangerous waste
127-18-4	Tetrachloroethene	Yes (SST System Part A)	Yes	Yes
127-18-4	Tetrachloroethene	Yes (Interim Status Detection)	Yes	Yes
1319-77-3	Cresols	Evaluate (SST System Part A)	Yes (as isomers) ^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
141-78-6	Ethyl acetate	Yes (SST System Part A)	No	Yes - dangerous waste in SST System Part A
14265-44-2	Phosphate	Yes (Interim Status Detection)	No	No - detected in groundwater above background value; not a dangerous waste, no action level for screening
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 2-1 ^e as present in WMA S-SX SSTs during leaks
14797-65-0	Nitrite	Yes (Interim Status Detection)	No	Yes - detected in groundwater above background value; not a dangerous waste; maximum result greater than action level; identified in Table 2-1 ^e as present in WMA S-SX SSTs during leaks
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
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

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)
14808-79-8	Sulfate	Yes (Interim Status Detection)	No	No - Detected in groundwater above background value; not a dangerous waste; maximum result less than action level
156-59-2	cis-1,2-Dichloroethylene	Yes (Interim Status Detection)	No	Yes - Detected in groundwater above background value, dangerous waste
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
24959-67-9	Bromide	Yes (Interim Status Detection)	No	No - detected in groundwater above background value; not a dangerous waste, no action level for screening
25167-82-2	Trichlorophenol	Yes (Interim Status Detection)	No	Yes - Detected in groundwater above background value, dangerous waste; not routinely analyzed by commercial laboratories and will be monitored by two isomers ^f
56-23-5	Carbon tetrachloride	Yes (SST System Part A)	Yes	Yes
56-23-5	Carbon tetrachloride	Yes (Interim Status Detection)	Yes	Yes
59-89-2	n-Nitrosomorpholine	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)
60-29-7	Ethyl ether	Yes (SST System Part A)	No	Yes - dangerous waste in SST System Part A
67-56-1	Methanol	Yes (SST System Part A)	No	Yes - dangerous waste in SST System Part A
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
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
71-43-2	Benzene	Yes (Interim Status Detection)	Yes	Yes
71-55-6	1,1,1-Trichloroethane	Yes (SST System Part A)	Yes	Yes
71-55-6	1,1,1-Trichloroethane	Yes (Interim Status Detection)	Yes	Yes
7429-90-5	Aluminum	Yes (Interim Status Detection)	No	Yes - detected in groundwater above background value; not a dangerous waste; maximum result greater than action level; identified in Table 2-1 ^e as present in WMA S-SX SSTs during leaks
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 2-1 ^e as

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)
				present in WMA S-SX SSTs during leaks
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 2-1 ^e as present in WMA S-SX SSTs during leaks
7439-97-6	Mercury	Yes (Interim Status Detection)	Yes	Yes
7439-98-7	Molybdenum	Yes (Interim Status Detection)	No	No - Detected in groundwater above background value; not a dangerous waste; maximum result less than action level
7440-02-0	Nickel	Yes (Interim Status Detection)	Yes	Yes
7440-09-7	Potassium	Yes (Interim Status Detection)	No	No - detected in groundwater above background value; not a dangerous waste, no action level for screening
7440-22-4	Silver	Yes (Interim Status Detection)	Yes	Yes
7440-23-5	Sodium	Yes (Interim Status Detection)	No	No - detected in groundwater above background value; not a

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)
				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
7440-31-5	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
7440-39-3	Barium	Yes (Interim Status Detection)	Yes	Yes
7440-43-9	Cadmium	Yes (Interim Status Detection)	Yes	Yes
7440-47-3	Chromium	Yes (Interim Status Detection)	Yes	Yes
7440-48-4	Cobalt	Yes (Interim Status Detection)	Yes	Yes
7440-50-8	Copper	Yes (Interim Status Detection)	Yes	Yes
7440-62-2	Vanadium	Yes (Interim Status Detection)	Yes	Yes
7440-66-6	Zinc	Yes (Interim Status Detection)	Yes	Yes
7440-70-2	Calcium	Yes (Interim Status Detection)	No	No - detected in groundwater above background value; not a dangerous waste, no action level for screening
74-87-3	Chloromethane	Yes (Interim Status Detection)	Yes	Yes
75-01-4	Vinyl chloride	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)
75-05-8	Acetonitrile	Yes (Interim Status Detection)	No	Yes - detected in groundwater above background value, dangerous waste
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
75-27-4	Bromodichloromethane	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
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	Evaluate (SST System Part A)	No	Yes - dangerous waste in SST System Part A
7664-41-7	Ammonia	Yes (Interim Status Detection)	No	Yes - detected in groundwater above background value, dangerous waste
7782-49-2	Selenium	Yes (Interim Status Detection)	Yes	Yes
78-83-1	Isobutanol	Evaluate (SST System Part A)	Yes	Yes
78-93-3	2-Butanone	Yes (Interim Status Detection)	Yes	Yes
78-93-3	Methyl ethyl ketone	Yes (SST System Part A)	Yes	Yes
79-00-5	1,1,2-Trichloroethane	Yes (SST System Part A)	Yes	Yes
79-01-6	Trichloroethylene	Yes (SST System Part A)	Yes	Yes
79-01-6	Trichloroethene	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)
79-46-9	2-Nitropropane	Evaluate (SST System Part A)	No	Yes - dangerous waste in SST System Part A
84-66-2	Diethylphthalate	Yes (Interim Status Detection)	Yes	Yes
93-51-6	Cresylic acid	Evaluate (SST System Part A)	No	No - related compound included; not routinely analyzed by commercial laboratories ^g
95-50-1	Ortho-dichlorobenzene	Yes (SST System Part A)	Yes	Yes
98-95-3	Nitrobenzene	Yes (SST System Part A)	Yes	Yes

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

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

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

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

e. Table 2-1 in SGW-60577, *Engineering Evaluation Report For Single Shell Tank Waste Management Area S-SX Groundwater Monitoring*, provides the nonradiological waste profiles for the WMA S-SX SSTs during leak events.

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

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

CAS = Chemical Abstracts Service

K_d = distribution coefficient

SST = single-shell tank

WMA = waste management area

As described in Section 3.3, potential monitoring constituents that are also listed in Appendix 5 of Ecology Publication No. 97-407 were identified (Table 5). Monitoring for the dangerous wastes listed in Appendix 5 of Ecology Publication No. 97-407 has already been prescribed for WMA S-SX. Therefore, the 49 potential monitoring constituents that are also included in Appendix 5 of Ecology Publication No. 97-407 were identified as proposed monitoring constituents.

The remaining potential monitoring constituents (N = 32) 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 = 23) 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 WMA S-SX SSTs during leak events (Table 2-1 in SGW-60577)

Of the remaining 23 potential monitoring constituents, 6 are dangerous wastes and were included as proposed monitoring constituents (Table 5). One of these 6 proposed monitoring constituents (trichlorophenol) (initially detected in 1991) is not routinely analyzed by commercial laboratories and will be monitored using two of its commonly analyzed isomers (2,4,5-trichlorophenol and 2,4,6-trichlorophenol). None of the remaining potential monitoring constituents were already identified for monitoring by related chemicals.

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 profile for the WMA S-SX SSTs during leak events (Table 2-1 in SGW-60577). The remaining 12 constituents were removed from consideration as potential monitoring constituents.

In summary, 68 constituents were identified as proposed monitoring constituents to detect and monitor any groundwater impacts from dangerous waste releases at WMA S-SX. Five of the 68 constituents are nondangerous constituents that were quantified in groundwater above the applicable action level and were identified in the waste profile for the WMA S-SX SSTs during leak events.

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/ N/A)
7429-90-5	Aluminum	18300	299-W22-44	13-May-1997	50	40 CFR 143.3	Yes
14798-03-9	Ammonium ion	400	299-W22-45	24-Nov-1992	Not available	N/A	N/A
24959-67-9	Bromide	320	299-W23-19	27-Sep-2005	Not available	N/A	N/A
7440-70-2	Calcium	290000	299-W23-19	16-Jan-2003	Not available	N/A	N/A
16887-00-6	Chloride	36000	299-W22-45	19-Jun-2015	250000	40 CFR 143.3	No
7439-89-6	Iron	22200	299-W22-50	30-Aug-2011	11200	WAC 173-340-720(4)(b)(iii)(A) and (B)	Yes
7439-95-4	Magnesium	94600	299-W23-19	16-Jan-2003	Not available	N/A	N/A
7439-96-5	Manganese	920	299-W22-44	18-Mar-1994	50	40 CFR 143.3	Yes
7439-98-7	Molybdenum	18	299-W22-93	19-Dec-2016	80	WAC 173-340-720(4)(b)(iii)(A) and (B)	No
14797-55-8	Nitrate	1680000	299-W23-19	16-Jan-2003	45000	40 CFR 141.62	Yes
14797-65-0	Nitrite	3020	299-W22-48	8-Mar-2001	1000	40 CFR 141.62	Yes
14797-73-0	Perchlorate anion	400	299-W22-44	29-Sep-1993	Not available	N/A	N/A
14797-73-0	Perchlorate anion	400	299-W22-45	29-Sep-1993	Not available	N/A	N/A
14797-73-0	Perchlorate anion	400	299-W22-45	29-Sep-1993	Not available	N/A	N/A
14265-44-2	Phosphate	414	299-W23-15	8-May-1997	Not available	N/A	N/A
7440-09-7	Potassium	950000	299-W22-44	13-May-1997	Not available	N/A	N/A
7440-23-5	Sodium	388000	299-W22-44	13-May-1997	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/ N/A)
7440-24-6	Strontium	1220	299-W23-19	16-Jan-2003	9600	WAC 173-340-720(4)(b)(iii)(A) and (B)	No
14808-79-8	Sulfate	62800	299-W22-45	19-Jun-2015	250000	40 CFR 143.3	No

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 S-SX under interim status monitoring plans, 68 waste constituents are identified as proposed monitoring constituents to detect and monitor any groundwater impacts from dangerous waste releases at WMA S-SX (Table 7). Five of the 68 are nondangerous waste constituents that were quantified in groundwater above the applicable action level and were identified in the waste profile for the WMA S-SX SSTs during leak events.

Table 7. Proposed Groundwater Monitoring Constituents for WMA S-SX

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-Dichloroethane	107-06-2
1,4-Dichlorobenzene	106-46-7
2,4-Dinitrotoluene	121-14-2
2-Nitropropane	79-46-9
2,4,5-Trichlorophenol	95-95-4
2,4,6-Trichlorophenol	88-06-2
Acetone	67-64-1
Acetonitrile	75-05-8
Ammonia	7664-41-7
Antimony	7440-36-0
Arsenic	7440-38-2
Barium	7440-39-3
Benzene	71-43-2
Bis(2-ethylhexyl) phthalate	117-81-7
Bromodichloromethane	75-27-4
Cadmium	7440-43-9
Carbon disulfide	75-15-0
Carbon tetrachloride	56-23-5

Table 7. Proposed Groundwater Monitoring Constituents for WMA S-SX

Waste Constituent	CAS Number
Chlorobenzene	108-90-7
Chloroform	67-66-3
Chloromethane	74-87-3
Chromium	7440-47-3
cis-1,2-Dichloroethylene	156-59-2
Cobalt	7440-48-4
Copper	7440-50-8
Cresols	1319-77-3
Cyclohexanone	108-94-1
Diethylphthalate	84-66-2
Ethyl acetate	141-78-6
Ethyl ether	60-29-7
Ethylbenzene	100-41-4
Hexavalent Chromium	18540-29-9
Isobutanol	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
n-Nitrosodimethylamine	10595-95-6
n-Nitrosomorpholine	59-89-2
Nitrobenzene	98-95-3
Nickel	7440-02-0
Ortho-dichlorobenzene (1,2-dichlorobenzene)	95-50-1
Pyridine	110-86-1

Table 7. Proposed Groundwater Monitoring Constituents for WMA S-SX

Waste Constituent	CAS Number
Selenium	7782-49-2
Silver	7440-22-4
Sulfide	18496-25-8
Tetrachloroethene	127-18-4
Tin	7440-31-5
Toluene	108-88-3
Tributyl phosphate	126-73-8
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
Nitrite	14797-65-0

CAS = Chemical Abstracts Service

8 References

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