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7. Abstract

PRELIMINARY ANALYTICAL RESULTS OF THE 183-H BASIN WASTE TESTING

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183-H BASIN MIXED WASTE ANALYSIS AND TESTING REPORT

INTRODUCTION

The purpose of this sampling and analysis report is to provide data necessary to support treatment and disposal options for the low-level mixed waste from the 183-H solar evaporation ponds. The 183-H Basins are located in the 100 H Area, north of the 100 H reactor buildings. In 1973, four of the 16 flocculation and sedimentation basins were designated for use as solar evaporation basins. The purpose of the 183-H Basins was to provide a means of waste reduction by natural evaporation of the liquid chemical wastes resulting from the 300 Area (N Reactor) fuel fabrication facilities. The natural evaporation process involved temporary storage of the wastes in the basins to accommodate the evaporation process. In November 1985, the last shipment of wastes were sent to the 183-H Basins. After evaporation the remaining sediment was removed from the basins and placed into 55-gallon drums. The drums of waste were then shipped to the 200 Area Central Waste Complex (CWC) for storage.

The primary purpose of this sampling and analysis effort is to gather chemical and bulk property data for the waste in the drums/boxes at CWC. Formic acid concentration data was collected to support the submission of a petition to demonstrate equivalent treatment by stabilization for formic acid. According to process knowledge two pounds of formic acid were mixed with routine waste solution and added to the basins. Waste composition data and waste samples were collected to support the stabilization treatment process. Bulk property and packaging data were collected to support treatment facility design and on-going waste operations at Hanford.

A secondary purpose of the sampling and analysis program is to support the development of acceptable waste forms for disposal of these and similar wastes. This includes certification of disposal compliance and support to the design of the Waste Receiving and Processing (WRAP) Module 2A Facility.

Approximately 12,000 drums and 14 boxes of this waste are in storage at CWC. The sampling strategy was to select the appropriate number and variety of containers as samples for testing that will represent the entire waste stream and provide an adequate data base to make estimates of composition and properties of the waste.

Each waste type represents a process which produced a waste. Each container within a type is expected to possess the same chemical and physical properties as any other container. Each waste type is considered independently for testing and analysis purposes per this program.

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The waste was segregated into the following smaller units of homogenous waste (waste type):

Basin 3 Solids	3,182 drums
Basin 4 Solids	1,407 drums
Solidified Evaporated Liquid	1,559 drums
Solidified Seepage Liquid	1,208 drums
Precipitated Crystal	4,437 drums
Sandblast Grit	189 drums
Miscellaneous Waste	220 drums/14 boxes
Repackage Drums	81 drums

The repackaged drums had been referred to as Unknown Basin 3 or 4 in the previous documents associated with this program. These were actually drums from basins 3 and 4 that were sent back to the 183-H basins to be repackaged, there were deficiencies with their original packaging that made them unsuitable for storage.

For this report, the term sample will be defined as a small portion selected to represent the whole, and a specimen shall mean an individual portion of the sample taken for a single test. The 125 drums taken to represent all of the 183-H Basin waste are samples. These samples were then subsampled again for chemical analysis. An example of this is a length of core, taken from a drum of solidified waste. The drum is a sample, and the core is a subsample. However, when the cores are homogenized, the waste put into a container for shipment to the laboratories for chemical analysis are a specimen.

PRELIMINARY ANALYTICAL RESULTS

The drums were subsampled between February and September 1994. The specimens were analyzed by Weston, for hazardous constituents, and TMA/Norcal, for radionuclides. Analyses were performed following EPA or laboratory specific protocol. Currently the data are undergoing validation by Los Alamos Technical Associates, Inc for the Westinghouse Hanford Company. The data presented here are preliminary and should not be considered validated data. Not all analytical results are available for evaluation at this time.

The data is presented using a median and two-tail 80% confidence interval. A major constituent is defined by a median of 11% or greater by weight. Major constituents have been identified for all waste types for which there is sufficient data available.

BASIN 3 SOLIDS

The median and confidence intervals for the basin 3 solids analytes are listed below.

Lab Analyte	Median	Confidence Interval
% Solids	85	(82.8, 86.6)
Chloride (IC)	82 mg/kg	(16.2, 144)
Fluoride (IC)	43900	(37000, 47600)
Formate (IC)	366 mg/kg	(214, 392)
Cyanide	1.61 mg/kg	(0.60, 3.05)
Sulfate (IC)	171000 mg/kg	(147000, 202000)
Fluoride	5620 mg/kg	(3930, 6780)
NO2/NO3	27700 mg-N/kg	(22800, 31000)
TOC	1330 mg/kg	(1060, 1360)
pH	11.6	(11.5, 12.1)
Phosphate P-total	218 mg/kg	(47.2, 779)
TIC	1650 mg/kg	(950, 1900)
Silver	174 mg/kg	(144, 200)
Aluminum	9270 mg/kg	(4400, 11700)
Barium	177 mg/kg	(123, 239)
Beryllium	2.31 mg/kg	(1.5, 3.2)
Calcium	7380 mg/kg	(5240, 13600)
Cadmium	2.70 mg/kg	(2.52, 2.8)
Cobalt	4.7 mg/kg	(3.2, 7.2)
Chromium	202 mg/kg	(178, 210)
Copper	86500 mg/kg	(72500, 96800)
Iron	3550 mg/kg	(2230, 4270)
Mercury	2.74 mg/kg	(2.34, 3.07)
Potassium	440 mg/kg	(326, 474)

Magnesium	1060 mg/kg	(737, 1840)
Manganese	670 mg/kg	(546, 721)
Molybdenum	5.76 mg/kg	(5.6, 6.0)
Sodium	202000 mg/kg	(174000, 215000)
Nickel	74.9 mg/kg	(60.9, 81.9)
Antimony	8.2 mg/kg	(7.4, 9.6)
Selenium	0.46 mg/kg	(0.35, 0.96)
Silicon	3010 mg/kg	(2490, 3970)
Vanadium	31.6 mg/kg	(11.7, 46.3)
Zinc	253 mg/kg	(212, 273)
Zirconium	22300 mg/kg	(19800, 28000)
Selenium 79	0.71, 1.5 pCi/g	only 2 samples
Iodine 129	ND, 0.049 pCi/g	only 2 samples
Np 237	0.12, 0.11 pCi/g	only 2 samples
Tc99	805 pCi/g	(670, 830)
Total U	1200 ug/g	(1100, 1300)

ND = nondetect

The major constituents were identified in this study as: sodium, sulfate, and moisture.

The cyanide results were checked against the total cyanide limit concentration for the Land Disposal Restriction (LDR) of 590 mg/kg and were found to be under the threshold. The median value was 1.61 mg/kg and the upper limit is 3.05 mg/kg. Due to a misunderstanding with the laboratory amenable cyanide was not analyzed for.

There was no difficulty opening the drums. The basin 3 solids consist of sludge and soil-like material. The waste was not deemed pourable and was black/brown in color. The waste pH has a median of 11.6. Two of the basin drums did not contain sludge as expected but were full of plastic.

The basin 3 drums did not contain free liquid with the exception of two drums. The amount of free liquid in either drum was not quantified. Samples from eight drums were analyzed for corrosivity. All results were below the reporting limit, therefore corrosivity is not considered a concern for this waste

According to the Storage/Disposal Authorization Request (SDAR), the basin 3 Solids are contained in galvanized steel 55-gallon drums. The drums should contain a 90 mil high density polyethylene (HDPE) liner as well as a 10 mil liner sealed with reinforced tape. The observed drums did contain a 90 mil liner and an 8 or 10 mil plastic liner that was not taped and horsetailed. The median amount of absorbent was 3.0% by volume.

BASIN 4 SOLIDS

The median and confidence intervals for basin 4 solids are listed below.

Lab Analyte	Median	Confidence Interval
% Solids	88.1	(85.7, 90.6)
Chloride (IC)	140 mg/kg	(136, 146)
Fluoride (IC)	40300 mg/kg	(36900, 43500)
Formate (IC)	89.6 mg/kg	(72, 161)
Cyanide	0.52 mg/kg	(0.28, 1.5)
Sulfate (IC)	143000 mg/kg	(115000, 169000)
Fluoride	7750 mg/kg	(5830, 12800)
NO ₂ /NO ₃	80900 mg-N/kg	(68900, 87900)
TOC	1525 mg/kg	(1160, 2090)
pH	9.5	(9.3, 9.9)
Phosphate P-total	45.5 mg/kg	(17.2, 59.9)
TIC	4415 mg/kg	(2270, 5150)
Silver	170 mg/kg	(135, 200)
Aluminum	428 mg/kg	(319, 736)
Barium	4.4 mg/kg	(3.4, 4.6)
Beryllium	4.3 mg/kg	(3.8, 4.5)
Calcium	282 mg/kg	(228, 324)
Cadmium	2.8 mg/kg	(2.4, 3.1)
Cobalt	0.92 mg/kg	(0.65, 3.49)
Chromium	169 mg/kg	(144, 192)
Copper	81700 mg/kg	(62700, 90700)
Iron	1470 mg/kg	(1240, 1620)

Mercury	11.9 mg/kg	(11.0, 14.6)
Potassium	535 mg/kg	(409, 815)
Magnesium	14.7 mg/kg	(2.07, 64)
Manganese	554 mg/kg	(457, 648)
Molybdenum	2.0 mg/kg	(0.78, 5.4)
Sodium	222000 mg/kg	(177000, 249000)
Nickel	75.5 mg/kg	(61.7, 80.7)
Antimony	10 mg/kg	(6.7, 22.75)
Selenium	0.37 mg/kg	(.032, 0.53)
Silicon	3300 mg/kg	(2700, 3610)
Vanadium	1.15 mg/kg	(0.23, 3.22)
Zinc	226 mg/kg	(184, 241)
Zirconium	21900 mg/kg	(20700, 26600)
Tc99	1750 pCi/g	(1300, 2200)
Total U	675 ug/g	(490, 750)

The major constituents were identified as: nitrate, sodium, sulfate, and moisture.

The total cyanide results were checked against the total cyanide limit concentration for the LDR of 590 mg/kg, and were found to be under the threshold. The median value was 0.52 mg/kg and the upper limit is 1.50 mg/kg. Due to a misunderstanding with the laboratory amenable cyanide was not analyzed for.

The overall package condition was good with several drums having wear and rust spots. There was no difficulty opening the drums. A few of the drums had a rusted bolt ring. The basin 4 solids consist of a black sludge which was sometimes wet. The drums contain a small amount of yellow/white or yellow/brown absorbent material. The basin 4 waste was not deemed pourable with the exception of a few drums. The waste pH had a median of 9.5. Three of the basin drums did not contain sludge as expected but were full of plastic.

The basin 4 drums did not contain free liquid with the exception of a couple of drums. The amount of free liquid in either drum was not quantified. Specimens from four drums were analyzed for corrosivity. All results were below the reporting limit, therefore corrosivity is not considered a concern for this waste.

The basin 4 solids are contained in painted steel 55-gallon drums. According to the SDAR, the drums should contain two 10-mil polyethylene liners that are pigtailed. The observed drums did contain two 8 or 10 mil plastic liners, but they were not pigtailed. The median amount of absorbent was 6.5% by volume.

REPACKAGED DRUMS

The median and confidence intervals for the unknown basin 3 or 4 solids analytes are listed below.

Lab Analyte	Median	Confidence Interval
% Solids	76.7	(58.6, 81.7)
Chloride (IC)	584 mg/kg	(432, 930)
Fluoride (IC)	21200 mg/kg	(1010, 44100)
Formate (IC)	40.7 mg/kg	(9.8, 54)
Cyanide (total)	1.38 mg/kg	(0.25, 3.68)
Sulfate (IC)	59300 mg/kg	(19900, 110000)
Fluoride	1680 mg/kg	(128, 3430)
NO2/NO3	43400 mg-N/kg	(6370, 51500)
TOC	631 mg/kg	(231, 1330)
pH	9.9	(8.2, 10.6)
Phosphate P-total	91.8 mg/kg	(78.3, 193)
TIC	1650 mg/kg	(243, 2600)
Silver	65.7 mg/kg	(6.4, 115)
Aluminum	7990 mg/kg	(4190, 9690)
Barium	150 mg/kg	(37.9, 190)
Beryllium	1.2 mg/kg	(0.37, 2.7)
Calcium	9900 mg/kg	(3620, 11100)
Cadmium	3.55 mg/kg	(3.33, 4.06)
Cobalt	5.1 mg/kg	(4.99, 12.0)
Chromium	110 mg/kg	(38.7, 160)
Copper	31700 mg/kg	(2250, 64400)
Iron	7570 mg/kg	(4140, 11800)

Mercury	1.71 mg/kg	(0.25, 5.6)
Potassium	1155 mg/kg	(1035, 1385)
Magnesium	4590 mg/kg	(1770, 5420)
Manganese	363 mg/kg	(111, 503)
Molybdenum	34.3 mg/kg	(7.2, 38.6)
Sodium	133000 mg/kg	(19100, 174000)
Nickel	49.9 mg/kg	(15.7, 102)
Antimony	39.65 mg/kg	(32.5, 43.4)
Selenium	1.14 mg/kg	(0.65, 1.6)
Silicon	2130 mg/kg	(1070, 3490)
Vanadium	32.3 mg/kg	(5, 92.6)
Zinc	140 mg/kg	(92.8, 199)
Zirconium	9460 mg/kg	(705, 20000)
Tc99	760 pCi/g	(150, 1100)
Total U	510 ug/g	(260, 1700)
Silver (TCLP)	598 ug/l	(12.8, 1610)
Arsenic (TCLP)	13.3 ug/l	(13.3, 66)
Barium (TCLP)	151.5 ug/l	(102, 204)
Cadmium (TCLP)	33.3 ug/l	(17.2, 36.9)
Chromium (TCLP)	195.5 ug/l	(99.6, 1260)
Mercury (TCLP)	1.5 ug/l	(0.36, 13)
Lead (TCLP)	13.9 ug/l	(13.9, 41.4)
Selenium (TCLP)	63 ug/l	(63, 314)

The major constituents were identified in this study as: sodium, sulfate, and moisture.

The TCLP results demonstrate at 90% confidence one tailed test are less than regulatory thresholds stated per WAC 173-303-090 (8).

The total cyanide results were checked against the total cyanide limit concentration for the LDR of 590 mg/kg, and were found to be under the threshold. The median value was 1.38 mg/kg and the upper limit is 3.68 mg/kg. Due to a misunderstanding with the laboratory amenable cyanide was not analyzed for.

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The overall package condition of unknown basin 3 or 4 drums was good. There was no difficulty opening the drums. Some drums had small spots of paint missing or corrosion present. The unknown basin 3 or 4 solids consisted of a black sludge which was deemed not pourable. The waste pH had a median of 9.9.

The unknown basin 3 or 4 solids drums did not contain free liquid with the exception of two drums. The amount of free liquid in either drum was not quantified. Samples from four drums were analyzed for corrosivity. All results were below the reporting limit, therefore corrosivity is not considered a concern for this waste.

The unknown basin 3 or 4 solids are contained in either galvanized or painted steel 55-gallon drums. According to the SDAR, the drums should contain a 90-mil HDPE liner. The drums did contain the 90-mil liner and also contained an 8 or 10 mil liner that was not horsetailed. The median amount of absorbent was 80% by volume.

SANDBLAST GRIT

The median and confidence intervals for the sandblast grit analytes are listed below.

Lab Analyte	Median	Confidence Interval
% Solids	94.7	(82.6, 96.4)
Chloride (IC)	53.2 mg/kg	(33.7, 79.6)
Fluoride (IC)	79.1 mg/kg	(61.3, 104)
Formate (IC)	3.3 mg/kg	(1.3, 3.5)
Cyanide	0.27 mg/kg	(0.25, 0.28)
Sulfate (IC)	348.5 mg/kg	(95.9, 441)
Fluoride	72.3 mg/kg	(56.5, 113)
NO2/NO3	89.2 mg-N/kg	(0.63, 108)
TOC	670 mg/kg	(492, 1060)
pH	9.2	(9.0, 9.6)
Phosphate P-total	109 mg/kg	(81, 150)
TIC	348.5 mg/kg	(23.8, 1880)
Silver	2.05 mg/kg	(0.63, 2.07)
Aluminum	1290 mg/kg	(8.15, 1960)
Barium	15.9 mg/kg	(2.25, 25.9)

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Beryllium	0.27 mg/kg	(0.13, 0.8)
Calcium	4420 mg/kg	(27.95, 7340)
Cadmium	0.46 mg/kg	(0.13, 1.3)
Cobalt	1.95 mg/kg	(1.5, 3.1)
Chromium	7.1 mg/kg	(1.65, 9.4)
Copper	88.9 mg/kg	(1.65, 409)
Iron	3310 mg/kg	(9.05, 4530)
Mercury	0.03 mg/kg	(0.03, 0.05)
Potassium	216 mg/kg	(123, 443.5)
Magnesium	681 mg/kg	(35.75, 1350)
Manganese	62.5 mg/kg	(0.65, 94)
Molybdenum	1.3 mg/kg	(0.3, 2.8)
Sodium	543 mg/kg	(355, 777)
Nickel	3.2 mg/kg	(1.6, 4.6)
Antimony	12.7 mg/kg	(1.35, 24)
Selenium	0.14 mg/kg	(0.13, 1.3)
Silicon	283 mg/kg	(98.6, 507)
Vanadium	4.3 mg/kg	(2.2, 9.3)
Zinc	37 mg/kg	(6.3, 60.1)
Zirconium	131 mg/kg	(14, 351)
Tc99	3.6 pCi/g	(2.6, 7.2)
Total U	4.6 ug/g	(0.098, 11)
Silver (TCLP)	2.1 ug/l	(2.1, 2.1)
Arsenic (TCLP)	10.8 ug/l	(10.8, 10.8)
Barium (TCLP)	287 ug/l	(140, 792)
Cadmium (TCLP)	3.85 ug/l	(1.3, 11.9)
Chromium (TCLP)	7.95 ug/l	(5.3, 24)
Mercury (TCLP)	0.05 ug/l	(0.05, 0.05)
Lead (TCLP)	10.3 ug/l	(10.3, 58.2)

Selenium (TCLP)	63 ug/l	(25.6, 63)
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Major constituents have yet to be identified in this study.

The TCLP results demonstrate at 90% confidence one tailed test are less than regulatory thresholds stated per WAC 173-303-090 (8).

The cyanide results were checked against the total cyanide limit concentration for the LDR of 590 mg/kg, and were found to be under the threshold. The median value was 0.27 mg/kg and the upper limit is 0.28 mg/kg. Due to a misunderstanding with the laboratory amenable cyanide was not analyzed for.

The overall package condition of sandblast grit drums was good. Most of the drums had small spots of paint missing or corrosion present. There was no difficulty opening the drums. The sandblast grit drums consisted of grit and natural sand. The waste was deemed pourable and was brown and purple in color. The waste pH had a median of 9.2.

The sandblast grit drums did not contain free liquid with the exception of three drums. The amount of free liquid in the three drums was not quantified. Samples from eight drums were analyzed for corrosivity. All results were below the reporting limit, therefore corrosivity is not considered a concern for this waste.

The sandblast grit is contained in either galvanized or painted steel 55-gallon drums. According to the SDARs, the drums in some cases should contain two 10-mil polyethylene liners that are pigtailed or in other cases a 90-mil HDPE liner. The observed drums did contain two 8 or 10 mil liners; however, they were not properly pigtailed. The drums that contained the 90-mil liner also contained an 8 or 10 mil liner inside the 90-mil liner that was not pigtailed. The median amount of absorbent was 6.0% by volume.

PRECIPITATED CRYSTAL

The median and confidence intervals for precipitate crystal analytes are listed below.

Lab Analyte	Median	Confidence Interval
% Solids	97.9	(96.8, 98.2)
Chloride (IC)	324 mg/kg	(31.8, 32.3)
Fluoride (IC)	2740 mg/kg	(2230, 3750)
Formate (IC)	697 mg/kg	(65, 741)
Cyanide (amenable)	6.35 mg/kg	(0.26, 12.6)
Cyanide (total)	0.26 mg/kg	(0.26, 0.26)

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Sulfate (IC)	13000 mg/kg	(11700, 16300)
Fluoride	1710 mg/kg	(1100, 2170)
NO2/NO3	143500 mg-N/kg	(118000, 151000)
TOC	378 mg/kg	(347, 456)
pH	11.3	(10.4, 11.7)
Phosphate P-total	16.7 mg/kg	(8.8, 28.4)
TIC	567.5 mg/kg	(245, 805)
Silver	0.36 mg/kg	(0.29, 0.65)
Aluminum	375.5 mg/kg	(218, 513)
Barium	2.3 mg/kg	(1.4, 3.4)
Beryllium	0.02 mg/kg	(0.01, 0.02)
Calcium	1520 mg/kg	(864, 3020)
Cadmium	0.15 mg/kg	(0.15, 0.15)
Cobalt	0.2 mg/kg	(0.17, 0.2)
Chromium	4.5 mg/kg	(3.1, 4.9)
Copper	156.5 mg/kg	(118, 192)
Iron	275.5 mg/kg	(117, 415)
Mercury	0.03 mg/kg	(0.02, 0.04)
Potassium	108.4 mg/kg	(43.8, 169)
Magnesium	349.5 mg/kg	(129, 606)
Manganese	4.1 mg/kg	(2.4, 6.2)
Molybdenum	1.5 mg/kg	(1.5, 1.5)
Sodium	241000 mg/kg	(216000, 246000)
Nickel	1.5 mg/kg	(0.83, 1.7)
Antimony	1.68 mg/kg	(1.6, 1.69)
Selenium	All below	reporting limit
Silicon	440 mg/kg	(244, 727)
Vanadium	0.90 mg/kg	(0.21, 1.1)
Zinc	3.6 mg/kg	(2.4, 4.5)

Zirconium	69.1 mg/kg	(63.9, 95.2)
Tc99	120 pCi/g	(100, 140)
Total U	25 ug/g	(17, 29)
Silver (TCLP)	6.5 ug/l	(2.9, 9)
Arsenic (TCLP)	28.9 ug/l	(13.3, 41.2)
Barium (TCLP)	467 ug/l	(136, 508)
Cadmium (TCLP)	1.5 ug/l	(1.5, 1.5)
Chromium (TCLP)	72.9 ug/l	(63.4, 98.8)
Mercury (TCLP)	0.34 ug/l	(0.3, 0.4)
Lead (TCLP)	13.9 ug/l	(13.9, 24.4)
Selenium (TCLP)	63 ug/l	(25.6, 63)

The major constituents were identified in this study as: sodium, and nitrate.

The TCLP results demonstrate at 90% confidence one tailed test are less than regulatory thresholds stated per WAC 173-303-090 (8).

All of the total and amenable cyanide results were below the reporting limit. Therefore, cyanide is below the LDR regulatory threshold of 590 mg/kg.

The overall package condition of the precipitate crystal drums was good. There was no difficulty opening the drums. A few of the drums had spots of paint missing or a little corrosion present. The precipitate crystal consisted of a fine to chunky and often hard material. The waste was deemed not pourable and was brown/white in color. The waste pH had a median of 11.3.

The precipitated crystal drums did not contain free liquid with the exception of four drums. The amount of free liquid in the drums was not quantified. Samples from 22 drums were analyzed for corrosivity. All results were below the reporting limit, therefore corrosivity is not considered a concern for this waste.

The precipitated crystal is contained in either galvanized or painted steel 55-gallon drums. According to the SDAR, the drums should contain two 10-mil polyethylene liners that are pigtailed. The observed drums did contain two 8 or 10 mil liners which were generally pigtailed, but not always. The median amount of absorbent was 9.0% by volume.

SOLIDIFIED EVAPORATED LIQUID

The median and confidence intervals for solidified evaporated liquid are listed below.

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Lab Analyte	Median	Confidence Interval
% Solids	77.5	(77.1,78.2)
Chloride(IC)	802.5 mg/kg	(770,872)
Fluoride(IC)	503.5 mg/kg	(486,514)
Formate(IC)	216 mg/kg	(200,227)
Cyanide(amenable)	All below	reporting limit
Cyanide(Total)	0.98 mg/kg	(0.33,1.3)
Sulfate(IC)	10400 mg/kg	(6800,12100)
Fluoride	55.1 mg/kg	(52,57.8)
NO2/NO3	4975 mg N/kg	(4400,4770)
TOC	6520 mg/kg	(3300,9500)
pH	13.2	(13.1,13.2)
Phosphate P-total	44.1 mg/kg	(23.4,48)
TIC	6780 mg/kg	(4260,9710)
Silver	0.3 mg/kg	(0.29,0.3)
Aluminum	7450 mg/kg	(7060,7660)
Arsenic	1.75 mg/kg	(1.15,1.8)
Barium	16.45 mg/kg	(15.6,17.5)
Beryllium	0.27 mg/kg	(0.02,0.3)
Calcium	147500 mg/kg	(141000,151000)
Cadmium	0.28 mg/kg	(0.28,0.29)
Cobalt	2.35 mg/kg	(2.1,2.4)
Chromium	37.6 mg/kg	(32.6,39.6)
Iron	3445 mg/kg	(3320,3490)
Lead	4.2 mg/kg	(3.6,4.9)
Mercury	0.3 mg/kg	(0.3,0.3)
Potassium	1680 mg/kg	(1580,1810)
Magnesium	17900 mg/kg	(17400,19000)
Manganese	53.65 mg/kg	(52.9,57.5)

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Molybdenum	2.85 mg/kg	(2.8,2.85)
Sodium	75900 mg/kg	(74300,78600)
Nickel	15.95 mg/kg	(13.9,16.7)
Antimony	1.7 mg/kg	(1.7,1.7)
Selenium	0.81 mg/kg	(0.13,0.98)
Silicon	6555 mg/kg	(5080,9300)
Thallium	All below	reporting limit
Vanadium	5.9 mg/kg	(5.4,6.2)
Zinc	12.65 mg/kg	(11.2,13.4)
Boron	12.1 mg/kg	(6.05,12.4)
Zirconium	37.2 mg/kg	(34.2,40.7)
Lithium	3.55 mg/kg	(2.75,4.3)
Strontium	66.85 mg/kg	(62.1,68.8)
Titanium	275 mg/kg	(273,284)
Tin	6.15 mg/kg	(6.15,6.25)
Selenium 79	All below	reporting limit
Iodine 129	450 pCi/g	2 of 3 below reporting limit
Np 237	All below	reporting limit
Tc99	4500 pCi/g	(3900,4800)
Total U	290 ug/g	(180,330)
Silver(TCLP)	2.3 ug/l	(2.3,2.3)
Arsenic(TCLP)	37.23 ug/l	(29.45,50.1)
Barium(TCLP)	258 ug/l	(225,314)
Cadmium(TCLP)	2.2 ug/l	(2.2,2.2)
Chromium(TCLP)	1050 ug/l	(871,1150)
Mercury(TCLP)	0.46 ug/l	(0.26,0.62)
Lead(TCLP)	9.5 ug/l	(9.5,9.5)
Selenium(TCLP)	25.5 ug/l	(25.5,25.5)

The major constituents were identified as: calcium

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The TCLP results demonstrate at 90% confidence one tailed test are less than regulatory thresholds stated per WAC 173-303-090 (8).

The total cyanide results were checked against the total cyanide limit concentration for the LDR of 590 mg/kg, and were found to be under the threshold. The amenable cyanide results were all below the reporting limit which is below the 30 mg/kg threshold. The median value was total cyanide was 0.98 mg/kg and the upper limit was 1.3 mg/kg.

The overall package condition was fair with several drums having small amounts of rust inside. All the drums had bulging of the bottom and/or top, varying from 1-2 inches. There was no difficulty opening the drums. The solidified evaporated liquid consist of a white/grey material that was deemed not pourable. The drums contained a small amount yellow/white absorbent material; the average amount was 4.8%. The waste pH had a median of 13.2. This pH level causes this waste to be coded as a state only D002.

The solidified evaporated liquid drums did not contain free liquid. Samples from eighteen drums were analyzed for corrosivity. All results were below the reporting limit, therefore corrosivity is not considered a concern for this waste.

The solidified evaporated liquids are contained in painted steel 55 gallon drums. According to the SDAR, the drums should contain one 10 mil plastic liner taped and horsetailed. The drums did contain the liner but none were taped and horsetailed. The overall packaging condition was fair with drums having small amounts of inside rust. All the drums were in 85 gallon overpacks that are in excellent condition. The median amount of absorbent was 5.0% by volume.

SOLIDIFIED SEEPAGE LIQUID

The median and confidence intervals for solidified seepage liquid are listed below. The preliminary data available for this waste stream was very limited.

Lab Analyte	Median	Confidence Interval
Formate(IC)	181.5 mg/kg	(117,193)
Cyanide(Amenable)	0.33 mg/kg	(0.33,0.35)
Cyanide(Total)	0.33 mg/kg	(0.33,0.35)
pH	13.1	(13.0,13.1)
Vanadium	5.9 mg/kg	(4.8,6.3)
Selenium 79	All below	reporting limit
Iodine 129	0.06 pCi/g	(0.02,0.1)

Np 237	0.01 pCi/g	(0.002,0.013)
Tc99	2450 pCi/g	(2400,5100)
Total U	120 ug/g	(120,330)
Silver(TCLP)	All below	reporting limit
Arsenic(TCLP)	49.8 ug/l	(27.7,66.3)
Barium(TCLP)	172 ug/l	(138,198)
Cadmium(TCLP)	All below	reporting limit
Chromium(TCLP)	475 ug/l	(357,731)
Mercury(TCLP)	9.5 ug/l	(9.5,9.5)
Lead(TCLP)	0.24 ug/l	(0.19,0.42)
Selenium(TCLP)	All below	reporting limit

The major constituents have not yet been identified in this study.

The TCLP results demonstrate at 90% confidence one tailed test are less than regulatory thresholds stated per WAC 173-303-090 (8).

The total cyanide results were checked against the total cyanide limit concentration for the LDR of 590 mg/kg, and were found to be under the threshold. The amenable cyanide results were checked against the amenable cyanide limit concentration of 30 mg/kg, and were found to be under the threshold. The median value was 0.33 mg/kg and the upper limit is 0.35 mg/kg for both total and amenable cyanide.

The concentration of chromium in the extract waste type specimens subjected to TCLP are less than 5 mg/l, as determined using a one-tailed test at 90% confidence.

The overall package condition of the solidified seepage liquid drums was fair to good. Six of the 15 drums had bulging on the top and bottoms varying from 1/2 - 1 1/2 inches. There was no difficulty opening the drums. The solidified seepage liquids consisted of a moist white/grey material that was deemed not pourable. The drums contained a small amount of absorbent; the average amount was 7.4%. The waste pH had a median of 13.2. This pH level causes this waste to be coded as a state only D002.

The solidified seepage liquid drums did not contain free liquid. Samples from 11 drums were analyzed for corrosivity. All results were below the reporting limit, therefore corrosivity is not considered a concern for this waste.

The solidified seepage liquids are contained in steel 55 gallon drums. According to the SDAR, the drums should contain one 10 mil plastic liner that

is sealed with reinforced taped. The observed drums did contain a 8-10 mil liner but only one was taped and sealed. The overall packaging condition was fair to good with the drums having a small amount of inside rust. Twelve of 15 drums were in 85 gallon overpacks. The overpacks are considered to be in excellent condition. The median amount of absorbent was 5.75% by volume.

FORMATE ANALYSIS

The analytical results for formic acid provided by the contract laboratory, Weston Labs, were much higher than expected based on process knowledge of the 183-H Basins. Process knowledge indicates a concentration of approximately 200 to 300 ppb. However, split samples were taken for some of the formic acid analyses. These split samples were sent to Pacific Northwest Laboratories (PNL) in Richland WA. The results were very different, with the PNL values being about an order on magnitude less than the Weston values. It is felt that the formate numbers are significantly lower than those supplied by Weston. But the actual concentration of formic acid is not known.

MISCELLANEOUS WASTE

Drums and boxes of miscellaneous (debris) waste were not subsampled for chemical analysis. These containers were opened and visually inspected. Notes, photographs, and video were used to document the contents and packaging. The containers' contents were removed as much as possible to allow a complete, as possible, visual examination.

The overall package condition of the miscellaneous drums and boxes was good. Most of the drums had scrape and wear marks present. There was no difficulty opening either the drums or the boxes.

There are two SDAR's for the miscellaneous waste that called for a 55 gallon steel drum with two 10 mil liners pigtailed and taped. Twice the absorbent needed to sorb the liquid present was required. Both the drums packaged under these SDAR's had the liners but neither drum examined had the liner pigtailed. Both drums had absorbent of 2 to 4 and 10 to 13 gallons respectively. There are two SDAR's for the miscellaneous waste that called for a 8x4x5 metal box, with a 20 foot wide 10 mil liner and with 40 pounds of absorbent on top of the waste and 40 pounds at the bottom. There were three metal boxes 8x4x5 packaged under these SDAR's. The liners were taped shut or horsetailed as required. All three boxes were in good condition and met the liner requirement. The entire contents of the boxes were not emptied so the total amount of absorbent was not ascertained. Five of the eight containers packaged under the above box SDAR were 55 gallon drums not boxes. The drums were steel and in good condition. Each contained two 8-10 mil plastic liners which were taped and horsetailed. Each contained from 2 to 4 gallons of absorbent on top. All of the contents of the miscellaneous waste containers, except one drum, were able to meet the determination as debris waste. This one drum contained about 2/3 concrete, rocks, and sand by volume. These objects were primarily smaller than 2.5 inches in all dimensions.

BIASED SAMPLES

Three additional containers called out as biased samples were not subsampled for chemical analysis. These were not randomly selected as were the other drums and boxes in this test program. They were included so that at least one container was opened and inspected for each SDAR under which the waste was packaged and shipped to storage. These containers were opened, and visually examined. Notes, photographs, and video were utilized to document the contents and packaging.

The first of two biased waste drum SDARs called for two, 10 mil liners pigtailed and taped. The drum examined did have the liner but it was not pigtailed. Twice the absorbent needed to sorb the liquid present was required, 5% of the volume of the drum was absorbent.

The second called for a 90 mil HDPE liner and 2 inches of absorbent on top after the waste had cured. Twice the absorbent needed to sorb the liquid present was required. The 90 mil liner was present in both drums, but no absorbent was present.

The overall package condition was good. There was no difficulty opening the drums. The biased waste consist of a white/grey material that is not pourable. The drums contain a small amount white/grey absorbent material. The average amount was less than 5%. The biased waste drums did not contain free liquid.

The biased waste are contained in painted steel 55 gallon drums. According to the SDAR, one of the drums should contain two 10 mil plastic liners taped and horsetailed. The drums did contain liners but they were not taped and horsetailed. This drum was full of debris. Two of the drums were to contain a 90 mil HDPE liner. The drums did contain the 90 mil liner, one drum contained absorbent, the other contained no absorbent. The overall packaging condition was good with drums having minor amounts of corrosion inside.

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