WHC-EP-0342
Addendum 26

242-A Evaporator Steam Condensate Stream-Specific Report

Prepared for the U.S. Department of Energy
Office of Environmental Restoration
and Waste Management

Westinghouse
Hanford Company Richland, Washington

Hanford Operations and Engineering Contractor for the
U.S. Department of Energy under Contract DE-AC06-87RL10930

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242-A Evaporator Steam Condensate Stream-Specific Report

Tank Farms Environmental Engineering

Date Published
August 1990

Prepared for the U.S. Department of Energy
Office of Environmental Restoration
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242-A EVAPORATOR STEAM CONDENSATE STREAM-SPECIFIC REPORT

Tank Farms Environmental Engineering

ABSTRACT

The proposed wastestream designation for the 242-A Evaporator Steam Condensate wastestream is that this stream is not a dangerous waste, pursuant to the Washington (State) Administration Code (WAC) 173-303, Dangerous Waste Regulations.* *A combination of process knowledge and sampling data was used to make this determination.*

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*Ecology, 1989, *Dangerous Waste Regulations*, Washington (State) Administrative Code (WAC) 173-303, Washington State Department of Ecology, Olympia, Washington.

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EXECUTIVE SUMMARY

The proposed wastestream designation for the 200 East Area 242-A Evaporator Steam Condensate wastestream is that this stream is not a dangerous waste, pursuant to the Washington (State) Administrative Code (WAC) 173-303, *Dangerous Waste Regulations*.* A combination of process knowledge and present sampling data was used to determine if the effluent contains a listed dangerous waste (WAC 173-303-080). Sampling data alone are compared to the dangerous waste criteria (WAC 173-303-100) and dangerous waste characteristics (WAC 173-303-090). Process knowledge was based on knowledge of the process configuration and operations in the tank farm facilities (including the chemicals that are utilized). Sample data are based on four random samples taken at one sampling point from October 30, 1989, to March 22, 1990, downstream of all process contributors. The sampling and process knowledge presented in this report is considered representative for the current 242-A Evaporator Steam Condensate wastestream configuration.

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*Ecology, 1989, *Dangerous Waste Regulations*, Washington (State) Administrative Code (WAC) 173-303, Washington State Department of Ecology, Olympia, Washington.

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LIST OF TERMS

CI	confidence interval
CPM	counts per minute
DP	differential pressure
DST	double-shell tank
DOE	U.S. Department of Energy
EC	evaporator/crystallizer
Ecology	Washington State Department of Ecology
EC%	percent equivalent concentration
EP	extraction procedure
EPA	U.S. Environmental Protection Agency
HEPA	high-efficiency particulate air (filter)
HH	halogenated hydrocarbons
HVAC	heating, ventilation, and air conditioning
MSDS	material safety data sheet
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
SARA	*Superfund Amendments and Reauthorization Act*
SSE	safe shutdown earthquake
TOC	total organic concentration
UBC	Uniform Building Code
WAC	Washington (State) Administrative Code

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242-A EVAPORATOR STEAM CONDENSATE STREAM-SPECIFIC REPORT

1.0 INTRODUCTION

1.1 BACKGROUND

In response to the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1989), comments were received from the public about reducing the discharge of liquid effluents into the soil column. As a result, the U.S. Department of Energy (DOE), with the concurrence of the Washington State Department of Ecology (Ecology) and the U.S. Environmental Protection Agency (EPA), committed to assess the contaminant migration potential of liquid discharges at the Hanford Site (Lawrence 1989).

This assessment is described in the *Draft Liquid Effluent Study Project Plan* (WHC 1989a), a portion of which characterizes 33 liquid effluent streams. This characterization consists of integrating the following elements, pursuant to the Washington (State) Administrative Code (WAC) 173-303 requirements (Ecology 1989): process data, sampling data, and dangerous waste regulations.

The results of the characterization study are documented in 33 separate reports, one report per wastestream. The complete list of stream-specific reports appears in Table 1-1. This document is one of the 33 reports.

1.2 APPROACH

This report characterizes the 200 East Area 242-A Evaporator Steam Condensate wastestream in sufficient detail so a wastestream designation, in accordance with WAC 173-303, can be proposed. This report also provides a means of assessing the relative effluent priorities with regard to the need for treatment and/or alternative disposal practices.

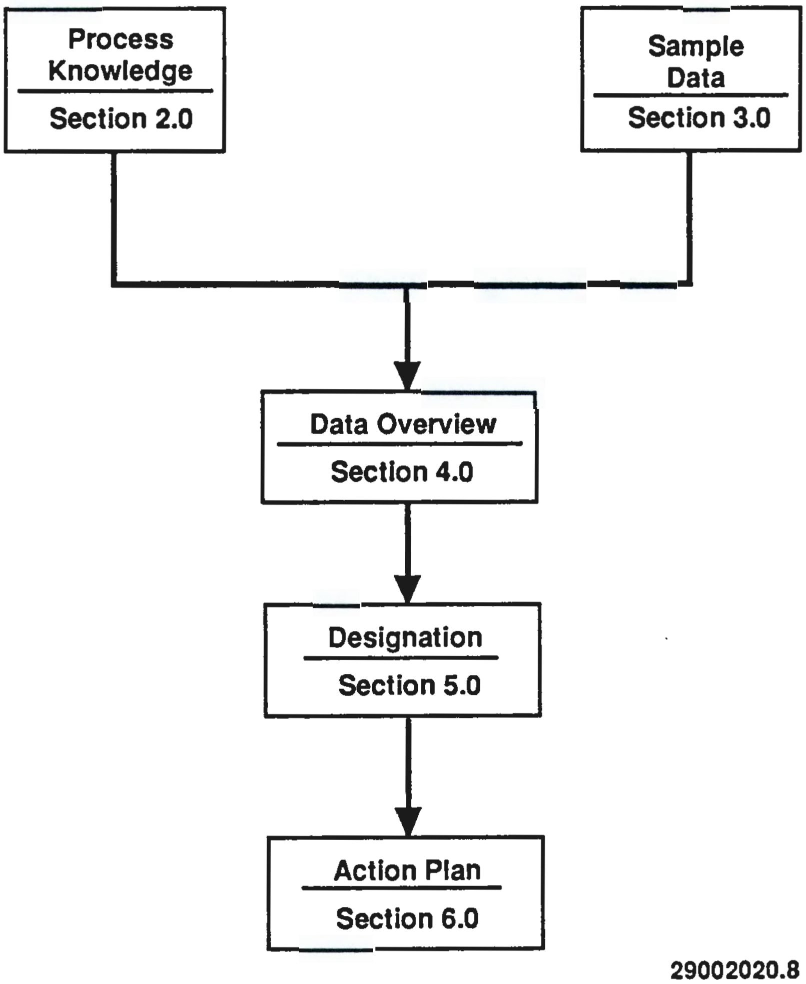
The characterization strategy undertaken in this report (shown in Figure 1-1) is implemented by means of the following steps:

1. Describe the current process based on the knowledge of the system and the chemical/radiological constituents that are known to be present. An historical perspective of the process configuration, along with future projects/upgrades, also has been presented so the reader can better understand the current status and current and future disposition of the effluent (Section 2.0).

Table 1-1. Stream-Specific Characterization Reports.

WHC-EP-0342	Addendum 1	300 Area Process Wastewater
WHC-EP-0342	Addendum 2	PUREX Plant Chemical Sewer
WHC-EP-0342	Addendum 3	N Reactor Effluent
WHC-EP-0342	Addendum 4	163N Demineralization Plant Wastewater
WHC-EP-0342	Addendum 5	PUREX Plant Steam Condensate
WHC-EP-0342	Addendum 6	B Plant Chemical Sewer
WHC-EP-0342	Addendum 7	UO_3/U Plant Wastewater
WHC-EP-0342	Addendum 8	Plutonium Finishing Plant Wastewater
WHC-EP-0342	Addendum 9	S Plant Wastewater
WHC-EP-0342	Addendum 10	T Plant Wastewater
WHC-EP-0342	Addendum 11	2724-W Laundry Wastewater
WHC-EP-0342	Addendum 12	PUREX Plant Process Condensate
WHC-EP-0342	Addendum 13	222-S Laboratory Wastewater
WHC-EP-0342	Addendum 14	PUREX Plant Ammonia Scrubber Condensate
WHC-EP-0342	Addendum 15	242-A Evaporator Process Condensate
WHC-EP-0342	Addendum 16	B Plant Steam Condensate
WHC-EP-0342	Addendum 17	B Plant Process Condensate
WHC-EP-0342	Addendum 18	2101-M Laboratory Wastewater
WHC-EP-0342	Addendum 19	UO_3 Plant Process Condensate
WHC-EP-0342	Addendum 20	PUREX Plant Cooling Water
WHC-EP-0342	Addendum 21	242-A Evaporator Cooling Water
WHC-EP-0342	Addendum 22	B Plant Cooling Water
WHC-EP-0342	Addendum 23	241-A Tank Farm Cooling Water
WHC-EP-0342	Addendum 24	284-E Powerplant Wastewater
WHC-EP-0342	Addendum 25	244-AR Vault Cooling Water
WHC-EP-0342	Addendum 26	242-A Evaporator Steam Condensate
WHC-EP-0342	Addendum 27	284-W Powerplant Wastewater
WHC-EP-0342	Addendum 28	400 Area Secondary Cooling Water
WHC-EP-0342	Addendum 29	242-S Evaporator Steam Condensate
WHC-EP-0342	Addendum 30	241-AY/AZ Tank Farms Steam Condensate
WHC-EP-0342	Addendum 31	209-E Laboratory Reflector Water
WHC-EP-0342	Addendum 32	T Plant Laboratory Wastewater
WHC-EP-0342	Addendum 33	183-D Filter Backwash Wastewater

Figure 1-1. Characterization Strategy.



2. Characterize the wastestream by presenting chemical and radioactive analytical results from samples taken over time in the wastestream (Section 3.0).

3. Compare characterization data obtained through both process knowledge and sampling data. Provide an estimate of stream loadings for radionuclides and chemical constituents based on these factors (Section 4.0).

4. Utilize the process knowledge and sample data to propose a dangerous waste designation (Section 5.0).

5. Identify new tasks needed to further characterize the wastestream or to demonstrate continued compliance (Section 6.0).

1.3 SCOPE

This report is a characterization of the current 242-A Evaporator Steam Condensate effluents that enter the soil column at the 216-B-3 Pond. The report does not address any other wastestream leaving the 242-A Evaporator (e.g., solid, gaseous, or sanitary waste).

Historical changes, process campaign changes, and sampling data are considered only if relevant to the characterization of the wastestream as it presently exists. Future configuration and process modifications are addressed only if they will significantly alter the present effluent. Aerial views of the 242-A Evaporator and 216-B-3 Pond are shown in Figures 1-2 and 1-3, respectively.

Figure 1-2. Aerial View of the 242-A Evaporator.

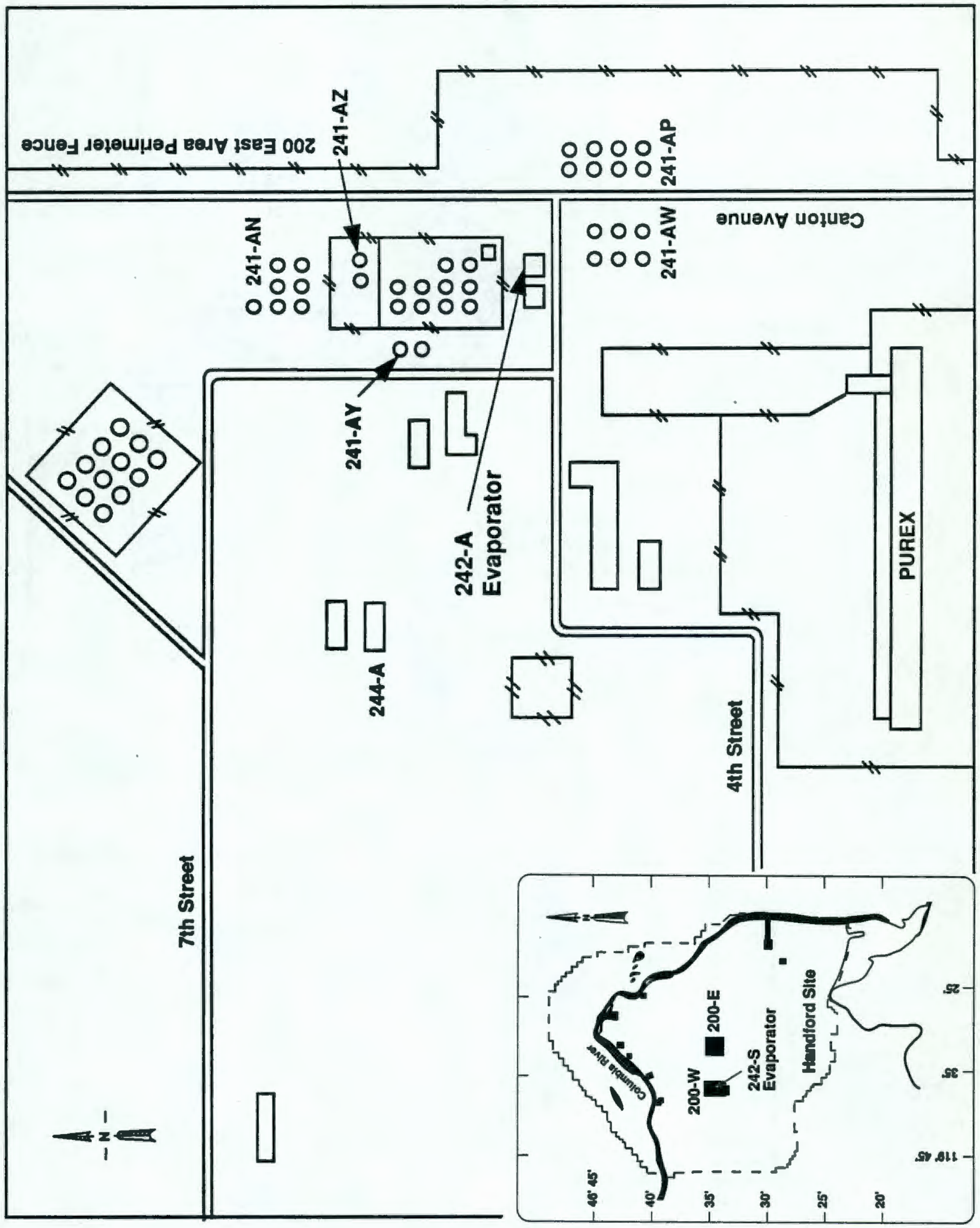
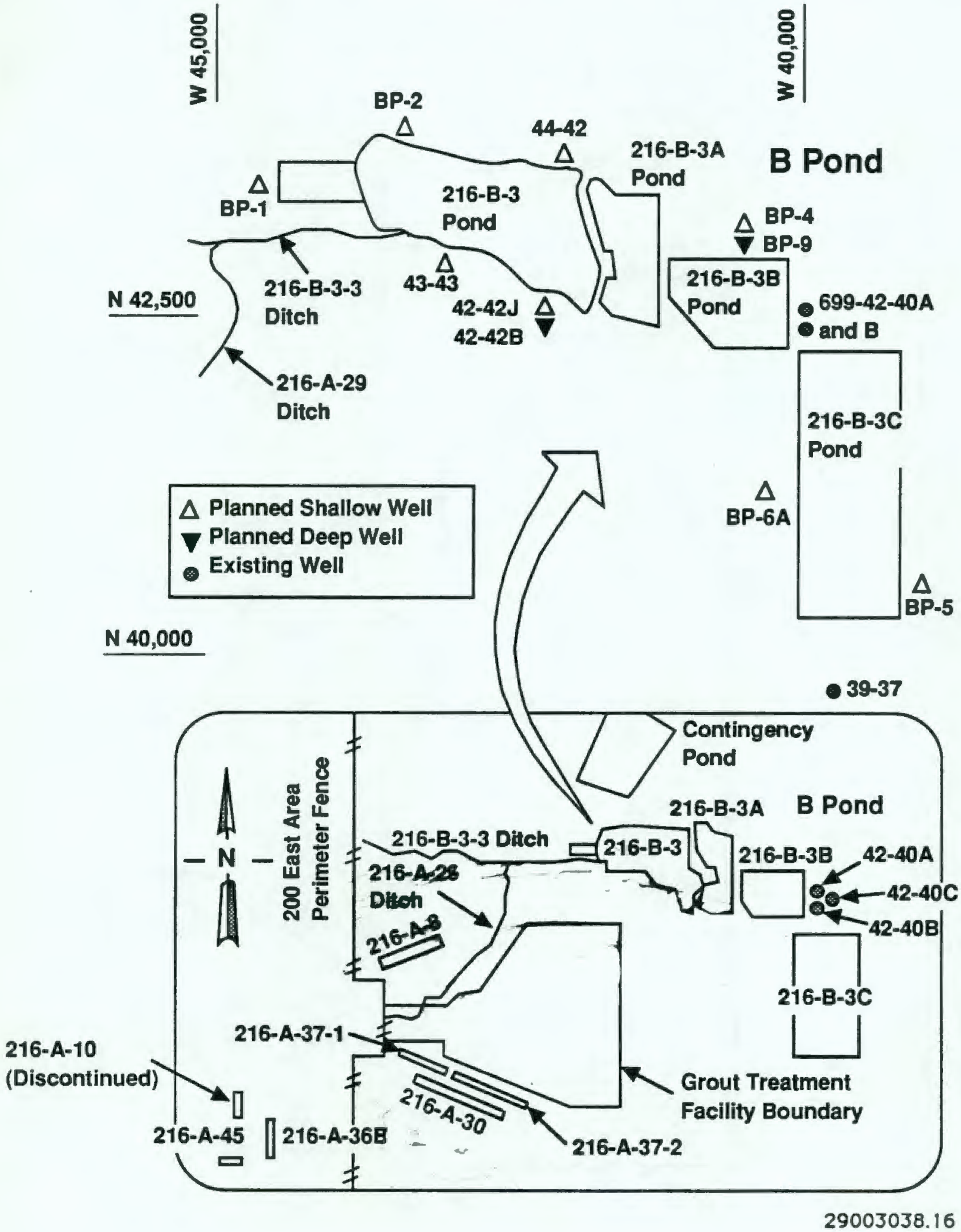


Figure 1-3. Aerial View of the 216-B-3 Pond.



2.0 PROCESS KNOWLEDGE

This section presents a qualitative and quantitative process knowledge characterization of the chemical and radiological constituents of the 200 East Area 242-A Evaporator Steam Condensate wastestream. The process knowledge is discussed in terms of the following factors:

1. Location and physical layout of the process facility
2. The identity of the wastestream contributors
3. A general description of the present, past, and future activities of the process
4. The identity of constituents that are known to be present in each of the contributors.

2.1 PHYSICAL LAYOUT

The 242-A Evaporator, which is located in the 200 East Area of the Hanford Site, started operation in 1977. The purpose of this facility is to reduce the volume of radioactive waste through evaporation and concentration. This process reduces the number of double-shell tanks (DST) required to store this type of waste by 35% to 60%. Upgrades are in progress that will ensure the safe and efficient operation of the evaporator through the year 2000.

The 242-A Building contains the evaporator vessel and supporting process equipment. The building ventilation exhaust fans and high-efficiency particulate air (HEPA) filter housing are located on the north side of the building. An emergency diesel generator is located on the south side of the building. Raw water, steam, and electrical power are provided to the 242-A Building from existing service facilities in the 200 East Area.

The principal process components of the evaporator-crystallizer (EC) system are located in the 242-A Building with supporting service and operating areas. The building comprises two adjoining but structurally independent structures, designated A and B. Structure A, which houses processing and service areas (evaporator room; heating, ventilation, and air conditioning [HVAC] room; etc.), is a reinforced concrete shear wall and slab structure, measuring 71 ft in height with horizontal dimensions of 25 ft by 22 ft. This structure is not accessible to personnel during radioactive solution processing and is constructed to withstand safe shutdown earthquake (SSE) ground motions in accordance with *Hanford Plant Standards* SDC-4.1 (DOE-RL 1990).

Structure B of the 242-A Building, separated from Structure A by a seismic joint, houses operating and personnel support areas (control room, lunchroom, etc.). The roof consists of metal decking supported by structural steel members spanning to reinforced concrete block walls. The foundations for Structure B are continuous strip footings. This structure measures 11 ft in height with approximate horizontal dimensions of 42 ft by 47 ft and is constructed in accordance with Uniform Building Code (UBC) requirements.

A new addition to Structure B was recently completed. This addition houses the new 242-A Control Room, which will be equipped with new process control equipment. This addition is 40 ft by 43 ft, with a height close to that of Structure B.

2.2 CONTRIBUTORS

The current process configuration for the 242-A Evaporator Steam Condensate wastestream includes the vacuum pump seal water as the only active contributor. The flowrate of this contributor (and the overall stream) is approximately 90 gal/h. The flowrate during sampling of this stream consisted of a flow of 22 gal/h which is used in Section 4.0 for stream deposition.

During active operations of the 242-A Evaporator there are additional contributors, as discussed in Section 2.3.2. These are not addressed here because the facility was shut down during this sampling campaign.

2.3 PROCESS DESCRIPTIONS

The 242-A Evaporator EC facility began operation in 1977. This facility is used to reduce the volume of radioactive liquid waste by evaporating water from the feed solution to produce a concentrated saltcake solution. The solution separates on cooling to form saltcake and residual liquor.

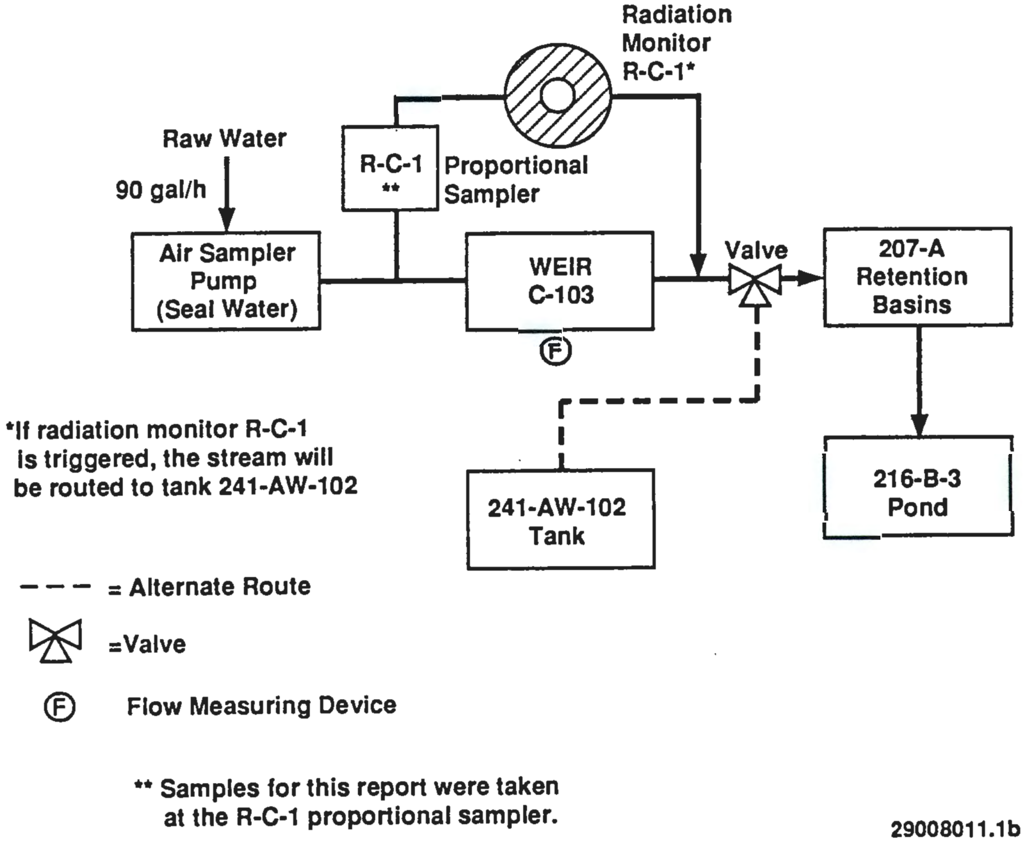
The 242-A Evaporator operated very successfully until it was shut down in March 1989. At that time the process condensate stream was determined to be a dangerous waste and discharge of the wastestream was halted. Modifications are currently in progress to allow for retention and treatment of the process condensate to allow restart of this facility. Upgrades are also in progress that will ensure the safe and efficient operation of the evaporator through the year 2000.

2.3.1 Present Activities

The current configuration of the 242-A Evaporator Steam Condensate wastestream is shown in Figure 2-1. The only active contributor to this wastestream is the air-sampler pump seal water. This contributor leads to an overall flow of approximately 90 gal/h.

The air-sampler pump draws air samples from various areas of the 242-A Evaporator facility to identify abnormal levels of airborne radioactive material. The rooms that air samples are currently withdrawn from include the evaporator room, ion exchange column room, pump room, loading dock room, and

Figure 2-1. 242-A Evaporator Steam Condensate Wastestream (Current Configuration).



the loadout and hot equipment storage room. The air line from each of these rooms has an in-line continuous air monitor that houses a beta-gamma radiation detector. When the detector indicates a predetermined level above background radiation levels, an alarm is activated. This alarm signals personnel that a radioactive airborne concern in the room.

Raw water is used in the air-sampler pump to maintain a positive water seal within the pump. The raw water is supplied from the Columbia River via the 200 East Area powerhouse. After leaving the vacuum pump, the water is deposited in a 500-gal flow measuring weir (TK-C-103), which signals a proportional sampler to take a sample after a certain volume of water has passed over it. From the flow measuring weir, the stream flows to a two-way diversion valve. This valve diverts stream flow to the 207-A retention basins during normal operations. The valve is also capable of diverting the flow to the 241-AW-102 DST in case of an upset condition.

A radiation monitor is in place as part of the R-C-1 sampling system (Figure 2-2). This detector is used to identify any potential leaks of radioactive material into the wastestream. If radiation is detected by this gamma monitor above a predetermined setpoint, then a signal is sent to the two-way diversion valve to divert the flow to the 241-AW-102 DST. This prevents discharge of the stream to the 207-A retention basins until the radiation contamination has been identified and the cause of the contamination corrected.

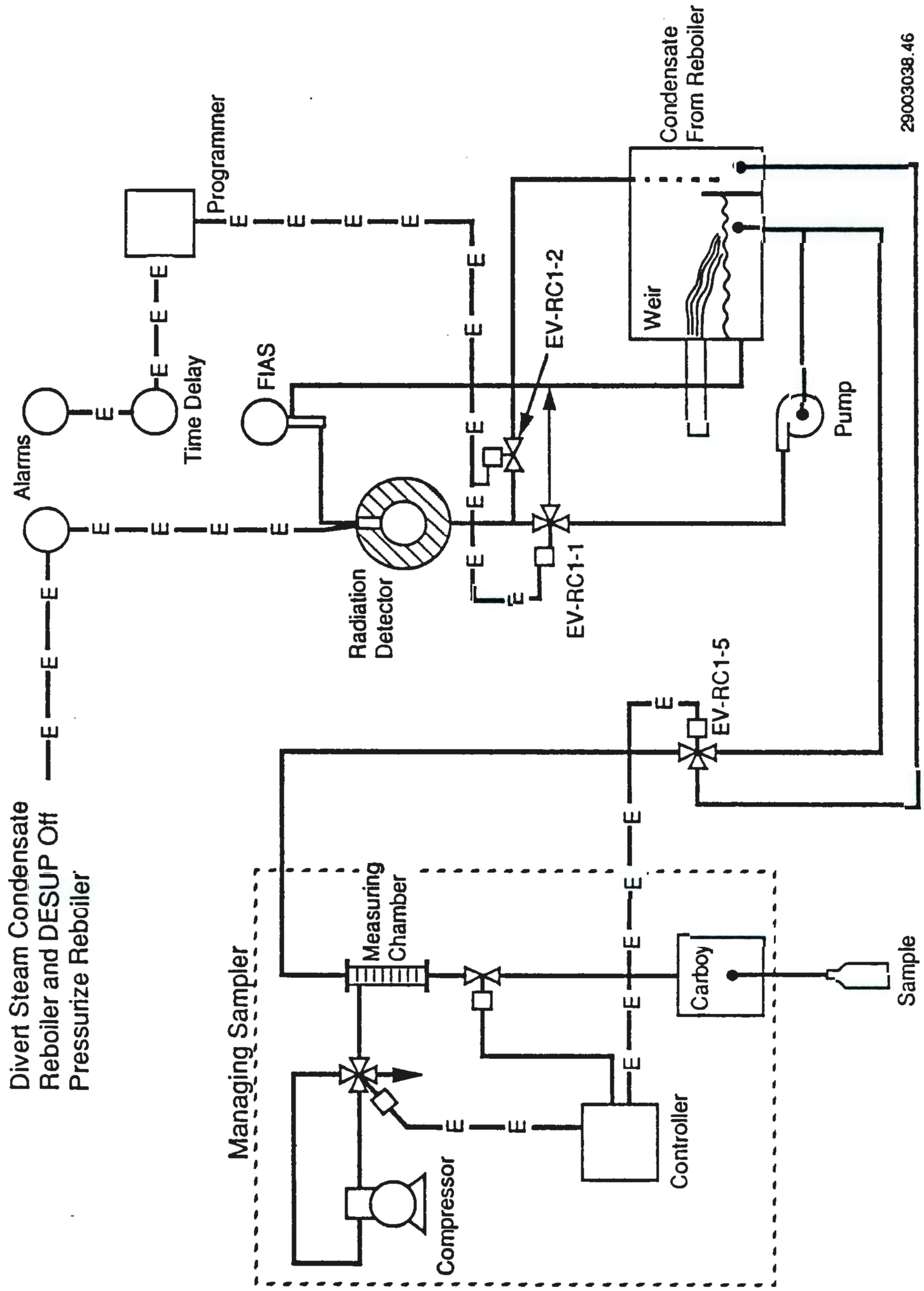
The steam condensate flows into one of the three cells at the 207-A retention basins until it has reached operational capacity. At that time the steam condensate flow is diverted to one of the two remaining cells. The cell that has reached capacity is then sampled. These samples are analyzed at the 222-S Laboratory for radionuclides as an indication of process control. The steam condensate from the full diversion basin is then discharged to the B-3-3 Pond (located northeast of the 200 East Area) if the analytical results are within set radionuclide limits.

2.3.2 Past Activities

The 242-A Evaporator Steam Condensate stream has 11 contributors during operation of the process. This stream results in a discharge of approximately 17 Mgal/yr to the 207-A retention basins and the 216-B-3 Pond. The past process configuration is shown in Figure 2-3 with the major contributors to the wastestream as described below.

1. **Reboiler Steam Condensate**--Steam is required for the evaporation process to heat the process fluids for evaporation and concentration. Steam pressure is reduced in several stages to the necessary pressure before it enters the 16-in.-dia feed line to the reboiler. The steam temperature is then lowered to ensure saturation by adding filtered raw water before the steam is used in the reboiler. After passing through the reboiler, the steam condensate is discharged past an inline radiation monitor at the flow measuring

Figure 2-2. R-C-1 Sampling System.



9 1 1 2 0 4 7 0 5 2 4

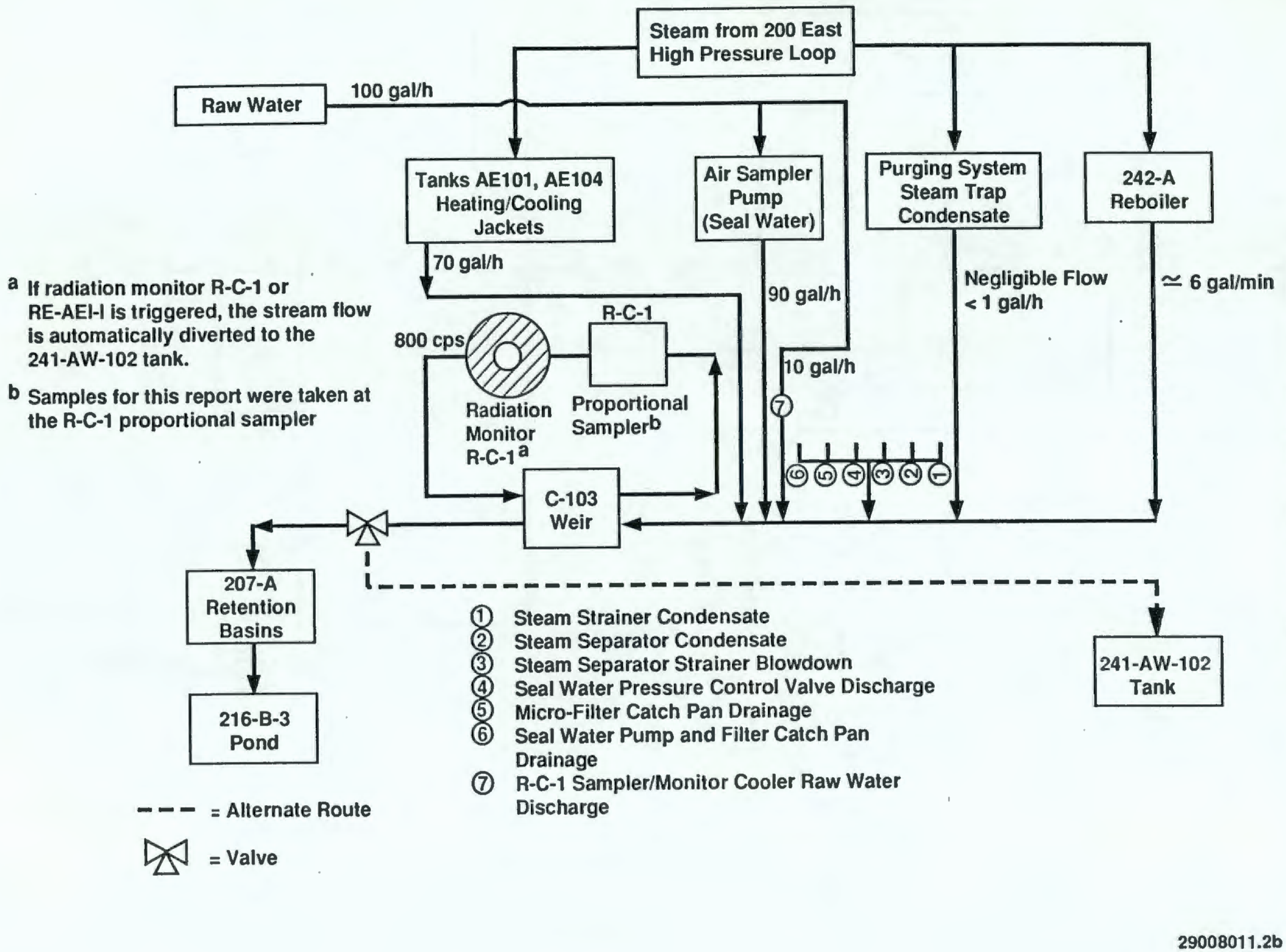


Figure 2-3. 242-A Evaporator Steam Condensate Wastestream (Past Configuration).

weir. A portion of the steam condensate is pumped from upstream of the weir through a proportional sampler and radiation monitor (R-C-1) and then returned to the steam condensate line downstream of the weir.

2. **Steam Condensate and Raw Water from Heating and Cooling Jackets**--Tanks AE-101 and AE-104 are equipped with jackets that allow the contents of the tanks to be maintained at desired temperatures. The flow out of these jackets is combined and discharged into the steam condensate effluent stream.

3. **Purging System Steam Trap Condensate**--A purging system is used to clear instrument piping needed to obtain specific gravity measurements of tank waste. The steam supply used for this system is equipped with a steam trap that drains into the steam condensate effluent stream.

4. **Vacuum Pump Seal Water**--The air-sampler pump configuration is similar to the system described in Section 2.3.1, with all air samples withdrawn from all necessary rooms in the facility.

5. **Steam Strainer Condensate**--Condensate from the steam strainers in the supply line to the steam ejector system drain into this wastestream. The steam ejectors are used to maintain a vacuum in the evaporator vessel. This condensate flows into a 2-in. drain funnel which drains into the main steam condensate line to Tank C-103.

6. **Steam Separator Condensate**--Condensate from the steam separator in the steam ejector system drains into this wastestream. This condensate flows into the same drain funnel discussed above.

7. **Steam Separator Strainer Blowdown**--Condensate from blowdowns of the steam separator strainer flows into this wastestream. This condensate flows into the same drain funnel discussed above.

8. **Seal Water Pressure Control Valve Discharge**--Seal water from the process pumps is bled into this wastestream when excessive pressure is present. If the seal water pressure exceeds 150 lb/in^2 (gauge), the seal water pressure control valve opens to bleed water to the wastestream. This valve remains open until the pressure is below 150 lb/in^2 (gauge). The discharge from this stream also flows into the drain funnel discussed above.

9. **Micro-filter Catch Pan Drainage**--Drainage from the micro-filters drains to a catch pan which in turn drains to the drain funnel discussed above. These micro-filters are required to filter raw water used in the deentrainer pad spray for the evaporator.

10. **Seal Water Pumps and Filter Catch Pan Drainage**--Leakage from the pump seal water system and drainage from the seal water pump filters drain into a catch pan. This then drains into the wastestream via the C-103 tank.

11. **R-C-1 Sampler/Monitor Cooler Raw Water Discharge**--Raw water used in the cooler for the R-C-1 sampler drains into the main condensate line to Tank C-103.

The 242-A Evaporator process did not involve the intentional addition of constituents to the steam condensate stream or to its contributors. Monitoring and sampling capabilities are the same as described in Section 2.3.1.

2.3.3 Future Activities

The evaporator is expected to be restarted at the end of calendar year 1990. The configuration of the steam condensate process will be identical to the past configuration.

2.4 PROCESS DATA

No chemicals are intentionally added to the 242-A Evaporator Steam Condensate system. Chemicals expected to be detected in the wastestream are those present in the raw water utilized by the air-sampler pump.

3.0 SAMPLE DATA

This section is intended to characterize the wastestream by presenting chemical and radioactive analytical results from samples taken over time. The discussion identifies the source of the sampling (Section 3.1) and addresses data presentation (Section 3.2).

3.1 DATA SOURCE

The chemical data used in this report were obtained from four samples taken during the October 30, 1989, to March 22, 1990 timeframe. The chemical data samples were taken at the R-C-1 sampling system in the 242-A Evaporator condenser room on October 30, 1989; January 30, 1990; February 9, 1990; and March 22, 1990. These samples were all taken with the evaporator shut down (Section 2.3.1). This is the current configuration for this wastestream and is, therefore, representative of the overall stream configuration.

The analysis of the samples was performed at the Contract Laboratory in Richland, Washington. Appendix A contains a complete listing of the analysis performed and data obtained from these sampling efforts. The EPA sampling and analytical protocols were followed in obtaining this chemical data about the steam condensate (EPA 1986).

Chemical data are also in existence for sampling conducted between August 29, 1985, and February 3, 1987. These data represent the configuration in which the 242-A Evaporator is operating (Section 2.3.2). The data from the earlier timeframe are not utilized for the designation purposes of this report. Both sets of data are presented in Appendix B in a combined tabular form for completeness of the report.

Process control sampling data are also available for the period from 1976 to 1988. The analysis of these samples was performed at the 222-S Laboratory and was intended for process control rather than environmental sampling. The designation process used in this report is based solely on the data presented in this section, which does not include the 222-S Laboratory data. The process control data were previously presented in the *Waste Stream Characterization Report* (WHC 1989) and are referenced here for completeness.

3.2 DATA PRESENTATION

A total of 20 chemical analytes were detected in quantities greater than the minimum detectable concentrations and are presented in Table 3-1. Additional analytes presented include alkalinity, alpha activity, beta activity, conductivity, ignitability, pH, reactivity cyanide, reactivity sulfide, total dissolved solids, temperature, total organic carbon, total organic halides, ^{60}Co, ^{90}Sr, ^{234}U, and ^{238}U.

Table 3-1. Statistics For the 242-A Evaporator Steam Condensate. (sheet 1 of 2)

Constituent	N	MDA	Method	Mean	StdErr	90%CILim	Maximum
Arsenic (EP Toxic)	4	4	n/a	<5.00E+02	0.00E+00	<5.00E+02	<5.00E+02
Barium	4	0	n/a	3.12E+01	8.54E-01	3.26E+01	3.30E+01
Barium (EP Toxic)	4	4	n/a	<1.00E+03	0.00E+00	<1.00E+03	<1.00E+03
Boron	4	1	DL	1.85E+01	2.90E+00	2.33E+01	2.30E+01
Cadmium (EP Toxic)	4	4	n/a	<1.00E+02	0.00E+00	<1.00E+02	<1.00E+02
Calcium	4	0	n/a	1.93E+04	6.41E+02	2.03E+04	2.07E+04
Chloride	4	0	n/a	1.10E+03	8.16E+01	1.23E+03	1.30E+03
Chromium (EP Toxic)	4	4	n/a	<5.00E+02	0.00E+00	<5.00E+02	<5.00E+02
Copper	4	1	DL	1.10E+01	7.07E-01	1.22E+01	1.30E+01
Fluoride	4	0	n/a	1.29E+02	1.49E+00	1.31E+02	1.32E+02
Iron	4	0	n/a	8.40E+01	4.24E+01	1.53E+02	2.11E+02
Lead	4	3	DL	5.50E+00	5.00E-01	6.32E+00	7.00E+00
Lead (EP Toxic)	4	4	n/a	<5.00E+02	0.00E+00	<5.00E+02	<5.00E+02
Magnesium	4	0	n/a	4.54E+03	6.05E+01	4.64E+03	4.71E+03
Manganese	4	3	DL	1.42E+01	9.25E+00	2.94E+01	4.20E+01
Mercury	4	3	DL	1.05E-01	5.00E-03	1.13E-01	1.20E-01
Mercury (EP Toxic)	4	4	n/a	<2.00E+01	0.00E+00	<2.00E+01	<2.00E+01
Nitrate	4	1	DL	5.50E+02	2.89E+01	5.97E+02	6.00E+02
Potassium	4	0	n/a	7.50E+02	2.61E+01	7.93E+02	8.27E+02
Selenium (EP Toxic)	4	4	n/a	<5.00E+02	0.00E+00	<5.00E+02	<5.00E+02
Silicon	4	0	n/a	2.50E+03	1.20E+02	2.70E+03	2.69E+03
Silver (EP Toxic)	4	4	n/a	<5.00E+02	0.00E+00	<5.00E+02	<5.00E+02
Sodium	4	0	n/a	2.20E+03	6.44E+01	2.31E+03	2.34E+03
Strontium	4	0	n/a	9.62E+01	2.02E+00	9.96E+01	1.02E+02
Sulfate	4	0	n/a	1.05E+04	1.19E+02	1.07E+04	1.08E+04
Uranium	2	0	n/a	5.20E-01	1.01E-01	8.31E-01	6.21E-01
Zinc	4	0	n/a	1.87E+01	5.95E+00	2.85E+01	2.90E+01
Ammonia	4	2	DL	6.30E+01	7.78E+00	7.57E+01	8.10E+01
Alkalinity (Method B)	4	0	n/a	6.22E+04	1.44E+03	6.46E+04	6.60E+04
Alpha Activity (pCi/L)	2	1	DL	6.46E-01	2.98E-01	1.56E+00	9.44E-01
Conductivity (µS)	4	0	n/a	1.65E+02	8.62E+00	1.79E+02	1.82E+02
Ignitability (°F)	4	0	n/a	2.07E+02	1.73E+00	2.04E+02	2.04E+02
pH (dimensionless)	4	0	n/a	8.04E+00	4.97E-02	8.12E+00	8.18E+00
Reactivity Cyanide (mg/kg)	4	4	n/a	<1.00E+02	0.00E+00	<1.00E+02	<1.00E+02
Reactivity Sulfide (mg/kg)	4	4	n/a	<1.00E+02	0.00E+00	<1.00E+02	<1.00E+02
TDS	4	0	n/a	7.60E+04	2.74E+03	8.05E+04	8.40E+04
Temperature (°C)	4	0	n/a	2.37E+01	1.81E+00	2.67E+01	2.88E+01
TOC	3	2	DL	1.10E+03	4.98E-05	1.10E+03	1.10E+03
Total Carbon	4	0	n/a	1.43E+04	6.52E+02	1.54E+04	1.61E+04
^{14}C (pCi/L)	2	0	n/a	4.04E+00	4.60E-01	5.46E+00	4.50E+00
^{90}Sr (pCi/L)	2	0	n/a	4.98E-01	1.90E-01	1.08E+00	6.88E-01
^{234}U (pCi/L)	2	0	n/a	1.92E-01	8.50E-03	2.19E-01	2.01E-01
^{238}U (pCi/L)	2	0	n/a	1.69E-01	8.50E-03	1.96E-01	1.78E-01

Table 3-1. Statistics For the 242-A Evaporator Steam Condensate.
(sheet 2 of 2)

NOTES:

Mean values, standard errors, confidence interval limits and maxima are in ppb (parts per billion) unless indicated otherwise.

The column headed MDA (Minimum Detectable Amount) is the number of results in each data set below the detection limit.

The column headed Method shows the MDA replacement method used: replacement by the detection limit (DL), replacement of single-valued MDAs by the log-normal plotting position method (LM), or replacement of multiple valued MDAs by the normal plotting position method (MR).

The column headed "90%CILim" (90% Confidence Interval Limit) is the lower limit of the one-tailed 90% confidence interval for all ignitability data sets and pH data sets with mean values below 7.25. For all other data sets it is the upper limit of the one-tailed 90% confidence interval.

The column headed "Maximum" is the minimum value in the data set for ignitability, the value furthest from 7.25 for pH, and the maximum value for all other analytes.

Table 3-1 is organized to provide the mean concentration, standard error, 90% confidence interval (90%CI), and maximum concentration encountered in any of the samples for each analyte.

4.0 DATA OVERVIEW

The purpose of this section is to compare the characterization data obtained through both process knowledge and sampling of the wastestream. This section will also provide an estimate of the stream loadings based on radionuclide and chemical constituents.

4.1 DATA COMPARISON

Process knowledge indicates that the steam condensate effluent should be similar to the raw water background because no chemicals are added to the stream. To confirm this, the sample data results were compared with the raw water background data mean. The 200 East Area raw waterstream data are presented in Appendix C.

To perform an adequate comparison, a ratio of the wastestream mean concentration and the raw water mean concentration has been utilized to determine analytes of interest. This comparison of the wastestream to the raw water is presented in Table 4-1. Three of the analytes (iron, manganese, and mercury) were shown to be present in concentrations significantly above that found in the raw water mean data.

Iron and manganese were found at concentrations approximately 1.32 and 1.45 times higher than those expected in raw water. Increases in these metallic compounds can be attributed to the corrosion of carbon steel materials. The carbon steel pipelines associated with this wastestream are composed mainly of iron but have been shown to contain up to 1.65% manganese (Jastrezbski 1976).

Mercury was identified in the wastestream and no background data are available for the 200 East Area raw water supply. No compounds are intentionally added to this wastestream that would lead to the presence of mercury in this wastestream. Section 5.0 will discuss the designation of the stream due to the presence of organic and inorganic constituents, including mercury.

Table 4-2 presents a comparison of average constituent concentrations to various screening criteria. These criteria are not used here for compliance purposes. Analytes presented in this table are those that have a derived concentration guide/maximum concentration level that were present in the wastestream.

4.2 STREAM DEPOSITION RATES

Table 4-3 has been included to provide deposition rates using the average data from Appendix A adjusted according to flow data from Section 2.0.

Table 4-1. Comparison of Chemical Sample Data to 200 East Area Raw Water. (ppb unless otherwise stated; ratios are dimensionless)

Analyte	Sampling (average)	Background (average)	Ratio[1]
Alpha activity (pCi/L)	0.44	1.0	0.44
Beta activity (pCi/L)	4.6	5.2	0.88
Aluminum*	180	BDL	n/a
Ammonium	76	BDL	n/a
Barium	16	27	0.6
Cadmium*	4	BDL	n/a
Calcium	9,600	19,000	0.5
Chloride*	770	830	0.9
Chromium*	14	BDL	n/a
Conductivity** (μS)	110	110	1.0
Copper	39	11	3.5
Iron	8,500	70	121.4
Lead (GFAA)	22	BDL	n/a
Magnesium	2,300	4,300	0.53
Manganese	25	9.0	2.8
Nickel*	14	BDL	n/a
Nitrate	720	1,000	0.72
pH**	6.1	7.1	0.86
Phenol*	35	BDL	n/a
Potassium	410	820	0.5
Sodium	1,300	2,100	0.62
Sulfate	5,400	11,000	0.49
Temperature (°C)	32	16	2.0
Total organic carbon	2,000	1,400	1.4
Uranium	0.55	0.73	0.75
Zinc	55	21	2.6

[1]Ratio is sampling average/background average

*Result is not an average; analyte was detected in only one sample from the 242-A Evaporator steam condensate wastestream, with the result shown.

**Measurements taken in the field.

Table 4-2. Evaluation of 242-A Evaporator Steam Condensate.

Constituent	Result[a]	SV1[b]	SV2[c]
Barium	3.1E-02	5.0E+00 g	
Chloride	1.1E+00	2.5E+02 h	
Copper	1.1E-02	1.0E+00 h	
Fluoride	1.3E-01	2.0E+00 g	
Iron	8.4E-02	3.0E-01 h	
Lead	5.5E-03	5.0E-02 g	
Manganese	1.4E-02	5.0E-02 h	
Mercury	1.1E-04	2.0E-03 g	
Nitrate	5.5E-01	4.5E+01 e	
Sulfate	1.0E+01	2.5E+02 h	
Zinc	1.9E-02	5.0E+00 h	
Alpha Activity (pCi/L)[n]	6.5E-01	1.5E+01 g	3.0E+01
^{14}C (pCi/L)	4.0E+00	3.0E+03 e	7.0E+04
^{90}Sr (pCi/L)	5.0E-01	5.0E+01 e	1.0E+03
^{234}U (pCi/L)	1.9E-01		5.0E+02
^{238}U (pCi/L)	1.7E-01		6.0E+02
TDS	7.6E+01	5.0E+02 h	

NOTES:

[a]Units of results are mg/L unless indicated otherwise. The results are the mean values reported in the Statistics table of Section 3.0.

[b]Screening Value 1 (SV1) lists the value first, basis second and an asterisk (*) third if the result exceeds the regulatory value. The basis is the proposed primary MCL (e), the proposed secondary MCL (f), the primary MCL (g), or the secondary MCL (h). The value is the smaller of two MCLs: the proposed primary MCL (or the primary MCL as a default) or the proposed secondary MCL (or the secondary MCL as a default). See WHC-EP-0342, "Hanford Site Stream-Specific Reports", August 1990.

[c]Screening Value 2 (SV2) lists the value first and an asterisk (*) second if the result exceeds the SV2). These values are derived concentration guides obtained from Appendix A of WHC-CM-7-5, "Environmental Compliance Manual", Revision 1, January 1990.

[n]The SV1 and SV2 values for Gross Alpha are used to evaluate Alpha Activity.

Table 4-3. Deposition Rate for 242-A Evaporator Steam Condensate Flowrate: 6.31 E+04 L/mo.

Constituent	Kg/L*	Kg/mo*
Barium	3.12E-08	1.97E-03
Boron	1.85E-08	1.17E-03
Calcium	1.93E-05	1.22E+00
Chloride	1.10E-06	6.94E-02
Copper	1.10E-08	6.94E-04
Fluoride	1.29E-07	8.14E-03
Iron	8.40E-08	5.30E-03
Lead	5.50E-09	3.47E-04
Magnesium	4.54E-06	2.87E-01
Manganese	1.42E-08	8.96E-04
Mercury	1.05E-10	6.63E-06
Nitrate	5.50E-07	3.47E-02
Potassium	7.50E-07	4.73E-02
Silicon	2.50E-06	1.58E-01
Sodium	2.20E-06	1.39E-01
Strontium	9.62E-08	6.07E-03
Sulfate	1.05E-05	6.63E-01
Uranium	5.20E-10	3.28E-05
Zinc	1.87E-08	1.18E-03
Ammonia	6.30E-08	3.98E-03
Alpha Activity *	6.46E-13	4.08E-08
TDS	7.60E-05	4.80E+00
TOC	1.10E-06	6.94E-02
Total Carbon	1.43E-05	9.02E-01
^{14}C *	4.04E-12	2.55E-07
^{90}Sr *	4.98E-13	3.14E-08
^{234}U *	1.92E-13	1.21E-08
^{238}U *	1.69E-13	1.07E-08

NOTES:

Data collected from October 1989 through March 1990.

Flow rate is the average of rates from Section 2.0.

Constituent concentrations are average values from the Statistics Report in Section 3.0.

Concentration units of flagged (*) constituents are reported as curies per liter.

Deposition rate units of flagged (*) constituents are reported as curies per month.

7.0 REFERENCES

APHA, 1985, *Standard Methods for the Examination of Water and Wastewater*, Sixteenth Edition, American Public Health Association, American Water Works Association and Water Pollution Control Federal, Washington, D.C.

ASTM, 1986, *1986 Book of ASTM Standards*, American Society of Testing and Materials, Philadelphia, Pennsylvania.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, Public Law 96-510, 94 Stat. 2767, 42 USC 9601 et seq.

DOE, 1988, *General Environmental Protection Program*, DOE Order 5400.1, U.S. Department of Energy, Washington, D.C.

DOE-RL, 1990, *Hanford Plant Standards (HPS) Program*, DOE-RL Order 6430.1C, SDC-4.1, U.S. Department of Energy-Richland Operations Office, Richland, Washington.

Ecology, 1989, *Dangerous Waste Regulations*, Washington (State) Administrative Code WAC 173-303, Washington State Department of Ecology, Olympia, Washington.

Ecology, EPA and DOE, 1989, *Hanford Federal Facility Agreement and Consent Order*, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

EPA, 1986, *Test Methods for Evaluating Solid Wastes*, SW-846, Third Edition, U.S. Environmental Protection Agency, Washington, D.C.

Jastrezbski, 1976, 1990, *Wastestream Designation of Liquid Effluent Analytical Data*, WHC-EP-0334, Westinghouse Hanford Company, Richland, Washington.

Jungfleisch, F. M., 1988, *Preliminary Evaluation of Hanford Liquid Discharge to Ground*, WHC-EP-0052, Westinghouse Hanford Company, Richland, Washington.

Lawrence, M. J., 1989, *Liquid Effluent Study*, (External Letter 8902106 to C. Gregoire, Washington State Department of Ecology; and R. Russell, U.S. Environmental Protection Agency, May 13, 1989), U.S. Department of Energy-Richland Operations Office, Richland, Washington.

Somers, S., 1989, *Hanford Sanitary Water Quality Surveillance, CY 1988*, HEHF-74, Hanford Environmental Health Foundation, Richland, Washington.

Somers, S., 1988, *Hanford Sanitary Water Quality Surveillance, CY 1987*, HEHF-71, Hanford Environmental Health Foundation, Richland, Washington.

Somers, S., 1987, *Hanford Sanitary Water Quality Surveillance, CY 1986*, HEHF-59, Hanford Environmental Health Foundation, Richland, Washington.

Somers, S., 1986, *Hanford Sanitary Water Quality Surveillance, CY 1985*, HEHF-55, Hanford Environmental Health Foundation, Richland, Washington.

Thurman, P. A., 1990, *Hanford Sanitary Water Quality Surveillance, CY 1989*, HEHF-76, Hanford Environmental Health Foundation, Richland, Washington.

WHC, 1990a, *Wastestream Designation of Liquid Effluent Analytical Data*, WHC-EP-0334, Westinghouse Hanford Company, Richland, Washington.

WHC, 1990b, *Liquid Effluent Study Project Plan*, WHC-EP-0275, Rev 2, Westinghouse Hanford Company, Richland, Washington.

WHC, 1989, *Waste Stream Characterization Report*, WHC-EP-0287, Vols 1-4, Westinghouse Hanford Company, Richland, Washington.

WHC, 1988, *Preliminary Evaluation of Hanford Liquid Discharges to the Ground*, WHC-EP-0052, Westinghouse Hanford Company, Richland, Washington.

5.0 DESIGNATION

The purpose of this section is to utilize process knowledge and sampling data to propose a designation of the wastestream in accordance with the requirements of WAC 173-303 (Ecology 1989).

The evaluation of the 242-A Evaporator Steam Condensate wastestream performed to compose this report indicates that the wastestream should not be designated as a dangerous waste. This procedure is shown in Figure 5-1. This proposed designation uses data from both the process knowledge and sampling data (Sections 2.0 through 4.0) and complies with the designation requirements of WAC 173-303-070.

- Dangerous Waste Lists (WAC 173-303-080)
- Dangerous Waste Criteria (WAC 173-303-100)
- Dangerous Waste Characteristics (WAC 173-303-090).

The proposed designation is based on the sample data collected between October 30, 1989, and March 22, 1990.

5.1 DANGEROUS WASTE LISTS

A waste is considered a listed dangerous waste if it either contains a discarded chemical product (WAC 173-303-081) or originates from a dangerous waste source (in accordance with WAC 173-303-082). The proposed designation was based on a combination of process knowledge and sampling data.

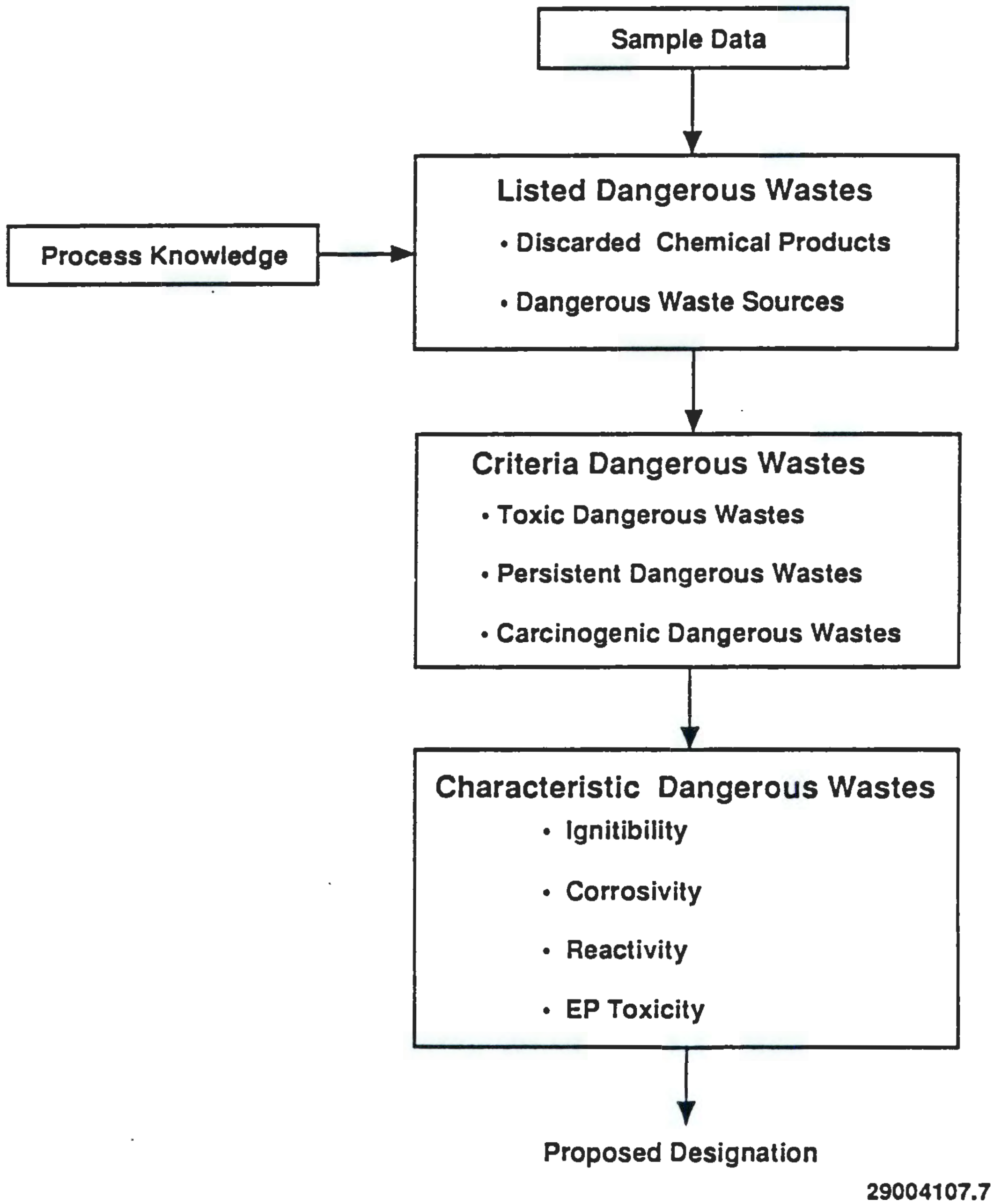
5.1.1 Discarded Chemical Products

A wastestream constituent is a discarded chemical product (WAC 173-303-081) if it is listed in WAC 173-303-9903 and is characterized by one or more of the following descriptions.

- The listed constituent is the sole active ingredient in a commercial chemical product that has been discarded. Commercial chemical products which, as purchased, contained two or more active ingredients were not designated as discarded chemical products. Products which contained nonactive components such as water, however, were designated if the sole active ingredient in the mixture was listed in WAC 173-303-9903.

- The constituent results from a spill of unused commercial chemical products. (A spill of a discarded chemical product would cause a wastestream to be designated during the time that the discharge is occurring. The approach taken is that the current wastestream would not be designated unless a review of past spill events

Figure 5-1. Designation Procedure.



indicates that the spills are predictable, systematic events that are ongoing or are reasonably anticipated to occur in the future. In this report, the evaluation of this criterion is based on a review of spill data in accordance with the *Comprehensive Environmental Response, Compensation, and Liability Act*.)

- The constituent is discarded in the form of a residue resulting from cleanup of a spill of an unused chemical on the discarded chemical products list. (A chemical product that is used in a process and then released to a wastestream is not a discarded chemical product. Off-specification, unused chemicals, and chemicals that have exceeded a shelf life but have not been used are considered discarded chemical products.)

5.1.2 Dangerous Waste Sources

A list of dangerous waste sources is contained in WAC 173-303-9904, pursuant to WAC 173-303-082. There are three major categories of sources in WAC 173-303-9904. The first is nonspecific sources from routine maintenance operations occurring at many industries. The second is specific sources (e.g., wastes from ink formulation, etc.). The third is a state source which is limited to polychlorinated biphenyl (PCB) contaminated transformers and capacitors, resulting from salvaging, rebuilding, or discarding activities.

5.2 LISTED WASTE DATA CONSIDERATIONS

The proposed designation of the wastestream described in this report is based on an evaluation of process and sampling data. The following sections describe the types of information used in this designation.

5.2.1 Process Evaluation

The process evaluation began with a thorough review of the processes contributing to the wastestream. Processes were reviewed and compared with the discarded chemical products list and the dangerous waste source list. This process evaluation is necessary because the stream could be a listed waste if a listed waste was known to have been added at any upstream location, even if a listed constituent was not detected at the sample point. The process evaluation included a review of the following information sources:

- Material Safety Data Sheets (MSDS)
- *Superfund Amendments and Reauthorization Act* (SARA) Title III Inventory reports
- Operating procedures

- Process chemical inventories
- Physical inspections, where possible.

If a listed chemical was identified, the specific use of the chemical was evaluated to determine if such use resulted in the generation of a listed waste.

5.2.2 Sampling Data

Sampling data were used as screening tools to enhance and support the results of the process evaluation. This screening compared the results of the sampling data with the WAC 173-303-9903 and -9904 lists. If a constituent was cited on one or both of these lists, an engineering evaluation was performed to determine if the constituent had entered the wastestream as a discarded chemical product or came from a dangerous waste source.

Screening organic constituents is a relatively simple procedure because analytical data for organic constituents are reported as substances and are easily compared to the WAC 173-303-9903 and -9904 lists. It is not as simple to screen inorganic analytical data because inorganic data are reported as ions or elements rather than as substances. For example, an analysis may show that a wastestream contains the cations sodium and calcium along with the anions chloride and nitrate. The possible combinations of substances include: sodium chloride, sodium nitrate, calcium chloride, and calcium nitrate. In a situation with many cations and anions, however, the list of possible combinations is extensive.

A procedure was developed by the Westinghouse Hanford Company for combining the inorganic constituents into substances. This screening procedure is described in WHC (1990) and is intended to be a tool in the evaluation of a wastestream. The listing of the inorganic substances developed by this screening procedure is not intended to be an indication that the substance was discharged to the wastestream, only that the necessary cations and anions are present and an investigation should be conducted to determine how they entered the wastestream.

5.3 PROPOSED LISTED WASTE DESIGNATIONS

A process evaluation, along with a review of sampling data, indicated that the 242-A Evaporator Steam Condensate stream did not contain a discarded chemical product or a listed waste source. The following sections discuss the evaluation that was conducted to substantiate this conclusion.

5.3.1 Discarded Chemical Products

As discussed in Section 5.2, a process evaluation of the contributor to the 242-A Evaporator Steam Condensate was conducted. This evaluation included a review of MSDSs at the plant and chemical inventories compiled for compliance with the SARA Title III requirements for possible listed waste contributors. Chemical products used at the facility are not sources of listed wastes because there is no access for waste addition to the stream via floor drains.

Two potential discarded chemical products were identified from sampling data (using the screening procedure described in Section 5.2) as shown in Table 5-1. They are hydrogen fluoride and mercury, which will be discussed in the following sections.

Based on the considerations and data presented in the previous sections, it is concluded that the wastestream does not contain any discarded chemical products.

5.3.1.1 Hydrogen Fluoride. A review of tank farms chemical inventory data did not show hydrogen fluoride to be present in any chemical compound used within tank farms.

Fluoride appeared in all four samples taken of the wastewater stream. The presence of the fluoride ion in the wastestream indicated that discarded hydrogen fluoride was a potential source of the fluoride. The actual compound hydrogen fluoride was not detected in the wastestream.

The concentration of fluoride in the four samples of the wastewater ranged from 125 to 132 ppb. The average concentration of fluoride in this wastestream was 154 ppb. The rejection criterion for fluoride based on sanitary water supplied to tank farms is 143 ppb as presented in Section 5.2. As the concentration of fluoride seen in all four samples is less than this rejection criterion, this constituent must be attributed to the incoming sanitary water supply. No fluoride or hydrogen fluoride is added to the wastestream as part of the current process configuration. The presence of the fluoride ion is certainly not the result of mixing with waste hydrogen fluoride, as none is utilized at the tank farms.

5.3.1.2 Mercury. Mercury was detected in one of four samples for this wastestream with a mean concentration of 0.105 ppb, as shown in Appendix A. This is only 0.005 ppb above the detection limit of 0.100 ppb and is within the standard error of 0.005 ppb. Mercury was also below the minimum detection level (50 ppb) in the extraction procedure (EP) toxicity test for all four samples.

Mercury is not utilized in the evaporator process and cannot be introduced inadvertently (via a floor drain) to this wastestream. The presence of mercury is attributed to statistical uncertainties. The presence of mercury is certainly not the result of discarded mercury entering the wastestream.

Table 5-1. Dangerous Waste Designation Report for the 242-A Evaporator Steam Condensate. (sheet 1 of 2)

Finding: Undesignated

Discarded Chemical Products - WAC 173-303-081

Substance	Review Number	Status	DW Number
Hydrogen fluoride	U134(DW)	Not Discarded	Undesignated
Mercury	U151(EHW)	Not Discarded	Undesignated

Dangerous Waste Sources - WAC 173-303-082

Substance	Review Number	Status	DW Number
None	None	Not applicable	None

Infectous Dangerous Waste - WAC 173-303-083

No regulatory guidance

Dangerous Waste Mixtures - WAC 173-303-084

Substance	Toxic EC%	Persistant HH%	Persistant PAH%	Carcinogenic Total%
Barium chloride	4.95E-09	0.00E+00	0.00E+00	0.00E+00
Calcium tetraborate	3.42E-09	0.00E+00	0.00E+00	0.00E+00
Copper(II) chloride	2.57E-07	0.00E+00	0.00E+00	0.00E+00
Iron(III) fluoride	3.10E-07	0.00E+00	0.00E+00	0.00E+00
Lead chloride	8.48E-09	0.00E+00	0.00E+00	0.00E+00
Magnesium chloride	5.35E-08	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	2.40E-08	0.00E+00	0.00E+00	0.00E+00
Magnesium sulfate	1.44E-07	0.00E+00	0.00E+00	0.00E+00
Mercury(II) chloride	1.53E-09	0.00E+00	0.00E+00	0.00E+00
Potassium fluoride	8.28E-08	0.00E+00	0.00E+00	0.00E+00
Sodium metasilicate	6.13E-08	0.00E+00	0.00E+00	0.00E+00
Uranyl nitrate	1.38E-09	0.00E+00	0.00E+00	0.00E+00
Zinc nitrate	8.26E-09	0.00E+00	0.00E+00	0.00E+00
Ammonia	7.57E-08	0.00E+00	0.00E+00	0.00E+00
Total	1.04E-06	0.00E+00	0.00E+00	0.00E+00
DW Number	Undesignated	Undesignated	Undesignated	Undesignated

Dangerous Waste Characteristics - WAC 173-303-090

Characteristic	Value	DW Number
Ignitability (Degrees F)	>204	Undesignated
Corrosivity-pH	8.12	Undesignated
Reactivity Cyanide (mg/kg)	<1.00E+02	Undesignated
Reactivity Sulfide (mg/kg)	<1.00E+02	Undesignated
EP Toxic Arsenic (mg/L)	<5.00E-01	Undesignated
EP Toxic Barium (mg/L)	<1.00E+00	Undesignated
EP Toxic Cadmium (mg/L)	<1.00E-01	Undesignated
EP Toxic Chromium (mg/L)	<5.00E-01	Undesignated
EP Toxic Lead (mg/L)	<5.00E-01	Undesignated
EP Toxic Mercury (mg/L)	<2.00E-02	Undesignated
EP Toxic Selenium (mg/L)	<5.00E-01	Undesignated
EP Toxic Silver (mg/L)	<5.00E-01	Undesignated

Table 5-1. Dangerous Waste Designation Report for the 242-A Evaporator Steam Condensate. (sheet 2 of 2)

Dangerous Waste Criteria - WAC 173-303-100

Substance	Toxic EC%	Persistant HH%	Persistant PAH%	Carcinogenic Total%	DW Number-Positive
Barium chloride	4.95E-09	0.00E+00	0.00E+00	0.00E+00	
Calcium tetraborate	3.42E-09	0.00E+00	0.00E+00	0.00E+00	
Copper(II) chloride	2.57E-07	0.00E+00	0.00E+00	0.00E+00	
Iron(III) fluoride	3.10E-07	0.00E+00	0.00E+00	0.00E+00	
Lead chloride	8.48E-09	0.00E+00	0.00E+00	0.00E+00	
Magnesium chloride	5.35E-08	0.00E+00	0.00E+00	0.00E+00	
Magnesium nitrate	2.40E-08	0.00E+00	0.00E+00	0.00E+00	
Magnesium sulfate	1.44E-07	0.00E+00	0.00E+00	0.00E+00	
Mercury(II) chloride	1.53E-09	0.00E+00	0.00E+00	0.00E+00	
Potassium fluoride	8.28E-08	0.00E+00	0.00E+00	0.00E+00	
Sodium metasilicate	6.13E-08	0.00E+00	0.00E+00	0.00E+00	
Uranyl nitrate	1.38E-09	0.00E+00	0.00E+00	0.00E+00	
Zinc nitrate	8.26E-09	0.00E+00	0.00E+00	0.00E+00	
Ammonia	7.57E-08	0.00E+00	0.00E+00	0.00E+00	
Total	1.04E-06	0.00E+00	0.00E+00	0.00E+00	
DW Number	Undesignated	Undesignated	Undesignated	Undesignated	

Dangerous Waste Constituents - WAC 173-303-9905

Substance
Hydrogen fluoride
Barium and compounds,NOS
Lead and compounds,NOS
Mercury and compounds,NOS

Substance names may include MB (monobasic), DB (dibasic), or TB (tribasic) to identify the equivalence of hydrogen ion that have been nutralized from polyprotic weak acids to form their conjugate bases.

Results based on a single datum are noted by an asterisk (*). Others are based on the lower limit of the one-tailed 90% confidence interval for pH data sets with mean values below 7.25 or by the upper limit of the one-tailed 90% confidence interval for all other data sets.

EP Toxic contaminants, ignitability, and reactivity are reported by standard methods when available. In the absence of EP Toxicity data, total contaminant concentrations are evaluated. In lieu of closed cup ignition results, ignitability is estimated from the sum of the contributions of all substances that are ignitable when pure. A waste is flagged as dangerous if sum of the ignitable substances exceeds one percent. Reactivity is by SW-846: 250 mg of cyanide as hydrogen cyanide per kg of waste or 500 mg of sulfide as hydrogen sulfide per kg of waste. Total cyanide and total sulfide are used in lieu of amenable cyanide and amenable sulfide.

Inorganic substances are fomulated and their possible concentrations calculated for designation purposes only. The actual existance in the waste of these substances is not implied and should not be infered.

5.3.2 Dangerous Waste Sources

The process evaluation (see Section 5.2) was also used to determine if the wastestream included any specific waste sources (K and W wastes) or any nonspecific waste sources (F wastes) in the WAC 173-303-9904.

Sampling data were utilized to enhance the process evaluation. No potential listed solvents were identified by the sampling data.

Consequently, this wastestream does not have a dangerous waste source.

5.4 DANGEROUS WASTE CRITERIA

A waste is considered a dangerous waste if it meets any of the following criteria categories (WAC 173-303-100): toxic dangerous waste, persistent dangerous waste, or carcinogenic dangerous waste. A description of the methods used to test the sampling data against the criteria is contained in WHC (1990). Summaries of the methods, along with the results, are contained in the following sections.

5.4.1 Toxic Dangerous Wastes

The procedure for determining if a wastestream is a toxic dangerous waste is below (WAC 173-303-101).

- Collect and analyze multiple samples from the wastestream.
- Calculate the upper limit of the one-sided 90% CI for each analyte in the wastestream.
- Formulate substances from the analytical data.
  NOTE: This step is only required for inorganic analytes since it is not possible to complete the evaluation based on the concentration of cations and anions. This methodology is based on an evaluation of the most toxic substances that can exist in an aqueous environment under normal temperatures and pressures (WHC 1990).
- Assign toxic categories to the neutral substances formulated for the wastestream.
- Calculate the contribution of each substance to the percent equivalent concentration (EC%).
- Calculate the EC% by summing the contributions of each substance.
- Designate the wastestream as a toxic dangerous waste if the EC% is greater than 0.001%, in accordance with WAC 173-303-9906.

Fourteen substances potentially present in the 242-A Evaporator Steam Condensate were determined to have toxic categories associated with them. These substances are listed in Table 5-1. The individual and sum EC% values for these substances are also listed in Table 5-1. The EC% is 1.04 E-06%, which is less than the designation limit of 1.0 E-03 (i.e., 0.001%). This wastestream is not a toxic dangerous waste.

5.4.2 Persistent Dangerous Wastes

The procedure for determining if a wastestream is a persistent dangerous waste is below (WAC 173-303-102).

- Collect multiple grab samples of the wastestream.
- Determine which substances in the wastestream are halogenated hydrocarbons (HH) and which are polycyclic aromatic hydrocarbons (PAH).
- Determine the upper limit of the one-sided 90% CI for the substances of interest.
- Calculate the weight percent (wt%) contributions of each HH and PAH separately.
- Sum the resulting HH% and PAH% separately.
- Designate the wastestream as persistent if the HH% concentration is greater than 0.01% or if the PAH% is greater than 1.0%, in accordance with WAC 173-303-9907.

No substances potentially present in the 242-A Evaporator Steam Condensate were determined to be HH and no chemical compounds were determined to be PAH. This wastestream is, therefore, not a persistent dangerous waste.

5.4.3 Carcinogenic Dangerous Wastes

The procedure for determining if a wastestream is a carcinogenic dangerous waste is below (WAC 173-303-103).

- Collect multiple grab samples of the wastestream.
- Determine the upper limit of the one-sided 90% CI for the substances of interest.

- Formulate substances from the analytical data. NOTE: This step is only required for inorganic analytes since it is not possible to complete the evaluation based on the concentration of cations and anions. This methodology is based on an evaluation of the most toxic compounds that can exist in an aqueous environment under normal temperatures and pressures (WHC 1990).

- Determine which substances in the wastestream are human or animal carcinogens according to the International Agency for Research on Cancer.

- Calculate the weight percent concentration for each carcinogen.

- Sum the resulting weight percent.

- Designate the wastestream as carcinogenic if any of the positive carcinogens are above 0.01% or if the total concentration for positive and suspected carcinogens is above 1.0%.

No substances potentially present in the 242-A Evaporator Steam Condensate stream were determined to be carcinogenic substances. This wastestream is, therefore, not a carcinogenic dangerous waste.

5.5 DANGEROUS WASTE CHARACTERISTICS

A waste is considered a dangerous waste if it is ignitable, corrosive, reactive, or EP toxic (WAC 173-303-090). A description of the methods used to evaluate the data in terms of these characteristics is contained in WHC (1990). Summaries of the methods, along with the results, are contained in the following sections.

5.5.1 Ignitability

As shown in Table 5-1, the flashpoint of this waste is above 204 °F. This is greater than the 140 °F at which wastes become regulated. Therefore, this stream is not an ignitable dangerous waste.

5.5.2 Corrosivity

A waste is a corrosive dangerous waste if the stream exhibited a pH of $\leq$2.0 or $\geq$12.5. The comparison to this characteristic was based on the lower limit of the 90% CI for a stream with a mean value of pH <7.25 and the upper limit of the one-sided 90% CI for a stream with a mean value of pH $\geq$7.25.

Because the mean value of the pH measurements for the 242-A Evaporator Steam Condensate is above 7.25, the upper limit 8.12 is used. The wastestream is not a corrosive dangerous waste (WAC 173-303-090(6)) based on this pH.

5.5.3 Reactivity

An aqueous waste is reactive if the waste contains an amount of cyanide or sulfide under conditions sufficient to threaten human health or the environment (WAC 173-303-090(7)). A recent revision to *Test Methods for Evaluating Solid Wastes* (SW-846) (EPA 1986) provides a more quantitative indicator level for cyanide and sulfide. It states that levels of (equivalent) HCN below 250 mg/kg or of (equivalent) H_2S below 500 mg/kg would not be considered reactive.

Both reactive cyanide and sulfide were below the minimum detectable amount (100 mg/kg) in all four of the samples taken for this wastestream. This wastestream is not a reactive dangerous waste.

5.5.4 Extraction Procedure Toxicity

A waste is an EP toxic dangerous waste if contaminant results from EP toxicity testing exceed the limits of WAC 173-303-090(8)(c). The EP toxicity tests detected no EP toxic metals above regulated limits, as shown in Table 5-1. This wastestream is not an EP toxic dangerous waste.

5.6 PROPOSED DESIGNATIONS

Because the 242-A Evaporator Steam Condensate wastestream does not contain any dangerous waste, as defined in WAC 173-303-070, it is proposed that the wastestream not be designated a dangerous waste.

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6.0 ACTION PLAN

This purpose of this section is to address recommendations for future waste characterization tasks for this wastestream. The final extent of and schedule for any recommended tasks are subject to negotiation between Ecology, the EPA, and DOE. An implementation schedule for the completion of these tasks will consider other compliance actions already underway as part of the Tri-Party Agreement (Ecology et al. 1989) and the availability of funding. All effluent monitoring and sampling will be conducted according to DOE Order 5400.1 (DOE 1988).

6.1 FUTURE SAMPLING

The sampling used in this report was performed during the recent sampling campaign of October 1989 to March 1990. This sampling covered the only current process configuration for this wastestream.

Current projections call for the 242-A Evaporator to restart in late calendar year 1990 in order to concentrate waste. Additional sampling of this stream upon restart of the 242-A Evaporator will be performed in accordance with the facility Waste Analysis Plan. This Waste Analysis Plan will be submitted as part of the 242-A Evaporator Part B Dangerous Waste Treatment, Storage, Disposal Permit Application.

6.2 TECHNICAL ISSUES

As described in Section 2.0, the effluent was sampled downstream of the only contributor that currently exists for this wastestream. This prevents the potential for dilution of the stream prior to the sampling point.

The samples collected at this point are considered to be representative of the types of constituents present in the contributing wastestream. As a result, the characterization data presented in this report are considered to be representative of the effluent stream.

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APPENDIX A

SAMPLING/ANALYTE INFORMATION

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Table A-1. 242-A Evaporator Steam Condensate Discharge.
October 1985 to September 1989
(thousands of gallons)

Month	Fiscal year				
	1985	1986	1987	1988	1989
October	961	998	2,344	403	1,392
November	1,514	2,131	2,912	464	1,537
December	1,211	2,671	1,395	535	2,033
January	2,505	1,866	84	336	1,335
February	857	719	2,371	569	1,243
March	365	1,928	225	1,793	1,520
April	1,801	842	227	1,464	60
May	1,727	2,676	183	1,800	20
June	2,951	1,744	1,287	1,328	38
July	2,142	621	1,910	1,589	0
August	1,861	280	2,563	1,846	0
September	2,384	607	1,367	1,623	66
Totals	20,279	17,082	16,867	13,750	9,244

Table A-1. Procedures for the 242-A Evaporator Steam Condensate Samples. (sheet 1 of 2)

LEAD#	50740	50907	50919	51087
CofC#	50740	50907	50919	51087
Alkalinity	X	X	X	X
Alpha counting	X			X
Ammonia	X	X	X	X
Arsenic	X	X	X	X
Atomic emission spectroscopy	X	X	X	X
Beta counting				X
Carbon-14	X			X
Conductivity-field	X	X	X	X
Curium isotopes	X			
Cyanide	X	X	X	X
Direct aqueous injection (GC)	X	X	X	X
Fluoride (LDL)	X	X	X	X
Gamma energy analysis	X			X
Hydrazine	X	X	X	X
Ion chromatography	X	X	X	X
Lead	X	X	X	X
Mercury	X	X	X	X
pH-field	X	X	X	X
Plutonium isotopes	X			X
Selenium	X	X	X	X
Semivolatile organics (GC/MS)	X	X	X	X
Strontium beta counting	X			X
Sulfide	X	X	X	X
Suspended solids	X	X	X	X
Temperature-field	X	X	X	X
Thallium	X	X	X	X
Total carbon	X	X	X	X
Total dissolved solids	X	X	X	X
Total organic carbon	X	X	X	X
Total organic halides (LDL)	X	X	X	X
Tritium	X			X
Uranium	X			X
Uranium isotopes	X			X
Volatile organics (GC/MS)	X	X	X	X
LEAD#	50740B	50907B	50919B	51087B
CofC#	50741	50908	50920	51088
Volatile organics (GC/MS)	X	X	X	X
LEAD#	50740T	50907T	50919T	51087T
CofC#	50742	50909	50921	51089
Volatile organics (GC/MS)	X	X	X	X

Table A-1. Procedures for the 242-A Evaporator Steam Condensate Samples. (sheet 2 of 2)

LEAD#	50740E	50907E	50919E	51087E
CofC#	50743	50910	50922	51090
Atomic emission spectroscopy	X	X	X	X
Ignitability	X	X	X	X
Mercury (mixed matrix)	X	X	X	X
Reactive cyanide	X	X	X	X
Reactive sulfide	X	X	X	X

NOTES:

Procedures that were performed for a given sample are identified by an "X". Procedure references appear with the data.

LEAD# is the Liquid Effluent Analytical Data number that appears in the data reports.

CofC# is the chain-of-custody number.

Abbreviations:

gas chromatography (GC)
low-detection limit (LDL)
mass spectrometry (MS)

Table A-2. Raw Analytical Data. (sheet 1 of 7)

Constituent	Sample #	Date	Method	Result
Arsenic (EP Toxic)	50740E	10/30/89	ICP	<5.00E+02
Arsenic (EP Toxic)	50907E	1/30/90	ICP	<5.00E+02
Arsenic (EP Toxic)	50919E	2/09/90	ICP	<5.00E+02
Arsenic (EP Toxic)	51087E	3/22/90	ICP	<5.00E+02
Barium	50740	10/30/89	ICP	3.30E+01
Barium	50907	1/30/90	ICP	3.20E+01
Barium	50919	2/09/90	ICP	3.10E+01
Barium	51087	3/22/90	ICP	2.90E+01
Barium (EP Toxic)	50740E	10/30/89	ICP	<1.00E+03
Barium (EP Toxic)	50907E	1/30/90	ICP	<1.00E+03
Barium (EP Toxic)	50919E	2/09/90	ICP	<1.00E+03
Barium (EP Toxic)	51087E	3/22/90	ICP	<1.00E+03
Boron	50740	10/30/89	ICP	2.30E+01
Boron	50907	1/30/90	ICP	<1.00E+01
Boron	50919	2/09/90	ICP	2.00E+01
Boron	51087	3/22/90	ICP	2.10E+01
Cadmium (EP Toxic)	50740E	10/30/89	ICP	<1.00E+02
Cadmium (EP Toxic)	50907E	1/30/90	ICP	<1.00E+02
Cadmium (EP Toxic)	50919E	2/09/90	ICP	<1.00E+02
Cadmium (EP Toxic)	51087E	3/22/90	ICP	<1.00E+02
Calcium	50740	10/30/89	ICP	1.87E+04
Calcium	50907	1/30/90	ICP	2.07E+04
Calcium	50919	2/09/90	ICP	1.99E+04
Calcium	51087	3/22/90	ICP	1.78E+04
Chloride	50740	10/30/89	IC	1.30E+03
Chloride	50907	1/30/90	IC	1.10E+03
Chloride	50919	2/09/90	IC	1.10E+03
Chloride	51087	3/22/90	IC	9.00E+02
Chromium (EP Toxic)	50740E	10/30/89	ICP	<5.00E+02
Chromium (EP Toxic)	50907E	1/30/90	ICP	<5.00E+02
Chromium (EP Toxic)	50919E	2/09/90	ICP	<5.00E+02
Chromium (EP Toxic)	51087E	3/22/90	ICP	<5.00E+02
Copper	50740	10/30/89	ICP	1.10E+01
Copper	50907	1/30/90	ICP	1.00E+01
Copper	50919	2/09/90	ICP	1.30E+01
Copper	51087	3/22/90	ICP	<1.00E+01
Fluoride	50740	10/30/89	IC	<5.00E+02
Fluoride	50740	10/30/89	ISE	1.32E+02
Fluoride	50907	1/30/90	IC	<5.00E+02
Fluoride	50907	1/30/90	ISE	1.28E+02
Fluoride	50919	2/09/90	IC	<5.00E+02
Fluoride	50919	2/09/90	ISE	1.30E+02
Fluoride	51087	3/22/90	IC	<5.00E+02
Fluoride	51087	3/22/90	ISE	1.25E+02
Iron	50740	10/30/89	ICP	2.11E+02
Iron	50907	1/30/90	ICP	4.90E+01

Table A-2. Raw Analytical Data. (sheet 2 of 7)

Constituent	Sample #	Date	Method	Result
Iron	50919	2/09/90	ICP	3.70E+01
Iron	51087	3/22/90	ICP	3.90E+01
Lead	50740	10/30/89	GFAA	7.00E+00
Lead	50907	1/30/90	GFAA	<5.00E+00
Lead	50919	2/09/90	GFAA	<5.00E+00
Lead	51087	3/22/90	GFAA	<5.00E+00
Lead (EP Toxic)	50740E	10/30/89	ICP	<5.00E+02
Lead (EP Toxic)	50907E	1/30/90	ICP	<5.00E+02
Lead (EP Toxic)	50919E	2/09/90	ICP	<5.00E+02
Lead (EP Toxic)	51087E	3/22/90	ICP	<5.00E+02
Magnesium	50740	10/30/89	ICP	4.43E+03
Magnesium	50907	1/30/90	ICP	4.71E+03
Magnesium	50919	2/09/90	ICP	4.52E+03
Magnesium	51087	3/22/90	ICP	4.49E+03
Manganese	50740	10/30/89	ICP	4.20E+01
Manganese	50907	1/30/90	ICP	<5.00E+00
Manganese	50919	2/09/90	ICP	<5.00E+00
Manganese	51087	3/22/90	ICP	<5.00E+00
Mercury	50740	10/30/89	CVAA	<1.00E-01
Mercury	50907	1/30/90	CVAA	<1.00E-01
Mercury	50919	2/09/90	CVAA	<1.00E-01
Mercury	51087	3/22/90	CVAA	1.20E-01
Mercury (EP Toxic)	50740E	10/30/89	CVAA/M	<2.00E+01
Mercury (EP Toxic)	50907E	1/30/90	CVAA/M	<2.00E+01
Mercury (EP Toxic)	50919E	2/09/90	CVAA/M	<2.00E+01
Mercury (EP Toxic)	51087E	3/22/90	CVAA/M	<2.00E+01
Nitrate	50740	10/30/89	IC	6.00E+02
Nitrate	50907	1/30/90	IC	6.00E+02
Nitrate	50919	2/09/90	IC	5.00E+02
Nitrate	51087	3/22/90	IC	<5.00E+02
Potassium	50740	10/30/89	ICP	8.27E+02
Potassium	50907	1/30/90	ICP	7.37E+02
Potassium	50919	2/09/90	ICP	7.11E+02
Potassium	51087	3/22/90	ICP	7.26E+02
Selenium (EP Toxic)	50740E	10/30/89	ICP	<5.00E+02
Selenium (EP Toxic)	50907E	1/30/90	ICP	<5.00E+02
Selenium (EP Toxic)	50919E	2/09/90	ICP	<5.00E+02
Selenium (EP Toxic)	51087E	3/22/90	ICP	<5.00E+02
Silicon	50740	10/30/89	ICP	2.69E+03
Silicon	50907	1/30/90	ICP	2.65E+03
Silicon	50919	2/09/90	ICP	2.50E+03
Silicon	51087	3/22/90	ICP	2.16E+03
Silver (EP Toxic)	50740E	10/30/89	ICP	<5.00E+02
Silver (EP Toxic)	50907E	1/30/90	ICP	<5.00E+02
Silver (EP Toxic)	50919E	2/09/90	ICP	<5.00E+02
Silver (EP Toxic)	51087E	3/22/90	ICP	<5.00E+02
Sodium	50740	10/30/89	ICP	2.34E+03

Table A-2. Raw Analytical Data. (sheet 3 of 7)

Constituent	Sample #	Date	Method	Result
Sodium	50907	1/30/90	ICP	2.22E+03
Sodium	50919	2/09/90	ICP	2.23E+03
Sodium	51087	3/22/90	ICP	2.03E+03
Strontium	50740	10/30/89	ICP	1.02E+02
Strontium	50907	1/30/90	ICP	9.30E+01
Strontium	50919	2/09/90	ICP	9.40E+01
Strontium	51087	3/22/90	ICP	9.60E+01
Sulfate	50740	10/30/89	IC	1.07E+04
Sulfate	50907	1/30/90	IC	1.04E+04
Sulfate	50919	2/09/90	IC	1.08E+04
Sulfate	51087	3/22/90	IC	1.03E+04
Uranium	50740	10/30/89	FLUOR	6.21E-01
Uranium	51087	3/22/90	FLUOR	4.19E-01
Zinc	50740	10/30/89	ICP	2.90E+01
Zinc	50907	1/30/90	ICP	1.00E+01
Zinc	50919	2/09/90	ICP	2.90E+01
Zinc	51087	3/22/90	ICP	7.00E+00
Ammonia	50740	10/30/89	ISE	7.10E+01
Ammonia	50907	1/30/90	ISE	<5.00E+01
Ammonia	50919	2/09/90	ISE	<5.00E+01
Ammonia	51087	3/22/90	ISE	8.10E+01
2-Butanone	50740	10/30/89	VOA	<1.00E+01
2-Butanone	50740B	10/30/89	VOA	<6.00E+00
2-Butanone	50740T	10/30/89	VOA	1.80E+01
2-Butanone	50907	1/30/90	VOA	<1.00E+01
2-Butanone	50907B	1/30/90	VOA	<6.00E+00
2-Butanone	50907T	1/30/90	VOA	<8.00E+00
2-Butanone	50919	2/09/90	VOA	<1.00E+01
2-Butanone	50919B	2/09/90	VOA	<5.00E+00
2-Butanone	50919T	2/09/90	VOA	<6.00E+00
2-Butanone	51087	3/22/90	VOA	<1.00E+01
2-Butanone	51087B	3/22/90	VOA	<1.00E+01
2-Butanone	51087T	3/22/90	VOA	<1.00E+01
Dichloromethane	50740	10/30/89	VOA	<5.00E+00
Dichloromethane	50740B	10/30/89	VOA	<3.00E+00
Dichloromethane	50740T	10/30/89	VOA	2.30E+01
Dichloromethane	50907	1/30/90	VOA	<5.00E+00
Dichloromethane	50907B	1/30/90	VOA	<4.00E+00
Dichloromethane	50907T	1/30/90	VOA	<4.00E+00
Dichloromethane	50919	2/09/90	VOA	<5.00E+00
Dichloromethane	50919B	2/09/90	VOA	<5.00E+00
Dichloromethane	50919T	2/09/90	VOA	<5.00E+00
Dichloromethane	51087	3/22/90	VOA	<5.00E+00
Dichloromethane	51087B	3/22/90	VOA	<5.00E+00
Dichloromethane	51087T	3/22/90	VOA	<5.00E+00
Tetrahydrofuran	50740	10/30/89	VOA	<1.00E+01
Tetrahydrofuran	50740B	10/30/89	VOA	1.70E+01

Table A-2. Raw Analytical Data. (sheet 4 of 7)

Constituent	Sample #	Date	Method	Result
Tetrahydrofuran	50740T	10/30/89	VOA	<1.00E+01
Tetrahydrofuran	50907	1/30/90	VOA	<1.00E+01
Tetrahydrofuran	50907B	1/30/90	VOA	<1.00E+01
Tetrahydrofuran	50907T	1/30/90	VOA	<8.00E+00
Tetrahydrofuran	50919	2/09/90	VOA	<1.00E+01
Tetrahydrofuran	50919B	2/09/90	VOA	<1.00E+01
Tetrahydrofuran	50919T	2/09/90	VOA	<1.00E+01
Tetrahydrofuran	51087	3/22/90	VOA	<1.00E+01
Tetrahydrofuran	51087B	3/22/90	VOA	<9.00E+00
Tetrahydrofuran	51087T	3/22/90	VOA	<6.00E+00
Alkalinity (Method B)	50740	10/30/89	TITRA	6.00E+04
Alkalinity (Method B)	50907	1/30/90	TITRA	6.60E+04
Alkalinity (Method B)	50919	2/09/90	TITRA	6.30E+04
Alkalinity (Method B)	51087	3/22/90	TITRA	6.00E+04
Alpha Activity (pCi/L)	50740	10/30/89	Alpha	<3.48E-01
Alpha Activity (pCi/L)	51087	3/22/90	Alpha	9.44E-01
Conductivity (μS)	50740	10/30/89	COND-Fld	1.48E+02
Conductivity (μS)	50907	1/30/90	COND-Fld	1.77E+02
Conductivity (μS)	50919	2/09/90	COND-Fld	1.82E+02
Conductivity (μS)	51087	3/22/90	COND-Fld	1.52E+02
Ignitability (°F)	50740E	10/30/89	IGNIT	2.10E+02
Ignitability (°F)	50907E	1/30/90	IGNIT	2.10E+02
Ignitability (°F)	50919E	2/09/90	IGNIT	2.04E+02
Ignitability (°F)	51087E	3/22/90	IGNIT	2.04E+02
pH (dimensionless)	50740	10/30/89	PH-Fld	7.98E+00
pH (dimensionless)	50907	1/30/90	PH-Fld	8.05E+00
pH (dimensionless)	50919	2/09/90	PH-Fld	7.96E+00
pH (dimensionless)	51087	3/22/90	PH-Fld	8.18E+00
Reactivity Cyanide (mg/kg)	50740E	10/30/89	DSPEC	<1.00E+02
Reactivity Cyanide (mg/kg)	50907E	1/30/90	DSPEC	<1.00E+02
Reactivity Cyanide (mg/kg)	50919E	2/09/90	DSPEC	<1.00E+02
Reactivity Cyanide (mg/kg)	51087E	3/22/90	DSPEC	<1.00E+02
Reactivity Sulfide (mg/kg)	50740E	10/30/89	DTITRA	<1.00E+02
Reactivity Sulfide (mg/kg)	50907E	1/30/90	DTITRA	<1.00E+02
Reactivity Sulfide (mg/kg)	50919E	2/09/90	DTITRA	<1.00E+02
Reactivity Sulfide (mg/kg)	51087E	3/22/90	DTITRA	<1.00E+02
TDS	50740	10/30/89	TDS	7.50E+04
TDS	50907	1/30/90	TDS	7.30E+04
TDS	50919	2/09/90	TDS	7.20E+04
TDS	51087	3/22/90	TDS	8.40E+04
Temperature (°C)	50740	10/30/89	TEMP-Fld	2.05E+01
Temperature (°C)	50907	1/30/90	TEMP-Fld	2.37E+01
Temperature (°C)	50919	2/09/90	TEMP-Fld	2.88E+01
Temperature (°C)	51087	3/22/90	TEMP-Fld	2.19E+01
TOC	50740	10/30/89	TOC	<1.70E+03
TOC	50907	1/30/90	TOC	<1.10E+03
TOC	50919	2/09/90	TOC	<1.10E+03

Table A-2. Raw Analytical Data. (sheet 5 of 7)

Constituent	Sample #	Date	Method	Result
TOC	51087	3/22/90	TOC	1.10E+03
Total Carbon	50740	10/30/89	TC	1.44E+04
Total Carbon	50907	1/30/90	TC	1.35E+04
Total Carbon	50919	2/09/90	TC	1.32E+04
Total Carbon	51087	3/22/90	TC	1.61E+04
^{14}C (pCi/L)	50740	10/30/89	LSC	4.50E+00
^{14}C (pCi/L)	51087	3/22/90	LSC	3.58E+00
^{90}Sr (pCi/L)	50740	10/30/89	Beta	3.08E-01
^{90}Sr (pCi/L)	51087	3/22/90	Beta	6.88E-01
^{234}U (pCi/L)	50740	10/30/89	AEA	2.01E-01
^{234}U (pCi/L)	51087	3/22/90	AEA	1.84E-01
^{238}U (pCi/L)	50740	10/30/89	AEA	1.61E-01
^{238}U (pCi/L)	51087	3/22/90	AEA	1.78E-01

The following table lists the methods that are coded in the method column.

Code	Analytical Method	Reference
ABN	Semivolatile Organics (GC/MS)	USEPA-8270
AEA	^{241}Am	UST-20Am01
AEA	Curium Isotopes	UST-20Am/Cm01
AEA	Plutonium Isotopes	UST-20Pu01
AEA	Uranium Isotopes	UST-20U01
ALPHA	Alpha Counting	EPA-680/4-75/1
ALPHA-Ra	Total Radium Alpha Counting	ASTM-D2460
BETA	Beta Counting	EPA-680/4-75/1
BETA	^{90}Sr	UST-20Sr02
COLIF	Coliform Bacteria	USEPA-9131
COLIFMF	Coliform Bacteria (Membrane Filter)	USEPA-9132
COND-Fld	Conductivity-Field	ASTM-D1125A
COND-Lab	Conductivity-Laboratory	ASTM-D1125A
CVAA	Mercury	USEPA-7470
CVAA/M	Mercury-Mixed Matrix	USEPA-7470
DIGC	Direct Aqueous Injection (GC)	UST-70DIGC
DIMS	Direct Aqueous Injection (GC/MS)	"USEPA-8240"
DSPEC	Reactive Cyanide (Distillation, Spectroscopy)	USEPA-CHAPTER 7
DTITRA	Reactive Sulfide (Distillation, Titration)	USEPA-CHAPTER 7
FLUOR	Uranium (Fluorometry)	ASTM-D2907-83
GEA	Gamma Energy Analysis Spectroscopy	ASTM-D3649-85
GFAA	Arsenic (AA, Furnace Technique)	USEPA-7060
GFAA	Lead (AA, Furnace Technique)	USEPA-7421
GFAA	Selenium (AA, Furnace Technique)	USEPA-7740
GFAA	Thallium (AA, Furnace Technique)	USEPA-7841
IC	Ion Chromatography	EPA-600/4-84-01
ICP	Atomic Emission Spectroscopy (ICP)	USEPA-6010
ICP/M	Atomic Emission Spectroscopy (ICP)-Mixed Matrix	USEPA-6010
IGNIT	Pensky-Martens Closed-Cup Ignitability	USEPA-1010

Table A-2. Raw Analytical Data. (sheet 6 of 7)

Code	Analytical Method	Reference
ISE	Fluoride-Low Detection Limit	ASTM-D1179-80-B
ISE	Ammonium Ion	ASTM-D1426-D
LALPHA	Alpha Activity-Low Detection Limit	EPA-680/4-75/1
LEPD	^{129}I	UST-20I02
LSC	^{14}C	UST-20C01
LSC	Tritium	UST-20H03
LTOX	Total Organic Halides-Low Detection Limit	USEPA-9020
PH-Fld	pH-Field	USEPA-9040
PH-Lab	pH-Laboratory	USEPA-9040
SPEC	Total and Amenable Cyanide (Spectroscopy)	USEPA-9010
SPEC	Hydrazine-Low Detection Limit (Spectroscopy)	ASTM-D1385
SSOLID	Suspended Solids	SM-208D
TC	Total Carbon	USEPA-9060
TDS	Total Dissolved Solids	SM-208B
TEMP-Fld	Temperature-Field	Local
TITRA	Alkalinity-Method B (Titration)	ASTM-D1067B
TITRA	Sulfides (Titration)	USEPA-9030
TOC	Total Organic Carbon	USEPA-9060
TOX	Total Organic Halides	USEPA-9020
VOA	Volatile Organics (GC/MS)	USEPA-8240

NOTES:

Sample # is the number of the sample. See Section 3.0 for corresponding chain-of-custody number.

Date is the sampling date.

Results are in ppb (parts per billion) unless otherwise indicated.

Analytical Method Acronyms:
- AA = atomic absorption spectroscopy.
- GC = gas chromatography.
- MS = mass spectrometry.
- ICP = inductively coupled plasma spectroscopy.

References:

ASTM--"1986 Annual Book of ASTM Standards", American Society for Testing and Materials, Philadelphia, Pennsylvania.

EPA--Various methods of the U.S. Environmental Protection Agency, Washington, D.C.

UST--Methods of the Contract Laboratory, Richland, Washington.

SM--"Standard Methods for the Examination of Water and Wastewater", 16th ed., American Public Health Association, American Water Works Association and Water Pollution Control Federation, Washington, D.C.

USEPA--"Test Methods for Evaluating Solid Waste Physical/Chemical Methods", 3rd ed., SW-846, U.S. Environmental Protection Agency, Washington, D.C.

Table A-3. Inorganic Chemistry Data. (sheet 1 of 2)

Constituent	ppb	Ion	Eq/g	Normalized
Charge normalization:				
Barium	3.26E+01	Ba+2	4.75E-10	
Boron	2.33E+01	B407-2	1.08E-09	3.50E-09
Calcium	2.03E+04	Ca+2	1.01E-06	
Chloride	1.23E+03	Cl-1	3.48E-08	1.13E-07
Copper	1.22E+01	Cu+2	3.83E-10	
Fluoride	1.31E+02	F-1	6.91E-09	2.25E-08
Iron	1.53E+02	Fe+3	8.24E-09	
Lead	6.32E+00	Pb+2	6.10E-11	
Magnesium	4.64E+03	Mg+2	3.82E-07	
Manganese	2.94E+01	Mn+2	1.07E-09	
Mercury	1.13E-01	Hg+2	1.13E-12	
Nitrate	5.97E+02	NO3-1	9.63E-09	3.14E-08
Potassium	7.93E+02	K+1	2.03E-08	
Silicon	2.70E+03	SiO3-2	1.92E-07	6.26E-07
Sodium	2.31E+03	Na+1	1.00E-07	
Strontium	9.96E+01	Sr+2	2.27E-09	
Sulfate	1.07E+04	SO4-2	2.24E-07	7.29E-07
Uranium	8.31E-01	UO2+2	6.98E-12	
Zinc	2.85E+01	Zn+2	8.72E-10	
Hydrogen Ion (from pH 8.1)		H+	(7.52E-12)	
Hydroxide Ion (from pH)		OH-	(1.33E-09)	
Cation total			1.53E-06	
Anion total			4.70E-07	
Anion normalization factor:	3.258			

Substance Formation:

Substance	%	Cation Out	Anion Out
Copper(II) chloride	2.57E-06	0.00E+00	1.13E-07
Mercury(II) chloride	1.53E-08	0.00E+00	1.13E-07
Uranyl nitrate	1.38E-07	0.00E+00	3.14E-08
Iron(III) fluoride	3.10E-05	0.00E+00	1.43E-08
Lead chloride	8.48E-07	0.00E+00	1.13E-07
Potassium fluoride	8.28E-05	6.03E-09	0.00E+00
Barium chloride	4.95E-06	0.00E+00	1.12E-07
Zinc nitrate	8.26E-06	0.00E+00	3.05E-08
Magnesium chloride	5.35E-04	2.69E-07	0.00E+00
Magnesium nitrate	2.40E-04	2.39E-07	0.00E+00
Calcium tetraborate	3.42E-05	1.01E-06	0.00E+00
Magnesium sulfate	1.44E-03	0.00E+00	4.90E-07
Sodium metasilicate	6.13E-04	0.00E+00	5.25E-07
Potassium metasilicate	4.65E-05	0.00E+00	5.19E-07
Manganese(II) metasilicate	7.01E-06	0.00E+00	5.18E-07
Strontium sulfate	2.09E-05	0.00E+00	4.88E-07
Calcium sulfate	3.32E-03	5.23E-07	0.00E+00

Table A-3. Inorganic Chemistry Data. (sheet 2 of 2)

NOTES:

Statistics based on a single datum are noted by an asterisk (*). With the exception of hydrogen ion and hydroxide, others report the upper limit of the one-tailed 90% confidence interval. Hydrogen ion is based on the lower limit of the one-tailed 90% confidence interval for pH sets with mean values below 7.25 and on the upper limit of the one-tailed 90% confidence interval for pH data sets with mean values of 7.25 or higher. The hydroxide magnitude is equal to 1.00E-20 equivalents per gram (Eq/g)**2 divided by the hydrogen ion value (in Eq/g).

Ion concentrations in Eq/g are based on the statistic. Conversions include scale (ppb to g/g), molecular weight (constituent form to ionic form), and equivalents (charges per ion). The column headed "Normalized" shows normalized concentrations (also in Eq/g) calculated by increasing concentrations of cations, excluding Hydrogen ion, or anions, excluding hydroxide, by the normalization factor. The normalization factor is the larger of the cation total, including Hydrogen ion, or anion total, including hydroxide, divided by the smaller total.

Substance names may include MB (monobasic), DB (dibasic), TB (tribasic) to identify the equivalents of hydrogen ion that have been neutralized from polycrotic weak acids to form their conjugate bases.

Substances are formulated in the order listed. The column headed "%" is the percent of the substance in the waste (gms/100gms). Substances formulated with oxygen are based on the residual concentration of the counterion. Other substance concentrations are based on the limiting residual concentration of the cation or anion. The columns headed "Cation Out" and "Anion Out" indicate the residual concentrations (in Eq/g) of each ion after a substance concentration has been calculated.

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APPENDIX B

CHEMICAL DATA

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Table B-1. Raw Analytical Data Including Data Prior to October 1989.
(sheet 1 of 10)

Constituent	Sample #	Date	Method	Result
Aluminum	50009	8/29/85	ICP	<1.50E+02
Aluminum	50073	6/24/86	ICP	<1.50E+02
Aluminum	50135	9/18/86	ICP	<1.50E+02
Aluminum	50172	11/07/86	ICP	<1.50E+02
Aluminum	50236	2/03/87	ICP	1.80E+02
Aluminum	50740	10/30/89	ICP	<1.50E+02
Aluminum	50907	1/30/90	ICP	<1.50E+02
Aluminum	50919	2/09/90	ICP	<1.50E+02
Aluminum	51087	3/22/90	ICP	<1.50E+02
Arsenic (EP Toxic)	50740E	10/30/89	ICP	<5.00E+02
Arsenic (EP Toxic)	50907E	1/30/90	ICP	<5.00E+02
Arsenic (EP Toxic)	50919E	2/09/90	ICP	<5.00E+02
Arsenic (EP Toxic)	51087E	3/22/90	ICP	<5.00E+02
Barium	50009	8/29/85	ICP	8.00E+00
Barium	50073	6/24/86	ICP	2.60E+01
Barium	50135	9/18/86	ICP	2.70E+01
Barium	50172	11/07/86	ICP	8.00E+00
Barium	50236	2/03/87	ICP	1.00E+01
Barium	50740	10/30/89	ICP	3.30E+01
Barium	50907	1/30/90	ICP	3.20E+01
Barium	50919	2/09/90	ICP	3.10E+01
Barium	51087	3/22/90	ICP	2.90E+01
Barium (EP Toxic)	50740E	10/30/89	ICP	<1.00E+03
Barium (EP Toxic)	50907E	1/30/90	ICP	<1.00E+03
Barium (EP Toxic)	50919E	2/09/90	ICP	<1.00E+03
Barium (EP Toxic)	51087E	3/22/90	ICP	<1.00E+03
Boron	50740	10/30/89	ICP	2.30E+01
Boron	50907	1/30/90	ICP	<1.00E+01
Boron	50919	2/09/90	ICP	2.00E+01
Boron	51087	3/22/90	ICP	2.10E+01
Cadmium	50009	8/29/85	ICP	4.00E+00
Cadmium	50073	6/24/86	ICP	<2.00E+00
Cadmium	50135	9/18/86	ICP	<2.00E+00
Cadmium	50172	11/07/86	ICP	<2.00E+00
Cadmium	50236	2/03/87	ICP	<2.00E+00
Cadmium	50740	10/30/89	ICP	<2.00E+00
Cadmium	50907	1/30/90	ICP	<2.00E+00
Cadmium	50919	2/09/90	ICP	<2.00E+00
Cadmium	51087	3/22/90	ICP	<2.00E+00
Cadmium (EP Toxic)	50740E	10/30/89	ICP	<1.00E+02
Cadmium (EP Toxic)	50907E	1/30/90	ICP	<1.00E+02
Cadmium (EP Toxic)	50919E	2/09/90	ICP	<1.00E+02
Cadmium (EP Toxic)	51087E	3/22/90	ICP	<1.00E+02
Calcium	50009	8/29/85	ICP	3.13E+03
Calcium	50073	6/24/86	ICP	1.60E+04
Calcium	50135	9/18/86	ICP	1.79E+04

Table B-1. Raw Analytical Data Including Data Prior to October 1989.
(sheet 2 of 10)

Constituent	Sample #	Date	Method	Result
Calcium	50172	11/07/86	ICP	6.04E+03
Calcium	50236	2/03/87	ICP	5.09E+03
Calcium	50740	10/30/89	ICP	1.87E+04
Calcium	50907	1/30/90	ICP	2.07E+04
Calcium	50919	2/09/90	ICP	1.99E+04
Calcium	51087	3/22/90	ICP	1.78E+04
Chloride	50009	8/29/85	IC	<5.00E+02
Chloride	50073	6/24/86	IC	<5.00E+02
Chloride	50135	9/18/86	IC	7.66E+02
Chloride	50172	11/07/86	IC	<5.00E+02
Chloride	50236	2/03/87	IC	<5.00E+02
Chloride	50740	10/30/89	IC	1.30E+03
Chloride	50907	1/30/90	IC	1.10E+03
Chloride	50919	2/09/90	IC	1.10E+03
Chloride	51087	3/22/90	IC	9.00E+02
Chromium	50009	8/29/85	ICP	1.40E+01
Chromium	50073	6/24/86	ICP	<1.00E+01
Chromium	50135	9/18/86	ICP	<1.00E+01
Chromium	50172	11/07/86	ICP	<1.00E+01
Chromium	50236	2/03/87	ICP	<1.00E+01
Chromium	50740	10/30/89	ICP	<1.00E+01
Chromium	50907	1/30/90	ICP	<1.00E+01
Chromium	50919	2/09/90	ICP	<1.00E+01
Chromium	51087	3/22/90	ICP	<1.00E+01
Chromium (EP Toxic)	50740E	10/30/89	ICP	<5.00E+02
Chromium (EP Toxic)	50907E	1/30/90	ICP	<5.00E+02
Chromium (EP Toxic)	50919E	2/09/90	ICP	<5.00E+02
Chromium (EP Toxic)	51087E	3/22/90	ICP	<5.00E+02
Copper	50009	8/29/85	ICP	<1.00E+01
Copper	50073	6/24/86	ICP	<1.00E+01
Copper	50135	9/18/86	ICP	1.80E+01
Copper	50172	11/07/86	ICP	1.20E+01
Copper	50236	2/03/87	ICP	8.80E+01
Copper	50740	10/30/89	ICP	1.10E+01
Copper	50907	1/30/90	ICP	1.00E+01
Copper	50919	2/09/90	ICP	1.30E+01
Copper	51087	3/22/90	ICP	<1.00E+01
Fluoride	50009	8/29/85	IC	<5.00E+02
Fluoride	50073	6/24/86	IC	<5.00E+02
Fluoride	50135	9/18/86	IC	<5.00E+02
Fluoride	50172	11/07/86	IC	<5.00E+02
Fluoride	50236	2/03/87	IC	<5.00E+02
Fluoride	50740	10/30/89	IC	<5.00E+02
Fluoride	50740	10/30/89	ISE	1.32E+02
Fluoride	50907	1/30/90	IC	<5.00E+02
Fluoride	50907	1/30/90	ISE	1.28E+02

Table B-1. Raw Analytical Data Including Data Prior to October 1989.
(sheet 3 of 10)

Constituent	Sample #	Date	Method	Result
Fluoride	50919	2/09/90	IC	<5.00E+02
Fluoride	50919	2/09/90	ISE	1.30E+02
Fluoride	51087	3/22/90	IC	<5.00E+02
Fluoride	51087	3/22/90	ISE	1.25E+02
Iron	50009	8/29/85	ICP	5.30E+01
Iron	50073	6/24/86	ICP	1.09E+02
Iron	50135	9/18/86	ICP	1.07E+02
Iron	50172	11/07/86	ICP	2.04E+02
Iron	50236	2/03/87	ICP	4.19E+04
Iron	50740	10/30/89	ICP	2.11E+02
Iron	50907	1/30/90	ICP	4.90E+01
Iron	50919	2/09/90	ICP	3.70E+01
Iron	51087	3/22/90	ICP	3.90E+01
Lead	50009	8/29/85	ICP	<3.00E+01
Lead	50135	9/18/86	GFAA	1.02E+01
Lead	50172	11/07/86	GFAA	6.50E+00
Lead	50236	2/03/87	GFAA	4.90E+01
Lead	50740	10/30/89	GFAA	7.00E+00
Lead	50907	1/30/90	GFAA	<5.00E+00
Lead	50919	2/09/90	GFAA	<5.00E+00
Lead	51087	3/22/90	GFAA	<5.00E+00
Lead (EP Toxic)	50740E	10/30/89	ICP	<5.00E+02
Lead (EP Toxic)	50907E	1/30/90	ICP	<5.00E+02
Lead (EP Toxic)	50919E	2/09/90	ICP	<5.00E+02
Lead (EP Toxic)	51087E	3/22/90	ICP	<5.00E+02
Magnesium	50009	8/29/85	ICP	7.29E+02
Magnesium	50073	6/24/86	ICP	3.68E+03
Magnesium	50135	9/18/86	ICP	4.06E+03
Magnesium	50172	11/07/86	ICP	1.22E+03
Magnesium	50236	2/03/87	ICP	1.59E+03
Magnesium	50740	10/30/89	ICP	4.43E+03
Magnesium	50907	1/30/90	ICP	4.71E+03
Magnesium	50919	2/09/90	ICP	4.52E+03
Magnesium	51087	3/22/90	ICP	4.49E+03
Manganese	50009	8/29/85	ICP	1.40E+01
Manganese	50073	6/24/86	ICP	1.30E+01
Manganese	50135	9/18/86	ICP	1.50E+01
Manganese	50172	11/07/86	ICP	<5.00E+00
Manganese	50236	2/03/87	ICP	5.60E+01
Manganese	50740	10/30/89	ICP	4.20E+01
Manganese	50907	1/30/90	ICP	<5.00E+00
Manganese	50919	2/09/90	ICP	<5.00E+00
Manganese	51087	3/22/90	ICP	<5.00E+00
Mercury	50009	8/29/85	CVAA	<1.00E-01
Mercury	50073	6/24/86	CVAA	<1.00E-01
Mercury	50135	9/18/86	CVAA	<1.00E-01

Table B-1. Raw Analytical Data Including Data Prior to October 1989.
(sheet 4 of 10)

Constituent	Sample #	Date	Method	Result
Mercury	50172	11/07/86	CVAA	<1.00E-01
Mercury	50236	2/03/87	CVAA	<1.00E-01
Mercury	50740	10/30/89	CVAA	<1.00E-01
Mercury	50907	1/30/90	CVAA	<1.00E-01
Mercury	50919	2/09/90	CVAA	<1.00E-01
Mercury	51087	3/22/90	CVAA	1.20E-01
Mercury (EP Toxic)	50740E	10/30/89	CVAA/M	<2.00E+01
Mercury (EP Toxic)	50907E	1/30/90	CVAA/M	<2.00E+01
Mercury (EP Toxic)	50919E	2/09/90	CVAA/M	<2.00E+01
Mercury (EP Toxic)	51087E	3/22/90	CVAA/M	<2.00E+01
Nickel	50009	8/29/85	ICP	1.40E+01
Nickel	50073	6/24/86	ICP	<1.00E+01
Nickel	50135	9/18/86	ICP	<1.00E+01
Nickel	50172	11/07/86	ICP	<1.00E+01
Nickel	50236	2/03/87	ICP	<1.00E+01
Nickel	50740	10/30/89	ICP	<1.00E+01
Nickel	50907	1/30/90	ICP	<1.00E+01
Nickel	50919	2/09/90	ICP	<1.00E+01
Nickel	51087	3/22/90	ICP	<1.00E+01
Nitrate	50009	8/29/85	IC	<5.00E+02
Nitrate	50073	6/24/86	IC	7.63E+02
Nitrate	50135	9/18/86	IC	6.72E+02
Nitrate	50172	11/07/86	IC	<5.00E+02
Nitrate	50236	2/03/87	IC	<5.00E+02
Nitrate	50740	10/30/89	IC	6.00E+02
Nitrate	50907	1/30/90	IC	6.00E+02
Nitrate	50919	2/09/90	IC	5.00E+02
Nitrate	51087	3/22/90	IC	<5.00E+02
Potassium	50009	8/29/85	ICP	1.40E+02
Potassium	50073	6/24/86	ICP	5.77E+02
Potassium	50135	9/18/86	ICP	8.20E+02
Potassium	50172	11/07/86	ICP	2.60E+02
Potassium	50236	2/03/87	ICP	2.31E+02
Potassium	50740	10/30/89	ICP	8.27E+02
Potassium	50907	1/30/90	ICP	7.37E+02
Potassium	50919	2/09/90	ICP	7.11E+02
Potassium	51087	3/22/90	ICP	7.26E+02
Selenium (EP Toxic)	50740E	10/30/89	ICP	<5.00E+02
Selenium (EP Toxic)	50907E	1/30/90	ICP	<5.00E+02
Selenium (EP Toxic)	50919E	2/09/90	ICP	<5.00E+02
Selenium (EP Toxic)	51087E	3/22/90	ICP	<5.00E+02
Silicon	50740	10/30/89	ICP	2.69E+03
Silicon	50907	1/30/90	ICP	2.65E+03
Silicon	50919	2/09/90	ICP	2.50E+03
Silicon	51087	3/22/90	ICP	2.16E+03
Silver (EP Toxic)	50740E	10/30/89	ICP	<5.00E+02

Table B-1. Raw Analytical Data Including Data Prior to October 1989.
(sheet 5 of 10)

Constituent	Sample #	Date	Method	Result
Silver (EP Toxic)	50907E	1/30/90	ICP	<5.00E+02
Silver (EP Toxic)	50919E	2/09/90	ICP	<5.00E+02
Silver (EP Toxic)	51087E	3/22/90	ICP	<5.00E+02
Sodium	50009	8/29/85	ICP	7.79E+02
Sodium	50073	6/24/86	ICP	2.17E+03
Sodium	50135	9/18/86	ICP	2.23E+03
Sodium	50172	11/07/86	ICP	7.29E+02
Sodium	50236	2/03/87	ICP	6.22E+02
Sodium	50740	10/30/89	ICP	2.34E+03
Sodium	50907	1/30/90	ICP	2.22E+03
Sodium	50919	2/09/90	ICP	2.23E+03
Sodium	51087	3/22/90	ICP	2.03E+03
Strontium	50009	8/29/85	ICP	<3.00E+02
Strontium	50073	6/24/86	ICP	<3.00E+02
Strontium	50135	9/18/86	ICP	<3.00E+02
Strontium	50172	11/07/86	ICP	<3.00E+02
Strontium	50236	2/03/87	ICP	<3.00E+02
Strontium	50740	10/30/89	ICP	1.02E+02
Strontium	50907	1/30/90	ICP	9.30E+01
Strontium	50919	2/09/90	ICP	9.40E+01
Strontium	51087	3/22/90	ICP	9.60E+01
Sulfate	50009	8/29/85	IC	1.75E+03
Sulfate	50073	6/24/86	IC	9.44E+03
Sulfate	50135	9/18/86	IC	9.52E+03
Sulfate	50172	11/07/86	IC	3.30E+03
Sulfate	50236	2/03/87	IC	2.84E+03
Sulfate	50740	10/30/89	IC	1.07E+04
Sulfate	50907	1/30/90	IC	1.04E+04
Sulfate	50919	2/09/90	IC	1.08E+04
Sulfate	51087	3/22/90	IC	1.03E+04
Uranium	50009	8/29/85	FLUOR	1.91E-01
Uranium	50073	6/24/86	FLUOR	8.97E-01
Uranium	50135	9/18/86	FLUOR	1.18E+00
Uranium	50172	11/07/86	FLUOR	2.98E-02
Uranium	50236	2/03/87	FLUOR	4.30E-01
Uranium	50740	10/30/89	FLUOR	6.21E-01
Uranium	51087	3/22/90	FLUOR	4.19E-01
Zinc	50009	8/29/85	ICP	2.70E+01
Zinc	50073	6/24/86	ICP	3.50E+01
Zinc	50135	9/18/86	ICP	6.90E+01
Zinc	50172	11/07/86	ICP	3.60E+01
Zinc	50236	2/03/87	ICP	1.08E+02
Zinc	50740	10/30/89	ICP	2.90E+01
Zinc	50907	1/30/90	ICP	1.00E+01
Zinc	50919	2/09/90	ICP	2.90E+01
Zinc	51087	3/22/90	ICP	7.00E+00

Table B-1. Raw Analytical Data Including Data Prior to October 1989.
(sheet 6 of 10)

Constituent	Sample #	Date	Method	Result
Ammonia	50009	8/29/85	ISE	<5.00E+01
Ammonia	50073	6/24/86	ISE	<5.00E+01
Ammonia	50135	9/18/86	ISE	<5.00E+01
Ammonia	50172	11/07/86	ISE	7.00E+01
Ammonia	50236	2/03/87	ISE	8.30E+01
Ammonia	50740	10/30/89	ISE	7.10E+01
Ammonia	50907	1/30/90	ISE	<5.00E+01
Ammonia	50919	2/09/90	ISE	<5.00E+01
Ammonia	51087	3/22/90	ISE	8.10E+01
2-Butanone	50009	8/29/85	VOA	<1.00E+01
2-Butanone	50073	6/24/86	VOA	<1.00E+01
2-Butanone	50073B	6/24/86	VOA	<1.00E+01
2-Butanone	50135	9/18/86	VOA	<1.00E+01
2-Butanone	50135B	9/18/86	VOA	<1.00E+01
2-Butanone	50172	11/07/86	VOA	<1.00E+01
2-Butanone	50172B	11/07/86	VOA	<1.00E+01
2-Butanone	50236	2/03/87	VOA	<1.00E+01
2-Butanone	50236B	2/03/87	VOA	<1.00E+01
2-Butanone	50740	10/30/89	VOA	<1.00E+01
2-Butanone	50740B	10/30/89	VOA	<6.00E+00
2-Butanone	50740T	10/30/89	VOA	1.80E+01
2-Butanone	50907	1/30/90	VOA	<1.00E+01
2-Butanone	50907B	1/30/90	VOA	<6.00E+00
2-Butanone	50907T	1/30/90	VOA	<8.00E+00
2-Butanone	50919	2/09/90	VOA	<1.00E+01
2-Butanone	50919B	2/09/90	VOA	<5.00E+00
2-Butanone	50919T	2/09/90	VOA	<6.00E+00
2-Butanone	51087	3/22/90	VOA	<1.00E+01
2-Butanone	51087B	3/22/90	VOA	<1.00E+01
2-Butanone	51087T	3/22/90	VOA	<1.00E+01
Dichloromethane	50009	8/29/85	VOA	<1.00E+01
Dichloromethane	50073	6/24/86	VOA	<1.00E+01
Dichloromethane	50073B	6/24/86	VOA	1.70E+02
Dichloromethane	50135	9/18/86	VOA	<1.00E+01
Dichloromethane	50135B	9/18/86	VOA	1.50E+02
Dichloromethane	50172	11/07/86	VOA	<1.00E+01
Dichloromethane	50172B	11/07/86	VOA	1.03E+02
Dichloromethane	50236	2/03/87	VOA	<1.00E+01
Dichloromethane	50236B	2/03/87	VOA	5.30E+01
Dichloromethane	50740	10/30/89	VOA	<5.00E+00
Dichloromethane	50740B	10/30/89	VOA	<3.00E+00
Dichloromethane	50740T	10/30/89	VOA	2.30E+01
Dichloromethane	50907	1/30/90	VOA	<5.00E+00
Dichloromethane	50907B	1/30/90	VOA	<4.00E+00
Dichloromethane	50907T	1/30/90	VOA	<4.00E+00
Dichloromethane	50919	2/09/90	VOA	<5.00E+00

Table B-1. Raw Analytical Data Including Data Prior to October 1989.
(sheet 7 of 10)

Constituent	Sample #	Date	Method	Result
Dichloromethane	50919B	2/09/90	VOA	<5.00E+00
Dichloromethane	50919T	2/09/90	VOA	<5.00E+00
Dichloromethane	51087	3/22/90	VOA	<5.00E+00
Dichloromethane	51087B	3/22/90	VOA	<5.00E+00
Dichloromethane	51087T	3/22/90	VOA	<5.00E+00
Phenol	50009	8/29/85	ABN	3.50E+01
Phenol	50073	6/24/86	ABN	<1.00E+01
Phenol	50135	9/18/86	ABN	<1.00E+01
Phenol	50172	11/07/86	ABN	<1.00E+01
Phenol	50236	2/03/87	ABN	<1.00E+01
Phenol	50740	10/30/89	ABN	<1.00E+01
Phenol	50907	1/30/90	ABN	<1.00E+01
Phenol	50919	2/09/90	ABN	<1.00E+01
Phenol	51087	3/22/90	ABN	<1.00E+01
Tetrahydrofuran	50740	10/30/89	VOA	<1.00E+01
Tetrahydrofuran	50740B	10/30/89	VOA	1.70E+01
Tetrahydrofuran	50740T	10/30/89	VOA	<1.00E+01
Tetrahydrofuran	50907	1/30/90	VOA	<1.00E+01
Tetrahydrofuran	50907B	1/30/90	VOA	<1.00E+01
Tetrahydrofuran	50907T	1/30/90	VOA	<8.00E+00
Tetrahydrofuran	50919	2/09/90	VOA	<1.00E+01
Tetrahydrofuran	50919B	2/09/90	VOA	<1.00E+01
Tetrahydrofuran	50919T	2/09/90	VOA	<1.00E+01
Tetrahydrofuran	51087	3/22/90	VOA	<1.00E+01
Tetrahydrofuran	51087B	3/22/90	VOA	<9.00E+00
Tetrahydrofuran	51087T	3/22/90	VOA	<6.00E+00
Alkalinity (Method B)	50740	10/30/89	TITRA	6.00E+04
Alkalinity (Method B)	50907	1/30/90	TITRA	6.60E+04
Alkalinity (Method B)	50919	2/09/90	TITRA	6.30E+04
Alkalinity (Method B)	51087	3/22/90	TITRA	6.00E+04
Alpha Activity (pCi/L)	50009	8/29/85	Alpha	1.50E-01
Alpha Activity (pCi/L)	50073	6/24/86	Alpha	3.38E-01
Alpha Activity (pCi/L)	50135	9/18/86	Alpha	6.73E-01
Alpha Activity (pCi/L)	50172	11/07/86	Alpha	9.26E-02
Alpha Activity (pCi/L)	50236	2/03/87	Alpha	9.37E-01
Alpha Activity (pCi/L)	50740	10/30/89	Alpha	<3.48E-01
Alpha Activity (pCi/L)	51087	3/22/90	Alpha	9.44E-01
Beta Activity (pCi/L)	50009	8/29/85	Beta	6.27E+00
Beta Activity (pCi/L)	50073	6/24/86	Beta	3.60E+00
Beta Activity (pCi/L)	50135	9/18/86	Beta	5.89E+00
Beta Activity (pCi/L)	50172	11/07/86	Beta	3.73E+00
Beta Activity (pCi/L)	50236	2/03/87	Beta	3.76E+00
Beta Activity (pCi/L)	51087	3/22/90	Beta	<1.91E+00
Conductivity (μS)	50009	8/29/85	COND-Fld	2.04E+02
Conductivity (μS)	50073	6/24/86	COND-Fld	1.17E+02
Conductivity (μS)	50135	9/18/86	COND-Fld	1.29E+02

Table B-1. Raw Analytical Data Including Data Prior to October 1989.
(sheet 8 of 10)

Constituent	Sample #	Date	Method	Result
Conductivity (µS)	50172	11/07/86	COND-Fld	5.90E+01
Conductivity (µS)	50236	2/03/87	COND-Fld	5.30E+01
Conductivity (µS)	50740	10/30/89	COND-Fld	1.48E+02
Conductivity (µS)	50907	1/30/90	COND-Fld	1.77E+02
Conductivity (µS)	50919	2/09/90	COND-Fld	1.82E+02
Conductivity (µS)	51087	3/22/90	COND-Fld	1.52E+02
Ignitability (°F)	50740E	10/30/89	IGNIT	2.10E+02
Ignitability (°F)	50907E	1/30/90	IGNIT	2.10E+02
Ignitability (°F)	50919E	2/09/90	IGNIT	2.04E+02
Ignitability (°F)	51087E	3/22/90	IGNIT	2.04E+02
pH (dimensionless)	50009	8/29/85	PH-Fld	6.24E+00
pH (dimensionless)	50073	6/24/86	PH-Fld	6.90E+00
pH (dimensionless)	50135	9/18/86	PH-Fld	7.40E+00
pH (dimensionless)	50172	11/07/86	PH-Fld	5.05E+00
pH (dimensionless)	50236	2/03/87	PH-Fld	4.90E+00
pH (dimensionless)	50740	10/30/89	PH-Fld	7.98E+00
pH (dimensionless)	50907	1/30/90	PH-Fld	8.05E+00
pH (dimensionless)	50919	2/09/90	PH-Fld	7.96E+00
pH (dimensionless)	51087	3/22/90	PH-Fld	8.18E+00
Reactivity Cyanide (mg/kg)	50740E	10/30/89	DSPEC	<1.00E+02
Reactivity Cyanide (mg/kg)	50907E	1/30/90	DSPEC	<1.00E+02
Reactivity Cyanide (mg/kg)	50919E	2/09/90	DSPEC	<1.00E+02
Reactivity Cyanide (mg/kg)	51087E	3/22/90	DSPEC	<1.00E+02
Reactivity Sulfide (mg/kg)	50740E	10/30/89	DTITRA	<1.00E+02
Reactivity Sulfide (mg/kg)	50907E	1/30/90	DTITRA	<1.00E+02
Reactivity Sulfide (mg/kg)	50919E	2/09/90	DTITRA	<1.00E+02
Reactivity Sulfide (mg/kg)	51087E	3/22/90	DTITRA	<1.00E+02
TDS	50740	10/30/89	TDS	7.50E+04
TDS	50907	1/30/90	TDS	7.30E+04
TDS	50919	2/09/90	TDS	7.20E+04
TDS	51087	3/22/90	TDS	8.40E+04
Temperature (°C)	50009	8/29/85	TEMP-Fld	3.17E+01
Temperature (°C)	50073	6/24/86	TEMP-Fld	3.15E+01
Temperature (°C)	50135	9/18/86	TEMP-Fld	1.99E+01
Temperature (°C)	50172	11/07/86	TEMP-Fld	3.33E+01
Temperature (°C)	50236	2/03/87	TEMP-Fld	4.19E+01
Temperature (°C)	50740	10/30/89	TEMP-Fld	2.05E+01
Temperature (°C)	50907	1/30/90	TEMP-Fld	2.37E+01
Temperature (°C)	50919	2/09/90	TEMP-Fld	2.88E+01
Temperature (°C)	51087	3/22/90	TEMP-Fld	2.19E+01
TOC	50172	11/07/86	TOC	<2.59E+02
TOC	50236	2/03/87	TOC	<5.93E+02
TOC	50740	10/30/89	TOC	<1.70E+03
TOC	50907	1/30/90	TOC	<1.10E+03
TOC	50919	2/09/90	TOC	<1.10E+03
TOC	51087	3/22/90	TOC	1.10E+03

Table B-1. Raw Analytical Data Including Data Prior to October 1989. (sheet 9 of 10)

Constituent	Sample #	Date	Method	Result
Total Carbon	50740	10/30/89	TC	1.44E+04
Total Carbon	50907	1/30/90	TC	1.35E+04
Total Carbon	50919	2/09/90	TC	1.32E+04
Total Carbon	51087	3/22/90	TC	1.61E+04
^{14}C (pCi/L)	50740	10/30/89	LSC	4.50E+00
^{14}C (pCi/L)	51087	3/22/90	LSC	3.58E+00
^{90}Sr (pCi/L)	50740	10/30/89	Beta	3.08E-01
^{90}Sr (pCi/L)	51087	3/22/90	Beta	6.88E-01
^{234}U (pCi/L)	50740	10/30/89	AEA	2.01E-01
^{234}U (pCi/L)	51087	3/22/90	AEA	1.84E-01
^{238}U (pCi/L)	50740	10/30/89	AEA	1.61E-01
^{238}U (pCi/L)	51087	3/22/90	AEA	1.78E-01

The following table lists the methods that are coded in the method column.

Code	Analytical Method	Reference
ABN	Semivolatile Organics (GC/MS)	USEPA-8270
AEA	^{241}Am	UST-20Am01
AEA	Curium Isotopes	UST-20Am/Cm01
AEA	Plutonium Isotopes	UST-20Pu01
AEA	Uranium Isotopes	UST-20U01
ALPHA	Alpha Counting	EPA-680/4-75/1
ALPHA-Ra	Total Radium Alpha Counting	ASTM-D2460
BETA	Beta Counting	EPA-680/4-75/1
BETA	^{90}Sr	UST-20Sr02
COLIF	Coliform Bacteria	USEPA-9131
COLIFMF	Coliform Bacteria (Membrane Filter)	USEPA-9132
COND-Fld	Conductivity-Field	ASTM-D1125A
COND-Lab	Conductivity-Laboratory	ASTM-D1125A
CVAA	Mercury	USEPA-7470
CVAA/M	Mercury-Mixed Matrix	USEPA-7470
DIGC	Direct Aqueous Injection (GC)	UST-70DIGC
DIMS	Direct Aqueous Injection (GC/MS)	"USEPA-8240"
DSPEC	Reactive Cyanide (Distillation, Spectroscopy)	USEPA-CHAPTER 7
DTITRA	Reactive Sulfide (Distillation, Titration)	USEPA-CHAPTER 7
FLUOR	Uranium (Fluorometry)	ASTM-D2907-83
GEA	Gamma Energy Analysis Spectroscopy	ASTM-D3649-85
GFAA	Arsenic (AA, Furnace Technique)	USEPA-7060
GFAA	Lead (AA, Furnace Technique)	USEPA-7421
GFAA	Selenium (AA, Furnace Technique)	USEPA-7740
GFAA	Thallium (AA, Furnace Technique)	USEPA-7841
IC	Ion Chromatography	EPA-600/4-84-01
ICP	Atomic Emission Spectroscopy (ICP)	USEPA-6010
ICP/M	Atomic Emission Spectroscopy (ICP)-Mixed Matrix	USEPA-6010

Table B-1. Raw Analytical Data Including Data Prior to October 1989.
(sheet 10 of 10)

Code	Analytical Method	Reference
IGNIT	Pensky-Martens Closed-Cup Ignitability	USEPA-1010
ISE	Fluoride-Low Detection Limit	ASTM-D1179-80-B
ISE	Ammonium Ion	ASTM-D1426-D
LALPHA	Alpha Activity-Low Detection Limit	EPA-680/4-75/1
LEPD	^{129}I	UST-20I02
LSC	^{14}C	UST-20C01 LSC
Tritium		UST-20H03
LTOX	Total Organic Halides-Low Detection Limit	USEPA-9020
PH-Fld	pH-Field	USEPA-9040
PH-Lab	pH-Laboratory	USEPA-9040
SPEC	Total and Amenable Cyanide (Spectroscopy)	USEPA-9010
SPEC	Hydrazine-Low Detection Limit (Spectroscopy)	ASTM-D1385
SSOLID	Suspended Solids	SM-208D
TC	Total Carbon	USEPA-9060
TDS	Total Dissolved Solids	SM-208B
TEMP-Fld	Temperature-Field	Local
TITRA	Alkalinity-Method B (Titration)	ASTM-D1067B
TITRA	Sulfides (Titration)	USEPA-9030
TOC	Total Organic Carbon	USEPA-9060
TOX	Total Organic Halides	USEPA-9020
VOA	Volatile Organics (GC/MS)	USEPA-8240

NOTES:

Sample # is the number of the sample. See Section 3.0 for corresponding chain-of-custody number.

Date is the sampling date.

Results are in ppb (parts per billion) unless otherwise indicated.

Analytical Method Acronyms:

AA = atomic absorption spectroscopy.
GC = gas chromatography.
MS = mass spectrometry.
ICP = inductively coupled plasma spectroscopy.

References:

ASTM--"1986 Annual Book of ASTM Standards", American Society for Testing and Materials, Philadelphia, Pennsylvania.

EPA--Various methods of the U.S. Environmental Protection Agency, Washington, D.C.

UST--Methods of the Contract Laboratory, Richland, Washington.

SM--"Standard Methods for the Examination of Water and Wastewater", 16th ed., American Public Health Association, American Water Works Association and Water Pollution Control Federation, Washington, D.C.

USEPA--"Test Methods for Evaluating Solid Waste Physical/Chemical Methods", 3rd ed., SW-846, U.S. Environmental Protection Agency, Washington, D.C.

APPENDIX C

RAW AND SANITARY WATER DATA

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Table C-1. Summary of 200 East Area Raw Water and Sanitary Water Data (1985-1988).

Constituent/Parameter [all ppb, exceptions noted]	Raw Water[a] (1986-1987)			Sanitary Water[b] (1985-1988)		
	N[c]	AVG	STD DEV	N	AVG	STD DEV
Arsenic				4	<5.00E+00	NA
Barium	5	2.80E+01	3.40E+00	4	*1.05E+02	1.00E+01
Cadmium	5	2.40E+00	8.94E-01	4	<5.00E-01	NA
Calcium	5	1.84E+04	1.47E+03			
Chromium				4	<1.00E+01	NA
Chloride	5	8.71E+02	2.37E+02	4	3.05E+03	6.76E+02
Conductivity-field (μS)	5	9.32E+01	4.61E+01			
Copper	5	1.06E+01	1.34E+00	4	*2.50E+01	1.00E+01
Color (units)				4	<5.00E+00	NA
Iron	5	6.36E+01	2.57E+01	4	*8.25E+01	5.19E+01
Fluoride				4	*1.13E+02	2.50E+01
Lead				4	<5.00E+00	NA
Magnesium	5	4.19E+03	4.83E+02			
Manganese	5	9.80E+00	3.49E+00	4	<1.00E+01	NA
Mercury				4	<5.00E-01	NA
Nickel	5	1.04E+01	8.94E-01			
Nitrate (as N)	5	9.96E+02	8.79E+02	4	*3.72E+02	5.44E+02
pH (dimensionless)	5	7.41E+00	1.18E+00			
Potassium	5	7.95E+02	6.24E+01			
Selenium				4	<5.00E+00	NA
Silver				4	<1.00E+01	NA
Sodium	5	2.26E+03	2.42E+02	4	2.28E+03	1.26E+02
Sulfate	5	1.06E+04	9.97E+02	4	1.68E+04	3.37E+03
Temperature-field (C)	5	1.64E+01	5.84E+00			
TOC (μg/g)	5	1.36E+03	2.53E+02			
TDS (mg/L)				4	8.10E+01	1.69E+01
Trichloromethane	5	1.18E+01	4.02E+00			
Uranium	4	7.26E-01	2.22E-01			
Zinc	5	2.00E+01	2.12E+01	4	<1.00E+02	NA
Radionuclides (pCi/L)						
Alpha Activity	4	8.85E-01	5.30E-01			
Beta Activity	4	4.47E+00	1.76E+00			

NOTES: Averages denoted by an asterisk include a mix of above- and below-detection limit in computations when the actual values are below the detection limit.

See companion table for inorganic detection limits as compiled from Hanford Environmental Health Foundation.

[a]Compiled from "Substance Toxicity Evaluation of Waste Data Base," provided by F. M. Jungfleisch (this data is an update of the data presented in WHC 1988, Preliminary Evaluation of Hanford Liquid Discharges to Ground, Westinghouse Hanford Company, Richland, Washington.

[b]Compiled from HEHF 1986, Hanford Sanitary Water Quality Surveillance, CY 1985, HEHF-55, Hanford Environmental Health Foundation, Environmental Health Sciences, April 1986, and HEHF-59; HEHF-71; and HEHF-74 (corresponding reports for CY 1986, 1987, and 1988).

[c]N is defined as the number of test results available for a particular analyte. N may reflect both single and multiple data sets.

ppb = parts per billion.
pCi/L = picoCuries/liter.
TOC = total organic carbon.
TOX = total organic halides.
TDS = Total Dissolved Solids.
μS = microsiemen.
μg = microgram.

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