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WHC-EP-0342
Addendum 22

B Plant Cooling Water 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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UC-630

B Plant Cooling Water Stream-Specific Report

K. A. Peterson

Date Published
August 1990

Prepared for the U.S. Department of Energy
Office of Environmental Restoration
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Richland, Washington 99352

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STREAM-SPECIFIC REPORT FOR B PLANT COOLING WATER

K. A. Peterson

ABSTRACT

The proposed wastestream designation for the B Plant Cooling Water (CBC) 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 B Plant Cooling Water (CBC) wastestream is that the stream is not a dangerous waste, pursuant to the Washington (State) Administrative Code (WAC) 173-303, *Dangerous Waste Regulations*.* This proposed designation, made by applying a combination of process knowledge and sample data for the CBC (October 1989 to March 1990), was used to determine if the effluent contains a listed dangerous waste (WAC 173-303-080). Sampling data alone is used to compare to the dangerous waste criteria (WAC 173-303-100) and dangerous waste characteristics (WAC 173-303-090). Sample data for the CBC operation was from the October 1989 to March 1990 timeframe that is based on the *Liquid Effluent Study Characterization Data* (WHC-EP-0355).**

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

**WHC, 1990, *Liquid Effluent Study Characterization Data*, WHC-EP-0355, Westinghouse Hanford Company, Richland, Washington.

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LIST OF TERMS

ALARA	as low as reasonably achievable
CBC	B Plant Cooling Water
DOE	U.S. Department of Energy
EC%	percent equivalent concentration
Ecology	Washington State Department of Ecology
EP	extraction procedure
EPA	U.S. Environmental Protection Agency
FPMCS	Facility/Process Monitor and Control System
HH	halogenated hydrocarbons
IARC	International Agency for Research on Cancer
ISE	ion specific electrode
MSDS	Material Safety Data Sheet
NCAW	neutralized current acid waste
PAH	polycyclic aromatic hydrocarbons
ppb	parts per billion
PUREX	Plutonium-Uranium Extraction
REDOX	Reduction-Oxidation
TOC	total organic carbon
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
U90%CI	upper 90% confidence interval
WAC	Washington (State) Administrative Code
WESF	Waste Encapsulation and Storage Facility
wt%	weight percent
Westinghouse Hanford	Westinghouse Hanford Company

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STREAM-SPECIFIC REPORT FOR B PLANT COOLING WATER

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 regarding reduction of 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 *Liquid Effluent Study Project Plan* (WHC 1990a), 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 (Ecology 1989): process data, sampling data, and dangerous waste regulations.

The results of the characterization study are documented in 33 separate reports, one report for each 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 B Plant Cooling Water (CBC) stream in sufficient detail to support a designation, per WAC 173-303, *Dangerous Waste Regulations*, and so that an assessment of the relative effluent priorities can be made with regard to the need for treatment and/or alternative disposal practices.

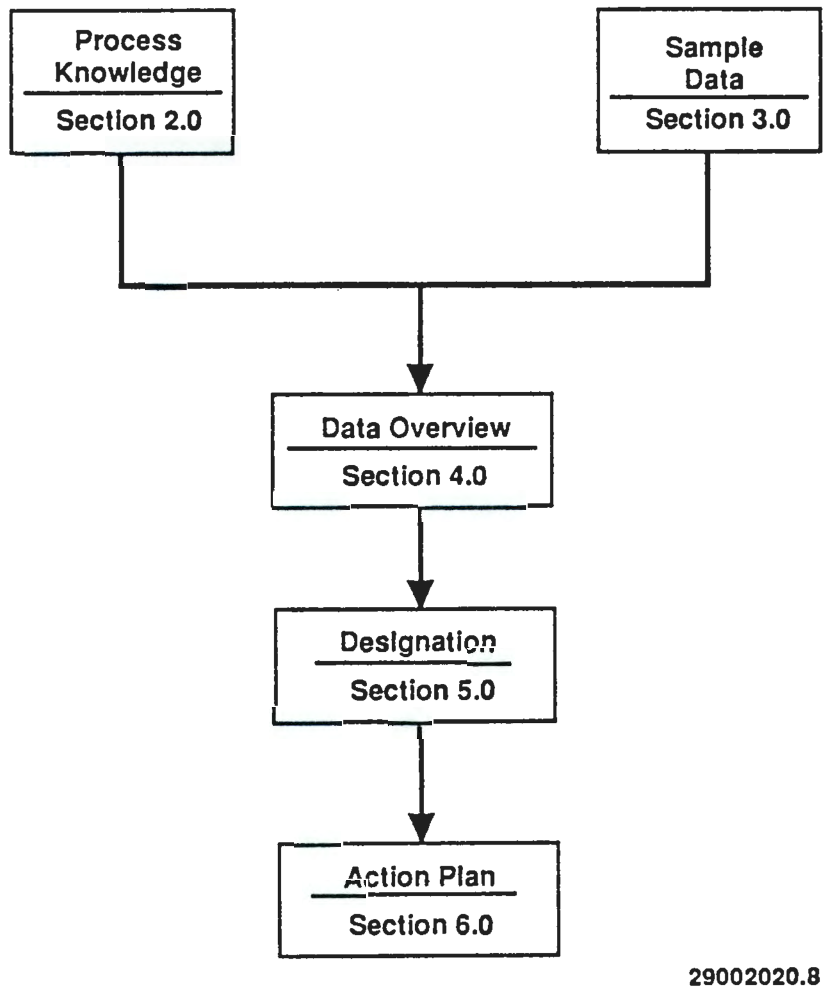
This characterization strategy (see Figure 1-1) is implemented by means of the following steps.

- Describe both process and sampling data (Sections 2.0 and 3.0, respectively).
- Compare data and stream deposition rates (Section 4.0).
- Propose a designation (Section 5.0).
- Design an action plan, if needed, to obtain additional characterization data (Section 6.0).

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.



1.3 SCOPE

The scope of this report is the characterization of the CBC effluent that enters the soil column. The time perspective of this document is focused on the recent past and the near future (approximately 1987 to 1993). Information outside of this time period was included if the data were relevant to the development of the study.

This report contains "new" sampling data (i.e., October 1989 through March 1990) because the CBC stream was active during this timeframe.

2.0 PROCESS KNOWLEDGE

This section presents a qualitative and quantitative process knowledge-based characterization of the chemical and radiological constituents of the CBC. These process data are discussed in terms of the following factors:

- Location and physical layout of the process facility
- General description of the present, past, and future activities of the process
- Identity of the wastestream contributors
- Concentration of the constituents of each contributor.

2.1 PHYSICAL LAYOUT (B PLANT GENERIC)

The B Plant is located on the Hanford Site in the 200 East Area (Figure 2-1). The B Plant comprises several adjoining buildings: the 221-B Processing Building; the 271-B Service and Office Buildings; and the Waste Encapsulation and Storage Facility (WESF) (the 225-B Building) (Figure 2-2). The 221-B Building and its attached service building (271-B) were constructed in 1943. Construction of the WESF was completed in 1974.

The following sections contain a brief description of each of the buildings listed previously (see Figure 2-2).

2.1.1 The 221-B Building

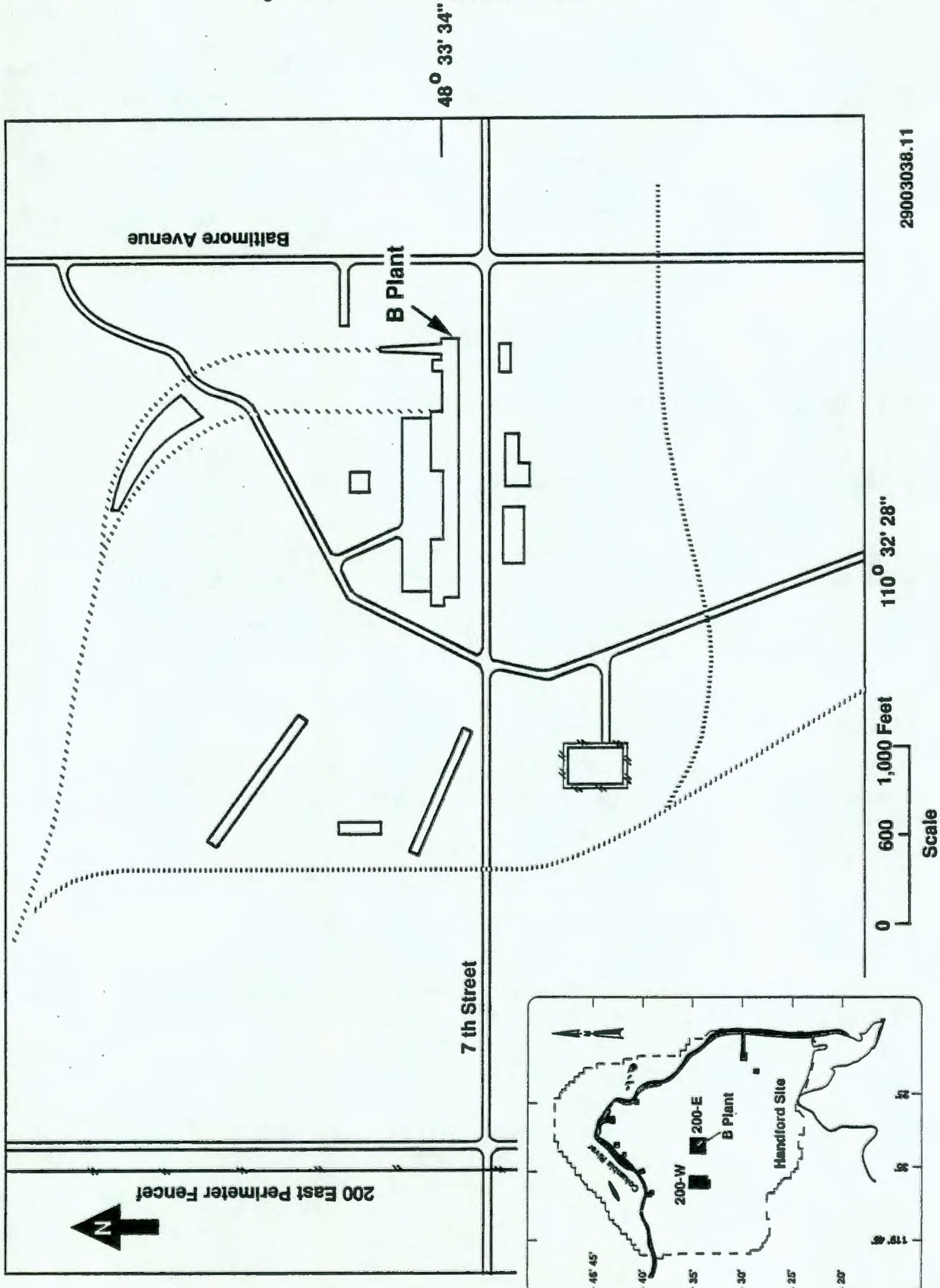
The processing portion of the 221-B Building consists of a canyon and craneway, 40 process cells, a hot pipe trench, and a ventilation tunnel.

The service and operating portion of the 221-B Building consists of an operating gallery, pipe gallery, and electrical gallery (Figure 2-3).

2.1.2 The 271-B Building

The 271-B Building (attached to the 221-B Building) includes offices, aqueous makeup facilities, and maintenance shops.

Figure 2-1. The B Plant Site Plan.



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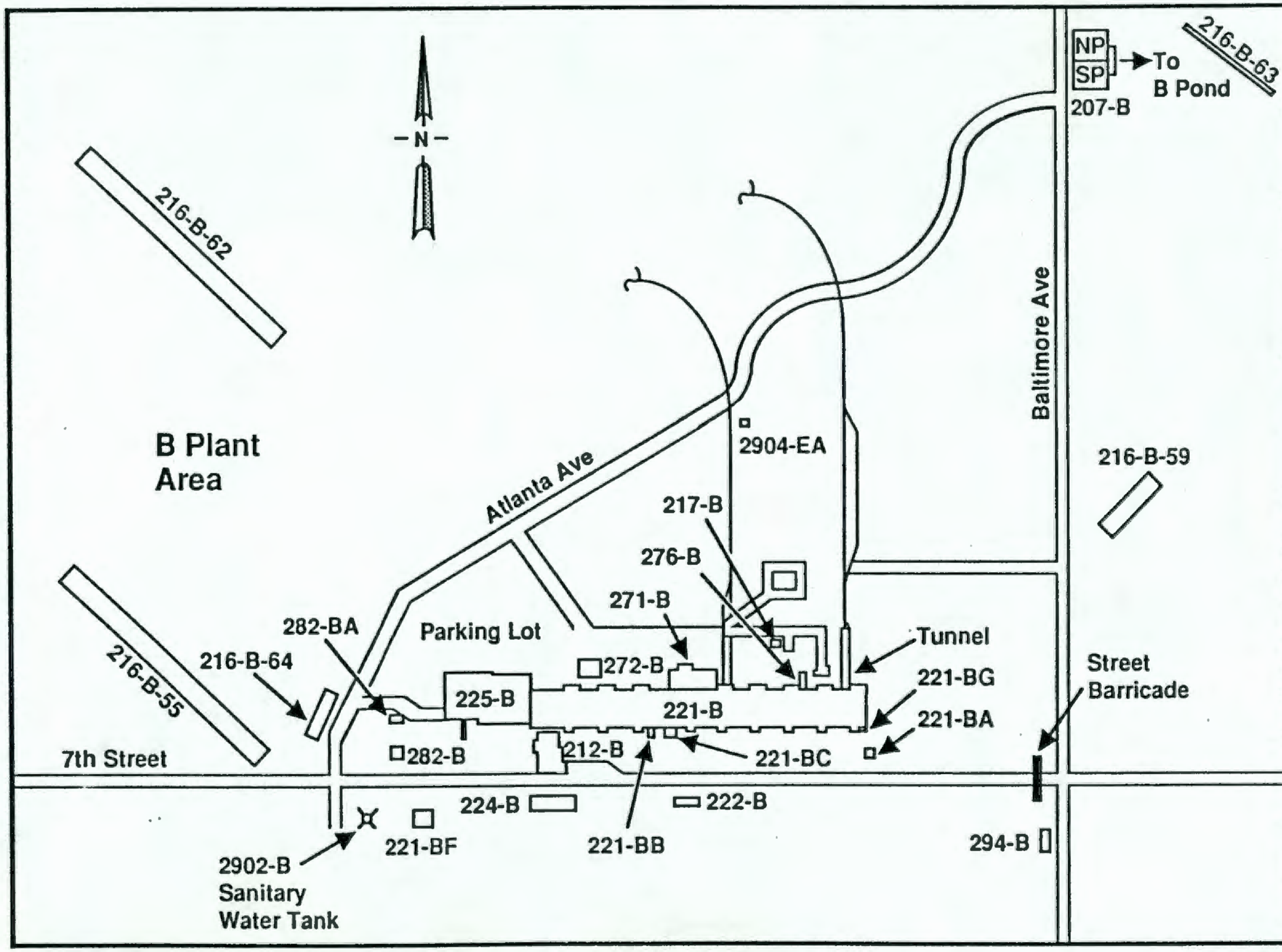

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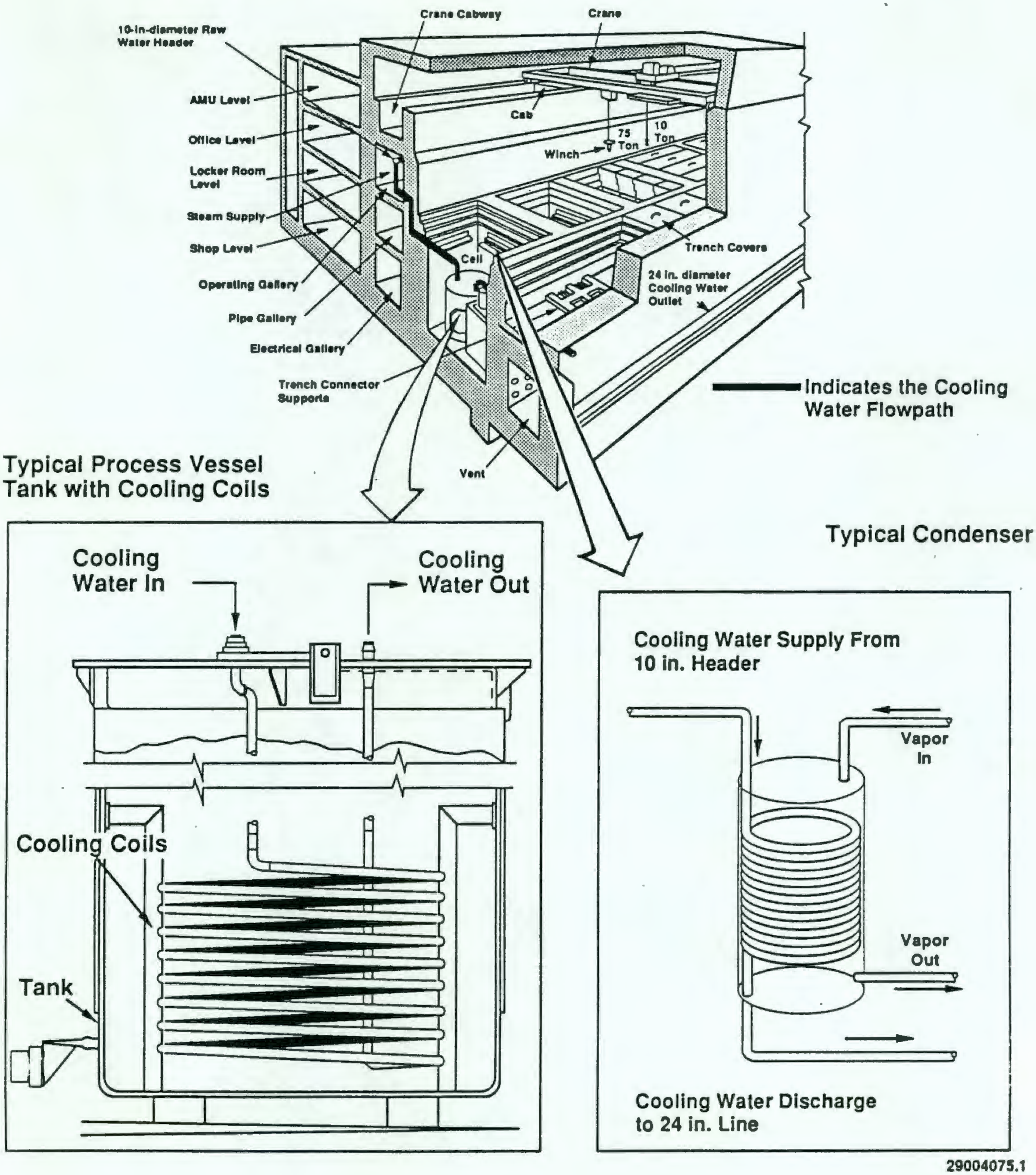
Figure 2-2. The B Plant and Related Facilities.

Figure 2-3. The B Plant Schematic, 221-B and 271-B Cutaway.



2.1.3 The Waste Encapsulation and Storage Facility

The WESF floor plan (approximate area is 20,000 ft^2) is partitioned into several areas, according to the functional requirement of each area. These include seven process hot cells, hot cell (canyon) service areas, operating areas, building services areas, and the storage pool area.

2.2 CONTRIBUTORS

The CBC stream is essentially free of radiological contamination. An analysis was performed of the current monitoring system's ability to detect and prevent leakage of process solution to the CBC system. The analysis also serves as a means to document effluent monitoring information required by Westinghouse Hanford Company in WHC-CM-7-5, *Environmental Compliance Manual* (WHC 1988a).

The analysis considered both normal operating conditions and upset accident conditions. Under these conditions, tanks to be used during neutralized current acid waste (NCAW) processing were grouped by function, and a common basis by which to compare the tank groups was chosen. Using this common basis, the groups were rated from greatest to lowest risk with respect to each hazardous or radioactive constituent. The groups were also rated from greatest to lowest risk based on the equivalent concentrations (WAC 173-303-101) (Ecology 1989) for hazardous substances and "sum of the fractions" WHC-CM-7-5 (WHC 1988a) for radioactive substances.

Based on the known performance of the monitoring system, it was demonstrated that the monitoring system would be able to detect and prevent unacceptable radioactive discharge to the environment. Also, the ratio of radioactive to hazardous material in any discharge would be sufficiently high to have the radioactive monitoring system detect an unacceptable discharge of hazardous material to the CBC stream.

2.2.1 B Plant

Discharge to the CBC stream consists of raw water passed through cooling coils and condensers on a once-through basis. The average flowrate of the CBC is approximately 1,700 gal/min. The potential sources to the CBC stream are listed in Table 2-1. The tanks listed in Table 2-1 are taken from the NCAW flowsheet and are grouped by function. In general, the groups of tanks are sections of the unit operations used during NCAW processing.

2.2.2 Waste Encapsulation and Storage Facility

In the WESF, pool cell water is cooled as it passes through heat exchangers. The water from the pool cells is isolated from the cooling water in the heat exchanger coils. The WESF contributes about 1,500 gal/min to the 24-in.-diameter cooling line. Three physical boundaries

Table 2-1. Tanks Using B Plant Cooling Water.

Tank analysis groups			
Group	Tanks	Worst-case tank*	Group function
I	TK-11-2 TK-9-2 TK-12-1 TK-13-1 TK-14-2 TK-33-1 TK-34-1	TK-11-2	Loading from 244-AR Vault (lag storage)
II	TK-34-1 TK-17-1 TK-17-2	TK-17-1	Post PHP storage
IIIa (1st cycle)	TK-18-1 TK-24-1	TK-24-1	Post IX
IIIb (2nd cycle)	TK-18-1 TK-24-1	TK-24-1	Post IX
IVa (1st cycle)	TK-20-1 TK-37-3	TK-20-1	Post E-20-2
IVb (2nd cycle)	TK-20-1 TK-37-3 TK-36-1	TK-36-1	Post E-20-2
V	TK-23-1 TK-25-2 TK-29-3 TK-32-1	TK-23-1	Post E-23-3
VI	225-B	NA	WESF pool cells
VII	VV #2 steam jet and surface condenser	NA	Motive/scrubbing of Vessel Vent #2 air stream after HEPA filtration
VIII	282-B 282-BA	282-BA	Deep well emergency backup pumps

*A worst-case tank is defined as a tank that contains the highest concentration of radioactive or hazardous material within a tank group.
NA = not available.
HEPA = high-efficiency particulate air.
IX = ion exchange.
PHP = pheumatic hydro-pulse.

(inner capsule, outer capsule, and heat exchanger) are in place to prevent leakage of radioactive material from the capsules, into the pool cells, and to the CBC stream. Two radiation monitoring systems (beta and gamma) are in place to detect loss of capsule integrity. Because of these extensive measures taken to isolate this source from the CBC, capsule leakage into the CBC was not considered a reasonable accident scenario.

As discussed previously, the CBC is a closed system consisting of raw water. In the unlikely event of leakage of process solution into the CBC stream, the chemicals and radionuclides that are identified in Table 2-2 could enter the CBC system. Dilution of any discharge because of flow from other tank cooling coils and WESF heat exchangers is taken into account to provide an "end-of-pipe" analysis. Products from the chance combination of the ions were considered as possible constituents of the contributor. Radionuclides were considered for their radioactive characteristics only.

In each case, the concentration of each combination of ions was based on 100% combination between anion and cation, controlled only by the limiting reactant concentration. No competing reactions or equilibriums were considered. Therefore, all equivalent concentrations (WAC 173-303-101) are conservative (i.e., high) estimations.

In all instances, the radioactive and hazardous species are intimately mixed. Introduction of hazardous species without radioactive species is precluded by system design and operation. The monitor is capable of detecting the most limiting radionuclide to a level such that the additive effect of all radionuclides in the stream is 30% of the discharge limits of WHC-CM-7-5, *Environmental Compliance Manual* (WHC 1988a). This detection level is based on the results of the operability test on the CBC monitoring systems and a facility effluent monitoring plan. From the available process information, the CBC stream is a nonhazardous waste. This designation is made because any hazardous constituents that are in the supply water are expected to be below regulatory concern and no additions to the CBC stream occur at B Plant. This designation will be compared with sample data in Sections 3.0, 4.0, and 5.0 to confirm the designation.

2.3 PROCESS DESCRIPTIONS

The B Plant is currently in a maintenance outage in preparation for the treatment of selected double-shell tank wastes and wastestreams to accomplish the separation into high-level, transuranic, and low-level waste fractions. This processing will be in preparation for disposal as either a vitrified or cementitous waste form.

2.3.1 Present Activities

This section covers the period between October 1989 and March 1990.

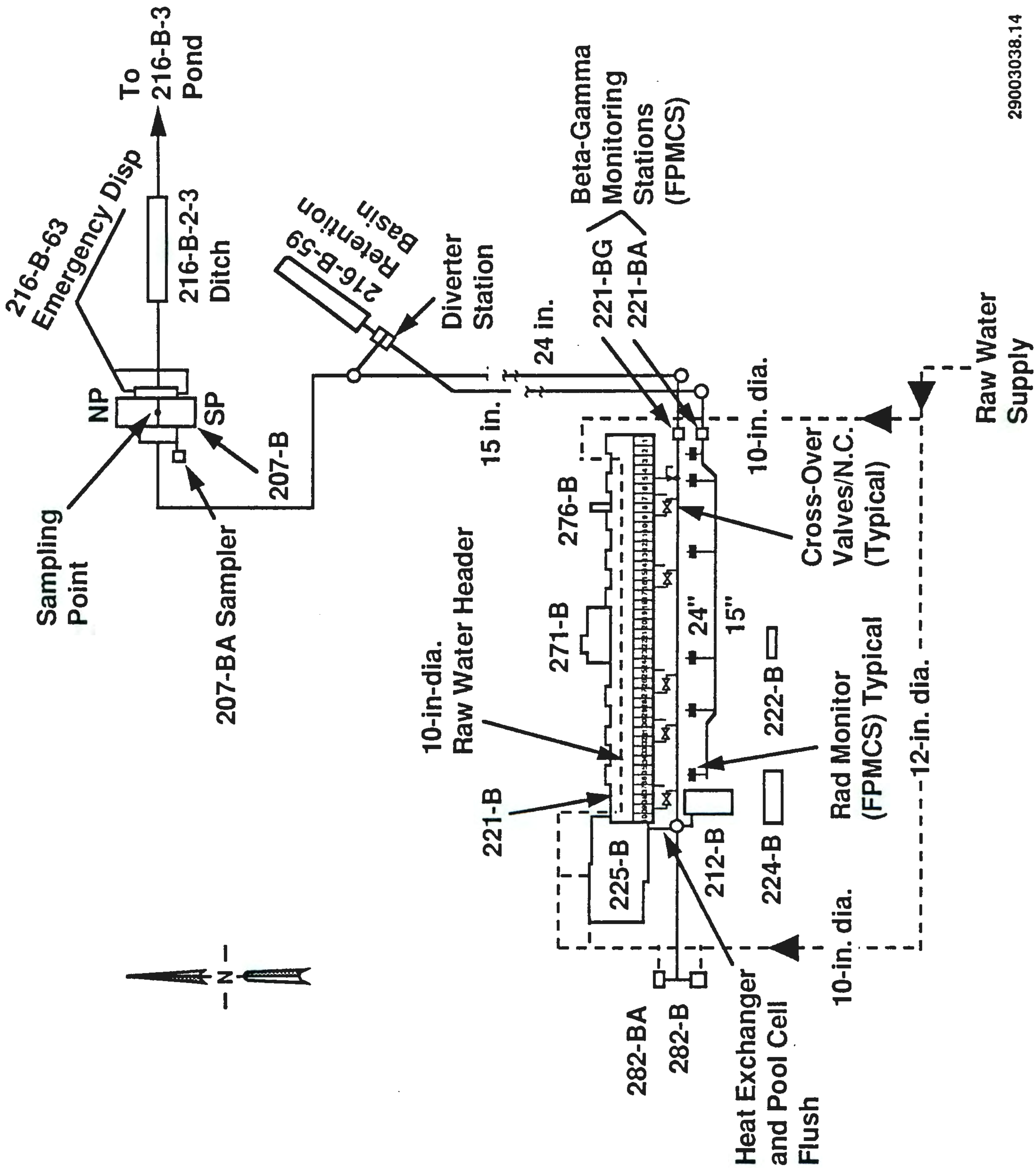
Table 2-2. Process Tank Constituents.

	Ionic species	
Sodium hydroxide	Sodium sulfate	Sodium nitrate
Sodium nitrite	Aluminum hydroxide	Sodium dichromate
Ferrous nitrate	Potassium hydroxide	Lead sulfate
Sodium fluoride	Sodium carbonate	Strontium nitrate
Zirconium nitrate	Zirconium sulfate	Ferric nitrate
	Radionuclides	
^{241}Am	^{90}Sr	^{137}Cs
$^{239/240}Pu$	^{237}Np	Cerium/^{144}Pr
Uranium	Ruthenium/^{106}Rh	
	Organics	
Tri-butyl phosphate	Normal paraffin hydrocarbons	Di-(2-ethylhexyl) phosphoric acid

The CBC is an active stream and receives discharged raw water from a single pass through the B Plant-WESF vessel cooling coils, condensers, and heat exchangers. The October 1989 through March 1990 flowrate for the CBC stream averaged approximately 1,700 gal/min. The stream discharges to the 216-B-3 Pond.

The cooling water is taken from the Columbia River via the 182-B Export Pumping Station. The raw water is pumped into a 42-in.-diameter line at the Columbia River site, the pipe reduces to a 24-in. diameter where it enters the 282-E Pumphouse and reservoir in the 200 East Area. Treatment of the raw water at the 282-E Facility is performed annually with the addition of chlorine granules (HTH-calcium hypochloride) as a biological inhibitor. This chemical is added by the 200 East Powerhouse (see Section 3.2.2). From the 282-E Facility, the water is pumped below grade north along Baltimore Avenue to B Plant (Figure 2-4). At the southeast corner of the 221-B Building, the header separates west through a 10-in.-diameter header and north through a 12-in.-diameter header to the northeast corner of the 221-B Building. Raw water routed to the west passes south of the 222-B Building and the 224-B Building then north to the front of the WESF-221-B Building. Three headers (3 in. diameter, 4 in. diameter, and 10 in. diameter) provide raw water supply to the WESF, entering on the north, east, and west sides. The raw water for the 221-B Building enters the building at both the east and west ends via 12- and 10-in.-diameter headers, respectively. A 10-in.-diameter header, located in the B Plant operating gallery, runs the entire length of the 221-B Building and supplies cooling water to the process cell vessels (tank cooling coils and condensers) (see Figure 2-3). The entry level on the east end is at the pipe gallery level. The west end entry is at the electrical gallery level near Cell 40. The

Figure 2-4. Cooling Water Discharge Flow Diagram.



approximate flowrate from the east area powerhouse is 5,000 to 7,000 gal/min. The pressure, at both the east and west ends of the 221-B Building operating gallery, is approximately 150 lb/in^2 (gage).

In the event of loss of raw water supply from the 282-E Facility reservoir, B Plant and the WESF have two emergency wells. Two diesel-driven backup emergency well pumps, 282-B and 282-BA Pumphouses (see Figure 2-4), can supply the necessary volume of raw water to meet the minimum process cooling requirements for B Plant and the WESF. Each of these emergency wells is tested every other week.

The cooling water discharged from B Plant and WESF enters one of two lines, a 24-in.-diameter line or a 15-in.-diameter line. These cooling water lines flow east of B Plant and combine into a common 24-in.-diameter line just north of the 216-B-59 Crib (see Figure 2-4). This single line, designated as the CBC stream, continues northward and discharges first into the 207-B Retention Basin, then on to the 216-B-3 Pond via the 216-B-2-3 and 216-B-2 Ditches.

2.3.1.1 The 24-in.-Diameter Cooling Water Line. The 24-in.-diameter cooling water line receives raw water discharges (single pass through) from those vessels considered to have low potential for possible contact with radioactive solutions. The cooling water flows by gravity, in gutter flow, with the pipe running less than one-third full.

Sources that can feed the 24-in.-diameter line include:

- The 221-B Building
    - E-20-3 Condenser (Cell 20)
    - E-22-4 Condenser (Cell 22)
    - E-23-4 Condenser (Cell 23)
    - B Plant steam condensate cooler from the 221-BB Process and Steam Condensate Building
    - Vessel vent #2 steam jet condensate and surface condenser (south side of the 221-B Building, near Cell 19)
- The WESF
    - Pool cell flush water
    - Pool cell heat exchangers
- The 212-B Fission Products Loadout Station

- The 282-B Pumphouse
  - Emergency well pump
- The 282-BA Water Pumphouse
  - Emergency well pump.

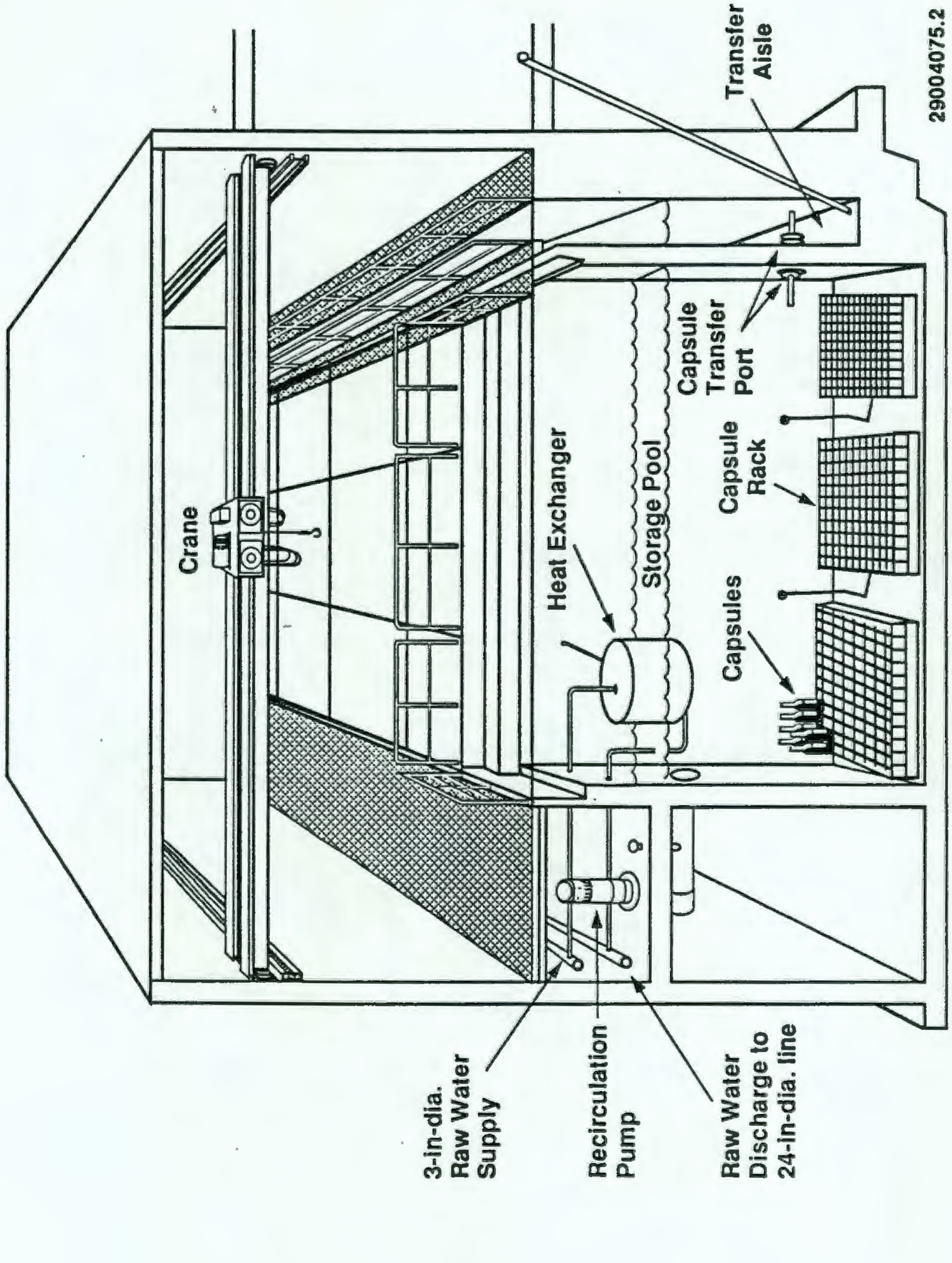
The 24-in.-diameter sewer line was fabricated from cast iron pipe and installed 2 ft from the south wall of the 221-B Building. This line is approximately 10 ft below grade at the west end of the 221-B Building and slopes to an approximate depth of 18 ft below grade on the east end of the 221-B Building. From the southwest corner of the 221-B Building, cooling water is routinely received into the 24-in.-diameter line from the 225-B pool cell heat exchangers. This cooling water, from the 225-B Pool cell heat exchangers, contributes about 1,500 gal/min to the 24-in. line and is used to cool the pool cell water (Figure 2-5).

Cooling water also is discharged into the 24-in.-diameter line, once a week for 4 h, from the weekly alternate testing of the 282-B and 282-BA Pumphouses (see Figure 2-4). Cooling water is discharged into the 24-in.-diameter line from the condensers in Cells 20, 22, and 23 and B Plant steam condensate sampling system cooler. In addition, steam condensate from the vessel vent #2 steam jet system and its surface condenser water discharge to the 24-in.-diameter line. Discharge from the condensers in Cells 20 and 23 is not continuous and occurs only during operation.

Under Project B-499, completed in 1988, the 221-BG B Plant Cooling Water Sampling Building was constructed to house radiation monitoring equipment and instrumentation for the 24-in.-diameter cooling water line. The 221-BG Building is located at the southeast corner of the 221-B Building (see Figure 2-4). This building houses a recirculating pump, online beta and gamma radiation monitors, an event sampler, and other associated equipment. Instrumentation within the 221-BG Building is monitored by the Facility/Process Monitor and Control System (FPMCS), which is located in the 271-B Building dispatch office and manned 24 h/d.

With this monitoring configuration, cooling water from the 24-in.-diameter line is continuously pumped from the continuously flowing stream through the existing standpipe and dam at the southeast corner of the 221-B Building and into the 221-BG Building radiation monitors. A diverted portion of the cooling water flows past a gamma and beta monitor and then back through the standpipe to recombine with the 24-in.-diameter stream. In the event that radiation is detected by either the gamma or beta monitor, alarms on the FPMCS are activated and an automatic diversion valve is energized in the monitor line in the 221-BG Building to collect a sample for laboratory analysis. The cooling water from the 24-in. stream can be held in either one of two 500,000-gal-capacity retention basins located at 207-B Building. If high levels of radioactivity were to reach the basins, the cooling water would be manually valved to the 216-B-63 Ditch. Administrative controls are in place to locate and isolate the source.

Figure 2-5. Waste Encapsulation Storage Facility Schematic, 225-B Pool Cell Heat Exchanger Cutaway.



2.3.1.2 The 15-in.-Diameter Cooling Water Line. The 15-in.-diameter cooling water line receives discharges from tank cooling coils considered to have a potential for possible contact with significant amounts of radioactive solutions should a leak occur. Differential pressures between the tank cooling coils and the tank solutions preclude inadvertent releases to the 15-in.-diameter discharge line. The radiological monitors and diversion-retention capabilities downstream of the process vessels provide the notification and controls necessary to prevent releases of hazardous or potentially hazardous materials to the environment.

Cooling water from the tank cooling coils enters the drain system via canyon cell wall nozzles. At the west end of the 15-in.-diameter sewer, the initial depth of the line below grade is roughly 4 ft, dropping an additional 9 ft (13 ft below grade) at the east end before leaving the 221-B Building. From the wall nozzles, the water enters a network of subheader lines, eventually combining to flow eastward through a 15-in.-diameter vitrified clay line.

The 15-in.-diameter line receives cooling water via six main subheader lines. Five of these are collection systems fed by individual subheaders; the sixth subheader (from Cell 5) discharges directly into a 14-in.-diameter pipe. The five subheader systems (identified in this document as 1 through 5, west to east) receive cooling water from groups of cells, as shown in Table 2-3.

Table 2-3. B Plant Cooling Water Subheaders.

Subheader Number	Combined cell(s)
1	36 - 39
2	28 - 35
3	20 - 27
4	10 - 19
5	6 - 9
6	5

Crossover lines, with valving, from the subheaders to the 24-in.-diameter line permit isolation and diversion capabilities, if required. The subheaders and 15-in.-diameter line operate in gutter flow by gravity.

Under Project B-499, completed in 1988, equipment and instrumentation in the 221-BA Monitoring Station were modified and a monitoring pump, online beta and gamma radiation monitors, an event sampler, and other associated instrumentation were added. Instrumentation within the 221-BA Station is monitored by the FPMCS, which is located in the 271-B Building and manned 24 h/d.

With this monitoring configuration, cooling water from the 15-in.-diameter line is continuously pumped from the continuously flowing stream through the existing standpipe at the 221-BA Station and into the radiation monitors, then back through the standpipe to recombine with the 15-in.-diameter stream. In the event that radiation is detected by either the gamma or beta monitor, alarms on the FPMCS Station are activated and an automatic diversion valve is energized in the 221-BA Station monitor line to collect a sample for laboratory analysis. In addition, when radiation is detected, the existing 216-B-59 automatic diversion valve will be activated to divert the entire contents of the 15-in.-diameter line into the 216-B-59 Retention Basin (see Figure 2-4). Administrative controls are in place to locate and isolate the source.

In addition to the online beta and gamma monitors on the 15-in.-diameter line at 221-BA Station, each of the six subheaders feeding the 15-in.-diameter line have individual gamma radiation monitors. The radiation monitors are inserted through 3-in.-diameter risers placed directly over each of the six subheader lines. Signals from each of these monitors are received and monitored by the FPMCS.

2.3.1.3 Combined B Plant Cooling Water. Just north of the 15-in.-diameter diverter station (see Figure 2-4), cooling water from the 15-in.-diameter line empties into the 24-in.-diameter line. The combined cooling water continues northward to the 207-B Retention Basin for sampling and monitoring.

Under Project B-499, completed in 1988, the 207-BA Building was constructed next to the inlet valve pit at the 207-B Retention Basin for sampling and monitoring of the CBC stream. The 207-BA Building houses a continuously operating pump, a flow totalizer and flow proportional sampler, pH meter, and associated equipment and instrumentation. When a preset volume has been measured by the flow totalizer, the sampler is activated and a predetermined sample volume is collected into a holding tank. Loss of one or both of the two upstream online beta and gamma radiation monitors, located in 221-BA Station and 221-BG Building, requires additional manual sampling of the CBC stream until the monitor(s) have been returned to service.

Sampling of the CBC stream is performed at the 207-BA Building. Sample aliquots are obtained on a weekly basis from the sample holding tank in the 207-BA Building for process control and monthly composites. The process control aliquots are analyzed by the 222-S Laboratory for radiological data and pH. The weekly composite aliquots are stored at the 222-S Laboratory. At the end of each month, the collected weekly composites are combined and radiological analyses, including pH, total organic carbon (TOC), and nitrate analyses, are performed. The composite sample analysis is then reported as the record data for the stream.

The CBC is discharged from the east side of 207-B Retention Basin to the 216-B-2-3 Ditch, continuing eastward to the 216-B-3 Pond located to the east, outside of the 200 East Area.

The DOE has established limits to ensure that all state and federal requirements are met. The policy of the DOE is to reduce or eliminate releases of dangerous waste to the environment and to maintain contamination levels as low as reasonably achievable (ALARA) (WHC 1987).

2.3.2 Past Activities

This section covers the period before October 1989.

A number of missions have been performed at B Plant since its construction in 1943. The plant's first mission was the recovery of plutonium using a bismuth phosphate chemical separation process. The process was carried out from April 1945 to October 1952. The B Plant was shut down after the Reduction-Oxidation (REDOX) and Plutonium-Uranium Extraction (PUREX) Plants came online. The B Plant was modified to begin its second mission in 1968--the recovery, purification, and encapsulation of cesium and strontium from wastes received from the tank farms. The present status of B Plant, including future activities, is discussed in Section 2.3.3.

In November 1981, it was necessary to clean out the calcium carbonate ($CaCO_3$) scale that coated the 24-in.-diameter cooling water discharge line. On November 3 and 4, 1981, the scale was removed from the line using 4,100 gal of a 28% hydrochloric (HCl) acid solution and high-pressure water. The acid solution was neutralized using 1,850 gal of 50% sodium hydroxide (NaOH). The majority of the calcium carbonate was removed manually through an inspection hole in the 24-in.-diameter line. In addition, 25 gal of a scale inhibitor containing 45% potassium hydroxide (KOH) was used to coat the 24-in.-diameter line.

2.3.3 Future Activities

This section covers the period since March 1990.

B Plant's mission is the treatment of selected double-shell tank wastes and wastestreams to accomplish the separation into high-level, transuranic, and low-level waste fractions. This processing will be in preparation for disposal as either a vitrified or cementitous waste form. The initiation of the pretreatment operation should not affect the content or designation of the CBC stream.

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3.0 SAMPLE DATA

This section provides an evaluation of the sampling data pertaining to the CBC stream. These data are divided into two categories--wastestream data and feed source data.

3.1 DATA SOURCE

The sampling scheme took representative samples by following *Test Methods for Evaluating Solid Wastes*, SW-846, procedure sampling and analytical protocol (EPA 1986). This protocol requires that a sufficient number of samples be taken in a random manner over a period of time sufficient to characterize variability or uniformity of the stream. This was accomplished by taking grab samples on a partitioned time random basis. The sampling was randomized by splitting each workday of the month to be sampled into two 4-h periods and selecting one of these time periods by using a random-number generator. All samples were taken to the contract laboratory for analysis. The details of the sampling, analytical, quality control, and quality assurance procedures utilized are contained in Volume 4 of the *Waste Stream Characterization Report* (WHC 1989).

3.2 DATA PRESENTATION

The analytical methods run on the corresponding samples are identified in Table 3-1.

3.2.1 Wastestream Data

The wastestream data set is composed of four samples collected over a 4-mo time period. This data set contains both radiological and chemical data for the CBC stream taken from October 1989 through March 1990. The dates these samples were taken and the sample identification number are listed in Appendix B of this report. Statistical wastestream data for the CBC are contained in Table 3-2 of this report.

For the CBC system, over 40,000 chemical analytes were of interest. The bulk of these analytes were compiled from a combined mass spectral library from the EPA, the National Institute of Occupational Safety and Health, and the National Bureau of Standards. This library was composed of approximately 40,000 chemical constituents, each with a unique signature on a gas chromatography/mass spectrometer analysis.

Sampling and monitoring of the CBC stream is provided to document the compliance with the discharge limits listed in WHC-CM-7-5, *Environmental Compliance Manual* (WHC 1988a).

Table 3-1. Procedures for B Plant Cooling Water Samples.
(sheet 1 of 2)

LEAD#	50788	50812	50931	51032
C of C#	50788	50812	50931	51032
Alkalinity	X	X	X	X
Alpha counting	X	X		X
^{241}Am	X	X		
Ammonia	X	X	X	X
Arsenic	X	X	X	X
Atomic emission spectroscopy	X	X	X	X
Beta counting	X	X		
^{14}C		X		
Conductivity-field	X	X	X	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		X
Hydrazine	X	X	X	X
Ion chromatography	X	X	X	X
Lead	X	X	X	X
Low-energy photon detection		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		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
Total radium alpha counting	X	X		X
Tritium				X
Uranium	X	X		X
Uranium isotopes	X	X		X
Volatile organics (GC/MS)	X	X	X	X
LEAD#	50788B	50812B	50931B	51032B
C of C#	50789	50813	50932	51033
Volatile organics (GC/MS)	X	X	X	X
LEAD#	50788T		50931T	51032T
C of C#	50790		50933	51034
Volatile organics (GC/MS)	X		X	X

Table 3-1. Procedures for B Plant Cooling Water Samples.
(sheet 2 of 2)

LEAD#	50788E	50812E	50931E	51032E
C of C#	50791	50814	50934	51035
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. C of C# is the chain-of-custody number.

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

Table 3-2. Statistics for B Plant Cooling Water.
(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	3.15E+01	6.45E-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	2	DL	1.57E+01	5.11E+00	2.41E+01	3.10E+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	1.88E+04	2.78E+02	1.93E+04	1.95E+04
Chloride	4	1	DL	8.75E+02	1.31E+02	1.09E+03	1.10E+03
Chromium (EP Toxic)	4	4	n/a	<5.00E+02	0.00E+00	<5.00E+02	<5.00E+02
Fluoride	4	0	n/a	1.32E+02	2.27E+00	1.36E+02	1.38E+02
Iron	4	1	DL	3.50E+01	2.12E+00	3.85E+01	3.90E+01
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	4.36E+03	1.12E+02	4.54E+03	4.57E+03
Manganese	4	3	DL	5.00E+00	0.00E+00	5.00E+00	5.00E+00
Mercury (EP Toxic)	4	4	n/a	<2.00E+01	0.00E+00	<2.00E+01	<2.00E+01
Nitrate	4	1	DL	5.00E+02	0.00E+00	5.00E+02	5.00E+02
Potassium	4	0	n/a	7.41E+02	1.53E+01	7.66E+02	7.68E+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	2.46E+03	6.79E+01	2.57E+03	2.66E+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	2.06E+03	3.15E+01	2.11E+03	2.13E+03
Strontium	4	0	n/a	9.40E+01	2.65E+00	9.83E+01	9.90E+01
Sulfate	4	0	n/a	1.03E+04	4.48E+02	1.11E+04	1.13E+04
Uranium	3	0	n/a	7.91E-01	3.18E-01	1.39E+00	1.42E+00
Zinc	4	2	DL	6.00E+00	7.07E-01	7.16E+00	8.00E+00
Acetone	4	3	DL	1.15E+01	1.50E+00	1.40E+01	1.60E+01
1-Butanol	1	0	n/a	1.20E+01	n/a	n/a	1.20E+01
2-Butanone	4	3	DL	1.00E+01	0.00E+00	1.00E+01	1.00E+01
Trichloromethane	4	3	DL	5.75E+00	7.50E-01	6.98E+00	8.00E+00
Alkalinity (Method B)	4	0	n/a	5.97E+04	8.54E+02	6.11E+04	6.20E+04
Beta Activity (pCi/L)	2	0	n/a	2.49E+00	2.00E-01	3.11E+00	2.69E+00
Conductivity (μS)	4	0	n/a	1.35E+02	4.03E+00	1.42E+02	1.44E+02
Ignitability (°F)	4	0	n/a	2.07E+02	2.06E+00	2.04E+02	2.02E+02
pH (dimensionless)	4	0	n/a	7.64E+00	1.84E-01	7.94E+00	8.12E+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	6.05E+04	2.34E+03	6.52E+04	6.40E+04
Temperature (°C)	4	0	n/a	1.06E+01	1.25E+00	1.27E+01	1.39E+01
TOC	3	2	DL	1.07E+03	3.33E+01	1.13E+03	1.10E+03
Total Carbon	4	0	n/a	1.50E+04	6.55E+02	1.61E+04	1.59E+04
*TOX (as Cl)	4	3	DL	8.25E+00	6.29E-01	9.28E+00	1.00E+01
^{60}Co (pCi/L)	3	2	DL	2.85E-01	1.52E-01	5.72E-01	5.86E-01
^{239,240}Pu (pCi/L)	2	1	DL	2.37E-03	8.15E-04	4.88E-03	3.19E-03
Radium Total (pCi/L)	3	2	DL	1.14E-01	4.63E-02	2.01E-01	2.04E-01

Table 3-2. Statistics for B Plant Cooling Water.
(sheet 2 of 2)

Constituent	N	MDA	Method	Mean	StdErr	90%CILim	Maximum
^{90}Sr (pCi/L)	3	1	DL	1.82E-01	3.18E-02	2.42E-01	2.39E-01
^{234}U (pCi/L)	3	0	n/a	2.51E-01	1.58E-02	2.80E-01	2.81E-01
^{238}U (pCi/L)	3	0	n/a	1.92E-01	7.75E-03	2.07E-01	2.02E-01

N is equal to the number of test results available.

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.

3.2.2 Raw Water Feed Data

This section contains information about 200 East Area raw and sanitary water data. For the CBC report, only 200 East Area raw water was used as a background reference source (see Table 3-3).

The 200 East and West Areas are the major consumers of water delivered via the Export Water System. This system includes the buildings, pumps, valve houses, reservoirs, and distribution piping that deliver water from the Columbia River to the 200 East and West Areas. The river water is pumped into the 25-Mgal 182-B Reservoir for initial settling. The water is then transferred from 182-B Reservoir to the individual 3-Mgal 200 East and West Area reservoirs for secondary settling. A backup capacity exists in 100 D Area. The raw water is then pumped directly to the raw water distribution piping and to the 283 Water Treatment Plants for sanitary water.

Currently, approximately 9-Mgal of both raw and sanitary water are used in the 200 East Area every 24 h. About one-half that amount (or 4.5 Mgal) is used in the 200 West Area. For both areas, raw water usage exceeds the sanitary water usage by a factor of 5 to 1. One-tenth of the sanitary water is used to produce steam.

As the water enters the 200 East and West treatment plants, on the way to becoming "sanitary water," chlorine is added for pretreatment, as needed, to control algae. Aluminum sulfate is added at a rate of 5% by weight, via a flash mixer, as a coagulant aide. The water is then fed into settling basins through floculators that provide slow mixing to facilitate flocculation. The water then flows through the settling basins, at which time the flocced suspended particles are allowed to settle out.

The water then passes through multimedia filters to remove alum and other particulate matter still in suspension. The filters consist of layers of various grades of gravel, sand, and anthracite coal. The filters reduce turbidity to an average of 0.2 NTU. From the filters, the water flows to two 200,000-gal concrete-lined, covered reservoirs for disinfection. Chlorine is added to maintain a free chlorine residual of 1.5 mg/L.

In addition, each area has storage "high tanks" on the sanitary distribution system that contain 200,000 gal of water in each area. The high tanks serve to maintain pressure on the sanitary system if pumping pressure drops (as backup fire protection).

Table 3-3. 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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4.0 DATA OVERVIEW

This section presents a comparison of the characterization data obtained through both process knowledge and sampling. It will also provide estimates of the stream loadings for radionuclides and chemical constituents.

4.1 DATA COMPARISON

Section 2.0 explains that raw water from the 282-E Reservoir is the sole source for the CBC system. The CBC stream is a closed system (i.e., nothing is added to the effluent stream within B Plant or WESF). Table 4-1 compares average constituent concentrations to various screening criteria. These criteria are not used here for compliance purposes.

4.2 STREAM DEPOSITION RATES

Table 4-2 has been included to provide deposition rates using the mean data from Table 3-2 adjusted according to flow data from Section 2.2.

Table 4-1. Evaluation of B Plant Cooling Water.

Constituent	Result[a]	SV1[b]	SV2[c]
Barium	3.2E-02	5.0E+00 g	
Chloride	8.8E-01	2.5E+02 h	
Fluoride	1.3E-01	2.0E+00 g	
Iron	3.5E-02	3.0E-01 h	
Lead	5.5E-03	5.0E-02 g	
Manganese	5.0E-03	5.0E-02 h	
Nitrate	5.0E-01	4.5E+01 e	
Sulfate	1.0E+01	2.5E+02 h	
Zinc	6.0E-03	5.0E+00 h	
Trichloromethane[j]	5.7E-03	1.0E-01 g	
Beta Activity (pCi/L)	2.5E+00		1.0E+03
^{60}Co (pCi/L)	2.8E-01	2.0E+02 e	5.0E+03
^{239,240}Pu (pCi/L)[l]	2.4E-03	4.0E+01 e	3.0E+01
^{90}Sr (pCi/L)	1.8E-01	5.0E+01 e	1.0E+03
^{234}U (pCi/L)	2.5E-01		5.0E+02
^{238}U (pCi/L)	1.9E-01		6.0E+02
TDS	6.0E+01	5.0E+02 h	

[a]Units of results are mg/L unless indicated otherwise. The results are the mean values reported in the Statistics table of chapter 3.

[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.

[j]The SV1 value for trihalomethanes is used to evaluate trichloromethane results.

[l]The SV1 value for ^{239}Pu is used to evaluate ^{239,240}Pu.

[o]The SV2 for Gross Beta is used to evaluate Beta Activity.

Table 4-2. Deposition Rate for B Plant Cooling Water.
Flowrate: 2.77E+08 L/mo.

Constituent	Kg/L*	Kg/mo*
Barium	3.15E-08	8.74E+00
Boron	1.57E-08	4.35E+00
Calcium	1.88E-05	5.21E+03
Chloride	8.75E-07	2.43E+02
Fluoride	1.32E-07	3.66E+01
Iron	3.50E-08	9.71E+00
Lead	5.50E-09	1.53E+00
Magnesium	4.36E-06	1.21E+03
Manganese	5.00E-09	1.39E+00
Nitrate	5.00E-07	1.39E+02
Potassium	7.41E-07	2.05E+02
Silicon	2.46E-06	6.82E+02
Sodium	2.06E-06	5.71E+02
Strontium	9.40E-08	2.61E+01
Sulfate	1.03E-05	2.86E+03
Uranium	7.91E-10	2.19E-01
Zinc	6.00E-09	1.66E+00
Acetone	1.15E-08	3.19E+00
1-Butanol	1.20E-08	3.33E+00
2-Butanone	1.00E-08	2.77E+00
Trichloromethane	5.75E-09	1.59E+00
Beta Activity *	2.49E-12	6.91E-04
TDS	6.05E-05	1.68E+04
TOC	1.07E-06	2.97E+02
Total Carbon	1.50E-05	4.16E+03
TOX (as Cl)	8.25E-09	2.29E+00
^{60}Co *	2.85E-13	7.90E-05
$^{239,240}Pu$ *	2.37E-15	6.57E-07
Radium Total *	1.14E-13	3.16E-05
^{90}Sr *	1.82E-13	5.05E-05
^{234}U *	2.51E-13	6.96E-05
^{238}U *	1.92E-13	5.32E-05

Data collected from October 1989 through March 1990. Flowrate is the average of rates from chapter 2. Constituent concentrations are average values from the Statistics Report in chapter 3. Concentration units of flagged (*) constituents are reported as curies per liter. Deposition rate units of flagged (*) constituents are reported as curies per month.

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5.0 DESIGNATION

This section proposes that the CBC stream not be designated a dangerous waste. This designation uses data from both the effluent source description and present (i.e., October 1989 to March 1990) sample data (Sections 2.0 through 4.0) and complies with the designation requirements of WAC 173-303-070 (Ecology 1989).

The procedure for determining whether a waste is a dangerous waste is contained in the *Dangerous Waste Regulations*, WAC 173-303-070. This procedure is illustrated in Figure 5-1 and includes the following:

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

5.1 DANGEROUS WASTE LISTS

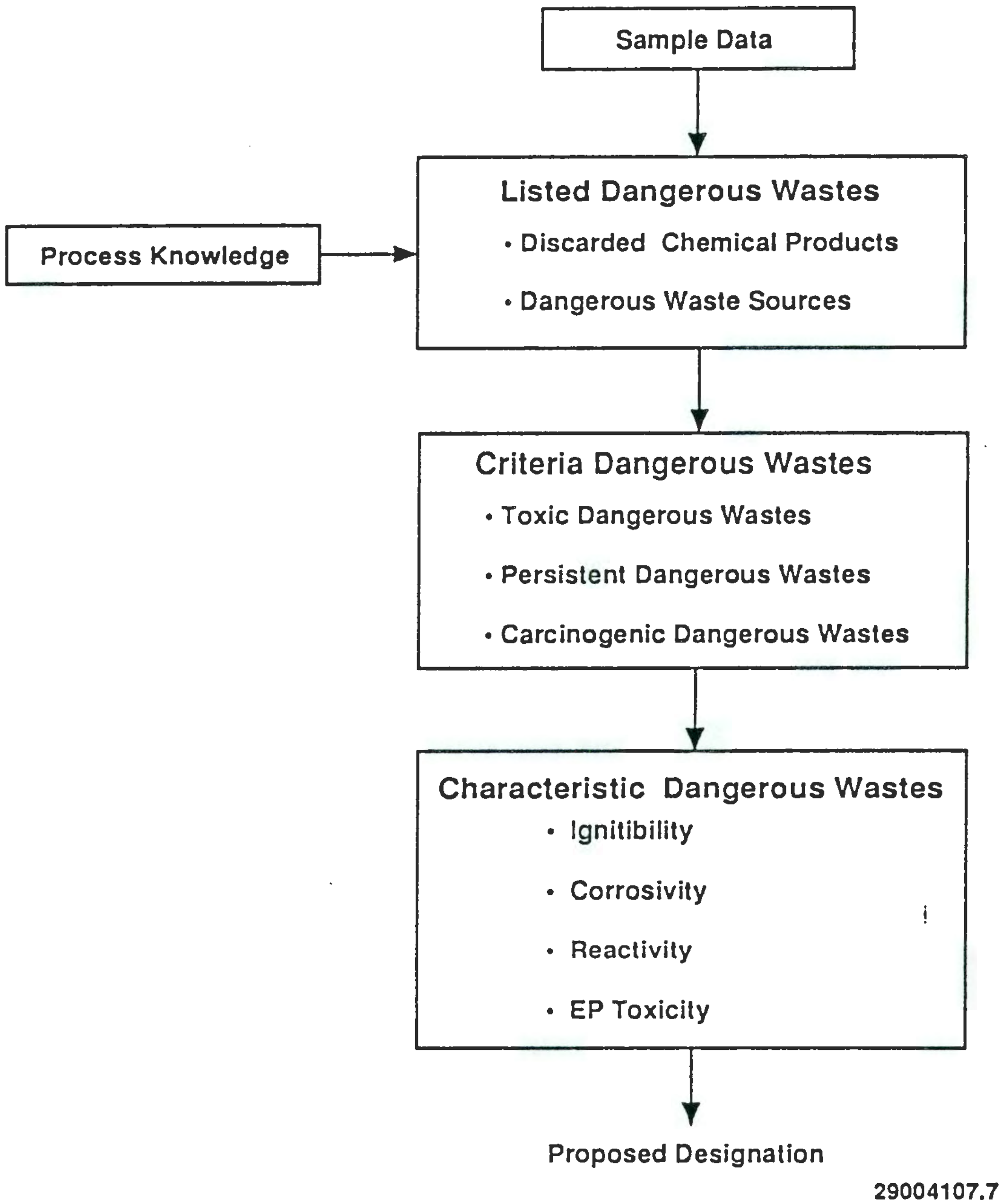
A waste is considered a listed dangerous waste (WAC 173-303-081) if it either contains a discarded chemical product (WAC 173-303-081) or originates from a dangerous waste source (WAC 173-303-082). The proposed designation was based upon a combination of process knowledge and present sampling data.

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 was the sole active ingredient in a commercial chemical product that had been discarded. Commercial chemical products that, as purchased, contained two or more active ingredients were not designated as discarded chemical products. Products that 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 chemicals. (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 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 criteria is based on a review of spill data reported in accordance with the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*.

Figure 5-1. Designation Procedure.



- The constituent is discarded in the form of a residue resulting from cleanup of a spill of an unused commercial chemical product on the discarded chemical products list. (A chemical product that is used in a process and then released to the 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 when not disposed of in accordance with the regulations.)

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 (Ecology 1989). There are three major categories of sources in WAC 173-303-9904. The first is nonspecific sources from routine operations occurring at many industries. The second is specific sources (e.g., wastes from ink formulation), none of which occur at B Plant. The third is state sources, which are limited to polychlorinated biphenyl-contaminated transformers and capacitors resulting from salvaging, rebuilding, or discarding activities.

Of the nonspecific sources, only F001 (specific spent halogenated degreasing solvents), F002 (specific spent halogenated solvents), F003 (specific spent nonhalogenated solvents), and F005 (specific spent nonhalogenated solvents) could apply to the CBC stream.

5.2 LISTED WASTE DATA CONSIDERATIONS

In this report, the proposed designation of the CBC stream 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 was 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* Title III inventory reports
- Operating procedures

- Process chemical inventories
- Physical inspections, where possible.

Additionally, appropriate interviews of facility personnel were conducted to determine whether any procedures or laboratory processes generated a listed waste that may not have been evident during other portions of the process evaluation.

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

5.2.2 Sampling Data

Present sampling data were used as screening tools to enhance and support the results of the process evaluation. This step compared the results of the sampling data to the WAC 173-303-9903 and -9904 lists (Ecology 1989). 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 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 the following: sodium chloride, sodium nitrate, calcium chloride, and calcium nitrate. In a situation with many cation and anions, however, the list of possible combinations is extensive.

A procedure was developed by Westinghouse Hanford for combining the inorganic constituents into substances. This screening procedure is described in WHC-EP-0334 (WHC 1990b) 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 CBC wastestream 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 on the contributors to the CBC was conducted. This evaluation included a review of MSDSs at the B Plant and the *Superfund Amendments and Reauthorization Act* Title III chemical inventories for possible listed waste contributors.

The CBC stream is a closed system, as described in Section 2.0. Facility interviews and inspections produced no evidence of a discharge of any chemical products into the CBC.

Table 5-1 contains a listing of the five potential discarded chemical products identified from sampling data (using the screening procedure described in Section 5.2). The five potential chemicals were acetone, 2-butanone, (methyl ethyl ketone), butyl alcohol (1-butanol), hydrogen fluoride, and trichloromethane. The two potential discarded compounds found to be present in B Plant during the process evaluation were acetone and 2-butanone. Discussions describing the presence of all potential compounds in the present sampling data follow.

5.3.1.1 Hydrogen Fluoride. A thorough review of plant chemical inventory data and interviews with plant personnel did not show hydrogen fluoride to be present in any chemical compound used within B Plant.

Hydrogen fluoride (U134) is a possible compound formed from the combination of ion analytes. The presence or absence of this compound is dependent on the source of fluoride because hydrogen is commonly found in the wastewater. Fluoride was detected in four of the four samples (ion specific electrode [ISE] method) at an average concentration of 132 ppb. In addition, the CBC system is a closed system (i.e., nothing is added within B Plant or WESF). Because this potential compound has no identified source, it is not considered to be a discarded chemical product in the CBC stream.

5.3.1.2 Acetone. Acetone (U002) is used in B Plant by maintenance and operations as a solvent to remove impurities (e.g., adhesive and grease) from various surfaces. Because of the potential of fire hazards, the use of acetone is tightly controlled to limit the amount of material present. Interviews with personnel in maintenance and operations and reviews of the procedures in place for disposal of spent chemicals in these areas provided no evidence that acetone had been disposed of as the sole active ingredient in an unused or out-of-specification chemical product. As noted in Section 2.0, B Plant makes no chemical additions to the cooling water system (i.e., the CBC stream is a closed system).

Acetone appeared in one of the four samples at a concentration of 11.5 ppb. The rejection criteria for acetone based on blank analysis is less than 37 ppb as presented in Section 5.2 of WHC-EP-0342. As the concentration of acetone seen in this sample is less than the rejection criteria, this data will not be considered in the designation of the wastestream as it is likely that acetone is present in this wastestream sample because of sample contamination.

Table 5-1. Dangerous Waste Designation Report for B Plant Cooling Plant. (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
Acetone	U002(DW)	Not Discarded	Undesignated
*1-Butanol	U031(DW)	Not Discarded	Undesignated
2-Butanone	U159(DW)	Not Discarded	Undesignated
Trichloromethane	U044(EHW)	Not Discarded	Undesignated

Dangerous Waste Sources - WAC 173-303-082

Substance	Review Number	Status	DW Number
Acetone	F003	Unlisted Source	Undesignated
*1-Butanol	F003	Unlisted Source	Undesignated
2-Butanone	F005	Unlisted Source	Undesignated

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	4.94E-09	0.00E+00	0.00E+00	0.00E+00
Calcium tetraborate	3.43E-09	0.00E+00	0.00E+00	0.00E+00
Iron(III) fluoride	7.77E-08	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	4.58E-08	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	1.98E-08	0.00E+00	0.00E+00	0.00E+00
Magnesium sulfate	1.52E-07	0.00E+00	0.00E+00	0.00E+00
Potassium fluoride	1.14E-07	0.00E+00	0.00E+00	0.00E+00
Sodium fluoride	3.50E-09	0.00E+00	0.00E+00	0.00E+00
Sodium metasilicate	5.55E-08	0.00E+00	0.00E+00	0.00E+00
Uranyl nitrate	2.30E-09	0.00E+00	0.00E+00	0.00E+00
Zinc nitrate	2.07E-09	0.00E+00	0.00E+00	0.00E+00
Acetone	1.40E-10	0.00E+00	0.00E+00	0.00E+00
*1-Butanol	1.20E-10	0.00E+00	0.00E+00	0.00E+00
2-Butanone	1.00E-10	0.00E+00	0.00E+00	0.00E+00
Trichloromethane	6.98E-08	6.98E-07	0.00E+00	6.98E-07
Total	5.59E-07	6.98E-07	0.00E+00	6.98E-07
DW Number	Undesignated	Undesignated	Undesignated	Undesignated

Dangerous Waste Characteristics - WAC 173-303-090

Characteristic	Value	DW Number
Ignitability (Degrees F)	>204	Undesignated
Corrosivity-pH	7.94	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 B Plant Cooling Plant. (sheet 2 of 2)

Dangerous Waste Characteristics - WAC 173-303-090 - Continued

Characteristic	Value	DW Number

Dangerous Waste Criteria - WAC 173-303-100

Substance	Toxic EC%	Persistant HH%	Persistant PAH%	Carcinogenic Total%	DW Number-Positive
Barium chloride	4.94E-09	0.00E+00	0.00E+00	0.00E+00	
Calcium tetraborate	3.43E-09	0.00E+00	0.00E+00	0.00E+00	
Iron(III) fluoride	7.77E-08	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	4.58E-08	0.00E+00	0.00E+00	0.00E+00	
Magnesium nitrate	1.98E-08	0.00E+00	0.00E+00	0.00E+00	
Magnesium sulfate	1.52E-07	0.00E+00	0.00E+00	0.00E+00	
Potassium fluoride	1.14E-07	0.00E+00	0.00E+00	0.00E+00	
Sodium fluoride	3.50E-09	0.00E+00	0.00E+00	0.00E+00	
Sodium metasilicate	5.55E-08	0.00E+00	0.00E+00	0.00E+00	
Uranyl nitrate	2.30E-09	0.00E+00	0.00E+00	0.00E+00	
Zinc nitrate	2.07E-09	0.00E+00	0.00E+00	0.00E+00	
Acetone	1.40E-10	0.00E+00	0.00E+00	0.00E+00	
*1-Butanol	1.20E-10	0.00E+00	0.00E+00	0.00E+00	
2-Butanone	1.00E-10	0.00E+00	0.00E+00	0.00E+00	
Trichloromethane	6.98E-08	6.98E-07	0.00E+00	6.98E-07	Undesignated
Total	5.59E-07	6.98E-07	0.00E+00	6.98E-07	
DW Number	Undesignated	Undesignated	Undesignated	Undesignated	

Dangerous Waste Constituents - WAC 173-303-9905

Substance
Hydrogen fluoride
Acetone
Trichloromethane
Barium and compounds,NOS
Lead 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.

In addition, acetone was seen in both the transfer and trip blanks on the same day as the detection discussed previously. The trip and transfer blanks had concentrations of 50 ppb and 25 ppb, respectively (see Appendix B, sample number 50931). This potential compound is not considered to be a discarded chemical product in the CBC stream.

5.3.1.3 Butyl Alcohol (1-Butanol). A review of plant chemical inventory data and interviews with plant personnel did not show butyl alcohol to be present in any chemical compound within B Plant or WESF. Also, the CBC stream is a closed system (i.e., nothing is added to the CBC within B Plant).

Butyl alcohol (U031) was detected in one of the four samples at a concentration of 12 ppb. The rejection criteria for butyl alcohol based on blank analysis is less than 33 ppb as presented in Section 5.2 of WHC-EP-0342. As the concentration of butyl alcohol seen in this sample of the CBC stream is less than the rejection criteria, this data will not be considered in the designation of the wastewater as it is likely that butyl alcohol is present in this sample because of sample contamination.

In addition, butyl alcohol was seen in both the transfer blank and trip blank on the same day as the detection listed previously. Because the trip and transfer blanks had concentrations of 13 ppb and 14 ppb, respectively, so the laboratory contamination is the source for this compound (see Appendix B, sample number 51032). This potential compound is not considered to be a discarded chemical product in the CBC stream.

5.3.1.4 2-Butanone (Methyl Ethyl Ketone). 2-Butanone (U159) does exist in the chemical makeup of some paint supplies used in general plant housekeeping. These paint supplies, remotely stored in the 2716-B Building, "Painter's Shack," located near B Plant, are tightly controlled to limit the amount of material present. Interviews with personnel in maintenance and operations and reviews of the procedures in place for disposal of spent chemicals in these areas provided no evidence that acetone had been disposed of as the sole active ingredient in an unused or out-of-specification chemical product. Also, the CBC is a closed system meaning nothing is added within B Plant.

2-Butanone appeared in one of the four samples at a concentration level of 10 ppb. The rejection criteria for 2-butanone based on blank analysis is less than 59 ppb as presented in Section 5.2 of WHC-EP-0342. As the concentration of 2-butanone seen in this sample of the CBC stream is less than the rejection criteria, this data will not be considered in the designation of the wastewater as it is likely that 2-butanone is present in this sample because of sample contamination.

In addition, 2-butanone was seen in both the transfer and trip blanks on the same day as the detection mentioned previously. Because the trip and transfer blanks had concentrations of 103 ppb and 91 ppb, respectively, sample contamination is the source for this compound (see Appendix B, sample number 50931). This potential compound is not considered to be a discarded chemical product in the CBC stream.

5.3.1.5 Trichloromethane. A review of plant chemical inventory data and interviews with plant personnel did not show trichloromethane to be present in any chemical compound used within B Plant. Also, the CBC stream is a closed system.

Trichloromethane (U044) was detected in the wastestream in one of the four samples at a concentration of 8 ppb. Additional sample sets were found to contain concentrations of 5 ppb and 11 ppb. Because the wastestream concentration was found to be in the same concentration range as the blanks, laboratory contamination is the likely source for this compound (see Appendix B, sample numbers 50788 and 50812). This potential compound is not considered to be a discarded chemical product in the CBC stream.

Based on the considerations and data presented in the previous sections, the wastestream did not contain any discarded chemical products.

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 wastes), state sources (W wastes), or any nonspecific waste sources (F wastes) in WAC 173-303-9904.

None of the activities identified by the specific sources or state sources occur at B Plant. Of the nonspecific sources, only the spent solvent activities occur at B Plant. The CBC stream is a closed system (see Section 2.2) so that wastes resulting from spent solvent operations cannot enter the wastestream. The three compounds discussed below were identified by the sampling data and could have been F003 (specific spent nonhalogenated solvent) waste.

5.3.2.1 Butyl Alcohol (1-Butanol). Butyl alcohol (F003) is not used at B Plant (see Section 5.3.1.3).

Because the CBC stream is a closed system (see Section 2.0), wastes resulting from spent solvent operations cannot enter the wastestream. Butyl alcohol was identified by the sampling data and could have been a F003 (specific spent nonhalogenated solvent) waste. As discussed in Section 5.3.1.3, it is concluded that butyl alcohol was present as the result of sample contamination.

5.3.2.2 Acetone. Acetone is used at B Plant (Section 5.3.1.3).

Because the CBC stream is a closed system (see Section 2.0), wastes resulting from spent solvent operations cannot enter the wastestream. Acetone was identified by the sampling data and could have been a F003 waste. As discussed in Section 5.3.1.2, it is concluded that acetone was present as the result of sample contamination.

5.3.2.3 2-Butanone. 2-Butanone (F005) (specific spent nonhalogenated solvents) is used at B Plant (Section 5.3.1.3).

Because the CBC stream is a closed system (see Section 2.0), wastes resulting from spent solvent operations cannot enter the wastestream. 2-Butanone was identified by the sampling data and could have been F005 waste. As discussed in Section 5.3.1.4, it is concluded that 2-butanone was present as the result of sample contamination.

Based on the discussion and data presented in the previous sections, the wastestream contributors are not listed dangerous waste sources.

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 (1990b). Summaries of the methods, along with the results, are contained in the following sections (see Table 5-1).

Table 5-2 shows how ion analytes were assigned to neutral substances that are required for designation. The table accounts for charge balancing the ion assemblage (from Table 3-2 [the statistical summary]) and the subsequent formulation of neutral substances. A detailed discussion can be found in the *Wastestream Designation of Liquid Effluent Analytical Data* (WHC 1990b).

Table 5-2. Inorganic Chemistry for B Plant Cooling Water.
(sheet 1 of 2)

Constituent	ppb	Ion	Eq/g	Normalized
Charge normalization:				
Barium	3.26E+01	Ba+2	4.74E-10	
Boron	2.41E+01	B4O7-2	1.12E-09	3.51E-09
Calcium	1.93E+04	Ca+2	9.62E-07	
Chloride	1.09E+03	Cl-1	3.08E-08	9.68E-08
Fluoride	1.36E+02	F-1	7.14E-09	2.25E-08
Iron	3.85E+01	Fe+3	2.07E-09	
Lead	6.32E+00	Pb+2	6.10E-11	
Magnesium	4.54E+03	Mg+2	3.74E-07	
Manganese	5.00E+00	Mn+2	1.82E-10	
Nitrate	5.00E+02	NO3-1	8.06E-09	2.54E-08
Potassium	7.66E+02	K+1	1.96E-08	
Silicon	2.57E+03	SiO3-2	1.83E-07	5.77E-07
Sodium	2.11E+03	Na+1	9.17E-08	
Strontium	9.83E+01	Sr+2	2.24E-09	
Sulfate	1.11E+04	SO4-2	2.30E-07	7.25E-07
Uranium	1.39E+00	UO2+2	1.17E-11	
Zinc	7.16E+00	Zn+2	2.19E-10	
Hydrogen Ion (from pH 7.9)		H+	(1.14E-11)	
Hydroxide Ion (from pH)		OH-	(8.78E-10)	
Cation total			1.45E-06	
Anion total			4.62E-07	
Anion normalization factor:	3.147			

Substance formation:

Substance	%	Cation out	Anion out
Uranyl nitrate	2.30E-07	0.00E+00	2.54E-08
Iron(III) fluoride	7.77E-06	0.00E+00	2.04E-08
Lead chloride	8.48E-07	0.00E+00	9.68E-08
Potassium fluoride	1.14E-04	0.00E+00	8.33E-10
Barium chloride	4.94E-06	0.00E+00	9.63E-08
Sodium fluoride	3.50E-06	9.09E-08	0.00E+00
Zinc nitrate	2.07E-06	0.00E+00	2.52E-08
Magnesium chloride	4.58E-04	2.78E-07	0.00E+00
Magnesium nitrate	1.98E-04	2.53E-07	0.00E+00
Calcium tetraborate	3.43E-05	9.59E-07	0.00E+00
Magnesium sulfate	1.52E-03	0.00E+00	4.72E-07
Sodium metasilicate	5.55E-04	0.00E+00	4.86E-07
Manganese(II) metasilicate	1.19E-06	0.00E+00	4.86E-07
Strontium sulfate	2.06E-05	0.00E+00	4.70E-07
Calcium sulfate	3.20E-03	4.89E-07	0.00E+00

Table 5-2. Inorganic Chemistry for B Plant Cooling Water.
(sheet 2 of 2)

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 (Eq/g)**2 divided by the hydrogen ion value (in Eq/g).

Ion concentrations in equivalents per gram (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.

5.4.1 Toxic Dangerous Wastes

The procedure for determining if a wastestream is a toxic dangerous waste (WAC 173-303-101) (Ecology 1989) is as follows.

- Collect and analyze multiple samples from the wastestream.
- Calculate the upper 90% confidence interval (U90%CI) for each analyte in the wastestream.
- Formulate substances from the analytical data.

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

- Assign toxic categories to the substances detected or, in the case of inorganics, postulated 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%, per WAC 173-303-9906.

There are over 500 substances potentially present at B Plant; however, because the CBC stream is a closed system, none can be added at B Plant. Sixteen of these substances are listed in Table 5-1. This table includes the individual and sum EC% values for these substances. Because the EC% sum is 5.9 E-07%, which is less than the cutoff of 0.001%, the 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 as follows (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 90%CI for the substances of interest.

- Calculate the weight percent (wt%) contribution of each HH and PAH.
- Sum the resulting weight percent of the contributors, separately.
- Designate the wastestream as persistent if the weight percent contribution of the HH is greater than 0.01% or if the weight percent contribution of the PAH is greater than 1.0, per WAC 173-303-9907.

One substance (trichloromethane) present in the CBC stream was determined to be HH, and no substances were determined to be PAH. The HH% value for this substance is 6.98 E-07%, which is less than the limit of 0.01%; therefore, the CBC stream is not a persistent dangerous waste.

5.4.3 Carcinogenic Dangerous Wastes

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

- Collect multiple grab samples of the wastestream.
- Determine the upper limit of the 90%CI for the substances of interest.
- Formulate substances from the analytical data. NOTE: This step is only required for inorganic analytes because it is not possible to complete the evaluation based on the concentration of cations and anions. This methodology is described in WHC (1990b) and is based on an evaluation of the carcinogenic substance that exist in an aqueous environment under normal temperatures and pressures.
- Determine which substances in the wastestream are carcinogenic according to the International Agency for Research on Cancer (IARC).
- Calculate the weight percent concentration for each carcinogen.
- Sum the resulting weight percent contributions.
- 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%.

One substance potentially present in the CBC stream (trichloromethane) was determined to be carcinogenic (see Table 5-1). Because the trichloromethane concentration at 6.98 E-07 does not exceed 0.01%, the CBC stream is not a carcinogenic dangerous waste.

5.5 DANGEROUS WASTE CHARACTERISTICS

A waste is considered a dangerous waste if it is ignitable, corrosive, reactive, or extraction procedure (EP) toxic (WAC 173-303-090) (Ecology 1989). A description of the methods used to evaluate the data in terms of these characteristics is contained in WHC (1990b). Summaries of the methods, along with the results, are contained in the sections that follow.

5.5.1 Ignitability

The flashpoint for the CBC stream is >204 °F. Therefore, the CBC stream is not an ignitable waste.

5.5.2 Corrosivity

A waste is a corrosive dangerous waste if the stream exhibited a pH of ≤2.0 or ≥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 ≥7.25. Because the 90%CI of the pH for the wastestream is 7.94, the wastestream is not a corrosive dangerous waste (WAC 173-303-090(6)).

5.5.3 Reactivity

An aqueous waste is reactive if the waste contains an amount of cyanide or sulfide that, under modified conditions, could 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 more quantitative indicator levels for cyanide and sulfide. It states that levels of cyanide as (equivalent) hydrogen cyanide below 250 mg/kg or of sulfide as (equivalent) hydrogen sulfide below 500 mg/kg would not be considered reactive.

All analyses for cyanides and sulfides were below the 100 mg/kg detection limit; this wastestream is not a reactive dangerous waste.

5.5.4 Extraction Procedure Toxicity

A waste is an EP toxic dangerous waste if individual chemical analytes exceed limits in WAC 173-303-090(8)(c). In the absence of specific EP toxicity test results, total analyte concentrations were used.

All analyses for EP toxic constituents were below detection limits. The CBC stream is not an EP toxic dangerous waste.

5.6 PROPOSED DESIGNATIONS

Because the CBC stream 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.

6.0 ACTION PLAN

This section addresses recommendations for future waste characterization tasks for the liquid effluents that are within the scope of the *Liquid Effluent Study Characterization Data* (WHC 1990c). The final extent of, and schedule for, any recommended tasks are subject to negotiation between the Ecology, EPA, and DOE. An implementation schedule for the completion of these tasks will give consideration to other compliance actions already underway as part of the Tri-Party Agreement (Ecology et al. 1989) and to the availability of funding. All effluent monitoring and sampling will be conducted according to DOE Order 5400.1, *General Environmental Protection Program* (DOE 1988).

6.1 FUTURE SAMPLING

The random sampling conducted during the October 1989 to March 1990 period covered the routine configuration of the CBC. There are no other configurations for this stream.

6.2 TECHNICAL ISSUES

As described in Section 2.0, the CBC stream was sampled at the 207-B Retention Basin. This sample point was chosen because it is a common, accessible location downstream of all the contributing wastestreams.

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

PROCESS INFORMATION

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APPENDIX A

PROCESS INFORMATION

A-1 POTENTIAL CHEMICAL MATERIAL SAFETY DATA SHEET

None applicable for the CBC stream.

A-2 PROCESS CHEMICAL MATERIAL SAFETY DATA SHEET

None applicable for the CBC stream.

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APPENDIX B

SAMPLING DATA FOR B PLANT COOLING WATER

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Table B-1. New Data for B Plant Cooling Water for the Period Between October 1989 and March 1990.
(sheet 1 of 7)

Constituent	Sample #	Date	Method	Result
Arsenic (EP Toxic)	50788E	11/22/89	ICP	<5.00E+02
Arsenic (EP Toxic)	50812E	11/29/89	ICP	<5.00E+02
Arsenic (EP Toxic)	50931E	2/12/90	ICP	<5.00E+02
Arsenic (EP Toxic)	51032E	3/08/90	ICP	<5.00E+02
Barium	50788	11/22/89	ICP	3.10E+01
Barium	50812	11/29/89	ICP	3.30E+01
Barium	50931	2/12/90	ICP	3.20E+01
Barium	51032	3/08/90	ICP	3.00E+01
Barium (EP Toxic)	50788E	11/22/89	ICP	<1.00E+03
Barium (EP Toxic)	50812E	11/29/89	ICP	<1.00E+03
Barium (EP Toxic)	50931E	2/12/90	ICP	<1.00E+03
Barium (EP Toxic)	51032E	3/08/90	ICP	<1.00E+03
Boron	50788	11/22/89	ICP	<1.00E+01
Boron	50812	11/29/89	ICP	<1.00E+01
Boron	50931	2/12/90	ICP	1.20E+01
Boron	51032	3/08/90	ICP	3.10E+01
Cadmium (EP Toxic)	50788E	11/22/89	ICP	<1.00E+02
Cadmium (EP Toxic)	50812E	11/29/89	ICP	<1.00E+02
Cadmium (EP Toxic)	50931E	2/12/90	ICP	<1.00E+02
Cadmium (EP Toxic)	51032E	3/08/90	ICP	<1.00E+02
Calcium	50788	11/22/89	ICP	1.82E+04
Calcium	50812	11/29/89	ICP	1.95E+04
Calcium	50931	2/12/90	ICP	1.90E+04
Calcium	51032	3/08/90	ICP	1.86E+04
Chloride	50788	11/22/89	IC	<5.00E+02
Chloride	50812	11/29/89	IC	9.00E+02
Chloride	50931	2/12/90	IC	1.10E+03
Chloride	51032	3/08/90	IC	1.00E+03
Chromium (EP Toxic)	50788E	11/22/89	ICP	<5.00E+02
Chromium (EP Toxic)	50812E	11/29/89	ICP	<5.00E+02
Chromium (EP Toxic)	50931E	2/12/90	ICP	<5.00E+02
Chromium (EP Toxic)	51032E	3/08/90	ICP	<5.00E+02
Fluoride	50788	11/22/89	IC	<5.00E+02
Fluoride	50788	11/22/89	ISE	1.38E+02
Fluoride	50812	11/29/89	IC	<5.00E+02
Fluoride	50812	11/29/89	ISE	1.31E+02
Fluoride	50931	2/12/90	IC	<5.00E+02
Fluoride	50931	2/12/90	ISE	1.27E+02
Fluoride	51032	3/08/90	IC	<5.00E+02
Fluoride	51032	3/08/90	ISE	1.32E+02
Iron	50788	11/22/89	ICP	3.80E+01
Iron	50812	11/29/89	ICP	3.90E+01
Iron	50931	2/12/90	ICP	<3.00E+01
Iron	51032	3/08/90	ICP	3.30E+01
Lead	50788	11/22/89	GFAA	<5.00E+00

Table B-1. New Data for B Plant Cooling Water for the Period Between October 1989 and March 1990.
(sheet 2 of 7)

Constituent	Sample #	Date	Method	Result
Lead	50812	11/29/89	GFAA	<5.00E+00
Lead	50931	2/12/90	GFAA	<5.00E+00
Lead	51032	3/08/90	GFAA	7.00E+00
Lead (EP Toxic)	50788E	11/22/89	ICP	<5.00E+02
Lead (EP Toxic)	50812E	11/29/89	ICP	<5.00E+02
Lead (EP Toxic)	50931E	2/12/90	ICP	<5.00E+02
Lead (EP Toxic)	51032E	3/08/90	ICP	<5.00E+02
Magnesium	50788	11/22/89	ICP	4.05E+03
Magnesium	50812	11/29/89	ICP	4.46E+03
Magnesium	50931	2/12/90	ICP	4.36E+03
Magnesium	51032	3/08/90	ICP	4.57E+03
Manganese	50788	11/22/89	ICP	<5.00E+00
Manganese	50812	11/29/89	ICP	5.00E+00
Manganese	50931	2/12/90	ICP	<5.00E+00
Manganese	51032	3/08/90	ICP	<5.00E+00
Mercury (EP Toxic)	50788E	11/22/89	CVAA/M	<2.00E+01
Mercury (EP Toxic)	50812E	11/29/89	CVAA/M	<2.00E+01
Mercury (EP Toxic)	50931E	2/12/90	CVAA/M	<2.00E+01
Mercury (EP Toxic)	51032E	3/08/90	CVAA/M	<2.00E+01
Nitrate	50788	11/22/89	IC	5.00E+02
Nitrate	50812	11/29/89	IC	5.00E+02
Nitrate	50931	2/12/90	IC	5.00E+02
Nitrate	51032	3/08/90	IC	<5.00E+02
Potassium	50788	11/22/89	ICP	7.33E+02
Potassium	50812	11/29/89	ICP	7.68E+02
Potassium	50931	2/12/90	ICP	7.01E+02
Potassium	51032	3/08/90	ICP	7.61E+02
Selenium (EP Toxic)	50788E	11/22/89	ICP	<5.00E+02
Selenium (EP Toxic)	50812E	11/29/89	ICP	<5.00E+02
Selenium (EP Toxic)	50931E	2/12/90	ICP	<5.00E+02
Selenium (EP Toxic)	51032E	3/08/90	ICP	<5.00E+02
Silicon	50788	11/22/89	ICP	2.36E+03
Silicon	50812	11/29/89	ICP	2.66E+03
Silicon	50931	2/12/90	ICP	2.44E+03
Silicon	51032	3/08/90	ICP	2.39E+03
Silver (EP Toxic)	50788E	11/22/89	ICP	<5.00E+02
Silver (EP Toxic)	50812E	11/29/89	ICP	<5.00E+02
Silver (EP Toxic)	50931E	2/12/90	ICP	<5.00E+02
Silver (EP Toxic)	51032E	3/08/90	ICP	<5.00E+02
Sodium	50788	11/22/89	ICP	2.01E+03
Sodium	50812	11/29/89	ICP	2.13E+03
Sodium	50931	2/12/90	ICP	2.00E+03
Sodium	51032	3/08/90	ICP	2.09E+03
Strontium	50788	11/22/89	ICP	9.30E+01
Strontium	50812	11/29/89	ICP	9.90E+01

Table B-1. New Data for B Plant Cooling Water for the Period Between October 1989 and March 1990.
(sheet 3 of 6)

Constituent	Sample #	Date	Method	Result
Strontium	50931	2/12/90	ICP	8.70E+01
Strontium	51032	3/08/90	ICP	9.70E+01
Sulfate	50788	11/22/89	IC	9.30E+03
Sulfate	50812	11/29/89	IC	9.90E+03
Sulfate	50931	2/12/90	IC	1.13E+04
Sulfate	51032	3/08/90	IC	1.08E+04
Uranium	50788	11/22/89	FLUOR	3.95E-01
Uranium	50812	11/29/89	FLUOR	1.42E+00
Uranium	51032	3/08/90	FLUOR	5.58E-01
Zinc	50788	11/22/89	ICP	<5.00E+00
Zinc	50812	11/29/89	ICP	<5.00E+00
Zinc	50931	2/12/90	ICP	8.00E+00
Zinc	51032	3/08/90	ICP	6.00E+00
Acetone	50788	11/22/89	VOA	<1.00E+01
Acetone	50788B	11/22/89	VOA	<7.00E+00
Acetone	50788T	11/22/89	VOA	<1.00E+01
Acetone	50812	11/29/89	VOA	<1.00E+01
Acetone	50812	11/29/89	ABN	<1.00E+01
Acetone	50812B	11/29/89	VOA	<1.00E+01
Acetone	50931	2/12/90	VOA	1.60E+01
Acetone	50931	2/12/90	ABN	<1.00E+01
Acetone	50931B	2/12/90	VOA	5.00E+01
Acetone	50931T	2/12/90	VOA	2.50E+01
Acetone	51032	3/08/90	VOA	<1.00E+01
Acetone	51032	3/08/90	ABN	<1.00E+01
Acetone	51032B	3/08/90	VOA	<1.00E+01
Acetone	51032T	3/08/90	VOA	<5.00E+00
1-Butanol	50788	11/22/89	DIGC	<1.00E+04
1-Butanol	50812	11/29/89	DIGC	<1.00E+04
1-Butanol	50931	2/12/90	DIGC	<1.00E+04
1-Butanol	51032	3/08/90	VOA	1.20E+01
1-Butanol	51032	3/08/90	DIGC	<1.00E+04
1-Butanol	51032B	3/08/90	VOA	1.30E+01
1-Butanol	51032T	3/08/90	VOA	1.40E+01
2-Butanone	50788	11/22/89	VOA	<1.00E+01
2-Butanone	50788B	11/22/89	VOA	<1.00E+01
2-Butanone	50788T	11/22/89	VOA	<1.00E+01
2-Butanone	50812	11/29/89	VOA	<1.00E+01
2-Butanone	50812B	11/29/89	VOA	<1.00E+01
2-Butanone	50931	2/12/90	VOA	1.00E+01
2-Butanone	50931B	2/12/90	VOA	1.03E+02
2-Butanone	50931T	2/12/90	VOA	9.10E+01
2-Butanone	51032	3/08/90	VOA	<1.00E+01
2-Butanone	51032B	3/08/90	VOA	<1.00E+01
2-Butanone	51032T	3/08/90	VOA	<1.00E+01

Table B-1. New Data for B Plant Cooling Water for the Period Between October 1989 and March 1990.
(sheet 4 of 7)

Constituent	Sample #	Date	Method	Result
Trichloromethane	50788	11/22/89	VOA	<5.00E+00
Trichloromethane	50788B	11/22/89	VOA	<3.00E+00
Trichloromethane	50788T	11/22/89	VOA	1.10E+01
Trichloromethane	50812	11/29/89	VOA	8.00E+00
Trichloromethane	50812B	11/29/89	VOA	<5.00E+00
Trichloromethane	50931	2/12/90	VOA	<5.00E+00
Trichloromethane	50931B	2/12/90	VOA	<4.00E+00
Trichloromethane	50931T	2/12/90	VOA	<3.00E+00
Trichloromethane	51032	3/08/90	VOA	<5.00E+00
Trichloromethane	51032B	3/08/90	VOA	<5.00E+00
Trichloromethane	51032T	3/08/90	VOA	<5.00E+00
Alkalinity (Method B)	50788	11/22/89	TITRA	5.80E+04
Alkalinity (Method B)	50812	11/29/89	TITRA	5.90E+04
Alkalinity (Method B)	50931	2/12/90	TITRA	6.20E+04
Alkalinity (Method B)	51032	3/08/90	TITRA	6.00E+04
Beta Activity (pCi/L)	50788	11/22/89	Beta	2.69E+00
Beta Activity (pCi/L)	50812	11/29/89	Beta	2.29E+00
Conductivity (µS)	50788	11/22/89	COND-Fld	1.44E+02
Conductivity (µS)	50812	11/29/89	COND-Fld	1.40E+02
Conductivity (µS)	50931	2/12/90	COND-Fld	1.26E+02
Conductivity (µS)	51032	3/08/90	COND-Fld	1.32E+02
Ignitability (°F)	50788E	11/22/89	IGNIT	2.08E+02
Ignitability (°F)	50812E	11/29/89	IGNIT	2.12E+02
Ignitability (°F)	50931E	2/12/90	IGNIT	2.08E+02
Ignitability (°F)	51032E	3/08/90	IGNIT	2.02E+02
pH (dimensionless)	50788	11/22/89	PH-Fld	7.50E+00
pH (dimensionless)	50812	11/29/89	PH-Fld	7.70E+00
pH (dimensionless)	50931	2/12/90	PH-Fld	7.25E+00
pH (dimensionless)	51032	3/08/90	PH-Fld	8.12E+00
Reactivity Cyanide (mg/kg)	50788E	11/22/89	DSPEC	<1.00E+02
Reactivity Cyanide (mg/kg)	50812E	11/29/89	DSPEC	<1.00E+02
Reactivity Cyanide (mg/kg)	50931E	2/12/90	DSPEC	<1.00E+02
Reactivity Cyanide (mg/kg)	51032E	3/08/90	DSPEC	<1.00E+02
Reactivity Sulfide (mg/kg)	50788E	11/22/89	DTITRA	<1.00E+02
Reactivity Sulfide (mg/kg)	50812E	11/29/89	DTITRA	<1.00E+02
Reactivity Sulfide (mg/kg)	50931E	2/12/90	DTITRA	<1.00E+02
Reactivity Sulfide (mg/kg)	51032E	3/08/90	DTITRA	<1.00E+02
TDS	50788	11/22/89	TDS	6.40E+04
TDS	50812	11/29/89	TDS	5.20E+04
TDS	50931	2/12/90	TDS	6.30E+04
TDS	51032	3/08/90	TDS	6.30E+04
Temperature (°C)	50788	11/22/89	TEMP-Fld	1.39E+01
Temperature (°C)	50812	11/29/89	TEMP-Fld	1.13E+01
Temperature (°C)	50931	2/12/90	TEMP-Fld	8.60E+00
Temperature (°C)	51032	3/08/90	TEMP-Fld	8.80E+00

Table B-1. New Data for B Plant Cooling Water for the Period Between October 1989 and March 1990. (sheet 5 of 7)

Constituent	Sample #	Date	Method	Result
TOC	50788	11/22/89	TOC	<1.30E+03
TOC	50812	11/29/89	TOC	<1.10E+03
TOC	50931	2/12/90	TOC	<1.00E+03
TOC	51032	3/08/90	TOC	1.10E+03
Total Carbon	50788	11/22/89	TC	1.53E+04
Total Carbon	50812	11/29/89	TC	1.58E+04
Total Carbon	50931	2/12/90	TC	1.31E+04
Total Carbon	51032	3/08/90	TC	1.59E+04
TOX (as Cl)	50788	11/22/89	LTOX	1.00E+01
TOX (as Cl)	50812	11/29/89	LTOX	<8.00E+00
TOX (as Cl)	50931	2/12/90	LTOX	<8.00E+00
TOX (as Cl)	51032	3/08/90	LTOX	<7.00E+00
^{60}Co (pCi/L)	50788	11/22/89	GEA	<9.40E-02
^{60}Co (pCi/L)	50812	11/29/89	GEA	<1.75E-01
^{60}Co (pCi/L)	51032	3/08/90	GEA	5.86E-01
^{239,240}Pu (pCi/L)	50788	11/22/89	AEA	3.19E-03
^{239,240}Pu (pCi/L)	50812	11/29/89	AEA	<1.56E-03
Radium Total (pCi/L)	50788	11/22/89	Alpha-Ra	2.04E-01
Radium Total (pCi/L)	50812	11/29/89	Alpha-Ra	<8.61E-02
Radium Total (pCi/L)	51032	3/08/90	Alpha-Ra	<5.07E-02
^{90}Sr (pCi/L)	50788	11/22/89	Beta	2.39E-01
^{90}Sr (pCi/L)	50812	11/29/89	Beta	<1.29E-01
^{90}Sr (pCi/L)	51032	3/08/90	Beta	1.78E-01
^{234}U (pCi/L)	50788	11/22/89	AEA	2.43E-01
^{234}U (pCi/L)	50812	11/29/89	AEA	2.81E-01
^{234}U (pCi/L)	51032	3/08/90	AEA	2.28E-01
^{238}U (pCi/L)	50788	11/22/89	AEA	1.77E-01
^{238}U (pCi/L)	50812	11/29/89	AEA	2.02E-01
^{238}U (pCi/L)	51032	3/08/90	AEA	1.98E-01

Sample# is the number of the sample. See chapter three for corresponding chain-of-custody number. Date is the sampling date. Results are in ppb (parts per billion) unless otherwise indicated. 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

Table B-1. New Data for B Plant Cooling Water for the Period Between October 1989 and March 1990.
(sheet 6 of 7)

Code	Analytical Method	Reference
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
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

Table B-1. New Data for B Plant Cooling Water for the Period Between October 1989 and March 1990.
(sheet 7 of 7)

Code	Analytical Method	Reference
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

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

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 United States Testing Company, Incorporated, 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.

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APPENDIX C

TOTAL DATA WITH ASSOCIATED SAMPLE NUMBERS

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Table C-1. Total Data with Associated Sample Numbers. (sheet 1 of 11)

Constituent	Sample #	Date	Method	Result
Arsenic (EP Toxic)	50788E	11/22/89	ICP	<5.00E+02
Arsenic (EP Toxic)	50812E	11/29/89	ICP	<5.00E+02
Arsenic (EP Toxic)	50931E	2/12/90	ICP	<5.00E+02
Arsenic (EP Toxic)	51032E	3/08/90	ICP	<5.00E+02
Barium	50015	9/12/85	ICP	2.90E+01
Barium	50031	4/18/86	ICP	2.50E+01
Barium	50091	7/16/86	ICP	3.20E+01
Barium	50145	10/02/86	ICP	2.60E+01
Barium	50230	1/23/87	ICP	3.10E+01
Barium	50788	11/22/89	ICP	3.10E+01
Barium	50812	11/29/89	ICP	3.30E+01
Barium	50931	2/12/90	ICP	3.20E+01
Barium	51032	3/08/90	ICP	3.00E+01
Barium (EP Toxic)	50788E	11/22/89	ICP	<1.00E+03
Barium (EP Toxic)	50812E	11/29/89	ICP	<1.00E+03
Barium (EP Toxic)	50931E	2/12/90	ICP	<1.00E+03
Barium (EP Toxic)	51032E	3/08/90	ICP	<1.00E+03
Boron	50788	11/22/89	ICP	<1.00E+01
Boron	50812	11/29/89	ICP	<1.00E+01
Boron	50931	2/12/90	ICP	1.20E+01
Boron	51032	3/08/90	ICP	3.10E+01
Cadmium (EP Toxic)	50788E	11/22/89	ICP	<1.00E+02
Cadmium (EP Toxic)	50812E	11/29/89	ICP	<1.00E+02
Cadmium (EP Toxic)	50931E	2/12/90	ICP	<1.00E+02
Cadmium (EP Toxic)	51032E	3/08/90	ICP	<1.00E+02
Calcium	50015	9/12/85	ICP	1.82E+04
Calcium	50031	4/18/86	ICP	1.70E+04
Calcium	50091	7/16/86	ICP	1.89E+04
Calcium	50145	10/02/86	ICP	1.94E+04
Calcium	50230	1/23/87	ICP	2.16E+04
Calcium	50788	11/22/89	ICP	1.82E+04
Calcium	50812	11/29/89	ICP	1.95E+04
Calcium	50931	2/12/90	ICP	1.90E+04
Calcium	51032	3/08/90	ICP	1.86E+04
Chloride	50015	9/12/85	IC	9.20E+02
Chloride	50031	4/18/86	IC	8.34E+02
Chloride	50091	7/16/86	IC	8.29E+02
Chloride	50145	10/02/86	IC	8.08E+02
Chloride	50230	1/23/87	IC	9.66E+02
Chloride	50788	11/22/89	IC	<5.00E+02
Chloride	50812	11/29/89	IC	9.00E+02
Chloride	50931	2/12/90	IC	1.10E+03

Table C-1. Total Data with Associated Sample Numbers. (sheet 2 of 11)

Constituent	Sample #	Date	Method	Result
Chloride	51032	3/08/90	IC	1.00E+03
Chromium	50015	9/12/85	ICP	1.20E+01
Chromium	50031	4/18/86	ICP	<1.00E+01
Chromium	50091	7/16/86	ICP	<1.00E+01
Chromium	50145	10/02/86	ICP	<1.00E+01
Chromium	50230	1/23/87	ICP	<1.00E+01
Chromium	50788	11/22/89	ICP	<1.00E+01
Chromium	50812	11/29/89	ICP	<1.00E+01
Chromium	50931	2/12/90	ICP	<1.00E+01
Chromium	51032	3/08/90	ICP	<1.00E+01
Chromium (EP Toxic)	50788E	11/22/89	ICP	<5.00E+02
Chromium (EP Toxic)	50812E	11/29/89	ICP	<5.00E+02
Chromium (EP Toxic)	50931E	2/12/90	ICP	<5.00E+02
Chromium (EP Toxic)	51032E	3/08/90	ICP	<5.00E+02
Cyanide	50015	9/12/85	SPEC	1.69E+01
Cyanide	50031	4/18/86	SPEC	<1.00E+01
Cyanide	50091	7/16/86	SPEC	<1.00E+01
Cyanide	50145	10/02/86	SPEC	<1.00E+01
Cyanide	50230	1/23/87	SPEC	<1.00E+01
Cyanide	50788	11/22/89	SPEC	<1.00E+01
Cyanide	50812	11/29/89	SPEC	<1.00E+01
Cyanide	50931	2/12/90	SPEC	<1.00E+01
Cyanide	51032	3/08/90	SPEC	<1.00E+01
Fluoride	50015	9/12/85	IC	<5.00E+02
Fluoride	50031	4/18/86	IC	<5.00E+02
Fluoride	50091	7/16/86	IC	<5.00E+02
Fluoride	50145	10/02/86	IC	<5.00E+02
Fluoride	50230	1/23/87	IC	<5.00E+02
Fluoride	50788	11/22/89	IC	<5.00E+02
Fluoride	50788	11/22/89	ISE	1.38E+02
Fluoride	50812	11/29/89	IC	<5.00E+02
Fluoride	50812	11/29/89	ISE	1.31E+02
Fluoride	50931	2/12/90	IC	<5.00E+02
Fluoride	50931	2/12/90	ISE	1.27E+02
Fluoride	51032	3/08/90	IC	<5.00E+02
Fluoride	51032	3/08/90	ISE	1.32E+02
Iron	50015	9/12/85	ICP	7.80E+01
Iron	50031	4/18/86	ICP	6.50E+01
Iron	50091	7/16/86	ICP	<5.00E+01
Iron	50145	10/02/86	ICP	8.90E+01
Iron	50230	1/23/87	ICP	<5.00E+01
Iron	50788	11/22/89	ICP	3.80E+01
Iron	50812	11/29/89	ICP	3.90E+01
Iron	50931	2/12/90	ICP	<3.00E+01
Iron	51032	3/08/90	ICP	3.30E+01
Lead	50015	9/12/85	ICP	<3.00E+01

Table C-1. Total Data with Associated Sample Numbers. (sheet 3 of 11)

Constituent	Sample #	Date	Method	Result
Lead	50145	10/02/86	GFAA	<5.00E+00
Lead	50230	1/23/87	GFAA	<5.00E+00
Lead	50788	11/22/89	GFAA	<5.00E+00
Lead	50812	11/29/89	GFAA	<5.00E+00
Lead	50931	2/12/90	GFAA	<5.00E+00
Lead	51032	3/08/90	GFAA	7.00E+00
Lead (EP Toxic)	50788E	11/22/89	ICP	<5.00E+02
Lead (EP Toxic)	50812E	11/29/89	ICP	<5.00E+02
Lead (EP Toxic)	50931E	2/12/90	ICP	<5.00E+02
Lead (EP Toxic)	51032E	3/08/90	ICP	<5.00E+02
Magnesium	50015	9/12/85	ICP	3.88E+03
Magnesium	50031	4/18/86	ICP	4.38E+03
Magnesium	50091	7/16/86	ICP	4.46E+03
Magnesium	50145	10/02/86	ICP	4.23E+03
Magnesium	50230	1/23/87	ICP	4.97E+03
Magnesium	50788	11/22/89	ICP	4.05E+03
Magnesium	50812	11/29/89	ICP	4.46E+03
Magnesium	50931	2/12/90	ICP	4.36E+03
Magnesium	51032	3/08/90	ICP	4.57E+03
Manganese	50015	9/12/85	ICP	1.20E+01
Manganese	50031	4/18/86	ICP	6.00E+00
Manganese	50091	7/16/86	ICP	1.00E+01
Manganese	50145	10/02/86	ICP	1.20E+01
Manganese	50230	1/23/87	ICP	<5.00E+00
Manganese	50788	11/22/89	ICP	<5.00E+00
Manganese	50812	11/29/89	ICP	5.00E+00
Manganese	50931	2/12/90	ICP	<5.00E+00
Manganese	51032	3/08/90	ICP	<5.00E+00
Mercury (EP Toxic)	50788E	11/22/89	CVAA/M	<2.00E+01
Mercury (EP Toxic)	50812E	11/29/89	CVAA/M	<2.00E+01
Mercury (EP Toxic)	50931E	2/12/90	CVAA/M	<2.00E+01
Mercury (EP Toxic)	51032E	3/08/90	CVAA/M	<2.00E+01
Nitrate	50015	9/12/85	IC	<5.00E+02
Nitrate	50031	4/18/86	IC	<5.00E+02
Nitrate	50091	7/16/86	IC	5.20E+02
Nitrate	50145	10/02/86	IC	<5.00E+02
Nitrate	50230	1/23/87	IC	<5.00E+02
Nitrate	50788	11/22/89	IC	5.00E+02
Nitrate	50812	11/29/89	IC	5.00E+02
Nitrate	50931	2/12/90	IC	5.00E+02
Nitrate	51032	3/08/90	IC	<5.00E+02
Potassium	50015	9/12/85	ICP	8.26E+02
Potassium	50031	4/18/86	ICP	6.42E+02
Potassium	50091	7/16/86	ICP	8.44E+02
Potassium	50145	10/02/86	ICP	8.30E+02
Potassium	50230	1/23/87	ICP	7.99E+02
Potassium	50788	11/22/89	ICP	7.33E+02

Table C-1. Total Data with Associated Sample Numbers. (sheet 4 of 11)

Constituent	Sample #	Date	Method	Result
Potassium	50812	11/29/89	ICP	7.68E+02
Potassium	50931	2/12/90	ICP	7.01E+02
Potassium	51032	3/08/90	ICP	7.61E+02
Selenium (EP Toxic)	50788E	11/22/89	ICP	<5.00E+02
Selenium (EP Toxic)	50812E	11/29/89	ICP	<5.00E+02
Selenium (EP Toxic)	50931E	2/12/90	ICP	<5.00E+02
Selenium (EP Toxic)	51032E	3/08/90	ICP	<5.00E+02
Silicon	50788	11/22/89	ICP	2.36E+03
Silicon	50812	11/29/89	ICP	2.66E+03
Silicon	50931	2/12/90	ICP	2.44E+03
Silicon	51032	3/08/90	ICP	2.39E+03
Silver (EP Toxic)	50788E	11/22/89	ICP	<5.00E+02
Silver (EP Toxic)	50812E	11/29/89	ICP	<5.00E+02
Silver (EP Toxic)	50931E	2/12/90	ICP	<5.00E+02
Silver (EP Toxic)	51032E	3/08/90	ICP	<5.00E+02
Sodium	50015	9/12/85	ICP	2.66E+03
Sodium	50031	4/18/86	ICP	2.28E+03
Sodium	50091	7/16/86	ICP	2.92E+03
Sodium	50145	10/02/86	ICP	2.38E+03
Sodium	50230	1/23/87	ICP	2.24E+03
Sodium	50788	11/22/89	ICP	2.01E+03
Sodium	50812	11/29/89	ICP	2.13E+03
Sodium	50931	2/12/90	ICP	2.00E+03
Sodium	51032	3/08/90	ICP	2.09E+03
Strontium	50015	9/12/85	ICP	<3.00E+02
Strontium	50031	4/18/86	ICP	<3.00E+02
Strontium	50091	7/16/86	ICP	<3.00E+02
Strontium	50145	10/02/86	ICP	<3.00E+02
Strontium	50230	1/23/87	ICP	<3.00E+02
Strontium	50788	11/22/89	ICP	9.30E+01
Strontium	50812	11/29/89	ICP	9.90E+01
Strontium	50931	2/12/90	ICP	8.70E+01
Strontium	51032	3/08/90	ICP	9.70E+01
Sulfate	50015	9/12/85	IC	9.20E+03
Sulfate	50031	4/18/86	IC	1.15E+04
Sulfate	50091	7/16/86	IC	1.22E+04
Sulfate	50145	10/02/86	IC	9.40E+03
Sulfate	50230	1/23/87	IC	1.26E+04
Sulfate	50788	11/22/89	IC	9.30E+03
Sulfate	50812	11/29/89	IC	9.90E+03
Sulfate	50931	2/12/90	IC	1.13E+04
Sulfate	51032	3/08/90	IC	1.08E+04
Uranium	50015	9/12/85	FLUOR	2.17E-01
Uranium	50031	4/18/86	FLUOR	7.71E-01
Uranium	50091	7/16/86	FLUOR	6.98E-01
Uranium	50145	10/02/86	FLUOR	6.40E-01
Uranium	50230	1/23/87	FLUOR	6.05E-01

Table C-1. Total Data with Associated Sample Numbers. (sheet 5 of 11)

Constituent	Sample #	Date	Method	Result
Uranium	50788	11/22/89	FLUOR	3.95E-01
Uranium	50812	11/29/89	FLUOR	1.42E+00
Uranium	51032	3/08/90	FLUOR	5.58E-01
Zinc	50015	9/12/85	ICP	7.00E+00
Zinc	50031	4/18/86	ICP	6.80E+01
Zinc	50091	7/16/86	ICP	7.00E+00
Zinc	50145	10/02/86	ICP	7.00E+00
Zinc	50230	1/23/87	ICP	1.10E+01
Zinc	50788	11/22/89	ICP	<5.00E+00
Zinc	50812	11/29/89	ICP	<5.00E+00
Zinc	50931	2/12/90	ICP	8.00E+00
Zinc	51032	3/08/90	ICP	6.00E+00
Acetone	50788	11/22/89	VOA	<1.00E+01
Acetone	50788B	11/22/89	VOA	<7.00E+00
Acetone	50788T	11/22/89	VOA	<1.00E+01
Acetone	50812	11/29/89	VOA	<1.00E+01
Acetone	50812	11/29/89	ABN	<1.00E+01
Acetone	50812B	11/29/89	VOA	<1.00E+01
Acetone	50931	2/12/90	VOA	1.60E+01
Acetone	50931	2/12/90	ABN	<1.00E+01
Acetone	50931B	2/12/90	VOA	5.00E+01
Acetone	50931T	2/12/90	VOA	2.50E+01
Acetone	51032	3/08/90	VOA	<1.00E+01
Acetone	51032	3/08/90	ABN	<1.00E+01
Acetone	51032B	3/08/90	VOA	<1.00E+01
Acetone	51032T	3/08/90	VOA	<5.00E+00
Ammonia	50015	9/12/85	ISE	<5.00E+01
Ammonia	50031	4/18/86	ISE	5.40E+01
Ammonia	50091	7/16/86	ISE	<5.00E+01
Ammonia	50145	10/02/86	ISE	<5.00E+01
Ammonia	50230	1/23/87	ISE	<5.00E+01
Ammonia	50788	11/22/89	ISE	<5.00E+01
Ammonia	50812	11/29/89	ISE	<5.00E+01
Ammonia	50931	2/12/90	ISE	<5.00E+01
Ammonia	51032	3/08/90	ISE	<5.00E+01
1-Butanol	50015	9/12/85	VOA	1.30E+01
1-Butanol	50788	11/22/89	DIGC	<1.00E+04
1-Butanol	50812	11/29/89	DIGC	<1.00E+04
1-Butanol	50931	2/12/90	DIGC	<1.00E+04
1-Butanol	51032	3/08/90	VOA	1.20E+01
1-Butanol	51032	3/08/90	DIGC	<1.00E+04
1-Butanol	51032B	3/08/90	VOA	1.30E+01
1-Butanol	51032T	3/08/90	VOA	1.40E+01
2-Butanone	50015	9/12/85	VOA	<1.00E+01
2-Butanone	50031	4/18/86	VOA	<1.00E+01
2-Butanone	50091	7/16/86	VOA	<1.00E+01

Table C-1. Total Data with Associated Sample Numbers. (sheet 6 of 11)

Constituent	Sample #	Date	Method	Result
2-Butanone	50091B	7/16/86	VOA	<1.00E+01
2-Butanone	50145	10/02/86	VOA	<1.00E+01
2-Butanone	50145B	10/02/86	VOA	<1.00E+01
2-Butanone	50230	1/23/87	VOA	<1.00E+01
2-Butanone	50230B	1/23/87	VOA	<1.00E+01
2-Butanone	50788	11/22/89	VOA	<1.00E+01
2-Butanone	50788B	11/22/89	VOA	<1.00E+01
2-Butanone	50788T	11/22/89	VOA	<1.00E+01
2-Butanone	50812	11/29/89	VOA	<1.00E+01
2-Butanone	50812B	11/29/89	VOA	<1.00E+01
2-Butanone	50931	2/12/90	VOA	1.00E+01
2-Butanone	50931B	2/12/90	VOA	1.03E+02
2-Butanone	50931T	2/12/90	VOA	9.10E+01
2-Butanone	51032	3/08/90	VOA	<1.00E+01
2-Butanone	51032B	3/08/90	VOA	<1.00E+01
2-Butanone	51032T	3/08/90	VOA	<1.00E+01
Dichloromethane	50015	9/12/85	VOA	<1.00E+01
Dichloromethane	50031	4/18/86	VOA	<1.00E+01
Dichloromethane	50091	7/16/86	VOA	<1.00E+01
Dichloromethane	50091B	7/16/86	VOA	1.70E+02
Dichloromethane	50145	10/02/86	VOA	1.10E+01
Dichloromethane	50145B	10/02/86	VOA	1.10E+02
Dichloromethane	50230	1/23/87	VOA	<1.00E+01
Dichloromethane	50230B	1/23/87	VOA	5.90E+01
Dichloromethane	50788	11/22/89	VOA	<5.00E+00
Dichloromethane	50788B	11/22/89	VOA	<3.00E+00
Dichloromethane	50788T	11/22/89	VOA	<5.00E+00
Dichloromethane	50812	11/29/89	VOA	<4.00E+00
Dichloromethane	50812B	11/29/89	VOA	<5.00E+00
Dichloromethane	50931	2/12/90	VOA	<5.00E+00
Dichloromethane	50931B	2/12/90	VOA	<5.00E+00
Dichloromethane	50931T	2/12/90	VOA	<3.00E+00
Dichloromethane	51032	3/08/90	VOA	<5.00E+00
Dichloromethane	51032B	3/08/90	VOA	<5.00E+00
Dichloromethane	51032T	3/08/90	VOA	<5.00E+00
Trichloromethane	50015	9/12/85	VOA	<1.00E+01
Trichloromethane	50031	4/18/86	VOA	<1.00E+01
Trichloromethane	50091	7/16/86	VOA	<1.00E+01
Trichloromethane	50091B	7/16/86	VOA	<1.00E+01
Trichloromethane	50145	10/02/86	VOA	<1.00E+01
Trichloromethane	50145B	10/02/86	VOA	<1.00E+01
Trichloromethane	50230	1/23/87	VOA	<1.00E+01
Trichloromethane	50230B	1/23/87	VOA	<1.00E+01
Trichloromethane	50788	11/22/89	VOA	<5.00E+00
Trichloromethane	50788B	11/22/89	VOA	<3.00E+00
Trichloromethane	50788T	11/22/89	VOA	1.10E+01
Trichloromethane	50812	11/29/89	VOA	8.00E+00

Table C-1. Total Data with Associated Sample Numbers. (sheet 7 of 11)

Constituent	Sample #	Date	Method	Result
Trichloromethane	50812B	11/29/89	VOA	<5.00E+00
Trichloromethane	50931	2/12/90	VOA	<5.00E+00
Trichloromethane	50931B	2/12/90	VOA	<4.00E+00
Trichloromethane	50931T	2/12/90	VOA	<3.00E+00
Trichloromethane	51032	3/08/90	VOA	<5.00E+00
Trichloromethane	51032B	3/08/90	VOA	<5.00E+00
Trichloromethane	51032T	3/08/90	VOA	<5.00E+00
Alkalinity (Method B)	50788	11/22/89	TITRA	5.80E+04
Alkalinity (Method B)	50812	11/29/89	TITRA	5.90E+04
Alkalinity (Method B)	50931	2/12/90	TITRA	6.20E+04
Alkalinity (Method B)	51032	3/08/90	TITRA	6.00E+04
Alpha Activity (pCi/L)	50015	9/12/85	Alpha	2.54E+00
Alpha Activity (pCi/L)	50031	4/18/86	Alpha	5.72E-01
Alpha Activity (pCi/L)	50091	7/16/86	Alpha	2.03E+00
Alpha Activity (pCi/L)	50145	10/02/86	Alpha	8.07E-01
Alpha Activity (pCi/L)	50230	1/23/87	Alpha	1.56E-01
Alpha Activity (pCi/L)	50788	11/22/89	Alpha	<2.21E-01
Alpha Activity (pCi/L)	50812	11/29/89	Alpha	<6.22E-01
Alpha Activity (pCi/L)	51032	3/08/90	Alpha	<1.89E-01
Beta Activity (pCi/L)	50015	9/12/85	Beta	3.01E+00
Beta Activity (pCi/L)	50031	4/18/86	Beta	3.23E+00
Beta Activity (pCi/L)	50091	7/16/86	Beta	3.75E+00
Beta Activity (pCi/L)	50145	10/02/86	Beta	2.61E+00
Beta Activity (pCi/L)	50230	1/23/87	Beta	4.45E+00
Beta Activity (pCi/L)	50788	11/22/89	Beta	2.69E+00
Beta Activity (pCi/L)	50812	11/29/89	Beta	2.29E+00
Conductivity (μS)	50015	9/12/85	COND-Fld	1.30E+02
Conductivity (μS)	50031	4/18/86	COND-Fld	1.30E+01
Conductivity (μS)	50091	7/16/86	COND-Fld	1.24E+02
Conductivity (μS)	50145	10/02/86	COND-Fld	1.22E+02
Conductivity (μS)	50230	1/23/87	COND-Fld	1.33E+02
Conductivity (μS)	50788	11/22/89	COND-Fld	1.44E+02
Conductivity (μS)	50812	11/29/89	COND-Fld	1.40E+02
Conductivity (μS)	50931	2/12/90	COND-Fld	1.26E+02
Conductivity (μS)	51032	3/08/90	COND-Fld	1.32E+02
Ignitability (°F)	50788E	11/22/89	IGNIT	2.08E+02
Ignitability (°F)	50812E	11/29/89	IGNIT	2.12E+02
Ignitability (°F)	50931E	2/12/90	IGNIT	2.08E+02
Ignitability (°F)	51032E	3/08/90	IGNIT	2.02E+02
pH (dimensionless)	50015	9/12/85	PH-Fld	8.40E+00
pH (dimensionless)	50031	4/18/86	PH-Fld	8.16E+00
pH (dimensionless)	50091	7/16/86	PH-Fld	6.29E+00
pH (dimensionless)	50145	10/02/86	PH-Fld	5.80E+00
pH (dimensionless)	50230	1/23/87	PH-Fld	5.20E+00
pH (dimensionless)	50788	11/22/89	PH-Fld	7.50E+00
pH (dimensionless)	50812	11/29/89	PH-Fld	7.70E+00
pH (dimensionless)	50931	2/12/90	PH-Fld	7.25E+00

Table C-1. Total Data with Associated Sample Numbers. (sheet 8 of 11)

Constituent	Sample #	Date	Method	Result
pH (dimensionless)	51032	3/08/90	PH-Fld	8.12E+00
Reactivity Cyanide (mg/kg)	50788E	11/22/89	DSPEC	<1.00E+02
Reactivity Cyanide (mg/kg)	50812E	11/29/89	DSPEC	<1.00E+02
Reactivity Cyanide (mg/kg)	50931E	2/12/90	DSPEC	<1.00E+02
Reactivity Cyanide (mg/kg)	51032E	3/08/90	DSPEC	<1.00E+02
Reactivity Sulfide (mg/kg)	50788E	11/22/89	DTITRA	<1.00E+02
Reactivity Sulfide (mg/kg)	50812E	11/29/89	DTITRA	<1.00E+02
Reactivity Sulfide (mg/kg)	50931E	2/12/90	DTITRA	<1.00E+02
Reactivity Sulfide (mg/kg)	51032E	3/08/90	DTITRA	<1.00E+02
TDS	50788	11/22/89	TDS	6.40E+04
TDS	50812	11/29/89	TDS	5.20E+04
TDS	50931	2/12/90	TDS	6.30E+04
TDS	51032	3/08/90	TDS	6.30E+04
Temperature (°C)	50015	9/12/85	TEMP-Fld	1.94E+01
Temperature (°C)	50031	4/18/86	TEMP-Fld	1.43E+01
Temperature (°C)	50091	7/16/86	TEMP-Fld	1.96E+01
Temperature (°C)	50145	10/02/86	TEMP-Fld	1.86E+01
Temperature (°C)	50230	1/23/87	TEMP-Fld	4.80E+00
Temperature (°C)	50788	11/22/89	TEMP-Fld	1.39E+01
Temperature (°C)	50812	11/29/89	TEMP-Fld	1.13E+01
Temperature (°C)	50931	2/12/90	TEMP-Fld	8.60E+00
Temperature (°C)	51032	3/08/90	TEMP-Fld	8.80E+00
TOC	50145	10/02/86	TOC	1.50E+03
TOC	50230	1/23/87	TOC	1.24E+03
TOC	50788	11/22/89	TOC	<1.30E+03
TOC	50812	11/29/89	TOC	<1.10E+03
TOC	50931	2/12/90	TOC	<1.00E+03
TOC	51032	3/08/90	TOC	1.10E+03
Total Carbon	50788	11/22/89	TC	1.53E+04
Total Carbon	50812	11/29/89	TC	1.58E+04
Total Carbon	50931	2/12/90	TC	1.31E+04
Total Carbon	51032	3/08/90	TC	1.59E+04
TOX (as Cl)	50015	9/12/85	TOX	<9.10E+00
TOX (as Cl)	50031	4/18/86	TOX	<6.60E+00
TOX (as Cl)	50091	7/16/86	TOX	<1.04E+01
TOX (as Cl)	50145	10/02/86	TOX	<1.00E+02
TOX (as Cl)	50230	1/23/87	LTOX	2.26E+01
TOX (as Cl)	50788	11/22/89	LTOX	1.00E+01
TOX (as Cl)	50812	11/29/89	LTOX	<8.00E+00
TOX (as Cl)	50931	2/12/90	LTOX	<8.00E+00
TOX (as Cl)	51032	3/08/90	LTOX	<7.00E+00
^{60}Co (pCi/L)	50788	11/22/89	GEA	<9.40E-02
^{60}Co (pCi/L)	50812	11/29/89	GEA	<1.75E-01
^{60}Co (pCi/L)	51032	3/08/90	GEA	5.86E-01
^{239,240}Pu (pCi/L)	50788	11/22/89	AEA	3.19E-03
^{239,240}Pu (pCi/L)	50812	11/29/89	AEA	<1.56E-03
Radium Total (pCi/L)	50788	11/22/89	Alpha-Ra	2.04E-01

Table C-1. Total Data with Associated Sample Numbers. (sheet 9 of 11)

Constituent	Sample #	Date	Method	Result
Radium Total (pCi/L)	50812	11/29/89	Alpha-Ra	<8.61E-02
Radium Total (pCi/L)	51032	3/08/90	Alpha-Ra	<5.07E-02
^{90}Sr (pCi/L)	50788	11/22/89	Beta	2.39E-01
^{90}Sr (pCi/L)	50812	11/29/89	Beta	<1.29E-01
^{90}Sr (pCi/L)	51032	3/08/90	Beta	1.78E-01
^{234}U (pCi/L)	50788	11/22/89	AEA	2.43E-01
^{234}U (pCi/L)	50812	11/29/89	AEA	2.81E-01
^{234}U (pCi/L)	51032	3/08/90	AEA	2.28E-01
^{238}U (pCi/L)	50788	11/22/89	AEA	1.77E-01
^{238}U (pCi/L)	50812	11/29/89	AEA	2.02E-01
^{238}U (pCi/L)	51032	3/08/90	AEA	1.98E-01

Sample# is the number of the sample. See chapter three for corresponding chain-of-custody number. Date is the sampling date. Results are in ppb (parts per billion) unless otherwise indicated. 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

Table C-1. Total Data with Associated Sample Numbers. (sheet 10 of 11)

Code	Analytical Method	Reference
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
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

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

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 United States Testing Company, Incorporated, Richland, Washington.

Table C-1. Total Data with Associated Sample Numbers. (sheet 11 of 11)

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.

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