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Origin of Wastes in Single-Shell Tanks 241-B-110 and 241-B-111

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CH2M HILL Hanford Group, Inc.

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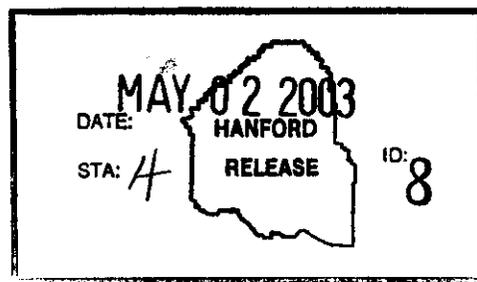
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Abstract: A review of waste transfer documents was conducted to identify the origin of wastes present in tanks B-110 and B-111. These tanks initially received second decontamination cycle (2C) waste from the 221-B Bismuth Phosphate Plant, which separated into 2C sludge and supernatant. The supernatant was discharged to cribs. 242-B Evaporator bottoms were briefly stored in these tanks. Later, these tanks received waste from fission product separations conducted at the 221-B Plant.

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**ORIGIN OF WASTES IN SINGLE-SHELL TANKS
241-B-110 AND 241-B-111**

M. E. Johnson
CH2M HILL Hanford Group, Inc.

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EXECUTIVE SUMMARY

A review of waste transfer documentation was conducted to determine the origin of waste transferred into single-shell tanks 241-B-110 and 241-B-111. This review was conducted to support decisions concerning disposition of the waste present in tanks 241-B-110 and 241-B-111.

These two tanks were operated for a number of years in a cascade along with tank 241-B-112. Waste was transferred into tank 241-B-110 and when this tank was filled, waste overflowed through an underground pipeline into tank 241-B-111. Similarly, when tank 241-B-111 was filled, waste overflowed through an underground pipeline into tank 241-B-112. In 1947, piping modifications were conducted which allowed waste to be transferred directly into any one of these three tanks. The wastes transferred into tanks 241-B-110, 241-B-111, and 241-B-112 are summarized in Table ES-1. Tanks 241-B-110, 241-B-111, and 241-B-112 generally received waste from operations conducted in the 221-B Plant.

Tanks 241-B-110, 241-B-111, and 241-B-112 received second decontamination cycle (2C) waste from spent nuclear fuel reprocessing (Bismuth Phosphate process) conducted in the 221-B Plant from May 1945 through June 1952. Low-activity cell drainage (5-6) waste was also transferred from B-Plant into these three tanks from June 1951 through June 1952. After cessation of the Bismuth Phosphate process in June 1952, tanks 241-B-110, 241-B-111, and 241-B-112 received wastes from cleanout of B-Plant from July 1952 through September 1954. The 2C, 5-6, and equipment cleaning wastes were purposely precipitated in tanks 241-B-110 and 241-B-111 to separate transuranic elements (primarily plutonium and americium), with supernatant cascading into tank 241-B-112. The soluble fractions of these wastes were transferred from tank 241-B-112 to an underground crib.

Following the shutdown of B-Plant, tanks 241-B-110 and 241-B-111 received evaporator bottoms from the 242-B Evaporator in April 1954. The evaporator bottoms waste was subsequently transferred to other single-shell tanks as part of plans to reactivate B-Plant. Reactivation of B-Plant for spent nuclear fuel reprocessing was conducted from October 1955 through March 1957. Equipment and process cells were flushed as part of these reactivation activities. These flush solutions were routed to tanks 241-B-110, 241-B-111, and 241-B-112, with the supernatant discharged from tank 241-B-112 to an underground crib. Plans to reactivate B-Plant for spent fuel reprocessing were cancelled in March 1957 and the plant was idled.

B-Plant was then reactivated for separating fission products (e.g., strontium-90, rare earth elements, and cesium-137) from plutonium-uranium extraction (PUREX) high-level waste and stored tank wastes. From September 1961 through June 1970, tanks 241-B-110, 241-B-111, and 241-B-112 received wastes from construction activities conducted at B-Plant, strontium and rare earth (Sr/RE) elements separations, cell 23 evaporator bottoms, and cesium ion exchange processing. Tank 241-B-112 also received from January 1973 through June 1974 evaporator bottoms from the in-tank solidification unit that was operated in tank 241-BY-112.

The Sr/RE waste, cell 23 evaporator bottoms, and cesium ion exchange process wastes were all transferred from tanks 241-B-110 and 241-B-111 to other single-shell tanks from 1965 through March 1972. Following these transfers, tanks 241-B-110 and 241-B-111 contained principally sludges formed from precipitation of the 2C waste and the Sr/RE waste, along with precipitated salts from the B-Plant cesium ion exchange waste. Tank 241-B-112 did not receive a measurable quantity of 2C sludge based on the cascade operating mode and sludge level measurements, but instead contains precipitated salts from B-Plant cesium ion exchange waste and evaporator bottoms from the in-tank solidification unit that was operated in tank 241-BY-112.

Table ES-1. Waste Types Added to Tanks 241-B-110, 241-B-111, and 241-B-112.

Waste Type ⁽¹⁾	Tank 241-B-110	241-B-111	241-B-112
2C ⁽²⁾	5/1945 – 8/1946	5/1945 – 8/1946	5/1945 – 8/1946
	5/1948 – 1/1949	5/1948 – 1/1949	5/1948 – 1/1949
	5/1950 – 5/1951	5/1950 – 5/1951	5/1950 – 5/1951
2C + 5-6	6/1951 – 7/1952	6/1951 – 7/1952	6/1951 – 7/1952
B-Plant Equipment Cleaning Waste	7/1952 – 9/1954	7/1952 – 9/1954	7/1952 – 9/1954
EB from 242-B Evaporator	4/1954	4/1954	In advertent addition of some EB to this tank
B-Plant Reactivation for 4X Program (cancelled in 3/1957)	10/1955 – 4/1957	10/1955 – 4/1957	Not added to tank
B-Plant Construction for Sr/RE Process	9/1961 – 12/1962	9/1961 – 12/1962	9/1961 – 12/1962
B-Plant Sr/RE Processing	8/1963 – 6/1966	8/1963 – 6/1966	8/1963 – 6/1966
B-Plant equipment flushing	7/1966 – 1Q/1968	7/1966 – 10/1967	7/1966 – 10/1967
EB from B-Plant Cell 23 evaporator	1Q/1968	10/1967	Not added to tank
B-Plant IX	3Q/1969	3Q/1969 – 2Q/1970	3Q/1969 – 2Q/1970
EB from ITS	Not added to tank	Not added to tank	1/1973 – 6/1974

Notes:

⁽¹⁾ Waste Type Definitions:

- 2C: Second decontamination cycle waste from B-Plant Bismuth Phosphate process
- 5-6: B-Plant low activity cell drainage
- EB: Evaporator bottoms
- ITS: In-Tank Solidification unit installed in tank 241-BY-112
- IX: waste from B-Plant cesium ion exchange process
- Q: calendar year quarter
- Sr/RE: Strontium / Rare Earths

⁽²⁾ 2C waste routed to tanks 241-B-104, 241-B-105, and 241-B-106 during period when tanks 241-B-110, 241-B-111, and 241-B-112 were filled.

CONTENTS

1.0	INTRODUCTION	9
2.0	WASTE TRANSFER INTO AND WASTE REMOVAL FROM TANKS 241-B-110, 241-B-111, AND 241-B-112	9
2.1	Description of Tanks 241-B-110, 241-B-111, and 241-B-112	9
2.2	Waste Transfers for Tanks 241-B-110, 241-B-111, and 241-B-112	11
2.2.1	Second Decontamination Cycle (2C) Waste	11
2.2.2	2C Waste Combined with Cell Drainage (5-6) Waste	13
2.2.3	221-B Equipment Cleaning Waste	14
2.2.4	242-B Evaporator Bottoms Receipt into Tanks 241-B-110 and 241-B-111	14
2.2.5	Waste from Preparations to Re-Activate 221-B Plant	15
2.2.6	Cesium and Strontium Scavenging of Supernatant	16
2.2.7	221-B Plant Strontium and Rare Earth Processing Waste	16
2.2.8	221-B Plant Cell 23 Evaporator Bottoms Waste	17
2.2.9	221-B Plant Cesium Ion Exchange Process Waste	18
2.2.10	Removal of Pumpable Liquids from Tanks 241-B-110 and 241-B-111	19
2.2.11	Comparison with Other Reports	20
3.0	TYPES OF TANK WASTE GENERATED AT THE HANFORD SITE CHEMICAL PROCESSING PLANTS	21
3.1	B AND T BISMUTH PHOSPHATE PROCESS PLANTS	21
3.1.1	221-B Cell Drainage (5-6) Waste	27
3.2	221-B PLANT FISSION PRODUCTS PROCESSING	30
3.2.1	STRONTIUM AND RARE EARTHS PROCESSING	30
3.2.2	CESIUM AND STRONTIUM PROCESSING	31
4.0	RADIONUCLIDE ANALYSES OF WASTE IN TANKS 241-B-110 AND 241-B-111	33
5.0	SUMMARY	34
6.0	REFERENCES	36

APPENDIX

A.	Volume of Wastes in Tanks 241-B-110, 241-B-111, and 241-B-112	A-1
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FIGURES

Figure 1.	Tanks 241-B-110, 241B-111 and 241-B-112 Waste Tank Cascade System	10
Figure 2.	Bismuth Phosphate Process Diagram	23

TABLES

Table 1. Volume of B-Plant Cesium Ion Exchange Waste Transferred to Tanks 241-B-110 and 241-B-111.....	19
Table 2. Estimated Composition of Bismuth Phosphate Plant Wastes.....	24
Table 3. Analyses of Bismuth Phosphate Process Supernatants Stored ^(1,2)	25
Table 4. Analyses of Metal Waste and First Decontamination Cycle / Coating Waste Supernatant	26
Table 5. Composition of Tank 5-6 Cell Drainage Waste from 221-B Plant. (2 Sheets)	28
Table 6. Concentrations of Radionuclides Present in	33
Table 7. Waste Types Added to Tanks 241-B-110, 241-B-111, and 241-B-112	35

LIST OF TERMS

1C	first cycle of the bismuth phosphate plutonium decontamination process
2C	second cycle of the bismuth phosphate plutonium decontamination process
5-6	low activity cell drainage waste
CAW	Current Acid Waste
cc	cubic centimeters
CW	Coating waste
DOE	U.S. Department of Energy
EB	evaporator bottoms
lbs	pounds
ITS	In-Tank Solidification
IX	Ion Exchange
mL	milliliters
MW	Metal waste
PAS	PUREX Acidified Sludge
PTA	phosphotungstic acid
PUREX	Plutonium Uranium Extraction Plant
REDOX	Reduction-Oxidation Plant
Sr/RE	strontium and rare earth
TBP	Tri-butyl Phosphate
wt%	weight percent
nCi/g	nanocuries per gram
μ Ci/cc	microcuries per cubic centimeters
μ Ci/g	microcuries per gram
μ g/cc	micrograms per cubic centimeters

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1.0 INTRODUCTION

The origin of the wastes in tanks 241-B-110, 241-B-111, and 241-B-112 is important in determining the disposition of these wastes and the waste storage tanks. Section 2.0 discusses the origin of waste transferred into and removed from single-shell tanks 241-B-110, 241-B-111, and 241-B-112. Section 3.0 provides a description of the different types of wastes that were generated at the Hanford Site chemical processing plants and transferred to the underground storage tanks 241-B-110, 241-B-111, and 241-B-112. Section 4.0 provides a discussion on the radionuclide analyses of the wastes in tanks 241-B-110, 241-B-111, and 241-B-112. Section 5.0 summarizes the waste types that were transferred into tanks 241-B-110, 241-B-111, and 241-B-112.

2.0 WASTE TRANSFER INTO AND WASTE REMOVAL FROM TANKS 241-B-110, 241-B-111, AND 241-B-112

This section provides a brief description of 241-B-110, 241-B-111, and 241-B-112 and summarizes waste transfers into and waste removal from these tanks. In order to determine the origins of the wastes presently stored in tanks 241-B-110, 241-B-111, and 241-B-112, publicly available reports for the Hanford Site were reviewed. With the exception of the waste status summary reports, all reports cited in this section are available electronically from the Hanford Declassified Document Retrieval System at <http://www2.hanford.gov/declass/> or the U.S. Department of Energy (DOE) Information Bridge at <http://www.osti.gov/bridge/>. The waste status summary reports are available only as photocopies from Hanford Site Central Files organization.

2.1 DESCRIPTION OF TANKS 241-B-110, 241-B-111, AND 241-B-112

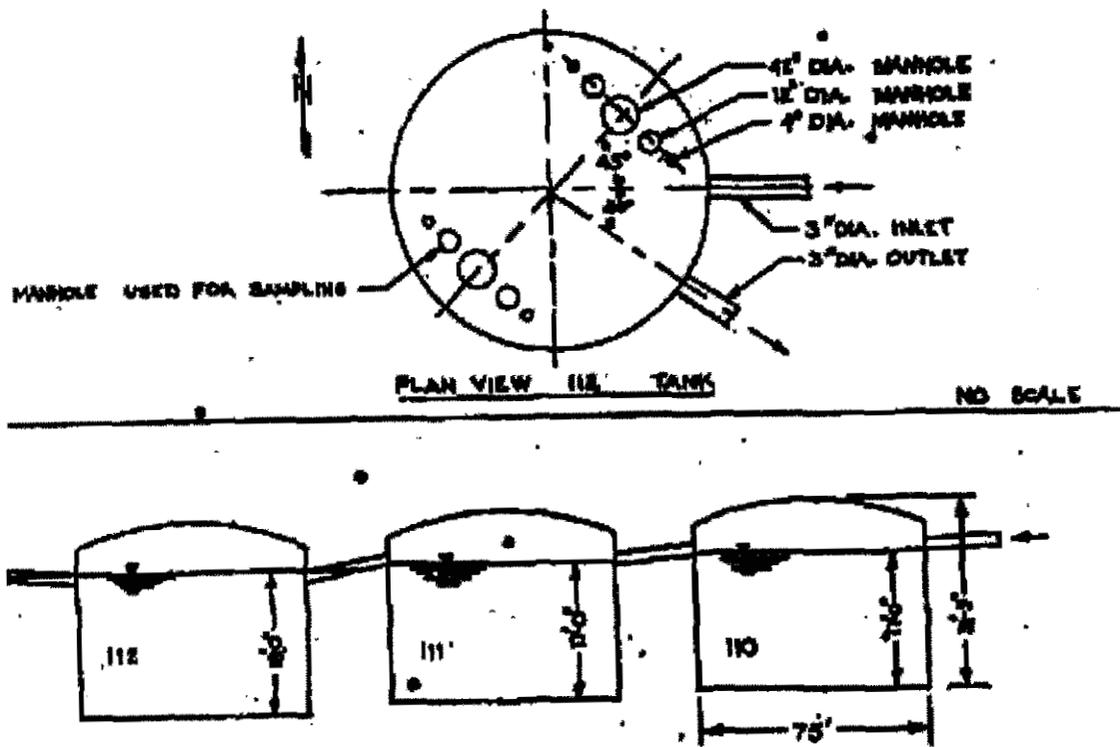
Single-shell tanks 241-B-110, 241-B-111, and 241-B-112 were originally constructed in 1944 as part of the Manhattan Project (HW-10475-C, chapter IX) and are three of the twelve, 100-series tanks in 241-B Tank Farm. The 100-series tanks are seventy-five-foot diameter underground tanks made of reinforced concrete with a steel liner on the bottom and sides. The steel liner extends to a height of nineteen feet. Each 100-series tank has a design capacity of 530,000 gallons at a liquid depth of sixteen-feet and eight-inches. The 241-B Tank Farm also includes four 200-series tanks that are of similar construction as the 100-series tanks, but are only twenty-foot diameter and each have a capacity of 55,000-gallons.

Tanks 241-B-110 and 241-B-111, along with tank 241-B-112, were connected together via underground piping to allow waste to cascade from the lead tank into the subsequent two tanks, as depicted in Figure 1. As discussed in subsequent sections, waste was discharged from these tanks through an underground pipeline to a crib for a number of years. In addition to the overflow piping, each tank is equipped with four, 3-inch diameter stainless steel inlet pipes. Originally, only the inlet pipes from tank 241-B-110 were connected to diversion box 241-B-153, with the inlet pipes for the other tanks blanked off close to each tank (HW-10475-C,

page 907 –908). However, in 1947, piping modifications were conducted to allow the direct transfer of waste from diversion box 241-B-153 to any of these three tanks (H-2-579 and HAN-45764, page 39).

The overflow pipe for tanks 241-B-110 and 241-B-111 is at an elevation that results in seventeen-feet of waste (~540,530 gallons) being retained in each tank. The overflow pipeline from tank 241-B-112 is at an elevation that results in eighteen-feet of waste (~573,530 gallons) being retained in this tank (HW-27035).

Figure 1. Tanks 241-B-110, 241B-111 and 241-B-112 Waste Tank Cascade System



2.2 WASTE TRANSFERS FOR TANKS 241-B-110, 241-B-111, AND 241-B-112

Tanks 241-B-110, 241-B-111, and 241-B-112 were operated as a cascade from May 1945 through June 1956. Piping modifications made in 1947 also allowed waste to be transferred directly into any of these three tanks. The design of the tank cascade system as shown in Figure 1 resulted in tanks 241-B-110 and 241-B-111 being constantly filled with waste that then cascaded into tank 241-B-112. From February 1948 through July 1953 (HW-33591, page 9), supernatant was periodically transferred from tank 241-B-112 to an underground crib, number 241-B-3. Crib number 241-B-3 was later re-numbered to crib 216-B-8 (HW-55176, Part VI, page 4). From December 1954 through October 1955, supernatant was periodically transferred from tank 241-B-112 to underground cribs number 241-B-1 and 241-B-2 (HW-44784, page 27). Crib numbers 241-B-1 and 241-B-2 were later renumbered to cribs 216-B-7a and 216-B-7b (HW-55176, Part VI, page 4). After October 1955, tank 241-B-112 no longer discharged supernatant to an underground crib.

The volume and radioactive content (plutonium, gross beta, and uranium) of waste discharged from these tanks to underground cribs is summarized in references HW-17088, HW-20583, HW-25301, HW-28121, HW-33591, HW-38562, and HW-44784. Appendix A provides a tabular listing of the volume of solids and total waste present in tanks 241-B-110, 241-B-111, and 241-B-112 from January 1945 through September 1976. All three tanks were removed from service in the 1970's and are assumed to have leaked waste to the surrounding soil.

The following sections describe in chronological order the waste types that were transferred into tanks 241-B-110, 241-B-111, and 241-B-112 along with the disposition of these wastes.

2.2.1 Second Decontamination Cycle (2C) Waste

The 241-B Tank Farm was originally constructed to receive waste from the 221-B Bismuth Phosphate plant (see Section 3.0). Tanks 241-B-110, 241-B-111, and 241-B-112 were operated as a cascade, with second decontamination cycle (designated as 2C) waste from the 221-B building being received into tank 241-B-110. Irradiated fuel was first processed in 221-B Plant beginning on April 13, 1945 (HW-7-1649-DEL, page 21) and 2C waste was reported as beginning to fill tank 241-B-110 in May 1945 (HW-7-1793-DEL, page 22).

Tanks 241-B-110, 241-B-111, and 241-B-112 continued to receive 2C waste through August 15, 1946, at which time these tanks were reported as being filled and 2C waste was diverted to tanks 241-B-104, 241-B-105, and 241-B-106 (HAN-45800-DEL, page 73 and HW-7-4739-DEL, page 21). While tanks 241-B-110, 241-B-111, and 241-B-112 remained filled with 2C waste, tanks 241-B-104, 241-B-105, and 241-B-106 continued to receive 2C waste from irradiated fuel reprocessing activities conducted at the 221-B Plant.

Plans were initiated in October 1946 to dispose of the 2C supernatant contained in these tanks to an underground crib (HW-7-5362-DEL, page 27). A new underground crib (designated as 241-B-3) was constructed in 1947. Tank 241-B-110 would be used to settle solids that formed in the 2C waste, with the supernatant cascading by gravity flow into tank 241-B-111 and then into tank 241-B-112. The clarified 2C supernatant would be jetted from tank 241-B-112 to the underground crib. Crib disposal of the clarified 2C supernatant was authorized on an experimental basis (HW-10321). Approximately 39,000-gallons of 2C waste contained in tank 241-B-112 was jetted to this underground crib in February 1948 (HW-9191-DEL, page 28), but had to be stopped when liquid entered the test shaft adjacent to the crib via connecting lateral pipes. This situation was corrected by sealing the lateral pipes that penetrated into the crib (HAN-45807-DEL, page 29).

Following extensive sampling of the soil beneath the crib (HW-9595-DEL, page 30), crib disposal of additional 2C supernatant from tank 241-B-112 was resumed in March 1948. By the end of April 1948, a total of 314,000-gallons of supernatant were discharged from tank 241-B-112 to crib 241-B-3 (HW-9922-DEL, page 31). All of the 2C supernatant was emptied from tank 241-B-112 on May 13, 1948 (HW-10166-DEL, page 31). Further disposal of 2C supernatant to the crib was halted while extensive soil samples were collected and analyzed to determine the movement of radioactivity in the soil.

The 221-B Plant continued to discharge 2C waste to tanks 241-B-104, 241-B-105, and 241-B-106 from August 1946 through May 14, 1948, at which time this cascade of three single-shell tanks was reported as being filled (HW-10166-DEL, page 31). Beginning on May 14, 1948, the 2C waste from the 221-B Plant was again collected in the cascade of tanks 241-B-110, 241-B-111, and 241-B-112, while efforts were conducted to remove the 2C supernatant from the cascade of tanks 241-B-104, 241-B-105, and 241-B-106.

Approximately 314,000-gallons of the 2C waste present in tank 241-B-104 were jetted to crib 241-B-3 from July through August 2, 1948 (HW-10714-DEL, page 32 and HW-10993-DEL, page 35). Disposal of the 2C waste from tank 241-B-104 had to be halted when personnel determined that 2C sludge was also being jetted along with the supernatant to the crib, causing restricted flow from the crib. In September 1948, jetting of the 2C supernatant present in tank 241-B-105 to crib 241-B-3 was initiated (HW-11226-DEL, page 32). However, the flow of supernatant from the crib was observed to be restricted. Personnel discharged several batches of 10-wt% nitric acid solution to crib 241-B-3 in an attempt to dissolve the solids that were thought to be causing the restricted flow of supernatant from the crib to the soil. However, these acid flushes did not improve the discharge rate of liquid from the crib to the soil. Crib disposal of the 2C supernatant from tank 241-B-105 was completed on December 8, 1948, with a total of 522,800-gallons of waste discharged from this tank into the crib (HW-12086-DEL, page 37). Disposal of the 2C supernatant present in tank 241-B-106 to crib 241-B-3 was initiated on December 14, 1948 (HW-12086-DEL, page 37) and completed during February 1949, with 531,250-gallons of waste discharged to the crib (HW-12666-DEL, page 34).

The cascade of tanks 241-B-110, 241-B-111, and 241-B-112 was again reported as being filled with 2C waste in January 1949 (HW-12391-DEL, page 39). With these tanks filled, 2C waste was again routed from the 221-B Plant into the cascade of tanks 241-B-104, 241-B-105, and

241-B-106. These tanks received 2C waste from February 1949 through April 1950 (HW-17660-DEL, page 46). Disposal of 2C supernatant from tanks 241-B-104, 241-B-105, and 241-B-106 to crib 241-B-3 was conducted from April 1950 (HW-17660-DEL, page 46) through June 1950 (HW-18221-DEL, page 43).

Disposal of 2C supernatant from tank 241-B-112 to crib 241-B-3 was initiated in December 1949 (HW-15550-DEL, page 42) and completed in February 1950, with a total of 497,000-gallons of supernatant disposed (HW-17056-DEL, page 44). Disposal of 2C supernatant from tank 241-B-110 to crib 241-B-3 was initiated in April 1950 (HW-17660-DEL, page 46) and completed in May 1950 (HW-17971-DEL, page 44).

The cascade of tanks 241-B-110, 241-B-111, and 241-B-112 was again reported as receiving 2C waste from the 221-B Plant in May 1950 (HW-17971-DEL, page 44). Disposal of 2C supernatant from tank 241-B-112 to crib 241-B-3 was resumed in October 1950 (HW-19325-DEL, page 49). The 2C waste formed solids, which tended to settle primarily in tank 241-B-110. Some 2C solids also formed in tank 241-B-111. The 2C supernatant overflowed by gravity from tank 241-B-110 into tank 241-B-111 and then into tank 241-B-112. The clarified 2C supernatant was periodically jetted from tank 241-B-112 to the crib through April 1951 (HW-20991-DEL, page 51). Modification to the discharge from tank 241-B-112 was conducted in May and June 1951 to allow the clarified 2C supernatant to overflow from tank 241-B-112 into the crib (H-2-1984 and HW-21506-DEL, page 56). As discussed in the next section, the cascade began to receive a combined waste stream.

2.2.2 2C Waste Combined with Cell Drainage (5-6) Waste

Beginning in June 1951, the neutralized, cell drainage waste from the 221-B Plant (designated as 5-6 waste) was combined with the 2C waste in the cascade of tanks 241-B-110, 241-B-111, and 241-B-112 (H-2-1991 and HW-21506-DEL, page 56). Tank 5-6 in the 221-B Plant was used to collect low-activity drainage from the process cells. The radionuclide content of cell drainage waste depended on the frequency of leaks that developed in the 221-B Plant process equipment. High-activity cell drainage waste was collected in tank 5-9 and either reworked or transferred to single-shell tank 241-B-107 (see Section 3.1.1).

The low-activity cell drainage was transferred to the cascade of tanks 241-B-110, 241-B-111, and 241-B-112 so "... that the major portion of the suspended plutonium carrying solids will settle out while the waste solution combines and cascades concurrently with the second decontamination cycle waste prior to underground cribbing by constant overflow" (HW-21506-DEL, page 56). The combined 2C waste and cell drainage waste from tank 5-6 were transferred to the cascade of tanks 241-B-110, 241-B-111, and 241-B-112. All three tanks were essentially filled with waste to the overflow pipeline. Solids settled by gravity in each tank of the cascade. Supernatant overflowed from tank 241-B-110 to tank 241-B-111, which then overflowed to tank 241-B-112. Supernatant overflowed from tank 241-B-112 to the crib. The combined disposal of low-activity cell drainage waste and 2C waste to the cascade of tanks 241-B-110, 241-B-111, and 241-B-112 continued until July 1952 (HW-25227-DEL, pages Ed-5 and Ed-6), after which the 221-B Plant stopped processing irradiated fuel.

2.2.3 221-B Equipment Cleaning Waste

Beginning in July 1952, cleanout of B-Plant and the 224-B Concentration building was initiated, with the irradiated nuclear fuel dissolver heels removed from equipment in the 221-B building (HW-25227-DEL, pages Ed-1 and Ed-6). The process equipment in B-Plant was flushed with nitric acid solution from July 1952 through September 1952 to remove plutonium. The recovered plutonium solutions were processed through the normal bismuth phosphate flowsheet (HW-25227-DEL page Ed-1 and Ed-6, HW-25533-DEL, pages Ed-1 and Ed-6, HW-25781-DEL, page Ed-1, and HW-26047-DEL, pages Ed-1 and Ed-5). Plutonium solutions derived from equipment cleanout activities in the 221-B building were processed in the 224-B Concentration building to recover the plutonium, with the 2C waste transferred to the cascade of tanks 241-B-110, 241-B-111, and 241-B-112 (HW-27838 and HW-27839).

Additional cleaning of the internal surfaces of piping and equipment in 221-B and 224-B buildings was conducted using various chemical solutions and water, as described in HW-27774. This cleaning occurred from October 1952 through March 1953.

Flushes of metal waste, first decontamination cycle, and second decontamination cycle equipment were transferred to the cascade of tanks 241-B-110, 241-B-111, and 241-B-112, as documented in waste status summary reports for the 200 Area tanks farms for this period (HW-27840, HW-27841, HW-27842, and HW-27775).

Flushing of the B-Plant building cells and wetting of process equipment with water was conducted in April 1953 through June 1, 1953 (HW-27932-DEL, page Ed-5; HW-28267-DEL, page Ed-5; and HW-28576-DEL, page Ed-5). These flush solutions were transferred to the cascade of tanks 241-B-110, 241-B-111, and 241-B-112, as documented in waste status summary reports for the 200 Area tanks farms for this period (HW-28043, HW-28377, and HW-28712). Flushing of the 221-B Plant cells and wetting of equipment was halted in July 1953 (HW-33591, page 9). These tanks again received flush solutions from the 221-B Plant in March 1954 (HW-31374, page 4) through September 1954 (HW-33396, page 4).

2.2.4 242-B Evaporator Bottoms Receipt into Tanks 241-B-110 and 241-B-111

In December 1953, approximately 105,000-gallons of supernatant were transferred from tank 241-B-110 to tank 241-C-111 (HW-30498, page 4). In February 1954 (HW-31126, page 4) and again in April 1954 (HW-31811, page 4 and HW-36979B, page 70), the supernatant present in tanks 241-B-110 and 241-B-111 was transferred to tank 241-B-112 and disposed to the crib. These transfers were made to prepare tanks 241-B-110 and 241-B-111 for receipt of concentrated waste from the 242-B Evaporator.

The 242-B Evaporator processed first decontamination cycle (1C) supernatant that was neutralized with coating removal waste to reduce the volume of waste stored in the single-shell tanks. Evaporator bottoms from the 242-B Evaporator were transferred into tank 241-B-105 and then transferred to tanks 241-B-110 and 241-B-111 in April 1954 (HW-31811, page 4). Tank 241-B-10 received an estimated 155,000-gallons of evaporator bottoms which was mixed with

221-B Plant flush solution and stored atop of the approximately 243,000-gallons of 2C sludge in this tank. Tank 241-B-111 received an estimated 335,000-gallons of evaporator bottoms which was mixed with 221-B Plant flush solution and stored atop of the approximately 161,000-gallons of 2C sludge in this tank.

In March 1955, approximately 182,000-gallons of supernatant (mixture of evaporator bottoms and 221-B Plant flush solution) were transferred from tank 241-B-110 into tanks 241-B-107 and 241-B-108 (HW-36001, page 4). An estimated 348,000-gallons of sludge remained in tank 241-B-110, with no supernatant. This sludge volume measurement implies that 105,000-gallons of evaporator bottoms precipitated atop of the 243,000-gallons of 2C waste present in tank 241-B-110.

In July 1955, approximately 281,000-gallons of supernatant (mixture of evaporator bottoms and 221-B Plant flush solution) were transferred from tank 241-B-111 into tank 241-B-108 (HW-38401, page 4). An estimated 249,000-gallons of sludge remained in tank 241-B-111, with no supernatant. This sludge volume measurement implies that 88,000-gallons of evaporator bottoms precipitated atop of the 161,000-gallons of 2C waste present in tank 241-B-111.

2.2.5 Waste from Preparations to Re-Activate 221-B Plant

In 1955, a program (4X Program) was initiated to operate all four of the chemical separation facilities (i.e. 221-B, 221-T, 202-S Reduction-Oxidation [REDOX], and 202-A Plutonium-Uranium Extraction [PUREX] Plants) for reprocessing irradiated nuclear fuel (HW-35825). The 221-B Plant was to be re-activated as part of this program and maintained in standby status in case the other chemical separation facilities failed to meet production goals.

Flushing of process cells and equipment within the 221-B Plant was again conducted from October 1955 (HW-39850, page 4) through April 1957 (HW-50127, page 4), with the waste solutions routed to tanks 241-B-110 and 241-B-111. Tanks 241-B-110 and 241-B-111 received a total of approximately 187,000-gallons and 105,000-gallons of flush solutions, respectively. The 4X Program was cancelled in March 1957 and the 221-B Plant was placed in lay-away status (DDTS-Generated-491, "Lay-Away of the Bismuth Phosphate – TBP Plants and the Metal Waste Removal Facilities").

These flush solutions apparently dissolved the evaporator bottoms precipitates that were present in tanks 241-B-110 and 241-B-111. In January 1957, the measured volumes of solids present in tanks 241-B-110 and 241-B-111 were 243,000-gallons and 161,000-gallons, respectively (HW-48144, page 4). Before receipt of the 221-B Plant flush solutions, the volume of solids present in tank 241-B-110 was 348,000-gallons, of which 243,000-gallons was previously reported as being 2C sludge (see Section 2.2.4). Before receipt of the 221-B Plant flush solutions, the volume of solids present in tank 241-B-111 was 249,000-gallons, of which 161,000-gallons was previously reported as being 2C sludge (see Section 2.2.4). Therefore, it is surmised that only 2C sludge comprised the solids present in tanks 241-B-110 and 241-B-111 in January 1957.

2.2.6 Cesium and Strontium Scavenging of Supernatant

In October 1956, the waste in tank 241-B-112 was noted as being contaminated with evaporator bottoms (HW-46382, page 4). Evaporator bottoms were likely inadvertently transferred into tank 241-B-112 through the overflow line from tank 241-B-111 during the period of time that tank 241-B-111 was used to store evaporator bottoms (see section 2.2.4).

In October 1957, the approximately 495,000-gallons of the supernatant present in tank 241-B-112 was transferred to tank 241-C-101 (HW-53573, page 4) for precipitation of strontium-90 and cesium-137 as part of the in-tank scavenging program for these radionuclides (HW-38955-REV). The remaining waste present in tank 241-B-112 was approximately 43,000-gallons of sludge.

The 241-B-112 supernatant was transferred from tank 241-C-101 to the 241-CR Vault. In the 241-CR Vault, the supernatant was adjusted to $\text{pH } 9.3 \pm 0.7$ by addition of nitric acid solution and then reacted with sodium ferrocyanide and nickel sulfate to precipitate strontium and cesium. The precipitate slurry was transferred to either tank 241-C-109 or 241-C-112 for settling of the nickel ferrocyanide precipitate, which contained the strontium-90 and cesium-137 radionuclides. After settling of the precipitate, the supernatant was pumped from tanks 241-C-109 and 241-C-112 to the 216-BC trenches for disposal (HW-48518, page 19).

As discussed in Section 2.2.4, the evaporator bottoms that were stored in tanks 241-B-110 and 241-B-111 were transferred to tanks 241-B-107 and 241-B-108 and stored with the 1C sludge (see Section 3.1) present in these tanks. The in-tank scavenging program also processed the supernatant stored in tanks 241-B-107 and 241-B-108 in September 1957 (HW-52932, page 4 and HW-83906-C-RD, page 80) in a manner similar to that described above for the tank 241-B-112 supernatant.

2.2.7 221-B Plant Strontium and Rare Earth Processing Waste

From May 1957 through June 1961, tanks 241-B-110, 241-B-111, and 241-B-112 did not receive any waste solutions. The 221-B Plant was in lay-away status, and no waste solutions were transferred to the single-shell tanks.

On September 18, 1961 (HW-71187-DEL, page F-2), renovation of cells 5 through 12 within the 221-B Plant canyon was initiated to use these cells for separating strontium and rare earths from a mixed fission product solution (HW-69011). Construction activities were completed, and the facility was accepted by operations on January 31, 1963 (HW-76848-DEL, page B-2). These construction activities resulted in the transfer of 81,000-gallons of equipment and facility flush solutions to the cascade of tanks 241-B-110, 241-B-111, and 241-B-112 from September 1961 (HW-72625, page 5) through December 1962 (HW-76223, page 4). Between January 1963 and June 1963, the supernatant present in tanks 241-B-110 and 241-B-111 was pumped into tank 241-B-112 in preparation for receipt of waste from B-Plant.

In August 1963, B-Plant began processing a strontium-90 and rare earths fission product (i.e. cerium-144 and promethium-147) solution that had been separated from a high-level waste solution within the PUREX facility (see Section 3.2.2). The strontium and rare earths solution was separated into two solutions, one solution containing strontium-90 and the other solution containing the rare earth fission products. The waste generated from the processing of the strontium and rare earths solutions in B-Plant was transferred into tank 241-B-110 and then pumped to either tank 241-B-111 or 241-B-112 (HW-80379, page 4). The strontium and rare earths waste transferred into these tanks contained precipitated metals (e.g., lead) and radionuclides (e.g., strontium-90) as well as soluble salts.

Waste transfers were periodically made in 1965 from tank 241-B-112 to single-shell tank 241-AX-101 in order to provide space in tanks 241-B-110, 241-B-111, and 241-B-112 to receive B-Plant waste solutions (RL-SEP-659, page 4, RL-SEP-821, page 4, and RL-SEP-923, page 4). Processing of strontium and rare earth solutions within B-Plant continued until June 1966 when processing activities within B-Plant were halted for construction activities (HAN-95105-DEL, page 15). From July 1966 (HAN-95284-DEL, page 13) through October 1967 (HAN-98918-DEL, page AIII-2), equipment within the 221-B Plant was flushed and replaced with new equipment for separating cesium and strontium from high-level wastes. The equipment flush solutions were also routed to tanks 241-B-110, 241-B-111, and 241-B-112.

2.2.8 221-B Plant Cell 23 Evaporator Bottoms Waste

Supernatant was transferred from tanks 241-B-110 and 241-B-111 into tank 241-B-112 in the fourth quarter (October 1 through December 31) of calendar year 1967 (ARH-326, page 5). On October 31, 1967, supernatant was transferred from tank 241-B-112 to the Cell 23 evaporator in B-Plant for concentration (HAN-98918-DEL, page AIII-3, ARH-326, page 5, and ISO-651-RD, page 300). The supernatant was concentrated and returned to tank 241-B-111 (HAN-99196-DEL, page AIII-3, HAN-99396-DEL, page AIII-3, ARH-326, page 5, and ISO-651-RD, page 300).

In the first quarter of calendar year 1968, the supernatant in tank 241-B-110 was transferred to tank 241-B-112 for concentration in the Cell 23 evaporator in B-Plant (ARH-534, page 5). The supernatant was concentrated and returned to tank 241-B-110 (HAN-99196-DEL, page AIII-3, HAN-99396-DEL, page AIII-3, and ARH-534, page 5).

The Cell 23 evaporator within B-Plant continued to be operated from January 1968 through February 2, 1968 to concentrate supernatant that was contained in tank 241-BX-102 (HAN-99604-DEL, page AIII-3 and ARH-534, page 6), with the concentrated supernatant returned to tanks 241-BX-101 and 241-BX-104 (ARH-534, page 6). After February 2, 1968, the Cell 23 evaporator concentrated waste from the cesium ion exchange process conducted in B-Plant (see Section 3.2.3).

2.2.9 221-B Plant Cesium Ion Exchange Process Waste

Supernatant was again transferred from tanks 241-B-110 and 241-B-111 to tank 241-B-112, then to tank 241-B-103 in the second and third quarters of calendar years 1969 (ARH-1200 B, page 5 and ARH-1200 C, page 5). These transfers were conducted to prepare tanks 241-B-110 and 241-B-111 to receive waste from cesium ion exchange process conducted at B-Plant (see Section 3.2.3). The quantities of B-Plant cesium ion exchange waste transferred into tanks 241-B-110 and 241-B-111 are summarized in Table 1. The specific batches of cesium ion exchange waste and estimated cesium-137 content are summarized in Appendix A, Table A-2

Tanks 241-B-110 received 199,000-gallons of waste from the B-Plant cesium ion exchange process from July through September 1969 (ARH-1200 C, page 5). Tank 241-B-111 received 214,000-gallons of waste from the B-Plant cesium ion exchange process from July through September 1969 (ARH-1200 C, page 5). Tank 241-BX-104 also received 611,000-gallons of waste from the B-Plant cesium ion exchange process from July through September 1969 (ARH-1200 C, page 6).

B-Plant process records indicate that thirty cesium ion exchange batches were conducted from July 1, 1969 through September 30, 1969 (ARH-N-82, page 146). These thirty ion exchange batches contained approximately 14.8 million curies of cesium-137 (See Appendix A, Table A-2). B-Plant process records indicate that the amount of cesium-137 separated from these thirty ion exchange batches was 15.9 million curies of cesium-137, with 0.27 million curies of cesium-137 (1.8% of the cesium-137 in the feed) sent to the single-shell tanks (ARH-N-82, pages 146 and 147). The discrepancy in the amounts of cesium-137 in the feed to the ion exchange process and the product is thought to be related to the sampling and analyses system accuracy.

Tank 241-B-111 continued to receive waste from the cesium ion exchange process operating within B-Plant from October 1969 through June 1970 (ARH-1200 D, page 5, ARH-1666 A, page 5 and ARH-1666 B, page 5). No other tanks received B-Plant cesium ion exchange waste during this period. The supernatant in tank 241-B-111 was periodically transferred to other single-shell tanks (241-B-103, 241-B-108, 241-B-109, 241-B-112, and 241-BY-112) while tank 241-B-111 was receiving B-Plant cesium ion exchange waste.

B-Plant process records indicate that forty-four cesium ion exchange batches were conducted from October 1, 1969 through June 30, 1970 (ARH-N-82, page 146 through 149). These ion exchange batches contained approximately 22.8 million curies of cesium-137 (See Appendix A, Table A-2). B-Plant process records indicate that the amount of cesium-137 separated from these forty-four ion exchange batches was 23.2 million curies of cesium-137, with 0.60 million curies of cesium-137 (2.6 percent of the cesium-137 in the feed) sent to the single-shell tank 241-B-111 (ARH-N-82, pages 146 through 149). The discrepancy in the amounts of cesium-137 in the feed to the ion exchange process and the product is thought to be related to the sampling and analyses system accuracy.

Table 1. Volume of B-Plant Cesium Ion Exchange Waste Transferred to Tanks 241-B-110 and 241-B-111.

Year	Month	Reference Document	Page	Tank 241-B-110	Tank 241-B-111
1969	July through September	ARH-1200 C	5	199,000-gallons	214,000-gallons
	October through December	ARH 1200 D	5	None	1,119,000-gallons
1970	January through March	ARH 1666 A	5	None	276,000-gallons
	April through June	ARH 1666 B	5	None	265,000-gallons

2.2.10 Removal of Pumpable Liquids from Tanks 241-B-110 and 241-B-111

From July 1970 through June 1971, no waste was added or removed from tanks 241-B-110, 241-B-111, or 241-B-112 (ARH-1666 C, page 5, ARH-1666 D, page 5, ARH-2074 A, page 5, and ARH-2074 B, page 5).

Between July and September 1971, 223,000-gallons of supernatant was transferred from tank 241-B-110 to tank 241-B-102 (ARH-2074 C, page 5), from tank 241-B-102 to tank 241-TX-101, then to tank 241-TX-118 (ARH-2074 D, page 5), and eventually processing in the 242-T Evaporator (ARH-2074 D, page 8). An estimated 2,000-gallons of supernatant remained in tank 241-B-110 at the end of September 1971.

Tank 241-B-110 received periodic transfers of flush water from July 1972 through March 1973, with the flush water transferred to tank 241-B-102 (ARH-2456 C, page 4, ARH-2456 D, page 4, and ARH-2794 A, page 4). In October 1973, tank 241-B-110 was identified as potentially leaking, but no information on the nature of the leak was provided (ARH-2974 D, page 4). From April 1974 (ARH-CD-133 B, page 4) through April 30, 1978 (60410-78-092), liquid was pumped from tank 241-B-110 into tank 241-B-102 to minimize the potential for additional waste leakage.

Between January and March 1972, 239,000-gallons of supernatant was transferred from tank 241-B-111 to tank 241-B-103 (ARH-2456 A, page 4), from tank 241-B-103 to tank 241-TX-101 (ARH-2456 A, page 5), then to tank 241-TX-118 and eventually processing in the 242-T Evaporator (ARH-2456 A, page 7). Tank 241-B-111 was estimated to contain no supernatant at the end of March 1972.

Between October and December 1971, 490,000-gallons of supernatant was transferred from tank 241-B-112 to tank 241-B-103 (ARH-2074 D, page 5), from tank 241-B-103 to tank 241-TX-101 (ARH-2074 D, page 5), then to tank 241-TX-118 and eventually processing in the 242-T Evaporator (ARH-2074 D, page 8). An estimated 50,000-gallons of supernatant remained in tank 241-B-112 at the end of December 1971. Tank 241-B-112 was subsequently used from January 1973 (ARH-2794 A, page 4) through June 1974 (ARH-CD-133 B, page 4) to receive evaporator bottoms from the in-tank solidification unit (heat exchanger used to evaporate waste) that was installed in tank 241-BY-112.

2.2.11 Comparison with Other Reports

Waste transfers into and waste removals from tanks 241-B-110 and 241-B-111 were summarized in *A History of the 200 Area Tank Farms* (WHC-MR-0132), *Supporting Document for the Historical Tank Content Estimate for B-Tank Farm* (WHC-SD-WM-ER-310), and *Waste Status and Transaction Record Summary (WSTRS) Rev. 4* (LA-UR-97-311). In general, the information cited in Sections 2.2.1 through 2.2.10 is in agreement with these previous reports.

These previous reports accurately state the volume of waste transferred into and removed from tanks 241-B-110 and 241-B-111, as well as the volume of solids and total waste stored in each tank. However, there are two discrepancies between the information reported in these previous reports and this report.

These previous reports indicate that only 2C waste was transferred into the cascade of tanks 241-B-110, 241-B-111, and 241-B-112 from February 1945 through June 1952. As discussed in Section 2.2.2, these tanks received low-activity cell drainage from tank 5-6 in B-Plant combined with 2C waste from June 1951 through July 1952 (see Section 2.2.2). Furthermore, WHC-MR-0132 erroneously reports that tanks 241-B-110, 241-B-111, and 241-B-112 received low-activity cell drainage waste (5-6 waste), 1C, and 2C waste from July 1952 through September 1954, which in reality these tanks received flush water and waste from equipment cleaning in B-Plant from July 1952 through September 1954 (see Section 2.2.3).

3.0 TYPES OF TANK WASTE GENERATED AT THE HANFORD SITE CHEMICAL PROCESSING PLANTS

There were numerous irradiated nuclear fuel reprocessing, research and development, and waste management activities conducted at the Hanford Site starting in 1944. These irradiated nuclear fuel reprocessing, research and development, and waste management activities conducted in the processing plants are discussed further in the DOE/RL-97-02, *National Register of Historic Places Multiple Property Document Form - Historic, Archaeological and Traditional Cultural Properties of the Hanford Site, Washington February 1997*.

It has been established in Section 2.0 that second decontamination cycle (2C) wastes and tank 5-6 cell drainage wastes from the 221-B Bismuth Phosphate plant were transferred into tanks 241-B-110, 241-B-111, and 241-B-112. Additionally, these tanks received evaporator bottoms from the evaporator in cell 23 of the 221-B Plant and waste from fission product processing conducted in the 221-B Plant. The following sections provide a discussion of the wastes originating from these operations.

3.1 B AND T BISMUTH PHOSPHATE PROCESS PLANTS

B- and T-Plants were constructed in 1944 through 1945 to separate plutonium from irradiated nuclear fuel using the bismuth phosphate process. Figure 2 shows a summary of the 221-B/T Plant bismuth phosphate process, which is referred to throughout this discussion.

In the bismuth phosphate process, the aluminum cladding of spent nuclear fuel elements was dissolved in boiling sodium nitrate solution, to which sodium hydroxide was slowly added (HW-10475-C, page 403). The cladding removal waste, sometimes referred to as coating waste (CW), was transferred to single-shell underground storage tanks (see item [1] in Figure 2).

The fuel element uranium cores (see item [2] in Figure 2) were then dissolved in nitric acid (HW-10475-C, chapter IV, page 405). Water and sulfuric acid were added to the dissolved uranium metal solution and the mixture was then transferred to the plutonium extraction section. The sulfuric acid formed a uranyl sulfate complex that prevented its precipitation as a phosphate in the subsequent plutonium extraction step (HW-10475-C, page 418).

Plutonium was extracted from the acid solution by addition of bismuth nitrate and phosphoric acid to form a bismuth phosphate carrier precipitate (HW-10475-C, page 503). The plutonium and bismuth phosphate carrier precipitate was centrifuged and washed with water to separate the acidic supernatant from the precipitate (see item [3] in Figure 2). The acidic solution remaining after the plutonium precipitation contained about 99 percent of the uranium, about 90 percent of the fission products. This separation process also removed and reduced the gamma radiation activity level in the plutonium precipitate by a factor of 10. However, zirconium phosphate is insoluble and zirconium-95 (10 percent of the activity) stayed with the plutonium product. The acidic uranium solution was then neutralized and transferred to the underground single-shell tanks as metal waste (MW).

Recent laboratory testing of the bismuth phosphate flowsheet confirms this partitioning of radionuclides (internal letter 7G300-02-NWK-024, "Bismuth Phosphate Process Radionuclide Partition Factors for the Hanford Defined Waste Model"). The laboratory tests indicate the percentage of cesium-137 and strontium-90 partitioned to the metal waste may have been as high as 100 percent and 89 percent, respectively. Additionally, the laboratory tests indicate that approximately 99.7 percent of the uranium partitioned to the metal waste, 0.3 percent of the uranium partitioned to the 1C waste, and 0.008 percent of the uranium partitioned to the 2C waste.

The plutonium-bearing cake was then dissolved in nitric acid and further decontamination of the plutonium to separate fission products was conducted (HW-10475-C, chapter VI). Sodium bismuthate, sodium dichromate, or potassium permanganate was added to oxidize the plutonium to the +6 valence-state. This step caused the bismuth phosphate to precipitate phosphate insoluble fission products ("by-product precipitation"), leaving the plutonium in solution. The precipitate was separated from the plutonium-bearing solution using centrifuges and washed to remove soluble plutonium. The plutonium was reduced to the +4 valence state to form a precipitate that could be separated from the remaining soluble fission products by centrifugation.

The fission products separated from the plutonium product during this first cycle of the decontamination process (designated as 1C) were combined with the coating removal waste and transferred to single-shell tanks. The 1C waste (see item [4] in Figure 2), contained approximately 10 percent of all fission products and approximately 1.4 percent of the plutonium present in the original fuel charged to the plant (HW-23043, pages 20 and 22). After 1951, the Bismuth Phosphate process flowsheet was modified to include cerium and zirconium scavenger precipitation in the 1C by-product step to remove lanthanide and zirconium radionuclides from the plutonium product (HW-23043, page 16).

The plutonium solids were again dissolved in nitric acid. A second decontamination cycle (see item [5] in Figure 2) was conducted to reduce the gamma activity level by a factor of 10,000 from that in the previous dissolved metal solution, giving an overall process decontamination factor of 100,000 below that of the original solution (HW-10475-C, page 627). The second decontamination step essentially repeated the steps previously described for the first cycle decontamination. The second decontamination cycle wastes (designated as 2C) were also transferred to the single-shell tanks. The 2C waste contained less than 0.1 percent of the uranium and fission products and about 0.4 percent of the plutonium present in the original fuel charged to the plant (HW-23043, pages 26 and 28). The plutonium product from the bismuth phosphate process was subsequently concentrated in the 224-T and 224-B buildings using a lanthanum fluoride precipitation process.

Table 2 provides the flowsheet estimated compositions of the neutralized CW, MW, 1C, and 2C waste solutions generated from the 221-B/T bismuth phosphate plants based on the October 1, 1951 flowsheet (HW-23043). Additional analyses of the supernatant fraction of MW, 1C, and 2C that was stored in single-shell tanks are provided in Tables 3 and 4. The CW was combined with the 1C waste in the same tanks in the Bismuth Phosphate process. Note that the coating waste (CW) batch size shown in Table 2 is based on 6,600-lbs uranium, but that the metal waste (MW) dissolution batch size is based on 2,200-lbs uranium.

Figure 2. Bismuth Phosphate Process Diagram

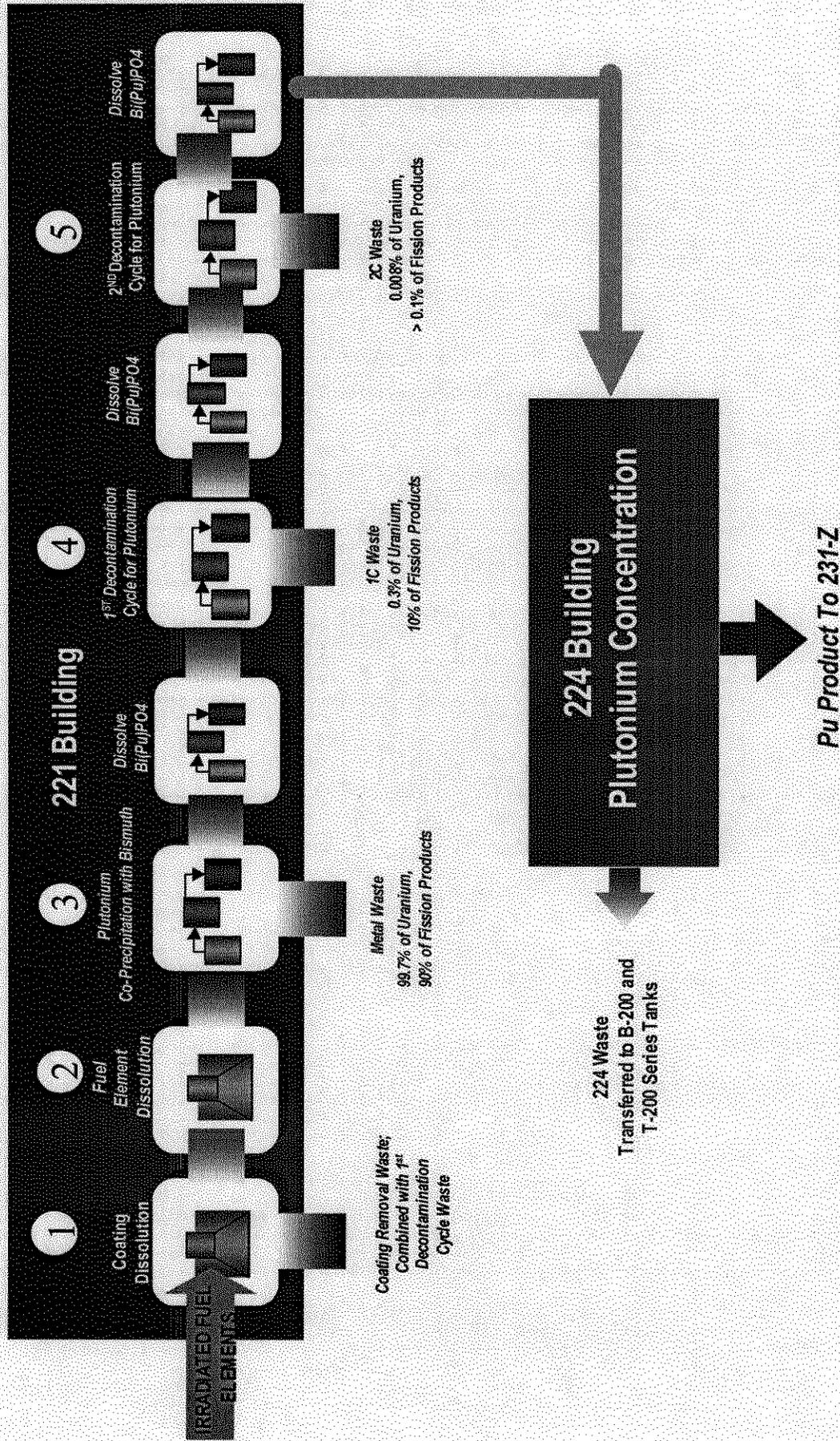


Table 2. Estimated Composition of Bismuth Phosphate Plant Wastes
From October 1, 1951 Flowsheet ⁽¹⁾

Analyte ⁽²⁾	Coating Removal Waste	Metal Waste	First Decontamination Cycle (1C) Waste	Second Decontamination Cycle (2C) Waste	224 Building Waste
Plutonium	3.3E-04	2.0E-04	6.0E-07 ⁽⁴⁾	1.6E-07 ⁽⁵⁾	1.68E-04 ⁽⁶⁾
Uranium	0.15		0.235 ⁽⁴⁾	Not reported	2.04E-05
Gamma	6.6E+04	1.3E+07	2.3E+06 ⁽⁴⁾	1.13E+04 ⁽⁵⁾	1.13E+02 ⁽⁶⁾
Sodium Aluminate (NaAlO ₂)	95.1				
Sodium Hydroxide (NaOH)	43.6				
Sodium Nitrate (NaNO ₃)	61.8				
Sodium Nitrite (NaNO ₂)	56.0				
Sodium Silicate (NaSiO ₃)	4.3				
Uranyl nitrate (UHN) ⁽³⁾		132			
Fluorine (F)					5.6
Nitrate (NO ₃)		9.7	93.1	61.3	42.4
Sulfate (SO ₄)		24.4	4.73	3.61	0.35
Phosphate (PO ₄)		25.2	26.2	23.0	3.05
Sodium (Na)		83.2	47.3	36.7	36.8
Bismuth (Bi)			2.59	1.31	1.18
Cerium (Ce)			0.030		
Lanthanum (La)					0.49
Manganese (Mn)					0.33
Zirconium (Zr)			0.030		
Iron (Fe)			1.37	1.82	
Chrome (Cr)			0.16	0.06	0.17
Ammonia (NH ₄)			1.98	1.71	0.12
Silicon Hexa-Fluoride (SiF ₆)			4.35	3.67	
Volume per Batch (gallons)	795	2,380	2,040	2,090	2,200

Notes:

- (1) See HW-23043
- (2) Analyses are reported in grams per liter, except for gamma activity, which is counts per minute per mL.
- (3) HW-23043, page 31, notes that uranium is not actually present in this form, but is probably as NaUO₂PO₄ and Na₄(UO₂)₂CO₃.
- (4) Pu and Gamma concentrations were calculated from the compositions of tanks 13-4 and 14-3 (HW-23043, pages 20 and 22).
- (5) Pu and Gamma concentrations were calculated from the compositions of tanks 18-4 and 19-3 (HW-23043, pages 26 and 28).
- (6) Pu and Gamma concentrations were calculated from the compositions of tanks A-4, D-4, B-3, and F-8 (HW-23043, pages 39, 44, 48, and 54).

These sample analyses support that the 2C waste contained less than 0.1 percent of the fission products. Analyses of the combined 2C / 224 building / tank 5-6 waste supernatant stored in tank 241-T-112 conducted on August 6, 1952 and September 24, 1952 indicate that the total beta emitters was comprised of 35 to 50 percent ruthenium, 35 to 50 percent cesium, 4 to 8 percent cerium, yttrium, and other rare earths, and 6 to 11 percent undetermined (HW-27035, page 8).

Table 3. Analyses of Bismuth Phosphate Process Supernatants Stored ^(1,2)

Waste Type	Tank	pH	Pu μg/liter	Gross Beta millicuries/liter	Gross Gamma millicuries/liter	Date Sampled
Metal Waste	T-101	10.1	70	200 ⁽³⁾	70 ⁽⁵⁾	12-12-1946
Metal Waste	T-101	10	35	110 ⁽⁵⁾	25 ⁽⁵⁾	7-01-1947
Metal Waste	T-102	9.9	60	120	20	7-01-1947
Metal Waste	T-103	9.8	60	150	20	7-01-1947
1C/CW	B-109	9.9	40	0.65	0.28	3-18-1947
1C/CW	C-112	9.9	12	12	4.4	3-18-1947
2C	B-111	6.9	7.2E-02	2.0E-03	3.0E-03	7-1-1947
2C	B-112	6.8	4.32E?? ⁽³⁾	1.5E-03	3.0E-03	7-1-1947
Waste Type	Tank	pH	Pu μg/liter	Gross Beta Counts / minute/ cc	Gross Gamma Counts / minute/ cc	Date Sampled
2C	T-110	Not reported ⁽⁴⁾	15	4.9E+04	30	7-13-1945
2C	T-110	9.8 ⁽⁴⁾	19	6.9E+04	55	7-25-1945
2C	B-110	9.6 ⁽⁴⁾	8.5	7.0E+04	55	7-25-1945

Notes:

- (1) See HW-10728 and HW-3-3220.
- (2) Solids formed in each of wastes, settling to the bottom of each tanks. These sample analyses are for the supernatant only and are not representative of the sludges.
- (3) The reported Pu sample analyses for tank B-112 seems to be in error and lacking an exponent in HW-10728.
- (4) Prior to October 1945, the 2C waste was neutralized to a pH of approximately 10. The wastes collected in tanks 241-B-110, 241-B-111, 241-B-112, 241-T-110, 241-T-111, and 241-T-112 were neutralized to about pH 7 after October 1945 to precipitate bismuth and plutonium (HW-3-3220, page 13).
- (5) Decrease in gross beta and gross gamma concentrations shown for the tank T-101 waste samples is due to decay of fission products with short half-lives.

Table 4. Analyses of Metal Waste and First Decontamination Cycle / Coating Waste Supernatant

Tank	Date Filled	Pu µg/cc	Gross Beta µCi/cc	Gross Gamma µCi/cc	Sr µCi/cc	Cs µCi/cc	Ru µCi/cc	Rare Earths + Y - Ce µCi/cc	Ce µCi/cc	Nb µCi/cc	Zr µCi/cc	Te µCi/cc
Analyses of Metal Waste Supernatant Following Uranium Extraction (1)												
C-106	Not specified				0.44	54.2						
BX-108	Not specified				0.26	132.4						
BX-109	Not specified				1.08	56.3						
C-112	Not specified				1.20	25.8						
C-109	Not specified				0.46	40.7						
C-111	Not specified				0.10	34.5						
Average Concentrations for Metal Waste												
					0.59	57.3						
Analyses of First Decontamination Cycle (1C) Waste Mixed with Coating Removal Waste (CW) (2)												
B-107	8-1945	1.7E-02	0.135	0.055	0.011	0.10						
T-107	9-1945	1.5E-03	0.170	0.093	0.0013	0.20						
B-108	12-1945	2.0E-02	0.183	0.044	0.022	0.12						
T-108 (Top)	12-1945	2.0E-02	0.25	0.073	0.12	0.17	0.0066	0.047	0.007	0.0018	0	1.2E-05
T-108 (Bottom)	12-1945	2.0E-02	0.25	0.070	0.12	Not reported	0.0065	0.029	0.0066	0.0024	0	3E-05
T-109	3-1946	2.6E-03	0.14	0.082	0.00038	0.15						
B-109	4-1946	1.8E-02	0.16	0.051	0.01	0.11						
T-104 (Top)	7-1946	3E-03	0.51	0.130	0.00013	0.13	0.058	0.004	0.051	0.028	0.010	2.4E-05
T-104 (Bottom)	7-1946	3E-03	0.52	0.160	0.00037	Not reported	0.059	0.003	0.050	0.028	0.015	3.6E-05
C-110	8-1946	2E-03	0.14	0.0067	0.00026	0.11						
C-111	11-1946	4.2E-03	0.16	0.069	0.01	0.13						
C-112	4-1947	3.1E-03	0.14	0.064	0.005	0.13						
U-110	4-1947	2.1E-04	0.13	0.069	0.00011	0.17						
U-111	10-1947	3.4E-04	0.12	0.060	0.00023	0.14						
TX-109 (3)	9-1949	2.7E-05	2.8	2.2	0.00087	0.27	0.34	0.0085	0.0035	0.34	1.2	8E-05
Average Concentrations for 1C / CW												
			0.39	0.22	0.02	0.15						

Notes: (1) HW-36717, Decontamination of Uranium Recovery Process Stored Wastes Interim Report, May 16, 1955, W. W. Schulz, General Electric Company, Richland, Washington.
 (2) HW-20195, Radioactive Content of Stored Bismuth Phosphate First Cycle Supernatants, February 5, 1951, General Electric Company, Richland, Washington.
 (3) Tank TX-109 exhibits higher gross beta and gross gamma radioactivity since this tank was sampled shortly after filling and the short-lived fission products (e.g., Ru, Nb, and Zr) had not decayed appreciably.

3.1.1 221-B Cell Drainage (5-6) Waste

During the operation of the 221-B Bismuth Phosphate plant, failure of process equipment, cooling jackets on process vessels, and piping occurred periodically, resulting in the discharge of cooling water, chemical solutions, and process solutions (e.g., MW, 1C, 2C wastes and plutonium product solutions) to the process cells. Each of the 40 process cells in the 221-B Plant contained a sump that was equipped with a conductivity probe beginning in August 1946 to detect a liquid leak in the process cell (HW-7-4739-DEL, page 21). The sumps gravity drained to a 24-inch diameter vitrified clay pipe that traversed under each cell and discharged to a deep, open top, stainless steel tank, number 5-7 in section 5 (cell 10) (HW-10475-C, page 914).

Cell drainage collected in tank 5-7 was jetted to tank 5-6 or tank 5-9, which were used for sampling and chemical treatment of the cell drainage solution. Waste in tanks 5-6 and 5-9 could be jetted between these two tanks. High-activity waste collected in 221-B Plant tank 5-9 could be jetted to single-shell tank 241-B-107 (HW-10475-C, page 918). Alternatively, the waste could be transferred to process vessels with the 221-B Plant and processed to recover plutonium. An example of this practice is cited in the January 1948 monthly report for the Hanford Works (HW-8931-DEL, page 28).

From April 1945 through September 4, 1947 (HW-33591, page 3), low-activity cell drainage waste collected in tank 5-6 was transferred to tank 241-B-361, which gravity drained to reverse well number 241-B-361 (also referred to as 216-B-5). Tank 241-B-361 also received waste from the 224-B Concentration building from May 1945 to October 1946.

Crib number 5-6 was used to dispose of the cell drainage waste from August 12, 1948 through July 4, 1951 (HW-33591, page 3). Cell drainage waste was routed to cribs 241-B-1 and 241-B-2 from October 3, 1947 through August 12, 1948 (HW-44784, page 27). After July 4, 1951, cell drainage waste was transferred along with 2C waste to the cascade of tanks 241-B-110, 241-B-111, and 241-B-112 (HW-21506-DEL, pages 56 and 57) and discharged to the 241-B-3 (also referred to as crib 216-B-8) until July 1953 and then the 241-B-1 and 241-B-2 cribs from December 1954 through October 1955 (HW-44784, page 27).

Table 5 provides analyses of cell drainage waste that was collected in tank 5-6 and transferred to either directly to a crib or to the cascade of tanks 241-B-110, 241-B-111, and 241-B-112. As evident from the analyses provided in Table 5, the neutralized, low-activity cell drainage waste contained soluble beta emitting radionuclides and plutonium. The plutonium, along with other metals, precipitated in the cascade of tanks 241-B-110, 241-B-111, and 241-B-112, while soluble compounds were discharged to the crib.

Table 5. Composition of Tank 5-6 Cell Drainage Waste from 221-B Plant. (2 Sheets)

Year	Month	Liters	Pu Grams	Total Beta Activity Curies	Comment
Tank 5-6 Cell Drainage Transferred to Crib ^(1,2)					
1948	January	No records			Total beta activity does not include radioactive iodine. Samples were measured for total alpha activity. Calculated Pu mass assumes that all alpha activity measured in samples was Pu. Uranium activity in samples contributed less than 8% of the total alpha activity ⁽¹⁾ .
	February	No records			
	March	No records			
	April	No records			
	May	No records			
	June	No records			
	July	No records			
	August	807,344	4	110	Tank 5-6, cell drainage waste routed to 5-6 Crib and tile field from 8/12/1948 through 7/04/1951 (HW-33591, page 3).
	September	945,276	9	590	
	October	1,284,019	8	225	
	November	1,278,568	16	185	
No records could be located for December 1948 through August 1949.					
1949	September	1.1E+06	3.8	78	
	October	1.05E+06	6.1	157	
	November	8.6E+05	2.8	64	
	December	8.3E+05	2.6	83	
1950	January	8.7E+05	2.7	83	
	February	9.0E+05	1.9	64	
	March	1.05E+06	2.0	46	
	April	9.4E+05	2.0	61	
	May	1.02E+06	4.8	301	
	June	9.9E+05	5.2	394	
	July	1.3E+06	4.9	682	
	August	1.5E+06	6.7	1,807	
	September	1.2E+06	10.8	630	
	October	1.1E+06	7.4	226	
	November	9.5E+05	6.8	272	
	December	1.0E+06	6.4	358	
No records could be located for January 1951 through December 1951. Beginning in July 1951, Tank 5-6 cell drainage waste along with 2C waste was routed to the cascade of tanks 241-B-110, 241-B-111, and 241-B-112.					
Tank 5-6 Cell Drainage Waste Discharged to the Cascade of Tanks 241-B-110, 241-B-111, and 241-B-112 ^(3,4)					
Year	Month	Liters	Pu Grams	Total Beta Activity Curies	Comment
1952	January	8.95E+05	7.1	1,150	
	February	8.20E+05	3.4	230	
	March	8.22E+05	4.8	335	
	April	3.08E+05	1.1	111	
	May	2.34E+05	1.1	30	
	June	3.17E+05	1.1	35	
	July	2.64E+05	1.1	55	
	August	3.28E+05	1.0	26	
	September	2.30E+05	1.1	13	
		October	2.12E+05	7.1	344

Table 5. Composition of Tank 5-6 Cell Drainage Waste from 221-B Plant. (2 Sheets)

Year	Month	Liters	Pu Grams	Total Beta Activity Curies	Comment
1952	November	5.15E+05	38.4	1,295	
	December	4.21E+05	35.4	1,825	
1953	January	3.65E+05	9.1	880	
	February	2.82E+05	3.2	88	
	March	1.77E+05	5.0	76	
	April	1.64E+05	1.7	15	
	May	1.49E+05	6.4	39	
	June	1.90E+05	2.0	18	
	July	1.65E+05	5.5	5	
	August				No tank 5-6 cell drainage discharges reported for August 1953 through November 1954.
	September				
	October				
	November				
	December				
1954	January				
	February				
	March				
	April				
	May				
	June				
	July				
	August				
	September				
	October				
	November				
	December	0.57E+05	0.02	0.09	Tank 5-6, cell drainage waste routed to 241-B-1 and 241-B-2 cribs beginning in December 1954. December 1954 through June 1955 values reported in HW-38562, page 9.
1955	January	0	0	0	
	February	0.36E+05	0.16	4.75	
	March	1.52E+05	4.27	45.6	
	April	2.74E+05	0.486	8.2	
	May	1.26E+05	0.648	10.3	
	June	1.05E+05	0.28	9.46	
	July	2.51E+05	0.321	4.77	July 1955 through October 1955 values reported in HW-44784, page 27.
	August	2.27E+05	4.48	32.0	
	September	1.75E+05	1.46	12.8	
	October	1.26E+05	11.5	118	
No discharge of tank 5-6, cell drainage waste or any waste from tanks 241-B-110, 241-B-111, or 241-B-112 was made to a crib after October 1955.					

Notes:

- (1) HW-11908, page 1
- (2) HW-20583, page 7
- (3) HW-25301, page 3
- (4) HW-33591, page 8

3.2 221-B PLANT FISSION PRODUCTS PROCESSING

From August 1963 through June 1966, B-Plant was used in conjunction with the PUREX facility, 244-CR Vault, and the 201-C Hot Semiworks (renamed Strontium Semiworks in 1963) to separate strontium-90 and rare earths (i.e., cerium-144 and promethium-147) from high-level waste solutions. Then, from July 1966 through December 1967, equipment was replaced within B-Plant to expand the processing capability to include cesium removal from fission high-level waste solutions using ion exchange equipment. The strontium and rare earths processing equipment was also replaced to include only strontium removal using a solvent extraction equipment, followed by precipitation and centrifugation equipment for purifying the strontium. Each of the fission products processing events in the B-Plant is discussed in more detail in the following sections.

3.2.1 STRONTIUM AND RARE EARTHS PROCESSING

On September 18, 1961 (HW-71187-DEL, page F-2), renovation of cells 5 through 12 within B-Plant canyon was initiated to use these cells for separating strontium and rare earths from a mixed fission product solution (HW-69011). Construction activities were completed, and the facility was accepted by operations on January 31, 1963 (HW-76848-DEL, page B-2). Processing of radioactive waste in cells 5 through 12 at the B-Plant commenced on August 2, 1963 (HW-78817-DEL, page B-2 and G-2).

B-Plant was used in conjunction with the PUREX facility, 244-CR Vault and the 201-C Hot Semiworks to separate strontium-90, cerium-144 and promethium-147 from high-level waste solutions. The PUREX facility generated a first cycle raffinate solution from the solvent extraction reprocessing of irradiated reactor fuel (i.e., high-level waste). The first cycle raffinate solution was highly acidic and contained most of the fission products (e.g., strontium-89/90, cerium-144, promethium-147, cesium-137) that were separated from the uranium and plutonium during the reprocessing of irradiated reactor fuel. The acidity of the first cycle raffinate solution was reduced by addition of sugar and digestion at elevated temperature to decompose the nitric acid solution.

In a section of the PUREX facility known as the head-end, first cycle raffinate solution was reacted with sodium sulfate and lead nitrate to precipitate strontium and rare earth (i.e., cerium and promethium) fission products (HW-63051 and HW-69534). Lead co-precipitated with strontium and increased the amount of strontium precipitated from the first cycle raffinate solution. The resulting strontium and rare earth precipitate was centrifuged and washed to separate the supernatant, which contained soluble fission products such as cesium-137, zirconium-niobium-95, and ruthenium-rhodium-106. The supernatant containing the soluble fission products (e.g., cesium-137, zirconium-niobium-95, and ruthenium-rhodium-106) was neutralized and transferred to underground storage tanks. The strontium and rare earth precipitate was metathesized to soluble carbonates by addition of sodium carbonate. The strontium and rare earth carbonate precipitates were then dissolved in nitric acid and transferred to B-Plant via 244-CR Vault for further processing.

In B-Plant, the strontium nitrate / rare earth nitrate solution were processed to form separate solutions containing strontium and rare earths (HW-77016). The strontium nitrate / rare earth nitrate solution was reacted with oxalic acid to precipitate the rare earths along with lead, leaving strontium in solution. The precipitate was centrifuged to separate the strontium solution from the rare earth precipitate. The strontium solution was stored in B-Plant and transferred periodically to the 201-C Hot Semiworks for purification. The rare earth precipitate was dissolved in nitric acid and stored in B-Plant for further processing.

Lead was removed from the rare earth solution by adding sodium hydroxide solution to form soluble plumbite and insoluble rare earth hydroxide precipitates (HW-81373, RL-SEP-197, page G-2, and HAN-90907, page 21). The plumbite was separated from the rare earth hydroxide precipitate by centrifugation and discarded to the single-shell tanks. The rare earth hydroxide precipitate was washed with sodium hydroxide solution to remove soluble lead and the wash solution was also discarded to the single-shell tanks. The rare earth hydroxide precipitate was dissolved in nitric acid, stored in B-Plant, and eventually transferred to the 201-C Hot Semiworks for purification.

Processing of strontium and rare earth solutions within B-Plant continued until June 1966 (HAN-95105-DEL, page 15). Separations of strontium and rare earths from the first cycle raffinate solution continued to be conducted in the head-end section of the PUREX facility through February 8, 1967 (HAN-96805-DEL, page AIII-4). The strontium and rare earth solution was transferred from PUREX to the 244-CR Vault for storage from July 1966 through February 1967, while equipment modifications were conducted at B-Plant.

3.2.2 CESIUM AND STRONTIUM PROCESSING

From July 1966 (HAN-95284-DEL, page 13) through October 1967 (HAN-98918-DEL, page AIII-2), equipment within the 221-B Plant was flushed and replaced with new equipment for separating cesium and strontium from high-level waste. In January 1967 (HAN-96590-DEL, page AIII-4) and in March 1967 (HAN-97066-DEL, page AIII-4), testing was conducted of a new centrifuge and a precipitation-decantation-centrifugation technique for separating iron and aluminum from PUREX sludge waste. Construction activities continued to be conducted in the 221-B Plant throughout 1967.

On December 27, 1967 (HAN-99396-DEL, page AIII-3), alkaline supernatants stored in the single-shell tanks were transferred to B-Plant, and cesium was separated using an ion exchange process. Cesium ion exchange processing continued at B-Plant until October 1983 using at first inorganic and later organic ion exchange materials (RHO-RE-SA-169). Cesium was also precipitated from acidic, PUREX high-level waste (known as CAW) using phosphotungstic acid (PTA), with the cesium precipitate dissolved in sodium hydroxide solution and processed through the ion exchange equipment for cesium recovery (ARH-CD-917).

On January 31, 1968, the solvent extraction equipment installed in B-Plant was operated to purify the inventory of rare earth solutions stored at B-Plant (HAN-99604-DEL, page AIII-3). The semi-purified promethium - cerium solution was stored in B-Plant process tank 6-2 (HAN-100127-DEL, page AIII-3). Separation of strontium from the strontium and rare earths solutions stored in the 244-CR Vault was then conducted in March 1968 using the solvent extraction equipment (HAN-100127-DEL, page AIII-3).

The B-Plant solvent extraction equipment began processing the PUREX first cycle raffinate solution to separate strontium on April 20, 1968 (HAN-100357-DEL, page AIII-3). The processing of PUREX first cycle raffinate solution was completed on August 30, 1968 (PRD-SEP-68-DEL, page AIII-3). The B-Plant solvent extraction equipment was then used to separate strontium from PUREX high-level waste sludges that had been acidified (known as PAS) in 244-AR Vault and transferred to B-Plant for centrifugation to separate solids and strontium removal (PRD-SEP-68-DEL, page AIII-4). In addition, the B-Plant solvent extraction equipment was operated periodically to separate strontium from CAW solutions following the PTA processing to separate cesium. Strontium separation from high-level waste solutions using the solvent extraction equipment continued at B-Plant until 1977.

4.0 RADIONUCLIDE ANALYSES OF WASTE IN TANKS 241-B-110 AND 241-B-111

The U.S. Department of Energy uses several factors to determine the disposition of radioactive wastes (DOE M 435.1). One of these factors is the concentration of alpha-emitting transuranic isotopes with half-life greater than 20 years present in the radioactive waste. Table 6 provides the concentrations of transuranic elements present in the wastes stored in tanks 241-B-110 and 241-B-111 as reported on March 31, 2003 from the Tank Waste Information Network (TWINS) database; <http://twins.pnl.gov:8001/twins.htm>. It is apparent from the information reported in Table 6 that the concentrations of transuranic elements in the wastes stored in tanks 241-B-110 and 241-B-111 both exceed 100 nanocuries per gram of waste. The concentration of transuranic elements present in the 241-B-110 and 241-B-111 wastes is consistent with these tanks having received 2C waste.

The concentrations of cesium-137 and strontium-90 present in the wastes stored in tanks 241-B-110 and 241-B-111 are also provided in Table 6. The concentrations of the fission products (Cs-137 and Sr-90) in these wastes is consistent with these tanks having received wastes from the strontium and rare earths and cesium ion exchange processes conducted at B-Plant.

Table 6. Concentrations of Radionuclides Present in Tank 241-B-110 and 241-B-111 Wastes

Tank	Np-237 nCi/g	Pu-239 nCi/g	Pu-240 nCi/g	Am-241 nCi/g	Sum of TRU nCi/g	Cs-137 μCi/g	Sr-90 μCi/g
241-B-110	0.11	100	11	72.7	183.8	11.64	83.8
241-B-111	0.07	83	14.2	85.5	182.8	132.6	206.7

5.0 SUMMARY

The wastes transferred into tanks 241-B-110, 241-B-111, and 241-B-112 are summarized in Table 7. Tanks 241-B-110, 241-B-111, and 241-B-112 generally received waste from operations conducted in the 221-B Plant.

Tanks 241-B-110, 241-B-111, and 241-B-112 received second decontamination cycle (2C) waste from spent nuclear fuel reprocessing (Bismuth Phosphate process) conducted in the 221-B Plant from May 1945 through June 1952. Low-activity cell drainage (5-6) waste was also transferred from B-Plant into these three tanks from June 1951 through June 1952. After cessation of the Bismuth Phosphate process in June 1952, tanks 241-B-110, 241-B-111, and 241-B-112 received wastes from cleanout of B-Plant from July 1952 through September 1954. The 2C, 5-6, and equipment cleaning wastes were purposely precipitated in tanks 241-B-110 and 241-B-111 to separate transuranic elements (primarily plutonium and americium), with supernatant cascading into tank 241-B-112. The soluble fractions of these wastes were transferred from tank 241-B-112 to an underground crib.

Following the shutdown of B-Plant, tanks 241-B-110 and 241-B-111 received evaporator bottoms from the 242-B Evaporator in April 1954. The evaporator bottoms waste was subsequently transferred to other single-shell tanks as part of plans to reactivate B-Plant. Reactivation of B-Plant for spent nuclear fuel reprocessing was conducted from October 1955 through March 1957. Equipment and process cells were flushed as part of these reactivation activities. These flush solutions were routed to tanks 241-B-110, 241-B-111, and 241-B-112, with the supernatant discharged from tank 241-B-112 to an underground crib. No spent nuclear fuel was reprocessed in B-Plant during this period. Plans to reactivate B-Plant for spent fuel reprocessing were cancelled in March 1957, and the plant was idled.

B-Plant was then reactivated for separating fission products (e.g., strontium-90, rare earth elements, and cesium-137) from PUREX high-level waste and stored tank wastes. From September 1961 through June 1970, tanks 241-B-110, 241-B-111, and 241-B-112 received wastes from construction activities conducted at B-Plant, strontium and rare earth (Sr/RE) elements separations, cell 23 evaporator bottoms, and cesium ion exchange processing. Tank 241-B-112 also received from January 1973 through June 1974 evaporator bottoms from the in-tank solidification unit that was operated in tank 241-BY-112.

The Sr/RE waste, cell 23 evaporator bottoms, and cesium ion exchange process wastes were all transferred from tanks 241-B-110 and 241-B-111 to other single-shell tanks from 1965 through March 1972. Following these transfers, tanks 241-B-110 and 241-B-111 contained principally sludges formed from precipitation of the 2C waste and the Sr/RE waste, along with precipitated salts from the B-Plant cesium ion exchange waste. Tank 241-B-112 did not receive a measurable quantity of 2C sludge based on the cascade operating mode and sludge level measurements, but instead contains precipitated salts from B-Plant cesium ion exchange waste and evaporator bottoms from the in-tank solidification unit that was operated in tank 241-BY-112.

Table 7. Waste Types Added to Tanks 241-B-110, 241-B-111, and 241-B-112

Waste Type ⁽¹⁾	Tank 241-B-110	241-B-111	241-B-112
2C ⁽²⁾	5/1945 – 8/1946 5/1948 – 1/1949 5/1950 - 5/1951	5/1945 – 8/1946 5/1948 – 1/1949 5/1950 - 5/1951	5/1945 – 8/1946 5/1948 – 1/1949 5/1950 - 5/1951
2C + 5-6	6/1951 – 7/1952	6/1951 – 7/1952	6/1951 – 7/1952
B-Plant Equipment Cleaning Waste	7/1952 – 9/1954	7/1952 – 9/1954	7/1952 – 9/1954
EB from 242-B Evaporator	4/1954	4/1954	In advertent addition of some EB to this tank
B-Plant Reactivation for 4X Program (cancelled in 3/1957)	10/1955 – 4/1957	10/1955 – 4/1957	Not added to tank
B-Plant Construction for Sr/RE Process	9/1961 – 12/1962	9/1961 – 12/1962	9/1961 – 12/1962
B-Plant Sr/RE Processing	8/1963 – 6/1966	8/1963 – 6/1966	8/1963 – 6/1966
B-Plant equipment flushing	7/1966 – 1Q/1968	7/1966 – 10/1967	7/1966 – 10/1967
EB from B-Plant Cell 23 evaporator	1Q/1968	10/1967	Not added to tank
B-Plant IX	3Q/1969	3Q/1969 – 2Q/1970	3Q/1969 – 2Q/1970
EB from ITS	Not added to tank	Not added to tank	1/1973 – 6/1974

Notes:

⁽¹⁾ Waste Type Definitions:

2C: Second decontamination cycle waste from B-Plant Bismuth Phosphate process

5-6: B-Plant low-activity cell drainage

EB: Evaporator bottoms

ITS: In-Tank Solidification unit installed in tank 241-BY-112

IX: Waste from B-Plant cesium ion exchange process

Q: calendar year quarter

Sr/RE: Strontium / Rare Earths

⁽²⁾ 2C waste routed to tanks 241-B-104, 241-B-105, and 241-B-106 during period when tanks 241-B-110, 241-B-111, and 241-B-112 were filled.

6.0 REFERENCES

- 60410-78-092, 1978, "Summary of Salt Well Pumping Status for the Period Ending April 30, 1978," (internal letter from D. R. Autery to J. W. Bailey), Rockwell Hanford Operations, Richland, Washington.
- 7G300-02-NWK-024, 2002, "Bismuth Phosphate Process Radionuclide Partition Factors for the Hanford Defined Waste Model,"(internal letter from B. A. Higley to J. G. Field, July 24), CH2M HILL Hanford Group, Inc., Richland, Washington.
- ARH-326, 1968, *Chemical Processing Division Waste Status Summary October 1, 1967 through December 31, 1967*, January 15, 1968, Atlantic Richfield Hanford Company, Richland, Washington.
- ARH-534, 1968, *Chemical Processing Division Waste Status Summary January 1, 1968 through March 31, 1968*, April 16, 1968, Atlantic Richfield Hanford Company, Richland, Washington.
- ARH-1200 B, 1969, *Chemical Processing Division-Waste Status Summary April 1, 1969 through June 30, 1969*, July 16, 1969, Atlantic Richfield Hanford Company, Richland, Washington.
- ARH-1200 C, 1969, *Chemical Processing Division-Waste Status Summary July 1, 1969 through September 30, 1969*, October 15, 1969, Atlantic Richfield Hanford Company, Richland, Washington.
- ARH-1200 D, 1970, *Chemical Processing Division-Waste Status Summary October 1, 1969 through December 31, 1969*, January 20, 1970, Atlantic Richfield Hanford Company, Richland, Washington.
- ARH-1666 A, 1970 *Chemical Processing Division Waste Status Summary January 1, 1970 through March 31, 1970*, April 30, 1970, Atlantic Richfield Hanford Company, Richland, Washington.
- ARH-1666 B, 1970, *Chemical Processing Division Waste Status Summary April 1, 1970 through June 30, 1970*, July 21, 1970, Atlantic Richfield Hanford Company, Richland, Washington.
- ARH-1666 C, 1970, *Chemical Processing Division Waste Status Summary July 1, 1970 through September 30, 1970*, October 26, 1970, Atlantic Richfield Hanford Company, Richland, Washington.
- ARH-1666 D, 1971, *Chemical Processing Division Waste Status Summary October 1, 1970 through December 31, 1970*, 1971, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 A, 1971, *Chemical Processing Division Waste Status Summary January 1, 1971 through March 31, 1971*, 1971, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 B, 1971, *Chemical Processing Division Waste Status Summary April 1, 1971 through June 30, 1971*, 1971, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 C, 1971, 1970, *Chemical Processing Division Waste Status Summary July 1, 1971 through September 30, 1971*, 1971, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 D, 1971, *Chemical Processing Division Waste Status Summary October 1, 1971 through December 31, 1971*, 1971, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2456 A, 1972 *Chemical Processing Division Waste Status Summary, January 1, 1974 through March 31, 1972*, Rockwell Hanford Operations, Richland, Washington.

ARH-2456 C, 1972, *Chemical Processing Division-Waste Status Summary, July 1, 1972 through September 30, 1972*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2456 D, 1973, *Chemical Processing Division-Waste Status Summary, October 1, 1972 through December 31, 1972*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 A, 1973, *Chemical Processing Division Waste Status Summary January 1, 1973 through March 31, 1973*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 D, 1974, *Manufacturing and Waste Management Division Waste Status Summary October 1, 1973 through December 31, 1973*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 B, 1974, *Chemical Processing Division Waste Status Summary April 1, 1974 through June 30, 1974*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-917, 1977, *Evaluation of Phosphotungstic Acid Process for Removal of Cesium-137 from PUREX Current Acid Waste*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-N-82, 1968, *Fission Process Product Summary*, Atlantic Richfield Hanford Company, Richland, Washington.

DDTS-Generated-491, 1957, "Lay-Away of the Bismuth Phosphate – TBP Plants and the Metal Waste Removal Facilities," (letter from A. T. Gifford, Director of Operations Division, to W. K. MacCready, General Manager Chemical Processing Department, General Electric

Company Hanford Atomic Products Operation, March 28), Atomic Energy Commission, Richland, Washington.

DOE M 435.1-1, 1999, *Radioactive Waste Management Manual*, July 9, 1999, U. S. Department of Energy, Washington, D.C.

DOE/RL-97-02, 1997, *National Register of Historic Places Multiple Property Document Form - Historic, Archaeological and Traditional Cultural Properties of the Hanford Site, Washington February 1997*, Rev. 0, available at <http://www.hanford.gov/doe/culres/mpd/toc.htm>, U. S. Department of Energy, Richland Operations Office, Richland, Washington.

H-2-579, Rev. 12, 1975, *Waste Disposal System Plan & Details 241-B*, E. I. Du Pont De Nemours Company, Richland, Washington.

H-2-1984, Rev. 2, 1965, *Sect. 5 Waste Settling & Cribbing Tie-In Tank 241-112 To Tile Field*, General Electric Company, Richland, Washington.

H-2-1991, Rev.1, 1951, *Sect. 5 Waste Settling & Cribbing Schematic Layout*, General Electric Company, Richland, Washington.

HAN-45764, 1947, *200 Area Daily Log for July 1, 1947 through December 31, 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.

HAN-45800-DEL, 1947, *200 Area Monthly Production Report, December 1944 through December 1946*, Army Corps of Engineers, Hanford Engineering Works, Pasco, Washington.

HAN-45807-DEL, 1948, *200 Area Monthly Reports 1948*, Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-90907, 1965, *Monthly Status and Progress Report for February 1965*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-95105-DEL, 1966, *Monthly Status and Progress Report for June 1966*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-95284-DEL, 1966, *Monthly Status and Progress Report for July 1966*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-96590-DEL, 1967, *Monthly Status and Progress Report for January 1967*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

HAN-96805-DEL, 1967, *Monthly Status and Progress Report for February 1967*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.

- HAN-97066-DEL, 1967, *Monthly Status and Progress Report for March 1967*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.
- HAN-98918-DEL, 1967, *Monthly Status and Progress Report for October 1967*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.
- HAN-99196-DEL, 1967, *Monthly Status and Progress Report for November 1967*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.
- HAN-99396-DEL, 1967, *Monthly Status and Progress Report for December 1967*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.
- HAN-99604-DEL, 1968, *Monthly Status and Progress Report for January 1968*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.
- HAN-100127-DEL, 1968, *Monthly Status and Progress Report for March 1968*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.
- HAN-100357-DEL, 1968, *Monthly Status and Progress Report for April 1968*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.
- HW-3-3220, 1945, *A Study of Decontamination Cycle Waste Solutions and Methods of Preparing Them for Disposal*, E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-1649-DEL, 1945, *Hanford Engineering Works Monthly Report April 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-1793-DEL, 1945, *Hanford Engineering Works Monthly Report May 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-4739-DEL, 1946, *Hanford Engineering Works Monthly Report August 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-5362-DEL, 1946, *Hanford Engineering Works Monthly Report October 1946*, E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-8931-DEL, 1948, *Hanford Works Monthly Report January 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-9191-DEL, 1948, *Hanford Works Monthly Report February 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-9595-DEL, 1948, *Hanford Works Monthly Report March 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.

- HW-9922-DEL, 1948, *Hanford Works Monthly Report April 1948*, General Electric Company, Richland, Washington.
- HW-10166-DEL, 1948, *Hanford Works Monthly Report May 1948*, General Electric Company, Richland, Washington.
- HW-10321, 1948, *Cribbing – Second Cycle Waste*, General Electric Company, Richland, Washington.
- HW-10475-C, 1944, *Hanford Technical Manual Section C*, E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-10714-DEL, 1948, *Hanford Works Monthly Report July 1948*, General Electric Company, Richland, Washington.
- HW-10728, 1948, “Process Waste Data – 200 Areas,” (letter from R. S. Bell to file, August 12), General Electric Company, Richland, Washington.
- HW-10993-DEL, 1948, *Hanford Works Monthly Report August 1948*, General Electric Company, Richland, Washington.
- HW-11226-DEL, 1948, *Hanford Works Monthly Report September 1948*, General Electric Company, Richland, Washington.
- HW-11499-DEL, 1948, *Hanford Works Monthly Report October 1948*, General Electric Company, Richland, Washington.
- HW-11908, 1948, *Audit of Radioactive Waste to Ground Through the 5-6 Crib Systems (January Through November 1948)*, General Electric Company, Richland, Washington.
- HW-12086-DEL, 1949, *Hanford Works Monthly Report December 1948*, General Electric Company, Richland, Washington.
- HW-12391-DEL, 1949, *Hanford Works Monthly Report January 1949*, General Electric Company, Richland, Washington.
- HW-12666-DEL, 1949, *Hanford Works Monthly Report February 1949*, General Electric Company, Richland, Washington.
- HW-15550-DEL, 1950, *Hanford Works Monthly Report December 1949*, General Electric Company, Richland, Washington.
- HW-17056-DEL, 1950, *Hanford Works Monthly Report February 1950*, General Electric Company, Richland, Washington.

- HW-17088, 1950, *The Underground Disposal of Liquid Wastes at the Hanford Works, Washington*, General Electric Company, Richland, Washington.
- HW-17660-DEL, 1950, *Hanford Works Monthly Report April 1950*, General Electric Company, Richland, Washington.
- HW-17971-DEL, 1950, *Hanford Works Monthly Report May 1950*, General Electric Company, Richland, Washington.
- HW-18221-DEL, 1950, *Hanford Works Monthly Report June 1950*, General Electric Company, Richland, Washington.
- HW-19325-DEL, 1950, *Hanford Works Monthly Report for October 1950*, General Electric Company, Richland, Washington.
- HW-20991-DEL, 1951, *Hanford Works Monthly Report for April 1951*, General Electric Company, Richland, Washington.
- HW-20195, 1951, *Radioactive Content of Stored Bismuth Phosphate First Cycle Waste Supernatants*, General Electric Company, Richland, Washington.
- HW-20583, 1951, *Process Waste Disposal Summary – 200 Areas September 1949 through December 1950*, General Electric Company, Richland, Washington.
- HW-21506-DEL, 1951, *Hanford Works Monthly Report for June 1951*, General Electric Company, Richland, Washington.
- HW-23043, 1951, *Flow Sheets and Flow Diagrams of Precipitation Separations Process*, General Electric Company, Richland, Washington.
- HW-25227-DEL, 1952, *Hanford Works Monthly Report for July 1952*, General Electric Company, Richland, Washington.
- HW-25301, 1952, *Process Waste Disposal Summary – 200 Areas January through June 1952*, General Electric Company, Richland, Washington.
- HW-25533-DEL, 1952, *Hanford Works Monthly Report for August 1952*, General Electric Company, Richland, Washington.
- HW-25781-DEL, 1952, *Hanford Works Monthly Report for September 1952*, General Electric Company, Richland, Washington.
- HW-26047-DEL, 1952, *Hanford Works Monthly Report for October 1952*, General Electric Company, Richland, Washington.

- HW-27035, 1953, *Crib Wastes from 221-T and 224-T*, General Electric Company, Richland, Washington.
- HW-27774, 1953, *Final Report – Decontamination of 221 – 224 B Process Equipment*, General Electric Company, Richland, Washington.
- HW-27775, 1953, *Waste Status Summary, Separations Section, Planning and Separations, March 31, 1953*, General Electric Company, Richland, Washington.
- HW-27838, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department, April, May, June 1952*, General Electric Company, Richland, Washington.
- HW-27839, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, July, August, September 1952*, General Electric Company, Richland, Washington.
- HW-27840, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, October, November, December 1952*, General Electric Company, Richland, Washington.
- HW-27841, 1953, *Waste Status Summary, Separations Section Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, January 1953*, General Electric Company, Richland, Washington.
- HW-27842, 1953, *Waste Status Summary, Separations Section, Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, February 1953*, General Electric Company, Richland, Washington.
- HW-27932-DEL, 1953, *Hanford Works Monthly Report for April 1953*, General Electric Company, Richland, Washington.
- HW-28043, 1953, *Waste- Status Summary, Separations Section, Planning and Scheduling, Separations - Operations, April 30, 1953*, General Electric Company, Richland, Washington.
- HW-28121, 1953, *Release of Radioactive Wastes to the Ground, May 20, 1953*, General Electric Company, Richland, Washington.
- HW-28267-DEL, 1953, *Hanford Works Monthly Report for May 1953*, General Electric Company, Richland, Washington.
- HW-28377, 1953, *Waste-Status Summary, Separations Section, May 31, 1953, Planning and Scheduling, Separations - Operations*, General Electric Company, Richland, Washington.

- HW-28576-DEL, 1953, *Hanford Works Monthly Report for June 1953*, General Electric Company, Richland, Washington.
- HW-28712, 1953, *Waste-Status Summary, Separations Section, June 30, 1953*, Planning and Scheduling, Separations – Operations, General Electric Company, Richland, Washington.
- HW-30498, 1953, *Waste-Status Summary, Separations Section, December 31, 1953*, Planning and Scheduling, Separations, General Electric Company, Richland, Washington.
- HW-31126, 1954, *Waste- Status Summary; Separations Section, February 1954*, Planning and Scheduling Separations – Operations, General Electric Company, Richland, Washington.
- HW-31374, 1954, *Waste- Status Summary; Separations Section, March 31, 1954*, Planning and Scheduling Separations – Operations, General Electric Company, Richland, Washington.
- HW-31811, 1954, *Waste- Status Summary; Separations Section, April 30, 1954*, Planning and Scheduling Separations – Operations, General Electric Company, Richland, Washington.
- HW-33396, 1954, *Waste- Status Summary; Separations Section, September 31, 1954*, Planning and Scheduling Separations, Projects and Personnel Development Sub-section, General Electric Company, Richland, Washington.
- HW-33591, 1954, *Summary of Liquid Radioactive Wastes Discharged to the Ground – 200 Areas July 1952 through June 1954*, General Electric Company, Richland, Washington.
- HW-35825, 1955, *Project Proposal, Revision 1, Hanford 4X Program – Bismuth Phosphate Plants (Project CG-603)*, March 22, 1955, General Electric Company, Richland, Washington.
- HW-36001, 1955, *Waste- Status Summary; Separations Section, March 31, 1955*, Separations – Projects and Personnel Development Sub-Section, General Electric Company, Richland, Washington.
- HW-36717, 1955, *Decontamination of Uranium Recovery Process Stored Wastes Interim Report*, General Electric Company, Richland, Washington.
- HW-36979B, 1954, *Summary of Tank Farm Operation from 0800 1-1-54 to 0800 12-31-54*, General Electric Company, Richland, Washington.
- HW-38401, 1955, *Waste- Status Summary; Separations Section, July 1955*, Separations – Projects and Personnel Development Sub-Section, General Electric Company, Richland, Washington.
- HW-38562, 1955, *Radioactive Contamination in Liquid Wastes Discharged to Ground at Separations Facilities Through June 1955*, General Electric Company, Richland, Washington.

- HW-38955-REV, 1955, *In Farm Scavenging Operating Procedure and Control Data*, General Electric Company, Richland, Washington.
- HW-39850, 1955, *Waste- Status Summary; Separations Section, October 1955*, Separations – Projects and Personnel Development Sub-Section, General Electric Company, Richland, Washington.
- HW-44784, 1956, *Radioactive Contamination in Liquid Wastes Discharged to Ground at Separations Facilities Through June 1956*, General Electric Company, Richland, Washington.
- HW-46382, 1956, *Waste- Status Summary; Chemical Processing Department, October 1956*, Planning and Scheduling – Production Operation, General Electric Company, Richland, Washington.
- HW-48144, 1957, *Waste- Status Summary; Chemical Processing Department, January 31, 1957*, Planning and Scheduling – Production Operation, Hanford Atomic Products, Richland, Washington.
- HW-48518, 1957, *Radioactive Contamination in Liquid Wastes Discharged to Ground at Separations Facilities Through December 1956*, General Electric Company, Richland, Washington.
- HW-50127, 1957, *Waste- Status Summary; Chemical Processing Department, April 30, 1957*, Planning and Scheduling – Production Operation, Hanford Atomic Products Operation, Richland, Washington.
- HW-52932, 1957, *Waste- Status Summary; Chemical Processing Department, September 30, 1957*, Planning and Scheduling – Production Operation, Hanford Atomic Products Operation, Richland, Washington.
- HW-53573, 1957, *Waste- Status Summary; Chemical Processing Department, October 1957*, Hanford Atomic Products Operation, Richland, Washington.
- HW-55176, Pt. VI, 1958, *Index of CPD Crib Building Numbers Design of CPD Radioactive Liquid Disposal Sites*, General Electric Company, Richland, Washington.
- HW-63051, 1961, *The Recovery of Fission Product Rare Earth Sulfates from PUREX IWW*, General Electric Company, Richland, Washington.
- HW-69011, 1961, *Project CGC-897 – Title I Design Fission Product Storage in B Plant*, General Electric Company, Richland, Washington.
- HW-69534, 1961 *Laboratory Development of a Carrier Precipitation Process for the Recovery of Strontium from PUREX Wastes*, General Electric Company, Richland, Washington.

- HW-71187-DEL, 1961, *Chemical Processing Department Monthly Report for September 1961*, General Electric Company, Richland, Washington.
- HW-72625, 1962, *Chemical Processing Department – Waste Status Summary, February 7, 1962*, Hanford Atomic Products Operation, Richland, Washington.
- HW-76223, 1962, *Chemical Processing Department – Waste Status Summary, July – December 1962*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.
- HW-76848-DEL, 1963, *Chemical Processing Department Monthly Report for February 1963*, General Electric Company, Richland, Washington.
- HW-77016, 1963, *B-Plant Phase I Information Manual*, General Electric Company, Richland, Washington.
- HW-78817-DEL, 1963, *Chemical Processing Department Monthly Report for August 1963*, General Electric Company, Richland, Washington.
- HW-80379, 1964, *Chemical Processing Department – Waste Status Summary, January 9, 1964*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.
- HW-81373, 1964, *Removal of Lead from B-Plant Cerium and Rare Earth Fractions*, General Electric Company, Richland, Washington.
- HW-83906-C-RD, 1964, *Chemical Processing Department 200 West Area Tank Farm Inventory and Waste Reports January 1957 through December 1958*, General Electric Company, Richland, Washington.
- ISO-651-RD, 1967, *Fission Product Process Engineering Monthly Report 01/1967 through 12/1967*, ISOCHEM INC., Richland, Washington
- LA-UR-97-311, 1997, *Waste Status and Transaction Record Summary (WSTRS) Rev. 4, Rev. 0*, Los Alamos National Laboratory, Los Alamos, New Mexico.
- PRD-SEP-68-DEL, 1968, *Monthly Status and Progress Report September 1968*, United States Atomic Energy Commission Richland Operations Office, Richland Washington.
- RHO-RE-SA-169, 1986, *Sixteen Years of Cesium Recovery Processing at Hanford's B Plant*, Rockwell Hanford Operations, Richland, Washington.
- RL-SEP-197, 1965, *Chemical Processing Department Monthly Report December 1964*, General Electric Company, Richland, Washington.

RL-SEP-659, 1965, *Chemical Processing Department – Waste Status Summary, January 1, 1965 Through June 30, 1965*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.

RL-SEP-821, 1965, *Chemical Processing Department – Waste Status Summary, July 1, 1965 Through September 30, 1965*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.

RL-SEP-923, 1966, *Chemical Processing Department – Waste Status Summary, October 1, 1965 Through December 31, 1965*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.

WHC-MR-0132, 1990, *A History of the 200 Area Tank Farms*, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-WM-ER-310, 1996, *Supporting Document for the Historical Tank Content Estimate for B-Tank Farm*, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

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APPENDIX A

**VOLUME OF WASTES IN
TANKS 241-B-110, 241-B-111, AND 241-B-112**

January 1945 through September 1976

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Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112 ⁽¹⁾

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
1945	January	Not Reported	Not Reported	Not Reported			No waste transferred into these tanks.
	February	Not Reported	Not Reported	Not Reported	HW-7-1388-DEL	16	Operations assumed responsibility for B-Plant with construction completion on February 10, 1945.
						19	Dummy runs with water were underway at month-end for February 1945.
	March	Not Reported	Not Reported	Not Reported	HW-7-1544-DEL	22	Conducted chemical runs and testing of dissolvers using rejected aluminum cans.
	April	Not Reported	Not Reported	Not Reported	HW-7-1649-DEL	21	First irradiated fuel slugs were placed in process at B-Plant on April 13, 1945.
	May		6.5%		HW-7-1793-DEL	22	B-110, B-111, and B-112 operated as a cascade. Second decontamination cycle (2C) waste transferred from 221-B into B-110, which when filled overflows to B-111. B-111 overflows to B-112 when filled.
	June		8.1%		HW-7-1981-DEL	23	Receiving 2C waste from 221-B.
	July		11.1%		HW-7-2177-DEL	22	Receiving 2C waste from 221-B.
	August		16.1%		HW-7-2361-DEL	21	Receiving 2C waste from 221-B.
	September		22.1%		HW-7-2548-DEL	22	Receiving 2C waste from 221-B. 2C sludge being neutralized to pH 7 instead of pH 9-10 as previously conducted. More Pu carried into sludge at pH 7.
	October		29.6%		HW-7-2706-DEL	21	Receiving 2C waste from 221-B.
	November		35.8%		HW-7-2957-DEL	21	Receiving 2C waste from 221-B.
	December		44.7%		HW-7-3171-DEL	21	Receiving 2C waste from 221-B.
1946	January		52.03%		HW-7-3378-DEL	24	Receiving 2C waste from 221-B
	February		59.2%		HW-7-3566-DEL	21	Receiving 2C waste from 221-B
	March		63.6%		HW-7-3751-DEL	21	Receiving 2C waste from 221-B
	April		72.3%		HW-7-4004-DEL	21	Receiving 2C waste from 221-B
	May		80.5%		HW-7-4193-DEL	21	Receiving 2C waste from 221-B
	June		88.2%		HW-7-4343-DEL	23	Receiving 2C waste from 221-B
	July		93.3%		HW-7-4542-DEL	22	Receiving 2C waste from 221-B

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112 ⁽¹⁾

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	August		100%		HW-7-4739-DEL	23	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	September		100%		HW-7-5194-DEL	26	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	October		100%		HW-7-5362-DEL	28	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	November		100%		HW-7-5505-DEL	28	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	December		100%		HW-7-5630-DEL	25	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
1947	January		100%		HW-7-5802-DEL	26	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	February		100%		HW-7-5944-DEL	25	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	March		100%		HW-7-6048-DEL	24	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	April		100%		HW-7-6184-DEL	26	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	May		100%		HW-7-6391-DEL	23 - 24	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade. Started excavation for crib and tile field for disposal of 2C supernatant.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112 ⁽¹⁾

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	June		100%		HW-7-7454-DEL	26	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	July		100%		HW-7283-DEL	26	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	August		100%		HW-7504-DEL	26 - 27	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade. Crib and tile field for disposal of 2C supernatant about 65% complete.
	September		100%		HW-7795-DEL	27	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	October		100%		HW-7997-DEL	25 - 27	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade. Continued work on crib and tile field for disposal of 2C supernatant.
	November		100%		HW-8267-DEL	28 - 29	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade. Completed crib and tile field for disposal of 2C supernatant.
	December		100%		HW-8438-DEL	27	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
1948	January		100%		HW-8931-DEL	28	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	February		100%		HW-9191-DEL	28 - 30	Cribbed 39,000-gallons of 2C supernatant from B-112. Liquid inadvertently entered test shaft adjacent to crib and needs to be removed before cribbing can resume. B-110 and B-111 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112 ⁽¹⁾

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	March		96%		HW-9595-DEL	30 - 32	Cribbed 28,350-gallons (total to date 67,350-gallons) of 2C supernatant from B-112. B-110 and B-111 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	April		80.2%		HW-9922-DEL	31 - 32	Cribbed 246,650-gallons (total to date 314,000-gallons) of 2C supernatant from B-112. B-110 and B-111 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	May		69.8%		HW-10166-DEL	31 - 32	Additional cribbing of 2C supernatant will be dependent on measurements of underground radionuclide movement. B-110 and B-111 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade. Cascade at 100%.
	June		76%		HW-10378-DEL	30	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade.
	July		81.2%		HW-10714-DEL	32	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. Resumed cribbing of 2C supernatant. Started cribbing 2C supernatant in tank B-104.
	August		85.4%		HW-10993-DEL	35 - 36	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. Completed cribbing 2C supernatant in tank B-104 on August 2, 1948. Flow from crib became restricted after receiving only 312,000-gallons from B-104; suspect that 2C solids plugged crib drain lines. Started cribbing 2C supernatant from B-105, but drainage from crib remains slow.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112 ⁽¹⁾

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	September		88.9%		HW-11226-DEL	32 - 33	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. Cribbed about 130,000-gallons of 2C supernatant from B-105, but drainage from crib remains slow. Attempted several 10wt% acid flushes of crib to remove restriction, but drain remains slow.
	October		92.2%		HW-11499-DEL	33 - 34	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. Cribbed about 81,000-gallons of 2C supernatant from B-105, but drainage from crib remains slow, limiting jetting rate to about 6,000-gallons per day.
	November		96.3%		HW-11835-DEL	35 - 36	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. Cribbed about 207,300-gallons (total to date 418,300) of 2C supernatant from B-105. Crib permitted to overflow into associated tile field on November 12, 1948.
	December		100%		HW-12086-DEL	37	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. Completed crib disposal of 2C supernatant from B-105 on December 8, 1948. Disposed of a total of 522,800-gallons. Started crib disposal of 2C supernatant from B-106. Disposed of 235,100-gallons to date.
1949	January		100%		HW-12391-DEL	38 - 39	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade. Continued crib disposal of 2C supernatant from B-106. Disposed of 458,000-gallons to date.
	February		100%		HW-12666-DEL	34 - 35	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade. Completed crib disposal of 2C supernatant from B-106. Disposed of a total of 531,250-gallons.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112 ⁽¹⁾

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	March		100%		HW-12937-DEL	40	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	April		100%		HW-13190-DEL	40	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	May		100%		HW-13561-DEL	42	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	June		100%		HW-13793-DEL	41	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	July		100%		HW-14043-DEL	42	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	August		100%		HW-14338-DEL	43	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	September		100%		HW-14596-DEL	43	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	October		100%		HW-14916-DEL	43	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	November		100%		HW-15267-DEL	44	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade.
	December		100%		HW-15550-DEL	42	B-110, B-111, and B-112 full. Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade. Started crib disposal of 2C supernatant from tank B-112.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112 ⁽¹⁾

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
1950	January		77.3%		HW-15843-DEL	44 -	Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade. Continued crib disposal of 2C supernatant from tank B-112. Disposed of 360,000-gallons to date.
	February		67.4%		HW-17056-DEL	44	Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade. Completed crib disposal of 2C supernatant from tank B-112. Disposed of 497,000-gallons in total.
	March		67.4%		HW-17410-DEL	47 - 48	Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade. Started crib disposal of 2C supernatant from tank B-106. Disposed of 165,000-gallons to date.
	April		40.3%		HW-17660-DEL	46 - 47	Receiving 2C waste from 221-B into B-104, B-105, and B-106 cascade. Conducted crib disposal of 2C supernatant from tanks B-106 and B-110. Disposed of 489,500-gallons in total from both tanks.
	May		58%		HW-17971-DEL	44	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. Conducted crib disposal of 2C supernatant from tanks B-106 and B-110. Disposed of 328,000-gallons in total from both tanks.
	June		31%		HW-18221-DEL	43 - 44	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. Conducted crib disposal of 486,000-gallons of 2C supernatant from tank B-105. All 2C supernatant emptied from tanks B-104, B-105, and B-106.
	July		73.3%		HW-18473-DEL	46	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade.
	August		83.3%		HW-18740-DEL	49	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade.
	September		92.6%		HW-19021-DEL	49	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112 ⁽¹⁾

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	October		1,127,000-gallons		HW-19325-DEL	49 - 50	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. Conducted crib disposal of 507,700-gallons of 2C supernatant from tank B-112.
	November		1,275,000-gallons		HW-19622-DEL	49	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade.
	December		1,200,000-gallons		HW-19842-DEL	50	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. Conducted crib disposal of 249,000-gallons of 2C supernatant from tank B-112.
1951	January		1,294,000-gallons		HW-20161-DEL	49 - 50	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. Conducted crib disposal of 119,000-gallons of 2C supernatant from tank B-112.
	February		1,431,000-gallons		HW-20438-DEL	49	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade.
	March		1,195,000-gallons		HW-20671-DEL	53	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. Conducted crib disposal of 377,072-gallons of 2C supernatant from tank B-112.
	April		1,250,000-gallons		HW-20991-DEL	51	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. Conducted crib disposal of 123,052-gallons of 2C supernatant from tank B-112.
	May		1,428,000-gallons		HW-21260-DEL	55	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. No crib disposal conducted in May 1951.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112 ⁽¹⁾

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	June		1,555,000-gallons		HW-21506-DEL	54 - 56	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. No crib disposal conducted in June 1951. Completed process pipe alterations, which allow overflow of 2C supernatant to the crib. Previously, waste was jetted to crib. Completed piping modifications that collect low-activity cell drainage with 2C waste in B-110, B-11, and B-112 cascade.
	July		1,621,000-gallons		HW-21802-DEL	41	Receiving 2C waste from 221-B into B-110, B-111, and B-112, which cascades to crib.
	August		Not Reported		HW-22075-DEL		Receiving 2C waste from 221-B into B-110, B-111, and B-112, which cascades to crib.
	September		Not Reported		HW-22304-DEL		Receiving 2C waste from 221-B into B-110, B-111, and B-112, which cascades to crib. "Slightly contaminated water" jetted from catch tank for diversion box 154-B to second cycle waste cascade (HAN-68671-DEL, page 84)
	October		Not Reported		HW-22610-DEL		Receiving 2C waste from 221-B into B-110, B-111, and B-112, which cascades to crib.
	November		Not Reported		HW-22875-DEL		Receiving 2C waste from 221-B into B-110, B-111, and B-112, which cascades to crib.
	December		Not Reported		HW-23140-DEL		Receiving 2C waste from 221-B into B-110, B-111, and B-112, which cascades to crib.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
1952	January	Not Reported	Not Reported	Not Reported	HW-23437-DEL		Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. B-112 discharges to crib.
	February	Not Reported	Not Reported	Not Reported	HW-23698-DEL		Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. B-112 discharges to crib.
	March	Not Reported	Not Reported	Not Reported	HW-23982-DEL		Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. B-112 discharges to crib.
	April	530,000-gallons	530,000-gallons	542,000-gallons	HW-27838	6 - 9	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks as of 5-1-1952 is 401,000-gallons
	May	530,000-gallons	530,000-gallons	542,000-gallons	HW-27838	17 - 20	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks as of 5-31-1952 is 403,000-gallons
	June	530,000-gallons	530,000-gallons	542,000-gallons	HW-27838	28 - 31	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 407,000-gallons
	July	530,000-gallons	530,000-gallons	542,000-gallons	HW-27839	6 - 9	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 409,000-gallons

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	August	530,000-gallons	530,000-gallons	542,000-gallons	HW-27839	17 - 20	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 411,000-gallons
	September	530,000-gallons	530,000-gallons	542,000-gallons	HW-27839	28 - 31	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 414,000-gallons
	October	530,000-gallons	530,000-gallons	542,000-gallons	HW-27840	6 - 9	Receiving 2C waste from 221-B into B-110, B-111, and B-112 cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 414,000-gallons
	November	530,000-gallons	530,000-gallons	542,000-gallons	HW-27840	17 - 20	Receiving flushes from 221-B Plant cleanout of section 5, 1 st and 2 nd cycle lines into cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 414,000-gallons
	December	530,000-gallons	530,000-gallons	542,000-gallons	HW-27840	28 - 31	Receiving flushes from 221-B Plant cleanout of section 5, 1 st and 2 nd cycle lines into cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 414,000-gallons
1953	January	530,000-gallons	530,000-gallons	542,000-gallons	HW-27841	6 - 9	Receiving flushes from 221-B Plant cleanout of section 5, 1 st and 2 nd cycle lines into cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 414,000-gallons
	February	530,000-gallons	530,000-gallons	542,000-gallons	HW-27842	6 - 9	Receiving flushes from 221-B Plant cleanout of section 5, 1 st and 2 nd cycle lines into cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 414,000-gallons

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	March	530,000-gallons	530,000-gallons	542,000-gallons	HW-27775	6 - 9	Receiving flushes from 221-B Plant cleanout of section 5, 1 st and 2 nd cycle lines into cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 414,000-gallons
	April	530,000-gallons	530,000-gallons	542,000-gallons	HW-28043	4	Receiving flushes from 221-B Plant cleanout of section 5, 1 st and 2 nd cycle lines into cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 414,000-gallons
	May	530,000-gallons	530,000-gallons	542,000-gallons	HW-28377	4	Receiving flushes from 221-B Plant cleanout of section 5, 1 st and 2 nd cycle lines into cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 414,000-gallons
	June	530,000-gallons	530,000-gallons	542,000-gallons	HW-28712	4	Receiving flushes from 221-B Plant cleanout of section 5, 1 st and 2 nd cycle lines into cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 414,000-gallons
	July	530,000-gallons	530,000-gallons	542,000-gallons	HW-29054	4	Receiving flushes from 221-B Plant cleanout of section 5, 1 st and 2 nd cycle lines into cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 414,000-gallons
	August	530,000-gallons	530,000-gallons	542,000-gallons	HW-29242	4	Receiving flushes from 221-B Plant cleanout of section 5, 1 st and 2 nd cycle lines into cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 414,000-gallons

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	September	530,000-gallons	530,000-gallons	542,000-gallons	HW-29624	4	Receiving flushes from 221-B Plant cleanout of section 5, 1 st and 2 nd cycle lines into cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 378,000-gallons in B-110, 237,000-gallons in B-111 and no sludge in B-112.
	October	530,000-gallons	530,000-gallons	542,000-gallons	HW-29905	4	Receiving flushes from 221-B Plant cleanout of section 5, 1 st and 2 nd cycle lines into cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 378,000-gallons in B-110, 237,000-gallons in B-111 and no sludge in B-112.
	November	530,000-gallons	530,000-gallons	542,000-gallons	HW-30250	4	Receiving flushes from 221-B Plant cleanout of section 5, 1 st and 2 nd cycle lines into cascade. B-112 discharges to crib. Estimated sludge volume in all three tanks is 378,000-gallons in B-110, 237,000-gallons in B-111 and no sludge in B-112.
	December	425,000-gallons	530,000-gallons	542,000-gallons	HW-30498	4	Pumped B-110 to C-111. Estimated sludge volume in all three tanks is 243,000-gallons in B-110, 161,000-gallons in B-111 and no sludge in B-112.
1954	January	425,000-gallons	530,000-gallons	542,000-gallons	HW-30851	4	Estimated sludge volume in all three tanks is 243,000-gallons in B-110, 161,000-gallons in B-111 and no sludge in B-112.
	February	Not legible	530,000-gallons	542,000-gallons	HW-31126	4	B-110 supernatant pumped to B-112, which discharges to crib. Estimated sludge volume in all three tanks is 243,000-gallons in B-110, 161,000-gallons in B-111 and no sludge in B-112.
	March	421,000-gallons	530,000-gallons	542,000-gallons	HW-31374	4	B-110 received 221-B Plant section 5 waste. Estimated sludge volume in all three tanks is 243,000-gallons in B-110, 161,000-gallons in B-111 and no sludge in B-112.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110 gallons	B-111 gallons	B-112 gallons	Reference	Page	Comments
	April	530,000-	530,000-	542,000-	HW-31811	4	Supernatant in B-110 and B-111 transferred to B-112 and then cribbed.
	May	530,000-	530,000-	542,000-	HW-32110	4	B-110 and B-111 received evaporator bottoms (EB) from tank B-105. EB volume in B-110 and B-111 estimated at 155,000-gallons and 335,000-gallons, respectively.
	June	530,000-	530,000-	542,000-	HW-32389	4	Tanks receive 221-B section 5 and 15 flushes. Estimated sludge volume in all three tanks is 243,000-gallons in B-110, 161,000-gallons in B-111 and no sludge in B-112.
	July	530,000-	530,000-	542,000-	HW-32697	4	Tanks receive 221-B section 5 and 15 flushes. B-112 cascades to crib.
	August	530,000-	530,000-	542,000-	HW-33002	4	Same as above.
	September	530,000-	530,000-	542,000-	HW-33396	4	Same as above.
	October	530,000-	530,000-	542,000-	HW-33544	4	No comments in monthly report.
	November	530,000-	530,000-	542,000-	HW-33904	4	No comments in monthly report. 375,000-gallons sludge in B-110 and 195,000-gallons sludge in B-111.
	December	530,000-	530,000-	542,000-	HW-34412	4	Same as above.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110 Not legible	B-111 Not legible	B-112 Not legible	Reference	Page	Comments
1955	January				HW-35022	4	
	February	530,000- gallons	530,000- gallons	542,000- gallons	HW-35628	4	No comments in monthly report. Estimated sludge volume in all three tanks is 375,000-gallons in B-110, 195,000-gallons in B-111 and no sludge in B-112.
	March	348,000- gallons	530,000- gallons	542,000- gallons	HW-36001	4	Transferred 182,000-gallons of Evaporator Bottoms waste from B-110 to B-107 and B-108.
	April	348,000- gallons	530,000- gallons	542,000- gallons	HW-36553	4	Estimated sludge volume in all three tanks is 348,000-gallons in B-110, 195,000-gallons in B-111 and no sludge in B-112.
	May	348,000- gallons	530,000- gallons	542,000- gallons	HW-37143	4	No comments in monthly report.
	June	348,000- gallons	530,000- gallons	542,000- gallons	HW-38000	4	No comments in monthly report.
	July	348,000- gallons	249,000- gallons	542,000- gallons	HW-38401	4	Transferred 281,000-gallons of Evaporator Bottoms waste from B-111 to B-108.
	August	348,000- gallons	249,000- gallons	542,000- gallons	HW-38926	4	Estimated sludge volume in all three tanks is 243,000-gallons in B-110, 249,000-gallons in B-111 and no sludge in B-112. Same as above.
	September	348,000- gallons	249,000- gallons	542,000- gallons	HW-39216	4	Same as above.
	October	356,000- gallons	249,000- gallons	542,000- gallons	HW-39850	4	221-B Plant being readied for restart to process irradiated reactor fuel. However, restart was not conducted. 221-B Plant flushes routed to tank B-110. No change in sludge volumes.
	November	361,000- gallons	249,000- gallons	542,000- gallons	HW-40208	4	221-B Plant flushes routed to tank B-110. No change in sludge volumes.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110 gallons	B-111 gallons	B-112 gallons	Reference	Page	Comments
1956	December	451,000-	249,000-	542,000-	HW-40816	4	221-B Plant flushes routed to tank B-110.
	January	486,000-	249,000-	542,000-	HW-41038	4	221-B Plant flushes routed to tank B-110.
	February	496,000-	249,000-	542,000-	HW-41812	4	221-B Plant flushes routed to tank B-110.
	March	501,000-	249,000-	542,000-	HW-42394	4	221-B Plant flushes routed to tank B-110.
	April	530,000-	249,000-	542,000-	HW-42993	4	221-B Plant flushes routed to tank B-110.
	May	530,000-	249,000-	542,000-	HW-43490	4	221-B Plant flushes routed to tank B-110.
	June	530,000-	251,000-	542,000-	HW-43895	4	221-B Plant flushes routed to tank B-110.
	July	530,000-	251,000-	542,000-	HW-44860	4	221-B Plant flushes routed to tank B-110.
	August	530,000-	265,000-	542,000-	HW-45140	4	221-B Plant flushes routed to tank B-110.
	September	530,000-	265,000-	542,000-	HW-45738	4	221-B Plant flushes routed to tank B-110.
	October	530,000-	268,000-	542,000-	HW-46382	4	221-B Plant flushes routed to tank B-110. Tank B-112 noted as being contaminated with evaporator bottoms waste.
	November	530,000-	268,000-	542,000-	HW-47052	4	221-B Plant flushes routed to tank B-110. Tank B-112 noted as being contaminated with evaporator bottoms waste.
1957	December	530,000-	270,000-	542,000-	HW-47460	4	221-B Plant flushes routed to tank B-110. Tank B-112 noted as being contaminated with evaporator bottoms waste.
	January	533,000-	270,000-	540,000-	HW-48144	4	Same as above. Estimated sludge volume is 243,000-gallons in B-110, 161,000-gallons in B-111 and no sludge in B-112.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	February	532,000-gallons	270,000-gallons	540,000-gallons	HW-48846	4	Same as above.
	March	532,000-gallons	270,000-gallons	538,000-gallons	HW-49523	4	Same as above.
	April	532,000-gallons	268,000-gallons	538,000-gallons	HW-50127	4	Same as above.
	May	535,000-gallons	279,000-gallons	538,000-gallons	HW-50617	4	No comments. 241-B-110 no longer receiving 221-B Plant flush solutions. Estimated sludge volume is 243,000-gallons in B-110, 161,000-gallons in B-111, and 23,000-gallons in B-112.
	June	535,000-gallons	279,000-gallons	538,000-gallons	HW-51348	4	Same as above.
	July	535,000-gallons	279,000-gallons	538,000-gallons	HW-51858	4	Same as above.
	August	535,000-gallons	279,000-gallons	538,000-gallons	HW-52414	4	Same as above.
	September	535,000-gallons	279,000-gallons	538,000-gallons	HW-52932	4	Same as above.
	October	535,000-gallons	279,000-gallons	43,000-gallons	HW-53573 HW-83906-C-RD, page 88	4	495,000-gallons of supernatant transferred from B-112 to tank C-101 for scavenging (i.e., Sr-90 and Cs-137 precipitation in CR Vault). Estimated sludge volume is 243,000-gallons in B-110, 161,000-gallons in B-111, and 43,000-gallons in B-112.
	November	535,000-gallons	279,000-gallons	43,000-gallons	HW-54067	4	243,000-gallons in B-110, 161,000-gallons in B-111, and 43,000-gallons sludge in B-112.
	December	535,000-gallons	279,000-gallons	43,000-gallons	HW-54519	4	Same as above.
1958	January	535,000-gallons	279,000-gallons	43,000-gallons	HW-54916	4	No comments.
	February	535,000-gallons	279,000-gallons	43,000-gallons	HW-55264	4	No comments.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110 gallons	B-111 gallons	B-112 gallons	Reference	Page	Comments
	March	535,000-	282,000-	43,000-	HW-55630	4	Latest electrode reading for B-111.
	April	535,000-	282,000-	43,000-	HW-55997	4	No comments.
	May	535,000-	282,000-	46,000-	HW-56357	4	Latest electrode reading for B-112. Estimated sludge volume is 243,000-gallons in B-110, 161,000-gallons in B-111, and 43,000-gallons in B-112.
	June	535,000-	282,000-	46,000-	HW-56761	4	No comments.
	July	535,000-	282,000-	46,000-	HW-57122	4	No comments.
	August	535,000-	279,000-	46,000-	HW-57550	4	Latest electrode reading for B-111.
	September	535,000-	279,000-	46,000-	HW-57711	4	No comments.
	October	535,000-	279,000-	46,000-	HW-58201	4	No comments.
	November	535,000-	279,000-	46,000-	HW-58579	4	No comments.
	December	535,000-	279,000-	46,000-	HW-58831	4	No comments.
1959	January	535,000-	334,000-	48,000-	HW-59204	4	New electrode reading in B-111.
	February	535,000-	334,000-	46,000-	HW-59586	4	No comments.
	March	532,000-	334,000-	46,000-	HW-60065	4	No comments.
	April	532,000-	334,000-	46,000-	HW-60419	4	No comments.
	May	532,000-	334,000-	46,000-	HW-60738	4	No comments.
	June	532,000-	334,000-	46,000-	HW-61095	4	No comments.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	July	532,000-gallons	334,000-gallons	46,000-gallons	HW-61582	4	No comments.
	August	532,000-gallons	334,000-gallons	45,000-gallons	HW-61952	4	No comments.
	September	532,000-gallons	334,000-gallons	45,000-gallons	HW-62421	4	No comments.
	October	532,000-gallons	334,000-gallons	43,000-gallons	HW-62723	4	Latest electrode reading for B-112.
	November	532,000-gallons	334,000-gallons	43,000-gallons	HW-63083	4	No comments.
	December	532,000-gallons	334,000-gallons	43,000-gallons	HW-63559	4	No comments.
1960	January	532,000-gallons	334,000-gallons	43,000-gallons	HW-63896	4	No comments.
	February	532,000-gallons	334,000-gallons	43,000-gallons	HW-64373	4	No comments.
	March	532,000-gallons	334,000-gallons	43,000-gallons	HW-64810	4	No comments.
	April	532,000-gallons	334,000-gallons	43,000-gallons	HW-65272	4	No comments.
	May	532,000-gallons	334,000-gallons	43,000-gallons	HW-65643	4	No comments.
	June	532,000-gallons	334,000-gallons	43,000-gallons	HW-66187	4	No comments.
	July	532,000-gallons	334,000-gallons	43,000-gallons	HW-66557	4	No comments.
	August	532,000-gallons	334,000-gallons	43,000-gallons	HW-66827	4	No comments.
	September	532,000-gallons	334,000-gallons	43,000-gallons	HW-67696	4	No comments.
	October	532,000-gallons	334,000-gallons	43,000-gallons	HW-67705	4	No comments.
	November	532,000-gallons	334,000-gallons	32,000-gallons	HW-68291	4	Tank B-112 shows an unexplained decrease of 11,000-gallons.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	December	532,000-gallons	334,000-gallons	32,000-gallons	HW-68292	4	No comments.
1961	January thru June	530,000-gallons	332,000-gallons	29,000-gallons	HW-71610	4	No comments. Sludge volumes estimated as 243,000-gallons in B-110, 161,000-gallons in B-111, and 29,000-gallons in B-112.
	July thru December	538,000-gallons	480,000-gallons	40,000-gallons	HW-72625	4	Received 8,000-gallons into B-110 and 148,000-gallons into B-111 from 221-B Plant. Latest electrode reading for B-112. Sludge volumes estimated as 243,000-gallons in B-110, 161,000-gallons in B-111, and 29,000-gallons in B-112.
1962	January thru June	532,000-gallons	554,000-gallons	35,000-gallons	HW-74647	4	Received 68,000-gallons from 221-B Plant into B-111. Sludge volumes estimated as 243,000-gallons in B-110, 161,000-gallons in B-111, and 35,000-gallons in B-112.
	July thru December	532,000-gallons	554,000-gallons	40,000-gallons	HW-76223	4	Received 5,000-gallons into B-112 from 221-B Plant. Sludge volumes estimated as 243,000-gallons in B-110, 161,000-gallons in B-111, and 40,000-gallons in B-112.
1963	January thru June	530,000-gallons	343,000-gallons	271,000-gallons	HW-78279	4	Pumping B-110 and B-111 to B-112. Sludge volumes estimated as 282,000-gallons in B-110, 300,000-gallons in B-111, and 35,000-gallons in B-112.
	July thru December	365,000-gallons	337,000-gallons	524,000-gallons	HW-80379	4	Receiving waste from fission product processing at 221-B Plant into B-110 and pumping from B-110 and B-111 to B-112. Sludge volumes estimated as 282,000-gallons in B-110, 300,000-gallons in B-111, and 35,000-gallons in B-112.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
1964	January thru June	528,000-gallons	338,000-gallons	536,000-gallons	HW-83308	4	Receiving waste from fission product processing at 221-B Plant into B-110 and pumping from B-110 and B-111 to B-112. Sludge volumes estimated as 282,000-gallons in B-110, 300,000-gallons in B-111, and 35,000-gallons in B-112.
	July thru December	528,000-gallons	392,000-gallons	536,000-gallons	RL-SEP-260	4	Receiving waste from fission product processing at 221-B Plant into B-110 and pumping from B-110 and B-111 to B-112. Sludge volumes estimated as 282,000-gallons in B-110, 300,000-gallons in B-111, and 35,000-gallons in B-112.
1965	January thru June	543,000-gallons	381,000-gallons	450,000-gallons	RL-SEP-659	4	Received 166,000-gallons of waste from fission product processing at 221-B Plant into B-111. Transferred 177,000-gallons of waste from B-111 to B-112. Transferred 263,000-gallons of waste from B-112 to AX-101. Sludge volumes estimated as 332,000-gallons in B-110, 310,000-gallons in B-111, and 35,000-gallons in B-112.
	July thru September	543,000-gallons	442,000-gallons	313,000-gallons	RL-SEP-821	4	Received 61,000-gallons of waste from fission product processing at 221-B Plant into B-111. Transferred 137,000-gallons of waste from B-112 to AX-101. Sludge volumes estimated as 332,000-gallons in B-110, 310,000-gallons in B-111, and 35,000-gallons in B-112.
	October thru December	543,000-gallons	477,000-gallons	106,000-gallons	RL-SEP-923	4	Received 35,000-gallons of waste from fission product processing at 221-B Plant into B-111. Transferred 207,000-gallons of waste from B-112 to AX-101. Sludge volumes estimated as 332,000-gallons in B-110, 310,000-gallons in B-111, and 35,000-gallons in B-112.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
1966	January thru March	541,000-gallons	469,000-gallons	211,000-gallons	ISO-226	4	Received 997,000-gallons of waste from fission product processing at 221-B Plant into B-111. [Note: Volume received into B-111 seems to be in error and is likely only 97,000-gallons based on previous monthly report and waste inventories reported for B-111 and B-112.] Transferred 105,000-gallons of waste from B-111 to B-112. Sludge volumes estimated as 332,000-gallons in B-110, 310,000-gallons in B-111, and 35,000-gallons in B-112. Report could not be located.
	April thru June				ISO-404		
	July thru September	541,000-gallons	442,000-gallons	337,000-gallons	ISO-538	4	Received 39,000-gallons of waste from fission product processing at 221-B Plant into B-111. Transferred 33,000-gallons of waste from B-111 to B-112. Sludge volumes estimated as 332,000-gallons in B-110, 310,000-gallons in B-111, and 35,000-gallons in B-112.
	October thru December	541,000-gallons	461,000-gallons	337,000-gallons	ISO-674	4	Received 19,000-gallons of waste from fission product processing at 221-B Plant into B-111.
1967	January thru March	541,000-gallons	497,000-gallons	337,000-gallons	ISO-806	4	Received 36,000-gallons of waste from fission product processing at 221-B Plant into B-111.
	April thru June	541,000-gallons	395,000-gallons	528,000-gallons	ISO-967	4	Received 89,000-gallons of waste from fission product processing at 221-B Plant into B-111. Transferred 191,000-gallons from B-111 to B-112.
	July thru September	536,000-gallons	426,000-gallons	528,000-gallons	ARH-95	5	Received 31,000-gallons of waste from fission product (FP) processing at 221-B Plant into B-111. Sludge volumes estimated as 243,000-gallons in B-110, 161,000-gallons in B-111, and 40,000-gallons in B-112.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	October thru December	466,000- gallons	243,000- gallons (FP) 280,000- gallons (EB)	120,000- gallons (FP) 49,000-gallons (EB)	ARH-326	5	153,000-gallons from B-110 transferred to B-112. Received 115,000-gallons from tank 9-2 in 221-B Plant into B-111. 221-B Plant cell 23 evaporator received feed from B-112 and transferred evaporator bottoms (EB) to B-111.
1968	January thru March	390,000- gallons (FP) 156,000- gallons (EB)	241,000- gallons (FP) 280,000- gallons (EB)	331,000- gallons (FP) 204,000- gallons (EB)	ARH-534	5	Received 311,000-gallons from 221-B Plant cell 23 evaporator bottoms (EB) into B-110. Tank B-110 received 135,000-gallons from 221-B Plant tank 9-2. B-112 received 366,000-gallons of waste from tank B-110. Sludge volumes estimated as 243,000-gallons in B-110, 161,000-gallons in B-111, and 40,000- gallons in B-112.
	April thru June	390,000- gallons (FP) 156,000- gallons (EB)	239,000- gallons (FP) 280,000- gallons (EB)	343,000- gallons (FP) 204,000- gallons (EB)	ARH-721	5 - 6	No waste received into B-110, B-111, or B-112. 221-B Plant waste routed to BX-101 and BX-104. Sludge volumes estimated as 297,000-gallons in B-110, 241,000-gallons in B-111, and 18,000-gallons in B-112.
	July thru September	390,000- gallons (FP) 156,000- gallons (EB)	239,000- gallons (FP) 280,000- gallons (EB)	343,000- gallons (FP) 204,000- gallons (EB)	ARH-871	5 - 6	Same as above.
	October thru December	93,000 (FP), 155,000 (EB), 297,000- gallons sludge	276,000 (EB), 241,000- gallons sludge	325,000 (FP), 204,000 (EB), 18,000-gallons sludge	ARH-1061	5	No waste received into B-110, B-111, or B-112. 221-B Plant waste routed to BX-101 and AX-101.
1969	January thru March	93,000 (FP), 152,000 (EB), 297,000- gallons sludge	272,000 (EB), 241,000- gallons sludge	325,000 (FP), 207,000 (EB), 18,000-gallons sludge	ARH-1200 A	5	No waste received into B-110, B-111, or B-112. 221-B Plant waste routed to BX-Farm, AX-101, AX-103, and AX-104. B-112 received 3,000-gallons of waste from pump testing caisson.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	April thru June	93,000 (EP), 151,000 (EB), 297,000- gallons sludge	147,000 (EB), 241,000- gallons sludge	83,000 (EB), 18,000-gallons sludge	ARH-1200 B	5	No waste received into B-110 or B-111. Transferred 127,000-gallons from B-111 to B-112. Received 21,000-gallons of waste from catch tank 241-B-301-B into B-112. Catch tank 241-B-301- B receives drainage from diversion boxes B-151, B-152, B-153, and B-252. Transferred 597,000-gallons from B-112 to B-103.
	July thru September	38,000 (EB), 199,000 (IX) 297,000- gallons sludge	24,000 (EB), 35,000 (IX) 241,000- gallons sludge	82,000 (EB), 179,000 (IX) 18,000-gallons sludge	ARH-1200 C	5	Transferred 206,000-gallons of waste from B-110 to B-112. Received 199,000-gallons of ion exchange (IX) column wash waste from 221-B Plant into B-110 and 214,000-gallons of IX waste into B-111. Transferred 312,000-gallons of waste from B-111 to BY-112. Transferred 339,000-gallons of waste from B-112 to B-103.
	October thru December	38,000 (EB), 199,000 (IX) 297,000- gallons sludge	349,000 (IX) 241,000- gallons sludge	106,000 (EB), 430,000 (IX) 18,000-gallons sludge	ARH-1200 D	5	Received 1,119,000-gallons of ion exchange (IX) column wash waste from 221-B Plant into B-111. Transferred 275,000-gallons of waste from B-111 to B-112, 428,000-gallons of waste to B-108, and 367,000-gallons of waste to B-109.
1970	January thru March	38,000 (EB), 196,000 (IX) 297,000- gallons sludge	199,000 (IX) 232,000- gallons sludge	106,000 (EB), 429,000 (IX) 18,000-gallons sludge	ARH-1666 A	5	Received 276,000-gallons of ion exchange (IX) column wash waste from 221-B Plant into B-111. Transferred 208,000-gallons of waste from B-111 to B-103.
	April thru June	38,000 (EB), 195,000 (IX) 297,000- gallons sludge	259,000 (IX) 244,000- gallons sludge	106,000 (EB), 434,000 (IX) 18,000-gallons sludge	ARH-1666 B	5	Received 265,000-gallons of ion exchange (IX) column waste from processing PUREX Supernatant Neutralized (PSN) waste at 221-B Plant into B-111. Transferred 279,000-gallons of waste from B-111 to B-103. B-111 received 11,000-gallons water flush and 7,000-gallons of waste from catch tank 301-B.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	July thru September	38,000 (EB), 195,000 (IX) 297,000- gallons sludge	259,000 (IX) 244,000- gallons sludge	106,000 (EB), 434,000 (IX) 18,000-gallons sludge	ARH-1666 C	5	No waste received into B-110, B-111, or B-112.
	October thru December	38,000 (EB), 195,000 (IX) 297,000- gallons sludge	258,000 (IX) 244,000- gallons sludge	106,000 (EB), 434,000 (IX) 18,000-gallons sludge	ARH-1666 D	5	No waste received into B-110, B-111, or B-112.
1971	January thru March	38,000 (EB), 192,000 (IX) 297,000- gallons sludge	258,000 (IX) 244,000- gallons sludge	106,000 (EB), 433,000 (IX) 18,000-gallons sludge	ARH-2074 A	5	No waste received into B-110, B-111, or B-112.
	April thru June	38,000 (EB), 190,000 (IX) 297,000- gallons sludge	258,000 (IX) 244,000- gallons sludge	106,000 (EB), 432,000 (IX) 18,000-gallons sludge	ARH-2074 B	5	No waste received into B-110, B-111, or B-112.
	July thru September	1,000 (EB), 3,000 (IX) 297,000- gallons sludge	258,000 (IX) 244,000- gallons sludge	106,000 (EB), 433,000 (IX) 18,000-gallons sludge	ARH-2074 C	5	No waste received into B-110, B-111, or B-112. Transferred 223,000-gallons of waste from B-110 to B-102.
	October thru December	1,000 (EB), 3,000 (IX) 297,000- gallons sludge	257,000 (IX) 244,000- gallons sludge	10,000 (EB), 40,000 (IX) 18,000-gallons sludge	ARH-2074 D	5	No waste received into B-110, B-111, or B-112. Transferred 490,000-gallons of waste from B-112 to B-103.
1972	January thru March	2,000 (IX) 297,000- gallons sludge	0-gallons supernatant, 241,000- gallons sludge	14,000 (EB), 55,000 (IX) 18,000-gallons sludge	ARH-2456 A	4	B-112 received 19,000-gallons of waste from catch tank 301-B. Transferred 239,000-gallons of waste from B-111 to B-103.
	April thru June	6,000 (IX) 282,000- gallons sludge	0-gallons supernatant, 246,000- gallons sludge	15,000 (EB), 57,000 (IX) 18,000-gallons sludge	ARH-2456 B	4	No waste received into B-110, B-111, or B-112.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	July thru September	0-gallons supernatant, 282,000- gallons sludge	17,000 (IX), 246,000- gallons sludge	13,000 (EB), 50,000 (IX) 14,000-gallons sludge	ARRH-2456 C	4	B-110 received 6,000-gallons of flush water and transferred 24,000-gallons of waste to B-102.
	October thru December	0-gallons supernatant, 282,000- gallons sludge	3,000 (IX), 246,000- gallons sludge	13,000 (EB), 50,000 (IX) 14,000-gallons sludge	ARRH-2456 D	4	B-110 received 3,000-gallons of flush water and transferred 14,000-gallons of waste to B-102.
1973	January thru March	0-gallons supernatant, 282,000- gallons sludge	0-gallons supernatant, 249,000- gallons sludge	288,000 supernatant 14,000-gallons sludge	ARRH-2794 A	4	B-110 received 1,000-gallons of flush water and transferred 3,000-gallons of waste to B-102. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit
	April thru June	0-gallons supernatant, 282,000- gallons sludge	0-gallons supernatant, 249,000- gallons sludge	289,000 supernatant 14,000-gallons sludge	ARRH-2974 B	4	No waste received into B-110 or B-111. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit
	July thru September	0-gallons supernatant, 282,000- gallons sludge	0-gallons supernatant, 249,000- gallons sludge	291,000 supernatant 14,000-gallons sludge	ARRH-2974 C	4	No waste received into B-110 or B-111. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit
	October thru December	0-gallons supernatant, 282,000- gallons sludge	0-gallons supernatant, 249,000- gallons sludge	291,000 supernatant 14,000-gallons sludge	ARRH-2974 D	4	No waste received into B-110 or B-111. Suspect B-110 tank as leaking. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit
1974	January thru March	0-gallons supernatant, 282,000- gallons sludge	0-gallons supernatant, 249,000- gallons sludge	291,000 supernatant 14,000-gallons sludge	ARRH-CD-133 A	4	No waste received into B-110 or B-111. Suspect B-110 tank as leaking. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	April thru June	0-gallons supernatant, 282,000-gallons sludge	0-gallons supernatant, 249,000-gallons sludge	314,000 supernatant 14,000-gallons sludge	ARH-CD-133 B	4	No waste received into B-110 or B-111. Suspect B-110 tank as leaking. Transferred 8,000-gallons of waste from B-110 to B-102. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit. B-112 received 23,000-gallons of waste from BY-107.
	July thru September	0-gallons supernatant, 282,000-gallons sludge	0-gallons supernatant, 249,000-gallons sludge	315,000 supernatant 14,000-gallons sludge	ARH-CD-133 C	4	No waste received into B-110 or B-111. Suspect B-110 tank as leaking. Transferred 15,000-gallons of waste from B-110 to B-102. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit.
	October thru December	0-gallons supernatant, 282,000-gallons sludge	3,000-gallons supernatant, 246,000-gallons sludge	294,000 supernatant 35,000-gallons sludge	ARH-CD-133 D	4	No waste received into B-110 or B-111. Suspect B-110 tank as leaking. Added 4,000-gallons of water to B-110, then transferred 7,000-gallons of waste to B-102. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit.
1975	January thru March	0-gallons supernatant, 282,000-gallons sludge	3,000-gallons supernatant, 246,000-gallons sludge	294,000 supernatant 35,000-gallons sludge	ARH-CD-336 A	4	No waste received into B-110 or B-111. Suspect B-110 tank as leaking. Transferred 2,000-gallons of waste from B-110 to B-102. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit.
	April thru June	0-gallons supernatant, 282,000-gallons sludge	3,000-gallons supernatant, 246,000-gallons sludge	294,000 supernatant 35,000-gallons sludge	ARH-CD-336 B	4	No waste received into B-110 or B-111. B-110 removed from service. Transferred 3,000-gallons of waste from B-110 to B-102. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit.
	July thru September	0-gallons supernatant, 282,000-gallons sludge	3,000-gallons supernatant, 246,000-gallons sludge	294,000 supernatant 35,000-gallons sludge	ARH-CD-336 C	4	No waste received into B-110 or B-111. B-110 removed from service. Transferred 5,000-gallons of waste from B-110 to B-102. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit.

Table A-1. VOLUME OF WASTES IN TANKS 241-B-110, 241-B-111, AND 241-B-112

Year	Month	B-110	B-111	B-112	Reference	Page	Comments
	October thru December	0-gallons supernatant, 282,000-gallons sludge	3,000-gallons supernatant, 246,000-gallons sludge	294,000 supernatant 35,000-gallons sludge	ARH-CD-336 D	4	No waste received into B-110 or B-111. B-110 removed from service. Transferred 5,000-gallons of waste from B-110 to B-102. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit.
1976	January thru March	0-gallons supernatant, 282,000-gallons sludge	3,000-gallons supernatant, 246,000-gallons sludge	294,000 supernatant 35,000-gallons sludge	ARH-CD-702 A	4	No waste received into B-110 or B-111. B-110 removed from service. Transferred 2,000-gallons of waste from B-110 to B-102. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit.
	April thru June	0-gallons supernatant, 282,000-gallons sludge	3,000-gallons supernatant, 246,000-gallons sludge	294,000 supernatant 35,000-gallons sludge	ARH-CD-702 B	4	No waste received into B-110 or B-111. B-110 and B-111 removed from service. Transferred 1,000-gallons of waste from B-110 to B-102. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit.
	September	0-gallons supernatant, 282,000-gallons sludge	3,000-gallons supernatant, 246,000-gallons sludge	297,000 supernatant 35,000-gallons sludge	ARH-CD-702 I	7	No waste received into B-110 or B-111. B-110 and B-111 removed from service. Saltwell pumping B-110 to B-102. B-112 being used to receive evaporator bottoms (EB) from In-Tank Solidification (ITS) unit.

(1) Percentages refer to the volume of waste present in all three tanks.

**Table A-2. Cesium Ion Exchange Batch Processing Information for B-Plant
July 1969 Through June 1970¹**

Batch Number	Start Date	Finish Date	Total Cs-137 In Curies	Cs-137 Recovered in TK-20-1 Curies	Percentage Recovered	Cs-137 Loss to Waste Curies	Percentage Loss	Waste Type ²
112	1-Jul	3-Jul	319,800	355,175	111.06%	6,487	2.0%	PSN
113	3-Jul	5-Jul	344,520	382,745	111.10%	1,942	0.6%	PSN
114	5-Jul	7-Jul	340,600	378,280	111.06%	3,425	1.0%	PSN
115	7-Jul	9-Jul	335,916	324,645	96.64%	528	0.2%	PSN
116	9-Jul	17-Jul	340,600	329,156	96.64%	2,159	0.6%	PSN
117	17-Jul	20-Jul	338,000	326,704	96.66%	16,547	4.9%	PSN
118	20-Jul	24-Jul	451,500	544,336	120.56%	5,189	1.1%	PSN
119	24-Jul	27-Jul	392,600	473,304	120.56%	8,993	2.3%	PSN
120	27-Jul	28-Jul	522,126	515,000	98.64%	6,953	1.3%	CAW
121	28-Jul	31-Jul	408,200	400,920	98.22%	6,128	1.5%	PSN
122	31-Jul	2-Aug	351,000	344,728	98.21%	5,536	1.6%	PSN
123	2-Aug	8-Aug	619,353	608,352	98.22%	10,055	1.6%	PSN
124	8-Aug	12-Aug	691,254	658,620	95.28%	1,752	0.3%	CAW
125	12-Aug	15-Aug	535,500	510,287	95.29%	4,625	0.9%	PSN
126	15-Aug	15-Aug	600,400	572,093	95.29%	5,810	1.0%	PSN
127	15-Aug	21-Aug	493,770	442,079	89.53%	2,310	0.5%	PSN
128	21-Aug	23-Aug	296,000	265,021	89.53%	11,381	3.8%	PSN
129	23-Aug	26-Aug	514,500	425,439	82.69%	4,811	0.9%	PSN
130	26-Aug	29-Aug	740,000	611,886	82.69%	19,663	2.7%	PSN
131	29-Aug	2-Sep	298,797	247,108	82.70%	1,280	0.4%	CAW
132	2-Sep	5-Sep	900,000	744,367	82.71%	1,476	0.2%	CAW
133	5-Sep	8-Sep	502,326	673,597	134.10%	15,006	3.0%	PSN
134	8-Sep	12-Sep	576,704	773,443	134.11%	4,733	0.8%	PSN
135	12-Sep	15-Sep	516,675	724,210	140.17%	17,227	3.3%	PSN
136	15-Sep	18-Sep	452,430	634,124	140.16%	9,332	2.1%	PSN
137	18-Sep	22-Sep	539,396	755,881	140.13%	15,451	2.9%	PSN
138	22-Sep	25-Sep	538,153	754,122	140.13%	36,025	6.7%	PSN
139	25-Sep	28-Sep	464,407	650,663	140.11%	15,928	3.4%	PSN
140	28-Sep	30-Sep	510,808	555,764	108.80%	21,758	4.3%	PSN
141	30-Sep	3-Oct	864,283	940,236	108.79%	173	0.0%	CAW
		Subtotal	14,799,618	15,922,285	107.59%	262,683	1.8%	
142	3-Oct	6-Oct	556,600	498,968	89.65%	16,701	3.0%	PSN
143	6-Oct	9-Oct	554,625	497,312	89.67%	10,459	1.9%	PSN
144	9-Oct	14-Oct	722,680	647,632	89.62%	72	0.0%	CAW
145	14-Oct	17-Oct	626,750	561,877	89.65%	6,153	1.0%	PSN
146	17-Oct	20-Oct	547,500	490,690	89.62%	17,017	3.1%	PSN
147	20-Oct	22-Oct	685,410	614,521	89.66%	15,094	2.2%	PSN
148	22-Oct	26-Oct	773,938	1,133,437	146.45%	1,088	0.1%	CAW
149	26-Oct	3-Nov	403,832	591,494	146.47%	1,544	0.4%	CAW
150	3-Nov	6-Nov	602,915	883,069	146.47%	3,913	0.6%	PSN
151	6-Nov	9-Nov	576,000	497,719	86.41%	5,755	1.0%	PSN
152	9-Nov	13-Nov	364,800	315,281	86.43%	12,200	3.3%	PSN

**Table A-2. Cesium Ion Exchange Batch Processing Information for B-Plant
July 1969 Through June 1970¹**

Batch Number	Start Date	Finish Date	Total Cs-137 In Curies	Cs-137 Recovered in TK-20-1 Curies	Percentage Recovered	Cs-137 Loss to Waste Curies	Percentage Loss	Waste Type ²
153	13-Nov	17-Nov	663,348	721,056	108.70%	5,780	0.9%	PSN
154	17-Nov	21-Nov	457,080	496,944	108.72%	5,100	1.1%	PSN
155	21-Nov	28-Nov	674,584	589,706	87.42%	7,400	1.1%	PSN
156	28-Nov	29-Nov	503,130	439,826	87.42%	9,440	1.9%	PSN
157	29-Nov	2-Dec	1,023,000	894,468	87.44%	0	0.0%	CAW
158	2-Dec	6-Dec	629,428	445,787	70.82%	14,300	2.3%	PSS
159	6-Dec	11-Dec	934,144	661,211	70.78%	15,000	1.6%	PSS
160	11-Dec	16-Dec	365,796	527,110	144.10%	5,000	1.4%	PSN
161	16-Dec	20-Dec	597,520	861,084	144.11%	2,000	0.3%	CAW
162A	20-Dec	23-Jan	193,800	279,174	144.05%	0	0.0%	CAW
162B	20-Dec	23-Jan	81,342	117,632	144.61%	0	0.0%	PSN
163	23-Jan	13-Feb	563,115	589,683	104.72%	2,800	0.5%	CAW
164A	13-Feb	5-Mar	369,132	386,562	104.72%	544	0.1%	CAW
164B	13-Feb	5-Mar	129,383	135,525	104.75%	190	0.1%	CAW
165	5-Mar	15-Mar	492,800	701,000	142.25%	223	0.0%	PSN
166	15-Mar	18-Mar	315,448	251,100	79.60%	33,298	10.6%	PSN
167	18-Mar	21-Mar	659,848	525,312	79.61%	33,377	5.1%	PSN
168	21-Mar	15-Apr	381,334	303,588	79.61%	9,707	2.5%	PSN
169	15-Apr	19-Apr	620,200	424,908	68.51%	20,240	3.3%	PSN
170	19-Apr	22-Apr	689,079	472,161	68.52%	5,330	0.8%	PSN
171	22-Apr	25-Apr	472,878	323,931	68.50%	34,300	7.3%	PSN
172	25-Apr	28-Apr	458,000	169,644	37.04%	51,860	11.3%	PSN
173	28-Apr	1-May	476,110	176,356	37.04%	79,420	16.7%	PSN
174	8-May	10-May	218,191	320,790	147.02%	33,790	15.5%	PSN
175	13-May	17-May	340,974	501,299	147.02%	7,000	2.1%	PSN
176	19-May	21-May	620,368	911,911	147.00%	2,070	0.3%	CAW
177R	24-May	25-May				620	Rework of batches 173, 174, 175.	
178	25-May	29-May	499,366	583,778	116.90%	22,400	4.5%	PSN
179	29-May	2-Jun	396,864	463,922	116.90%	37,900	9.5%	PSN
180	2-Jun	4-Jun	526,176	456,515	86.76%	120	0.0%	CAW
181	4-Jun	7-Jun	462,000	400,970	86.79%	14,970	3.2%	PSN
182	7-Jun	12-Jun	455,532	395,289	86.78%	16,900	3.7%	PSN
183	12-Jun	14-Jun	374,847	325,226	86.76%	15,600	4.2%	PSN
184	14-Jun	17-Jun	378,600	806,551	213.04%	13,500	3.6%	PSN + CO
185	17-Jun	20-Jun	390,352	831,449	213.00%	14,000	3.6%	PSN + CO
		Subtotal	22,828,819	23,223,468	101.73%	604,175	2.6%	
		Total	37,628,437	39,145,753	104.03%	866,858	2.3%	

¹ ARH-N-82, pages 146 through 149.

Notes:

² Definitions of Waste Type

CAW: Current Acid Waste, HLW from PUREX

PSN: PUREX Supernatant Neutralized. Neutralized to pH 10 PUREX HLW from tank farms.

PSN + CO: Recovered Cs-137 inventory is from PSN and Cs-137 from cleanout of equipment.

REFERENCES

ARH-N-82, 1968, *Fission Process Product Summary*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-95, 1967, *Chemical Processing Division Waste Status Summary, July to September*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-326, 1968, *Chemical Processing Division Waste Status Summary October 1, 1967 through December 31, 1967, January 15, 1968*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-534, 1968, *Chemical Processing Division Waste Status Summary January 1, 1968 through March 31, 1968*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-721, 1968, *Chemical Processing Division Waste Status Summary April 1, 1968 through June 30, 1968*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-871, 1968, *Chemical Processing Division Waste Status Summary July 1, 1968 through September 30, 1968*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1061, 1969, *Chemical Processing Division Waste Status Summary October 1, 1968 through December 31, 1968*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200A, 1969, *Chemical Processing Division Waste Status Summary January 1, 1969 through March 31, 1969*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 B, 1969, *Chemical Processing Division Waste Status Summary April 1, 1969 through June 30, 1969*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 C, 1969, *Chemical Processing Division-Waste Status Summary July 1, 1969 through September 30, 1969*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1200 D, 1970, *Chemical Processing Division-Waste Status Summary October 1, 1969 through December 31, 1969*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 A, 1970 *Chemical Processing Division Waste Status Summary January 1, 1970 through March 31, 1970*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 B, 1970, *Chemical Processing Division Waste Status Summary April 1, 1970 through June 30, 1970*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 C, 1970, *Chemical Processing Division Waste Status Summary July 1, 1970 through September 30, 1970*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1666 D, 1971, *Chemical Processing Division Waste Status Summary October 1, 1970 through December 31, 1970*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 A, 1971, *Chemical Processing Division Waste Status Summary January 1, 1971 through March 31, 1971*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 B, 1971, *Chemical Processing Division Waste Status Summary April 1, 1971 through June 30, 1971*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 C, 1971, *Chemical Processing Division Waste Status Summary July 1, 1971 through September 30, 1971*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2074 D, 1971, *Chemical Processing Division Waste Status Summary October 1, 1971 through December 31, 1971*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2456 A, 1972 *Chemical Processing Division Waste Status Summary, January 1, 1974 through March 31, 1972*, Rockwell Hanford Operations, Richland, Washington.

ARH-2456 B, 1972, *Chemical Processing Division Waste Status Summary, April 1, 1972 through June 30, 1972*, Rockwell Hanford Operations, Richland, Washington.

ARH-2456 C, 1972, *Chemical Processing Division-Waste Status Summary, July 1, 1972 through September 30, 1972*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2456 D, 1973, *Chemical Processing Division-Waste Status Summary, October 1, 1972 through December 31, 1972*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 A, 1973, *Chemical Processing Division Waste Status Summary January 1, 1973 through March 31, 1973*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 B, 1973, *Chemical Processing Division Waste Status Summary April 1, 1973 through June 30, 1973*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 C, 1973, *Chemical Processing Division Waste Status Summary July 1, 1973 through September 30, 1973*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2794 D, 1974, *Manufacturing and Waste Management Division Waste Status Summary October 1, 1973 through December 31, 1973*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-133 A, 1974, *Operations Division Waste Status Summary January 1, 1974 through March 31, 1974*, Atlantic Richfield Hanford Company, Richland, Washington.

- ARH-CD-133 B, 1974, *Operations Division Waste Status Summary April 1, 1974 through June 30, 1974*, Atlantic Richfield Hanford Company, Richland, Washington.
- ARH-CD-133 C, 1974, *Production and Waste Management Division Waste Status Summary July 1, 1974 through, September 30, 1974*, Atlantic Richfield Hanford Company, Richland, Washington.
- ARH-CD-133 D, 1975, *Production and Waste Management Division Waste Status Summary October 1, 1974 through, December 31, 1974*, Atlantic Richfield Hanford Company, Richland, Washington.
- ARH-CD-336 A, 1975, *Production and Waste Management Division Waste Status Summary January 1, 1975 through March 31, 1975*, Atlantic Richfield Hanford Company, Richland, Washington.
- ARH-CD-336 B, 1975, *Production and Waste Management Division Waste Status Summary April 1, 1975 through June 30, 1975*, Atlantic Richfield Hanford Company, Richland, Washington.
- ARH-CD-336 C, 1975, *Production and Waste Management Division Waste Status Summary July 1, 1975 through September 30, 1975*, Atlantic Richfield Hanford Company, Richland, Washington.
- ARH-CD-336 D, 1976, *Production and Waste Management Division Waste Status Summary October 1, 1975 through December 31, 1975*, Atlantic Richfield Hanford Company, Richland, Washington.
- ARH-CD-702 A, 1976, *Production and Waste Management Division Waste Status Summary January 1, 1976 through March 31, 1976*, Atlantic Richfield Hanford Company, Richland, Washington.
- ARH-CD-702 B, 1976, *Production and Waste Management Division Waste Status Summary April 1, 1976 through June 30, 1976*, Atlantic Richfield Hanford Company, Richland, Washington.
- ARH-CD-702 I, 1976, *Production and Waste Management Division Waste Status Summary September 30, 1976*, Atlantic Richfield Hanford Company, Richland, Washington.
- HW-7-1388-DEL, 1945, *Hanford Engineering Works Monthly Report February 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-1544-DEL, 1945, *Hanford Engineering Works Monthly Report March 1945*, E. I. Du Pont De Nemours Company, Richland, Washington.

- HW-7-1649-DEL, 1945, *Hanford Engineering Works Monthly Report April 1945*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-1793-DEL, 1945, *Hanford Engineering Works Monthly Report May 1945*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-1981-DEL, 1945, *Hanford Engineering Works Monthly Report June 1945*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-2177-DEL, 1945, *Hanford Engineering Works Monthly Report July 1945*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-2361-DEL, 1945, *Hanford Engineering Works Monthly Report August 1945*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-2548-DEL, 1945, *Hanford Engineering Works Monthly Report September 1945*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-2706-DEL, 1945, *Hanford Engineering Works Monthly Report October 1945*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-2957-DEL, 1945, *Hanford Engineering Works Monthly Report November 1945*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-3171-DEL, 1946, *Hanford Engineering Works Monthly Report December 1945*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-3378-DEL, 1946, *Hanford Engineering Works Monthly Report January 1946*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-3566-DEL, 1946, *Hanford Engineering Works Monthly Report February 1946*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-3751-DEL, 1946, *Hanford Engineering Works Monthly Report March 1946*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-4004-DEL, 1946, *Hanford Engineering Works Monthly Report April 1946*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-4193-DEL, 1946, *Hanford Engineering Works Monthly Report May 1946*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-4343-DEL, 1946, *Hanford Engineering Works Monthly Report June 1946*,
E. I. Du Pont De Nemours Company, Richland, Washington.

- HW-7-4542-DEL, 1946, *Hanford Engineering Works Monthly Report July 1946*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-4739-DEL, 1946, *Hanford Engineering Works Monthly Report August 1946*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-5194-DEL, 1946, *Hanford Engineering Works Monthly Report September 1946*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-5362-DEL, 1946, *Hanford Engineering Works Monthly Report October 1946*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-5505-DEL, 1946, *Hanford Engineering Works Monthly Report November 1946*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-5630-DEL, 1947, *Hanford Engineering Works Monthly Report December 1946*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-5802-DEL, 1947, *Hanford Engineering Works Monthly Report January 1947*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-5944-DEL, 1947, *Hanford Engineering Works Monthly Report February 1947*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-6048-DEL, 1947, *Hanford Engineering Works Monthly Report March 1947*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-6184-DEL, 1947, *Hanford Engineering Works Monthly Report April 1947*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-6391-DEL, 1947, *Hanford Engineering Works Monthly Report May 1947*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7-7454-DEL, 1947, *Hanford Engineering Works Monthly Report June 1947*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7283-DEL, 1947, *Hanford Engineering Works Monthly Report July 1947*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7504-DEL, 1947, *Hanford Engineering Works Monthly Report August 1947*,
E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-7795-DEL, 1947, *Hanford Works Monthly Report September 1947*,
E. I. Du Pont De Nemours Company, Richland, Washington.

- HW-7997-DEL, 1947, *Hanford Works Monthly Report October 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-8267-DEL, 1947, *Hanford Works Monthly Report November 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-8438-DEL, 1948, *Hanford Works Monthly Report December 1947*, E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-8931-DEL, 1948, *Hanford Works Monthly Report January 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-9191-DEL, 1948, *Hanford Works Monthly Report February 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-9595-DEL, 1948, *Hanford Works Monthly Report March 1948*, E. I. Du Pont De Nemours Company, Richland, Washington.
- HW-9922-DEL, 1948, *Hanford Works Monthly Report April 1948*, General Electric Company, Richland, Washington.
- HW-10166-DEL, 1948, *Hanford Works Monthly Report May 1948*, General Electric Company, Richland, Washington.
- HW-10378-DEL, 1948, *Hanford Works Monthly Report June 1948*, General Electric Company, Richland, Washington.
- HW-10714-DEL, 1948, *Hanford Works Monthly Report July 1948*, General Electric Company, Richland, Washington.
- HW-10993-DEL, 1948, *Hanford Works Monthly Report August 1948*, General Electric Company, Richland, Washington.
- HW-11226-DEL, 1948, *Hanford Works Monthly Report September 1948*, General Electric Company, Richland, Washington.
- HW-11499-DEL, 1948, *Hanford Works Monthly Report October 1948*, General Electric Company, Richland, Washington.
- HW-11835-DEL, 1948, *Hanford Works Monthly Report November 1948*, General Electric Company, Richland, Washington.
- HW-12086-DEL, 1949, *Hanford Works Monthly Report December 1948*, General Electric Company, Richland, Washington.

- HW-12391-DEL, 1949, *Hanford Works Monthly Report January 1949*, General Electric Company, Richland, Washington.
- HW-12666-DEL, 1949, *Hanford Works Monthly Report February 1949*, General Electric Company, Richland, Washington.
- HW-12937-DEL, 1949, *Hanford Works Monthly Report March 1949*, General Electric Company, Richland, Washington.
- HW-13190-DEL, 1949, *Hanford Works Monthly Report April 1949*, General Electric Company, Richland, Washington.
- HW-13561-DEL, 1949, *Hanford Works Monthly Report May 1949*, General Electric Company, Richland, Washington.
- HW-13793-DEL, 1949, *Hanford Works Monthly Report June 1949*, General Electric Company, Richland, Washington.
- HW-14043-DEL, 1949, *Hanford Works Monthly Report July 1949*, General Electric Company, Richland, Washington.
- HW-14338-DEL, 1949, *Hanford Works Monthly Report August 1949*, General Electric Company, Richland, Washington.
- HW-14596-DEL, 1949, *Hanford Works Monthly Report September 1949*, General Electric Company, Richland, Washington.
- HW-14916-DEL, 1949, *Hanford Works Monthly Report October 1949*, November 18, 1949, General Electric Company, Richland, Washington.
- HW-15267-DEL, 1949, *Hanford Works Monthly Report November 1949*, General Electric Company, Richland, Washington.
- HW-15550-DEL, 1950, *Hanford Works Monthly Report December 1949*, General Electric Company, Richland, Washington.
- HW-15843-DEL, 1950, *Hanford Works Monthly Report January 1950*, General Electric Company, Richland, Washington.
- HW-17056-DEL, 1950, *Hanford Works Monthly Report February 1950*, General Electric Company, Richland, Washington.
- HW-17410-DEL, 1950, *Hanford Works Monthly Report March 1950*, General Electric Company, Richland, Washington.

HW-17660-DEL, 1950, *Hanford Works Monthly Report April 1950*, General Electric Company, Richland, Washington.

HW-17971-DEL, 1950, *Hanford Works Monthly Report May 1950*, General Electric Company, Richland, Washington.

HW-18221-DEL, 1950, *Hanford Works Monthly Report June 1950*, General Electric Company, Richland, Washington.

HW-18473-DEL, 1950, *Hanford Works Monthly Report for July 1950*, General Electric Company, Richland, Washington.

HW-18740-DEL, 1950, *Hanford Works Monthly Report for August 1950*, General Electric Company, Richland, Washington.

HW-19021-DEL, 1950, *Hanford Works Monthly Report for September 1950*, General Electric Company, Richland, Washington.

HW-19325-DEL, 1950, *Hanford Works Monthly Report for October 1950*, General Electric Company, Richland, Washington.

HW-19622-DEL, 1950, *Hanford Works Monthly Report for November 1950*, General Electric Company, Richland, Washington.

HW-19842-DEL, 1950, *Hanford Works Monthly Report for December 1950*, General Electric Company, Richland, Washington.

HW-20161-DEL, 1951, *Hanford Works Monthly Report for January 1951*, General Electric Company, Richland, Washington.

HW-20438-DEL, 1951, *Hanford Works Monthly Report for February 1951*, General Electric Company, Richland, Washington.

HW-20671-DEL, 1951, *Hanford Works Monthly Report for March 1951*, General Electric Company, Richland, Washington.

HW-20991-DEL, 1951, *Hanford Works Monthly Report for April 1951*, General Electric Company, Richland, Washington.

HW-21260-DEL, 1951, *Hanford Works Monthly Report for May 1951*, General Electric Company, Richland, Washington.

HW-21506-DEL, 1951, *Hanford Works Monthly Report for June 1951*, General Electric Company, Richland, Washington.

- HW-21802-DEL, 1951, *Hanford Works Monthly Report for July 1951*, General Electric Company, Richland, Washington.
- HW-22075-DEL, 1951, *Hanford Works Monthly Report for August 1951*, General Electric Company, Richland, Washington.
- HW-22304-DEL, 1951, *Hanford Works Monthly Report for September 1951*, General Electric Company, Richland, Washington.
- HW-22610-DEL, 1951 *Hanford Works Monthly Report for October 1951*, General Electric Company, Richland, Washington.
- HW-22875-DEL, 1951 *Hanford Works Monthly Report for November 1951*, General Electric Company, Richland, Washington.
- HW-23140-DEL, 1952, *Hanford Works Monthly Report for December 1951*, General Electric Company, Richland, Washington.
- HW-23437-DEL, 1952, *Hanford Works Monthly Report for January 1952*, General Electric Company, Richland, Washington.
- HW-23698-DEL, 1952, *Hanford Works Monthly Report for February 1952*, General Electric Company, Richland, Washington.
- HW-23982-DEL, 1952, *Hanford Works Monthly Report for March 1952*, General Electric Company, Richland, Washington.
- HW-27775, 1953, *Waste Status Summary, Separations Section, Planning and Separations, March 31, 1953*, General Electric Company, Richland, Washington.
- HW-27838, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department, April, May, June 1952*, General Electric Company, Richland, Washington.
- HW-27839, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, July, August, September 1952*, General Electric Company, Richland, Washington.
- HW-27840, 1952, *Waste Status Summary, Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, October, November, December 1952*, General Electric Company, Richland, Washington.
- HW-27841, 1953, *Waste Status Summary, Separations Section Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, January 1953*, General Electric Company, Richland, Washington.

- HW-27842, 1953, *Waste Status Summary, Separations Section, Planning and Scheduling Group Waste Control Manufacturing Department; Separations Section, February 1953*, General Electric Company, Richland, Washington.
- HW-28043, 1953, *Waste- Status Summary, Separations Section, Planning and Scheduling, Separations - Operations, April 30, 1953*, General Electric Company, Richland, Washington.
- HW-28377, 1953, *Waste-Status Summary, Separations Section, May 31, 1953*, Planning and Scheduling, Separations - Operations, General Electric Company, Richland, Washington.
- HW-28712, 1953, *Waste-Status Summary, Separations Section, June 30, 1953*, Planning and Scheduling, Separations – Operations, General Electric Company, Richland, Washington.
- HW-29054, 1953, *Waste-Status Summary, Separations Section, July 31, 1953*, Planning and Scheduling, Separations, General Electric Company, Richland, Washington.
- HW-29242, 1953, *Waste-Status Summary, Separations Section, August 31, 1953*, Planning and Scheduling, Separations, General Electric Company, Richland, Washington.
- HW-29624, 1953, *Waste-Status Summary, Separations Section, September 30, 1953*, Planning and Scheduling, Separations, General Electric Company, Richland, Washington.
- HW-29905, 1953, *Waste-Status Summary, Separations Section, October 31, 1953*, Planning and Scheduling, Separations, General Electric Company, Richland, Washington.
- HW-30250, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, November 30, 1953*, General Electric Company, Richland, Washington.
- HW-30498, 1953, *Waste-Status Summary, Separations Section Planning and Scheduling, Separations, December 31, 1953*, General Electric Company, Richland, Washington.
- HW-30851, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, January 31, 1954*, General Electric Company, Richland, Washington.
- HW–31126, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, February 1954*, General Electric Company, Richland, Washington.
- HW-31374, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, March 31, 1954*, General Electric Company, Richland, Washington.

- HW-31811, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, April 30, 1954*, General Electric Company, Richland, Washington.
- HW-32110, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, May 31, 1954*, General Electric Company, Richland, Washington
- HW-32389, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Operations, June 30, 1954*, General Electric Company, Richland, Washington.
- HW-32697, 1954, *Waste- Status Summary; Separations Section, Production Planning and Scheduling Separations – Engineering and Control, July 31, 1954*, General Electric Company, Richland, Washington
- HW-33002, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations – Projects and Personnel Development Sub-section, August 31, 1954*, General Electric Company, Richland, Washington.
- HW-33396, 1954, *Waste- Status Summary; Separations Section, Planning and Scheduling Separations, Projects and Personnel Development Sub-section, September 31, 1954*, General Electric Company, Richland, Washington.
- HW-33544, 1954, *Waste- Status Summary; Separations Section, Separations –Projects and Personnel Development Sub-section, October 31, 1954*, General Electric Company, Richland, Washington.
- HW-33904, 1954, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-section, November 30, 1954*, General Electric Company, Richland, Washington.
- HW-34412, 1954, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-section, December 31, 1954*, General Electric Company, Richland, Washington.
- HW-35022, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-section, January 31, 1955*, General Electric Company, Richland, Washington.
- HW-35628, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, February 1955*, General Electric Company, Richland, Washington.

HW-36001, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, March 31, 1955*, General Electric Company, Richland, Washington.

HW-36553, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, April 30, 1955*, General Electric Company, Richland, Washington.

HW-37143, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, May 1955*, General Electric Company, Richland, Washington.

HW-38000, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, June 30, 1955*, General Electric Company, Richland, Washington.

HW-38401, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, July 31, 1955*, General Electric Company, Richland, Washington.

HW-38926, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, August 31, 1955*, General Electric Company, Richland, Washington.

HW-39216, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, September 30, 1955*, General Electric Company, Richland, Washington.

HW-39850, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, October 1955*, General Electric Company, Richland, Washington.

HW-40208, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, November 30, 1955*, General Electric Company, Richland, Washington.

HW-40816, 1955, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, December 31, 1955*, General Electric Company, Richland, Washington.

HW-41038, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-section, January 31, 1956*, General Electric Company, Richland, Washington.

- HW-41812, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, February 1956*, General Electric Company, Richland, Washington.
- HW-42394, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, March 31, 1956*, General Electric Company, Richland, Washington.
- HW-42993, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, April 30, 1956*, General Electric Company, Richland, Washington.
- HW-43490, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, May 31, 1956*, General Electric Company, Richland, Washington.
- HW-43895, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, June 30, 1956*, General Electric Company, Richland, Washington.
- HW-44860, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, July 31, 1956*, General Electric Company, Richland, Washington.
- HW-45140, 1956, *Waste- Status Summary; Separations Section, Separations – Projects and Personnel Development Sub-Section, August 31, 1956*, General Electric Company, Richland, Washington.
- HW-45738, 1956, *Waste- Status Summary; Chemical Processing Department, Production Operation – Chemical Processing Department, September 30, 1956*, General Electric Company, Richland, Washington.
- HW-46382, 1956, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, October 1956*, General Electric Company, Richland, Washington.
- HW-47052, 1956, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling Production Operation, November 30, 1956*, General Electric Company, Richland, Washington.
- HW-47640, 1956, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, December 31, 1956*, General Electric Company, Richland, Washington.

- HW-48144, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, January 31, 1957*, Hanford Atomic Products, Richland, Washington.
- HW-48846, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, February 1957*, Hanford Atomic Products Operation, Richland, Washington.
- HW-49523, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, March 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.
- HW-50127, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, April 30, 1957*, Hanford Atomic Products Operation, Richland, Washington.
- HW-50617, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, May 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.
- HW-51348, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, June 30, 1957*, Hanford Atomic Products Operation, Richland, Washington.
- HW-51858, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, July 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.
- HW-52414, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, August 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.
- HW-52932, 1957, *Waste- Status Summary; Chemical Processing Department, Planning and Scheduling – Production Operation, September 30, 1957*, Hanford Atomic Products Operation, Richland, Washington.
- HW-53573, 1957, *Waste- Status Summary; Chemical Processing Department, October 1957*, Hanford Atomic Products Operation, Richland, Washington.
- HW-54067, 1957, *Waste- Status Summary; Chemical Processing Department, November 30, 1957*, Hanford Atomic Products Operation, Richland, Washington.
- HW-54519, 1957, *Waste- Status Summary; Chemical Processing Department, December 31, 1957*, Hanford Atomic Products Operation, Richland, Washington.

- HW-54916, 1958, *Waste- Status Summary; Chemical Processing Department, January 31, 1958,*
Hanford Atomic Products Operation, Richland, Washington.
- HW-55264, 1958, *Waste- Status Summary; Chemical Processing Department, February 1958,*
Hanford Atomic Products Operation, Richland, Washington.
- HW-55630, 1958, *Waste- Status Summary; Chemical Processing Department, March 31, 1958,*
Hanford Atomic Products Operation, Richland, Washington.
- HW-55997, 1958, *Waste- Status Summary; Chemical Processing Department, April 30, 1958,*
Hanford Atomic Products Operation, Richland, Washington.
- HW-56357, 1958, *Waste- Status Summary; Chemical Processing Department, May 31, 1958,*
Hanford Atomic Products Operation, Richland, Washington.
- HW-56761, 1958, *Waste- Status Summary; Chemical Processing Department, June 30, 1958,*
Hanford Atomic Products Operation, Richland, Washington.
- HW-57122, 1958, *Waste- Status Summary; Chemical Processing Department, July 31, 1958,*
Hanford Atomic Products Operation, Richland, Washington.
- HW-57550, 1958, *Waste- Status Summary; Chemical Processing Department, August 31, 1958,*
Hanford Atomic Products Operation, Richland, Washington.
- HW-57711, 1958, *Waste- Status Summary; Chemical Processing Department, September 30,*
1958, Hanford Atomic Products Operation, Richland, Washington.
- HW-58201, 1958, *Waste- Status Summary; Chemical Processing Department, October 1958,*
Hanford Atomic Products Operation, Richland, Washington.
- HW-58579, 1958, *Waste- Status Summary; Chemical Processing Department, December 16,*
1958, Hanford Atomic Products Operation, Richland, Washington.
- HW-58831, 1959, *Waste- Status Summary; Chemical Processing Department, January 12, 1959,*
Hanford Atomic Products Operation, Richland, Washington.
- HW-59204, 1959, *Waste- Status Summary; Chemical Processing Department, February 10,*
1959, Hanford Atomic Products Operation, Richland, Washington.
- HW-59586, 1959, *Waste- Status Summary; Chemical Processing Department, March 10, 1959,*
Hanford Atomic Products Operation, Richland, Washington.
- HW-60065, 1959, *Waste- Status Summary; Chemical Processing Department, April 16, 1959,*
Hanford Atomic Products Operation, Richland, Washington.

- HW-60419, 1959, *Waste- Status Summary; Chemical Processing Department, May 18, 1959,*
Hanford Atomic Products Operation, Richland, Washington.
- HW-60738, 1959, *Waste- Status Summary; Chemical Processing Department, June 15, 1959,*
Hanford Atomic Products Operation, Richland, Washington.
- HW-61095, 1959, *Waste- Status Summary; Chemical Processing Department, July 14, 1959,*
Hanford Atomic Products Operation, Richland, Washington.
- HW-61582, 1959, *Waste- Status Summary; Chemical Processing Department, August 18, 1959,*
Hanford Atomic Products Operation, Richland, Washington.
- HW-61952, 1959, *Waste- Status Summary; Chemical Processing Department, September 17,*
1959, Hanford Atomic Products Operation, Richland, Washington.
- HW-62421, 1959, *Waste- Status Summary; Chemical Processing Department, October 19, 1959,*
Hanford Atomic Products Operation, Richland, Washington.
- HW-62723, 1959, *Waste- Status Summary; Chemical Processing Department, November 12,*
1959, Hanford Atomic Products Operation, Richland, Washington.
- HW-63083, 1959, *Waste- Status Summary; Chemical Processing Department, December 15,*
1959, Hanford Atomic Products Operation, Richland, Washington.
- HW-63559, 1960, *Waste- Status Summary; Chemical Processing Department, January 19, 1960,*
Hanford Atomic Products Operation, Richland, Washington.
- HW-63896, 1960, *Chemical Processing Department – Waste Status Summary, February 12,*
1960, Hanford Atomic Products Operation, Richland, Washington.
- HW-64373, 1960, *Chemical Processing Department – Waste Status Summary, March 17, 1960,*
Hanford Atomic Products Operation, Richland, Washington.
- HW-64810, 1960, *Chemical Processing Department Waste Status Summary March 1-31, 1960,*
General Electric Company, Richland, Washington.
- HW-65272, 1960, *Chemical Processing Department – Waste Status Summary, May 18, 1960,*
Hanford Atomic Products Operation, Richland, Washington.
- HW-65643, 1960, *Chemical Processing Department Waste Status Summary May 1-31, 1960,*
General Electric Company, Richland, Washington.
- HW-66187, 1960, *Chemical Processing Department – Waste Status Summary, July 25, 1960,*
Hanford Atomic Products Operation, Richland, Washington.

- HW-66557, 1960, *Chemical Processing Department – Waste Status Summary, August 22, 1960*, Hanford Atomic Products Operation, Richland, Washington.
- HW-66827, 1960, *Chemical Processing Department – Waste Status Summary, September 20, 1960*, Hanford Atomic Products Operation, Richland, Washington.
- HW-67696, 1960, *Chemical Processing Department – Waste Status Summary, November 29, 1960*, Hanford Atomic Products Operation, Richland, Washington.
- HW-67705, 1960, *Chemical Processing Department – Waste Status Summary, November 30, 1960*, Hanford Atomic Products Operation, Richland, Washington.
- HW-68291, 1961, *Chemical Processing Department – Waste Status Summary, January 25, 1961*, Hanford Atomic Products Operation, Richland, Washington.
- HW-68292, 1961, *Chemical Processing Department – Waste Status Summary, January 30, 1961*, Hanford Atomic Products Operation, Richland, Washington.
- HW-71610, 1961, *Chemical Processing Department – Waste Status Summary, November 6, 1961*, Hanford Atomic Products Operation, Richland, Washington.
- HW-72625, 1962, *Chemical Processing Department – Waste Status Summary, February 7, 1962*, Hanford Atomic Products Operation, Richland, Washington.
- HW-74647, 1962, *Chemical Processing Department – Waste Status Summary, Planning and Scheduling Production Operation, August 8, 1962*, Hanford Atomic Products Operation, Richland, Washington.
- HW-76223, 1962, *Chemical Processing Department – Waste Status Summary, Planning and Scheduling Production Operation, July – December 1962*, Hanford Atomic Products Operation, Richland, Washington.
- HW-78279, 1963, *Chemical Processing Department – Waste Status Summary, June 1963*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.
- HW-80379, 1964, *Chemical Processing Department – Waste Status Summary, January 9, 1964*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.
- HW-83308, 1964, *Chemical Processing Department – Waste Status Summary, July 15, 1964*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.

- HW-83906-C-RD, 1964, *Chemical Processing Department 200 West Area Tank Farm Inventory and Waste Reports January 1957 through December 1958*, General Electric Company, Richland, Washington.
- ISO-226, 1966, *Chemical Processing Division – Waste Status Summary January 1, 1966 through March 31, 1966*, ISOCHEM INC., Richland, Washington.
- ISO-404, 1966, *Chemical Processing Division – Waste Status Summary April 1, 1966 through June 30, 1966*, ISOCHEM INC., Richland, Washington.
- ISO-538, 1966, *Chemical Processing Division – Waste Status Summary July 1, 1966 through September 30, 1966*, ISOCHEM INC., Richland, Washington.
- ISO-674, 1967, *Chemical Processing Division Waste Status Summary, Operations Analysis Waste Management Section Contract AT (45-1)-1851, Item G-9*, ISOCHEM Inc., Richland, Washington.
- ISO-806, 1967, *Chemical Processing Division-Waste Status Summary, April 5, 1967*, ISOCHEM INC., Richland, Washington.
- ISO-967, 1967, *Chemical Processing Division-Waste Status Summary, July 12, 1967*, ISOCHEM INC., Richland, Washington.
- RL-SEP-260, 1965, *Chemical Processing Department – Waste Status Summary, July 1, 1964 Through December 31, 1964*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.
- RL-SEP-659, 1965, *Chemical Processing Department – Waste Status Summary, January 1, 1965 Through June 30, 1965*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.
- RL-SEP-821, 1965, *Chemical Processing Department – Waste Status Summary, July 1, 1965 Through September 30, 1965*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.
- RL-SEP-923, 1966, *Chemical Processing Department – Waste Status Summary, October 1, 1965 Through December 31, 1965*, Planning and Scheduling Production Operation, Hanford Atomic Products Operation, Richland, Washington.