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Tank 241-CX-71 Waste Characterization

EDT No.: 153632 ECN No.:

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New ID Number: WHC-SD-DD-TI-058 Rev. 0

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Title: Tank 241-CX-71 Waste Characterization

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J. R. Carver 1/13/92

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D. R. Speer

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Page 1 of 1

1. EDT 153632

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5. Proj./Prog./Dept./Div.:	6. Cog. Engr.:	7. Purchase Order No.:
81490	J. R. Carver	N/A
8. Originator Remarks: Attached is a summary of the characterization of the contents of tank 241-CX-71 and the detailed analyses reports.		9. Equip./Component No.: 241-CX-71
		10. System/Bldg./Facility: Strontium Semiworks
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		13. Permit/Permit Application No.: N/A
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1	1	Cog.Eng. J.R. Carver	J.R. Carver		R2-77	R.D. Wells		12-21-91	C4-58	1	1
1	1	Cog. Mgr. D. R. Speer	[signature]		R2-77						
3	6	QA R. G. Dieffenbacher	[signature]		H4-16						
3	6	Safety R. D. Lichfield			L6-57						
		Env.									
1	1	R. J. Landon	Roger J. Landon	1/7/92	B2-19						
1	1	M. C. Hughes	[signature]	12/31/91	L4-88						

18.	19.	20.	21. DOE APPROVAL (if required)
J. R. Carver J.R. Carver 12/6/91 Signature of EDT Originator Date	[signature] 12/31/91 Authorized Representative for Receiving Organization Date	D. R. Speer [signature] 1/7/92 Cognizant/Project Engineer's Manager Date	Ltr. No. [ ] Approved [ ] Approved w/comments [ ] Disapproved w/comments

BD-7400-172-2 (07/89) (EF) GEF097

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SUPPORTING DOCUMENT

1. Total Pages 541

2. Title
Tank 241-CX-71 Waste Characterization

3. Number
WHC-SD-DD-TI-058

4. Rev No.
0

5. Key Words
Waste, Tank, Characterization, RCRA, Permit, Closure

6. Author
Name: J. R. Carver
Signature
Organization/Charge Code 81490/UE3CA

7. Abstract

Tank 241-CX-71 is a small waste neutralization tank located at the Strontium Semiworks Plant site. The tank contains limestone and a small amount of sludge and liquid. It was sampled to identify radiological and hazardous constituents and the analyses are presented herein.

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TANK 241-CX-71 WASTE CHARACTERIZATION

J. R. Carver

December 1991

Westinghouse Hanford Company
Post Office Box 1970
Richland, Washington

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CONTENTS

LIST OF FIGURES

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TANK 241-CX-71 WASTE CHARACTERIZATION

1. INTRODUCTION

The waste in tank 241-CX-71 is a mixture of materials that remained after large volumes of liquid process effluents were passed through the tank for the purpose of neutralization by contact with a bed of limestone aggregate placed in the tank for this purpose. Historical data reported and analyzed in Appendices A (WHC 1989a) and B (WHC 1989b) could not be totally relied upon to accurately characterize the waste in accordance with present disposal requirements. Therefore, it was decided to obtain samples of the waste by boring out a core using a drill rig an to analyze samples from the core using approved methods. The status of this work is reported below.

2. TANK SIZE MEASUREMENTS

Since drawings of the tank have been destroyed, tank depth and size were measured. The depth from the ground level to tank top was found to be 3.5 ft by hand excavation. The tank diameter is 5 ft and the depth is 6.75 ft. See Appendix C (Skoglie 1990) and Figure 1.

3. WASTE SAMPLING

A 12-inch diameter vent riser on the top of the tank had been filled with grout after the tank was no longer in service. A drilling rig was used to drill a hole through the 60-inch deep column of grout. A core drilling tool was used to drill through the waste and to extract the waste samples. See Figure 1. A summary of the drilling work is given in Appendix C (Skoglie 1990).

The plan for controlling, analyzing, and reporting the characterization of the waste samples is given in Appendix D (WHC 1990). The core was divided into five separate samples representing the distinct layers of the waste material as shown in Figure 1. The five samples were divided and a portion of each was transported to the Hanford 222-S Laboratory and to the Martin Marietta Energy Systems, Inc., K-25 Laboratory at Oak Ridge for analysis. Two gas samples were obtained and transported to Pacific Northwest Laboratory, 325 Building, for analysis.

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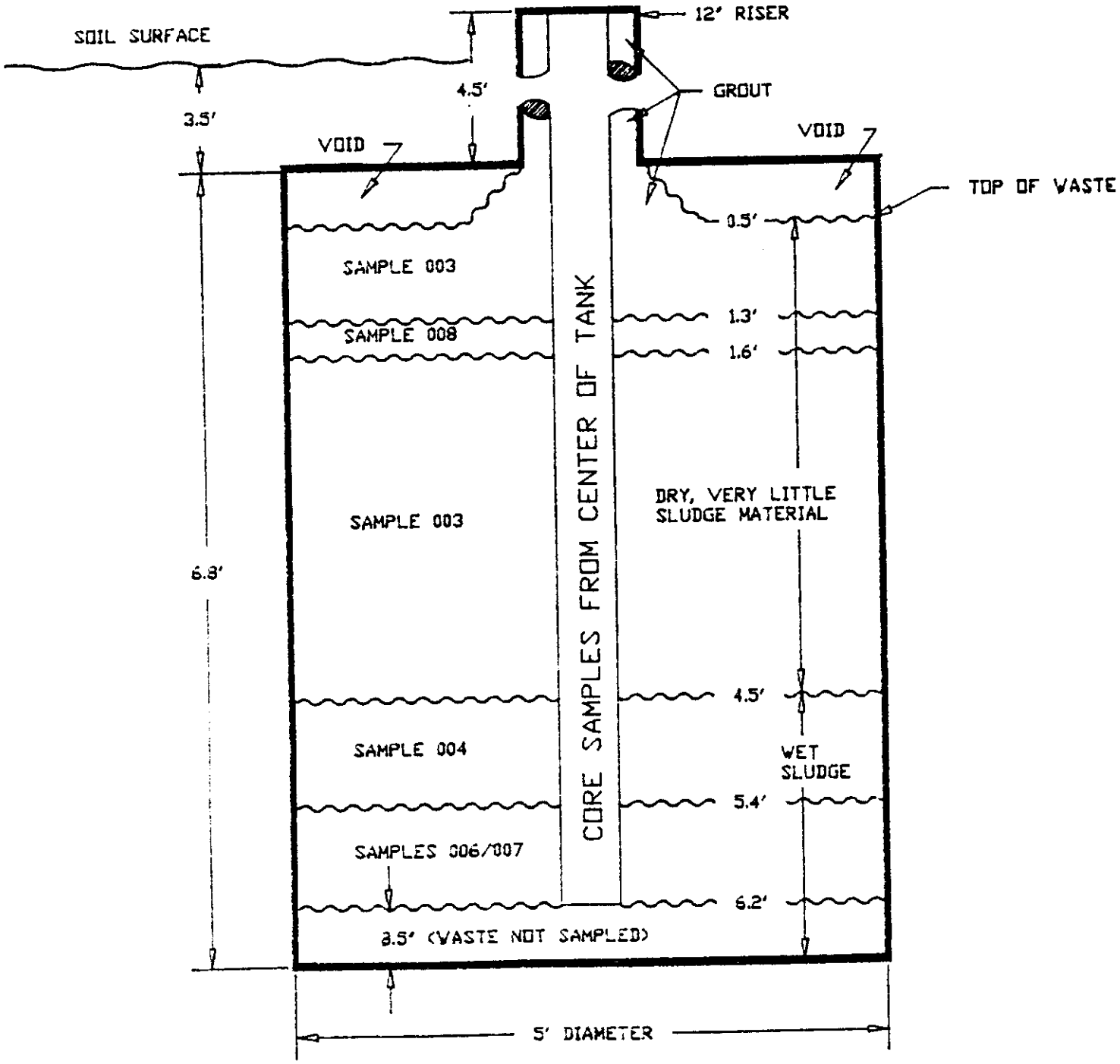
Figure 1. Tank 241-CX-71 Waste Sampling Diagram.



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4. WASTE CHARACTERIZATION RESULTS

The gas sample analysis results, reported in Appendix E (Latkovich 1990), are quoted below:

CLP Target Compounds: In order of abundance, 2-Butanone (MEK), toluene, acetone, and 2-Hexanone (MEK) were detected at levels that obtain adequate spectra. Several other Environmental Policy Act (EPA) target compounds were observed but at low levels which do not generated spectra of high quality.

Other Compounds: Non-EPA target compounds were observed at these low levels as well. Their spectra suggest they are other ketones and hydrocarbons. While quantification was not performed, analysis of two different quantities of gas resulted in a proportional change in instrument response.

The solid waste samples results, reported in Appendix F (Lerch 1991), are for characterization using the Toxicity Characteristic Leaching Procedure (TCLP). This procedure was performed at the K-25 Laboratory. Material obtained with the solid waste samples sent to the K-25 Laboratory was provided in parallel to the Hanford 222-S Laboratory for characterization as reported in Appendix C (Skoglie 1990). The 222-S Laboratory analyses, reported in Appendix G (Weiss 1991), include:

Chromium VI	Total Organic Halogen
Mercury	Anions
Selenium	Cyanide
Arsenic	Total alpha/beta/gamma
Thermal analysis	Strontium 90
Total organic carbon	Total Uranium
Plutonium 239 and 240	

The characterization data provided by the K-25 and 222-S laboratories was reviewed, as reported in Appendix H (Encke 1991), and a waste designation of Washington State toxic code WT01 or WT02 was recommended. Further analysis of the same data was performed and, as reported in Appendix I (Landon 1991), a minimum waste designation of WT02 was recommended and additional codes may eventually be applied depending on the resolution of each Federal and Washington State code determination. The presence of cyanide at one elevation was the basis for the WT02 designation.

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Encke, D. B., 1991, "Analytical Results From 241-CX-71 Tank Samples," DSI to D. R. Speer, dated May 8, 1991.

Landon, R. J., 1991, "Applicable Codes for 241-CX-71 Tank Waste," Internal Memo 81150-91-073, dated June 4, 1991.

Latkovich, J. M., 1990, "Transmittal of Volatile Organic Compound Analysis Report for Gaseous Headspace Samples CX71-G009 and CX71-G010," Letter to S. M. Loftus, dated November 29, 1990.

Lerch, J. A., 1991, "Analytical Results From Project 90-036, 241-CX-71 Tank Investigation," DSI to S. M. Loftus, dated March 14, 1991.

Skoglie, D. E., 1990, "241-CX-71 Tank Evaluation and Sampling Data," Internal Memo 81243-90-147, dated November 21, 1990.

Weiss, R. L., 1991, "CX-71 Data," DSI to D. R. Speer, dated March 20, 1991.

WHC, 1989a, "Tank 241-CX-71 Preliminary Waste Characterization," WHC-SD-DD-TI-039, Westinghouse Hanford Company, June 30, 1989, Richland, Washington.

WHC, 1989b, "Engineering Study Tank 241-CX-71 Alternate Sampling Methods," WHC-SD-DD-ES-007, Westinghouse Hanford Company, September 17, 1989, Richland, Washington.

WHC, 1990, "241-CX-71 Tank Investigation Task Plan," WHC-SD-EN-AP-036, Westinghouse Hanford Company, August 14, 1990, Richland, Washington.

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APPENDIX A

WHC-SD-DD-TI-039

Tank 241-CX-71 Preliminary Waste Characterization

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DISTRIBUTION SHEET

Distribution	From J. E. Cummings, Sr. Engineer Decommissioning Engineering	Page 1 of 1 Date June 30, 1989
Project Title/Work Order WHC-SD-DD-TI-039, "Tank 241-CX-71 Preliminary Waste Characterization		EDT No. 106870 ECN No

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J. D. Ludowise	R1-17	X		
A. Mihalic	R1-15	X		
R. S. Pavlina	R2-77	X		
R. K. Sanan	S1-52	X		
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Page 1 of 1

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5. Proj/Prog/Dept/Div: 80423

6. Cog/Proj Engr: J. E. Cummings

7. Purchase Order No: N/A

8. Originator Remarks:

9. Equip/Component No: N/A

10. System/Bldg/Facility: Strontium Semiworks

11. Receiver Remarks:

12. Major Assm Dwg No: N/A

13. Permit/Permit Application No. N/A

14. Required Response Date: N/A

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1		Cog. Proj. Eng. Mgr.	DR Speer	6/30/89	R2-77						
		QA									
		Safety									
1		VB Subrahmanyam			T6-31						
4		JD Ludowise		6-30-89							

J. E. Cummings
JE Cummings — Signature of EDT Originator — Date 6/30/89

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SUPPORTING DOCUMENT

1 Page 1 of 26

2 Title	3 Number	4 Rev No.
Tank 241-CX-71 Preliminary Waste Characterization	WHC-SD-DD-TI-039	0

5 Key Words

Strontium Semiworks, Tank 241-CX-71, Waste Characterization, Historical Documentation

6 Author

J. E. Cummings
Name (Type or Print)

J E Cummings 6/30/89
Signature

80423
Organization Code

7 Abstract

This report is provided to support an engineering study being prepared on alternative methods to sample Tank 241-CX-71 located at the Strontium Semiworks complex at 200-E Area. An investigation of available historical documentation was conducted to provide information on the waste characterization of this tank.

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TANK 241-CX-71 PRELIMINARY WASTE CHARACTERIZATION

June 30, 1989

Prepared by: J. E. Cummings 6/30/89
J. E. Cummings, Senior Engineer Date
Decommissioning Engineering
Environmental Division

Reviewed by: V. Subrahmanyam 6/30/89
V. B. Subrahmanyam Date
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TANK 241-CX-71 PRELIMINARY WASTE CHARACTERIZATION

TABLE OF CONTENTS

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TANK 241-CX-71 PRELIMINARY WASTE CHARACTERIZATION

EXECUTIVE SUMMARY

This report is provided to support an engineering study being prepared on alternative methods to sample the 241-CX-71 tank located at the Strontium Semiworks complex. An investigation of the available historical documentation on this tank was conducted to provide some information on the possible radiological and chemical constituents in this tank. This investigation included review of available documents, search of laboratory records for evidence of previous sampling analyses, and discussions with present as well as retired employees who are familiar with the history of this tank. No drawings exist to substantiate the dimensions of this tank but documentation indicates it to be a cylindrical, single-shell, stainless steel tank approximately 9 ft in diameter and 9 ft deep. A sketch of the configuration of Tank 241-CX-71 is attached. The time sequence of historical events at Strontium Semiworks is also attached.

The Strontium Semiworks records were sent to the Record Center after the Redox and Purex processes. Most of these records were destroyed in 1982. No microfiche of these records exist. Some early documentation does exist at the Battelle Library, some of which is classified and therefore access is limited. An extensive review of the historical documents that were available has revealed a number of inconsistencies. This is due in part to the nature of record keeping and data collection methods used during the 1950s and 1960s.

Based on available historical documentation, Tank 241-CX-71 was used during the Reduction Oxidation (REDOX) operations, the Plutonium Uranium Extraction (PUREX) operations, and the decontamination flushes following the completion of the PUREX operations. The tank was used to neutralize waste from the 201-C Building and the Hot Shop sink before routing to Crib 216-C-1. Historical information on Crib 216-C-1 is also included in this investigative report. Crib 216-C-1 was also used during the REDOX operations, the PUREX operations, and the decontamination flushes following completion of the PUREX operations. Although no correlation of the quantities of radionuclides estimated for Crib 216-C-1 can be made for Tank 241-CX-71, it would be expected that the tank and the crib would share the same species of radionuclides.

Although the types of chemicals and chemical compositions used are documented, the quantities used and the current compositions are unknown; i.e, limestone present in the tank would have neutralized chemicals such as nitric acid.

The REDOX process used a solvent extraction process to remove plutonium and uranium from dissolved fuels into a methyl isobutyl ketone (hexone) solvent. Waste streams from the REDOX process were slightly acidic and contained fission products and large volumes of aluminum nitrate used to promote extraction of the plutonium and uranium.

EXECUTIVE SUMMARY (Cont'd)

The PUREX process was an advanced extraction process using tributyl phosphate in kerosene solvent to extract plutonium and uranium from acid solutions of irradiated uranium. Nitric acid was used to promote extraction of plutonium and uranium as opposed to the metallic nitrates used in the REDOX process. Process condensates from the PUREX process contained predominantly dilute nitric acid and other inorganic contaminants.

A list of the decontamination solutions used for the various contamination and fission product species is attached.

A formal waste designation has not been performed on the waste in this tank because the quantity and concentrations of constituents are not known. Although the composition of the decontamination flushes used is known, the quantity used for each flush is not known. The presence of chromium in the decontamination flushes would cause the tank contents to be designated as potentially DANGEROUS WASTE. Other constituents, especially fluoride, would also influence the DANGEROUS WASTE designation.

1.0 INTRODUCTION

This report is provided to support an engineering study being prepared on alternative methods to sample the 241-CX-71 tank located at the Strontium Semiworks at the 200-E area. An investigation of the available historical documentation on this tank was conducted to provide some information on the possible radiological and chemical constituents in this tank. This investigation included review of available documents, search of laboratory records for evidence of previous sampling analyses, and discussions with present as well as retired employees who are familiar with the history of this tank.

Based on available historical documentation, Tank 241-CX-71 was used during the REDOX operations, the PUREX operations, and the decontamination flushes following the PUREX operations. The tank was used for neutralizing the 201-C process condensate and the coil and condenser cooling water. After the decontamination flushes, the tank was no longer used after June 1957. The time sequence of historical events at Strontium Semiworks is shown in Attachment 1.

No drawings exist to substantiate the dimensions of this tank but documentation indicates it to be a cylindrical, single-shell, stainless steel tank approximately 9 ft in diameter and 9 ft deep. The configuration of Tank 241-CX-71 is shown in Attachment 2.

Crib 216-C-1 was closely associated with Tank 241-CX-71 and was used during the same timeframe (REDOX, PUREX, and decontamination solutions). Historical information on Crib 216-C-1 is included in this report as it would be expected that the tank and the crib would share the same species of radionuclides.

2.0 HISTORICAL DOCUMENTATION

Because of the great length of time that this tank has been in existence and the nature of historical record keeping practices and resultant conflicting information, the historical data presented is coordinated directly with the corresponding reference source. Quotation marks have been eliminated.

2.1 HISTORY OF STRONTIUM SEMIWORKS AND TIME SEQUENCE OF EVENTS

NOTE: See Attachment 1 for time sequence of historical events.

2.1.1 Ref: "Level I Remedial Investigation Work Plan - 200 Area Strontium Semiworks Liquid Waste Disposal Sites", prepared by Pacific Northwest Laboratories (PNL), issued September 1987.

PAGE 2-25: The REDOX process was the first process to recover both plutonium and uranium from irradiated fuel materials. The process used a solvent extraction process to remove plutonium and uranium from dissolved fuels into a methyl isobutyl ketone (hexone)

2.0 HISTORICAL DOCUMENTATION (Cont'd)

2.1 HISTORY OF STRONTIUM SEMIWORKS AND TIME SEQUENCE OF EVENTS (Cont'd)

solvent. Waste streams from the REDOX process were slightly acidic and contained fission products and large volumes of aluminum nitrate used to promote extraction of the plutonium and uranium.

PAGE 2-25: The Strontium Semiworks facility was placed in service in 1952 and was first used in demonstration of the REDuction and OXidation (REDOX) process and later for demonstration of the Plutonium and Uranium Recovery through EXtraction (PUREX) process until 1956. The facility was out of service from 1956 to 1960 and was then modified for recovery and purification of Sr-90 (Strontium 90) from other Hanford reprocessing plant by-products. The Semiworks plant was retired in 1967.

PAGE 2-25: The Strontium Recovery Process performed at the Semiworks facility utilized a complex liquid organic ion exchanger, di-2-ethyl-hexyl phosphoric acid, to extract strontium from acid solutions of waste fuels.

2.2 PURPOSE OF TANK 241-CX-71

2.2.1 Ref: Memo, Harlow/Teal, "Disposition and Isolation of Tanks 270-E-1, 270-W, 241-CX-70, 241-CX-71, and 241-CX-72," dated July 2, 1974.

PAGE 4: Tank 241-CX-71 was used for neutralizing the 201-C condensate and the coil and condenser cooling water from December 1952 through November 1956.

PAGE 4: Flush wastes during decontamination also went through Tank 241-CX-71 from December 1956 through June 1957. After this date, the tank was no longer used.

2.2.2 Ref: SD-DD-FL-001, Rev 0.0, "Rockwell Retired Contaminated Facility Listing and Description," by A. A. Crusselle and T. Romano, dated July 1982.

PAGE 67: 241-CX-71 tank was used to neutralize waste from 201-C and the hot shop sink before routing to 216-C-1 crib. This tank is not currently in use and is considered retired.

2.2.3 Ref: SD-WM-SAR-003 issued, dated March 1984.

PAGE 5-49: Tank 241-CX-71 was used to neutralize waste from the Building 201-C and the Hot Shop sink before routing to the 216-C-1 crib.

2.0 HISTORICAL DOCUMENTATION (Cont'd)

2.3 DESCRIPTION OF TANK 241-CX-71 AND QUANTITY OF CONTENTS

See Attachment 2, Tank 241-CX-71 Configuration.

Location: 200 East Area - N42200/W50300

Reference Drawings: H-2-4420

2.3.1 Ref: SD-DD-FL-001, Rev 0.0, "Rockwell Retired Contaminated Facility Listing and Description," by A. A. Crusselle and T. Romano, dated July 1982.

PAGE 67: 241-CX-71 is a stainless steel, underground, neutralization tank. It is 9 ft in diameter and 9 ft high. There is a gooseneck vent riser visible above grade.

2.3.2 Ref: Harlow/Teal, "Disposition and Isolation of Tanks 270-E-1, 270-W, 241-CX-70, 241-CX-71, and 241-CX-72", dated July 2, 1974.

PAGE 4: Tank 241-CX-71 contains a limestone bed similar to that in 270-E-1 and 270-W. Although an extensive search was made, no prints of the tank could be found. Personnel associated with the facility in the early 1950s recall the tank is a five foot diameter by six foot deep tank located underground about 10 feet south of the road directly behind the 201-C Building.

2.3.3 Ref: SD-WM-SAR-003 issued, dated March 1984.

PAGE 5-49: Tank 241-CX-71 is a stainless steel, underground neutralization tank. It is 9 ft in diameter and 9 ft high. A schematic of the tank is shown in Figure 5.38, which represents the best information available on this vessel. Two risers extend above grade.

PAGE 5-49: Crushed limestone was added to the vessel through the large central riser. The limestone bed reacted with any acidic material poured through the tank. As the limestone was dissolved by the acid, new limestone was periodically added to renew the bed.

PAGE 5-56: Tank 241-CX-71 contains 2,300 gal of solids (primarily limestone used for waste neutralization) and 1,500 gal of water.

2.0 HISTORICAL DOCUMENTATION (Cont'd)

2.3 DESCRIPTION OF TANK 241-CX-71 AND QUANTITY OF CONTENTS (Cont'd)

2.3.4 Ref: Memo, Mirabella/Dukelow, "Aux Tanks, Sumps, and Vaults Solids and Liquid Volumes," dated March 3, 1978.

Identification: CX-71
Capacity (Gal): 5,000
Liquid (Gal): 1,500
Solid (Gal): 2,300
Comments: Solids = Limestone

2.3.5 Ref: Aux. Tanks - Approx. Stabil. Dates, dated August 1978.

Capacity (K gal): 5.0
Liquid (K gal): 1.50
Solids (K gal): 2.30
Total (K gal): 3.80
Requires Sampling: No
Active/Inactive: Inactive
Comments: Contains limestone. Leave as is.

2.3.6 Ref: Aux. Tanks - Approx. Stabil. Dates, dated August 25, 1978.

Capacity (K gal): 5.0
Liquid (K gal): 1.50
Solids (K gal): 2.30
Total (K gal): 3.80
Liquids Level (inches): 74.5
Solids Level (inches): 52.0
Requires Sampling: No
Active/Inactive: Inactive
Comments: Contains limestone. Leave as is.
Status: ---
Approx. Stab. Date: Primary Stab.

2.3.7 Ref: Aux. Tanks - Stabil. Plan, dated January 11, 1979.

Capacity (K gal): 5.0
Liquid (K gal): 1.50
Drainable Liquid (K gal): 1.8
Solids (K gal): 2.30
Total (K gal): 3.80
Liquids Level (inches): 74.5
Solids Level (inches): 52.0
Sampling: EF
Active/Inactive: Inactive
Comments: Contains limestone. Leave as is.
Approx. Stab. Date: Interim Stab.
Stabilization Plan: INTERIM STABILIZED