0026400

13 STA 4 FEB 11 1993

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT 156163

2. To: (Receiving Organization) Distribution	3. From: (Originating Organization) Decommissioning Engineering	4. Related EDT No.: N/A
5. Proj./Prog./Dept./Div.: 85100	6. Cog. Engr.: S. G. Marske	7. Purchase Order No.: N/A
8. Originator Remarks: Attached is WHC-SD-DD-TI-071 Rev. 0 for final approval.		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

MAR 1993 RECEIVED EDMC

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Impact Level	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	WHC-SD-DD-TI-071		0	Facility Decommissioning Report for Tank 241-CX-70	4	1		

16. KEY

Impact Level (F)	Reason for Transmittal (G)	Disposition (H) & (I)
1, 2, 3, or 4 (see MRP 5.43)	1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION (See Impact Level for required signatures)

(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.
1	1	Cog.Eng. S. G. Marske	S.G. Marske	11/13/92	R2-77						
1	1	Cog. Mgr. P. W. Griffin	P.W. Griffin	2.11.93	R2-77						
		QA									
		Safety									
		Env.									
1		R. G. Shuck	R. Shuck	2-11-93	S4-67						

18.	19.	20.	21. DOE APPROVAL (if required)
S. G. Marske S.G. Marske 11/13/92 Signature of EDT Originator Date	Authorized Representative for Receiving Organization Date	P.W. Griffin P.W. Griffin 2.11.93 Cognizant/Project Engineer's Manager Date	Ltr. No. [] Approved [] Approved w/comments [] Disapproved w/comments

BD-7400-172-2 (07/91) GEF097

BD-7400-172-1 (02/89)

SUPPORTING DOCUMENT

1. Total Pages 71

2. Title

FACILITY DECOMMISSIONING REPORT FOR TANK 241-CX-70

3. Number

WHC-SD-DD-TI-071

4. Rev No.

0

5. Key Words

CX-70, Facility Report, Hot Semiworks, D&D, Waste Removal

APPROVED FOR PUBLIC RELEASE KMB 2/4/93

6. Author

Name: T.C. Hasfjord/S.G. Marske

S.G. Marske FOR T.C. HASFJORD

Signature 11/13/92

Organization/Charge Code 85100/UE2CA

7. Abstract

This document describes the decommissioning work performed on Tank 241-CX-70. In 1979, liquid waste from the tank was pumped to the 101-AY double-shell tank farm. Not all of the waste was removed at that time therefore sluicing and pumping was resumed in the summer of 1987. The waste removal continued until the process of sluicing become too inefficient to continue, April 1988. Waste removal commenced again in September of 1991 which entailed vacuuming the waste from the tank into 16 gallon drums packed inside 90-mil plastic liners inside of 17-C 55 gallon drums. This process continued through December of 1991 when the tank was declared free of waste. The drums were then transported to the Transuranic Waste Storage and Assay Facility (TRUSAF) laocated at 224-T for safe storage.

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9. Impact Level 4

10. RELEASE STAMP

OFFICIAL RELEASE BY WHC (13)

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STA 4

A-6400-073 (11/91) (EF) WEF124

FACILITY DECOMMISSIONING REPORT

FOR TANK 241-CX-70

T. C. Hasfjord
S. G. Marske

November 1992

Westinghouse Hanford Company
P. O. Box 1970
Richland, Washington 99352

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EXECUTIVE SUMMARY

This document describes the work done on the 241-CX-70 waste tank. In 1979, the decommissioning of tank 241-CX-70 began by pumping the liquid waste to the double-shell tank farms (101-AY targeted for waste). There were 10,300 gal of waste left in the tank until the summer of 1987, when removal of the waste was resumed. A sluicing and pumping system transferred the waste liquid to tank 003-CR. This procedure was carried out from September 1987 through April 1988 at which time progress became inefficient and the operation ceased. At this time, 8 to 9 in. of waste remained (approximately 750 gal). For the remaining waste, addition of an absorbent was to be used to absorb the liquid thus allowing the waste to be removed using a vacuuming technique. However, upon opening the tank for close inspection, it was discovered that the liquid had evaporated to near dryness; therefore, the addition of the absorbent was omitted. The waste was vacuumed into 16-gal drums and packed inside 90-mil plastic liners within galvanized 17-C 55-gal drums. The vacuum operation was initiated in September 1991 and continued through December 1991. The drums were stored locally pending final analytical results, then transported to the Transuranic Waste Storage and Assay Facility (TRUSAF) located at 224-T.

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FACILITY DECOMMISSIONING REPORT FOR TANK 241-CX-72

1. DESCRIPTION, HISTORY, AND LOCATION

Tank 241-CX-70 is a 30,000 gal single-shell storage tank built in 1952 to hold high-level process waste from pilot tests of the reduction-oxidation (REDOX) process. The liquid inventory was pumped out in 1979 leaving approximately 10,300 gal of sludge. The tank decommissioning was started in 1984 as part of the Strontium Semiworks decommissioning project. An Environmental Assessment (EA) (RL 1985) issued by William A. Vaughn, Acting Assistant Secretary for Policy, Safety, and Environment, U.S. Department of Energy (DOE), showed a "Finding of No Significant Impact" for the project in May 1985. The EA listed the tank's contents as bearing 3 curies of alpha and 6,000 curies of beta.

Tank 241-CX-70 is buried approximately 11 ft below grade and is constructed from 1/4-in. stainless steel plate, 15 ft in depth and 20 ft in diameter. It is surrounded by 1-ft thick poured concrete on the top and sides with a concave bottom of thickness varying from 9 in. at the center to 2 ft at the edges. Two filler pipes entering the side of the tank were blanked off prior to the decommissioning of the 201-C Strontium Semiworks Facility (see Figure 1). The tank has nine risers extending above ground, and a manway that is 42 in. in diameter (see Figures 2 and 3). Tank 241-CX-70 is located approximately 128 ft southeast of the 201-C Building site of the Strontium Semiworks area in the 200 East Area. (See Figure 4.)

2. WORK SEQUENCE

The waste remaining, following the 1979 removal efforts, was represented by an initial grab sample, taken prior to the sluicing operation. A bottle and string technique was used, and samples were sent to Rockwell's Chemical Laboratory Unit. The results were questionable due to the concentration variance in the tank. They are believed to be roughly 50 percent accurate. Refer to Appendix A of SD-DD-TI-034 Rev. 0 (WHC 1991b) for a summary of the results.

2.1. WASTE REMOVAL PART I

2.1.1. Sluicing

Sluicing is a process of breaking up and thinning the sludge waste using a high pressure water spray thus allowing the contents to be pumped. An engineering study was prepared to evaluate several options before deciding on

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Figure 1. Aerial View of the Strontium Semiworks Facility Before Decommissioning.

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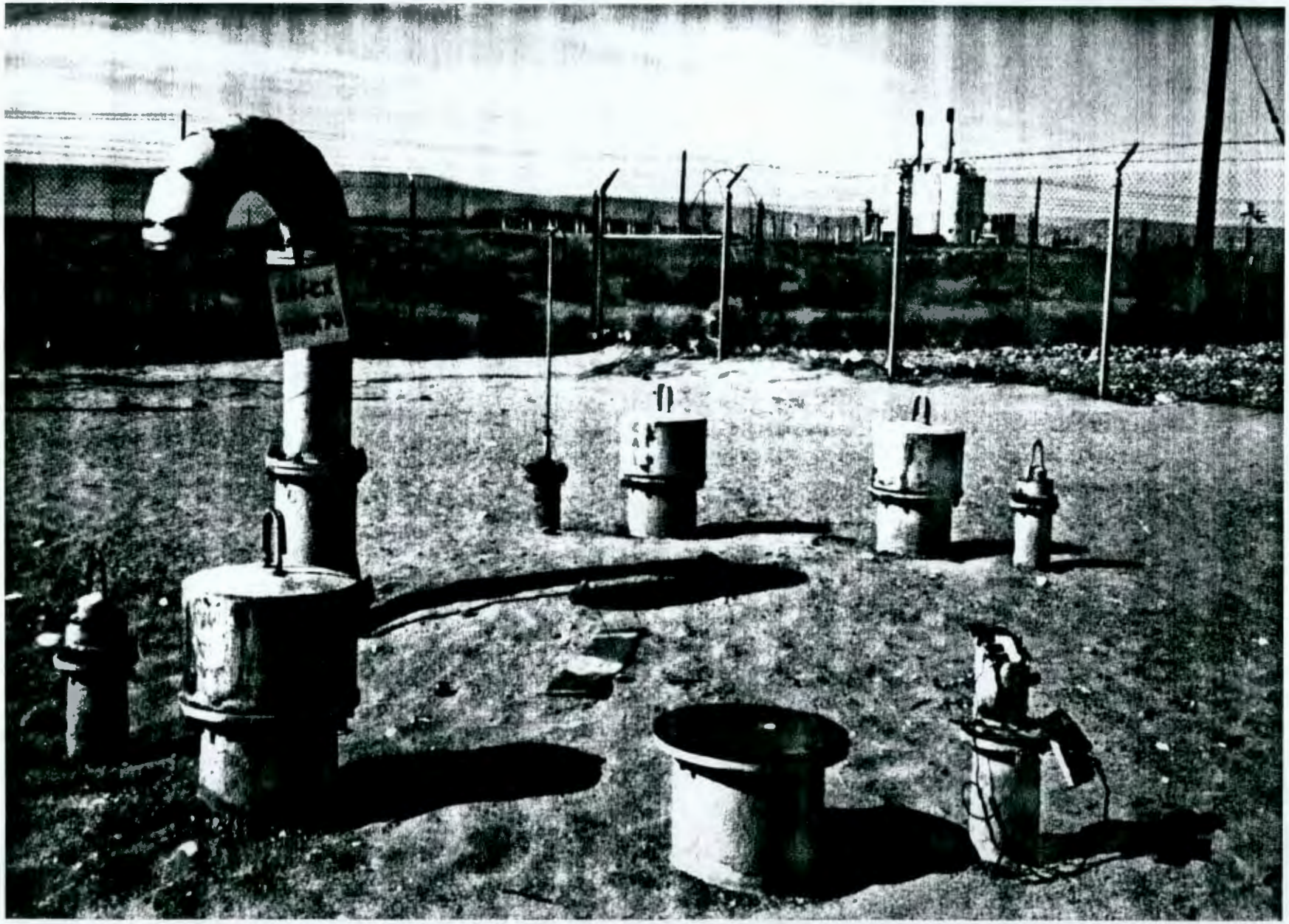

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Figure 2. Risers Coming from Tank 241-CX-70.

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Figure 3. Side View of Tank 241-CX-70.

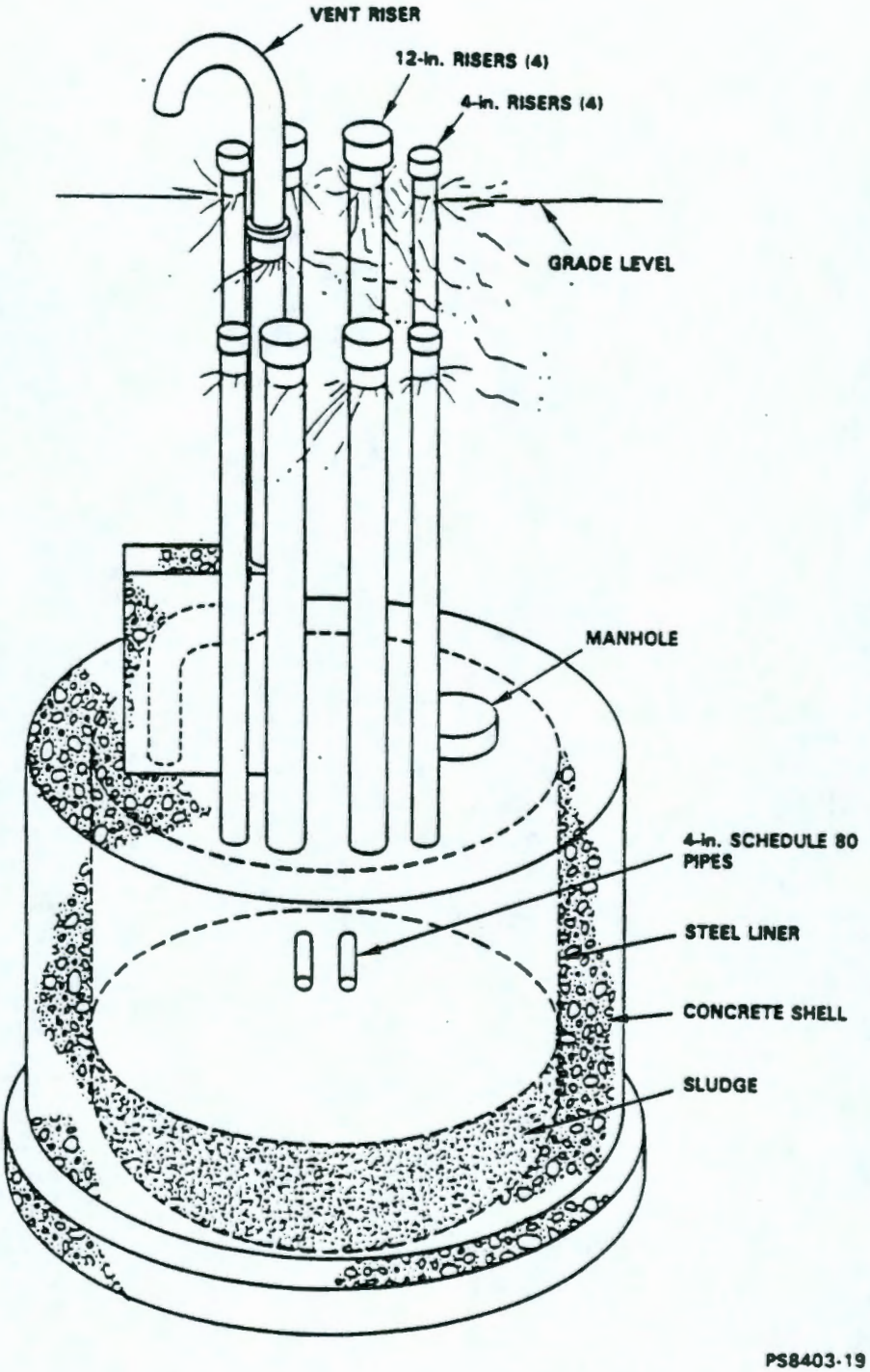

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Figure 4. Aerial View of Strontium Semiworks After Decommissioning the Major Buildings.

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the lead method. This method utilized a 190-ft over-the-ground pipeline to the 8900 pipeline which prevailed over four other conceptions (SD-DD-TI-008 Rev. 0, Appendix I [RHO 1987]). These concepts were (see Figure 5):

- A 600-ft aboveground transfer line to a railcar
- A 50-ft transfer line to a tanker truck
- A 2,000-ft aboveground pipeline to the 153-ER diversion box, bypassing 244-CR and continuing to 101-AY
- A 2,400-ft aboveground line to the 204-AR slurry pumping system.

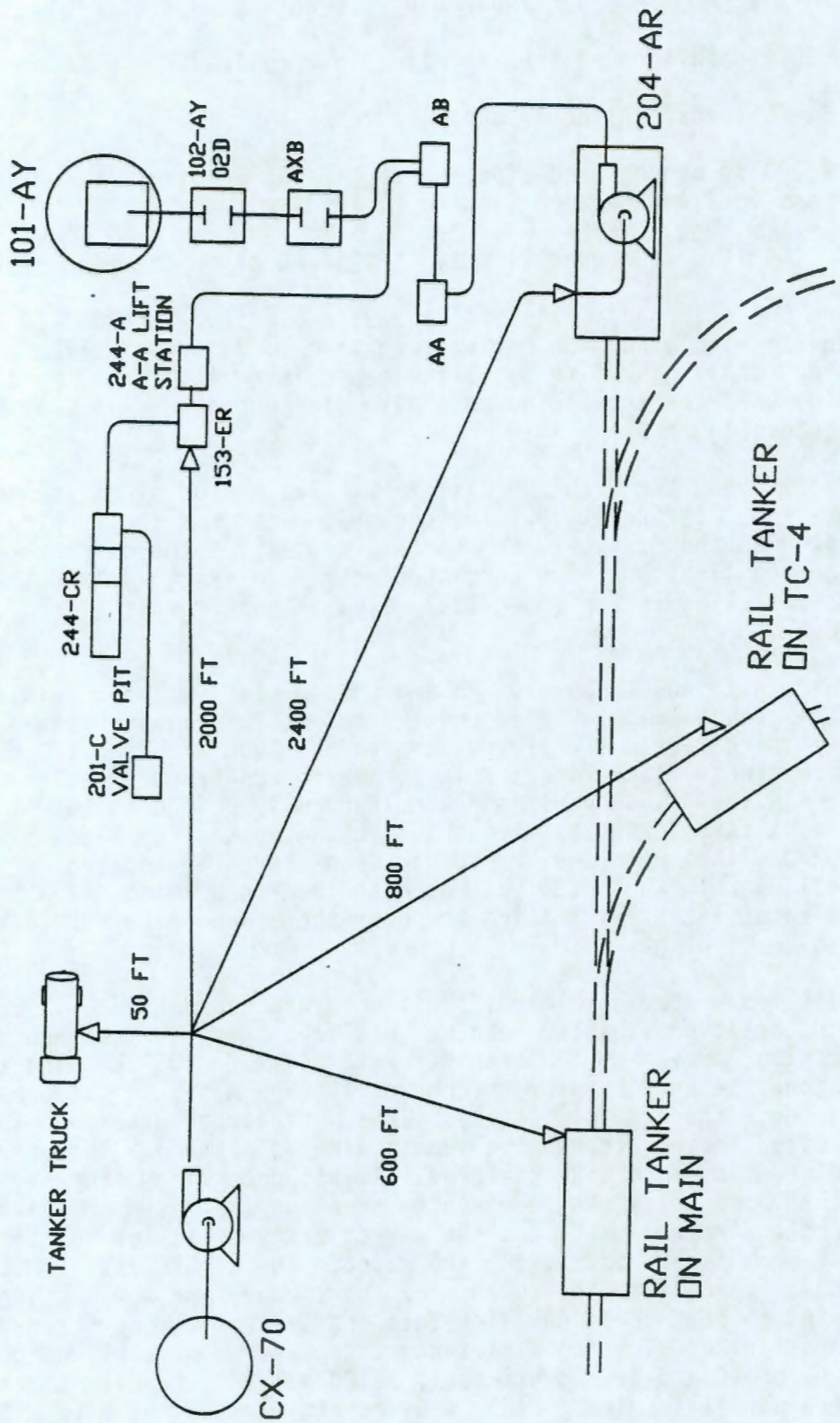
Tank Farm Operations' decision to upgrade and restore the 003-CR system made sluicing the viable and low cost alternative to decontamination and decommissioning (D&D). The 6-ft by 11-ft deep caisson was installed in July 1987 to be used for the sluice pump pit. The equipment was installed thereafter. (See Figure 6.)

A 1,000 cfm exhauster from 200 East Tank Farms was obtained for the sluicing operation. Before it could be engaged, minor repairs were necessary. Pinholes existed in the ductwork, and some insulating of the ductwork was required. The complications were corrected without difficulty, and the exhauster was installed in September 1987. The exhauster was disconnected in September 1989.

The liquid waste was to be sluiced and pumped via a welded, 2-in., carbon steel, over-the-ground transfer pipe constructed exclusively for the project. The transfer pipe connected the slurry pump to the 8900 pipeline 190 ft northeast of the tank. (See Figure 7.) The waste was transferred to tank 003-CR located in the 241-CR vault and simultaneously pumped to 101-AY of the double-shell tank farms, 200 East Area. Sluice water was supplied by a fire hydrant equipped with a water meter and backflow preventer located at coordinates 42150 north and 50295 west as described on drawing H-2-95501. The hydrant was also utilized for testing the over-the-ground pipe for leaks and flushing the 8900 pipeline.

After leak tests were completed, sluicing began September 25, 1987. Initially, a rotary-type sluicing head was utilized; however, the process was not very effective, proven by low transfer rates to tank 003-CR. The rotary head did not generate enough force or concentrate the water in the areas of the tank to produce the highest results. This, compounded with pump intake problems, resulted in the process not functioning as planned. The operation was briefly discontinued to take pictures. It was determined from the photographs that more force was required to break up the waste. A fire hose nozzle replaced the rotary head, and the direct spray amplified the technique by effectively breaking up and mixing the waste. The water flow from the fire nozzle created an opening in the surface of the sludge, and the suction hose, previously lying on top, could now sink into the cavity. Higher transfer rates were reported and sluicing efficiency increased. The tank was pumped down to a level of 26 in. or approximately 2,100 gal (Figure 8). At this level, the strainer-style pickup head, a 6-in. stainless steel pipe with numerous holes, became uncovered and could not be positioned well enough to

Figure 5. Tank 241-CX-70 Slurry Transfer Routes.



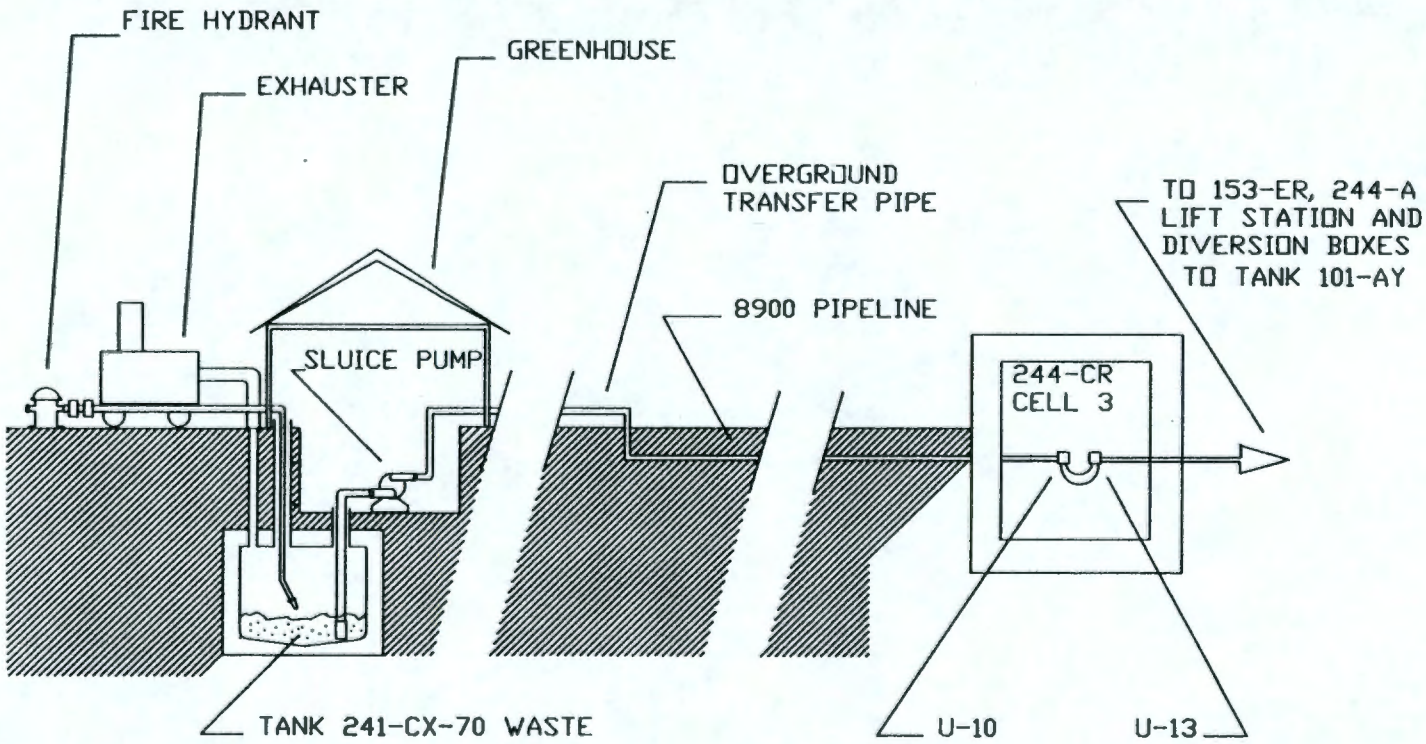


Figure 6. Sluicing Diagram.

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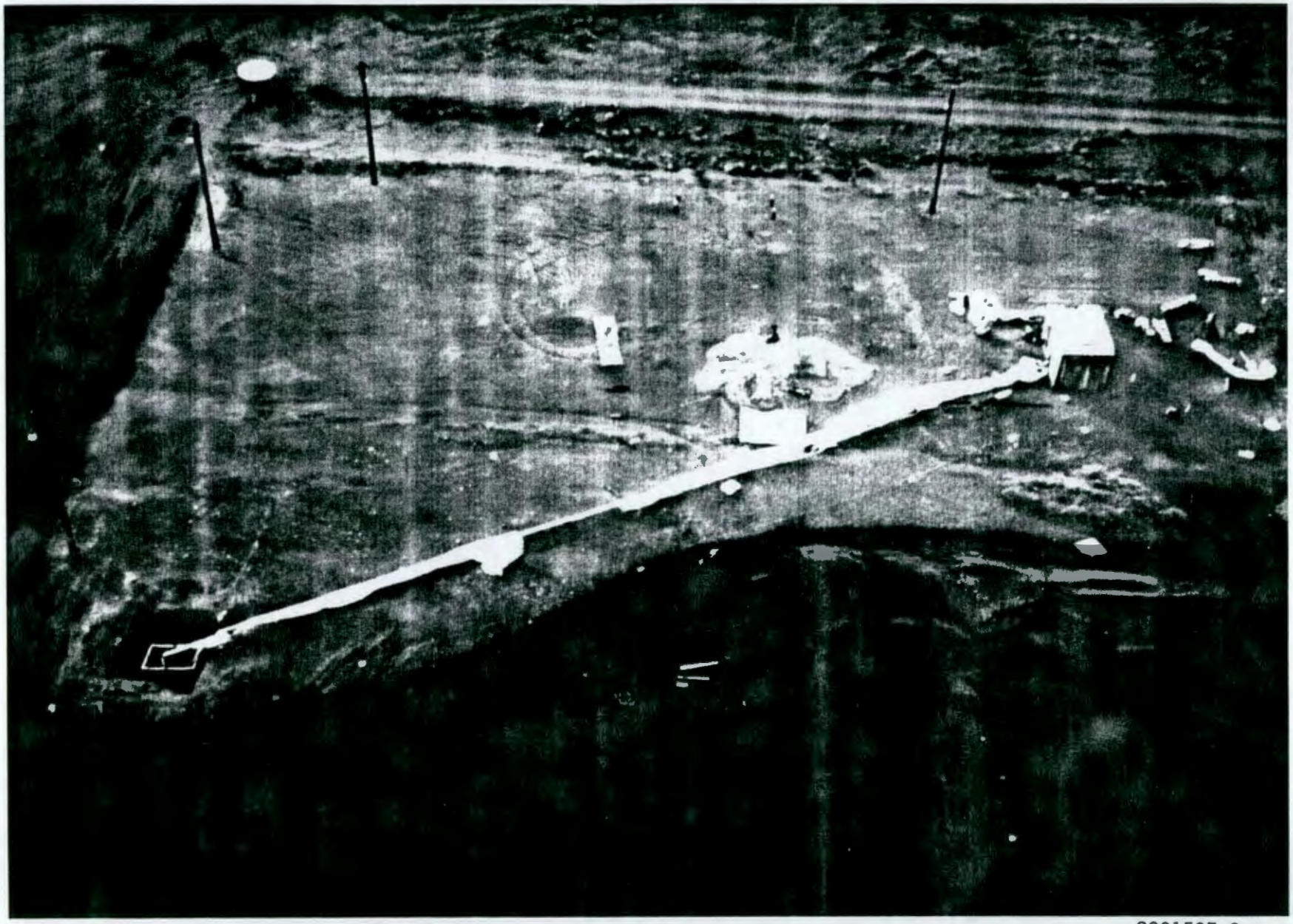

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Figure 7. View of the Pipeline Connecting the Slurry Pump to the 8900 Line.

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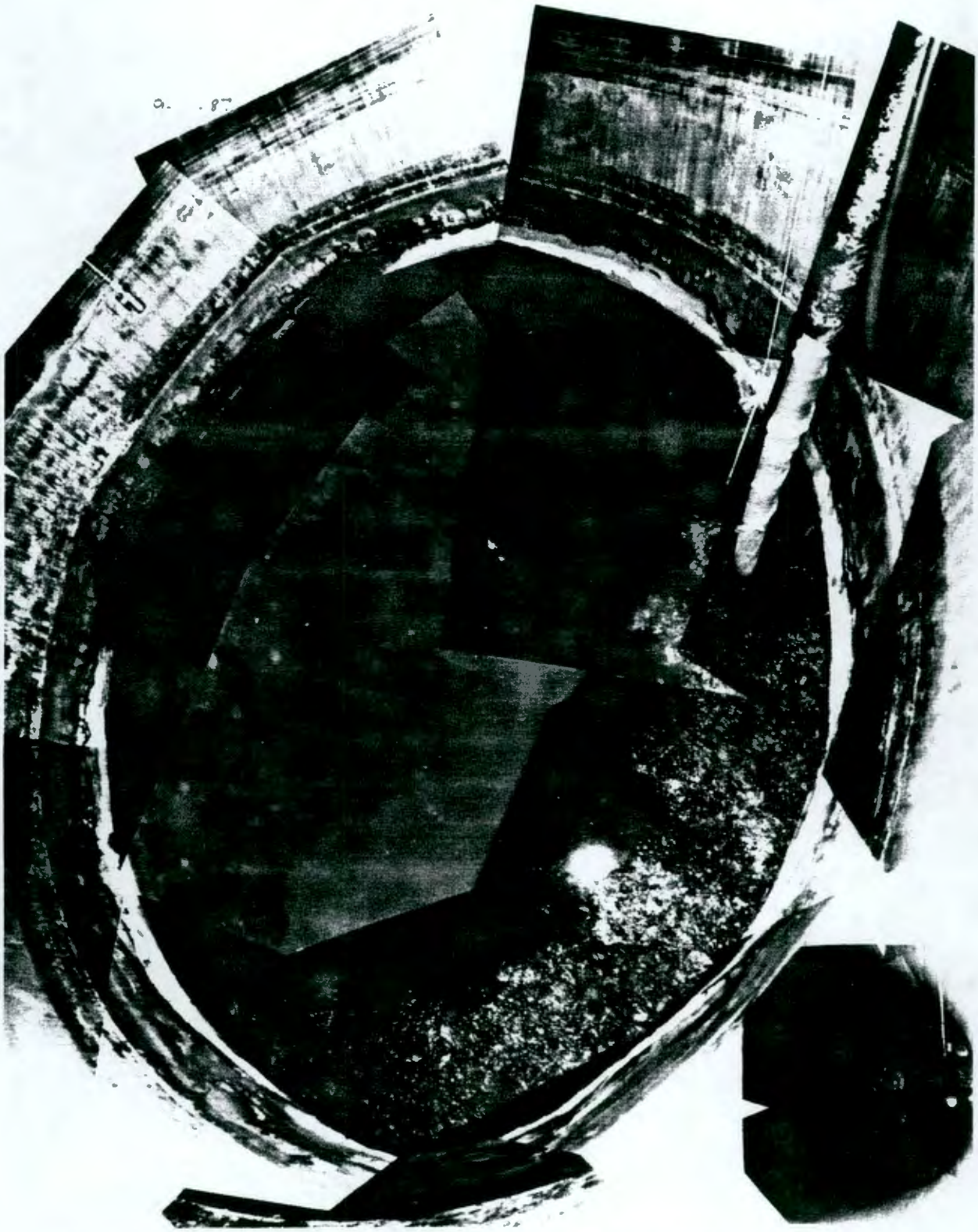

Figure 8. Inside View of Tank 241-CX-70 After Tank Was Pumped Down. (approximately 2,100 gal of waste left in tank)

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operate correctly; therefore, a pancake-style head was employed and the tank was pumped down to approximately 8 or 9 in. or approximately 750 gal (see Figures 8 and 9). At this level the pancake-style head could not be positioned properly to continue pumping because of difficulty in maneuvering within the tank. Progress stalled in July 1988, forcing the decision to discontinue in August 1988. Roughly 140,000 gal of water were used to remove about 9,550 gal of waste.

Three composite liquid samples which contained some solid material were taken during the sluicing operation. Sample 1, obtained November 1987, was sent to Westinghouse Analytical Chemistry Services Laboratory at 222-S primarily for pH analysis (pH : 11.46); sample 2, taken March 1988, was sent to Pacific Northwest Laboratories (PNL) 325 Building for composite and analysis; and sample 3, taken in July 1988, was sent to Westinghouse Process Chemistry Laboratory. All sluice samples were accomplished with an in-line Isolok[1] sampler. The sample corollaries are contained in Appendixes B, C, and D of SD-DD-TI-034 (WHC 1991b).

2.2. WASTE REMOVAL PART II

After the final sluicing operation in August 1988, three grab samples were obtained again from the remaining sludge in tank 241-CX-70. The samples were sent to Process Chemistry Laboratories. The tank at this time contained approximately 750 gal of waste. The results returned in November 1988 presented the radioactive constituents and a pH of 13.0. Based on elevated concentrations of transuranic radionuclides (see Appendix A), recommendations were made to continue waste cleanup of 241-CX-70. The pH report showed the waste as corrosive; therefore, additional consideration was involved in the waste removal (Herting 1988; WHC 1990; WHC 1991b).

2.2.1. Shoring

Shoring was used to facilitate excavation of the manway (Figure 10) in November 1988. It was later necessary, April 1991, to reinforce the shoring with steel angle iron and 2 x 4's fastened with lag screws to guarantee stability. The shoring is approximately 10 ft square and 11 ft deep.

On August 9, 1989, operations to tank 241-CX-70 were put on hold until the activity had been planned, scheduled, and funded. At this time, a period of time elapsed following the sluicing process. The 291-C-1 stack was demolished during this lapse.

Due to the corrosivity of the waste reported (Herting 1988), a Part A permit application was submitted to Washington State Department of Ecology in July 1990 identifying the designation as D002.

An evaluation was done to determine the most cost-effective means to remove the remaining waste. The evaluation indicated the foremost method was to vacuum the absorbed wet waste into containers. This idea prevailed over

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[1]Isolok is a trademark of the Bristol Equipment Company.

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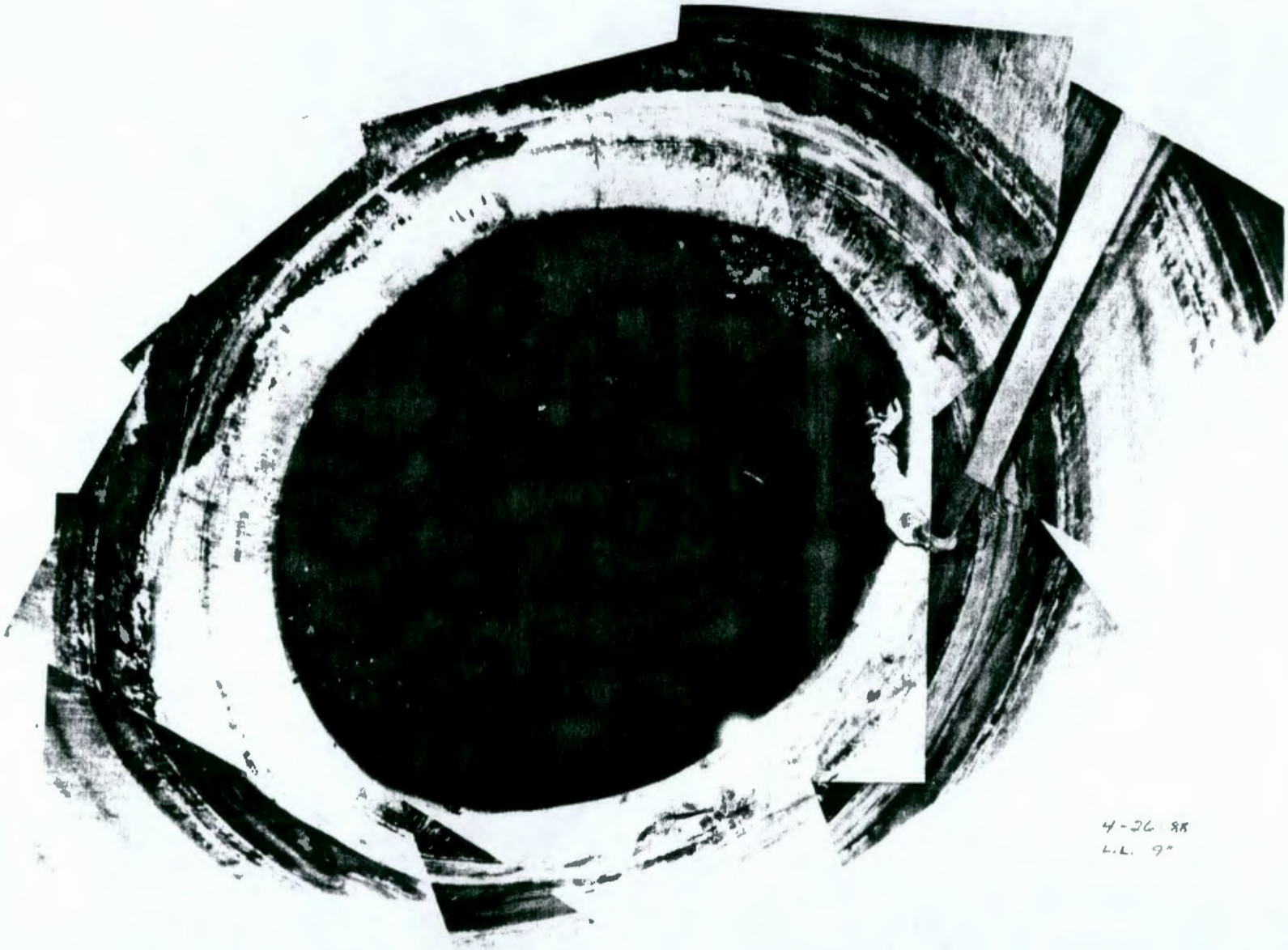

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Figure 9. Inside View of Tank 241-CX-70.
(approximately 750 gal of waste left in tank)

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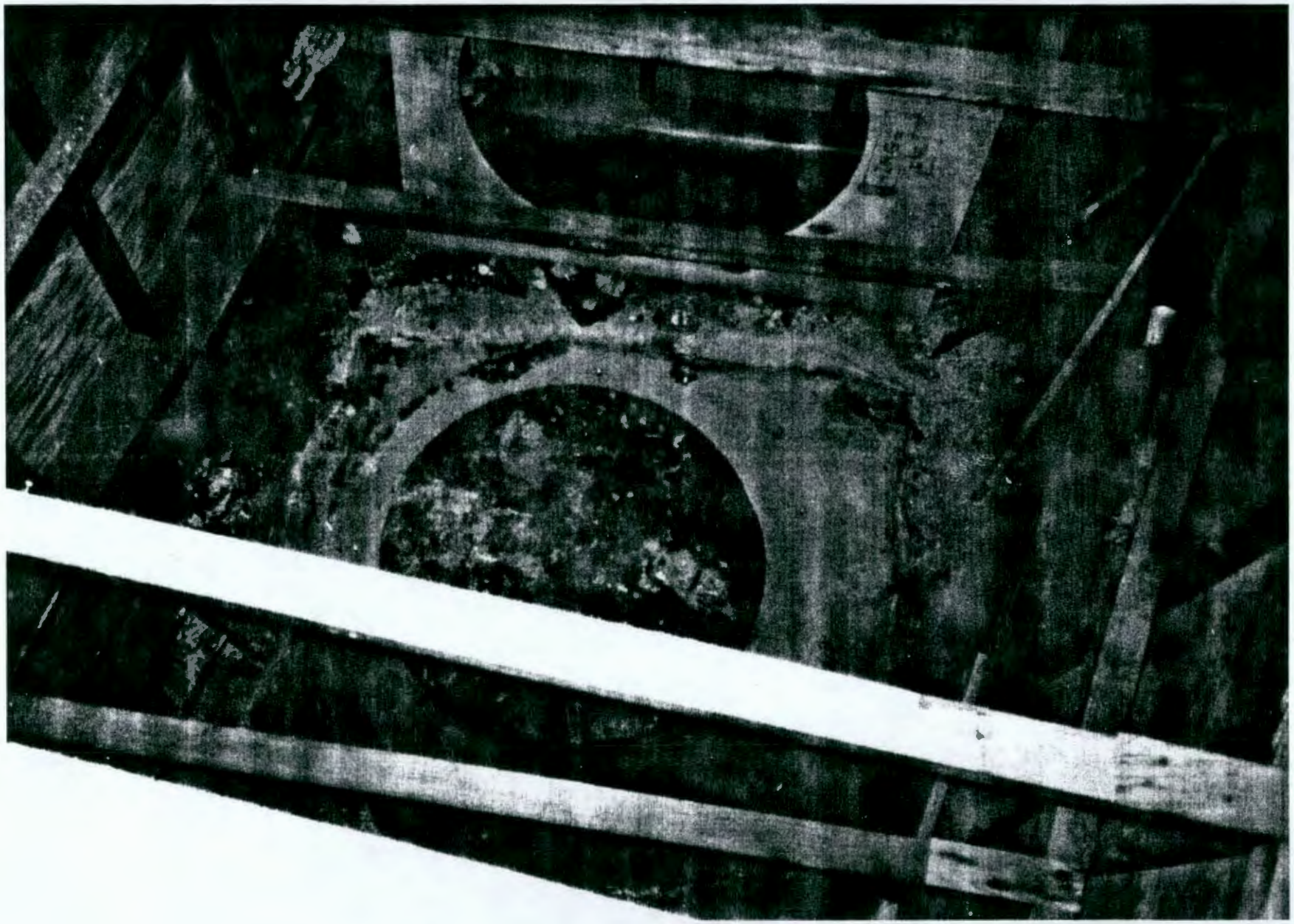

Figure 10. Shoring Around Manway Cover of Tank 241-CX-70.

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absorbing the liquid waste into pillow absorbent and scooping the waste out using hand-held devices (WHC 1991a) and prevailed over excavating along side the tank and boring a 4-ft by 4-ft opening through the concrete and stainless steel wall.

The remaining 750 gal of liquid waste were treated with concentrated sulfuric acid in January 1991 to lower the pH from roughly 13.1 to approximately 10.5, consequently dismissing it as corrosive waste. The work package and calculations were completed in January 1991, and 27 lb (6.6 liter) of sulfuric acid were added to the 500 gal of sodium hydroxide enriched liquid waste through one of the 12-in. risers. The sample report performed by 222-S Analytical Laboratories following the addition of sulfuric acid is comprised in Appendix B.

2.2.2. Exhauster

The original exhauster did not meet the latest required standards for the upcoming operations; therefore, another exhauster was procured. A design by Kaiser Engineers Hanford Company (KEH) and a low bid submitted by Charcoal Services Corporation, secured the D&D variable, portable 3000, 6000, 9000 cfm exhauster to comply with ER 8459-P3 Procurement Specification for Portable Exhauster Unit. The system was equipped with 18 high efficiency particulate air (HEPA) filters that can be blanked to provide variable flow to accommodate particular needs. The new exhauster was attached to one of the 12-in. risers in June 1991, providing air flow through the tank.

Preparations were made in August 1991 to remove the remaining liquid by way of sluicing, but the evaporating effects of the air from the exhauster moving over the waste reduced the liquid inventory to a dry waste as viewed through the manway. The dry contents called for rejection of the sluicing arrangements and examine other alternatives. Below is a tabulation of the best guess figures of the cost for the sluicing preparations that had to be canceled.

Readiness Review	5 K
Document Preparation	35 K
TRU Certification	6 K
Site Preparation	25 K
Craft Support	8 K
TOTAL	79 K

Resampling was performed on September 13, 1991 to allow waste designation for the remaining contents of tank 241-CX-70 after its removal. The levels of alpha emitting radionuclides were responsible for some requested analysis not performed on the samples (Weiss 1992). (See Appendix C.)

2.2.3. Manway

A 42-inch manway cover (see Figure 10) exists on the top of the 241-CX-70 tank and was removed in September 1991. The weight of the manway cover, using a dynamometer, was 2,100 lb. The manway cover was replaced March 11, 1992 after the waste was removed. Photographs were taken of the tank interior, and informal radiological characteristics were recorded.

Following the manway cover removal, an inspection of the tank contents revealed the sludge as a partially dry solid (Figure 11). Speculation is the effects of the heat and the use of the exhauster evaporated the liquid. The original plans included the addition of an absorbent to the wet solid and vacuuming the absorbed liquid waste into 16-gal canisters. Due to the evaporation, the step for adding absorbent was omitted.

2.2.4. Remaining Waste Removal

The plan for the solid waste removal was to use a 50 horsepower, electric motor-driven, industrial vacuum equipped with in-line filters. Installation of the system began in September 1991, and waste removal operations were completed on December 20, 1991 when the entire tank contents were removed. The vacuum suction hose for the system had a length of stiff PVC pipe (2 in. by 18 ft) attached to the end to reach the bottom of the tank. The operator who was positioned over the manway then manually directed the pipe across the bottom of the tank. The vacuum hose was routed to a 16-gal Department of Transportation (DOT) 47 E steel drum. The drum contained a double-stitched muslin bag including downcomers to keep the bag from collapsing. Outflow from the drum entered another 16-gal DOT 47 E steel drum containing a standard 11- by 24-in. diesel truck air cleaner (PH 2650 Baldwin A 927C). The air cleaner kept the smaller, finer particulates from entering the vacuum source and a three-successive HEPA filter system before passing the particulate-free air to the atmosphere. The waste periodically clogged the PVC pipe and was corrected by impacting the pipe on the side of the tank while the vacuum source was shut down.

2.2.5. Packaging

The vacuuming process loaded the waste into DOT 47 E 16-gal drums. The 16-gal drums were centered inside DOT 17 C 55-gal galvanized drums with a 90-mil plastic liner. Packing between each drum consisted of a plywood brace on top and bottom to centralize the inner barrel and approximately three bags of absorbent (50 lb sacks each) poured into the void. The 16-gal drum and 55-gal drum each carry a NUC-FIL-013 carbon composite filter to handle any possible gas generation. The 90-mil liner was vented by a small opening at the top. Both the 16- and 55-gal drum lids fastened with a nut and bolt drawn locking ring. Prior to moving the barrel arrangement into the greenhouse, plastic shielding was jacketed around them to protect against smearable contamination. Disposal of the plastic occurred after the drum was closed and prior to transporting out of the radiation zone. The D&D workers used a portable gantry, dynamometer, and chain hoist to weigh the barrels and then distributed pin numbers before loading into the conex box (Figure 12). The waste removal and packaging processes can be viewed via video tape, "Tank 241-CX-70 Hazardous Waste Removal," copy No. 3329/M. The average weight ranged between 300 to 325 lb. Waste containers included no accountable nuclear material and a 20-year life has been assigned to the 55-gal barrels. See Appendix D for barrel inventory.

A rabbit carcass was found inside tank 241-CX-70 (Figure 13), and therefore, one of the barrels had to be packaged as animal waste. Calcium oxide (lime, 2 ounces total) was required to be added with the animal waste in order to keep the growth of organisms from occurring.

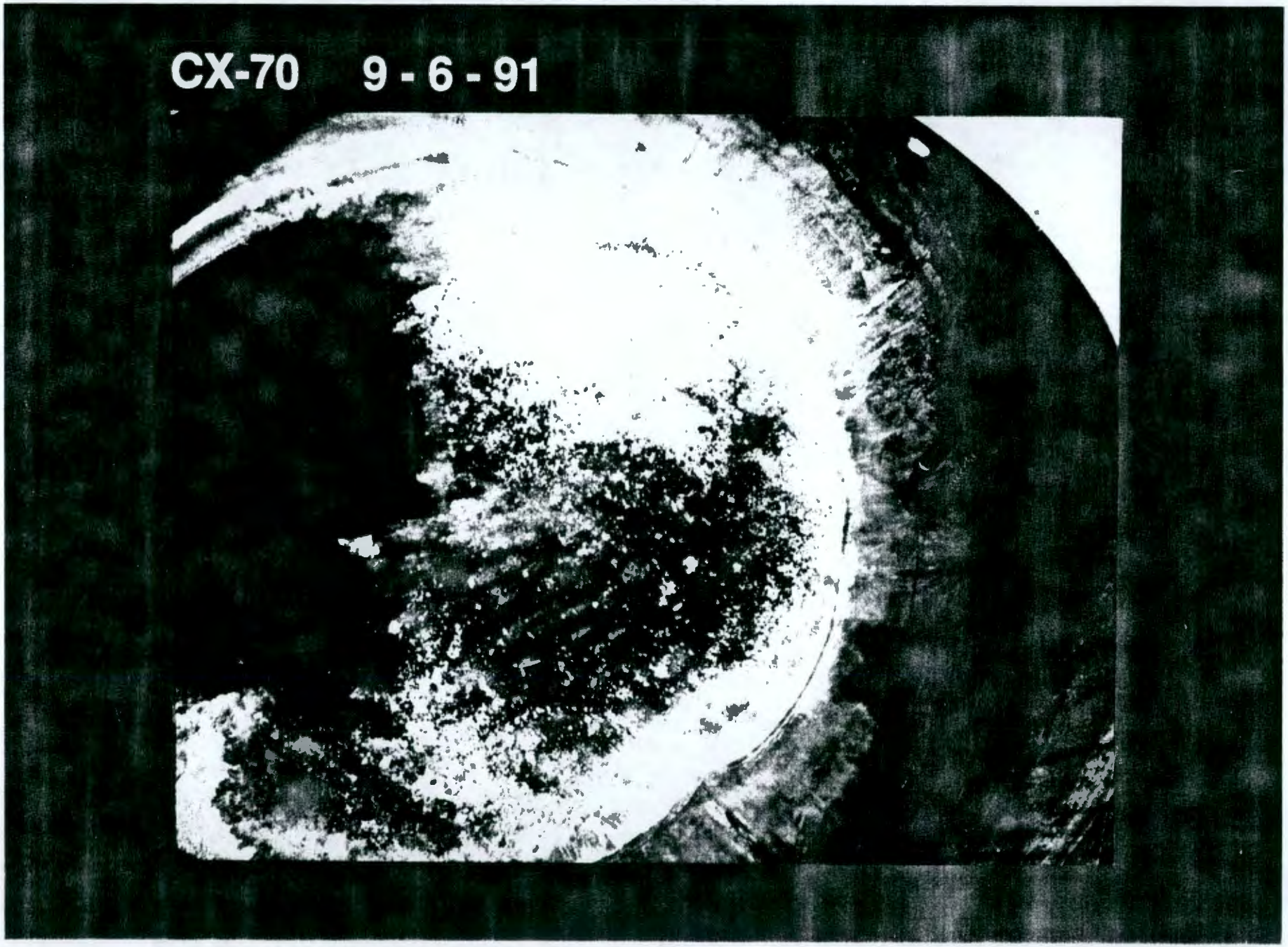

Figure 11. Inside of Tank 241-CX-70 Showing the Sludge as a Partially Dry Solid.

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Figure 12. Barrel of Waste Being Weighed
Using a Gantry, Dynamometer, and Chain Hoist.

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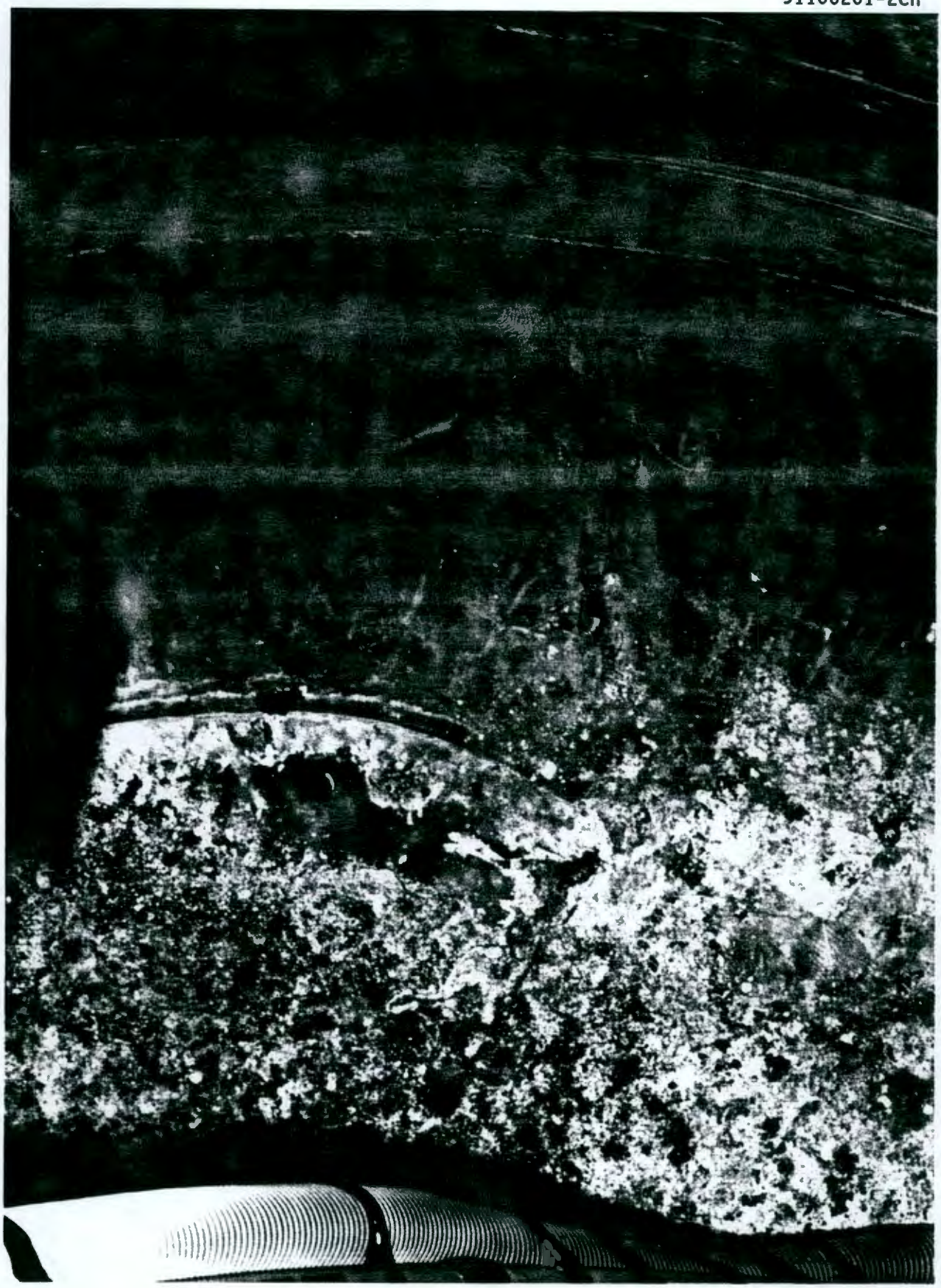

Figure 13. Inside Tank 241-CX-70 Showing Rabbit Carcass.

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Figure 14 shows the tank interior after all the waste was removed.

3. DOSE SUMMARY OF TANK 241-CX-70

Table 1 summarizes the dose readings from the emptied tank interior, taken in 1- to 1.5-ft intervals (mrads/hr, beta) in February 1992.

Table 1. Dose Readings from Tank 241-CX-70 After All Waste Removed.

INTERVAL NUMBER	READING (mrad/hr) (Beta)	APPROXIMATE HEIGHT from bottom (ft)
1	15000	0.0
2	6000	1.4
3	2500	2.7
4	2100	4.1
5	2000	5.4
6	2000	6.8
7	1900	8.2
8	1500	9.5
9	1300	10.9
10	1000	12.2
11	600	13.6
12 *	5 mr	15.0
* located in work area		Distance from bottom are based on averages

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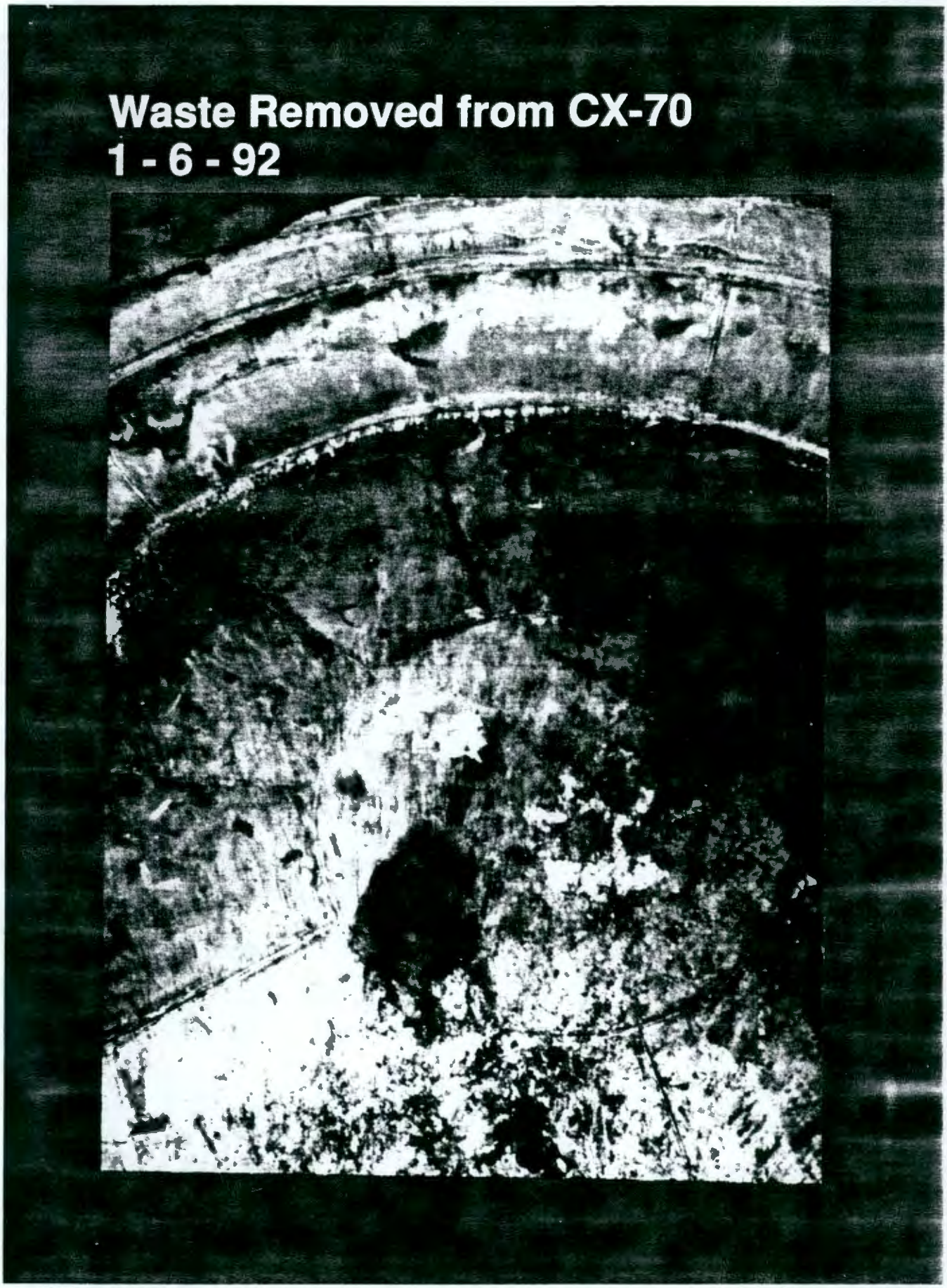

Figure 14. Interior of Tank 241-CX-70 After Waste Removal.

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4. STORAGE

The 55-gal drums are stored at TRUSAF, 224-T, in 200 West Area. Transport of the barrels commenced on May 5, 1992 and was extended over a 10-work day period. The last of the barrels were moved on May 18, 1992.

5. GREENHOUSES

Greenhouse-I was constructed in September 1987 and decommissioned in November 1988. The C-9 trench was designated for the burial site.

Greenhouse-II was constructed in December 1988 and was decommissioned in November 1992. Its destination was the 200 West burial grounds.

6. COST

Table 2 provides the cost breakdown from waste removal to present.

Table 2. Cost Breakdown.

ITEM	COST (Dollars)	
Waste Removal	185,000	The figures listed are based on logical estimates rounded to the nearest thousand
TRU Waste Burial Fee	135,000	
Misc. Rad. Waste Burial Fee	150,000	
Greenhouse disassembly	60,000	
Exhauster Design Fee Unit Cost Stack Monitor Cabinet CAM (alpha, beta and gamma)	 60,000 107,000 70,000 10,000	
Tank Monitoring System	8,000	
Shored Area Covers	7,500	
TOTAL	792,500	

7. FINAL WORK

7.1. MONITOR

A liquid monitoring device was installed in November 1992 to alarm if any liquid has entered the tank. The monitoring of the tank will take place on a monthly schedule. This meets the requirements of monitoring an empty tank stated in an internal memo (Miskho 1992) from Facility Compliance.

7.2. GREENHOUSE REMOVAL

The greenhouse was decommissioned following the elimination of all its contents. The decommissioning of the greenhouse was completed mid-November 1992, and the waste was sent to the 200 West burial grounds.

7.3. COVER

The concluding procedure for tank 241-CX-70 was the installation of two wood covers constructed from 2 by 6's and 3/4-in. plywood. The covers were devised to shield both the manway entrance to the tank and the pump pit from the elements. They are roped off to eliminate any traffic form crossing the covers.

8. REFERENCES

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RL, 1985, *Environmental Assessment Relating to the Decommissioning of Strontium Semiworks Facility*, DOE/EA-0259, U.S. Department of Energy, Field Office, Richland, Washington, May 1985.

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APPENDIX A

ANALYSIS OF SLUDGE SAMPLES

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Table A-1. Analysis of Filtrate Solutions from Sludge Samples. (WHC 1991c)

		R-2917	R-2918	R-2919
Total Beta	uCi/L	35.7	328	320
Total Alpha	uCi/L	1.7	<0.07	0.05
Pu-239	uCi/L	1.4		
Cs-137	uCi/L	4.4	238	244
Density	g/mL	1.04		
pH		13.0		
TOC	g/L	0.49	0.525	0.49
Cl	M	0.012	0.013	0.012
F	M	<0.008	0.015	0.0175
NO_3	M	0.024	<0.002	0.023
PO_4	M	0.0018	0.0013	0.002
SO_4	M	0.0039	0.0009	<0.015
OH	M	0.25		
Na	M	9.1E-01	9.9E-01	1.1E-00
Al	M	9.4E-02	1.0E-01	1.1E-01
Cr	M	3.0E-03	1.6E-03	1.7E-03
P	M	2.3E-03	2.3E-03	2.6E-03
K	M	1.5E-03		1.1E-03
Si	M		1.0E-03	1.6E-03
Ca	M	4.4E-04	4.4E-04	3.7E-04
Fe	M	2.8E-05	1.2E-04	

Table A-2. Analysis of Dissolved Solids from Sludge Samples[2] (WHC 1991c)

		R-2917	R-2918	R-2919
Wt % Filtered Solids		66	29	27
Total Beta	nCi/g	7.6E04	1.53E05	9.43E04
Total Alpha	nCi/g[3]	3.9E02	6.90E02	5.95E02
Cs-137	nCi/g	7.6E02		7.61E02
Al	mg/g	43.9	153.4	89.6
Na	mg/g	7.6	24.3	28.0
Fe	mg/g	9.9	9.1	5.8
Cr	mg/g	4.0	7.2	7.2
Mn	mg/g	1.8	6.1	2.0
Ca	mg/g	2.9	2.4	1.7
P	mg/g	0.7	0.9	0.9
Ni	mg/g	0.1	0.9	0.2
Mg	mg/g	1.1	0.4	0.3
Bi	mg/g	0.6	0.0	1.0

[2]All concentrations expressed per gram filtered solids.

[3]All three samples were 83% +/- 1% Pu-239/240, 17% Am-241

APPENDIX B

SAMPLE ANALYSIS RESULTS

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HOT SEMI-WORKS SAMPLE ANALYSIS SUMMARY

Tank: CX 70
Serial ID: R 8643
Customer ID: 0122-1

	LMCS Check Standard	Reagent Blank	Sample	Duplicate of Sample	Spike of Sample	LMCS Check Standard
Laboratory ID:	5513	5613	5713	5813	N/A	5513
pH	*	*	10.61	10.51	N/A	*
2nd Run	100.90%	5.77	10.54	10.53	N/A	100.30%
Laboratory ID:	5597	5697	5797	5897	5997	5597
Mercury	102.91%	<2.00E-4 ppm	<2.00E-3 ppm	<2.00E-3 ppm	116.30%	107.77%

* The standard had expired.

Sample Appearance: No observable solids were present in the aqueous sample. The liquid was transparent yellow in color and displayed no organic phasing.

ICP DATA SUMMARY

Direct Analysis

Date Analyzed:	March 13, 1991	LMCS Check Standard	R8643-5550
Procedure:	LA-505-151/A-0	Reagent Blank	NONE
Analyst:	L. L. Morrison	Sample	R8643-5750
		Duplicate	R8643-5850
		Spike	R8643-5950

	Instrument Starting LMCS Standard %	Reagent BLANK ppm	Wet Weight Sample ug/mL		Wet Weight Sample Duplicate ug/mL		Spike Recovery %	Closing LMCS Standard %
Aluminum	103.20		20		16		105.57	101.00
Antimony	99.46		9		6	LT		95.08
Arsenic	84.40 #		4		3		84.65	81.20 #
Barium	103.85		0	LT	0	LT		105.80
Beryllium	100.42		0	LT	0	LT	98.25	98.50
Bismuth	102.60		5	LT	5	LT		101.20
Boron	99.00		1	LT	1	LT		98.20
Cadmium	95.93		0	LT	0	LT		90.60
Calcium	97.37		11		14			98.80
Cerium	94.00		8	LT	8	LT		92.00
Chromium	95.60		164		176			92.20
Cobalt	96.80		2	LT	2	LT		93.50
Copper	102.70		1	LT	1	LT		103.40
Europium	98.60		0	LT	0	LT		99.20
Iron	101.80		1		0	LT		99.40
Lanthanum	95.20		1	LT	1	LT		95.60
Lead	97.60		2	LT	2	LT		97.80
Lithium	100.20		0	LT	0	LT		105.00
Magnesium	99.40		20		2			97.40
Manganese	98.40		0		0			96.00
Mercury	105.20		1		1		100.00	100.20
Molybdenum	97.00		2		1		80.65	93.40
Neodymium	98.40		13	LT	13	LT		97.40
Nickel	95.60		1	LT	1	LT		91.60
Phosphorous	103.80		48		45		102.73	98.00
Potassium	88.68 #		30		34			74.40 #
Samarium	95.00		9	LT	9	LT		93.00
Selenium	99.00		69		67		NOT CALC	94.00
Silicon	99.80		8		4		97.16	97.70
Silver	101.80		1	LT	1	LT		101.80
Sodium	94.20		31754		31477			93.90
Strontium	99.10		0	LT	0	LT		100.70
Sulfur	103.80		1872		1953		NOT CALC	99.20
Tantalum	94.50		2	LT	2	LT	91.37	90.70
Thallium	104.60		46		40		NOT CALC	100.40
Thorium	106.50		1	LT	1	LT		105.20
Tin	100.60		5		4			95.00
Titanium	99.80		0	LT	0	LT	98.86	96.80
Tungsten	100.30		2	LT	2	LT	97.85	95.70
Uranium	112.40 #		874		834			97.40
Vanadium	97.70		3		2		95.44	93.80
Zinc	98.98		0	LT	0	LT		98.82
Zirconium	96.20		1	LT	1	LT	95.16	93.20

LT: Less Than
NC: Not Calibrated
NOT CALC: Not Calculated
Instrument Standards Outside Control Limits

APPENDIX C

SAMPLE RESULTS OF RESAMPLING
(Weiss 1992)

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ANALYTE	SAMPLE ID NUMBERS				UNITS	SPIKE[1]
	913-5	913-4	913-3	913-3[2]		913-3
pH	11.4	11.4	11.3	11.3		NA[3]
Cyanide	<0.5	<0.5	<0.5	<0.5	ug/g	99%
Al[4]	72000	57000	60000	55000	ug/g	110%
Ca[4]	1600	1500	2100	1800	ug/g	NA
Cr[4]	5400	4600	5100	5000	ug/g	SXS[5]
Fe[4]	3200	2800	2900	2700	ug/g	SXS
Hg[6]	<0.0004	<0.0005	<0.0005	<0.0005	ug/g	110%
K[4]	320	240	240	250	ug/g	NA
Mg[4]	150	10	180	100	ug/g	NA
Mn[4]	2400	1700	1900	1600	ug/g	NA
Na[4]	62000	59000	58000	59000	ug/g	NA
Ni[4]	120	96	110	93	ug/g	110%
Se[4]	500	390	460	450	ug/g	110%
Se[7]	<0.005	<0.005	<0.005	<0.005	ug/g	120%
U[4]	18000	17000	17000	19000	ug/g	110%
Zn[4]	70	49	109	60	ug/g	110%
Total Alpha	0.46	0.35	<0.4	0.44	uCi/g	110%
Total Beta	96	75	88	84	uCi/g	100%
Cs-137[8]	1.2	1.3	1.2	1.2	uCi/g	85%
Sr-90	30	24	25	26	uCi/g	NA
Am-241	0.13	0.40	0.14	0.18	uCi/g	NA
Pu-239/240	<0.6	<0.7	<0.8	<0.8	uCi/g	NA

[1] Sample of 913-3 spiked with known amount of material. Values represent percent recovery of known addition.
[2] Duplicate analysis on sample #913-3.
[3] Spike not added to sample.
[4] Analysis by Inductively Coupled Plasma Spectroscopy.
[5] Sample concentration exceeded four times spike addition, spike recovery calculation is not valid in these cases.
[6] Analysis by Cold Vapor Atomic Absorption Spectroscopy.
[7] Analysis by Hydride Atomic Absorption Spectroscopy.

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APPENDIX D

BARREL INVENTORY

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PIN NUMBER	GROSS WEIGHT (lbs)	NUCLIDES (Curies)				TRU * FISSILE _ Weight (grams)				HAZARD MATERIAL Weight (Kg)	
		Sr-90	Y-90	Cs-137	Ba-137	Pu-239 (95%)	Pu-240 (5%)	Am-241	U-238	Chromium	Selenium
201C-91-0117	350	1.158	1.158	5.018 E-2	5.018 E-2	.0195	.00209	.1560	7.334 E+2	.21	.019
201C-91-0118	330	.885	.885	3.835 E-2	3.835 E-2	.0149	.00215	.1192	5.605 E+2	.16	.015
201C-91-0119	325	1.638	1.638	7.098 E-2	7.098 E-2	.0138	.00199	.1103	5.187 E+2	.15	.014
201C-91-0120	330	.885	.885	3.835 E-2	3.835 E-2	.0149	.00215	1.192 E-1	5.605 E+2	.16	.015
201C-91-0121	350	1.158	1.158	5.018 E-2	5.018 E-2	.0195	.00209	.1560	7.334 E+2	.21	.019
201C-91-0122	350	2.316	2.316	.10	.10	.0195	.00209	.1560	7.334 E+2	.21	no
201C-91-0123	380	.1359	.1359	3.138	3.138	.0264	.00381	.2114	9.937 E+2	.28	.026
201C-91-0124	360	2.592	2.592	.11232	.11232	.0218	.00314	.1746	8.2 E+2	.23	.022
201C-91-0125	355	1.227	1.227	5.137 E-2	5.137 E-2	.0207	.00298	1.653 E-1	7.771 E+2	.22	.02
201C-91-0126	350	2.316	2.316	.10	.10	no data	no data	no data	7.334 E+2	.21	.019
201C-91-0127	360	1.296	1.296	5.616 E-2	5.616 E-2	.0218	.00314	.1746	8.208 E+2	.23	.022
201C-91-0128	350	1.158	1.158	5.018 E-2	5.018 E-2	.0195	.00209	.156	7.334 E+2	.21	.019
201C-91-0129	320	1.50	1.50	6.5 E-2	6.5 E-2	.0126	.00182	.1011	4.75 E+2	.14	.013
201C-91-0130	350	2.316	2.316	.10	.10	no data	no data	no data	7.334 E+2	.21	.019
201C-91-0131	340	2.184	2.184	8.866 E-2	8.866 E-2	.0172	.00248	.1378	6.479 E+2	.18	.017
201C-91-0132	350	2.316	2.316	.10	.10	.0195	.00209	.1560	7.334 E+2	.21	.019
201C-91-0133	345	2.184	2.184	9.464 E-2	9.464 E-2	.0184	.00265	.1471	6.916 E+2	.20	.018
201C-91-0134	345	2.184	2.184	9.464 E-2	9.464 E-2	.0184	.00265	.1471	6.916 E+2	.20	.018
201C-91-0135	330	1.77	1.77	7.67 E-2	7.67 E-2	.0149	.00215	.1192	5.60 E+2	.16	.015
201C-91-0136	360	2.592	2.592	.11232	.11232	.0218	.00314	.1746	8.2 E+2	.23	.022
201C-91-0137	390	3.408	3.408	.1477	.1477	.0287	.00413	.2296	1.079 E+3	.31	.028
201C-91-0138	350	3.16	3.16	1.004	1.004	.0195	.00209	.1560	7.334	.21	.019
201C-91-0139	340	2.184	2.184	8.866 E-2	8.866 E-2	.0172	.00248	.1378	6.479 E+2	.18	.017

PIN NUMBER	GROSS WEIGHT (lbs)	NUCLIDES (Curies)				TRU * FISSILE _ Weight (grams)				HAZARD MATERIAL Weight (Kg)	
		Sr-90	Y-90	Cs-137	Ba-137	Pu-239 (95%)	Pu-240 (5%)	Am-241	U-238	Chromium	Selenium
201C-91-0140	380	.1359	.1359	3.138	3.138	.0264	.00381	.2114	9.937 E+2	.28	.026
201C-91-0141	375	3.0	3.0	.13	.13	.0253	.00364	.2021	9.2 E+2	.27	.025
201C-91-0142	365	2.73	2.73	.1183	.1183	.0230	.00331	.1839	8.656 E+2	.25	.023
201C-91-0143	400	3.684	3.684	.1596	.1596	.0311	.00447	.2482	1.166 E+2	.33	.031
201C-91-0144	380	3.138	3.138	.13598	.13598	.0264	.00381	.2114	9.937 E+2	.28	.026
201C-91-0145	340	2.184	2.184	8.866 E-2	8.866 E-2	.0172	.00248	.1378	6.481	no data	no data
201C-91-0146	380	3.138	3.138	.13598	.13598	.0264	.00381	.2114	9.937 E+2	.28	2.026
201C-91-0147	340	2.184	2.184	8.866 E-2	8.866 E-2	.0172	.00248	.1378	6.481 E+2	.18	.017
201C-91-0148	340	2.184	2.184	8.866 E-2	8.866 E-2	.0172	.00248	.1378	6.481 E+2	.18	.017
201C-91-0149	390	3.408	3.408	.1477	.1477	.0287	.00413	.2296	1.079 E+3	.31	.028
201C-91-0150	390	3.408	3.408	.1477	.1477	.0287	.00413	.2296	1.079 E+3	.31	.028
201C-91-0151	385	3.27	3.27	.1417	.1417	.0276	.00397	.2203	1.03E+3	.29	.027
201C-91-0152	365	2.73	2.73	.1183	.1183	.0230	.00331	.1839	8.656 E+2	.25	.023
201C-91-0153	410	3.948	3.948	.1709	.1709	.0333	.00479	.2660	1.25 E+2	.36	.033
201C-91-0154	360	2.592	2.592	.11232	.11232	.0218	.00314	.1746	8.2 E+2	.23	.022
201C-91-0155	320	1.50	1.50	.065	.065	.0126	.00182	.1011	4.75 E+2	.14	.013
201C-91-0156	380	3.138	3.138	.13598	.13598	.0264	.00381	.2114	9.937 E+2	.28	.026
201C-91-0157	360	2.592	2.592	.11232	.11232	.0218	.00314	.1746	8.2 E+2	.23	.022
201C-91-0158	300	.954	.954	5.34 E-2	5.34 E-2	.0080	.00116	.0643	.03021	.086	.008
201C-91-0159	360	2.592	2.592	.11232	.11232	.0218	.00314	.1746	8.2 E+2	.23	.022
201C-91-0160	360	2.592	2.592	.11232	.11232	.0218	.00314	.1746	8.2 E+2	.23	.022
HRO-92-0186	380	3.138	3.138	.0136	.0136	.0264	.00318	.2114	9.939 E+2	.28	.026
HRO-92-0187	360	2.592	2.592	.01123	.01123	.0218	.00314	.1746	8.208	.23	.022

PIN NUMBER	GROSS WEIGHT (lbs)	NUCLIDES (Curies)				TRU * FISSILE _ Weight (grams)				HAZARD MATERIAL Weight (Kg)	
		Sr-90	Y-90	Cs-137	Ba-137	Pu-239 (95%)	Pu-240 (5%)	Am-241	U-238	Chromium	Selenium
HRO-92-0188	375	3.0	3.0	.013	.013	.0253	.00364	.2021	9.5 E+2	.27	.025
HRO-92-0189	320	1.5	1.5	6.5 E-2	6.5 E-2	.0126	.00182	.1011	4.75 E+2	.14	.013
HRO-92-0190	330	.058	.058	.00026	.00026	.00504	7.02 E-5	3.905 E-3	18.35	.004909	.000454
HRO-92-0203	330	1.77	1.77	.0767	.0767	.0149	.00215	.1192	5.60 E+2	.16	.015
HRO-92-0204	300	.954	.954	.0534	.0534	.0080	.00116	.0643	3.021 E+2	.086	.008
HRO-92-0205	300	.954	.954	.0534	.0534	.0080	.00116	.0643	3.021 E+2	.086	.008
HRO-92-0206	315	1.362	1.362	.059	.059	.0115	.00165	.0918	4.313 E+2	.12	.011
HRO-92-0207	290	.684	.684	2.964 E-2	2.964 E-2	.0058	.00083	.0461	2.166 E+2	.061	.006
HRO-92-0208	290	.342	.342	1.482 E-2	1.482 E-2	.0058	.00083	4.61 E-2	2.166 E+2	.061	.006
HRO-92-0209	280	.204	.204	8.84 E-3	8.84 E-3	.0034	.00049	2.75 E-2	1.292 E+2	.037	.003

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APPENDIX E

WASTE DESCRIPTION

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WASTE DESCRIPTION

Table E-1 is a informational summary of the isotopes contained in the 241-CX-70 waste based on the barrel inventories of Appendix D.

TABLE E-1

ISOTOPE	SYMBOL	HALF-LIFE	DECAY MODE
STRONTIUM	Sr-90	28 years	BETA
YTTRIUM	Y-90	64.2 hours	BETA
CESIUM	Cs-137	30 years	BETA
BARIUM	Ba-137		
URANIUM	U-238	4.51 E9 years	ALPHA, SF
PLUTONIUM	Pu-239	24,360 years	ALPHA, SF
PLUTONIUM	Pu-240	6,580 years	ALPHA, SF
AMERICIUM	Am-241	458 years	
		SF : Spontaneous Fission	

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Date Received: 12-8-92 JO	INFORMATION RELEASE REQUEST ✓	Reference: WHC-CM-3-4

Complete for all Types of Release

Purpose		ID Number (include revision, volume, etc.)
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Title	Unclassified Category	Impact Level
Facility Decommissioning Report for Tank 241-CX-70	UC-	4

New or novel (patentable) subject matter? [X] No [] Yes
If "Yes", has disclosure been submitted by WHC or other company?
[] No [] Yes Disclosure No(s).

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Intended Audience
[] Internal [] Sponsor [X] External

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Project Title/Work Order:

Facility Decommissioning Report for Tank 241-CX-70, WHC-SD-DD-TI-071 Rev. 0

EDT No.: 156163

ECN No.:

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