Origin of TRU Waste in Hanford Single-Shell Tanks

March 02, 2004

Approved for Public Release;
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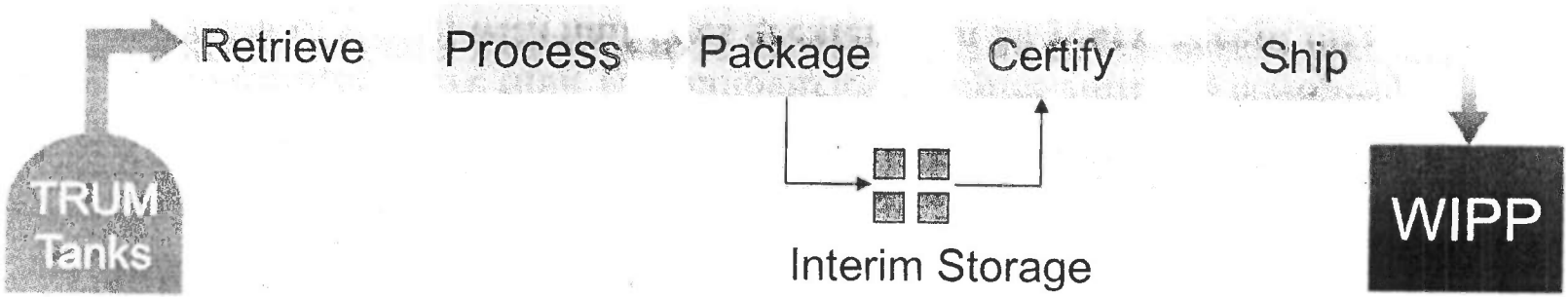
Topics

- Program
- TRU Regulatory Perspective
- Origin of Wastes
- TRU Waste Composition
- TRU Tanks

Overview of Hanford Tank TRU Program



TRU Waste Regulatory Perspective

- **Waste Isolation Pilot Plant Land Withdrawal Act of 1992, as amended.**

  TRANSURANIC WASTE: The term "transuranic waste" means waste containing more than 100 nanocuries of alpha-emitting isotopes per gram of waste, with half-lives greater than 20 years, except for:

  A. **High-level radioactive waste;**

  B. **Waste that the Secretary has determined, with the concurrence of the Administrator, does not need the degree of isolation required by the disposal regulations; or**

  C. **Waste that the Nuclear Regulatory Commission has approved for disposal on a case-by-case basis in accordance with part 61 of title 10, Code of Federal Regulations.**

  HIGH-LEVEL RADIOACTIVE WASTE: The term "high-level radioactive waste" has the meaning given such a term in the Nuclear Waste Policy Act of 1982 (42 U.S.C.10101(12)).

TRU Waste Regulatory Perspective continued

- **42 U.S.C.10101(12) of the Nuclear Waste Policy Act of 1982**

  The term "high-level radioactive waste" means –

  (A) the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and

  (B) other highly radioactive material that the Nuclear Regulatory Commission, consistent with existing law, determines by rule required permanent isolation.

- **42 U.S.C.10101(23) of the Nuclear Waste Policy Act of 1982**

  The term "spent nuclear fuel" means fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated by reprocessing.

TRU Waste Regulatory Perspective continued

- U.S. District Court of Idaho memorandum decision on DOE Order 435.1 (Civ. No. 01-0413-S-BLW)
  - Judge Windmill stated in the analysis of this memorandum decision "... Congress defined HLW in NWPA as 'highly radioactive material resulting from the reprocessing of spent nuclear fuel'. Congress then used the word 'including' to signal that what followed were examples designed to illustrate the definition just given. The two examples are (1) 'liquid waste produced directly in reprocessing'; and (2) 'solids material derived from the such liquid waste that contains fission products in sufficient concentrations." [Memorandum Decision page 9 -10]
  - Judge Windmill further stated "The liquid and solids are treated differently by the Act. While NWPA allows DOE to treat the solids to remove fission products, thereby permitting reclassification of the waste, NWPA does not offer the option of reclassification for liquid waste produced directly in reprocessing. [Memorandum Decision page 10]

TRU Waste Regulatory Perspective continued

- The TRU tank wastes are derived from <u>plutonium solids</u> that were produced from reprocessing spent nuclear fuel.
  - The aluminum coating around the spent nuclear fuel was first dissolved and discarded to waste storage tanks.
  - The spent nuclear fuel (SNF) was then dissolved.
  - Plutonium, a special nuclear material, was precipitated as a solid from the dissolved SNF.
  - The dissolved SNF was a liquid that was discarded to waste storage tanks.
  - The special nuclear material, plutonium solids, were further processed. Waste from processing the plutonium solids was transferred to separate waste storage tanks.

TRU Waste Regulatory Perspective continued

- **The Atomic Energy Act of 1954 (P.L. 83-703) section 11 subpart (aa) defines:**
  - The term "special nuclear material" means (1) plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the Commission, pursuant to the provisions of section 51 determines to be special nuclear material, but does not include source material; or (2) any material artificially enriched by any of the foregoing, but does not include source material.
- **The plutonium separated from the spent nuclear fuel is a special nuclear material; not high-level waste.**
- **Any waste produced from processing a special nuclear material is not high-level waste, since this waste is not produced directly from the reprocessing of spent nuclear fuel.**

Origin of Wastes

- Identified waste in tanks is TRU
  - Resulted from purification of Plutonium Products; not fuel reprocessing
  - Subset of SST's have not been intermixed with fuel reprocessing HLW
  - Waste is not spent fuel

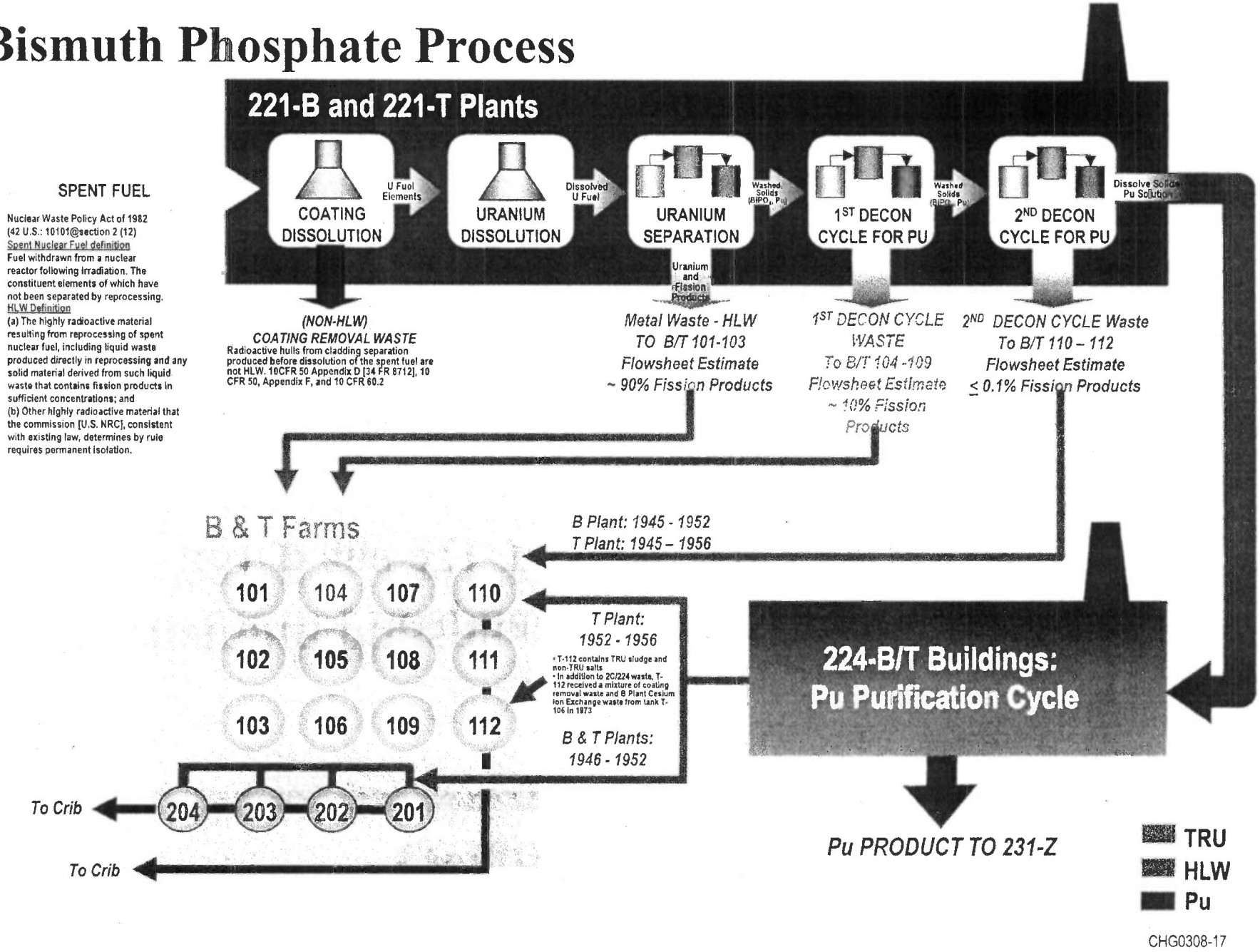
Confidence for waste origin

- Taking advantage of characterization data developed as part of TPA M-44 milestone and DNFSB 93-5
- Have good records:
  - physical configuration
  - fill history
  - characterization

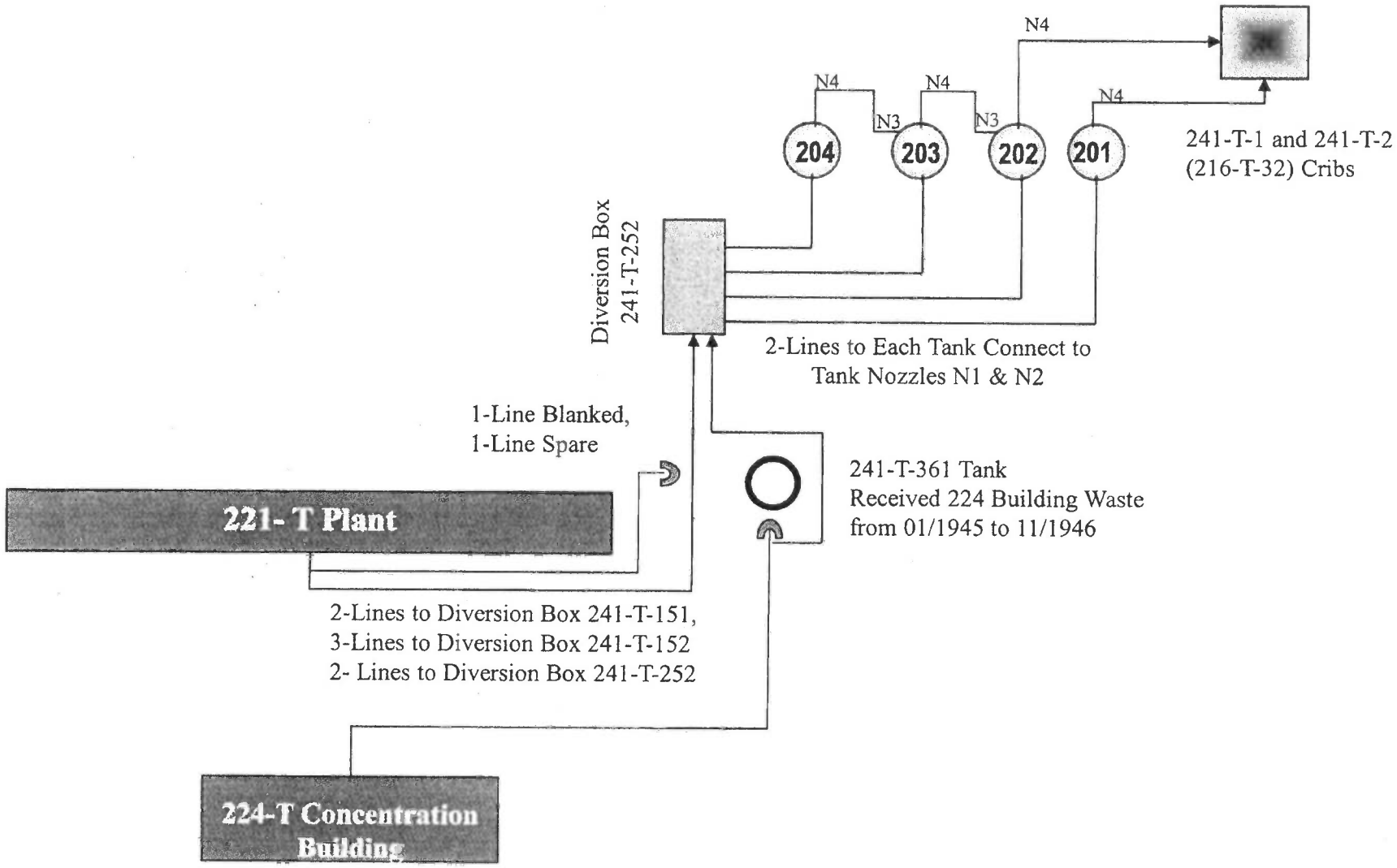
Origin of Wastes

- Bismuth Phosphate Process
  - 221-B and 221-T Plants
- Plutonium Concentration
  - 224-B and 224-T Buildings

Bismuth Phosphate Process

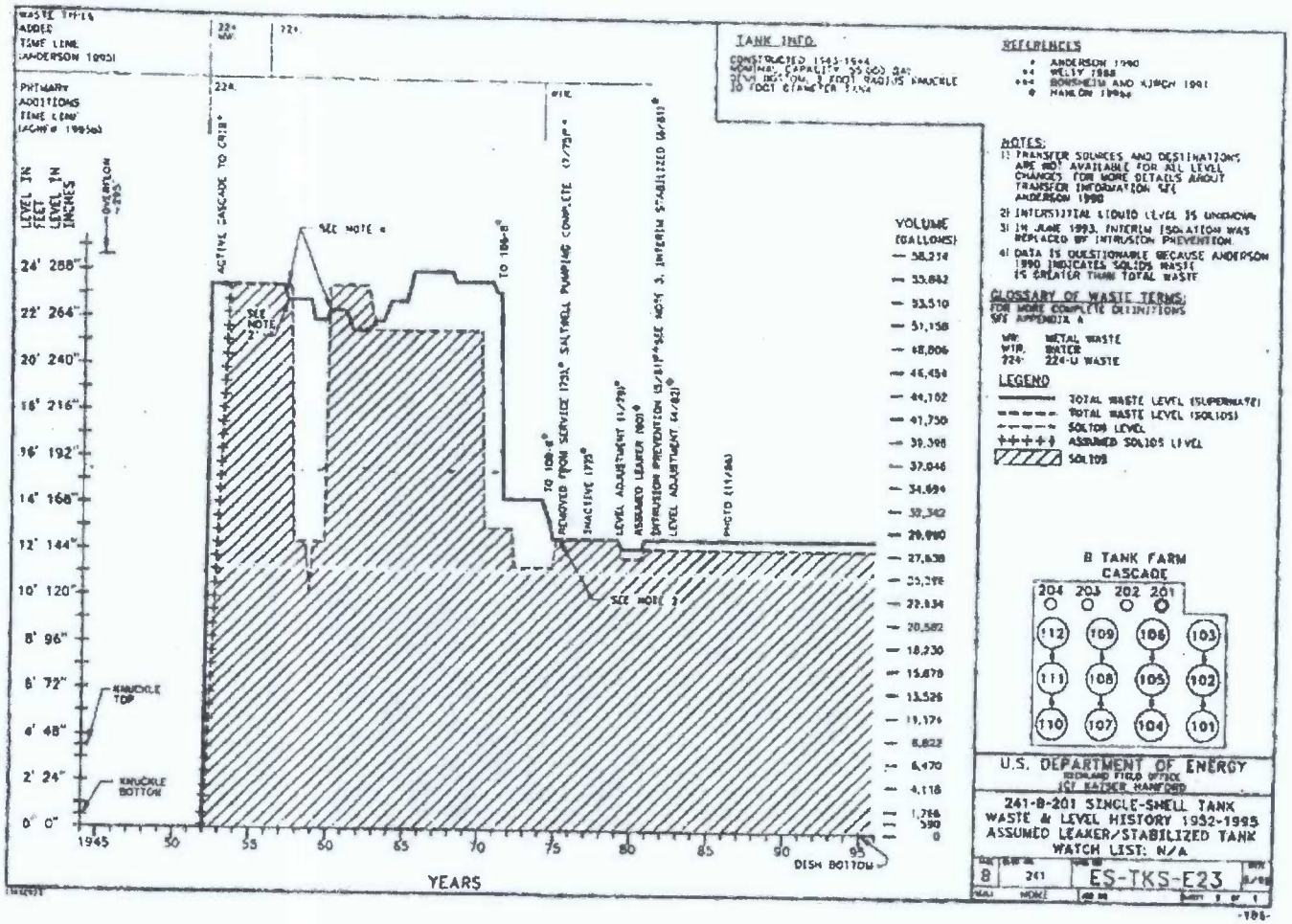


Example physical configuration
224-T Waste Routing to T-200 Series SSTs



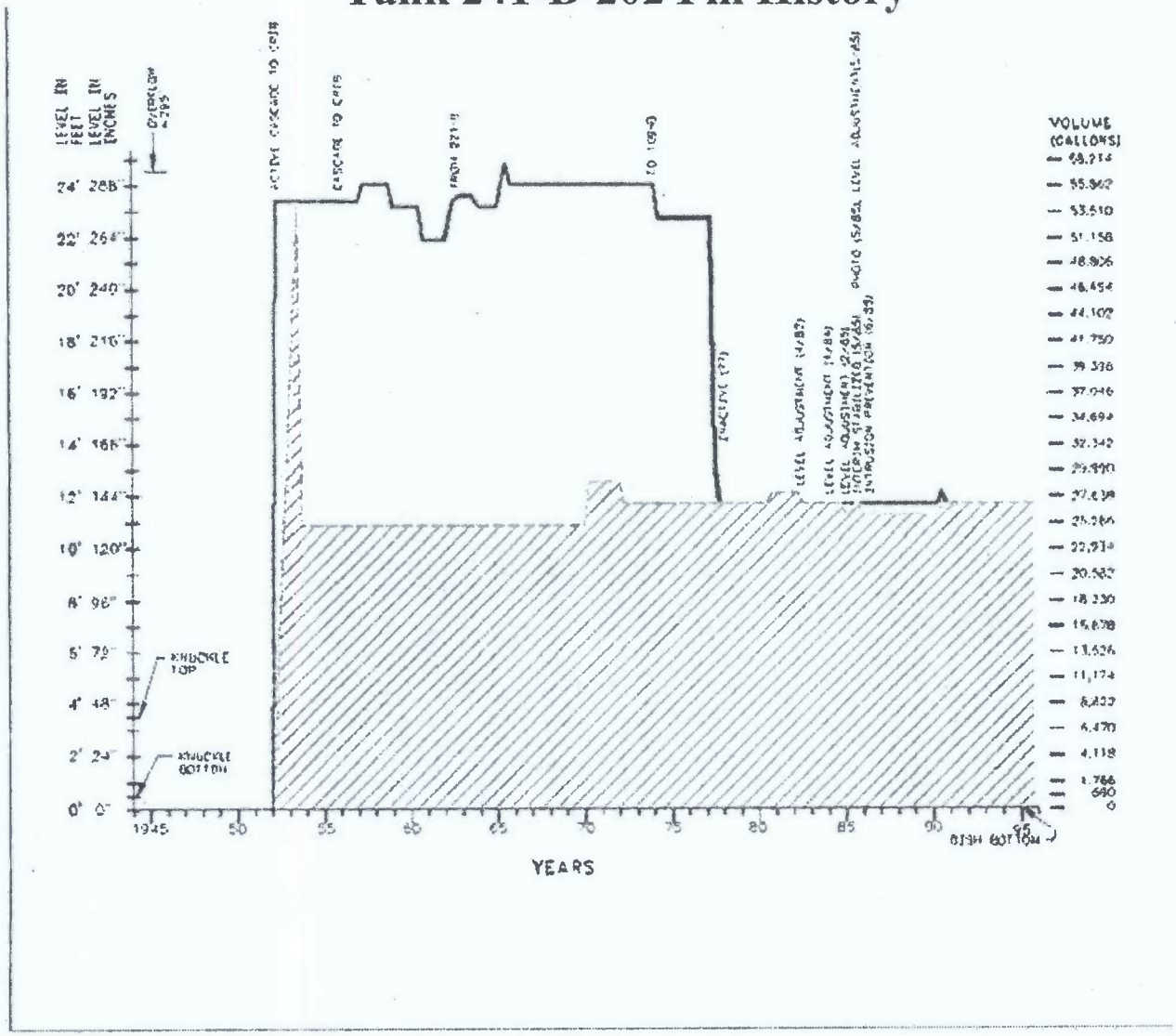
Waste Fill History and Characterization

Tank 241-B-201 Fill History



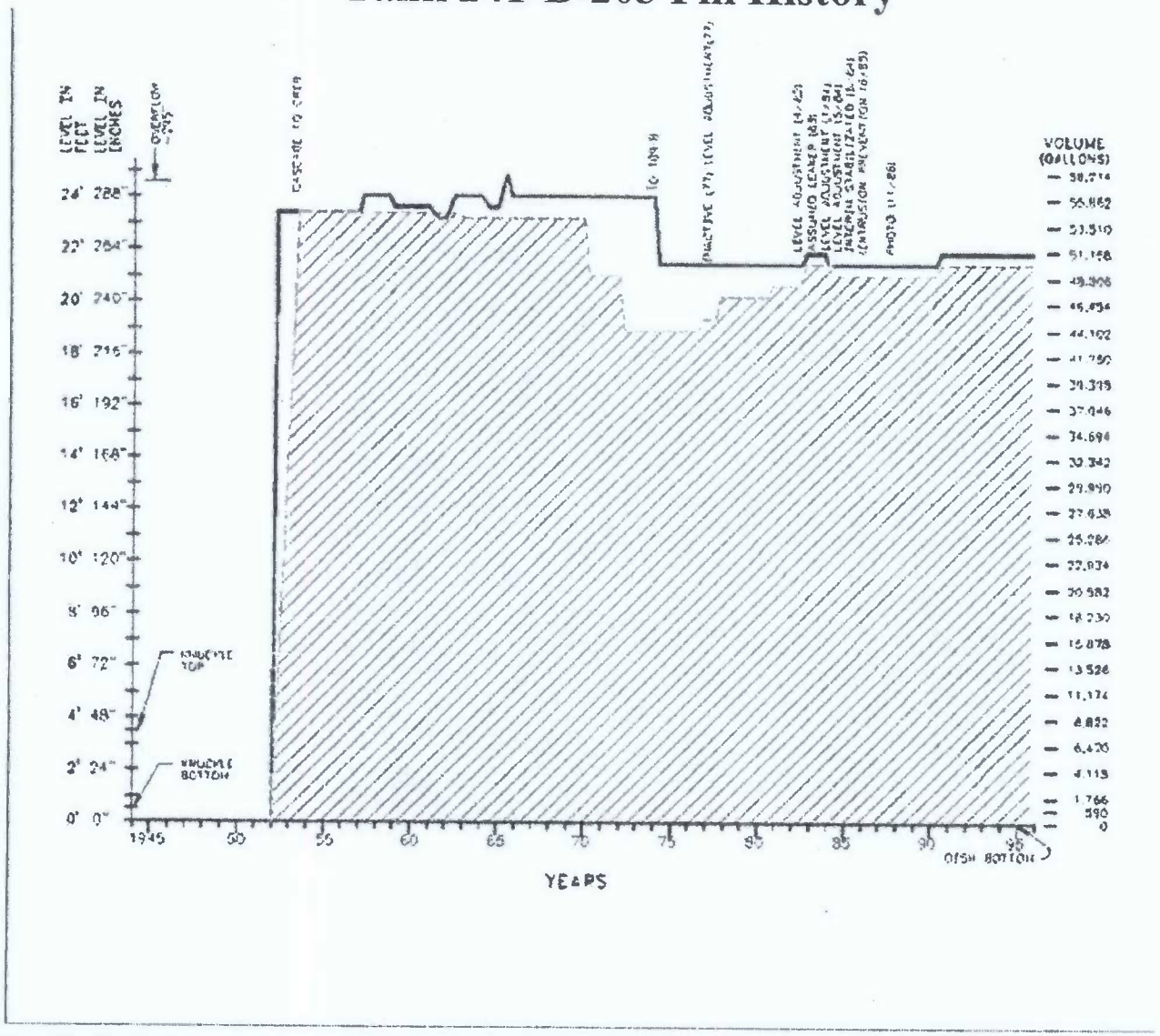
Note: 224 Bldg. Waste Routed to B-201 in October 1946 per the Hanford site monthly report (HW-7-5362-DEL, page 27). The Hanford site monthly reports did not tract the volume of waste present in the B-200's or T-200's series tanks. Beginning in 1952, the volume of waste present in the B-200's or T-200's series tanks was tracked in the Waste Status Summary reports.

Tank 241-B-202 Fill History



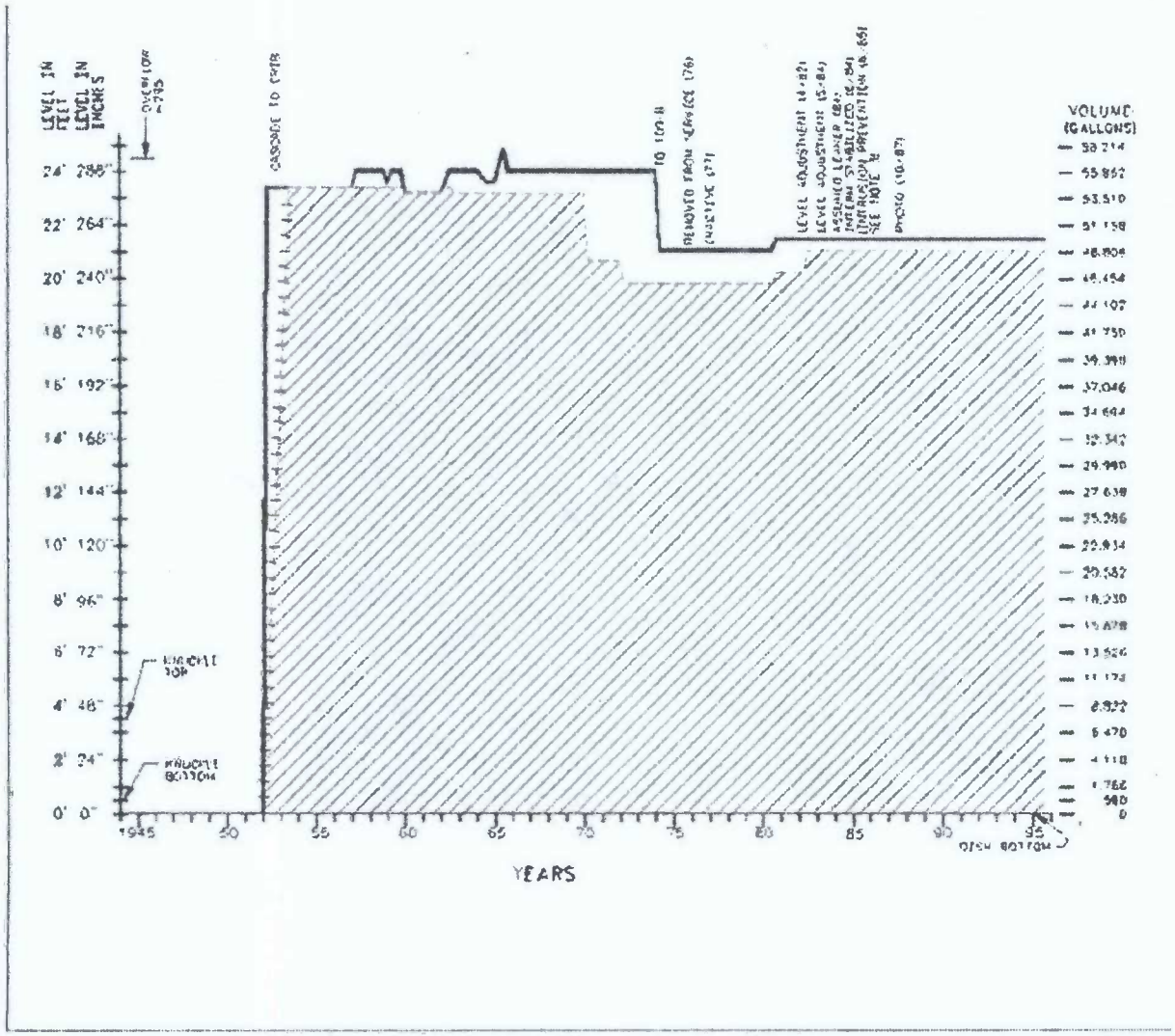
Note: The Hanford site monthly reports did not tract the volume of waste present in the B-200's or T-200's series tanks. Beginning in 1952, the volume of waste present in the B-200's or T-200's series tanks was tracked in the Waste Status Summary reports.

Tank 241-B-203 Fill History



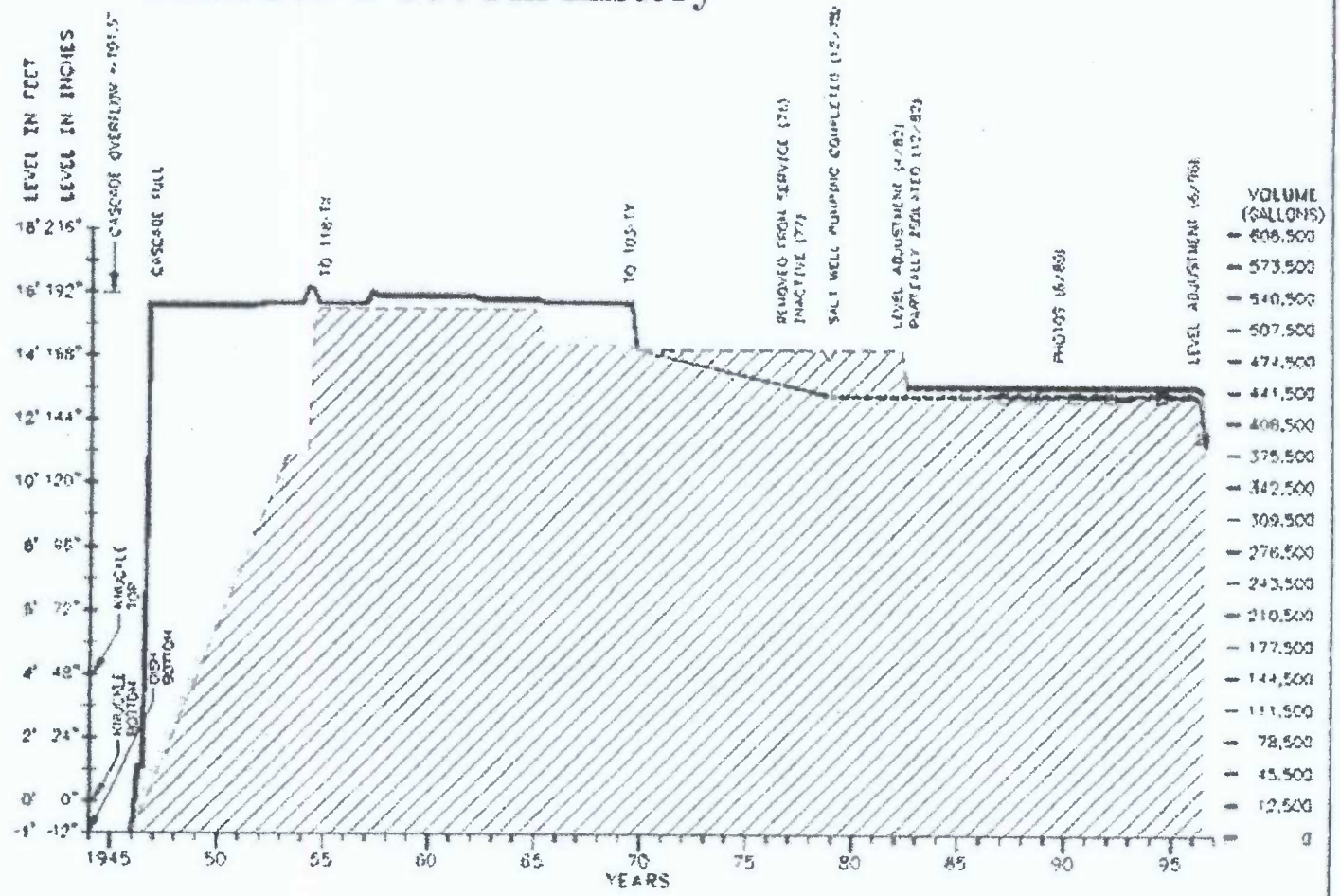
Note: The Hanford site monthly reports did not tract the volume of waste present in the B-200's or T-200's series tanks. Beginning in 1952, the volume of waste present in the B-200's or T-200's series tanks was tracked in the Waste Status Summary reports.

Tank 241-B-204 Fill History

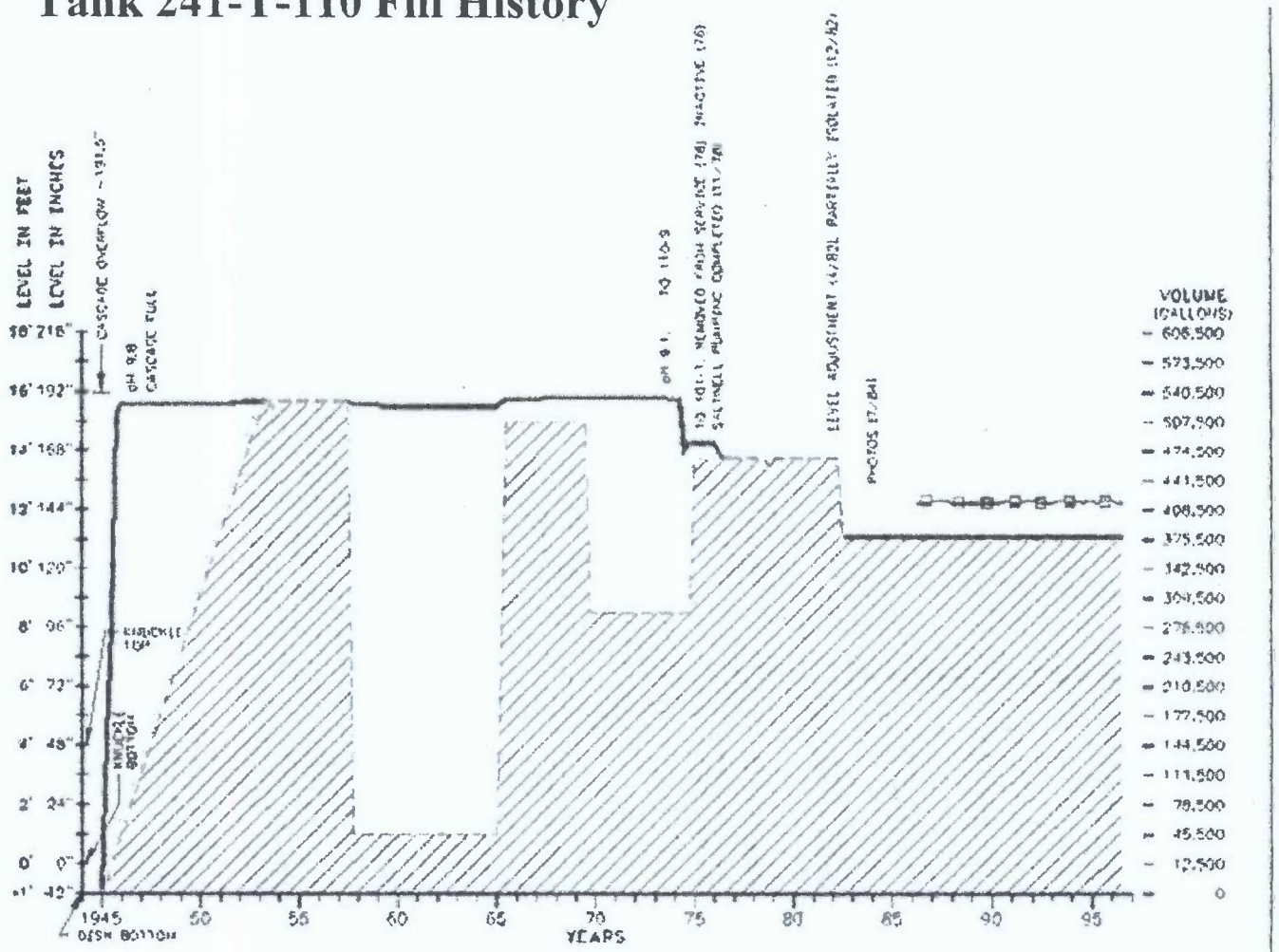


Note: The Hanford site monthly reports did not tract the volume of waste present in the B-200's or T-200's series tanks. Beginning in 1952, the volume of waste present in the B-200's or T-200's series tanks was tracked in the Waste Status Summary reports.

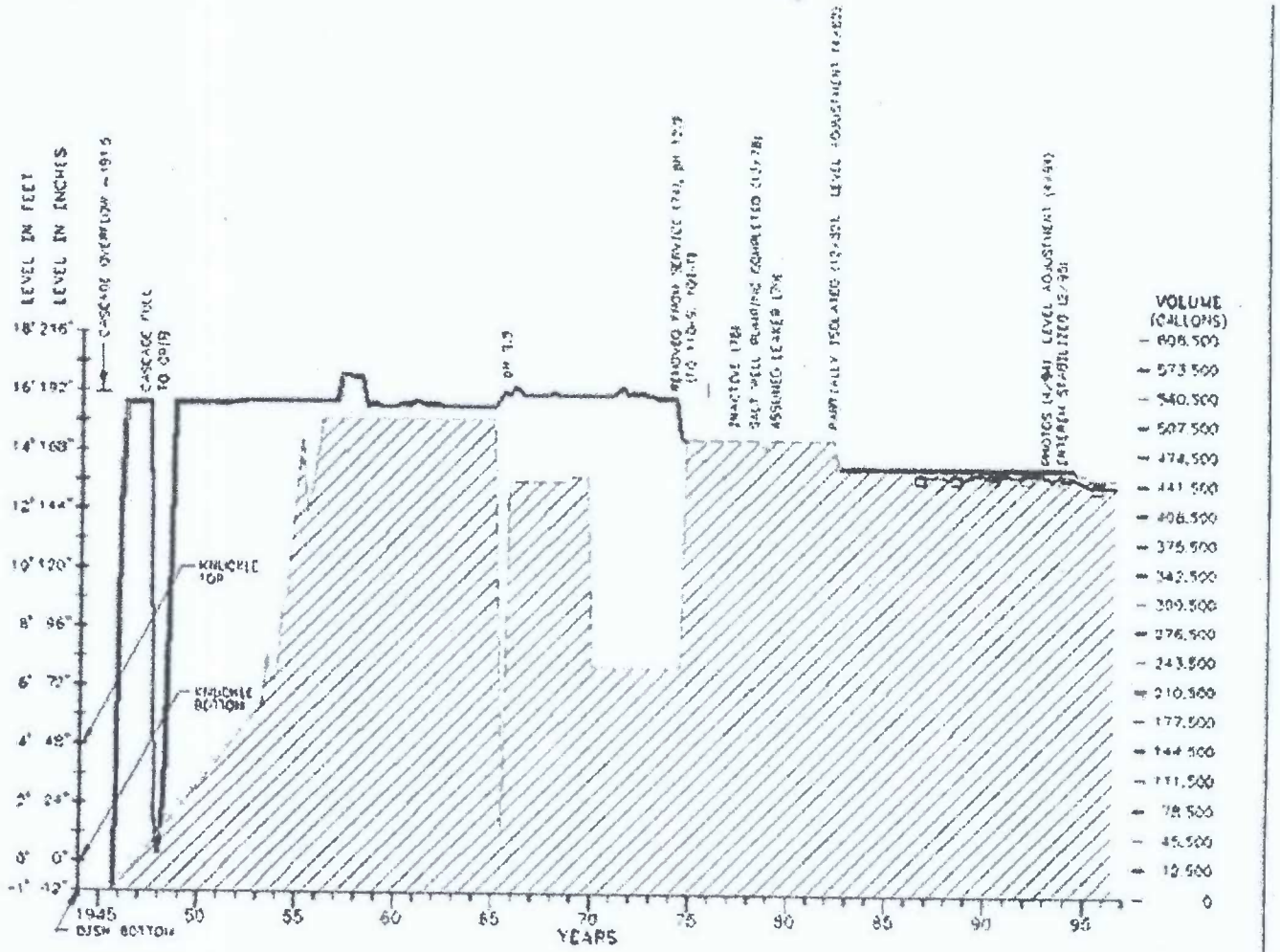
Tank 241-T-104 Fill History



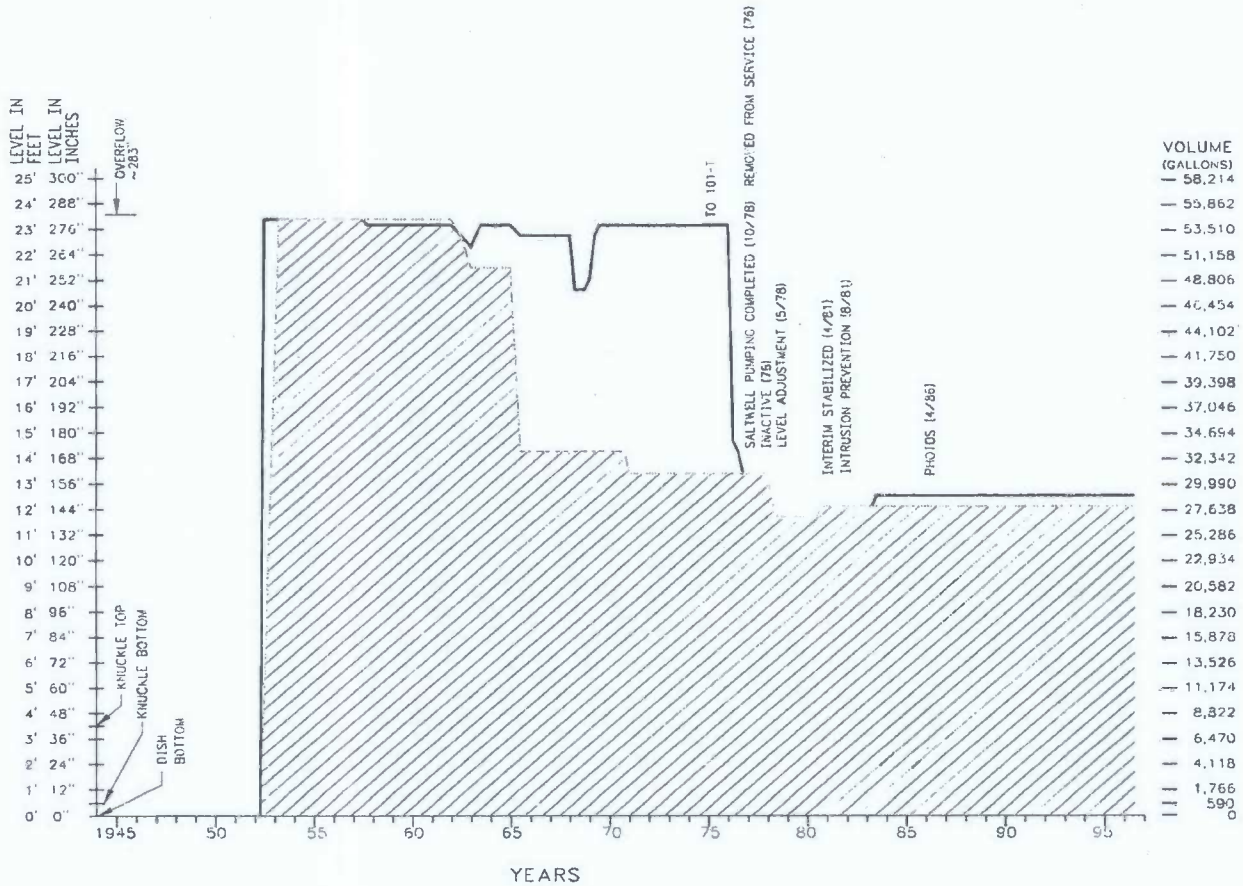
Tank 241-T-110 Fill History



Tank 241-T-111 Fill History

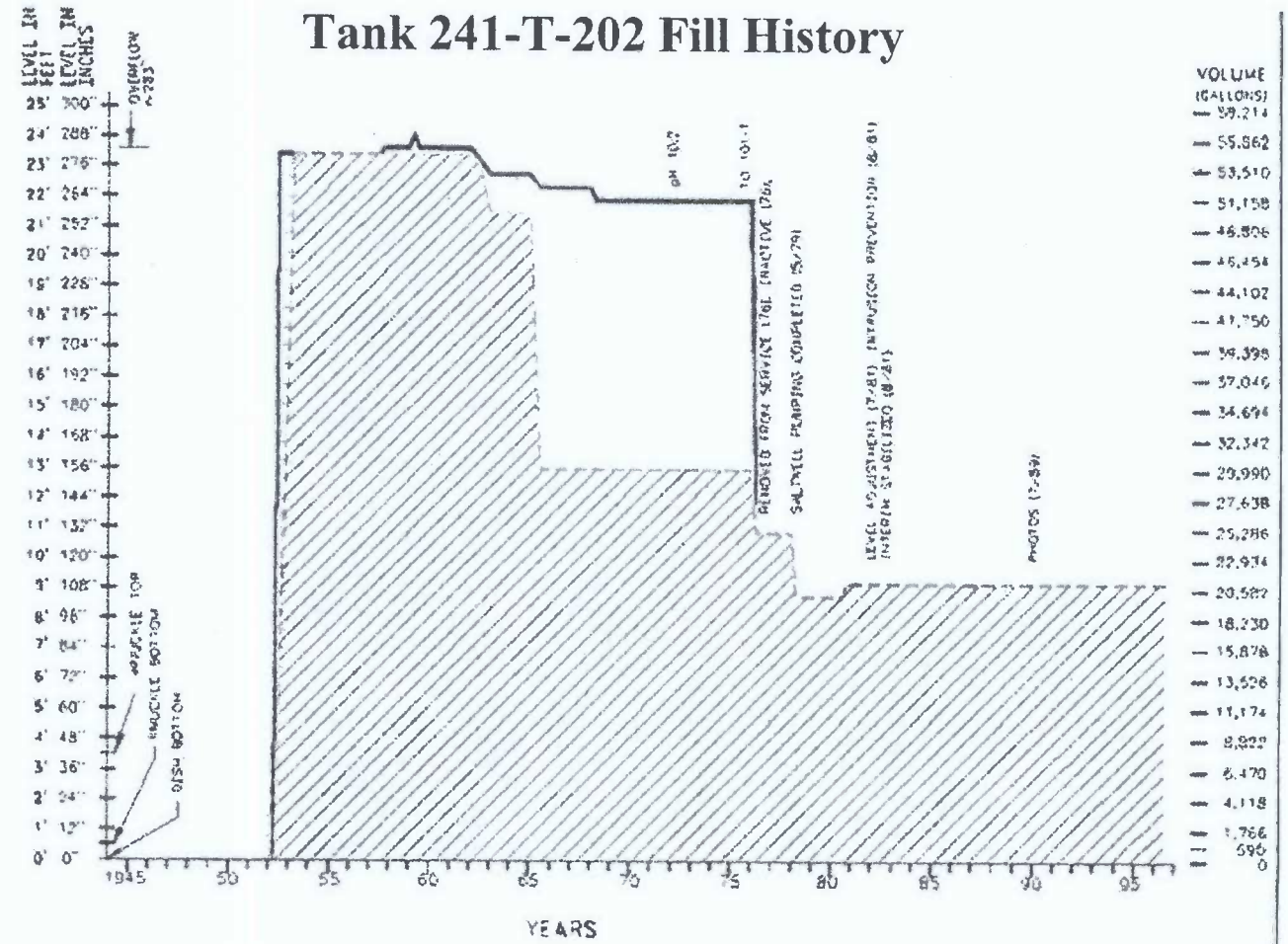


Tank 241-T-201 Fill History



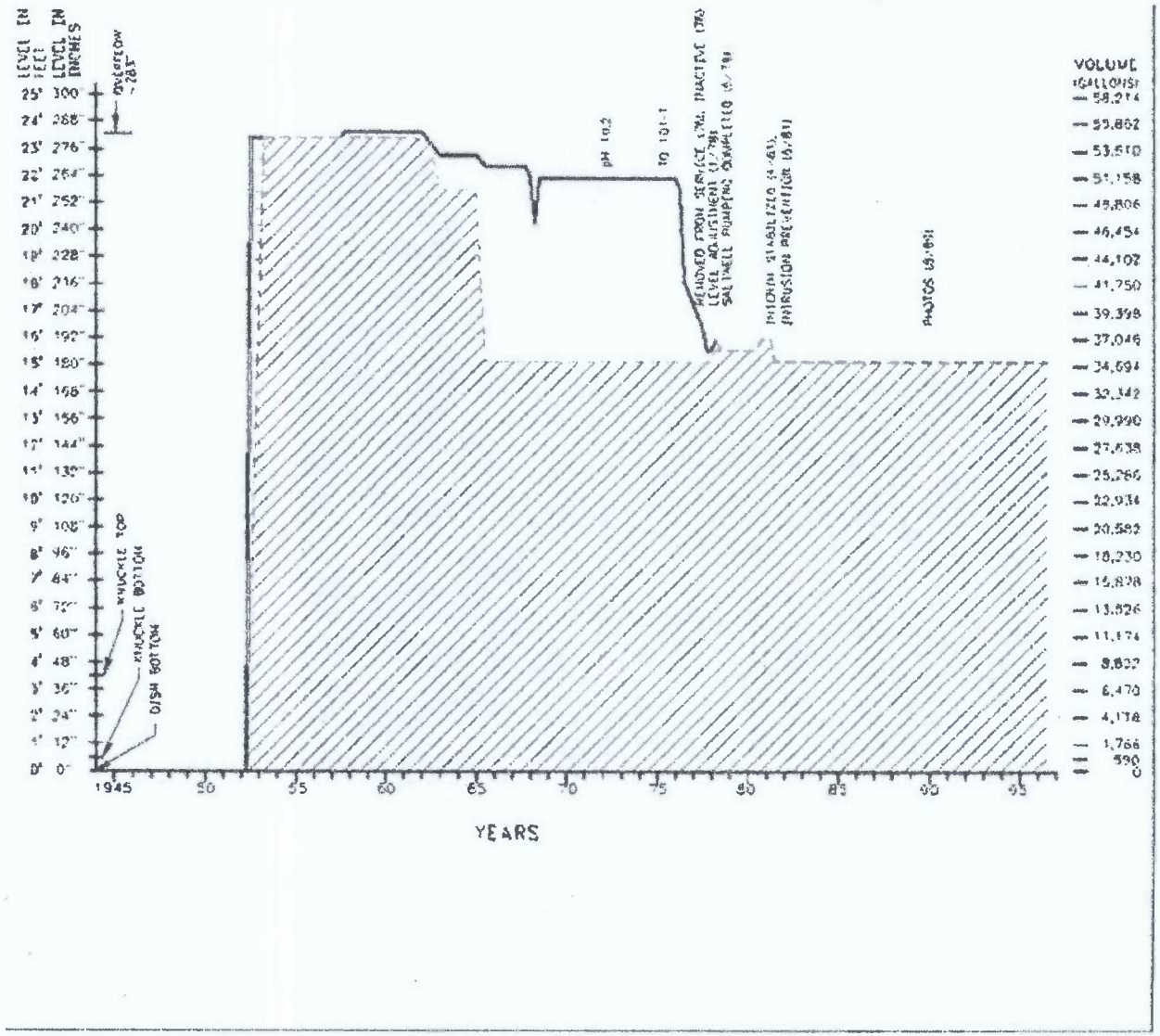
Note: 224 Bldg. Waste Routed to T-201 in October 1946 per the Hanford site monthly report (HW-7-5362-DEL, page 27). The Hanford site monthly reports did not tract the volume of waste present in the B-200's or T-200's series tanks. Beginning in 1952, the volume of waste present in the B-200's or T-200's series tanks was tracked in the Waste Status Summary reports.

Tank 241-T-202 Fill History



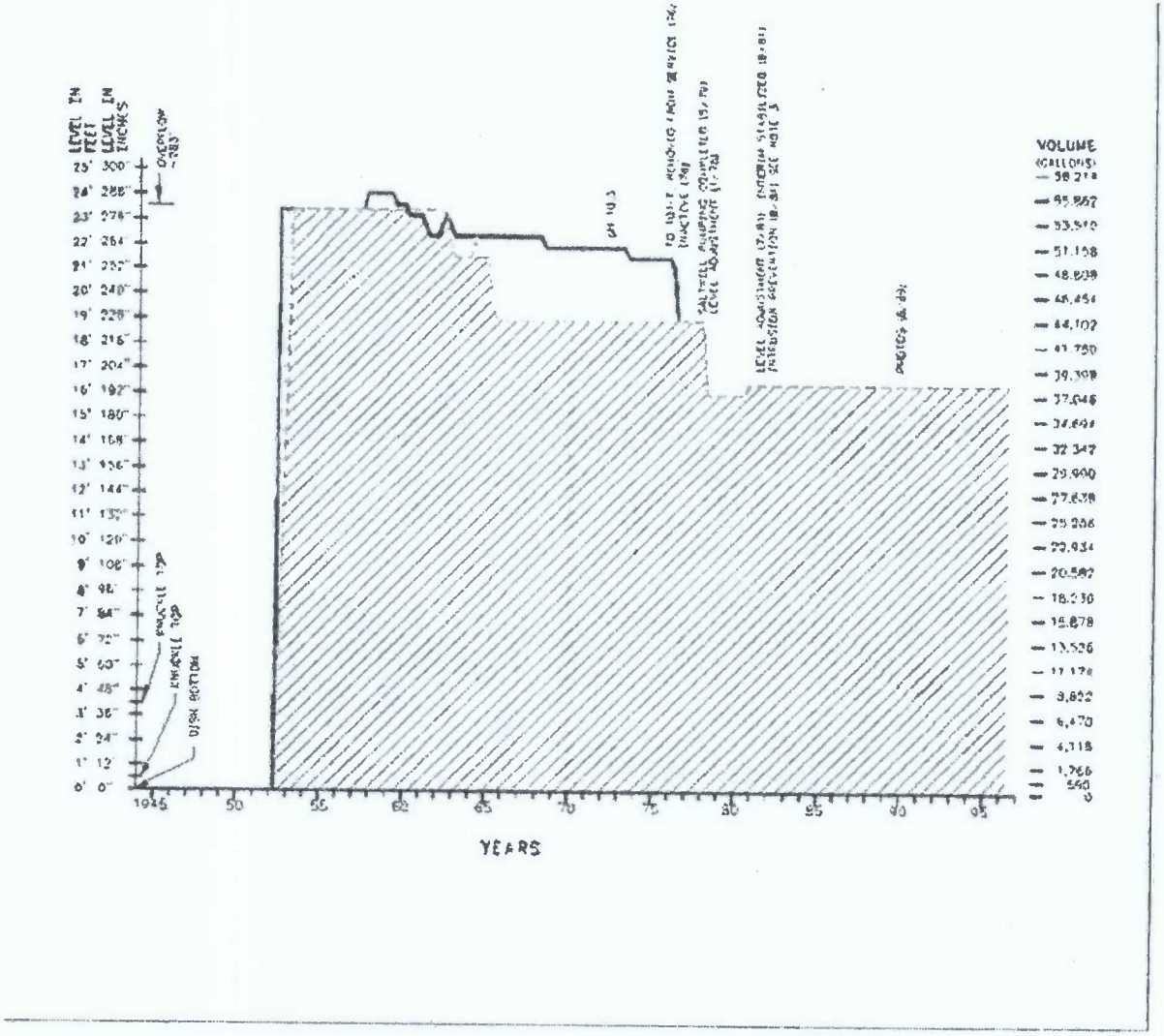
Note: The Hanford site monthly reports did not tract the volume of waste present in the B-200's or T-200's series tanks. Beginning in 1952, the volume of waste present in the B-200's or T-200's series tanks was tracked in the Waste Status Summary reports.

Tank 241-T-203 Fill History



Note: The Hanford site monthly reports did not tract the volume of waste present in the B-200's or T-200's series tanks. Beginning in 1952, the volume of waste present in the B-200's or T-200's series tanks was tracked in the Waste Status Summary reports.

Tank 241-T-204 Fill History



Note: The Hanford site monthly reports did not tract the volume of waste present in the B-200's or T-200's series tanks. Beginning in 1952, the volume of waste present in the B-200's or T-200's series tanks was tracked in the Waste Status Summary reports.

SST CH-TRU Waste Inventory Confidence

- **Best Basis Inventory**
  - Chemical and radionuclide inventories for TRU sludges are based on analyses of core samples
  - Waste Templates are used to estimate the concentration of some analytes
  - Uranium and Plutonium isotopic distributions estimated based on models

Tank	Core Sample Date
B-201, B-202	1991
B-203, B-204	1995
T-111	1991
T-110, T-201, T-202 T-203, T-204	1997
T-104	1992

TRU Concentration in Sludges

Tank	Waste Type	Sludge Volume (kgal)	TRU ηCi/gm
B-201	224	30	824
B-202	224	29	214
B-203	224	51	297
B-204	224	50	263
T-201	224	29	754
T-202	224	21	221
T-203	224	37	295
T-204	224	37	243
T-110	2C / 224	369	67(*)
T-111	2C / 224 / DW	447	182
T-104	1C / CW	317	158

(*) After low temperature drying, the TRU concentration in the T-110 sludge will be ~170 ηCi/gm

Cs^{137} Concentrations in Sludges

Tank	Waste Type	Cs^{137} µCi/gm	Basis	Total Cs^{137} Curies
B-201	224	0.145	Sample	21.1
B-202	224	0.082	Sample	11.1
B-203	224	0.0124	Sample	1.63
B-204	224	< 0.028	Sample	< 6.3
T-201	224	0.026	Sample	3.4
T-202	224	< 0.026	Sample	< 2.6
T-203	224	< 0.0134	Sample	< 2.5
T-204	224	0.007	Sample	1.2
T-110	2C / 224	0.0525	Sample	27.8
T-111	2C / 224 / DW	0.11	Sample	229
T-104	1C / CW	0.166	Sample	257
Total for Above Tanks				~564
Fraction of Total Cs^{137} in All 177 Tanks			(46.08E+06 Ci)	0.0012%

Sr^{90} Concentrations in Sludges

Tank	Waste Type	Sr^{90} µCi/gm	Basis	Total Sr^{90} Curies
B-201	224	1.84	Sample	267
B-202	224	3.23	Sample	437
B-203	224	0.074	Template	17.1
B-204	224	1.37	Template	314
T-201	224	0.079	Sample	10.4
T-202	224	0.0023	Sample	0.23
T-203	224	0.0024	Sample	0.41
T-204	224	0.0042	Sample	0.73
T-110	2C / 224	0.097	Sample	51.2
T-111	2C / 224 / DW	4.4	Sample	9,230 (*)
T-104	1C / CW	2.19	Sample	3,380
Total for Above Tanks				~ 13,708
Fraction of Total Sr^{90} in All 177 Tanks			(50.28E+06 Ci)	0.027%

(*) Tank T-111 has a higher Sr-90 inventory due to the receipt of equipment decontamination waste (DW)

Final Waste Form
Concentrations per Standard Waste Box

Tank	Total Grams Pu	TRU ηCi/gm	Wt% Pu	Pu-239 FGE	PE Ci	Number of SWBs
B-201	1.76E+03	1730	0.0025%	34.4	2.17	55.4
B-202	2.88E+02	617	0.0006%	15.3	0.78	37.9
B-203	7.26E+02	1030	0.0011%	17.1	1.29	53.3
B-204	8.76E+02	906	0.0013%	21.3	1.14	52.4
T-201	1.61E+03	1870	0.0028%	36.9	2.34	46.7
T-202	3.13E+02	738	0.0011%	16.5	0.93	23.0
T-203	4.92E+02	980	0.0010%	15.8	1.23	40.4
T-204	3.50E+02	739	0.0006%	12.2	0.93	43.8
T-110	1.64E+03	241	0.0003%	4.8	0.30	389.0
T-111	4.39E+03	604	0.0007%	109.0	0.76	503.9
T-104	3.17E+03	430	0.0006%	27.1	0.49	455.2

Reference: Calculation No. 20843.PCAL.001, revision E dated February 20, 2004, except for tank T-104 which was calculated using TWINS best basis inventory data and assuming final waste form contained 20wt% water.

Comparison of CH-TRU Tank Waste with HLW Sludge in Tank 241-AZ-101

	CH-TRU Tank Waste											HLW Sludge
	Micro-curie per gram of waste											
Analyte	B-201	B-202	B-203	B-204	T-201	T-202	T-203	T-204	T-111	T-110	T-104	AZ-101 Sludge
129I	1.99E-08	1.37E-08	1.39E-08	1.31E-08	1.94E-08	1.37E-08	1.38E-08	1.41E-08	8.34E-08	1.36E-07	9.05E-07	1.25E-03
137Cs	1.46E-01	8.20E-02	3.33E-02	2.97E-02	3.05E-02	2.73E-02	1.72E-02	7.27E-03	1.09E-01	1.59E-02	1.66E-01	7.64E+02
137mBa	1.37E-01	7.75E-02	3.15E-02	2.81E-02	2.88E-02	2.58E-02	1.63E-02	6.91E-03	1.03E-01	1.51E-02	1.57E-01	7.23E+02
14C	1.52E-06	1.05E-06	1.06E-06	9.96E-07	1.48E-06	1.05E-06	1.05E-06	1.08E-06	6.39E-06	1.04E-05	4.47E-05	1.04E-03
151Sm	1.15E-03	7.98E-04	8.06E-04	7.56E-04	1.12E-03	7.93E-04	7.96E-04	8.11E-04	4.77E-03	7.73E-03	5.16E-02	6.78E+02
233U	4.22E-11	5.24E-11	5.40E-11	4.94E-11	4.00E-11	3.21E-11	3.09E-11	4.33E-11	1.01E-09	5.60E-12	2.65E-10	2.55E-04
234U	5.17E-05	1.41E-04	5.92E-05	5.38E-05	4.37E-05	3.50E-05	3.38E-05	4.74E-05	1.17E-03	7.10E-06	4.06E-04	1.77E-03
235U	2.29E-06	4.82E-06	2.63E-06	2.40E-06	1.95E-06	1.56E-06	1.50E-06	2.11E-06	5.20E-05	3.20E-07	1.31E-05	6.74E-05
236U	5.35E-07	1.52E-06	5.14E-07	4.71E-07	3.81E-07	3.06E-07	2.95E-07	4.13E-07	9.39E-06	5.09E-08	3.92E-06	1.43E-04
237Np	6.53E-08	4.51E-08	4.57E-08	4.30E-08	6.37E-08	4.51E-08	4.54E-08	4.63E-08	2.73E-07	3.13E-05	2.96E-06	1.92E-02
238Pu	6.44E-03	2.08E-03	1.27E-03	1.56E-03	4.48E-03	1.31E-03	1.18E-03	8.47E-04	7.72E-04	2.86E-04	1.66E-03	2.14E-01
238U	5.21E-05	1.08E-04	6.01E-05	5.47E-05	4.44E-05	3.56E-05	3.43E-05	4.81E-05	1.19E-03	7.22E-06	3.00E-04	1.22E-03
239Pu	7.52E-01	1.28E-01	1.94E-01	2.39E-01	6.85E-01	2.01E-01	1.81E-01	1.29E-01	1.29E-01	5.78E-02	1.25E-01	1.85E+00
240Pu	4.33E-02	2.17E-02	1.70E-02	2.10E-02	6.01E-02	1.76E-02	1.59E-02	1.13E-02	1.07E-02	4.34E-03	1.51E-02	5.57E-01
241Am	2.85E-02	6.50E-02	2.10E-03	2.59E-03	7.41E-03	2.18E-03	1.96E-03	1.40E-03	4.24E-02	4.93E-03	1.80E-02	3.75E+01
241Pu	1.07E-02	9.23E-02	4.01E-02	4.94E-02	1.42E-01	4.16E-02	3.75E-02	2.68E-02	2.27E-02	7.04E-03	5.86E-02	1.64E+01
242Pu	2.58E-06	4.24E-06	2.60E-07	3.21E-07	9.21E-07	2.70E-07	2.44E-07	1.74E-07	1.44E-07	4.31E-08	7.44E-07	8.64E-05
90Sr	1.84E+00	3.23E+00	1.50E+00	1.40E+00	7.82E-02	2.41E-03	2.44E-03	4.32E-03	4.40E+00	2.93E-02	2.19E+00	2.06E+04
90Y	1.84E+00	3.23E+00	1.50E+00	1.40E+00	7.82E-02	2.41E-03	2.44E-03	4.32E-03	4.40E+00	2.93E-02	2.19E+00	2.06E+04
99Tc	1.05E-05	5.20E-03	7.40E-06	6.94E-06	1.02E-05	7.28E-06	7.30E-06	7.45E-06	7.91E-03	7.22E-05	6.30E-04	1.48E-01

Approved for Public Release;
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Documentation Confirms Waste Origin

- Extensive review of waste transfer records, Hanford site monthly reports, AEC monthly reports and other historical documents
  - RPP-13300, Origin of Wastes in B-200 and T-200 Series SSTs
  - RPP-13873, Origin of Wastes in SSTs 241-T-110 and 241-T-111
  - RPP-16129, Origin of Waste in Single-Shell Tank 241-T-104
- Statistical uncertainty for concentrations of transuranic isotopes reviewed (except T-104)
  - Internal letter number 7G300-02-JGF-009, Transuranic Calculations for Twelve Tanks, dated October 2, 2002
- Waste transfer routings verified

Identified Hanford TRU Tanks

SST Tank	Handling	Volume (kgal)	Series Totals (kgal)
B-201	Contact	30	284
B-202	Contact	29	
B-203	Contact	51	
B-204	Contact	50	
T-201	Contact	29	
T-202	Contact	21	
T-203	Contact	37	
T-204	Contact	37	
T-111	Contact	447	817
T-110	Contact	370	
T-104	Contact	317	317

Identified Hanford TRU Tanks (cont.)

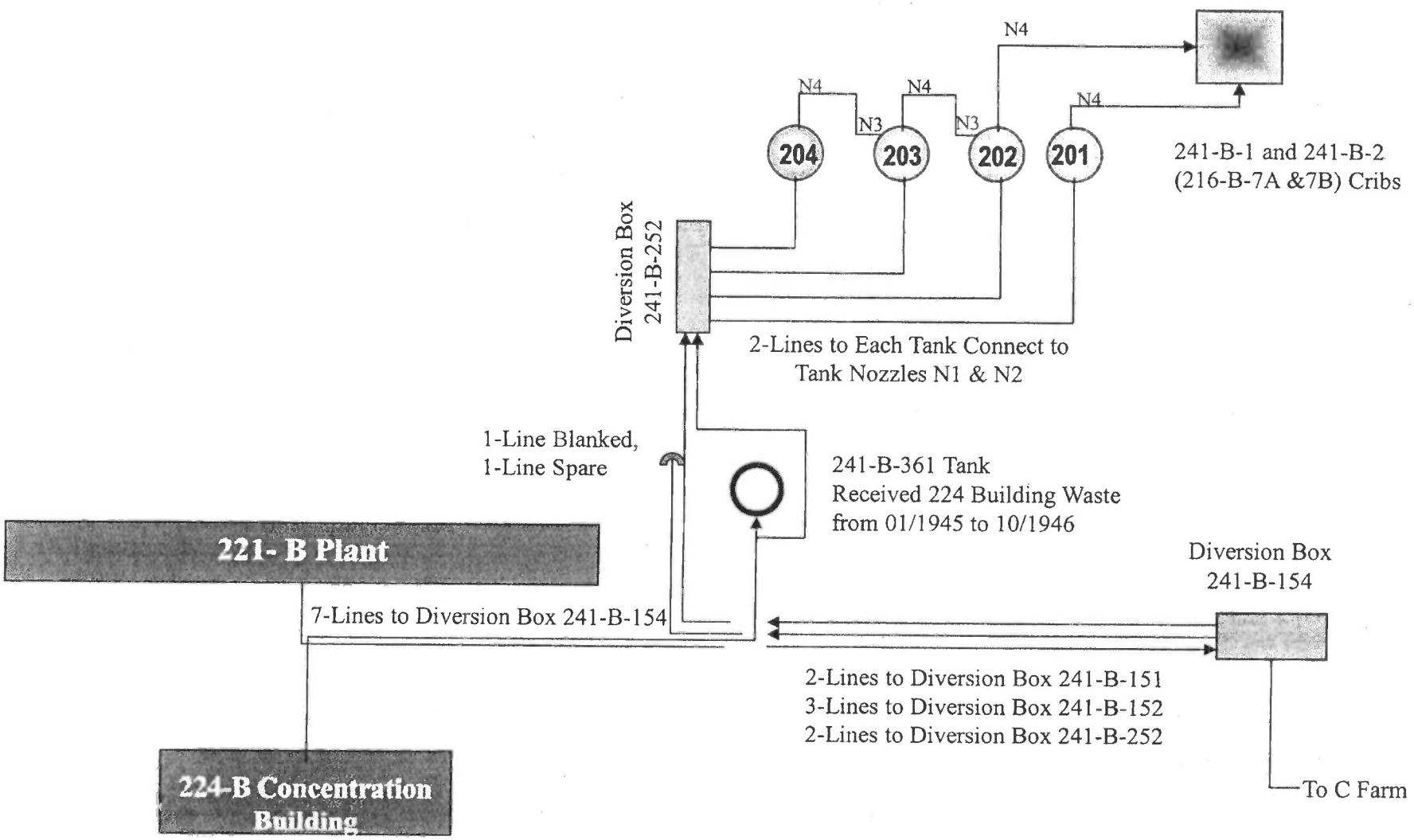
DST Tank	Handling	Volume (kgal)	Series Totals (kgal)
SY-102	Remote	71	607
AW-103	Remote	273	
AW-105	Remote	263	

Additional Hanford Tanks being evaluated

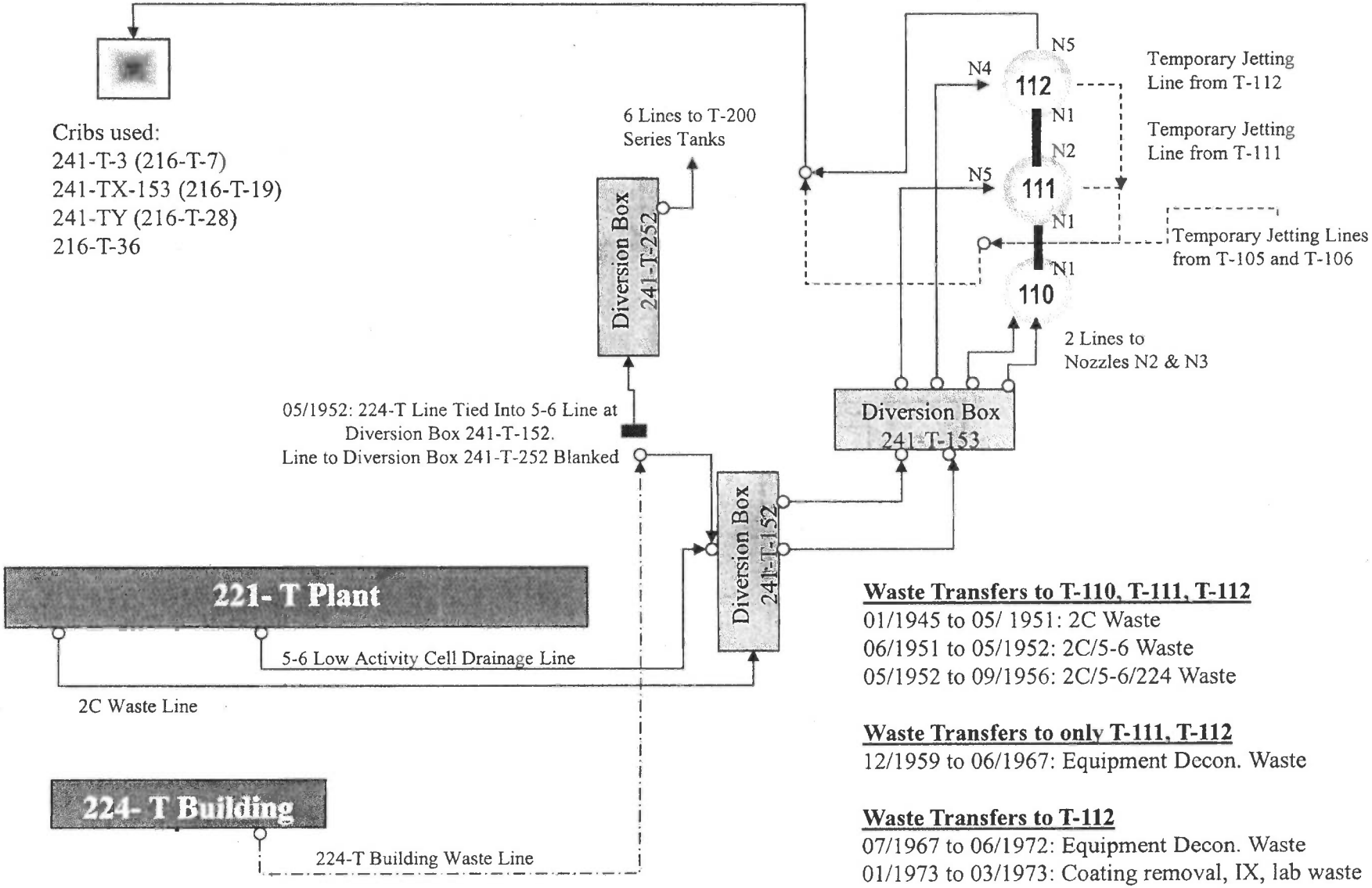
SST	Handling	Volume (kgal)	Waste Types	Series Totals (kgal)
B-107	Remote	86 (+ Saltcake 75)	1C / PUREX CW / Saltcake	902
B-110	Remote	244	2C / B Plant Sr/RE / B Plant IX	
B-111	Remote	241	2C / B Plant Sr/RE / B Plant IX	
T-105	Remote	98	2C / 1C / CW / B Plant IX	
T-107	Remote	173	1C / CW / B Plant IX	
T-112	Remote	60	2C / 224 / T-Plant Decon / B Plant IX	
B-361	Contact	20.6	224	45.1
T-361	Contact	24.5	224	

Backups

224-B Waste Routing to B-200 Series SSTs



Second Decontamination Cycle, Low Activity Cell Drainage and 224 Waste Routing to 241-T-110, T-111, and T-112



Waste Transfers to T-110, T-111, T-112

01/1945 to 05/ 1951: 2C Waste
06/1951 to 05/1952: 2C/5-6 Waste
05/1952 to 09/1956: 2C/5-6/224 Waste

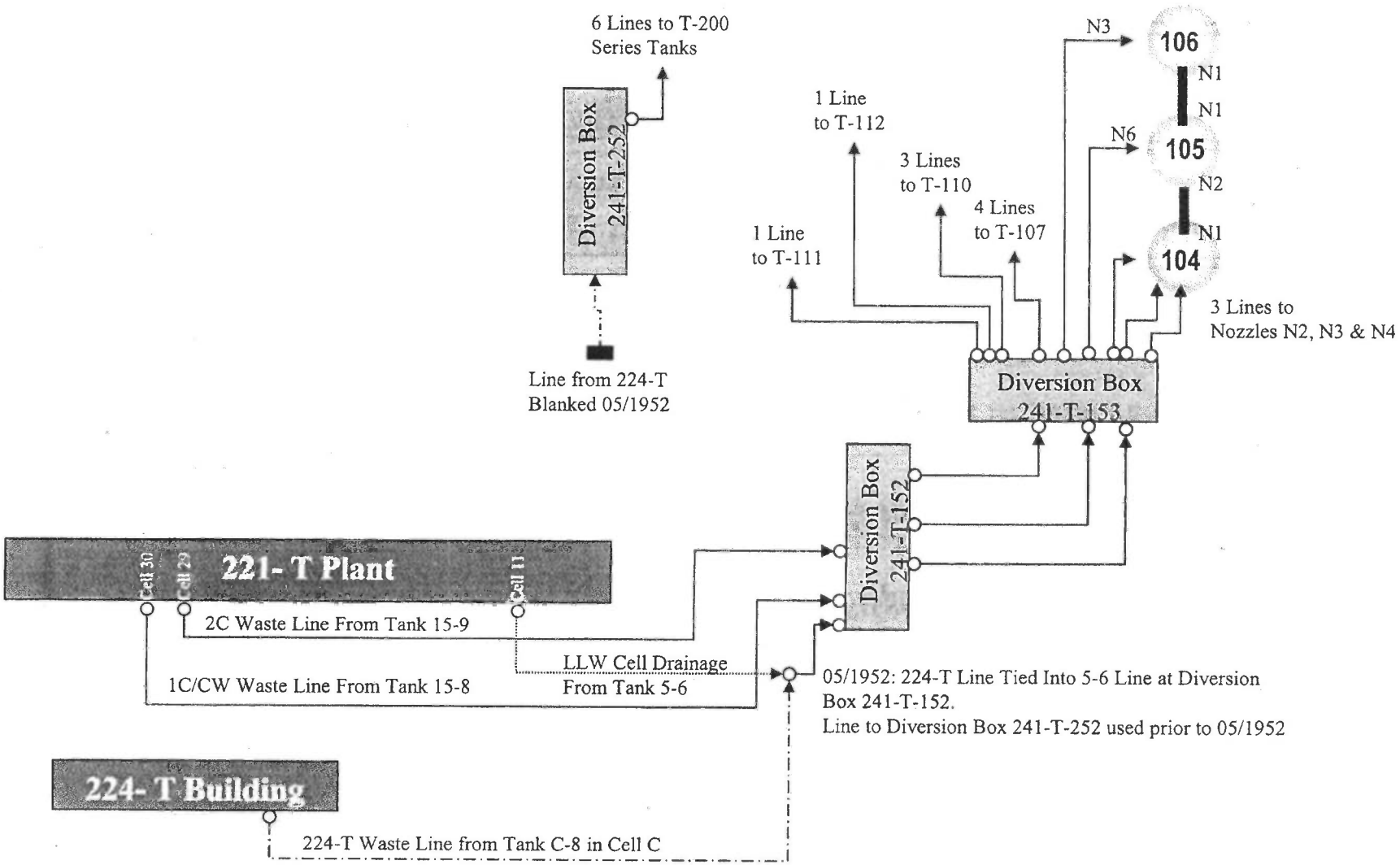
Waste Transfers to only T-111, T-112

12/1959 to 06/1967: Equipment Decon. Waste

Waste Transfers to T-112

07/1967 to 06/1972: Equipment Decon. Waste
01/1973 to 03/1973: Coating removal, IX, lab waste

First Decontamination Cycle and Coating Removal Waste Routing to Tank 241-T-104



TRU Waste Types

Waste Type	Description
1C	First Pu Decontamination Cycle Waste from Bismuth Phosphate Plant
2C	Second Pu Decontamination Cycle Waste from Bismuth Phosphate Plant
224	224-B/T Plutonium Concentration Building Waste
CW	Coating Removal Waste from Dissolution of the Coating on Irradiated Nuclear Fuel Elements
DW	Equipment decontamination waste from 221-T Plant

221-B and 221-T Plants Operations

- Irradiated Reactor Fuel Dissolution
  - Irradiated reactor fuel coating dissolved in boiling sodium nitrate / sodium hydroxide solution (Coating Removal Waste)
  - Irradiated fuel dissolved in nitric acid to form uranium metal solution
- Uranium and Fission Products Extraction
  - Bismuth and phosphate added to uranium metal solution to precipitate plutonium and zirconium-95 as phosphate solids
  - Bismuth / plutonium phosphate solids separated from uranium and fission products (e.g., Cs-137 and Sr-90) by centrifugation
  - Uranium and fission product containing supernatant neutralized and discharged to SSTs (Metal Waste)

221-B and 221-T Plants Operations cont.

- First Plutonium Decontamination Cycle
  - Bismuth / plutonium precipitate dissolved in nitric acid and re-precipitated to remove trace amounts of fission products
  - Bismuth / plutonium phosphate solids separated from residual fission products by centrifugation, mixed with coating removal waste and discharged to SSTs (1C/CW waste)
- Second Plutonium Decontamination Cycle
  - Bismuth / plutonium precipitate dissolved in nitric acid and re-precipitated to remove trace amounts of fission products
  - Bismuth / plutonium phosphate solids separated from residual fission products by centrifugation, neutralized and discharged to SSTs (2C waste)
  - Plutonium solution transferred to 224 Concentration Building

224-B and 224-T Building Operations

- Bismuth Separation
  - Plutonium oxidized to valence state +6 by addition of sodium bismuthate
  - Bismuth precipitated by addition of phosphoric acid, separated from plutonium by centrifugation, and discarded to SSTs
- Trace Fission Product Separation
  - Lanthanum (La) salts and hydrogen fluoride (HF) added to plutonium solution to precipitate LaF3 and americium, curium, europium, lanthanum, ruthenium, and samarium
  - Solids separated from plutonium solution by centrifugation and discharged to SSTs

224-B and 224-T Building Operations cont.

- Plutonium Concentration
  - Plutonium reduced to valence state +4 by addition of oxalic acid
  - Lanthanum (La) salts and hydrogen fluoride (HF) added to plutonium solution to precipitate LaF3 and PuF4.
  - Solids separated from plutonium solution by centrifugation, with supernatant discharged to SSTs
  - LaF3 and PuF4 precipitate dissolved in potassium hydroxide solution and centrifuged to separate solids
  - Plutonium hydroxide solution transferred to 231-Z or 234-Z for further purification

Waste Categorization

- **Metal Waste from Bismuth Phosphate Plants is HLW**
  - Contains fission products in sufficient concentrations to require permanent isolation
  - Waste is equivalent to liquid waste from operation of the first cycle solvent extraction system
- **1C/CW, 2C and 224 wastes are not HLW**
  - Significantly lower fission product concentrations than Metal Waste
  - Wastes are not resulting from the reprocessing of spent nuclear fuel nor resulting from the operation of the first cycle solvent extraction system, or equivalent, and the concentrated wastes from subsequent extraction cycles, or equivalent
  - Waste originate from processing plutonium that was separated as a solid from dissolved spent nuclear fuel

DST TRU Waste Inventory Confidence

- **Best Basis Inventory**
  - Chemical and radionuclide inventories for TRU sludges are based on analyses of core samples
  - Waste Templates are used to estimate the concentration of some analytes
  - Uranium and Plutonium isotopic distributions estimated based on models

Tank	Core Sample Date
AW-103	1999
AW-105	2001
SY-102	2000

TRU Concentration in RH-TRU SST Sludges

Tank	Waste Type	Sludge Volume (kgal)	TRU ηCi/gm
B-107	1C / PUREX CW / Saltcake	86 (+ Saltcake 75)	285
B-110	2C / B Plant Sr/RE / B Plant IX	244	236
B-111	2C / B Plant Sr/RE / B Plant IX	241	201
T-105	2C / 1C / CW / B Plant IX	98	215
T-107	1C / CW / B Plant IX	173	158
T-112	2C / 224 / T-Plant Decontamination waste / B Plant IX	60	74(*)

(*) After low temperature drying, the TRU concentration in the T-112 sludge will be ~780 ηCi/gm

Cs^{137} Concentrations in RH-TRU SST Sludges

Tank	Waste Type	Cs^{137} µCi/gm	Basis	Total Cs^{137} Curies(*)
B-107	1C / PUREX CW / Saltcake	28.4	Sample Template	15,210
B-110	2C / B Plant Sr/RE / B Plant IX	11.6	Engineering estimate	14,600
B-111	2C / B Plant Sr/RE / B Plant IX	133	Sample	144,000
T-105	2C / 1C / CW / B Plant IX	52.4	Sample / Sample Template	28,400
T-107	1C / CW / B Plant IX	15.8	Sample	16,100
T-112	2C / 224 / T-Plant Decontamination waste / B Plant IX	17.6	Sample Template	5,094
Total for Above Tanks				223,404
Fraction of Total Cs^{137} in All 177 Tanks			(46.08E+06 Ci)	0.48%

(*) The Cs137 content of these sludges may be reduced 25% to 80% by washing these sludges

Sr^{90} Concentrations in RH-TRU SST Sludges

Tank	Waste Type	Sr^{90} µCi/gm	Basis	Total Sr^{90} Curies(*)
B-107	1C / PUREX CW / Saltcake	222.4	Sample Template	119,270
B-110	2C / B Plant Sr/RE / B Plant IX	83.5	Engineering estimate	105,000
B-111	2C / B Plant Sr/RE / B Plant IX	206.9	Sample	224,000
T-105	2C / 1C / CW / B Plant IX	82	Sample / Sample Template	44,400
T-107	1C / CW / B Plant IX	108.6	Sample	111,000
T-112	2C / 224 / T-Plant Decontamination waste / B Plant IX	11.5	Sample Template	3,324
Total for Above Tanks				606,904
Fraction of Total Cs^{137} in All 177 Tanks			(50.28E+06 Ci)	1.2%

Estimated Final Waste Form Concentrations per RH-72B Canister

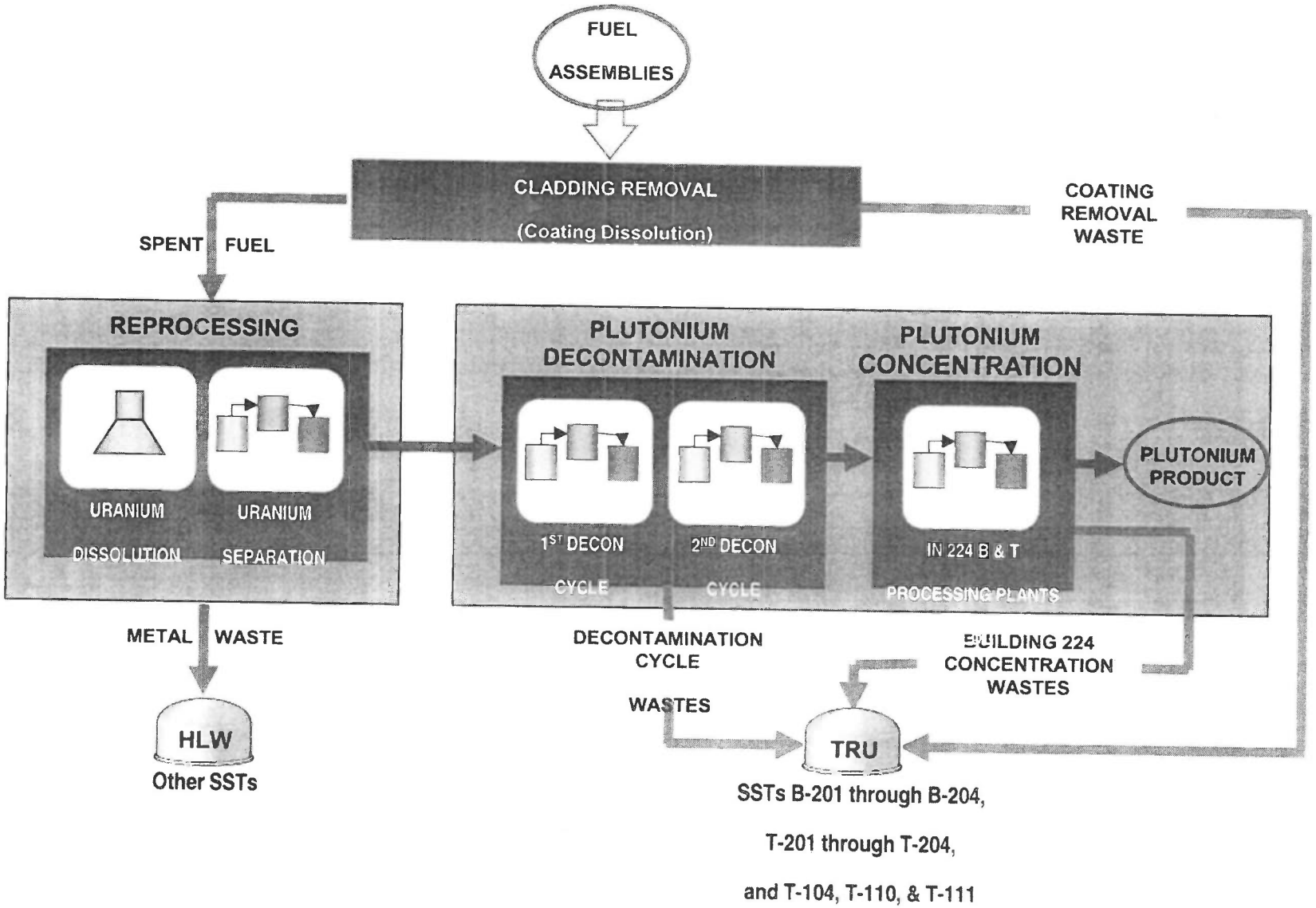
Tank	Total Grams Pu	TRU ηCi/gm	Wt% Pu	Pu-239 FGE	PE Ci	Number of RH-72B Cans
B-107	2550	678	0.0006%	49.5	1.6	165.1
B-110	2080	360	0.0003%	14.7	0.87	257.5
B-111	1500	403	0.0003%	14.5	0.96	196.1
T-105	1740	714	0.0006%	80.7	1.75	118.4
T-107	2150	225	0.0003%	526.2	0.53	274.8
T-112	1090	786	0.0012%	60.7	1.83	37.0

Total Radionuclides Present in Candidate TRU Sludges

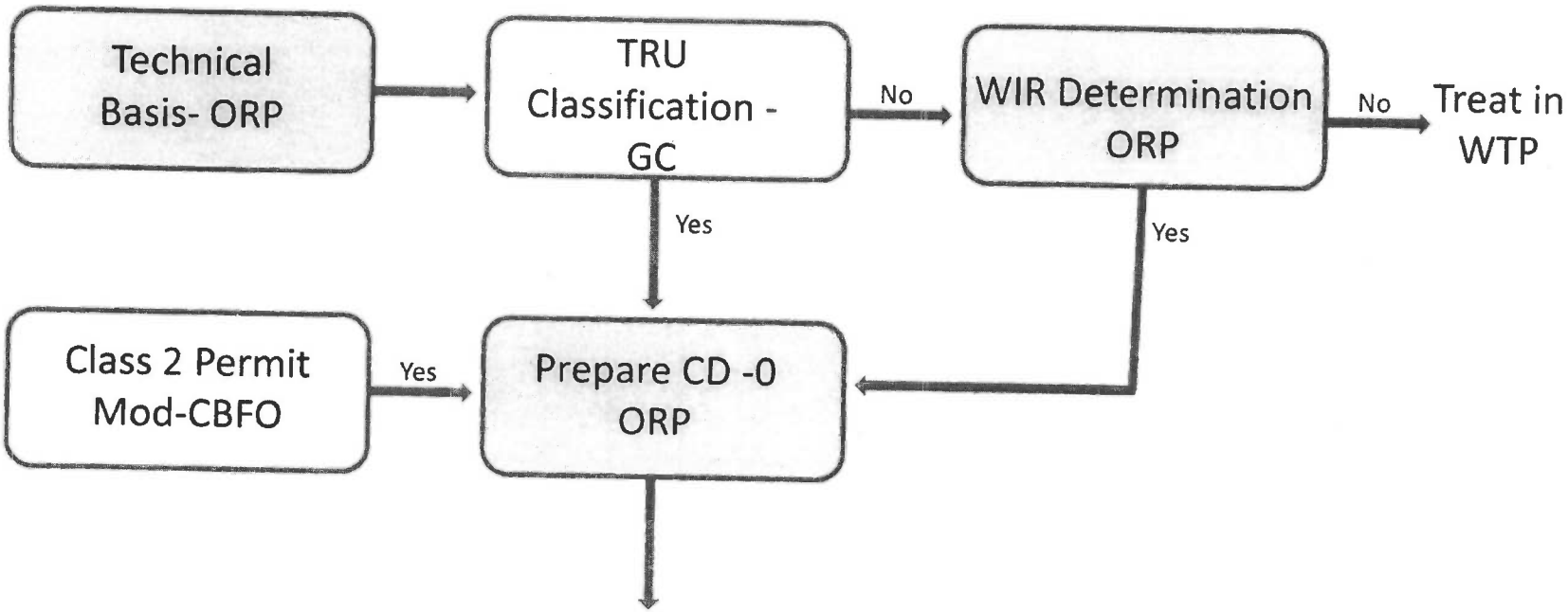
	Tank	Curies[1]	
CH-TRU	241-B-201	7.00E+02	
	241-B-202	9.38E+02	
	241-B-203	7.62E+02	
	241-B-204	7.14E+02	
	241-T-201	1.61E+02	
	241-T-202	3.08E+01	
	241-T-203	4.62E+01	
	241-T-204	3.22E+01	
	241-T-104	7.69E+03	
	241-T-110	3.01E+02	
	241-T-111	1.94E+04	CH-TRU Subtotal 3.08E+04
RH-TRU	241-B-107	2.69E+05	
	241-B-110	2.44E+05	
	241-B-111	7.64E+05	
	241-T-105	1.44E+05	
	241-T-107	2.54E+05	
	241-T-112	1.66E+04	
	241-AW-103	9.76E+04	
	241-AW-105	1.27E+05	
	241-SY-102	3.03E+05	RH-TRU Subtotal 2.22E+06
Total	All 20 Tanks	2.25E+06	

(1) Inventories are for sludge fraction only and are decayed to January 1, 2001

Spent Fuel Reprocessing and TRU Waste Generation



Approved for Public Release;
Further Dissemination Unlimited



ROD - ORP
CD-1 Alternatives Analysis for Treatment
CD-2 Design
RCRA Permit-Ecology
CD-3

Risks

- TRU Classification – GC does not support ORP's defining these 11 tanks as CH-TRU.
- WIPP Class 2 Permit Mod not approved; would require Class 3 Permit Mod, thus increasing time.
- Some packages from waste retrieved from the 11 may be LLW needing a disposal path in either ERDF or IDF (Ecology concern)
- Timeline to complete does not meet public's expectation with retrieval of leaking tanks
- Lack of funding

Benefits

- Retrieves 11 tanks(3- 100 Series and 8- 200 Series)
- Addresses high visiblity leaking tanks
- Significant Cost Benefit: ~$1.7 B
  - Reduce WTP operations by 1 year
  - Reduce canister count: 1000 less HLW canisters and 1000 less LAW canisters
- Reduce wear on WTP by reduction of solids through plant
- Enables 1.6 Mgal of waste to be disposed of offsite at WIPP

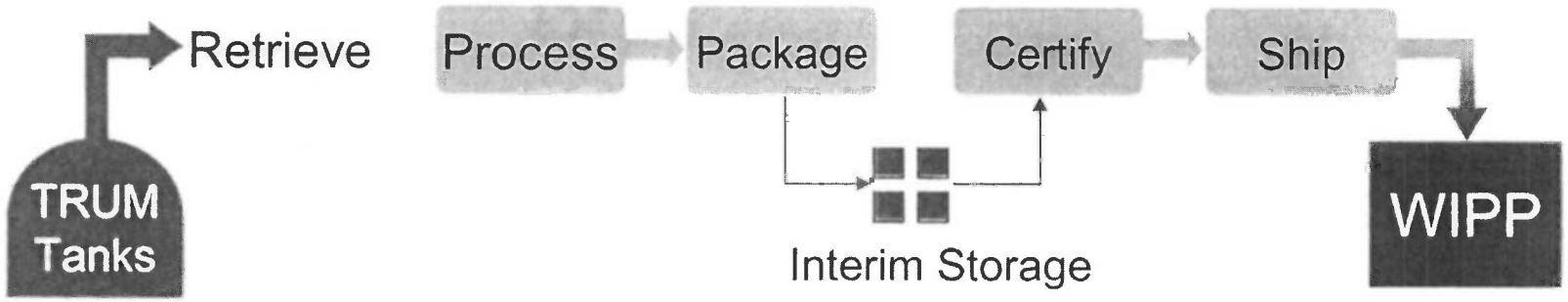
Origin of TRU Waste in Hanford Single-Shell Tanks

November 5, 2003

Topics

- Program
- TRU Regulatory Perspective
- Origin of Wastes
- TRU Waste Composition
- TRU Tanks

Overview of Hanford Tank TRU Program



TRU Waste Regulatory Perspective

- **Waste Isolation Pilot Plant Land Withdrawal Act of 1992, as amended.**

TRANSURANIC WASTE: The term "transuranic waste" means waste containing more than 100 nanocuries of alpha-emitting isotopes per gram of waste, with half-lives greater than 20 years, except for:

A. High-level radioactive waste;

B. Waste that the Secretary has determined, with the concurrence of the Administrator, does not need the degree of isolation required by the disposal regulations; or

C. Waste that the Nuclear Regulatory Commission has approved for disposal on a case-by-case basis in accordance with part 61 of title 10, Code of Federal Regulations.

HIGH-LEVEL RADIOACTIVE WASTE: The term "high-level radioactive waste" has the meaning given such a term in the Nuclear Waste Policy Act of 1982 (42 U.S.C.10101(12)).

TRU Waste Regulatory Perspective continued

- **42 U.S.C.10101(12) of the Nuclear Waste Policy Act of 1982**

  The term "high-level radioactive waste" means –

  (A) the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and

  (B) other highly radioactive material that the Nuclear Regulatory Commission, consistent with existing law, determines by rule required permanent isolation.

- **42 U.S.C.10101(23) of the Nuclear Waste Policy Act of 1982**

  The term "spent nuclear fuel" means fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated by reprocessing.

TRU Waste Regulatory Perspective continued

- U.S. District Court of Idaho memorandum decision on DOE Order 435.1 (Civ. No. 01-0413-S-BLW)
  - Judge Windmill stated in the analysis of this memorandum decision "... Congress defined HLW in NWPA as 'highly radioactive material resulting from the reprocessing of spent nuclear fuel'. Congress then used the word 'including' to signal that what followed were examples designed to illustrate the definition just given. The two examples are (1) 'liquid waste produced directly in reprocessing'; and (2) 'solids material derived from the such liquid waste that contains fission products in sufficient concentrations." [Memorandum Decision page 9 -10]
  - Judge Windmill further stated "The liquid and solids are treated differently by the Act. While NWPA allows DOE to treat the solids to remove fission products, thereby permitting reclassification of the waste, NWPA does not offer the option of reclassification for liquid waste produced directly in reprocessing. [Memorandum Decision page 10]

Origin of Wastes

- Identified waste in tanks is TRU
  - Resulted from purification of Plutonium Products; not fuel reprocessing
  - Subset of SST's have not been intermixed with fuel reprocessing HLW
  - Waste is not spent fuel

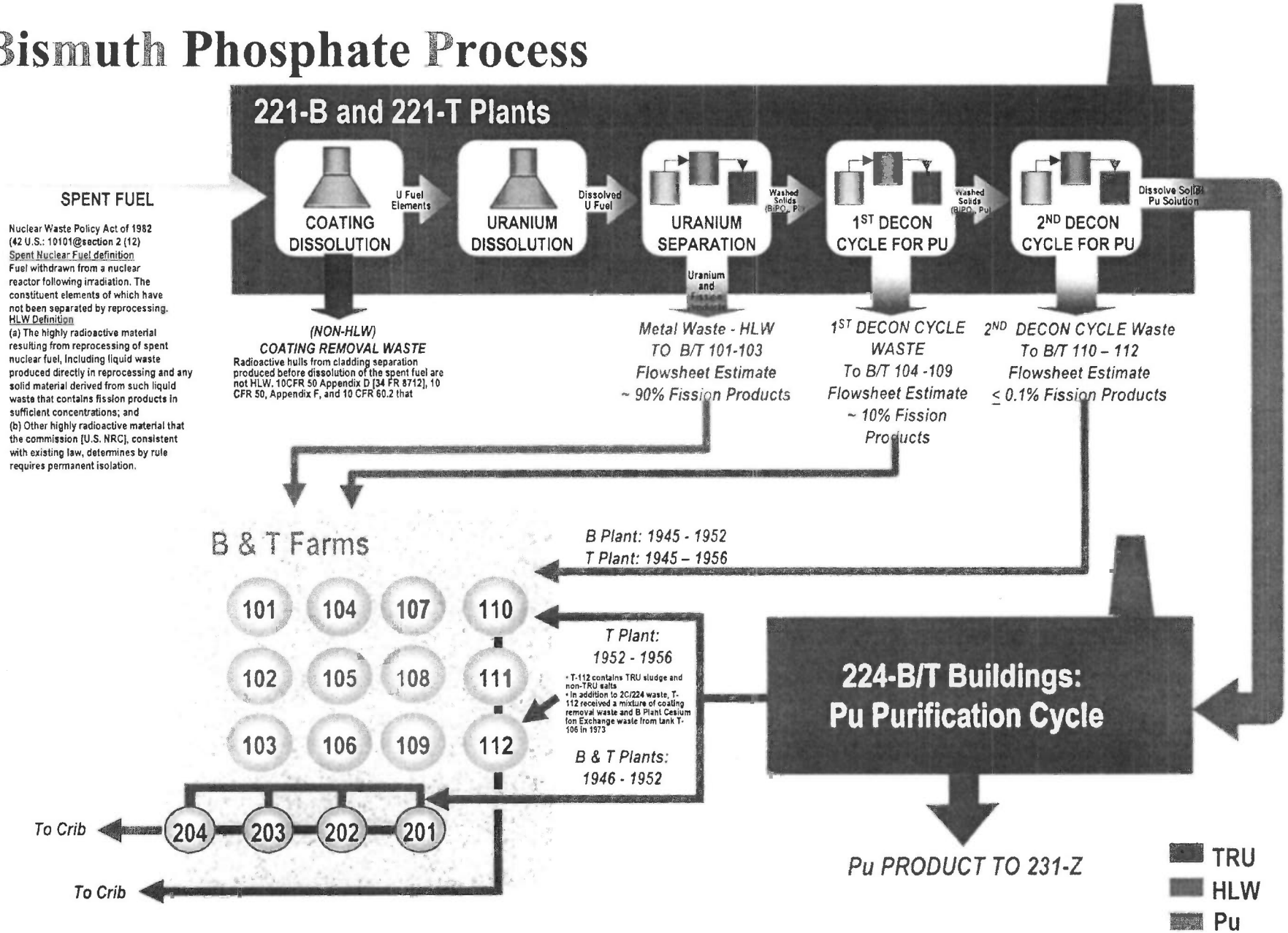
Confidence for waste origin

- Taking advantage of characterization data developed as part of TPA M-44 milestone and DNFSB 93-5
- Have good records:
  - physical configuration
  - fill history
  - characterization

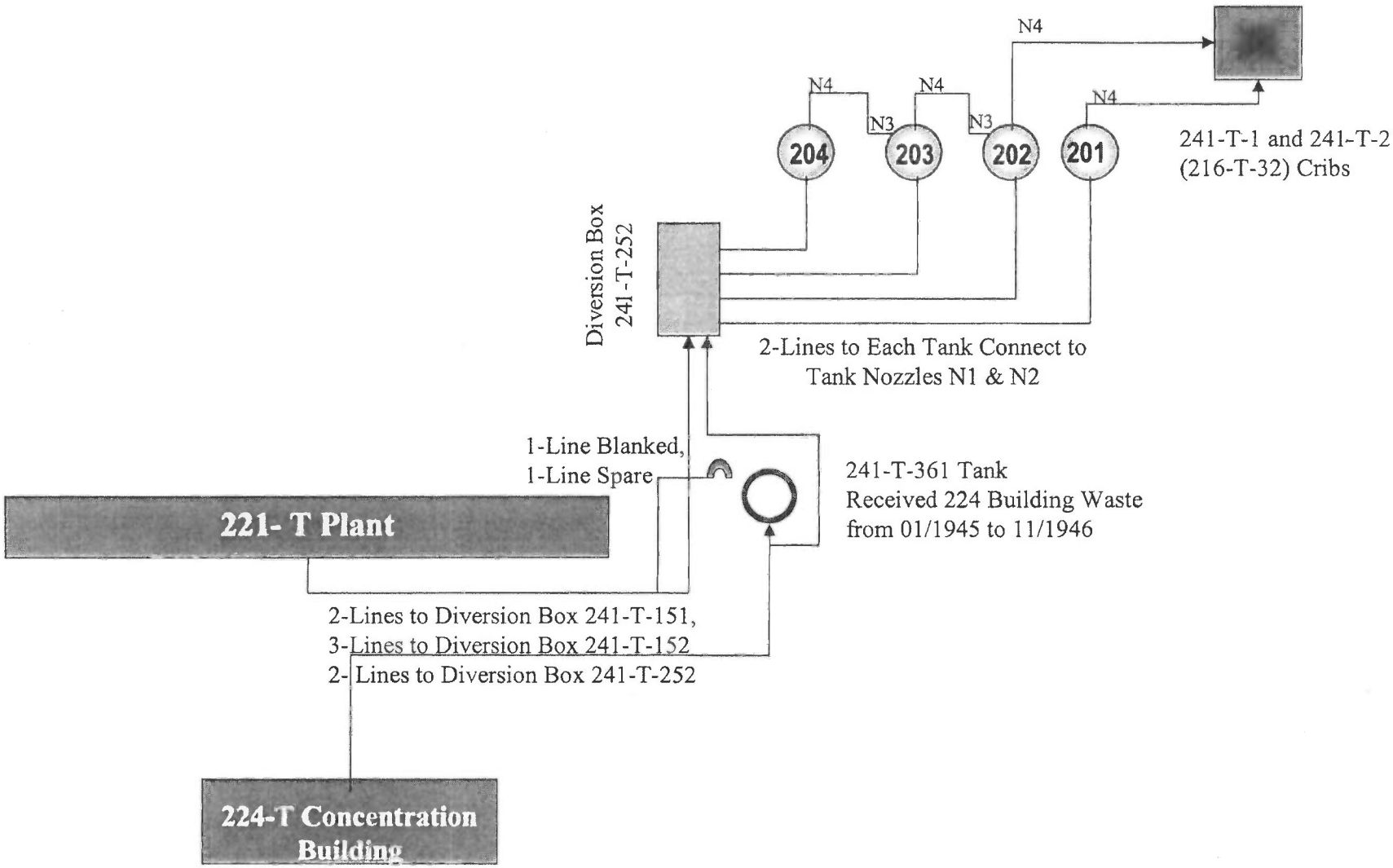
Origin of Wastes

- Bismuth Phosphate Process
  - 221-B and 221-T Plants
- Plutonium Concentration
  - 224-B and 224-T Buildings

Bismuth Phosphate Process

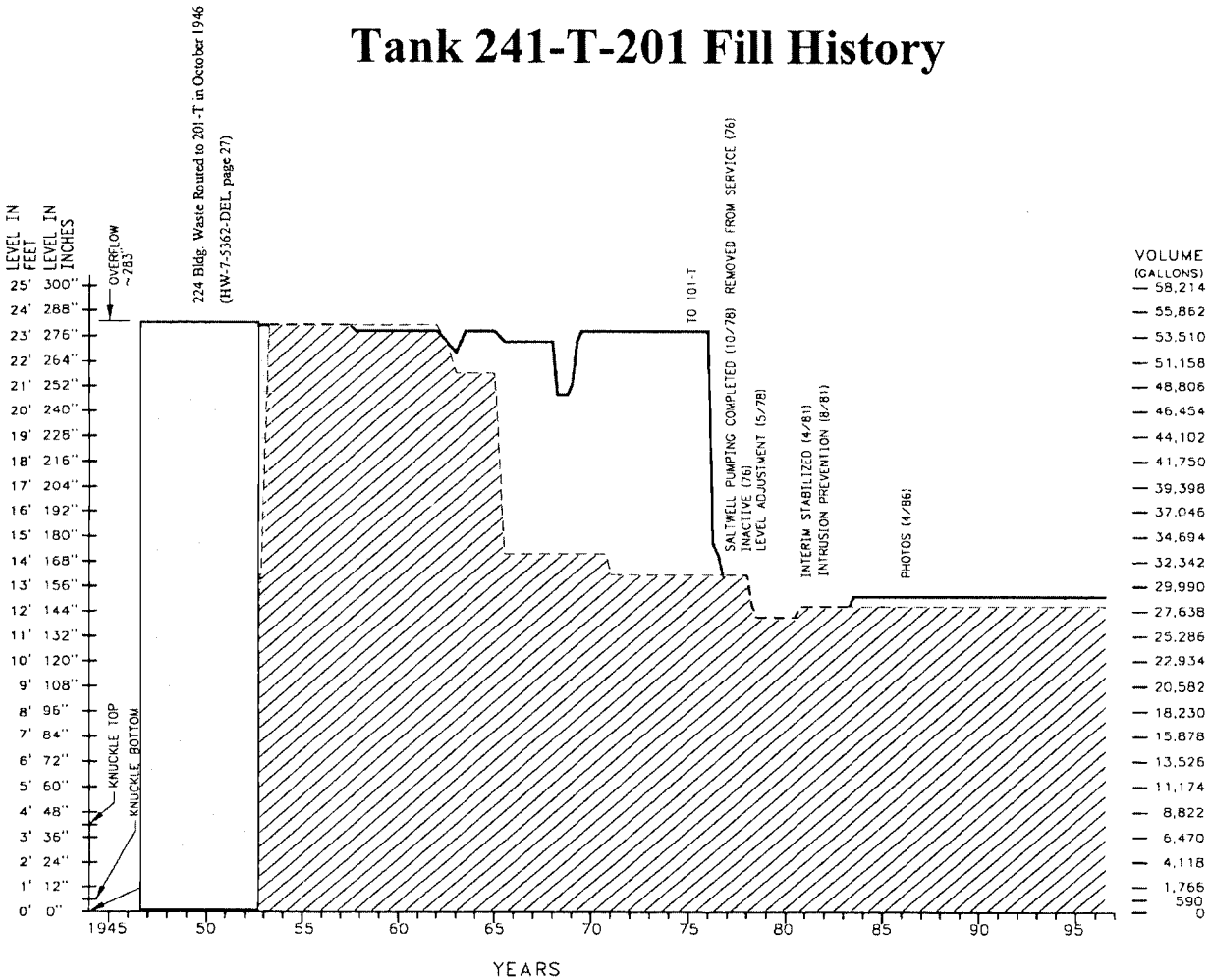


Example physical configuration
224-T Waste Routing to T-200 Series SSTs



Waste Fill History and Characterization

Tank 241-T-201 Fill History



TRU Waste Inventory Confidence

- **Best Basis Inventory**
  - Chemical and radionuclide inventories for TRU sludges are based on analyses of core samples
  - Waste Templates are used to estimate the concentration of some analytes
  - Uranium and Plutonium isotopic distributions estimated based on models

Tank	Core Sample Date
AW-103	1999
AW-105	2001
B-201, B-202	1991
B-203, B-204	1995
SY-102	2000
T-111	1991
T-110, T-201, T-202 T-203, T-204	1997

TRU Concentration in 2C and 224 Wastes

Tank	Waste Type	Sludge Volume (kgal)	TRU ηCi/gm
B-201	224	30	824
B-202	224	29	214
B-203	224	51	297
B-204	224	50	263
T-201	224	29	754
T-202	224	21	221
T-203	224	37	295
T-204	224	37	243
T-110	2C / 224	369	67(*)
T-111	2C / 224 / DW	447	182

5 of 6

(*) After low temperature drying, the TRU concentration in the T-110 sludge will be ~170 ηCi/gm

Cs^{137} Concentrations in 2C and 224 Sludges

Tank	Waste Type	Cs^{137} µCi/gm	Basis	Total Cs^{137} Curies
B-201	224	0.145	Sample	21.1
B-202	224	0.082	Sample	11.1
B-203	224	0.0124	Template	1.63
B-204	224	< 0.028	Sample	< 6.3
T-201	224	0.026	Sample	3.4
T-202	224	< 0.026	Sample	< 2.6
T-203	224	< 0.0134	Sample	< 2.5
T-204	224	0.007	Sample	1.2
T-110	2C / 224	0.0525	Sample	27.8
T-111	2C / 224 / DW	0.11	Sample	229
Total for Above Tanks				~307
Fraction of Total Cs^{137} in All 177 Tanks			(46.08E+06 Ci)	0.0007%

Sr^{90} Concentrations in 2C and 224 Sludges

Tank	Waste Type	Sr^{90} µCi/gm	Basis	Total Sr^{90} Curies
B-201	224	1.84	Sample	267
B-202	224	3.23	Sample	437
B-203	224	0.074	Template	17.1
B-204	224	1.37	Template	314
T-201	224	0.079	Sample	10.4
T-202	224	0.0023	Sample	0.23
T-203	224	0.0024	Sample	0.41
T-204	224	0.0042	Sample	0.73
T-110	2C / 224	0.097	Sample	51.2
T-111	2C / 224 / DW	4.4	Sample	9,230 (*)
Total for Above Tanks				~ 10,328
Fraction of Total Sr^{90} in All 177 Tanks			(50.28E+06 Ci)	0.02%

(*) Tank T-111 has a higher Sr-90 inventory due to the receipt of equipment decontamination waste (DW)

Documentation Confirms Waste Origin

- Extensive review of waste transfer records, Hanford site monthly reports, AEC monthly reports and other historical documents
  - RPP-13300, Origin of Wastes in B-200 and T-200 Series SSTs
  - RPP-13873, Origin of Wastes in SSTs 241-T-110 and 241-T-111
- Statistical uncertainty for concentrations of transuranic isotopes reviewed
  - Internal letter number 7G300-02-JGF-009, Transuranic Calculations for Twelve Tanks, dated October 2, 2002
- Waste transfer routings verified

Identified Hanford TRU Tanks

SST Tank	Handling	Volume (kgal)	Series Totals (kgal)
B-201	Contact	30	731
B-202	Contact	29	
B-203	Contact	51	
B-204	Contact	50	
T-201	Contact	29	
T-202	Contact	21	
T-203	Contact	37	
T-204	Contact	37	
T-111	Contact	447	
DST Tank			
SY-102	Remote	71	607
AW-103	Remote	273	
AW-105	Remote	263	

Additional Hanford Tanks being evaluated

SST	Handling	Volume (kgal)	Waste Types	Series Totals (kgal)
B-107	Remote	86 (+ Saltcake 75)	1C / PUREX CW / Saltcake	902
B-110	Remote	244	2C / B Plant Sr/RE / B Plant IX	
B-111	Remote	241	2C / B Plant Sr/RE / B Plant IX	
T-105	Remote	98	2C / 1C / CW / B Plant IX	
T-107	Remote	173	1C / CW / B Plant IX	
T-112	Remote	60	2C / 224 / T-Plant Decon / B Plant IX	
T-104	Contact	317	1C	317
B-361	Contact	20.6	224	45.1
T-361	Contact	24.5	224	

Path forward

- Develop Acceptable Knowledge package on retrieved waste
  - Waste processing history including storage history
  - Fill history
  - Analytical characterization data
- Continue to share information with key stakeholders
  - New Mexico regulators and stakeholders
  - Washington State regulators and stakeholders
  - EPA
- Proceed to make follow-on decision

Hildman, Cynthia M

From: Tedeschi, Allan R (Rick)
Sent: Wednesday, April 13, 2011 9:07 AM
To: Koll, Ronald J
Cc: Cloud, Jack D; Burrows, Christopher
Subject: TRU Story
Attachments: TRU Replanning White Paper R1.docx

Follow Up Flag: Follow up
Flag Status: Flagged

Categories: Teal

Ron,

Jack mentioned that you called regarding information on the TRU project for an upcoming WIPP interface. Let me know how I can help.

Attached is a recent white paper I prepared for WRPS senior management, with some minor editing changes. This white paper does not represent a formal WRPS position, but is a draft recommendation to stay the course of the current baseline. It provides some background, most of which you know, as we have dialogued over the years. Please contact me with any questions.

Rick Tedeschi
WTP Support Project Management
Wiped Film Evaporator Project
Washington River Protection Solutions LLC,
contractor to the United States Department of Energy

TOC Transuranic Waste Program Proposal for Continued Delay
White Paper

Purpose: This white paper describes the strategy for maintaining out-year (post-contract) scheduling of the Tank Operating Contractor (TOC) Transuranic (TRU) Waste Program.

Original TRU Waste Program: This program was started in 2002 and organized into three projects: Retrieval, Packaging, and Characterization/Storage/Shipping (CSS). It had two phases: waste when retrieved and packaged by 2005 that met disposal contact-handling requirements (CH-TRU), and retrieval and treatment of higher radioactive waste into remote-handled (RH-TRU) packages eight years later (Figure 1). Only CH-TRU effort was begun, with the majority of work expended upon the Packaging project as a design/build/operate activity. Retrieved sludge waste was to be dried and packaged in 55-gallon drums, and then shipped to the Waste Isolation Pilot Plant (WIPP) in New Mexico for final disposal. Preliminary Packaging design, permits, and waste source evaluations for CH-TRU were drafted during this time.

This program was slowed and then eventually placed in "Standby" in 2005 to resolve delay of DOE issuing environmental permits related to stakeholder issues. The TRU program was rebaselined for a continued delay during final Standby activities.

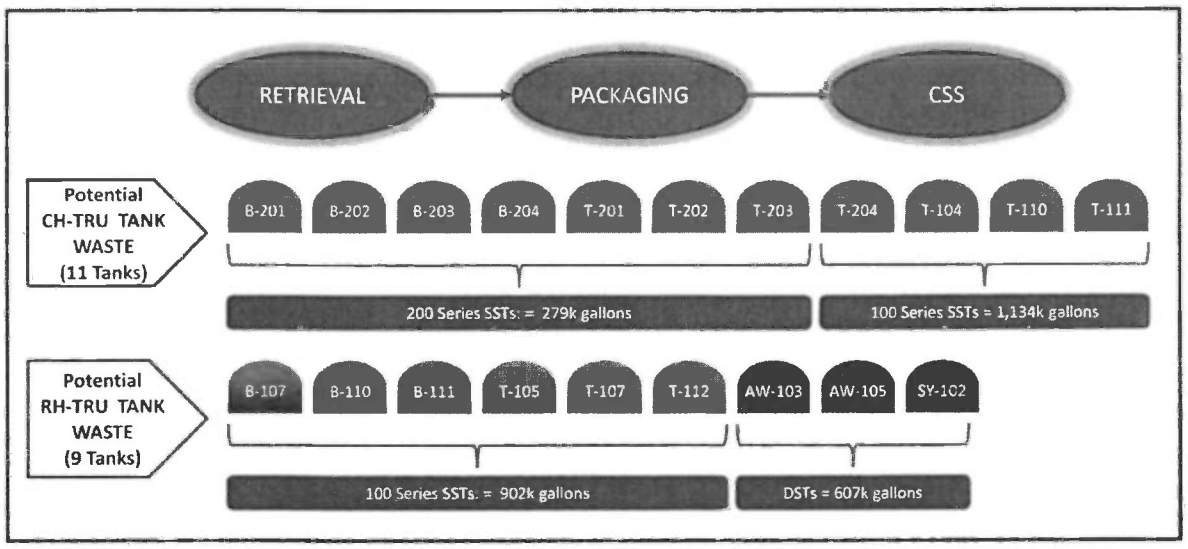


Figure 1. Original TRU Program Project Strategy

Value of TRU Program: Retrieving the waste sludges in the potential TRU tanks would mitigate the waste, and allow closure of the SSTs, all without impacting DST space. The current applied technology uses a low temperature vacuum dryer for liquid removal, retaining almost all of the radioactive material within the solids. This allows the dryer condensate to be directly shipped to the 200 Area Effluent Treatment Facility instead of being sent to the DSTs. It allows for additional unplanned water usage to retrieve and motivate the sludges if necessary all without impacting DST space, thus mitigating a major risk to untried sludge retrievals.

Current Baseline: The CH-TRU project has been delayed in the baseline for a 2014 restart to allow adequate time for inclusion of the TRU program within the new Tank Closure and Waste Management Environmental Impact Statement (TC&WM EIS), and DOE final waste designation. The baseline scope, costs, and schedule are shown below in Figures 2 and 3. (Retrieval baseline costs are not normally quoted for the TRU program since the waste will need retrieved regardless of the final applied treatment.) RH-TRU was removed from the baseline in 2008; current ORP System Plan strategy is to process this previously identified material as high-level waste at the vitrification facility.

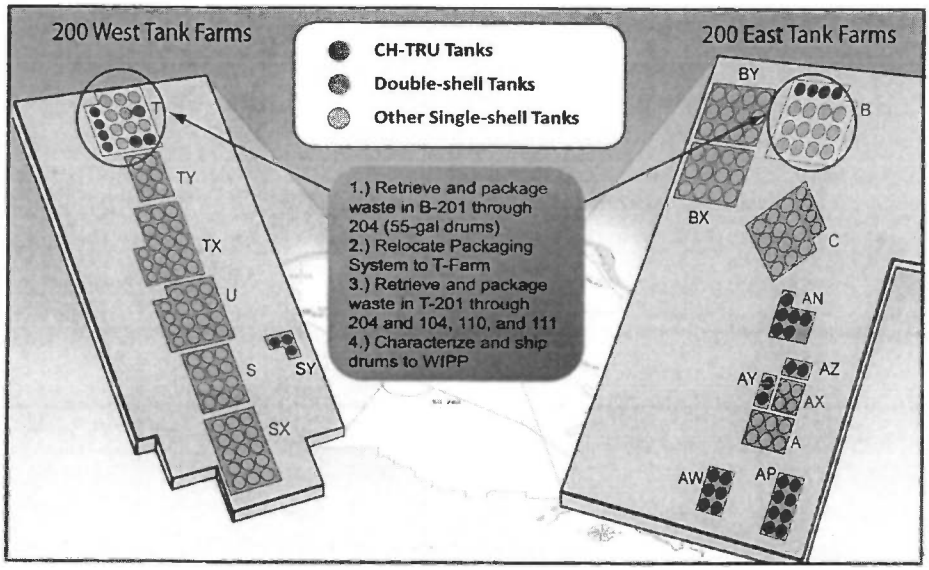
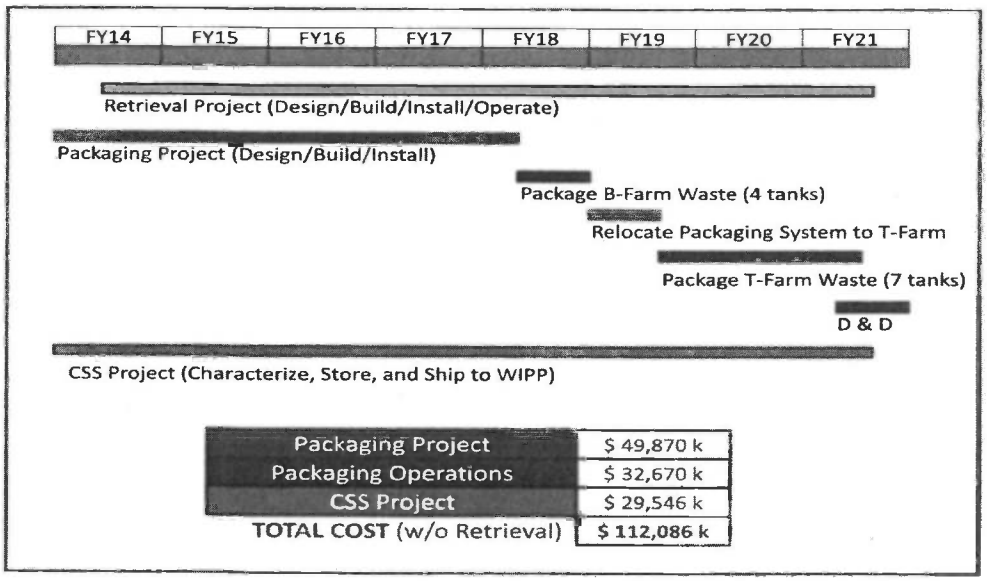


Figure 2. CH-TRU Baseline Scope



Packaging Project	$ 49,870 k
Packaging Operations	$ 32,670 k
CSS Project	$ 29,546 k
TOTAL COST (w/o Retrieval)	**$ 112,086 k**

Figure 3. CH-TRU Baseline Cost and Schedule

Prior Recent Proposal for Treatment and Temporary Storage as "Special Waste":

A proposal for accelerating SST retrievals was prepared for the DOE in January, 2010 by the TOC. This proposal included an option for also accelerating retrieval and packaging of the waste within the four 200-series potential CH-TRU B-farm tanks as "Special Waste." The waste would be retrieved and packaged under the assumption and WRPS quality assurance protocols as if it were TRU waste, but would not be so designated. This allowed retrieval and packaging without requiring the involvement of WIPP or the New Mexico Environmental Management Department.

The packaged "Special Waste" was to be stored at the 200-West Area Central Waste Complex (CWC) until such time as the DOE completed its waste designation. If DOE concluded the material as TRU then it would undergo final characterization, quality review, environmental permitting revision to the WIPP RCRA permit, and then shipment to WIPP. If instead DOE concluded this material was high-level waste, or the WIPP RCRA permitting process failed, then the packaged waste would be returned to the tank farms in some future project, to be blended with other liquid tank waste as feed for the vitrification facility. Three of the four tanks to be retrieved are identified as "potential leakers", thus this effort would mitigate that risk. It would also stage a treatment system to address the potential TRU waste in T-farm.

Central Waste Complex in 200-W

The "Special Waste" option of the SST acceleration retrieval proposal has high risk. It would require the Washington State Department of Ecology to approve a RCRA Part B permit for Packaging System treatment without a DOE waste designation – a strategy they have informally rejected in the past. Because WIPP would not be involved in this project, the waste would be packaged at risk (WIPP is extremely involved with all project phases for current generation of disposal packages across the DOE complex.) Extended storage above ground of the dried solids would add safety and environmental risk at the CWC. Lastly, the cost burden would be large to the DOE should they conclude the material was not TRU or the WIPP permitting process fail; besides the loss of the value of the early retrieval and packaging costs, a new project would be needed to reintroduce this material into the vitrification facility feed stream.

It is proposed that no further effort be expended upon this strategy because of its high risks.

Proposal to Maintain Delay of the TOC TRU Program: It is proposed that the TRU program stay on baseline for a FY14 start or even be delayed 1-2 additional years. This continued or extra delay, while allowing time for DOE waste designation and completion of the TC&WM EIS (both items still open with considerable risk) has one major new advantage. This schedule coincides with a significant future downturn in SST retrievals; slowed in the future because of high DST volumes caused by vitrification facility startup delay.

System Plan revision 6 draft (ORP-11242) contains a potential scenario for how retrieval of the TRU tanks, without impacting any DST space, can fill in this low retrieval gap (Figure 4). This TRU operation would sustain key technical and operational personnel, maintaining expertise and stable expenditure profiles.

The Figure 4 proposed start date for CH-TRU tank retrievals in mid FY18 matches the baseline start date. Delay by one or even two years still helps sustain stable retrieval operations through the low period of 2025, positioning the TOC to enormously expand operations to match vitrification facility feed.

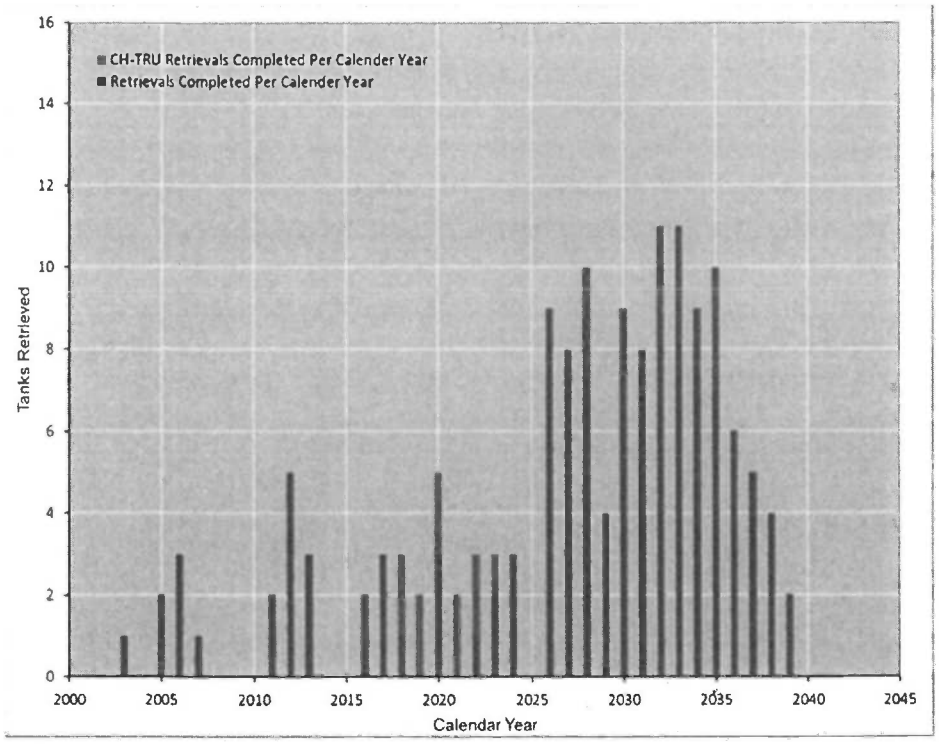


Figure 4. CH-TRU Operations Scenario from ORP System Plan R6 draft

The delay also allows deployment and operational experience with a new evaporation technology, "Wiped Film Evaporator." This technology may provide distinct advantages over the current dryer in the TRU Packaging design by minimizing material at risk with a simpler operation. One other advantage may be realized during the delay: there is an ongoing reevaluation of the leaker status of the three B-200 series tanks. This evaluation has a high probability of reclassifying these three tanks as non-leakers allowing a much simpler and faster retrieval process.

TOC Transuranic Waste Program Proposal for Continued Delay
White Paper

Value of Continued or Extended Delay: Summarizing, maintaining the TRU Program on track with the current baseline provides the following advantages and risk reduction.

- Maintain operational and technical staff expertise during future low retrieval time period
- Provide time for completion and issuance of the TC&WM EIS
- Provide time for ORP completion of waste designation
- Provide time for completion of the B-200 series tank leaker status
- Provide time for deployment and experience of the Wiped Film Evaporator project

Near-term Recommendations: The following recommendations are proposed to ensure a successful TRU program restart in FY14 or out-years.

1. **Continue to support DOE in completion of final waste designation of this potential TRU material as soon as possible.** Several white papers have been prepared previously outlining potential options for this process, such as publication in the federal register. Final waste designation as TRU provides the primary gate for interface with the environmental agencies: Washington State Department of Ecology, New Mexico State Environmental Department, and the EPA.
2. **Maintain the current proposed Hanford tank waste TRU inventory without change, as managed by the Environmental Protection Agency (EPA).** This requires minimal interface by the TOC to respond to EPA biannual data calls. The inventory list should be updated as soon as final waste designation is completed.
3. **Continue to support DOE in final approval/issuance of the TC&WM EIS.** TOC environmental personnel are currently assigned to aiding DOE in its public comment resolution and issuance.
4. **Maintain previous CH-TRU project records and remaining equipment.** This effort is being done by the MSA contractor and the TOC at minimal or no cost.
5. **Re-establish interface with DOE TRU Program Corporate Board.** Provide TOC presence at the annual corporate board meeting. This was a normal occurrence during the active TRU program. This is new scope, but involves minimal cost for travel. Knowledge and interface gained from this complex-wide meeting support the DOE waste designation process.
6. **Establish TOC/ORP team for implementing/tracking near term objectives.** Currently, ORP has no assigned Federal Project Director, nor does the TOC have any near-term scope for the TRU program. A specific ORP advocate would ensure action towards waste designation prior to project restart. This may require minor additional TOC funding depending upon effort requested by DOE. Waste designation must be completed prior to project restart or all program effort would be initiated at high risk.

Hildman, Cynthia M

From: Colosi, Kristin A
Sent: Friday, March 13, 2009 8:05 AM
To: Harp, Benton J (Ben); Charboneau, Stacy L; Trenchard, Glyn D; Koll, Ronald J; Tedeschi, Allan R (Rick); Hewitt, William M
Attachments: Hanford Transuranic Waste Project FY09 Proposed Effort Rev E.ppt

Follow Up Flag: Follow up
Flag Status: Flagged

Categories: Teal

All,

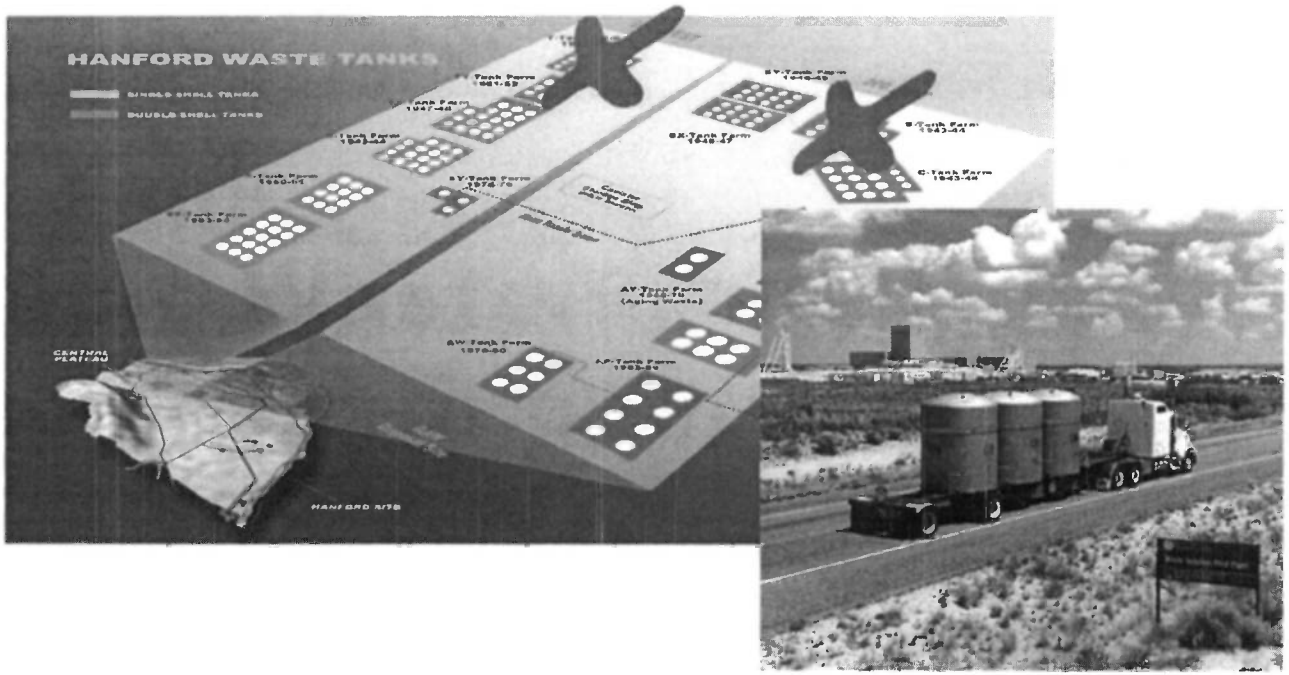
I will schedule a 1/2 hour next week to go over this proposal. Essentially, we are proposing for this year to look at the regulatory risk and confidence level of sucess through the regulatory process and cost/benefit analysis. Cost is approximately $300K.

Any thoughts before hand are welcomed.

Kris

washington river protection solutions

Hanford Tank Transuranic Waste Project Proposed FY09 Scope



Kris Colosi
Rick Tedeschi

Proposed Scope

PREPARE evaluation that supports ORP resolution of potential transuranic tank waste within 11 SSTs

DELIVER to ORP Correspondence with the following supporting documentation

- Regulatory Risk Assessment
  - ***Prepare*** evaluation of confidence to overcome regulatory hurdles, allowing disposal of waste as CH-TRU
- Cost/Benefit Analysis
  - ***Prepare*** evaluation of waste disposition options examining costs, schedule, and tank closure programmatic impacts

COST & SCHEDULE

$300k; 4 month duration

Regulatory Risk Assessment

Deliverable: Documentation providing sufficient information for continuation of CH-TRU project effort (currently in Standby), based upon project risk in achieving regulatory approvals

Scope: Evaluation of strategy and risk impacts for waste classification and permitting approval associated with NEPA, RCRA, and Waste Classification regulations

Stakeholder Interface: WRPS and ORP to initiate communication with Washington state and New Mexico state RCRA approval authorities, EPA, DOE, and WIPP to qualify issues related to waste classification and permit approvals of Hanford tank waste

Challenges: Obtaining qualification of NEPA strategy in draft Closure EIS, and meaningful data from New Mexico Environmental Department apart from a RCRA Class III change request submittal

Cost/Benefit Analysis

Deliverable: Documentation providing technical analysis of costs and value for disposal of waste as CH-TRU

Scope: Description and evaluation of treatment options for disposal of waste as either vitrified product from the WTP or packaged product for WIPP.

Evaluation of the two treatment paths will also include analysis of schedule delays, tank farm operations, waste feed delivery to WTP, waste reclassification should preferred option fail, and WIPP operating schedule.

Hildman, Cynthia M

From: Hewitt, William M
Sent: Wednesday, March 04, 2009 12:10 PM
To: Koll, Ronald J
Subject: FW: Draft TRU Presentation
Attachments: Hanford Transuranic Waste Project FY09 Proposed Effort Rev A.pptx

Follow Up Flag: Follow up
Flag Status: Flagged

Categories: Teal

Ron,

Would you be able to meet at 8 tomorrow in my office to discuss this? I've asked Rick to reschedule to 8am Thursday.

Bill Hewitt
President, YAHSGS LLC (Subcontractor to PAC supporting ORP)
Cell: 509 539 7629

From: Tedeschi, Allan R (Rick)
Sent: Wednesday, March 04, 2009 11:24 AM
To: Hewitt, William M
Subject: Draft TRU Presentation

Bill,

Would you have some time this late afternoon to discuss, or what would be a good time Thursday morning?

If we do not connect, I'll plan on stopping by tomorrow at 0730.

Thanks.

Rick

washington river protection solutions

Hanford Tank Waste Transuranic Project Proposed FY09 Scope

DRAFT

Kris Colosi

Proposed Scope

INITIATE FY09 project activities that support resolution of potential transuranic tank waste

DELIVER to ORP in FY09

- Justification of Mission Need
  - ***Evaluate*** value of a project effort to remove, package, and ship tank waste in 11 SSTs to Waste Isolation Pilot Plant
- CH-TRU Restart Plan
  - ***Prepare*** strategy for restart of Transuranic Waste Project, currently in Standby

Justification of Mission Need

What: Document providing sufficient information to Decision Makers for continuation of project effort

Criteria: WRPS Procedure TFC-PRJ-PM-C-02, "Project Management for DOE 413.3A Projects

Includes preliminary: Functional requirements, ROM & schedule (consistent with PMB), NEPA strategy, Risk assessment, and Alternative actions

In addition will include: Cost/benefit analysis compared to WTP treatment, and Waste classification strategy options (DOE 435 and Section 3116)

Will coordinate: final scope with ORP using project tailoring checklist

CH-TRU Restart Plan

What: Document providing information to Decision Makers and Project Management for improved efficiency of restart effort

Basis: TRU Standby Report, RPP-RPT-25638

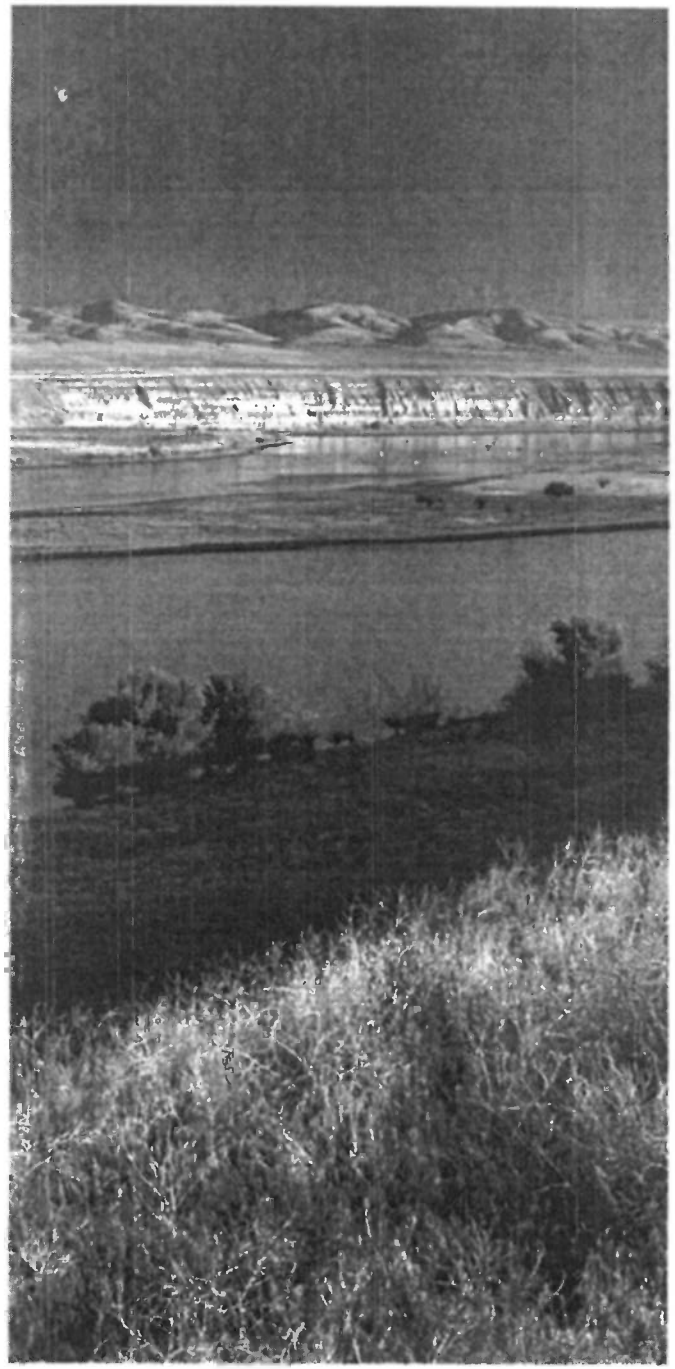
Includes: Design A/E pre-qualification, Communications plan, Environmental and safety planning, staffing plan, development testing, and disposition of existing records and equipment

Will resume interface with: TRU Corporate Board, PRC, CBFO

Will coordinate: issuance of document with ORP – review and comment incorporation

Cost and Schedule

- Issue Justification of Mission Need
  - Start 4/1/09
  - Complete 7/1/09
  - Cost: insert
- Issue CH-TRU Restart Plan
  - Start 6/1/09
  - Complete 9/30/09
  - Cost: insert



Hanford Tank Transuranic/Mixed Waste Treatment and Disposal

J. G. Kristofzski, Director
Waste Disposal Strategic Planning
CH2M HILL Hanford Group, Inc.

Presented to
Defense Nuclear Facilities Safety Board
May 3, 2006

U.S. Department of Energy

Office of River Protection

CH2MHILL
Hanford Group, Inc.

Mission

CH2MHILL
Office of River Protection
Bechtel National, Inc.
River Protection Project Mission
TRUM Processing
WIPP
(Outside of RPP Scope)
Tank Farm Closure
SST Tanks
Retrieval
222-S Analytical Services
LAW Supplemental Treatment
Integrated Disposal Facility
Waste Treatment & Immobilization Plant
ILAW
IHLW
DST Tanks
Retrieval/Waste Feed Delivery
Canister Storage Facility
Yucca Mountain Repository
(Outside of RPP Scope)
Condensate
242-A
Evaporator
ETF
Liquid Disposal
(Outside of RPP Scope)
CHG0310-04 Rev C.0

TRU Project Benefits

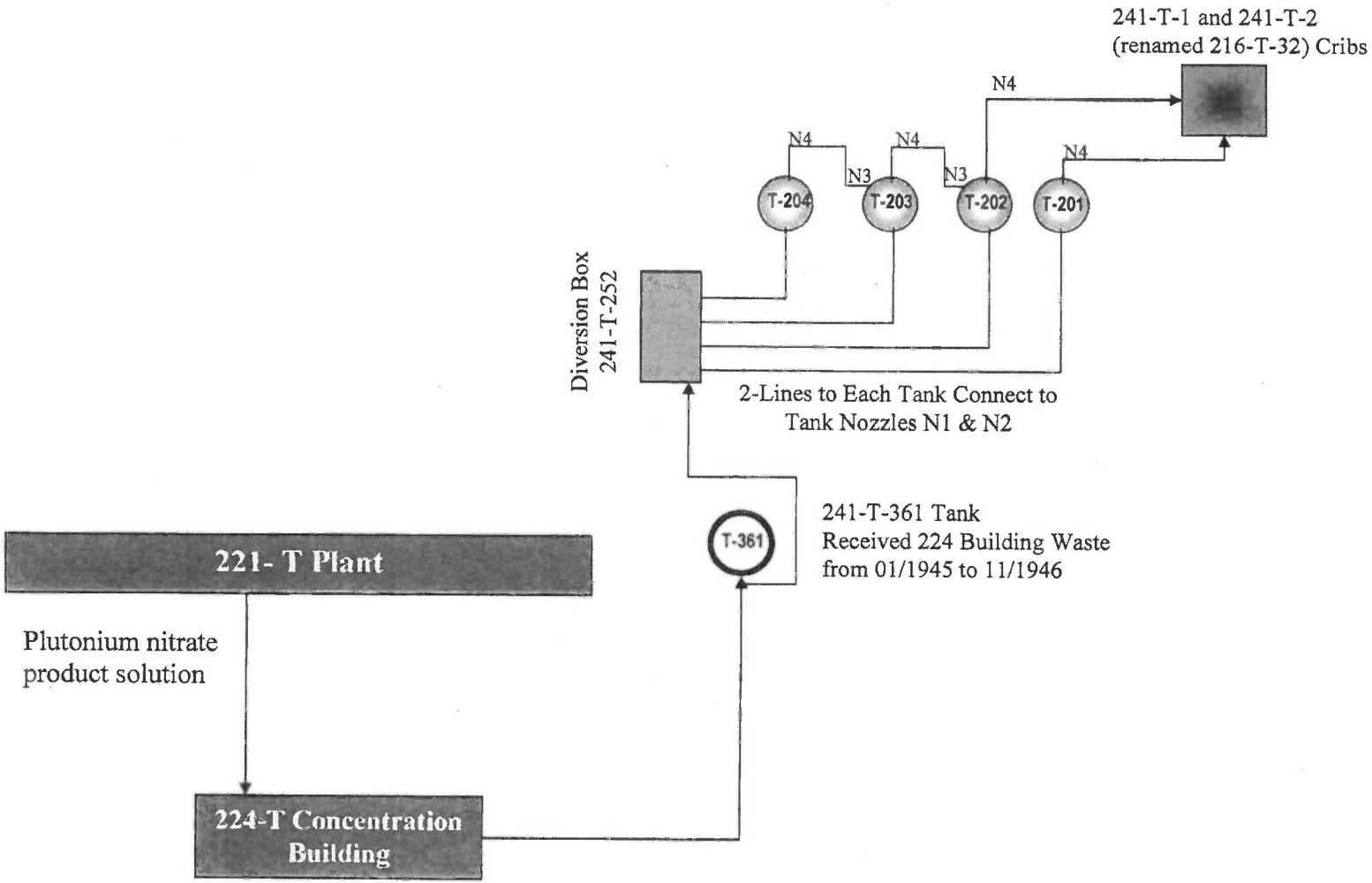
- Provides for early disposal of Hanford Tank waste in national repository (WIPP)
- Simple treatment/packaging technology (dryer dewatering) has no impact on limited double-shell tank (DST) space
- Supports challenging treatment schedule of Hanford Facility Federal Agreement and Consent Order (Tri-Party Agreement) with supplemental low-activity waste (LAW) treatment
- Significant cost savings over Waste Treatment Plan treatment

20 Hanford "TRU" Tanks

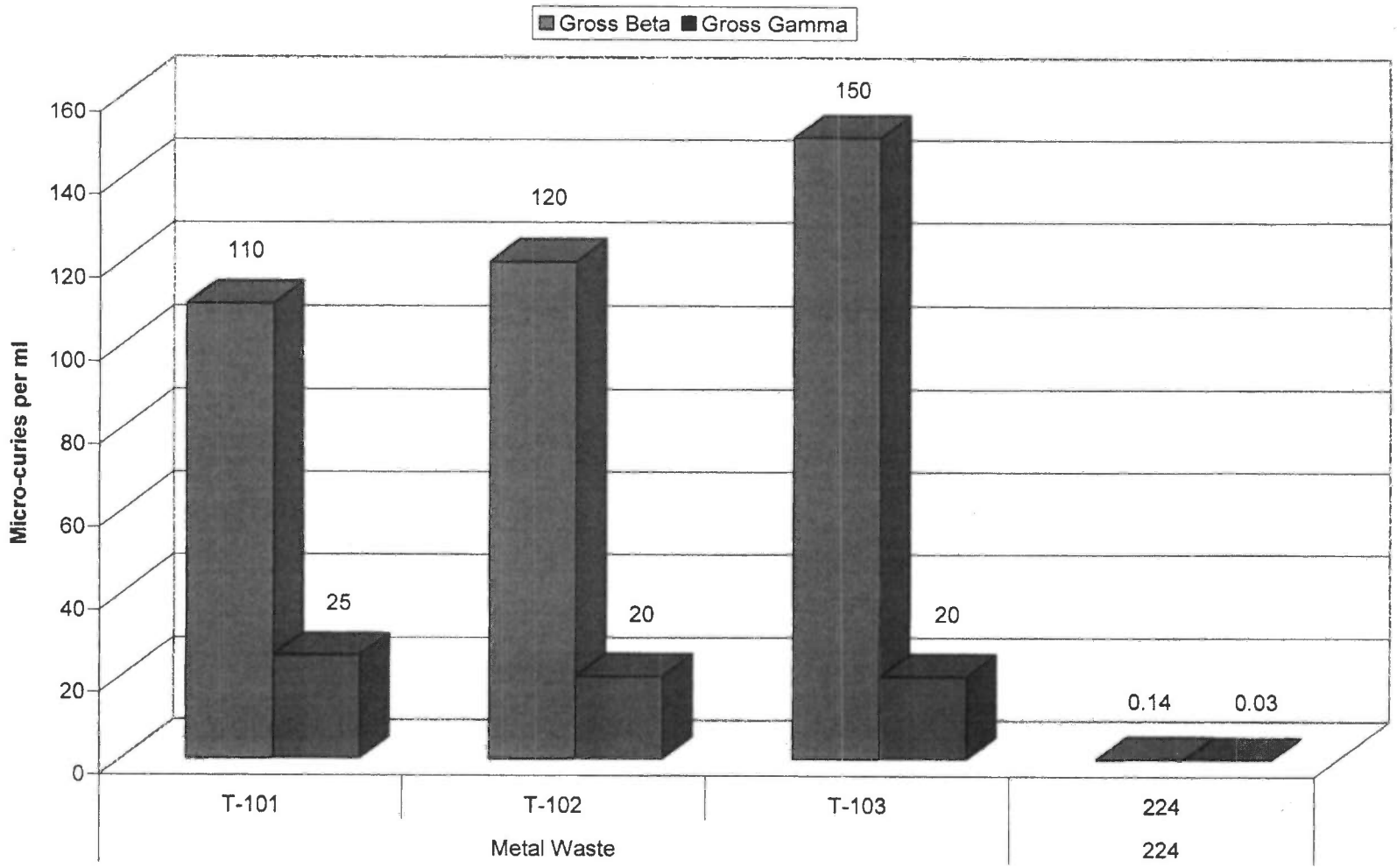
		SST's Contact Handled	SST's Handling TBD	DST's Likely Remote Handled
12 Tanks in CRA	*Initial 8 Tanks*	*B-201** *B-202* *B-203** *B-204** *T-201* *T-202* *T-203* *T-204*		
		T-111*		SY-102 AW-103 AW-105
Remaining Potentially TRU Tanks		T-104 T-110	B-107* B-110* B-111* T-105 T-107 T-112	

Handling TBD - Data is not available at this time to determine whether these tanks are contact or remote handled TRU tanks
SST's - Single Shell Tanks
DST's - Double Shell Tanks
* - Assumed/confirmed Leaker
NOTE – All of these tanks are included in the Tank Closure EIS

224-T Waste Routing to T-200 Series SSTs



Historical Gross Beta and Gross Gamma Analysis for Metal Waste and 224 Building Waste



Highly Radioactive

200 Series TRU Tanks (8)

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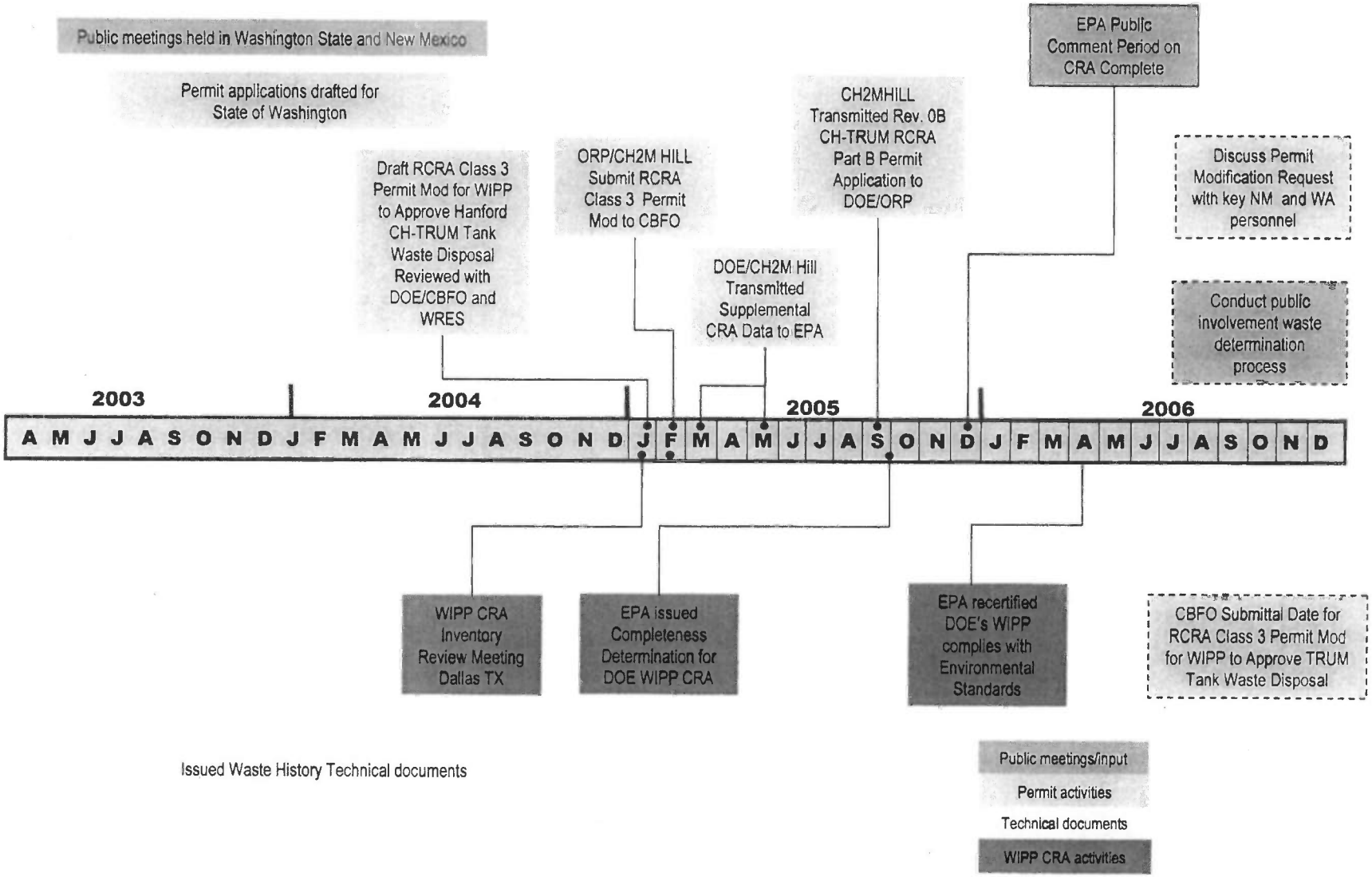
TRU Timeline at Hanford Site 2003 - 2006



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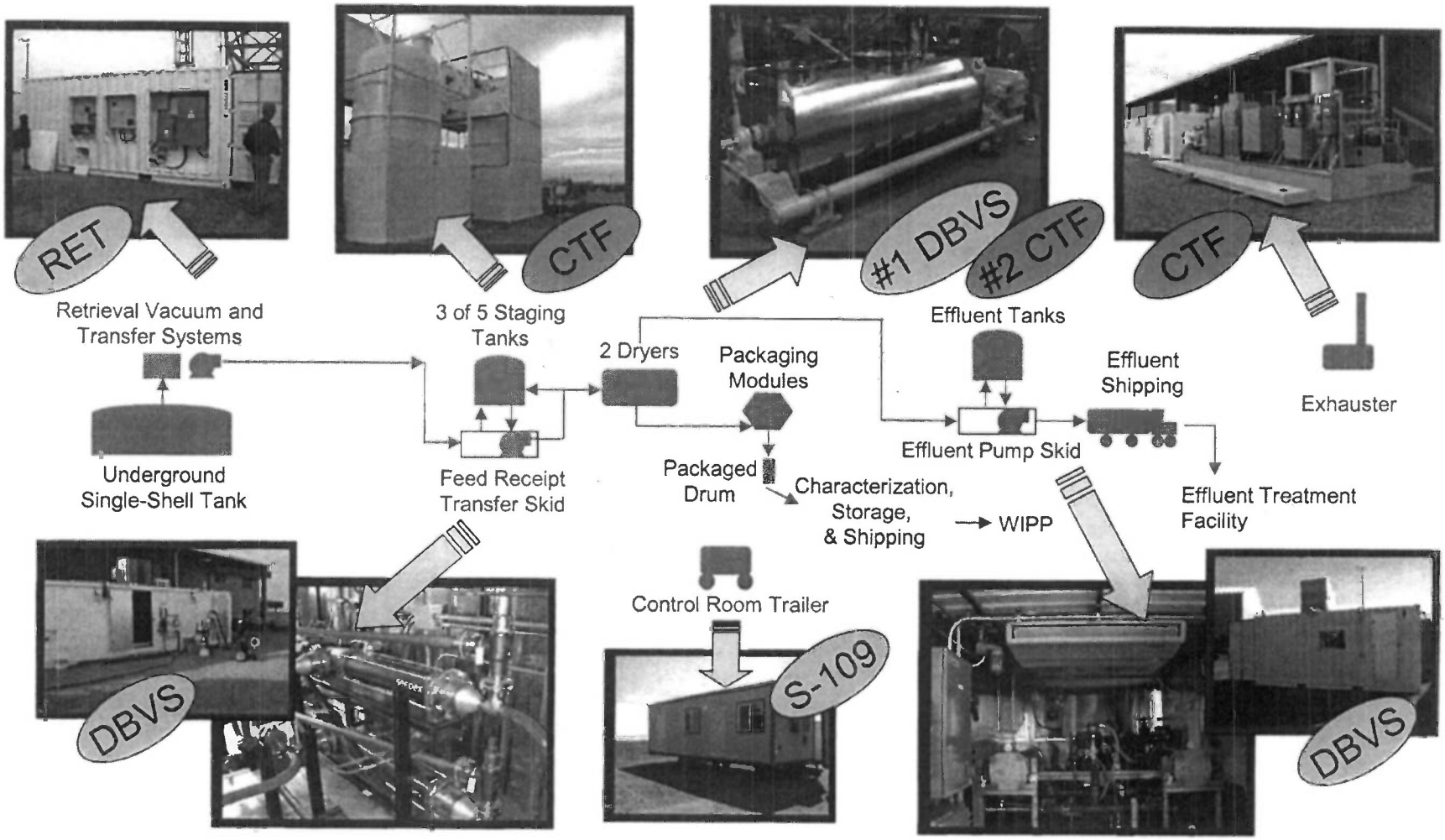
Contact Handled (CH)-TRU Project Status

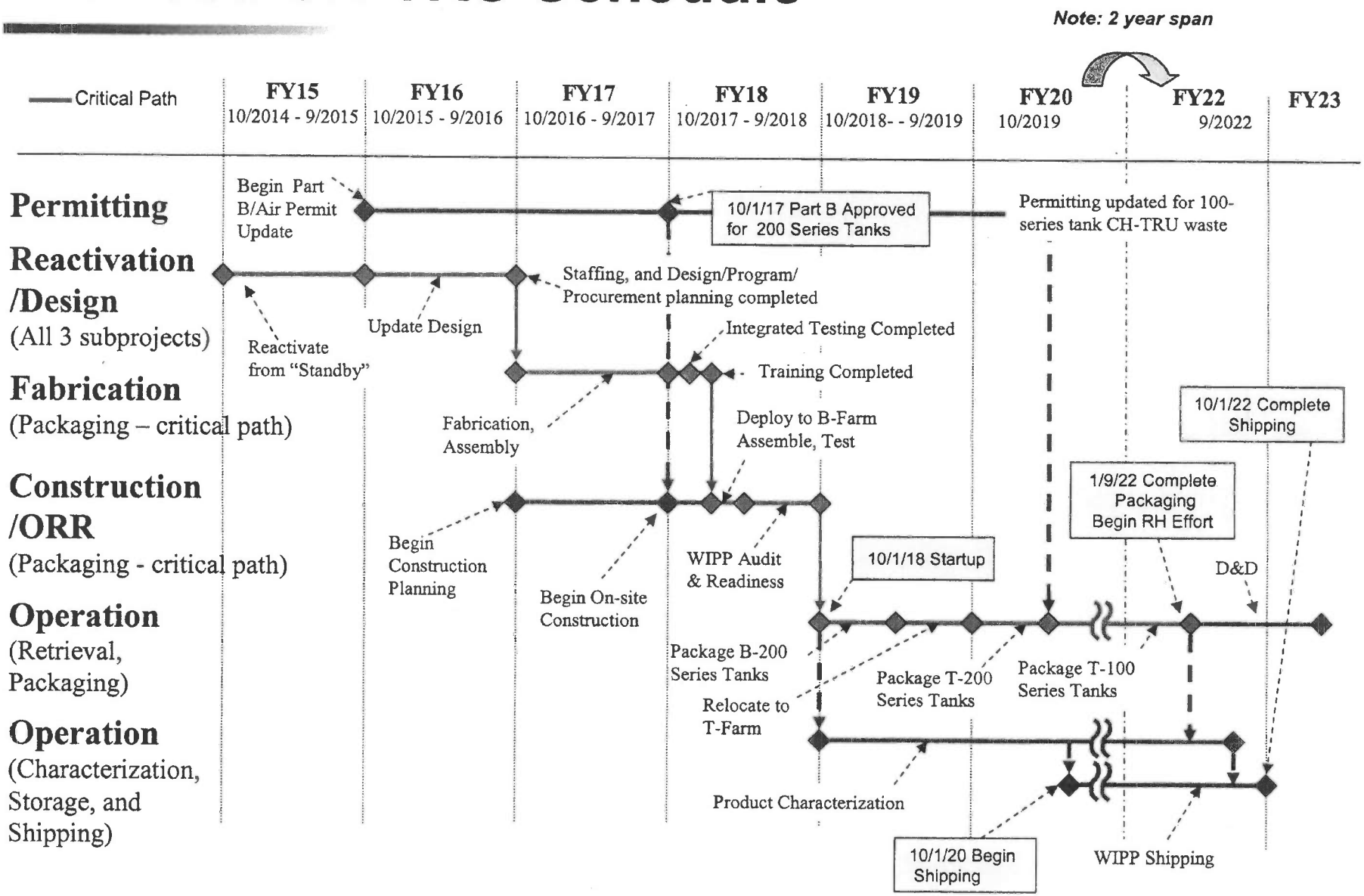
- All three TRU sub-projects (Retrieval, Packaging, and Characterization/Storage/Shipping) were ramped down from April 2005 to end of fiscal year.
- Standby effort completed September 30,2005:
  - Dispositioned records, contracts, staff, equipment
  - Documented ramp-down in Standby Report RPP-RPT-25638
- Baseline Change Request (BCR) generated during ramp-down based on environmental permitting critical path yielding project ramp-up starting October 1, 2006.
- Tank Farm Project baseline is being revised to restart project in October 2014 based on current funding constraints.
- The additional delays impact on project record and equipment management will be evaluated.
- Continuing to work the regulatory pathway with DOE, EPA, Washington State Department of Ecology and New Mexico Environment Department.

Current CH-TRU Equipment Disposition



Key: **RET** - Turned over to Retrieval project for other SST retrievals
DBVS - Turned over to Demonstration Bulk Vitrification System project
S-109 - Turned over to S-109 Retrieval project to support DBVS
CTF - Stored at Cold Test Facility still under management by TRU project

Revised CH-TRU Schedule



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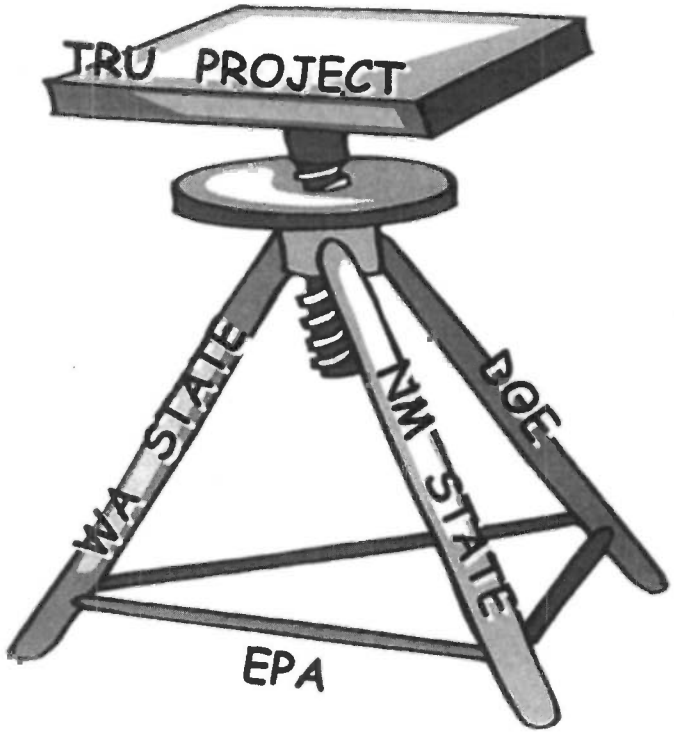
Project Environmental Endorsement Needs

- **EPA**
  - Recertified DOE WIPP Compliance with Environmental Standards…
- **DOE**
  - NEPA documentation
  - Waste determination
- **State of New Mexico**
  - Class 3 Permit Modification
- **State of Washington**
  - RCRA permit



Summary

- Eight (200 series) tanks are generally recognized by most stakeholders as having a sound and comprehensive basis for designation as CH-TRU.
- NEPA documents, Part B, PDSA, and design are ready for formal regulator review and approval on these eight tanks.
- Waste determination process proposed by DOE during EPA WIPP recertification efforts is in its infancy.
- TRU treatment and disposal are not affected by WTP delays.
- Additional delay imposes project cost impacts from reconstitution of project team, technical approach, and hardware.

Hanford CH-TRU treatment and disposal is a WIN-WIN

Hanford Site River Protection Project Transuranic Tank Waste Identification and Planning For Retrieval, Treatment, and Eventual Disposal at WIPP

John Kristofzski, Rick Tedeschi, Michael E. Johnson, Mike Jennings
CH2MHill Hanford Group, Inc.
P.O. Box 1500, Richland, WA 99352

Diane Clark
Office of River Protection, Department of Energy
P.O. Box 450, Richland, WA 99352

ABSTRACT

The CH2MHill Hanford Group, Inc. (CHG) conducts business to achieve the goals of the Office of River Protection (ORP) at Hanford. As an employee owned company, CHG employees have a strong motivation to develop innovative solutions to enhance project and company performance while ensuring protection of human health and the environment. CHG is responsible to manage and perform work required to safely store, enhance readiness for waste feed delivery, and prepare for treated waste receipts for the approximately 53 million gallons of legacy mixed radioactive waste currently at the Hanford Site tank farms. Safety and environmental awareness is integrated into all activities and work is accomplished in a manner that achieves high levels of quality while protecting the environment and the safety and health of workers and the public. This paper focuses on the innovative strategy to identify, retrieve, treat, and dispose of Hanford Transuranic (TRU) tank waste at the Waste Isolation Pilot Plant (WIPP).

INTRODUCTION

It has been recognized and documented for decades that there is a range of radioactive wastes stored at the Hanford Site Tank Farms. The breadth of materials includes various physical forms such as sludges, saltcakes, and liquids as well as a range of chemicals used in the defense mission. The waste includes high level waste, transuranic (TRU) waste, and low level waste [5 and 6]. The cleanup of these wastes will be in compliance with the *Hanford Federal Facility Agreement and Consent Order*.

The U.S. Department of Energy (DOE) once considered a single waste treatment approach to treat the Hanford Site tank waste, the Waste Treatment and Immobilization Plant (WTP). The WTP is the largest facility of its kind in the world. As a result of ongoing waste characterization efforts opportunities have been identified to aligning the characteristics of the various wastes that were placed in the tanks with the treatment and disposal methodologies that could beneficially be applied to those wastes.

In a number of cases, wastes in the tanks were not generated by the reprocessing of spent nuclear fuel. These include wastes produced during cladding removal prior to reprocessing; wastes produced during plutonium purification; wastes produced due to equipment/facility decontamination; and laboratory wastes. An example of this was a tank of double-shell tank

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waste that the Nuclear Regulatory commission stated "clearly do not contain HLW..." and was retrieved, treated and retrievably disposed at the Hanford Site in 1989 [12]. By tailoring treatment and disposal to a waste stream's origin and characteristics, the DOE can increase the overall treatment efficiency and reduce the time and lifecycle cost to complete the cleanup of tank wastes in full compliance with applicable regulations and the DOE commitments. Specific to this workshop, selected Hanford Site TRU waste tanks will be discussed.

EXTENSIVE CHARACTERIZATION CONDUCTED

Extensive characterization work has been conducted in the past decade on the history, origin, chemical, physical, and radiological properties of the Hanford waste stored within its tank farms. This work was conducted in response to *Defense Nuclear Facility Safety Board Recommendation 93-5* and for the *Hanford Federal Facility Agreement and Consent Order* milestone M-44 and resulted in numerous technical publications (see http://twins.pnl.gov/twins.htm). The characterization work included an extensive review of operational records to understand the waste generation processes, how the physical configuration of piping went from the processes to the tanks and the resultant tank fill history. Information provided by these records is confirmed by sampling and analysis of tank contents. A pivotal discovery was that the eight TRU tanks discussed in this paper when retrieved, treated and packaged would be contact handled versus the prior assumption they would be remote handled.

WASTE GENERATION PROCESSES AT THE HANFORD SITE

The Hanford Site was created in 1943 to produce plutonium from spent nuclear fuel (SNF) as part of national defense activities. During the over 50 years of operations conducted at the Hanford Site, three main chemical separation processes were used to recover plutonium from SNF. All three of these chemical separation processes generated product streams, as well as, High Level Waste (HLW), low-level waste, and TRU waste streams. The wastes from the Reduction-Oxidation (REDOX) process: 1951 - 1967; and Plutonium-Uranium Extraction (PUREX) process: 1956 - 1990 processes were not transferred to the tanks that are the subject of this paper and are not discussed further. In general, the low-level waste streams generated from these chemical separation processes have been either disposed or mixed with HLW in the tank system. The HLW generated from reprocessing SNF in these chemical processes will be treated at the Hanford Site Waste Treatment and Immobilization Plant and disposed at the national SNF and HLW repository.

The wastes in the eight tanks discussed in this paper are from the Bismuth Phosphate process (BPP): 1945 – 1956. The contact-handled TRU waste stored in the eight Hanford tanks originated from the Plutonium Concentration Building (224 building) work conducted from 1945 through 1956. The 224 Plutonium Concentration Building received Plutonium product solution from the separations building (221 Plant), both of which were part of the Bismuth Phosphate Process (BPP).

Bismuth Phosphate Process

The BPP, the first production-scale SNF reprocessing process ever used, was deployed during the Manhattan Project (World War II) to separate plutonium (Pu) from SNF [1 and2]. The BPP

process was a batch specific process with a specific input stream (such as Plutonium solids) entered a process step and well understood product streams (such as declad SNF) and waste streams (such as condensate) exited a process step.

Figure 1 is a simplified diagram of the BPP process that is used to illustrate the batch processes and demarcation points between process steps. The BPP achieved thorough liquid/solids separation via centrifugation and multiple water rinses of the centrifuge solids cake, thereby removing liquids and soluble materials from the cake. Each batch process step resulted in an extensive and selective separation of the process wastes from the process product streams that contained plutonium.

The BPP consisted of five batch process steps conducted in the 221-B and 221-T Plants and plutonium concentration step conducted in the 224-B and 224-T Buildings. The five BPP batch process steps conducted in the 221-B and 221-T Plants were:

Coating Dissolution;
Uranium Dissolution;
Uranium Separation;
First Decontamination Cycle for plutonium; and
Second Decontamination Cycle for plutonium

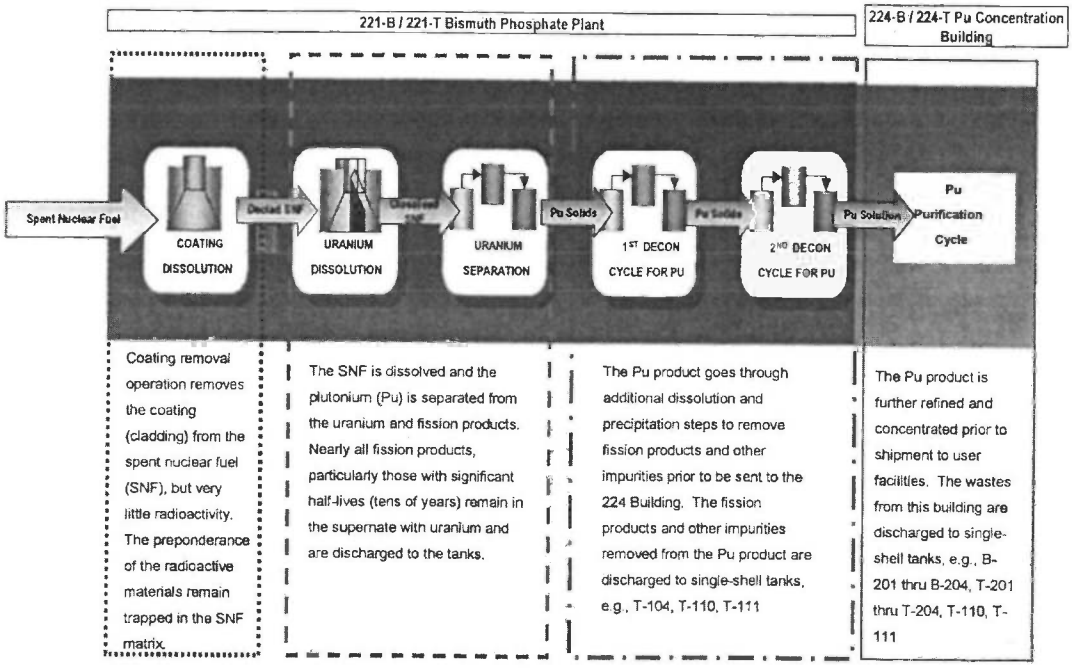

Figure 1. Simplified Bismuth Phosphate Process Diagram.

Coating Removal

Prior to actual reprocessing of the SNF, the aluminum coating of the SNF had to be removed to expose the uranium fuel. A boiling solution of sodium nitrate and sodium hydroxide was used to dissolve coating. While virtually all of the radioactive fission products remained within the intact spent fuel matrix, small amounts of radioactive materials at the surface of the fuel slugs entered the coating removal solutions. The coating removal step is considered a "head-end process" and not part of SNF reprocessing since the SNF remained intact throughout the coating removal process. The coating removal wastes were subsequently combined with first cycle plutonium decontamination waste (discussed below) to use the excess sodium hydroxide in the coating removal wastes to neutralize acids in the first cycle decontamination wastes. The eight Hanford tanks discussed in this paper did not receive coating waste.

Uranium Dissolution and Uranium Separation

Following removal of the coating, the uranium fuel slugs were dissolved in nitric acid. Once dissolved, water and sulfuric acid were added to convert uranyl nitrate to uranyl sulfate. Next, bismuth nitrate and phosphoric acid were added and a bismuth phosphate carrier solid was formed that extracted plutonium from solution as precipitated solids. The uranyl sulfate remained in solution along with nearly all of the long-lived fission products such as cesium-137 (Cs^{137}) and strontium-90 (Sr^{90}). The plutonium solids were then separated from the uranium and fission products solution via centrifuging. The bismuth phosphate and plutonium solids were rinsed with water and re-centrifuged three times to remove any waste liquids and soluble fission products that may have been initially entrained in the solids. The bismuth and plutonium solids were transferred to the first plutonium decontamination cycle.

The uranium and fission products solution along with the water used to wash the plutonium solids were combined and discharged to specific underground storage tanks. This combined waste stream was known as metal waste (designated as MW).

Acids introduced during uranium dissolution dissolved the SNF, placing the plutonium, the uranium, and all of the fission products in solution. The dissolved uranium fuel was then acted upon in the uranium separation step to separate plutonium as a solid. The uranium separation process step selectively precipitated the plutonium as a solid, leaving the uranium and fission products in solution as so-called metal waste.

The metal waste from uranium separations contained over 99.5% of the SNF constituent elements including >99.5% of the uranium, ~99% of the Cs^{137}, and ~90% of the Sr^{90}. The extensive liquid/solids separations and multiple rinses conducted during uranium separations ensured that any liquid wastes produced directly in reprocessing were discharged as liquid wastes and did not follow the plutonium solids into the first or second decontamination cycles or beyond. The eight Hanford tanks discussed in this paper did not receive metal waste.

First and Second Decontamination Cycles

The plutonium precipitate from the uranium separation step, once triple rinsed, contained >99.5% of the plutonium, <0.5% of the uranium, and ~10% of the fission products. At least half of the fission products were short-lived isotopes that decayed to deminimis levels within one to two years. Because the SNF constituent elements were separated during uranium separations, no SNF was present in the subsequent plutonium decontamination cycles.

In the first plutonium decontamination cycle (called '1C' waste), the plutonium solids were dissolved and oxidized to the +6 valence state via the addition of sodium bismuthate and sodium dichromate. Sodium bismuthate, phosphoric acid, zirconium nitrate, and cerium nitrate were added to precipitate bismuth phosphate and fission products (primarily strontium, cerium, and zirconium). The bismuth phosphate and fission product precipitate solids were centrifuged to separate them from the plutonium which remained in the liquid phase. The bismuth phosphate and fission product precipitate solids were dissolved in nitric acid and discharged to specific underground storage tanks as part of the first decontamination cycle waste.

Following separation, the plutonium in the liquid phase was reacted with bismuth subnitrate and phosphoric acid to produce a bismuth phosphate carrier and co-precipitate plutonium phosphate as solids. The bismuth phosphate carrier and plutonium phosphate solids were separated from the mother liquor by centrifugation. The plutonium phosphate solids were water washed and centrifuged three times. The mother liquor and wash water were combined and discharged to specific underground storage tanks as part of the first decontamination cycle waste.

The bismuth phosphate and plutonium phosphate solids were then dissolved in nitric acid, forming plutonium nitrate and bismuth nitrate in solution. This solution was then transferred to the second decontamination cycle where the first decontamination process steps (except for zirconium nitrate and cerium nitrate addition) were repeated to further purify the plutonium product. Waste solutions generated from the second decontamination cycle were discharged to specific underground storage tanks.

The eight Hanford tanks discussed in this paper did not receive first or second plutonium decontamination cycle wastes.

At the end of the second decontamination cycle (called '2C' waste), the washed plutonium solids were dissolved in nitric acid and transferred to the 224-B or 224-T Concentration Buildings for further processing.

224 Buildings

The plutonium solution from the 221-B (or 221-T) Plant was transferred to the 224-B (or 224-T) Concentration Building to remove the bismuth phosphate and residual fission products which were essentially all short half-life contaminants. The plutonium solution was received at 224 Concentration Building in a +4 valence state. It was first oxidized with sodium bismuthate to a +6 valence state. Phosphoric acid was added to precipitate bismuth phosphate along with residual Zr^{95} and Nb^{95} fission products, which were then removed by centrifugation leaving the plutonium in solution. Hydrogen fluoride and lanthanum fluoride were added to precipitate remaining fission products leaving the plutonium in solution. Hydrogen fluoride and lanthanum salts were then added to create lanthanum fluoride and plutonium fluoride solids which were separated by centrifugation. The lanthanum fluoride and plutonium fluoride solids were reacted with potassium hydroxide to produce lanthanum hydroxide and plutonium hydroxide. The lanthanum hydroxide and plutonium hydroxide solids were reacted with nitric acid to produce the high purity plutonium nitrate/lanthanum nitrate product.

The waste solution generated from processing plutonium solutions in the 224 Concentration Buildings were discharged to specific underground storage tanks. An extensive review of historical documents such as monthly reports and construction drawings was conducted to verify the waste transfer routes. Figure 2 depicts the waste routing from the 222-B Plant to the four B-200 series tanks. "Beginning in October 1946, tanks 241-B-201 through 241-B-204 were used *as* settling tanks for the solids that were contained in the 224-B Concentration building waste, with the liquid discharged to the 241-B-1 and 241-B-2 cribs. Prior to October 1946, the waste from the 224-B Concentration building was transferred to the 361-B settling tank and the liquid portion discharged to the 241-B-361, reverse-well. By September 1946, solids had accumulated in the 361-B settling tank to *a* point where the tank had reached its storage capacity, causing shutdown of 221-B and 224-B building operations, as reported in the Army Corp of Engineers monthly report for September 1946 (14, page 77). A project was initiated in August 1946 to divert the 224-B Concentration building waste to tank 241-B-201 (15). The Army Corp of Engineers monthly report for October 1946 reports this project was completed on October 1. 1946, at which time a connection was made from the 224-B building waste transfer line to tank 241-B-201 (14, page 87)." Tanks 241-B-201 through 241-B-204 received waste from the 224-B Concentration Building until June 1952. Tanks 241-B-201 through 241-B-204 also received miscellaneous low-level wastes (e.g., off-gas scrubber condensate and flush solutions). Similarly, the 224-T Concentration Building waste was initially transferred to the 361-T settling tank (December 1944 through October 1946) and subsequently to tanks 241-T-201 through 241-T-204 (November 1946 through May 1952) [13].

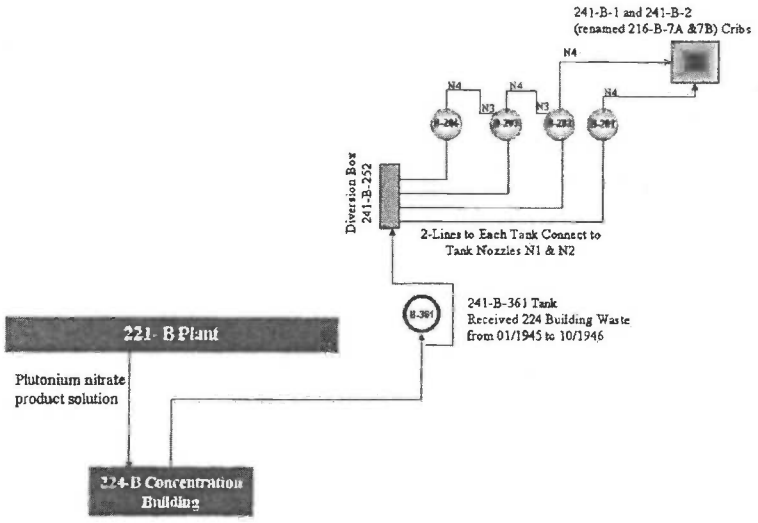

Figure 2. 224-B Waste Routing to B-200 Series SSTs.

Tanks Receiving BPP Wastes

The fission product concentrations are expected to be orders of magnitude higher for the wastes from the reprocessing step than for the other steps in the process because of the batch nature of the BPP. This is confirmed by analytical results. Figure 3 provides the gross gamma and gross beta concentrations of fission products measured in the waste received into some of these tanks from the BPP. These gross gamma and gross beta concentration measurements were obtained at the time each tank was filled with the specified waste. Figure 3 clearly shows that the concentration of fission products from the reprocessing step (the 'metal waste' or HLW) was dramatically higher than any subsequent step further validating the ability to characterize where the waste from the various process steps came from. In fact the metal waste is seen to be more than 100 times that of 1C waste, more than 1,000 to 100,000 times that of 2C and 224 wastes.

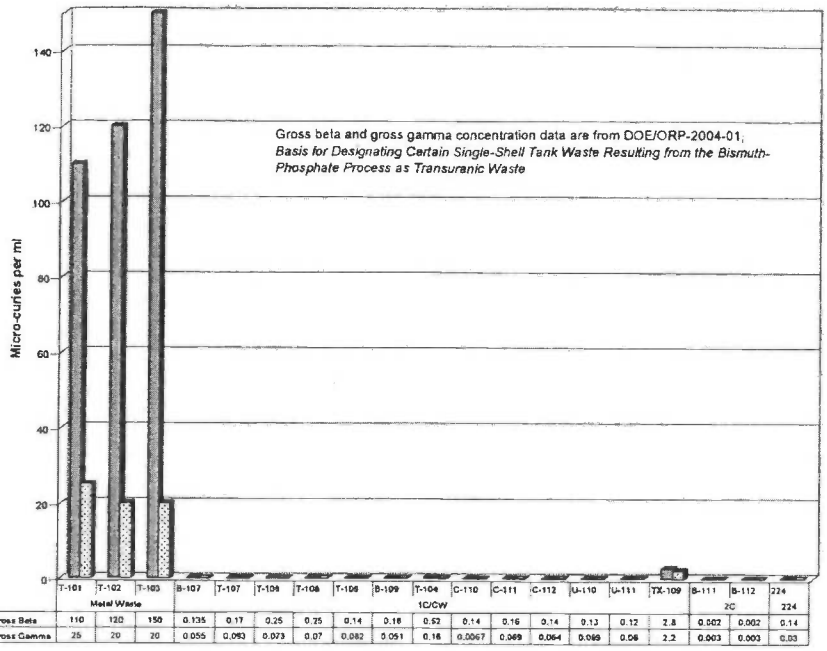

Figure 3. Fission Product Activity in Bismuth Phosphate Process Wastes (Late 1940's)

The fission product and TRU elements concentrations of the TRU solids stored in these eight (8) SSTs are listed in Table 1. The low fission product concentrations (see Table 1) in these wastes are consistent with origin of the waste.

Table 1. Candidate Contact-Handled Single-Shell Tanks TRU Waste Designation

Tank	Waste Volume (kgal)	TRU (nanocuries/gram)	Cs^{137} (curies/liter) (1)	Sr^{90} (curies/liter) (1)
B-201	30	824	0.0002	0.002
B-202	29	214	0.0001	0.004
B-203	51	297	0.000008	0.00009
B-204	50	263	0.00003	0.0017
T-201	29	754	0.00004	0.0001
T-202	21	221	0.00003	0.000003
T-203	37	295	0.00002	0.000003
T-204	37	243	0.000009	0.000005

Notes: (1) The concentrations of Cs^{137} and Sr^{90} are reported for these wastes as presently stored in these tanks. The treatment process will increase the concentration of radionuclides by removing free and bound water from these wastes. The Hanford Site maintains a Best Basis Inventory for all tank wastes, which is available at http://twins.pnl.gov/twins.htm. The Best Basis Inventories are re-evaluated on a periodic basis when new information becomes available.

WASTE MANAGEMENT PRACTICES

A summary description of the processes used to generate the subject waste, the piping configurations used to carry the waste to the specific tanks and the analytical information that confirms the understanding was presented above. It is also instructive to review how the waste has been managed and what decisions have been made regarding the subject waste.

The U.S. Department of Energy (DOE) has regulatory authority associated with the radioactive material stored in Hanford Tanks and has long had in place waste management rules that require the segregation of TRU waste from HLW to the extent practical (e.g., DOE Order 5820.2A, which was later superseded by DOE Order 435.1). Similarly, DOE's predecessor agencies required the segregation of wastes based on waste characteristics. The requirements were intended to facilitate both treatment and disposal activities.

In the Hanford Site tank farms, this segregation was achieved by establishing separate, dedicated storage tanks for each waste type where possible (e.g., high-level, low level, and TRU wastes), restricting the transfer of wastes among tanks, and by subjecting tank wastes to specific administrative controls and decision-making processes. The administrative controls associated with segregating the TRU tank wastes remain in effect today.

Notwithstanding the physical segregation of waste by type, DOE and its contractors at the Hanford Site managed the TRU tank wastes under the stringent standards for HLW in order to preclude the need to construct and maintain a separate tank system for interim storage of TRU tank wastes. This also avoided the establishment of separate safety protocols for the management of different tanks, depending on whether the wastes were high-level, TRU, or low-level. Management efficiencies were achieved by applying the same safety standards to all tank wastes regardless of type.

DECISIONS REGARDING TRU TANK WASTES

In 1988, following the preparation of the Hanford Defense Waste Environmental Impact Statement [7], DOE issued a Record of Decision (ROD) (53 FR 12449, April 8, 1988, "Record of Decision, Hanford High-Level, TRU, and Tank Wastes") on the proposed disposition of the tank wastes. DOE's ROD announced its decision to retrieve and treat wastes contained in the Double Shell Tanks (DSTs). The ROD also announced that wastes contained in the Single Shell Tanks (SSTs), as well as buried TRU and other site wastes, would be further studied and their treatment and disposal would be the subject of future National Environmental Policy Act analyses and decisions. Consistent with this ROD, DOE initiated plans to construct the Hanford Waste Vitrification Plant, which would have had the capacity to complete waste treatment of DST wastes.

In the early 1990's, DOE determined that it needed to develop and implement a strategy to retrieve and treat the tank wastes in both the SST and DST systems. This strategic change required a significant increase in the total treatment capacity. The Hanford Waste Vitrification Plant, in design at that time, was determined to have insufficient capacity to support completion

of the mission and was cancelled. A series of technical studies were undertaken in 1993 to establish a new path forward. A new plan emerged in 1995 to construct a much larger vitrification facility, with a pretreatment facility to separate low-activity tank wastes from high-activity tank wastes. The separate waste streams would then go to large vitrification facilities; one to immobilize the fraction of the wastes commonly called low-activity waste, and one to immobilize the high-activity waste fraction of the wastes, commonly called the HLW. This new treatment complex was to be constructed and begin operations in 1998, with the completion date of 2028 for the retrieval and treatment mission (approximately 30 years of operations).

During the planning timeframe of the early 1990's, DOE and its contractors conducted a series of additional studies to consider other waste treatment strategies. One particular study conducted in 1995 focused on identifying SSTs and DSTs containing TRU wastes [8]. As an element of that study, the tank histories and inventories were reviewed to identify which of the tanks contained TRU wastes. TRU tank waste treatment strategies were developed using the definitions from the WIPP Land Withdrawal Act (LWA), the draft WIPP Waste Acceptance Criteria (WAC), and an earlier U.S. Nuclear Regulatory Commission proposed rulemaking associated with HLW definitions.

This same study identified an initial population of tanks that contain TRU wastes. The study also indicated that further characterization and development of tank process history would likely establish that additional tanks contained TRU wastes.

In 1995, the DOE determined that alternative tank waste disposal strategies should be evaluated based on the projected cost difference between estimated disposal costs for the HLW repository (assumed to be Yucca Mountain) and WIPP. Two follow-on technical studies were commissioned and issued.

The first was a decision document issued in 1996 recommending that the technical planning baseline be modified to include blending of the TRU tank wastes with HLW feeds for treatment and disposal of that blended material in the national HLW repository, rather than separately packaging it for disposal at the WIPP [9]. The decision document was updated in 1996 to include an alternatives evaluation appendix. The second document, issued in 1996, established the technical feasibility of separately processing this TRU material for disposal in the WIPP [10].

In August 1996, DOE concurred with the recommendation that TRU tank waste should be processed with the HLW and authorized changes to the planning basis [11]. As a consequence of this decision, the TRU tank waste streams were not included in the 1995 TRU Waste Baseline Inventory Report (TWBIR) for WIPP because DOE believed it had another cost-effective disposal pathway. Nevertheless, DOE specifically precluded any changes to the waste management procedures, thus requiring continued segregation of stored TRU wastes from HLW.

Subsequent developments prompted a re-evaluation of the most appropriate and cost-effective pathway for the disposition of TRU tank wastes. The primary changes were:

- Historical knowledge of the sources and inventories of wastes in the tank farm has confirmed that the wastes in up to twenty tanks originated from the processing and purification operations of TRU elements.

- Based on its current capacity and processing schedule, the Waste Treatment and Immobilization Plant will not have the capability to process the tank wastes by the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) milestone of 2028. It is evident that processing the TRU tank wastes in the Waste Treatment and Immobilization Plant would require two to three years of additional operation at ~$400M per year.

- Significant tank waste characterization has been accomplished since 1996, and it is apparent that the TRU wastes contained in eight of the tanks will be contact-handled when packaged for disposal at the WIPP.

- The WIPP has several years of operating experience with various types of TRU wastes, and the Waste Acceptance Criteria for WIPP disposal are better known and understood.

REGULATORY PROCESSES

Statutory Definitions

In evaluating the wastes contained in these tanks, the Department has applied the definition of TRU waste from the WIPP Land Withdrawal Act of 1996, as amended (LWA) and the definition of HLW from the Nuclear Waste Policy Act of 1982, as amended (NWPA).

The *WIPP Land Withdrawal Act (LWA) of 1992, P. L. No. 102-579, 106 Stat. 4777, as amended by the WIPP LWA Amendments of 1996, P. L. 104-201, 110 Stat. 2422*), defines TRU wastes as:

> *The term "transuranic waste" means waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years, except for:*
>
> *(A) high-level radioactive waste;*
>
> *(B) waste that the Secretary has determined, with the concurrence of the Administrator, does not need the degree of isolation required by the disposal regulations; or*
>
> *(C) waste that the Nuclear Regulatory Commission has approved for disposal on a case-by-case basis in accordance with part 61 of title 10, Code of Federal Regulations.*

The Nuclear Waste Policy Act of 1982 (42 U.S.C. 10101(12)), as amended defines HLW as:

> *(A) the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and (B) other highly radioactive material that the Commission, consistent with existing law, determines by rule requires permanent isolation*

Reprocessing is a chemical process by which spent nuclear fuel is dissolved and the isotopes of interest such as plutonium and uranium are separated from other spent fuel constituents, i.e., waste products. A key element of reprocessing is the separation of isotopes of interest (e.g., plutonium) and waste products from spent nuclear fuel. The term "spent nuclear fuel" means fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated by reprocessing. In the Bismuth Phosphate process, the plutonium recovery technology initially used at the Hanford Site, spent nuclear fuel was separated into its constituent elements during the uranium metal dissolution process step.

As discussed, the wastes in these eight (8) tanks came from the 224 plutonium Concentration Buildings. These buildings received only Plutonium solution and did not see SNF or HLW. The wastes received in these eight (8) tanks were derived from processing plutonium and not from processing SNF. The wastes in the subject tanks meet the definition of TRU waste set forth in the LWA and are, therefore, appropriate for disposal at WIPP. Specifically, these wastes are not HLW and, when retrieved, treated and packaged for eventual shipment to WIPP will meet all WIPP waste acceptance criteria including that these wastes contain more than 100 nanocuries of alpha-emitting TRU isotopes per gram of waste, with half-lives greater than 20 years.

The fact that these wastes are not HLW is supported by comparison of tank waste fission product concentrations to the U.S. Nuclear Regulatory Commission limits for near surface disposal of low-level waste. As expected, the tank waste fission product concentrations for waste from process steps after the reprocessing step are orders of magnitude lower than required for disposal of in a geologic repository (see 10 CFR Part 61), as depicted in Figure 4 [3].

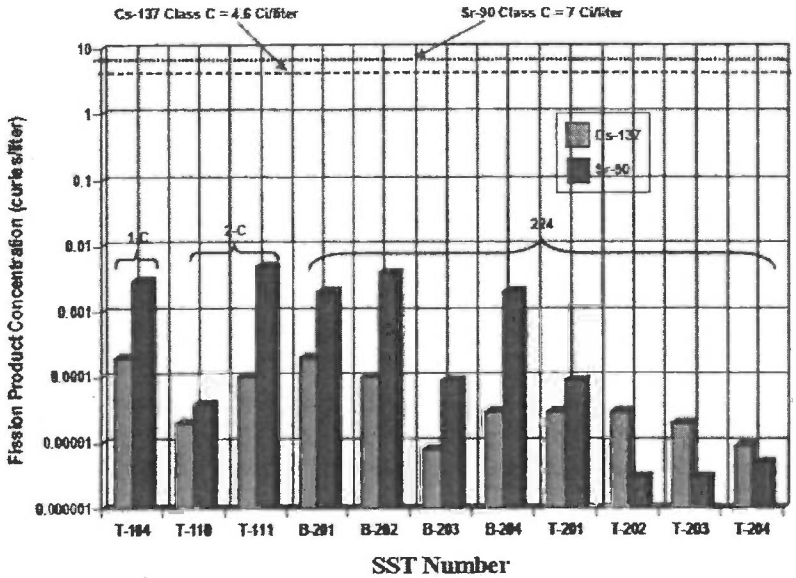

Figure 4. Cs^{137} and Sr^{90} Concentrations in 1C, 2C, and 224 Wastes from BPP[1].

TRU TANK WASTE TREATMENT PLAN

To prepare the Hanford Site TRU tank wastes for shipment to WIPP, the DOE will retrieve the wastes using a retrieval system in conjunction with a limited amount of water to facilitate recovery and to transfer wastes to the co-located waste treatment and packaging system. The wastes will be retrieved from the waste tanks in a systematic and controlled fashion, utilizing a closed loop retrieval process which ensures the wastes and supporting Acceptable Knowledge remains unaffected, which ensures the acceptability of the wastes at the WIPP. The retrieval system will further homogenize the wastes as a function of the retrieval operations.

The contact-handled TRU tank wastes would be dewatered and mixed with additives (adsorbent such as sand and vermiculite are being considered) to yield a homogeneous solid waste form meeting WIPP waste acceptance criteria. The WIPP waste acceptance and transportation protocols will be adhered to throughout the treatment and packaging operations. Wastes will be packaged in NRC-certified waste containers. Waste containers will be visually examined to confirm the acceptability of the wastes while providing independent validation that wastes are compliant with the waste stream profile and meet the WIPP requirements.

WIPP compliant waste characterization will be performed by trained professional staff performing to WIPP approved procedures, on certified equipment, and in compliance with the waste acceptance criteria. Independent review and certification of wastes to verify compliance

[1] DOE/RL-2004-01, page 9: The Cs^{137} and Sr^{90} concentrations are decay corrected to January 1, 2001 and are based on analyses of waste samples obtained from the identified tanks.

with the WIPP Hazardous Waste Facility Permit requirements will be performed by an independent, trained, and certified waste certification team.

Waste loading and shipping operations will be performed in compliance with the WIPP Hazardous Waste Facility Permit, the Nuclear Regulatory Commission, and the U.S. Department of Transportation (DOT) transportation criteria. These operations will be performed by trained staff in accordance with approved procedures on certified equipment. Loading operations personnel, equipment, facilities, and processes will comply with the requirements and be independently certified to ensure WIPP compliance. Waste packages and their supporting characterization data will be submitted, independently reviewed, and authorized for shipment prior to the commencement of loading and shipping operations.

CONCLUSION

The waste within the Hanford Site tank farms has been managed under the more restrictive HLW requirements, as a matter of operations management policy. Depending on origin, process history, and radiological characteristics, the wastes in any specific tank will be appropriately retrieved, treated and disposed as HLW, TRU, or low-level waste. The TRU waste from the eight (8) Hanford Site tanks discussed in this paper are the result of batch processes that enable a clear understanding of what waste came from what part of the process. This is substantiated by physical sample and analysis characterization information. As a result, the waste may be beneficially packaged and disposed at the WIPP.

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9. WHC-SD-WM-ES-368, 1996, *Decision Document for Transuranic Tank Waste Disposal*, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

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Transuranic Tank Waste Projections

Based on current information as of April of 2006
Prepared by M. Jennings

Contact Handled Transuranic Waste (CH-TRU)

- **Data Provided in FY05 – 8,600 total drums to be generated**
  - ~~FY07 – reactivation of TRU Project with Limited Funding Available~~
  - ~~FY08 – Fabricate, Test & Assemble; continue with permitting~~
  - ~~FY09 – Deployment, Training & WIPP Certification~~
  - ~~FY10 – Packaging and Characterization~~
  - ~~FY11 – Packaging and Characterization Continued Through FY12 & D&D in FY13~~
  - ~~FY12 – Commence Shipping – Assume to ship 50% of total containers~~
  - ~~FY13 – Complete Shipping – Assume to ship 50% of total containers~~

- **Current Planning Data – *8,600 total drums* to be generated**
  - CH-TRU Project Start Delayed Eight Years, From FY07 to FY14, therefore:
    - FY15 – reactivation of TRU Project with Limited Funding Available
    - FY16 – Fabricate, Test & Assemble; continue with permitting
    - FY17 – Deployment, Training & WIPP Certification
    - FY18 – Packaging and Characterization
    - FY19 – Packaging and Characterization Continued
    - ***FY20 – Commence Shipping – Assume to ship 50% of total containers***
    - ***FY21 – Complete Shipping – Assume to ship 50% of total containers***

Remote Handled Transuranic Waste (RH-TRU)

- **Data Provided in FY05 – *4,236 RH72B Canisters* to be Generated (Direct Loaded)**
  - ~~FY13 – RH TRU Project with Limited Funding Available~~
  - ~~FY14 to FY15 – Permitting, Engineering/Design~~
  - ~~FY16 – Deployment, Training & WIPP Certification; continue with permitting~~
  - ~~FY17 to FY28 Packaging and Characterization~~
  - ~~FY17 to FY29 – Shipping Assume level shipping profile~~

- **Current Planning Data – 4,236 RH72B Canisters to be Generated (Direct Loaded)**
  - RH-TRU Project Start Delayed Eight Years, From FY13 to FY20, therefore:
  - FY21 – RH TRU Project with Limited Funding Available
  - FY22 to FY23 Permitting, Engineering/Design
  - FY24 – Deployment, Training & WIPP Certification; continue with permitting
  - FY25 to FY36 Packaging and Characterization
  - ***FY25 to FY36 –Shipping Assume level shipping profile***
    - ***FY25 through FY36 – Plan for 8 shipments/wk @ 50wk/yr for 10.6 years***
      - ***One Canister per shipment***

Key:

- ~~Strikeout~~ is dated information that was provided in FY05 but is no longer current
- ***Bold/Italic*** text indicated waste forecast information of interest to FH Forecast Updates

Hildman, Cynthia M

From: Tedeschi, Allan R (Rick)
Sent: Wednesday, October 07, 2009 1:28 PM
To: Koll, Ronald J
Subject: 2009-10-08 Project Status to Dave French.pptx
Attachments: 2009-10-08 Project Status to Dave French.pptx

Follow Up Flag: Follow up
Flag Status: Flagged

Ron,

Here is a revision incorporating some comments from Bill. I have added a text slide to show challenges to original concept, removed the slide with the table showing the 20 tanks as superfluous info, and modified the "determination" wording to "designation."

Thanks,

Rick

washington river protection solutions

Hanford Tank Transuranic Waste Project Update

Presented to Dave French
October 8, 2009

Rick Tedeschi, WRPS
Bill Hewitt, WRPS/YAH
Ron Koll, DOE-ORP

TRU Project – Big Picture/Original Concept

washington river protection solutions

	B-201	B-202	B-203	B-204	T-201	T-202	T-203	T-204
	LEAKER		LEAKER	LEAKER				
Waste Volume (gallons)	29,000	28,000	50,000	50,000	30,000	20,000	36,000	36,000

279,000 gallons

Other Potential TRU Tank Waste

	3 Tanks	9 Tanks
Waste Volume (gallons)	1,134,000	1,509,000
	~5,900 Contact-handled 55-gallon drums	~4,300 Remote-handled canisters

$

- Estimated Packaging Operation Costs for these 8 tanks: ~$30M
- Current Project Lifecycle (excluding Retrieval and WIPP): ~$250M
- Cost to date (Project Start in FY03): ~$25M

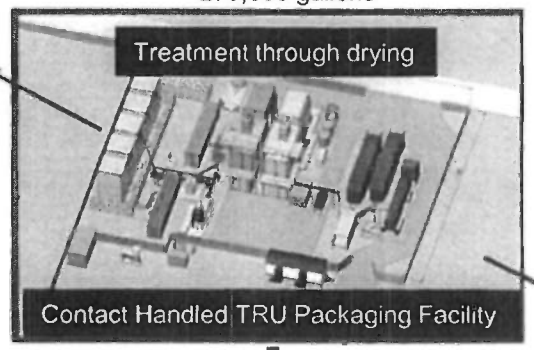
Major Long Lead Equipment Procured

Exhauster

3 of 5 Storage Tanks

1 of 2 Dryers – 80%

Liquid Effluent Pump Module



Effluent shipped to on-site Effluent Treatment Facility – No impact on existing Double-Shell Tank space

Average Dose rate 70-140 mrem

~1,600 Contact-handled (CH) 55-gallon drums

PRC/CCP - On-site drum storage, sampling, assay, characterization, and shipment preparation

STATUS

- Project Ramped down in FY05 to allow for permit processing
- TRU Waste inventory provided to WIPP
- Updated baseline included with Tank Farm Contractor BCR
- Equipment and records stored and managed for restart

CONTACT-HANDLED PROCESSING SCHEDULE

2 years: Reactivation & Design → 2 ½ years: Fabrication & Construction → 1 ½ years: 8 – Tank CH Packaging → 1 ½ years: Remaining CH Packaging

washington river protection solutions

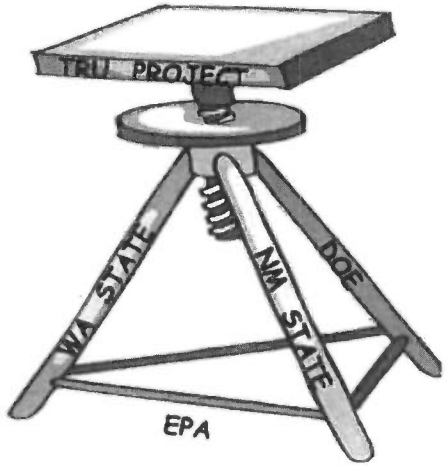
TRU Project – Challenges to Original Concept

- Tank waste designation not completed
- NEPA process through Tank Closure EIS – not approved
- DOE-HQ perspective that the eight 200 series tanks are insufficient basis
- Original modular design strategy may require significant additional confinement design
- Standby delay (will be 9 years with current baseline)
- RH-TRU not in current baseline

Regulatory Story

Project has been delayed because of NEPA/institutional issues

- All environmental permits were drafted during original project 2003 – 2005
- WIPP Class 3 permit Change Request drafted after WIPP changes
- DOE revised strategy for NEPA to inclusion within Tank Closure EIS
- DOE CH-TRU designation not completed



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Tank Waste Story

CH-TRU

Tank	In-tank Volume (k gallons)	Treatment Method	Packaged Mass [1] (kg)	Packaged Volume [1] (gallons)	Estimate No of 55-gal Drums [2]	Operational Inefficiencies [5]	Disposed Volume (m^3)	Mass of Waste per Drum [4] (lbs)	TWBIR ID # [6]	Waste Origin	Waste Origin Reference Document
B-201	29	Drying	73,572	12,147	259.8	298.8	62.7	631.5	RP-W754	4 Building wa	RPP-13300
B-202	28	Drying	45,895	7,578	162.1	186.4	39.1	631.5	RP-W754	4 Building wa	RPP-13300
B-203	50	Drying	64,415	10,636	227.5	261.6	54.9	631.5	RP-W754	4 Building wa	RPP-13300
B-204	50	Drying	63,300	10,451	223.6	257.1	54.0	631.5	RP-W754	4 Building wa	RPP-13300
T-201	30	Drying	62,882	10,382	222.1	255.4	53.6	631.5	RP-W754	4 Building wa	RPP-13300
T-202	20	Drying	27,755	4,583	98.0	112.7	23.7	631.5	RP-W754	4 Building wa	RPP-13300
T-203	36	Drying	48,878	8,070	172.6	198.5	41.7	631.5	RP-W754	4 Building wa	RPP-13300
T-204	36	Drying	53,046	8,758	187.3	215.4	45.2	631.5	RP-W754	4 Building wa	RPP-13300
T-110	370	Drying	470,409	77,668	1,661.3	1,910.5	401.2	631.5	RP-W755	224 Building waste and 2C waste	RPP-13873
T-111	447	Drying	609,872	100,695	2,153.9	2,477.0	520.2	631.5	RP-W755	224 Building waste and 2C waste	RPP-13873
T-104 [3]	317	Drying	597,021	98,583	2,108.7	2,425.0	509.3	631.5	RP-TFC001	1C / CW waste	RPP-16129
Totals	**1,413**		**2,117,045**	**349,551**	**7,477**	**8,599**	**1,806**				

Notes

[1] Calculation No. 20843.PCAL.001, page 18, dated July 22, 2004, *CH-TRUM Material Balance*, DMJM Technology, Richland Washington

[2] Assumes drums are filled to 85%

[3] Data for tank T-104 waste is not included in original calculation no. 20843.PCAL.001 but was included in revised calculation

[4] Assumes 5 vol% vermiculite (0.7 kg/L) added to each drum

[5] Assumed operational inefficiencies 15%

Tank Waste Story, cont. Undetermined/RH-TRU

Tank	In-tank Sludge Volume (k gallons)	Treatment Method	Packaged Mass [3,5] (kg)	Packaged Volume [1,4] (m^3)	Estimate No of RH-72B Canisters [2]	Disposed Volume (m^3)	Mass of Waste per Canister (lbs)	TWBIR ID # [6]	Waste Origin	Waste Origin Reference Document	Contact Handled or Remote Handled
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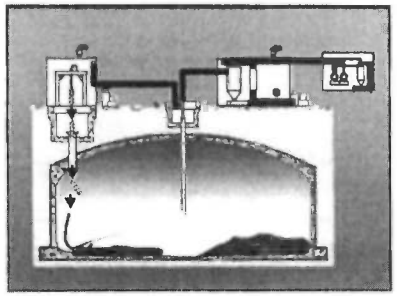

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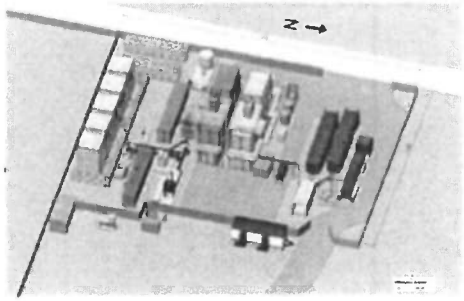

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CH-TRU DESIGN SCHEDULE PLANNING

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Start Shipping 2nd quarter FY18

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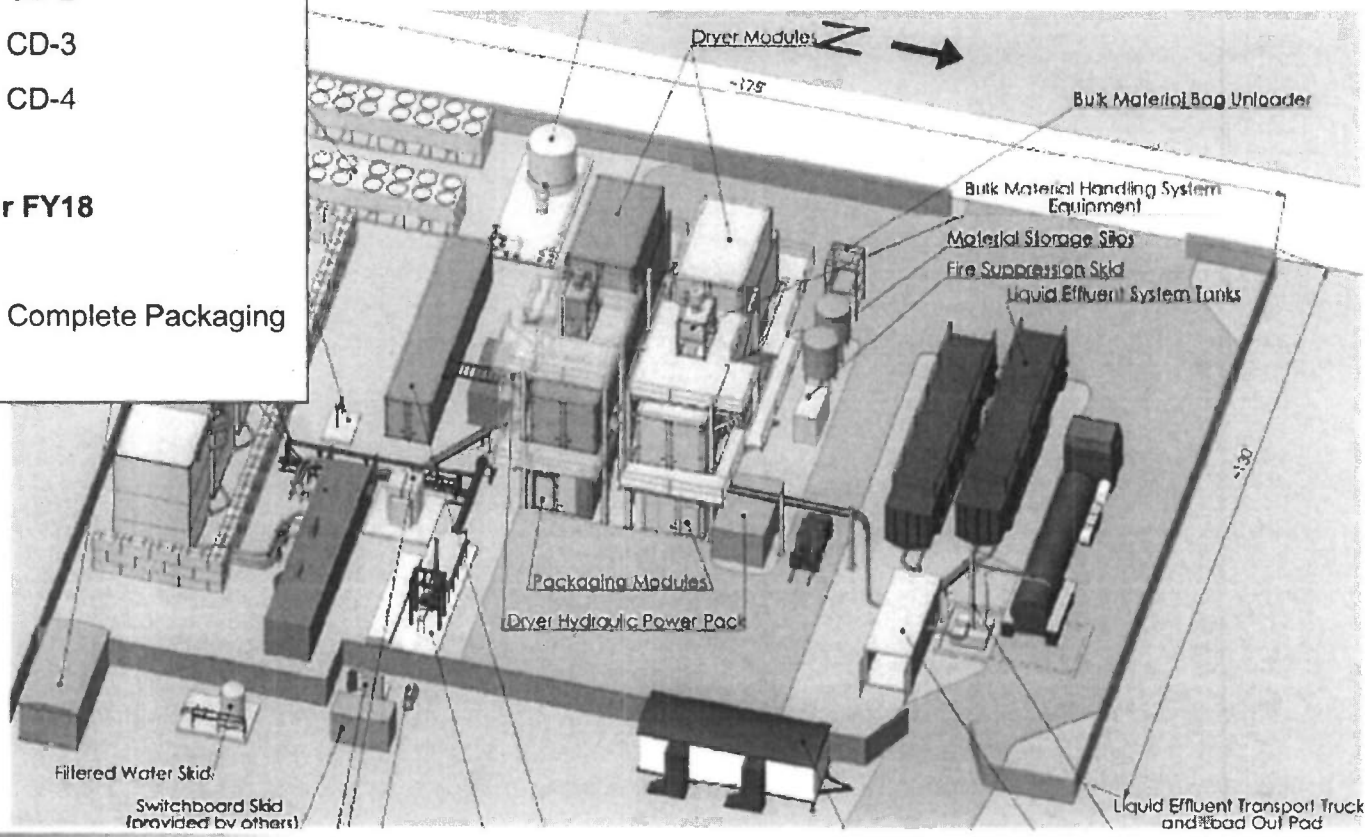

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Hanford Tank Transuranic Waste Project Update

Presented to Dave French
October 8, 2009

Rick Tedeschi, WRPS
Bill Hewitt, WRPS/YAH
Ron Koll, DOE-ORP

TRU Project – Big Picture/Original Concept

	B-201	B-202	B-203	B-204	T-201	T-202	T-203	T-204
	LEAKER		LEAKER	LEAKER				
Waste Volume (gallons)	29,000	28,000	50,000	50,000	30,000	20,000	36,000	36,000

279,000 gallons

Other Potential TRU Tank Waste

	3 Tanks	9 Tanks
Waste Volume (gallons)	1,134,000	1,509,000
	~5,900 Contact-handled 55-gallon drums	~4,300 Remote-handled canisters

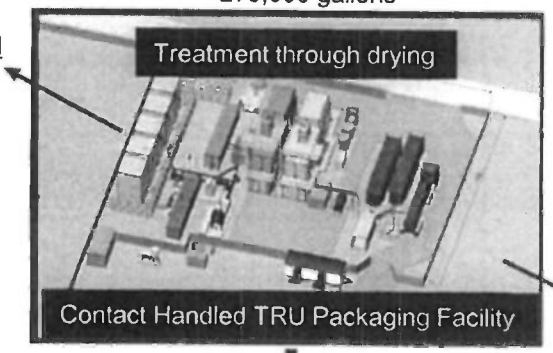
Major Long Lead Equipment Procured

Exhauster

3 of 5 Storage Tanks

1 of 2 Dryers – 80%

Liquid Effluent Pump Module



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STATUS

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CONTACT-HANDLED PROCESSING SCHEDULE

2 years: Reactivation & Design

2 ½ years: Fabrication & Construction

1 ½ years: 8 – Tank CH Packaging → 1 ½ years: Remaining CH Packaging

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- Tank waste designation not completed
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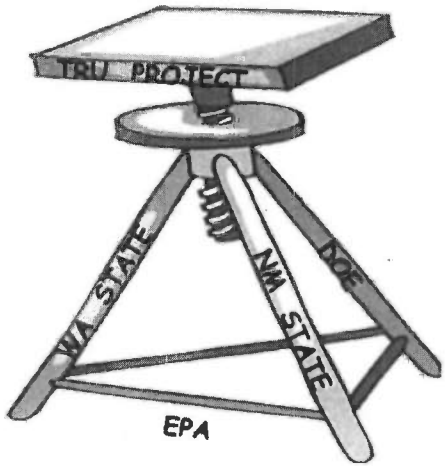

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Tank Waste Story

CH-TRU

Tank	In-tank Volume (k gallons)	Treatment Method	Packaged Mass [1] (kg)	Packaged Volume [1] (gallons)	Estimate No of 55-gal Drums [2]	Operational Inefficiencies [5]	Disposed Volume (m^3)	Mass of Waste per Drum [4] (lbs)	TWBIR ID # [6]	Waste Origin	Waste Origin Reference Document
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Hildman, Cynthia M

From: Tedeschi, Allan R (Rick)
Sent: Wednesday, October 07, 2009 4:03 PM
To: Koll, Ronald J; Hewitt, William M
Cc: Cloud, Jack D
Subject: Final Presentation to Dave French on TRU Project
Attachments: 2009-10-08 Project Status to Dave French.pptx

Follow Up Flag: Follow up
Flag Status: Flagged

Ron and Bill,

The attached file contains some final small editing changes.

I will bring copies to the meeting.

Thanks,

Rick

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washington river protection solutions

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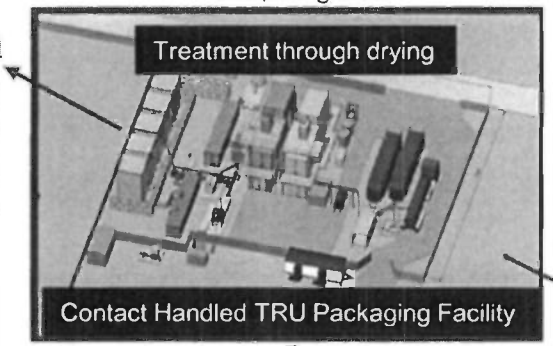

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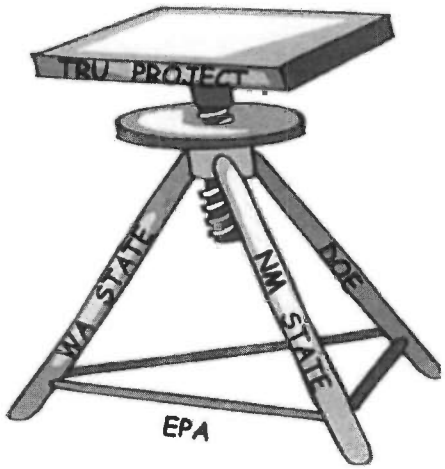

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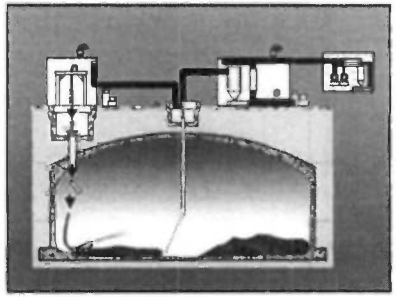

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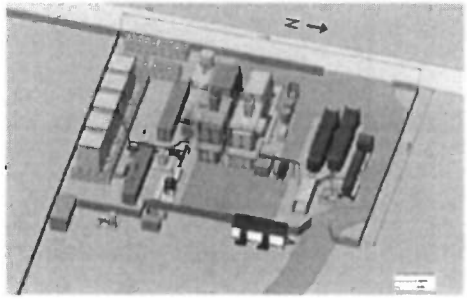

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Design Plan

CH-TRU DESIGN SCHEDULE PLANNING

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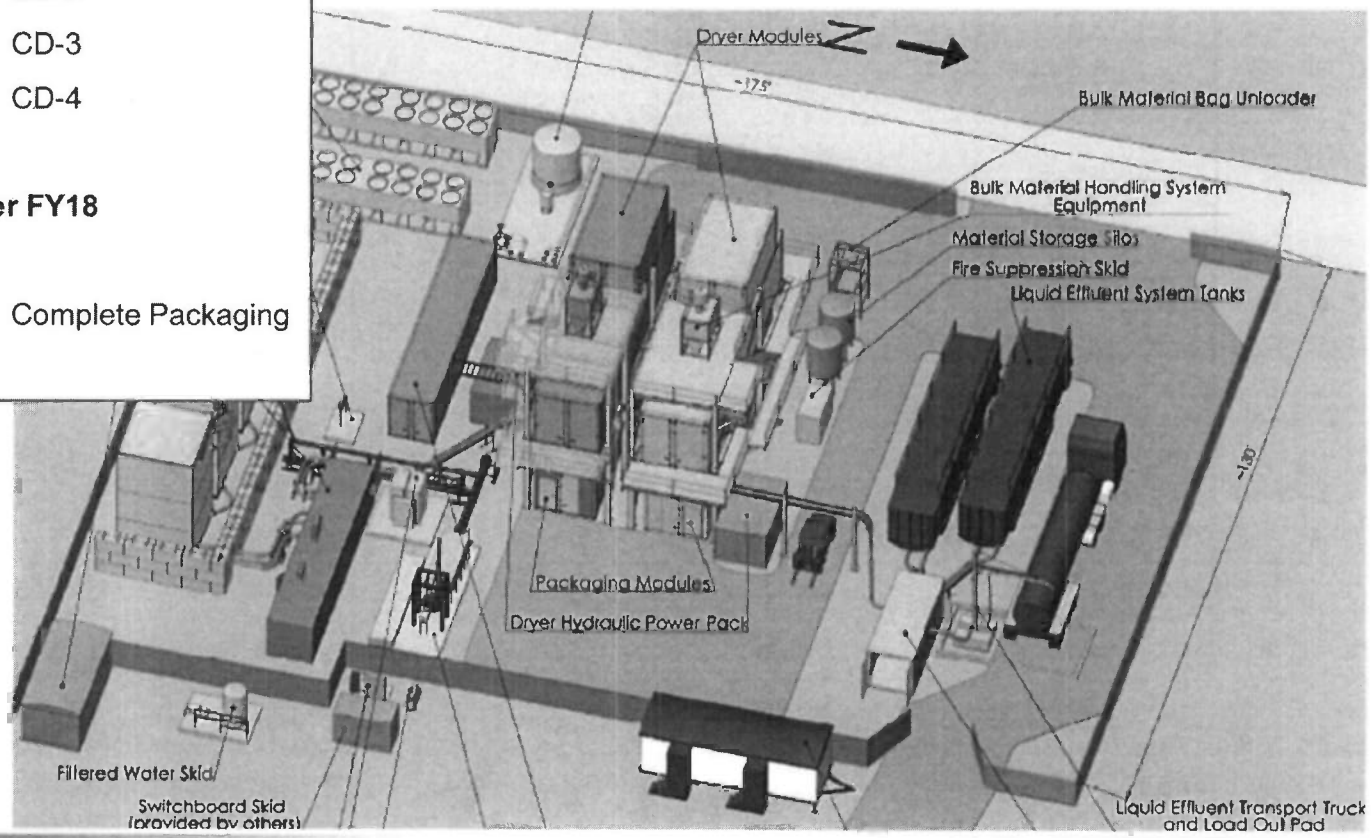

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Contact Handled Transuranic/Mixed (CH-TRUM) Tank Waste Processing

Program Update

John Kristofzski

Office of River Protection

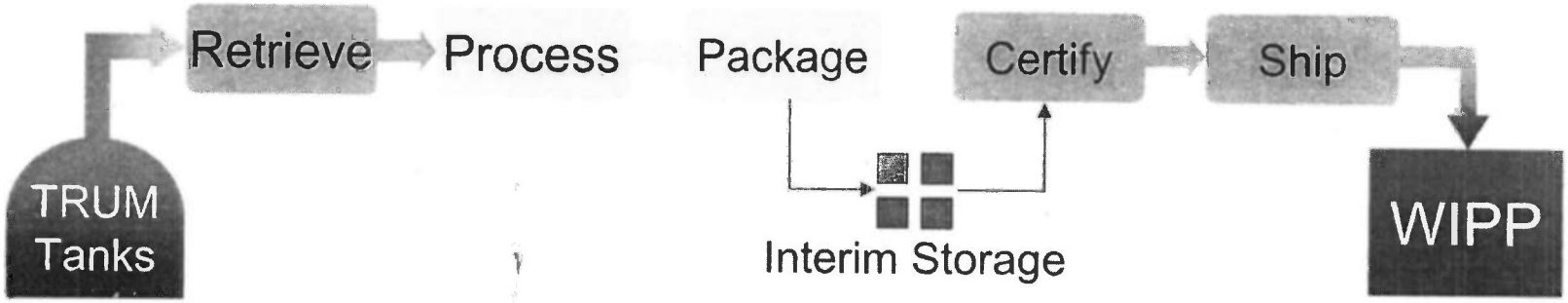
CH2MHILL
Hanford Group, Inc

Approved for Public Release;
Further Dissemination Unlimited

AGENDA

- Project Overview
- Schedule Recovery
- Procurement Status
- Regulatory Status
- Balance of Program Elements

Overview of Hanford Tank TRUM Program



Identified Hanford TRUM Tanks

Tank	Handling	Volume (kgal)	Series Totals (kgal)
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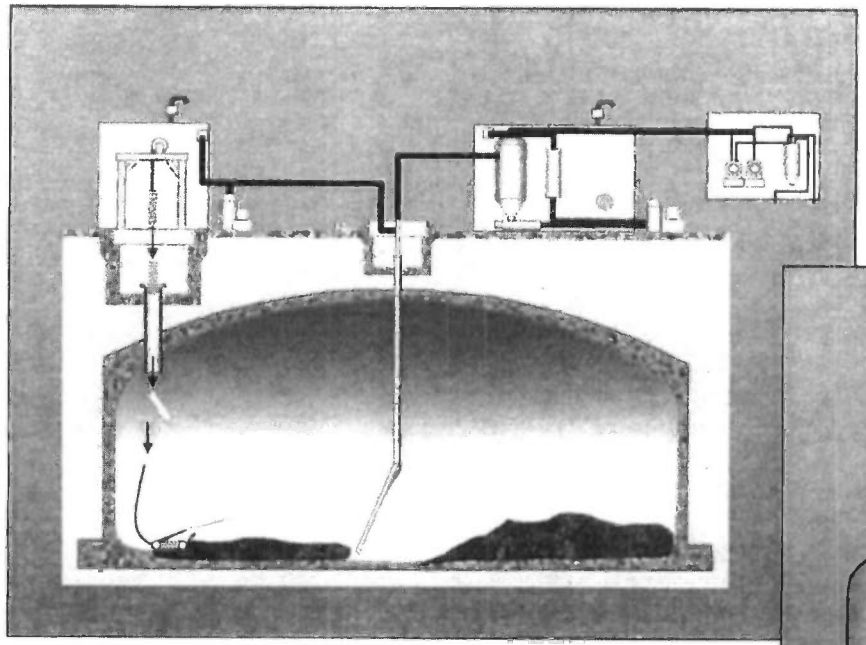
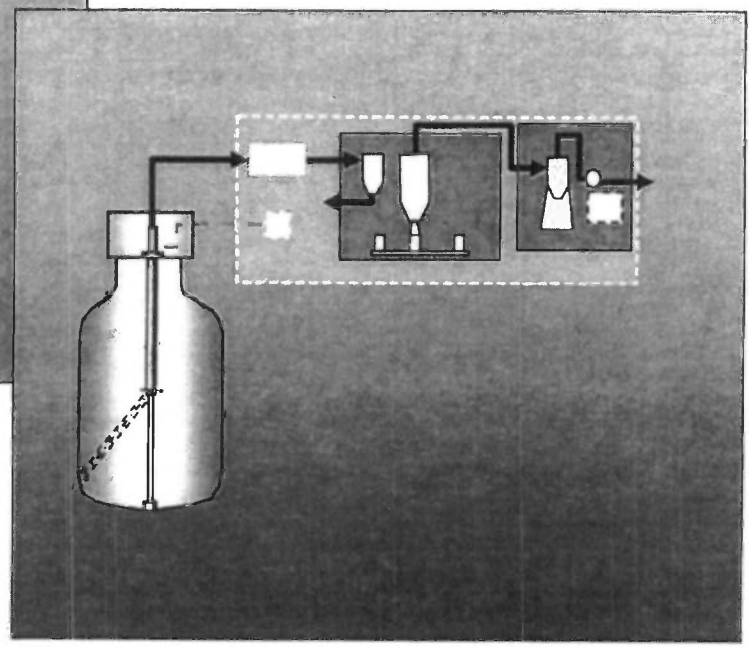
B-202	Contact	29	
B-203	Contact	51	
B-204	Contact	50	
T-201	Contact	29	
T-202	Contact	21	
T-203	Contact	37	
T-204	Contact	37	
T-111	Contact	447	
SY-102	Remote	105	571
AW-103	Remote	233	
AW-105	Remote	233	

TRUM Retrieval

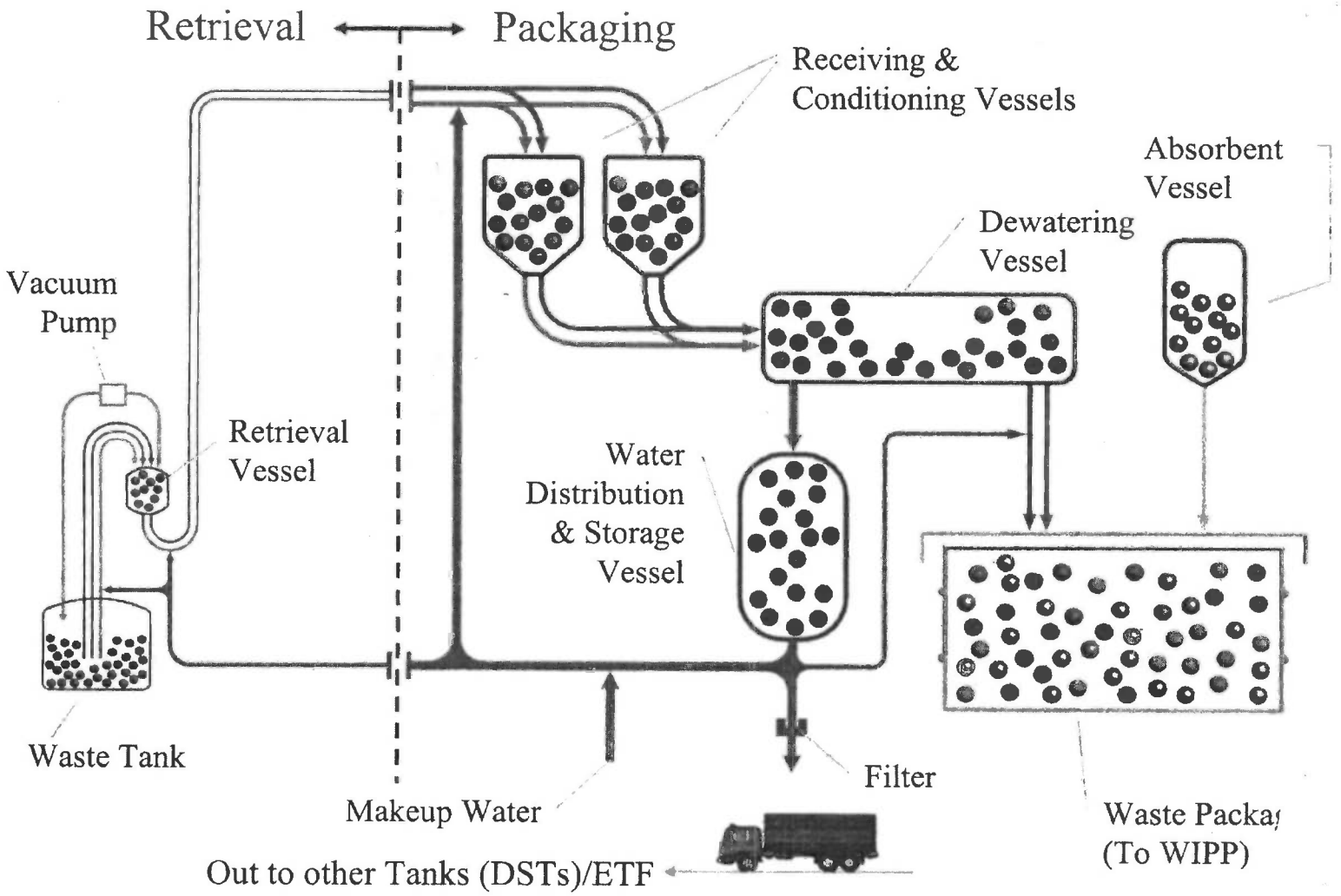




200 Series Tanks
- Articulated Mast System

100 Series Tanks
- Articulated Mast System
- Crawler

Conceptual TRUM Process



CH-TRUM Waste Generation Rate

CALCULATION EXAMPLE

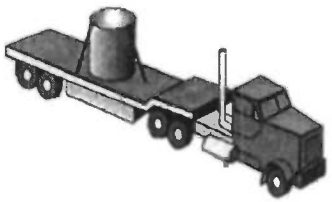
	SWB	55-Gallon DRUM
Waste Volume per Container	259 gallons	46 gallons
Filled Container Generation Rate	10 per day	64 per day
Total Number of Filled Containers	4254	27,500
Number of Shipments to WIPP	1,064	1,310

shipments
fits the schedule
vs # of
& type of
packaging.

- Many variables to consider for container planning
  - *For Example*: container types, shipment package types, shipping and container weights, waste density, container dose, fabrication costs, processing time
  - Optimization study in progress
- Major Assumptions for Table above
  - 1.1M gallons of waste processed 10/28/04 – 12/31/05 = 2558 gal/day (7 day/wk)
  - SWBs are shipped in 2-unit TRUPACT II's
  - Major limiting factor is weight; conservative waste density used: 1.45 gm/ml
- Operation fits within 50% Design TOE of 2880 gal/day with 2 systems

TRUM Programmatic Activities

- >90 Day Storage - where ??
- Visual Examination - characterization needs to be clef
- Real Time Radiograph
- Head Space Sample
- NDA
- Sampling



Schedule Recovery

CH-TRUM Project

82 Days Negative Float

10/28/04

Retrieval Start Enables

Closure by 2006

technical authorization is desired

- Recovery Strategy: Tie Part B Effectiveness to Retrieval Hot Tie-in – Recovers negative float
- Mitigation action: Issue Permitting Plan outlining this strategy signed by CH2M HILL, ORP, and Ecology
- IMES schedule contains Permitting Plan logic and manually forced line item (MA20625) which will reset schedule to 0 days float upon approval of Permitting Plan

target Fitzmons to agree (verbal) + local rep to sign it.

precedent in this plan has been established (1-2-03 document)

RISK MITIGATION

- Issue informal 60% Part B to Ecology to provide early assurance quality Rev 0 submittal – Complete 7/7/03

will meet weekly w/ permit writer

- Request additional design detail in bid proposals to allow early Part B incorporation while finalizing contract
- Vendor Incentive to provide final Part B technical information

Packaging System Procurement Process

Draft RFP Design/Build/Deploy Packaging System Only	April 2003 - COMPLETE
RFI for RFP Revision Design/Build, Retrieve, Package, D&D	April 2003 - COMPLETE Fedbizzops web page; 45+ em
Vendor One-on-Ones	May 5-7, 2003 - COMPLETE
Issue Revised RFP Design/Build Packaging + Strategy from RFI	June 4, 2003 - COMPLETE; Original Strategy of Just Packaging System; Bids due 7/28/2003
SEB Evaluation	August 4, 2003; Begin incorporation of technical data into Part B
Award Contract	Mid September, 2003

TRUM Waste Regulatory Path

- Transportation & WIPP disposal covered by existing permits/NEPA
- Retrieval covered by existing RCRA permits/NEPA
- Processing & packaging need RCRA permits/NEPA
- Air permits for retrieval and packaging will be required

TRUM Waste Regulatory Path continued

Processing & Packaging

- RCRA options considered
  - Interim Status (covered by existing permit)
  - Treatment by Generator
  - RD&D
  - ★ Final Status (Part B)
    - 60% draft to Ecology 7/7/03 for 30 day informal review

TRUM Waste Regulatory Path continued

- Part B Prerequisites
  - 80% critical systems design
  - SEPA Checklist
  - NEPA coverage
- Part B Schedule Opportunity
  - State agrees to expedited review
  - State agrees to offsite manufacturing

TRUM Waste Regulatory Path continued

Processing & Packaging

- NEPA options
  - Categorical Exclusion
  - ★ Supplement Analysis #4
  - Tank Closure EIS

SA4 BOUNDING ANALYSES

- Retrieval and Transfer
- Separation and Processing
- Packaging
- Secondary Waste
- Interim Storage
- Transportation and Disposal to WIPP

SA4 STATUS

- Preliminary Draft completed
- Internal review completed
  - Also includes review by CHI NEPA expert and CEES NEPA expert
- Comments addressed and incorporated
- TC EIS data package information presently being incorporated into Appendix

POTENTIAL RISKS WITH SA4

- Challenge to TC EIS scope
- Challenge to adequacy of SA4, including
  - TRUM waste treatment not within the scope of TWRS EIS
  - Inadequate bounding within TWRS EIS based on the final CH-TRUM waste form
  - Inadequate bounding within TWRS EIS of interim storage for the CH-TRUM waste
  - Inadequate bounding within TWRS EIS of transport and disposal for the CH-TRUM waste

1. RISK: SA4 AFFECTS THE SCOPE OF THE TC EIS

- Challenge: Will bounding the CH-TRUM element using the TWRS EIS affect the scope and impact the TC EIS schedule/cost?
- Mitigation: Changes to the TC EIS scope related to CH-TRUM would be included in the ongoing scoping process
- Supporting Rationale: Scoping is a continuing process and not a single event that can bring issues to resolution early in the process instead of delaying the DEIS
- Consequences: Potential schedule/cost impact to TC EIS

2A. RISK: CH-TRUM NOT CONSIDERED IN TWRS EIS

- Challenge: Does the TWRS EIS bound the CH-TRUM project if i. did not explicitly consider this waste?
- Mitigation: No further action required
- Supporting Rationale: SA4 details how the TWRS EIS included CH-TRUM with HLW treatment; the HLW processing evaluated in the TWRS EIS was a much more aggressive process that bounds the CH-TRUM project
- Consequences: If a challenge is sustained, the TC EIS would provide NEPA coverage; CH-TRUM project schedule impacts may result

2B. RISK: CH-TRUM FINAL WASTE FORM NOT ADEQUATELY BOUNDED

- Challenge: Is the final CH-TRUM waste bounded even though it is not an immobilized waste form as in the TWRS EIS?
- Mitigation: No further action required
- Supporting Rationale: The CH-TRUM waste will be contained in a waste box meeting NRC and DOT standards to mitigate releases; the dewatered waste form with absorbent effectively prevents mobilization of spills in accordance with the WIPP waste acceptance criteria
- Consequences: If a challenge is sustained, the TC EIS would provide NEPA coverage; CH-TRUM project schedule impacts may result

2C. RISK: INTERIM STORAGE IS NOT ADEQUATELY BOUNDED

- Challenge: Is the CH-TRUM interim storage bounded by the TWRS EIS evaluation of an immobilized (vitrified) waste form?
- Mitigation: No further action required
- Supporting Rationale: Duration of CH-TRUM interim storage will be less than IHLW; the dewatered CH-TRUM waste would differ in physical state, but mobility of the contamination would not change the associated impacts
- Consequences: If a challenge is sustained, the TC EIS would provide NEPA coverage; CH-TRUM project schedule impacts may result

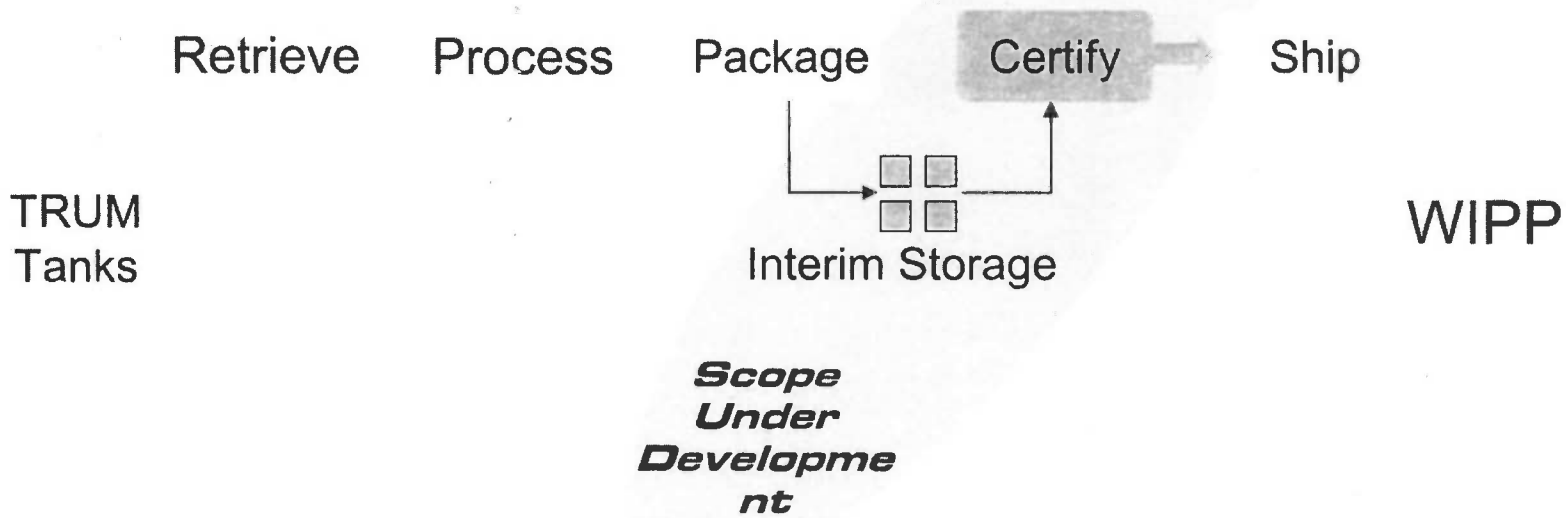
2D. RISK: TRANSPORTATION AND DISPOSAL NOT ADEQUATELY BOUNDED

- Challenge: Is the transportation and disposal of CH-TRUM tank waste bounded by the WIPP SEIS-II?
- Mitigation: A Supplement Analysis for the WIPP SEIS-II is being prepared to evaluate the effect of the updated Base Inventory Report (BIR) on the WIPP SEIS-II findings (includes 9 SST CH-TRUM inventory)
- Supporting Rationale: The WIPP SEIS-II included a conservatively large estimate of Hanford TRUM waste that bounds the CH-TRUM tank waste
- Consequences: None to the CH-TRUM project

NEXT STEPS

- Incorporate final revision of the TC EIS Data Package information into SA4 and quantify changes
- Distribute SA4 for evaluation of programmatic considerations
- Provide recommendation to ORP
- NEPA NCO review panel August
- ORP Manager review/signature

Overview of Hanford Tank TRUM Program



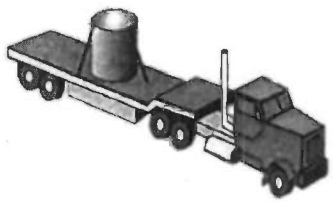
TRUM WIPP Program Options

- WIPP Scope Evaluation Development
  - Package waste and send to FH
    - Characterization
    - Certification
    - Shipping
  - Self Perform
    - Sample at generation
    - Package compliantly
    - Characterization
  - Self Perform with support
    - NDA Support from Carlsbad
    - Sample with summa method sample to INEEL
    - Bring key pieces under FH umbrella
  - Self Perform with support from Carlsbad
    - NDA support from Carlsbad
    - Sample with summa method analysis to INEEL
    - Develop own program

significant cost

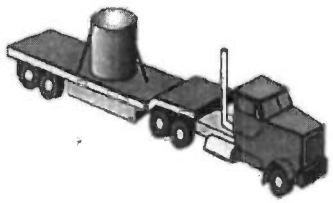
Development Team Members

- CH2M Hill Hanford Group
- WIPP CAO and/or Westinghouse TRU Solutions
- Rocky Flats Environmental Technology Site
- Fluor Hanford



Development Schedule

- June 15 - Establish Team
- June 30 - Team Summary Plan
- July 30 - Status Briefing
- August 15 - Recommendation Plan
- August 30 – Plan Implementation



TRUM - What's Next?

- Stakeholder Communications
  - Briefed DNFSB staff (Trone) will brief Sullivan on this month
  - HAB, Indian Nation advice
  - Public Notification of Permits
  - Briefings to NM being arranged by CFO
- Balance of program (WIPP Relationship)
  - Working with WTS/FH on balance of program
- Packaging Vendor Identification & Selection

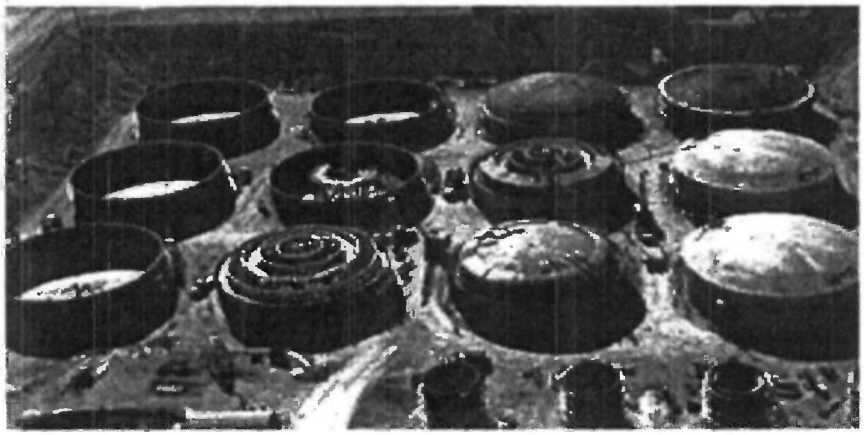
Hildman, Cynthia M

From:	Tedeschi, Allan R (Rick)
Sent:	Friday, May 22, 2009 9:33 AM
To:	Koll, Ronald J
Cc:	Colosi, Kristin A
Subject:	CH-TRU Pedigree Documents Set 2
Attachments:	RPP-20393-VA.pdf; HNF-EP-0182 - Rev 250 - [0904160343][1].pdf
Follow Up Flag:	Follow up
Flag Status:	Flagged

Ron,

The second set of files I mentioned in my previous email are attached: a formal presentation on the eleven CH-TRU tanks, RPP-20393-VA R1; and primary document for reporting of tank contents, levels, and tank status, "Waste Tank Summary Report," HNF-EP-0182.

Rick Tedeschi
Washington River Protection Solutions
allan_r_rick_tedeschi@rl.gov (Note underscores)
W (509) 373-6018
M (509) 438-9017



Origin of Waste in Selected Hanford Single-Shell Tanks

CH2MHILL
Hanford Group, Inc.

John Kristofzski, Ph.D.
Waste Disposal Strategic Planning Director

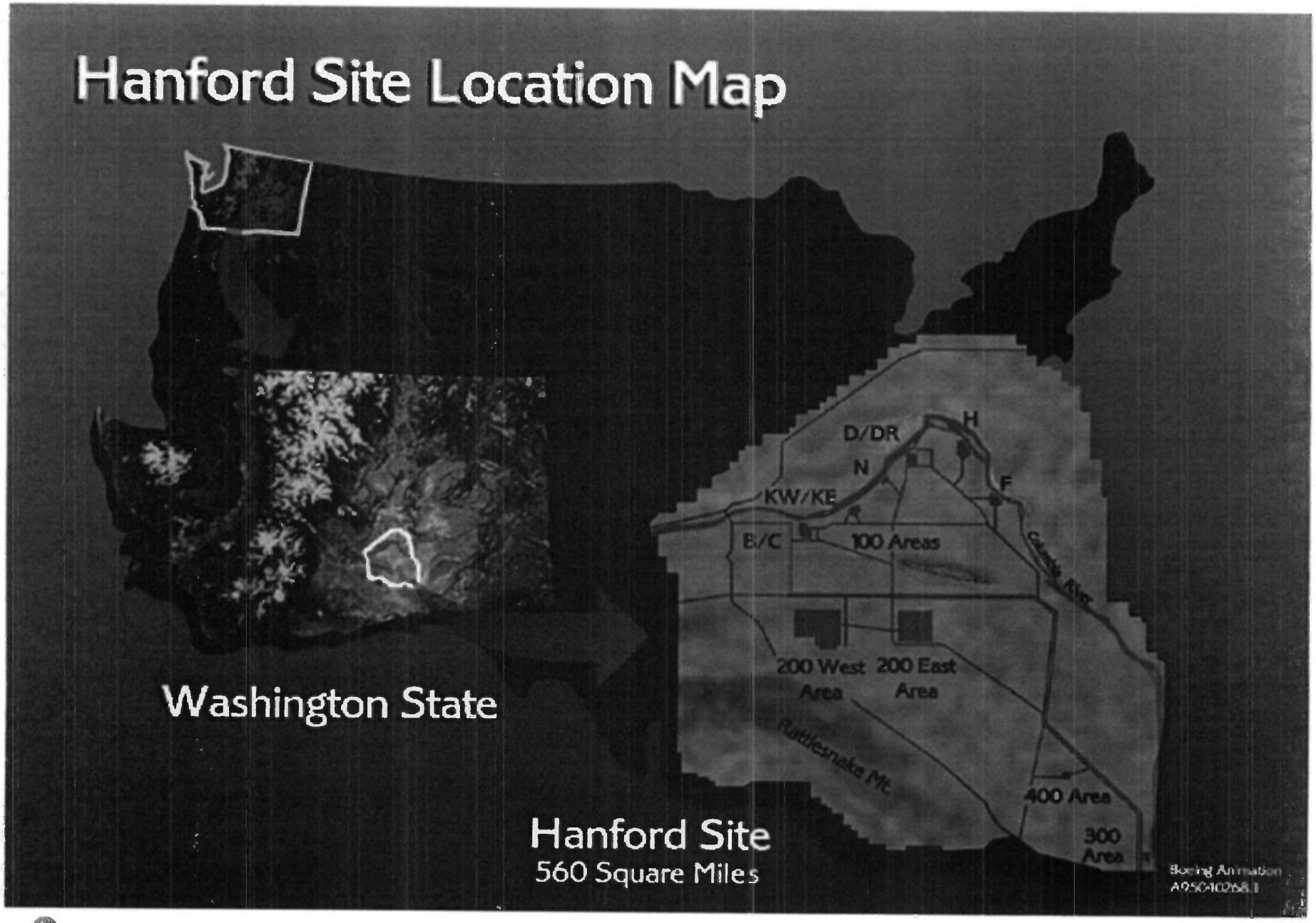
Office of River Protection

Rob Yasek
TRU Project Manager

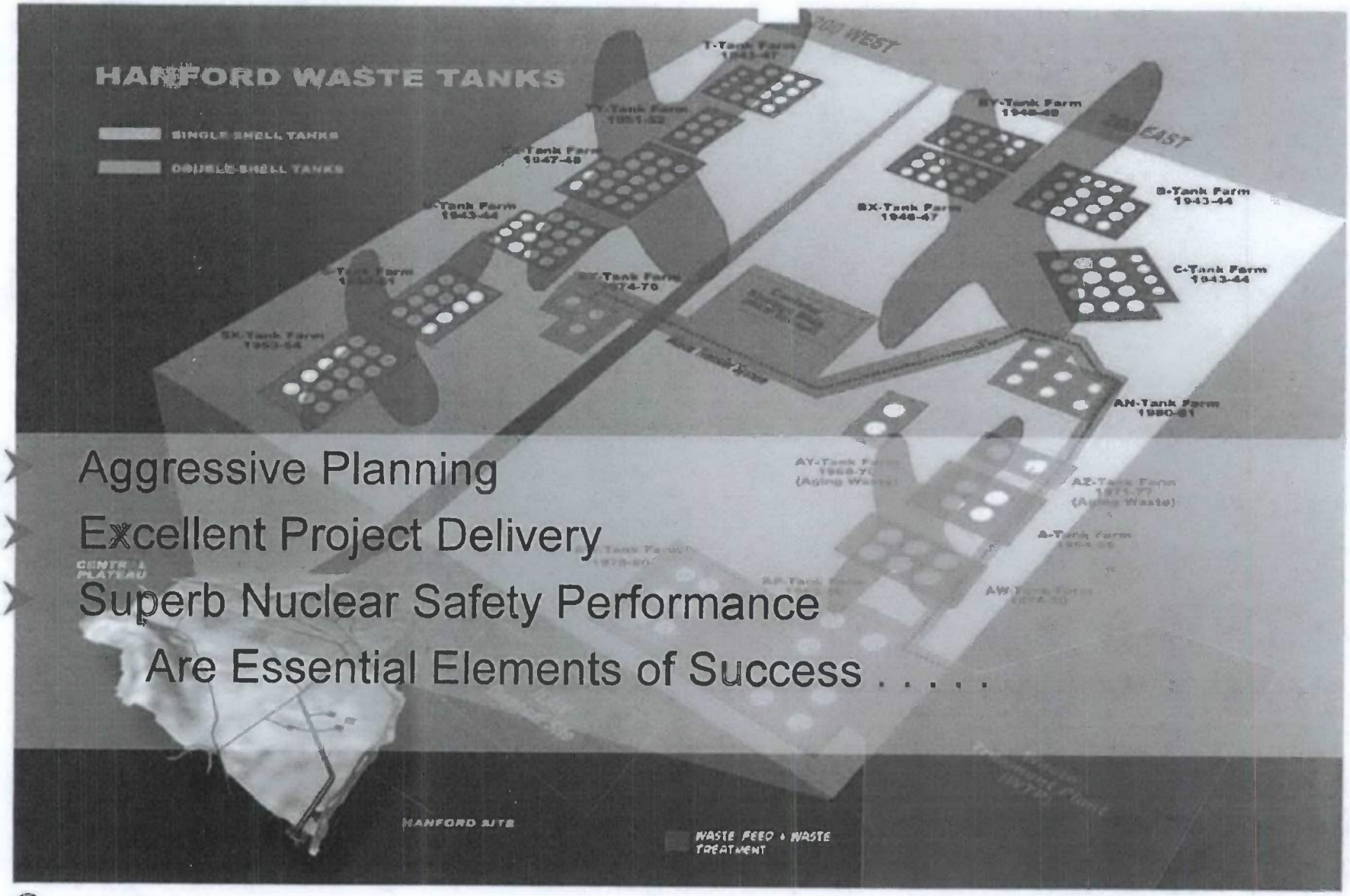
March 2004

RPP-20393-VA Rev 1

Hanford Site Location Map



The Mission is Clear . . . . .



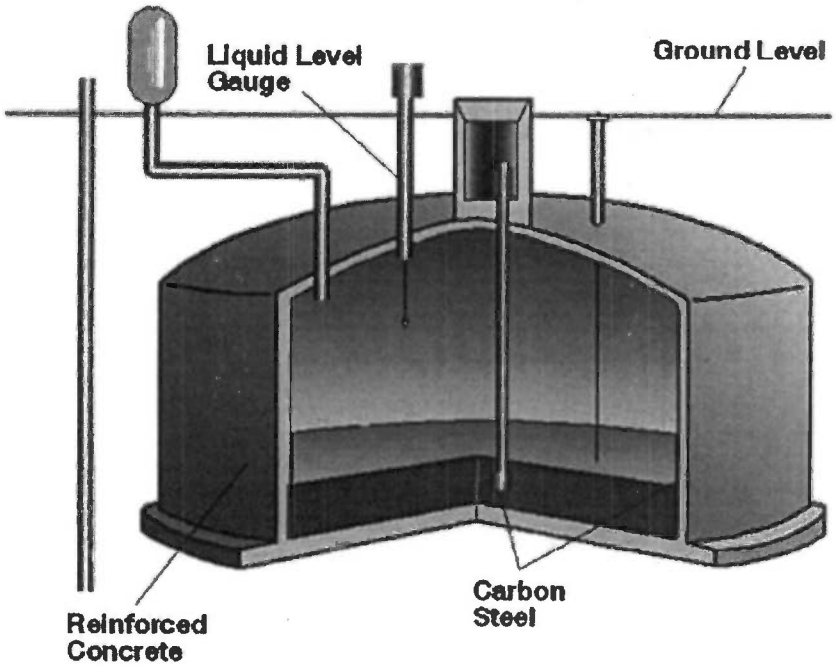
- Aggressive Planning
- Excellent Project Delivery
- Superb Nuclear Safety Performance

Are Essential Elements of Success . . . . .

Hanford Tank Characterization

- Extensive knowledge of the tank waste history
  - Operational records demonstrate origin of the waste based on:
    - Physical configuration of piping
    - Tank fill history
    - These records confirmed by sampling and analysis of tank contents
- Information was developed during work on *Hanford Federal Facility Agreement and Consent Order* milestone M-44 and in response to Defense Nuclear Facilities Safety Board Recommendation 93-5
- Extensive knowledge of the origin, physical, chemical and radioactive properties of the waste has enabled the closure of the Wyden safety issues and enabled planning for treatment and disposal of the tank waste.

Single-Shell Tanks

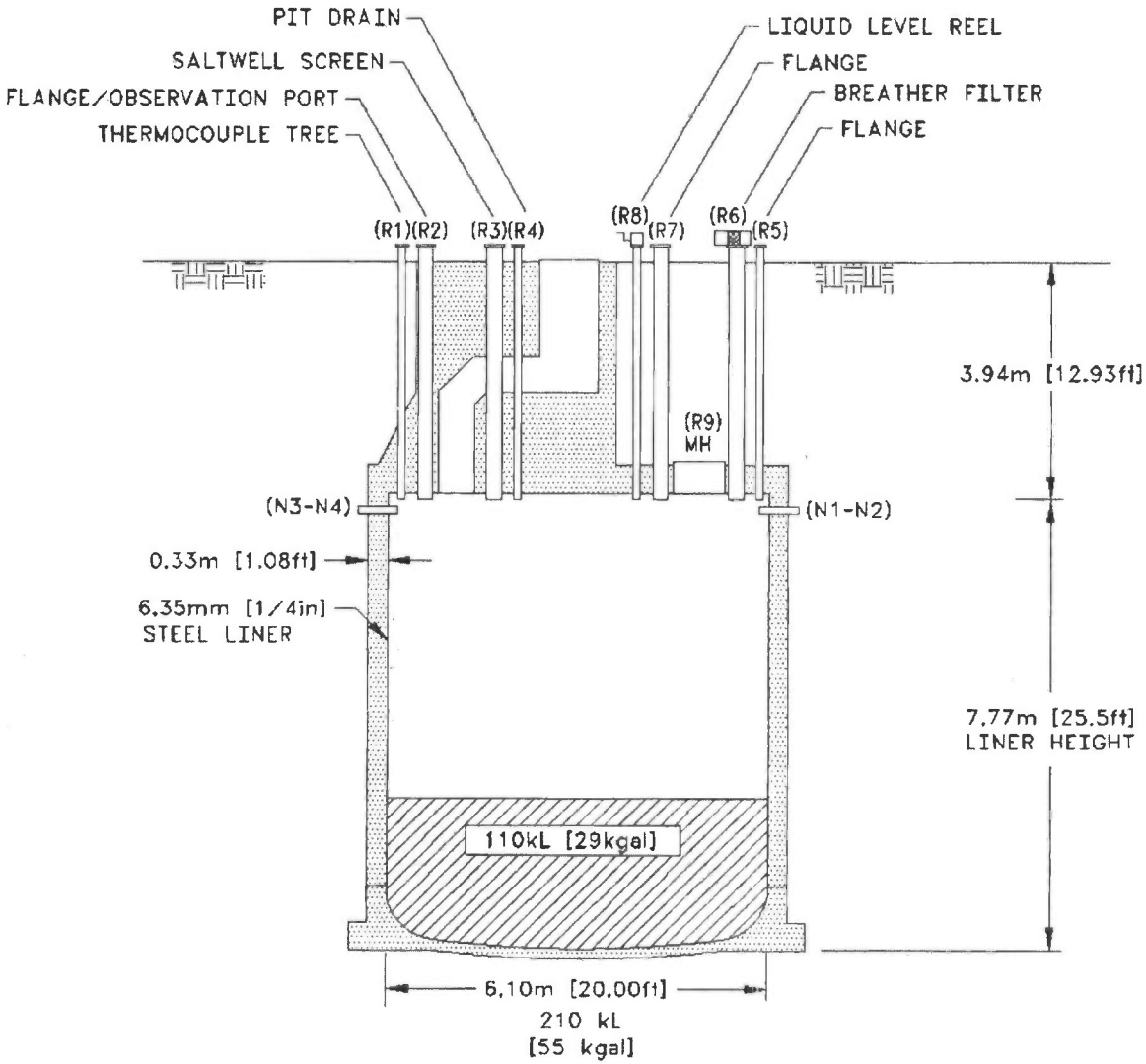


- 149 Tanks Constructed 1943-64
- ~210 m^3 to 3,800 m^3 Capacity (55 kgal to 1 Mgal)
- Bottom of Tanks at Least 50 m (150 Feet) Above Groundwater
- No Waste Added to Tanks Since 1980
- Tanks Currently Contain:

  ~117,000 m^3 (~31Mgal) of Salt Cake, Sludge, and Liquid

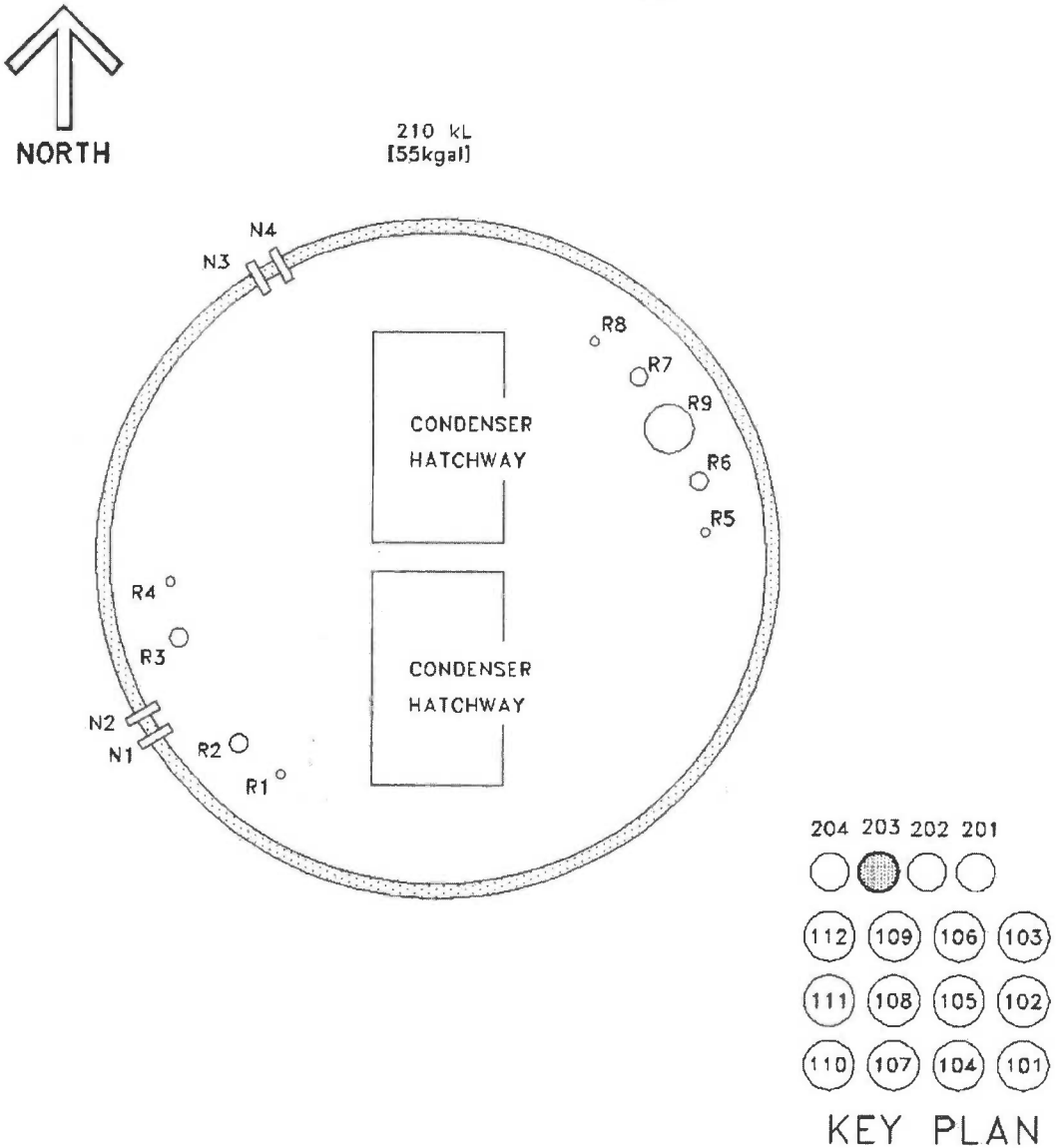
  ~355 x 10^{16} Bq (~96 MCi)

Typical for Tanks 241-B-201 thru 241-B-204

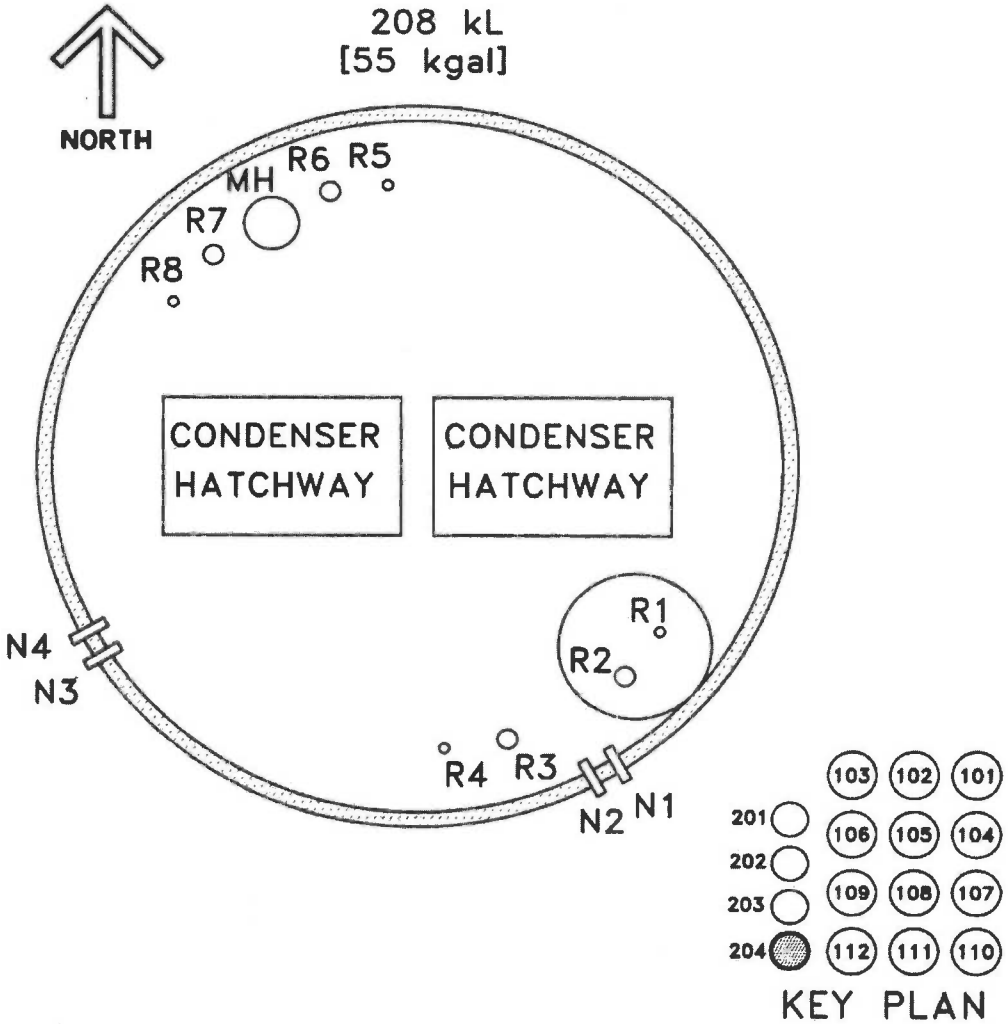


CH2MHILL
Hanford Group, Inc

Tank 241-B-201 through 241-B-204



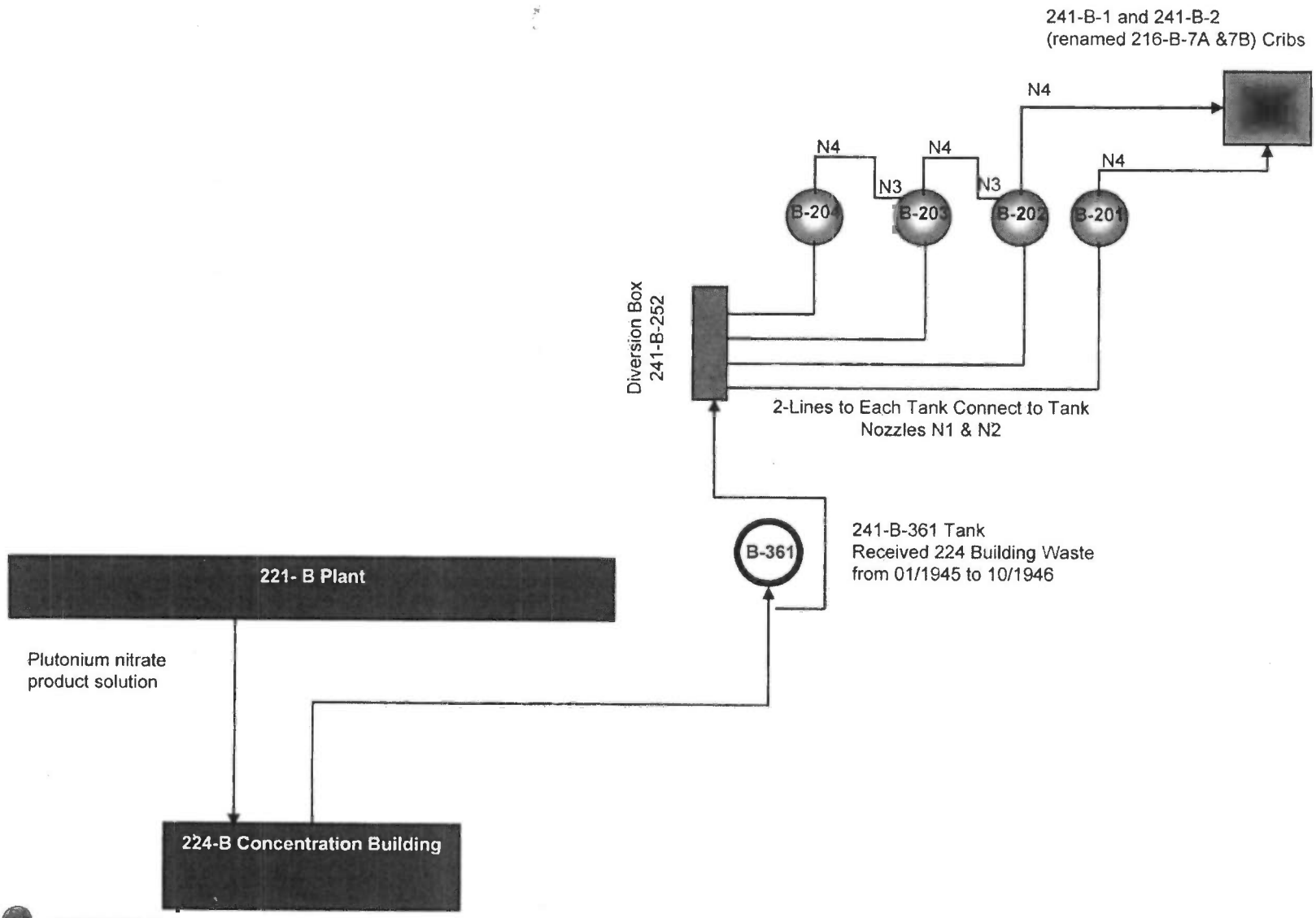
Tank 241-T-201 through 241-T-204



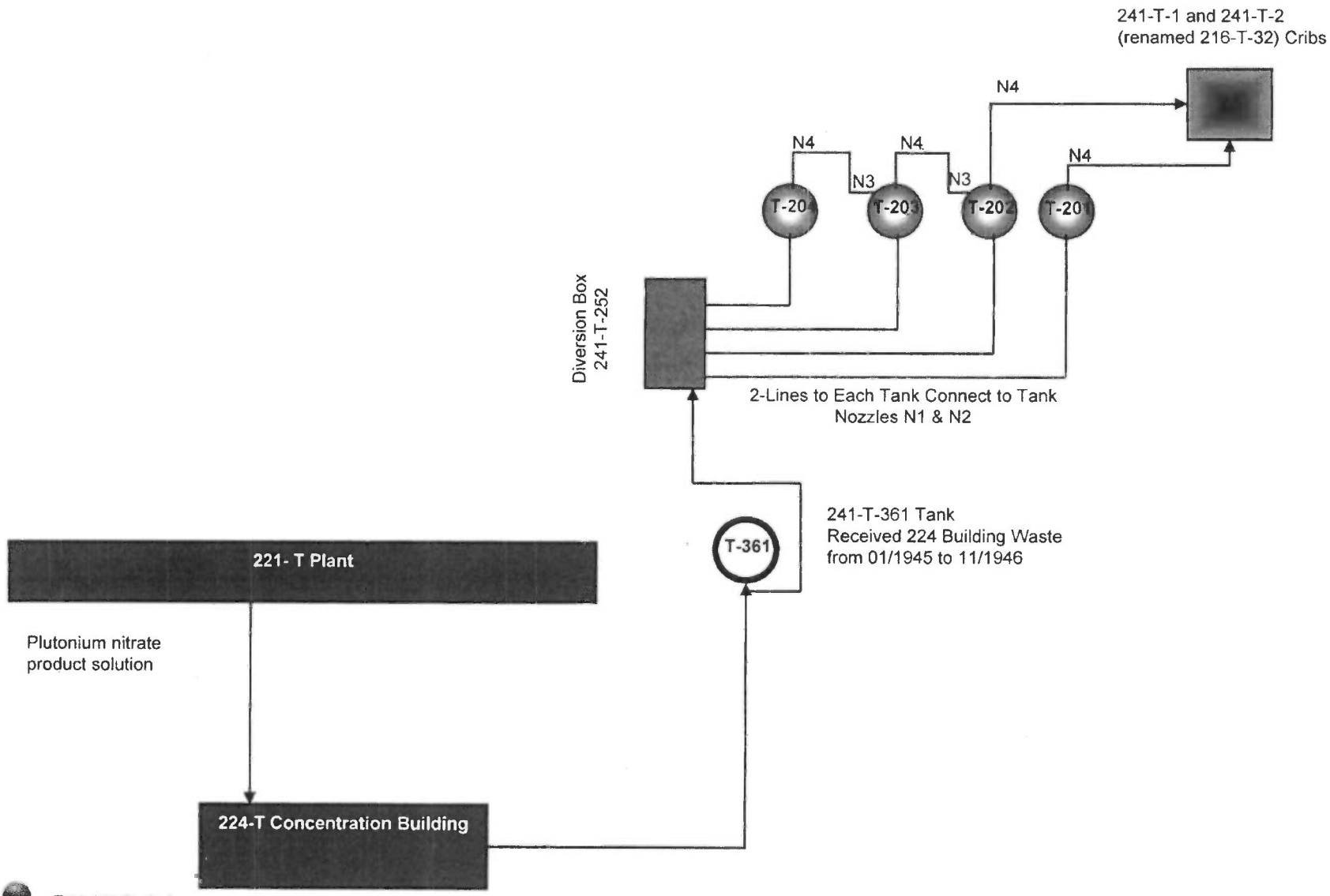
Waste Routing

221-T Plant in background (~1945)
P 7846

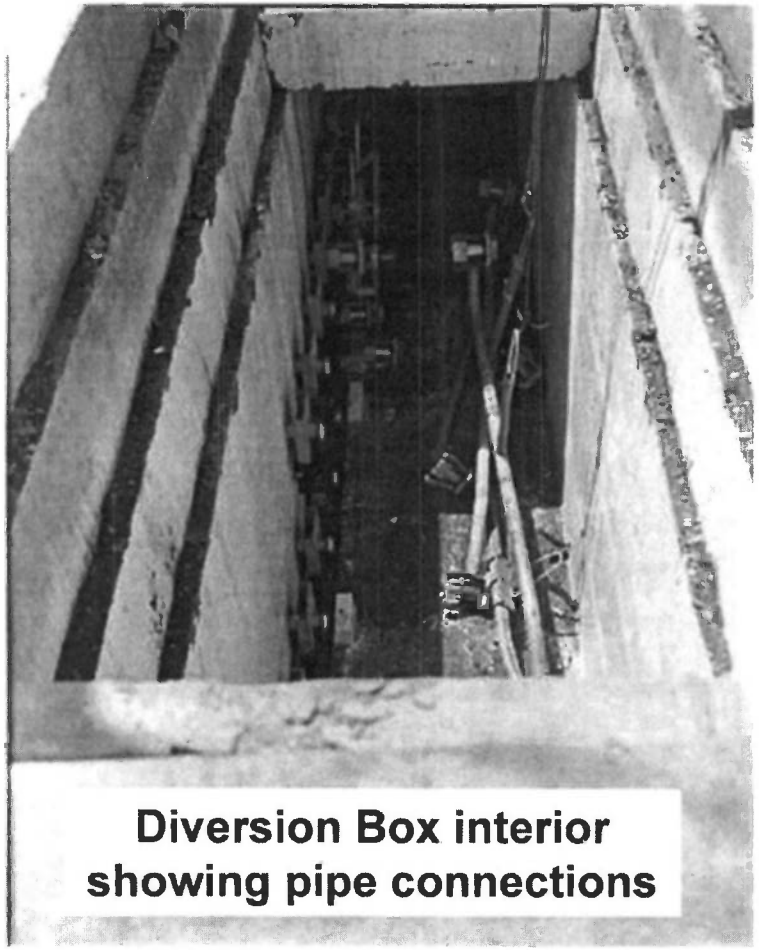
224-B Waste Routing to B-200 Series SSTs



224-T Waste Routing to T-200 Series SSTs



Typical Diversion Box (circa 1953)

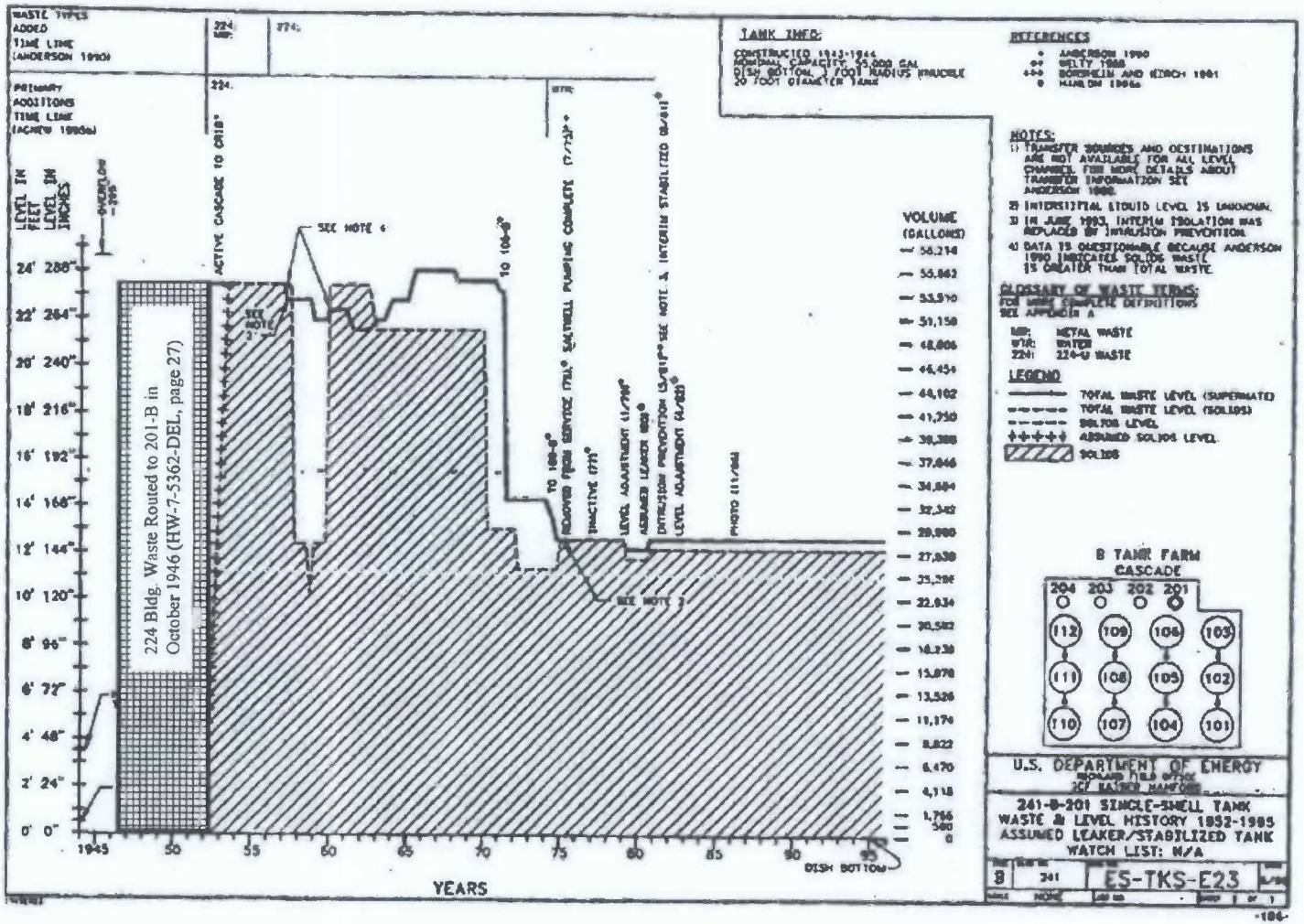


Diversion Box interior showing pipe connections

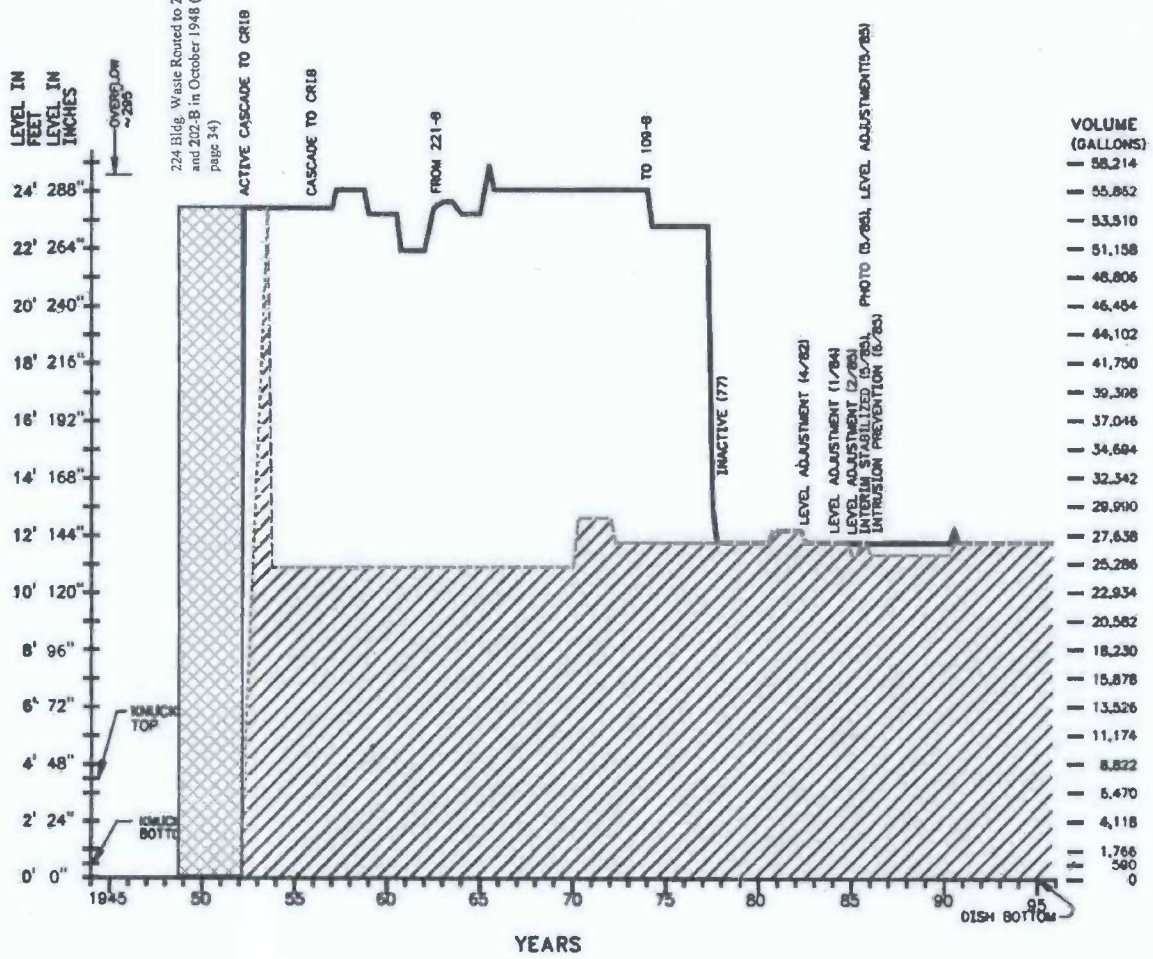
Crane removing concrete covers from diversion box

Waste Surface Level History

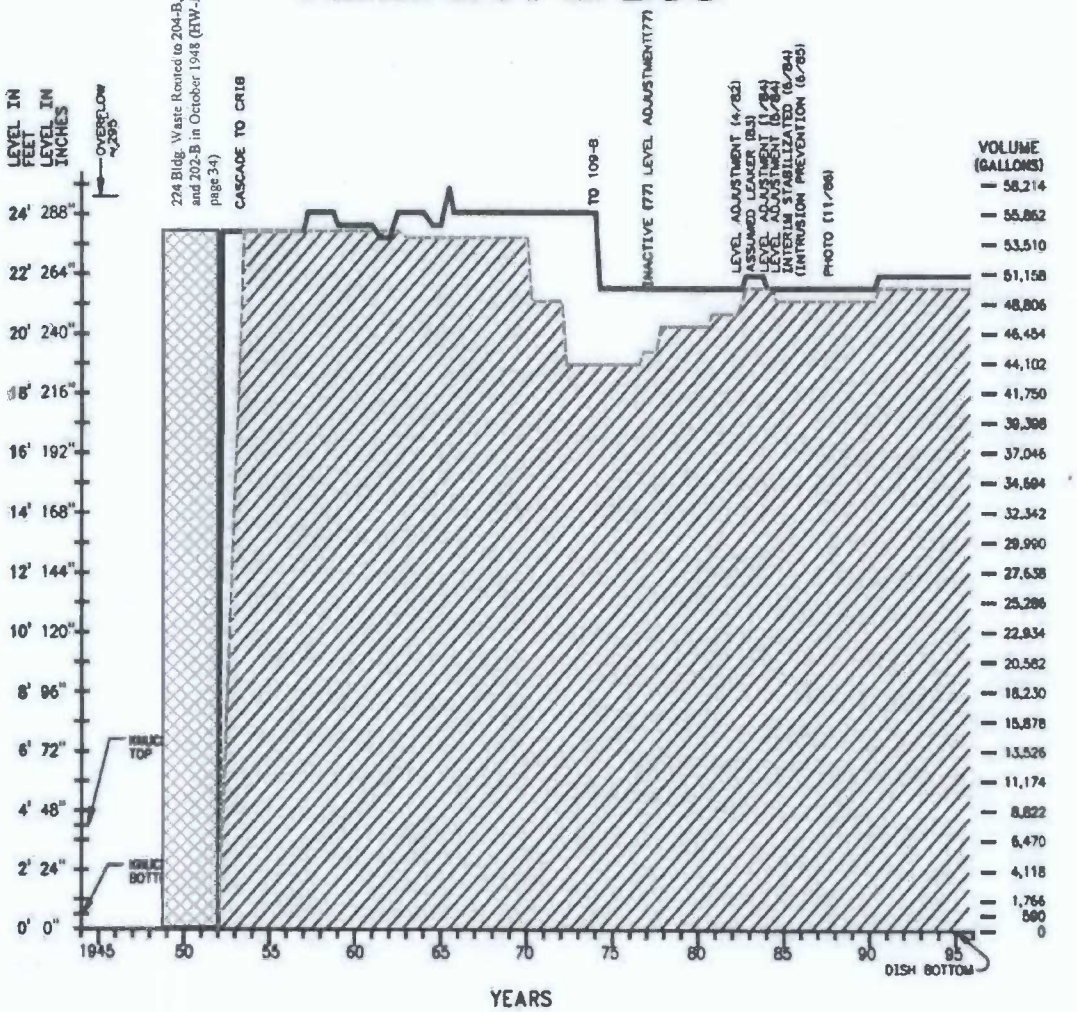
Tank 241-B-201



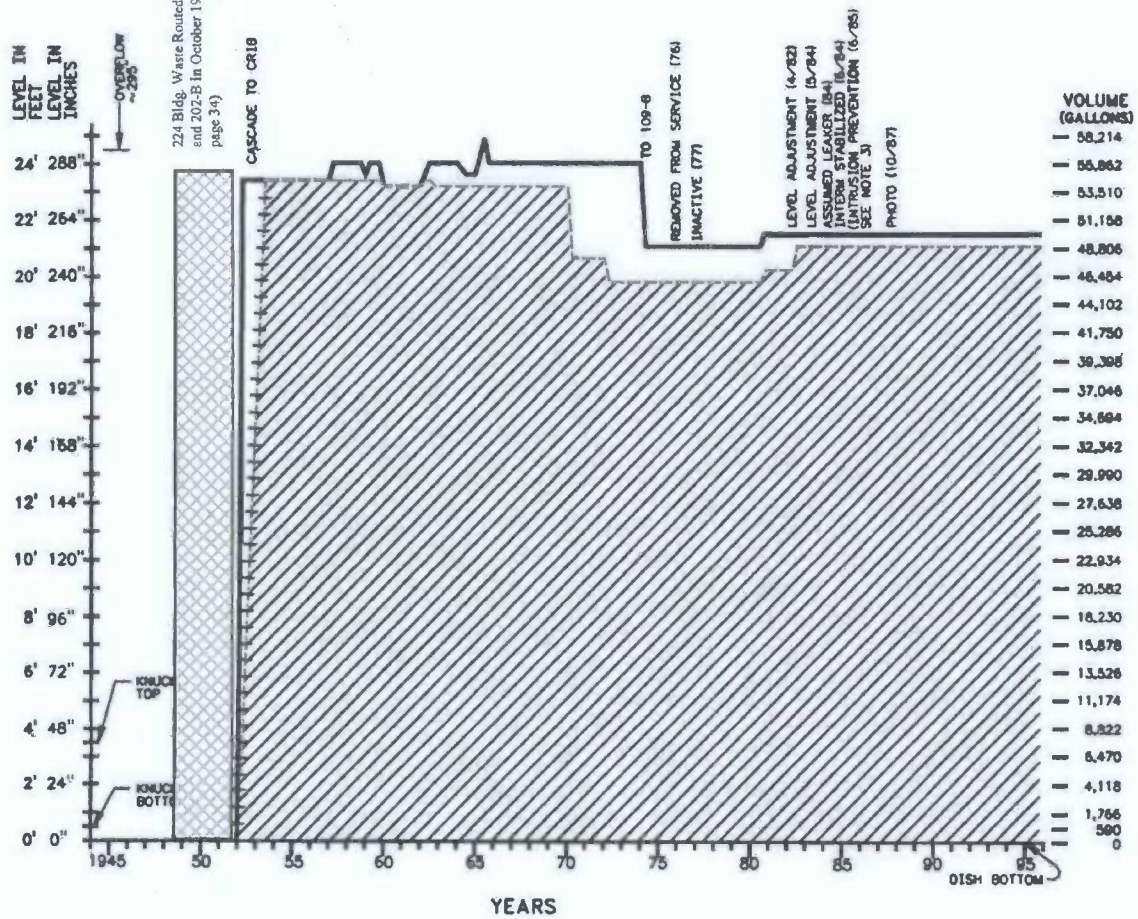
Tank 241-B-202



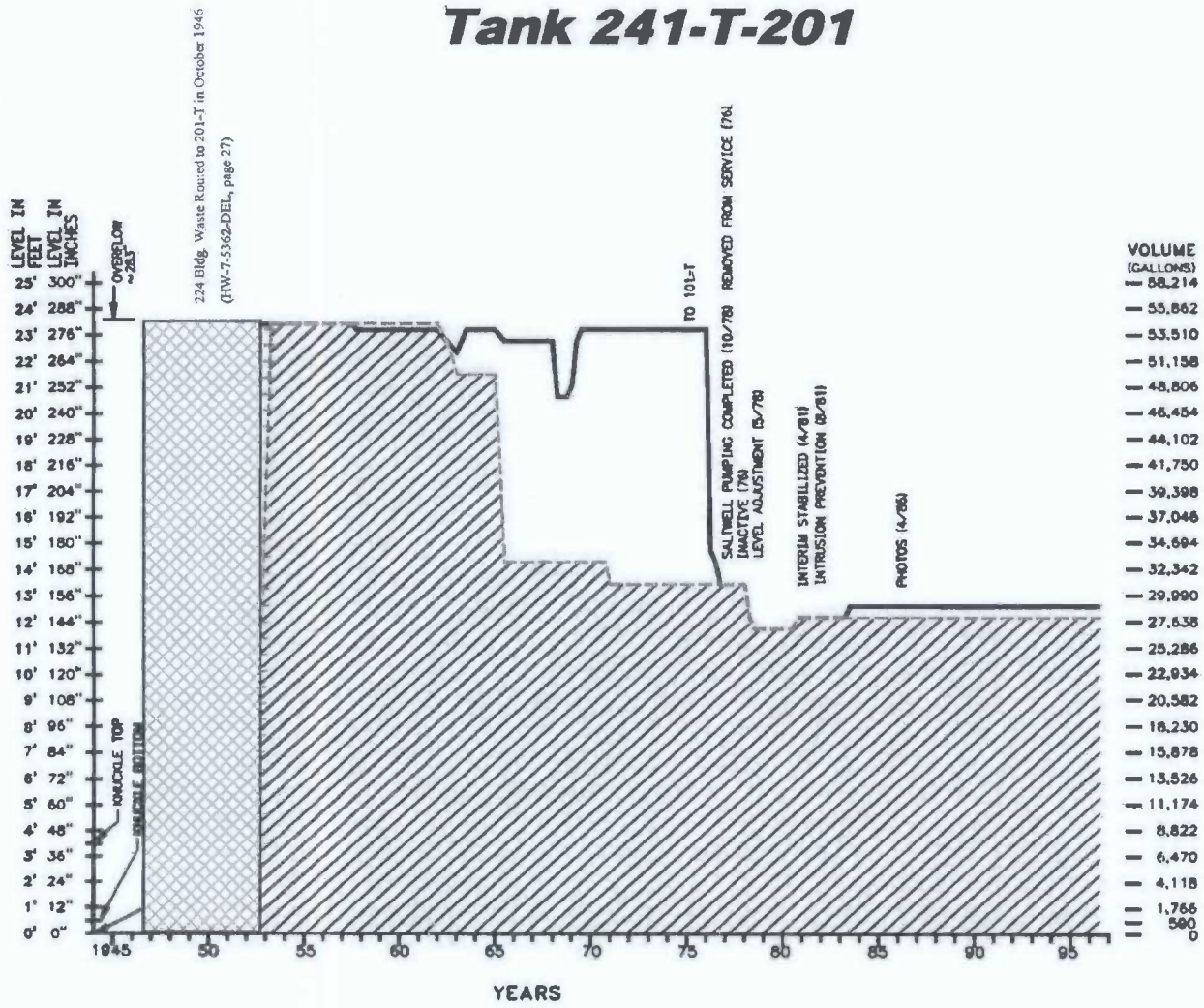
Tank 241-B-203



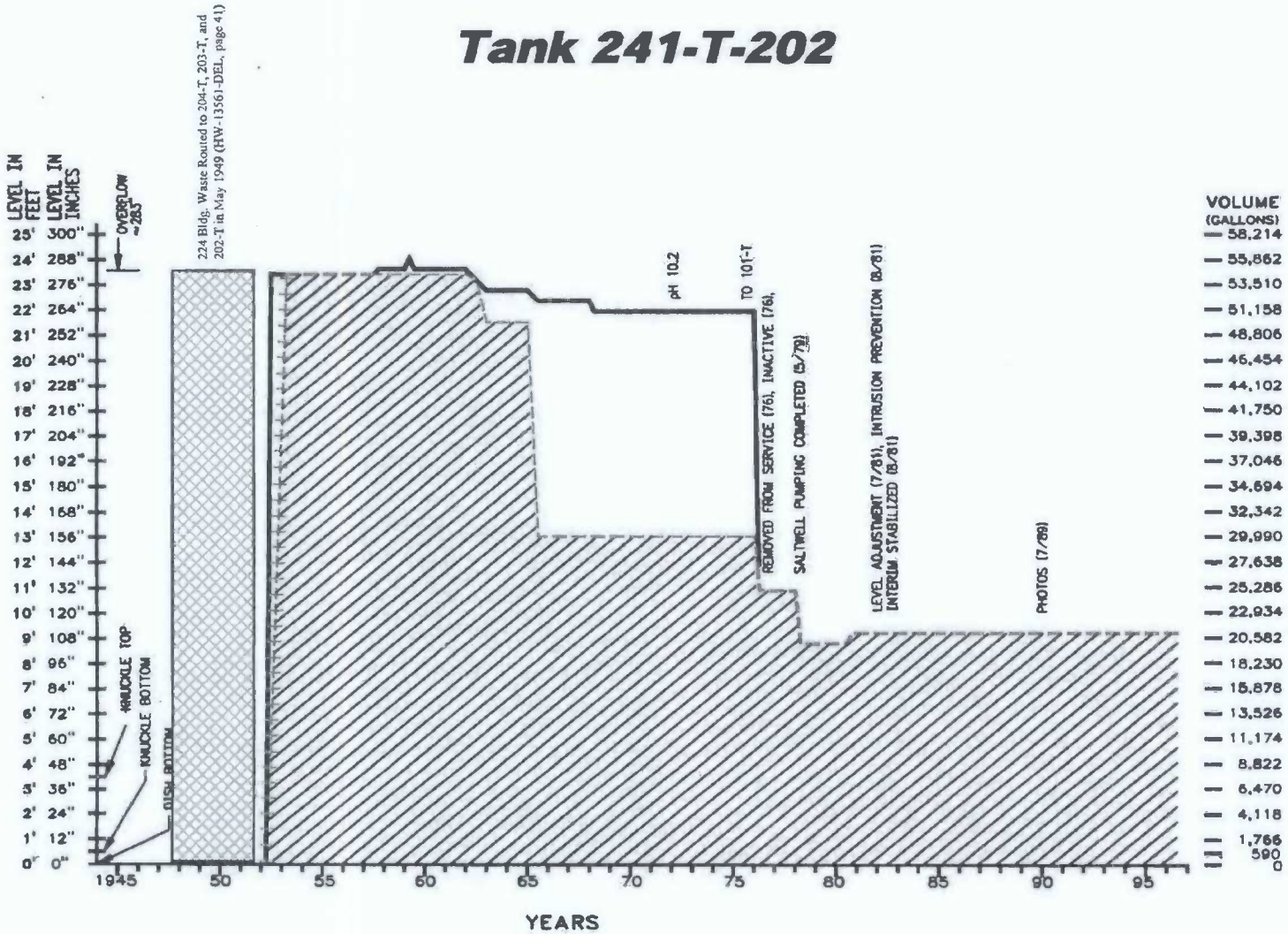
Tank 241-B-204



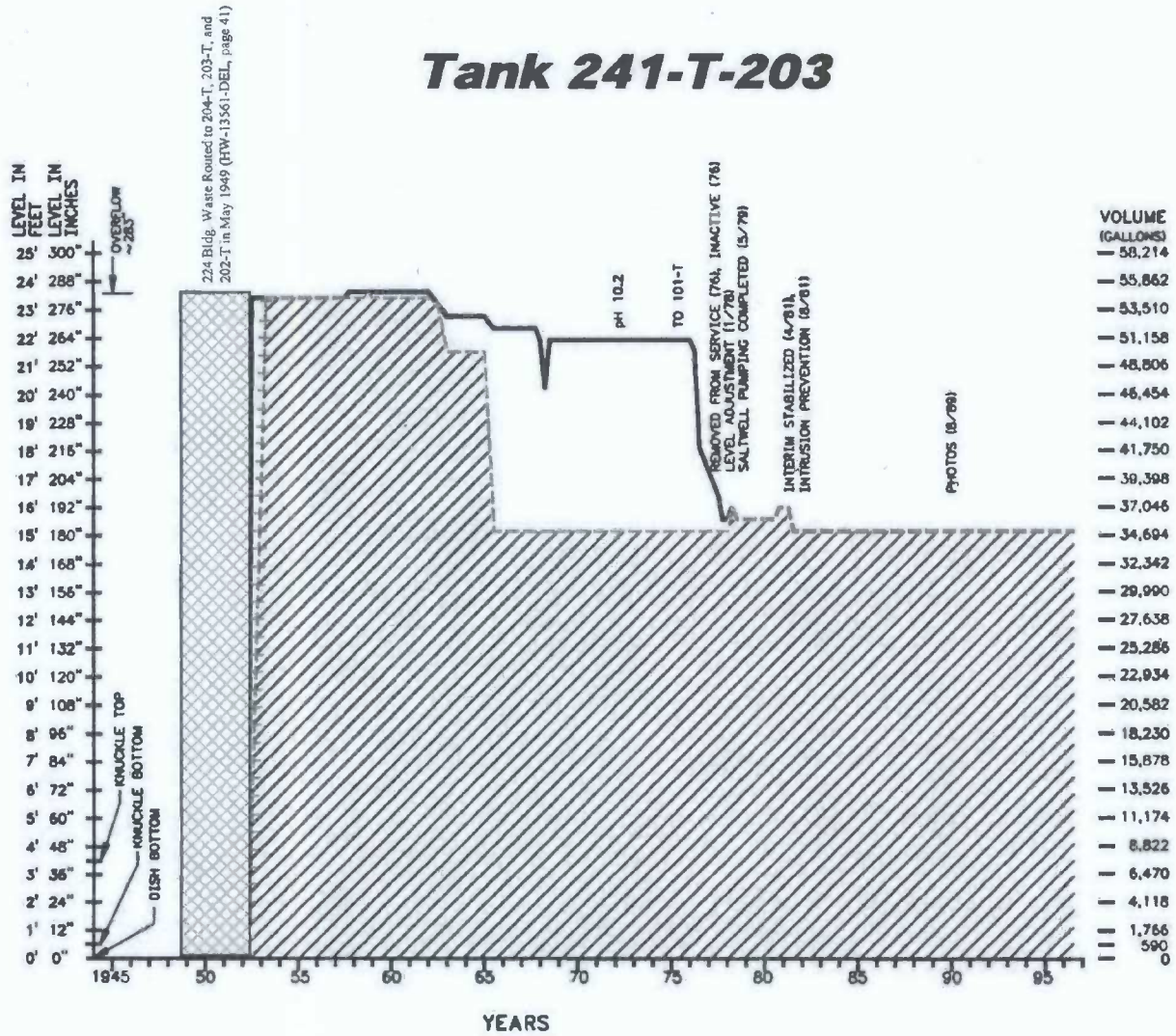
Tank 241-T-201



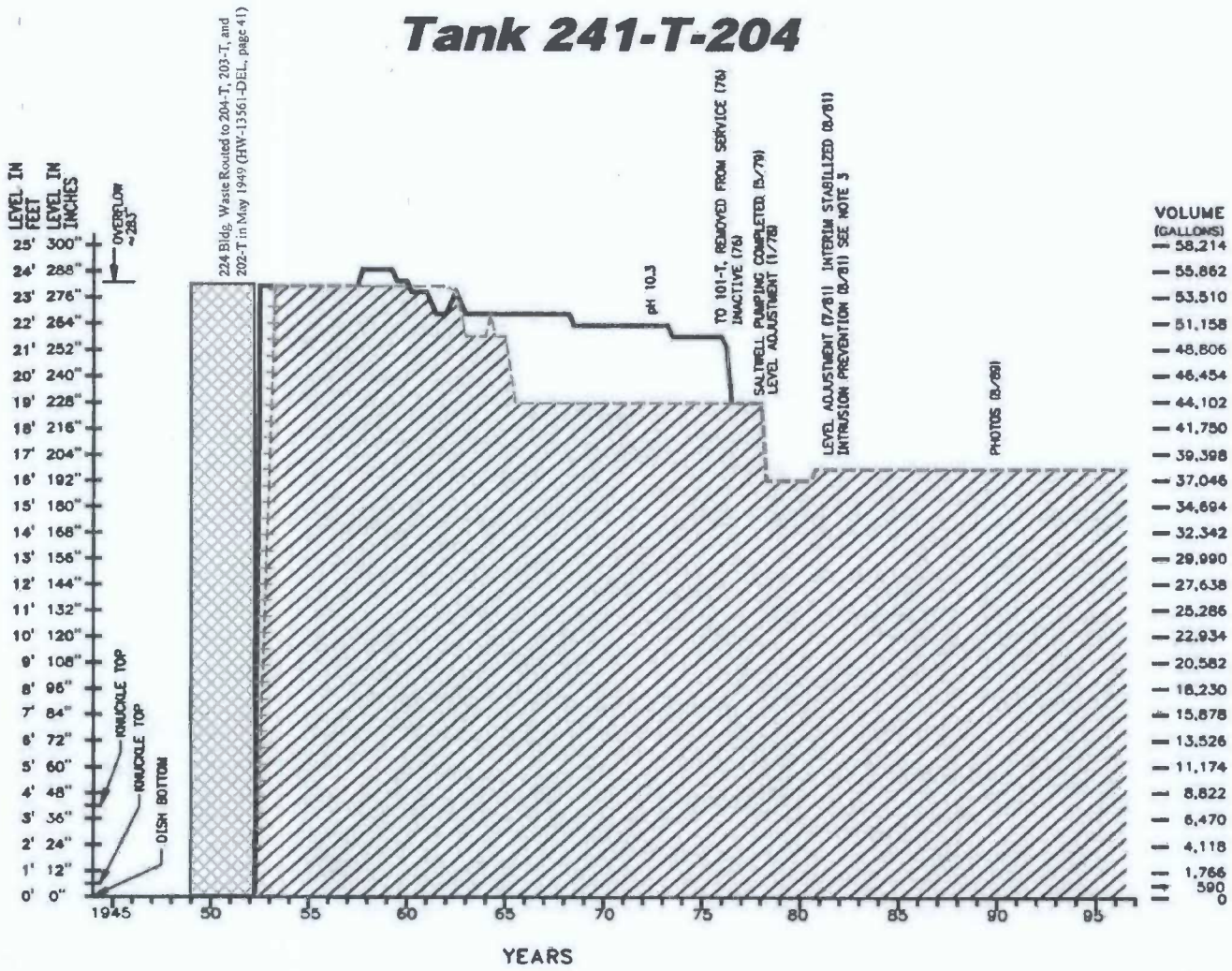
Tank 241-T-202



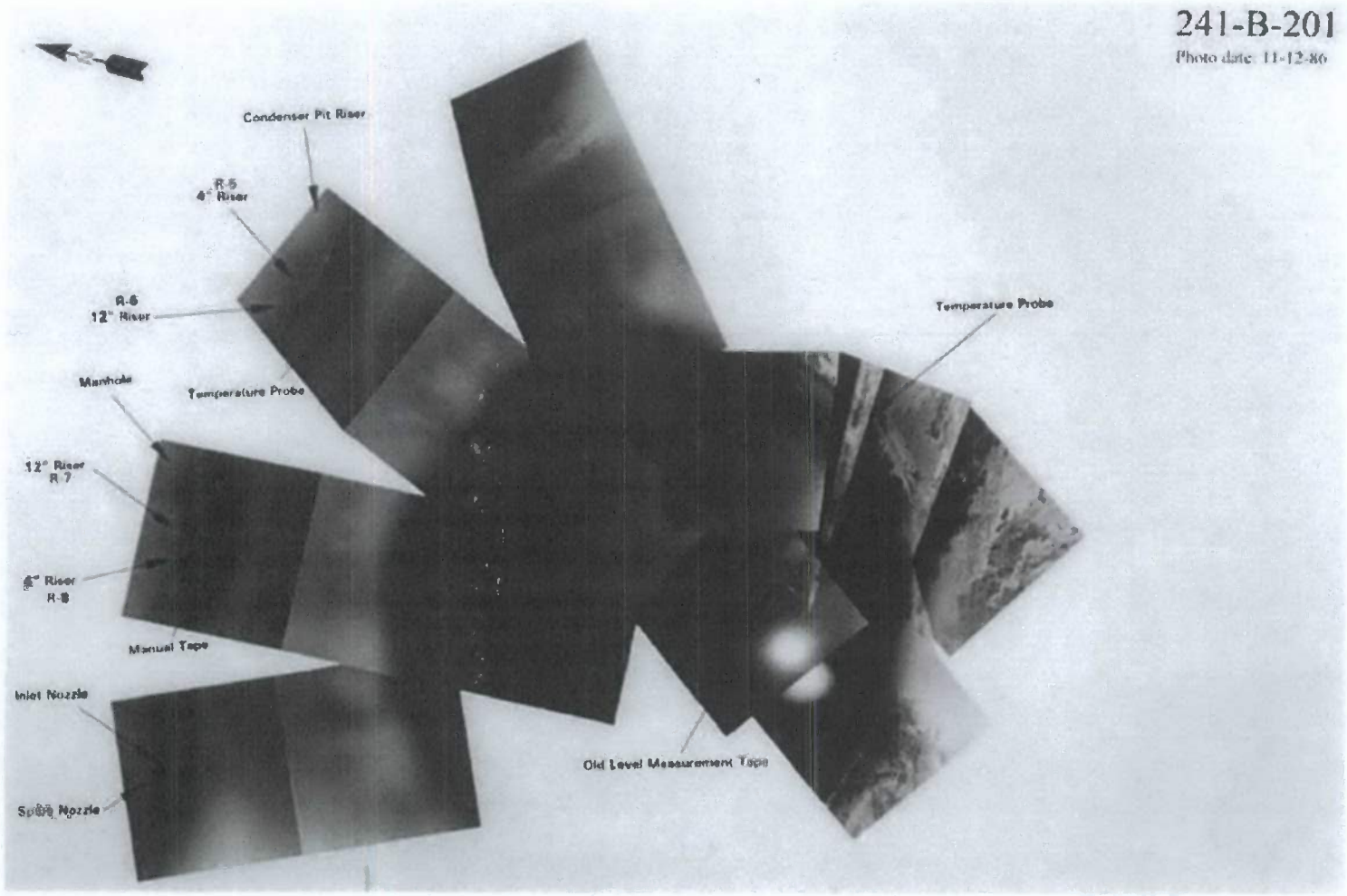
Tank 241-T-203



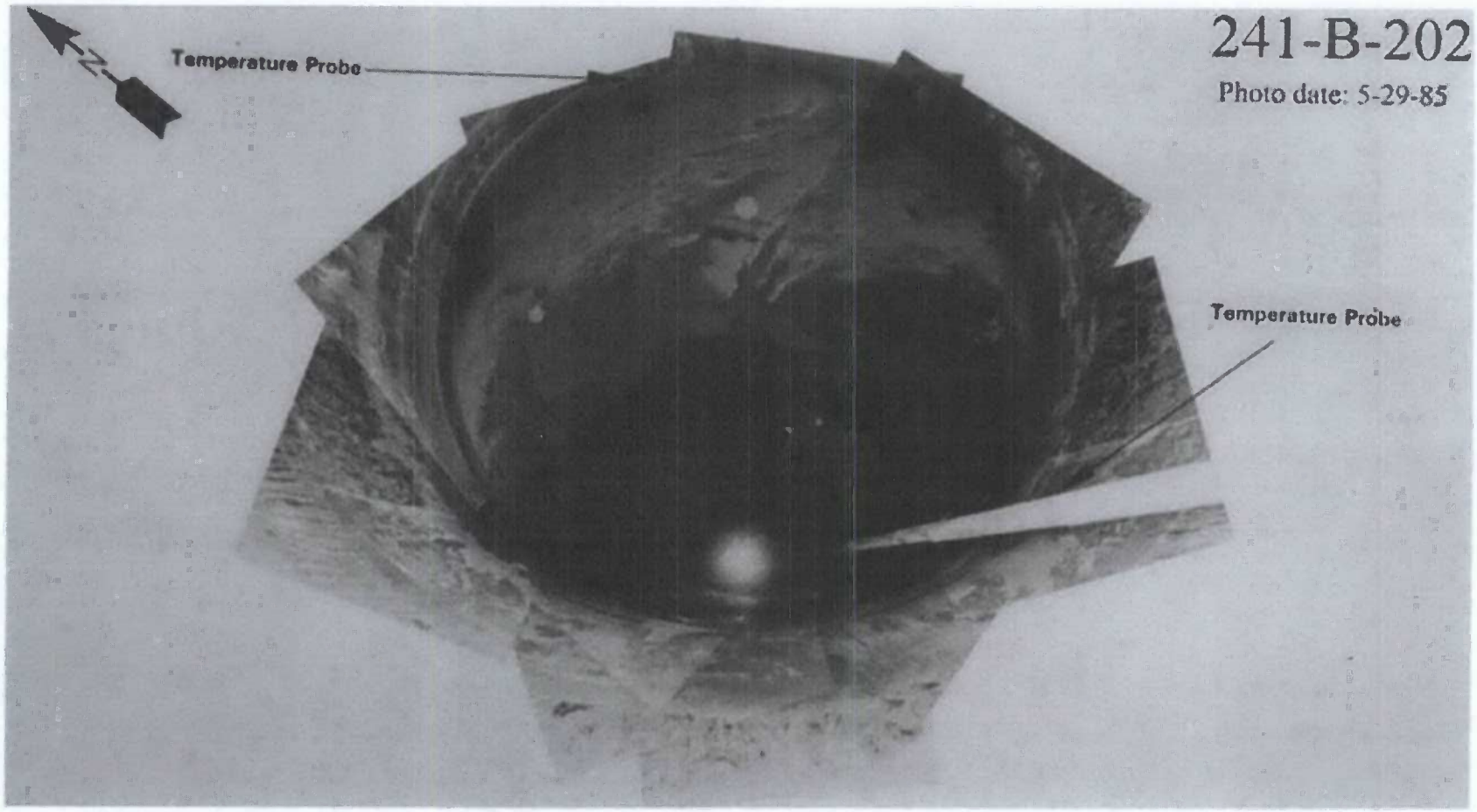
Tank 241-T-204



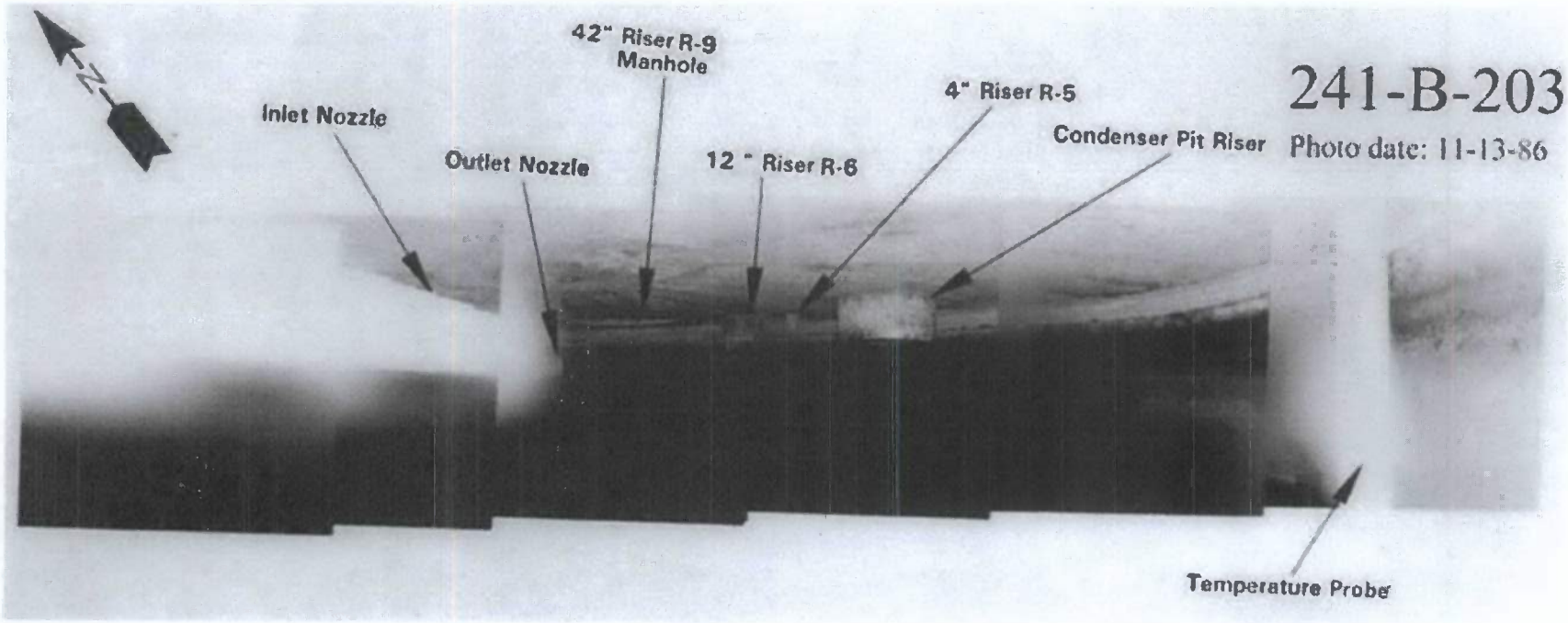
B-201 Tank Waste



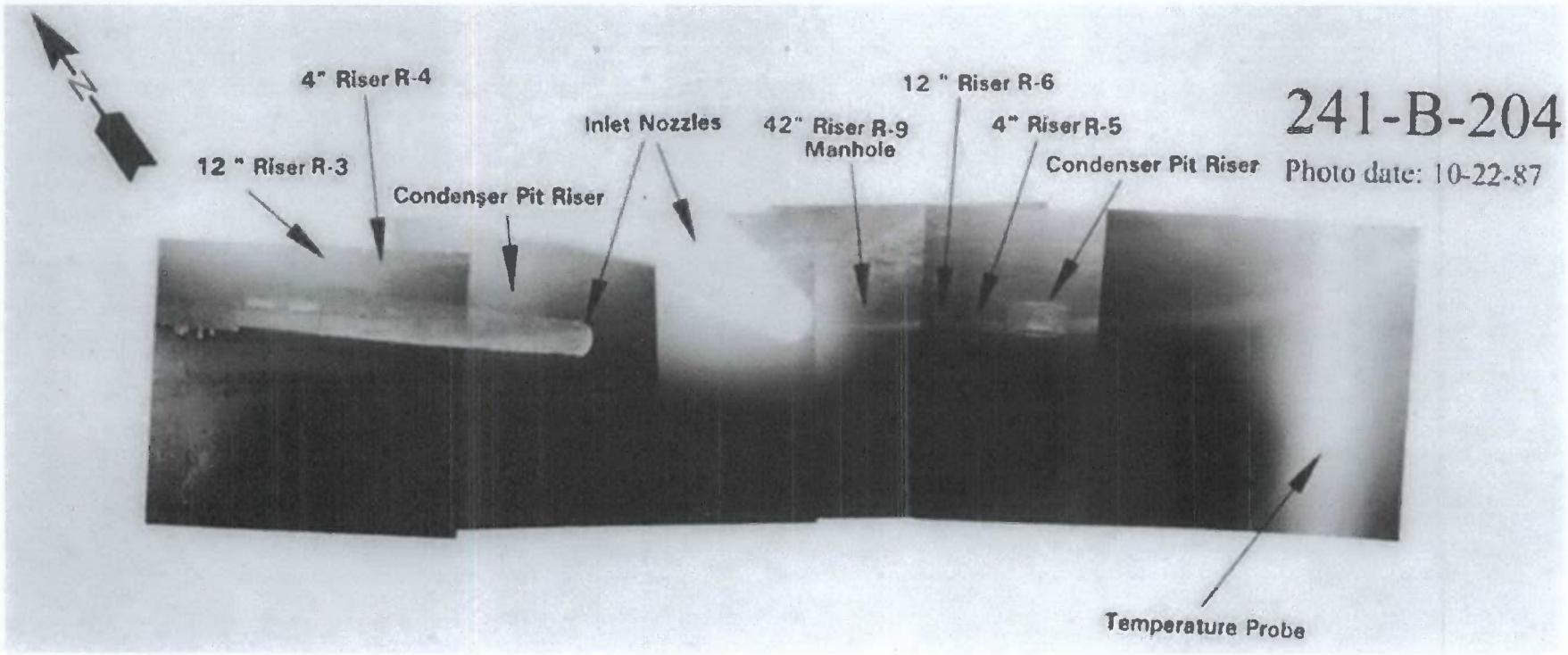
B-202 Tank Waste



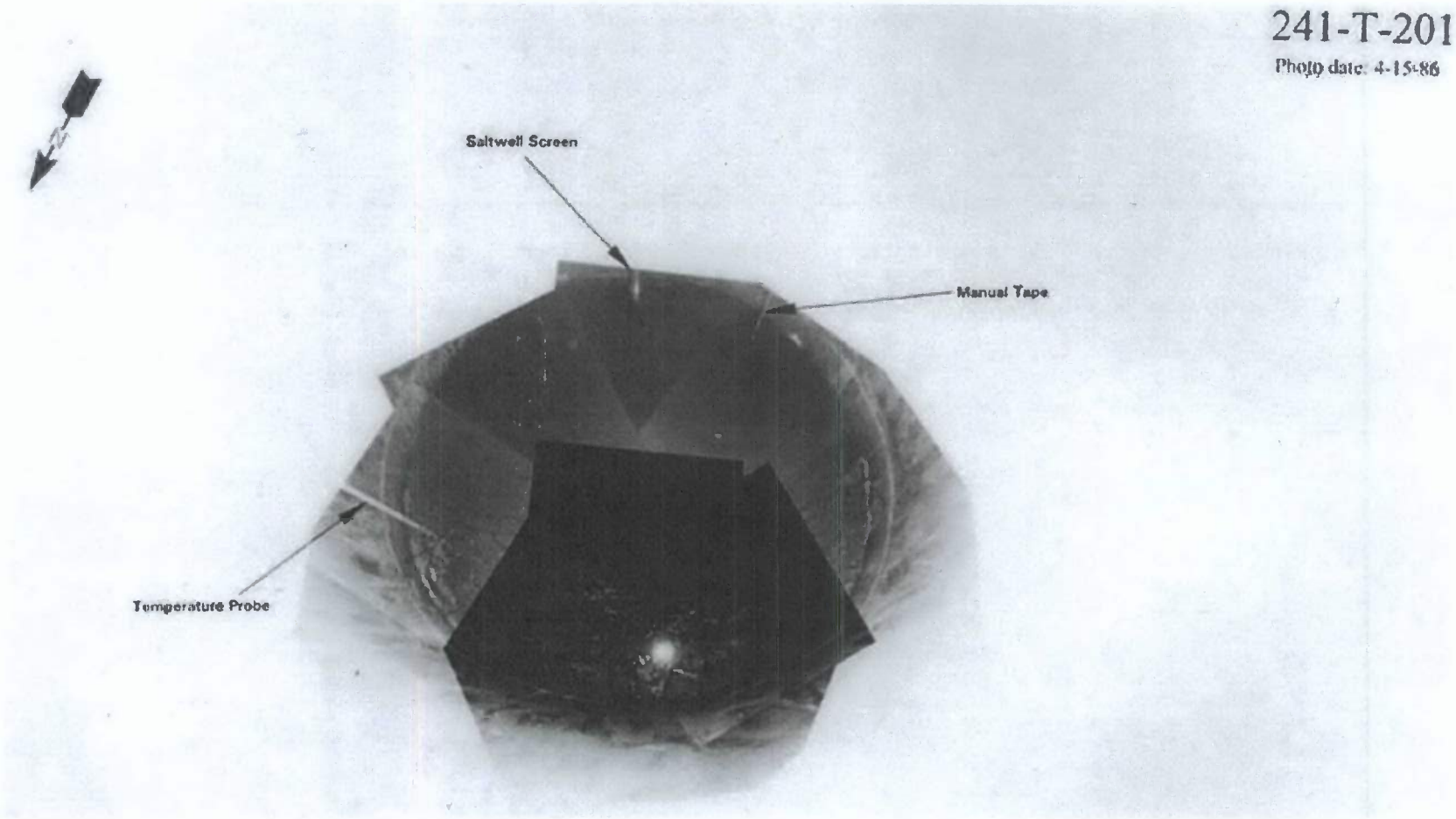
B-203 Tank Waste



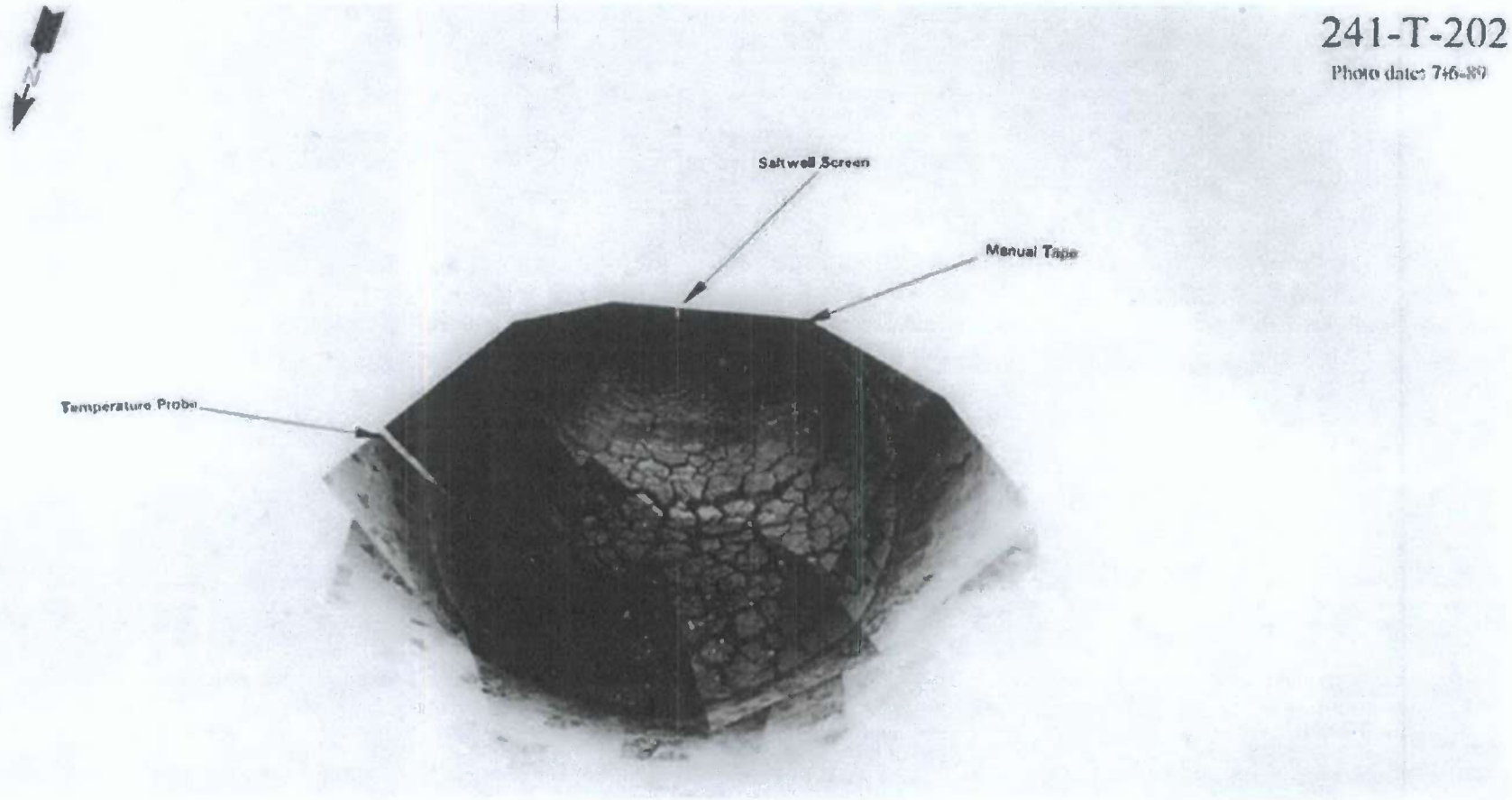
B-204 Tank Waste



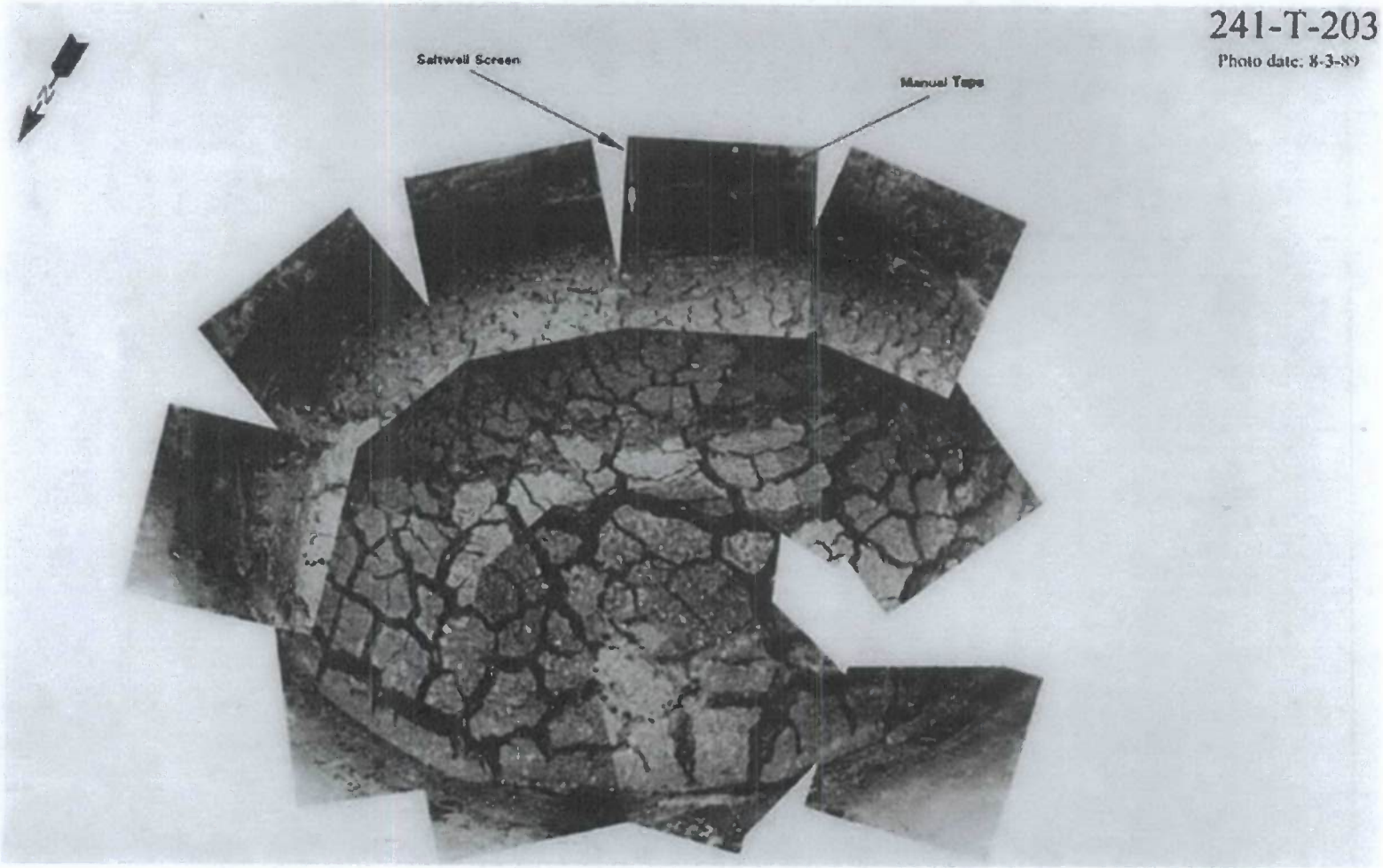
T-201 Tank Waste



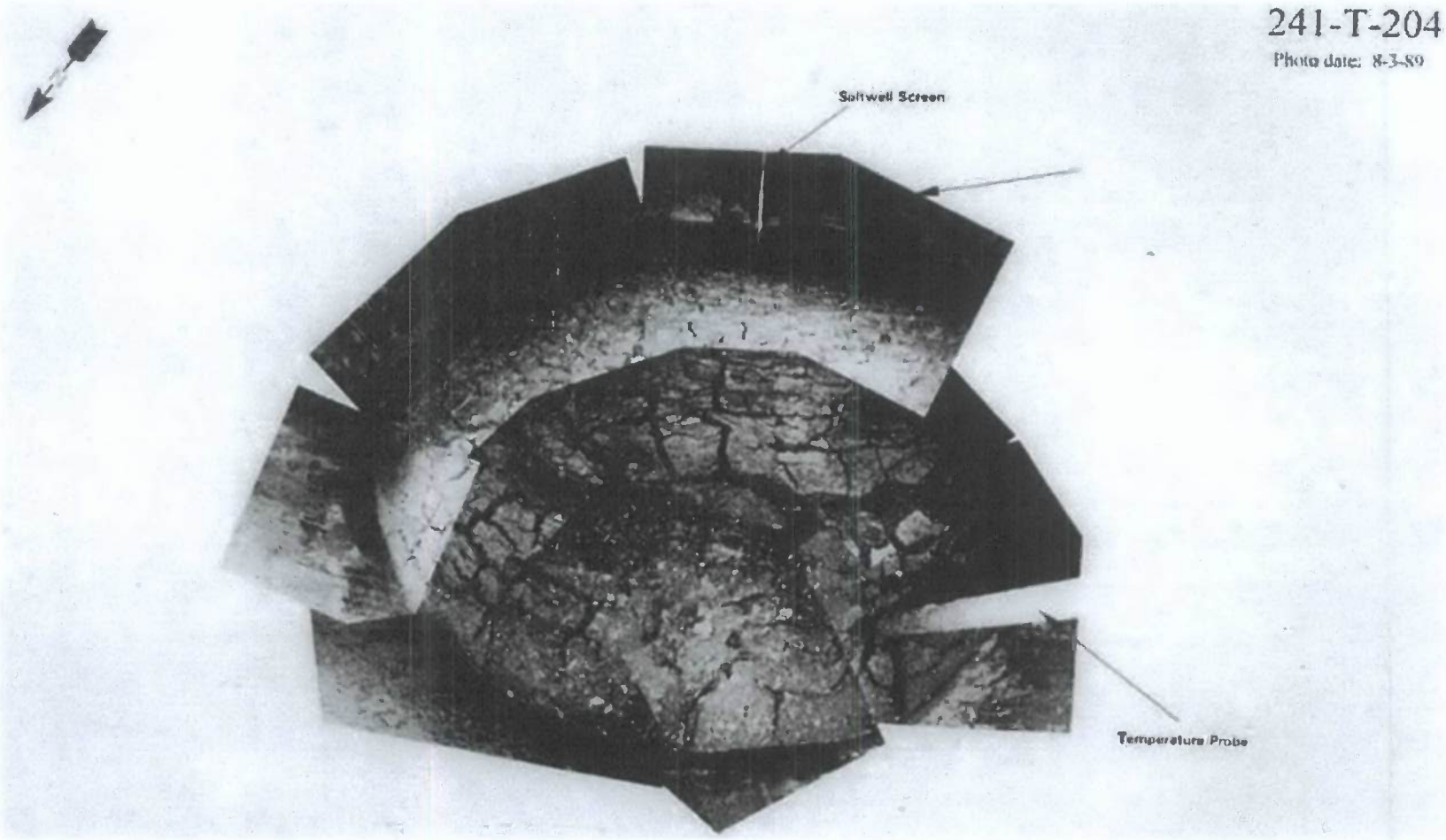
T-202 Tank Waste



T-203 Tank Waste



T-204 Tank Waste



Hanford Analytical Services Quality Assurance Requirements Document (HASQARD)

- Serves as the quality basis for sampling and field/laboratory analytical services provided in support of Hanford Site environmental clean up mission.

- The HASQARD applies to field sampling, field analytical, research, and development activities that support work conducted under the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement)

- HASQARD is based on professional and regulatory quality assurance (QA) principles and practices that cover environmental sampling as well as field/laboratory analytical chemistry activities.

  - The U.S. Environmental Protection Agency (EPA) SW-846, *Methods for Evaluating Solid Wastes, Physical and Chemical Methods*, and the statements of work for the EPA Contract Laboratory Program for organic and inorganic analysis are the model for organic and inorganic analytical QA/QC.

  - The American National Standards Institute (ANSI) N42.2, *Measurement Quality Assurance for Radioassay Laboratories*, is the primary driver for the radiochemical quality assurance/quality control (QA/QC).

SST Waste Inventory Confidence

- **Best Basis Inventory**
  - Chemical and radionuclide inventories for sludges are based on analyses of core samples
  - Waste Templates are used to estimate the concentration of some analytes
  - Uranium and Plutonium isotopic distributions estimated based on models

Tank	Core Sample Date
B-201, B-202	1991
B-203, B-204	1995
T-201, T-202 T-203, T-204	1997

TRU Concentration in Sludges

Tank	Waste Type	Sludge Volume (kgal)	TRU ηCi/gm
B-201	224	30	824
B-202	224	29	214
B-203	224	51	297
B-204	224	50	263
T-201	224	29	754
T-202	224	21	221
T-203	224	37	295
T-204	224	37	243

Cs^{137} Concentrations in Sludges

Tank	Waste Type	Cs^{137} µCi/gm	Basis	Total Cs^{137} Curies
B-201	224	0.145	Sample	21.1
B-202	224	0.082	Sample	11.1
B-203	224	0.0124	Sample	1.63
B-204	224	< 0.028	Sample	< 6.3
T-201	224	0.026	Sample	3.4
T-202	224	< 0.026	Sample	< 2.6
T-203	224	< 0.0134	Sample	< 2.5
T-204	224	0.007	Sample	1.2
Total for Above Tanks				~50
Fraction of Total Cs^{137} in All 177 Tanks				~0.00011%

Note: Cs137 in all 177 tanks 46.08E+06 Ci

Sr^{90} Concentrations in Sludges

Tank	Waste Type	Sr^{90} µCi/gm	Basis	Total Sr^{90} Curies
B-201	224	1.84	Sample	267
B-202	224	3.23	Sample	437
B-203	224	0.074	Template	17.1
B-204	224	1.37	Template	314
T-201	224	0.079	Sample	10.4
T-202	224	0.0023	Sample	0.23
T-203	224	0.0024	Sample	0.41
T-204	224	0.0042	Sample	0.73
Total for Above Tanks				~ 1,047
Fraction of Total Sr^{90} in All 177 Tanks				0.0021%

Note: Sr^{90} in all 177 tanks (50.28E+06 Ci)

DATA ANALYSIS

- The slides that follow illustrate by example the activity levels in the B-200/T-200 series tanks as compared with Tank AZ-101 which contains waste from the 1st cycle of the PUREX process

- This is for illustration only; each tank and it's content are different

- Examination of the date also illustrates that the content of the B-200/T-200 series tanks is consistent with TRU waste.

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Further Dissemination Unlimited

Comparison of Fission Products Between B200/T200 Tank Waste and Sludge in Tank 241-AZ-101

Radionuclide	B200/T200 Tank Waste Micro-curie per gram of waste	Sludge in Tank AZ-101 Micro-curie per gram of waste
^{129}I	1.3E-08 to 2.0E-08	1.3E-03
^{137}Cs	7.3E-03 to 1.5E-01	7.6E+02
^{137m}Ba	6.9E-03 to 1.4E-01	7.2E+02
^{14}C	1.0E-06 to 1.5E-06	1.0E-03
^{151}Sm	7.6E-04 to 1.1E-03	6.8E+02
^{90}Sr	2.4E-03 to 3.2E+00	2.1E+04
^{90}Y	2.4E-03 to 3.2E+00	2.1E+04
^{99}Tc	7.3E-06 to 5.2E-03	1.5E-01

Comparison of Uranium and Transuranic Isotopes Between B200/T200 Tank Waste and Sludge in Tank 241-AZ-101

Radionuclide	B200/T200 Tank Waste Micro-curie per gram of waste	Sludge in Tank AZ-101 Micro-curie per gram of waste
^{233}U	3.1E-11 to 5.4E-11	2.6E-04
^{234}U	3.4E-05 to 1.4E-04	1.8E-03
^{235}U	1.5E-06 to 4.8E-06	6.7E-05
^{236}U	3.0E-07 to 1.5E-06	1.4E-04
^{237}Np	4.3E-08 to 6.5E-08	1.9E-02
^{238}Pu	8.5E-04 to 6.4E-03	2.1E-01
^{238}U	3.4E-05 to 1.1E-04	1.2E-03
^{239}Pu	1.3E-01 to 7.5E-01	1.8E+00
^{240}Pu	1.1E-02 to 6.0E-02	5.6E-01
^{241}Am	1.4E-03 to 6.5E-02	3.8E+01
^{241}Pu	1.1E-02 to 1.4E-01	1.6E+01
^{242}Pu	1.7E-07 to 4.2E-06	8.6E-05

Confidence for waste origin

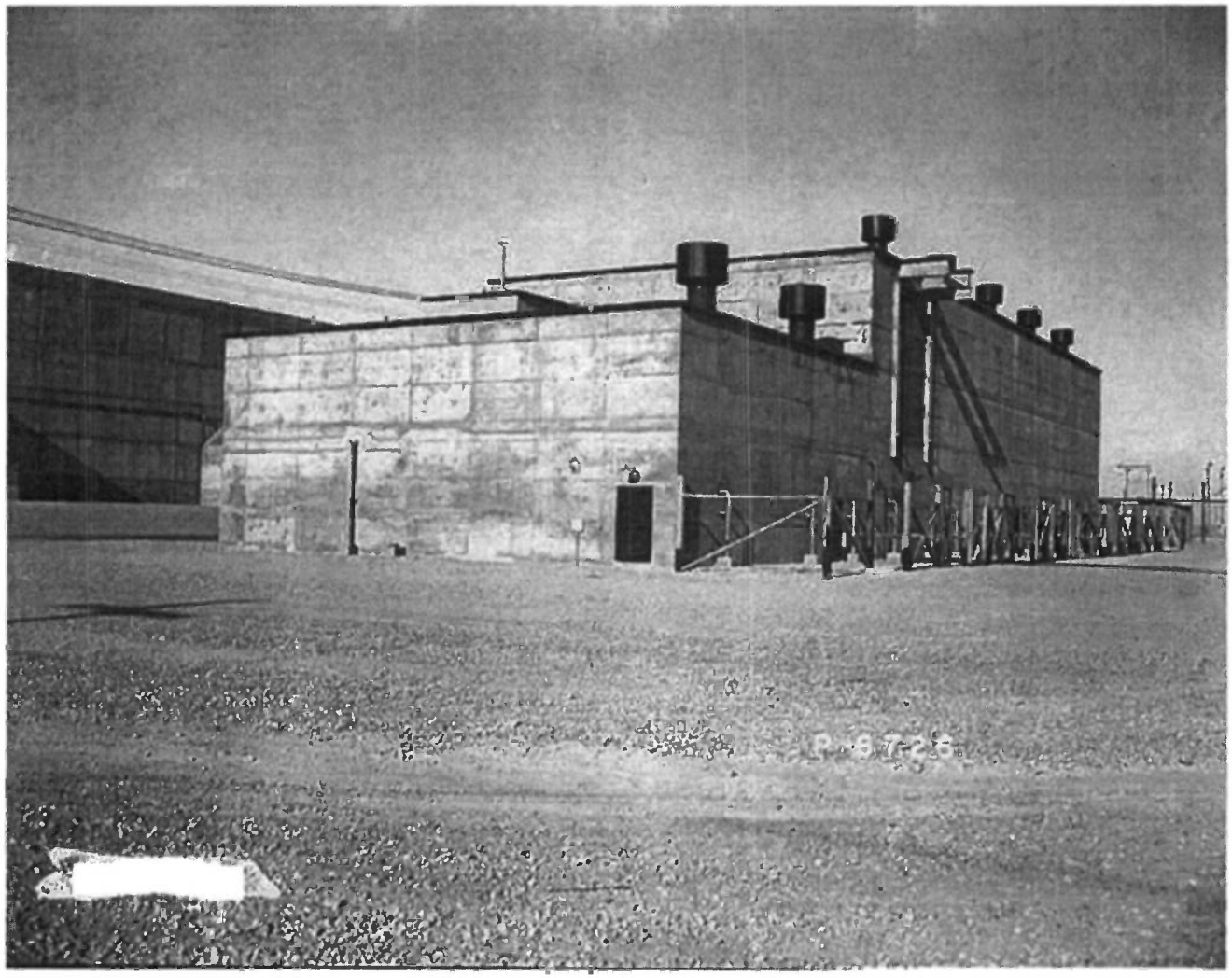
- Information was developed during work on *Hanford Federal Facility Agreement and Consent Order* milestone M-44 and in response to Defense Nuclear Facilities Safety Board Recommendation 93-5

- Extensive knowledge of the origin, physical, chemical and radioactive properties of the waste has enabled the closure of the Wyden safety issues and enabled planning for treatment and disposal of the tank waste.

Confidence for waste origin

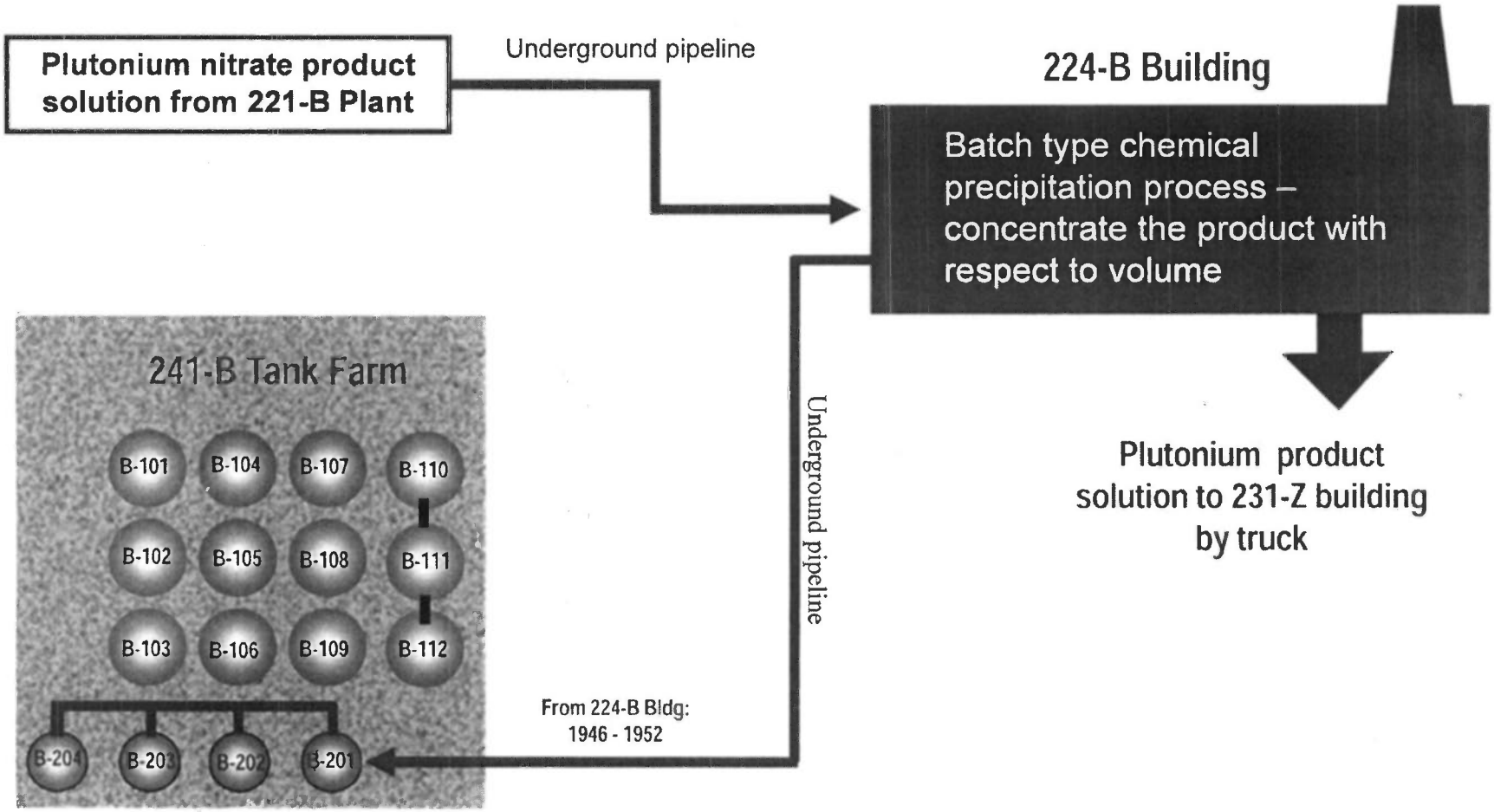
- Operational records demonstrate the origin of the waste based on:
  - Physical configuration of piping
  - Tank fill history
- Information provided by these records is confirmed by sampling and analysis of tank contents
- Extensive review of waste transfer records, Hanford site monthly reports, AEC monthly reports and other historical documents
  - RPP-13300, Origin of Wastes in B-200 and T-200 Series SSTs

224-T Concentration Building (~1945)



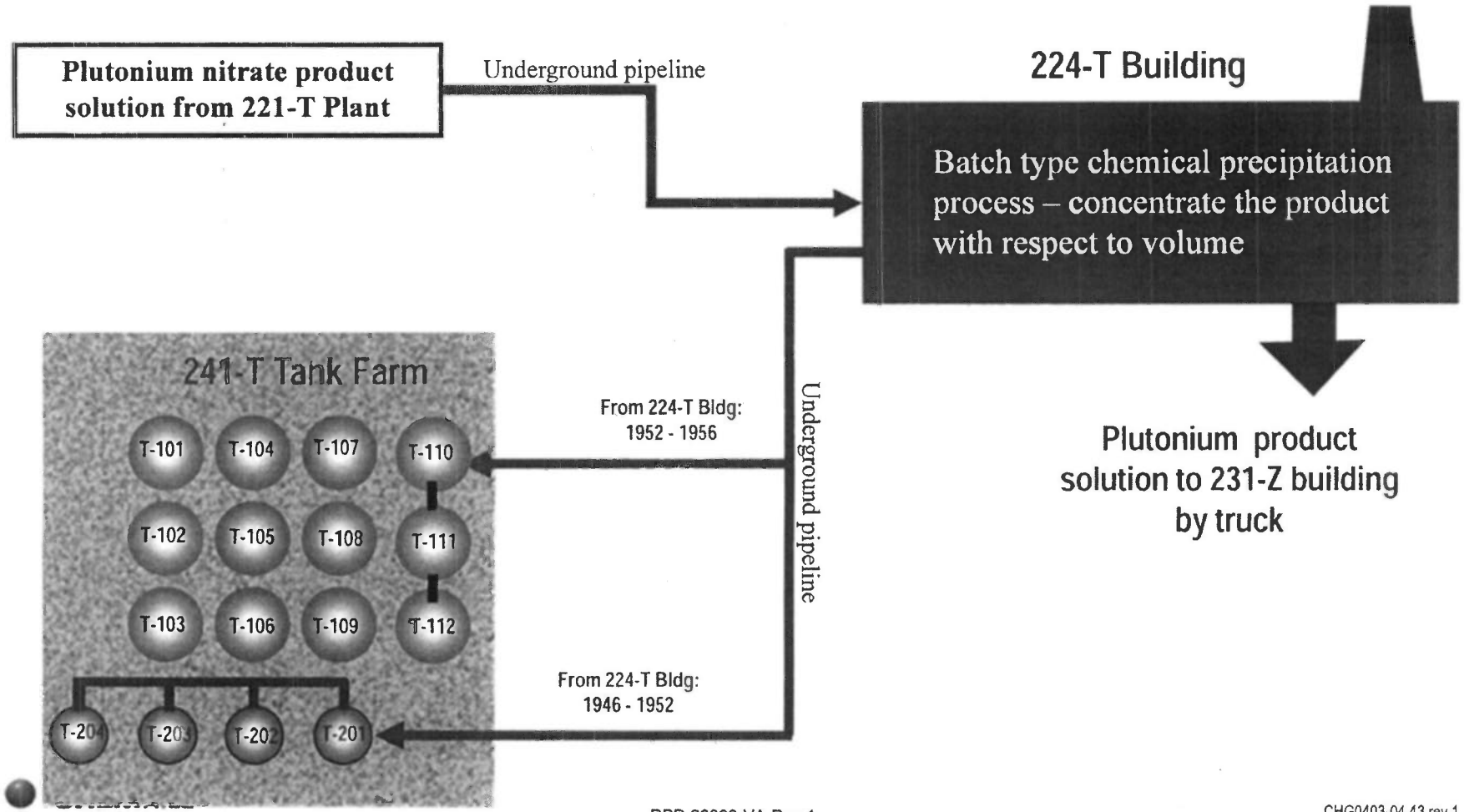
224-B Plutonium Purification Cycle

Basis: HW-23043, Flowsheets and Flow Diagrams of Precipitation Separation Process



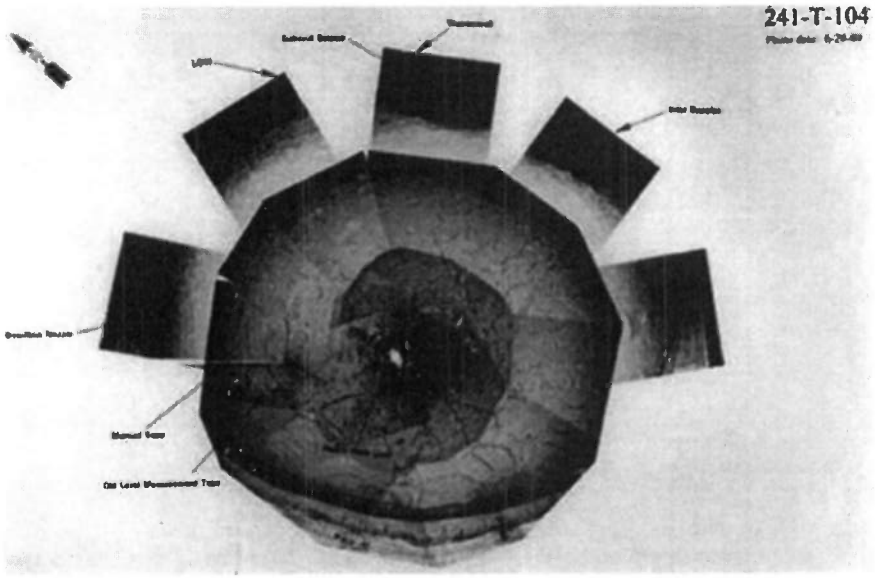
224-T Plutonium Purification Cycle

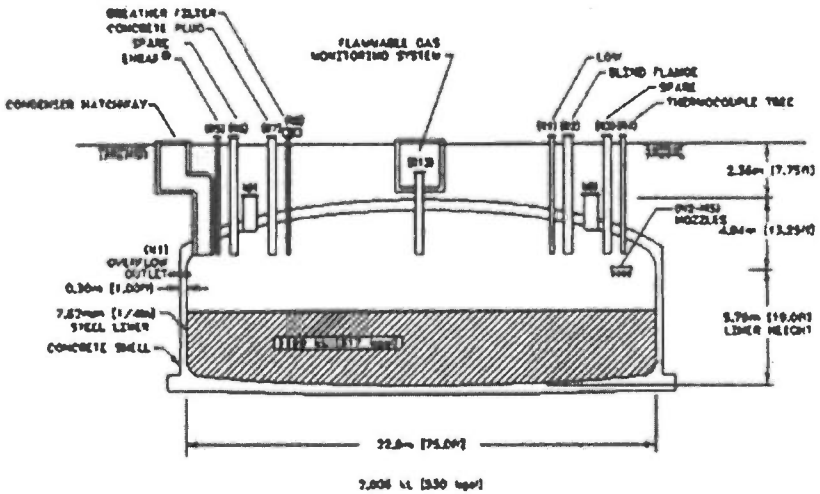
Basis: HW-23043, Flowsheets and Flow Diagrams of Precipitation Separation Process



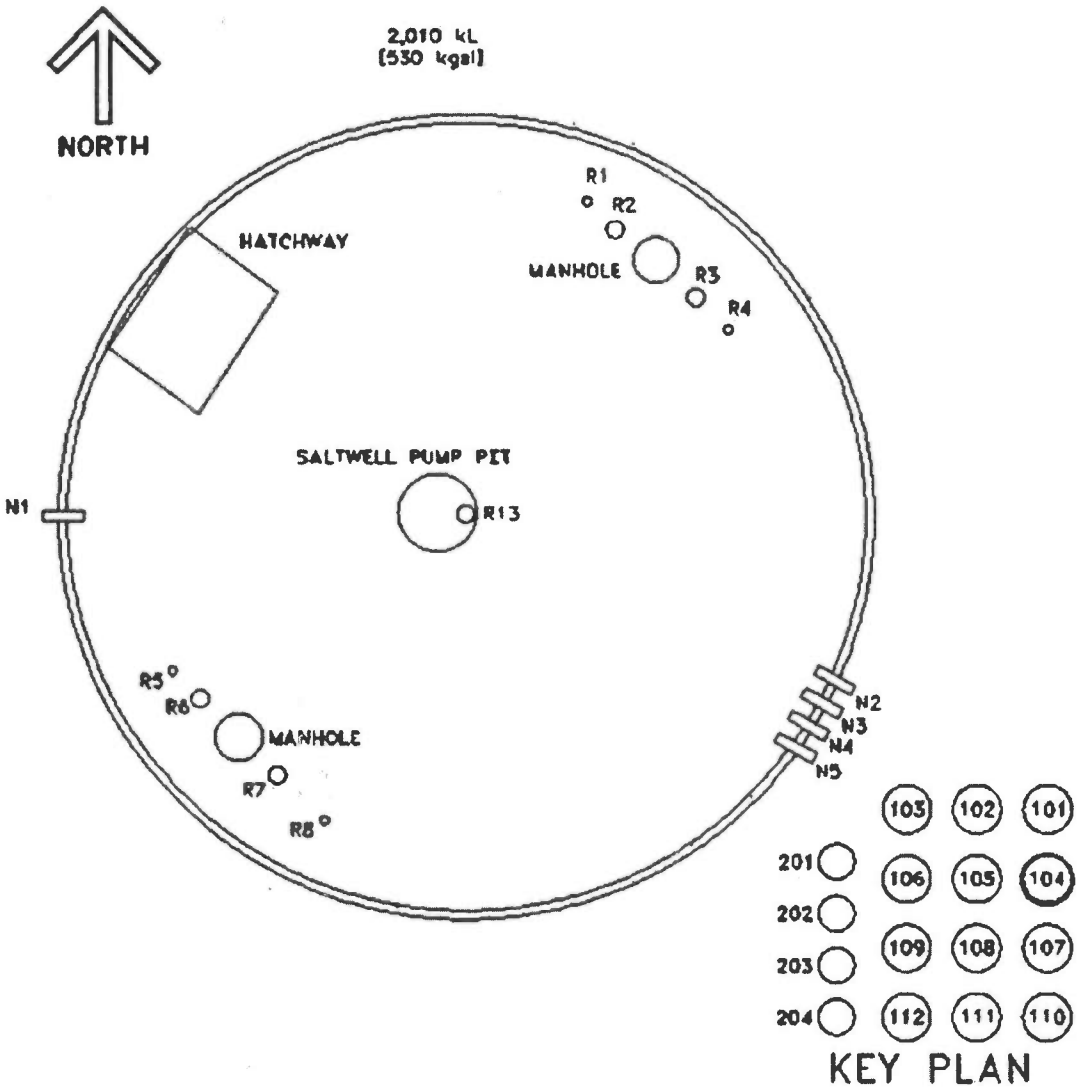
Let's look at a few other tanks

Tank 241-T-104

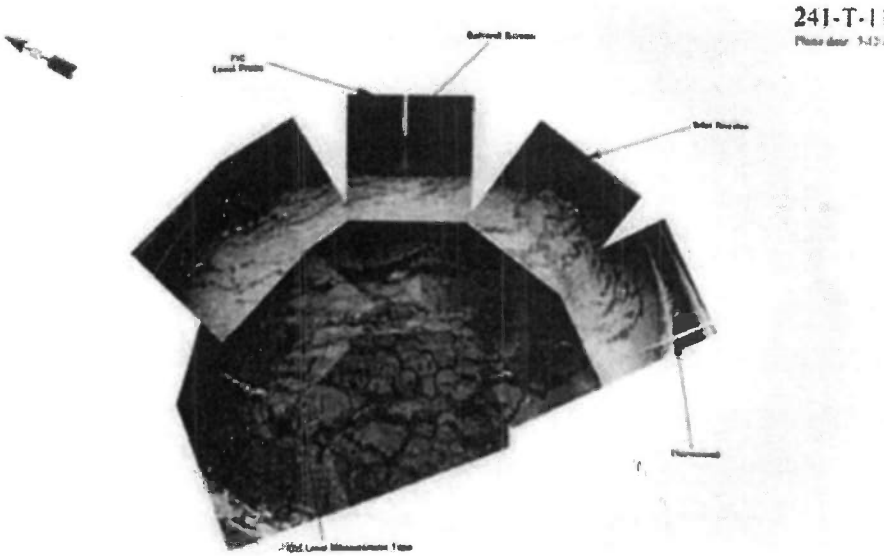


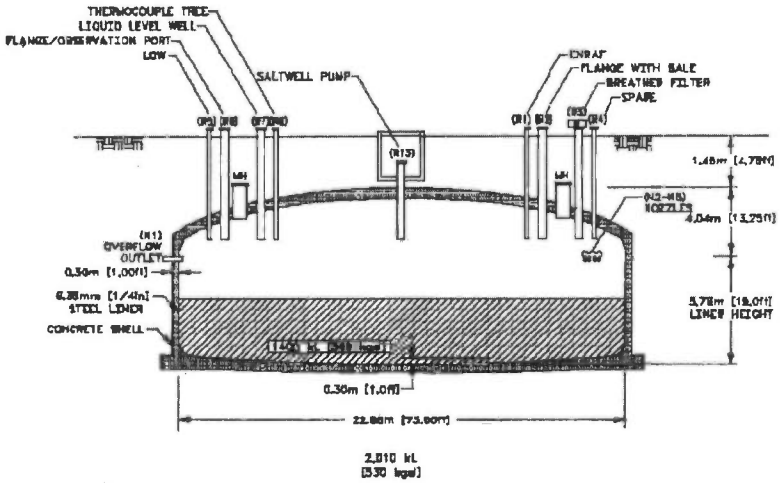


Tank 241-T-104

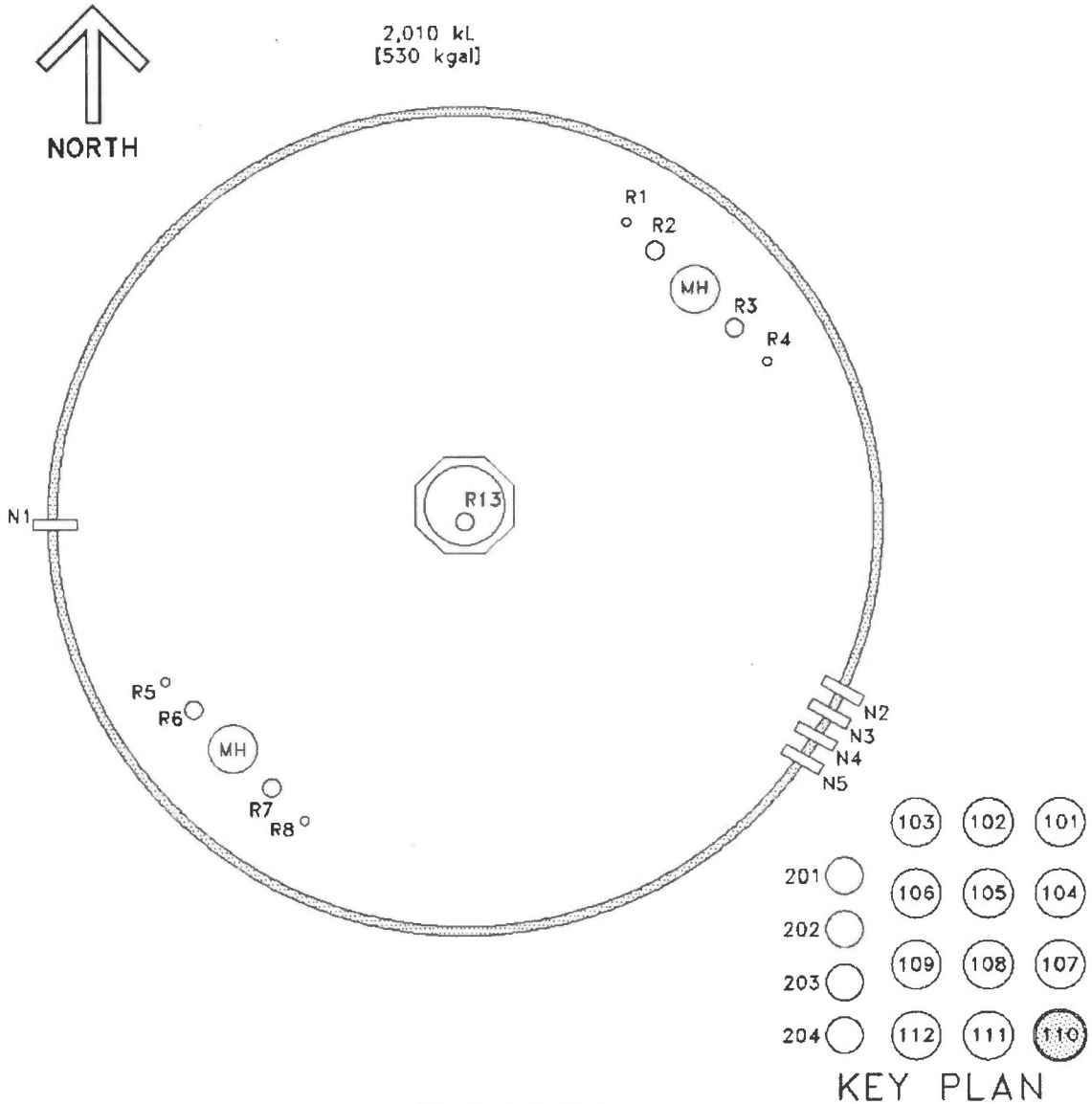


Tank 241-T-110

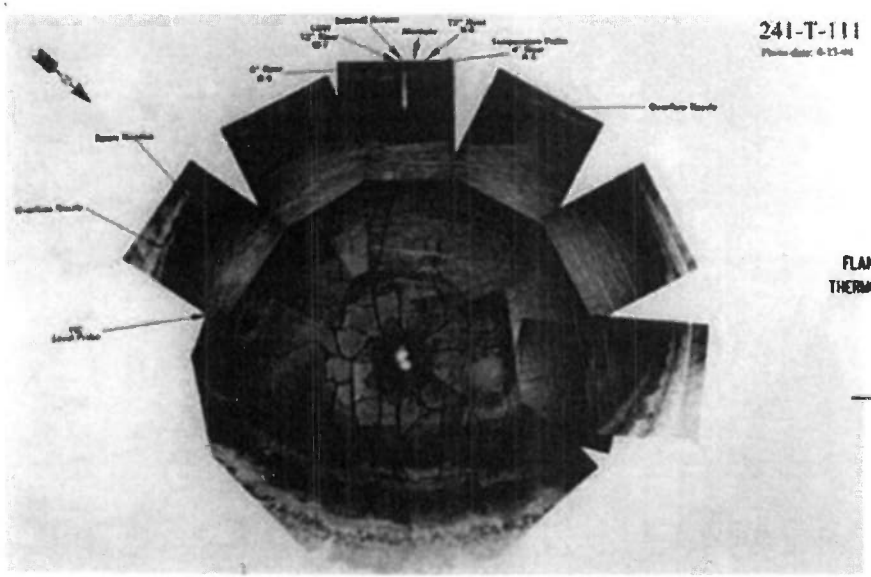


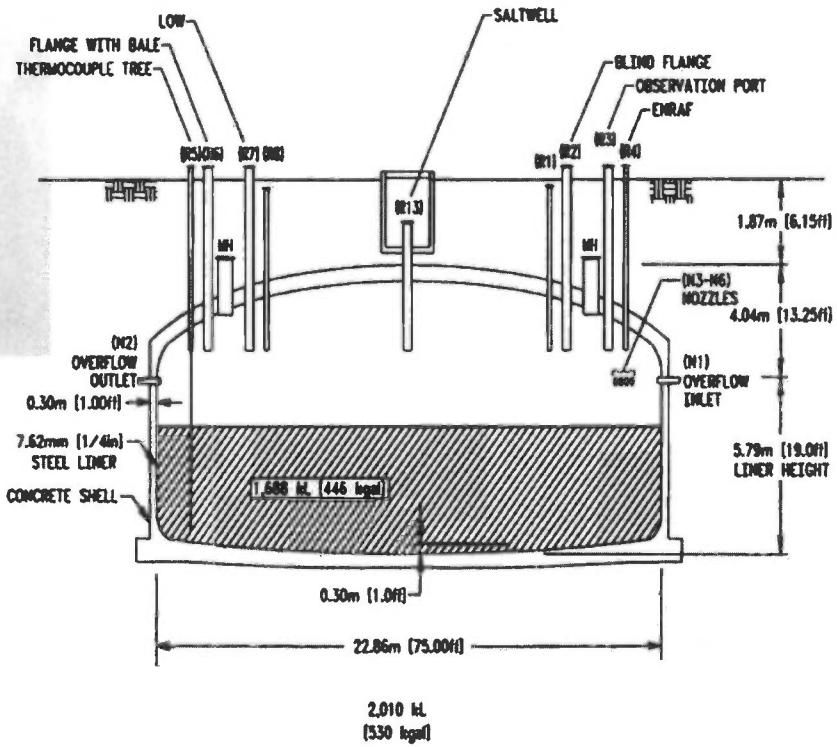


Tank 241-T-110

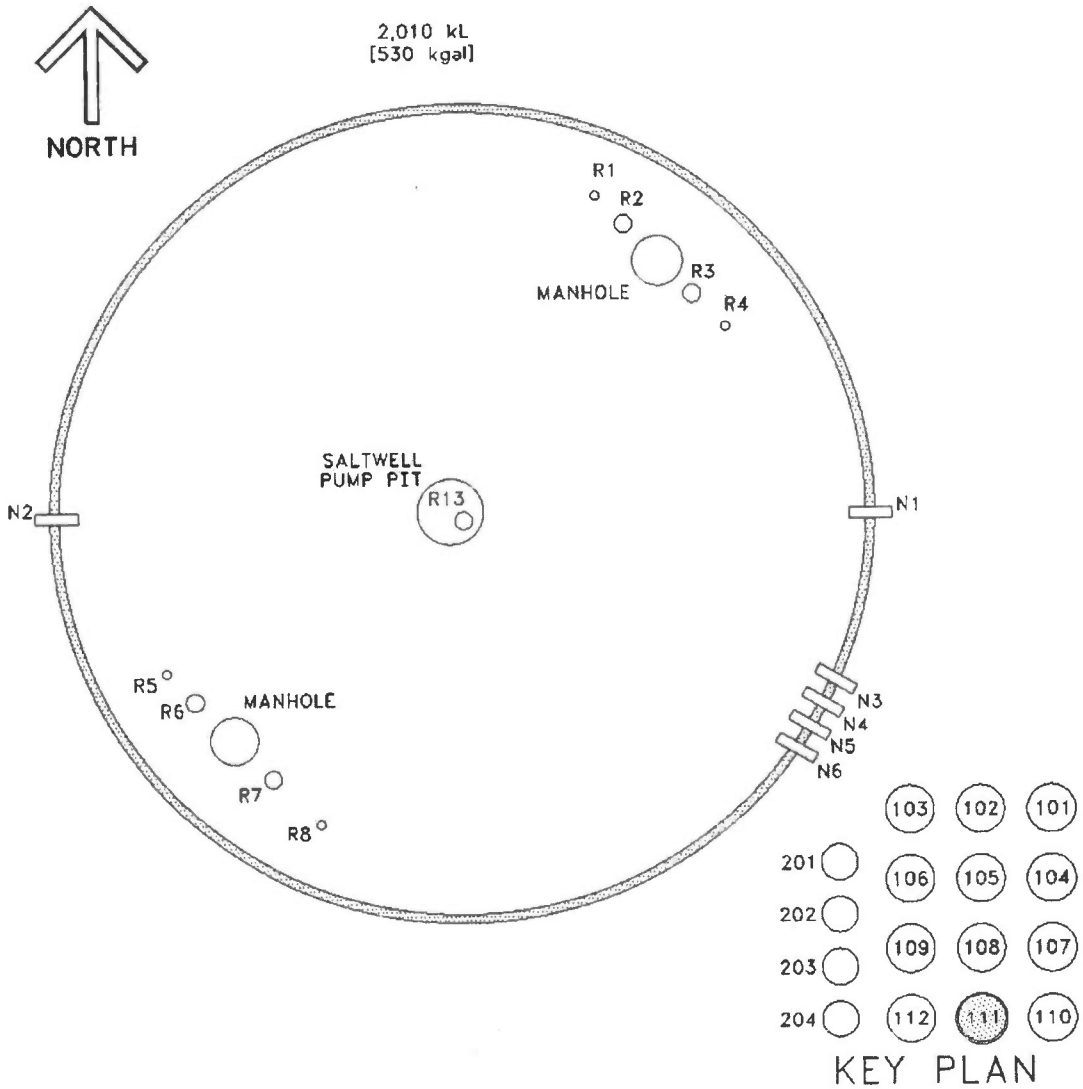


Tank 241-T-111



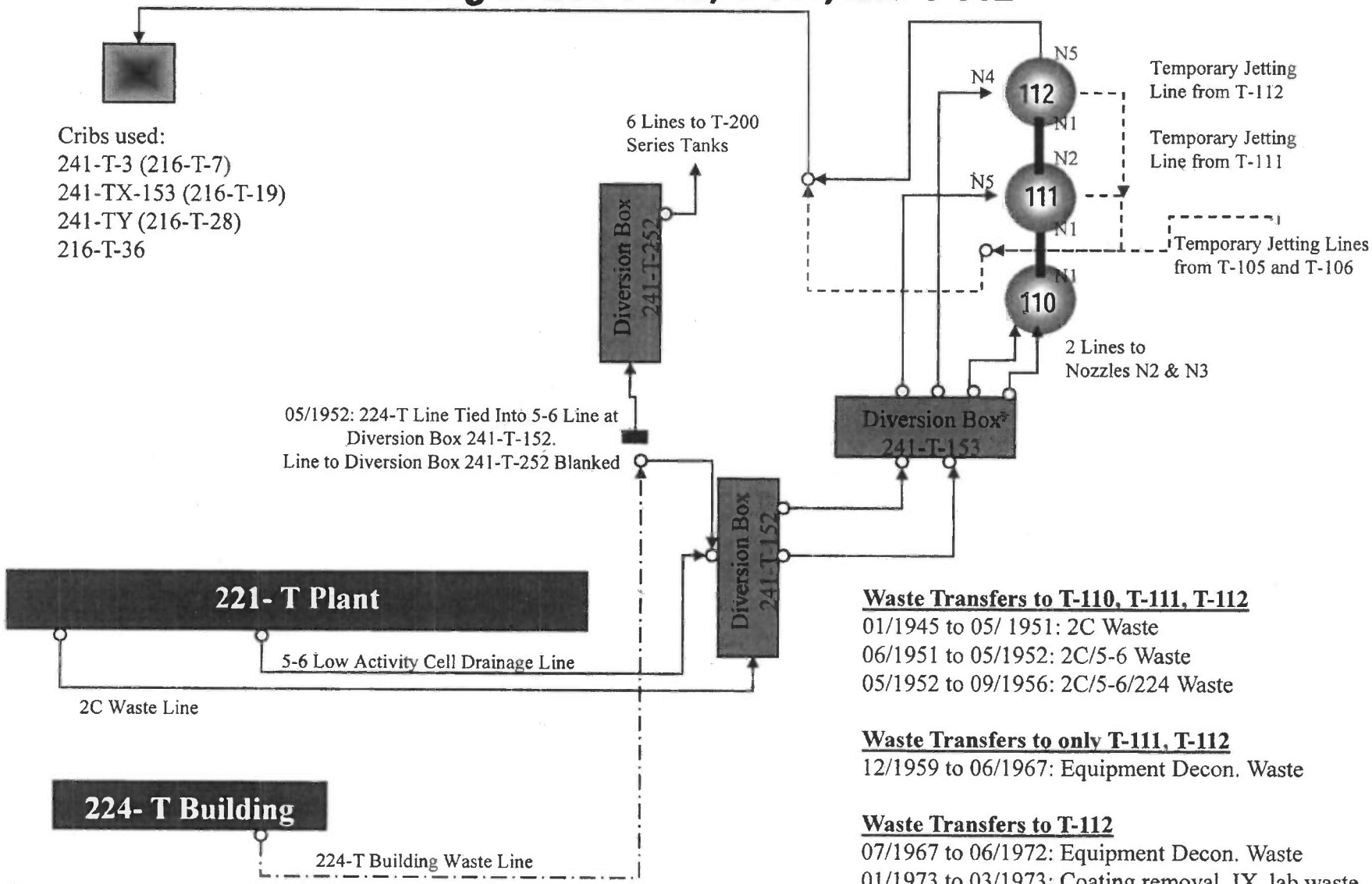


Tank 241-T-111



221-T Plant in background (~1945)
P 7846

Second Decontamination Cycle, Low Activity Cell Drainage and 224 Waste Routing to 241-T-110, T-111, and T-112

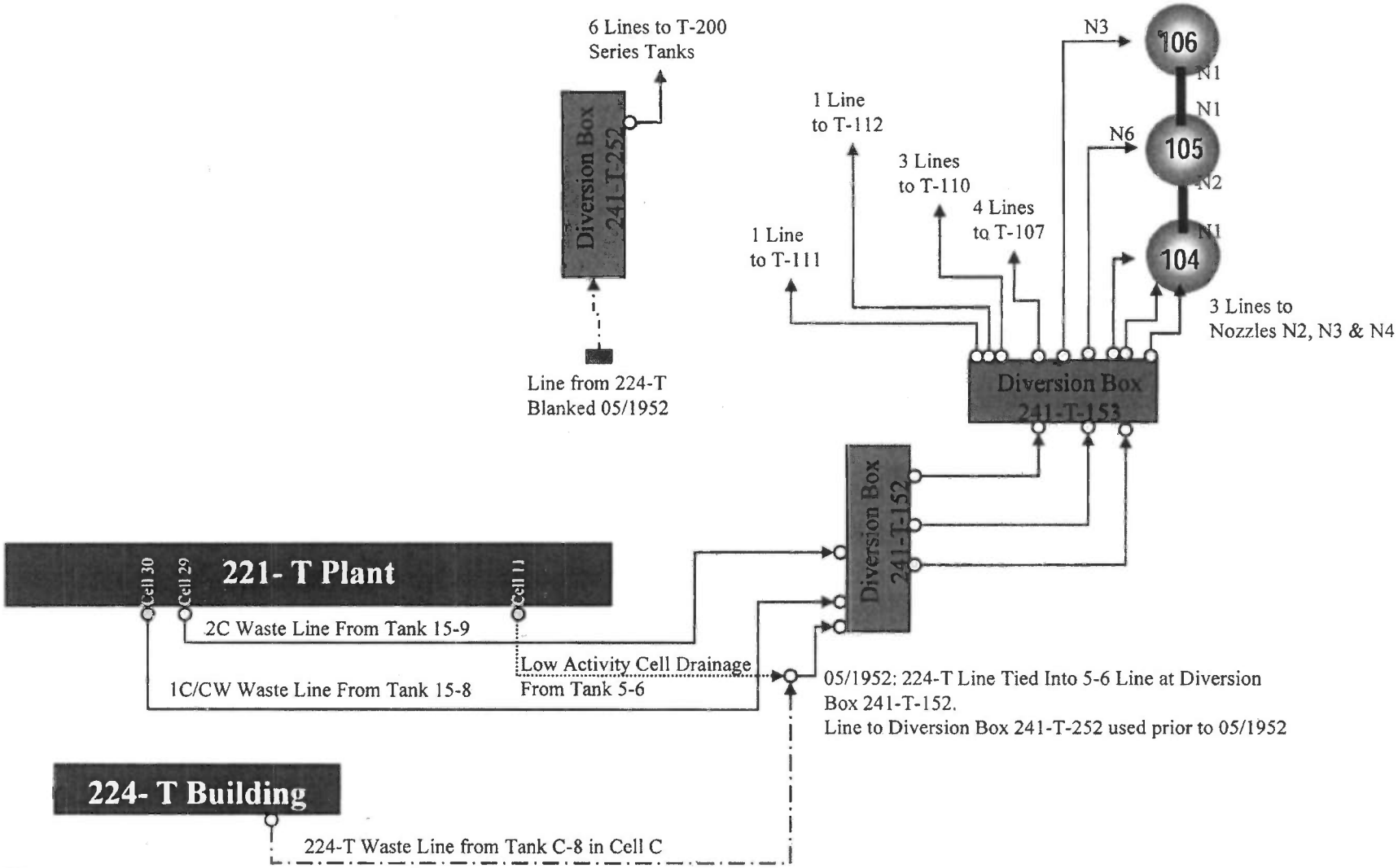


Waste Transfers to T-110, T-111, T-112
01/1945 to 05/ 1951: 2C Waste
06/1951 to 05/1952: 2C/5-6 Waste
05/1952 to 09/1956: 2C/5-6/224 Waste

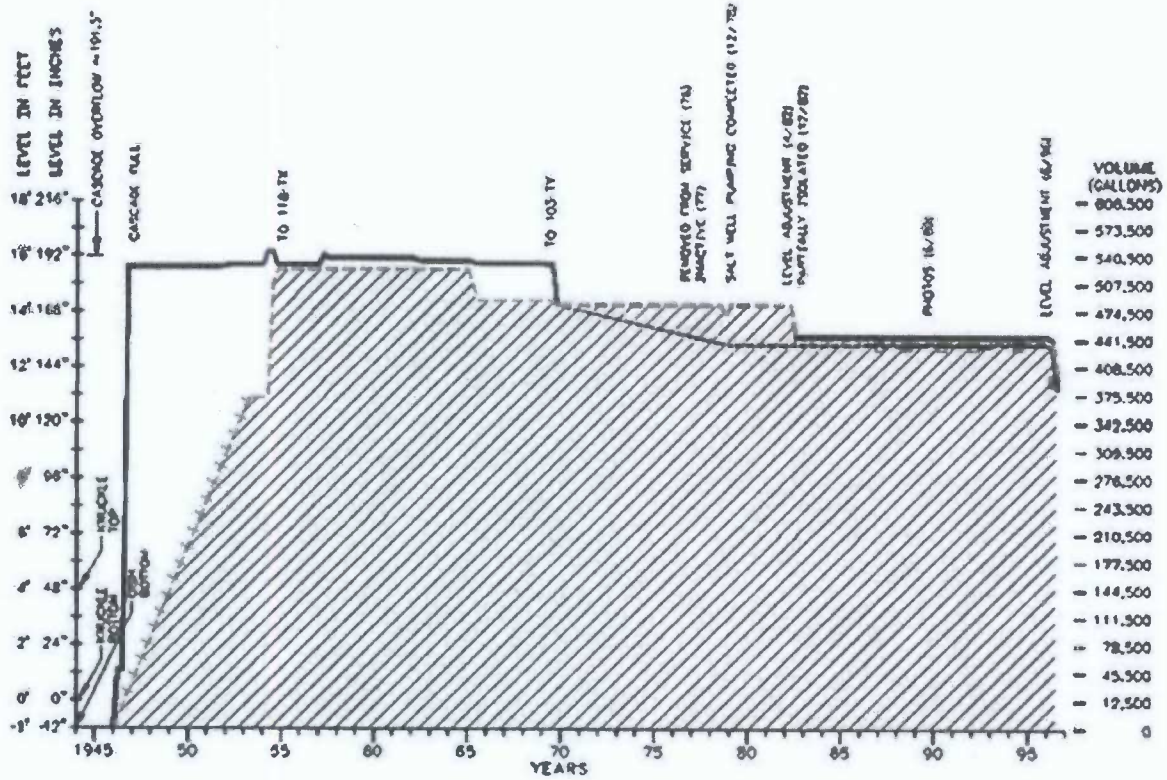
Waste Transfers to only T-111, T-112
12/1959 to 06/1967: Equipment Decon. Waste

Waste Transfers to T-112
07/1967 to 06/1972: Equipment Decon. Waste
01/1973 to 03/1973: Coating removal, IX, lab waste

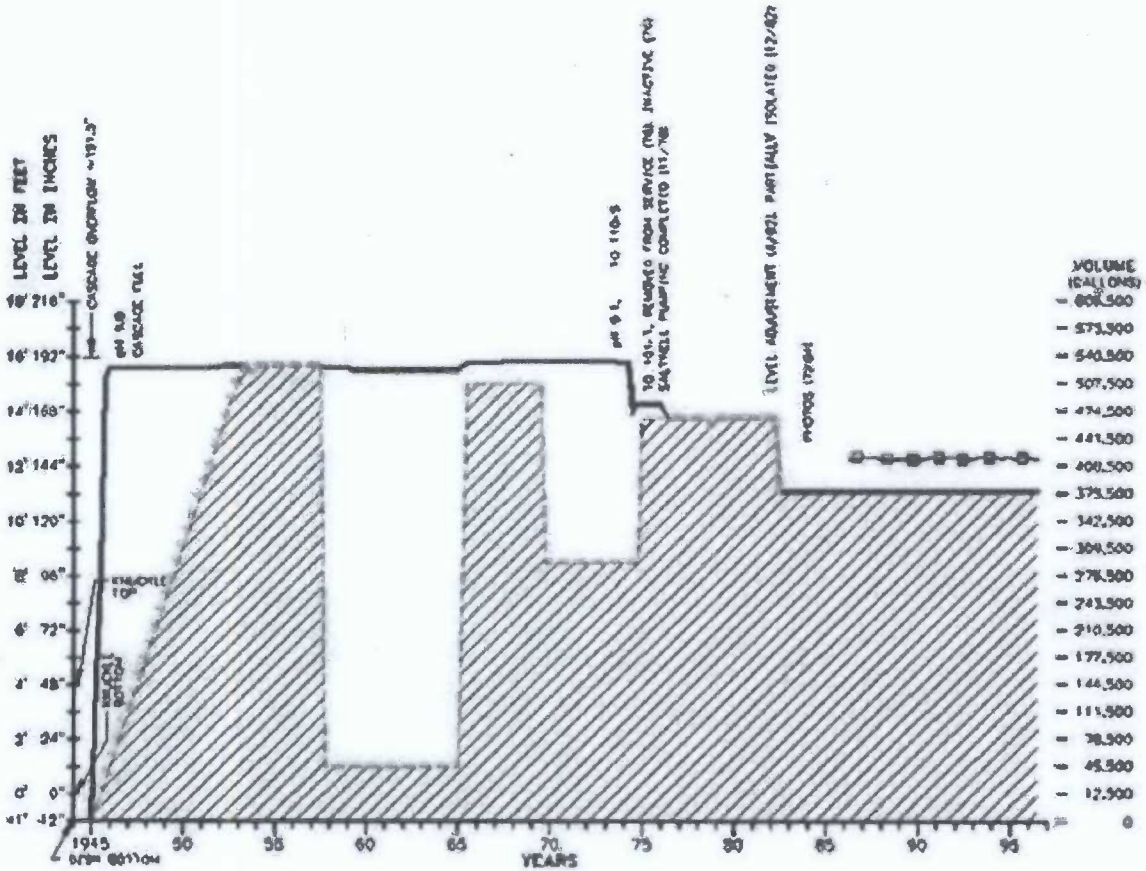
First Decontamination Cycle and Coating Removal Waste Routing to Tank 241-T-104



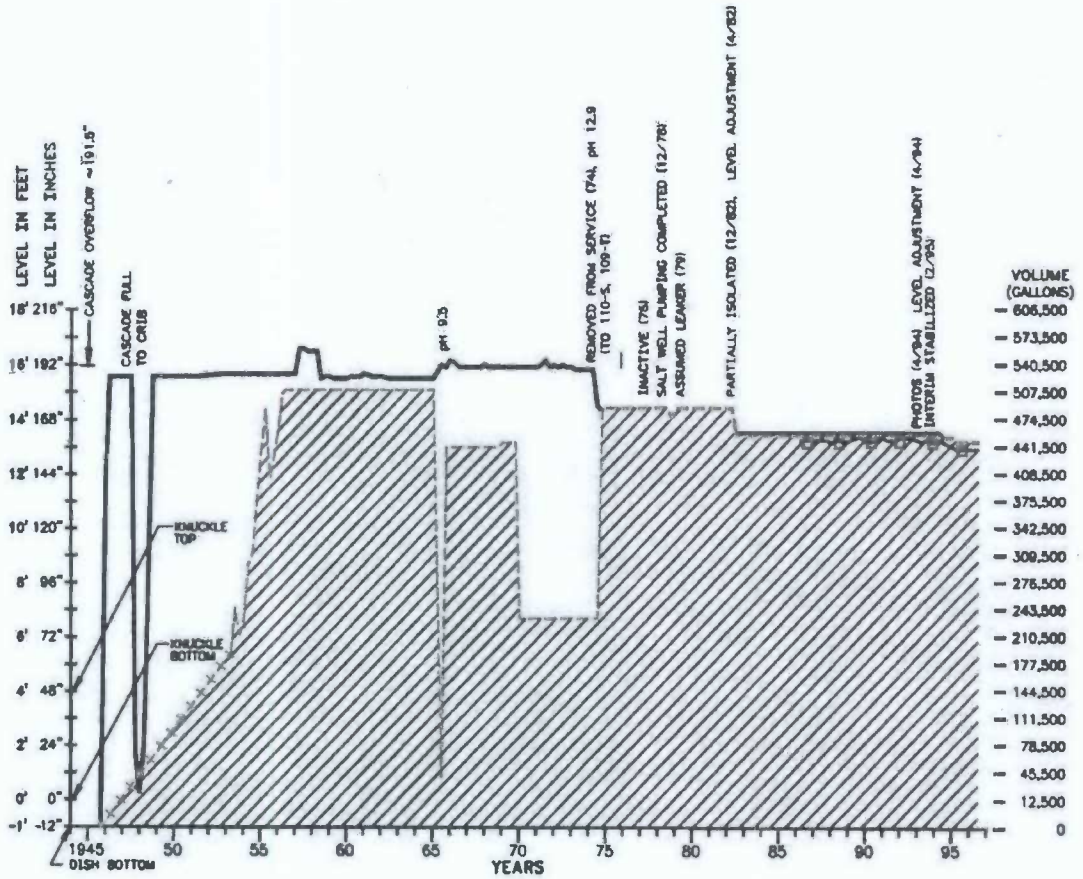
Tank 241-T-104



Tank 241-T-110



Tank 241-T-111



SST Waste Inventory Confidence

- **Best Basis Inventory**
  - Chemical and radionuclide inventories for sludges are based on analyses of core samples
  - Waste Templates are used to estimate the concentration of some analytes
  - Uranium and Plutonium isotopic distributions estimated based on models

Tank	Core Sample Date
T-104	1992
T-111	1991
T-110	1997

TRU Concentration of the Wastes

Tank	Waste Type	Sludge Volume (kgal)	TRU ηCi/gm
T-104	1C/CW	317	158
T-110	2C / 224	369	241(*)
T-111	2C / 224 / DW	447	182

(*) After packaging

Cs^{137} Concentrations in 2C and 224 Sludges

Tank	Waste Type	Cs^{137} µCi/gm	Basis	Total Cs^{137} Curies
T-104	1C/CW	0.166	Sample	257
T-110	2C / 224	0.0525	Sample	27.8
T-111	2C / 224 / DW	0.11	Sample	229
Total for Above Tanks				~514
Fraction of Total Cs^{137} in All 177 Tanks				0.0011%

Note: Cs137 in all 177 tanks 46.08E+06 Ci

Sr^{90} Concentrations in 2C and 224 Sludges

Tank	Waste Type	Sr^{90} µCi/gm	Basis	Total Sr^{90} Curies
T-104	1C/CW	2.19	Sample	3,380
T-110	2C / 224	0.097	Sample	51.2
T-111	2C / 224 / DW	4.4	Sample	9,230 (*)
Total for Above Tanks				~ 12,661
Fraction of Total Sr^{90} in All 177 Tanks				0.025%

Note: Sr^{90} in all 177 tanks 50.28E+06 Ci

(*) Tank T-111 has a higher Sr-90 inventory due to the receipt of equipment decontamination waste (DW)

Final Waste Form
Concentrations per Standard Waste Box

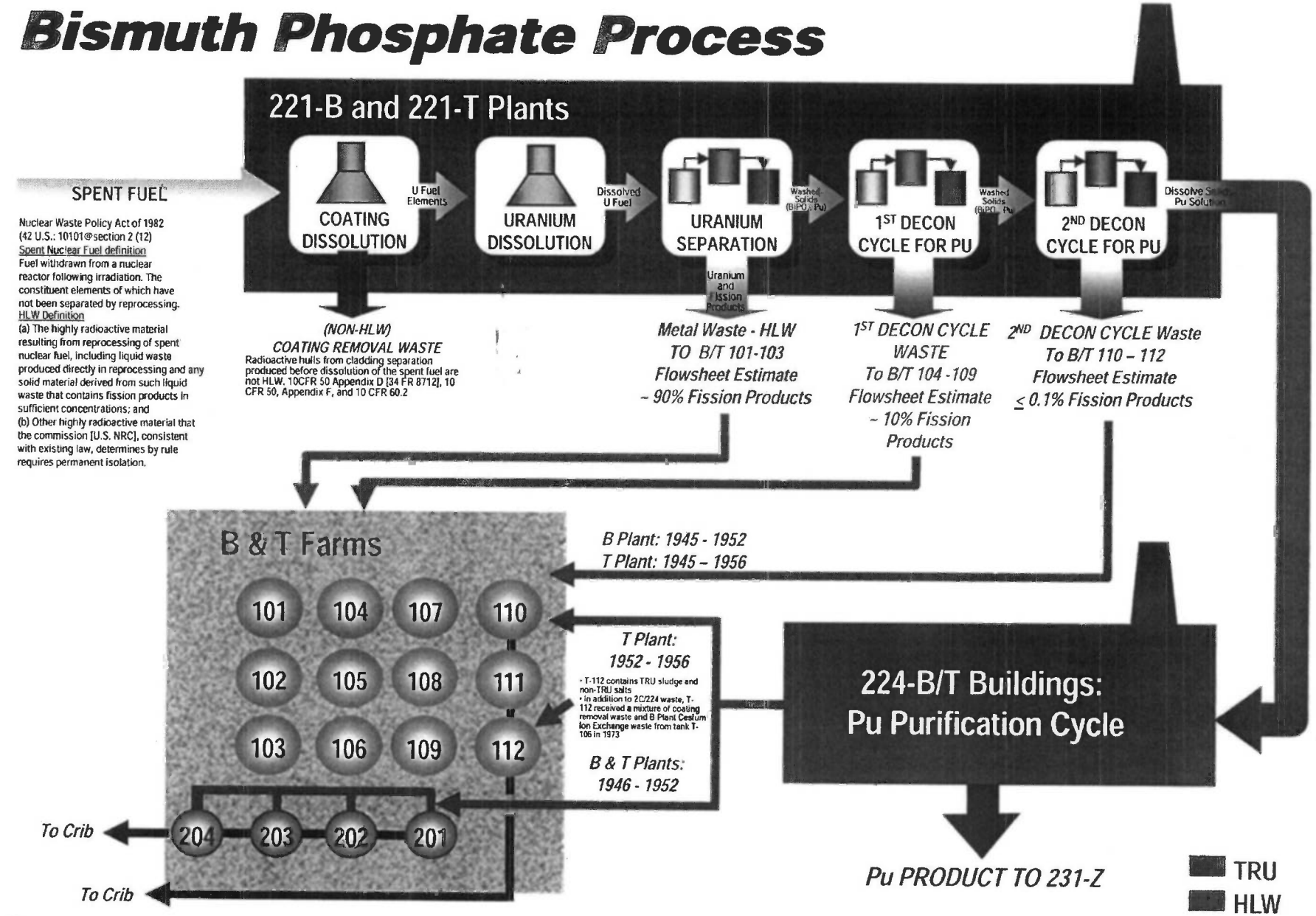
Tank	Total Grams Pu	TRU ηCi/gm	Wt% Pu	Pu-239 FGE	PE Ci	Number of SWBs
T-110	1.64E+03	241	0.0003%	4.8	0.30	389
T-111	4.39E+03	604	0.0007%	109.0	0.76	504
T-104	3.17E+03	430	0.0006%	27.1	0.49	455

Reference: Calculation No. 20843.PCAL.001, revision E dated February 20, 2004, except for tank T-104 which was calculated using TWINS best basis inventory data and assuming final waste form contained 20wt% water.

Confidence for waste origin

- Operational records demonstrate the origin of the waste based on:
  - Physical configuration of piping
  - Tank fill history
- Information provided by these records is confirmed by sampling and analysis of tank contents
- Extensive review of waste transfer records, Hanford site monthly reports, AEC monthly reports and other historical documents
  - RPP-13873, Origin of Wastes in SSTs 241-T-110 and 241-T-111
  - RPP-16129, Origin of Waste in Single-Shell Tank 241-T-104

Bismuth Phosphate Process



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Hanford Group, Inc.

CHG0403-04.65 rev 1

Final Waste Form Concentrations per Standard Waste Box

Tank	Total Grams Pu	TRU ηCi/gm	Wt% Pu	Pu-239 FGE	PE Ci	Number of SWBs
B-201	1.76E+03	1730	0.0025%	34.4	2.17	55
B-202	2.88E+02	617	0.0006%	15.3	0.78	38
B-203	7.26E+02	1030	0.0011%	17.1	1.29	53
B-204	8.76E+02	906	0.0013%	21.3	1.14	52
T-201	1.61E+03	1870	0.0028%	36.9	2.34	47
T-202	3.13E+02	738	0.0011%	16.5	0.93	23
T-203	4.92E+02	980	0.0010%	15.8	1.23	40
T-204	3.50E+02	739	0.0006%	12.2	0.93	44

Reference: Calculation No. 20843.PCAL.001, revision E dated February 20, 2004.

S

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(b) Responsible Manager (Print/Sign): J. G. Reynolds	Jack Reynolds	Date: 04-15-2009
(c) Reviewer (Optional, Print/Sign): D. J. Washenfelder	D J Washenfelder	Date: 04-08-2009
(d) Reviewer (Optional, Print/Sign):		Date:

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WASTE TANK SUMMARY REPORT FOR MONTH ENDING JANUARY 31, 2009

M. J. RODGERS
WASHINGTON RIVER PROTECTION SOLUTIONS
Richland, WA 99352
U.S. Department of Energy Contract DE-AC27-08RV14800

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Abstract: See page 7 (Purpose and Summary)

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Tank Farm Contractor (TFC) **RECORD OF REVISION**	(1) Document Number: **HNF-EP-0182**	Page 1

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WASTE TANK SUMMARY REPORT FOR MONTH ENDING JANUARY 31, 2009

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HNF-EP-0182
Revision 250

Waste Tank Summary Report for Month Ending January 31, 2009

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
Office of River Protection under Contract DE-AC27-08RV14800

washington river protection solutions

P. O. Box 850
Richland, Washington 99352

HNF-EP-0182
Revision 250

Waste Tank Summary Report for Month Ending January 31, 2009

M. J. Rodgers
Washington River Protection Solutions

Date Published
April 2009

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
Office of River Protection under Contract DE-AC27-08RV14800

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Total Pages: _____

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ACRONYMS

DCRT	Double-Contained Receiver Tank
DIL	Drainable Interstitial Liquid
DLR	Drainable Liquid Remaining
DST	Double-Shell Tank
Gal	Gallon
GPM	Gallons Per Minute
ILL	Interstitial Liquid
Kgal	Kilogallons
IP	Intrusion PreventionIS Interim Stabilized
MT/	Manual Tape/
ENRAF	ENRAF Corporation (surface level measurement devices)
OSD	Operating Specifications Document
PFP	Plutonium Finishing Plant
SACS	Surveillance Automated Control System
SST	Single-Shell Tank
TMACS	Tank Monitor and Control System
TPA	Hanford Federal Facility Consent and Compliance Order, "Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy," as amended (Tri-Party Agreement)
TWINS	Tank Waste Information Network System
UPR	Unplanned Release
WRPS	Washington River Protection Solutions, LLC.

GLOSSARY

General

Characterization - Characterization is understanding the Hanford tank waste chemical, physical, and radiological properties to the extent necessary to ensure safe storage and interim operation, and ultimate disposition of the waste.

Drainable Interstitial Liquid (DIL) -Drainable Interstitial Liquid is calculated based on saltcake and sludge volumes and calculated porosity values. Interstitial liquid is the liquid that fills the interstitial spaces of the solids waste. The sum of the interstitial liquid contained in saltcake and sludge minus an adjustment for capillary height is the initial volume of DIL. Interstitial liquid that is not held in place by capillary forces will, therefore, migrate or move with gravity.

Supernatant Liquid - The liquid above the solids or in large liquid pools covered by floating solids in waste storage tanks.

Total Waste - For purposes of this document, solids volume (sludge and saltcake including liquids) plus supernatant liquid.

Interim Stabilization (Single-Shell Tanks only)

Interim Stabilized (IS) - A tank which contains less than 50 Kgallons of drainable interstitial liquid and less than 5 Kgallons of supernatant. If the tank was jet pumped to achieve interim stabilization, then the jet pump flow or saltwell screen inflow must also have been at or below 0.05 gpm before interim stabilization criteria are met.

Jet Pump - The centrifugal pump and jet assembly used to pump the interstitial liquid from the saltwell screen into the pump pit, nominally a 40-foot elevation rise. Pumping rates vary from 0.05 to about 4 gpm.

Saltwell Screen - The saltwell system is a 10-inch diameter saltwell casing consisting of a stainless steel saltwell screen welded to a Schedule 40 carbon steel pipe. The casing and screen are to be inserted into the 12-inch tank riser located in the pump pit. The stainless steel screen portion of the system extend through the tank waste to near the bottom of the tank.

Retrieval/Closure-(Single-Shell Tanks only)

Closure (C) - Final closure of the operable units (tank farms) shall be defined as regulatory approval of completion of closure actions and commencement of post-closure actions. For the purposes of this agreement (Hanford Federal Facility Agreement and Consent Order Change Control Form, Change Number M-45-02-03), all units located within the boundary of each tank farm will be closed in accordance with Washington Administrative Code 173-303-610.

Retrieval (R) - The process of removing, to the maximum extent practical, all the waste from a given underground storage tank. The retrieval process is selected specific to each tank and accounts for the waste type stored and the access and support systems available. Per OSD-T-151-00031 a tank is officially in "retrieval status" if one of two conditions is meet: either waste has been physically removed from the tank by retrieval operations, or preparations for retrieval operations are directly responsible for rendering the leak or intrusion monitoring instrument "out of service".

Tank Integrity

Assumed Leaker - The integrity classification of a waste storage tank for which surveillance data indicate a loss of liquid attributed to a breach of integrity.

Sound - The integrity classification of a waste storage tank for which surveillance data indicate no loss of liquid attributed to a breach of integrity.

Surveillance Instrumentation

Annulus - The annulus is the space between the inner and outer shells on DSTs only. Drain channels in the insulating and/or supporting concrete carry any leakage to the annulus space where conductivity probes are installed. The annulus conductivity probes or ENRAFs are the primary means of leak detection for all DSTs. The Leak Detection System may not be replaced by, but may be supplemented by, the operation of an annulus ventilation system Continuous Air Monitor (CAM).

Drywells - Historically, the drywells were monitored with gross logging tools as part of a secondary leak monitoring system. In some cases, neutron-moisture sensors were used to monitor moisture in the soil as a function of well depth, which could be indicative of tank leakage. The routine gross gamma logging data were stored electronically from 1974 through 1994; a program was initiated in 1995 to log each of the available drywells in each tank farm with a spectral gamma logging system. The spectral gamma logging system provides quantitative values for gamma-emitting radionuclides. The baseline spectral gamma logging database is available electronically.

Spectral drywell scans can be run by special request. A select subset of drywells is routinely monitored by the Vadose Zone Characterization Project to assess movement of gamma-emitting radionuclides in the subsurface.

ENRAF 854 ATG Level Detector - The ENRAF®[1] gauge, fabricated by Honeywell, determines waste level by detecting variations in the weight of a displacer suspended in the tank waste. ENRAFs and future installations will transmit digital level data to TMACS via an ENRAF Computer Interface Unit (CIU). The CIU allows fully remote communication with the gauge, minimizing tank farm entry.

Laterals - Laterals are horizontal drywells positioned 8 to 10 feet under single-shell waste storage tanks, 3 per tank, to detect radionuclides in the soil which could be indicative of tank leakage. These drywells can be monitored by radiation detection probes. Laterals are located only in A and SX farms. There are currently no functioning laterals and no plan to prepare them for use.

Liquid Observation Well (LOW) - In-tank liquid observation wells are used for monitoring the ILL in single-shell tanks. The wells are usually constructed of fiberglass or TEFZEL®[2]-reinforced epoxy-polyester resin. A few LOWs are constructed of steel. Gamma and neutron probes are used to monitor changes in the ILL, and can indicate intrusions or leakage by increases or decreases in the ILL. The OSD-T-151-00031 identifies which LOWs are designated as the primary monitoring device in the SSTs. All of the SST LOWs are monitored quarterly. Two LOWs installed in DSTs SY-102 and AW-103 are used for special, rather than routine, surveillance purposes only.

Surface Levels - The surface level measurements in all waste storage tanks are monitored by manual probes or ENRAFs, and recorded and transmitted via the Surveillance Analysis Computer System.

[1] ENRAF® is a registered trademark of Honeywell International, Inc., Morristown, New Jersey.
[2] TEFZEL® is a trademark of E. I. du Pont de Nemours & Company, Wilmington, Delaware.

1.0 PURPOSE AND SCOPE

This report is the official inventory for radioactive waste stored in underground tanks in the 200 Areas at the Hanford Site. Data that depict the status of stored radioactive waste and tank vessel integrity are contained within the report. This report provides data on each of the existing 177 large underground waste storage tanks and 61 smaller miscellaneous underground storage tanks and special surveillance facilities, and supplemental information regarding tank surveillance anomalies and ongoing investigations. This report is intended to meet the requirement of U.S. Department of Energy Order 435.1 (DOE-HQ, August 28, 2001, Radioactive Waste Management, U.S. Department of Energy-Washington, D.C.) requiring the reporting of waste inventories and space utilization for the Hanford Site Tank Farm tanks.

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2.0 WASTE TANK STATUS

Table 2-1. Waste Tank Status

Double-Shell Tanks (DST)	28 double-shell	10/86 - date last DST tank was completed
Single-Shell Tanks (SST)	149 single-shell	1966 - date last SST tank was completed
Assumed Leaker Tanks	67 single-shell	02/94 - date last Assumed Leaker was identified (4)
Sound Tanks	28 double-shell 82 single-shell	1986 - date DSTs determined sound 07/93 - date last SST determined sound
Interim Stabilized Tanks (IS)	149 single-shell	03/04 - date last IS occurred (1)
Retrieval	11 single-shell	4/08 - date last Retrieval completed (2)
Misc. Underground Storage Tanks (MUST) and Special Surveillance Facilities (Active)	10 Tanks East Area 7 Tanks West Area	03/01 - last date a tank was added or removed from MUST list
Misc. Underground Storage Tanks (IMUST) and Special Surveillance Facilities (Inactive)	18 Tanks East Area 25 Tanks West Area	11/01 - last date a tank was added or removed from IMUST list (3)

Table 2-1 Footnotes:

(1) Tanks are declared Interim Stabilized when pumping stops; the tank may be placed in evaluation at this time. Tank U-108 was placed in evaluation on March 18, 2004, due to major equipment failure; documentation was completed August 16 and the declaration letter sent to DOE-RL on September 8, 2004. A letter was submitted to DOE on September 29, 2005, that stated S-102 met interim stabilization criteria. Retrieval operations began in this tank on December 16, 2004 and are ongoing. Interim Stabilization requirements are held in abeyance during retrieval. (3rd Amendment to Consent Decree CT-99-5076-EFS)

Saltwell pumping for the tanks covered by the Consent Decree was completed in March 2004. (Tank C-106 is not included in the Consent Decree and is not Interim Stabilized; Retrieval was completed December 31, 2003). The Consent Decree table and footnotes have been removed from this document; all actions in this decree have been completed.

(2) Under a previous definition for retrieval status, the tank status for C-104, C-201, C-202, C-203, C-204, S-102, S-103, S-105 and S-106 was changed to "Retrieval," effective October 2002, and the tank status for C-103, C-105, C-106, and S-112 was changed to "Retrieval" in October 2003. Hanford Federal Facility Agreement and Consent Order (signed August 2004) modified Milestone M-45-00C (Change Order M-45-04-01) changing the regulatory requirements for retrieval of waste in tanks S-103, S-105, and S-106. Table 2-1 identifies the tanks currently in retrieval status (see Glossary for definition of Retrieval status).

(3) Inactive Miscellaneous Underground Storage Tanks (IMUST) reflect those tanks managed by Washington River Protection Solutions, LLC (WRPS).

(4) Occurrence Report RL-WHC-TANKFARM-1994-0009 states that tank 241-T-111 was declared an "assumed re-leaker" on February 28, 1994, due to a decreasing trend in surface level measurement.

2.1 WASTE TANK STATUS HIGHLIGHTS

Table 2-2. Single-Shell Tanks in Retrieval Status

Tank Number	Comments	Nominal Volume of Remaining Waste (gal) (1)	Reference
241-C-103	Declared "Retrieval Completed," August 23, 2006	2528	(3)
241-C-106	Declared "Retrieval Completed," December 31, 2003	2770	(4)
241-C-108	Declared "Retrieved to Limit of Modified Sluicing Technology" April 27, 2007	7700	(10)
241-C-109	Declared "Retrieval to Limit of Modified Sluicing Technology," August 23, 2007	8600	(11)
241-C-110	Retrieval in progress – retrieval initiated September 22, 2008	75.8 kgal	(2)
241-C-201	Declared "Retrieval Completed," March 23, 2006	144	(5)
241-C-202	Declared "Retrieval Completed," August 11, 2005	147	(6)
241-C-203	Declared "Retrieval Completed," March 24, 2005	139	(7)
241-C-204	Declared "Retrieval Completed," December 11, 2006	134	(8)
241-S-102	Retrieval in progress – retrieval initiated December 16, 2004	31.2 kgal	(2)
241-S-112	Declared "Retrieval Completed," March 2, 2007	2389	(9)

Table 2-2 Footnotes:

(1) Nominal volume of waste inventory is the best estimate of residual volume. Retrieval Data Reports also provide 95% upper confidence level volume as the bounding estimate of remaining waste.

(2) Engineering estimate of waste inventory used for retrievals in progress.

(3) RPP-RPT-33060 Rev. 0 *Demonstration Retrieval Data Report for Single-Shell Tank 241-C-103*

(4) RPP-20577 Rev. 1 *Stage 2 Retrieval Data Report for Single-Shell Tank 241-C-106*

(5) RPP-29441 Rev. 0 *Post-Retrieval Waste Volume Determination for Single-Shell Tank 241-C-201*

(6) RPP-RPT-29095 Rev. 0 *Demonstration Retrieval Data Report for Single-Shell Tank 241-C-202*

(7) RPP-RPT-26475 Rev. 1A *Demonstration Retrieval Data Report for Single-Shell Tank 241-C-203*

(8) RPP-RPT-34062 Rev. 0 *Demonstration Retrieval Data Report for Single-Shell Tank 241-C-204*

(9) RPP-RPT-35112 Rev. 0 *Retrieval Data Report for Single-Shell Tank 241-S-112*

(10) CH2M-0603302.4, *Contract Number DE-AC27-99RL 14047 – Completion of Performance Based Incentive 3, Revision 2, Fee Bearing Milestone PBI-3.2.a.05, C-108 Completion of Retrieval Operations - Request for Incremental Fee Approval.*

(11) CH2M-0701435.4, *Contract Number DE-AC27-99RL 14047 – Completion of Performance Based Incentive 3, Revision 2, Fee Bearing Milestone PBI-3.2.b.05, C-109 Completion of Retrieval Operations - Request for Incremental Fee Approval.* Letter indicated that 241-C-109 contained 1320 ft^3 of remaining waste at time of writing. Volume in table reflects minor changes as a result of further retrieval operations since that time.

Hanford Federal Facility Agreement and Consent Order (HFFACO) Milestone M-46-21

The U.S. Department of Energy sent a letter (05-TPD-115) to the Department of Ecology on December 15, 2005 stating that the HFFACO Milestone M-46-21 has been completed. The milestone includes completing implementation of double-shell tank space optimization study recommendations and creating sufficient double-shell tank storage to accommodate retrieval and

closure demonstrations at tanks C-104, C-106, S-102, S-103, S-105, S-106, and S-112. TPA Change Package M-45-04-01 substantially changed the tank retrieval sequence to eliminate retrieval of S-103, S-105 and S-106. The DST space-saving measures of M-46-21 provide sufficient space to support retrieval of the C farm tanks that are to be retrieved in lieu of S-103, S-105 and S-106.

Tank Leak Volume Estimates

In *Waste Tank Summary Report for Month Ending September 30, 2005*, HNF-EP-0182, Rev. 210, the leak volume estimates were revised per *Tank Farm Vadose Zone Contamination Volume Estimates*, RPP-23405, Rev. 1. The Washington State Department of Ecology has submitted comments on *Tank Farm Vadose Zone Contamination Volume Estimates* and until these comments have been resolved, the previous leak volume estimates have been reinstated

Subsequent to issuance of RPP-23405, the U.S. Department of Energy and the Washington State Department of Ecology agreed on a process to update leak volume estimates and the conclusions presented in RPP-23405 (DOE-ORP 06-TPD-059). Pursuant to that commitment, RPP-32681, Rev. 0, *Process to Assess Tank Farm Leaks in Support of Retrieval and Closure Planning* established the process to develop estimates of tank farm leak loss inventories. The process is used to assess the source of tank farm leaks when necessary to support tank waste retrieval technology selections, and re-assess and update volume estimates and inventories for previously identified tank leaks. If the results suggest a change to the tank's integrity classification, the Tank Leak Assessment Process TFC-ENG-CHEM-D-42 would be invoked. The bases for revisions to leak volume estimates or for changes to tank integrity resulting from this activity are footnoted after table 4-3.

DST Space Gains

OSD-T-151-00007 *Operating Specification for Double-Shell Storage Tanks,* has updated the operating limits in the double-shell tanks. Currently all tank farms except AP-Farm assume Normal Operating Limits. AP-Farm assumes the Maximum Operating Limit of 454 inches, which results in space gains of 836 Kgal.

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3.0 DOUBLE-SHELL TANKS MONTHLY SUMMARY TABLES

Table 3-1. Inventory and Status by Tanks - Double-Shell Tanks

All volume data obtained from Tank Waste Information Network System (TWINS)

					Waste Volumes			
Tank	Tank Integrity	Tank Level (inches)	Total Waste (Kgal)	Available Space (Kgal)	Supernatant Liquid (Kgal)	Sludge (Kgal)	Saltcake (Kgal)	Solids Volume Update
241-AN TANK FARM STATUS								
AN-101	SOUND	415	1140	20	1109	0	31	12/31/03
AN-102	SOUND	383	1054	106	900	0	154	01/01/05
AN-103	SOUND	348	957	203	469	0	488	01/12/09
AN-104	SOUND	383	1052	108	607	0	445	07/01/02
AN-105	SOUND	410	1126	34	588	0	538	01/31/03
AN-106	SOUND	279	767	393	429	321	17	01/30/09
AN-107	SOUND	396	1090	70	860	0	230	12/31/03
7 TANKS - TOTAL			7186	934	4962	321	1903	
241-AP TANK FARM STATUS								
AP-101	SOUND	419	1151	96	1151	0	0	05/01/89
AP-102	SOUND	394	1083	164	1055	28	0	07/01/07
AP-103	SOUND	412	1133	114	1081	0	52	10/01/08
AP-104	SOUND	179	491	756	473	0	18	04/01/08
AP-105	SOUND	356	980	267	875	0	105	10/01/07
AP-106	SOUND	414	1137	110	1137	0	0	10/13/88
AP-107	SOUND	405	1113	134	1113	0	0	12/30/03
AP-108	SOUND	453	1245	2	1133	0	112	07/01/08
8 TANKS - TOTAL			8333	1643	8018	28	287	
241-AW TANK FARM STATUS								
AW-101	SOUND	411	1130	30	734	0	396	01/31/03
AW-102	SOUND	380	1046	79	997	49	0	04/01/08
AW-103	SOUND	397	1091	69	771	280	40	10/01/07
AW-104	SOUND	387	1063	97	809	97	157	01/01/08
AW-105	SOUND	150	413	747	165	248	0	11/01/08
AW-106	SOUND	413	1135	25	854	0	281	05/06/08
6 TANKS - TOTAL			5878	1047	4330	674	874	
241-AY TANK FARM STATUS								
AY-101	SOUND	348	956	45	851	105	0	11/01/08
AY-102	SOUND	344	947	54	796	151	0	11/01/08
2 TANKS - TOTAL			1903	99	1647	256	0	
241-AZ TANK FARM STATUS								
AZ-101	SOUND	344	946	55	894	52	0	02/14/08
AZ-102	SOUND	66	182	819	77	105	0	11/01/08
2 TANKS - TOTAL			1128	874	971	157	0	
241-SY TANK FARM STATUS								
SY-101	SOUND	403	1108	52	853	0	255	04/01/08
SY-102	SOUND	204	560	600	357	203	0	10/01/07
SY-103	SOUND	268	737	423	380	0	357	07/01/07
3 TANKS - TOTAL			2405	1075	1590	203	612	

Notes:
1 Kgal differences are the result of computer rounding.
Supernatant + Sludge (includes liquid) + Saltcake (includes liquid) = Total Waste.
Available Space Volumes include restricted space.
Tanks AN-103, AN-104, AN-105, AW-101, SY-101 and SY-103 contain retained gas in the saltcake.
Solids Volume Update lists the last verified date when the Sludge or Saltcake volume in the tank changed.

Table 3-2. Double-Shell Tank Space Allocation, Inventory and Waste Receipts (all volumes in kgallons)

TOTAL DST CAPACITY	
TOTAL=	32,505

TOTAL DST WASTE INVENTORY	
INVENTORY ON 1/31/09	26,833
INVENTORY ON 12/31/08	26,778
CHANGE =	55

ALLOCATION OF REMAINING DST SPACE	
TOTAL DST CAPACITY (*) =	32,505
WASTE INVENTORY =	-26,833
RESTRICTED USAGE SPACE (**) =	-1,028
EMERGENCY SPACE ALLOCATION (***) =	-1,265
AVAILABLE SPACE =	3,379

(*) Assumes Maximum Operating Limits per OSD-T-151-00007: AN, SY farms = 422", AW farm = 422" except AW-102 = 409"; AP farm = 454"; AY, AZ farms = 364". Volumes at maximum operating limit from RPP-CALC-33163 Rev. 0 and RPP-13019 Rev. 0

(**) Restricted space associated with flammable gas Waste Group A and tanks controlled for waste feed delivery per Feed Control List, HNF-SD-WM-OCD-015, Tank Farms Waste Transfer Compatibility report. These tanks are: AN-102, -103, -104, -105, -107; AW-101; AY-102; and SY-103.

(***) Includes 1265 kgallons emergency space allocation per HNF-3484 Rev. 8, and emergency WTP returns per 24950-WTP-ICD-MG-019, Rev. 4, ICD 19 - Interface Control Document for Waste Feed.

JANUARY DST WASTE RECEIPTS					
FACILITY GENERATIONS		OTHER GAINS ASSOCIATED WITH		OTHER LOSSES ASSOCIATED WITH	
TANK FARMS	5	AZ-301 CONDENSATE	3	242-A EVAPORATOR WVR (1)	0
242-A EVAPORATOR	0	INSTRUMENTATION (2)	14	INSTRUMENTATION (2)	2
C-110	51	MISCELLANEOUS (3)	2	MISCELLANEOUS (3)	3
				WASTE EVAPORATION	15
TOTAL =	56	TOTAL=	19	TOTAL=	20

(1) 242-A EVAPORATOR WVR is total (before flush) waste volume reduction for 242-A Evaporator

(2) Adjustments due to instrumentation recalibrations and/or instrument flushing

(3) Adjustments for gas retention and release from Waste Group A tanks

DST NET WASTE INVENTORY CHANGE					
DATE	FACILITY GENERATION	GAINS	REDUCTIONS	NET WASTE VOLUME CHANGE	TOTAL DST WASTE INVENTORY
01/09	56	19	20	55	26,833

4.0 SINGLE SHELL TANKS MONTHLY SUMMARY TABLES

Table 4-1. Inventory and Status by Tanks - Single-Shell Tanks
All volume data obtained from Tank Waste Information Network System (TWINS)

				Waste Volumes							
Tank Number	Tank Integrity	Tank Status	Total Waste (Kgal)	Super-natant Liquid (Kgal)	Drainable Interstitial Liquid (Kgal)	Pumped this Month (Kgal)	Total Pumped (Kgal)	Drainable Liquid Remaining (Kgal)	Sludge (Kgal)	Salt-cake (Kgal)	Solids Volume Update
241-A TANK FARM STATUS											
A-101	SOUND	IS/IP(4)	320	0	37	0	543	37	3	317	06/30/04
A-102	SOUND	IS	40	3	9	0	40	12	0	37	01/31/03
A-103	ASMD LKR	IS/IP	378	4	86	0	111	90	2	372	07/01/05
A-104	ASMD LKR	IS/IP	28	0	0	0	0	0	28	0	01/27/78
A-105	ASMD LKR	IS/IP	37	0	0	0	0	0	37	0	10/31/00
A-106	SOUND	IS/IP	79	0	9	0	0	9	50	29	01/01/02
6 TANKS - TOTAL			882	7					120	755	
241-AX TANK FARM STATUS											
AX-101	SOUND	IS	358	0	44	0	369	44	3	355	12/31/03
AX-102	ASMD LKR	IS/IP	30	0	0	0	13	0	6	24	01/01/02
AX-103	SOUND	IS/IP	107	0	22	0	0	22	8	99	09/30/03
AX-104	ASMD LKR	IS/IP	7	0	0	0	0	0	7	0	01/01/02
4 TANKS - TOTAL			502	0					24	478	
241-B TANK FARM STATUS											
B-101	ASMD LKR	IS/IP	109	0	20	0	0	20	28	81	01/01/02
B-102	SOUND	IS/IP	32	4	7	0	0	11	0	28	06/30/99
B-103	ASMD LKR	IS/IP	56	0	10	0	0	10	1	55	01/01/02
B-104	SOUND	IS/IP	374	0	45	0	0	45	309	65	01/01/02
B-105	ASMD LKR	IS/IP	290	0	20	0	0	20	28	262	01/01/02
B-106	SOUND	IS/IP	123	1	8	0	0	9	122	0	12/31/03
B-107	ASMD LKR	IS/IP	161	0	23	0	0	23	86	75	01/01/02
B-108	SOUND	IS/IP	92	0	19	0	0	19	27	65	06/30/04
B-109	SOUND	IS/IP	126	0	23	0	0	23	50	76	10/01/05
B-110	ASMD LKR	IS/IP	245	1	27	0	0	28	244	0	01/01/02
B-111	ASMD LKR	IS/IP	242	1	23	0	0	24	241	0	01/01/02
B-112	ASMD LKR	IS/IP	35	3	2	0	0	5	15	17	01/01/02
B-201	ASMD LKR	IS/IP	29	0	5	0	0	5	29	0	07/01/04
B-202	SOUND	IS/IP	28	0	4	0	0	4	28	0	07/01/04
B-203	ASMD LKR	IS/IP	50	1	5	0	0	6	49	0	07/01/04
B-204	ASMD LKR	IS/IP	50	1	5	0	0	6	49	0	07/01/05
16 TANKS - TOTAL			2042	12					1306	724	
241-BX TANK FARM STATUS											
BX-101	ASMD LKR	IS/IP	48	0	4	0	0	4	48	0	01/01/02
BX-102	ASMD LKR	IS/IP	79	0	0	0	0	0	79	0	06/30/04
BX-103	SOUND	IS/IP	75	13	4	0	0	17	62	0	01/01/83
BX-104	SOUND	IS/IP	100	3	4	0	17	7	97	0	01/01/02
BX-105	SOUND	IS/IP	72	5	4	0	15	9	42	25	01/01/05
BX-106	SOUND	IS/IP	38	0	4	0	14	4	10	28	01/01/05
BX-107	SOUND	IS/IP	347	0	37	0	23	37	347	0	09/18/90
BX-108	ASMD LKR	IS/IP	31	0	4	0	0	4	31	0	01/31/01
BX-109	SOUND	IS/IP	193	0	25	0	8	25	193	0	09/17/90
BX-110	ASMD LKR	IS/IP	214	1	35	0	2	36	65	148	08/25/05
BX-111	ASMD LKR	IS/IP	188	0	6	0	117	6	32	156	08/25/05
BX-112	SOUND	IS/IP	164	1	9	0	4	10	163	0	01/01/02
12 TANKS - TOTAL			1549	23					1169	357	

Table 4-1. Inventory and Status by Tanks - Single-Shell Tanks
All volume data obtained from Tank Waste Information Network System (TWINS)

				Waste Volumes							
Tank Number	Tank Integrity	Tank Status	Total Waste (Kgal)	Super-natant Liquid (Kgal)	Drainable Interstitial Liquid (Kgal)	Pumped this Month (Kgal)	Total Pumped (Kgal)	Drainable Liquid Remaining (Kgal)	Sludge (Kgal)	Salt-cake (Kgal)	Solids Volume Update
241-BY TANK FARM STATUS											
BY-101	SOUND	IS/IP	370	0	24	0	36	24	37	333	01/01/02
BY-102	SOUND	IS	278	0	40	0	159	40	0	278	08/25/05
BY-103	ASMD LKR	IS	414	0	55	0	96	55	9	405	07/01/05
BY-104	SOUND	IS/IP	405	0	44	0	330	44	46	359	01/01/02
BY-105	ASMD LKR	IS	481	0	47	0	45	47	48	433	03/31/03
BY-106	ASMD LKR	IS	430	0	37	0	99	37	32	398	12/31/03
BY-107	ASMD LKR	IS/IP	271	0	42	0	56	42	15	256	07/01/05
BY-108	ASMD LKR	IS/IP	222	0	33	0	28	33	40	182	01/01/02
BY-109	SOUND	IS	287	0	37	0	157	37	24	263	06/30/04
BY-110	SOUND	IS/IP	366	0	20	0	213	20	43	323	01/01/02
BY-111	SOUND	IS/IP	402	0	14	0	313	14	0	402	08/25/05
BY-112	SOUND	IS/IP	286	0	24	0	116	24	2	284	03/31/02
12 TANKS - TOTAL			4212	0					296	3916	
241-C TANK FARM STATUS											
C-101	ASMD LKR	IS/IP	88	0	4	0	0	4	88	0	11/29/83
C-102	SOUND	IS/IP	316	0	62	0	47	62	316	0	09/30/95
C-103	SOUND	RC	3	Retrieval Completed 08/26/06 – See Footnote (9)				0	2	0	08/26/06
C-104	SOUND	IS/IP	260	1	29	0	0	29	259	0	01/01/02
C-105	SOUND	IS	132	0	10	0	0	10	132	0	02/29/00
C-106	SOUND	RC	3	Retrieval Completed 12/31/03 – See Footnote (1)				0	3	0	02/26/04
C-107	SOUND	IS/IP	247	0	30	0	41	30	247	0	06/30/04
C-108	SOUND	R	8	Retrieved to Limit of Modified Sluicing Technology 4/27/07 – See Footnote (11)				0	7	0	04/27/07
C-109	SOUND	R	9	Retrieved to Limit of Modified Sluicing Technology 8/13/07 – See Footnote (12)				0	8	0	08/13/07
C-110	ASMD LKR	R	76	Retrieval in Progress – See Footnote (13)					75	0	10/01/08
C-111	ASMD LKR	IS/IP	57	0	4	0	0	4	57	0	06/30/04
C-112	SOUND	IS/IP	104	0	6	0	0	6	104	0	09/18/90
C-201	ASMD LKR	RC	0	Retrieval Completed 03/23/06 – See Footnote (8)				0	0	0	04/27/06
C-202	ASMD LKR	RC	0	Retrieval Completed 08/11/05 – See Footnote (2)				0	0	0	08/11/05
C-203	ASMD LKR	RC	0	Retrieval Completed 03/24/05 – See Footnote (5)				0	0	0	3/24/05
C-204	ASMD LKR	RC	0	Retrieval Completed 12/13/06 – See Footnote (10)				0	0	0	12/13/06
16 TANKS - TOTAL			1303	4					1298	0	
241-S TANK FARM STATUS											
S-101	SOUND	IS	352	0	45	0	67	45	235	117	04/30/04
S-102	SOUND	R	31	Retrieval in progress – See Footnote (6)					17	13	04/27/07
S-103	SOUND	IS (3)	237	1	45	0	24	46	9	227	06/30/04
S-104	ASMD LKR	IS/IP (4)	288	0	49	0	0	49	132	156	12/20/84
S-105	SOUND	IS/IP (3)	406	0	42	0	114	42	2	404	01/01/02
S-106	SOUND	IS (3)	455	0	26	0	204	26	0	455	02/28/01
S-107	SOUND	IS	358	0	42	0	83	42	320	38	02/26/04
S-108	SOUND	IS	550	0	4	0	200	4	5	545	01/01/02
S-109	SOUND	IS	533	0	16	0	34	16	13	520	07/01/04
S-110	SOUND	IS	389	0	30	0	203	30	96	293	07/01/04
S-111	SOUND	IS (4)	401	0	42	0	100	42	76	325	07/01/04
S-112	SOUND	RC	2	Retrieval Completed 03/02/07 – See Footnote (7)				0	2	0	03/02/07
12 TANKS - TOTAL			4002	2					907	3093	

Table 4-1. Inventory and Status by Tanks - Single-Shell Tanks
All volume data obtained from Tank Waste Information Network System (TWINS)

				Waste Volumes							
Tank Number	Tank Integrity	Tank Status	Total Waste (Kgal)	Super-natant Liquid (Kgal)	Drainable Interstitial Liquid (Kgal)	Pumped this Month (Kgal)	Total Pumped (Kgal)	Drainable Liquid Remaining (Kgal)	Sludge (Kgal)	Salt-cake (Kgal)	Solids Volume Update
241-SX TANK FARM STATUS											
SX-101	SOUND	IS	420	0	44	0	33	45	144	276	06/30/04
SX-102	SOUND	IS	342	0	37	0	98	37	55	287	08/31/04
SX-103	SOUND	IS	509	0	40	0	134	40	78	431	09/30/03
SX-104	ASMD LKR	IS/IP	446	0	48	0	231	48	136	310	04/30/00
SX-105	SOUND	IS	375	0	39	0	153	39	63	312	12/31/02
SX-106	SOUND	IS	396	0	37	0	148	37	0	396	01/31/03
SX-107	ASMD LKR	IS/IP	94	0	7	0	0	7	94	0	07/01/04
SX-108	ASMD LKR	IS/IP	74	0	0	0	0	0	74	0	06/30/04
SX-109	ASMD LKR	IS/IP	241	0	0	0	0	0	66	175	07/01/04
SX-110	ASMD LKR	IS/IP	56	0	0	0	0	0	49	7	07/01/04
SX-111	ASMD LKR	IS/IP	115	0	11	0	0	11	97	18	07/01/04
SX-112	ASMD LKR	IS/IP	75	0	6	0	0	6	75	0	07/01/04
SX-113	ASMD LKR	IS/IP	19	0	0	0	0	0	19	0	01/01/02
SX-114	ASMD LKR	IS/IP	155	0	30	0	0	30	126	29	07/01/04
SX-115	ASMD LKR	IS/IP	4	0	0	0	0	0	4	0	01/01/02
15 TANKS - TOTAL			3321	0					1080	2241	
241-T TANK FARM STATUS											
T-101	ASMD LKR	IS	99	0	16	0	25	16	37	62	06/30/04
T-102	SOUND	IS/IP	32	13	3	0	0	16	19	0	08/31/84
T-103	ASMD LKR	IS/IP	27	4	3	0	0	7	23	0	11/29/83
T-104	SOUND	IS	317	0	31	0	150	31	317	0	11/30/99
T-105	SOUND	IS/IP	98	0	5	0	0	5	98	0	05/29/87
T-106	ASMD LKR	IS/IP	22	0	0	0	0	0	22	0	01/01/01
T-107	ASMD LKR	IS	173	0	34	0	11	34	173	0	05/31/96
T-108	ASMD LKR	IS/IP	16	0	4	0	0	4	5	11	01/01/01
T-109	ASMD LKR	IS/IP	62	0	11	0	0	11	0	62	01/01/02
T-110	SOUND	IS	370	1	48	0	50	49	369	0	03/31/02
T-111	ASMD LKR	IS	447	0	38	0	10	38	447	0	01/01/02
T-112	SOUND	IS/IP	67	7	4	0	0	11	60	0	04/28/82
T-201	SOUND	IS/IP	30	2	4	0	0	6	28	0	07/01/04
T-202	SOUND	IS/IP	20	0	3	0	0	3	20	0	07/01/04
T-203	SOUND	IS/IP	36	0	5	0	0	5	36	0	07/01/04
T-204	SOUND	IS/IP	36	0	5	0	0	5	36	0	07/01/04
16 TANKS - TOTAL			1852	27					1690	135	
241-TX TANK FARM STATUS											
TX-101	SOUND	IS/IP	91	0	7	0	0	7	74	17	01/01/02
TX-102	SOUND	IS/IP	217	0	27	0	94	27	2	215	03/31/03
TX-103	SOUND	IS/IP	145	0	18	0	68	18	0	145	01/01/02
TX-104	SOUND	IS/IP	69	2	9	0	4	11	34	33	06/30/04
TX-105	ASMD LKR	IS/IP	576	0	25	0	122	25	8	568	01/01/02
TX-106	SOUND	IS/IP	348	0	37	0	135	37	5	343	03/31/02
TX-107	ASMD LKR	IS/IP	30	0	7	0	0	7	0	30	01/31/03
TX-108	SOUND	IS/IP	127	0	8	0	14	8	6	121	06/30/04
TX-109	SOUND	IS/IP	363	0	6	0	72	6	363	0	01/01/02
TX-110	ASMD LKR	IS/IP	467	0	14	0	115	14	37	430	01/01/02
TX-111	SOUND	IS/IP	364	0	10	0	98	10	43	321	06/30/04
TX-112	SOUND	IS/IP	634	0	26	0	94	26	0	634	01/01/02
TX-113	ASMD LKR	IS/IP	638	0	18	0	19	18	93	545	06/30/04
TX-114	ASMD LKR	IS/IP	532	0	17	0	104	17	4	528	01/01/02
TX-115	ASMD LKR	IS/IP	553	0	25	0	99	25	8	545	06/30/04
TX-116	ASMD LKR	IS/IP	599	0	21	0	24	21	66	533	04/30/03
TX-117	ASMD LKR	IS/IP	480	0	10	0	54	10	29	451	06/30/04
TX-118	SOUND	IS/IP	247	0	31	0	89	31	0	247	06/30/04
18 TANKS - TOTAL			6480	2					772	5706	

Table 4-1. Inventory and Status by Tanks - Single-Shell Tanks
All volume data obtained from Tank Waste Information Network System (TWINS)

				Waste Volumes							
Tank Number	Tank Integrity	Tank Status	Total Waste (Kgal)	Super-natant Liquid (Kgal)	Drainable Interstitial Liquid (Kgal)	Pumped this Month (Kgal)	Total Pumped (Kgal)	Drainable Liquid Remaining (Kgal)	Sludge (Kgal)	Salt-cake (Kgal)	Solids Volume Update
241-TY TANK FARM STATUS											
TY-101	ASMD LKR	IS/IP	118	0	2	0	8	2	42	76	07/01/05
TY-102	SOUND	IS/IP	69	0	13	0	7	13	0	69	01/01/02
TY-103	ASMD LKR	IS/IP	154	0	23	0	12	23	103	51	06/30/04
TY-104	ASMD LKR	IS/IP	44	1	4	0	0	5	43	0	03/31/02
TY-105	ASMD LKR	IS/IP	231	0	12	0	4	12	231	0	04/28/82
TY-106	ASMD LKR	IS/IP	16	0	1	0	0	1	16	0	01/01/02
6 TANKS - TOTALS			632	1					435	196	
241-U TANK FARM STATUS											
U-101	ASMD LKR	IS/IP	23	0	4	0	0	4	23	0	06/30/04
U-102	SOUND	IS	327	1	37	0	87	38	43	283	12/31/02
U-103	SOUND	IS	417	1	33	0	99	34	11	405	01/01/05
U-104	ASMD LKR	IS/IP	54	0	0	0	0	0	54	0	01/01/02
U-105	SOUND	IS	353	0	44	0	88	44	32	321	03/30/01
U-106	SOUND	IS	170	2	36	0	39	39	0	168	06/30/04
U-107	SOUND	IS	294	0	32	0	135	32	15	279	12/31/03
U-108	SOUND	IS	434	0	46	0	115	46	29	405	09/30/04
U-109	SOUND	IS	401	0	47	0	78	47	35	366	04/30/02
U-110	ASMD LKR	IS	176	0	16	0	0	16	176	0	01/01/02
U-111	SOUND	IS	222	0	31	0	86	31	26	196	08/31/03
U-112	ASMD LKR	IS/IP	45	0	4	0	0	4	45	0	02/10/84
U-201	SOUND	IS/IP	4	1	1	0	0	2	3	0	06/30/03
U-202	SOUND	IS/IP	4	1	0	0	0	1	3	0	06/30/03
U-203	SOUND	IS/IP	3	1	0	0	0	1	2	0	06/30/03
U-204	SOUND	IS/IP	3	1	0	0	0	1	2	0	06/30/03
16 TANKS - TOTALS			2930	8					499	2423	

Note: +/- 1 Kgal difference in volumes is due to rounding.
Tank farm totals do not include volumes from tanks in retrieval

Tank Integrity:
ASMD LKR – Assumed Leaker
SOUND – Sound Tank

Tank Status:
IS – Interim Stabilized
IP – Intrusion Prevention
R – Tank in Retrieval
RC – Tank Retrieval Completed

Table 4-1 Footnotes:

(1) C-106: Nominal Waste Volume: Total waste 2771 gallons; sludge 2686 gallons; supernatant 85 gallons (RPP-20577 Rev. 0 *Stage 2 Retrieval Data Report for Single-Shell Tank 241-C-106*)

(2) C-202: Nominal Waste Volume: Total waste 147 gallons; sludge 145 gallons; supernatant 2 gallons (RPP-RPT-29095 Rev. 0 *Demonstration Retrieval Data Report for Single-Shell Tank 241-C-202*)

(3) Hanford Federal Facility Agreement and Consent Order (signed August 2004) modified Milestone M-45-00C (Change Order M-45-04-01) changed the regulatory requirements for retrieval of waste in tanks S-103, S-105, and S-106. "Retrieval" status in these tanks is thereby rescinded.

(4) Tank A-101 contains retained gas in saltcake; tanks S-102, S-111, U-103, and U-109 contain retained gas in saltcake and sludge.

Table 4-1 Footnotes:

(5) C-203 Nominal Waste Volume: Total waste 139 gallons; sludge 126 gallons; supernatant 13 gallons (RPP-RPT-26475 Rev. 1 *Demonstration Retrieval Data Report for Single-Shell Tank 241-C-203*)

(6) S-102: Volume estimate: Total waste 34000 gallons

(7) S-112: Nominal Waste Volume: Total waste 2387 gallons; sludge/saltcake 2263 gallons; supernatant 124 gallons (RRP-RPT-35112 Rev 0 *Retrieval Data Report for Single-Shell Tank 241-S-112*)

(8) C-201: Nominal Waste Volume: Total waste 144 gallons; sludge 142 gallons; supernatant 2 gallons (RPP-29441 Rev. 0 *Post-Retrieval Waste Volume Determination for Single-Shell Tank 241-C-201*)

(9) C-103: Nominal Waste Volume: Total waste 2529 gallons; sludge 2282 gallons; supernatant 247 gallons (RPP-RPT-33060 Rev. 0 *Demonstration Retrieval Data Report for Single-Shell Tank 241-C-103*)

(10) C-204 Nominal Waste Volume: Total waste 137 gallons; sludge 134 gallons; supernatant 3 gallons (RPP-RPT-34062 Rev. 0 *Demonstration Retrieval Data Report for Single-Shell Tank 241-C-204*)

(11) C-108: 4th Quarter FY2007 Best-Basis Inventory update: 7700 gallons.

(12) C-109: 3rd Quarter FY2008 Best-Basis Inventory update: 7800 gallons. Approximately 800 gallons of water was added to the tank while flushing transfer lines, leaving the final estimate to be 8600 gallons.

(13) C-110: 1st Quarter FY2009 Best-Basis Inventory update, dated 1-1-2009: 126000 gallons. A Progress Report dated 1-31-09 lists a volume of 75800 gallons in the tank.

Table 4-2. Single-Shell Tanks Interim Stabilization Status

Tank Number	Tank Integrity	Interim Stabilization Date (1)	Interim Stabilization Method	Tank Number	Tank Integrity	Interim Stabilization Date (1)	Interim Stabilization Method
A-101	SOUND	11/03	JET (4)	BY-107	ASMD LKR	07/79	JET
A-102	SOUND	08/89	SN	BY-108	ASMD LKR	02/85	JET
A-103	ASMD LKR	06/88	AR	BY-109	SOUND	07/97	JET
A-104	ASMD LKR	09/78	AR (3)	BY-110	SOUND	01/85	JET
A-105	ASMD LKR	07/79	AR	BY-111	SOUND	01/85	JET
A-106	SOUND	08/82	AR	BY-112	SOUND	06/84	JET
AX-101	SOUND	06/03	JET (4)	C-101	ASMD LKR	11/83	AR
AX-102	ASMD LKR	09/88	SN	C-102	SOUND	09/95	JET (2)
AX-103	SOUND	08/87	AR	C-103	SOUND	Retrieval Completed 8/26/06(4)	
AX-104	ASMD LKR	08/81	AR	C-104	SOUND	09/89	SN
B-101	ASMD LKR	03/81	SN	C-105	SOUND	10/95	AR
B-102	SOUND	08/85	SN	C-106	SOUND	Retrieval Completed 12/31/03	
B-103	ASMD LKR	02/85	SN	C-107	SOUND	09/95	JET
B-104	SOUND	06/85	SN	C-108	SOUND	Retrieved to limit of technology 4/27/07	
B-105	ASMD LKR	12/84	AR	C-109	SOUND	Retrieved to limit of technology 8/23/07	
B-106	SOUND	03/85	SN	C-110	ASMD LKR	Retrieval in progress	
B-107	ASMD LKR	03/85	SN	C-111	ASMD LKR	03/84	SN
B-108	SOUND	05/85	SN	C-112	SOUND	09/90	AR
B-109	SOUND	04/85	SN	C-201	ASMD LKR	Retrieval Completed 03/23/06	
B-110	ASMD LKR	12/84	AR	C-202	ASMD LKR	Retrieval Completed 08/11/05	
B-111	ASMD LKR	06/85	SN	C-203	ASMD LKR	Retrieval Completed 03/24/05	
B-112	ASMD LKR	05/85	SN	C-204	ASMD LKR	Retrieval Completed 12/13/06	
B-201	ASMD LKR	08/81	AR (3)	S-101	SOUND	12/03	JET (4)
B-202	SOUND	05/85	AR (2)	S-102	SOUND	Retrieval in progress (4)	
B-203	ASMD LKR	06/84	AR	S-103	SOUND	04/00	JET (4)
B-204	ASMD LKR	06/84	AR	S-104	ASMD LKR	12/84	AR
BX-101	ASMD LKR	09/78	AR (3)	S-105	SOUND	09/88	JET
BX-102	ASMD LKR	11/78	AR	S-106	SOUND	02/01	JET (4)
BX-103	SOUND	11/83	AR (2) (3)	S-107	SOUND	08/03	JET (4)
BX-104	SOUND	09/89	SN	S-108	SOUND	12/96	JET
BX-105	SOUND	03/81	SN	S-109	SOUND	06/01	JET (4)
BX-106	SOUND	07/95	SN	S-110	SOUND	01/97	JET
BX-107	SOUND	09/90	JET	S-111	SOUND	05/05	Jet (4)
BX-108	ASMD LKR	07/79	SN	S-112	SOUND	Retrieval Completed 3/2/07 (4)	
BX-109	SOUND	08/90	JET	SX-101	SOUND	08/03	JET (4)
BX-110	ASMD LKR	08/85	SN	SX-102	SOUND	08/03	JET (4)
BX-111	ASMD LKR	03/95	JET	SX-103	SOUND	05/03	JET (4)
BX-112	SOUND	09/90	JET	SX-104	ASMD LKR	04/00	JET (4)
BY-101	SOUND	05/84	JET	SX-105	SOUND	08/02	JET (4)
BY-102	SOUND	04/95	JET	SX-106	SOUND	05/00	JET (4)
BY-103	ASMD LKR	11/97	JET (2)	SX-107	ASMD LKR	10/79	AR
BY-104	SOUND	01/85	JET	SX-108	ASMD LKR	08/79	AR
BY-105	ASMD LKR	03/03	JET (4)	SX-109	ASMD LKR	05/81	AR
BY-106	ASMD LKR	12/03	JET (4)	SX-110	ASMD LKR	08/79	AR

-Shell Tanks Interim Stabilization Status

Tank Number	Tank Integrity	Interim Stabilization Date (1)	Interim Stabilization Method	Tank Number	Tank Integrity	Interim Stabilization Date (1)	Interim Stabilization Method
SX-111	ASMD LKR	07/79	SN	TX-111	SOUND	04/83	JET
SX-112	ASMD LKR	07/79	AR	TX-112	SOUND	04/83	JET
SX-113	ASMD LKR	11/78	AR	TX-113	ASMD LKR	04/83	JET
SX-114	ASMD LKR	07/79	AR	TX-114	ASMD LKR	04/83	JET
SX-115	ASMD LKR	09/78	AR (3)	TX-115	ASMD LKR	09/83	JET
T-101	ASMD LKR	04/93	SN	TX-116	ASMD LKR	04/83	JET
T-102	SOUND	03/81	AR (2)(3)	TX-117	ASMD LKR	03/83	JET
T-103	ASMD LKR	11/83	AR	TX-118	SOUND	04/83	JET
T-104	SOUND	11/99	JET (4)	TY-101	ASMD LKR	04/83	JET
T-105	SOUND	06/87	AR	TY-102	SOUND	09/79	AR
T-106	ASMD LKR	08/81	AR	TY-103	ASMD LKR	02/83	JET
T-107	ASMD LKR	05/96	AR	TY-104	ASND KJR	11/83	AR
T-108	ASMD LKR	11/78	AR	TY-105	ASMD LKR	02/83	JET
T-109	ASMD LKR	12/84	AR	TY-106	ASMD LKR	11/78	AR
T-110	SOUND	01/00	JET (4)	U-101	ASMD LKR	09/79	AR
T-111	ASMD LKR	02/95	JET	U-102	SOUND	06/02	JET (4)
T-112	SOUND	03/81	AR (2)(3)	U-103	SOUND	09/00	JET (4)
T-201	SOUND	04/81	AR (3)	U-104	ASMD LKR	10/78	AR
T-202	SOUND	08/81	AR	U-105	SOUND	03/01	JET (4)
T-203	SOUND	04/81	AR	U-106	SOUND	03/01	JET (4)
T-204	SOUND	08/81	AR	U-107	SOUND	10/03	JET (4)
TX-101	SOUND	02/84	AR	U-108	SOUND	03/04	JET (4)
TX-102	SOUND	04/83	JET	U-109	SOUND	04/02	JET (4)
TX-103	SOUND	08/83	JET	U-110	ASMD LKR	12/84	AR
TX-104	SOUND	09/79	SN	U-111	SOUND	06/03	JET (4)
TX-105	ASMD LKR	04/83	JET	U-112	ASMD LKR	09/79	AR
TX-106	SOUND	06/83	JET	U-201	SOUND	08/79	AR
TX-107	ASMD LKR	10/79	AR	U-202	SOUND	08/79	SN
TX-108	SOUND	03/83	JET	U-203	SOUND	08/79	AR
TX-109	SOUND	04/83	JET	U-204	SOUND	08/79	SN
TX-110	ASMD LKR	04/83	JET				

Table 4-2 Legend:

AR	Administratively Interim Stabilized
JET	Saltwell Jet Pumped to Remove Drainable Interstitial Liquid
SN	Supernatant Pumped (Non-Jet Pumped)
ASMD LKR	Assumed Leaker

Interim Stabilized Single-Shell Tanks	149 (5)
Total Single-Shell Tanks	149

Table 4-2 Footnotes:

(1) These dates indicate when the tanks were actually interim stabilized. In some cases, the official interim stabilization documents were issued at a later date.

Table 4-2 Footnotes:

(2) Although tanks 241-BX-103, T-102, and T-112 met the interim stabilization administrative procedure at the time they were stabilized, they no longer meet the updated administrative procedure. The tanks were re-evaluated in 1996 and a letter was issued to DOE-RL recommending that no further pumping be performed on these tanks, based on an economic evaluation. In February 2000, it was determined that five tanks no longer met the stabilization criteria (241-BX-103, T-102, and T-112 exceed the supernatant criteria, and BY-103 and C-102 exceed the Drainable Interstitial Liquid [DIL]criteria).

An intrusion investigation was completed on tank 241-B-202 in 1996 and it was determined that this tank no longer meets the recently updated administrative procedure for 200 series tanks.

(3) Original interim stabilization data are missing on four tanks: 241-B-201, T-102, T-112, and T-201. In February 2001, three additional tanks were added to those missing stabilization data: 241-A-104, BX-101, and SX-115.

(4) One of 29 single-shell tanks incorporated in Consent Decree CT-99-5076-EFS, dated September 29, 1999. Interim Stabilization completion notices for the single-shell tanks are provided in the following table. Stabilized waste descriptions are provided in HNF-EP-0182, Revision 247.

Tank	Contractor Letter No.	Notification Letter Date	USDOE/ORP Letter No.	Notification Letter Date
A-101	CH2M-0302326.2	06/30/2004	04-TOD-040	07/01/2004
AX-101	CH2M-0302326.1	01/19/2004	03-TOD-047	07/09/2003
BY-105	CH2M-0301258	03/25/2003	03-TPD-041	04/28/2003
BY-106	CH2M-0304871.1	06/30/2005	05-TOD-049	07/06/2005
C-103	CH2M-0300891.1	08/13/2003	03-TOD-058	08/21/2003
S-101	CH2M-0304870.1	04/30/2004	04-TOD-033	05/10/2004
S-102	CH2M-0502948 CH2M-0502948 R1	09/29/2005 12/20/2005	06-TOD-020	03/31/2006
S-103	CHG-0001990	04/18/2000	00-OSD-086	07/31/2000
S-106	CHG-0100762	02/12/2001	01-OPD-019	03/06/2001
S-107	CH2M-0303283.1	02/04/2004	04-TOD-017	03/17/2004
S-109	CHG-0103192	06/16/2001	01-OMD-008	07/11/2001
S-111	CH2M-0303290.4 CH2M-0303290.5	05/26/2005 06/09/2005	05-TOD-041	06/10/2005
S-112	CH2M-0403993 CH2M-0403993.1	12/27/2004 06/29/2005	05-TOD-050	07/06/2005
SX-101	CH2M-0300345.2	08/22/2003	03-TOD-066	09/04/2003
SX-102	CH2M-0303290.3	08/04/2004	04-TOD-058	08/12/2004
SX-103	CH2M-0204339.1	06/13/2003	03-TOD-042	06/30/2003
SX-104	CHG-0001991	04/26/2000	00-OSD-086	07/31/2000
SX-105	CHG-0203745	08/20/2002	02-OMD-066	09/12/2002
SX-106	CHG-0002454	05/05/2000	00-OSD-086	07/31/2000
T-104	LMHC-9958640	11/19/1999	00-ORL-034	03/14/2000
T-110	CHG-0059091	01/27/2000	00-ORL-034	03/14/2000
U-102	CHG-0202901	06/28/2002	01-OMD-037 02-OMD-066	09/27/2001 09/12/2002
U-103	CHG-0004512	09/11/2000	00-OSD-134	10/31/2000
U-105	CHG-0003827.1	04/05/2001	01-OPD-047	05/17/2001
U-106	CHG-0100083.1	03/28/2001	01-OPD-038	04/06/2001
U-107	CH2M-0303290.2	01/19/2004	04-TOD-004	01/29/2004
U-108	CH2M-0400855.1	09/08/2004	04-TOD-065	09/14/2004
U-109	CHG-0202630	06/20/2002	01-OMD-037	09/27/2001
U-111	CH2M-0302576	07/14/2003	03-TOD-051	07/30/2003

Table 4-3. Single-Shell Tank Leak Volume Estimates

Tank Number	Confirmed or Assumed Leaker (3)	Estimated Leak Volume Gallons (2)	Interim Stabilized (9)	Leak Estimate	
				Updated	Reference
241-A-103 (14)	1987	5500 (7)	06/88	1987	(j)(t)
241-A-104 (14)	1975	500 to 2500	09/78	1983	(a)(p)(t)
241-A-105 (1)(14)	1963	10000 to 270000	07/79	1991	(b)(c)(t)
241-AX-102 (14)	1988	3000 (7)	09/88	1989	(h)(t)
241-AX-104 (14)	1977	-- (6)	08/81	1989	(g)(t)
241-B-101	1974	-- (6)	03/81	1989	(g)
241-B-103	1978	-- (6)	02/85	1989	(g)
241-B-105	1978	-- (6)	12/84	1989	(g)
241-B-107	1980	8000 (7)	03/85	1986	(d)(f)
241-B-110	1981	10000 (7)	03/85	1986	(d)
241-B-111	1978	-- (6)	06/85	1989	(g)
241-B-112	1978	2000	05/85	1989	(g)
241-B-201	1980	1200 (7)	08/81	1984	(e)(f)
241-B-203	1983	300 (7)	06/84	1986	(d)
241-B-204	1984	400 (7)	06/84	1989	(g)
241-BX-101	1972	-- (6)	09/78	1989	(g)
241-BX-102	1971	70000	11/78	1986	(d)
241-BX-108	1974	2500	07/79	1986	(d)
241-BX-110	1976	-- (6)	08/85	1989	(g)
241-BX-111	1984 (11)	-- (6)	03/95	1993	(g)
241-BY-103	1973	<5000	11/97	1983	(a)
241-BY-105	1984	-- (6)	03/03	1989	(g)
241-BY-106	1984	-- (6)	N/A	1989	(g)
241-BY-107	1984	15100 (7)	07/79	1989	(g)
241-BY-108	1972	<5000	02/85	1983	(a)
241-C-101 (13)	1980	20000 (7)(8)	11/83	1986	(d)
241-C-110 (13)	1984	2000	05/95	1989	(g)
241-C-111 (13)	1968	5500 (7)	03/84	1989	(g)
241-C-201 (4)	1988	550	03/82	1987	(i)
241-C-202 (4)	1988	450	08/81	1987	(i)
241-C-203	1984	400 (7)	03/82	1986	(d)
241-C-204 (4)	1988	350	09/82	1987	(i)
241-S-104	1968	24000 (7)	12/84	1989	(g)
241-SX-104	1988	6000 (7)	04/00	1988	(k)
241-SX-107	1964	<5000	10/79	1983	(a)
241-SX-108 (5)(12)	1962	2400 to 35000	08/79	1991	(l)(p)(s)
241-SX-109 (5)(12)	1965	<10000	05/81	1992	(m)(s)
241-SX-110	1976	5500 (7)	08/79	1989	(g)
241-SX-111 (12)	1974	500 to 2000	07/79	1986	(d)(s)
241-SX-112 (12)	1969	30000	07/79	1986	(d)(s)
241-SX-113	1962	15000	11/78	1986	(d)
241-SX-114	1972	-- (6)	07/79	1989	(g)
241-SX-115	1965	50000	09/78	1992	(n)
241-T-101	1992	7500 (7)	04/93	1992	(o)
241-T-103	1974	<1000 (7)	11/83	1989	(g)
241-T-106	1973	115000 (7)	08/81	1986	(d)
241-T-107	1984	-- (6)	05/96	1989	(g)
241-T-108	1974	<1000 (7)	11/78	1980	(f)
241-T-109	1974	<1000 (7)	12/84	1989	(g)

Table 4-3. Single-Shell Tank Leak Volume Estimates

Tank Number	Confirmed or Assumed Leaker (3)	Estimated Leak Volume Gallons (2)	Interim Stabilized (9)	Leak Estimate	
				Updated	Reference
241-T-111	1979, 1994 (10)	<1000 (7)	02/95	1994	(f)(r)
241-TX-105	1977	-- (6)	04/83	1989	(g)
241-TX-107 (5)	1984	2500	10/79	1986	(d)
241-TX-110	1977	-- (6)	04/83	1989	(g)
241-TX-113	1974	-- (6)	04/83	1989	(g)
241-TX-114	1974	-- (6)	04/83	1989	(g)
241-TX-115	1977	-- (6)	09/83	1989	(g)
241-TX-116	1977	-- (6)	04/83	1989	(g)
241-TX-117	1977	-- (6)	03/83	1989	(g)
241-TY-101	1973	<1000 (7)	04/83	1980	(f)
241-TY-103	1973	3000	02/83	1986	(d)
241-TY-104	1981	1400 (7)	11/83	1986	(d)
241-TY-105	1960	35000	02/83	1986	(d)
241-TY-106	1959	20000	11/78	1986	(d)
241-U-101	1959	30000	09/79	1986	(d)
241-U-104	1961	55000	10/78	1986	(d)
241-U-110	1975	5000 to 8100 (7)	12/84	1986	(d)(p)
241-U-112	1980	8500 (7)	09/79	1986	(d)
67 Tanks					

Table 4-3 Footnotes:

(1) Current estimates [see Reference (b)] are that 610 Kgallons of cooling water was added to tank A-105 from November 1970 to December 1978 to aid in evaporative cooling. In accordance with Dangerous Waste Regulations [Washington Administrative Code 173-303-070 (2)(a)(ii), as amended, Washington State Department of Ecology, 1990, Olympia, Washington], any of this cooling water that has been added and subsequently leaked from the tank must be classified as a waste and should be included in the total leak volume. In August 1991, the leak volume estimate for this tank was updated in accordance with the WAC regulations. Previous estimates excluded the cooling water leaks from the total leak volume estimates because the waste content (concentration) in the cooling water which leaked should be much less than the original liquid waste in the tank (the sludge is relatively insoluble). The total leak volume estimate in this report (10 to 277 Kgallons) is based on the following (see References):

a. Reference (b) contains an estimate of 5 to 15 Kgallons for the initial leak prior to August 1968.

Reference (b) contains an estimate of 5 to 30 Kgallons for the leak while the tank was being sluiced from August 1968 to November 1970.

Reference (b) contains an estimate of 610 Kgallons of cooling water added to the tank from November 1970 to December 1978, but it was estimated that the leakage was small during this period. This reference contains the statement "Sufficient heat was generated in the tank to evaporate most, and perhaps nearly all, of this water." This results in a low estimate of zero gallons leakage from November 1970 to December 1978.

b. Reference (c) contains an estimate that 378 to 410 Kgallons evaporated out of the tank from November 1970 to December 1978. Subtracting the minimum evaporation estimate from the cooling water added estimate provides a range from 0 to 232 Kgallons of cooling water leakage from November 1970 to December 1978.

	Low Estimate	High Estimate
Prior to August 1968	5,000	15,000
August 1968 to November 1970	5,000	30,000
November 1970 to December 1978	0	232,000
Totals	10,000	277,000

Table 4-3 Footnotes:

(2) Tank leak volume estimates presented here are being updated as a result of tank leak volume assessments and review of tanks for retrieval/closure consideration. Tank leak volume estimates presented here do not include (with some exceptions), such things as: (a) cooling/raw water leaks, (b) intrusions (rain infiltration) and subsequent leaks, (c) leaks inside the tank farm but not through the tank liner (surface leaks, pipeline leaks, leaks at the joint for the overflow or fill lines, etc.), and (d) leaks from catch tanks, diversion boxes, encasements, etc.

(3) In many cases, a leak was suspected long before it was identified or confirmed. For example, Reference (d) shows that tank U-104 was suspected of leaking in 1956. The leak was confirmed in 1961. This report lists the "assumed leaker" date of 1961. Using present standards, tank U-104 would have been declared an assumed leaker in 1956. In 1984, the criteria designations of "suspected leaker," "questionable integrity," "confirmed leaker," "declared leaker," and "borderline and dormant" were merged into one category now reported as "assumed leaker." See Reference (f) for explanation of when, how long, and how fast some of the tanks leaked.

(4) The leak volume estimate date for these tanks is before the declared leaker date because the tank was in a suspected leaker or questionable integrity status; however, a leak volume had been estimated prior to the tank being reclassified.

(5) The increasing radiation levels in drywells and laterals associated with these three tanks could be indicating continuing leak or movement of existing radionuclides in the soil. There is no conclusive way to confirm these observations. (There are currently no functioning laterals and no plan to prepare them for use).

(6) Methods were used to estimate the leak volumes from these 19 tanks based on the assumption that their cumulative leakage is approximately the same as for 18 of the 24 tanks identified in footnote (9). For more details see Reference (g). The total leak volume estimate for these tanks is 150 Kgallons (rounded to the nearest Kgallon), for an average of approximately 8 Kgallons for each of 19 tanks.

(7) Leak volume estimate is based solely on observed liquid level decreases in these tanks. This is considered to be the most accurate method for estimating leak volumes.

(8) Tank C-101 experienced a liquid level decrease in the late 1960s and was taken out of service and pumped to a minimum heel in December 1969. In 1970, the tank was classified as a "questionable integrity" tank. Liquid level data show decreases in level throughout the 1970s and the tank was saltwell pumped during the 1970s, ending in April 1979. The tank was reclassified as a "confirmed leaker" in January 1980. See References (p) and (q); refer to Reference (q) for information on the potential for there to have been leaks from other C-farm tanks (specifically, C-102, C-103, and C-109).

(9) These dates indicate when the tanks were declared to be interim stabilized. In some cases, the official interim stabilization documents were issued at a later date. Also, in some cases, the field work associated with interim stabilization was completed at an earlier date.

(10) Tank T-111 was declared an "assumed re-leaker" on February 28, 1994, due to a decreasing trend in surface level measurement. This tank was pumped, and interim stabilization completed on February 22, 1995.

(11) Tank BX-111 was declared an "assumed re-leaker" in April 1993. Preparations for pumping were delayed, following an administrative hold placed on all tank farm operations in August 1993. Pumping resumed and the tank was declared interim stabilized on March 15, 1995.

(12) The leak volume and curie release estimates on tanks SX-108, SX-109, SX-111, and SX-112 have been re-evaluated using a Historical Leak Model [see Reference (s)]. In general, the model estimates are much higher than the values listed in the table, both for volume and curies released. The values listed in the table do not reflect this revised estimate because, "In particular, it is worth emphasizing that this report was never meant to be a definitive update for the leak baseline at the Hanford Site. It was rather meant to be an attempt to view the issue of leak inventories with a new and different methodology." (This quote is from the first page of the referenced report).

(13) Leaks from Tanks C-101 C-110, and C-111 were re-assessed in RPP-ENV-33418 Rev. 1 *Hanford C-Farm Leak Assessments Report: 241-C-101, 241-C-110, 241-C-111, 241-C-105, and Unplanned Waste Releases.*

(14) Leaks from Tanks A-103, A-104, A-105, AX-102, and AX-104 were re-assessed in RPP-ENV-37956 Rev 1, *Hanford A and AX Farm Leak Assessments Rpeort:241-A-103, 241-A-104, 241-A-105, 241-AX-102, 241-AX-104 and Unplanned Waste Releases.*

Table 4-3 References:

(a) Murthy, K. S., et al., June 1983, *Assessment of Single-Shell Tank Residual Liquid Issues at Hanford Site, Washington*, PNL-4688, Pacific Northwest Laboratory, Richland, Washington

(b) WHC, 1991a, *Tank 241-A-105 Leak Assessment*, WHC-MR-0264, Westinghouse Hanford Company, Richland, Washington

(c) WHC, 1991b, *Tank 241-A-105 Evaporation Estimate 1970 Through 1978*, WHC-EP-0410, Westinghouse Hanford Company, Richland, Washington

(d) Smith, D. A., January 1986, *Single-Shell Tank Isolation Safety Analysis Report*, SD-WM-SAR-006, Rev. 1, Rockwell Hanford Operations, Richland, Washington

(e) McCann, D. C., and T. S. Vail, September 1984, *Waste Status Summary*, RHO-RE-SR-14, Rockwell Hanford Operations, Richland, Washington

(f) Catlin, R. J., March 1980, *Assessment of the Surveillance Program of the High-Level Waste Storage Tanks at Hanford*, Office of Environmental Compliance and Review, for the U.S. Department of Energy, Washington D.C.

(g) Baumhardt, R. J., May 15, 1989, Letter to R. E. Gerton, U.S. Department of Energy-Richland Operations Office, *Single-Shell Tank Leak Volumes*, 8901832B R1, Westinghouse Hanford Company, Richland, Washington; and Jensen, L. and Merril, J.A., March 28, 1989, Internal Letter to R.E. Raymond, *Estimation of Single Shell Tank Leak Volumes*, 12710-89-042, Westinghouse Hanford Company, Richland, Washington

(h) WHC, 1990a, Occurrence Report, *Surface Level Measurement Decrease in Single-Shell Tank 241-AX-102*, WHC-UO-89-023-TF-05, Westinghouse Hanford Company, Richland, Washington

(i) Groth, D. R., July 1, 1987, Internal Memorandum to R. J. Baumhardt, *Liquid Level Losses in Tanks 241-C-201, -202 and -204*, 65950-87-517, Westinghouse Hanford Company, Richland, Washington

(j) Groth, D. R., and G. C. Owens, May 15, 1987, Internal Memorandum to J. H. Roecker, *Tank 103-A Integrity Evaluation*, Rockwell Hanford Operations, Richland, Washington

(k) Dunford, G. L., July 8, 1988, Internal Memorandum to R. K. Welty, *Engineering Investigation: Interstitial Liquid Level Decrease in Tank 241-SX-104*, 13331-88-416, Westinghouse Hanford Company, Richland, Washington

(l) WHC, 1992a, *Tank 241-SX-108 Leak Assessment*, WHC-MR-0300, Westinghouse Hanford Company, Richland, Washington

(m) WHC, 1992b, *Tank 241-SX-109 Leak Assessment*, WHC-MR-0301, Westinghouse Hanford Company, Richland, Washington

(n) WHC, 1992c, *Tank 241-SX-115 Leak Assessment*, WHC-MR-0302, Westinghouse Hanford Company, Richland, Washington

(o) WHC, 1992d, Occurrence Report, *Apparent Decrease in Liquid Level in Single Shell Underground Storage Tank 241-T-101, Leak Suspected; Investigation Continuing*, RL-WHC-TANKFARM-1992-0073, Westinghouse Hanford Company, Richland, Washington

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

(q) WHC, 1993, *Assessment of Unsaturated Zone Radionuclide Contamination Around Single-Shell Tanks 241-C-105 and 241-C-106, WHC-SD-EN-TI-185*, REV OA, Westinghouse Hanford Company, Richland, Washington

(r) WHC, 1994, Occurrence Report, *Apparent Liquid Level Decrease in Single Shell Underground Storage Tank 241-T-111; Declared an Assumed Re-Leaker*, RL-WHC-TANKFARM-1994-0009, Westinghouse Hanford Company, Richland, Washington

Table 4-3 References:

(s) HNF, 1998, Agnew, S. F., and R. A. Corbin, August 1998, *Analysis of SX Farm Leak Histories - Historical Leak Model* (HLM), HNF-3233, Rev. 0, Los Alamos National Laboratory, Los Alamos, New Mexico

(t) Johnson, M. E., August 2008, *Hanford A and AX Farm Leak Assessments Rpeort:241-A-103, 241-A-104, 241-A-105, 241-AX-102, 241-AX-104 and Unplanned Waste Releases*, RPP-ENV-37956, Rev 1, CH2M Hill Hanford, Richland, Washingtion.

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5.0 MISCELLANEOUS UNDERGROUND STORAGE TANKS AND SPECIAL SURVEILLANCE FACILITIES

Table 5-1. East and West Area Miscellaneous Underground Storage Tanks and Special Surveillance Facilities (1).

Facility	Location	Receives Waste From:	Waste (Gallons)	Monitored By:	Remarks
EAST AREA					
204-AR	W of A Farm Complex	Liquid waste from 100-Area, 300-Area Rail and Truck Tankers	290	SACS/WTF/Manual	Out of service (9)
209-E-TK-111	209 E Bldg.	Decon Catch Tank	Unknown	NM	Removed from service 1988
241-A-302-A	A Farm	A-151 DB	661	SACS/ENRAF/TMACS	
241-A-302-B	A Farm	A-152 DB	6265	SACS/MT	Isolated 1985, Project B-138, Interim Stabilized 1990, rain intrusion
241-AX-151 (5 tanks)	N. of PUREX	PUREX	Unknown	NM	Isolated 1985 (8)
241-AX-152	AX Farm	AX-152 DB	26	SACS/MT	Declared Assumed Leaker, pumped to AY-102, 3/01, no longer being used
241-AZ-151	AZ Farm	AZ-702 Condensate	1399	SACS/ENRAF/TMACS	Out-of-service 6/05. Isolated 6/06. (M-48-07)
241-AZ-154	AZ Farm		25	Zip Cord	Not monitored after 05/06
241-AZ-301 (11)	AZ Farm	AZ-702 Condensate	N/A	SACS/ENRAF/TMACS	Volume changes daily - pumped to AY-101 as needed
241-B-301-B	B Farm	B-151, 152, 153, 252 DB	22250	NM	Isolated 1985 (2)
241-B-302-B	B Farm	B-154 DB	4930	NM	Isolated 1985 (2)
241-BX-302-A	BX Farm	BR-152, BX-153, BXR-152, BYR-152 DB	840	NM	Isolated 1985 (2)
241-BX-302-B	BX Farm	BX-154 DB	1040	NM	Isolated 1985 (2)
241-BX-302-C	BX Farm	BX-155 DB	870	NM	Isolated 1985 (2)
241-BXR-TK/SMP-001	BX Farm	Transfer lines	7200	NM	Interim Stabilization 1985 (2)
241-BXR-TK/SMP-002	BX Farm	Transfer Lines	2180	NM	Interim Stabilization 1985 (2)
241-BXR-TK/SMP-003	BX Farm	Transfer Lines	1810	NM	Interim Stabilization 1985 (2)
241-BXR-TK/SMP-011	BX Farm	Transfer Lines	7100	NM	Interim Stabilization 1985 (2)
241-BY-ITS2-TK 1	BY Farm	Vapor condenser	Unknown	NM	Isolated
241-BY-ITS2-TK 2	BY Farm	Heater Flush Tank	Unknown	NM	Stabilized 1977
241-C-301-C	C Farm	C-151, 152, 153, 252 DB	10470	NM	Isolated 1985 (2)
241-ER-311	B Plant	ER-151, ER-152 DB	Unknown	SACS/ENRAF/Manual	Declared Assumed Leaker 3/2006 (3)
241-ER-311A	SW of B Plant	ER-151 DB	Empty	NM	Abandoned in place 1954
244-AR Vault (4 tanks)	A Complex	Between farms and B Plant	Unknown (7)		Stabilized 8/03, RPP-12051 Tanks 001-004 and Cell 1-3 Sumps monitored quarterly

Table 5-1. East and West Area Miscellaneous Underground Storage Tanks and Special Surveillance Facilities (1).

Facility	Location	Receives Waste From:	Waste (Gallons)	Monitored By:	Remarks
244-A-TK/SMP	A Complex	DCRT - Receives from several farms	4670	SACS/WTF/MCS	WTF - Receives transfers and is pumped as needed
244-BX-TK/SMP	BX Complex		10970	SACS/MT	Out of Service 6/05. Isolated 6/06 (M-48-07)
241-A-350	A Farm	Collects drainage	460	SACS/WTF/MCS	WTF (uncorrected), pumped as needed
241-A-417	A Farm		1176	SACS/WTF/Manual	WTF
CR-003-TK-SMP	C Farm	DCRT	2146	SACS/ZIP CORD/Manual	Zip cord installed; MT removed; more accurate conversion table used (10)
WEST AREA					
213-W-TK-1	E. of 213-W Compactor Facility	Water Retention Tank	Unknown	NM	Contains only water
231-W-151-001	N. of Z Plant	231-Z Floor drains	Unknown	NM	Inactive, last data 1974
231-W-151-002	N. of Z Plant	231-Z Floor drains	Unknown	NM	Inactive, last data 1974
240-S-302	S Plant	240-S-151-DB	1660		Assumed Leaker, EPDA 85-04 (4)
241-S-302A	S Farm	241-S-151-DB	0		Assumed Leaker TF-EFS-90-042
	Partially filled with grout 2/91, determined to be an Assumed Leaker after leak test. No surface level or intrusion readings obtainable. S-304 (active) replaced S-302				
241-S-302B	SX Farm	S Encasements	Empty	NM	Isolated 1985 (2)
241-S-304	S Farm	S-151 DB	1	SACS/ENRAF/Manual	Sump not alarming
241-SX-302	SX Farm	SX-151 DB, 151 TB	Unknown	NM	Isolated 1987
241-T-301	T Farm	DB T-151, 151, 153, 252	Unknown	NM	Isolated 1985 (T-301-B)
241-TX-302	TX Farm	TX-153 DB	Unknown	NM	Isolated 1985 (2)
241-TX-302B	E. of TX Farm	TX-155 DB	3312	SACS/ENRAF/TMACS	New ENRAF installed 9/02
241-TX-302-B(R)	E. of TX Farm	TX-155 DB	Unknown	NM	Isolated, replaced TX-302-B
241-TX-302C	T Plant	TX-154 DB	194	SACS/ENRAF/TMACS	
241-TX-302-X-B	TX Farm	TX Encasements	Unknown	NM	Isolated 1985 (2)
241-TY-302A	TY Farm	TX-153 DB	Unknown	NM	Isolated 1985 (2)
241-TY-302B	TY Farm	TY Encasements	Empty	NM	Isolated 1985 (2)
241-U-301B	U Farm	U-151, 152, 153, 252 DB	1438	SACS/ENRAF/Manual	Pumped to SY-101, 12/03
241-UX-302A	U Plant	UX-154	120	SACS/ENRAF/Manual	Catch Tank pumped in October 2006 (5)
241-Z-8	E. of Z Plant	Recuplex waste	Unknown	NM	Isolated, 1974, 1975
242-S TK C-100	242-S	Process Condensate	Unknown	NM	Process condensate receiver during 242-S Evaporator operation
242-T-135	T Evaporator	T Evaporator	Unknown	NM	Isolated
242-TA-R1	T Evaporator	Z Plant waste	Unknown	NM	Isolated
243-S-TK-1	NW of S Farm	Personnel Decon. Facility	Empty	NM	Isolated
244-S-TK/SMP	S Farm	From SSTs for	3955	SACS/WTF/Manual	WTF. Out of Service

Table 5-1. East and West Area Miscellaneous Underground Storage Tanks and Special Surveillance Facilities (1).

Facility	Location	Receives Waste From:	Waste (Gallons)	Monitored By:	Remarks
		transfer to SY-102			6/05. Isolated 6/06. (TPA M-48-07)
244-TXR-TK/SMP-001	TX Farm	Transfer lines	Unknown	NM	Interim Stabilized, MT removed 1984 (2)
244-TXR-TK/SMP-002	TX Farm	Transfer lines	Unknown	NM	Interim Stabilized, MT removed 1984 (2)
244-TXR-TK/SMP-003	TX Farm	Transfer lines	Unknown	NM	Interim Stabilized, MT removed 1984 (2)
244-TX-TK/SMP	TX Farm		7043	SACS/MT	Received from 241-Z, tank D-5, 11/04
244-U –TK/SMP	U Farm	-	Unknown	NM	Never placed in service. Isolated 06/30/2006. May contain up to 10,000 gallons leak test raw water.
244-UR-001 Vault TK	U Farm	Tank, Sump and Cell	4220	NM	Stabilized 1985
244-UR-002 Vault TK	U Farm	Tank, Sump and Cell	1400	NM	Stabilized 1985
244-UR-003 Vault TK	U Farm	Tank, Sump and Cell	5996	NM	Stabilized 1985
244-UR-004 Vault TK	U Farm	Tank, Sump and Cell	Empty	NM	Stabilized 1985
241-EW-151 Vent Station Catch Tank		Cross Site Transfer Line	499	SACS/MT	MT. Rain intrusion, 1/03 (6)

Table 5-1 Legend:

DB, TB	Diversion Box, Transfer Box
DCRT	Double-Contained Receiver Tank
ENRAF, MT	Surface Level Measurement Devices
MCS	Monitor and Control System
Manual	Not connected to any automated system
MT	Manual Tape
NM	Not Monitored
O/S	Out of Service
SACS	Surveillance Automated Control System
TK, SMP	Tank, Sump
WTF	Weight Factor (can be recorded as WTF, WTF [uncorrected] or CWF [uncorrected])

Table 5-1 Footnotes:

(1) WHC-SD-WM-TI-356, Waste Storage Tank Status and Leak Detection Criteria, Rev. 0, September 30, 1988. Inactive Miscellaneous Underground Storage Tanks (IMUST) reflect only those tanks managed by CH2M HILL Hanford Group, Inc. (CH2M HILL).

(2) WHC-SD-WM-TI-356, Waste Storage Tank Status and Leak Detection Criteria, Rev. 0, September 30, 1988.

Table 5-1 Footnotes:

(3) A leak assessment was performed because of the 0.5 inch liquid level decrease between early October 2005 and January 31, 2006. The leak assessment concluded that a tank leak was the most likely explanation for the level trend. The leak assessment report (RPP-RPT-29163) was issued on March 17, 2006.

Solids volume in the tank is not known. Sample activities conducted during November, 1999 concluded that there were approximately 7 to 9" of solids beneath the east riser and no solids beneath the west riser (HNF-5985 Rev. 0 *ER-311 Flammable Gas Response and Findings*). The remaining liquid in the tank was evaporated to dryness between October 13, 2006 and February 15, 2007. A subsequent video inspection on March 17, 2007 indicated no remaining free liquid was present (07-TOD-026).

(4) A leak assessment was performed because of a steady, predictable liquid level decrease of ~ 0.33 inches/year since the early 1980's. The tank was designated as an "Assumed Leaker" in 1985, but had no record of a formal leak assessment. The leak assessment report (RPP-ASMT-35057) was issued on October 10, 2007.

A total of 6,265 gallons of supernatant was pumped from the tank between September 21, 2008 and September 28, 2008. A solids level of 14.12 inches (1,361 gallons) was measures with ENRAF™ densitometer on September 9, 2008. A post-pumping visual inspection showed a small 1 foot wide by 10 feet long pool of liquid centered beneath the pump, corresponding to less than 6 gallons of free liquid. The remaining volume is estimated to be 1,360 to 1660 gallons, based on ENRAF and densitometer readings in different risers, and assuming that the solids are level across the tank.

(5) A leak assessment was performed because of the 0.7 inch level decrease between January 2004 and February 2006. The leak assessment concluded that a tank leak was the most likely explanation for the level trend. The leak assessment report (RPP-RPT-29711) was issued on May 12, 2006.

Pumping of the remaining free liquid from the tank was completed October 25, 2006 (06-TOD-090). An estimated 75 to 110 gallons of sludge, and 10 gallons of free liquid remain in the tank (RPP-RPT-31779 Rev. 0 *241-UX-302A Catch Tank Liquid Mitigation Completion Report*). The high estimate of 120 gallons total waste is reported in the table.

(6) A leak assessment was performed because of a 1.25 inch liquid level decrease between July, 2006 and November, 2006. The leak assessment concluded that the level decrease was the result of evaporation from an operating exhauster connected to tank 241-ER-311. This was confirmed when the exhauster was shut down and the liquid level stabilized. The tank remains classified as a "sound" tank. The leak assessment report (RPP-ASMT-33741) was issued on June 25, 2007.

(7) Following stabilization, the remaining volume of liquid in the tanks and sumps was estimated to total no more than 659 gallons; the volume of sludge <100 gallons (RPP-12051).

(8) 241-AX-151 consists of four 50 gallon diverter tanks (Tanks D – G) located in individual cells and the ~12,200 gallon capacity 241-AX-151-CT catch tank (stainless steel lined concrete vault and sump referred) receiving drainage from the pump pit and the four cells.

(9) 204-AR Customer Waste Unloading Facility includes a 1,500 gal catch tank enclosed in an stainless steel lined pit and pit sump; combined capacity of the catch tank and pit are 4,550 gallons (WHC-SC-WM-SAR-040 Rev. 1).

(10) 244-CR Vault contains two 40,000 gallon tanks CR-011 and CR-01, and two 15,000 gallon tanks CR-002 and CR-003 in individual cells. A 2004 liquid level assessment reported that 244-CR contained a total of 17,400 gallons of waste in the tanks and cells (04-TOD-085). Table 5-1 reports the liquid volume in tank CR-003 used previously as a saltwell receiver.

(11) AZ-301 is an active part of the DST system.

APPENDIX A - TANK CONFIGURATION AND FACILITIES CHARTS

Figure A-1. Underground Waste Storage Tank Configurations

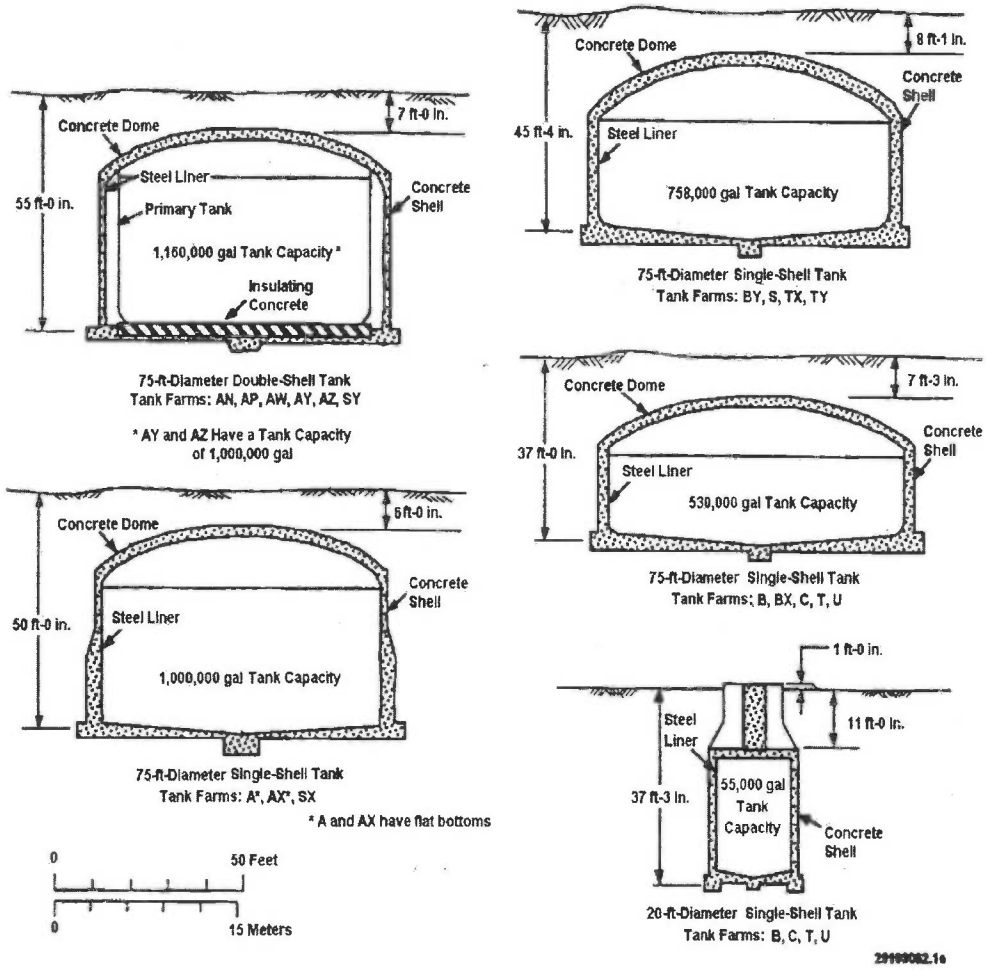


Figure A-2. Double-Shell Tank Instrumentation Configuration

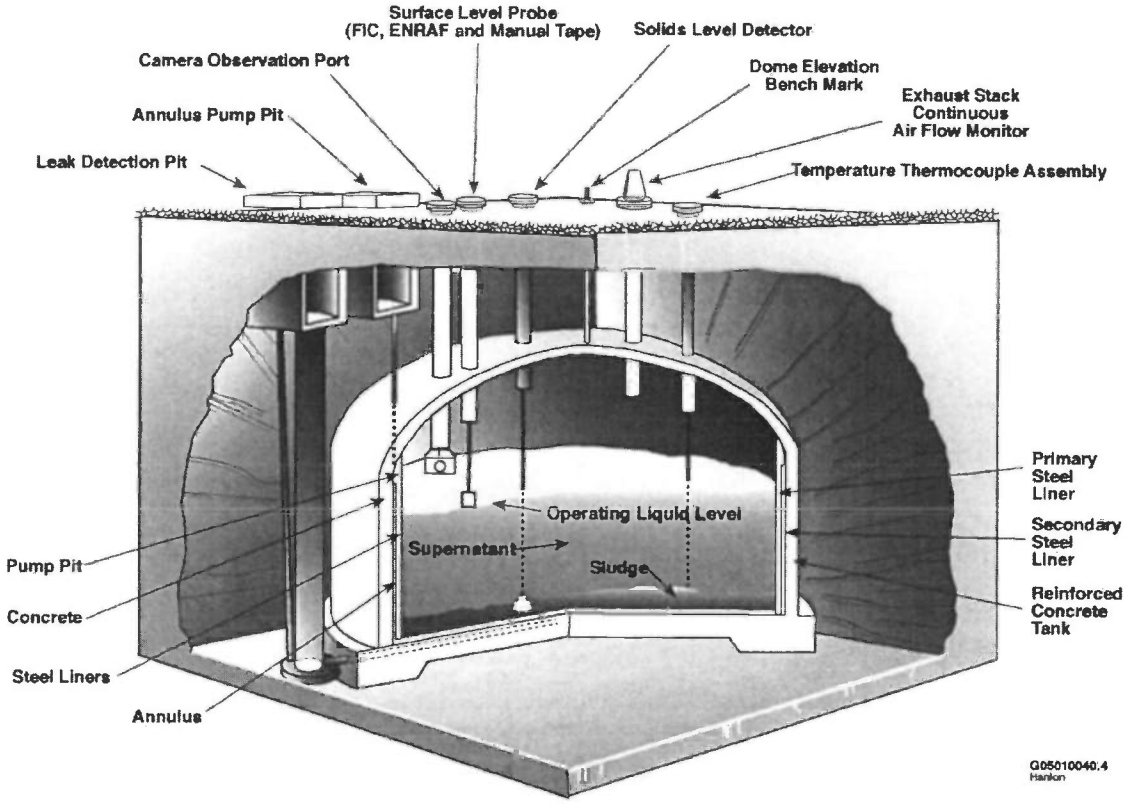
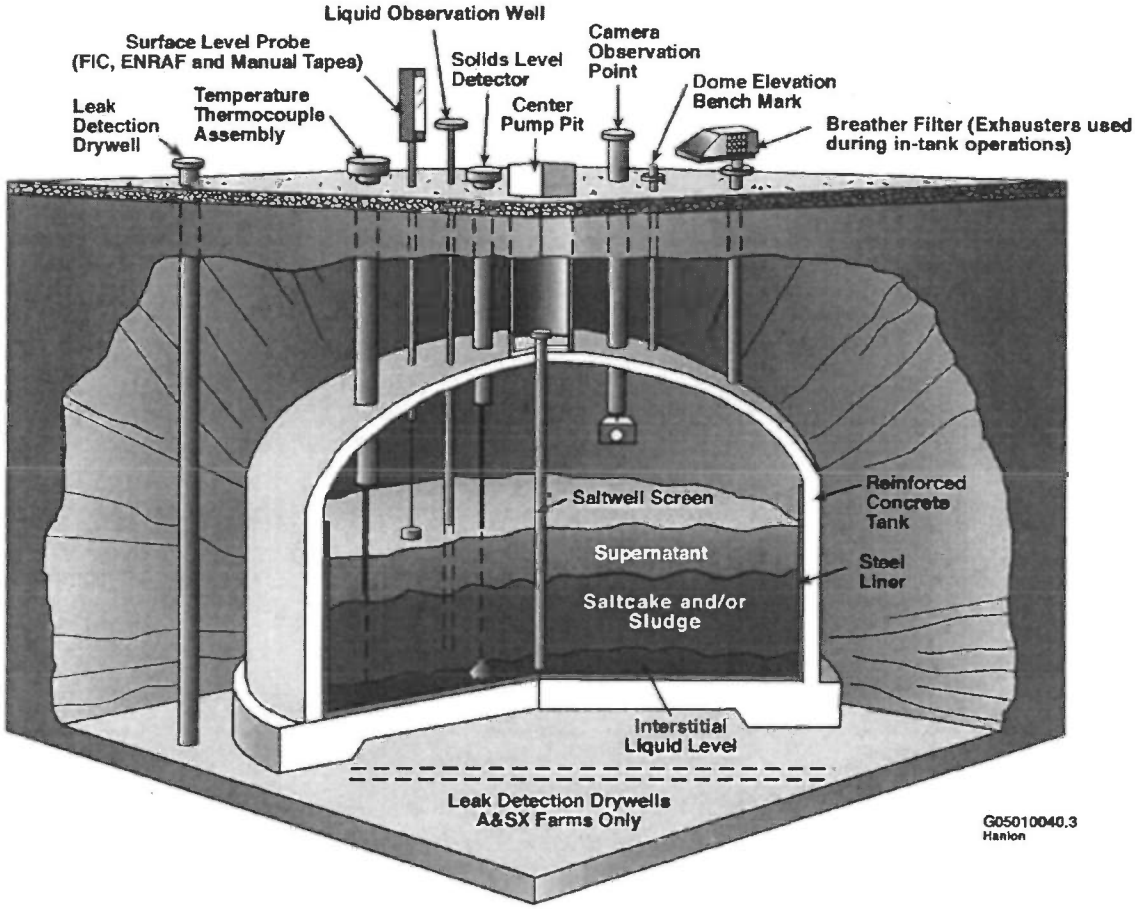


Figure A-3. Single-Shell Tank Instrumentation Configuration



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