Department of Energy
Office of River Protection
P.O. Box 550
Richland, Washington 99352

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99-PDD-084

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Mr. Michael A. Wilson, Program Manager
Nuclear Waste Program
State of Washington
Department of Ecology
P.O. Box 47600
Olympia, Washington 98504

Dear Mr. Wilson:

COMPLETION OF PROPOSED HANFORD FEDERAL FACILITY AGREEMENT AND CONSENT ORDER (TRI-PARTY AGREEMENT) INTERIM MILESTONE M-45-02D, "SUBMIT ANNUAL UPDATE OF SINGLE-SHELL TANK (SST) RETRIEVAL SEQUENCE DOCUMENT," DUE SEPTEMBER 1999

This letter provides notification of the completion of Tri-Party Agreement Interim Milestone M-45-02D, "Submit Annual Update of SST Retrieval Sequence Document," with the submittal of the attached report "SST Waste Retrieval Sequence, Fiscal Year 1999 Update," dated September 29, 1999.

This report is submitted as a supplement to the sequence information contained in the "Tank Waste Remediation System Operations and Utilization Plan," dated on May 5, 1999. The attached report contains the SST retrieval sequence used as the planning basis for the Fiscal Year (FY) 1999 Baseline Update effort, the SST Program Plan, and the FY2000 Multi-Year Work Plan.

In the attached report, the strategy for sequencing of SST waste retrieval projects has been refined from previous years. This current sequence reflects a strategy which is risk based and prioritizes factors such as:

- Soundness of the tanks;
- Waste feed delivery requirements;
- Risk reduction by early retrieval of high curie content tanks;
- Early infrastructure upgrade or new project demands,
- Complexity of the retrieval environment,
- Acceleration of SST in Retrieval Sequence.

The point of contact for this matter is Bob Lober, on (509) 373-7949.

Sincerely,

George H. Sanders, Administrator
Hanford Tri-Party Agreement

PDD:RWL

Attachment

cc w/attach
J. R. Wilkinson, CTUIR
R. F. Stanley, Ecology
D. R. Sherwood, EPA
J. S. Hertzel, FDH
TPA Administrative Record, FDH
M. B. Reeves, HAB
P. Sabotta, NPT
M. L. Blazek, OOE
R. Jim, YN

SINGLE-SHELL TANK WASTE RETRIEVAL SEQUENCE FISCAL YEAR 1999 UPDATE

September 1999

Prepared by:
William J. Stokes
Lockheed Martin Hanford Corporation
Richland, Washington

Prepared for
U.S. Department of Energy
Richland, Washington

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LIST OF TERMS

BUG	Baseline Updating Guidance
DST	double-shell tank
FY	fiscal year
HLW	high-level waste
LAW	low-activity waste
RPP	River Protection Project
SST	single-shell tank
TWRSO&UP	Tank Waste Remediation System Operations and Utilization Plan

SINGLE-SHELL TANK WASTE RETRIEVAL SEQUENCE
FISCAL YEAR 1999 UPDATE

1.0 Introduction

This report documents the baseline single-shell tank (SST) waste retrieval sequence for the River Protection Project (RPP) updated for Fiscal Year (FY) 1999. Information contained within this report includes the proposed retrieval order (sequence) and retrieval dates, tank selection criteria, rationale, and reference retrieval method for the SSTs. In addition, this sequence report satisfies the requirement of the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) Milestone M-45-02D, "Submit Annual Update of SST Retrieval Sequence Document for Ecology Approval."

This updated sequence report is based upon the results of the retrieval sequence studies performed in support of

- "Tank Waste Remediation System Operations and Utilization Plan (TWRSO&UP)," HNF-SD-WM-SP-012, Revision 1, submitted in H.L. Boston, LMHC to R.T. French, RL, letter "Partial Completion of Performance Agreement TWR1.3.4," LMHC-9952966, dated May 5, 1999; and
- Ongoing evaluations of requirements for SST retrieval and waste feed delivery contained in W.J. Taylor, ORP to R.D. Hanson, FDH, letter "Planning Guidance Revision for Development of Contract Deliverables Required by Performance Agreement TWR1.3.5," 99-AMPD-006, dated April 1, 1999.

The development of a SST waste retrieval sequence will aid in determining:

- Programmatic and system assumptions and requirements;
- Feasibility of meeting waste retrieval and processing commitments;
- Effects on blending associated with alternative systems configurations; and
- Effects of alternative sequences upon the types and quantities of retrieval and infrastructure equipment needed to support SST retrieval requirements.

2.0 Reference Single-Shell Tank Retrieval Method

For this study, the baseline SST waste retrieval method was assumed to be past practice sluicing. Using this method, the waste would be diluted to maximum of 5 molar (M) Sodium (Na) or 10 wt% solids before being pumped to the DST receiver tank for subsequent transfer to the immobilization plant. The assumed retrieval rates are based upon past-practice sluicing and may change in the future if other retrieval methods are chosen. Past practice sluicing was selected as the reference technology because of the availability of data for key performance parameters, such as retrieval rates and water volume additions, modeled by the computer simulations. A technical refinement of the modeling is the planning for technology insertion points to incorporate data for alternative technologies developed under the SST test and evaluation project.

3.0 Single-Shell Tank Selection Criteria and Rationale

The TWRSO&UP, Section 4.3, "Single-Shell Tank Retrieval Sequence" documents the criteria and rationale for SST selection and sequencing waste retrieval. The selection criteria and rationale were based on the "Single-Shell Tank Retrieval Program Mission Analysis Report," HNF-2944, Revision 0, dated August 1998. The sequence utilized to support the FY99 baseline update and the FY00 Multi-Year Work Plan (MYWP), modified the TWRSO&UP prioritization of retrieval, discussed in TWRSO&UP, Section 4.3.4, to de-emphasize the low Technetium-99 (^{99}Tc) content tanks and gain greater reduction in the potential for long-term human health risk from early retrievals. The Category 1 or low ^{99}Tc contents tanks identified in TWRSO&UP, Section 4.3.4 were deferred to the latter portion of the retrieval sequence and the Category 2 or sound saltcake tanks with high ^{99}Tc content were assigned first priority in the sequencing.

The prioritization and sequencing were further adjusted for consideration given to waste feed delivery needs for high level sludge wastes during Phase 1B and grouping of tank sequences to minimize the need for extensive infrastructure systems development during the early stages of SST retrieval.

The process flow configurations and assignments of DSTs as vessels to receive wastes retrieved from SSTs were unchanged from the description contained in TWRSO&UP, Revision 1.

4.0 Single-Shell Tank Waste Retrieval Sequence and Schedule

SST waste retrieval will be segregated into three phases:

- Phase 1 waste feed requirements;
- Backfill DSTs that are retrieved to provide feed for waste processing during FY 2001 with SST waste that will be used for FY 2011 waste feed requirements; and
- Long-term SST waste retrieval for FY 2011.

For Phase 1, retrieval of SST waste is restricted due to the limited space available in DSTs. Backfilling DSTs is restricted due to Phase 1 private contractor's processing rates for providing space in the DSTs.

Following retrieval of wastes from the four Phase 1 SSTs, wastes in 15 SSTs will be retrieved during or prior to 2018 to backfill DSTs that will be emptied to provide waste feed for Phase 1 and stage wastes to support Phase 2 immobilization. This approach was established to retrieve wastes necessary to meet Phase 1 feed delivery requirements, improve retrieval deployment cost effectiveness, and maximize risk reduction benefits from SST retrieval projects.

Figure 1 shows the SST waste retrieval schedule for the chosen sequence including retrieval duration for each SST. Superimposed are the Tri-Party Agreement milestones for initiating retrieval activities for the designated numbers of SSTs. Table 1 shows the data depicted in Figure 1 (except for the Tri-Party Agreement milestone dates), and includes the retrieved volumes of the waste retrieved from each tank. As-retrieved volumes include the minimum dilution water necessary to reduce the sodium concentrations to<5M and the insoluble solids content to 10-wt%.

The sequence is based on the April 1, 1999, baseline update guidance with the planning assumption that Phase 2 immobilization starts in 2018 with a capacity of twice the Phase 1 LAW processing capacity and four times the Phase 1 HLW processing capacity.

In addition, Figure 1 shows that SST waste retrieval, based on the immobilization processing assumptions stated above, does not meet the Tri-Party Agreement Milestone M-45-05 series target milestone schedule. This analysis will be updated next year with the latest assumptions regarding Phase 1 private contractor hot-start dates and processing rates, construction conflict resolution, Phase 2 transfer and processing planning, Phase 2 sequencing to support closure, and DST space availability to support SST retrieval.

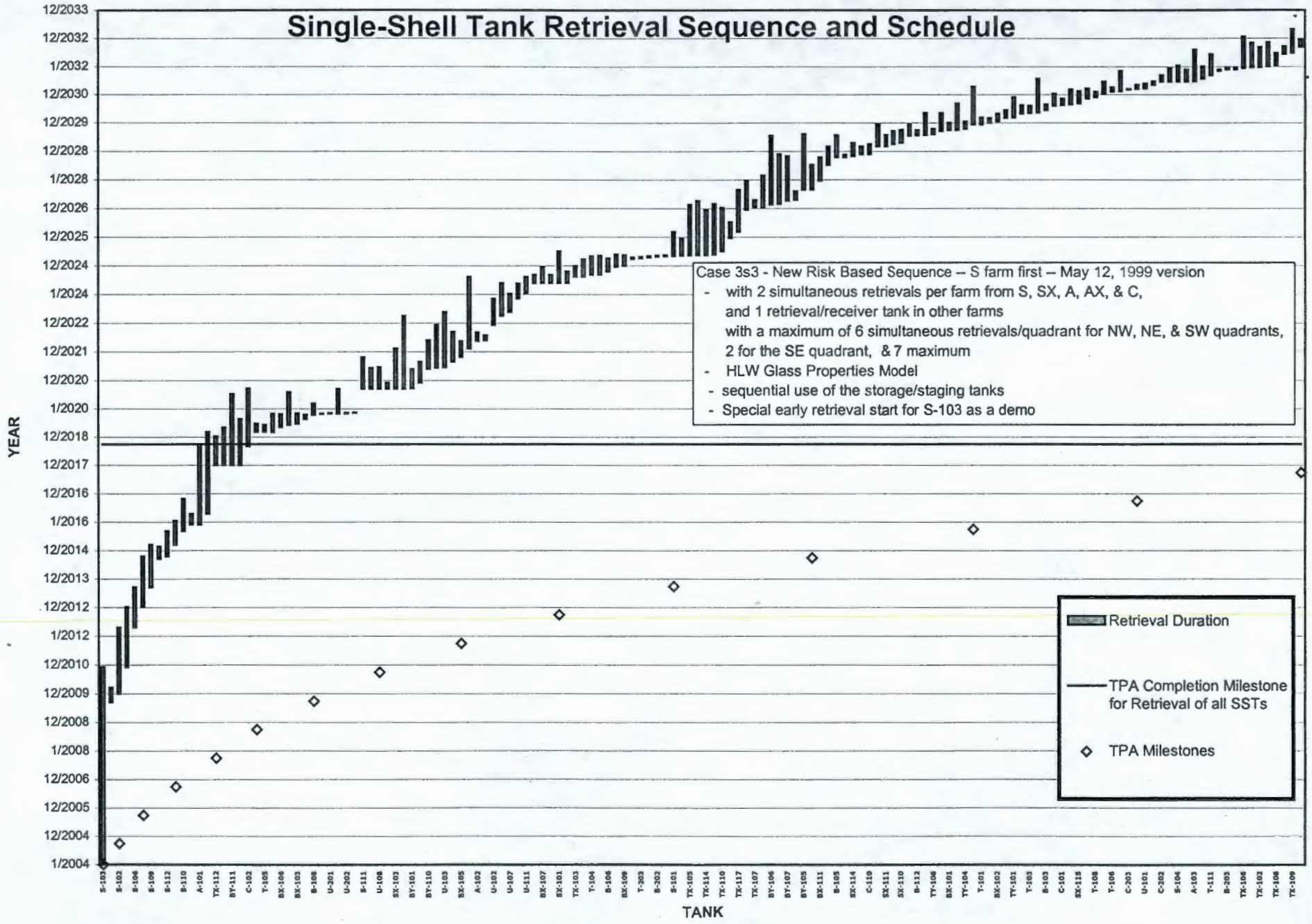
Single-Shell Tank Retrieval Sequence and Schedule
Case 3s3 - New Risk Based Sequence -- S farm first -- May 12, 1999 version
- with 2 simultaneous retrievals per farm from S, SX, A, AX, & C,
and 1 retrieval/receiver tank in other farms
with a maximum of 6 simultaneous retrievals/quadrant for NW, NE, & SW quadrants,
2 for the SE quadrant, & 7 maximum
- HLW Glass Properties Model
- sequential use of the storage/staging tanks
- Special early retrieval start for S-103 as a demo
Retrieval Duration
TPA Completion Milestone for Retrieval of all SSTs
TPA Milestones
YEAR
12/2033
12/2032
1/2032
12/2030
12/2029
12/2028
1/2028
12/2026
12/2025
12/2024
1/2024
12/2022
12/2021
12/2020
1/2020
12/2018
12/2017
12/2016
1/2016
12/2014
12/2013
12/2012
1/2012
12/2010
12/2009
12/2008
1/2008
12/2006
12/2005
12/2004
1/2004
TANK

Table 1
Baseline Single-Shell Tank Retrieval Sequence and Associated Data

Tank	Retrieval Start Date	Retrieval Duration	Retrieval End Date	Retrieved Liquid Vol. (gal)	Retrieved Solids Vol. (gal)	Total Retrieved Vol. (gal)
241-S-103	1/1/2004	2528	12/3/2010	632,739	7,552	640,291
241-C-104	9/15/2009	185	3/1/2010	753,878	59,779	813,657
241-S-102	1/1/2010	838	4/18/2012	1,438,761	3,993	1,442,754
241-S-105	12/3/2010	765	1/6/2013	1,264,803	17,013	1,281,816
241-S-106	4/18/2012	517	9/17/2013	1,370,993	3,000	1,373,993
241-S-108	1/6/2013	650	10/18/2014	1,371,858	20,620	1,392,478
241-S-109	9/17/2013	544	3/15/2015	1,395,575	3,787	1,399,362
241-C-107	9/15/2014	158	2/20/2015	813,432	30,803	844,234
241-S-112	10/18/2014	323	9/6/2015	1,437,733	8,711	1,446,444
241-S-107	3/15/2015	310	1/19/2016	1,017,456	39,224	1,056,680
241-S-110	9/6/2015	418	10/28/2016	900,764	28,413	929,177
241-AX-103	11/28/2015	140	4/16/2016	291,175	6,920	298,095
241-A-101	11/28/2015	1008	9/1/2018	2,055,832	899	2,056,731
241-AX-101	4/16/2016	1055	3/7/2019	1,871,840	1,438	1,873,278
241-TX-112	1/1/2018	372	1/8/2019	1,961,117	37,891	1,999,008
241-BY-102	1/1/2018	490	5/6/2019	948,023	26,537	974,560
241-BY-111	1/1/2018	922	7/11/2020	1,516,798	34,209	1,551,007
241-BY-112	1/1/2018	595	8/19/2019	1,201,825	30,340	1,232,165
241-C-102	9/1/2018	749	9/19/2020	770,245	31,650	801,895
241-TX-101	3/7/2019	105	6/20/2019	401,895	15,997	417,893
241-T-105	3/7/2019	92	6/7/2019	293,805	11,325	305,131
241-C-103	3/7/2019	238	10/31/2019	491,645	15,241	506,886
241-BX-106	5/6/2019	171	10/24/2019	155,349	5,973	161,322
241-BX-104	6/7/2019	424	8/4/2020	693,257	26,270	719,527
241-BX-103	6/20/2019	135	11/2/2019	178,834	7,156	185,991
241-T-102	8/19/2019	58	10/16/2019	294,916	11,079	305,994
241-B-108	10/16/2019	145	3/9/2020	269,972	10,787	280,759
241-U-203	10/24/2019	6	10/30/2019	11,193	431	11,623
241-U-201	10/30/2019	7	11/6/2019	22,702	872	23,574
241-C-109	10/31/2019	319	9/14/2020	295,938	11,328	307,266
241-U-202	11/2/2019	7	11/9/2019	22,702	872	23,574
241-U-204	11/6/2019	6	11/12/2019	15,469	576	16,045
241-S-111	9/14/2020	406	10/25/2021	1,652,275	36,191	1,688,466
241-U-109	9/14/2020	268	6/9/2021	1,487,925	4,175	1,492,100
241-U-108	9/14/2020	276	6/17/2021	1,269,986	17,389	1,287,375
241-C-108	9/14/2020	80	12/3/2020	202,030	7,839	209,869
241-SX-103	9/14/2020	513	2/9/2022	1,557,222	14,208	1,571,430

Table 1
Baseline Single-Shell Tank Retrieval Sequence and Associated Data

Tank	Retrieval Start Date	Retrieval Duration	Retrieval End Date	Retrieved Liquid Vol. (gal)	Retrieved Solids Vol. (gal)	Total Retrieved Vol. (gal)
241-SX-105	9/14/2020	929	4/1/2023	1,695,387	3,998	1,699,385
241-BY-101	9/19/2020	249	5/26/2021	904,075	20,025	924,100
241-BY-109	12/3/2020	265	8/25/2021	838,603	20,841	859,445
241-BY-110	5/26/2021	362	5/23/2022	1,085,760	23,543	1,109,303
241-U-105	6/9/2021	545	12/6/2022	1,080,457	12,031	1,092,488
241-U-103	6/17/2021	702	5/20/2023	1,320,962	14,588	1,335,550
241-BY-104	8/25/2021	382	9/11/2022	1,118,913	24,594	1,143,507
241-BX-105	10/25/2021	203	5/16/2022	156,358	6,099	162,458
241-SX-102	2/9/2022	913	8/10/2024	1,244,046	14,804	1,258,850
241-A-102	5/16/2022	111	9/4/2022	101,328	4,411	105,739
241-B-102	5/23/2022	64	7/26/2022	121,470	3,660	125,130
241-U-102	12/6/2022	337	11/8/2023	1,232,216	3,682	1,235,898
241-SX-106	4/1/2023	418	5/23/2024	1,103,600	10,145	1,113,745
241-U-107	5/20/2023	235	1/10/2024	884,790	4,419	889,210
241-U-106	11/8/2023	192	5/18/2024	593,210	8,304	601,514
241-U-111	1/10/2024	214	8/11/2024	783,193	8,163	791,356
241-C-105	5/23/2024	108	9/8/2024	414,492	15,640	430,133
241-BX-107	5/23/2024	208	12/17/2024	793,584	31,824	825,407
241-B-109	5/23/2024	106	9/6/2024	513,756	20,662	534,418
241-SX-101	5/23/2024	404	7/1/2025	1,269,846	31,090	1,300,935
241-A-106	5/23/2024	149	10/19/2024	291,304	12,329	303,633
241-TX-103	8/10/2024	140	12/28/2024	471,715	8,758	480,472
241-T-110	8/11/2024	224	3/23/2025	591,571	14,788	606,359
241-T-104	9/6/2024	237	5/1/2025	1,061,920	36,754	1,098,674
241-C-112	9/8/2024	244	5/10/2025	478,275	18,986	497,261
241-B-106	10/19/2024	167	4/4/2025	182,103	7,295	189,398
241-BX-112	12/17/2024	156	5/22/2025	332,231	12,963	345,195
241-BX-109	12/28/2024	137	5/14/2025	239,350	9,081	248,431
241-T-204	3/23/2025	23	4/15/2025	55,298	2,154	57,452
241-T-203	4/4/2025	21	4/25/2025	57,970	2,243	60,213
241-T-201	4/15/2025	18	5/3/2025	110,912	4,170	115,081
241-B-202	4/25/2025	18	5/13/2025	34,518	1,344	35,862
241-T-202	5/1/2025	15	5/16/2025	32,386	1,266	33,653
241-S-101	5/3/2025	309	3/8/2026	1,701,325	41,533	1,742,858
241-B-104	5/10/2025	221	12/17/2025	538,234	15,369	553,604
241-TX-105	5/13/2025	644	2/16/2027	1,825,283	34,939	1,860,222
241-TX-115	5/14/2025	692	4/6/2027	1,678,953	29,750	1,708,703

Table 1
Baseline Single-Shell Tank Retrieval Sequence and Associated Data

Tank	Retrieval Start Date	Retrieval Duration	Retrieval End Date	Retrieved Liquid Vol. (gal)	Retrieved Solids Vol. (gal)	Total Retrieved Vol. (gal)
241-TX-114	5/16/2025	575	12/12/2026	1,632,866	28,058	1,660,925
241-TX-113	5/22/2025	645	2/26/2027	1,494,936	32,957	1,527,893
241-TX-110	7/1/2025	557	1/9/2027	1,316,052	27,106	1,343,159
241-SX-109	12/17/2025	205	7/10/2026	1,139,350	46,562	1,185,912
241-TX-117	3/8/2026	536	8/26/2027	1,832,076	26,642	1,858,718
241-TX-116	12/12/2026	374	12/21/2027	1,757,511	17,374	1,774,885
241-TX-107	1/9/2027	97	4/16/2027	94,450	2,886	97,337
241-SX-104	1/9/2027	411	2/24/2028	1,451,047	18,307	1,469,354
241-BY-106	2/16/2027	884	7/19/2029	1,922,239	3,975	1,926,214
241-BY-103	2/26/2027	636	11/23/2028	1,075,881	15,911	1,091,792
241-BY-107	4/6/2027	572	10/29/2028	962,550	32,119	994,669
241-AX-102	4/16/2027	110	8/4/2027	77,718	2,208	79,926
241-BY-105	8/26/2027	713	8/8/2029	1,212,058	23,819	1,235,877
241-BY-108	8/26/2027	319	7/10/2028	471,323	17,885	489,208
241-BX-111	12/21/2027	299	10/15/2028	463,278	9,839	473,117
241-BX-110	7/10/2028	236	3/3/2029	617,156	16,252	633,407
241-B-105	10/15/2028	283	7/25/2029	347,948	3,421	351,369
241-AX-104	10/15/2028	36	11/20/2028	89,501	3,343	92,844
241-SX-114	10/29/2028	172	4/19/2029	868,268	34,278	902,546
241-U-104	11/20/2028	103	3/3/2029	269,527	11,444	280,971
241-C-110	11/23/2028	129	4/1/2029	280,323	11,621	291,944
241-B-107	3/3/2029	280	12/8/2029	449,037	18,591	467,628
241-SX-111	3/3/2029	148	7/29/2029	603,402	23,605	627,007
241-A-105	4/1/2029	170	9/18/2029	321,464	12,055	333,519
241-SX-110	4/19/2029	166	10/2/2029	294,480	11,553	306,033
241-TY-103	7/19/2029	142	12/8/2029	412,627	17,072	429,699
241-B-112	7/25/2029	65	9/28/2029	39,321	1,700	41,021
241-SX-112	7/29/2029	286	5/11/2030	440,496	17,276	457,772
241-TY-106	8/8/2029	70	10/17/2029	63,059	2,465	65,525
241-A-104	9/18/2029	232	5/8/2030	233,428	8,746	242,174
241-BX-101	9/28/2029	96	1/2/2030	286,850	10,929	297,779
241-SX-107	10/2/2029	343	9/10/2030	525,589	20,661	546,250
241-TY-104	10/17/2029	93	1/18/2030	136,503	5,460	141,963
241-U-110	12/8/2029	494	4/16/2031	1,396,287	52,447	1,448,734
241-T-101	12/8/2029	93	3/11/2030	756,454	29,342	785,795
241-BX-108	1/2/2030	63	3/6/2030	43,210	1,829	45,039
241-BX-102	1/18/2030	101	4/29/2030	185,355	7,084	192,439

Table 1
Baseline Single-Shell Tank Retrieval Sequence and Associated Data

Tank	Retrieval Start Date	Retrieval Duration	Retrieval End Date	Retrieved Liquid Vol. (gal)	Retrieved Solids Vol. (gal)	Total Retrieved Vol. (gal)
241-B-101	3/6/2030	99	6/13/2030	401,532	9,849	411,382
241-TY-101	3/11/2030	264	11/30/2030	765,124	28,802	793,927
241-T-112	4/29/2030	111	8/18/2030	110,128	4,225	114,353
241-T-103	5/8/2030	92	8/8/2030	254,285	9,489	263,774
241-SX-108	5/11/2030	441	7/26/2031	355,054	14,220	369,274
241-B-103	6/13/2030	75	8/27/2030	172,790	5,240	178,030
241-T-109	8/8/2030	158	1/13/2031	192,538	1,251	193,788
241-C-101	8/18/2030	87	11/13/2030	243,482	9,491	252,973
241-T-107	8/27/2030	195	3/10/2031	380,097	15,080	395,177
241-SX-115	9/10/2030	160	2/17/2031	56,661	2,227	58,888
241-U-112	11/13/2030	129	3/22/2031	293,892	11,149	305,040
241-T-108	11/30/2030	69	2/7/2031	128,410	5,374	133,784
241-C-111	1/13/2031	158	6/20/2031	368,009	13,825	381,834
241-T-106	2/7/2031	58	4/6/2031	116,823	4,425	121,248
241-SX-113	2/17/2031	263	11/7/2031	57,403	2,146	59,550
241-C-203	3/10/2031	7	3/17/2031	30,714	1,186	31,901
241-C-204	3/17/2031	52	5/8/2031	14,556	563	15,119
241-U-101	3/22/2031	63	5/24/2031	104,817	4,126	108,943
241-C-201	5/8/2031	45	6/22/2031	15,806	605	16,411
241-C-202	6/20/2031	83	9/11/2031	6,716	273	6,989
241-TY-105	6/20/2031	175	12/12/2031	738,546	29,737	768,283
241-S-104	6/20/2031	208	1/14/2032	1,662,526	65,538	1,728,064
241-B-111	6/20/2031	157	11/24/2031	222,618	9,427	232,044
241-A-103	6/22/2031	412	8/7/2032	999,859	17,960	1,017,820
241-B-110	7/26/2031	162	1/4/2032	382,675	16,200	398,875
241-T-111	9/11/2031	271	6/8/2032	622,877	23,748	646,625
241-B-201	11/7/2031	18	11/25/2031	92,181	3,487	95,668
241-B-203	11/24/2031	28	12/22/2031	77,294	2,972	80,266
241-B-204	11/25/2031	28	12/23/2031	67,091	2,612	69,704
241-TX-106	12/12/2031	404	1/19/2033	1,097,688	19,335	1,117,022
241-TX-111	12/22/2031	315	11/1/2032	1,034,370	22,016	1,056,385
241-TX-102	12/23/2031	259	9/7/2032	647,804	12,954	660,757
241-TX-118	1/4/2032	310	11/9/2032	801,127	26,571	827,698
241-TX-108	1/14/2032	161	6/23/2032	393,196	9,780	402,976
241-TX-104	6/8/2032	101	9/17/2032	164,994	5,609	170,602
241-TX-109	6/23/2032	309	4/28/2033	516,846	21,229	538,075
241-TY-102	9/7/2032	99	12/15/2032	215,130	997	216,127