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1988 Tank Farm Waste Volume Projections

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Prepared for the U.S. Department of Energy
Assistant Secretary for Defense Programs

Westinghouse
Hanford Company Richland, Washington

Hanford Operations and Engineering Contractor for the
U.S. Department of Energy under Contract DE-AC06-87RL10930

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ABSTRACT

This report projects the double-shell tank space requirements to the year 2015. This document is based on operational and waste generation assumptions developed from the major Hanford waste generating facilities. Suggestions are presented to alleviate potential tank space shortages.

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ABBREVIATIONS, ACRONYMS, AND INITIALISMS

ASF	ammonia scrubber feed
BS	B Plant aging waste solids
BT	B Plant TRU solids
CC	complexant concentrate waste
CP	concentrated phosphate waste
DC	dilute complexed waste
D&D	decommissioning and decontaminating
DN	dilute noncomplexed waste
DP	dilute phosphate waste
DSS	double-shell slurry
DSSF	double-shell slurry feed
DST	double-shell tank
EDTA	ethylenediaminetetraacetic acid
FFTF	Fast Flux Test Facility
FY	fiscal year
GTF	Grout Treatment Facility
HEDTA	hydroxyethylenediaminetriacetic acid
HWVP	Hanford Waste Vitrification Plant
IDA	iminodiacetic acid
MMEC	Material Management Executive Committee
MTU	metric tonnes of uranium
NCAW	neutralized current acid waste
NCRW	neutralized cladding removal waste
NFAW	neutralized high-level acid waste
pCC	CC pretreated at B Plant
PD	PUREX decladding sludge (transuranic)
PFM	Process Facility Modification
PFP	Plutonium Finishing Plant
pNCAW	NCAW pretreated at B Plant
pNCRW	NCRW pretreated at B Plant
pPFP	PFP waste pretreated at B Plant
PREDICT	a computer code to model the evaporator
PRF	Plutonium Reclamation Facility
PSW	phosphate/sulfate waste
PT	PFP TRU solids
PUREX	Plutonium Uranium Extraction Facility
PWR II	Pressurized Water Reactor, Shippingport Core II
QWP	quarterly waste volume projections
RMC	Remote Mechanical C (Line)
SDPR	Special Design Production Reactor
SLP	Shear-Leach Processing
SWL	salt well liquid
TRU	transuranic
TRUEX	transuranic extraction
WG	weapons grade
WNP-1	Washington Public Power Supply System Plant 1
WVRF	waste volume reduction factor

1.0 INTRODUCTION

Waste volume projections are performed to optimize the storage of radioactive liquid waste streams generated on the Hanford Site and to analyze the coordination between tank farm activities (receiving facility waste, retrieving waste, and supplying facility feeds). Volume projections quantify the impact of changes in processing missions, the impact of new waste streams, the impact of waste retrieval, and the effect of technological enhancements on double-shell tank (DST) waste volumes. Volume projections predict future DST space shortages and provide a basis for technology studies to address potential problems.

Tank usage considerations include both interim storage costs and final disposal costs. A major cost associated with interim storage is DST construction. The major costs associated with final disposal are facility construction, retrieval, pretreatment, grout disposal operation, glass disposal operation, and repository fees.

This document provides an analysis of four processing cases: a Control Case, a Trended Case, a Lower Planning Case, and an Upper Planning Case. The Control Case is used for comparison and monitoring of actual waste generation rates. This case is based on fiscal year (FY) 1989 Budget Guidance and FY 1990 Recommended Activity. It is also based on waste volume generation targets. The Trended Case is a realistic picture of the current tank space situation and the direction in which the tank space situation is developing. The Trended Case is based on FY 1989 Budget Guidance and FY 1990 Budget Targets. The waste generation rates of the Trended Case are based on historical waste generation trends. The Lower Planning Case is representative of the lower bound of pressures that could increase tank requirements above the Trended Case. The case includes extended Plutonium Finishing Plant (PFP) operations and a 2-yr delay in Grout Treatment Facility (GTF) processing of regulated waste. The Upper Planning Case is representative of the upper bound of pressures that could increase tank requirements above the Lower Planning Case. The Upper Planning Case assumptions include processing Special Design Production Reactor (SDPR) fuel (beyond 1998) and completing salt well liquid (SWL) pumping in FY 1993. The Upper Planning Case is also based on the fact that 3.3 Mgal of SWL is complexed and that the GTF operations will require an extra tank for staging purposes. The Special Case (Appendix A) covers the possibility of an N Reactor restart after a delay, with all other assumptions consistent with the Trended Case.

This document will establish "base case" data for use in studies throughout the year. Special waste volume projections are generated throughout the year to provide input into the effects of contemplated changes in facility operations.

2.0 SUMMARY

This document presents a basis for evaluating anticipated DST needs. It presents a projected range of tank needs which is used to generate recommendations regarding production activities, waste management activities, and facility requirements. This document presents four cases (Control, Trended, Lower Planning, and Upper Planning Cases) which represent varying degrees of tank need pressures. An additional case, the Special Case, is included in Appendix A.

The Control Case reflects the FY 1989 Budget Guidance, 1990 Recommended Activity levels, and waste generation "target" rates. This case represents a "goal" to strive for. The Trended Case represents budget guidance (FY 1989 Guidance and 1990 Target Budget levels) and historical waste generation trends. This case represents the expected DST needs, given plant performance experience and budgeted activities. Various pressures (delays in the GTF startup, acceleration of SWL pumping completion, etc.) could potentially increase DST space requirements. The Lower Planning Case represents the tank space requirements based on modest additional tank space pressures above the Trended Case. The Upper Planning Case represents the tank space requirements based on maximum additional tank space pressures. The Special Case examines the possibility of an N Reactor restart after a delay, with all other assumptions consistent with the Trended Case.

The FY 1988 Control and Trended Case projections are significantly different from the FY 1987 Control Case projection in terms of peak tank need (Figure 1). The FY 1988 Trended Case was added this year because it better reflects actual site operating experience. The major change from the FY 1987 to the FY 1988 projection was the assumption that N Reactor will not operate past 1987. Without N Reactor operating, the number of metric tonnes of uranium (MTU) processed at the Plutonium Uranium Extraction (PUREX) Facility is significantly reduced. This greatly reduces the volume of waste requiring storage in the tank farm system. For the FY 1988 Control and Trended Cases, the existing tank space is sufficient to meet projected waste tank space needs. Spare aging waste space would be distributed among the aging waste tanks for 3 to 6 yr.

The significant assumption changes in the FY 1988 cases relative to the FY 1987 cases include the following:

- No restart of the N Reactor
- Decreases in the total number of MTU processed
- Changes in the PUREX Facility processing schedule
- Changes in the PFP processing schedules
- Changes in waste generation rates

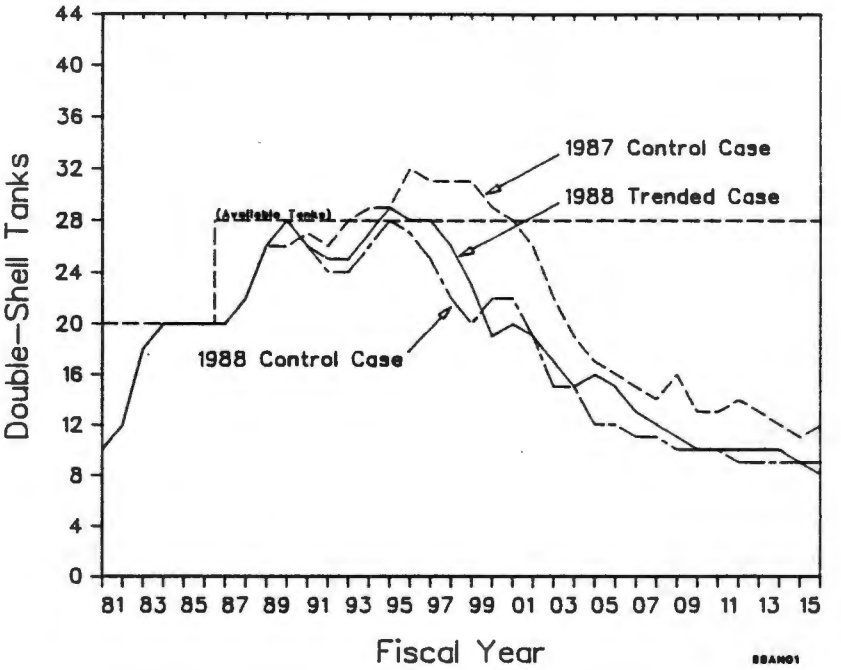

Figure 1. Comparison of Selected FY 1987 and FY 1988 Cases.

- Cancellation of AQ Tank Farm construction
- Reduction in the number of neutralized cladding removal waste (NCRW) receivers required.

These changes in assumptions significantly alter the projected tank needs. The assumptions for the 1987 Control Case, 1988 Control Case, and 1988 Trended Case are summarized in Table 1. Table 2 presents the major contributions to volume differences between the FY 1987 and FY 1988 Control Cases for the year of peak projected tank requirements (end of FY 1995).

The four cases (Control, Trended, Lower Planning, and Upper Planning) are presented in Figure 2. The shaded area between the Trended and Upper Planning Case represents the "range of probable tank needs." The planning of waste management actions is based on the assumption that the actual DST needs will fall within this range. As can be seen in Figure 2, there are two critical time periods relating to DST needs. The first is the time period between FY 1988 and FY 1991. The second critical time period is from FY 1992 to FY 2001.

2.1 AGING WASTE TANKS

Based on current projections, additional aging waste space will not be required beyond the capacity of the AY and AZ Tank Farms. The loss of a dedicated aging waste spare tank is projected for a period of 3 to 6 yr. During that time, there will be 1 Mgal of distributed space in the four aging waste tanks. The number of aging waste tanks required for the Control Case is shown in Figure 3.

Table 1. Major Assumption Comparisons for the FY 1987 Control and the FY 1988 Control and Trended Projections. (sheet 1 of 2)

Facility	FY 1987 Control Case	FY 1988 Control Case	FY 1988 Trended Case
N Reactor			
Shutdown date	FY 1995	FY 1987	FY 1987
Restart date	--	No	No
PUREX Processing			
Total (MTU) (FY 1987 and on)	10,609	4,404	4,279
PUREX processing complete	FY 1998	FY 1994	FY 1993
Shear-Leach processing	FY 1995	FY 1994	FY 1993
Type fuel processed in Shear-Leach processing	FFTF PWR II	FFTF	FFTF
N Reactor fuel (MTU) (FY 1987 and on)	8,828	2,976	2,851
PWR II fuel (eq. MTU)	51	51	51
FFTF fuel (eq. MTU)	1,730	1,377	1,377
B Plant Processing Start Dates			
Retrieved NCAW	FY 1991	FY 1992	FY 1993
Complexant concentrate	FY 1998	FY 1999	FY 2000
PFP TRU solids	FY 2003	FY 2003	FY 2004
NCRW solids	Not Processed	FY 2004	FY 2006
Hanford Waste Vitrification Plant			
Startup date	FY 1999	FY 1999	FY 1999
Grout Treatment Facility			
Startup date	FY 1988	FY 1988	FY 1988
Vault fill schedule (Vaults filled per year starting in FY 1988)	0.5,0.5,1, 1,2,5...	0.5,0.5,1, 3,3,5...	0.5,0.5,1, 1,2,5...
Vaults filled through FY 1993	10	13	10

Table 1. Major Assumption Comparisons for the FY 1987 Control and the FY 1988 Control and Trended Projections. (sheet 2 of 2)

Facility	FY 1987 Control Case	FY 1988 Control Case	FY 1988 Trended Case
Plutonium Finishing Plant			
Processing schedule			
Plutonium Reclamation Facility	FY 1987-92	FY 1987-92	FY 1987-98
Remote Mechanical C Line	FY 1987-96	FY 1987-91	FY 1987-94
TRUEX implemented	No	No	FY 1993
Salt Well Liquid Pumping			
FY 1986-92 (Mgal)	1.2	1.2	1.2
Total volume pumped (Mgal)	5.5	5.5	5.5
Miscellaneous			
AQ Tank farm operational	January 1993	Cancelled	Cancelled
Tank 107-AN conversion to aging spare service (if needed)	January 1991	Cancelled	Cancelled
Interim waste storage form	Double-Shell Slurry Feed (DSSF)		
Number of NCRW tanks			
Before consolidation of tanks 103 and 105-AW	4	3	3
After consolidation (FY 1995)	4	2	2

FFTF = Fast Flux Test Facility.
FY = Fiscal Year.
MTU = Metric tonnes uranium.
NCAW = Neutralized current acid waste.
NCRW = Neutralized cladding removal waste.
PFP TRU = Plutonium Finishing Plant transuranic.
PUREX = Plutonium Uranium Extraction Facility.
PWR II = Pressurized Water Reactor, Shippingport Core II fuel.
TRUEX = Transuranic extraction.

Table 2. Major Contributions to Concentrated Volume Differences Between FY 1987 and FY 1988 Control Cases.

Change	Volume (kgal)	Remarks
Inventory	+105	The decrease in waste generation from limited facility operations was offset by increased waste generation. With facilities starting up and shutting down, waste generation rates per MTU were higher than previously assumed.
PUREX		
NCAW	-1274	Due to decreased MTU processing.
NCRW	-2280	Operations require only two NCRW tanks instead of four as in the FY 1987 Control Case.
	-281	Due to decrease in number of MTU processed.
Miscellaneous	-208	Due to decrease in number of MTU processed.
B Plant		
NCAW Processing	-927	Due to delaying B Plant schedule 2 yr.
Retrieval	-2280	Two retrieval tanks were used in the FY 1987 Control Case. For the FY 1988 Control Case, the solids were not retrieved from the tank and waste was put on top of the solids.
Total	-7145	Reduction in the number of MTU processed, number of tanks required (retrieval and NCRW), and B Plant delay significantly reduced our tank needs.

FY = Fiscal year.
MTU = Metric tonnes uranium.
NCAW = Neutralized current acid waste.
NCRW = Neutralized cladding removal waste.
PUREX = Plutonium Uranium Extraction Facility.

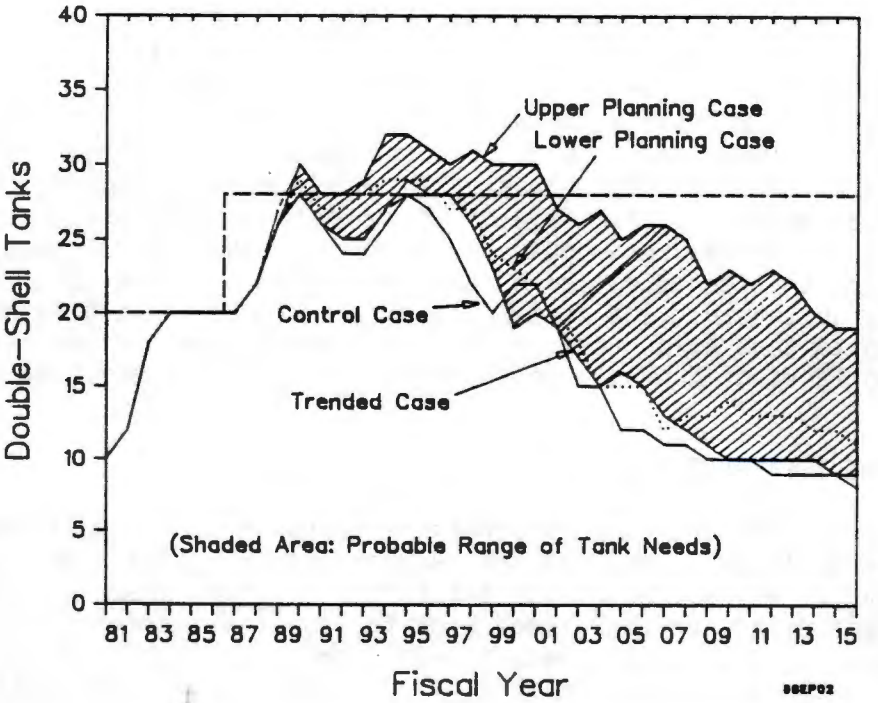

Figure 2. Comparison of Tank Requirements for the Four Cases.

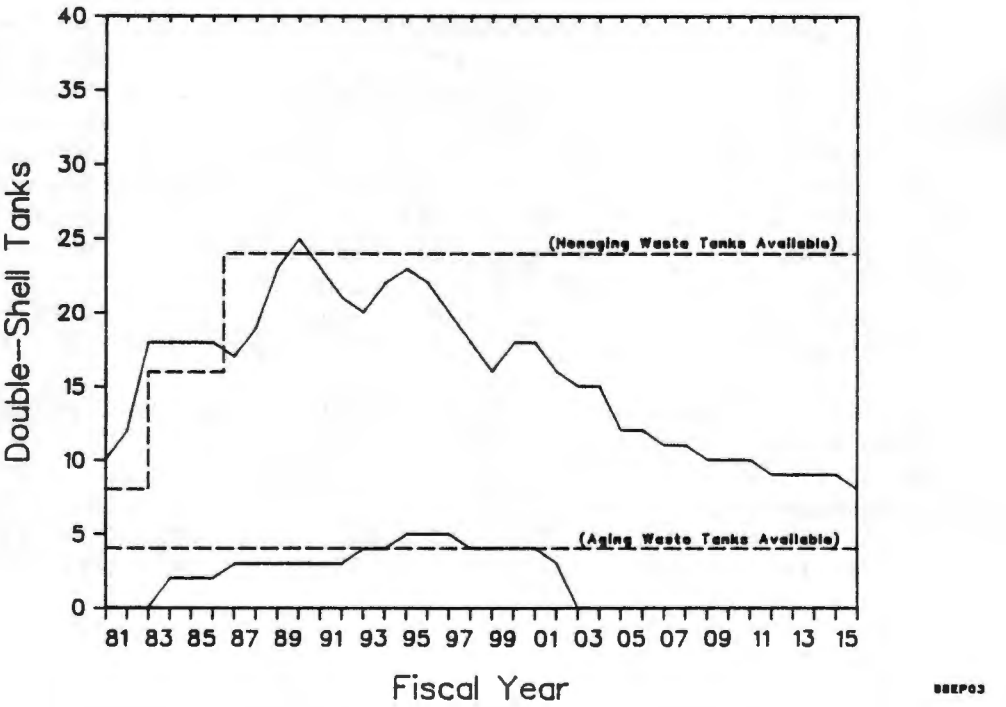

Figure 3. Tank Needs by Waste Type for the Control Case.

Aging waste space needs can be reduced by generating less waste or putting more waste into each aging waste tank. The PUREX Facility has not consistently reached the target neutralized current acid waste (NCAW) generation rate of 245 gal/MTU. The third aging waste tank is projected to be only partially full. If the PUREX Facility aging waste generation rate was reduced to the target rate, the third aging waste tank would not be needed to store NCAW. More waste could be stored in each aging waste tank if the concentration of the liquid in these tanks could be increased. There is a process test planned to increase the concentration of the waste from 5.0M sodium to 5.5M. If this effort is successful, 10% more waste can be stored in each aging waste tank. If the waste generation rate is decreased and/or the concentration in the first two tanks of NCAW can be increased, one aging waste tank could be saved.

2.2 GROUT TREATMENT FACILITY

Grout Treatment Facility operations represent the single most influential final waste disposal activity for recovery of DST space. Increasing the processing of waste through the GTF before the tank space peak is reached can help manage projected tank space shortfalls. The increased throughput could be achieved by increasing the work-off rate or by increasing the waste loading in the grout. The GTF waste work-off rate should be increased to the level of 0.5, 0.5, 1, 3, 3, 5 . . . vaults filled per year starting in FY 1988 (13 vaults through FY 1993).

2.3 NONAGING WASTE TANKS

Waste generation rate reduction actions should continue to be tracked and pursued. Waste generators must continue to strive to achieve the target waste generation rates that are reflected in the Control Case assumptions. Efforts should also be directed at improving the efficiency of tank space utilization. As an example, tanks 103 and 105-AW contain over one million gallons of usable storage space. If this space were utilized, projected needs could be reduced by one tank. Proposed ways of utilizing that space are to consolidate tanks 103 and 105-AW or to find a waste that can be stored on top of the transuranic (TRU) solids. Tanks 103 and 105-AW could be combined after retrieval technology is demonstrated and the PUREX Facility is successfully producing a low-level decladding sludge. This issue should be resolved before FY 1991.

Another possible space-saving action is to make double-shell slurry (DSS) from double-shell slurry feed (DSSF). This would save up to 1.5 tanks (from FY 1989 to FY 1994) for the Upper Planning Case. Production of DSS is not a desirable measure because the retrieval of DSS is expected to be much more difficult than retrieval of DSSF and significantly increases final disposal costs. For this reason, production of DSS should be a "fallback" option for the recovery of tank space.

3.0 DISCUSSION

3.1 GENERAL METHODOLOGY

The process of making waste volume projections begins with the request for waste generation and waste composition information from each of the operating facilities that will contribute waste to DST inventory during the period of interest (FY 1988 through FY 2015). The operating facilities provide estimates of volume, composition, and radionuclide content data for each distinct waste stream exiting the facility. The operating facilities also provide assumptions concerning facility operation and the startup and shutdown dates of any major projects that will affect waste volumes and compositions.

Composition and radionuclide content data are used to determine waste segregation requirements (due to chemical, radionuclide, or heat content) and to provide input to evaporator performance models.

The composition data are combined with volumetric data to determine operational schedules for feed pretreatment, waste transfers, and evaporation. Concurrent with schedule determination, DST space is allocated as required. Philosophies used in operating DST farms (i.e., segregation of waste types) and operational requirements are adhered to as much as possible.

Most of the information used in the waste volume projection process is stored and evaluated by automated means. Data processing is illustrated in Figure 4.

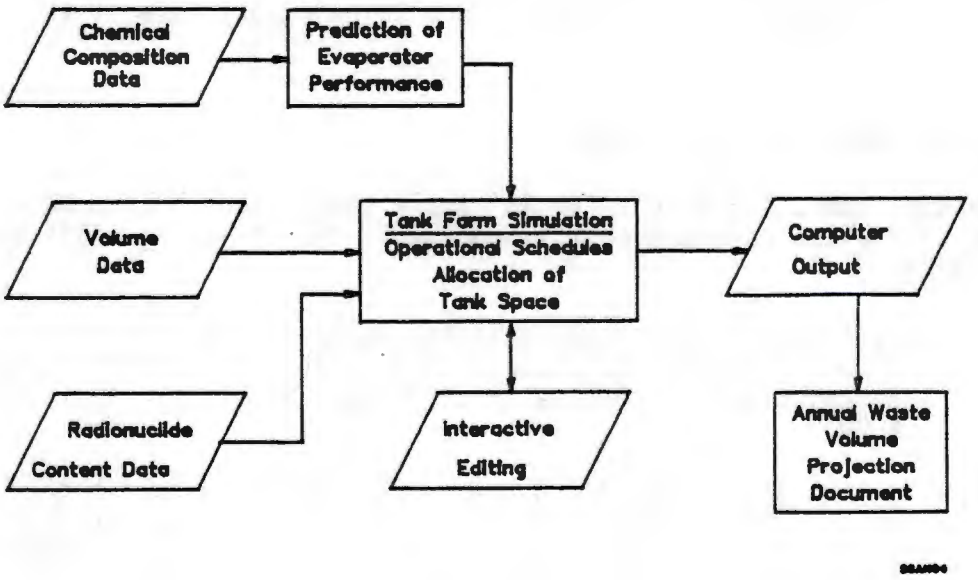

Figure 4. Waste Volume Projection Data Processing.

3.2 MAJOR FACILITY ASSUMPTIONS

The processing and waste handling assumptions pertinent to each processing facility are described in this section. Case-dependent information is presented in the Case Descriptions section (Section 3.3) and in Table 3.

3.2.1 N Reactor

It is assumed that N Reactor will not restart in all cases except the Special Case (Appendix A) in which restart will occur in FY 1990.

3.2.2 PUREX/Shear-Leach

Processing assumptions applicable to PUREX/Shear-Leach include the following:

- The PUREX Facility will process 2,851 MTU of N Reactor fuel and 51 MTU of the Pressurized Water Reactor, Shippingport Core II (PWR II), fuel through solvent extraction.
- Waste generation rates will differ for the four planning cases. Concentrated PUREX Facility waste generation rates are given in Table 4.
- The PUREX/Shear-Leach Facility will process 1,377 MTU (through solvent extraction) of Fast Flux Test Facility (FFTF) fuel using a shear-leach process.
- Shear-Leach processing will not be used for N Reactor or the pressurized water reactor from Shippingport Core II (PWR II) fuel in this study.

3.2.3 Double-Shell Tank Farms

Waste-type designations for DST imply segregation of one waste type from another. For the purposes of this document, the following waste types are considered:

- Neutralized Current Acid Waste (NCAW) is the high activity waste from PUREX Facility processing of spent nuclear fuel. Fuel types contributing to this waste stream are N Reactor, FFTF, PWR II, and SDPR.
- Dilute Complexed (DC) Waste is characterized by a high content of organic complexants with ethylenediaminetetraacetic acid (EDTA), citric acid, hydroxyethylenediaminetriacetic acid (HEDTA), and iminodiacetic acid (IDA) being the major complexants used. The main source of DC waste in this report is the SWL inventory.

Table 3. Major Assumptions for FY 1988.
(sheet 1 of 3)

Facility	Control Case	Trended Case	Lower Planning Case	Upper Planning Case	Special Case
N Reactor					
Restart date	No	No	No	No	1990[a]
Shutdown date	--	--	--	--	1996
Washington Public Power Supply System Plant 1					
Processing	None	None	None	Tritium	None
Startup date	--	--	--	1995	--
PUREX					
Date processing ceases	1994	1993	1994	1994[a]	1997
MTU FY 1984-92	6,157	6,032	6,157	6,157	7,056
MTU FY 1988-92	2,851	2,726	2,851	2,851	3,750
Total MTU from N Reactor					
FY 1984 to end of PUREX	6,157	6,032	6,157	6,157	11,523
FY 1988 to end of PUREX	2,851	2,726	2,851	2,851	8,217
PWR II fuel (eq. MTU)	51	51	51	51	51
FFTF fuel (eq. MTU)[b]	1,377	1,377	1,377	1,377	1,377
WNP-1, MTU (FY 1998-2015)[a]	0	0	0	904	0
Waste generation rates for N Reactor fuel processing, dilute gal/MTU (concentrated gal/MTU)					
NCAW (5M Na^+)	309(245)	405(320)	405(320)	405(320)	405(320)
Decladding Supn[c,d]	461(9)	461(9)	461(9)	461(9)	461(9)
Decladding Solids[c]	165(165)	165(165)	165(165)	165(165)	165(165)
Spent Metath. Supn[c,d]	328(45)	328(45)	328(45)	328(45)	328(45)
Spent Metath. Solids[c]	5(5)	5(5)	5(5)	5(5)	5(5)
Misc[d]	1,345(40)	2,533(43)	2,533(43)	2,533(43)	2,533(43)
Total	2,285(509)	3,897(587)	3,897(587)	3,897(587)	3,897(587)
Processing Facility Modification					
Startup	No	No	No	No	No
Tanks					
AQ Farm	None	None	None	None	None
107-AN conversion	None	None	None	None	None
NCAW tank limit	5M Na^+	5M Na^+	Solids	Solids	5M Na^+

Table 3. Major Assumptions for FY 1988.
(sheet 2 of 3)

	Control Case	Trended Case	Lower Planning Case	Upper Planning Case	Special Case
Salt Well Liquid Pumping					
Through FY 1993 (Mgal)	1.2	1.2	1.2	5.5	1.2
Completion date (5.5 Mgal)	FY 1996	FY 1996	FY 1996	FY 1993	FY 1996
Dilute complexed SWL	None	None	None	3.3 Mgal	None
Porosity	45%	45%	45%	45%	45%
B Plant					
Date NCAW demonstration	FY 1992	FY 1993	FY 1992	FY 1992	FY 1993
Crane replacement (mo)	6	6	6	6	6
Start first NCAW	FY 1993	FY 1994	FY 1993	FY 1993	FY 1994
NCAW rate (mo/tank)	24	24	24	24	24
TRUEX	Yes	Yes	Yes	Yes	Yes
Setup time (mo)	15	15	15	15	15
CC					
Demonstration (mo)	6	6	6	6	6
Process rate (kgal/yr)	1300	1300	1300	1300	1300
Volume processed (Mgal)	4.1	4.1	4.1	7.0	4.1
PFP TRU solids					
Demonstration (mo)	6	6	6	6	6
Process rate (kgal/yr)	242	242	242	242	242
TRU-NCRW					
Demonstration (mo)	6	6	6	6	6
process rate (kgal/yr)	210	210	210	210	210
Grout Treatment Facility					
Schedule (starting FY 1988)	(0.5,0.5, 1,3,3, 5...)	(0.5,0.5, 1,1,2, 5...)	(0.5,0.5, 0,0,2, 5...)	(0.5,0.5, 0,0,2, 3...)	(0.5,0.5, 1,1,2, 5...)
Vaults filled thru 1993	13	10	8	6	10
Grout staging/feed tanks	(1,1,1, 1,1,2...)	(1,1,1, 1,1,2...)	(1,1,1, 1,1,2...)	(2,2,2, 2,2,2...)	(1,1,1, 1,1,2...)
Date concentrated waste processing begins (CP, DSSF, DSS, NCAW supernatant, NCRW solids)	FY 1990	FY 1990	FY 1992	FY 1992	FY 1990
Hanford Waste Vitrification Plant					
Characterization time per tank in years	1	1	1	1	1
Startup date	FY 1999	FY 1999	FY 1998	FY 1998	FY 1999

Table 3. Major Assumptions for FY 1988.
(sheet 3 of 3)

	Control Case	Trended Case	Lower planning Case	Upper planning Case	Special Case
PFP					
TRUEX	None	1993	1993	1993	1993
Date processing ceases	FY 1992[e]	FY 1999	FY 2015	FY 2015	FY 2002
Line operation (sequential or concurrent)	Seq.	Seq.	Con.	Con.	Seq.
DSS Production	None	None	None	None	None

[a]The WNP-1 fuel will be processed in a new PUREX type facility which will separate fuel and cladding in a shear-leach process.

[b]This fuel is assumed to be declad in a shear-leach type process.

[c]Starting in FY 1989, the NCRW stream will be split into two streams to minimize the amount of TRU solids generated. The two streams are the spent metathesis stream (containing TRU solids) and the decladding stream (low-TRU solids).

[d]Concentrated values are calculated based on the PREDICT code to double-shell slurry feed (DSSF).

[e]The PFP operation ends 1 yr after the PUREX Facility finishes processing N Reactor fuel.

CC = Complexant concentrate waste.
CP = Concentrated phosphate.
DSS = Double-shell slurry.
DSSF = Double-shell slurry feed.
FFTF = Fast Flux Test Facility.
FY = Fiscal year.
MTU = Metric tonnes uranium.
Na = Sodium.
NCAW = Neutralized current acid waste.
NCRW = Neutralized cladding removal waste.
PFP = Plutonium Finishing Facility.
PREDICT = A computer code used to model the evaporation.
PUREX = Plutonium Uranium Extraction Facility.
PWR II = Pressurized Water Reactor, Shippingport Core II.
SWL = Salt well liquid.
TRU = Transuranic.
TRUEX = Transuranic extraction.

Table 4. Concentrated PUREX Waste Generation Rates (gal/MTU).

FY 1988

Waste	Control Case	Trended Case	Lower Planning Case	Upper Planning Case	Special Case
Aging waste @ 5M Na^+	245	320	320	320	320
NCRW supernatant (as DSSF)	83	91	91	91	91
NCRW solids	170	170	170	170	170
ASF (as DSSF)	120	120	120	120	120
Miscellaneous (as DSSF)	40	43	43	43	43
Total	658	744	744	744	744

FY 1989 Through Shutdown

Waste	Control Case	Trended Case	Lower Planning Case	Upper Planning Case	Special Case
Aging waste @ 5M Na^+	245	320	320	320	320
Decladding supernatant[a] (as DSSF)	9	9	9	9	9
Decladding solids	165	165	165	165	165
Spent metathesis supernatant (as DSSF)	45	45	45	45	45
Spent metathesis solids (as DSSF)	5	5	5	5	5
Miscellaneous (as DSSF)	40	43	43	43	43
Total	509	587	587	587	587

[a]Starting in FY 1989, the NCRW stream will be split into two streams to minimize the amount of TRU solids generated. The two streams are the spent metathesis stream (containing TRU solids) and the decladding stream (containing low-level solids.)

ASF = Ammonia scrubber feed.
DSSF = Double-shell slurry feed.
MTU = Metric tonnes uranium.
Na = Sodium.
NCRW = Neutralized cladding removal waste.
PUREX = Plutonium Uranium Extraction Facility.
TRU = Transuranic.

- Concentrated Complexant (CC) Waste is the concentrated product from the evaporation of DC waste.

- Dilute Noncomplexed (DN) Waste is the low activity liquid waste originating from T and S Plants, the 300 and 400 Areas, PUREX Facility (decladding supernatant and miscellaneous wastes), 100-N Area (sulfate waste), B Plant, salt wells, and PFP (supernatant).

- Double-Shell Slurry Feed (DSSF) is an interim storage form of concentrated product from evaporation of DN waste. This form is not as concentrated as DDS.

- Double-Shell Slurry (DSS) is an interim storage form of concentrated product from evaporation of DN waste.

- Dilute Phosphate (DP) Waste is the waste originating from the decontamination of the Hanford N Reactor. The waste is characterized by its high phosphate concentration (relative to other components).

- Concentrated Phosphate (CP) Waste is the concentrated product for DP waste.

- PUREX Neutralized Cladding Removal Waste Sludge is the solids portion of the NCRW waste stream. The NCRW waste stream is received in the tank farms as a slurry. The solids are allowed to settle and the noncomplexed liquid is decanted and concentrated. This stream is currently classified as TRU waste. Planned process modifications should generate a low-level waste, but a TRU fraction (metathesis waste) will remain.

- PUREX NCRW Low-Level Sludge is the the low-level sludge produced by the above mentioned planned process modifications.

- B Plant Aging Waste Supernatant is the NCAW liquid which has undergone a cesium and TRU removal process.

- B Plant Aging Waste Solids (BS) are the strontium and TRU solids from pretreatment of NCAW for processing to a final disposal waste form.

- PFP TRU Solids (PT) refer to the TRU solids from 200 West Area operations.

- B Plant TRU Solids (BT) refer to the TRU solids from pretreatment of CC, PFP TRU solids, and NCRW TRU solids at B Plant for processing to a final disposal waste form.

Waste types are segregated in tank farms for safety, operational, and economic reasons. Aging wastes are segregated from nonaging wastes to retain lower heat content in nonaging waste tanks. Phosphate and complexed wastes are segregated from noncomplexed wastes so the maximum waste volume reduction can be obtained for the noncomplexed wastes. Finally, dilute wastes are stored separately from concentrated wastes to avoid reevaporation of the concentrated wastes.

The current DSTs in the 241-AY (AY), 241-AZ (AZ), 241-AW (AW), 241-AN (AN), 241-SY (SY), and 241-AP (AP) tank farms provide for a total of 28 DSTs (including four aging waste tanks).

Efficient operation of these tanks is required so a lack of tank space does not curtail waste management or chemical processing missions. To model the operation of the tank farm system, certain tanks are designated as dilute receivers, slurry receivers, evaporator feed, grout feed, aging, aging spare, nonaging spare, and nonaging tanks. The use of a designated intermediate tank is more desirable than routing waste throughout the tank farm system, because of improved operating efficiency or routing consideration.

The following assumptions are made concerning the wastes and the operation of the 200 East and 200 West Area facilities.

- The 242-S evaporator (200 West Area) will not restart during the time frame of the study.

- Tank 103-SY will be retrieved and cross-site transferred during FY 1994. It will be treated as complexed waste upon receipt in 200 East Area. This waste will be moved to provide tank space to store 200 West Area SWL and low-level solids generated from the transuranic extractor (TRUEX) process in the PFP.

- Tank 101-SY will be retrieved and cross-site transferred when B Plant starts processing CC waste. It will be treated as complexed waste upon receipt in 200 East Area.

- Tank 101-AN will be used as the 200 East Area SWL receiver from FY 1992 to FY 1996.

- Tank 104-AW is designated as the dilute receiver for the 200 East Area.

- Tank 102-SY will be the designated receiver for wastes from S and T Plants and the PFP before tank 103-SY is cleaned out.

- After tank 103-SY is cleaned out (FY 1994), it will be used as a low-level receiver (S Plant, T Plant, PFP, and SWL).

- Tank 102-AW is designated as the evaporator feed tank during the time frame of the study.

- Tank 106-AW is the designated slurry receiver (the tank that

- Tank 106-AW is the designated slurry receiver (the tank that receives the concentrated waste generated by the evaporator).

- The projected aging waste filling sequence will be tanks 101-AZ, 102-AZ, 101-AY, and 102-AY.

All DSTs (except those in the AY and AZ Farms and the evaporator feed tank) are assumed to have a maximum capacity of 1.14 Mgal. The maximum capacities of the AY, AZ, and evaporator feed tanks are assumed to be 1 Mgal. Fill limits for each individual tank will depend on the contents of each tank. Fill limits (fraction of tank capacity) assumed for this document are listed in Table 5.

3.2.4 Salt Well Liquids

It is assumed that SWL pumping will occur for all tanks containing residual moisture greater than 5% of the tank volume. Supernatant pumping will occur for all tanks not scheduled for SWL pumping but containing free-standing supernatant greater than 5% of the tank volume. Salt well liquid pumping of tanks will terminate when a flow rate of 0.05 gal/min to the well head occurs or a major mechanical failure occurs and the tank in question contains less residual moisture than 5% of the tank volume. All cases, with the exception of the Upper Planning Case, assume that SWL will be noncomplexed, and the program will be completed by FY 1996 with 5.5 Mgal of SWL being pumped. The Upper Planning Case assumes completion of all SWL pumping by FY 1993. It also assumes that 3.3 Mgal of the 5.5 Mgal of SWL will be complexed and must be segregated. All leaking tanks will be pumped.

3.2.5 B Plant

Processing assumptions for B Plant include the following:

- The processing of PUREX Facility NCAW will be demonstrated at B Plant using 100 kgal of waste removed from the first aging waste tank (tank 101-AZ). This will take 12 mo. The NCAW will be processed by a settle-decant cycle. The solids (containing the TRU and strontium) will be washed and then sent to an aging waste tank to await vitrification in the Hanford Waste Vitrification Plant (HWVP). The supernatant, after passing through the inverted pneumatic hydropulse filter, will be run through an ion exchange process to remove the cesium and then sent to the tank farms. All tanks of retrieved NCAW are assumed to be sufficiently cooled so the supernatant can be evaporated with other noncomplexed wastes before grouting. This is because the NCAW was generated from processing the backlog fuel. The cesium recovered from the NCAW supernatant will be stored in B Plant to await a final decision on byproduct purification. This report assumes that the cesium will be mixed with the solids and sent to the HWVP for vitrification.

Table 5. Fractional Tank Fill Limit Assumptions.

Waste type	Fractional Tank fill limit[a]	Reason
Aging wastes (all)	0.98	Allows room for airlift circulator operation
Complexant concentrate	0.98	Two percent allowance for slurry growth[b]
Dilute complexed	1.00	
Double-shell slurry feed	1.00	
Dilute noncomplexed	1.00	
Dilute phosphate	1.00	
Double-shell slurry	0.90	Eight percent slurry growth[b] is assumed and 36-in. headspace for retrieval
Concentrated phosphate	1.00	
PUREX decladding sludge	0.81	Decanting operations
PFP TRU solids	0.61	Decanting operations and criticality considerations
B Plant TRU solids	0.98	Operations

[a]Aging waste tank capacity is 1 Mgal; capacity for other waste types is 1.14 Mgal.

[b]Slurry growth is a phenomenon whereby gas evolution results in an increase in the slurry volume.

PFP = Plutonium Finishing Plant.
PUREX = Plutonium Uranium Extraction Facility.
TRU = Transuranic.

- B Plant will be out of operation for 6 mo following the demonstration for crane replacement and maintenance.

- Production processing of the remainder of the first aging waste tank will follow the downtime. The remainder of the first tank will be processed in 24 mo.

- The second and third aging waste tanks will be processed at the rate of two years per full tank (980 kgal).

- There will be a 15-mo down period to install the TRUEX process in B Plant.

- Processing of CC waste will begin after all available NCAW has been processed. The TRUEX process and complexant destruction will be used to remove the TRU and complexants from the CC. The TRU solids will be sent to the tank farm system to await vitrification. The supernatant will be evaporated with other noncomplexed wastes before grouting. There is a 6-mo demonstration period assumed before full processing.

- Processing of PFP TRU solids will follow the CC waste processing. The TRUEX process will be used to remove the TRU from the PFP solids. The TRU solids from processing of PFP TRU solids will be sent to the tank farm system to await vitrification. The supernatant will be evaporated with noncomplexed wastes before grouting. There is a 6-mo demonstration period assumed before full processing of this waste.

- The NCRW solids will be processed after the PFP TRU solids using the TRUEX process. The TRU solids will be sent to the tank farm system to await vitrification. The supernatant will be evaporated with noncomplexed wastes before grouting. There is a 6-mo demonstration period assumed before full processing.

A detailed schedule of B Plant operations is given in Table 6.

3.2.6 Grout Treatment Facility

The GTF will become operational in FY 1988. Major facility assumptions for the GTF (Control Case) include the following.

- Dilute phosphate waste will be processed in the GTF during the first two campaigns (one vault filled).

- The DST wastes will be processed in the GTF starting in the third quarter of FY 1990.

- The amount of blending liquid for each waste type for grout purposes is summarized in Table 7.

- Due to the requirements for staging, characterizing, and grouting wastes, one dedicated grout feed tank will be required for up to three vaults per year grout processing rate. Two dedicated grout feed tanks will be required to process four or five vaults per year.

3.2.7 Hanford Waste Vitrification Plant

The HWVP will become operational in July 1999. Pretreated NCAW solids, cesium extracted from NCAW supernatant, pretreated CC TRU solids, pretreated PFP TRU solids, and pretreated NCRW TRU solids will be processed in the HWVP. The HWVP will only receive feed from pretreated waste stored in DSTs (i.e., it will not receive feed directly from B Plant).

Table 6. B Plant Schedule.

	Control Case	Trended Case	Lower Planning Case	Upper Planning Case
Startup date	Oct. 1991	Oct. 1992	Oct. 1991	Oct. 1991
NCAW processing				
First tank	April 1993	April 1994	April 1993	April 1993
Second tank	April 1995	April 1996	April 1995	April 1995
Third tank	April 1997	April 1998	June 1996	June 1996
CC Processing	Sept. 1998	Feb. 2000	June 1999	June 1999
PFP Processing	July 2002	Dec. 2003	April 2003	July 2005
NCRW Processing	April 2004	Nov. 2005	April 2006	July 2008

CC = Concentrated complexant waste.
NCAW = Neutralized current acid waste.
NCRW = Neutralized cladding removal waste.
PFP = Plutonium Finishing Plant.

Table 7. Grout Blending Ratios for Various Wastes.

Waste	Volume ratio blending liquid:waste
Dilute phosphate	No dilution
Concentrated phosphate	1:1
Double-shell slurry feed	1:1
Plutonium Uranium Extraction Facility neutralized current acid waste low-level sludge	2.3:1
B Plant aging waste supernatant	No dilution
Double-shell slurry	2:1

3.2.8 Plutonium Finishing Plant

Processing missions identified for the PFP include the following.

- The Plutonium Reclamation Facility (PRF) is an active solvent extraction facility which will be used to process Hanford scrap and Material Management Executive Committee (MMEC) scrap into pure, concentrated plutonium nitrate solutions.
- The Remote Mechanical C (RMC) Line will be used to convert PUREX weapons grade (WG) plutonium nitrate to metal.
- The RMC Line will also be used to convert the plutonium nitrate received from PRF processing of MMEC scrap to metal.
- The TRUEX process will be implemented in the PFP in FY 1993 for all cases except the Control Case.

3.2.9 S Plant (222-S Laboratories)

All planning cases assume continued support from the 222-S Laboratories from FY 1988 through FY 2015. Waste generation rates differ for each case ranging from 0.31 to 0.61 concentrated kilogallons per year.

3.2.10 T Plant

It is assumed that decontamination activities at T Plant will continue from FY 1988 to FY 2015. Waste generation rates differ for each of the four cases from 4.5 to 13.5 concentrated kilogallons per year.

3.2.11 100-N Area

The Hanford N Reactor was shut down in FY 1987. Backlog irradiated N Reactor fuel will be shipped to the chemical processing areas (PUREX) for reprocessing. The majority of future waste volumes originate from N Reactor fuel reprocessing activities.

3.2.12 300 and 400 Areas

3.2.12.1 Fuels Fabrication Waste. The only case that assumes the N Reactor will restart is the Special Case (Appendix A). In this case, the Fuels Fabrication Facility (which supplies fuel for N Reactor) will operate until the end of FY 1995 (1 yr before N Reactor shuts down in the Special Case). In the other four cases, N Reactor is not assumed to restart, and Fuels Fabrication waste is not projected to be generated. The waste generation rates used for the Special Case are based on the trended rates.

3.2.12.2 300 and 400 Areas Facility Waste. The facilities in the 300 and 400 Areas generate miscellaneous wastes. The waste generation rates for the cases vary from 0.7 to 2.4 concentrated kilogallons per year.

3.2.13 Miscellaneous

It is assumed that no wastes currently going to soil columns (cribs) will be sent to the tank farms.

3.3 CASE DESCRIPTIONS

3.3.1 General Assumptions

The following general assumptions are assumed for all cases.

- The 200 East Area evaporator, 242-A, will be operational throughout the time frame of the study, except for an outage in FY 1989 for upgrades.
- No restart of the 200 West Area evaporator, 242-S, will occur during the time frame of the study.
- Salt well liquid will be pumped until residual moisture in the tank does not exceed 5% of the tank volume. A total of 5.5 Mgal of SWL will be pumped.
- The 200 West Area wastes will be cross-site transferred throughout the time frame of study.

The assumptions used for all cases are presented in Table 3.

3.3.2 Control Case

The assumptions pertaining to the Control Case are described in this section. The timing of the key assumptions associated with the Control Case is illustrated in Figure 5.

3.3.2.1 B Plant. The assumptions for the Control Case that pertain to B Plant include the following.

- The B Plant NCAW demonstration will involve the processing of 100 kgal from October 1991 to September 1992.
- The NCAW will not be processed at B Plant from September 1992 to April 1993 to allow for crane repair and maintenance.

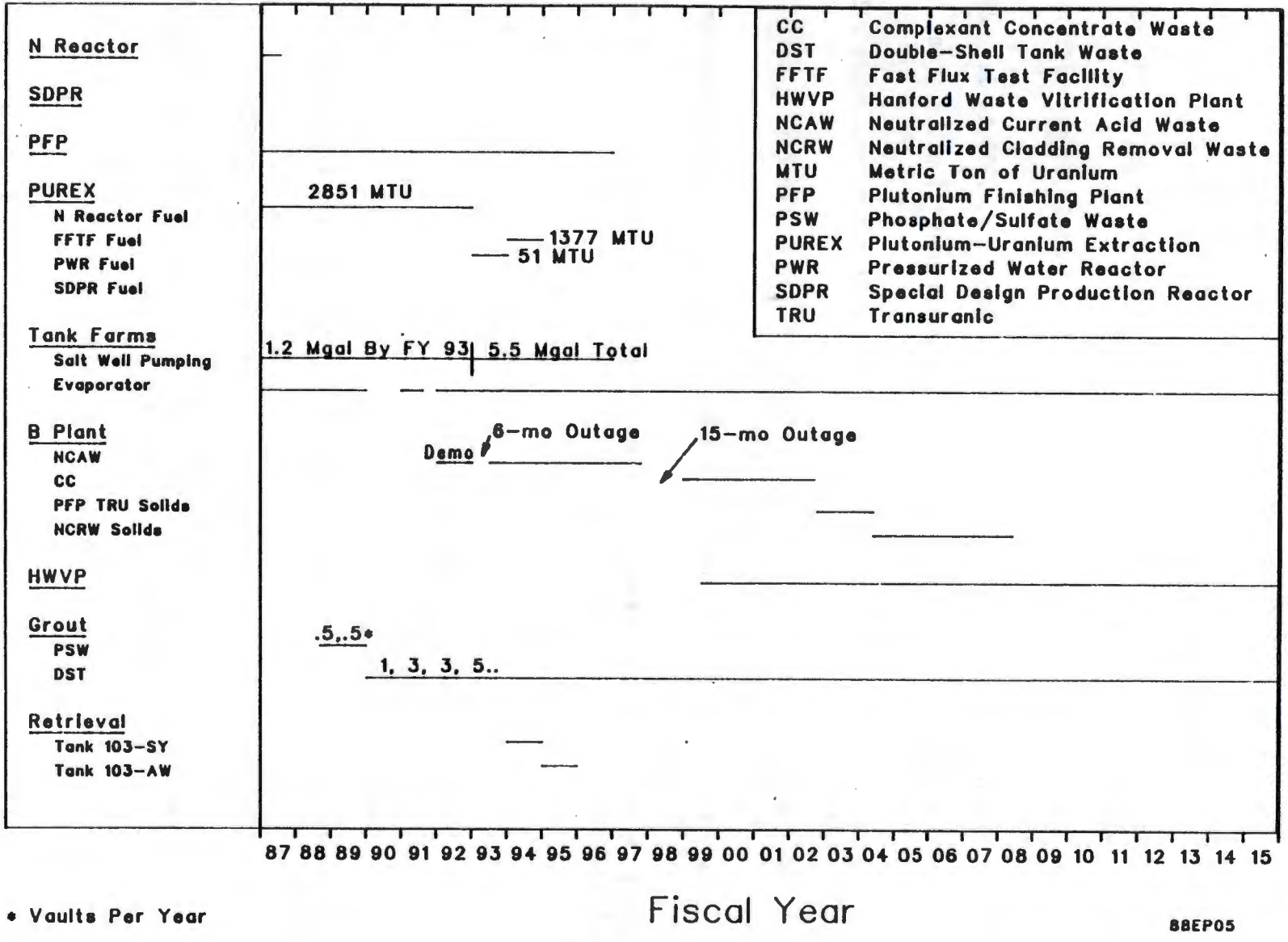

Figure 5. Key Assumptions Associated with the Control Case.

- Full-scale production processing of NCAW at B Plant will continue from April 1993 to April 1995 in order to process the remainder of the first tank of NCAW.

- The second and third tanks of NCAW will be processed from April 1995 to June 1997 at the rate of two years per full (980 kgal) tank.

- The B Plant process operations will be halted to install the TRUEX process from June 1997 to September 1998.

- The CC demonstration processing will occur from September 1998 to March 1999.

- Production processing of CC will occur from March 1999 to July 2002.

- The demonstration of PFP TRU solids processing will occur from July 2002 to January 2003.

- Production processing of PFP TRU solids will occur from January 2003 to April 2004.

- The demonstration processing of NCRW TRU solids processing will occur from April 2004 to October 2004.

- Production processing of NCRW TRU solids will occur from October 2004 to April 2008.

3.3.2.2 Hanford Waste Vitrification Plant. The assumptions for the Control Case that pertain to the HWVP include the following.

- The HWVP will become operational in July 1999.

- Feed sources for the HWVP are as follows:

- Pretreated NCAW Solids and cesium
- Pretreated CC TRU solids
- Pretreated PFP TRU solids
- Pretreated NCRW TRU solids.

3.3.2.3 Plutonium Finishing Plant. The assumptions for the Control Case that pertain to the PFP include the following.

- The MMEC scrap will be processed from FY 1988 to FY 1991.

- The RMC Line will convert PUREX WG plutonium nitrate to metal from FY 1988 to FY 1991. At that time, all of the WG fuel from N Reactor will have been processed at the PUREX Facility.

- The PRF, a solvent extraction facility, will process plutonium from FY 1988 to FY 1992.

- The TRUEX process will not be implemented in the Control Case because it cannot be implemented until after PFP operations stop.

- The PFP production operations will stop in FY 1992.

3.3.2.4 PUREX. The assumptions for the Control Case that pertain to the PUREX facility include the following.

- The amount of N Reactor and PWR II fuel processed through the PUREX Facility will be 2,902 MTU from FY 1988 to FY 1993.

- The PUREX/Shear-Leach Facility will process 1,337 equivalent MTU of FFTF fuel during FY 1994.

3.3.2.5 Tank Farms. The assumptions for the Control Case that pertain to the tank farms include the following.

- The total SWL to be transferred to DSTs through FY 1996 will be 5.5 Mgal.

- The SWL pumping goal for FY 1988 to FY 1993 will be 1.2 Mgal.

- All SWL generated will be noncomplexed.

- The volume of NCAW stored in the aging waste tanks will be limited by the 5M sodium limit.

- The solids in tank 103-SY will be retrieved in FY 1994.

- Tank 103-AW will be consolidated into tank 105-AW in FY 1995.

3.3.2.6 Grout Treatment Facility. The assumptions for the Control Case that pertain to the GTF include the following.

- The GTF will become operational in FY 1988.

- A half vault of dilute phosphate waste will be processed in FY 1988 and the second half vault in FY 1989.

- Concentrated DST waste will be processed at the GTF starting in FY 1990.

- The GTF processing schedule (vaults filled per year starting in FY 1988) will be 0.5, 0.5, 1, 3, 3, 5, ...

- Due to the requirements for staging, sampling, and grouting wastes, two dedicated grout feed tanks will be required to ensure the four or five vault per year grout processing rate.

3.3.3 Trended Case

The assumptions pertaining to the Trended Case are the same as those pertaining to the Control Case, except as noted in this section. The timing of the key assumptions associated with the Trended Case is illustrated in Figure 6.

3.3.3.1 PUREX/Shear-Leach. The assumptions for the Trended Case that pertain to the PUREX facility include the following.

- A total of 2726 MTU of N Reactor fuel will be processed. This processing will not include the unirradiated fuel currently in the core.
- The FFTF fuel will be processed in FY 1993.
- Waste generation rates will be higher (see Table 4).

3.3.3.2 B Plant. The B Plant schedules will slip 1 yr. The NCAW demonstration will be processed from October 1992 through September 1993. A detailed schedule of B Plant operations is in Table 6.

3.3.3.3 Plutonium Finishing Plant. The assumption for the Trended Case that pertain to the PFP include the following.

- The PFP production operations will stop in FY 1999.
- The TRUEX process will be implemented in 1993.

3.3.3.4 Grout Treatment Facility. The GTF processing schedule will be 0.5, 0.5, 1, 1, 2, 5, . . . vaults filled per year starting in 1988.

3.3.4 Lower Planning Case

The assumptions pertaining to the Lower Planning Case are the same as the Trended Case, except as noted in this section. The timing of the key assumptions associated with the Lower Planning Case is illustrated in Figure 7.

3.3.4.1 PUREX/Shear-Leach. The assumptions for the Lower Planning Case that pertain to the PUREX facility include the following.

- A total of 2851 MTU of N Reactor fuel will be processed.
- The FFTF fuel will be processed in FY 1994.

3.3.4.2 Tank Farms. The volume of NCAW stored in the aging waste tanks will be limited by the solids-heat loading limit instead of the 5M sodium limit. The solids-heat loading limit will reduce the solids allowed in an aging waste tank for most of the high-heat wastes.

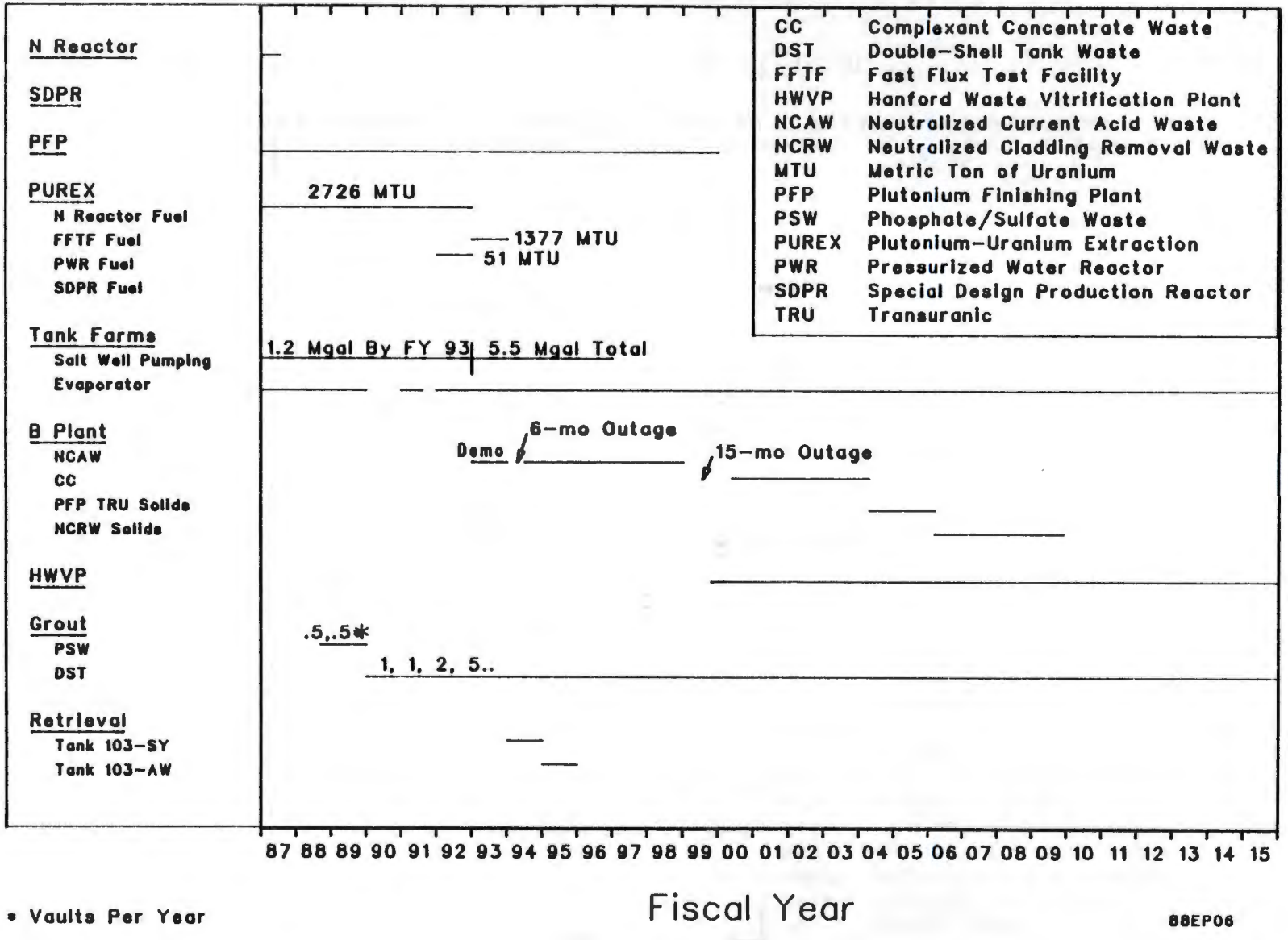

Figure 6. Key Assumptions Associated with the Trended Case.

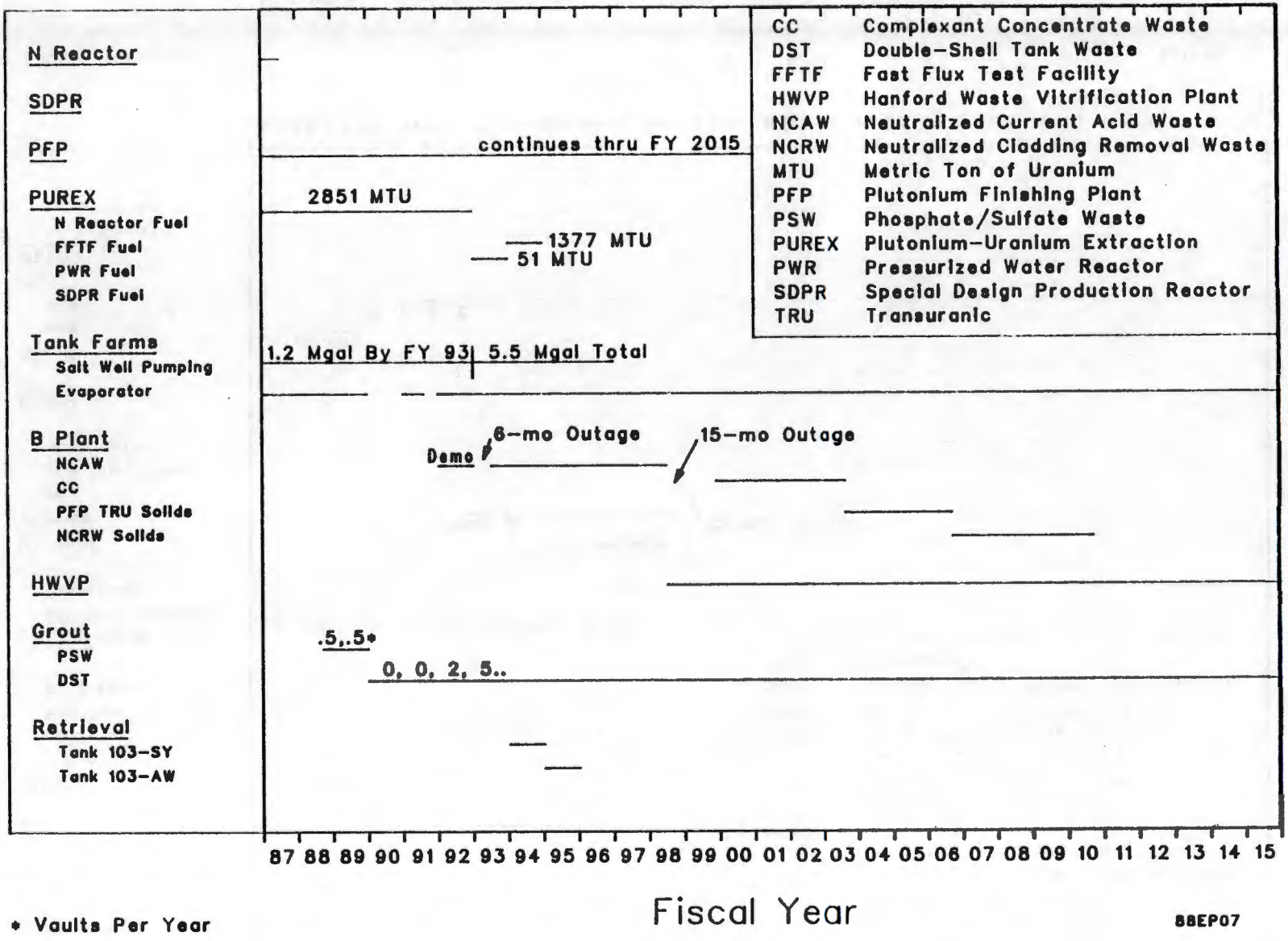

Figure 7. Key Assumptions Associated with the Lower Planning Case.

3.3.4.3 B Plant. The B Plant schedule will be accelerated 1 yr, beginning with the NCAW demonstration scheduled from October 1991 through September 1992. A detailed schedule for B Plant operations is shown in Table 6.

3.3.4.4 Plutonium Finishing Plant. The assumptions for the Lower Planning Case that pertain to the PFP include the following.

- The PFP production operations will be extended to FY 2015 to support additional MMEC scrap processing.
- The RMC Lines and PRF will be run concurrently.

3.3.4.5 Grout Treatment Facility. The GTF processing schedule (vaults filled per year starting in FY 1988) will be 0.5, 0.5, 0, 0, 2, 5, ... This reflects a 2-yr delay in the processing of regulated waste.

3.3.4.6 Hanford Waste Vitrification Plant. The HWVP startup is scheduled to begin 1 yr earlier (FY 1998).

3.3.5 Upper Planning Case

The assumptions pertaining to the Upper Planning Case are the same as the Lower Planning Case, except as noted in this section. The timing of the key assumptions associated with the Upper Planning Case is illustrated in Figure 8.

3.3.5.1 Washington Public Power Supply System Plant 1. The SDPR is assumed to be the Washington Public Power Supply System Nuclear Plant 1 (WNP-1) as converted to a tritium production facility in 1995.

3.3.5.2 PUREX. High-level waste from processing SDPR fuel in a new PUREX Facility will be sent directly to HWVP.

3.3.5.3 B Plant. The volume of CC waste processed will increase to seven million gallons. The additional complexed waste will come from SWL pumping operations.

3.3.5.4 Grout Treatment Facility. The GTF processing schedule will be 0.5, 0.5, 0, 0, 2, 3, . . . vaults filled per year starting in FY 1988. The number of vaults filled per year will peak at three.

3.3.5.5 Tank Farms. Salt well liquid pumping will be completed by FY 1993. A total of 5.5 Mgal will be pumped of which 3.3 Mgal will be DC waste.

3.4 WASTE ORIGINS

This section briefly describes the waste streams and waste types associated with each facility. Waste generation and waste volume reduction factors associated with each stream are given in Sections 3.5 and 3.6, respectively.

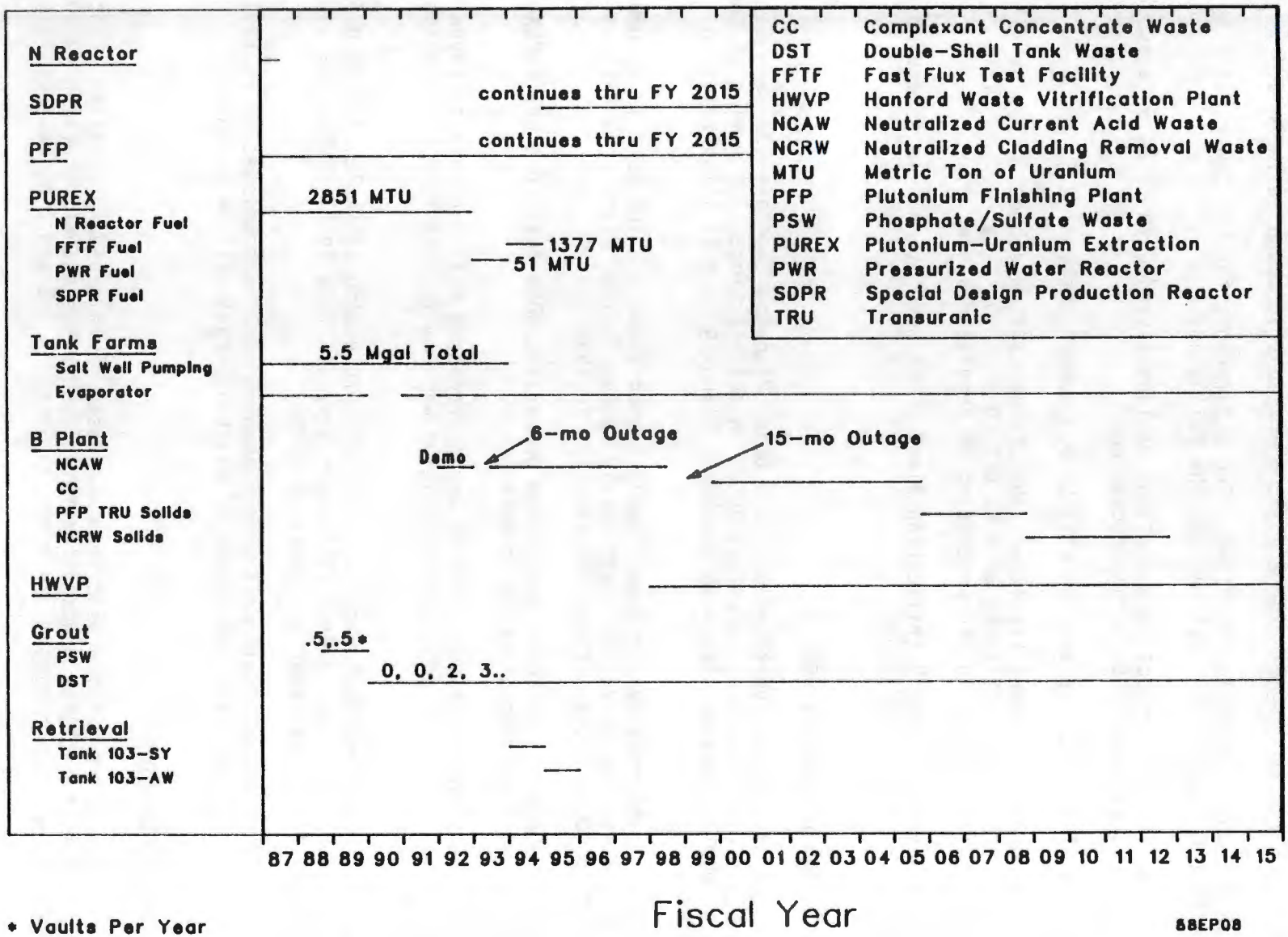

Figure 8. Key Assumptions Associated with the Upper Planning Case.

3.4.1 Plutonium Finishing Plant

Wastes from the PFP originate from solvent extraction, scrap stabilization, anion exchange, plutonium nitrate to plutonium metal conversion, and laboratory activities. The PFP waste stream is characterized as a slurry. After solids settle, the dilute, noncomplexed supernatant is decanted and processed as a low-level waste. The TRU solids will be stored until processed in B Plant before final disposal. After the TRUEX process is implemented in the PFP, the solids should be low-level waste.

3.4.2 PUREX

The NCAW waste from the PUREX Facility originates from the first-cycle solvent extraction column. The waste will be processed in B Plant before final disposal.

The NCRW waste is a slurry originating from the dissolution of the zircaloy cladding from N Reactor fuel. This waste is sent to a tank to settle. The supernatant is mixed with other dilute, noncomplexed wastes. This mixture is evaporated and grouted. Starting in FY 1989, the NCRW stream will be split into a spent metathesis stream and a decladding waste stream. The spent metathesis stream will contain small amounts of TRU solids, while the decladding waste stream should contain low-level solids. These streams will be sent to separate tanks. The solids will settle out and the supernatant will be mixed with other dilute, noncomplexed wastes and evaporated. This concentrated waste will be stored for final disposal in grout. The low-level NCRW solids will be grouted. Any TRU solids will be segregated and stored for pretreatment in B Plant before processing for final disposal.

The PUREX Facility miscellaneous wastes originate from decladding operations, solvent recovery, ammonia scrubber, acid recovery, and canyon cell sump wastes. This waste will be evaporated before final disposal in grout.

3.4.3 B Plant

B Plant produces miscellaneous noncomplexed waste from canyon cell sump and vessel cleanout. This waste will be evaporated before final disposal in grout.

B Plant processing of NCAW will generate a supernatant stream, which can be processed into grout or evaporated and then grouted. The NCAW processing will also generate a strontium and TRU solids stream which will be sent to an aging waste tank to await vitrification.

B Plant processing of CC, PFP TRU solids, and NCRW TRU solids will generate dilute, noncomplexed wastes and a TRU solid stream, each of which will be stored in tanks before processing for final disposal.

3.4.4 S Plant

Dilute, noncomplexed waste from S Plant is produced by 222-S Laboratory activities. This waste will be mixed with other dilute, noncomplexed wastes and then evaporated and grouted.

3.4.5 Tank Farms

Dilute waste from single-shell tanks (SWL) is the primary waste from tank farms to the DST inventory. The dilute, noncomplexed SWL is mixed with other dilute, noncomplexed waste. A portion of the SWL waste may be complexed. If so, the dilute, complexed SWL will be concentrated and processed in B Plant with other CC waste.

3.4.6 T Plant

T Plant waste is produced by decontamination activities. This waste is a dilute, noncomplexed slurry. The solids are low-level wastes, but as long as this stream is sent to 102-SY, the solids will be mixed with TRU solids. The supernatant from this waste will be mixed with other dilute, noncomplexed wastes and then evaporated and grouted.

3.4.7 Hanford Waste Vitrification Plant

Dilute, noncomplexed waste from the HWVP is produced by plant operations (offgas cleanup, etc.). This waste will be mixed with other dilute, noncomplexed waste and then evaporated and grouted.

3.4.8 100-N Area

Dilute, noncomplexed sulfate waste is produced by the regeneration of the N Reactor ion exchange column. This waste will be mixed with other dilute, noncomplexed wastes and then evaporated and grouted.

Dilute phosphate waste is from the decontamination of N Reactor. This phosphate waste will be sent directly to grout.

3.4.9 300 and 400 Areas

Dilute, noncomplexed waste originates from the 300 and 400 Area laboratories, the 300 Area Fuels Fabrication Facility, and the FFTF. This waste will be mixed with other dilute, noncomplexed wastes and then evaporated and grouted.

3.4.10 Grout Treatment Facility

The GTF will generate small quantities of waste from line flushes and decontamination.

3.4.11 Flush Water

Flush water volumes included in this document originate from the flushing of process vessels, piping, and railroad cars.

3.5 WASTE GENERATION VOLUMES

Dilute waste generation volumes for each case are presented in Appendix B.

3.6 WASTE VOLUME REDUCTION FACTORS

The waste volume reduction factor (WVRF) is a measure of how much water can be removed from a waste stream, specifically:

$$WVRF = 100\ (1-Vf/Vi)$$

where:

Vf = Final waste volume (solids and liquids) after all evaporative processing.

Vi = Initial volume of dilute waste sent to tank farms.

The WVRF factor represents the percent of initial volume removed as water.

Figure 9 illustrates a simplified flowsheet for evaporative processing using the tank farm evaporator. Actual processing of wastes will require several passes through the evaporator before the interim concentrated volume is reached.

Figure 10 illustrates evaporation from an aging waste tank. The heat source for evaporation from an aging waste tank can be from the waste itself, or heat may be added using steam coils present in these tanks.

Table 8 is a compilation of waste types and waste volume reduction factors associated with each waste stream.

Table 9 is a compilation of waste types and waste volume reduction factors associated with the DST inventory at the end of FY 1987.

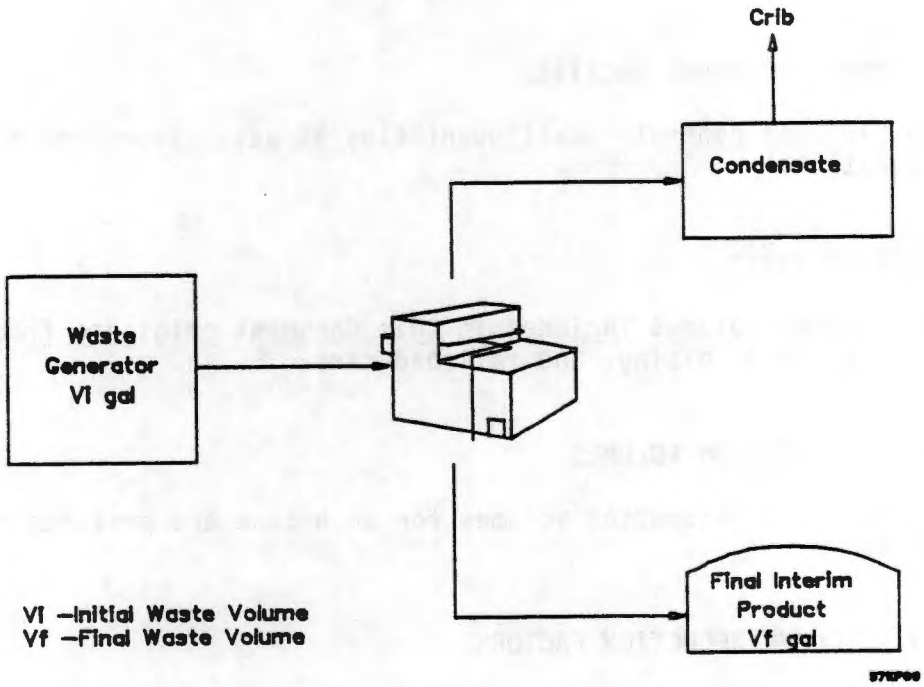

Figure 9. Evaporative Processing Using the 242-A Evaporator.

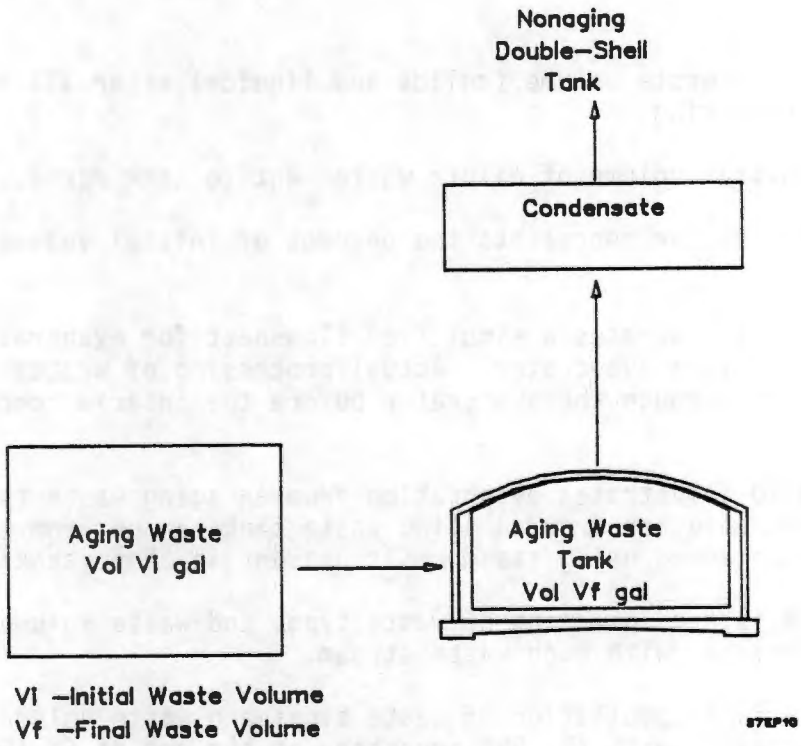

Figure 10. Evaporative Processing Using the an Aging Waste Tank.

Table 8. Waste Types and Waste Volume Reduction Factors for FY 1988. (sheet 1 of 10)

Waste origin	Waste type input to tank farms	Concentrated volume per 100 parts input to tank farms	Final interim product	Waste volume reduction factor (WVRF) (%)
Plutonium Finishing Plant				
PRF supernatant (No TRUEX)	Dilute noncomplexed	33	Double-shell slurry	67
		43	Double-shell slurry feed	57
PRF supernatant	Dilute noncomplexed	31	Double-shell slurry	69
		40	Double-shell slurry feed	60
PRF sludge	PFP TRU solids	100	PFP TRU solids	Not evaporated
RMC supernatant	Dilute noncomplexed	28	Double-shell slurry	72
		36	Double-shell slurry feed	64
RMC sludge	PFP low-level solids	100	PFP low-level solids	Not evaporated
PFP supernatant (lab waste)	Dilute noncomplexed	31	Double-shell slurry	69
		40	Double-shell slurry feed	60

Table 8. Waste Types and Waste Volume Reduction Factors for FY 1988. (sheet 2 of 10)

Waste origin	Waste type input to tank farms	Concentrated volume per 100 parts input to tank farms	Final interim product	Waste volume reduction factor (WVRF) (%)
PUREX				
NCAW	Aging waste	79	Aging waste	21
NFAW from PWR II processing	Aging waste	79	Aging waste	21
NCRW sludge	NCRW sludge	100	NCRW sludge	Not evaporated
NCRW supernatant (FY 1988 only)	Dilute noncomplexed	6	Double-shell slurry	94
		8	Double-Shell Slurry Feed	92
Decladding supernatant (FY 1989 on)	Dilute noncomplexed	1	Double-shell slurry	99
		2	Double-shell slurry feed	98
Spent methathesis (FY 1989 on)	Dilute noncomplexed	9	Double-shell slurry	91
		12	Double-shell slurry feed	88

Table 8. Waste Types and Waste Volume Reduction Factors for FY 1988. (sheet 3 of 10)

Waste origin	Waste type input to tank farms	Concentrated volume per 100 parts input to tank farms	Final interim product	Waste volume reduction factor (WVRF) (%)
Miscellaneous (FY 1988 on)	Dilute noncomplexed	2	Double-shell slurry	98
		3	Double-shell slurry feed	97
Miscellaneous from PWR II processing	Dilute noncomplexed	2	Double-shell slurry	98
		3	Double-shell slurry feed	97
PUREX/Shear-Leach				
NFAW from FFTF processing	Aging waste	42	Aging waste	58
Miscellaneous from FFTF processing	Dilute noncomplexed	2	Double-shell slurry	98
		3	Double-shell slurry feed	97
S Plant	Dilute noncomplexed	1	Double-shell slurry	99
		2	Double-shell slurry feed	98
Salt Well Liquid	Dilute noncomplexed	47	Double-shell slurry	53
		61	Double-shell slurry feed	39
	Dilute complexant	86	Concentrated complexant	14

Table 8. Waste Types and Waste Volume Reduction Factors for FY 1988. (sheet 4 of 10)

Waste origin	Waste type input to tank farms	Concentrated volume per 100 parts input to tank farms	Final interim product	Waste volume reduction factor (WVRF) (%)
T Plant				
As-is mode and FY 1988 standby	Dilute noncomplexed	3	Double-shell slurry	97
		4	Double-shell slurry feed	96
FY 1989-2015 standby	Dilute noncomplexed	1	Double-shell slurry	99
		2	Double-shell slurry feed	98
100 N Area				
Phosphate	Dilute phosphate	53	Concentrated phosphate	47
Sulfate	Dilute noncomplexed	1	Double-shell slurry	99
		2	Double-shell slurry feed	98
300, 400 Areas				
Fuels Fabrication Facility special case	Dilute noncomplexed	18	Double-shell slurry	82
		23	Double-shell slurry feed	77
300/400 Laboratory and other miscellaneous waste (all cases)	Dilute noncomplexed	1	Double-shell slurry	99
		2	Double-shell slurry feed	98

Table 8. Waste Types and Waste Volume Reduction Factors for FY 1988. (sheet 5 of 10)

Waste origin	Waste type input to tank farms	Concentrated volume per 100 parts input to tank farms	Final interim product	Waste volume reduction factor (WVRF) (%)
B Plant				
Cell drainage miscellaneous waste (FY 1988)	Dilute noncomplexed	8	Double-shell slurry	92
		10	Double-shell slurry feed	90
Cell drainage miscellaneous waste (FY 1989-2015)	Dilute noncomplexed	17	Double-shell slurry	83
		22	Double-shell slurry feed	78
NCAW processing (first tank)				
(pNCAW Liquid)	B Plant aging waste supernatant	53	Double-shell slurry	47
		69	Double-shell slurry feed	31
(pNCAW Solid)	B Plant aging waste solids	NA[a]	B Plant aging waste solids	NA[a]
NCAW Processing (second tank - Control/Trended/Special Cases)				
(pNCAW Liquid)	B Plant aging waste supernatant	53	Double-shell slurry	47
		69	Double-shell slurry feed	31
(pNCAW Solid)	B Plant aging waste solids	NA[a]	B Plant aging waste solids	NA[a]

Table 8. Waste Types and Waste Volume Reduction Factors for FY 1988. (sheet 6 of 10)

Waste origin	Waste type input to tank farms	Concentrated volume per 100 parts input to tank farms	Final interim product	Waste volume reduction factor (WVRF) (%)
NCAW Processing (second tank - Lower/Upper Planning Cases)				
(pNCAW Liquid)	B Plant aging waste supernatant	51	Double-shell slurry	49
		66	Double-shell slurry feed	34
(pNCAW Solid)	B Plant aging waste solids	NA[a]	B Plant aging waste solids	NA[a]
NCAW Processing (third tank - Control/Trended Cases)				
(pNCAW Liquid)	B Plant aging waste supernatant	55	Double-shell slurry	45
		72	Double-shell slurry feed	28
(pNCAW Solid)	B Plant aging waste solids	NA[a]	B Plant aging waste solids	NA[a]
NCAW Processing (third tank - Special Case)				
(pNCAW Liquid)	B Plant aging waste supernatant	52	Double-shell slurry	48
		66	Double-shell slurry feed	34
(pNCAW Solid)	B Plant aging waste solids	NA[a]	B Plant aging waste solids	NA[a]

Table 8. Waste Types and Waste Volume Reduction Factors for FY 1988. (sheet 7 of 10)

Waste origin	Waste type input to tank farms	Concentrated volume per 100 parts input to tank farms	Final interim product	Waste volume reduction factor (WVRF) (%)
NCAW Processing (third tank - Lower/Upper Planning Cases)				
(pNCAW Liquid)	B Plant aging waste supernatant	53	Double-shell slurry	47
		69	Double-shell slurry feed	31
(pNCAW Solid)	B Plant aging waste solids	NA[a]	B Plant aging waste solids	NA[a]
NCAW Processing (fourth tank - Special Case)				
(pNCAW Liquid)	B Plant aging waste supernatant	55	Double-shell slurry	45
		72	Double-shell slurry feed	28
(pNCAW Solid)	B Plant aging waste solids	NA[a]	B Plant aging waste solids	NA[a]
CC processing (supernatant from inventory)				
(pCC Liquid)	Dilute noncomplexed	32	Double-shell slurry	68
		42	Double-shell slurry feed	58
(pCC Solid)	TRU solids	NA[b]	TRU solids	NA[b]

Table 8. Waste Types and Waste Volume Reduction Factors for FY 1988. (sheet 8 of 10)

Waste origin	Waste type input to tank farms	Concentrated volume per 100 parts input to tank farms	Final interim product	Waste volume reduction factor (WVRF) (%)
CC processing (complexed SWL)				
(pCC Liquid)	Dilute noncomplexed	35	Double-shell slurry	65
		45	Double-shell slurry feed	55
(pCC Solid)	TRU solids	NA[b]	TRU solids	NA[b]
PFP TRU solids processing (Control/Special Cases)				
(pPFP Liquid)	Dilute noncomplexed	54	Double-shell slurry	46
		70	Double-shell slurry feed	30
(pPFP Solid)	TRU solids	NA[b]	TRU solids	NA[b]
PFP TRU solids processing (Trended Case)				
(pPFP Liquid)	Dilute noncomplexed	42	Double-shell slurry	58
		55	Double-shell slurry feed	45
(pPFP Solid)	TRU solids	NA[b]	TRU solids	NA[b]

Table 8. Waste Types and Waste Volume Reduction Factors for FY 1988. (sheet 9 of 10)

Waste origin	Waste type input to tank farms	Concentrated volume per 100 parts input to tank farms	Final interim product	Waste volume reduction factor (WVRF) (%)
PFP TRU solids processing (Lower/Upper Planning Case)				
(pPFP Liquid)	Dilute noncomplexed	53	Double-shell slurry	47
		68	Double-shell slurry feed	32
(pPFP Solid)	TRU solids	NA[b]	TRU solids	NA[b]
NCRW TRU solids processing (all cases)				
(pNCRW Liquid)	Dilute noncomplexed	20	Double-shell slurry	80
		26	Double-shell slurry feed	74
(pNCRW Solid)	TRU solids	NA[b]	TRU solids	NA[b]
Hanford Waste Vitrification Plant	Dilute noncomplexed	1	Double-shell slurry	99
		2	Double-shell slurry feed	98

Table 8. Waste Types and Waste Volume Reduction Factors for FY 1988.
(sheet 10 of 10)

NOTE: The volume of DSSF is based on a 30% increase in solids volume over DSS volume.

[a]Does not apply because this stream is not evaporated due to high radiolytic heat and radionuclide content.
[b]Does not apply because this stream is not evaporated before being fed to HWVP.

CC = Complexant concentrate waste.
DSS = Double-shell slurry.
DSSF = Double-shell slurry feed.
FFTF = Fast Flux Test Facility.
FY = Fiscal year.
NCAW = Neutralized current acid waste.
NCRW = Neutralized cladding removal waste.
NFAW = Neutralized high-level acid waste.
pCC = CC pretreated at B Plant.
PFP = Plutonium Finishing Plant.
pNCAW = NCAW pretreated at B Plant.
pNCRW = NCRW pretreated at B Plant.
pPFP = PFP waste pretreated at B Plant.
PRF = Plutonium Reclamation Facility.
PWR II = Pressurized Water Reactor, Shippingport Core II.
RMC = Remote Mechanical C Line.
SWL = Salt well liquid.
TRU = Transuranic.
TRUEX = Transuranic extraction.
WVRF = Waste volume reduction factor.

$$WVRF = 100(1 - Vf/Vi)$$

where:

Vf = Final waste volume (solids and liquids) after all evaporative processing
Vi = Initial volume of dilute waste sent to tank farms

The WVRF factor represents the percent of initial volume removed as water.

Table 9. Double-Shell Tank Inventory at the End of FY 1987.

Tank	Inventory (Kgal)	Inventory waste type	Maximum final interim[a] waste type	Maximum WVRF (%)
101-AN	663	DN	DSS	97
102-AN	1119	CC	CC	0
103-AN	935	DSS	DSS	0
104-AN	1067	DSSF	DSS	26
105-AN	1128	DSSF	DSS	31
106-AN	1048	CP	CP	0
107-AN	1095	CC	CC	0
101-AP	19	DN	DSS	100 (Water)
102-AP	971	DN	DSS	100 (Water)
103-AP	22	DN	DSS	100 (Water)
104-AP	1075	DP	CP	60
105-AP	19	DN	DSS	100 (Water)
106-AP	17	DN	DSS	100 (Water)
107-AP	17	DN	DSS	100 (Water)
108-AP	19	DN	DSS	100 (Water)
101-AW	1119	DSSF	DSS	4
102-AW	855	DN	DSS	62
103-AW	352/286	PD/DN	PD/DSS	0/92
104-AW	341	DN	DSS	97
105-AW	263/699	PD/DN	PD/DSS	0/49
106-AW	861	DN	DSS	62
101-AY	872	DC	CC	74
102-AY	259	DN	DSS	83
101-AZ	978	NCAW	NCAW	@ 5M Na[b]
102-AZ	262	NCAW	NCAW	@ 5M Na[b]
101-SY	457/664	CC/DSS	CC/DSS	0/0
102-SY	145/177	PT/DN	PT/DSS	0/93
103-SY	592	DSS	DSS	0

[a]This form would not necessarily be stored in the same tank.
[b]Volume calculated at 5M Na.

CC = Complexant concentrate.
CP = Concentrated phosphate.
DC = Dilute complexed.
DN = Dilute noncomplexed waste.
DP = Dilute phosphate.
DSS = Double-shell slurry factor.
DSSF = Double-shell slurry feed.
NCAW = Neutralized current acid waste.
PD = PUREX decladding sludge (transuranic).
PT = PFP transuranic solids.
PUREX = Plutonium Uranium Extraction Facility.
WVRF = Waste volume reduction factor.

3.7 YEARLY STORED VOLUMES

Calculations using the assumptions previously mentioned result in the storage volumes shown in Appendix C.

3.8 WASTE INFLOW AND OUTFLOW TO TANK FARMS

Figures 11 through 14 illustrate inflow, outflow, and accumulation volumes for each case. Each of these figures is drawn directly from the data bases maintained for waste volume projections. The lower most curve represents total accumulated volumes in DSTs. Adding to the accumulated volume, the remaining curves show the relative volumes of waste flowing out of the system. The upper most curve represents total cumulative inflow to DSTs, i.e., the total volume of waste that has ever flowed into the DST system.

3.9 EVAPORATOR OPERATION

Figures 15 through 18 illustrate waste volume reduction and throughput per year using the 242-A evaporator. The waste volume reduction is the amount of water removed from the waste. The throughput is the summed volume of feed to the evaporator reboiler for processing a given amount of initial feed through the evaporator using multiple passes. Also, during FY 1990, no evaporation is projected because the evaporator will be down for upgrades. These schedules represent evaporator operations required to minimize stored waste volumes.

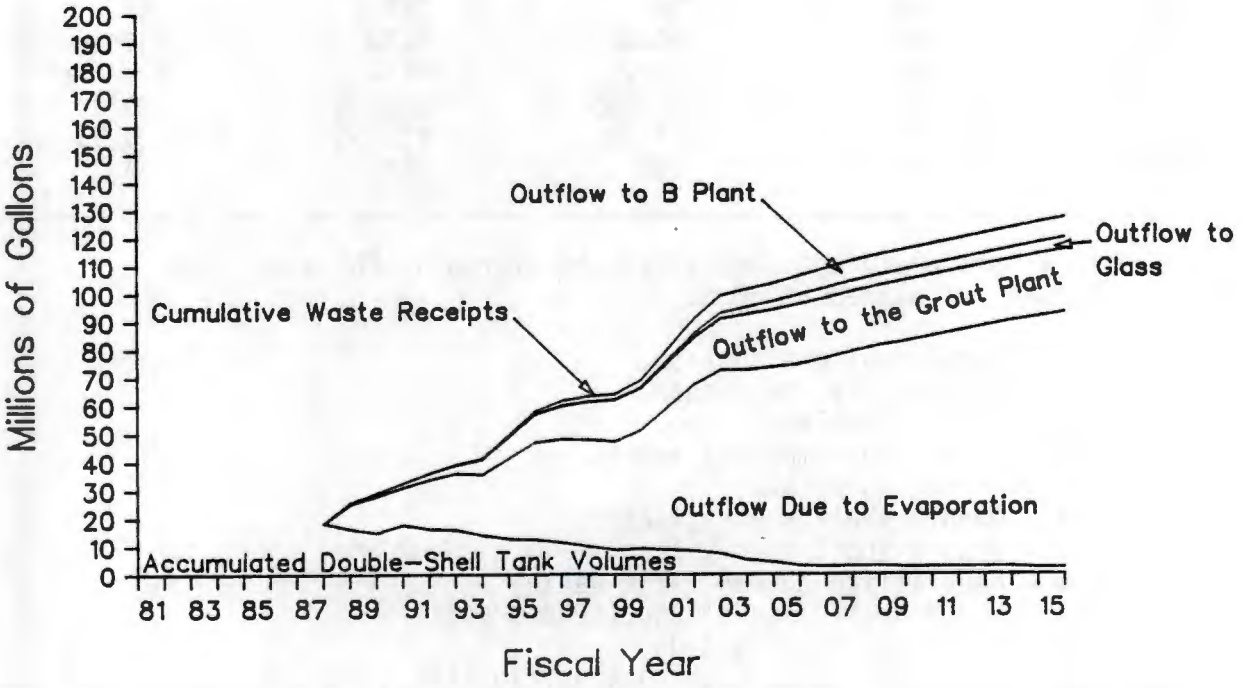

Figure 11. Inflow, Outflow, and Accumulative Volumes for the Control Case.

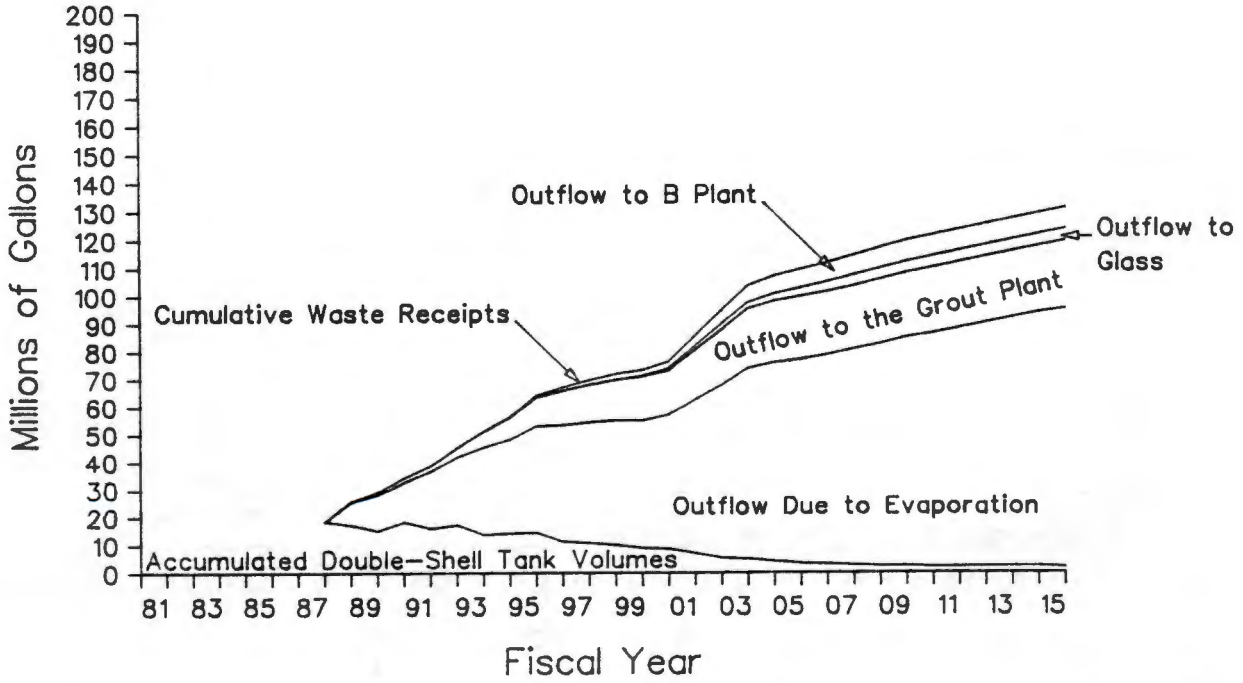

Figure 12. Inflow, Outflow, and Accumulative Volumes for the Trended Case.

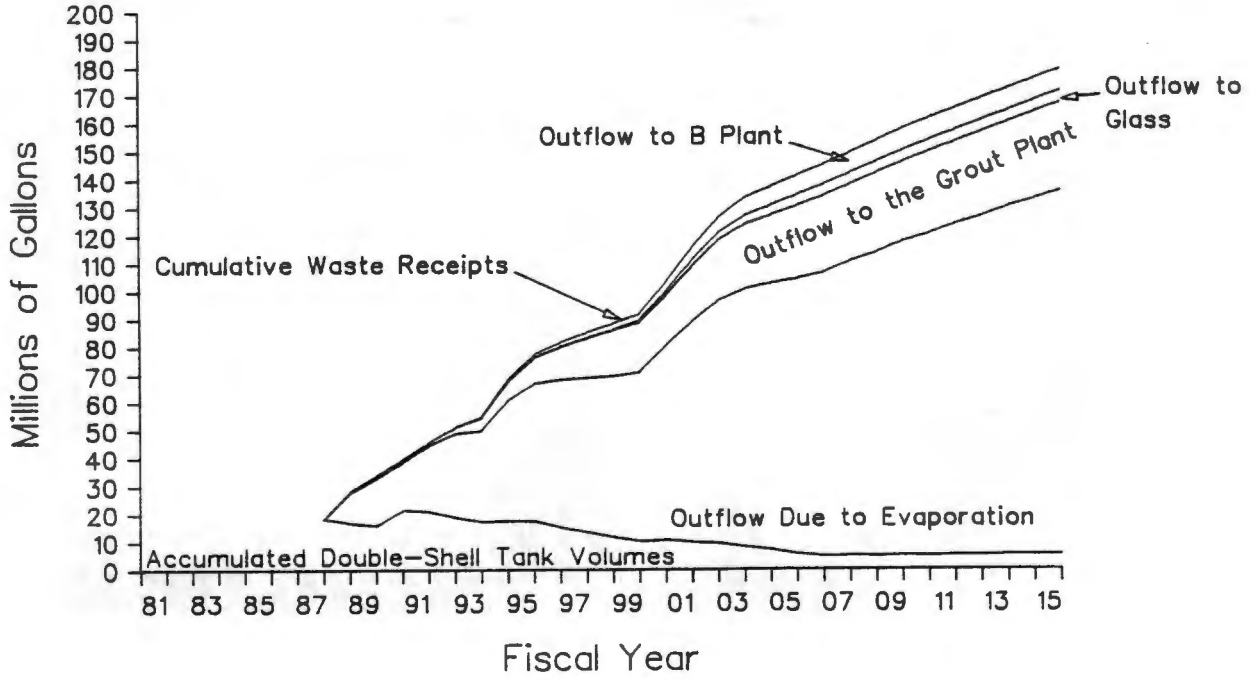

Figure 13. Inflow, Outflow, and Accumulative Volumes for the Lower Planning Case.

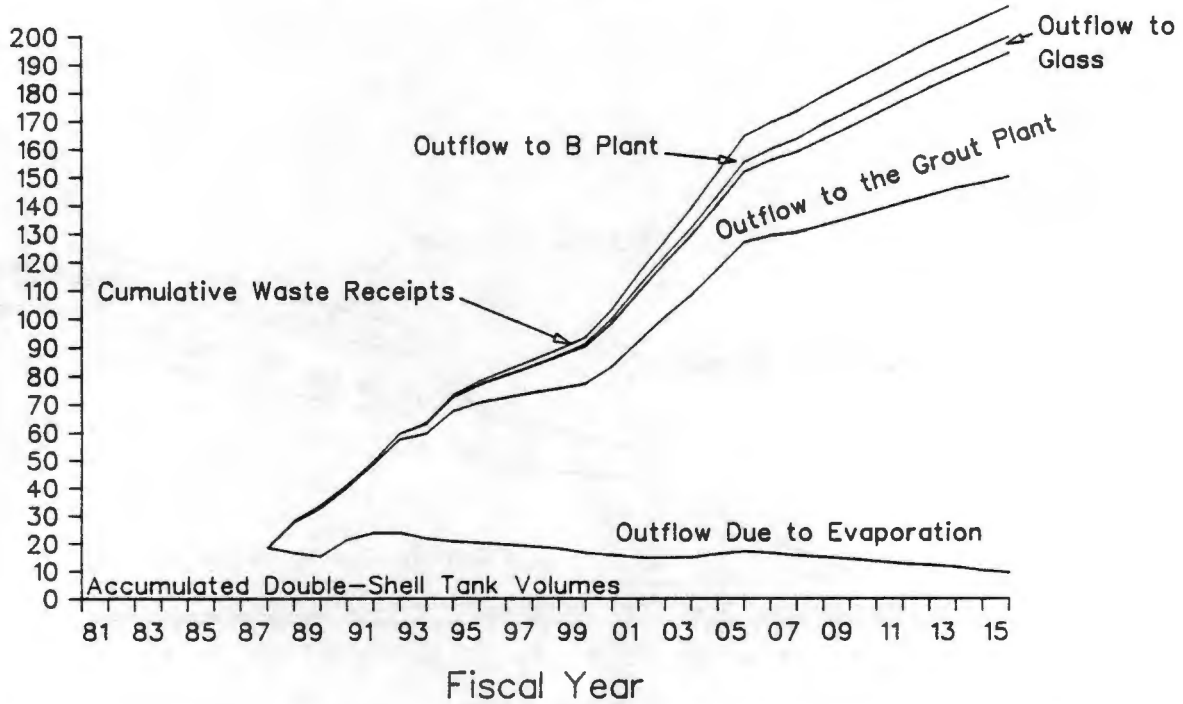

Figure 14. Inflow, Outflow, and Accumulative Volumes for the Upper Planning Case.

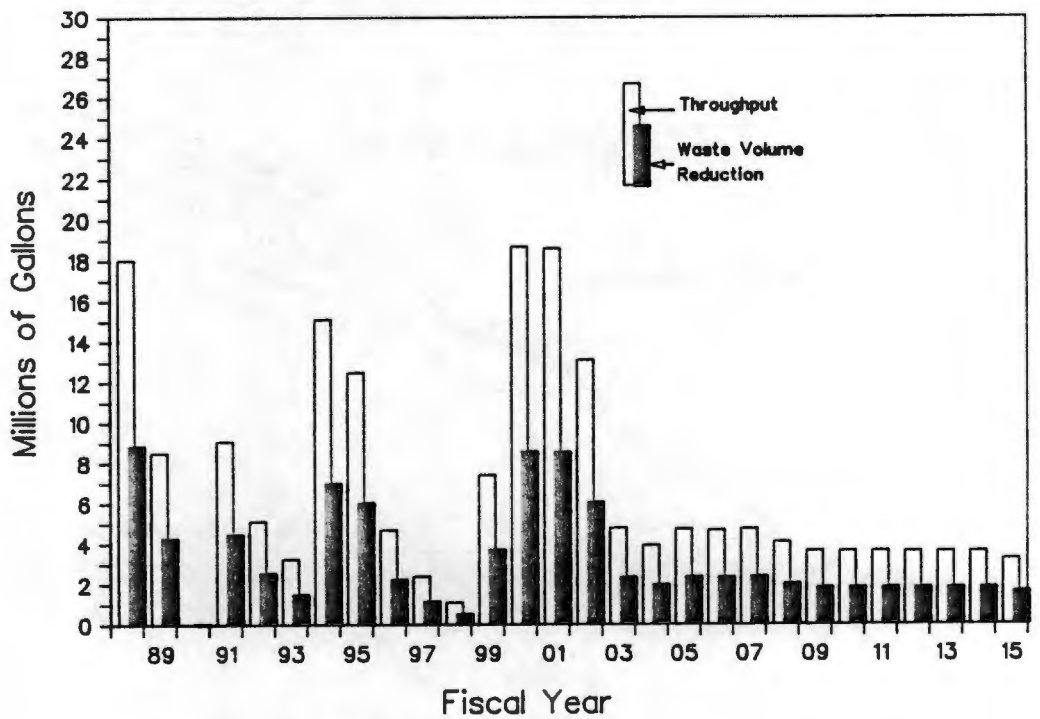

Figure 15. Evaporator Throughput and Waste Volume Reduction for the Control Case.

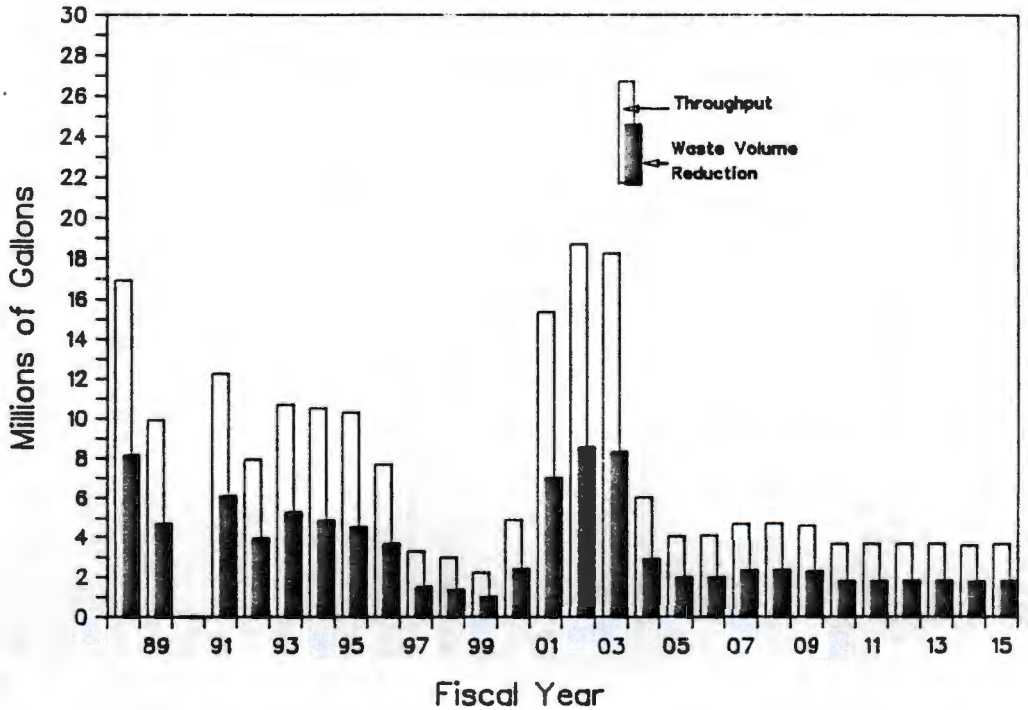

Figure 16. Evaporator Throughput and Waste Volume Reduction for the Trended Case.

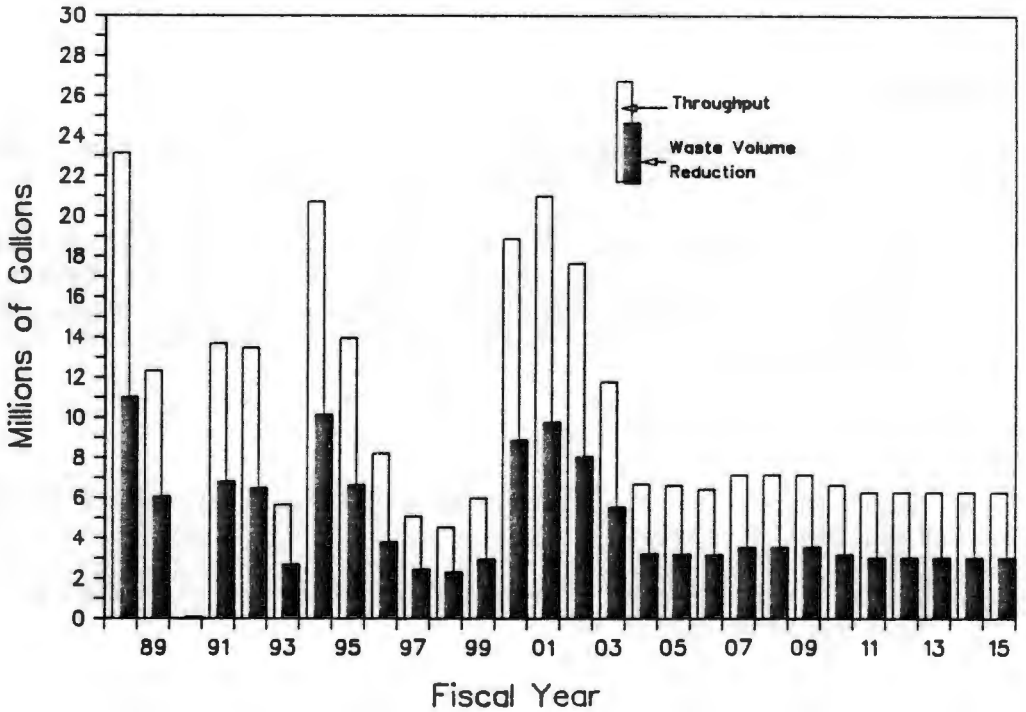

Figure 17. Evaporator Throughput and Waste Volume Reduction for the Lower Planning Case.

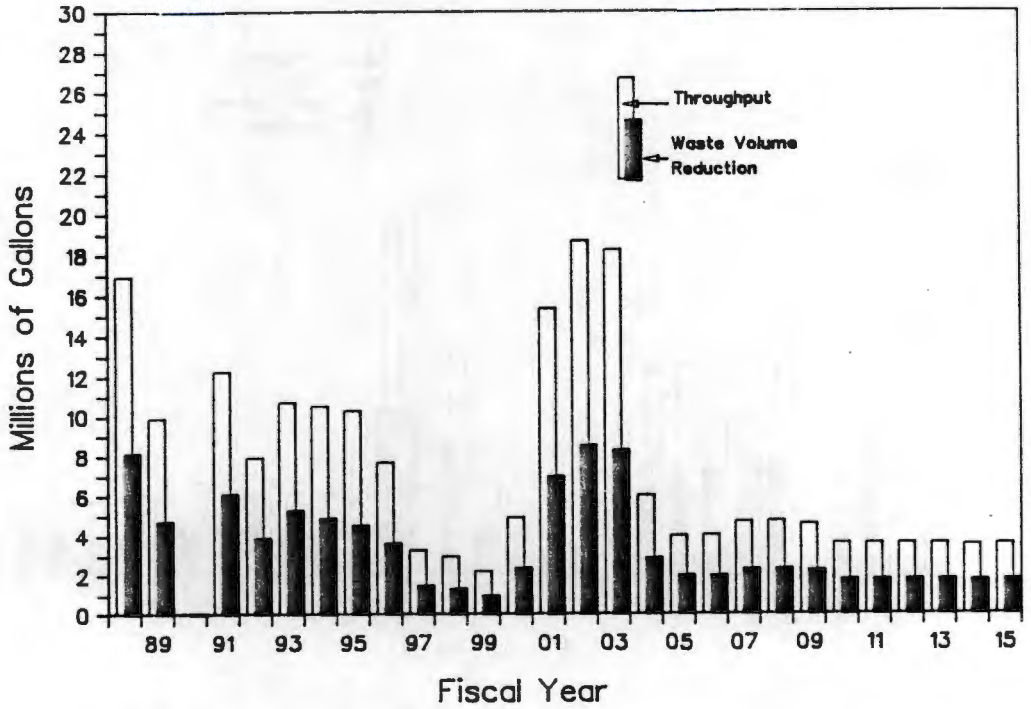

Figure 18. Evaporator Throughput and Waste Volume Reduction for the Upper Planning Case.

3.10 TANK USAGE

The use of tanks for the handling and/or storage of wastes received by tank farms is divided into six categories as follows:

- Inventory volume of wastes in their final interim form. (Although the current operational practice is not to concentrate wastes to their final interim form (DSSF) unless absolutely necessary, this form is used for modeling to estimate the minimum tank volume requirements.)
- Operational tanks
- Requirements for the storage of PUREX Facility wastes and any future treatment of these wastes
- Requirements for the storage of other wastes generated by the Hanford Site facilities
- Requirements for the storage of SWL from single-shell tank stabilization

- Spares and contingency tanks

  - Aging and nonaging spare space to allow for the emergency pumping of leaking DSTs

  - Contingency space to account for variation in projected versus received waste compositions.

3.10.1 Control Case

Tank requirements for the Control Case are described in the following sections.

3.10.1.1 Inventory Storage. A total of 16 tanks would have been required to store the concentrated inventory as of the end of FY 1987 if all the waste had been stored as DSSF. Table 10 summarizes the tank requirements by waste type.

Table 10. Control Case Inventory Storage Requirements by Waste Type.

Waste types	Current volume (tanks)	Concentrated volume (tanks)
Complexant concentrate	4	5
Concentrated phosphate	1	1
Dilute complexed	1	--
Dilute noncomplexed	5	--
Dilute phosphate	1	0[a]
Double-shell slurry feed	3	4
Double-shell slurry	1	1
NCAW	2	2
PFP TRU waste	1	1
PUREX NCRW sludge	2	2
	21	16
Unused AP tanks	7	--
Total	28	16

[a]Stored in operational tank (grout feed tank) awaiting processing.

AP = AP Tank Farm.
NCAW = Neutralized current acid waste.
NCRW = Neutralized cladding removal waste.
PFP = Plutonium Finishing Plant.
PUREX = Plutonium Uranium Extraction Facility.
TRU = transuranic.

3.10.1.2 Operational Tanks. The number of operational tanks varies from year to year. A minimum of four tanks will be required for staging and processing operations in tank farms.

- A dilute, noncomplexed receiver will be required to receive incoming dilute, noncomplexed waste and to store waste before evaporation.

- The evaporator feed tank is specially equipped with airlift circulators to provide mixing capability and special pipe routings and pump pits. This function cannot be practically or economically moved from tank to tank.

- The slurry receiver will be necessary to optimize the waste volume reduction on multiple-pass evaporator runs. Not designating a slurry receiver could result (1) in the mixing of different waste types, which could lower the overall waste volume reduction, or (2) the mixing of dilute and concentrated wastes, which results in reprocessing of wastes.

- One grout feed tank will be required to stage and mix wastes before grouting. The grout tank is specially equipped and the equipment cannot be economically moved from tank to tank. The GTF will require two tanks for feed and mixing purposes when processing more than three campaigns.

- Other operational tanks required at various times include: 107 and 108-AP (during tank modification), 200 East Area SWL receiver, and retrieval tanks.

  During FY 1988 and FY 1989, tanks 107 and 108-AP are not available due to riser and pump pit modifications. Because these modifications require cutting into the tank, they are assumed unavailable for waste receipts during modifications.

  The 200 East Area SWL receiver is needed because the piping routes from the single-shell tanks go to one tank (tank 101-AN). This tank is set aside to receive SWL.

3.10.1.3 PUREX Facility Tanks. Storage requirements for wastes generated by the PUREX Facility constitute four categories: aging wastes (NCAW), NCAW pretreated at B Plant (pNCAW), NCRW wastes, and DSSF. Aging waste tanks will be required for the storage of PUREX NCAW and pNCAW strontium and TRU solids. Designated tanks will be required for the storage of PUREX Facility decladding sludge. Dilute, noncomplexed wastes from the PUREX Facility will be stored in nonaging waste tanks as DSSF.

- <u>NCAW Storage</u> - Tank 101-AZ is currently filled with NCAW. It is accounted for in the inventory storage section. The PUREX Facility is currently filling tank 102-AZ with NCAW. At the end of FY 1993, NCAW will be sent to tank 101-AY. See Figure 19 for aging waste tank usage.

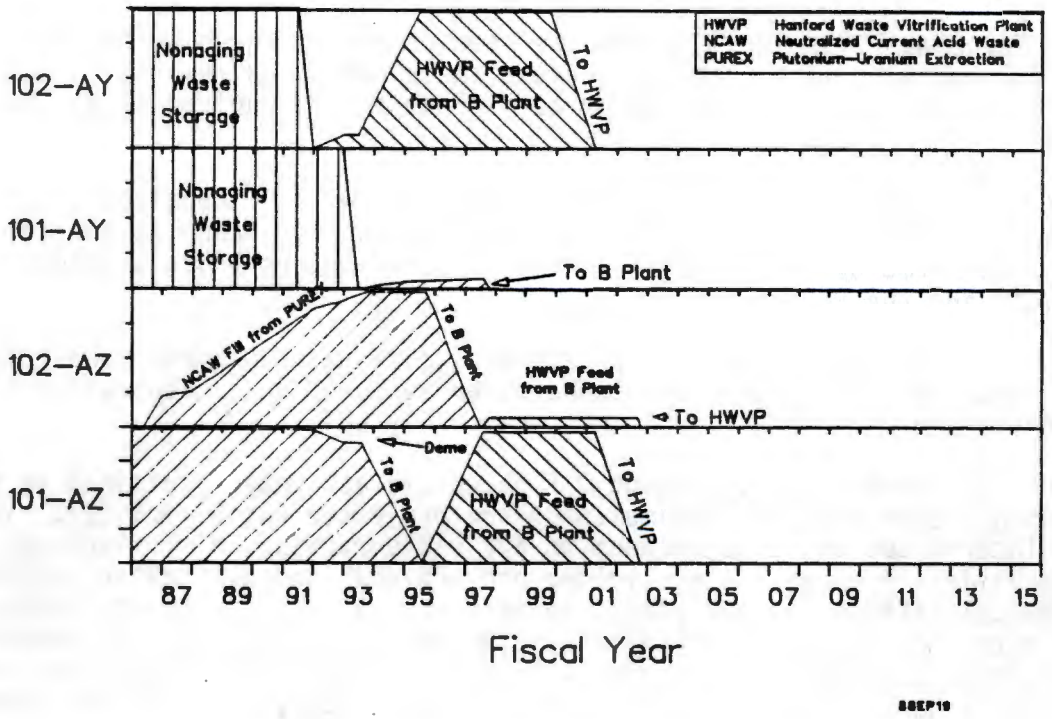

Figure 19. Aging Waste Tank Usage for the Control Case.

- <u>(pNCAW) Storage</u> - The waste generated from B Plant pretreating of NCAW requires two types of tanks for storage: one for the pNCAW solids stream and the other for the pNCAW supernatant stream. The pNCAW solids stream is sent to an aging waste tank because it contains most of the heat-producing radionuclides in the NCAW. One tank of NCAW generates one tank of pNCAW solids. The pNCAW supernatant stream will go to an aging or nonaging tank, depending on how "old" the NCAW is. For the control case, the pNCAW supernatant from all projected NCAW tanks will be aged enough to be sent to a nonaging waste tank. See Figure 19 for the aging tank usage.

- <u>NCRW Sludge Storage</u> - Tanks 103-AW and 105-AW are currently being used to store PUREX Facility TRU NCRW sludge. These tanks are included in the inventory. Beginning in FY 1989, the PUREX Facility will split the NCRW stream into a spent metathesis stream and a declad stream. The metathesis stream will contain TRU solids and will continue to be sent to tank 105-AW. The decladding waste stream will contain low-level solids and will be sent to tank 101-AP to segregate the TRU and low-level solids. Tank 103-AW will no longer receive NCRW waste and will be available for other waste after waste that is currently in the tank is retrieved in FY 1994.

- <u>DSSF Storage Required</u> - Only one tank will be required for the storage of final interim forms of decladding supernatant, PUREX Facility miscellaneous wastes, and pNCAW supernatant.

The peak PUREX Facility storage requirement is three aging waste tanks and two nonaging waste tanks. Because these peak requirements do not occur at the same time, the maximum number of storage tanks required at any time is four.

3.10.1.4 Other Wastes. A maximum of one tank will be required to store wastes generated by facilities other than the PUREX Facility and SWL pumping during the time-frame of this study. The major contributors to this category will be B Plant and the PFP.

3.10.1.5 Salt Wells. Dilute, noncomplexed waste from single-shell tanks will require a maximum of two tanks after evaporative concentration to a final interim form.

3.10.1.6 Spares and Contingency. The volume estimates contained in this document represent best estimates of the projected waste receipts. In reality, the interim concentrated volumes of all waste receipts will fluctuate due to variability in compositions, volume projections, and evaporator performance. A typical statistical analysis (see Section 3.12 on Sensitivity Analysis) estimates the need for approximately two million gallons of contingency space. Therefore, the second spare tank will also be needed as a contingency tank. The aging spare will be required to provide storage space in the event of an aging waste tank leak.

The Control Case will require a minimum of 28 DSTs for the storage and processing of wastes projected over the period of interest. The maximum number of tanks for each category may not occur in the same year. Therefore, the minimum required tanks could be lower than the sum of the maximum for each category. Figure 20 details DST usage as a function of time. Only integral tank needs are estimated in Figure 20. For example, SWL pumping will require one full tank by the end of FY 1993. No tanks are shown for SWL pumping during the period of FY 1989 through FY 1992 because the total occupied by this waste will be less than one full tank. From Figure 20, it can be observed that the projected tank requirements remain below the available tanks.

See Appendix D, Figure D-1, for a detailed usage of these tanks.

3.10.2 Trended Case

Tank requirements for the Trended Case are described in detail in the following sections.

3.10.2.1 Inventory Storage. A total of 16 tanks would have been required to store the concentrated inventory as of the end of FY 1987 if all the waste had been stored as DSSF.

3.10.2.2 Operational Tanks. A maximum of 10 tanks will be required for operational purposes.

The GTF will require two tanks for feed and mixing purposes when processing more than three campaigns.

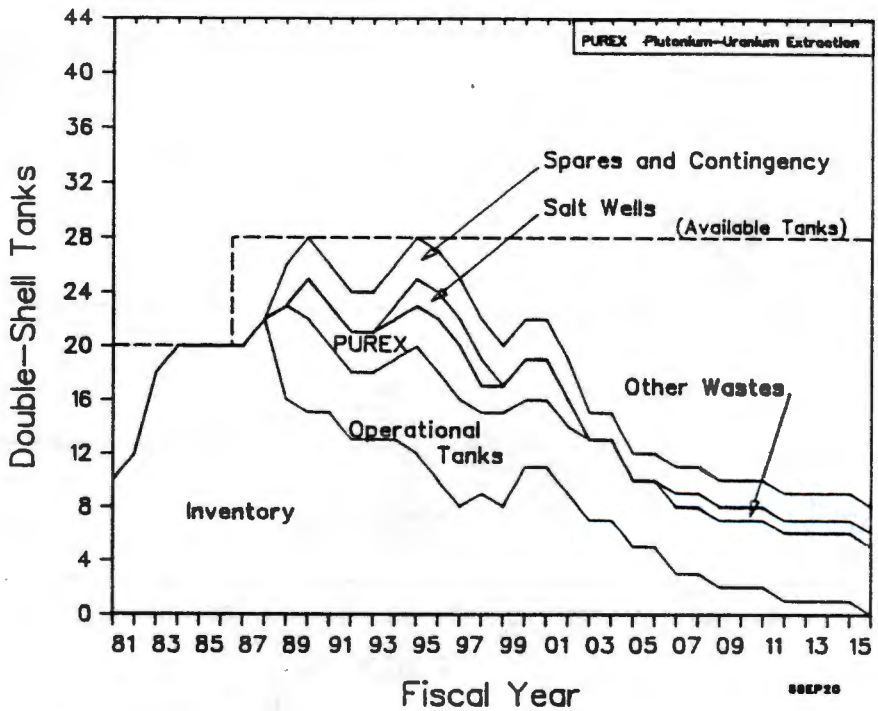

Figure 20. Double-Shell Tank Requirements for the Control Case.

3.10.2.3 PUREX Facility Tanks. During FY 1986, the first aging waste tank was filled, and the second tank (tank 102-AZ) started receiving NCAW. A third tank of NCAW will start receiving NCAW in FY 1992. A fourth aging waste tank will be required during FY 1993 (for HWVP feed). One tank will be required during FY 1989 to store decladding low-level sludge. A maximum of one tank will be required for the storage of the concentrated dilute, noncomplexed waste from the PUREX Facility after all possible volume reduction. The peak PUREX Facility storage requirements will be three aging waste tanks and two nonaging waste tanks. Because these peak requirements will not occur at the same time, the maximum number of storage tanks required at one time will be four. See Figure 21 for the aging tank usage chart.

3.10.2.4 Other Wastes. A maximum of one tank will be required for the storage of wastes from other facilities (excluding the PUREX Facility and salt wells) on the Hanford Site.

3.10.2.5 Salt Wells. Two tanks will be required for the storage of the noncomplexed waste from single-shell tanks after all possible volume reduction.

3.10.2.6 Spares and Contingency. A minimum of three tanks will be required for spare and contingency purposes.

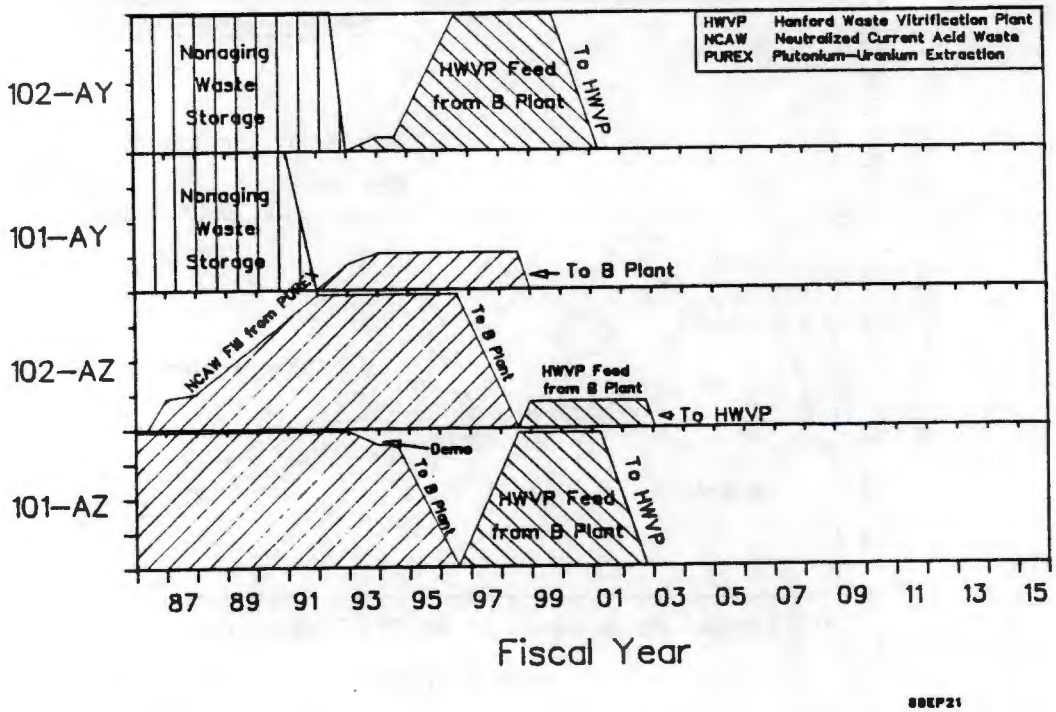

Figure 21. Aging Waste Tank Usage for the Trended Case.

The Trended Case will require a minimum of 29 DSTs for the storage and processing of the waste projected over the period of interest. Figure 22 details DST usage as a function of time. Figure 22 shows that a DST space short-fall will occur in FY 1994. This can be managed by some of the options listed in the Section 5.0, "Recommendations."

See Appendix D, Figure D-2, for detailed usage of these tasks.

3.10.3 Lower Planning Case

Tank requirements for the Lower Planning Case are described in detail in the following sections.

3.10.3.1 Inventory Storage. A total of 16 tanks would have been required to store the concentrated inventory as of the end of FY 1987 if all the waste had been stored as DSSF.

3.10.3.2 Operational Tanks. A maximum of nine tanks will be required for operational purposes.

3.10.3.3 PUREX Facility Tanks. The second aging waste tank (tank 102-AZ) began receiving NCAW from the PUREX Facility during FY 1986. The third will be required during FY 1989 for NCAW.

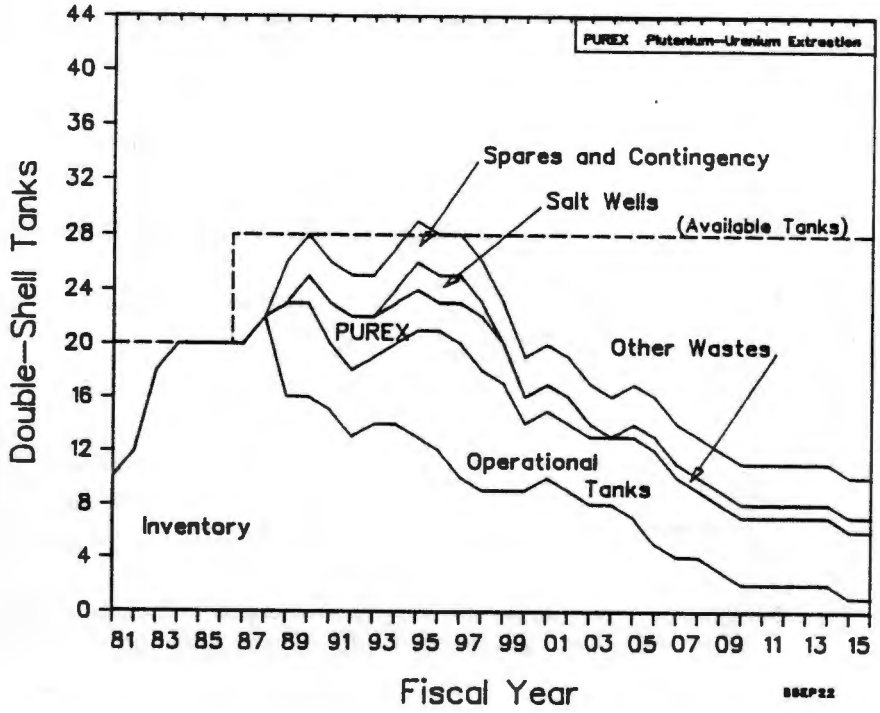

Figure 22. Double-Shell Tank Requirements for the Trended Case.

For decladding waste during FY 1989, one tank will be required for the receipt of PUREX Facility spent metathesis low-level sludge. One tank will be required for the storage of DSSF from PUREX Facility noncomplexed wastes.

3.10.3.4 Other Wastes. A maximum of four tanks will be required for the storage of wastes from sources other than the PUREX Facility and salt wells.

3.10.3.5 Salt Wells. A maximum of two tanks will be required for the storage of SWLs after all possible waste volume reduction.

3.10.3.6 Spares and Contingency. A minimum of three tanks will be required for spare and contingency purposes.

The Lower Planning Case will require a minimum of 29 DSTs to store and process the waste projected. Figure 23 details DST usage as a function of time. Figure 23 shows that all DST space will be consumed by FY 1993.

See Appendix D, Figure D-3, for detailed usage of these tanks.

3.10.4 Upper Planning Case

Tank requirements for the Upper Planning Case are described in the following sections.

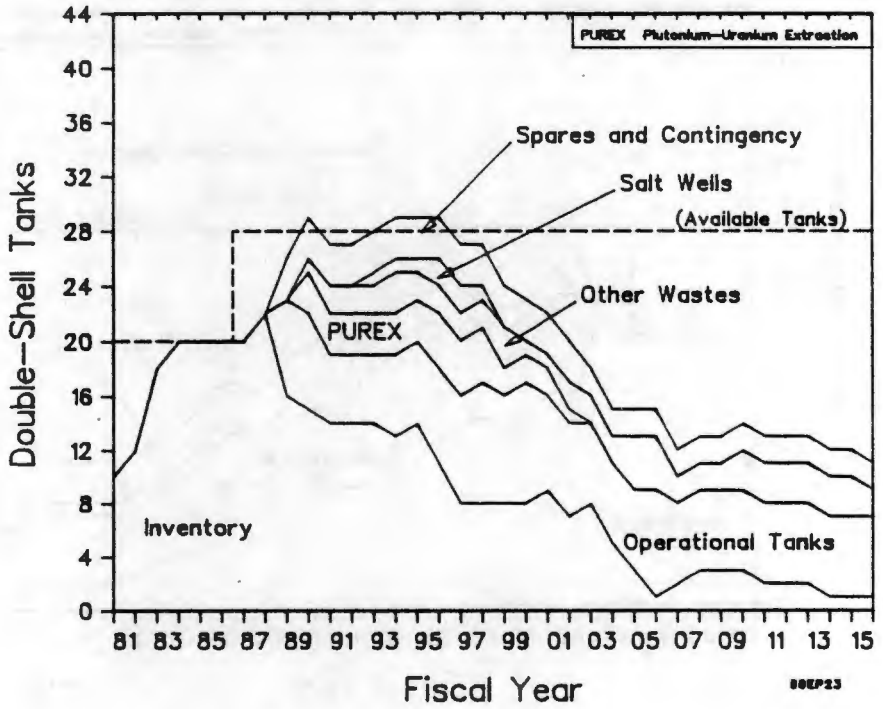

Figure 23. Double-Shell Tank Requirements for the Lower Planning Case.

3.10.4.1 Inventory Storage. A total of 16 tanks would have been required to store the concentrated inventory as of the end of FY 1987 if all the waste had been stored as DSSF.

3.10.4.2 Operational Tanks. A maximum of eight tanks will be required for operational purposes.

3.10.4.3 PUREX Facility Tanks. A maximum of four tanks will be required.

3.10.4.4 Other Waste. A maximum of five tanks will be required for the storage of wastes from other Hanford facilities (excluding the PUREX Facility and salt wells).

3.10.4.5 Salt Wells. Wastes from single-shell tanks will require a maximum of four tanks after all possible waste volume reduction.

3.10.4.6 Spares and Contingency. A minimum of three tanks will be required to serve as spare and contingency tanks.

The Upper Planning Case will require a minimum of 32 tanks for the storage and processing of the projected wastes. Figure 24 details DST usage as a function of time. Figure 24 shows that all DST space will be consumed by FY 1989.

See Appendix D, Figure D-4, for a detailed usage of these tanks.

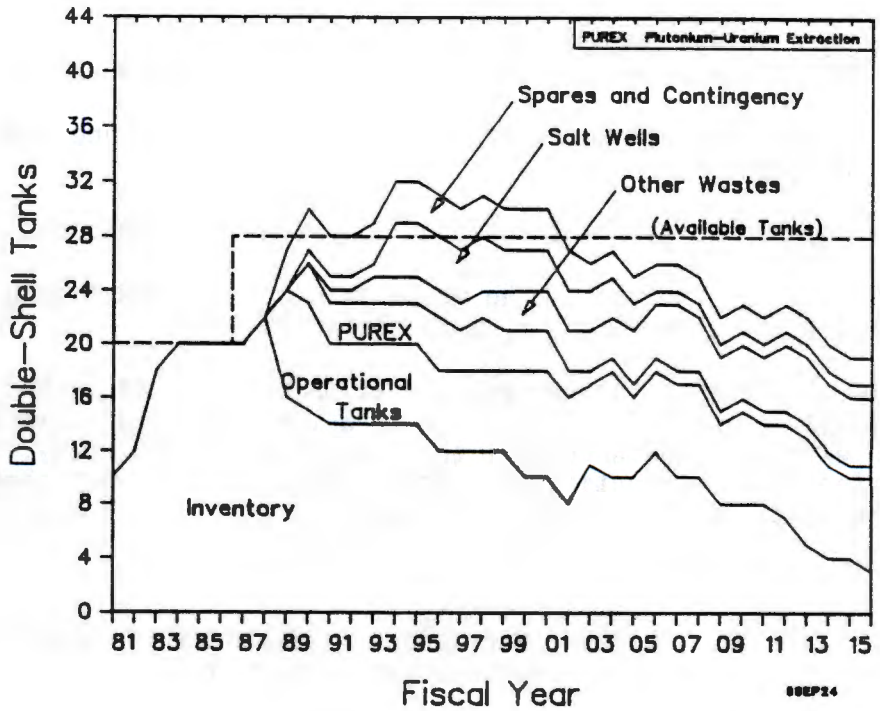

Figure 24. Double-Shell Tank Requirements for the Upper Planning Case.

3.11 PROCESSING ALTERNATIVES AND IMPROVEMENTS

Methods of reducing interim storage costs are being evaluated continuously. The Control Case examined in this document depended on technology to reduce waste volume generation and chemical usage from the 1987 actual waste generation rates to the values found in this document. A number of technological items have been identified to reduce future DST requirements. Some of these items include the following:

- Reducing facility waste generation rates
- Studing the feasibility of increasing tank capacity by modifying tank specifications
- Accelerating grout operations and/or increasing waste loading of grout
- Making better use of available tank space (combining partially filled tanks).

3.12 SENSITIVITY ANALYSIS

There are several potential sources of uncertainty in preparing this annual waste volume projection study. They fall into two categories:

- Uncertainties due to waste volume (generation and reduction) projection
- Uncertainties due to changes in operating scenarios.

Uncertainties in forecasting waste volumes can come from uncertainties in forecasting waste generation or waste concentration.

Table 11 presents the percent variation between actual and projected waste volumes. Figures 25 through 28 show the effects of this amount of variation extrapolated throughout the time frame of the study. This variation leads to the need for contingency tanks. These contingency tanks are needed due to the statistical variations in waste generation and value reduction rates.

Table 11. Observed Variations in Waste Volume Generation and Waste Volume Reduction.

Waste origin	Variations Volume generation (%)	Volume reduction (%)
B Plant		
Dilute noncomplexed	91	103
PFP		
Supernatant	135	101
Sludge	133	101
PUREX		
NCAW	106	107
NCRW	108	103
Miscellaneous	76	101
S Plant	116	101
T Plant	97	101
100-N Area		
Sulfate	162	101
300 and 400 Areas	89	101

NCAW = Neutralized current acid waste.
NCRW = Neutralized cladding removal waste.
PFP = Plutonium Finishing Plant.
PUREX = Plutonium Uranium Extraction Facility.

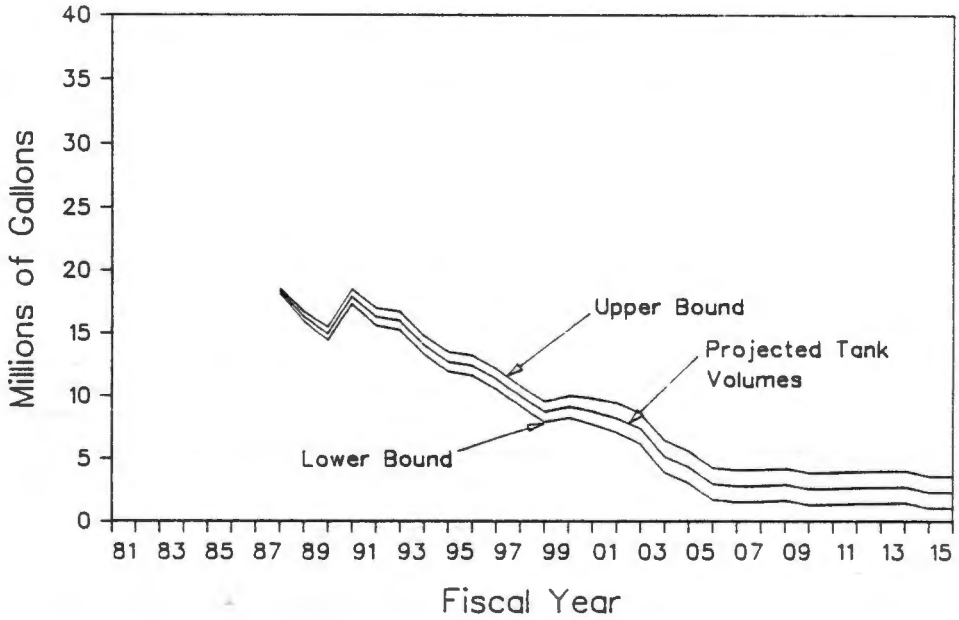

Figure 25. Volume Uncertainty Associated with the Control Case.

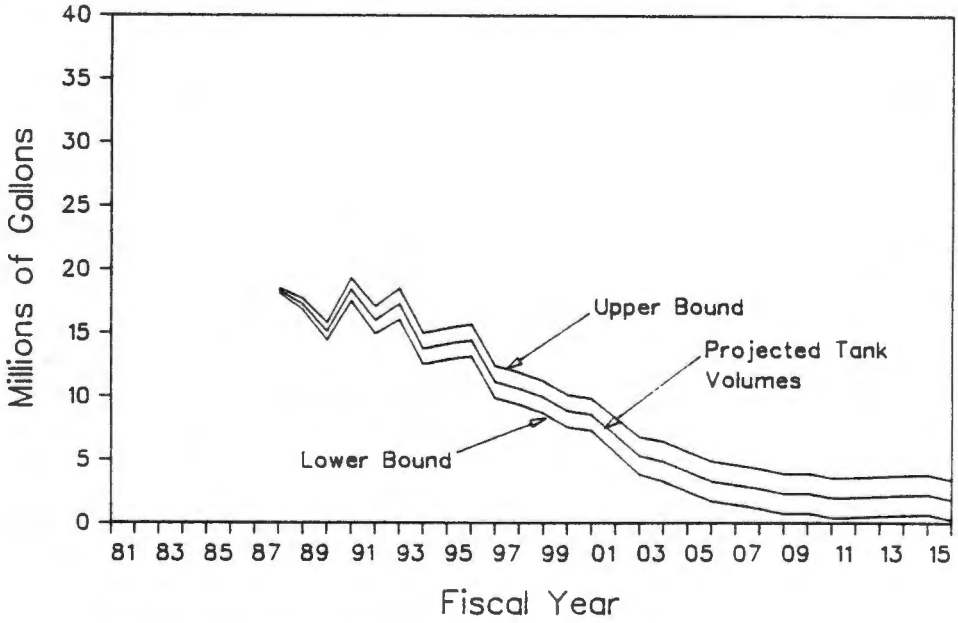

Figure 26. Volume Uncertainty Associated with the Trended Case.

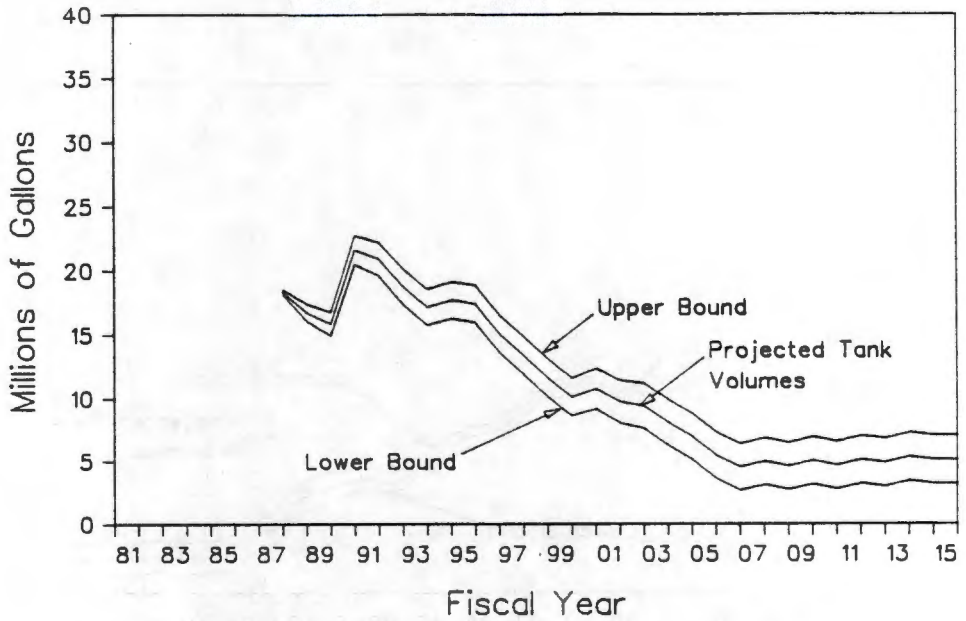

Figure 27. Volume Uncertainty Associated with the Lower Planning Case.

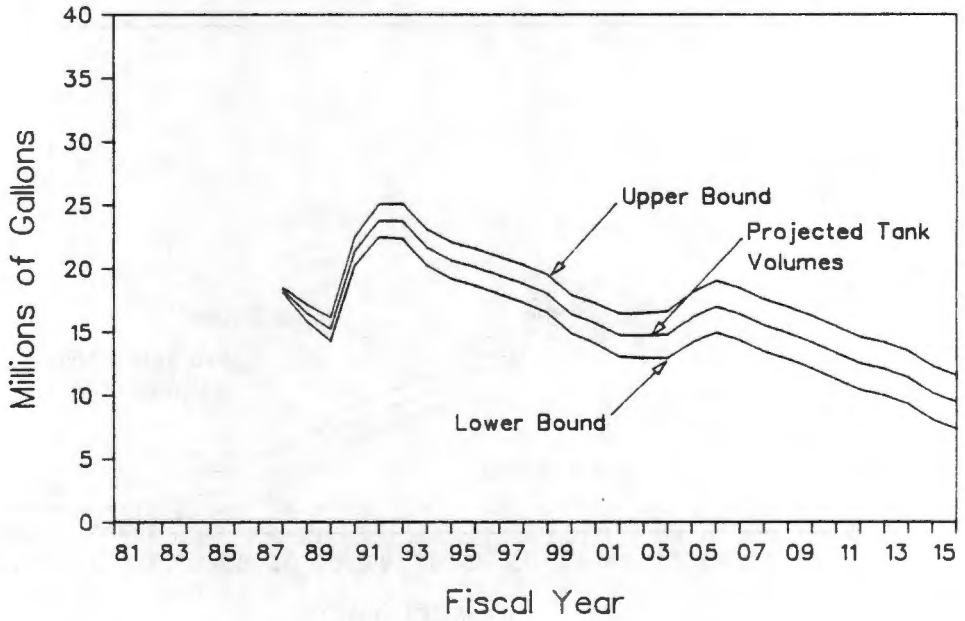

Figure 28. Volume Uncertainty Associated with the Upper Planning Case.

Operating chanages can cause uncertainties in waste volume projections. These operational changes could include the following:

- Facility startup dates
- Facility schedules
- MTU processing schedules
- SWL pumping schedules
- Pumping needs due to leaking tanks
- Unexpected waste sources
- Delays of facilities or projects.

Operating changes cannot be accounted for by any known method. The range of cases examined in this document attempts to bracket the range of tank needs. These cases do not cover all possible assumption changes. These changes are examined throughout the year with special projections.

4.0 CONCLUSIONS

A projection of DST requirements was performed for the period of FY 1988 through FY 2015. Four different cases with differing assumptions were examined as a part of the projection. These cases included a Control Case, which represents current planning and required budget and is the case to which tank usage is being monitored and controlled. The remaining three cases, the Trended, Lower Planning, and Upper Planning Cases, represent the effects of increasing tank space pressures. The tank space requirements for these four cases were summarized in Figure 2. The Trended Case represents the expected DST needs.

For all cases, there will be a number of years in which all four aging waste tanks (AY and AZ Farms) will contain aging waste (NCAW and pNCAW solids). At those times, a dedicated aging spare will not be available, but the distributed spare space exceeds one full tank. This time period will be between 3 and 6 yr.

For all cases except the Control Case, the TRUEX process will be assumed to be implemented in the PFP. The PFP currently generates TRU solids, but after the TRUEX process is implemented, the solids should be low-level. This requires the retrieval of tank 103-SY by mid-FY 1993 to provide tank space for segregation of the low-level wastes that are generated by the TRUEX process. If tank 103-SY is not retrieved before the TRUEX process is implemented, low-level solids will have to be mixed with TRU solids in the current 200 West Area receiver (tank 102-SY), or an alternative method of storing the TRUEX treated waste must be found. Mixing of the wastes would eliminate the main justification for implementing the TRUEX process, which is to reduce final disposal costs by reducing the amount of TRU wastes.

The Control Case waste tank space requirements can be met by available tank space. This assumes that facility operating scenarios proceed as currently planned and that waste generation targets are met.

Waste volumes for the Trended and Lower Planning Cases are projected to exceed available tank space. These cases will exceed available tank space by one tank. This tank shortage can be managed by eliminating a dedicated aging spare tank during that time period and by using the distributed spare space available.

For the Upper Planning Case, the maximum required number of tanks will exceed available tank space by four tanks. One of these will be a dedicated aging spare. During this period, there will be sufficient unused space in the four aging waste tanks to maintain a distributed aging waste spare. Removing the dedicated aging waste spare tank will leave a shortfall of three nonaging tanks. Also in the Upper Planning Case, there will be logistical concerns with transferring PFP solids and CC wastes from 200 West Area to 200 East Area.

5.0 RECOMMENDATIONS

5.1 AGING WASTE TANKS

Aging waste space needs can be reduced by generating less waste or putting more waste into each aging waste tank. The PUREX Facility has not consistently reached the target NCAW generation rate of 245 gal/MTU. The third aging waste tank is projected to be only partially full. If the PUREX Facility aging waste generation rate was reduced to the target rate, the third aging waste tank would not be needed to store NCAW. More waste could be stored in each aging waste tank if the concentration of the liquid in these tanks could be increased. A process test is planned to increase the concentration of the waste from 5.0M sodium to 5.5M. If this effort is successful, 10% more waste can be stored in each aging waste tank. If the waste generation rate is decreased and/or the concentration in the first two tanks of NCAW can be increased, one aging waste tank could be saved.

5.2 NONAGING WASTE TANKS

Waste generation rate reduction actions should continue to be tracked and pursued. Waste generators must continue to strive to achieve the target waste generation rates that are reflected in the Control Case assumptions.

Another possible space-saving action is to make DSS from DSSF. This would save up to 1.5 tanks (from FY 1989 to FY 1994 for the Upper Planning Case). Production of DSS is not a desirable measure because the retrieval of DSS is expected to be much more difficult than retrieval of DSSF and significantly increases final disposal costs. For this reason, production of DSS should be a "fallback" option for the recovery of tank space.

5.3 GROUT TREATMENT FACILITY

Grout Treatment Facility operations represent the single most influential final waste disposal activity for recovery of DST space. Increasing the processing of waste through the GTF before the tank space peak is reached can help manage projected tank space shortfalls. The increased throughput could be achieved by increasing the work-off rate or by increasing the waste loading in the grout. The GTF waste work-off rate should be increased to the level of 0.5, 0.5, 1, 3, 3, 5 . . . vaults filled per year starting in FY 1988 (13 vaults through FY 1993).

6.0 UNCERTAINTIES

There are a number of uncertainties that could make major changes in the projections. These uncertainties are discussed in this section.

6.1 ACCELERATION OF THE SALT WELL LIQUID PUMPING SCHEDULE

The acceleration of SWL pumping would cause the tank-need curves to climb faster before FY 1996. After FY 1996, there should be no impact from this acceleration. Therefore, the effects of this would be seen in the pre-FY 1996 time period. Accelerated SWL pumping would also impact the ability to segregate complexed and noncomplexed waste. With accelerated pumping and complexed waste in the single-shell tanks, there would be more overlap in the pumping of complexed and noncomplexed waste. This would increase the possibility that some noncomplexed waste would be mixed into the complexed waste.

6.2 WASTE FROM TERMINAL CLEANOUT AND DECOMMISSIONING AND DECONTAMINATING OF FACILITIES

The amount and type of wastes that would be generated from terminal cleanout and the decommissioning and decontaminating (D&D) of facilities are unknown at this time. The cleanout work could generate large volumes of waste. The resulting waste may require segregation and may not be groutable. Even if the waste is groutable, the volume of the waste may impact the number of tanks required. The facility cleanouts that are of major concern are those that would occur before or during the period of peak tank needs (until FY 1997). Some of the facilities that might be cleaned up during that period include N Reactor, PUREX, and PFP. As an example, N Reactor decontamination might generate additional DSTs of phosphate waste. This waste is not currently included in the projections and therefore would adversely impact projected tank requirements.

6.3 INCREASES IN WASTE VOLUMES RESULTING FROM ENVIRONMENTAL PRESSURES

The increased waste volumes to the tank farms due to environmental pressures are another uncertainty. Substantial volumes of waste currently are being disposed of into the soil column. Environmental pressures might require some of these wastes to be sent to the tank farm system. If this occurs, there are concerns of exceeding the evaporator capacity as well as exceeding the available tank space.

6.4 PRODUCTION OF UNPLANNED COMPLEXED WASTE

The current projections assume that no new complexed waste comes into the DST farm system (except the Upper Planning Case). The receipt of complexed waste could require additional tanks for segregation of that waste. Complexed waste is also ungroutable. Therefore, it would have to be pretreated in B Plant.

6.5 IMPACT OF CHANGES IN THE RETRIEVAL SCHEDULES

Changes in the tank retrieval schedule will also impact the projected number of tanks required. Early retrieval may require retrieval tanks during periods of tank space shortages. Late retrieval may result in tanks not being cleaned out in time to receive waste, resulting in loss of waste segregations.

6.6 DECREASES IN GROUT SCHEDULES

Any decreases in the grout schedule will make a corresponding change in the number of required tanks. Every vault decrease in the schedule will increase the number of required tanks by about half a tank.

6.7 INCREASES IN WASTE GENERATION RATES

Increases in waste generation rates could cause increased tank requirements.

6.8 WASTE FROM AMMONIA DESTRUCTION PROCESS IN THE PUREX FACILITY

Currently the tank farm system is receiving the PUREX Facility ASF. This waste was sent to the tank farms because the ammonia content is too high for disposal to the cribs. In FY 1989, a new process is planned that will treat this waste. The result of this treatment will be a waste stream sent to the cribs and a smaller waste stream sent to the tank farm system. The composition and volume of the waste stream to the tank farm system is unknown at this time. Preliminary estimates show that this waste stream might generate about 500 kgal of total interim product for storage. This is not included in the projections.

6.9 REDUCTION IN EVAPORATOR CAPACITY

Due to more testing and analysis required to release waste to cribs, the evaporator capacity to process waste may be reduced. This impact is not currently known in detail.

Also, due to the high level of ammonium, there may be a need to blend wastes to improve evaporation efficiency, which may also reduce the evaporator capacity.

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APPENDIX A

SPECIAL CASE

The Special Case is a modification of the Trended Case. The Special Case uses the same assumptions as the Trended Case, with the exception that the N Reactor is assumed to be restarted in FY 1990 and operated for 5 yr on a plutonium mission. For this case, the amount of N Reactor fuel processed from FY 1988 to shutdown would increase from 2726 to 8217 MTU.

The restarting of N Reactor and the processing of the fuel would impact other facilities. The restart would require that fuel be fabricated. This could involve restarting the Fuels Fabrication Facility, which would generate waste. With N Reactor restarted, phosphate and sulfate waste would be generated at the 100-N Area. Phosphate decontamination waste would be expected to be generated in FY 1992 and FY 1994. The increased processing of N Reactor fuel would also generate more plutonium to be processed in the PFP. The PFP schedule would be extended to FY 2001. In addition, the extended processing of the N Reactor fuel would postpone the PUREX Facility processing of PWR II and FFTF fuels.

The results of the Special Case are presented in Figures A-1 and A-2. Figure A-1 shows the total tank needs and usage for this case. Figure A-2 shows the aging and nonaging split for this case.

Results

The Special Case requires four more aging waste tanks than are currently available. The first new aging waste tank would be needed in FY 1993. This tank would be needed as a dedicated aging spare tank. Operations could continue without a dedicated aging waste spare (with distributed spare) until FY 1995 (2 yr). In FY 1995, a new aging waste tank would be needed to hold NCAW. In FY 1998, a third aging waste tank would be needed to store aging waste supernatant; and in FY 2000, a fourth aging waste tank would be needed to store aging waste supernatant.

The nonaging waste space is sufficient to meet tank needs.

The same retrieval concerns discussed in the body of this document apply to the Special Case. One concern is that tank 103-SY would not be retrieved before the TRUEX process is implemented in the PFP. Not retrieving tank 103-SY would cause a loss in segregation when the low-level solids from the TRUEX process are mixed with the TRU solids in tank 102-SY. This would not create a tank space penalty, but would be a final disposal cost penalty. As in the Trended Case, HWVP processing would suffer some loss of continuity with a one-year break in operations in FY 2007.

Recommendations

To have sufficient tank space for this case, four additional aging waste tanks would have to be constructed. Other recommendations presented in the body of this document apply to the Special Case.

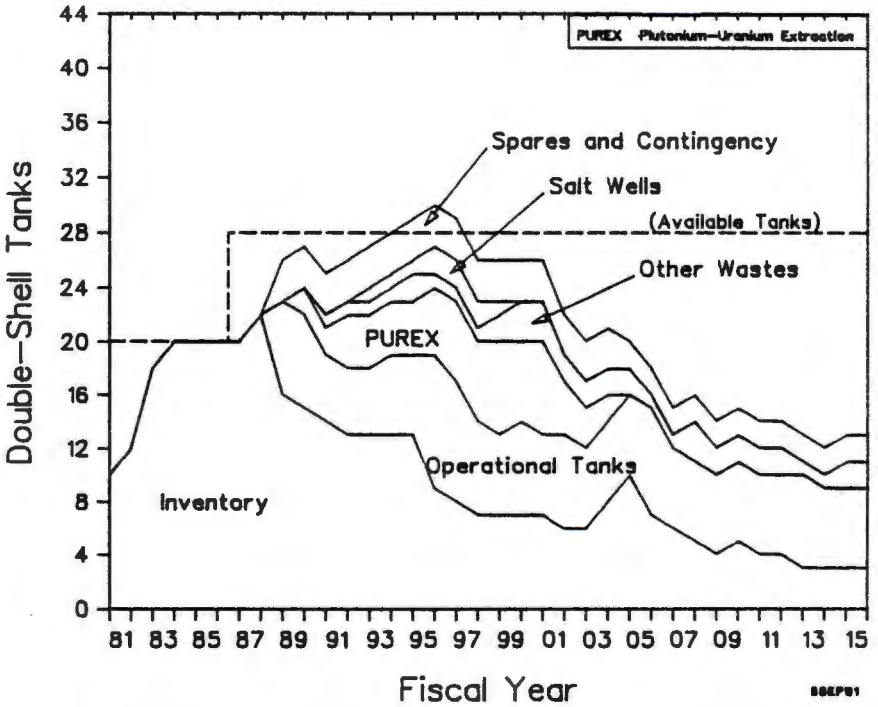

Figure A-1. Double-Shell Tank Requirements for the Special Case.

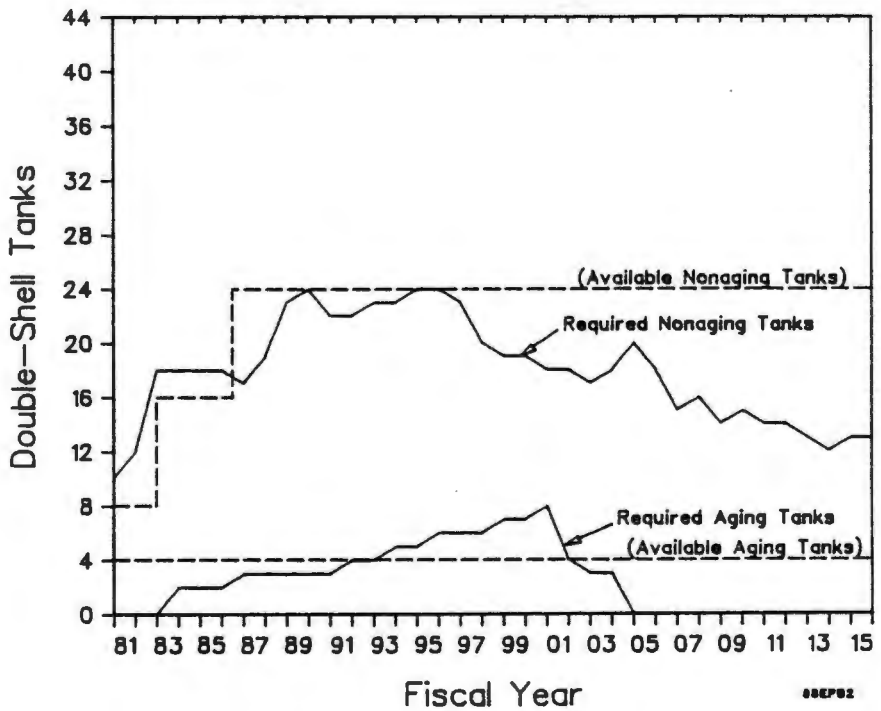

Figure A-2. Tank Needs for Special Case by Waste Type (Aging and Nonaging Split).

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APPENDIX B

DILUTE WASTE GENERATION VOLUMES

Table B-1. Dilute Waste Generation Volumes for the Control Case.

THOUSANDS OF GALLONS

FISCAL YEAR	COMBINED PFP WASTE STREAM (NO TRUEX)	COMBINED PFP SOLIDS (NO TRUEX)	PUREX NCAW FROM THE PROCESSING OF NPR FUEL	PUREX NCAW FROM THE PROCESSING OF PWR FUEL	AGING WASTE FROM FFTF PROCESSING SHEAR/LEACH PROCESSING	PUREX NCRW SUPERNATE (FY 1988 ONLY)	PUREX NCRW SLUDGE (FY 1988 ONLY - TRU SOLIDS)	PUREX DECLADDING WASTE STREAM (FY 1989 ON)	PUREX DECLADDING SOLIDS (FY 1989 ON - NON-TRU SOLIDS)	PUREX SPENT METHATHESIS WASTE (FY 1989 ON)	PUREX SPENT METHATHESIS SOLIDS (FY 1989 ON - TRU SOLIDS)	PUREX MISC. WASTE FROM PROCESSING NPR FUEL	PUREX MISC. WASTE FROM PROCESSING PWR FUEL	PUREX MISC. WASTE FROM PROCESSING FFTF FUEL	PUREX AMMONIUM SCRUBBER FEED	S PLANT DILUTE NON-COMPLEXED	SALT WELL LIQUID FROM EAST AREA DILUTE, NON-COMPLEXED	SALT WELL LIQUID FROM WEST AREA DILUTE, NON-COMPLEXED	T PLANT SUPERNATE (STANDBY MODE)	T PLANT SOLIDS (NO TRUEX - TRU SOLIDS)	T PLANT SOLIDS (TRUEX ACTIVE - NON-TRU SOLIDS)	100-H AREA SULFATE	300/400 AREA LAB WASTE	300/400 AREA LAB WASTE	B PLANT MISCELLANEOUS WASTE (FY 1988 ONLY)	B PLANT MISC. WASTE (FY 1989 ON)	B PLANT AGING WASTE FROM NCAW PROCESSING	B PLANT AGING WASTE FROM NCRW PROCESSING ALL TANKS	B PLANT AGING WASTE SUPERNATE FROM NCRW PROCESSING (1ST TANK)	B PLANT AGING WASTE SUPERNATE FROM NCRW PROCESSING (COMBINED)	B PLANT AGING WASTE SUPERNATE FROM NCRW PROCESSING (COMBINED 2	B PLANT SOLID STREAM FROM PROCESSING (COMBINED 3	B PLANT LIQUID FROM CC WASTE (INV	B PLANT SOLIDS STREAM FROM PFP PROCESSING (INVENTORY)	B PLANT LIQUID STREAM FROM PFP PROCESSING	B PLANT SOLID STREAM FROM TRU-NCRW PROCESSING (COMBINED)	B PLANT LIQUID STREAM FROM TRU-NCRW PROCESSING	HWVP WASTE	CX-70 COMPLEX CLEAN UP WASTE	CONCENTRATED COMPLEXANT SOLIDS	FLUSH WATER
1988	171	18	147	0	0	620	102	0	0	0	0	607	0	0	1600	31	144	0	140	10	0	286	70	0	806	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	1546
1989	215	24	151	0	0	0	0	284	102	202	3	630	0	0	0	31	154	0	140	10	0	286	70	0	0	220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	684
1990	204	21	149	0	0	0	0	280	100	199	3	616	0	0	0	31	237	0	140	10	0	286	70	0	0	220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	757
1991	190	16	149	0	0	0	0	280	100	199	3	616	0	0	0	31	91	136	140	0	10	286	70	0	0	220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	742
1992	98	8	103	0	0	0	0	184	69	136	2	565	0	0	0	31	163	40	140	0	10	286	70	0	0	220	100	116	0	0	0	0	0	0	0	0	0	0	0	0	716
1993	70	4	0	12	0	0	0	24	8	17	0	0	69	0	0	31	200	49	140	0	10	0	70	30	0	220	216	253	0	0	0	0	0	0	0	0	0	0	0	0	685
1994	70	4	0	0	30	0	0	0	0	0	0	0	0	655	0	31	22	3749	140	0	10	0	70	30	0	220	439	509	0	0	0	0	0	0	0	0	0	0	0	0	4388
1995	66	3	0	0	30	0	0	0	0	0	0	0	0	655	0	31	653	1458	140	0	10	0	70	30	0	220	463	265	262	0	0	0	0	0	0	0	0	0	0	0	4044
1996	39	0	0	0	21	0	0	0	0	0	0	0	0	493	0	31	184	131	140	0	10	0	70	30	0	220	491	0	570	0	0	0	0	0	0	0	0	0	0	0	1150
1997	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	140	0	10	0	70	0	0	220	320	0	265	66	0	0	0	0	0	0	0	0	0	0	524
1998	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	140	0	10	0	70	0	0	220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	136
1999	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	140	0	10	0	70	0	0	220	0	0	0	0	270	2495	0	0	0	0	314	0	0	0	1402
2000	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	140	0	10	0	70	0	0	220	0	0	0	0	488	4514	0	0	0	0	1262	0	93	0	4106
2001	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	140	0	10	0	70	0	0	220	0	0	0	0	486	4469	0	0	0	0	1255	0	0	0	4101
2002	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	140	0	10	0	70	0	0	220	0	0	0	0	374	3452	0	0	0	0	1247	0	0	0	2702
2003	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	140	0	10	0	70	0	0	220	0	0	0	0	0	0	80	182	0	0	1257	0	0	0	262
2004	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	140	0	10	0	70	0	0	220	0	0	0	0	0	0	42	86	11	47	1262	0	0	0	229
2005	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	140	0	10	0	70	0	0	220	0	0	0	0	0	0	0	0	93	416	1257	0	0	0	380
2006	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	140	0	10	0	70	0	0	220	0	0	0	0	0	0	0	0	93	416	1231	0	0	0	380
2007	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	140	0	10	0	70	0	0	220	0	0	0	0	0	0	0	0	93	416	1270	0	0	0	380
2008	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	140	0	10	0	70	0	0	220	0	0	0	0	0	0	0	0	34	151	1270	0	0	0	224
2009	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	140	0	10	0	70	0	0	220	0	0	0	0	0	0	0	0	0	0	1270	0	0	0	136
2010	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	140	0	10	0	70	0	0	220	0	0	0	0	-0	0	0	0	0	0	1270	0	0	0	136
2011	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	140	0	10	0	70	0	0	220	0	0	0	0	0	0	0	0	0	0	1275	0	0	0	136
2012	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	140	0	10	0	70	0	0	220	0	0	0	0	0	0	0	0	0	0	1257	0	0	0	136
2013	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	140	0	10	0	70	0	0	220	0	0	0	0	0	0	0	0	0	0	1257	0	0	0	136
2014	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	140	0	10	0	70	0	0	220	0	0	0	0	0	0	0	0	0	0	1257	0	0	0	136
2015	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	140	0	10	0	70	0	0	220	0	0	0	0	0	0	0	0	0	0	1059	0	0	0	136

Table B-2. Dilute Waste Generation Volumes for the Trended Case.

THOUSANDS OF GALLONS

FISCAL YEAR	COMBINED PFP WASTE STREAM (NO TRUEX)	COMBINED PFP WASTE STREAM (TRUEX)	COMBINED PFP SOLIDS (NO TRUEX)	COMBINED PFP SOLIDS (TRUEX)	PUREX NCAW FROM THE PROCESSING OF NPR FUEL	PUREX NCAW FROM THE PROCESSING OF PWR FUEL	AGING WASTE FROM FFTF PROCESSING SHEAR/LEACH PROCESSING	PUREX NCRW SUPERNATE (FY 1988 ONLY)	PUREX NCRW SLUDGE (FY 1988 ONLY - TRU SOLIDS)	PUREX DECLADDING WASTE STREAM (FY 1989 ON)	PUREX DECLADDING SOLIDS (FY 1989 ON - NON-TRU SOLIDS)	PUREX SPENT METHATHESIS WASTE (FY 1989 ON)	PUREX SPENT METHATHESIS SOLIDS (FY 1989 ON - TRU SOLIDS)	PUREX MISC. WASTE FROM PROCESSING NPR FUEL	PUREX MISC. WASTE FROM PROCESSING PWR FUEL	PUREX MISC. WASTE FROM PROCESSING FFTF FUEL	PUREX AMMONIUM SCRUBBER FEED	S PLANT DILUTE NON-COMPLEXED	SALT WELL LIQUID FROM EAST AREA DILUTE, NON-COMPLEXED	SALT WELL LIQUID FROM WEST AREA DILUTE, NON-COMPLEXED	T PLANT SUPERNATE (STANDBY MODE)	T PLANT SOLIDS (NO TRUEX - TRU SOLIDS)	T PLANT SOLIDS (TRUEX ACTIVE - NON-TRU SOLIDS)	100-H AREA SULFATE	300/400 AREA LAB WASTE	300/400 AREA LAB WASTE	B PLANT MISCELLANEOUS WASTE (FY 1988 ONLY)	B PLANT MISC. WASTE (FY 1989 ON)	B PLANT AGING WASTE FROM NCAW PROCESSING	B PLANT AGING WASTE SUPERNATE FROM NCRW PROCESSING ALL TANKS	B PLANT AGING WASTE SUPERNATE FROM NCRW PROCESSING (1ST TANK)	B PLANT AGING WASTE SUPERNATE FROM NCRW PROCESSING (COMBINED 2	B PLANT SOLID STREAM FROM PROCESSING (COMBINED 3	B PLANT LIQUID FROM CC PROCESSING OF CC WASTE (INV	B PLANT SOLIDS STREAM FROM PFP PROCESSING (INVENTORY)	B PLANT LIQUID STREAM FROM PFP PROCESSING	B PLANT SOLID STREAM FROM TRU-NCRW PROCESSING (COMBINED)	B PLANT LIQUID STREAM FROM TRU-NCRW PROCESSING	HWVP WASTE	CX-70 COMPLEX CLEAN UP WASTE	CONCENTRATED COMPLEXANT SOLIDS	FLUSH WATER
1988	202	0	22	0	128	0	0	487	68	0	0	0	0	1013	0	0	2400	31	144	0	157	11	0	286	70	0	1032	0	0	0	0	0	0	0	0	0	0	0	0	10	0	1531
1989	233	0	23	0	172	0	0	0	0	248	89	176	3	360	0	0	0	31	154	0	157	11	0	286	70	0	0	180	0	0	0	0	0	0	0	0	0	0	0	0	0	204
1990	275	0	33	0	192	0	0	0	0	277	89	197	3	520	0	0	0	31	237	0	157	11	0	286	70	0	0	180	0	0	0	0	0	0	0	0	0	0	0	0	0	349
1991	250	0	31	0	192	0	0	0	0	277	89	197	3	520	0	0	0	31	81	136	157	11	0	286	70	0	0	180	0	0	0	0	0	0	0	0	0	0	0	0	0	886
1992	250	0	31	0	188	16	0	0	0	295	106	210	3	492	128	0	0	31	183	40	157	11	0	286	70	30	0	180	0	0	0	0	0	0	0	0	0	0	0	0	0	2688
1993	0	307	0	12	0	0	80	0	0	0	0	0	0	0	0	3	488	0	31	200	49	157	0	11	0	70	30	0	180	100	116	0	0	0	0	0	0	0	0	0	0	238
1994	0	307	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	31	22	749	157	0	11	0	70	0	0	180	219	254	0	0	0	0	0	0	0	0	0	0	2	249
1995	0	290	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	31	883	456	157	0	11	0	70	0	0	180	439	509	0	0	0	0	0	0	0	0	0	0	3	935
1996	0	81	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	31	184	131	157	0	11	0	70	0	0	180	464	255	283	0	0	0	0	0	0	0	0	0	0	1014
1997	0	286	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	157	0	11	0	70	0	0	180	480	0	568	0	0	0	0	0	0	0	0	0	0	801
1998	0	172	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	157	0	11	0	70	0	0	180	440	0	285	225	0	0	0	0	0	0	0	0	0	700
1999	0	251	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	157	0	11	0	70	0	0	180	56	0	0	65	0	0	0	0	0	0	314	0	0	280
2000	0	172	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	157	0	11	0	70	0	0	180	0	0	0	0	53	488	0	0	0	0	282	0	93	412
2001	0	172	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	157	0	11	0	70	0	0	180	0	0	0	0	488	504	0	0	0	0	255	0	0	2453
2002	0	67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	157	0	11	0	70	0	0	180	0	0	0	0	488	488	0	0	0	0	255	0	0	2408
2003	0	67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	157	0	11	0	70	0	0	180	0	0	0	0	488	504	0	0	0	0	0	0	0	3437
2004	0	67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	157	0	11	0	70	0	0	180	0	0	0	0	105	865	32	84	0	0	1251	0	0	889
2005	0	67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	157	0	11	0	70	0	0	180	0	0	0	0	0	0	108	222	0	0	262	0	0	303
2006	0	67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	157	0	11	0	70	0	0	180	0	0	0	0	0	0	12	25	38	163	257	0	0	243
2007	0	67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	157	0	11	0	70	0	0	180	0	0	0	0	0	0	0	0	83	418	255	0	0	374
2008	0	67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	157	0	11	0	70	0	0	180	0	0	0	0	0	0	0	0	83	417	270	0	0	375
2009	0	67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	157	0	11	0	70	0	0	180	0	0	0	0	0	0	0	0	82	387	270	0	0	348
2010	0	67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	157	0	11	0	70	0	0	180	0	0	0	0	0	0	0	0	0	0	270	0	0	130
2011	0	67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	157	0	11	0	70	0	0	180	0	0	0	0	0	0	0	0	0	0	270	0	0	130
2012	0	67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	157	0	11	0	70	0	0	180	0	0	0	0	0	0	0	0	0	0	270	0	0	130
2013	0	67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	157	0	11	0	70	0	0	180	0	0	0	0	0	0	0	0	0	0	270	0	0	130
2014	0	67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	157	0	11	0	70	0	0	180	0	0	0	0	0	0	0	0	0	0	227	0	0	130
2015	0	67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	0	157	0	11	0	70	0	0	180	0	0	0	0	0	0	0	0	0	0	257	0	0	130

Table B-3. Dilute Waste Generation Volumes for the Lower Planning Case.

THOUSANDS OF GALLONS

FISCAL YEAR	COMBINED PFP WASTE STREAM (NO TRUEX)	COMBINED PFP WASTE STREAM (TRUEX)	COMBINED PFP SOLIDS (NO TRUEX)	COMBINED PFP SOLIDS (TRUEX)	PUREX NCAW FROM THE PROCESSING OF NPR FUEL	PUREX NCAW FROM THE PROCESSING OF PWR FUEL	AGING WASTE FROM FFTF PROCESSING SHEAR/LEACH PROCESSING	PUREX NCRW SUPERNATE (FY 1988 ONLY)	PUREX NCRW SLUDGE (FY 1988 ONLY – TRU SOLIDS)	PUREX DECLADDING WASTE STREAM (FY 1989 ON)	PUREX DECLADDING SOLIDS (FY 1989 ON – NON-TRU SOLIDS)	PUREX SPENT METHATHESIS WASTE (FY 1989 ON)	PUREX SPENT METHATHESIS SOLIDS (FY 1989 ON – TRU SOLIDS)	PUREX MISC. WASTE FROM PROCESSING NPR FUEL	PUREX MISC. WASTE FROM PROCESSING PWR FUEL	PUREX MISC. WASTE FROM PROCESSING FFTF FUEL	PUREX AMMONIUM SCRUBBER FEED	S PLANT DILUTE NON-COMPLEXED	SALT WELL LIQUID FROM EAST AREA DILUTE, NON-COMPLEXED	SALT WELL LIQUID FROM WEST AREA DILUTE, NON-COMPLEXED	T PLANT SUPERNATE (STANDBY MODE)	T PLANT SOLIDS (NO TRUEX – TRU SOLIDS)	T PLANT SOLIDS (TRUEX ACTIVE – NON-TRU SOLIDS)	100-N AREA SULFATE	300/400 AREA LAB WASTE	300/400 AREA LAB WASTE	B PLANT MISCELLANEOUS WASTE (FY 1988 ONLY)	B PLANT MISC. WASTE (FY 1989 ON)	B PLANT AGING WASTE FROM NCAW PROCESSING	B PLANT AGING WASTE FROM NCRW PROCESSING ALL TANKS	B PLANT AGING WASTE SUPERNATE FROM NCRW PROCESSING (1ST TANK)	B PLANT AGING WASTE SUPERNATE FROM NCRW PROCESSING (COMBINED 2	B PLANT AGING WASTE SUPERNATE FROM PROCESSING (COMBINED 3	B PLANT SOLID STREAM FROM PROCESSING OF CC WASTE (INV	B PLANT LIQUID FROM CC PROCESSING (INVENTORY)	B PLANT SOLIDS STREAM FROM PFP PROCESSING	B PLANT LIQUID STREAM FROM PFP PROCESSING	B PLANT SOLID STREAM FROM TRU-NCRW PROCESSING (COMBINED)	B PLANT LIQUID STREAM FROM TRU-NCRW PROCESSING	HWVP WASTE	CX-70 COMPLEX CLEAN UP WASTE	CONCENTRATED COMPLEXANT SOLIDS	FLUSH WATER
1988	214	0	14	0	192	0	0	885	102	0	0	0	0	520	0	0	3600	50	144	0	421	28	0	640	210	0	032	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	983
1989	530	0	44	0	187	0	0	0	0	284	102	202	3	563	0	0	0	50	154	0	421	28	0	640	210	0	0	220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	020
1990	530	0	44	0	184	0	0	0	0	280	100	199	3	536	0	0	0	50	237	0	421	28	0	640	210	0	0	220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	097
1991	704	0	81	0	194	0	0	0	0	280	100	199	3	538	0	0	0	50	91	136	421	28	0	640	210	0	0	220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	146
1992	704	0	81	0	134	0	0	0	0	194	69	138	2	064	0	0	0	50	163	40	421	28	0	640	210	0	0	220	100	116	0	0	0	0	0	0	0	0	0	0	0	0	105
1993	0	865	0	25	0	16	0	0	0	24	8	17	0	0	129	0	0	50	200	49	374	26	0	0	210	30	0	220	218	253	0	0	0	0	0	0	0	0	0	0	0	0	013
1994	0	865	0	25	0	0	80	0	0	0	0	0	0	0	03	468	0	50	22	749	374	26	0	0	210	30	0	220	439	509	0	0	0	0	0	0	0	0	0	0	0	0	199
1995	0	865	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	50	683	456	374	0	26	0	210	0	0	220	463	258	282	0	0	0	0	0	0	0	0	0	0	0	218
1996	0	865	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	50	184	131	374	0	26	0	210	0	0	220	465	0	423	116	0	0	0	0	0	0	0	0	0	0	341
1997	0	865	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	374	0	26	0	210	0	0	220	392	0	0	455	0	0	0	0	0	0	0	0	0	0	939
1998	0	865	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	374	0	26	0	210	0	0	220	169	0	0	198	0	0	0	0	0	0	314	0	0	0	887
1999	0	865	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	374	0	26	0	210	0	0	220	0	0	0	0	0	0	0	0	0	0	258	0	0	0	482
2000	0	865	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	374	0	26	0	210	0	0	220	0	0	0	0	4003	684	0	0	0	0	257	0	93	0	013
2001	0	865	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	374	0	26	0	210	0	0	220	0	0	0	0	488	489	0	0	0	0	253	0	0	4	428
2002	0	865	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	374	0	26	0	210	0	0	220	0	0	0	0	488	500	0	0	0	0	252	0	0	2	747
2003	0	865	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	374	0	26	0	210	0	0	220	0	0	0	0	2452	264	0	0	0	0	257	0	0	1	611
2004	0	865	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	374	0	26	0	210	0	0	220	0	0	0	0	0	0	108	230	0	0	262	0	0	8	36
2005	0	865	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	374	0	26	0	210	0	0	220	0	0	0	0	0	0	110	232	0	0	222	0	0	6	40
2006	0	865	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	374	0	26	0	210	0	0	220	0	0	0	0	0	0	36	76	16	71	270	0	0	5	60
2007	0	865	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	374	0	26	0	210	0	0	220	0	0	0	0	0	0	0	0	83	418	270	0	0	7	06
2008	0	865	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	374	0	26	0	210	0	0	220	0	0	0	0	0	0	0	0	83	417	270	0	0	7	07
2009	0	865	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	374	0	26	0	210	0	0	220	0	0	0	0	0	0	0	0	83	416	270	0	0	7	06
2010	0	865	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	374	0	26	0	210	0	0	220	0	0	0	0	0	0	0	0	28	127	270	0	0	5	36
2011	0	865	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	374	0	26	0	210	0	0	220	0	0	0	0	0	0	0	0	0	0	270	0	0	4	62
2012	0	865	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	374	0	26	0	210	0	0	220	0	0	0	0	0	0	0	0	0	0	270	0	0	4	62
2013	0	865	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	374	0	26	0	210	0	0	220	0	0	0	0	0	0	0	0	0	0	270	0	0	4	62
2014	0	865	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	374	0	26	0	210	0	0	220	0	0	0	0	0	0	0	0	0	0	270	0	0	4	62
2015	0	865	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	374	0	26	0	210	0	0	220	0	0	0	0	0	0	0	0	0	0	270	0	0	4	62

Table B-4. Dilute Waste Generation Volumes for the Upper Planning Case.

THOUSANDS OF GALLONS

FISCAL YEAR	COMBINED PFP WASTE STREAM (NO TRUEX)	COMBINED PFP WASTE STREAM (TRUEX)	COMBINED PFP SOLIDS (NO TRUEX)	COMBINED PFP SOLIDS (TRUEX)	PUREX NCAW FROM THE PROCESSING OF NPR FUEL	PUREX NCAW FROM THE PROCESSING OF PWR FUEL	AGING WASTE FROM FFTF PROCESSING	SHEAR/LEACH PROCESSING (FY 1988 ONLY)	PUREX NCRW SUPERNATE	PUREX NCRW SLUDGE (FY 1988 ONLY - TRU SOLIDS)	PUREX DECLADDING WASTE STREAM (FY 1989 ON)	PUREX DECLADDING SOLIDS (FY 1989 ON - NON-TRU SOLIDS)	PUREX SPENT METHATHESIS WASTE (FY 1989 ON)	PUREX SPENT METHATHESIS SOLIDS (FY 1989 ON - TRU SOLIDS)	PUREX MISC. WASTE FROM PROCESSING NPR FUEL	PUREX MISC. WASTE FROM PROCESSING PWR FUEL	PUREX MISC. WASTE FROM PROCESSING FFTF FUEL	MISC. WASTE GENERATED FROM THE PROCESSING OF SDPR FUEL	HIGH TRITIUM CONTAINING WATER FROM SDPR PROCESSING	PUREX AMMONIUM SCRUBBER FEED	S PLANT DILUTE NON-COMPLEXED	SALT WELL LIQUID FROM EAST AREA DILUTE, NON-COMPLEXED	SALT WELL LIQUID FROM EAST AREA COMPLEXED	SALT WELL LIQUID FROM WEST AREA DILUTE, NON-COMPLEXED	SALT WELL LIQUID FROM WEST AREA COMPLEXED	T PLANT SUPERNATE (STANDBY MODE)	T PLANT SOLIDS (NO TRUEX - TRU SOLIDS)	T PLANT SOLIDS (TRUEX ACTIVE - NON-TRU SOLIDS)	100-H AREA SULFATE	300/400 AREA LAB WASTE	300/400 AREA LAB WASTE	B PLANT MISCELLANEOUS WASTE (FY 1988 ONLY)	B PLANT MISC. WASTE (FY 1989 ON)	FROM NCAW PROCESSING ALL TANKS	B PLANT AGING WASTE FROM NCRW PROCESSING	B PLANT AGING WASTE SUPERNATE FROM NCRW PROCESSING (1ST TANK)	B PLANT AGING WASTE SUPERNATE FROM NCRW PROCESSING (COMBINED 2)	B PLANT AGING WASTE SUPERNATE FROM NCRW PROCESSING (COMBINED 3)	B PLANT SOLID STREAM FROM PROCESSING OF CC WASTE (INV)	B PLANT SOLID STREAM FROM PROCESSING OF CC WASTE (CMP)	B PLANT LIQUID FROM CC PROCESSING (INVENTORY)	B PLANT LIQUID FROM CC PROCESSING (COMPLX SWL)	B PLANT SOLIDS STREAM FROM PFP PROCESSING	B PLANT LIQUID STREAM FROM PFP PROCESSING	B PLANT SOLID STREAM FROM TRU-NCRW PROCESSING (COMBINED)	B PLANT LIQUID STREAM FROM TRU-NCRW PROCESSING	HWVP WASTE	CX-70 COMPLEX CLEAN UP WASTE	CONCENTRATED COMPLEXANT SOLIDS	FLUSH WATER
1988	214	0	14	0	192	0	0	385	102	0	0	0	0	520	0	0	0	0	500	81	119	0	0	0	421	28	0	940	210	0	032	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	981
1989	530	0	44	0	187	0	0	0	0	284	102	202	3	863	0	0	0	0	0	81	0	174	0	0	421	28	0	940	210	0	0	220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	043
1990	530	0	44	0	194	0	0	0	0	280	100	199	3	538	0	0	0	0	0	81	0	558	0	0	421	28	0	940	210	0	0	220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	819
1991	704	0	81	0	194	0	0	0	0	280	100	199	3	538	0	0	0	0	0	81	293	0	171	0	421	28	0	940	210	0	0	220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	586
1992	704	0	81	0	134	0	0	0	0	194	69	138	2	084	0	0	0	0	0	81	320	0	0	187	421	28	0	940	210	0	0	220	100	116	0	0	0	0	0	0	0	0	0	0	0	0	422
1993	0	365	0	25	0	16	0	0	0	24	8	17	0	0	129	0	0	0	0	81	17	0	192	0	374	26	0	0	210	30	0	220	218	253	0	0	0	0	0	0	0	0	0	0	0	0	976
1994	0	365	0	25	0	0	80	0	0	0	0	0	0	0	0	488	0	0	0	81	0	0	0	0	374	26	0	0	210	30	0	220	438	509	0	0	0	0	0	0	0	0	0	0	0	0	431
1995	0	365	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	81	0	0	0	0	374	0	26	0	210	0	0	220	483	255	282	0	0	0	0	0	0	0	0	0	0	0	083
1996	0	365	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	81	0	0	0	0	374	0	26	0	210	0	0	220	485	0	423	116	0	0	0	0	0	0	0	0	0	0	029
1997	0	365	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	81	0	0	0	0	374	0	26	0	210	0	0	220	392	0	0	455	0	0	0	0	0	0	0	0	0	0	942
1998	0	365	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	183	374	0	81	0	0	0	374	0	26	0	210	0	0	220	169	0	0	196	0	0	0	0	0	0	0	0	314	0	784
1999	0	365	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	183	374	0	81	0	0	0	374	0	26	0	210	0	0	220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	559
2000	0	365	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	183	374	0	81	0	0	0	374	0	26	0	210	0	0	220	0	0	0	0	400	0	384	0	0	0	0	0	257	0	438
2001	0	365	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	183	374	0	81	0	0	0	374	0	26	0	210	0	0	220	0	0	0	0	486	0	489	0	0	0	0	0	253	0	517
2002	0	365	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	183	374	0	81	0	0	0	374	0	26	0	210	0	0	220	0	0	0	0	486	0	500	0	0	0	0	0	93	0	528
2003	0	365	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	183	374	0	81	0	0	0	374	0	26	0	210	0	0	220	0	0	0	0	245	862	262	533	0	0	0	0	157	0	901
2004	0	365	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	183	374	0	81	0	0	0	374	0	26	0	210	0	0	220	0	0	0	0	0	580	0	555	0	0	0	0	262	0	550
2005	0	365	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	183	374	0	81	0	0	0	374	0	26	0	210	0	0	220	0	0	0	0	0	500	0	200	0	0	0	0	257	0	593
2006	0	365	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	183	374	0	81	0	0	0	374	0	26	0	210	0	0	220	0	0	0	0	0	0	0	0	78	164	0	0	222	0	885
2007	0	365	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	183	374	0	81	0	0	0	374	0	26	0	210	0	0	220	0	0	0	0	0	0	0	0	110	232	0	0	28	0	737
2008	0	365	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	183	374	0	81	0	0	0	374	0	26	0	210	0	0	220	0	0	0	0	0	0	0	0	89	188	0	0	274	0	703
2009	0	365	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	183	374	0	81	0	0	0	374	0	26	0	210	0	0	220	0	0	0	0	0	0	0	0	0	0	84	286	1270	0	727
2010	0	365	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	183	374	0	81	0	0	0	374	0	26	0	210	0	0	220	0	0	0	0	0	0	0	0	0	0	83	416	1270	0	803
2011	0	365	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	183	374	0	81	0	0	0	374	0	26	0	210	0	0	220	0	0	0	0	0	0	0	0	0	0	83	416	1270	0	803
2012	0	365	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	183	374	0	81	0	0	0	374	0	26	0	210	0	0	220	0	0	0	0	0	0	0	0	0	0	73	327	1270	0	751
2013	0	365	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	183	374	0	81	0	0	0	374	0	26	0	210	0	0	220	0	0	0	0	0	0	0	0	0	0	0	0	1270	0	559
2014	0	365	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	183	374	0	81	0	0	0	374	0	26	0	210	0	0	220	0	0	0	0	0	0	0	0	0	0	0	0	1270	0	559
2015	0	365	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	183	374	0	81	0	0	0	374	0	26	0	210	0	0	220	0	0	0	0	0	0	0	0	0	0	0	0	1270	0	559

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APPENDIX C

DOUBLE-SHELL TANK VOLUMES

Table C-1. Double-Shell Tank Volumes for the Control Case.

FISCAL YEAR	THOUSANDS OF GALLONS													
	NEUTRALIZED CURRENT ACID WASTE	COMPLEXANT CONCENTRATE	DILUTE COMPLEXED	DOUBLE-SHELL SLURRY FEED	DILUTE NON-COMPLEXED	DILUTE PHOSPHATE WASTE	DOUBLE-SHELL SLURRY	CONCENTRATED PHOSPHATE WASTE	PUREX NCRW SLUDGE (TRU)	B PLANT AGING WASTE SUPERNATANT	B PLANT AGING WASTE SOLIDS	PUREX NCRW SLUDGE (LOW-LEVEL)	PFP TRU SOLIDS	B PLANT TRU SOLIDS
1987	1240	2671	872	3314	5169	1075	2191	1048	615	0	0	0	145	0
1988	1387	2671	872	4840	1831	538	2191	1048	727	0	0	0	173	0
1989	1538	2671	872	5522	19	0	2191	1048	730	0	0	102	207	0
1990	1687	2671	872	5522	3259	0	2191	524	733	0	0	202	238	0
1991	1836	2671	872	5866	1519	0	2191	0	736	0	0	302	264	0
1992	1839	2671	872	5504	1361	0	2191	0	738	0	100	371	280	0
1993	1833	2671	872	3578	1351	0	2191	0	738	0	318	379	294	0
1994	1224	3491	0	2841	1351	0	1609	0	738	0	757	379	298	0
1995	790	3491	0	2885	1351	0	1619	0	738	0	1220	0	301	0
1996	320	3491	0	2046	1413	0	1317	0	738	0	1711	0	301	0
1997	0	3491	0	1446	1282	0	704	0	738	0	2031	0	301	0
1998	0	4155	0	174	1282	0	50	0	738	0	2031	0	301	0
1999	0	2341	1121	1208	1282	0	60	0	738	0	1862	0	301	270
2000	0	1648	558	2119	1282	0	70	0	738	0	1183	0	301	852
2001	0	971	0	3004	1282	0	80	0	738	0	510	0	301	1338
2002	0	0	0	2929	1688	0	90	0	738	0	0	0	301	1607
2003	0	0	0	1626	1282	0	100	0	738	0	0	0	124	1248
2004	0	0	0	1317	1282	0	110	0	714	0	0	0	0	860
2005	0	0	0	537	1282	0	120	0	502	0	0	0	0	514
2006	0	0	0	749	1282	0	130	0	290	0	0	0	0	311
2007	0	0	0	964	1282	0	140	0	78	0	0	0	0	379
2008	0	0	0	1115	1282	0	150	0	0	0	0	0	0	388
2009	0	0	0	724	1282	0	160	0	0	0	0	0	0	363
2010	0	0	0	822	1282	0	170	0	0	0	0	0	0	338
2011	0	0	0	919	1282	0	180	0	0	0	0	0	0	293
2012	0	0	0	1014	1282	0	190	0	0	0	0	0	0	217
2013	0	0	0	1109	1282	0	200	0	0	0	0	0	0	141
2014	0	0	0	705	1282	0	210	0	0	0	0	0	0	65
2015	0	0	0	792	1282	0	220	0	0	0	0	0	0	0

Table C-2. Double-Shell Tank Volumes for the Trended Case.

FISCAL YEAR	THOUSANDS OF GALLONS													
	NEUTRALIZED CURRENT ACID WASTE	COMPLEXANT CONCENTRATE	DILUTE COMPLEXED	DOUBLE-SHELL SLURRY FEED	DILUTE NON-COMPLEXED	DILUTE PHOSPHATE WASTE	DOUBLE-SHELL SLURRY	CONCENTRATED PHOSPHATE WASTE	PUREX NCRW SLUDGE (TRU)	B PLANT AGING WASTE SUPERNATANT	B PLANT AGING WASTE SOLIDS	PUREX NCRW SLUDGE (LOW-LEVEL)	PFP TRU SOLIDS	B PLANT TRU SOLIDS
1987	1240	2671	872	3314	5159	1075	2191	1048	615	0	0	0	145	0
1988	1368	2671	872	4887	2714	538	2191	1048	693	0	0	0	178	0
1989	1540	2671	872	5580	0	0	2191	1048	696	0	0	89	212	0
1990	1732	2671	872	5580	4134	0	2191	524	699	0	0	188	256	0
1991	1924	2671	872	6151	1550	0	2191	0	702	0	0	287	298	0
1992	2128	2671	872	5637	1454	0	2191	0	705	0	0	393	340	0
1993	2108	2671	872	3857	1501	0	2191	0	705	0	100	393	363	0
1994	1889	3491	0	2402	3201	0	1599	0	705	0	319	393	386	0
1995	1450	3491	0	2531	3952	0	1621	0	705	0	758	0	386	0
1996	988	3491	0	2196	1431	0	1321	0	705	0	1222	0	386	0
1997	498	3491	0	1777	1438	0	719	0	705	0	1712	0	386	0
1998	56	4153	0	1276	1361	0	73	0	705	0	2152	0	386	0
1999	0	4155	0	1544	1414	0	90	0	705	0	2039	0	386	0
2000	0	4020	0	1021	1361	0	106	0	705	0	1360	0	386	146
2001	0	2768	0	1908	1361	0	122	0	705	0	683	0	386	634
2002	0	1519	9	3262	1291	0	133	0	705	0	9	0	386	1120
2003	0	269	0	4033	1291	0	144	0	705	0	0	0	386	1608
2004	0	0	0	2665	1291	0	155	0	705	0	0	0	316	1315
2005	0	0	0	1246	1291	0	166	0	705	0	0	0	73	983
2006	0	0	0	1083	1291	0	177	0	622	0	0	0	0	592
2007	0	0	0	803	1291	0	188	0	410	0	0	0	0	260
2008	0	0	0	1022	1291	0	199	0	197	0	0	0	0	348
2009	0	0	0	1227	1291	0	210	0	0	0	0	0	0	405
2010	0	0	0	843	1291	0	221	0	0	0	0	0	0	380
2011	0	0	0	947	1291	0	232	0	0	0	0	0	0	355
2012	0	0	0	1045	1291	0	243	0	0	0	0	0	0	330
2013	0	0	0	1140	1291	0	254	0	0	0	0	0	0	305
2014	0	0	0	1235	1291	0	265	0	0	0	0	0	0	236
2015	0	0	0	830	1291	0	276	0	0	0	0	0	0	160

Table C-3. Double-Shell Tank Volumes for the Lower Planning Case.

FISCAL YEAR	THOUSANDS OF GALLONS													
	NEUTRALIZED CURRENT ACID WASTE	COMPLEXANT CONCENTRATE	DILUTE COMPLEXED	DOUBLE-SHELL SLURRY FEED	DILUTE NON-COMPLEXED	DILUTE PHOSPHATE WASTE	DOUBLE-SHELL SLURRY	CONCENTRATED PHOSPHATE WASTE	PUREX NCRW SLUDGE (TRU)	B PLANT AGING WASTE SUPERNATANT	B PLANT AGING WASTE SOLIDS	PUREX NCRW SLUDGE (LOW-LEVEL)	PFP TRU SOLIDS	B PLANT TRU SOLIDS
1987	1240	2671	872	3314	5159	1075	2191	1048	615	0	0	0	145	0
1988	1432	2671	872	4955	2047	575	2191	1048	727	0	0	0	188	0
1989	1629	2671	872	5681	620	0	2191	1048	730	0	0	102	261	0
1990	1823	2671	872	5681	6042	0	2191	1048	733	0	0	202	334	0
1991	2017	2671	872	6393	4205	0	2191	1048	736	0	0	302	424	0
1992	2051	2671	872	7327	1916	0	2191	0	738	0	100	371	514	0
1993	1849	2671	872	5540	2008	0	2191	0	738	0	318	379	565	0
1994	1490	3491	0	4934	3707	0	1599	0	738	0	757	379	616	0
1995	1026	3491	0	4636	3414	0	1650	0	738	0	1220	379	616	0
1996	561	3491	0	3797	2089	0	1701	0	738	0	1665	379	616	0
1997	169	3491	0	2547	1958	0	1752	0	738	0	2077	0	616	0
1998	0	4153	0	1417	1958	0	641	0	738	0	2077	0	616	0
1999	0	4155	0	956	1958	0	255	0	738	0	1400	0	616	0
2000	0	3129	2	2813	1958	0	306	0	738	0	725	0	616	493
2001	0	1863	0	3112	1958	0	357	0	738	0	51	0	616	979
2002	0	970	0	3608	1958	0	408	0	738	0	0	0	616	1062
2003	0	0	0	3419	1958	0	459	0	738	0	0	0	616	868
2004	0	0	0	2812	1958	0	510	0	738	0	0	0	374	536
2005	0	0	0	1823	1958	0	561	0	738	0	0	0	130	219
2006	0	0	0	964	1958	0	612	0	702	0	0	0	0	246
2007	0	0	0	1566	1958	0	663	0	490	0	0	0	0	314
2008	0	0	0	1225	1958	0	714	0	277	0	0	0	0	382
2009	0	0	0	1816	1958	0	765	0	65	0	0	0	0	450
2010	0	0	0	1394	1958	0	816	0	0	0	0	0	0	453
2011	0	0	0	1876	1958	0	867	0	0	0	0	0	0	428
2012	0	0	0	1575	1958	0	918	0	0	0	0	0	0	403
2013	0	0	0	2049	1958	0	969	0	0	0	0	0	0	378
2014	0	0	0	1752	1958	0	1020	0	0	0	0	0	0	353
2015	0	0	0	1726	1958	0	1071	0	0	0	0	0	0	328

Table C-4. Double-Shell Tank Volumes for the Upper Planning Case.

FISCAL YEAR	THOUSANDS OF GALLONS													
	NEUTRALIZED CURRENT ACID WASTE	COMPLEXANT CONCENTRATE	DILUTE COMPLEXED	DOUBLE-SHELL SLURRY FEED	DILUTE NON-COMPLEXED	DILUTE PHOSPHATE WASTE	DOUBLE-SHELL SLURRY	CONCENTRATED PHOSPHATE WASTE	PUREX NCRW SLUDGE (TRU)	B PLANT AGING WASTE SUPERNATANT	B PLANT AGING WASTE SOLIDS	PUREX NCRW SLUDGE (LOW-LEVEL)	PFP TRU SOLIDS	B PLANT TRU SOLIDS
1987	1240	2671	872	3314	5159	1075	2191	1048	615	0	0	0	145	0
1988	1432	2671	872	4785	2054	537	2191	1048	727	0	0	0	188	0
1989	1629	2821	872	5542	0	0	2191	1048	730	0	0	102	261	0
1990	1823	3643	872	5542	4962	0	2191	1048	733	0	0	202	334	0
1991	2017	3643	872	6070	6485	0	2191	1048	736	0	0	302	424	0
1992	2051	4262	3826	7779	1883	0	2191	0	738	0	100	371	514	0
1993	1849	5532	872	7052	2157	0	2191	0	738	0	318	379	565	0
1994	1490	6352	0	6715	1965	0	1599	0	738	0	757	379	616	0
1995	1026	6352	0	6131	1965	0	1650	0	738	0	1220	379	616	0
1996	561	6352	0	5422	1965	0	1701	0	738	0	1685	379	616	0
1997	169	6352	0	4719	1965	0	1752	0	738	0	2077	379	616	0
1998	0	7014	0	4049	1965	0	1141	0	738	0	2077	379	616	0
1999	0	7016	0	3480	1553	0	1190	0	738	0	1400	379	616	0
2000	0	5990	0	3983	1965	0	1241	0	738	0	725	379	616	0
2001	0	4742	9	4919	1965	0	1292	0	738	0	51	379	616	0
2002	0	3632	0	5825	1965	0	1343	0	738	0	0	379	616	0
2003	0	2243	0	7463	1965	0	1394	0	738	0	0	379	616	0
2004	0	986	0	9993	1965	0	1445	0	738	0	0	379	616	0
2005	0	0	0	11820	1965	0	1496	0	738	0	0	379	616	0
2006	0	0	0	11297	1965	0	1547	0	738	0	0	379	443	0
2007	0	0	0	10604	1965	0	1598	0	738	0	0	379	199	0
2008	0	0	0	10135	1965	0	1649	0	738	0	0	379	0	0
2009	0	0	0	9502	1965	0	1700	0	592	0	0	379	0	0
2010	0	0	0	8830	1965	0	1751	0	380	0	0	379	0	0
2011	0	0	0	8168	1965	0	1802	0	168	0	0	379	0	0
2012	0	0	0	7295	2520	0	1853	0	0	0	0	379	0	0
2013	0	0	0	7111	1965	0	1904	0	0	0	0	379	0	0
2014	0	0	0	5850	1965	0	1955	0	0	0	0	379	0	0
2015	0	0	0	5057	1965	0	2006	0	0	0	0	379	0	0

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APPENDIX D

DOUBLE-SHELL TANK PICTOGRAPHS

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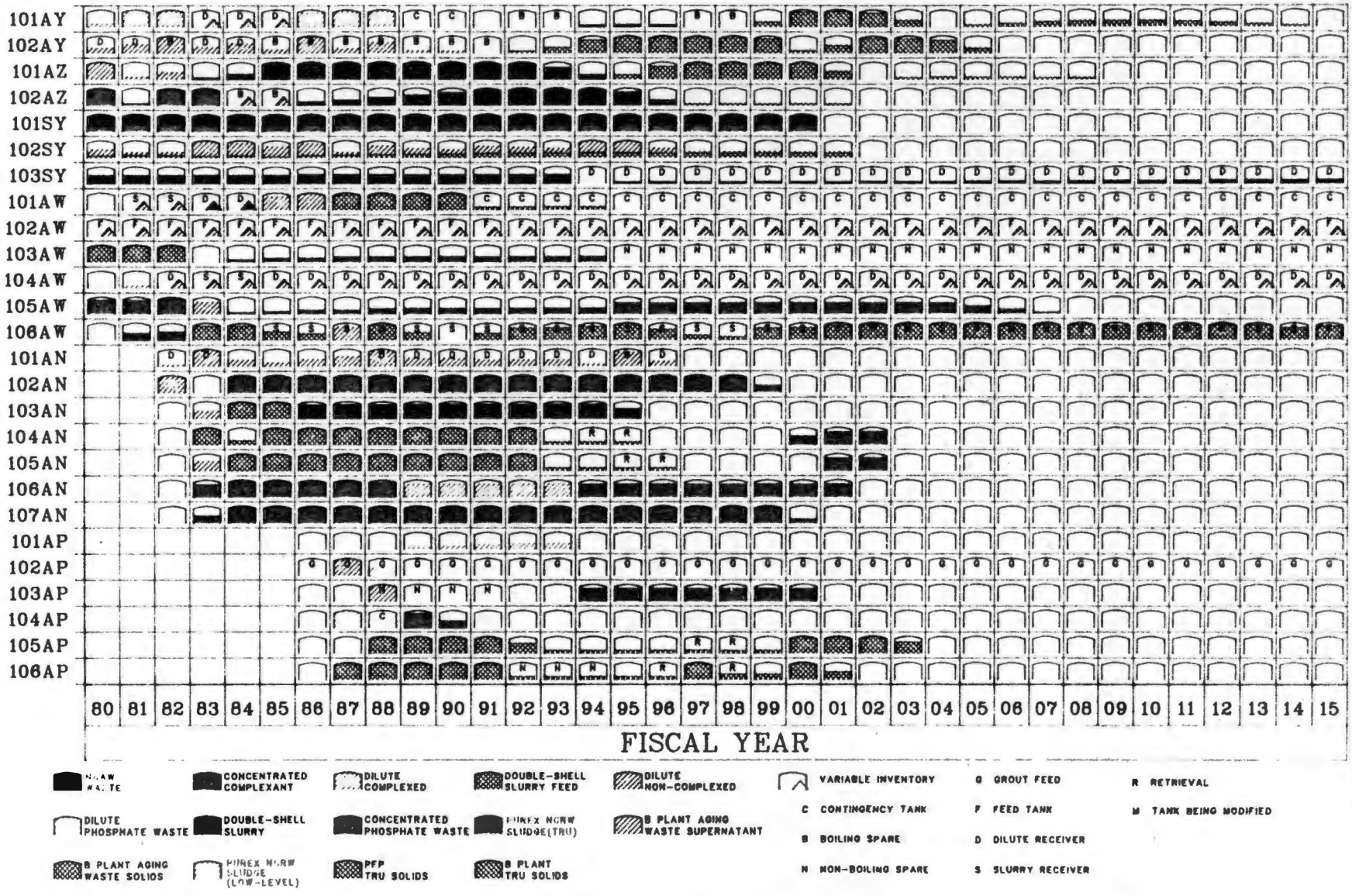

Figure D-1. Double-Shell Tank Pictograph for the Control Case. (sheet 1 of 2)

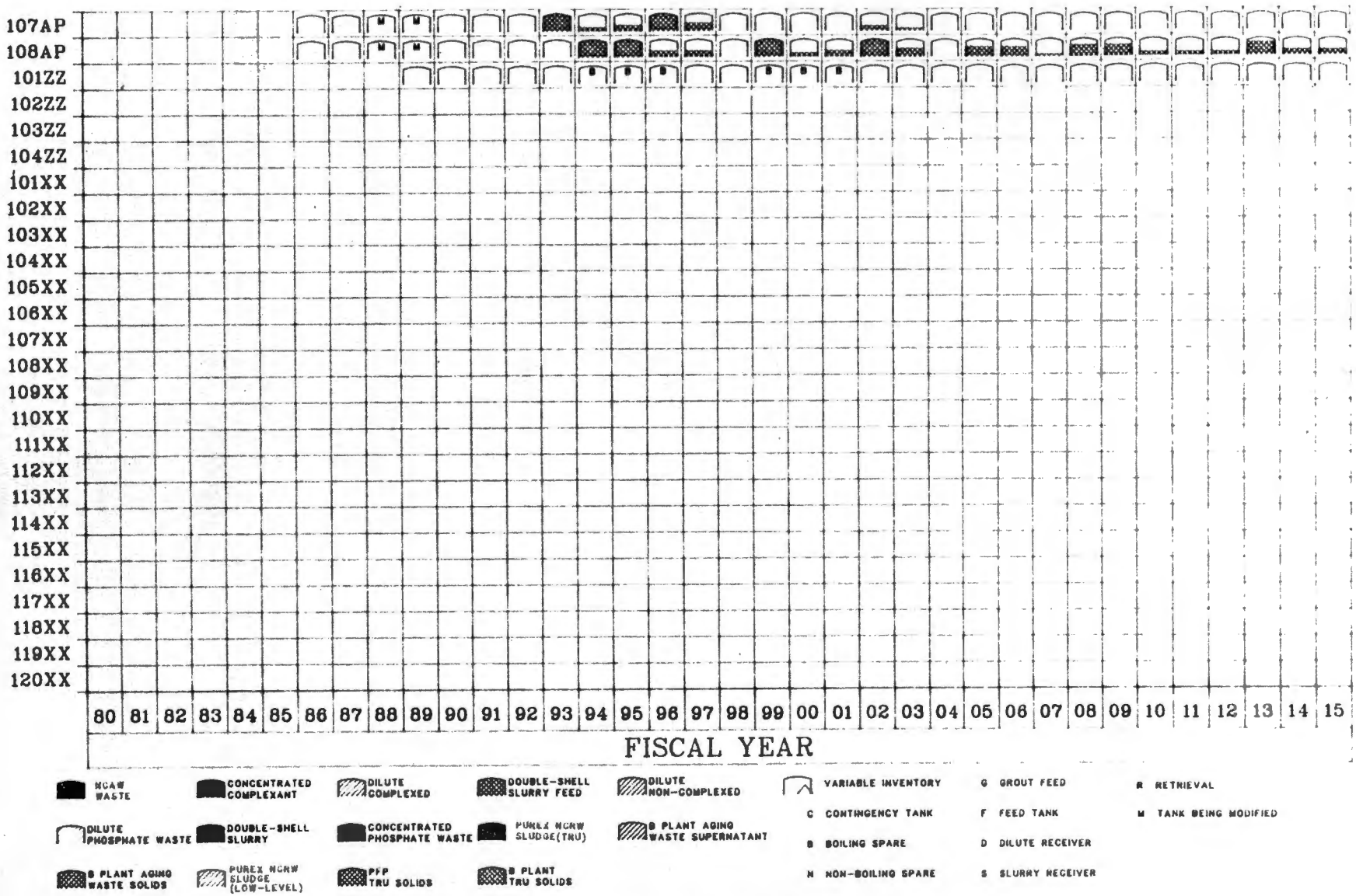

Figure D-1. Double-Shell Tank Pictograph for the Control Case. (sheet 2 of 2)

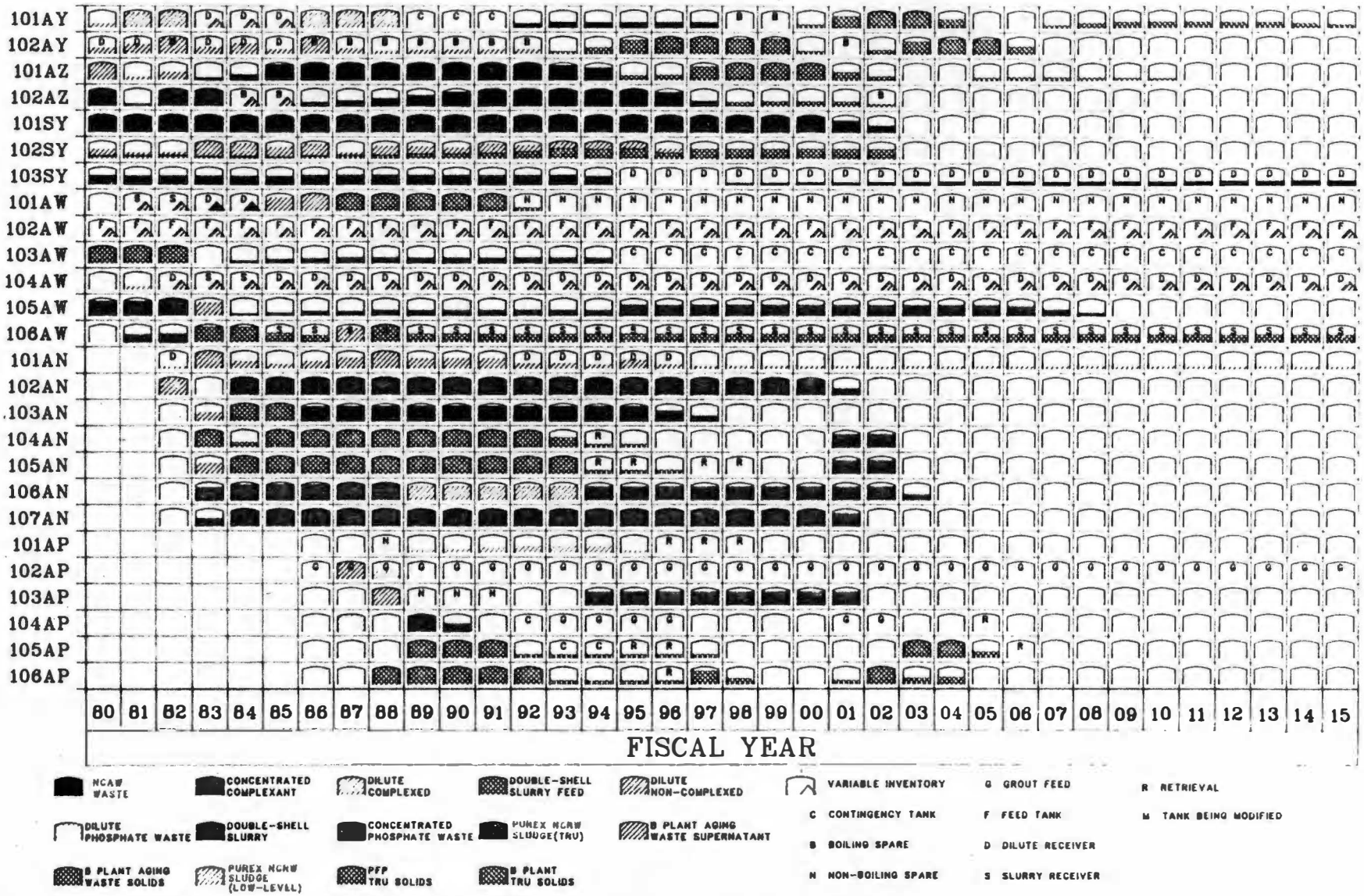

Figure D-2. Double-Shell Tank Pictograph for the Trended Case. (sheet 1 of 2)

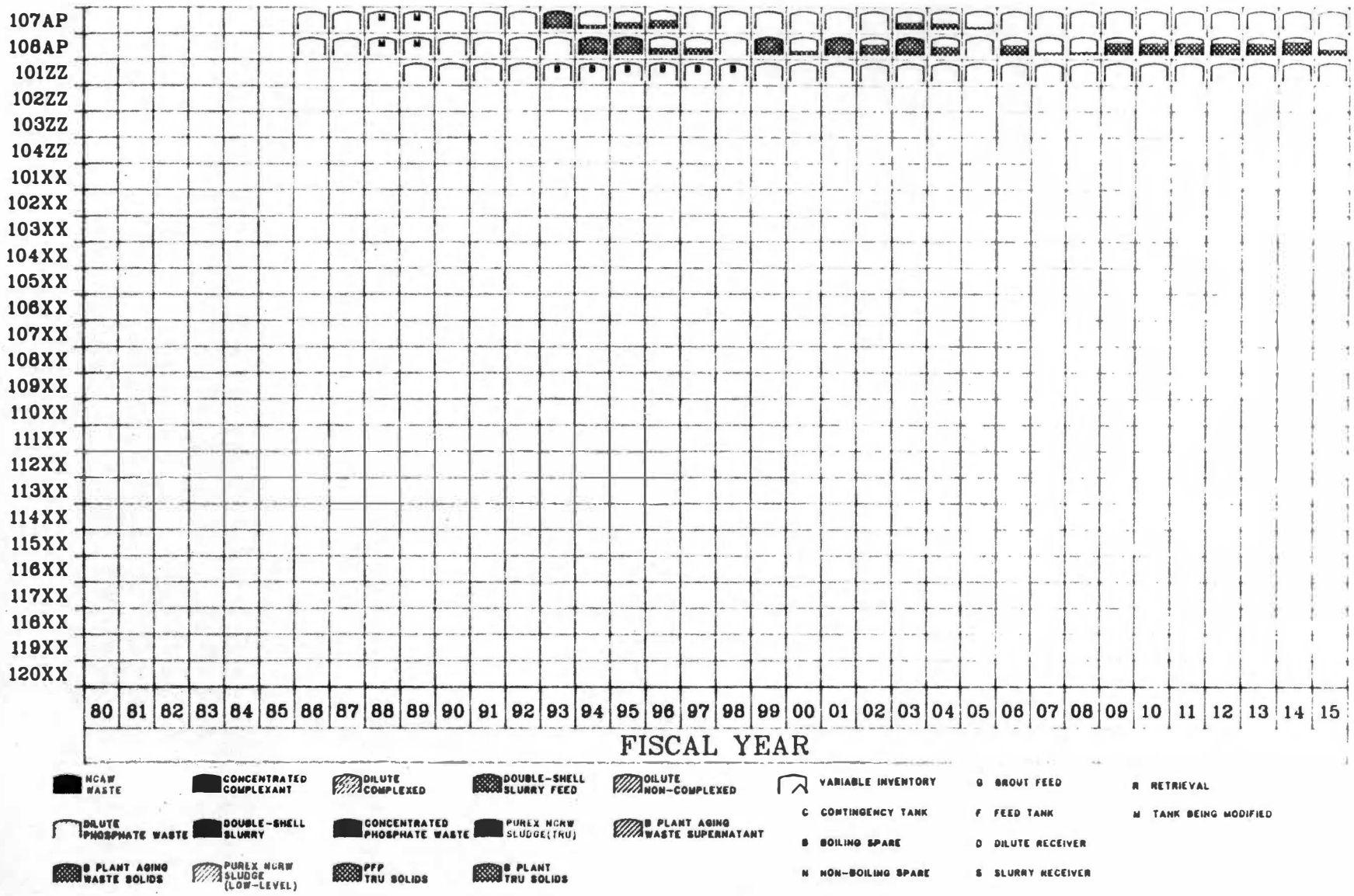

Figure D-2. Double-Shell Tank Pictograph for the Trended Case. (sheet 2 of 2)

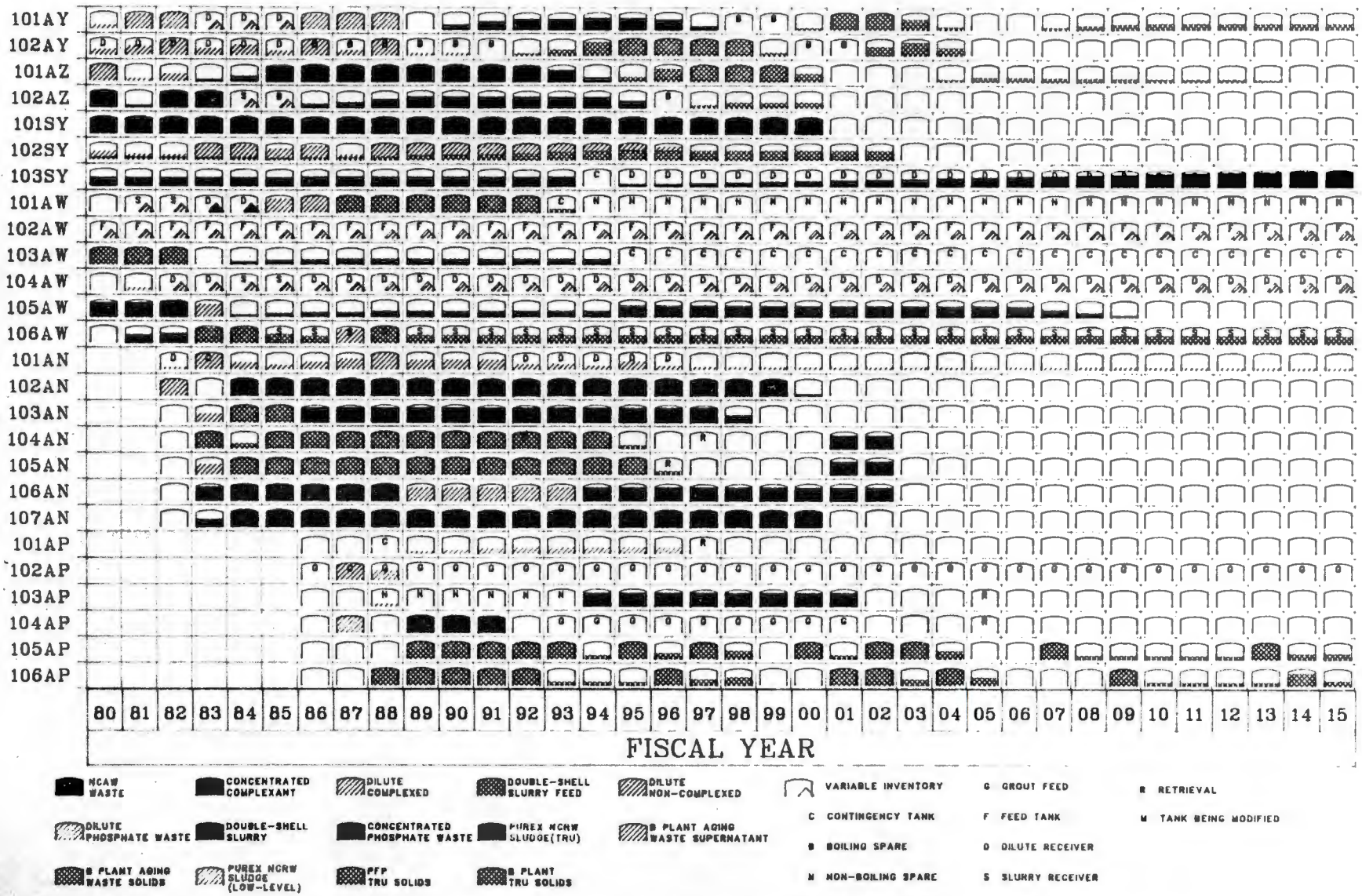

Figure D-3. Double-Shell Tank Pictograph for the Lower Planning Case. (sheet 1 of 2)

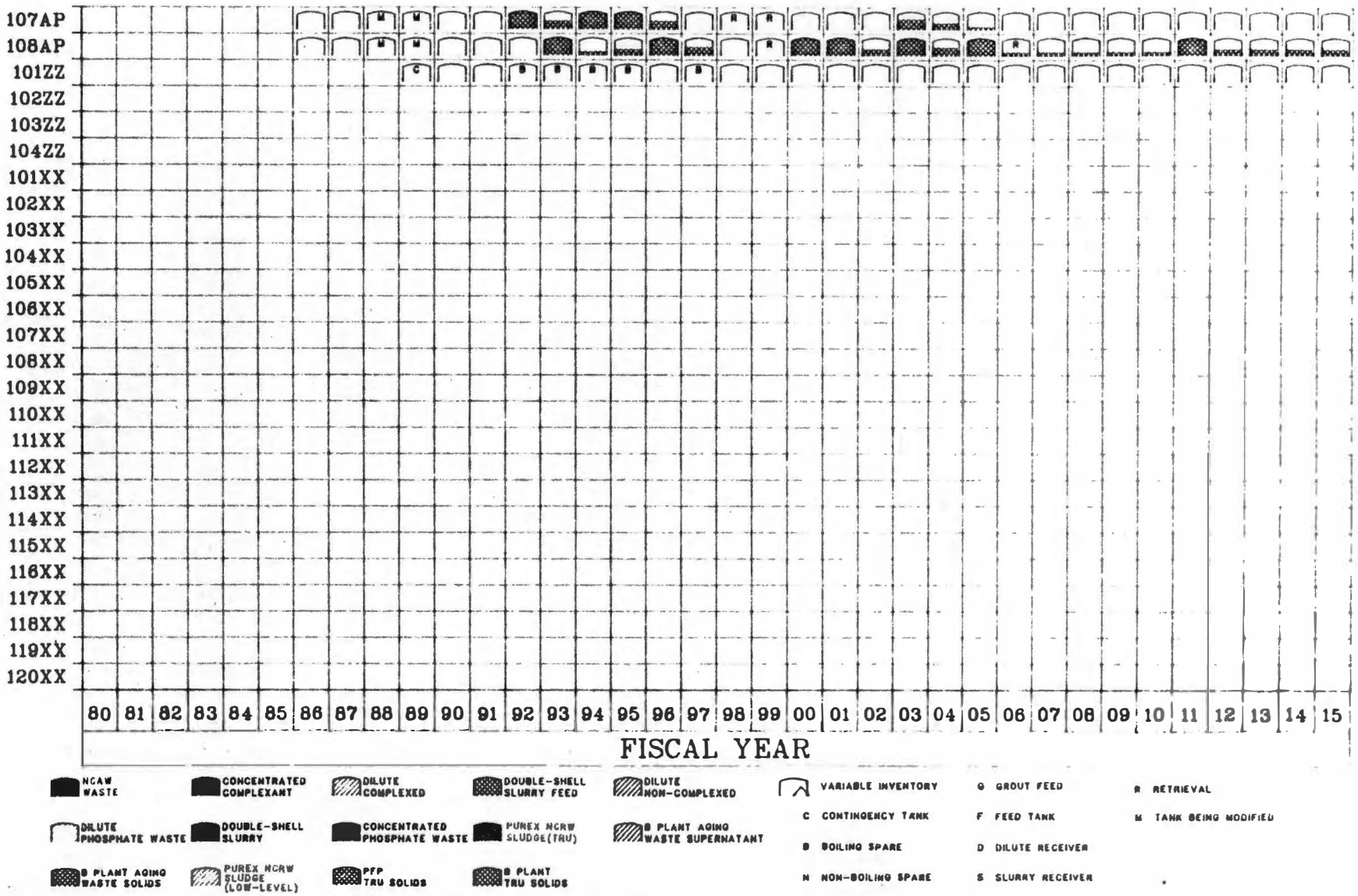

Figure D-3. Double-Shell Tank Pictograph for the Lower Planning Case. (sheet 2 of 2)

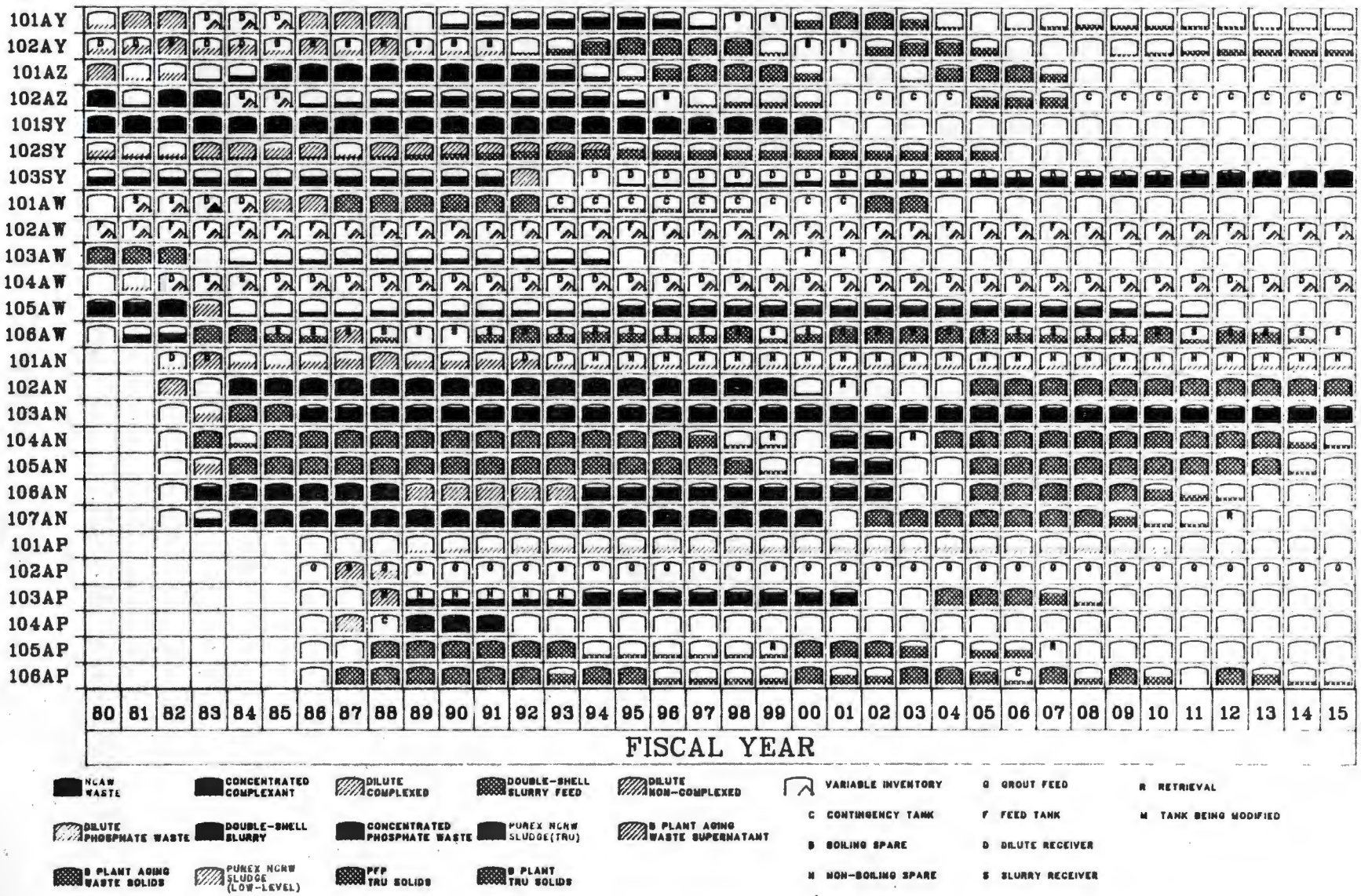

Figure D-4. Double-Shell Tank Pictograph for the Upper Planning Case. (sheet 1 of 2)

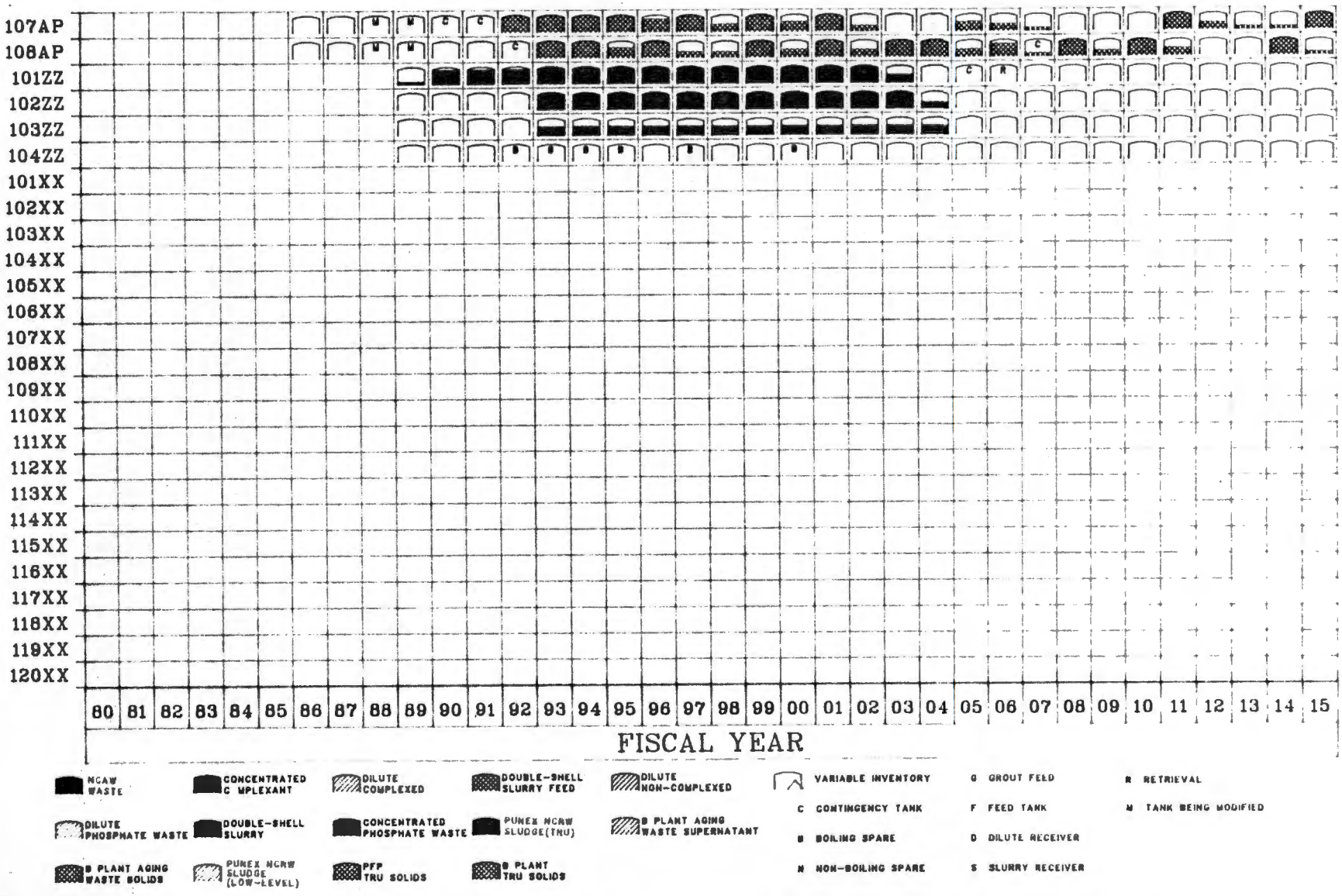

Figure D-4. Double-Shell Tank Pictograph for the Upper Planning Case. (sheet 2 of 2)

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