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ENGINEERING CHANGE NOTICE

Page 1 of 2

1. ECN 635540

Proj. ECN

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.	4. USQ Required?	5. Date
Supplemental [] Direct Revision [X] Change ECN [] Temporary [] Standby [] Supersedure [] Cancel/Void []	James N. Strode, Models and Inventory, R2-11, 373-1280	[] Yes [X] No	08/19/97
	6. Project Title/No./Work Order No.	7. Bldg./Sys./Fac. No.	8. Approval Designator
	Operational Waste Volume Project	N/A	N/A
	9. Document Numbers Changed by this ECN (includes sheet no. and rev.)	10. Related ECN No(s).	11. Related PO No.
	WHC-SD-WM-ER-029, Rev. 22	See Block 12	N/A

12a. Modification Work	12b. Work Package No.	12c. Modification Work Complete	12d. Restored to Original Condition (Temp. or Standby ECN only)
[] Yes (fill out Blk. 12b) [X] No (NA Blks. 12b, 12c, 12d)	N/A	N/A Design Authority/Cog. Engineer Signature & Date	N/A Design Authority/Cog. Engineer Signature & Date

13a. Description of Change

13b. Design Baseline Document? [] Yes [X] No

This document updates Revision 22 by incorporating changed facility schedule assumptions, as well as waste generation rates and volumes which have occurred since the publication of Revision 22. All the values in this document will be updated several times per year.

Continued from Block ~~9~~ 10: ECN-603360, ECN-189210, ECN-166505, ECN-606102, and ECN-631389.

14a. Justification (mark one)

Criteria Change	[X]	Design Improvement	[]	Environmental	[]	Facility Deactivation	[]
As-Found	[]	Facilitate Const	[]	Const. Error/Omission	[]	Design Error/Omission	[]

14b. Justification Details

See Block 12 above.

15. Distribution (include name, MSIN, and no. of copies)

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1. ECN (use no. from pg. 1) ECN-635540

16. Design Verification Required	17. Cost Impact				18. Schedule Impact (days)	
	ENGINEERING		CONSTRUCTION			
[] Yes	Additional	[] $	Additional	[] $	Improvement	[]
[X] No	Savings	[] $	Savings	[] $	Delay	[]

19. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 13. Enter the affected document number in Block 20.

SDD/DD	[]	Seismic/Stress Analysis	[]	Tank Calibration Manual	[]
Functional Design Criteria	[]	Stress/Design Report	[]	Health Physics Procedure	[]
Operating Specification	[]	Interface Control Drawing	[]	Spares Multiple Unit Listing	[]
Criticality Specification	[]	Calibration Procedure	[]	Test Procedures/Specification	[]
Conceptual Design Report	[]	Installation Procedure	[]	Component Index	[]
Equipment Spec.	[]	Maintenance Procedure	[]	ASME Coded Item	[]
Const. Spec.	[]	Engineering Procedure	[]	Human Factor Consideration	[]
Procurement Spec.	[]	Operating Instruction	[]	Computer Software	[]
Vendor Information	[]	Operating Procedure	[]	Electric Circuit Schedule	[]
OM Manual	[]	Operational Safety Requirement	[]	ICRS Procedure	[]
FSAR/SAR	[]	IEFD Drawing	[]	Process Control Manual/Plan	[]
Safety Equipment List	[]	Cell Arrangement Drawing	[]	Process Flow Chart	[]
Radiation Work Permit	[]	Essential Material Specification	[]	Purchase Requisition	[]
Environmental Impact Statement	[]	Fac. Proc. Samp. Schedule	[]	Tickler File	[]
Environmental Report	[]	Inspection Plan	[]		[]
Environmental Permit	[]	Inventory Adjustment Request	[]		[]

20. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number Revision
N/A		

21. Approvals

	Signature	Date		Signature	Date
Design Authority			Design Agent		
Cog. Eng. J.N. Strode/V.C. Boyles	JNS/VCB	8/19/97	PE		
Cog. Mgr. K.M. Hodgson	K.M. Hodgson	8/19/97	QA		
QA			Safety		
Safety			Design		
Environ.			Environ.		
Other			Other		
J.G. Kristofzski, Process Engineering	JGK	8/19/97			
J.H. Wicks, Tank Farms Operations	JHWicks	19 Aug 97	DEPARTMENT OF ENERGY		
			Signature or a Control Number that tracks the Approval Signature		
R.L. Treat, Tank Waste Disposal	RLT	8/19/97			
			ADDITIONAL		
D.W. Lindsey, Liquid Waste Processing Facilities		8/19/97			
B.G. Erlandson, Environment	BGE by DJL	8/19/97			

Operational Waste Volume Projection

J.N. Strode/V.C. Boyles
Lockheed Martin Hanford, Corp., Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-96RL13200

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Key Words: Waste Volume Projection, Tank Space Management Board, Waste Volume Reduction, Double-Shell Tank, Evaporator, LERF

Abstract: Waste receipts to the double-shell tank system are analyzed and wastes through the year 2015 are projected based on generation trends of the past 12 months. A computer simulation of site operations is performed, which results in projections of tank fill schedules, tank transfers, evaporator operations, tank retrieval, and aging waste tank usage.

This projection incorporates current budget planning and the clean-up schedule of the Tri-Party Agreement. Assumptions were current as of July, 1997.

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Operational Waste Volume Projection

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OPERATIONAL WASTE VOLUME PROJECTION

JULY 1997

Prepared by

J. N. Strode
V. C. Boyles

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1.0 SUMMARY

The Operational Waste Volume Projection (OWVP) presents a basis for evaluating future Double-Shell Tank (DST) space through FY 2015. This report presents a projected range of tank needs which is used to generate recommendations regarding site activities, waste management activities, facility requirements, and the need to build additional double-shell tanks. This document presents the results of three distinct projections cases (TPA Compliant, Disposal Planning, and Ecology Planning Cases). Operating assumptions for the three cases were established prior to July 1997:

- The TPA Compliant Case presents projected DST needs based on TPA milestones, TWRS program planning, and the current operational assumptions. The TPA Compliant Case exceeds available space by one tank in FY 2005-2006 and by up to two tanks in FY 2011-2015.

- The Disposal Planning Case predicts the DST needs for a reduced SST solids retrieval schedule. This projection does not exceed available space through FY 2015.

- The Ecology Planning Case (also meets all TPA milestones) presents the impacts of a two year evaporator outage (8/2000-8/2002) and the use of two aging waste tanks to retrieve Tank 106-C solids. During the evaporator outage, dilute receiver tanks and the evaporator feed tank are filled to capacity without impacting the tank needs line. Requiring two tanks to store retrieved Tank 106-C solids would require additional tank space to allow in-tank washing of the aging waste solids to proceed. As expected, this projection exceeds available space by up to two tanks during the period FY 2001-2015.

A comparison of the projected tank space needs required for the three projection cases is depicted in Figure 1. Key assumptions for the three projection cases are summarized in Table 1. Differences in assumptions have been highlighted. Detailed assumptions and space saving alternatives are presented later in this document. A brief summary of the risks associated with these projections is provided in Table 2. Additional information and references for Table 2 can be found later in this document by referring to the section listed under comments. At a minimum, this DST space forecast will be updated annually with the latest information available regarding the estimated volume of waste requiring storage in the DSTs.

Areas Requiring Management Consideration

Facility waste minimization requirements initiated by the Tank Space Management Board (TSMB) helped to guarantee tank space availability prior to the 242-A Evaporator restart. However, considering the possibility of future tank space shortages, the Terminal Clean-out (TCO) and monthly waste generations will continually need to be minimized. The Waste Feed Process Control Group is a new group which meets on a monthly basis to review projected waste generations, waste transfers, and tank configuration control. Issues that cannot be resolved by this group will be elevated to the Feed Process Senior Management board.

Should a tank space shortage occur during the projection period (Figure 1), the shortage could be solved using a combination of the following actions (see Section 6.0 for a more complete listing):

- o delay the Single-Shell Tank (SST) stabilization
- o delay the SST solids retrieval
- o accelerate processing and vitrification of waste
- o establish Phase 2 contract terms for privatization to require rates of retrieval and processing equivalent to TPA rates
- o construct new double-shell tanks

Approximately 6-8 years are required to build additional double-shell tanks (DSTs). The TPA Compliant Case presented in this document projects that tank space needs will be at or exceed the available space during the FY 2005-2006 and FY 2011-2015 timeframes. However, budget reductions occurring at the Hanford site may not allow SST solids retrieval (or other activities) to occur on schedule to meet TPA milestones as assumed for the TPA Compliant Projection. This in essence, could reduce the retrieved SST waste volumes to those used for the Disposal Planning Case which would not require additional tank space. In addition, a number of space saving options are presented to rectify the tank space shortage. This document is recommending that since time is still available, that the space saving options, the budget, and the projection assumptions be monitored closely over the next year to determine whether new double-shell tanks are needed. In the event additional tanks are needed, there will be adequate time next year to prepare for the additional tanks.

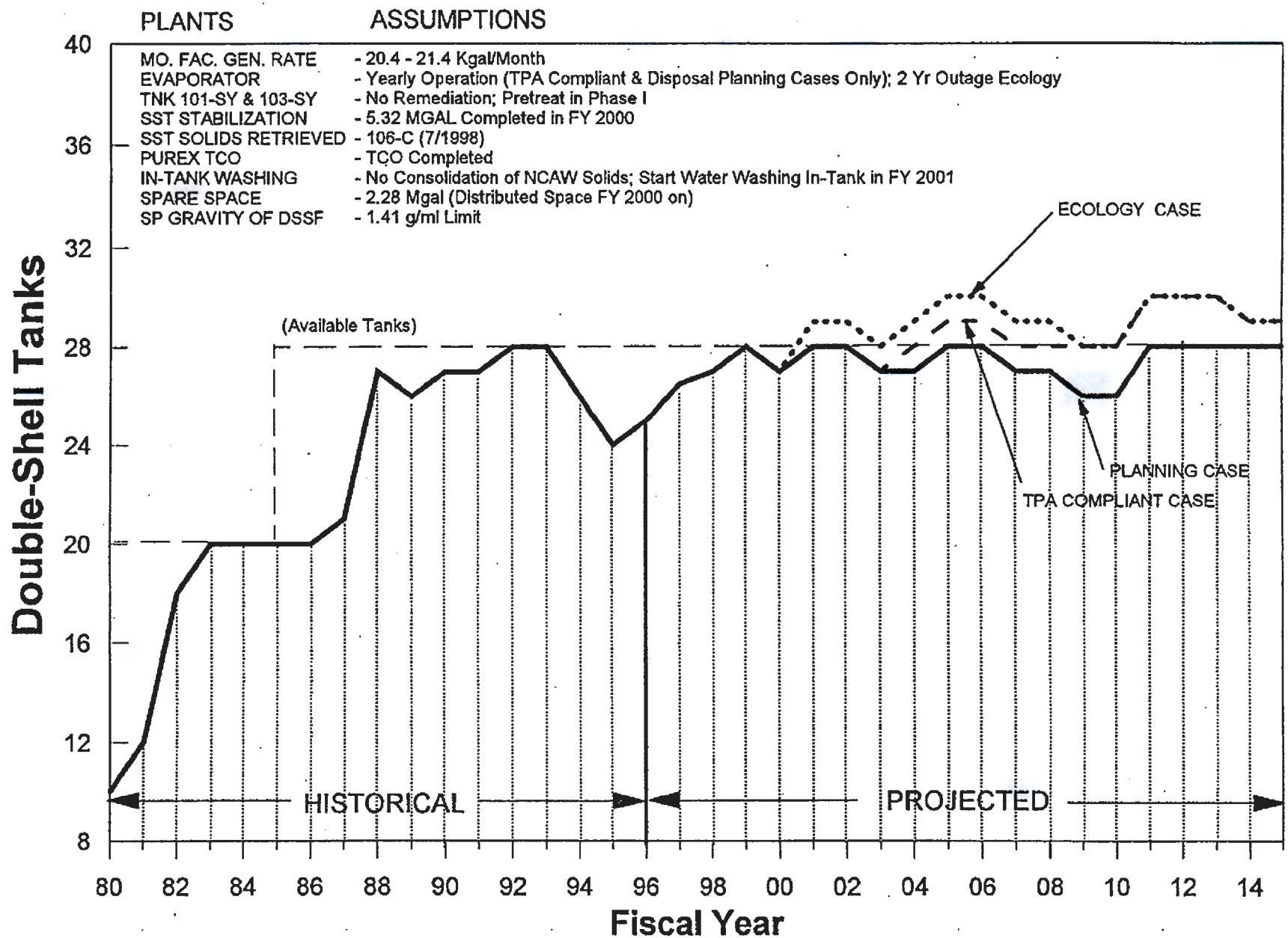

Figure 1. Comparison of Tank Requirements For the 7/97 Projection Cases

OF1

Table 1. Summary of Assumptions For the 1997 Projection Cases (references in Sect. 3)

Facility or Project	TPA Compliant Case (L97TPA) Assumptions	Disposal Planning Case (L97BC2) Assumptions	Ecology Planning Case (L97ECO) Assumptions
Total Monthly Facility Generations	20.1-21.4 Kgal/month	20.1-21.4 Kgal/month	20.1-21.4 Kgal/month
PUREX Misc After TCO Completed	5 Kgal/year DN	5 Kgal/year DN	5 Kgal/year DN
B Plant TCO	TCO FY97-98 (0.200 Mgal DN)	TCO FY97-98 (0.200 Mgal DN)	TCO FY97-98 (0.200 Mgal DN)
100N Area TCO	TCO FY97 (0.014 Mgal DN & solids)	TCO FY97 (0.014 Mgal DN & solids)	TCO FY97 (0.014 Mgal DN & solids)
100K Area TCO	TCO FY00-01 (0.35 Mgal DN)	TCO FY00-01 (0.35 Mgal DN)	TCO FY00-01 (0.35 Mgal DN)
105 F & H Basin Cleanout	TCO FY00-05 (0.24 Mgal DN)	TCO FY00-05 (0.24 Mgal DN)	TCO FY00-05 (0.24 Mgal DN)
Evaporator Operation Outage	Yearly through 2015 None	Yearly through 2015 None	Yearly except for two year outage from August 2000-August 2002
Liquid Effluent Treatment Facility Startup Rate (Mgal/Year)	11/1995 50	11/1995 50	11/1995 50
SST Stabilization Porosity Saltcake/Sludge Complexed SWL Volume Pumped Volume Pumped 1997-1998	50%/21% 1.75 Mgal ~5.32 Mgal (1997-2000) 2.96 Mgal (1997-1998)	50%/21% 1.75 Mgal ~5.32 Mgal (1997-2000) 2.96 Mgal (1997-1998)	50%/21% 1.75 Mgal ~5.32 Mgal (1997-2000) 2.96 Mgal (1997-1998)
PFP Stabilization	34 Kgal (FY 1997-2006)	34 Kgal (FY 1997-2006)	34 Kgal (FY 1997-2006)
Tank 101-SY Processing Dilution	No Dilution until treatment (4/2006)	No Dilution until treatment (4/2006)	No Dilution until treatment (4/2006)
Tank 103-SY Processing Dilution	No Dilution until treatment (8/2006)	No Dilution until treatment (8/2006)	No Dilution until treatment (8/2006)
SST Solids Retrieval 106-C solids (start; receiver tank) SST Solids Retrieval Start Rate SST Waste Retrieval Complete SST Site Closure Complete	TPA Compliant 7/1998; Tank 102-AY 12/2003 2.0 Mgal in FY 2004-2005; 5.0 Mgal in FY 2006-2007; FY 2018 FY 2024	Reduced Rate 7/1998; Tank 102-AY 12/2003 1.6 Mgal in FY 2004-2005; 4.0 Mgal in FY 2006-2007; FY 2020 FY 2024	TPA Complaint; 106-C changes 7/1998; Tank 102-AY & 101-AY 12/2003 2.0 Mgal in FY 2004-2005; 5.0 Mgal in FY 2006-2007; FY 2018 FY 2024
Phase 1B Privatization Processing startup	06/2002	06/2002	06/2002
LAW Processing Rate (Mgal/Yr)	2.03 in 1st Year (6/2002-5/2003) 2.22 in 2nd Year	2.03 in 1st Year (6/2002-5/2003) 2.22 in 2nd Year	2.03 in 1st Year (6/2002-5/2003) 2.22 in 2nd Year
LAW Vendor Feed Tanks LAW Intermediate Feed Staging Tanks Sr/TRU & Entrained Solids Receipt Tank	2 2 1	2 2 1	2 2 1
Phase 2 Privatization Maximum Processing Rate,Mgal/Yr @ 7M Na Maximum Processing Rate,Mgal/Yr @ 5M Na HLW Vitrification startup HLW Return Tanks	2011 17.2 24.1 2013 3	2011 17.2 24.1 2013 3	2011 17.2 24.1 2013 3
In-Tank Washing (FY 1998-2004) Consolidate NCAW solids Consolidate NCAW supernates to	Case 8 Modified (Sect. 3.17) No 101-AY + 1 DST	Case 8 Modified (Sect. 3.17) No 101-AY + 1 DST	Case 8 Modified (Sect. 3.17) No 101-AY + 1 DST
Evaporation Limit for Wastes--SpG	1.41	1.41	1.41
Spare Space	2.28	2.28	2.28
Contingency Tank	None	None	None
Loss of DST Space	None	None	None

Table 2. Risk Assessment Summary for Waste Volume Projections

RISK ASSESSMENT SUMMARY FOR WASTE VOLUME PROJECTIONS									
Technical/Program Basis for Waste Volume Projections	Confidence of Basis Being Accurate			Waste Volume Impact if Wrong			Consequence if Assumption Wrong		COMMENTS
	HIGH	MED	LO	MAJOR	MINOR	QUANTITY	MAJOR	MINIMAL	
Remaining SWL pumping volume is ~5.32 Mgal		X		X		Dependent on magnitude of change	X		Delay TPA milestones; Large concentrated volume; see Section 3.8; Could prevent initial feed staging for Phase 1B LAW Privatization
CC waste and TRU sludge in Tank 102-SY are compatible		X		X		Dependent on magnitude of change	X		Could delay SWL pumping TPA milestones; see Section 3.8
242-A Evaporator available without an outage to 2015		X		X		Dependent on magnitude of change	X		Tank Space Projections based on concentrated volumes; see Section 3.2
Evaporation limit for new DSSF will be SpG of 1.41		X		X		Dependent on magnitude of change	X		Reduction in SpG could be required by safety;Section 3.2
Facility generations will not exceed TPA Compliant Case levels		X			X	Dependent on magnitude of change		X	Small concentrated volume; could delay site cleanup; see Section 3.0
Facility TCO volumes: B Plant < 0.200 Mgal 100 Areas <0.6 Mgal		X			X	Dependent on magnitude of change		X	Could delay site cleanup; see Section 3.0
No loss of DST space	X			X		1 mgal/tank	X		see Section 3.22
LAW Phase 1B treatment starts FY02; ~2.2 Mgal/yr		X		X		Dependent on magnitude of change	X		Could delay SST solids retrieval (TPA); Section 3.17
LAW Phase 2 treatment starts FY11; 24.1 Mgal/yr			X	X		Dependent on magnitude of change	X		Could delay SST solids retrieval (TPA); Section 3.18
Crossite transfer lines are available	X			X		Dependent on magnitude of change	X		Could delay SWL pumping TPA milestones and/or site cleanup; see Section 3.11
Use Grout in emergencies to free up 2-3 Mgal of space		X		X		Dependent on magnitude of change	X		DOE and public acceptance unlikely; see Sections 3.3 & 5.1
No volume set aside for upsets or new streams		X			X	Dependent on magnitude of change	X		Consequences depend on volume, composition, and timing see Section 3.20

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2.0 INTRODUCTION

2.1 Purpose

The purpose of the Operational Waste Volume Projection (OWVP) is to present a basis for evaluating future Double-Shell Tank (DST) needs to meet Tri-Party Agreement (TPA) Milestones M-46-00 and M-46-01. Milestone M-46-00 states that an OWVP report shall be prepared and issued annually evaluating DST needs. Milestone M-46-01 requires the Tank Waste Remediation System (TWRS), to review and recommend whether or not to build additional DSTs on an annual basis.

This report presents a projected range of tank needs which is used to generate recommendations regarding site activities, waste management activities, facility requirements, and the need to build additional DSTs. This document presents the results of three projections cases (TPA Compliant, Disposal Planning, and Ecology Planning Cases) which represent varying degrees of tank space demands. All projection cases incorporate the "privatization" of waste treatment and disposal. The term "privatization" refers to the a DOE strategy for phased retrieval and treatment of Hanford tank wastes which would use private contractors to design, permit, build, operate, and deactivate the facilities for waste treatment and immobilization (DOE, 1995). The TPA Compliant Case is intended to present tank space needs based on all TPA milestones, TWRS program planning, and current operational assumptions. The Disposal Planning Case was completed using a reduced SST solids retrieval schedule which might lower tank space needs. The Ecology Planning Case (Hepner, 1997) was completed using assumption changes requested by the Washington Department of Ecology which might increase tank space needs. Operating assumptions for the three cases were established prior to July 1997. Need dates for new DST construction, tank retrievals, facility schedules, waste generation reductions, conflicts in meeting TPA milestones (WDOE, 1994; WHC, 1996a; WHC, 1996b), and funding priorities can then be reviewed in relation to tank space availability.

2.2 Methodology

The process followed in preparing an OWVP is shown in Figure 2, below.

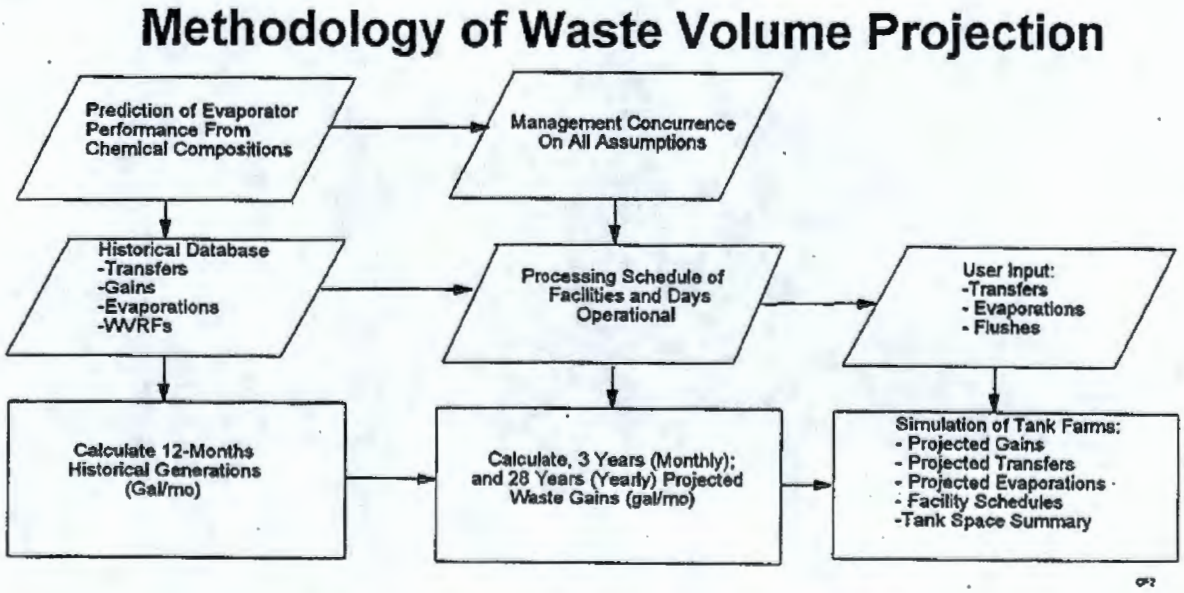

Figure 2. Methodology of the OWVP

The process of updating the OWVP begins with the request for updated facility or project "assumptions" from each of the operating facilities and projects that will contribute waste to DST inventory. The term "assumption" in this document refers to engineering inputs or bases supplied by the facilities based on their future operational plans (determined by budget, DOE directive, TPA milestones, etc.). Typical assumptions include operating schedules, waste generation rates, stream compositions, modes of operation, etc. The operating facilities and projects provide estimates of volume, composition, and radionuclide content data for each distinct waste stream exiting the facility. In addition to the projected facility waste generation rates, the processing schedules of each of the plants are factored into the projection. For the Plutonium-Uranium Extraction (PUREX) facility, B Plant, and 100 Area facilities the projected volumes of waste generated from Terminal Clean-out (TCO) are estimated and entered. For the Plutonium Finishing Plant (PFP), 300 Area, 400 Area, and Tank Farms, monthly waste generations are entered from facility inputs and/or actual observed generation rates. These projected waste generation rates and plant schedules are used to project waste volumes that each plant will be producing per month or year. The composition data is used to calculate Waste Volume Reduction Factors (WVRFs) and to determine waste segregation requirements (due to chemical, radionuclide, or heat content). The WVRF (Riley, 1988) is defined as the percent of water (by volume) that can be removed from a waste stream to achieve a certain interim waste form such as double-shell slurry feed. From the facility assumptions, a matrix of basic assumptions for the three cases to be incorporated into the OWVP projections were prepared and presented to Hanford contractor management and program office for approval.

Once the projection cases have been approved, the database of past waste gains, transfers, and evaporations is updated with data from the most recent months of Tank Farm operations. The early years of the projection are simulated in more detail than the later years. In the first period of the projection, monthly waste volumes are predicted. For the last years of the projection, yearly waste volumes are predicted.

The processing sequence in the simulation is designed to model the actual activities in the tank farms. After a dilute receiver tank is filled with waste, the contents are transferred to an available holding tank, sampled (sampling and analysis require four months), and transferred to the 242-A Evaporator feed tank (Tank 241-AW-102[1]) for evaporation. After dilute waste is concentrated in the 242-A Evaporator, it is sent to a slurry receiver tank (Tank 106-AW) as Double-Shell Slurry Feed (DSSF) which will eventually be disposed of through the Low-Activity Waste (LAW) processing and vitrification process.

The processing sequence for the Neutralized Current Acid Waste (NCAW) solids is for the solids to be washed in-tank and then immobilized in the High-Level Waste (HLW) vitrification plant. The separated supernates and washes will be pretreated to form high-level and low-activity waste streams. The HLW vitrification facility will incorporate high-level and transuranic (TRU) wastes into a glass matrix for disposal. The low-activity waste stream will be sent to LAW vitrification for final disposal.

[1] Waste tanks are hereafter referred to in an abbreviated form; for example, Tank 102-AW.

3.0 GENERAL FACILITY DESCRIPTIONS AND ASSUMPTIONS

A brief description of the facilities and projects pertinent to the TPA Compliant Case are listed in the following section. Assumptions unique to the Disposal Planning and Ecology Case are described in Section 4. Facility operating dates, waste generation volumes, WVRFs, flushes, and other pertinent assumptions are described. This information has been summarized for each of the three cases in Table 9, which is included at the end of this section. The spreadsheet for the TPA Compliant Case (Section 5.1) lists the waste generations for each year for facilities that presented a range of waste generation rates (e.g., T Plant).

This year, there has been an attempt to totally integrate the OWVP and Disposal Engineering assumptions and the integration is good thru FY 2004. Phase 1B processing assumptions, tank usage, and the order of processing were furnished by Disposal Engineering (Kirkbride, 1997) and are consistent between the two projects. The SST solids schedules and Phase 2 assumptions used in this document were drafts furnished by Disposal Engineering. Phase 2 assumptions furnished by Disposal Engineering consisted of waste workoff rates (Wittman, 1997a and 1997b). Detailed information on the amount and nature of HLW returns to the aging waste tanks was not available when these projections were completed. The HLW return volumes and workoffs, which start in 2011, are estimates only. The OWVP and Disposal Engineering assumptions will be further integrated in next year's OWVP document.

3.1 B Plant/WESF

B Plant was constructed in 1945 to recover plutonium by the bismuth phosphate process. The facility was refurbished in 1967 to recover cesium and strontium byproducts from the high level waste tanks (Westra, 1997). In 1974, the Waste Encapsulation and Storage Facility (WESF), was constructed on the west end of B Plant to support B Plant's mission. WESF's original mission was to encapsulate, cool, store, and monitor the high heat generating cesium and strontium capsules. The byproduct recovery mission was completed in FY 1984 and B Plant was once considered for waste processing. B Plant is no longer considered a viable option for processing of Hanford tank waste and is presently transitioning to shutdown in FY 1998.

B Plant discharges a low-level miscellaneous waste stream (dilute non-complexed waste) resulting from cell drainage, vessel clean-out, condensate collection, etc. Future TCO activities will generate wastes that can be separated into three categories (Smith, 1994): 1) aqueous phase waste generated during organic solvent removal (may be complexed waste); 2) dilute non-complexed (DN) waste; and 3) uncharacterized waste resulting from vessel flushing (assumed to be DN waste). Uncharacterized wastes will be characterized when they are produced.

The B Plant projected TCO waste volume for the TPA Compliant Case (Westra, 1997) was approximately 200 Kgal until plant stabilization has been completed. Cleanout and stabilization of B Plant is estimated to occur from FY 1997-1998 and will generate additional uncharacterized (assumed to be dilute non-complexed in this projection) TCO wastes. WESF will generate approximately

20 Kgal of waste in FY 1997. When B Plant has completed TCO, WESF will continue to generate approximately 5 Kgal/year of waste from 1998-2028. The WVRF to evaporate either B Plant miscellaneous or TCO waste to DSSF is 99 (Sederburg, 1995). No flushes are anticipated for B Plant miscellaneous or TCO streams based on their dilute nature and lack of solids.

All three cases in this document were based on the waste generations described above. The upper waste rate supplied by B Plant engineers (Westra, 1997) would increase the B Plant TCO volume to 355 Kgal and the WESF monthly waste generation from 5 Kgal/month to approximately 10 Kgal/month.

3.2 242-A Evaporator and LERF

The 242-A Evaporator was restarted on April 15, 1994. To understand the projection model for the 242-A Evaporator, it is necessary to understand the waste flow during evaporator operation and the simulation model. Waste from the dilute holding tanks are transferred into the evaporator feed tank (Tank 102-AW). Waste in the feed tank is then transferred to the 242-A Evaporator for boil-down. In the evaporator operation, four to six months is required for wastes to be sampled and analyzed per Evaporator DQO requirements (Von Bargen, 1995) before they can be evaporated.

- This projection model assumed that the 242-A Evaporator would operate in a "Linked Run" process mode (Guthrie, 1993). A "Linked Run" is a continuous operation of the 242-A Evaporator, made possible by simultaneously transferring from the DST's to the Evaporator feed tank (Tank 102-AW).

- A period of four to six months is required from the time a holding tank is filled with dilute wastes before the waste can be evaporated. This period allows time for sampling and analysis, documentation, and facility preparation (Guthrie, 1993). These projections assumed that a four month period would be required for these purposes.

- In the computer simulation, dilute waste is transferred to the evaporator feed tank (Tank 102-AW) for evaporation. Provided the waste has not reached its concentration limit, the monthly evaporation is continued until the maximum Waste Volume Reduction (WVR) for the month is achieved.

- The desired WVR for each 242-A Evaporator campaign is determined by boil-down studies, computer simulation, and/or process control sampling. The concentration of waste increases after each pass through the Evaporator until it reaches a concentration level consistent with engineering studies. The waste volume projection model of the 242-A Evaporator operation used in these projections cases produced DSSF with a specific gravity of 1.41. Upon reaching the desired concentration level, the concentrated waste is transferred to the evaporator receiver tank (Tank 106-AW). At the end of a campaign or when Tank 106-AW has been filled, DSSF is transferred to a holding tank.

- The Liquid Effluent Retention Facility (LERF) has a 6.5 million gallon storage capacity (Basin 42) to store the evaporator process condensate until the condensate could be treated (Guthrie, 1997b).

- The ratio of process condensate sent to LERF for every gallon of Waste Volume Reduction (WVR) for Evaporator Campaigns 94-1, 94-2, and 95-1 was 1.29, 1.24, and 1.26, respectively (Guthrie, 1996). The evaporator seal water and demister spray upgrade could reduce future process condensate production to 1.15 gallon of condensate/gallon of WVR which would lower the value used for future projections. This projection used a value of 1.20 gallon of condensate/gallon of WVR (Guthrie, 1997a). The Effluent Treatment Facility started to process the condensate stored in LERF Basins 42 and 43 in November 1995 and processed all stored condensate by August 1996 (Wagner 1996). Since the Effluent Treatment Facility has a capacity of approximately 50 Mgal/year (Wagner, 1996), it was assumed that LERF capacity would not limit future evaporator operations.

- The maximum monthly WVR during Evaporator operation should be approximately 1500 kgal/month based on a near optimum Campaign 94-2 and 96-1 performance with approximately a 50% initial WVR per pass through the evaporator (Guthrie, 1997a).

- An average evaporation rate of 500 Kgal/month (Guthrie, 1997a) was used in this simulation taking in to consideration:
  - the 242-A Evaporator historical processing rates
  - downtime between campaigns
  - waste characterization
  - staging and tank transfers

- The simulation used in this projection evaporates all dilute wastes to a concentrated interim storage form in the same year that a tank has been filled. This assumption is valid if the evaporator is operating and the yearly waste generation rate has not exceeded the annual WVR limit of the evaporator. Historically, dilute wastes were concentrated to near the aluminate boundary which would produce concentrated wastes with a specific gravity which could range from 1.3 to 1.67. However, it has been noted that all of the DSTs currently on the Flammable Gas Watch List (i.e., tanks with safety concerns related to hydrogen build-up) have specific gravities greater than 1.4 (Reynolds, 1994). To avoid production of future Flammable Gas Watch List tanks, it has been proposed that all future waste concentrations should be limited to a specific gravity of 1.41 unless additional technical evaluation shows flammable gas will not build-up (Fowler, 1995 and Mulkey, 1997).

  The waste volume projection model of the 242-A Evaporator operation used in projections thru 1994, typically produced DSSF with a specific gravity of 1.50-1.55. Reducing these wastes to a specific gravity of 1.41 could increase waste storage volumes by approximately 22-35 percent, depending on the chemical composition of the waste. Although the evaporation limit for concentrated wastes was a specific gravity of 1.41, the last five evaporator campaigns produced concentrated wastes with a specific gravity closer to 1.3 (Guthrie, 1997b). This document projected DST needs based on the evaporation of wastes to the specific gravity limit of 1.41.

- The waste volume reduction (WVR) achieved by the 242-A Evaporator since its restart in 1994 are summarized in the table below.

Campaign	Start Date	Waste Source	Waste Feed Type	Approximate WVR, Mgal
94-1	4/94	102-AW, 106-AW, & 103-AP	DN	2.42
94-2	9/94	102-AW, 106-AW, 101-AP, 107-AP, & 108-AP	DN	2.79
95-1	6/95	102-AW, 106-AW, 107-AP, & 108-AP	DN	2.16
96-1	5/96	102-SY, 105-AW, & 102-AY	DN	1.12
97-1	3/97	101-AN	DN-SWL	0.4

- The next evaporator campaign (97-2) is scheduled to start in September 1997, to evaporate dilute complexed waste from Tanks 101-AY and 106-AN.

- The TPA Compliant projection assumed that evaporation capability would be available annually to evaporate all dilute wastes. The annual evaporation of dilute waste minimizes tank space requirements and allows site cleanup activities to continue unabated to allow completion of TPA milestones. [Late Note: Recent RL Waste Disposal Division guidance assumes that the 242-A Evaporator (or alternate capability) will be available through 2011 with the Phase 2 contractor providing evaporator capability for the period after 2011 (O'Toole, 1997).]

- Previous projections assumed that the 242-A Evaporator would require a 1 year outage for maintenance and or upgrades every 10 years based on a 10 year design life of the 242-A Evaporator (WHC-EP-0342). The TPA Compliant projection did not include an evaporator outage but the Ecology Case did include a two year outage (see Section 4.2).

- Evaporator certification training runs prior to evaporator operation will add approximately 50 Kgal to tank farms and 50 Kgal to the LERF and will occur on a bi-yearly basis (Guthrie, 1997a). The training run in April 1995, added 57 Kgal to DSTs.

- Evaporator flushing after each campaign was previously projected to add 35 Kgal/campaign (Haigh, 1992). Actual flushes for the first three campaigns completed since April 1995 have varied from 27 to 58 kgal/campaign.

- Projected waste generations for the 242-A Evaporator due to training/flushing for FY 1995 evaporator operations was 85 Kgal. For the years 1997-1999, it was estimated that 1 to 2 campaigns would be required each year based on waste generations, segregation requirements, and tank space availability. The additional operations would be needed to evaporate the anticipated increased SWL (complexed and non-complexed) and TCO wastes. Based on these considerations, the projected waste generation for the evaporator was increased to 100 Kgal/year for the period 1997-1999. From FY 2000 on, the estimated evaporator waste generation was reduced to 85 Kgal/year. The WVR for evaporation of these flushes to DSSF was 99 (Sederburg, 1995).

3.3 Grout

- No additional Grout Vaults are scheduled to be poured at the Hanford site. TWRS program planning requires that all tank wastes be separated into low-activity and high-activity fractions and each fraction be immobilized into suitable waste forms for ultimate disposal. Tanks that were originally designated and set aside as grout feed tanks were used for other purposes.

3.4 Effluent Treatment Facility

- A new facility called the Effluent Treatment Facility (ETF) started operation in November 1995 to process the stored evaporator condensate from the LERF, newly generated evaporator condensate, and aqueous waste water containing low specific radioactivity (Wagner, 1996). Treated effluent is discharged to the State Approved Land Disposal Site (SALDS), north of the 200 West Area. This site was chosen to allow tritium to decay away before the groundwater migration reaches the Columbia River. The ETF does not remove tritium because no feasible production-scale tritium removal technology presently exists. The ETF has a capacity to treat 50 Mgal/year for future feeds. The ETF should not send any streams to DSTs.

3.5 PFP

The Plutonium Finishing Plant (PFP) is a facility in the 200 West Area which houses the processes and supporting operations for (Bergquist, 1997):

1) stabilization of reactive solid residues by muffle furnace calcination (OPERATIONAL);
2) shipping, receiving and storage of special nuclear materials (OPERATIONAL);
3) analytical and development laboratories (OPERATIONAL);
4) treatment and handling of PFP liquid wastes destined for tank farms and the ETF (OPERATIONAL).

An Environmental Impact Statement (EIS) was issued for public comment in November 1995 covering the PFP facility stabilization and clean out. The PFP EIS and Record of Decision (ROD) was published in May 1996. The waste volume projections are based on the preferred alternatives identified in the EIS for facility cleanout and stabilization. The volume of waste anticipated to be produced for the TPA Compliant Case is developed from the existing waste generation rate at PFP (100 untreated gallons/month), and the anticipated use of a direct denitration vertical calciner coupled with an ion exchange processing system currently being developed and tested by the development laboratories. The vertical calciner (Bergquist, 1997) is the most promising technology for plutonium residue stabilization and facility clean out. The TPA Compliant Case would generate up to 34 Kgal of waste from 1997 through 2006 (Bergquist, 1997). The WVRF to evaporate PFP wastes to DSSF is 81 (Sederburg, 1995). Flush volumes for PFP stabilization waste streams is 22 per cent (flushes of waste transfer lines from PFP to 244-TX and from 244-TX to Tank 102-SY).

The percent solids experienced in past PFP waste generations are listed below (Barrington, 1991):

% Solids in PRF waste	3.5%
% Solids in RMC waste	4.4%
% Solids in lab waste	4.5%

3.6 PUREX

The Plutonium Uranium Extraction (PUREX) Facility was used to separate irradiated N Reactor fuel into plutonium nitrate, uranyl nitrate hexahydrate (UNH), neptunium nitrate, and waste products. The main processing operations involved dissolution of cladding and irradiated fuel, solvent extraction and conversion of plutonium nitrate to plutonium oxide. Acid recovery, solvent treatment systems, and off-gas treatment supported the major processes.

The deactivation of PUREX was completed in FY 1997 and the waste transfer system has been deactivated. However, condensate is collected in the PUREX main stack catch tank (216-A-TK-2) and the #2 Filter catch tank (V11-1). This accumulation would result in approximately 5 Kgal of dilute waste being transferred to tank farms once per year (Eiholzer, 1997).

All three projection cases projected 5 Kgal/year of waste additions from PUREX. Based on the average waste composition presented for PUREX TCO wastes, the WVRF for evaporation of PUREX TCO wastes to DSSF is 99 (Sederburg, 1995). Flush volumes for PUREX TCO waste streams is 10 per cent.

3.7 S Plant

S Plant (or 222-S Labs) is a dedicated laboratory facility. The Laboratory currently provides analytical chemistry services in support of Hanford processing plants and tank characterization. Emphasis is on waste management processing plants, environmental monitoring programs, B Plant, Tank Farms, 242-A Evaporator, Waste Encapsulation Storage Facility (WESF), Plutonium Finishing Plant (PFP), research support activities, and essential materials. Most of the radioactive liquid waste generated at the laboratory complex originates from analytical activities performed within the 222-S Laboratory in support of tank characterization (Tollefson, 1997). Radioactive and radioactive hazardous (mixed) wastes generated by the 222-S Laboratory are discharged to the 219-S Waste Handling Facility. Dilute, non-complexed wastes are currently being transported to 204-AR vault via tanker truck. Projected S Plant monthly waste generations rates (Tollefson, 1997) were approximately 2.1 Kgal/month for FY 1997 through 2028 for the TPA Compliant Case. All three projection cases used the same waste generation rates. Based on the waste composition presented for 222-S Laboratory wastes, the WVRF for evaporation of 222-S miscellaneous wastes to DSSF is 99 (Sederburg, 1995). Flush volumes for 222-S waste streams is 22 per cent.

3.8 Salt Well Liquid Pumping

Salt Well Liquid (SWL) pumping will occur for single-shell tanks (SSTs) which have 50,000 gallons or more of drainable interstitial liquid. Pumping is scheduled to stop when the output rate decreases to 0.05 gallons per minute. SWL pumping assumptions for all three projection cases are listed below:

- The TPA Compliant Case used a 50 percent saltcake porosity/21 percent sludge porosity resulting in a remaining volume of 5.32 million gallons (Brown, 1996) of SWL to be pumped from FY 1997 through the end of FY 2000 to meet TPA milestone M-41-00 (volume for Tank 106-C included with single shell tank solids retrieval). The schedule for SWL pumping was based on schedules received from Stapley (1996) and De Ford (1997). The WVRF for evaporation of dilute non-complexed (DN) SWL to DSSF is 47 (Sederburg, 1995). The WVRF for evaporation of dilute complexed (DC) SWL to Complexant Concentrate (CC) is 10 (Sederburg, 1995).

- Flushing of the salt well liquid and transfer lines will generate approximately 1.45 Mgal (26 percent) of water (Brown, 1996). The WVRF used for this flush is 99 (Sederburg, 1995).

- Approximately 1.75 Mgal (33 percent) of the total SWL volume is complexed based on available analytical information.

- Total Amount of SWL to be pumped from FY 1997-2000 for the TPA Compliant Case is approximately 5.32 Mgal without flush.

- Tank 106-AP was designated as the 200 East Area non-complexed SWL receiver tank.

- Tank 101-AN was designated as the 200 East Area dilute complexed SWL receiver tank.

- Pumping SWL in West Area presents special problems due both to the limited tank space available and due to the transuranic (TRU) heel in Tank 102-SY. Tanks 101-SY and 103-SY contain complexed waste and are also designated as Watch List Tanks. Addition of waste to Watch List tanks is prohibited unless a safer alternative cannot be found.

  Therefore, Tank 102-SY was designated as the West Area SWL receiver for both non-complexed and complexed SWL starting in FY 1998. Tank 102-SY contains approximately 133 Kgal of TRU solids (Table 8) that are not scheduled to be retrieved until January 2006. Historically, complexed waste and TRU wastes have been segregated to minimize the amount of waste requiring more expensive disposal and to comply with U.S. Department of Energy (DOE) Order 5820.2A. The Hanford Site has implemented this order by segregating waste that was considered complexed (greater than 10 grams/liter total organic carbon) from TRU waste sludge (Reynolds, 1995). The schedule presented in Table 3 would require pumping complexed SWL over the sludge in Tank 102-SY in order to meet TPA milestones for the years 1998-2000. Studies are being conducted to resolve this issue and to determine exactly how much of the

waste in the 200 West Area are complexed (Estey, 1996). Some options include--delaying complexed SWL pumping in West Area until Tank 102-SY solids are retrieved; accelerating the retrieval of the TRU solids from Tank 102-SY; dilution and retrieval of the waste from either Tank 101-SY or 103-SY to free up additional tank space; conduct experiments to prove the complexed SWL can be added to the TRU solids in Tank 102-SY without solubilizing the TRU; or use a DCRT to pump complexed SWL to East Area without sending the waste to Tank 102-SY. In this projection, the complexed wastes are shown being pumped to Tank 102-SY to meet the current TPA schedule.

- The pumping schedule for the TPA Compliant Case is presented in Table 3 based on the schedules received from Stapley (1996) and De Ford (1997). Total volumes were taken from Brown (1996) at 50% saltcake porosity/21% sludge porosity. [Late Note: Technical delays and funding decreases will delay some of the SWL volume projected for FY 1997-1998. This means the projected DST needs for FY 1997-1998 will be conservative.]

Table 3. Salt Well Pumping Schedule for the TPA Complaint Case

Salt Well Pumping Schedule for 50% Saltcake/21% Sludge Porosity (Brown, 1996)					
FISCAL YEAR	EAST AREA		WEST AREA		TOTALS
	DN	DC	DN	DC	
Historical SWL Pumping 1989-1996					
1989	55 KGAL	0 KGAL	0 KGAL	17 KGAL	72 KGAL
1990	44 KGAL	0 KGAL	0 KGAL	0 KGAL	44 KGAL
1991	227 KGAL	0 KGAL	0 KGAL	0 KGAL	227 KGAL
1992	121 KGAL	0 KGAL	0 KGAL	0 KGAL	121 KGAL
1993	0 KGAL	0 KGAL	37 KGAL	0 KGAL	37 KGAL
1994	189 KGAL	0 KGAL	32 KGAL	0 KGAL	221 KGAL
1995	194 KGAL	105 KGAL	18 KGAL	0 KGAL	317 KGAL
1996	22 KGAL	0 KGAL	218 KGAL	0 KGAL	240 KGAL
Projected SWL Pumping 1997-2000					
1997	71 KGAL	84 KGAL	285 KGAL	0 KGAL	440 KGAL
1998	314 KGAL	546 KGAL	1592 KGAL	72 KGAL	2524 KGAL
1999	6 KGAL	226 KGAL	1016 KGAL	585 KGAL	1833 KGAL
2000	0 KGAL	56 KGAL	273 KGAL	190 KGAL	519 KGAL
TOTALS	1225 KGAL	1017 KGAL	3525 KGAL	864 KGAL	6595 KGAL

3.9 Single-Shell Tank Solids Retrieval

- This projection assumed that the retrieval of Tank 106-C solids would be started in July 1998 and completed by June 1999 (Kirch, 1997). Initially, approximately 170 Kgal of solids would be retrieved. Retrieval of Tank 106-C solids will require approximately a 3:1 ratio of dilution water to solids (Estey, 1994). Solids retrieved from Tank 106-C will be stored in Tank 102-AY.

- Approximately 12.2 Mgal of sludge and 23.4 Mgal of saltcake will be retrieved from SSTs (Hanlon, 1995). Dilution of these solids for retrieval and processing results in a total retrieved volume of approximately 109 Mgal (Penwell, 1997 and Slaathaug, 1997).

- Saltcake would be diluted to 5 M Na and sludge will be diluted to 10 weight percent solids (Kirkbride, 1997). Approximately a 3:1 ratio of dilution water to solids will be required for the retrieval of the remaining SST solids. It is further assumed that all solids will be removed from the SSTs and that SST site closure will be complete by FY 2024 (M-45-06).

- For the TPA Compliant and Ecology Cases, the retrieval schedule for SST solids retrieval was based on Case OWVP-2 received from Disposal Engineering (Penwell, 1997) which started December 2003 (M-45-03-T1) and was completed by the end of FY 2018 (TPA milestone). The retrieved volume of waste for this case is approximately 2.0 Mgal for FY 2004-2005 and an additional 5.0 Mgal for FY 2006-2007. The as retrieved volumes for the remaining SST solids are shown in the spreadsheet for the TPA Compliant Case (Section 5.1) and are based on retrieval at 5 M Na.

- For the Disposal Planning Case, the retrieval schedule for SST solids retrieval was based on Case MOD-250A received from Disposal Engineering (Slaathaug, 1997) which would also start in December 2003 but would not complete retrieval until approximately FY 2020. The retrieved volume of waste for this case is approximately 1.6 Mgal for FY 2004-2005 and an additional 4.0 Mgal for FY 2006-2007.

3.10 T Plant

T Plant's primary mission is decontamination and treatment of radiologically and chemically contaminated waste and equipment located throughout the Hanford site (Girres, 1996). T Plant also provides inspection and repackaging services to various Hanford facilities and the certification (hydrostatic leak testing) of the railcars used to transport liquid wastes to Tank Farms. New railcars are being procured which will eliminate the need for hydrostatic leak testing and the projected waste volumes reflect this decrease. The 2706-T Low-Level Decontamination Facility (where low-level equipment decontamination is performed) is an approved decontamination facility that commenced operation in September 1994. Limited 221-T canyon decontamination activities (primarily Tank Farms long-length contaminated equipment) were initiated in 1995.

T Plant is currently testing new decontamination techniques (ice blasting and CO_2 decontamination systems) which have reduced liquid waste generations from

those reported previously. Dilute, non-complexed wastes collected at T Plant during decontamination, repackaging, condensate collection, or railcar certification are currently being transported to 204-AR vault via railcar. These wastes contain approximately 5 % solids (Girres, 1997). Projected T Plant monthly waste generations (Triner, 1996) were based on a combination of anticipated work loads and actual observed generation rates. The projected volumes supplied by T Plant engineers ranged from 1.4 Kgal/month to 2.7 Kgal/month (the exact waste volume generation used for each year is shown in the spreadsheet for the TPA Compliant Case--Section 5.1). All three projection cases used the same generation rates. The WVRF for evaporation of T Plant miscellaneous wastes to DSSF is 99 (Sederburg, 1995). Flush volumes for T Plant waste streams is 22 per cent.

3.11 Tank Farms

There are currently 28 double-shell tanks (DSTs) used to receive, store, and evaporate the liquid wastes generated at the Hanford facilities to an interim waste form. The interim waste form (e.g., DSSF) is currently stored in tank farms awaiting processing and vitrification for final disposal. Tank farm waste generation sources and operational considerations are listed below for the aging and non-aging waste tanks. Tank Farm waste generations are primarily from line, cross-site, and air-lift circulator flushes.

Aging Double-Shell Tanks

Four of the DSTs (AY and AZ farms) are designated as aging waste tanks that were designed to store high-heat wastes (e.g., NCAW wastes or wastes containing high-heat loads due to the presence of ^{90}Sr or ^{137}Cs). The aging waste tanks are equipped with condensers and air-lift circulators. The purpose of the condensers is to handle the vapors from primary tank vent systems when hot liquid is present. Condensates are collected in catch tanks (e.g., 151-AZ, 152-AX, or TK-417) and returned either to an aging waste tank or to a dilute receiver tank. The air-lift circulators aid in suspending NCAW solids and in heat removal. Air-lift circulators require periodic (approximately once/week) to prevent clogging when they are operating. When the air-lift circulators are not operating, flushing is less frequent.

Aging waste tank operation assumptions used in all three projections follow:

- Aging waste tanks can be used for storage of dilute non-aging waste.
- It is assumed that there will be no additional aging waste produced by the Hanford facilities. However, certain wastes containing high ^{90}Sr or ^{137}Cs contents may require storage in aging waste tanks due to their radioactivity. HLW returns to DSTs during Phase 2 processing will be stored in three aging waste tanks (see section 3.18 for more detail).
- Single-shell tank (SST) solids retrieved from Tank 106-C will be stored in an aging DST (Tank 102-AY) due to the high heat content of the solids.
- One million gallons of aging tank space is kept available for receiving the contents of an aging waste tank, in the unlikely event of a tank leak (Department of Energy order 5820.2A).

- Tank 102-AY was designated as the 200 East Area dilute receiver for non-complexed wastes through mid FY 1996 and then Tank 106-AP was designated as the 200 East Area dilute receiver. This change allowed Tank 102-AY to be used to store the solids retrieved from Tank 106-C. Tank 106-AP is currently receiving direct transfers of wastes from B Plant and rail or truck shipments via 204-AR vault from S Plant, T Plant, 100 Area, 300 Area, and 400 Area. Tank 106-AP is also receiving non-complexed SWL. Tank 101-AN will receive complexed SWL in 200 East Area.

Non-Aging Double-Shell Tanks

The remaining 24 DSTs are called non-aging waste tanks and are used to store wastes that do not contain high-heat loads in accordance with applicable operational and waste segregation policies. Non-aging waste tank operation assumptions are as follows:

- Approximately 66 Kgal of caustic will be added to Tank 107-AN in FY 1998 to mitigate the low caustic condition in the tank for all projection cases (Carothers, 1997a).

- Current operational tank usage for this projection are summarized in Table 4. Projected Tank usage will be covered in Section 5.

Table 4. Current Operational Tanks and Usage

Operation	Designated Tank
Evaporator Feed Tank	Tank 102-AW
Evaporator Receiver Tank	Tank 106-AW (tank level varies)
200 East Dilute Receiver Tank	Tank 105-AW (PUREX direct transfers; 100 Area wastes)
200 East Dilute Receiver Tank	Tank 106-AP (FY 1997-2000)
200 West Dilute Receiver Tank	Tank 102-SY (FY 1997-2015)
200 East SWL Receiver (DN)	Tank 106-AP (FY 1997-2000)
200 East SWL Receiver (DC)	Tank 101-AN (FY 1997-2000)
200 West SWL Receiver (DN)	Tank 102-SY
200 West SWL Receiver (DC)	Tank 102-SY
Private Contractor Feed Tanks	Tanks 106-AP and 108-AP (~FY 2001)
Intermediate Staging Tanks	Tanks 102-AP and 104-AP (~FY 2001)
Sr/TRU/Entrained Solids Return Waste	Tank 107-AP (~6/2002)
Dilute Feed Staging	Tanks 104-AP, 107-AP; Tank 103-AP (1999 on)
Spare Tank Space	Tank 103-AP (1997-1999); distributed space from late in FY 1999 on

- Starting in FY 1999, 0.72 Mgal of operational space in the evaporator Feed and Receipt Tanks (Tanks 102-AW and 106-AW) was used as spare space (Awadalla, 1995) in all three projection cases.

- It was assumed that the TRU solids in Tank 102-SY would be retrieved to Tank 105-AW starting in January 2006. The NCRW solids in Tank 105-AW were not combined with the solids in Tank 103-AW in this projection.

- Flushes are generated during the receipt of waste transfers either from railroad tank cars, tanker trucks, or after tank to tank transfers. Percent flushes are included with a description of each of the facility generations in Section 3.

- Tank 106-AP is currently receiving direct transfers of wastes from B Plant and rail or truck shipments via 204-AR vault from S Plant, T Plant, 100 Area, 300 Area, and 400 Area.

- Tank 101-AN will be used as the complexed SWL receiver and Tank 106-AP as the non-complexed SWL receiver in 200 East Area (Hanson, 1996).

Projected waste generations for Tank Farms were based on a combination of previously observed waste generation rates and anticipated operational needs that are explained below:

- Tank Farm water additions to DSTs. Tank Farms waste generation rates and flushing activities generally increase with the restart of the 242-A Evaporator due to the additional waste transfers. The 242-A Evaporator was restarted in April 1994. During the period April 1994 through May 1995, the average monthly waste generation rate for Tank Farms was 10.92 Kgal/month. The average monthly waste generation for Tank Farms during FY 1996 was ~7.3 Kgal/month. The target rate set for Tank Farms waste generations was 10 Kgal/month. All three projection cases estimated that Tank Farms would generate 10 Kgal/month or 120 Kgal/year to cover transfer line and air-lift circulator flushes. The WVR for evaporation of these flushes to DSSF was 99 (Sederburg, 1995).

- Cross-site Transfers. All projection cases assumed that either the existing cross-site transfer line or the new cross-site transfer line (Project W-058, scheduled to be completed in 1998) would be available to allow cross-site transfer of SWL, facility generations, DST solids from Tank 102-SY and/or SST solids. Without operable cross-site lines many of the TPA milestones involving West area wastes could not be achieved.

  Previous projections have estimated that 50 Kgal of water (35 Kgal testing + 20 Kgal for transfer) would be needed for cross-site transfers. In this projection the water addition for cross-sites was reduced to 35 Kgal/transfer due to waste minimization actions defined for the FY 1995 transfer. During the period 1998-2001, approximately two cross-sites would be needed each year due to the volume of SWL being pumped. Based on the projected cross-site testing and transfers anticipated, 70 Kgal/year was projected for the period FY 1998-2001. All three projection cases used the same volumes for cross-site transfer line tests and flushes. The WVR for evaporation of these flushes to DSSF was 99 (Sederburg, 1995).

- Tank Fill Limits (except for special tank fill considerations):
  - AY, AZ Tanks: 980 Kgals
  - All other DSTs: 1140 Kgals

- o The assumptions used to simulate tank transfers in this projection are listed below:

  - Tank 102-SY: 878 Kgal in the tank, and PRF not operating, pumped down to 358 Kgal until TRU solids have been removed.
  - Tank 102-AY: Start transfer at 900 Kgal.
  - Tank 105-AW and other dilute receivers: Start transfer at 1000 Kgal, pump down to 50 Kgal above solids.

3.12 UO_3 Facility

The UO_3 Facility concentrated and calcined uranyl nitrate hexahydrate (UNH) recovered by the PUREX plant to produce uranium oxide (UO_3) and nitric acid (HNO_3). Deactivation of the UO_3 Facility is complete and therefore, no waste will be sent to DSTs.

3.13 Waste Sampling and Characterization Facility (WSCF)

The Waste Sampling and Characterization Facility (WSCF) was started in FY 1994. This projection assumed that WSCF would send its waste to ETF and not to DSTs (Collins, 1996).

3.14 100 Area

100-N Basin

The 100-N Basin was constructed in 1963 to receive irradiated fuel assemblies discharged from the N Reactor for the purpose of inspection, storage, and preparation for shipment. In 1988 the N Reactor was placed in a "cold standby" status (shutdown but capable of restarting). In 1989 all nuclear fuel was removed from N Basin and transferred to K Basin. In 1991 the Department of Energy-Richland (DOE-RL) directed Westinghouse to begin deactivation activities. A significant quantity of radioactively contaminated equipment, hardware, debris, and sediment have accumulated in 100-N Basin that will need to be removed. Deactivation of the N Basin Facility was projected to occur in FY 1997 (Greenidge, 1997). For the TPA Compliant Case, it was assumed that N Basin water and Emergency Dump Basin water would be transferred to ETF for processing (Greenidge, 1997). Approximately 524 gallons of sediment would be slurried in 13,000 gallons of North Cask Pit residual water and transferred to DSTs in FY 1997. The same waste generation volume was used for all three cases. [Late Note: The options to dispose of 100-N wastes are being reviewed and may change in the future. One option would dewater the solids and either no waste or minimal waste would be sent to tank farms. If waste from 100-N Basin is sent to DSTs it will likely be at a later date.]

100-K Basin

Fuel handling operations have resulted in some cladding damage to N-Reactor fuel. Subsequent fuel oxidation resulted in fuel and fission products accumulating in fuel canisters and in K Basin where the fuel handling occurred. Aluminum oxide, iron oxide, concrete grit, and other debris has accumulated and mixed with the fuel corrosion products to form a sludge on the basin floor. Approximately 350 Kgal of water and sediment (approximately 18.5 Kgal of sediment) would be transferred to DSTs (Alderman, 1996). Transfers would occur on a monthly basis over a two year period (2000-2001). The above generations for 100-K Basin cleanout were used in all three projection cases.

[Late Note: The options to dispose of 100-K wastes are being reviewed and may change in the future. One option would dissolve the solids in acid, destroy polychlorinated biphenyls (PCBs), blend with depleted uranium, and neutralize before sending the wastes to tank farms--this option would increase the liquid and solid volumes sent to tank farms.]

105-F & 105-H Basins

Plans to cleanout the 105-F and 105-H Basins are still being reviewed and the date of cleanout is uncertain due to funding. The projected plan is to clean out the 40,000 gallons in 105-F in the year 2000 and the 200,000 gallons from 105-H in the year 2005 (McGuire, 1997). These assumptions for 105-F and 105-H Basin cleanout were used for all three projection cases.

The WVRF for evaporation of all 100 Area Basin wastes to DSSF is 99 (Sederburg, 1995). Flush volumes for 100 Area wastes is 44 per cent.

3.15 300 Area

Facilities in the 300 Area are used primarily for research and development activities or for analytical support. Some waste received in FY 1995 was generated by decon of facilities. Liquid wastes from the various 300 Area Facilities are transferred to the 340 Facility. Liquid wastes collected at the 340 Facility are transferred to 204-AR vault in 20,000 gallon railroad tank cars. Facilities in the 300 Area sent 52 Kgal of waste (includes flush) to DSTs (4.3 Kgal/month) in FY 1996. The TPA Compliant Case projected 4.2 Kgal/month of miscellaneous waste would be generated from 300 Area facilities including flush (Halgren, 1997). All three projection cases used the same generation rates. Based on the chemical composition supplied for 300 Area waste streams, the WVRF for evaporation of 300 Area miscellaneous wastes to DSSF is 94 (Sederburg, 1995). Flush volume for 300 Area waste streams is 44 per cent.

3.16 400 Area

There are three major facilities in the 400 Area (Dillhoff, 1996). These include the Fast Flux Test Facility (FFTF), the Maintenance and Storage Facility (MASF), and the Fuel and Material Examination Facility (FMEF). Radioactive liquid waste is primarily generated in conjunction with the removal of residual sodium from reactor components or with decontamination activities. A phased process was begun in December 1993 to place the FFTF into a radiologically and industrially safe shutdown condition. Shutdown of the FFTF has increased the amount of liquid waste generated by the plant's Sodium Removal System. Approximately 11 Kgal of wastes were received from 400 Area in FY 1994-1995 (~0.5 Kgal/month). The TPA Compliant Case projected a 7 Kgal shipment of miscellaneous waste would be generated from 400 Area facilities every third year starting in FY 1998. All three projection cases used the same generation rates. The WVRF for evaporation of 400 Area miscellaneous wastes to DSSF is 94 (Sederburg, 1995). Flush volume for 300 Area waste streams is 44 per cent.

3.17 Phase 1B Privatization Processing

- Privatization Concept. The revised DOE strategy for treatment of Hanford tank wastes, termed "privatization," would use private contractors to design, permit, build, operate, and decommission the facilities for waste treatment and immobilization (DOE, 1995). Final details of the privatization work will not be developed until later in the process and the assumptions listed below are subject to change. As currently proposed, privatization would be divided into two phases. Phase 1B would include privatization of waste tank supernatant processing, Low-Activity Waste (LAW) immobilization, and an optional High-Level Waste (HLW) immobilization (Washenfelder, 1996b) by two private contractors. The scale of processing during Phase 1B of privatization has been established to demonstrate the technical and commercial capability. Phase 2 of privatization would include additional tank waste retrieval, supernatant processing, sludge/solid processing, LAW immobilization, HLW immobilization, disposition of encapsulated Cs/Sr, and interim storage of immobilized waste (Washenfelder, 1996 and Kirkbride, 1997).

- Phase 1B Schedule. The target schedule for Phase 1B is summarized below:

-Authorization to Proceed with Phase 1B	April 30, 1998
-Start construction	December 31, 1999
-Operations	June 1, 2002-June 1, 2011

- Intermediate Feed Staging Tanks. Tanks 102-AP and 104-AP were used for intermediate staging of wastes by the Project Hanford Management Contractor (PHMC). The intermediate feed staging tanks were assumed to be fully operational on 10/1/2000.

- Privatization Contractor Feed Tanks. Wastes from Tanks 102-AP and 104-AP will be transferred to Tanks 106-AP and 108-AP, respectively. Tanks 106-AP and 108-AP will be used as privatization contractor feed tanks or vendor feed tanks. At the time these tanks were transferred to the private contractors they remain in use by the PHMC Team for waste management activities (TWRS 1997).

- HLW Processing and Immobilization. Phase 1B processing of tank waste sludges would be conducted within existing DSTs and would involve sludges in Tanks 101-AZ, 102-AZ, 102-AY, and the high heat solids retrieved from single-shell tank 106-C. The NCAW supernates removed prior to in-tank washing of the NCAW solids, could not be combined into a single aging tank (Tank 101-AY) due to the 5 M Na limit but would be concentrated and sent to Tank 101-AY and an additional non-aging tank (Powell, 1996b). The in-tank washing assumptions summarized in Table 5 and presented below were obtained from Disposal Engineering (Kirkbride, 1997).

  In Revision 21 of this document, it was assumed that all NCAW solids and the 106-C solids would be combined into one aging waste tank (Tank 102-AZ) and that all NCAW supernates would be concentrated into one aging waste tank (Tank 101-AZ). Since that document was published, studies

have been completed which looked at numerous sludge washing/combination options (Powell, 1996a). The alternatives for consolidating high heat sludges have been reviewed by a decision board comprised of Hanford contractor management, a DOE/RL representative, and a WDOE representative. It was concluded that consolidating all the sludges into a single tank would require modifications to the tank farm safety basis. The preliminary decision reached was not to consolidate all the high heat sludges into a single tank. The selected alternative (Alternative 8 Modified) would wash the sludges in the tanks they reside in without additional consolidation of solids.

In-Tank Washing of Tank 101-AZ Sludge

- The first step of in-tank washing for all three projection cases involved the decanting of supernatant from Tank 101-AZ to Tank 101-AY (current DC inventory of Tank 101-AY projected to be evaporated in September 1997) in November 2000. The decanted aging waste supernate from Tank 101-AZ would require storage in an aging waste tank due to its heat content.

  Approximately 146,000 gallons of wash solution (0.1 M sodium hydroxide, 0.011 M sodium nitrate) would be added in December 2000. The solids would be mobilized with mixer pumps, settled for one month, and the wash would be decanted in February 2001 to a non-aging DST.

  The washed NCAW solids would then be sampled to determine the effectiveness of the washing process. This washing operation would be conducted a total of three times during the period March through August 2001. The washed solids were covered with a cover solution in September 2001 that would be used to mix and transfer the washed solids to the private contractors for disposal during the period June 2002 through July 2003.

In-Tank Washing of Tank 102-AZ Sludge

- The supernatant from Tank 102-AZ will be concentrated in-tank and then decanted in March 2002. A portion of this supernatant would go to Tank 101-AY with the remainder going to non-aging DSTs. Due to questions about the allowable final Na concentration and the amount of heat in the supernatant, storage of the remaining supernatant could require one or two additional DSTs (Powell, 1996a and 1996b). The projection cases assumed this supernatant would be stored in Tank 101-AY plus one additional non-aging DST.

  Approximately 213,000 gallons of wash solution (0.1 M sodium hydroxide, 0.011 M sodium nitrate) would be added in April 2002. The solids would be mobilized with mixer pumps, settled for one month, and the wash would be decanted in September 2002 to a non-aging DST.

  The washed NCAW solids would then be sampled to determine the effectiveness of the washing process. This washing process would be conducted a total of four times during the period October 2002 to March 2003. Again, the washed solids would be covered with a cover solution in April 2003 that would be used to mix and transfer the washed solids to the private contractors for disposal during the period July 2003 to February 2006.

In-Tank Washing of Tank 102-AY/Tank 106-C Sludges

- The supernatant from Tank 102-AY would be decanted from Tank 102-AY in May 2005. This supernatant would be transferred to a non-aging DST for further evaporation.

  Approximately 320,000 gallons of wash solution (0.1 M sodium hydroxide, 0.011 M sodium nitrate) would be added in June 2005. The solids would be mobilized with mixer pumps, settled for one month, and the wash would be decanted in August 2005 to a non-aging DST.

  The washed NCAW solids would then be sampled to determine the effectiveness of the washing process. This washing process would be conducted a total of two times during the period September 2005 through December 2005. Again, the washed solids would be covered with a cover solution in December 2005 that would be used to mix and transfer the washed solids to the private contractors for disposal during the period February 2006 through August 2009.

  All three projection cases assumed that approximately 340 metric tons of high-level waste oxides would be transferred to the vendor for immobilization during the period June 2002 through August 2009. It was assumed that this action would process all solids from Tanks 101-AZ, 102-AZ, 102-AY, and 106-C. The private contractor would provide a tank for receipt of the washed sludges; existing DSTs would not be used for these functions (Washenfelder, 1996b). In-tank washing activities and waste work-off schedules are summarized in the following table.

Table 5. Summary of In-Tank Washing Activities

Date	In-Tank Washing Activity
July 1998-June 1999	Complete retrieval of Tank 106-C solids into Tank 102-AY.
Nov. 2000	Decant the NCAW supernate from Tank 101-AZ to Tank 101-AY.
Dec. 2000-Aug. 2001	Wash NCAW solids in Tank 101-AZ three times.
September 2001	Sample Tank 101-AZ and cover with liquid.
May 2005	Decant Tank 102-AZ supernatant to Tank 101-AY and one other non-aging DST.
April 2002-March 2003	Wash NCAW solids in Tank 102-AZ four times.
April 2003	Sample Tank 102-AZ solids and cover with liquid.
May 2002-July 2003	Transfer Tank 101-AZ solids to contractors.
July 2003-February 2006	Transfer Tank 102-AZ solids to contractors.
May 2005	Decant supernatant from tank 102-AY to a non-aging DST.
June 2005-December 2005	Wash solids in Tank 102-AY (existing solids plus Tank 106-C solids) twice.
December 2005	Sample Tank 102-AY solids and cover with liquid.
February 2006-August 2009	Transfer Tank 102-AY solids to contractors

- Low-Activity Waste (LAW) Treatment. The current DOE strategy calls for a demonstration of LAW treatment and immobilization by two private vendors at a rate dependent on the type of waste being processed. Envelope A feed is typically double-shell slurry feed (DSSF), double-shell slurry (DSS), or dilute non-complexed waste (DN). Envelope B feed is NCAW supernate. Envelope C feed is typically complexant concentrate (CC). Minimum and maximum processing quantities for each contractor as well as the approximate quantity of sodium processed for all three projection cases are listed in the table below (Kirkbride, 1997).

Waste Type	Minimum Amount Processed for Two Contractors (Metric Tons Sodium)	Maximum Amount Processed for Two Contractors (Metric Tons Sodium)	Approximate Quantity Processed for all Projection Cases for Two Contractors (Metric Tons Sodium)
Envelope A	5200	9800	4122*
Envelope B	200	2000	234
Envelope C	200	4800	4554
Total A+B+C	---	10200	8910

* On-going work with the privatization feed envelope definitions should result in some of the waste defined as envelope C being redefined as envelope A waste. This change would place the majority of the envelope C sodium in envelope A, thus raising the envelope A sodium quantity above the 5200 Metric Tons minimum contract value.

- Schedule for LAW Processing. The schedule used for processing of LAW is summarized in Table 6 (Kirkbride, 1997). Dates shown are the date the wastes are transferred to the intermediate feed staging tank. Actual processing of wastes begins in June 2002. Tank dilutions, contractor number, and multiple batches are not shown. This schedule was developed from input supplied by Disposal Engineering (Kirkbride, 1997). Solids are left in the tanks when wastes are retrieved for LAW processing.

- Storage of Separated Sr/TRU and Entrained Solids. Entrained solids and transuranic (TRU) elements removed from LAW waste by the private contractors were assumed to be returned to one DST for storage. During the period FY 2002-2003, the solids were sent to Tank 107-AP but from FY 2004 on, the solids in Tank 107-AP plus all future solids were transferred to Tank 101-AZ. This allowed Tank 107-AP to be used to store retrieved SST solids while the higher heat Sr/TRU and entrained solids were stored in an aging waste tank (Tank 101-AZ).

Table 6. Projected Processing Schedule for Phase 1B

Tank	Waste Type	Envelope	Volume with solids (Kgal)	Approximate Quantity of Na Delivered (MT Na)	Existing or Future Waste	Transfer Date for Processing
105-AN	DSSF	A	1128	~1026	Existing	3/2001
104-AN	DSSF	A	1057	~1070	Existing	10/2001
101-AW	DSSF	A	1128	~ 856	Existing	1/2003
103-AN	DSS	A	957	~1170	Existing	10/2003
101-AY	NCAW Supernate	B	215 OF 978	~ 234	Future	5/2004
107-AN	CC	C	1057	~ 738	Existing	3/2005
102-AN	CC	C	1079	~ 952	Existing	8/2005
106-AN	CC	C	1088	~ 844	Future	12/2005
101-SY	CC	C	1114	~1248	Existing	4/2006
103-SY	CC	C	747	~ 772	Existing	7/2006

3.18 Phase 2 Privatization Processing

- The scale of processing during Phase 1B of privatization has been established to demonstrate the technical and commercial capability. Phase 2 of privatization would include the remaining tank waste retrieval, supernatant processing, sludge/solid processing, LAW immobilization, HLW immobilization, disposition of encapsulated Cs/Sr, and interim storage of immobilized waste (Washenfelder, 1996b). The proposed target schedule for Phase 2 processing is summarized below:

Contract Award	2004
Design, permitting, licensing, construction, and startup	
-Low-Activity Wastes	2005-2011
-High-Level Wastes	2005-2013
Operations	
-Low-Activity Wastes	2011-2021
-High-Level Wastes	2013-2028
Estimated Maximum Processing Rates (Wittman, 1997a and 1997B)	
-Liquid Wastes, Mgal/yr @ 7M Na	17.2
-Liquid Wastes, Mgal/yr @ 5M Na	24.1
-Solid Wastes, Mgal/yr (5M Na or 10 wt% solids)	1.55

Processing rates will ramp up during Phase 2--1/3 full rate the first year, 2/3 full rate the second year, and full rate the third year. Three aging waste tanks will be needed to store HLW returns from Phase 2 processing.

3.19 Watch List/Safety

- All three projection cases assumed that agitation using a mixer pump would continue to be used for mitigation of the flammable gas buildup in Tank 101-SY.

It was assumed that Tanks 101-SY and 103-SY would not require dilution until just prior to retrieval for processing which was scheduled to start in Phase 1B. Tank 101-SY was diluted to approximately 7 M Na and transferred to Tank 102-SY by April 2006. The retrieved wastes were transferred from Tank 102-SY to Tanks 102-AN and 107-AN. Tank 103-SY was diluted up to approximately 7 M Na and transferred to Tank 102-SY by August 2006.

All three cases assume that timely permission is obtained to remove waste from watch-list tanks used as LAW feed sources and to remove the watch-list designation from that tank immediately after retrieval.

All three cases assume that the authorization basis is amended to support all activities related to Phase 1B activities (for example, LAW feed staging and delivery, HLW feed staging and delivery, return of Sr/TRU and entrained solids, etc.

3.20 Spare/Contingency Space

- Spare space is space reserved in case of a leak in a double-shell tank per DOE Order 5820.2A. Contingency space has historically been set aside to account for possible inaccuracies in the WVP software when projecting waste generations and/or waste volume reduction factors.

  A total of 2.28 million gallons (one aging and one non-aging tank) of spare/contingency space was reserved for all three projection cases. From FY 1999 on, 0.72 Mgal of the operational space in Tanks 102-AW and 106-AW was designated as spare space (Awadalla, 1995) in all three projection cases.

3.21 Waste Segregation

Waste segregation and compatibility are requirements of DOE Order 5820.2A (DOE, 1990) and WAC 173-303-395 (Dangerous Waste Regulations). The overriding purpose of waste segregation and compatibility are to ensure the safety of waste storage and tank farms operations; to minimize future processing costs; and to comply with DOE Order 5820.2A and WAC 173-303-393. Wastes that are typically segregated include:

- Phosphate Wastes--dilute phosphate (DP) or concentrated phosphate (CP).
- Wastes Containing High Organic Concentrations--dilute complexed (DC) or complexant concentrate (CC).
- TRU containing wastes--Neutralized Cladding Removal Wastes (NCRW solids) or PFP solids (PT).
- Watch list tank wastes to prevent inadvertent commingling with other wastes.
- Pretreated waste streams.
- Washed NCAW solids, etc.
- Concentrated interim waste types--e.g., double-shell slurry feed (DSSF) or double-shell slurry (DSS) need to be separated from dilute wastes to prevent the need to reconcentrate.
- Wastes exhibiting exothermic reactions.

All three projections assume that current waste segregation practices are observed with the exception of SWL pumping in 200 West Area as discussed in Section 3.8. Waste segregation practices are summarized in Table 7 (Fowler, 1995).

Table 7. Waste Compatibility Matrix

Source Waste Type	Receiver Waste Type							
	DN	DSSF	DC	CC	(PD) NCRW	PT	NCAW	CP
DN	X	X	X	X	X	X	X	X
DSSF	X	X						
DC			X	X*				
CC			X*	X				
(PD) NCRW SOLIDS	X				X	X		
(PT) PFP SOLIDS	X				X	X		
NCAW							X	
CP								X

(*) Adding CC to DC is permitted but would not ordinarily be done. The volume of combined waste which would need to be evaporated would be increased, resulting in increased evaporation costs.

3.22 Loss of DST Space

Corrosion studies completed to date (Anantatmula and Ohl, 1996) show a 40-60% chance of a pit corrosion failure occurring in a DST by FY 2028. Some of the corrosion potential could be mitigated by maintaining a corrosion control program for the DSTs. In all three projection cases, it was assumed that none of the DSTs would be removed from service by the end of FY 2015.

3.23 New DST Construction

All three projection cases assumed that no new DSTs would be constructed by 2015.

3.24 DST Tank Solids Levels

Solids levels in the DSTs are shown in Table 8 (Hanlon, 1997; Estey and Guthrie, 1996; Stauffer, 1997; and Carothers, 1997b). Solids levels have been estimated for the tanks marked with an asterisk (*) based on the previous solids level measurement and the percent solids in facility generations that have been added to the tank since the last solids level measurement. Tanks with no solids level listed have either not been measured or have a minimal solids volume. The total DST solids used for this projection was approximately 4.974 Mgal.

Table 8. DST Solids Levels (Kgal)

TANK	SOLIDS	TANK	SOLIDS	TANK	SOLIDS	TANK	SOLIDS
101-AY	83	101-AN	33	101-AP		101-AW	306
102-AY	32	102-AN	89	102-AP		102-AW	33
101-AZ	35	103-AN	410	103-AP	1	103-AW*	487
102-AZ	95	104-AN	449	104-AP		104-AW*	390
101-SY	605	105-AN	489	105-AP	154	105-AW	300
102-SY*	133	106-AN	17	106-AP		106-AW	224
103-SY	362	107-AN	247	107-AP			
				108-AP			

3.25 IMUST Wastes

Approximately 500 kilogallons of wastes are projected to be received from Inactive Miscellaneous Underground Storage Tanks (IMUSTs) between FY 2011 and 2015 (Wacek, 1996). This is a new waste type added to these projections.

3.26 Assumption Summary

Assumptions used for all cases are presented in Table 9. Differences in assumptions between the three cases have been highlighted.

Table 9. Assumption Matrix
For the 1996 Operational Waste Volume Projection
(All Years are Fiscal Years)

	TPA Complaint Case	Disposal Planning Case	Ecology Case
Meets TPA Milestones	Yes	No	Yes
Facility Generations			
Total Limit, Kgal/mo	20.4-21.4	20.4-21.4	20.4-21.4
PUREX			
Yearly Rate, Kgal/yr	5	5	5
TCO Scheduled	Completed	Completed	Completed
TCO Volume, Kgal	0	0	0
Flush for TCO	---	---	---
WVRF for TCO (to DSSF)	99	99	99
B Plant			
TCO Scheduled	1997-1998	1997-1998	1997-1998
TCO Volume, Kgal DN	200	200	200
Flush for TCO	10%	10%	10%
WVRF for TCO (to DSSF)	99	99	99
WESF			
Monthly Rate, Kgal/mo	1.7(1997)	1.7(1997)	1.7(1997)
Monthly Rate, Kgal/mo	0.5(1998-2028)	0.5(1998-2028)	0.5(1998-2028
Flush for misc. waste	0%	0%	0%
WVRF, misc. waste(to DSSF)	99	99	99
S Plant			
Monthly Rate, Kgal/mo	2.1	2.1	2.1
Flush for misc. waste	22%	22%	22%
WVRF, misc. waste(to DSSF)	99	99	99
T Plant			
Monthly Rate, Kgal/mo	1.4 to 2.7	1.4 to 2.7	1.4 to 2.7
Flush for misc. waste	22%	22%	22%
WVRF, misc. waste(to DSSF)	99	99	99
300 Area			
Monthly Rate, Kgal/mo	4.2	4.2	4.2
Flush for misc. waste	44%	44%	44%
WVRF, misc. waste(to DSSF)	94	94	94
400 Area			
Rate, Kgal-every 3rd yr	7(1998)	7(1998)	7(1998)
Flush for misc. waste	44%	44%	44%
WVRF, misc. waste(to DSSF)	94	94	94
WSCF			
Monthly Rate, Kgal/mo	0.0	0.0	0.0
Tank Farms			
Monthly Rate, Kgal/mo	10	10	10
WVRF, flushes (to DSSF)	99	99	99

Table 9. Assumption Matrix
For the 1996 Operational Waste Volume Projection
(continued)

	TPA Complaint Case	Disposal Planning Case	Ecology Case
IMUST Wastes			
Tot. Volume, Kgal (2011-15)	500	500	500
100 Area			
100-N			
TCO Scheduled	1996-1997	1996-1997	1996-1997
TCO Waste Received	1997	1997	1997
TCO Volume, Kgal	13.5	13.5	13.5
100-K Basin Cleanout			
TCO Scheduled	2000-2001	2000-2001	2000-2001
TCO Volume, Kgal	350	350	350
105-F & 105-H Basin			
TCO waste in 2000, Kgal	40	40	40
TCO waste in 2005, Kgal	200	200	200
Flush, ALL 100 Area Waste	44%	44%	44%
WVRF, ALL TCO waste(to DSSF)	99	99	99
Tank 107-AN Caustic Addition			
Addition in 1998 (Kgal)	66	66	66
Salt Well Liquid Pumping			
Volume remaining (Mgal)	5.32	5.32	5.32
Volume pumped in 1997	0.44	0.44	0.44
West Area Receiver	Tank 102-SY	Tank 102-SY	Tank 102-SY
Start Complexed SWL in 200W	1998	1998	1998
Pumping Completion, FY	2000	2000	2000
Dilute Complexed SWL (Mgal)	1.75	1.75	1.75
Porosity saltcake/sludge	50%/21%	50%/21%	50%/21%
Flush for SWL Pumping	26%	26%	26%
WVRF, non-complexed (to DSSF)	47	47	47
WVRF, complexed (to DSSF)	10	10	10
Single-Shell Tank (SST) Solids			
Tank 106-C Retrieval	7/1998	7/1998	7/1998
# Tanks to store 106-C solids	1	1	2
Start Remaining SST Retvl	2004	2004	2004
Tank Farm Closure start	2018	2020	2018
Approximate Dilution Ratio	3:1	3:1	3:1
Retrieved Vol 2004-2005(Mgal)	2.0	1.5	2.0
Retrieved Vol 2006-2007(Mgal)	5.0	4.0	5.0
Meets TPA Milestones	Yes	No	Yes
No. SSTs Retrieved	149	149	149
Sludge Retrieved (Mgal)	12.2	12.2	12.2
Saltcake Retrieved (Mgal)	23.4	23.4	23.4

Table 9. Assumption Matrix
For the 1996 Operational Waste Volume Projection
(continued)

	TPA Compliant Case	Disposal Planning Case	Ecology Case
PFP Stabilization			
Dates	1997-2006	1997-2006	1997-2006
Volume, Kgal	34	34	34
Flush	22%	22%	22%
WVRF	81	81	81
Evaporator			
242-A Shutdown	~2011	~2011	~2011
New Evaporator (Privatize)	2011	2011	2011
Next Outage Date	None	None	8/2000-8/2002
Training Vol. (bi-yearly)	50	50	50
Ave. Evap Rate, Kgal/mo	500	500	500
Evaporation Product	dDSSF	dDSSF	dDSSF
Evaporation Limit (g/ml)	1.41	1.41	1.41
LERF capacity (Mgal)	13	13	13
Gal. condensate/gal. WVR	1.20	1.20	1.20
Yearly evaporation of DN (i.e., maintain currency)	Yes	Yes	No Two Year Outage
Effluent Treatment Facility			
Start date (mo/yr)	11/1995	11/1995	11/1995
Rate (Mgal/year)	50	50	50
Watch List/Safety			
101-SY Processing Dilution	4/2006	4/2006	4/2006
103-SY Processing Dilution	8/2006	8/2006	8/2006
Spare/Contingency Space			
Spare Space, Mgal	2.28	2.28	2.28
Use 0.72 Mgal of Operational space in 106-AW as part of spare space from 1999 on	Yes	Yes	Yes
Contingency space, Mgal	None	None	None
-date	N/A	N/A	N/A
Waste Segregation/DST Solids			
Total DST solids (Mgal)	4974	4974	4974
Store DSSF on NCRW solids	Yes	Yes	Yes
Store DSSF on NCAW solids	No	No	No
Segregate Complexed wastes	If Possible	If Possible	If Possible
Loss of DST Space			
Number Tanks Removed from Service	None	None	None
New DST Construction	None	None	None
Date Constructed	N/A	N/A	N/A
New Cross-Site Transfer Line			
Start Construction (TPA)	11/1995	11/1995	11/1995
Operational (TPA)	02/1998	02/1998	02/1998
Old line operational	Yes	Yes	Yes

Table 9. Assumption Matrix
For the 1996 Operational Waste Volume Projection
(continued)

	TPA Complaint Case	Disposal Planning Case	Ecology Case
DST Retrieval			
102-SY solids retrieved to 200 East Area	1/2006	1/2006	1/2006
Consolidation of NCRW solids in 103-AW & 105-AW	No	No	No
Phase 1B Privatization Processing			
Authorization to Proceed	4/30/1998	4/30/1998	4/30/1998
Start Construction(mo/yr)	12/1999	12/1999	12/1999
Operations (Phase 1B)	06/2002-06/2011	06/2002-06/2011	06/2002-06/2011
LAW Processing Rate	2 MT/day/contractor	2 MT/day/contractor	2 MT/day/contractor
No. of LAW contractors	2	2	2
HLW Processing Rate	0.164 MT NVOL/day	0.164 MT NVOL/day	0.164 MT NVOL/day
Total Processed Quantities:			
Envelope A (MT Na)	4122	4122	4122
Envelope B (MT Na)	234	234	234
Envelope C (MT Na)	4554	4554	4554
Staging/Characterization time per tank	100 days	100 days	100 days
Approximate Concentration of retrieved DSSF, CC	7 M, Na	7 M, Na	7 M, Na
Approximate Volume Pretreated, Mgal			
Yr 1 (06/2002-05/2003)	2.03	2.03	2.03
Yr 2 (05/2003-06/2004)	2.22	2.22	2.22
Intermediate Feed Staging Tank	2	2	2
Vendor Feed Tank	2	2	2
LAW Returned To DSTs	None	None	None
Entr. Solid Receipt Tanks	1	1	1
HLW Immobilization of solids from 101-AZ, 102-AZ, 106-C, and 102-AY	2002-2010	2002-2010	2002-2010
HLW Immobilized (MT)	340	340	340
Phase 2 Privatization Processing			
Contract Award	2005	2005	2005
LAW Operations	2011-2021	2011-2021	2011-2021
HLW Operations	2013-2028	2013-2028	2013-2028
HLW Return Tanks	3	3	3
Includes New Evaporator	Yes	Yes	Yes
Step Processing Rates--1/3 first year; 2/3 second year; then full rate			
Maximum Processing Rates			
LAW, Mgal/yr @7M Na	17.2	17.2	17.2
LAW, Mgal/yr @5M Na	24.1	24.1	24.1
HLW, Mgal/yr @5M Na	1.55	1.55	1.55
In-Tank Washing			
Consolid. of NCAW solids	No	No	No
Consolidate NCAW supernate to	101-AY + 1 DST	101-AY + 1 DST	101-AY + 1 DST
Decant 101-AZ	11/2000	11/2000	11/2000
Decant 102-AZ	3/2002	3/2002	3/2002
Decant 102-AY	5/2005	5/2005	5/2005

4.0 DISPOSAL PLANNING AND ECOLOGY CASE ASSUMPTIONS

The TPA Compliant Case is meant to project DST needs based on TPA milestones, TWRS program planning, and the most realistic operational assumptions (described in Section 3). The TPA Compliant Case presents a basis for evaluating future DST space needs through the end of FY 2015. This report presents a projected range of tank needs which is used to generate recommendations regarding site activities, waste management activities, facility requirements, and the need to build additional double-shell tanks. This document presents the results of three projections cases--TPA Compliant Case, Disposal Planning Case, and the Ecology Planning Case. The TPA Compliant and Ecology Cases reflect TPA milestones. The Disposal Planning Case incorporates a reduced SST solids retrieval schedule and volume to prevent over filling available DST space and hence would not meet the TPA milestone date for completion of SST solids retrieval (FY 2018) but would meet the date for SST farm closure (FY 2024). The Disposal Planning and Ecology Cases present a range of operational assumptions meant to answer the impact of various delays or changes on DST needs. The Disposal Planning and Ecology Planning Cases do not present a lower or an upper limit on double-shell tank needs which could vary significantly depending on the assumption changes. Operating assumptions for the three projection cases were established by July 1997. The following section will describe assumptions specific to the Disposal Planning and Ecology Cases. These assumptions are also summarized in Table 9.

4.1 Disposal Planning Case Assumptions

Assumptions for the Disposal Planning Case are the same as those for the TPA Compliant Case except for the following:

- Single-Shell Tank Solids Retrieval. Disposal Engineering (Penwell, 1997) reduced the schedule and volume of single-shell tank solids retrieved to prevent over filling available DST space. This delayed completion of SST solids retrieval from 2018 to 2020.

Assumption	TPA Compliant and Ecology Cases	Disposal Planning Case
Volume Retrieved in 2004 (Mgal)	1.6	0.7
Volume Retrieved in 2005 (Mgal)	0.4	1.9
Volume Retrieved in 2006 (Mgal)	1.1	0.4
Volume Retrieved in 2007 (Mgal)	3.9	3.6
Volume Retrieved in 2008 (Mgal)	0.4	1.8
Volume Retrieved in 2009 (Mgal)	2.7	0.4
Volume Retrieved in 2010 (Mgal)	0.1	0.9
Volume Retrieved in 2011 (Mgal)	5.9	6.7
Volume Retrieved in 2012 (Mgal)	13.9	11.8
Volume Retrieved in 2013 (Mgal)	9.7	15.3
Volume Retrieved in 2014 (Mgal)	15.7	15.7
Volume Retrieved in 2015 (Mgal)	21.5	15.6
Volume Retrieved in 2016 (Mgal)	15.1	13.2
Volume Retrieved in 2017 (Mgal)	13.3	9.7
Volume Retrieved in 2018 (Mgal)	3.3	8.4
Volume Retrieved in 2019 (Mgal)	0	3.0
Volume Retrieved in 2020 (Mgal)	0	0.2

4.2 Ecology Planning Case Assumptions

Assumptions for the Ecology Planning Case are the same as those for the TPA Compliant Case except for the following requested changes from the Washington Department of Ecology (Hepner, 1997):

- Two Year Evaporator Shutdown Between 2000 and 2005 . At the request of the Washington Department of Ecology, a two year evaporator outage was scheduled between 2000 and 2005. To lessen the impact, the outage was scheduled after the last evaporator campaign in FY 2000 or from August 2000 to August 2002. Delaying the outage to a later date when DST wastes were being diluted for processing or when SST solids retrieval was occurring would have had a larger impact.

- Retrieval of Tank 106-C Solids Requires In Excess of 1 Mgal After 1997. It was assumed that the solids retrieved from Tank 106-C would have to be stored in two aging waste tanks (Tank 102-AY and 101-AY) instead of just a single tank (Tank 102-AY).

5.0 RESULTS AND CONCLUSIONS

The results of a waste volume projection can be used to forecast tank space needs versus time, forecast evaporator operation, LAW processing and disposal, HLW processing and disposal, analyze tank space issues for aging and non-aging waste tanks, tank usage, or to determine the need and schedule for retrievals or cross-site transfers. To predict tank space needs, a graphic is produced showing tank count versus time as compared to the available space. Generations and evaporations for the near term (thru 2000) are modeled on a monthly basis whereas the remainder of the projection is typically modeled on an annual basis.

All projection cases assume that dilute waste will be evaporated to DSSF in the year they are produced, provided an evaporator is operational and the WVR limit of the evaporator has not been exceeded. In later parts of the projections when tank space becomes tight due to processing needs and/or the amount of SST solids being retrieved, the evaporator is assumed to operate yearly even if volumes are small in order to minimize waste storage needs. Long range projection graphics for the TPA Compliant, Disposal Planning, and Ecology Planning Case are presented in Sections 5.1, 5.2, and 5.3, respectively. Short range graphics, tank usage graphics, evaporator WVR data, and a spreadsheet showing inputs/outputs have been included for the TPA Compliant Case only.

This year's projection cases incorporate several space saving assumptions. These space saving alternatives reduce the need to build additional DSTs but add additional risks to the TWRS program. These actions and some of the risks are listed below:

- Waste generation rates and TCO volumes have been reduced compared to those used in Rev. 22.

- It was assumed that agitation using a mixer pump would continue to be used for mitigation of the flammable gas buildup in Tank 101-SY. It was assumed that neither Tank 101-SY or 103-SY would require dilution until just prior to retrieval for processing during Phase 1B processing.

  If the mixer pump option was not available to meet the flammable gas buildup and a 1:1 dilution was required at a future date the increase in tank space to dilute both Tanks 101-SY and 103-SY would be approximately 1.9 million gallons.

- In Revision 21 of this document, it was assumed that all NCRW and PFP solids could be consolidated into one DST (Awadalla, 1995). In Revs. 22 and 23 of this document, it was assumed that the solids in Tanks 103-AW and 105-AW would not be combined. However, the PFP solids from Tank 102-SY and the solids from the 100 Area TCO activities were combined into Tank 105-AW. To further minimize the impact of this non consolidation of solids compared to Revision 21, this year's projections assumed that slurry feed (DSSF) could be stored on top of the solids in Tanks 103-AW and 104-AW. The acceptability of this assumption is still being reviewed.

- Spare space is space reserved in case of a leak in a double-shell tank per DOE Order 5820.2A. Contingency space has historically been set aside to account for possible inaccuracies in the WVP software when projecting waste generations and/or waste volume reduction factors. A total of 2.28 million gallons (one aging and one non-aging tank) of spare/contingency space was reserved for all three projection cases. Operational space in Tanks 102-AW and 106-AW was used to provide 0.72 Mgal of the required 2.28 Mgal of spare/contingency space from FY 1999 on (Awadalla, 1995). This assumption change reduces operational space which may create operational/space problems during the period when SST solids are being retrieved.

- Tank 102-SY was used to pump complexed SWL in West area starting in mid FY 1998 in order to meet intermediate TPA milestones for SWL pumping. Retrieval of the TRU solids in this tank is not scheduled until January 2006. Segregation issues involving contacting complexed SWL with the TRU heel in Tank 102-SY may make this assumption impossible which could delay SWL pumping TPA milestones (see Section 3.8 for more on SWL pumping).

- These projections assumed that dilute non-complexed waste could be evaporated to a specific gravity (SpG) of 1.41. Limiting the evaporation of waste to a SpG of 1.41 has been proposed as an acceptable threshold for preventing the accumulation of flammable gas in DSTs (Fowler, 1995). The special projection L9503A which was completed in April 1995 (Awadalla, 1995) reduced waste to a SpG of 1.35. The higher specific gravity limit used in this projection allows waste to be evaporated further, saving approximately 2/3 of a tank by the end of the projections.

- Some double-shell tanks are nearing their design life. None of this year's projections provide for the loss of any DST space through 2015. The volume of this impact would be approximately one million gallons if one DST is lost (see the Ecology Planning Case in Rev. 22). Spare space would be used if a loss of a double-shell tank should occur.

- In the TPA Compliant Projection it was assumed that evaporator capacity was available on an annual basis from FY 1997-2015. A reduction in evaporation capacity during years when space is tight or when waste receipts are high could result in a tank space shortage.

- The Privatization contracts state that each Privatization Contractor will modify their assigned feed tank (Tank 106-AP or Tank 108-AP) and supporting systems. Due to DST tank space limitations, the current feed staging plans and OWVP projections continue to use these tanks for waste management during the same time frame that tank modifications and turnover are expected to occur.

- The PHMC team will need to use Tanks 102-AP and 104-AP for waste management during the same time frame that Project W-211 is preparing them for use as intermediate feed staging tanks.

- After retrieval of waste from a watch-list tank, the tank is immediately available for unrestricted use.

The space saving actions listed above reduce the need for construction of new DST space that was recommended based on a previous projection (Rev. 20) but introduce additional uncertainties and risks into the overall TWRS program. If many of these items are not possible or if waste generations exceed those used in this projection, it may be necessary to either delay site cleanup activities, delay TPA milestones (e.g., SWL pumping and/or SST solids retrieval), increase the waste processing rate, or build additional tank space in order to avoid exceeding the available DST space. Additional studies are currently in progress to address and solve the issues that have been identified.

Results of the projection cases and the projected tank space needs are included in the following sections.

5.1 TPA Compliant Case Results and Conclusions

Assumptions for the TPA Compliant Case represent the current planning basis for TWRS programs to meet TPA commitments. Projected tank space needs for the TPA Compliant Case are shown in Figure 3. [Late Note: Technical delays and funding decreases will delay some of the SWL volume projected for FY 1997-1998. This means the projected DST needs shown for FY 1997-1998 are conservative.] The TPA Compliant Case exceeds available tank space by one tank in the period FY 2005-2006 and by up two tanks in the period FY 2011-2015. The tank space shortage in FY 2005-2006 results from trying to retrieve a relatively large volume of SST solids through Tank 102-SY before the TRU solids residing in Tank 102-SY have been removed and at a time when Tank 102-SY is being used to retrieve wastes from Tanks 101-SY and 103-SY. Options to meet or avoid the need for extra space in 200 West Area during FY 2005-2006 include the following:

- Accelerate both the removal of the TRU solids from the bottom of Tank 102-SY and the retrieval of wastes from Tanks 101-SY and 103-SY to a date preceding the start of SST solids retrieval (12/2003). This should provide space in Tank 102-SY to handle the SST solids retrieval schedule in the TPA Compliant Case. This would also mean that the wastes in Tanks 101-SY and 103-SY would have to be pretreated at an earlier date in the Phase 1B schedule.

- Reduce the amount of SST solids waste retrieved in 200 West Area until after Tank 102-SY has been cleaned out and Tanks 101-SY and 103-SY have been retrieved (after August 2006) and/or reduce the SST solids retrieval schedule (may delay TPA milestones). The affect of reducing the SST solids retrieval schedule on DST space needs is presented for the Disposal Planning Case (shown in Section 5.2).

- Delay SWL pumping to reduce tank space needs (delays TPA milestone). One of the 200 West Area tanks would still have to be diluted and moved to 200 East Area to provide space where it is needed. This means that up to 2.8 million gallons of SWL (assumed WVRF of 47) might have to be delayed to accommodate the diluted volume of Tank 103-SY (current inventory 747 Kgal; assumed 1:1 dilution).

- Increase Phase 1B processing rates to free up additional tank space. Since the space is needed in West Area, one of the tanks in West Area would have to be moved earlier in the Phase 1B schedule. Tank 103-SY has only a total of 747 Kgal and the final diluted volume would be smaller.

- Build additional tanks. Should the projection require building new tanks, approximately six to eight years lead time would be required to provide additional storage tanks. Consequently, a decision to add storage capacity can be delayed until 1998 when the tank space needs will be re-evaluated. Annual evaluation of tank space needs and the decisions on additional storage capacity are required by the M-46 series Tri-Party Agreement Milestones.

Options to meet or avoid the need for extra space needed during FY 2011-2015 include the following:

- Reduce the amount of SST solids waste retrieval volume during FY 2011-2015 (may delay TPA milestones).
- Delay SWL pumping to reduce tank space (delays TPA milestones).
- Increase Phase 1B and/or Phase 2 processing rates to free up additional tank space.
- Build additional tanks.

A spreadsheet summarizing the waste generations, evaporator WVR, and processing requirements has been added to this document and is included as Table 10. This spreadsheet is included to present a global view of how the various inputs and outputs affect tank space. This spreadsheet is useful to review waste inventories and waste receipts but cannot accurately predict the dynamics of tank usage or the full impact of partially filled tanks on tank space needs. Information on the amount and nature of HLW returns to the aging waste tanks was not available when these projections were completed. The HLW return volumes and workoffs shown in this document are estimates only and are likely to change.

The projected tank inventories and tank space usage as of September 2000 are included in Table 11.

Figure 4 shows the waste additions and available space in a bar graph format to allow the user to more easily visualize the tank space usage. Numbered comments have been added to the bar graph explaining the inventory changes. These comments follow the figure. During the period when SST solids are being retrieved and pretreated (full Phase 2 processing rate will pretreat a full tank of SST solids waste in less than one month), some of the tanks are being filled and pretreated (up to twice) within the same fiscal year. These tanks will show up as "empty" in the graphic because they have been filled and pretreated within the same fiscal year and their inventory at the end of the year has been reduced to a heel. Thus, the bar graph misleads the user into believing that most of the space dedicated to SST solids retrieval is not needed. The space is actually needed to allow staging and processing of the SST solids wastes. Retrieval and processing rates are high enough in FY 2014-2015 that it is difficult to retrieve the wastes, allow the 100 days assumed for characterization, and pretreat at the specified processing rate.

No new tanks are needed in the next 6-8 years but tank space is critical in the FY 2005-2006 and FY 2011-2015 timeframes. Options are continued to be reviewed. It takes 6-8 years to build additional tanks so the tight space seen in the 2005-2006 timeframe will be monitored closely next year to see if new tanks are needed. Several options are being investigated and reviewed for next year's submittal of the OWVP.

Efforts will be made next fiscal year to accelerate retrieval of the tanks in SY farm earlier as mentioned in the above options. This action will not impact TPA milestones. The other options will also be looked at further. By completing one of the options, the projected tank space needs could be reduced to fit the available space. Lockheed Martin Hanford Company is concerned about the projected tank space shortage in FY 2011-2015 and beyond but appropriate time is available to review the assumptions and projected tank space in later years.

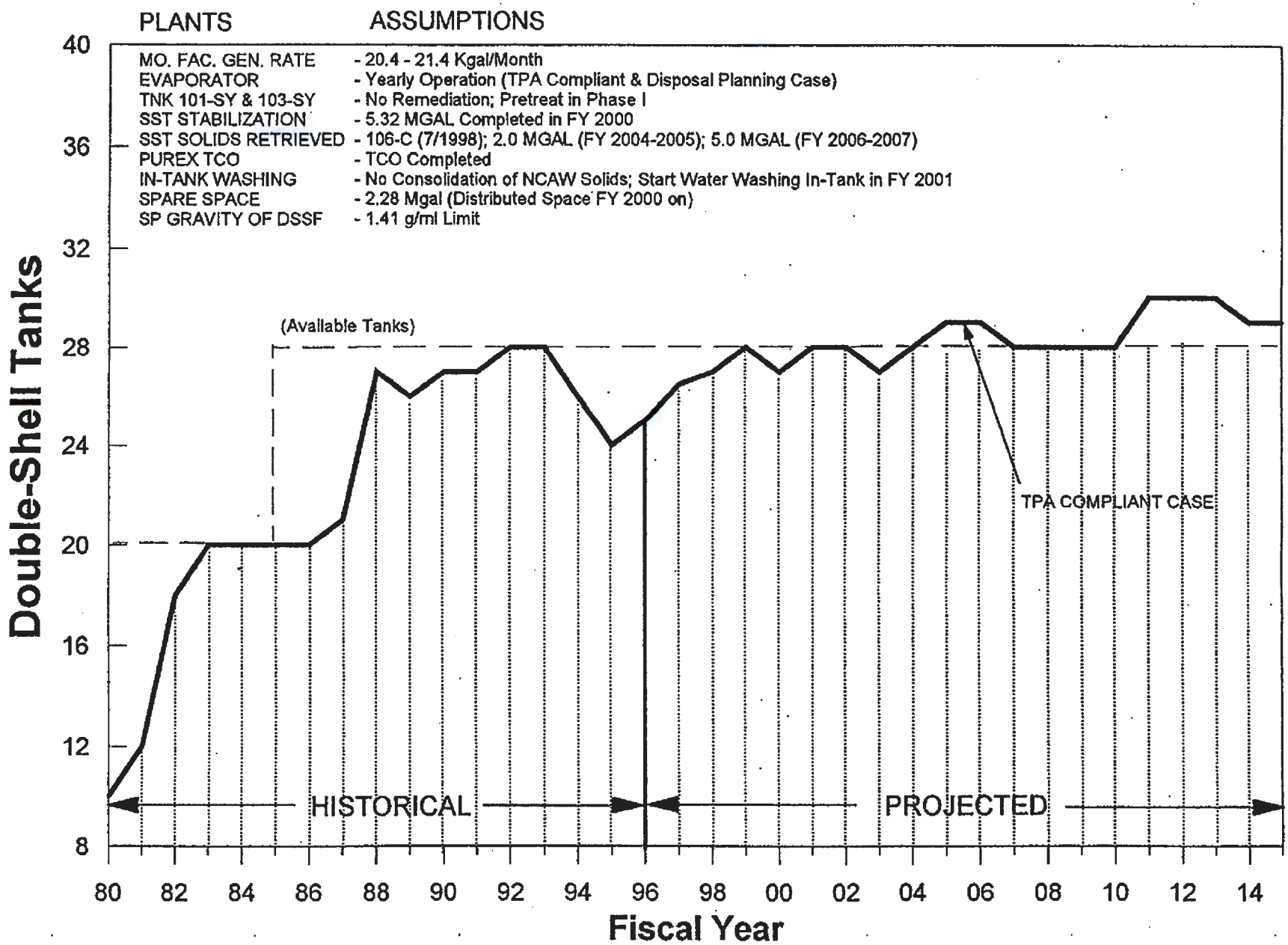

Figure 3. Double-Shell Tank Requirements for the TPA Compliant Case

OF3

Table 10. Spreadsheet of Waste Additions and Reductions for TPA Compliant Case

FISCAL YEAR	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
STARTING INVENTORY	0	18996	18961	20560	22605	22268	22853	22521	21559	21523	21095	21677	22482	20726	23067	23204	25397	27253	16979	11267
SPACE UTILIZATION																				
Spare Space	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280	2280
Watchlist Space	709	709	709	709	709	697	614	602	419	419	2224	0	0	0	0	0	0	0	0	0
Contingency Space	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Segregated Space	2254	4377	3960	3568	613	1206	1536	564	844	3195	2515	443	719	994	42	42	0	0	0	0
Priority Operational Space	3411	3653	3239	2382	5939	4687	5247	5426	6098	5748	3448	5440	7046	4448	4511	4858	4089	14449	20242	20766
NEW WASTE ADDITIONS																				
B Plant/WSCF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S Plant	0	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
T Plant	0	17	17	17	24	24	24	25	25	25	25	26	26	26	27	27	27	27	28	28
300/400 Areas	0	50	57	50	50	57	50	50	57	50	50	57	50	50	57	50	50	57	50	50
TCO	0	144	60	5	76	325	0	0	0	200	0	0	0	0	0	0	0	0	0	0
Flushes	0	196	814	629	229	445	67	68	253	156	68	70	67	67	70	67	67	70	67	67
SWL Pumping	0	439	2525	1836	524	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tank Farms	0	230	155	240	190	240	155	205	155	205	155	205	155	205	155	205	155	205	155	205
SST Retrieval	0	0	175	576	0	0	0	0	1564	429	1113	3927	366	2721	124	5934	13864	9872	15681	21469
PFP	0	2	4	4	4	4	4	3	3	3	3	0	0	0	0	0	0	0	0	0
Inventory	17735	48	66	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Retrieval Water	0	0	0	0	0	0	0	0	183	0	1965	0	0	0	0	0	400	0	0	0
Everything Else	1261	20	45	135	5	5	40	75	105	105	105	105	105	5	5	307	505	1002	1305	1521
Pretreatment Dilution	0	0	0	0	0	386	526	650	762	792	240	0	0	0	0	0	0	0	0	0
In-Tank Washing	0	0	0	0	0	580	426	650	0	648	462	0	0	0	0	0	0	0	0	0
NEW WASTE ADDITIONS TOTAL	18996	1171	3943	3540	1127	2091	1317	1751	3132	2638	4211	4415	794	3099	463	6615	15093	11058	17291	23365
TOTAL WASTE BEFORE EVAP	18996	20167	22903	24100	23733	24361	24170	24273	24693	24162	25308	26093	23277	23828	23533	29821	40491	38312	34272	34634
EVAPORATOR WVR	0	-1206	-1600	-1495	-1464	-1470	-762	-370	-736	-800	-1085	-990	-303	-479	-326	-355	-332	-403	-345	-394
CUM EVAPORATOR WVR	0	-1206	-2806	-4301	-5765	-7235	-7997	-8367	-9103	-9903	-10988	-11978	-12281	-12760	-13086	-13441	-13773	-14176	-14521	-14915
Outflow to SST Wash Facility	0	0	-744	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Low activity waste	0	0	0	0	0	0	-730	-2152	-2152	-2126	-2396	-2344	-1971	-4	0	-4067	-11964	-20543	-21757	-21993
High Level Waste Contractor	0	0	0	0	0	0	-96	-191	-280	-140	-139	-276	-276	-275	0	0	-941	-386	-901	-1416
Loss in Vol when wastes dissolved	0	0	0	0	0	-36	-81	0	0	0	-9	0	0	0	0	0	0	0	0	0
EVAP AND OUTFLOWS TOTAL:	0	-1206	-2344	-1495	-1464	-1506	-1649	-2713	-3168	-3066	-3629	-3610	-2550	-758	-326	-4422	-13237	-21332	-23003	-23803
NET INVENTORY CHANGE	18996	-35	1599	2045	-337	585	-332	-962	-36	-428	582	805	-1756	2341	137	2193	1856	-10274	-5712	-438
END OF YEAR INVENTORY	18996	18961	20560	22605	22268	22853	22521	21559	21523	21095	21677	22482	20726	23067	23204	25397	27253	16979	11267	10829
TOTAL CAPACITY	27650	29980	30747	31544	31810	31725	32198	30432	31166	32738	32146	30646	30772	30792	30040	32579	33623	33709	33791	33877
	25	27	27	28	28	28	29	27	28	29	29	27	27	27	27	29	30	30	30	30

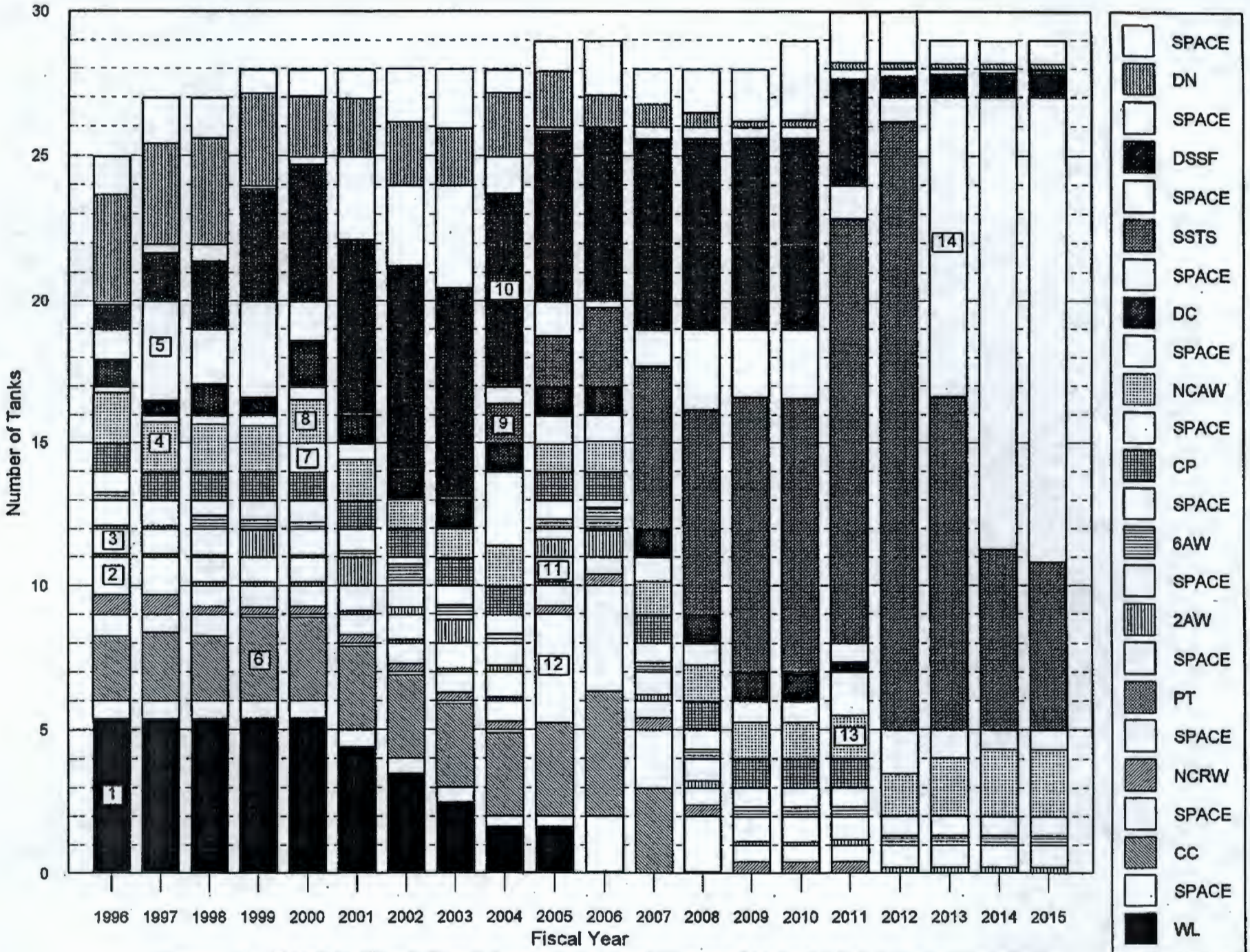

Figure 4. Double-Shell Tank Inventory and Space for the TPA Compliant Case

L97BW_B2

Comments for Figure 4--Double-Shell Tank Inventory and Space for the TPA Compliant Case

This bar chart graphic is meant to show the increase and decrease in the various waste categories or waste types for the TPA Compliant Projection L97TPA. Tank space needs for "in-tank washing" have been included. Spare and processing receipt tanks are not shown. Beginning in 1999, a portion of the evaporator operational space maintained in Tanks 102-AW and 106-AW (abbreviated 2AW and 6AW on Figure 4) will also be considered as spare space to decrease tank space needs. Levels of Dilute Non-complexed waste (DN) in the dilute receiver and evaporator tanks will vary with time. The bar for each year depicts the tank space needs for the end of that fiscal year and may not show tank space changes occurring during the fiscal year, especially if the tank inventory has been removed prior to the end of the fiscal year.

Numbered Comments for "Tank Inventory and Space" Graphic

1. "Watch List" (WL) tank inventories are constant from 1995-2000. In FY 2001, the contents of Tank 105-AN are diluted and transferred to the intermediate staging tanks to supply feed for Phase 1B processing.

2. Space above Neutralized Cladding Removal Waste (NCRW) solids is routinely used to store Dilute Non-complexed (DN) waste. For clarity, the graph shows this DN inventory in with the other DN inventory toward the top of the graph. (i.e, to ascertain "free" space, add the space shown in the NCRW group to that shown in the DN group).

3. Space above PFP Tru (PT) solids is used to store DN waste, (see note 2). It is assumed that complexed salt well liquid pumping in 200 West Area would be added to Tank 102-SY before the PT (PFP TRU) solids were retrieved (see note 9).

4. The slight decrease in the NCAW category from 1997-2002 is caused by in-tank concentration of the NCAW supernates.

5. In 1997 there is an increase in space above the Dilute Complexed (DC) waste inventory. This results from pumping the DC waste from Tank 101-AY (980 Kgal) to other tanks prior to and during evaporation (Tanks 108-AP, 106-AN, and 102-AW), thus creating more net headspace. Reduction in the DC waste inventory in 1997 is caused by an evaporation. Evaporation is necessary to cleanout Tank 101-AY for pre-staging of Envelope B feed and to reduce storage volume. Projection L97TPA included approximately 1.75 Mgal of additional complexed SWL.

6. The CC (or DSSF) group shows increases in inventory over time due to the evaporation of dilute complexed wastes. When a CC tank becomes full, a new tank must be added, which obviously has empty space in it. This is shown graphically year-to-year with step increases in the number of CC tanks and variations in the available space shown in the group. Increase in CC volumes occur due to Salt Well Liquid (SWL) pumping. In 2005, the large increase in the number of tanks in the CC group is caused by staging CC wastes into the processing staging tanks.

7. The increase in the number of tanks used to store CP waste in 2000 is due to the transfer of CP wastes from Tank 103-AP to 102-AP. For a short period of time both tanks are counted as being in the CP group.

8. The changes in NCAW inventory and tank needs starting in 2000 were partially caused by in-tank washing of the NCAW solids. The final result of the operations were completed by the end of FY 2006 but the NCAW solids vitrification is not completed until FY 2009 (See Table 5 for additional detail). The increase in tank count in FY 2004 is caused by staging aging waste supernate into processing feed tanks which are then temporarily counted as part of this group. The increase in inventory from 2009 on is caused by the slow accumulation of either Sr/TRU entrained solids.

9. Retrieval of Single-Shell Tank Solids (SSTS) was started in FY 2004. Initial SST solids were stored in Tanks 103-AN and 102-SY.

10. Decrease in DSSF inventory in FY 2004 results from Phase 1B processing. The DSSF category actually shows a slight increase in inventory and tank count as waste staging occurs in FY 2002-2003. By 2004, the workoff due to processing has decreased the inventory and tank count.

11. The PT (PFP TRU) solids from Tank 102-SY were cross-sited to Tank 105-AW beginning January 2006. Therefore, the PT waste category and space are eliminated by the end of FY 2005.

12. Increase in CC inventory and tank count in 2005 is caused by dilution and staging of watch list waste from Tank 107-AN for processing in Phase 1B (March 2005). The tank count remains at a high level for the CC group (staging tanks classified as CC group during use) until CC wastes have been worked off. By 2009, all CC wastes have been pretreated and the category disappears.

13. Increase in the "NCAW" category caused by the generation of HLW returns (from 2013) which are stored in Tanks 102-AY, 101-AZ, and 102-AZ. These wastes have been included in the "NCAW" category due to their possible high heat content

14. By FY 2013, the Phase 2 processing is operating at full capacity and is working off wastes faster than SST solids volumes are being retrieved. All the tanks in the SST Solids (SSTS) category contained waste at some time during the year (some have been filled and emptied twice) but by the end of the Fiscal Year the tanks happen to be empty and the ending inventory is much lower than the tank capacity for this group. Thus, the bar graph misleads the user into believing that most of the space dedicated to SST solids retrieval is not needed. The space is actually needed to allow staging and processing of the SST solids wastes. Retrieval and processing rates are high enough in FY 2014-2015 that it is difficult to retrieve the wastes, allow the 100 days assumed for characterization, and pretreat at the specified processing rate.

Table 11. Projected Tank Usage on 9/2000 for the TPA Compliant Case

Tank	Liquid (Kgal)	Solids (Kgal)	Total (Kgal)	Comment/Projected Usage for Tank as of 9/2000
101-AY	688	83	771	Received NCAW supernate from 1AZ starting 6/2000
102-AY	772	208	980	Received C-106 solids starting 7/1998
101-AZ	150	35	185	Start in-tank washing 6/2000 by decanting to 1AY
102-AZ	830	95	925	NCAW inventory
101-SY	509	605	1114	CC/SL inventory; watch list (WL) tank
102-SY	396	133	529	DN/PT inventory; 200 West Area SWL and dilute receiver
103-SY	362	385	747	CC/SL inventory; WL tank
101-AW	784	344	1128	DSSF/SL inventory; WL tank; third tank to be pretreated
102-AW	63	55	118	Evaporator feed tank
103-AW	653	487	1140	DSSF/PD solids; "topped off" w/ DSSF in 8/1998
104-AW	750	390	1140	Refilled w/ DSSF in FY 1998-1999
105-AW	258	302	560	DN heel/PD solids; receives all 100 Area wastes & solids from 9/1997-2005; dilute receiver FY 2001
106-AW	28	225	253	Evaporator slurry receiver tank
101-AN	1107	33	1140	SWL-DC receiver until 3/1999; filled w/ DSSF by 12/1999
102-AN	990	89	1079	CC (TRU) inventory
103-AN	544	413	957	DSS inventory; WL tank
104-AN	562	495	1057	DSSF inventory; WL tank; second tank to be pretreated
105-AN	568	560	1128	DSSF inventory; WL tank; first tank to be pretreated; 200 East Area dilute receiver FY 2002 on
106-AN	1123	17	1140	Filled w/ CC wastes by 7/1999
107-AN	989	134	1123	CC (TRU)/SL inventory
101-AP	1140		1140	Filled w/ DSSF by 4/1999
102-AP	28		28	CP inventory; empty 10/1999 to 3AP; processing intermediate staging tank 10/2000 on
103-AP	1098		1098	Spare tank until 3/1999; DC staging for evaporation 3/1999 to 10/1999; receives CP waste from 2AP in 10/1999
104-AP	28		28	Stage DN for evaporation until 7/2000; processing intermediate staging tank 10/2000 on
105-AP	986	154	1140	Filled w/ DSSF by 6/1998;
106-AP	790	4	794	SWL-DN receiver and dilute receiver in E. Area until 10/2000; vendor staging tank 10/2000 on
107-AP	832		832	Stage DN for evaporation; start refilling w/ DSSF 9/2000
108-AP	384		384	Stage DC for evaporation; vendor staging tank 10/2000 on

Interpretation of Short Range Projection Results

This section provides an interpretation of detailed short range projection results. The OWVP presents certain information in the form of graphics. A number of these graphics show 12 months of historical operations and 24 months of projected operations. Most of the vertical axis represents thousands of gallons of waste generated. An example of this type of graphic is the facility waste generation graphic. The volume generated per month for each facility is depicted on a facility waste generation graph. An example of the facility waste generation graph for PUREX waste is shown below (Figure 5).

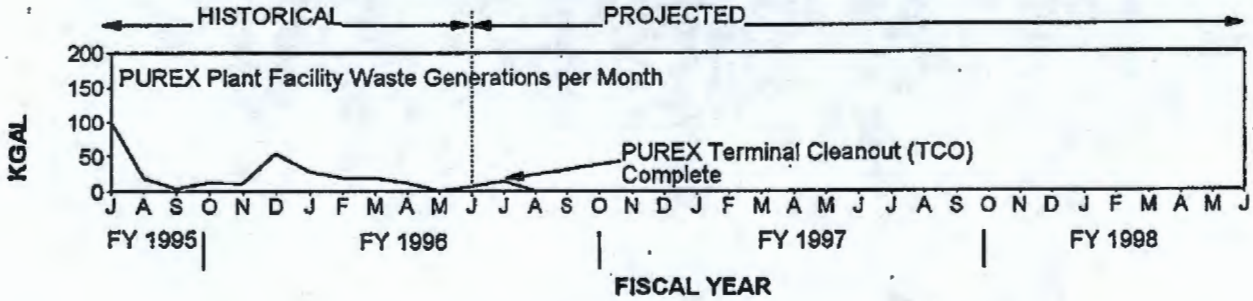

Figure 5. Facility Waste Generation Graphic

In the computer simulation, facility waste streams are routed to a receiver tank. A tank fill graphic shows the filling of the receiver tank and is on the same page as the facility waste generation graph of the waste stream it receives. The tank fill graphic shows the rate a specific tank is filled with waste. Usually when a receiver tank is full, waste is transferred to a holding tank. This waste is either evaporated or stored for future disposal. For every transfer out of a tank, there is a corresponding receipt of the same volume into another tank or facility. For every evaporation out of a tank there is a corresponding receipt of the more concentrated waste in the receiving tank and an increase in the condensate from the 242-A Evaporator being sent to the LERF.

An example of this type of graph (a tank fill graphic) for Tank 105-AW is shown below (Figure 6).

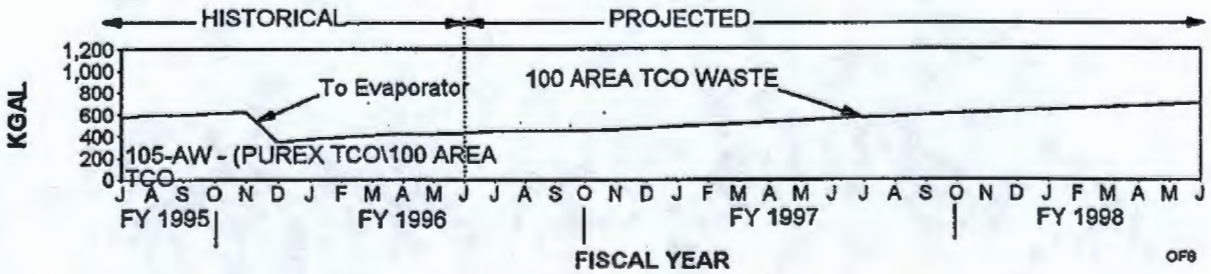

Figure 6. Tank Fill Graphic

The accuracy of this projection is directly related to the facility supplied assumptions. Some of the major assumptions are listed below:

- Process operating schedules define the planned dates of plant operations or deactivation activities. These assumptions are consistent with the TWRS program planning. Volumes and schedules for the various Hanford facilities for the three projection cases are presented in Sections 3 and 4.

- Plant waste generation assumptions define the volume and type of waste that will be generated by the plants. These assumptions result from an analysis of recent waste generation history and future plans specified by the plants. Most waste streams volumes are projected based on historical data and/or facility supplied operating schedules. Section 5.4 includes a comparison of actual waste receipts to the new facility waste generation targets for the period October 1995 to September 30, 1996.

Tank roles and waste routings define the use of tanks in the system. For example, a tank will be designated to act as receiver of the PUREX facility miscellaneous waste (Tank 105-AW), while other tanks will store concentrated waste.

The graphics depicted on the next few pages summarize the short range projection results of the TPA Compliant Case. Figure 7 shows the role of each tank for a period of four years. It should be noted that if a tank has several transfers in or out of the tank in one month, no fluctuation in the tank level may appear. This is because the graphic program plots tank levels as of the last day of the month and any changes that occur during the month are not shown. The simplified routing schematic shown in Figure 8 depicts the assumptions that are made about the routing of waste from the plants to the tanks and from tanks to the facilities.

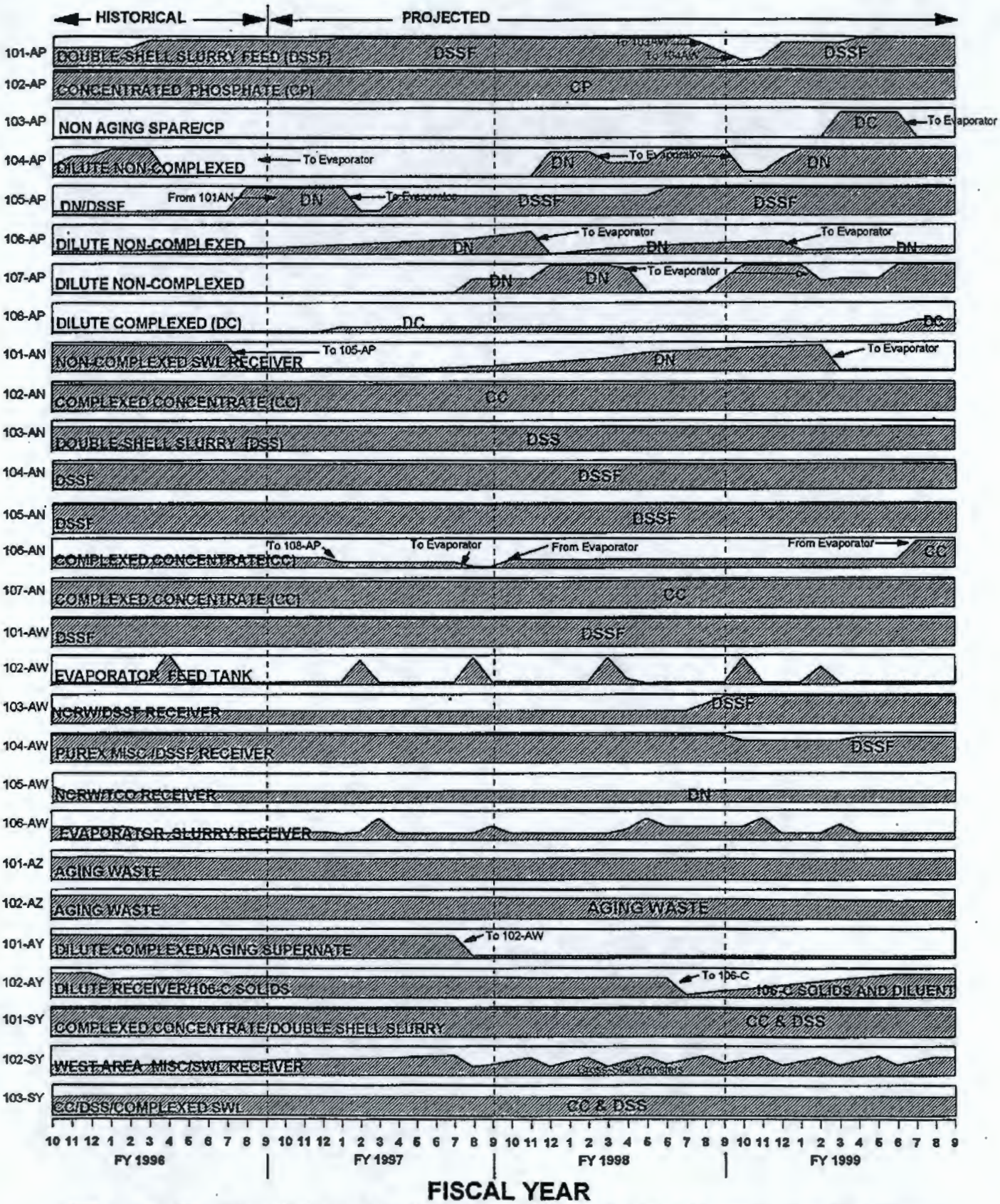

Figure 7. Tank Levels During the Short Range Projection

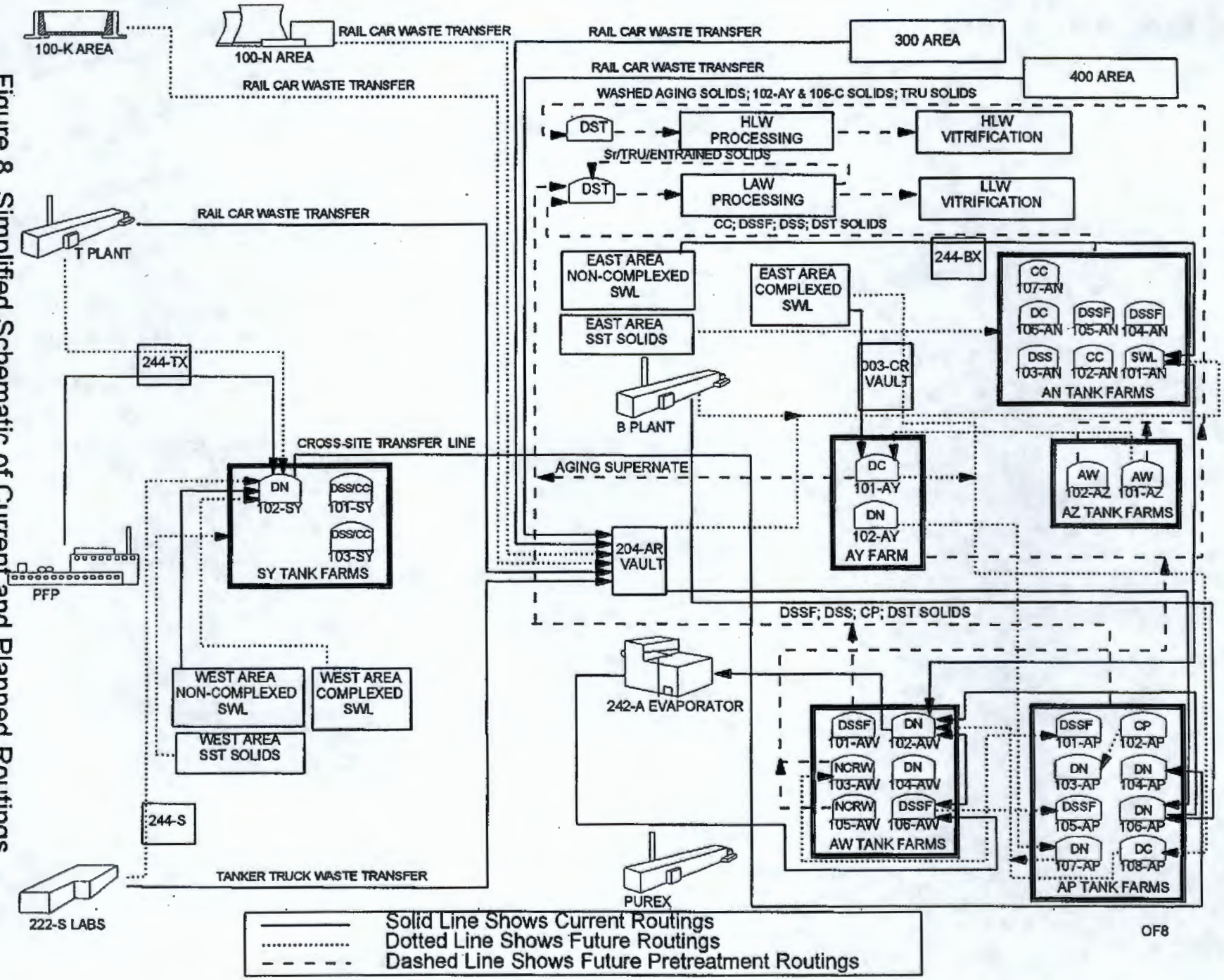

Figure 8. Simplified Schematic of Current and Planned Routings

The results of this projection are forecasts of evaporator operations, LAW processing and disposal, HLW processing and disposal, and an analysis of tank space issues for aging and non-aging waste tanks.

Evaporator WVR and LERF Condensate

Schedule and operational considerations presented in Section 3 result in the following Evaporator Waste Volume Reduction (WVR) and LERF Condensate production volumes for the TPA Compliant Case. The ratio of process condensate sent to LERF for every gallon of Waste Volume Reduction (WVR) for Evaporator Campaigns 94-1, 94-2, and 95-1 was 1.29, 1.24, and 1.26, respectively (Guthrie, 1996). The evaporator seal water and demister spray upgrade could reduce future process condensate production to 1.15 gallon of condensate/gallon of WVR which would lower the value used for future projections. This projection used a value of 1.20 gallon of condensate/gallon of WVR (Guthrie, 1997a) to project future condensate production recorded in Table 12. These volumes also assume that there will be no evaporator outages before 2015. The waste sources, campaign schedule, and concentrated waste receiver tanks used in this projection are summarized Table 13.

Table 12. Evaporator WVR and LERF Additions for the TPA Compliant Case

FISCAL YEAR	EVAPORATOR WVR (KGAL)	CONDENSATE TO LERF (KGAL)
1997	1210	1450
1998	1600	1920
1999	1500	1800
2000	1460	1750
2001	1470	1760
2002	760	910
2003	370	440
2004	740	890
2005	800	960
2006	1090	1310
2007	990	1190
2008	300	360
2009	480	580
2010	330	400
2011	360	430
2012	330	400
2013	400	480
2014	350	420
2015	400	480

Table 13. Evaporator Campaign Schedule for the TPA Compliant Case

Campaign	Start Date	Staging Tank(s)	Source	Waste Feed Type	Feed Volume (Kgal)	Receiver Tank
97-1	3/97	105-AP	102-AW 101-AN	DN DN-SWL	60 970	105-AP
97-2	9/97	Direct to 102-AW	101-AY & 106-AN	DC	970	106-AN
98-1	4/98	104-AP 107-AP	106-AP & 102-AY 102-SY	DN DN-SWL	1000+ 1000	105-AP 101-AP
99-1	11/98	104-AP	102-SY	DN-SWL	1100	101-AP
99-2	3/99	107-AP	102-SY & 104-AW	DN-SWL & DN	1100	101-AP 104-AW
99-3	7/99	103-AP	101-AN	DC-SWL	1000	106-AN 108-AP
00-1	10/99	104-AP 107-AP	104-AW,102-SY,106-AP 102-SY	DN-SWL & DN DN-SWL	1000+ 1000	104-AW 101-AN
00-2	7/00	104-AP	102-SY	DC-SWL	1000	101-AN 107-AP

Note: Tank 101-AP is characterized and once the contents are found to be suitable, the DSSF contents are stored on top of the solids in Tanks 103-AW and 104-AW in early 1998. This allows Tank 101-AP to be refilled later in 1999. This method should allow topping off Tanks 103-AW and 104-AW with DSSF with less likelihood of producing another watch list tank than direct transfers from Tank 106-AW.

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See Figure 9 for dilute receiver tanks, evaporator WVR, and the 242-A Evaporator operating schedules for the TPA Compliant Case.

Based on the 50 Mgal/year treatment capacity for the ETF, the ETF should have no problem processing the projected evaporator condensates thru 2015. There should be sufficient LERF and DST space for storage of Hanford facilities generated waste and condensates between FY 1997 and the end of 2015, provided:

- the 242-A Evaporator schedule is achieved
- the amount of condensate sent to LERF does not grossly exceed the 1.2 gallon condensate/gallon WVR factor
- facilities stay within their respective generation limits
- no unexpected waste receipts are received in the DSTs

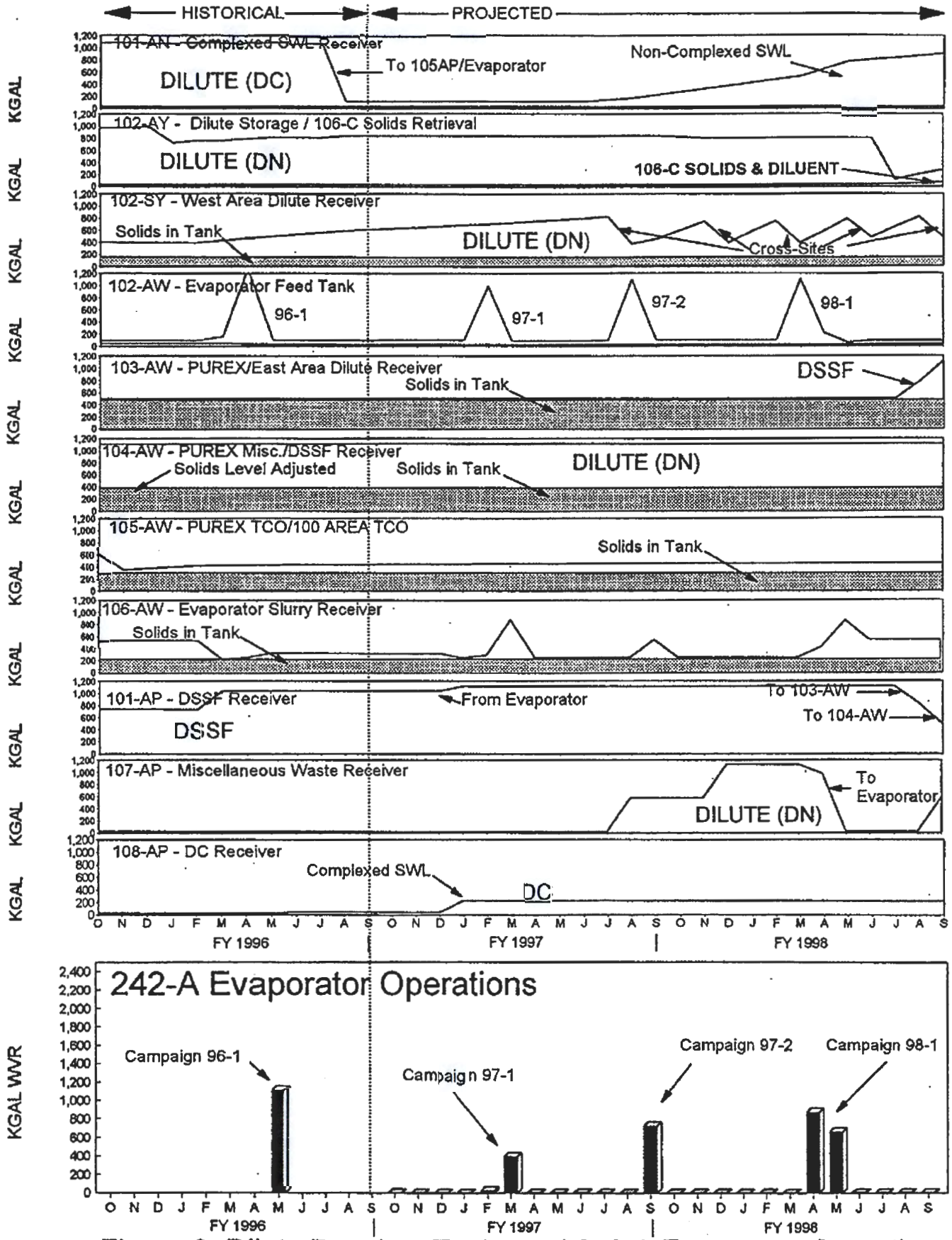


Figure 9. Dilute Receiver Tanks and 242-A Evaporator Operations

NON-AGING TANK SPACE

In later parts of the projections when tank space becomes tight due to processing needs and/or the amount of SST solids being retrieved, the evaporator is assumed to operate yearly to minimize waste storage needs and to decrease the volume of retrieved SST solids waste. Tank space pinches occurring between FY 2000 and FY 2015 (Figure 3) are caused by a combination of factors, including:

- SWL pumping (SST stabilization) volumes pumped by the end of FY 2000
- Four tanks are designated for staging wastes for Phase 1B processing--two vendor tanks (Tanks 106-AP and 108-AP) and two intermediate staging tanks (Tanks 102-AP and 104-AP)
- The large volume of SST solids retrieved beginning in FY 2004
- The decision not to operate the Grout Facility has eliminated an early means of freeing up DST space
- The decision not to consolidate NCAW solids has increased the DST space needs from 2001 on
- Overlap of retrieval of wastes from Tanks 101-SY, 102-SY, and 103-SY with the retrieval of SST solids in 200 West Area

Figures 10 through 14 show the operation of most of the DST waste tanks for the TPA Compliant Case projection.

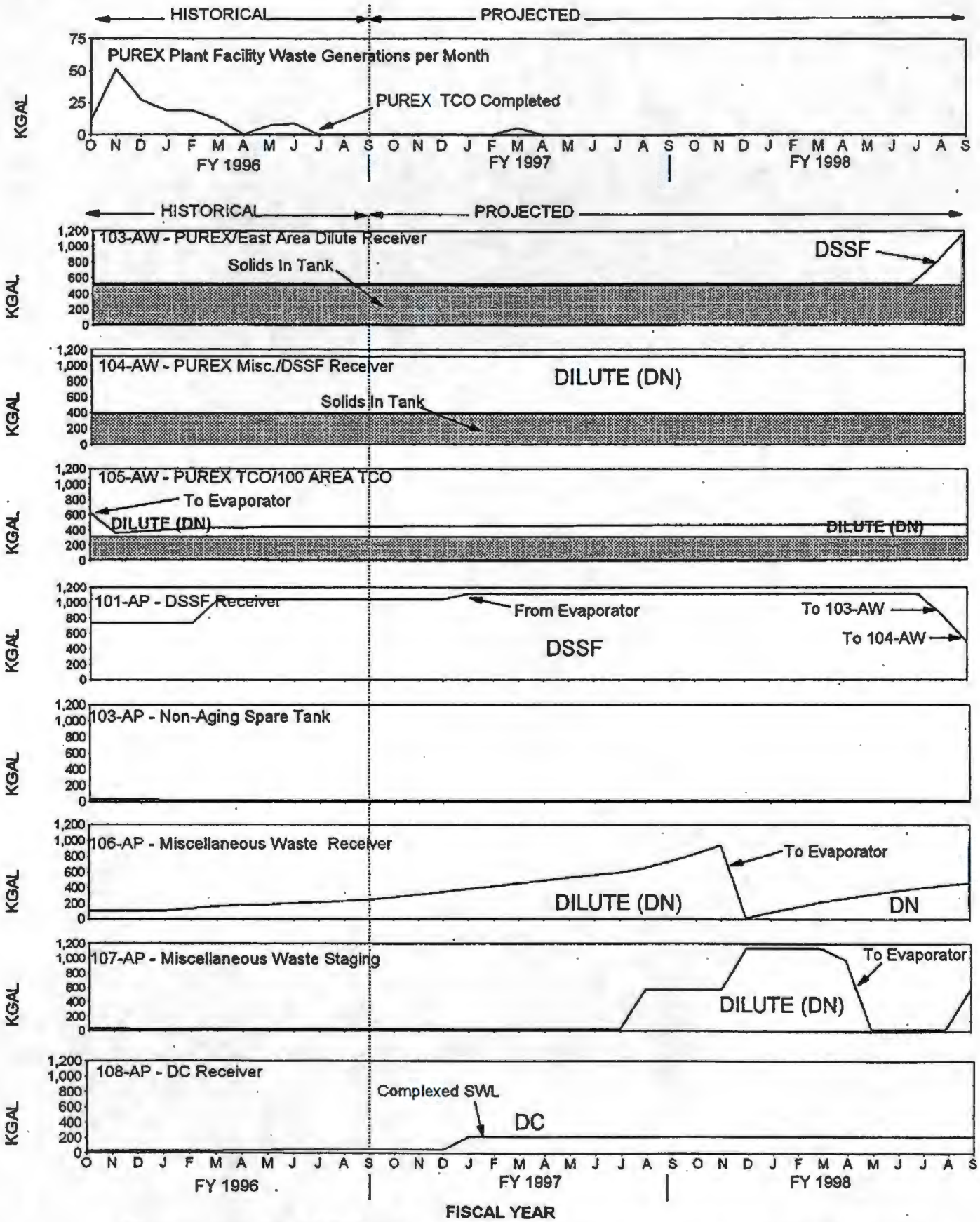


Figure 10. PUREX Facility Waste Generations and Tank Levels OF10

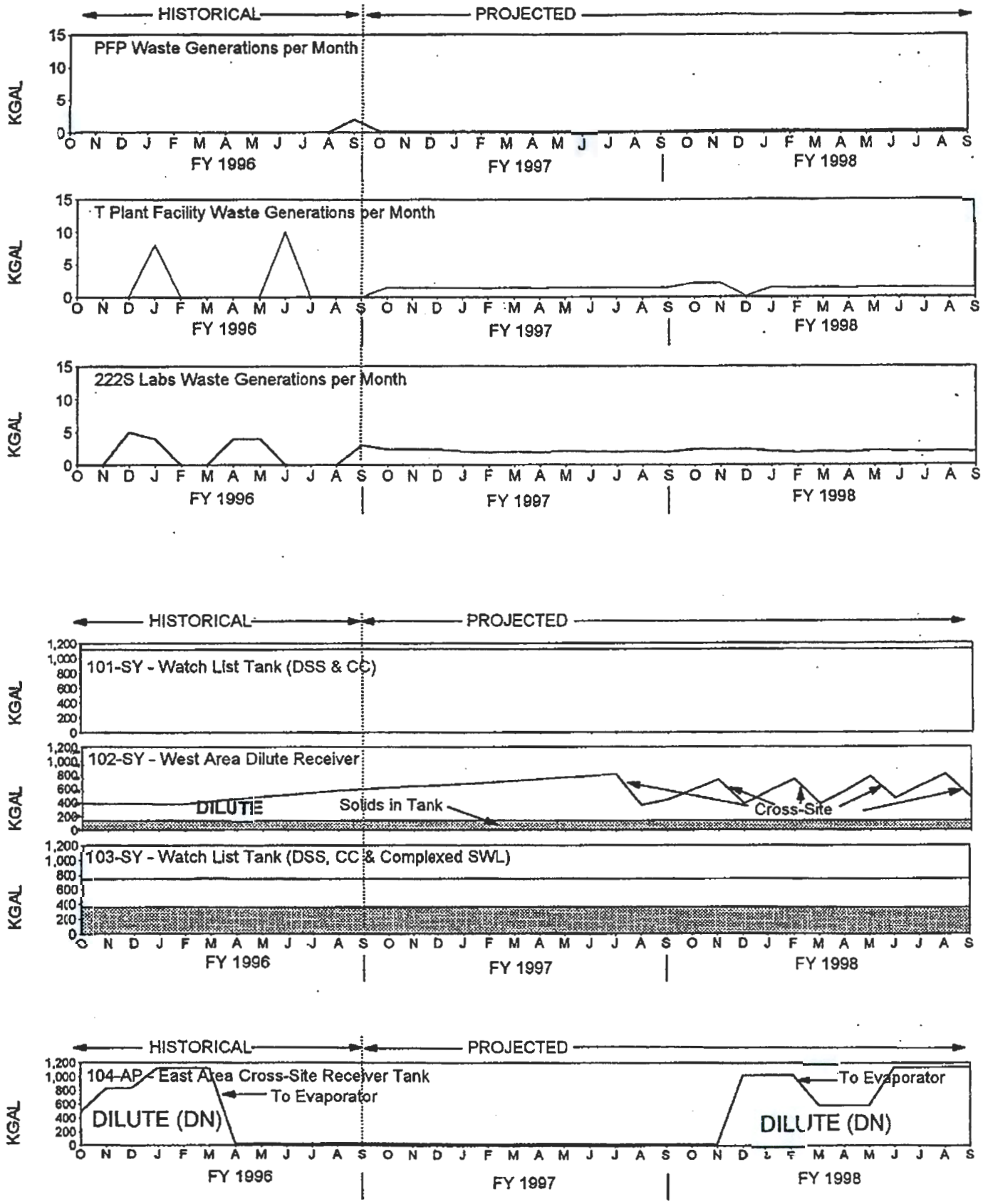
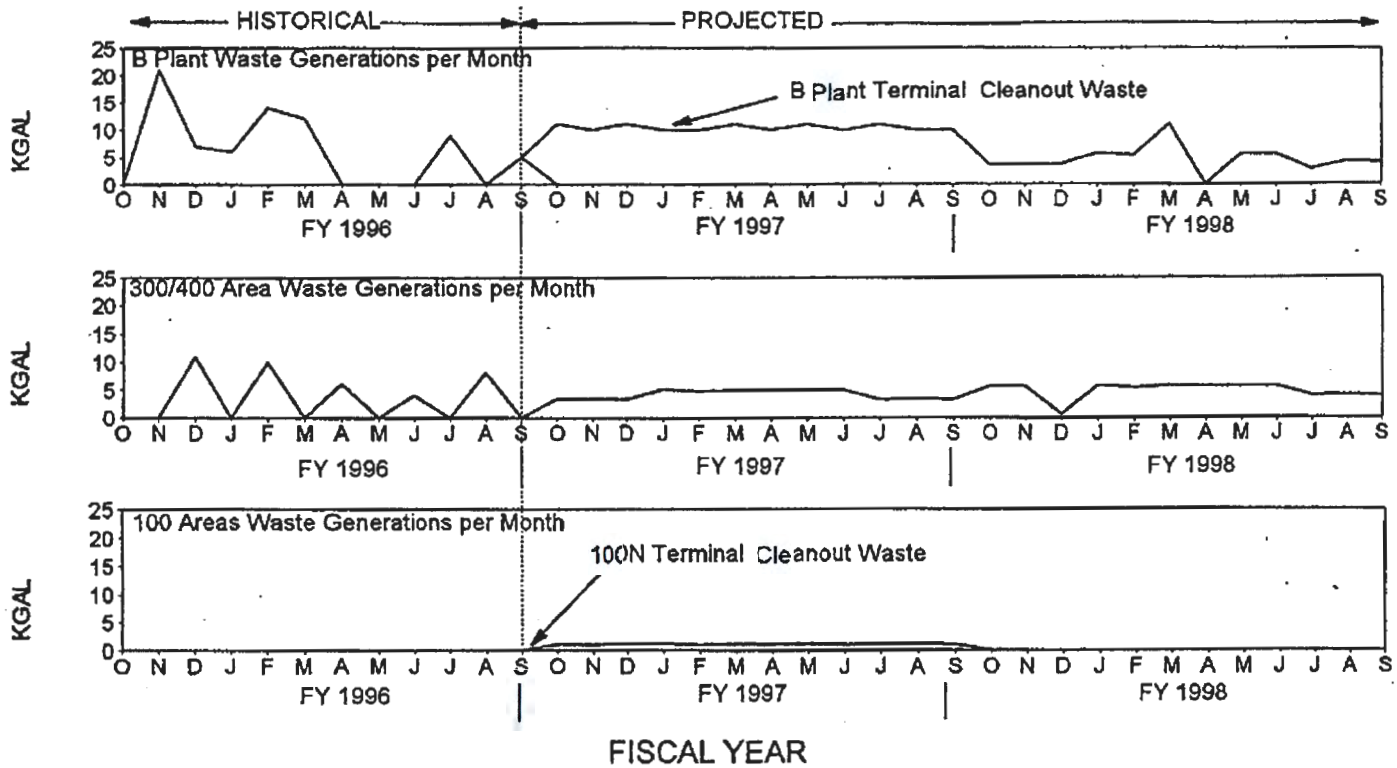


Figure 11. West Area Waste Generations and Tank Levels

OF11



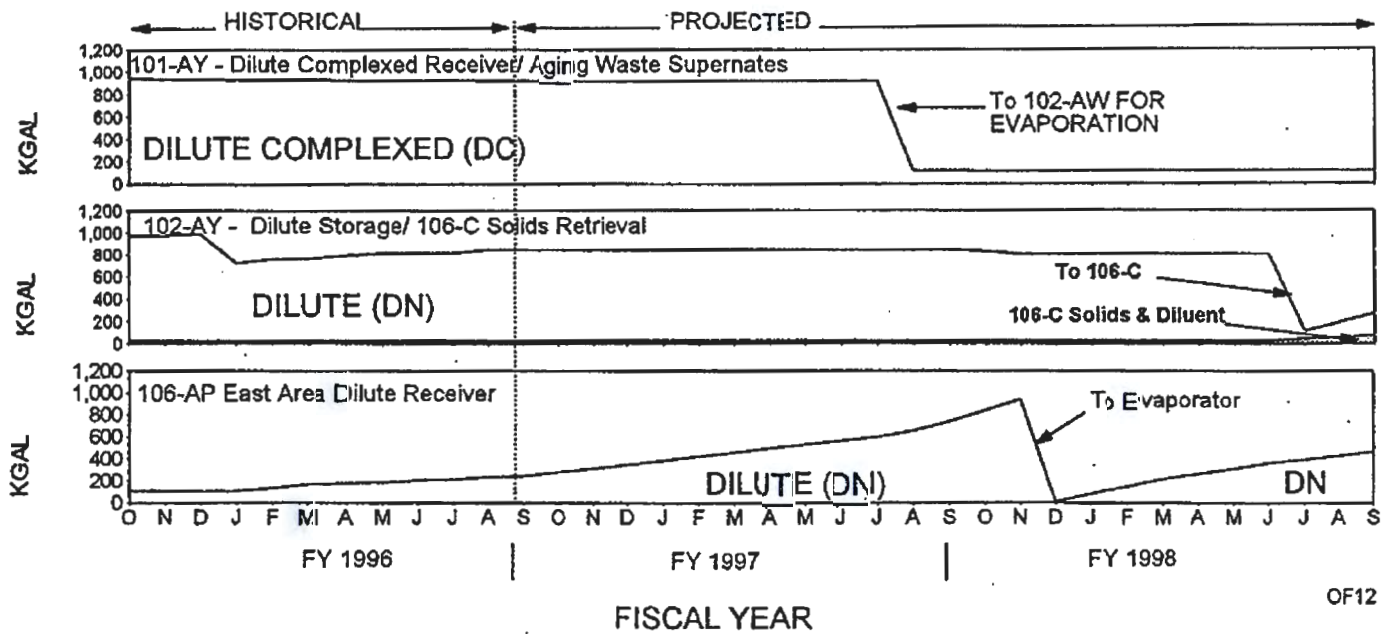


Figure 12. B Plant and Hanford Facility Waste

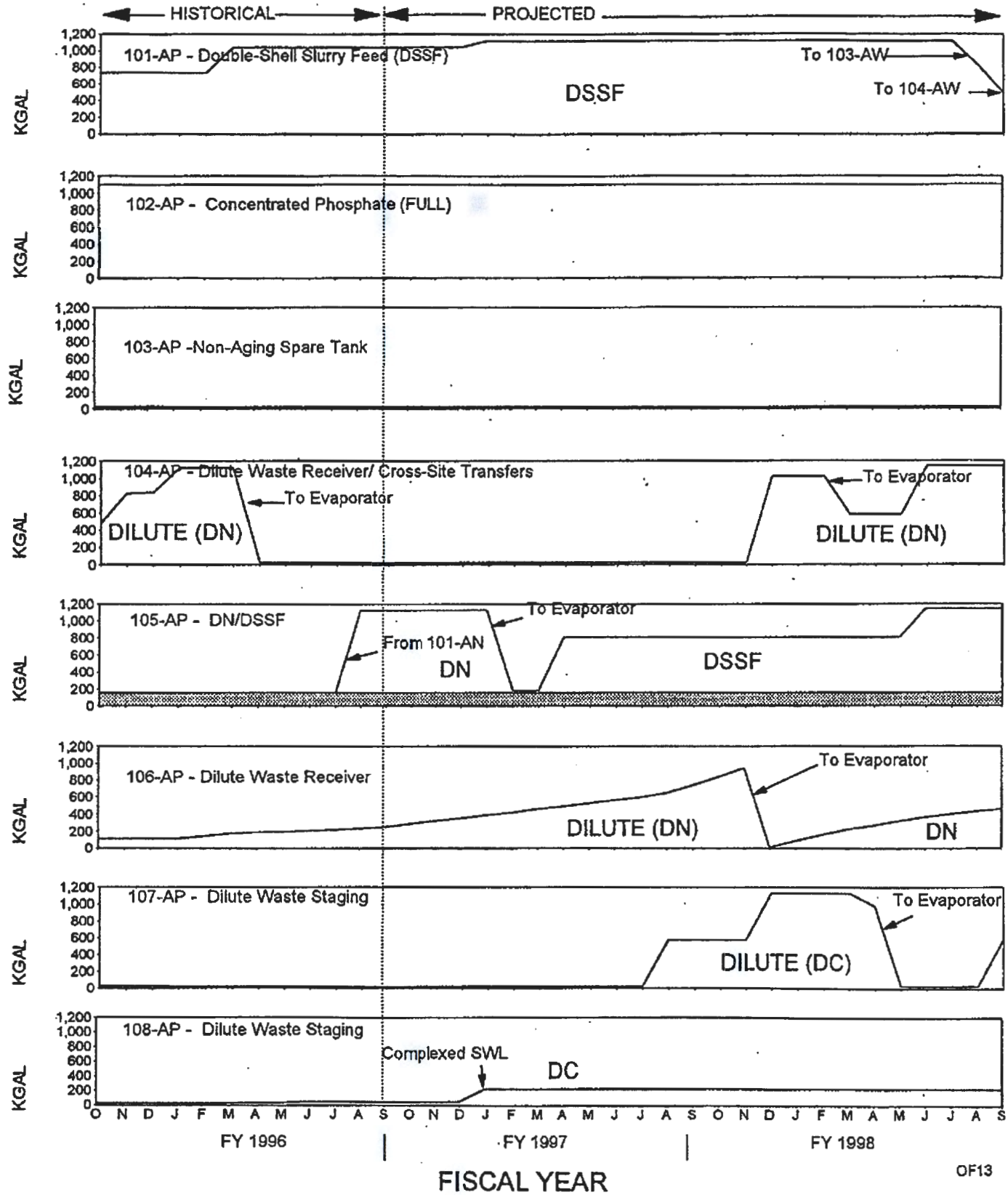


Figure 13. AP Tank Farm Levels

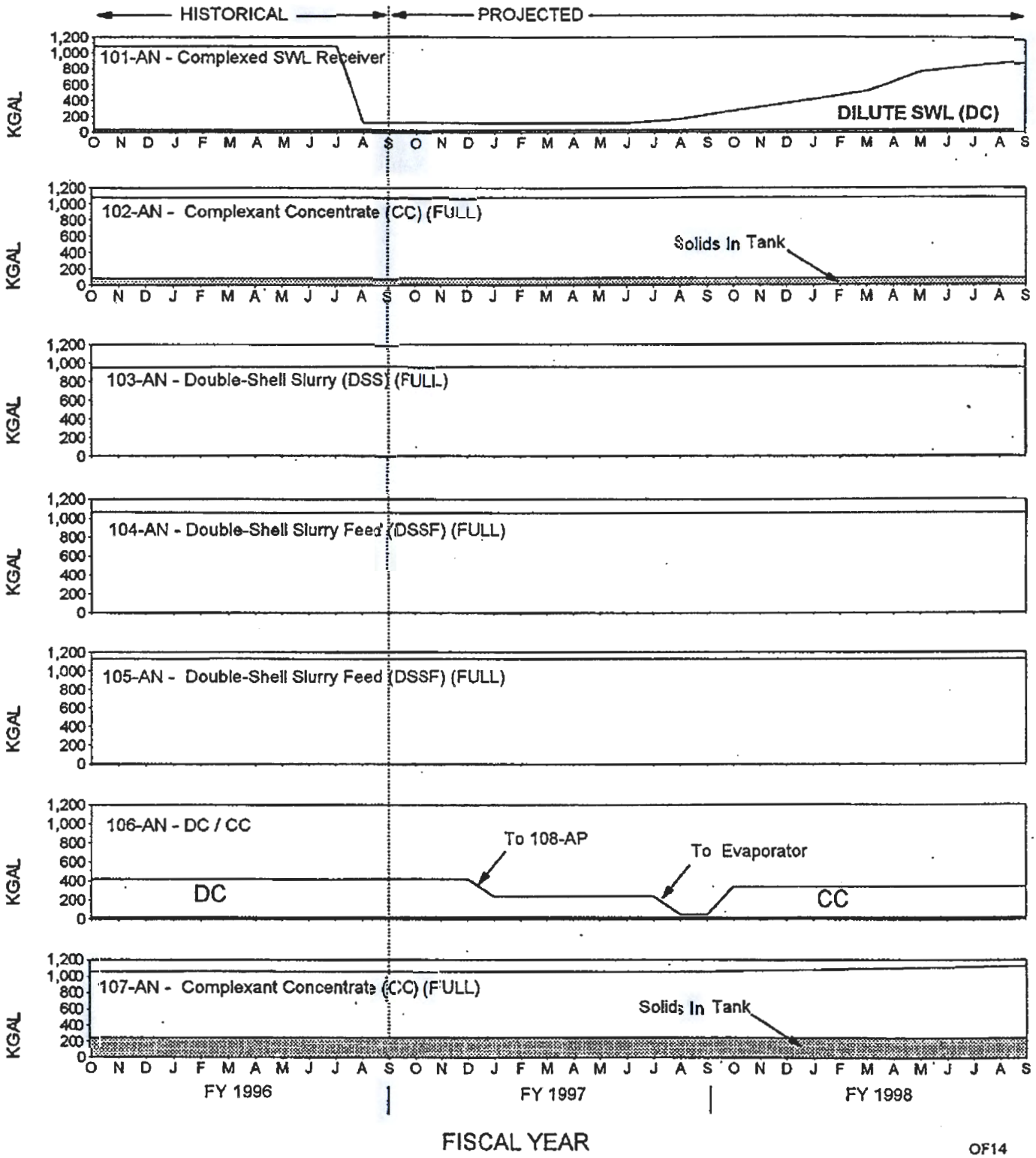


Figure 14. AN Tank Farm Levels

AGING WASTE TANK SPACE

It is assumed that the PUREX facility will not restart. With PUREX not restarting only two aging waste tanks (Tanks 101-AZ and 102-AZ) are required to store existing aging waste.

One additional aging waste tank will be required to retrieve and store the contents of Tank 106-C (a SST containing high heat waste). Waste from Tank 106-C is assumed to be retrieved to Tank 102-AY from July 1998 thru June 1999.

In Revision 21 of this document, it was assumed that all NCAW solids and the 106-C solids would be combined into one aging waste tank (Tank 102-AZ) and that all NCAW supernates would be concentrated into one aging waste tank (Tank 101-AZ). Since that document was published, studies have been completed which looked at numerous sludge washing/combination options (Powell, 1996a). The alternatives for consolidating high heat sludges have been reviewed by a decision board comprised of Hanford contractor management, a DOE/RL representative, and a WDOE representative. It was concluded that consolidating all the sludges into a single tank would require modifications to the tank farm safety basis. The preliminary decision reached was not to consolidate all the high heat sludges into a single tank. The selected alternative (Alternative 8 Modified) would wash the sludges in the tanks they reside in without additional consolidation of solids. The NCAW supernates could not be combined into a single aging tank (Tank 101-AY) due to the 5 M Na limit but would be concentrated and sent to Tank 101-AY and an additional non-aging tank (Powell, 1996b). This action has increased DST needs from FY 2001 as compared to Revision 21 DST space needs.

A graph of aging waste tank space requirements as a function of time is presented in Figure 15. The uses of each individual aging waste tank for the TPA Compliant Case are shown in Figure 16.

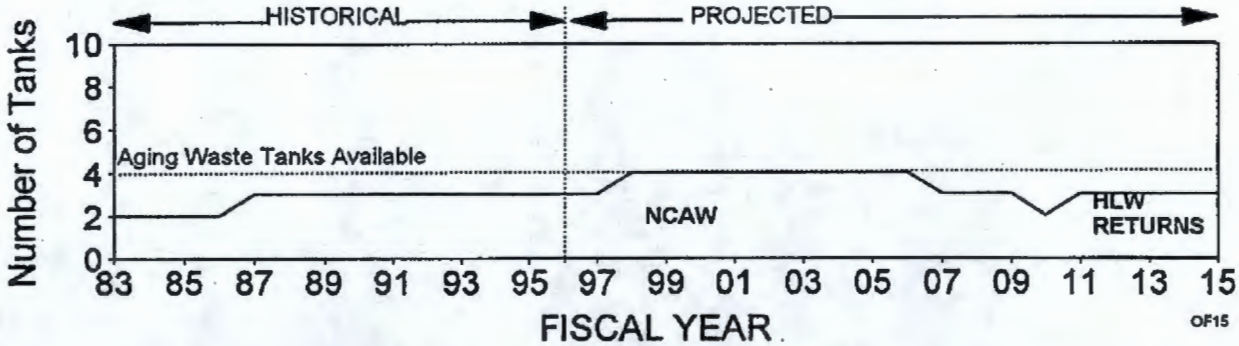


Figure 15. Aging Tank Requirements

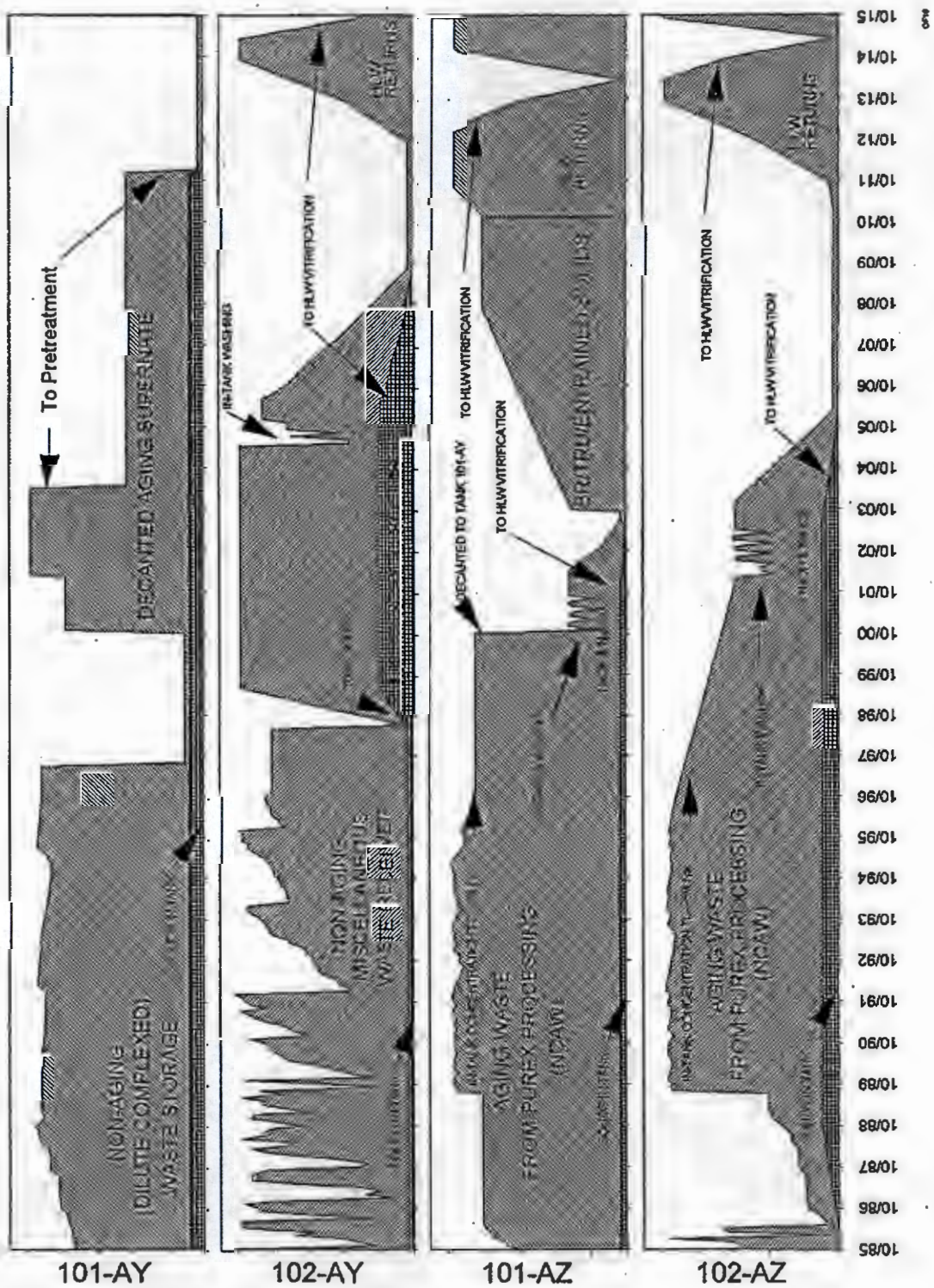


Figure 16. Aging Waste Tank Usage

5.2 Disposal Planning Case Results and Conclusions

Tank space needs for the Disposal Planning Case are shown in Figure 17. The Disposal Planning Case incorporates a reduced SST solids retrieval schedule and volume to prevent over filling available DST space and hence would not meet the TPA milestone date for completion of SST solids retrieval (FY 2018). However, this projection case does meet the date to complete closure of all single shell tank farms (Milestone M-45-00; 9/30/2024). Results from this projection indicate that decreasing the rate of SST solids retrieval would lower the DST space needs to fit available space and no new tanks would be needed.

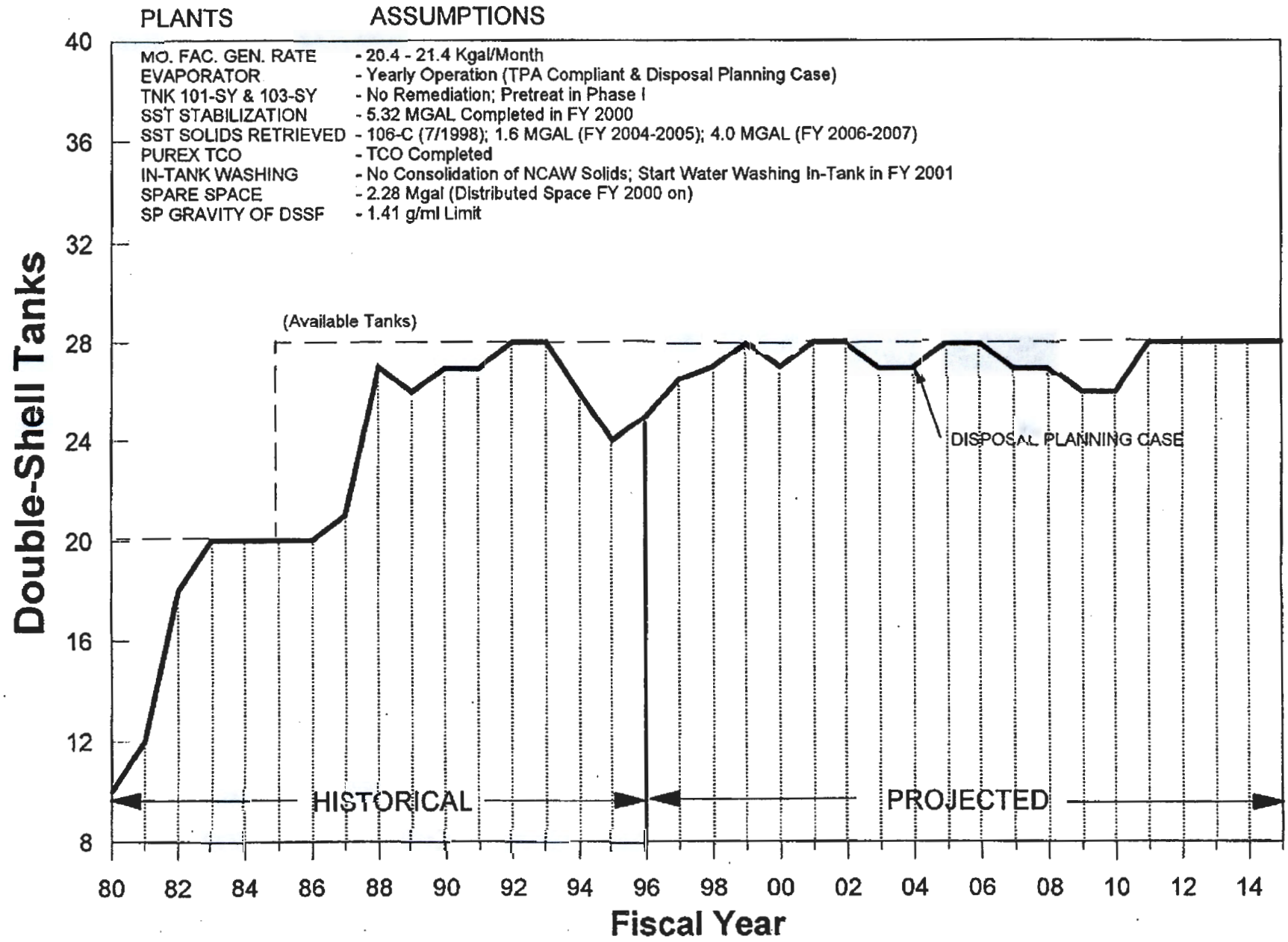


Figure 17. Double-Shell Tank Requirements for the Disposal Planning Case

OF17

5.3 Ecology Planning Case Results and Conclusions

Tank space needs for the Ecology Planning Case are shown in Figure 18. The requested assumption changes (Hepner, 1997) and their impact are summarized below:

- Two Year Evaporator Shutdown Between 2000 and 2005 . At the request of the Washington Department of Ecology, a two year evaporator outage was scheduled between 2000 and 2005. To lessen the impact, the outage was scheduled after the last evaporator campaign in FY 2000 or from August 2000 to August 2002. Delaying the outage to a later date when DST wastes were being diluted for processing or when SST solids retrieval was occurring would have had a larger impact. Scheduling the outage earlier in FY 1999-2000, when SWL volumes were being received would have also had a larger impact.

  During the evaporator outage, dilute wastes were allowed to accumulate in the tanks being used to store dilute wastes (Tanks 102-SY, 105-AW, and 105-AN) until the maximum DST capacity of 1140 Kgal was reached. A full tank of dilute waste was staged in Tank 102-AW (evaporator feed tank) in November 2001 for evaporation in August 2002. The excess dilute wastes were evaporated off in FY 2003. By filling the dilute receiver tanks and the evaporator feed tank, the two year outage for maintenance was achieved without an increase in DST needs. This assumption change proved that an evaporator maintenance outage of up to two years could be endured without increasing DST needs if the outage is timed properly so that it does not overlap times when waste generations are high, processing dilution is occurring, or large volumes of SST wastes are being retrieved.

- Retrieval of Tank 106-C Solids Requires In Excess of 1 Mgal After 1997. It was assumed that the solids retrieved from Tank 106-C would have to be stored in two aging waste tanks (Tank 102-AY and 101-AY) instead of just a single tank (Tank 102-AY). The total volume of waste retrieved was slightly over 1 Mgal for this projection.

  During the period when the solids from Tank 106-C are to be retrieved (July 1998-June 1999), Tank 101-AY is being used as a dedicated aging spare tank. Hence the solids from Tank 106-C could be retrieved into Tank 101-AY as long as distributed spare space equal to one million gallons was available within the four aging waste tanks. This meant that more dilute wastes from the retrieval process and other aging waste tanks had to be evaporated in FY 1998-1999. By evaporating off more of the dilute waste on top of the NCAW solids and using distributed aging spare space, no projected increase in tank count occurs until FY 2001.

  In November 2000, the in-tank washing of Tank 101-AZ solids is projected to start by decanting the supernate to an aging waste tank but the other three tanks had high heat solids in them. At this point the options were to either transfer the supernate from Tank 101-AZ on top of the high heat solids in one of the aging waste tanks or to move the supernates to a new tank. Transferring the supernate to one of the other aging waste tanks would complicate the washing process and could delay some of the in-tank washing of NCAW solids. For this reason, this

projection assumed that an empty tank was the preferred option. This resulted in a one tank increase in projected tank space needs from FY 2000 on until sufficient aging waste space could be freed up by the HLW immobilization of NCAW solids.

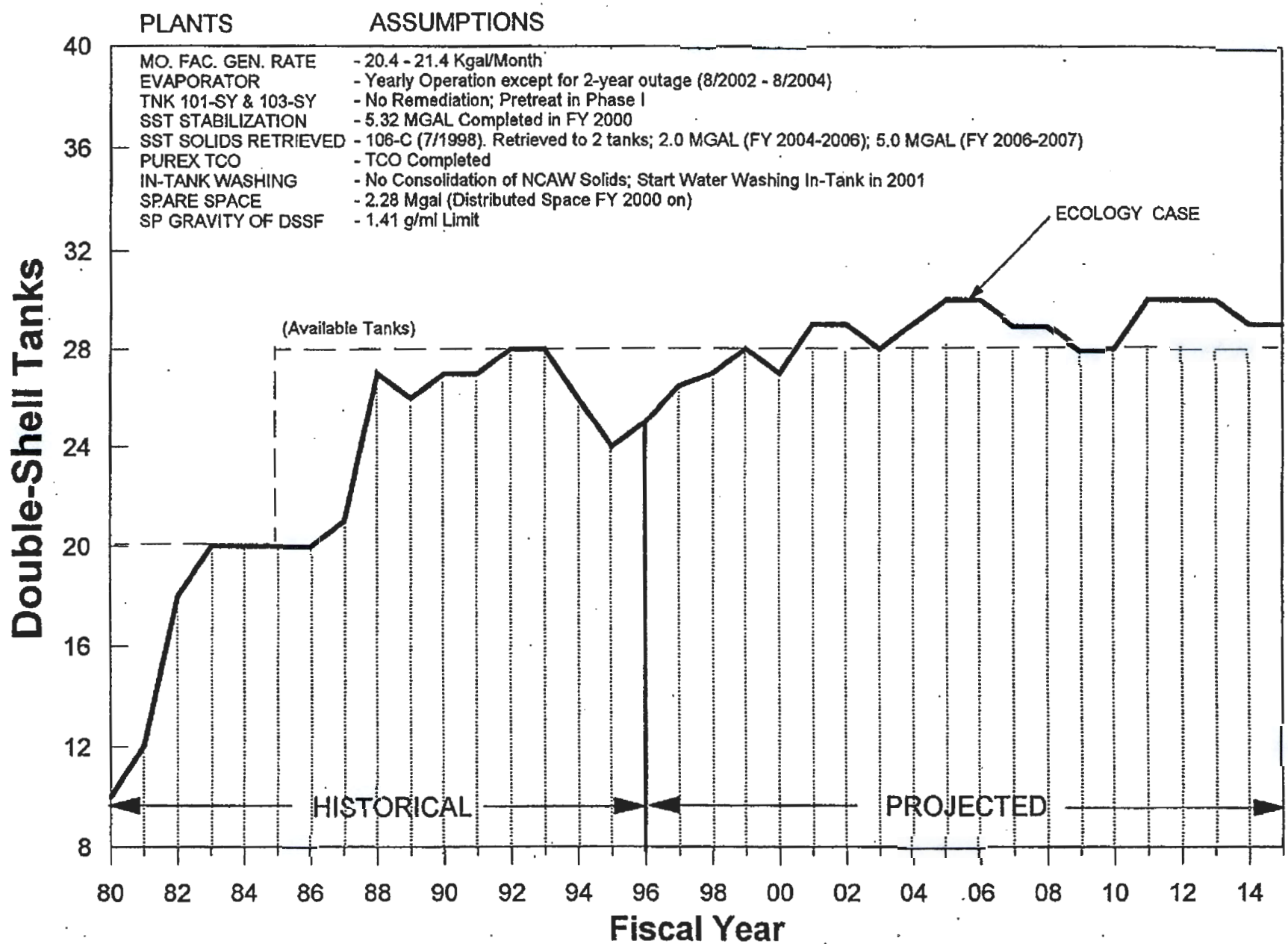


Figure 18. Double-Shell Tank Requirements for the Ecology Case

OF18

5.4 Actual Waste Generation Compared to Management Limits

During the Tank Space Management Board (TSMB) meeting on August 7, 1991, the need to establish new facility waste generation limits was discussed with the Hanford facility representatives based on additional delays in the 242-A Evaporator restart. A new total monthly waste generation rate of 64 Kgal/month was adopted based on: discussions with facility representatives, the average monthly waste generation rate for each facility during FY 1991, and the need to provide contingency space for potential delays in the 242-A Evaporator restart.

Facility generation limits were not established for high priority waste generations, which were assigned to "Priority Space". These generations included the PFP stabilization campaign (safety), SWL pumping (TPA milestone), and the 242-A Evaporator (space necessary for the mini-run and restart).

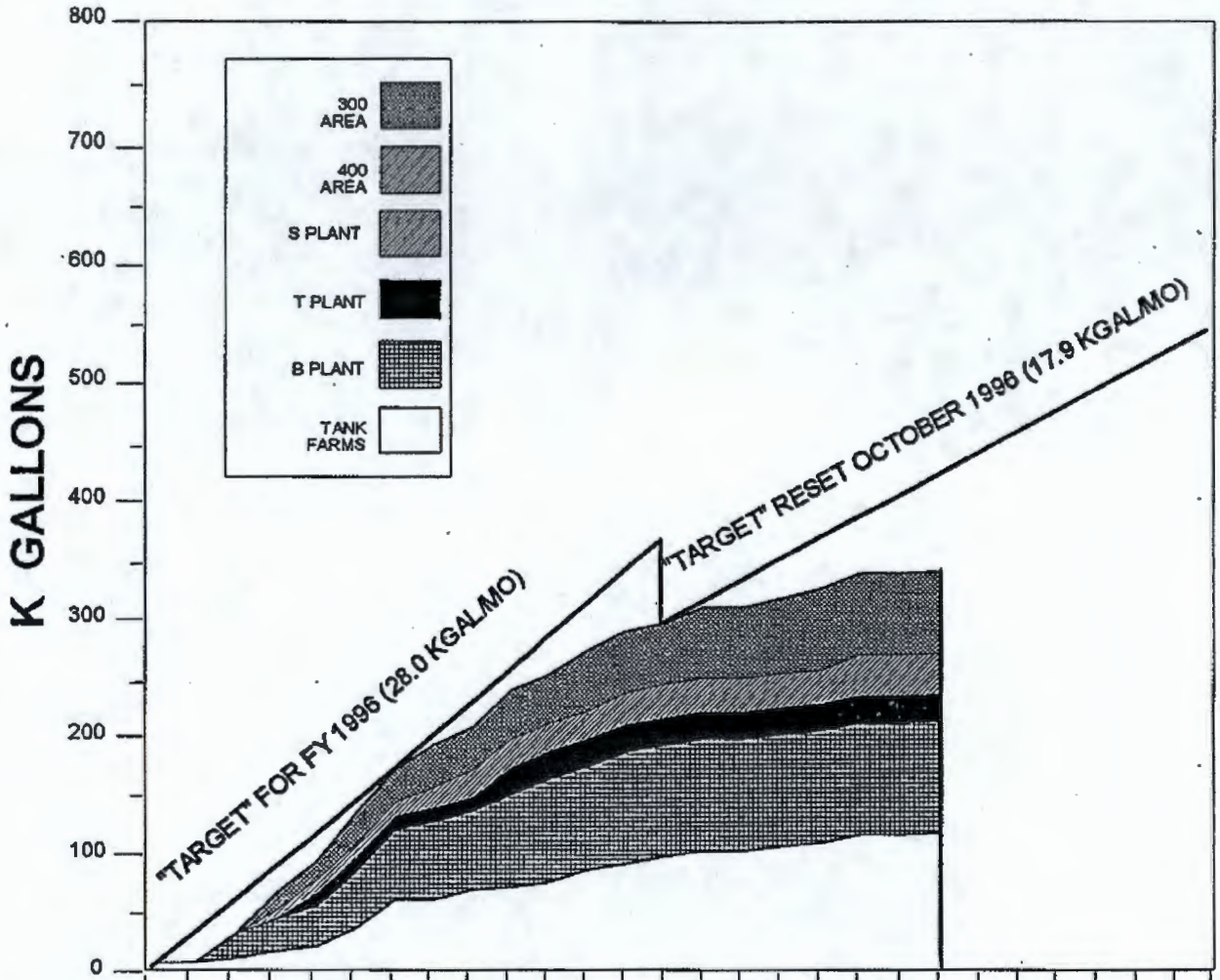
New average monthly waste generation targets have been established for this projection with waste generations being reduced by the facilities (references and discussion in Section 3). Table 14 presents a comparison of the previous limits established for each facility, the newly established target rates for this projection, and the actual average monthly waste generation rate (Kgal/month) for the period October 1995 through September 30, 1996. B Plant is currently in a terminal cleanout (TCO) mode and therefore does not have a monthly target waste generation for miscellaneous waste generations for Rev. 23. TCO at the PUREX facility was completed last year but the facility will be sending 5 Kgal/year of collected condensate to Tank Farms.

Table 14. Comparison of Average Monthly Waste Generation Rates (Kgal/month)

FACILITY	64 KGAL/MONTH MANAGEMENT LIMIT FROM OWVP REV. 20	FACILITY TARGET FOR REV. 23 #	AVERAGE MONTHLY FACILITY GENERATIONS (10/95 - 9/96)
TANK FARMS	10.0	10.0	7.2
B PLANT	23.0	N/A-TCO MODE	7.9
WESF	N/A	1.7	With B PLANT
PUREX	N/A	0.4	N/A-TCO MODE
PFP	N/A	0.4	N/A
T PLANT	6.0	1.4	2.0
S PLANT	5.0	2.1	2.3
300 AREA	5.0	4.2	4.3
400 AREA	0.0	0.2	0.0
TOTAL	64.0	20.4	23.7

Monthly Totals do not Include Terminal Clean-out Volumes or SWL Pumping

Due to the commendable efforts by the Hanford facilities, all waste generators are at or below their new waste generation target for the period October 1995 through September 30, 1996. A comparison of the volumes of waste entering the DST tank space for that time period is compared graphically to the various targets or projected generations in Figures 19-22.



TARGET		10/95	11/95	12/95	1/96	2/96	3/96	4/96	5/96	6/96	7/96	8/96	9/96	10/96	11/96	12/96	1/97	2/97	3/97	4/97	5/97	6/97	7/97	8/97	9/97	10/97	11/97	12/97
300 AREA	2.1	0	0	15	0	13	0	8	0	6	0	10	0	0	8	0	4	5	0	0	0							
400 AREA	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
S PLANT	2.1	0	0	7	5	0	0	6	6	0	0	0	4	1	0	0	0	0	6	0	0							
T PLANT	1.4	0	0	0	12	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0							
B PLANT	**	0	21	7	6	14	12	7	0	12	9	0	7	**	**	**	**	**	**	**	**							
TANK FARMS	10.0	1	4	6	4	16	24	0	9	2	4	11	5	6	5	0	4	3	7	0	1							
TOTAL	17.9	1	25	35	27	43	36	21	15	32	13	21	16	7	13	0	8	8	13	0	1							

NOTE: THIS GRAPHIC DEPICTS CONTRIBUTIONS FROM FACILITY GENERATIONS; TERMINAL CLEAN-OUT AND SWL PUMPING IS NOT SHOWN
** B-PLANT LISTED UNDER TERMINAL CLEAN-OUT FROM 10/96.

Figure 19. Comparison of Facility Generations to "TARGET"

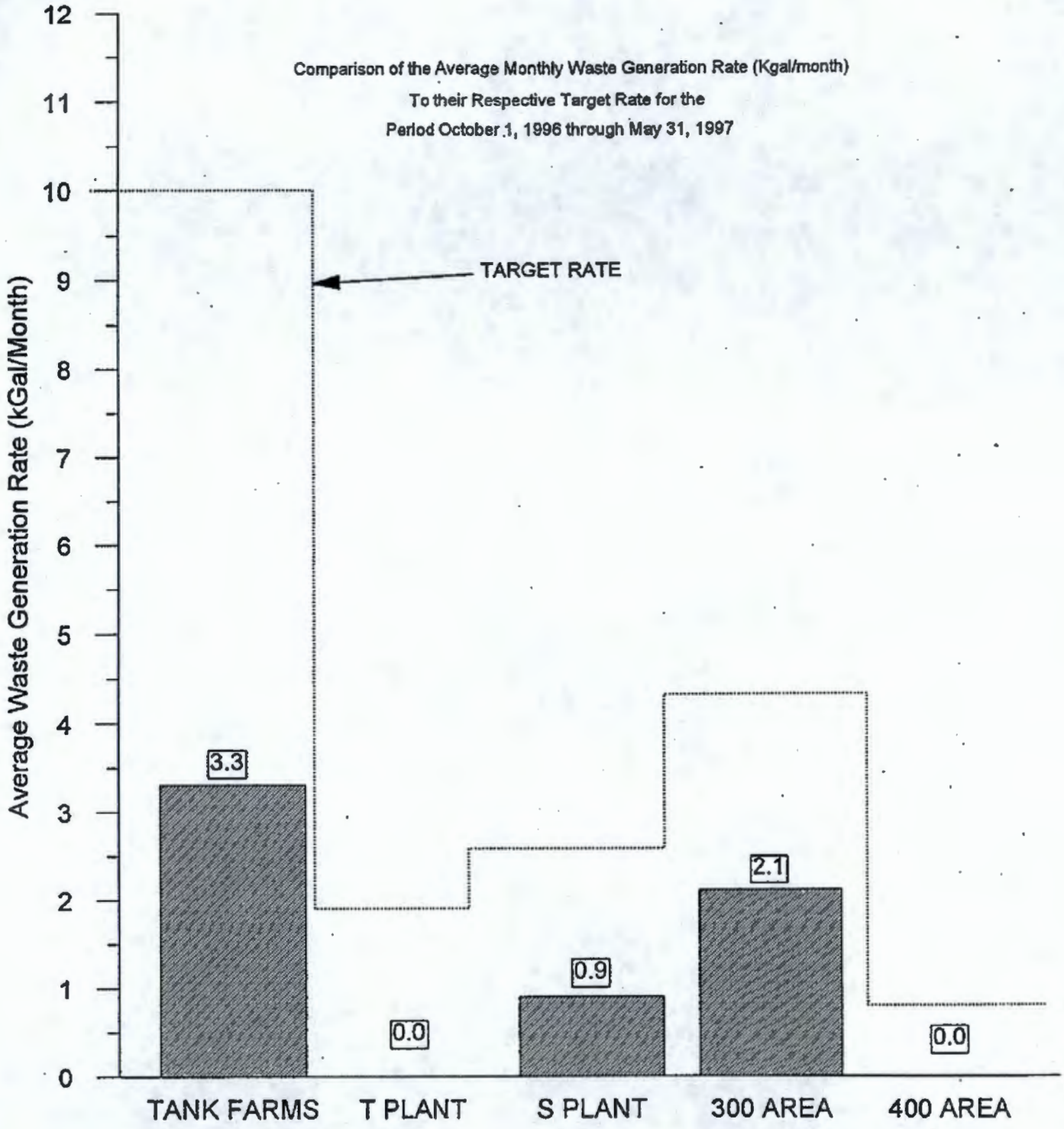
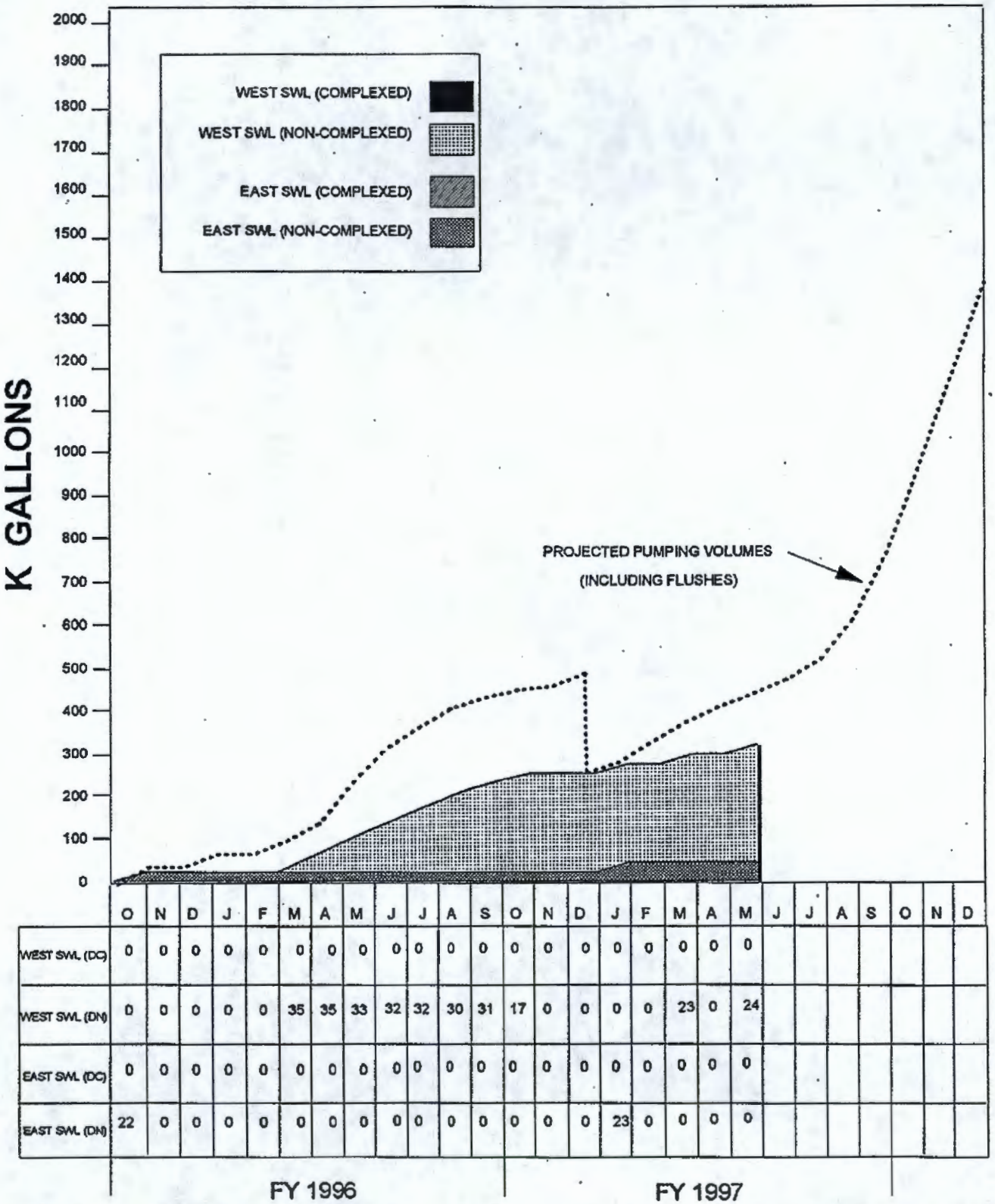


Figure 20. Comparison of Monthly Average Waste Generation To Target Rate



	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
WEST SWL (DC)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
WEST SWL (DN)	0	0	0	0	0	35	35	33	32	32	30	31	17	0	0	0	0	23	0	24							
EAST SWL (DC)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
EAST SWL (DN)	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	0	0	0	0							

Figure 21. Contributions From Salt Well Liquid Pumping

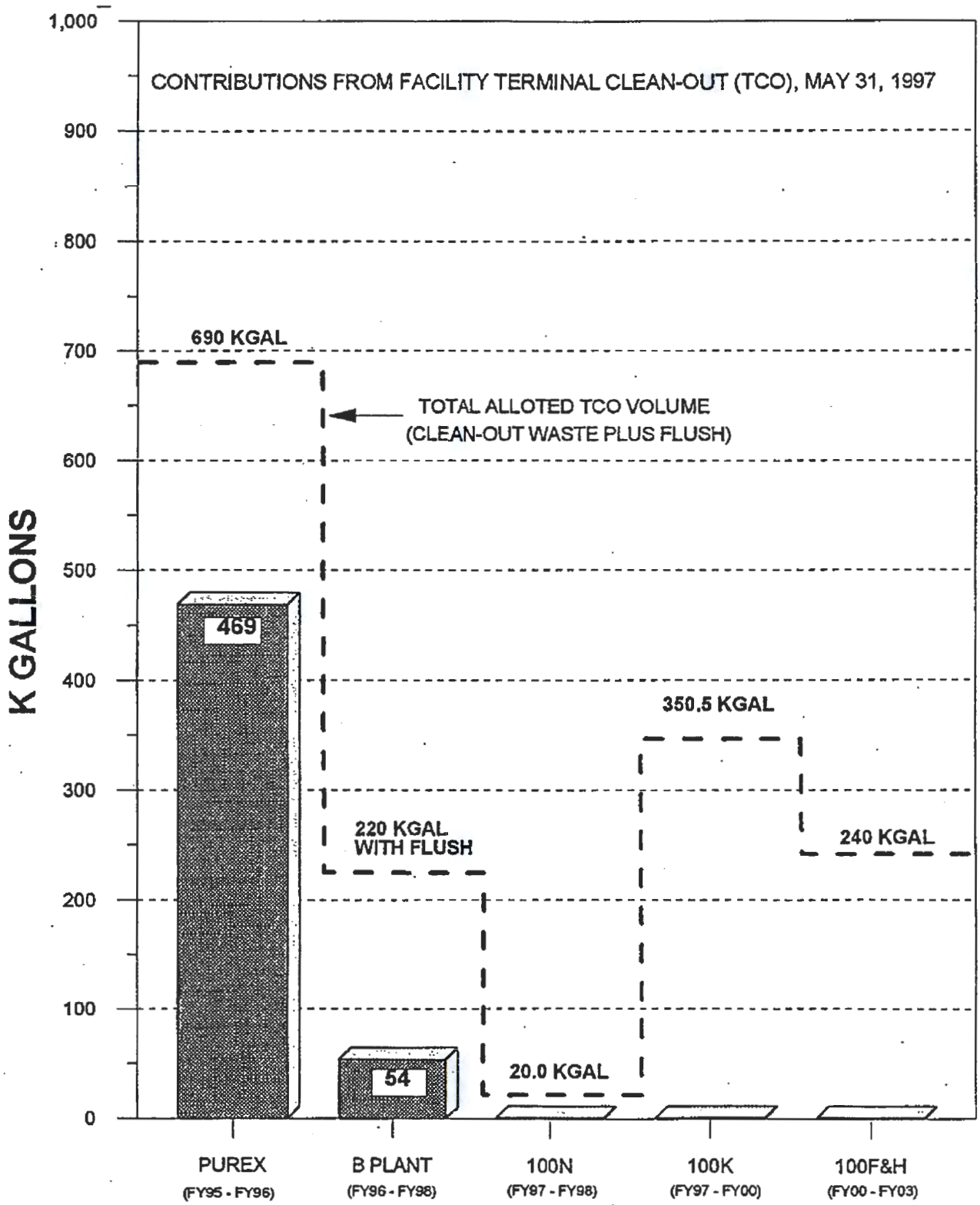


Figure 22. Contributions From TCO (June 30, 1996)

6.0 SPACE SAVING ALTERNATIVES

In the near term, space saving alternatives include waste minimization, continued availability of the 242-A Evaporator, LERF availability, and the operation of the ETF. These alternatives must be considered because new inputs to the system may develop (e.g., unexpected new waste streams or a leaking SST or DST).

Should a tank space shortage develop in the period 1998 through 2015, response to the shortage for the TPA Compliant Case must be in one of three areas. The inflows to the system must be reduced, the outflows to the system must be increased (or started earlier), or the available tank space increased. Inflows to the system include miscellaneous facility waste generations, TCO wastes, in-tank washing, dilution of Tanks 101 and 103-SY (for processing), processing, SWL pumping, and SST solids retrieval. Outflows include the 242-A Evaporator and waste disposal (processing and vitrification). Increasing the tank space available could be done by building more tanks (a six to eight year task), mixing segregated waste types (which would gain about half a million gallons of space), or operating without reserved spare tank space. A cost/benefit analysis needs to be completed to determine the best alternative.

In addition to minimizing waste generations, other actions could be pursued. The list below includes many actions which can result in tank space savings or economization, and can serve as a starting point in a tank space optimization program.

<u>PUREX Facility</u>

- TCO of PUREX was completed in FY 1997. Therefore, waste reductions for PUREX will not be a viable option.

<u>B Plant</u>

- Continue to reduce waste being generated at B Plant
- Reduce or eliminate flush volumes following low-level waste transfers to DSTs

<u>Plutonium Finishing Plant</u>

- Continue to reduce waste being generated at PFP (only 34 Kgal of total waste are scheduled to be generated from FY 1997-2006

6.0 SPACE SAVING ALTERNATIVES (CONTINUED)

Tank Farms

- Continue to reduce waste being added to DSTs
- Continue waste accountability and minimization controls
- Develop a total waste cutoff plan
- Increase the 5 M Na limitation on aging waste tanks
- Use dilute waste for retrieval, air lift circulator flushes, line flushes, etc.
- Increase the WVR of the 242-A Evaporator
- Accelerate plans to consolidate solids from Tanks 102-SY into Tank 105-AW
- Delay SWL pumping
- Build new tanks
- Accept loss of waste segregation (used as a last resort)
- Store facility generated waste in designated "spare tank space" (used in an extreme emergency)
- Improve efficiency of the 242-A Evaporator
- Solidify treated waste and dispose of as low level waste in burial grounds
- Consolidate NCAW and Tank 106-C solids in one aging tank with one additional aging tank being used to combine NCAW supernates (requires modification of safety basis).
- Increase the heat limit on non-aging DSTs to allow either the Tank 106-C wastes or the supernate from Tank 101-AZ to be stored in a non-aging DSTs if the in-tank washing consolidations are not allowed
- Concentrate DSSF to Double-Shell Slurry (DSS). Experience with Tank 101-SY makes this alternative highly unlikely.
- Store waste in single-shell tanks (used in an extreme emergency; would require approval by DOE, EPA, and Ecology)
- Store waste in facility storage tanks or portable tanks such as railcars (used in an extreme emergency; total space available is small compared to the contents of a DST)

Grout

- Reinstate the Grout Disposal Program (unlikely to occur; considered an emergency option only)
- Grout the existing waste in Tanks 102-AP and 101-AW

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APPENDIX

APPENDIX. Acronyms

ASD - ammonia scrubber distillate from
ASF - ammonia scrubber feed from
AW - aging waste, also called NCAW
BCP - B Plant process condensate
CC - complexant concentrate waste
CP - concentrated phosphate waste
DC - dilute complexed waste
DCRT - doubly contained receiver tank
DN - dilute non-complexed waste
DOE - U.S. Department of Energy
DP - dilute phosphate waste
DSS - double-shell slurry (most concentrated double-shell tank waste)
DSSF - double-shell slurry feed
DST - double-shell tank
EIS - Environmental Impact Study
FFTF - Fast Flux Test Facility
FSAR - Facility Safety Analysis Report
FY - fiscal year
GTF - Grout Treatment Facility
HFW - Hanford facility waste (waste produced at 100, 300, 400 areas)
HLW - High Level Waste
IPM - Initial Pretreatment Module
IX - ion-exchange
KGAL - kilogallon (1000 gallons)
LERF - Liquid Effluent Retention Facility
LETF - Liquid Effluent Treatment Facility
LAW - Low Activity Waste
MOTU - metric tons of uranium
NCAW - neutralized current acid waste
NCRW - neutralized cladding removal waste
OWVP - Operational Waste Volume Projection
NEA - National Environmental Policy Act
NSF - New Pretreatment Facility
NEV - New Pretreatment Vault
NVOL - Non-volatile oxide less sodium and silicon
PAD - process distillate discharge from PUREX
PFP - Plutonium Finishing Plant
PRF - Plutonium Reclamation Facility
PAW - phosphate/sulfate waste
PHMC - Project Hanford Management Contractor
PUREX - Plutonium-Uranium Extraction
RMC - Remote Mechanical C Line
SpG - Specific Gravity
SST - single-shell tank
SWL - salt well liquid
TCO - terminal clean-out
TOE - total operating efficiency
TPA - Tri-Party Agreement
TRU - transuranic
TRUEX - Transuranic Extraction Process
TSMB - Tank Space Management Board
UO_3 - Uranium Oxide Facility
WSCF - Waste Sampling and Characterization Facility
WVR - waste volume reduction

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