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TECHNICAL BASES DWPF LATE WASHING FACILITY (U)

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TECHNICAL BASES - DWPF LATE WASHING FACILITY (U)

INTRODUCTION

The tetraphenylborate slurry produced during In-Tank Precipitation (ITP) operations in Tank 48 will be concentrated to nominally 10 wt% insoluble solids, washed and transferred to Tank 49 for storage. It is anticipated that the initial slurry produced will have accumulated in Tank 49 for at least two years before radioactive operation in DWPF commences (6/94). Sodium nitrite additions will be required to prevent pitting corrosion of the carbon steel tanks. Current projections by Interim Waste Management indicate that the slurry temperature will be maintained between 55°C and 60°C (without additional cooling capacity). At 60°C, the nitrite concentration in the slurry batched to the Late Wash Facility (LWF) will range between 0.13 M and 0.14 M.

Laboratory-scale precipitate hydrolysis studies using tetraphenylborate slurry simulants irradiated to a dose equivalent to 2 years storage in Tank 49 (@24 Ci Cs-137/gal) have demonstrated that this level of nitrite and the radiolysis products produced during storage will (1) require a concentration of catalyst

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during hydrolysis that will likely exceed the copper solubility in glass and (2) necessitate the use of the reductant hydroxylamine nitrate (HAN) to reduce the production of organic tars. Although this flowsheet has been successfully demonstrated on a bench-scale and pilot-scale to meet hydrolysis technical constraints at nitrite concentrations in the feed slurry up to 0.20M (aqueous basis), the non-polar organics in the aqueous product (PHA) have been shown to steam strip in downstream melter feed preparation processes and accumulate in the vessel vent system. In addition, the HAN used during hydrolysis is the principal source of ammonium flow to the Chemical Process Cell which has been demonstrated to subsequently evolve as ammonia during melter feed processes and accumulate as ammonium nitrate (a known explosive) in the vessel vent system. These two conditions, unless mitigated, will compromise the safety and operability of the DWPF.

A task force recommended that the technical feasibility of a "Late Wash" facility be assessed [1]. In this facility, each batch of tetraphenylborate slurry from Tank 49 would be given a final wash to reduce the concentrations of nitrite and radiolysis products to acceptable levels. Laboratory-scale studies have demonstrated that if the nitrite content of the slurry fed to DWPF is reduced to 0.01M or less (and at least a 4X reduction in concentration of the soluble species is attained), (1) the need for HAN during hydrolysis is eliminated (eliminating the production of ammonium ion during hydrolysis), (2) hydrolysis may be done with a catalyst concentration that will not exceed the copper solubility in glass and (3) the non-polar organic production during hydrolysis is significantly reduced. The first phase of an aggressive research and development program has been completed and all test results obtained to date support the technical feasibility of Late Washing.

Paralleling this research and development effort is an aggressive design study directed by DWPF to scope and cost retrofitting the Auxiliary Pump Pit (APP) to enable performing a final wash of each batch of precipitate slurry before it is transferred into the DWPF Salt Processing Cell (SPC). An initial technical bases for the Late Wash Facility was transmitted to DWPF on June 15, 1992. Research and development activities are continuing directed principally at optimization of the cross-flow filter decontamination methodology and pilot-scale validation of the recommended benzene stripping metodology.

PROCESS DESCRIPTION

General

The LWF must have the capability of producing a batch of washed slurry with a nitrite content equal to or less than 0.01M every 43 hours to meet the DWPF design basis attainment. Each batch received in the LWF will be treated with NaTPB to precipitate any soluble Cs-137, the insoluble solids concentration will be increased to 10 wt% and finally, the slurry will be washed to reduce the nitrite content to 0.01M or less.

Filtrate (spent wash) produced during the concentration/washing cycles will be accumulated in the APP's Recycle Pump Tank (RPT) and the Sludge Pump Tank (SPT). The benzene will then be stripped from the wash into the process vessel vent system followed by caustic addition. After analytically confirming that the Tank 22 receipt limits have been met (i.e. total radionuclide content <0.60 Ci/gal, OH- content $\geq$ 1.0M and the benzene concentration is less than 5 ppm), the spent wash will be transferred to Tank 22.

Processing Steps

Step 1 A batch of precipitate slurry is transferred from Tank 49 into the APP's Precipitate Pump Tank (PPT). The batch size would be that required to meet the DWPF design basis attainment. However, the batch size may be less if the nitrite content of the feed would produce an inhibited spent wash volume in excess of the working volume of the RPT and SPT.

Step 2 Sodium tetraphenyborate (NaTPB) is added to the PPT to reprecipitate any soluble cesium, potassium and ammonium in the slurry transferred from Tank 49. This step will achieve a minimum DF for Cs-137 of 150 (DF = the concentration of soluble cesium before reprecipitation divided by the concentration of soluble cesium after reprecipitation) and ensure the Tank 22 constraint (<0.61 Ci/gal) is met.

Step 3 The slurry is filtered via the cross-flow filter to increase the total insoluble solids content to 10 wt%.

Step 4 The slurry is recirculated through the cross-flow filter while wash water (containing 0.004M NaTPB) is added at a rate equivalent to the cross-flow filter permeate rate until the nitrite content of the aqueous fraction of the washed slurry is reduced to 0.01M or less. The permeate (spent wash) is accumulated in the RPT and the SPT.

Step 5 Following drainage of any washed precipitate in the cross-flow filter and associated piping to the PPT, the washed precipitate slurry is transferred to the Precipitate Reactor Feed Tank (PRFT) in the SPC after confirmation that the nitrite content of the aqueous fraction is 0.01M or less.

Step 6 As the permeate from the washing operation accumulates in the RPT and the SPT, it is continuously stripped into the vessel vent system by a combination of nitrogen sparging and spraying into the vapor space to reduce the soluble benzene content of the spent wash to 5 ppm or less.

Step 7 Sufficient 50 wt% sodium hydroxide is added to the spent wash to adjust the hydroxide content to 1.0M or greater.

Step 8 Following confirmation that the spent wash meets radionuclide, benzene and hydroxide limits, the spent wash is transferred to Tank 22.

Figure 1 is a process flow diagram of the Late Wash Process.

MATERIAL BALANCE

A late wash material balance has been prepared based on ITP operations being carried out in Tank 48 at a temperature of 60°C. Assuming two years storage in Tank 49, the nitrite content in the aqueous fraction of a slurry batch transferred into the LWF will range from 0.13 M to 0.14 M. The calculational bases and a complete material balance across the Late Wash Facility are located in Appendix A.

Table I lists batch sizes for selected process streams based on the reference material balance in Appendix A. As shown in Table I, the inhibited spent wash (~9000 gallons) is at 95% of the combined capacity afforded by the RPT and the SPT. This is due in large part to the 650 gallons operating heel in the PPT. Without this heel, the quantity of inhibited spent wash produced per cycle (at a nitrite concentration in the precipitate slurry batched to the PPT of 0.135M) is about 8,000 gallons, or 85% of the combined capacity of the RPT and SPT. Consequently, the maximum allowable nitrite concentration in the precipitate slurry batched to the LWF is about 0.15.

TECHNICAL BASES

General

It is assumed that the LWF will use a cross-flow filter identical in filter surface area to that to be used in In-tank Precipitation. This filter has 230 ft^2 of filter surface.

- The late wash cycle is 43 hours (based on DWPF design basis attainment).
- The portion of the late wash cycle to execute washing is limited to a maximum of 20 hours.

  The wash cycle period (20 hours) is based on attaining an average crossflow filter permeate flux of 0.032 gal/min-ft^2 over a wash cycle assuming a wash water requirement (~8750 gal) that would produced 9400 gallons of inhibited spent wash - the maximum combined capacity of the RPT and the SPT.

- o Maximum available spent wash storage capacity in the APP is 9400 gallons.
- o Technical constraints for spent wash transfer to Tank 22:
  - Benzene must be equal to or less than 5 ppm
  - Radionuclide content must be less than 0.61 Ci/gal
  - Hydroxide content must be equal to or greater than 1.0M
- o At least a 4X dilution of the soluble species in the slurry batched to the Late Wash Facility must be attained in the late wash cycle to mitigate the impact of soluble organic species (produced by radiolysis during storage in Tank 49) on the effectiveness of the copper catalyst during precipitate hydrolysis.
- o The precipitate slurry recirculation pump and the transfer pump in the PPT must be of the low shear type.
- o Water used for (1) precipitate washing, (2) filter flushing and (3) makeup of cold chemicals must be pretreated to ensure that no insoluble solids are present (or produced) that could plug the cross-flow filter.
- o Water to be used for washing must be adjusted with NaTPB solution (0.55M NaTPB - 0.10M NaOH) to a target NaTPB concentration of 0.004M to 0.0045M.

Characteristics of Tetraphenylborate Slurry Batched to the Late Wash Facility

This section describes the physical and chemical properties of typical irradiated, washed tetraphenylborate precipitate simulant slurry to be batched to the LWF. However, it should be recognized the the chemical makeup of this slurry can vary significantly.

Chemical

Insolubles	Wt% (dry)[a]	Solubles	Wt% (dry)[b]
KTPB	85.5	Na2C2O4	5.11
CsTPB	1.26	Na2CO3	42.9
NH4TPB	4.88	Na2SO4	0.66
Hg(C6H5)2	2.03	NaAl(OH)4	1.19
NaTi2O5H	2.22	C6H5OH	7.45
BaSO4	0.50	C6H6	0.99
(C6H5)2	2.29	CsOH	0.19
(C6H5)2C6H4	0.28	KOH	5.95
C6H5B(OH)2	0.98	NH4OH	1.84
		Na2B4O7	6.01
		NaNO2	26.8
		NaNO3	0.55
		NaOH	0.063
		Na2CrO4	0.018
		Na3PO4	0.047
		NaCl	0.044
		NaF	0.021
		Na2SiO3	0.016
		pH	~10
		Density	63.6 lbs/ft^3

	wt% (wet)
Insoluble Solids	9.12
Soluble Solids	3.07
Water	87.8
Density	64.0 lbs/ft^3

a - Insoluble Solids Fraction Only
b - Soluble Solids Fraction Only

Physical

The following data are based on a slurry that has been irradiated to a dose equivalent to 2-years storage in Tank 49 (assuming 24 Ci/gal Cs-137) and contains a total insoluble solids content of ~10 wt%.

o Consistency	3.0	cp
o Yield Stress	<10	dynes/cm2

Consistency and yield stress for a slurry irradiated to a dose less than that equivalent to 2 years storage in Tank 49 is shown in Figures 2 and 3.

Process Cycles

Batch Transfer from Tank 49 to PPT

A batch of washed precipitate slurry will be transferred from Tank 49 to the PPT at least every 43 hours to meet the DWPF design basis attainment.

Reprecipitation

During storage in Tank 49, a fraction of the the Cs/K/NH4TPB becomes soluble due to radiolysis. It is conservatively projected that 6.5% per year of the tetraphenylborate solids solubilize. NaTPB is added to reprecipitate the Cs/K/NH4 to ensure the Cs-137 content of the spent wash meets the Cs-137 limit for transfer to Tank 22 [2].

- o Precipitant - NaTPB
- o Solution Composition (identical to the NaTPB solution to be used in ITP)

• NaTPB	0.55M
• NaOH	0.10M

- o Density - 63.6 lbs/ft^3
- o Storage Considerations

• Freezing Point (-5°C)	Freeze protection recommended
• Flammability	NaTPB contains benzene. Tank should be blanketed with nitrogen
• Capacity	Nominal addition - 504 gallons
• Transfer Rate	No technical basis for a controlled rate of addition to the PPT
• Benzene Generation	NaTPB thermally decomposes. Recommend storage temperature not to exceed 40°C

- o NaTPB Requirement

Calculational Basis: see Appendix B

The required quantity of NaTPB is based on the stoichiometric quantity needed to precipitate the soluble potassium, cesium and ammonium plus that required to adjust the aqueous fraction to 0.004M NaTPB. The composition of the batch of precipitate slurry used to calculated the NaTPB requirement will be the last analyses of the slurry in storage in Tank 49 corrected for the elapsed period between the time the sample was obtained from Tank 49 and the time that reprecipitation is planned in the PPT. Sampling the PPT after each batch of slurry is received from Tank 49 is received is not required.

- o Mix Period After Addition - 30 minutes

__Surface Active Agent Addition__ (post NaTPB addition)

It is not anticipated that a surface active agent will have to be added to mitigate foaming and enhance cross-flow filter performance. Research and development are continuing in this area. However, for purposes of developing a cost estimate for the proposed Late Wash Facility, it is recommended that facilities be included in the scope-of-work capable of delivering a surface active agent to the PPT.

Although the preferred surface active agent has not been determined, for the purpose of sizing the surfactant tank, it is assumed that the surfactant Surfynol 104E would be used (limited cross-flow -filter tests have been performed using Surfynol 104E):

- o Specific Gravity - 0.999 @ 25°C
- o Concentration of Active Component - 50 wt%
- o Surface Active Agent Batch Size

  Calculational Basis: See Appendix B

  Based on the material balance in Appendix A, about 4 gallons of Surfynol 104E would be added to the PPT after reprecipitation to attain 500 ppm (by weight) of the active component in the Surfynol 104E solution.

- o Surface Active Agent Hold Tank Capacity

  Recommend the LWF scope-of-work include a 50 gallon surfactant tank servicing the PPT.

- o Mix Period After Addition Prior to Next Process Step - 15 minutes

__Concentration__

Following reprecipitation, the slurry is filtered to raise the concentration of insoluble solids 10.0 wt%. The filtrate is accumulated in one of the spent wash hold tanks. Concentrating the slurry prior to washing offers two distinct advantages. First, the quantity of wash water required to reduce the nitrite content to 0.01M is reduced and secondly, the batch size to the Salt Processing Cell (SPC) is reduced.

- o Target Insoluble Solids Concentration - 10 wt%

  Calculational Basis: see Appendix B

  No additional analyses other than that of the batch transferred from Tank 49 will be required.

  Note: The sample schedule will call for a sample to be taken post concentration and analyzed for nitrite content of the aqueous fraction and total insoluble solids. This is not a process control sample but will be used to validate the initial calculation of the wash water requirement. If a correction to the wash water requirement is required, the wash cycle period allows adequate time to make such an adjustment.

- o Physical Characteristic of Concentrated Product Slurry (@11.0 wt% insoluble solids)

  Consistency - 4 cp
  Yield Stress - <10 dynes/cm2

- o Cross-Flow Filter Process Operating Parameters

  See "Cross-Flow Filter Parameters" in subsequent section.

Washing

During this step, wash water is added to the PPT at a rate equivalent to the cross-flow filter permeate rate. Agitation is maintained throughout the wash cycle to ensure the PPT behaves as a weel mixed, continuously stirred tank. Loss of agitation should be accompanied by the immediate shutdown of the slurry recirculation pump and the wash water delivery system. The wash water addition rate can be controlled off the level of the slurry in the PPT. The permeate from the cross-flow filter is accumulated in the spent wash hold tanks (RPT and SPT).

Wash Water Specifications

All water used for washing, cross-flow filter flushing, makeup of cleaning solutions, makeup of trim chemicals and layup of the cross-flow filter must be pretreated to ensure there are no insoluble solids introduced into the system (or subsequently produced) that could plug the cross-flow filter. See Section - "Water Treatment" for pretreatment options.

In addition, the chemical composition of the water used for washing must be as follows:

- o NaTPB Concentration - 0.0035M to 0.0045M
- o NaOH Concentration - 0.001M to 0.010M

The NaTPB content of the wash water is required to prevent a portion of the CsTPB from becoming soluble during the washing cycle. Failure to maintain an excess of NaTPB in the precipitate slurry throughout the wash cycle could result in the Cs-137 concentration in the spent wash water potentially exceeding the Tank 22 limit.

Wash Volume

That volume of wash water required to reduce the nitrite concentration of the aqueous fraction of the slurry to 0.01M or less. See Appendix B for the algorithm to calculate the wash water requirement. The initial estimate of the wash water requirement will require no additional off-line analyses. However, when the analytical results of the post-concentration sample are received (NO2- and total insoluble solids), the initial estimate of the wash water requirement will be checked and adjusted as required.

Nominal wash water requirement - ~7300 gallons

Wash Water Addition Rate

The wash water delivery system must be capable of metering the wash water into the PPT at a rate equivalent to the permeate rate (i.e. at a rate that maintains the slurry level in the PPT constant). It is recommended that the wash water delivery system be capable of matching a cross-flow filter permeate flux ranging from 0.010 gal/min-ft^2 to 0.16 gal/min-ft^2.

Cross-Flow Filter Operating Parameters (applicable to washing/reconcentration cycles)

Typical cross-flow filter process operating parameters are indicated below. A subsequent section addresses the cross-flow filter design bases.

• Slurry velocity in cross-flow filter tubes	6 ft/sec (nominal)
• Transmembrane pressure	15 psig to 25 psig
• Slurry temperature	20°C - 30°C
• Backpulse frequency	every 5 min
• Backpulse pressure	125 psig ± 10% (nitrogen)
• Backpulse duration	1.0 - 2.0 seconds

Backpulsing involves forcing permeate radially back through the filter pores to dislodge accumulated solids from the filter (while the slurry continues to circulate through the filter tubes).

Post Washing/Cross-Flow Filter Layup

Following the wash cycle, the cross-flow filter system is drained of residual washed precipitate into the PPT. The washed slurry is then ready for transfer to DWPF pending confirmation that the nitrite content of the aqueous fraction of the washed precipitate slurry is 0.01M or less.

If the cross-flow filter permeate flux at the conclusion of the wash cycle is greater than 0.045 gal/min-ft^2 or the required transmembrane pressure to sustain the permeate flux is less than 25 psig, a cleaning cycle is not required and the cross-flow filter need only inventoried with water until the next concentration cycle. If the permeate flux or transmembrane pressure at the end of the wash cycle do not meet these constraints, a cleaning cycle should be executed (see section "Recovering Cross-Flow Filter Flux")

Benzene Stripping

The benzene content of the spent wash must be reduced to 5 ppm or less to permit transfer to Tank 22. This will be accomplished by a combination of sparging the spent wash (@50°C) with nitrogen and recirculating the spent wash via spray nozzles into the vessel vapor space of the PRT and SPT. Laboratory experiments and modeling studies indicate the benzene content of the spent wash can be reduced to 5 ppm in less than 20 hours [3]. It is important that the nitrogen sparging and spraying be initiated as soon as filtrate from the concentration cycle and the spent wash begins to be received in a spent wash hold tanks.

Design Bases:

Sparging

o Sparge Fluid	Nitrogen
o Sparging Rate	1.24 scfm/ft^2 of wash surface
o Bubble Size	2 mm
o Spent Wash Temperature	50°C

Recirculation

o Recirculation Rate	20 gpm
o Number of Spray Nozzles	4
o Spent Wash Temperature	50°C
o Spray Droplet Size	0.10 mm to 0.25 mm

Figure 4 depicts the projected benzene profile in the RPT and the SPT during the wash cycle.

During the benzene sparging cycle, foam will be produced. Using cross-flow filter permeate produced during washing of irradiated precipitate, studies were conducted to determine foam height as a function of wash temperature, degree of agitation and sparge rate. At a sparge flux of 1.33 scfm/ft2, (design basis =1.24 scfm/ft2), at no time did the foam height exceed 5 inches. The foam is unstable and rapidly subsides upon stopping sparging and agitation [3].

Inhibitor Adjustment of Spent Wash

Transfers into Tank 22 must contain a hydroxide concentration of at least 1.0M.

- o Inhibitor - 50 wt% NaOH
- o Caustic Requirement

Calculational Bases: see Appendix B

- Nominal NaOH Requirement - 500 gallon

CROSS-FLOW FILTER DESIGN BASES

The cross-flow filter system is to be capable of meeting the following requirements:

o Minimum Filter Surface	230 ft^2
o Filter Pore Size	0.5 micron (nominal)
o Material of Consruction	316 L SS
o Slurry/Cleaning Solution Velocity in Cross-Fow Filter Tubes	4 to 8 ft/sec
o Transmembrane pressure	0 psig to 60 psig
o Slurry Temperature	<40°C [a]
o Backpulse Frequency	every 5 - 30 min
o Backpulse Pressure	90 psig to 125 psig (nitrogen)
o Backpulse Duration	0.5 sec to 10 sec

a - The system to limit the temperature of the slurry entering the cross-flow filter to a maximum of 40°C must accommodate the maximum temperature the slurry transferred from Tank 49. Interim Waste is currently developing what the maximum temperature a batch of washed slurry will be that is transferred to the LWF. Until this design parameter is available, 60°C should be assumed.

CROSS-FLOW FILTER PERFORMANCE

Essentially all the cross-flow filter performance data with irradiated tetraphenylborate slurries have been been developed in a bench-scale unit consisting of a single 0.5 micron, 3/8-inch ID x 16 7/8-inch long filter tube, and a three gallon recirculating tank [4]. A diaphragm pump was used to re-circulate the slurry at constant solids concentration by returning the permeate to the recirculating tank. The inlet pressure and the tube flow (linear velocity) was adjusted to gather flux measurements at various pressures and flows. Table II in an excerpt from Reference 4 summarizing cross-flow filter performance using irradiated feed.

Filter performance decay is summarized in Figure 5. The decay is slight, both for fresh and reprecipitated slurry and indicates that filter cleaning may not be needed after each late wash cycle.

Based on the data obtained from bench-scale tests, a permeate flux of 0.032 gal/min-ft^2 (required flux to affect washing in the LWF within 20 hours - assuming the maximum wash water requirement) appears easily attainable.

RECOVERING CROSS-FLOW FILTER FLUX

During cross-flow filtration the permeate flow drops off rapidly as a filter cake accumulates on the surface of the filter tubes. Frequent backpulsing (reverse permeate flow) is used to lift the filter cake and restore flow. However, as the filtration continues, the pores plug with fines and the permeate flux (at a given transmembrane pressure) gradually falls off to an unacceptable rate, or the transmembrane pressure required to maintain an acceptable permeate flux gets too high, necessitating cleaning. Although the frequency of the need to clean the filter has not been determined, provisions to clean after each late wash cycle should be provided.

The most effective cleaning technique demonstrated to date is high flow (~6 ft/sec) axial recirculation of 4 wt% oxalic acid through the filter tubes followed by low velocity flushing with 4 wt% NaOH solution. It is recommended that the cleaning solutions be reused to minimize waste volume. The oxalic acid solution should be replaced when the pH exceeds 2. The sodium hydroxide solution should be replaced when the pH falls below 13. The oxalic acid solution should also be replaced if the radiation level exceeds 0.25 mrem/hr at the outside of the shielding wall. Recent tests indicate that spent cleaning solutions will have to be replaced every 5 to 6 cleaning cycles.

The LWF must be engineered to prevent cleaning solutions and rinses/flushes from being discharged into the PPT or spent wash hold tanks (RPT and SPT)
Facilities and systems are to be provided to meet the following design criteria and recommended cross-flow filter cleaning strategy:

Cleaning Solution Vessel Requirements

Oxalic Acid Cleaning Tank (4 wt% $H_2C_2O_4$)

This tank must at least accomodate the equivalent cross-flow filter and associated piping system inventory (~250 gallon) plus that additional volume which will ensure the oxalic acid recirculation pump will not run dry when circulating oxalic acid through the filter at 8 ft/sec. The larger the capacity of this tank the less frequent spent cleaning solution will have to be transferred to Tank 48. Material of construction - 304L SS. Sampler required.

Caustic Cleaning Tank (4 wt% NaOH)

The caustic will be used to flush the filter system. Material of construction - 304L SS. Sampler required.

Spent Flush Tank

This tank will be used to accumulate the cleaning solution inventory in the cross-flow filter system that is flushed following each cleaning solution recirculation cycle. Recommended minimum capacity - 3000 gallons. Sampler required. Material of construction - 304-L SS.

Biological Shielding Requirement

The cell designed to accomodate the cleaning solution storage tanks must have sufficient biological shielding to reduce the radiation level to 0.25 mr/hr based on a cleaning solution inventory of 6000 gallons containing 6.0 Ci of Cs-137/L. A preliminary assessment of the biological shielding requirement is described in Reference 5. This report was transmitted to DWPF under tranmittal letter WSRC-RP-92-902TL on July 17, 1992.

Cold Feed Service Requirements

To Oxalic Acid Cleaning Tank:	4 wt% oxalic acid 50 wt% NaOH[a] Treated water
To Caustic Cleaning Tank:	4 wt% NaOH Treated water
To Spent Flush Tank:	50 wt% NaOH[a] Treated water
To Wash Water Tank	0.55M NaTPB, 0.10M NaOH solution
To Recycle Pump Tank	50 wt% NaOH[a]
To Sludge Pump Tank	50 wt% NaOH[a]

a- the 50 wt% NaOH storage tank will require freeze protection

Pump Requirements

- The Oxalic Acid Cleaning Tank's recirculation pump must be capable of recirculating oxalic acid solution through the cross-flow filter at 6 - 8 ft/sec with the permeate being returned to the source of the cleaning solution. The recircluation pump in the Caustic Cleaning Tank need only be be capable of flushing the system at a low recirculation rate (0.5 to 1.0 ft/sec). Each tank must have a transfer pump to transfer spent cleaning solution to Tank 48.

- The Spent Flush Tank must have the capability to transfer spent flush solutions to Tank 48.

Cleaning Sequence

Step 1 Fill cross-flow filter with water. Pulse 10 times, each pulse duration 1 - 2 sec. Drain to PPT.
Step 2 Repeat Step 1
Step 3 De-inventory shell side to PPT (via backpulsing or draining)
Step 5 Recirculate 4 wt% oxalic acid solution for 60 minutes at 6 - 8 ft/sec while backpulsing for 1.0 - 2.0 seconds every 5 minutes
Step 6 Flush system with 250 gallon of water to the Spent FlushTank. Drain system (including shell side) to Spent Flush Tank
Step 7 Recirculate 4 wt% sodium hydroxide solution for 60 minutes at 0.5 to 1.0 ft/sec while backpulsing for 1.0 - 2.0 seconds every 5 minutes
Step 8 Flush system with 250 gallons of water to the Spent Flush Tank to Spent Wash Tank.

PROCESS WATER TREATMENT

Process water will be used in the preparation of cleaning solutions, cross-flow filter flushes, cross-flow filter layup and precipitate slurry wash water. During the cold run testing of the ITP cross-flow filter, the filter plugged with process water (well water). The pluggage has been tentatively attributed to the colloidal iron and silica content of the process water (well water). Treatment by filtration with the appropriate filter porosity will remove these colloidal particles. However, the hydroxide content of the precipitate slurry could precipitate soluble cations in the process water such as iron which could subsequently plug the cross-flow filter. Pretreatment is required. Two options are recommended for assessment:

Option 1 - Air Oxidation/Filtration

- Adjust pH of process water to 10 - 11
- Sparge the water with air
  - Contact Time - 15 minutes
  - Total air sparge requirement - 3 tank volumes
- Filter through a 0.2 micron filter

Option 2 - Filtration/Ion Exchange

This option uses a deionizer (mixed bed) to remove the soluble cations and anions. The process water flow to the deionizer must be filtered through a 0.2 micron filter. The effluent from the deionizer must be adjusted to a pH between 10 and 11 with NaOH.

EXTENDED OUTAGE

If the cross-flow filter system is going to be down for an extended period (> 2 days), the filter cleaning sequence is to be performed.

EMERGENCY SHUTDOWN

If during the late wash slurry concentration cycle or the wash cycle services are lost (e.g. power failure), the capability to drain the slurry from the cross-flow filter tubes to the PPT and layup the filter tubes with water are required.

FLAMMABILITY CONTROL

Late Wash Facility

The projected benzene emissions from washed tetraphenylborate precipitate in the PPT re[illegible]ted in Design Change Form (DCF - 20676) being approved for appropriate modifications to address the flammability control strategy in both the APP and the Low Point Pump Pit. During washing of the precipitate in the APP's PPT, benzene will accompany the spent wash that will be accumulated in the RPT and the SPT. A similar flammability control strategy (MOC control) should be implemented to prevent a flammable atmosphere occurring in the RPT and SPT vessel vent systems.

The vapor effluents from the pump tanks will be combined with the air sweep of the pump pit and filtered before discharge to the atmosphere. The vessel vent header is to be maintained safe by air dilution [i.e. the benzene concentration is maintained below the Lower Flammability Limit (LFL) for benzene in air - 1.3 vol%]. The APP pump pit process vessel vent system is presently designed to maintain the benzene concentration below 25% of the LFL assuming an instantaneous benzene emission rate of 25 pph. Each batch of precipitate processed in the LWF will contain about 7 lbs of benzene which will be stripped to the atmosphere. In addition, some additional benzene is expected to be generated during oxalic acid cleaning of the filter, by radiolysis and by thermal decomposition of NaTPB. The present APP air dilution design basis should be adequate to handle the exxpected benzene emissions from the LWF.

The required alarms and interlocks specified in DCF-20676 should be extended to the APP's RPT and SPT and adhered to upon implementation of the Late Wash Facility.

The APP is currently scoped to have an oxygen analyzer to monitor the oxygen content of the vapor exiting the PPT. Reliance on an oxygen analyzer common to all three vessel vent flows doesn't assure the oxygen content in the vapor exiting each tank is below the MOC. The capability to determine the oxygen content in the vapor space of each pump tank must be provided. One option is to provide on-line oxygen monitoring of the vapor exiting each pump tank.

Tank 22

The current OSR requires the capability to respond to a ventilation outage within 7 days. The time that the benzene concentration in the Tank 22 vapor space would reach the LFL in the event of a ventilation outage assuming the spent wash from the Late Wash Facility is transferred to Tank 22 has been reassesed. Based on the calculational bases itemized below, it will take 240 days to reach the LFL for benzene in air (1.3 vol%).

Calculational Bases (Late Wash - average case)

- o Temperature of Tank 22 Contents - 55°C
- o Sodium Ion Concentration - 2.2M
- o Volume in Tank 22 - 455,000 gallons
- o Cs-137 Concentration - 0.004 Ci/L
- o Benzene Concentration in Stripper Bottoms - 1 mg/L

Even in an extreme case (see calculational bases below), the time to reach the LFL in event of a ventilation outage is 14 days. This is still longer than the time allowed in the current OSR. Consequently, there are no changes required to the ITP OSR or the ITP Process Requirements.

Calculational Bases (extreme case)

- Temperature of Tank 22 Contents - 70°C
- Sodium Ion Concentration - 2.2 M
- Volume in Tank 22 - 1,000,000 gallons
- Cs-137 Concentration - 0.16 Ci/L (Tank 22 limit)
- Benzene Concentration in Stripper Bottoms - 5 mg/L

The time to reach the LFL in the Tank 22 vapor space is most sensitive to the temperature of the tank contents and the volume. The Cs-137 concentration and ITP benzene stripper efficiency have very little effect.

PERMITTING REQUIREMENTS

The pump pits are currently included in the DWPF permitted emissions. This permit assumes that essentially all of the benzene in solution in the precipitate slurry transferred from Tank 49 is released from one or the other of the pump pits (the APP or the Low Point Pump Pit). With Late Washing, essentially all the benzene in the precipitate slurry will be sparged to the atmosphere. Some additional benzene will be generated due to oxalic acid cleaning of the cross-flow filter, by radiolysis and thermal decomposition of the NaTPB. The total projected emissions from the pump pits in the DWPF permit should not change significantly.

Elimination for the need for the reductant (HAN) during precipitate hydrolysis in the SPC will change the flammability control strategy during precipitate hydrolysis. Less inert flow will be required and consequently benzene emissions from the SPC to the atmosphere are projected to be reduced from about 30 tons/yr to about 18 tons/yr (depending on the amount of NOx generated during precipitate hydrolysis - data not yet acquired).

These process changes will require minor modifications to the DWPF air permit and possibly to the DWPF waste water permit (due to changes in the SPC operation).

The radionuclide (and NaTPB) content of the spent wash transferred to Tank 22 from the Late Wash Facility will increase benzene emissions from Tank 22. The ITP air quality permit and waste water permit would likely require some modification.

TANK 22 SPENT WASH ACCEPTANCE LIMITS [6]

o Free Hydroxide	≥ 1.0M
o Benzene	≤ 5 ppm
o Radionuclide	≤ 0.61 Ci/gal
o Temperature	≤ 70°C

SAMPLE AND ANALYTICAL SCHEDULE

Feed Batch (these data will be available from Tank 49 sampling results)

		Typical Concentration
Nitrite (aqueous fraction)	ppm	6,000 - 6450
Total Insoluble Solids	wt%	9.0 - 9.2
KTPB	wt%	7.8
CsTPB	wt%	0.12
NH4TPB	wt%	0.45
Hg(C6H5)2	wt%	0.18
Cesium (soluble)	ppm	50
Potassium (soluble)	ppm	1300
Ammonium (soluble)	ppm	300
Soluble Benzene	ppm	300 - 350
pH		10 - 11

Precipitate Slurry - Post Concentration

Nitrite (aqueous fraction)	ppm	5000 - 6000
Total Insoluble Solids	wt%	9.5 - 10.5

Note: These are not process control analyses in the sense that the subsequent processing step (washing) must wait until the analytical results are available. The results will be used to validate the previously determined wash water requirement and if necessary, appropriately adjust the wash water requirement before the end of the wash cycle.

Washed Precipitate Slurry* (at end of wash cycle in PPT)

Nitrite (aqueous fraction)	ppm	≤ 460

Spent Wash (post benzene stripping - post inhibitor adjustment)

Total radionuclide concentration	Ci/gal	0.006 - 0.61
Benzene	ppm	1.0 - 5.0
Free Hydroxide	M	1.0 - 1.3

Wash Water

NaTPB	Na+	ppm	92 - 104
	TPB-	M	0.004
	pH		10 - 11

Cold Feeds

NaTPB			
	Na+	M	11,500 - 12,650
	TPB-	M	0.50 - 0.55
	OH-	M	0.008 - 0.012
	Cu++	ppm	0.01 - 0.1
H2C2O4		wt%	4.0
NaOH		wt%	4.0

Spent Oxalic Acid Cleaning Solution

H+	Total H+ Equiv	≤0.88

Spent Caustic Cleaning Solution

Hydroxide	Total Base Equiv	0.25 - 1.0

Flush Tank Solution

Hydroxide	OH-
Acidity	H+
Oxalate	C2O4=

CORROSION

Cyclic potentiodynamic polarization scans were performed on Type 304L stainless steel specimens immersed in an irradiated simulant of the spent wash (filtrate) solution to be produced in the proposed Late Wash Facility. Tests were run at temperatures of 50, 80 and 90°C. The results indicate that 304L stainless steel is immune to localized corrosion in this application. The polarization scans showed that the passive film remained intact, and the post-scan microscopic examination of the specimens showed no pitting [7].

MONITORING/DATA ACQUISITION REQUIREMENTS

Vessels

Precipitate Pump Tank

- Temperature
- Level
- Foam Level

Note: A pneumatic bubbler terminating in vapor space above the maximum projected liquid level has proven effective in detecting foaming in the Precipitate Reactor located in the 1/5-scale Precipitate Hydrolysis Experimental Facility (PHEF)

- Specific Gravity
- Agitator Speed
- N2 Purge Rate
- Vapor Space Pressure

Recycle Pump Tank

- Temperature
- Level
- Foam Level
- Specific Gravity
- Agitator Speed
- Sampler
- N2 Purge Rate
- N2 Sparge Rate
- Wash Recirculation Rate to Spray Nozzles
- Vapor Space Pressure

Sludge Pump Tank

- Temperature
- Level
- Foam Level
- Specific Gravity
- Agitator Speed
- Sampler
- N2 Purge Rate
- N2 Sparge Rate
- Wash Recirculation Rate to Spray Nozzles
- Vapor Space Pressure

Surfactant Tank

- Level
- Specific Gravity

Cross-Flow Filter Cleaning Solution Tanks

- o Level
- o Specific Gravity
- o Agitator Speed
- o Temperature
- o Radiation at Cell Wall Exterior

Backpulse Tank

- o Level
- o Vapor Space Pressure

Wash Water Storage Tank

- o Level

NaOH Tank

- o Level
- o Specific Gravity

NaTPB Solution

- o Level
- o Specific Gravity

Processing Operations

Concentration/Wash Cycles

- o Slurry Flow to Cross-Flow Filter (calculated linear velocity display)
- o Temperature of Slurry Entering Cross-Flow Filter
- o Transmembrane Pressure
- o Cross-Flow Filter Permeate Rate
- o Wash Water Addition Rate (this flow should be level controlled by the level in the PPT)
- o Flow Differential Between Wash Water Rate and Permeate Rate
- o Backpulse N2 Pressure
- o Backpulse Frequency
- o Backpulse Duration
- o Cs-137 Concentration in Cross-Flow Filter Permeate Flow
- o Nitrite Concentration in Cross-Flow Filter Permeate Flow
- o ΔP Across Slurry Inlet/Outlet of Cross-Flow Filter Tubes
- o PPT Agitator Speed

Benzene Removal from Spent Wash

- o Nitrogen Sparge Rate
- o Spent Wash Recirculation Rate to Spray Nozzles
- o Inlet pressure to Spray Nozzles

Flammability Control

- Nitrogen Flow to Vessel Vapor Space of PPT, RPT and SPT
- Oxygen Concentration in Vapor Exiting PPT. RPT and SPT
- Benzene Concentration in Process Vessel Vent Header
- Pressure in NaTPB Storage Tank Vapor Space

INTERLOCK REQUIREMENTS

In addition to normal process control interlock responses (e.g. stopping transfers into a tank at a HIGH-HIGH liquid level, flammability control, etc.), the following special interlock and alarm actions are required:

- Upon loss of agitation in the PPT during the wash cycle, flow of wash water into the PPT must be stopped and the PPT recirculation pump must be shutdown.
- The nitrogen sparge to the RPT and the SPT and agitation should be stopped upon detection of foam.
- LOW recirculation flow (<10 gpm) to the RPT and SPT spray nozzles to be alarmed
- LOW slurry flow to the cross-flow filter (<4 ft/sec) to be alarmed
- LOW-LOW slurry flow to the cross-flow filter (< 3 ft/sec) to shutdown PPT recirculation pump and all transfers into the PPT
- HIGH slurry flow to the cross-flow filter (>8 ft/sec) to be alarmed.
- LOW transmembrane pressure (<10 psig) to be alarmed.
- HIGH transmembrane pressure (25 psig) to be alarmed.
- HIGH-HIGH transmembrane pressure (>40 psig) to shutdown PPT recirculation pump and all transfers into the PPT.
- Flow differential (>0.5 gpm) between wash water flow to the PPT and the permeate flow to be alarmed.
- HIGH pressure drop (>5.0 psig) across the cross-flow filter tubes to be alarmed.
- If process heat exchangers are used to control the temperature of the slurry entering the cross-flow filter, pressure drop between the shell side and the process side must be maintained greater than 15 psig. If the differential falls below 15 psig, an alarm should be activated.

SPECIAL ON-LINE MONITORING

If technically feasible, the following on-line monitoring systems are recommended:

- System to monitor the nitrite concentration in cross-flow filter permeate flow.
- System to measure the gamma activity (calibrated in Cs-137 equivalents) in spent wash water flow to the RPT and the SPT.
- System to monitor the benzene concentration inthe spent wash water being circulated to the spray nozzles in the RPT and SPT.
- If process heat exchangers are employed, system to monitor the gamma activity in the recirculation cooling water .

SERVICES

- Nitrogen to RPT, SPT and PPT Vapor Space (flammability control))
- Nitrogen to RPT and SPT Spargers
- Nitrogen to NaTPB Storage Tank (flammability control)
- NaTPB to PPT
- NaTPB to Wash Water Tank
- Surfactant to PPT
- 125 psig Nitrogen to Cross-Flow Filter Permeate Backpulse Tank
- Wash Water to PPT (insoluble solids particle size <0.2 micron)
- 4.0 wt% Oxalic Acid to Oxalic Acid Cleaning Tank
- 4.0 wt% NaOH to Caustic Cleaning Tank
- Flush Water to Cross-Flow Filter
- N2 flow to PPT, RPT and SPT Liquid Level Pneumatic Bubbler Tubes
- Nitrogen Flow to PPT, RPT and SPT Foam Detectors (if this type of foam detection is employed)
- Flush Water to Foam Detectors
- 50 wt% NaOH to Oxalic Acid Cleaning Tank
- 50 wt% NaOH to Spent Flush Tank
- 50 wt% NaOH to SPT and RPT

REFERENCES

1. J. C. Marek, "DWPF Report of Task Force on Options to Mitigate the Effect of Nitrite on DWPF Operations (U)", WSRC-TR-92-67, March 1992.

2. D. D. Walker, "Precipitation Kinetics in Late Washing", SRT-LWP-92-073, May 18, 1992.

3. L. F. Landon, "Benzene Stripping - Late Wash Facility - Status Report", SRTC-PTD-92-036, July 31, 1992.

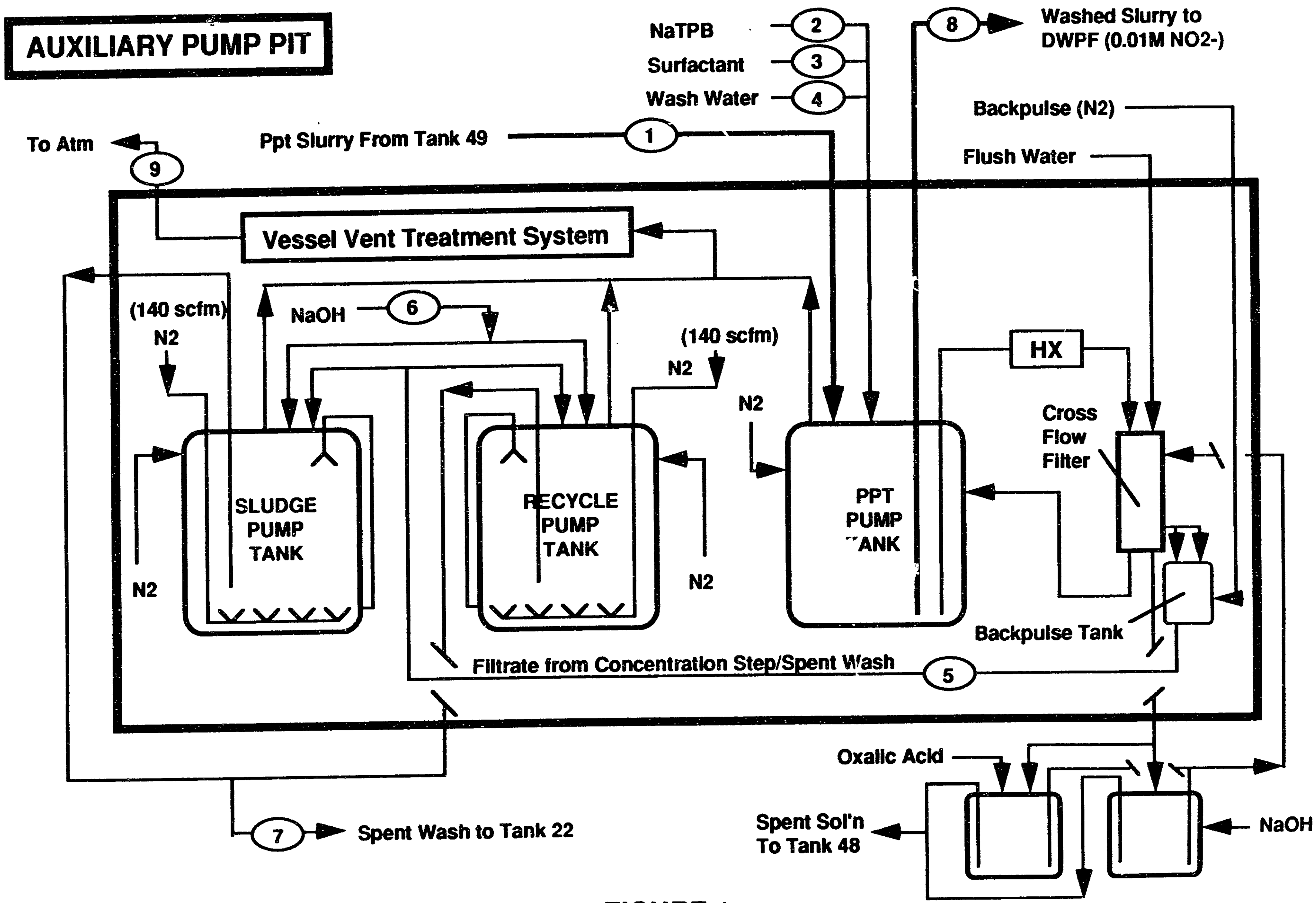
4. L. O. Dworjanyn and M. F. Morrissey, "Initial Technical Basis for the Use of a Spare ITP Filter in DWPF Late Washing (U)", WSRC-RP-92-766, June 5, 1992.

5. S. A. Epperson, "New Spent Wash Tank and New Wash Cleaning Tank Preliminary Shielding Analysis", ESH-HPT-92-0246, June 17, 1992.

6. L. V. Ehrke, "ITP Acceptance Criteria for Late Wash Water to Tank 22", WER-WMH-920180, April 22, 1992.

7. P. E. Zapp, "Corrosion Evaluation for 304L Stainless Steel in the Spent Wash Water from the Proposed Late Washing Facility (U)", SRT-MTS-92-3016, May 8, 1992.

LATE WASH PROCESS PROCESS FLOW DIAGRAM



Note: See Table 1 for Batch Sizes

FIGURE 1

FIGURE 2

Effect of Irradiation
Consistency

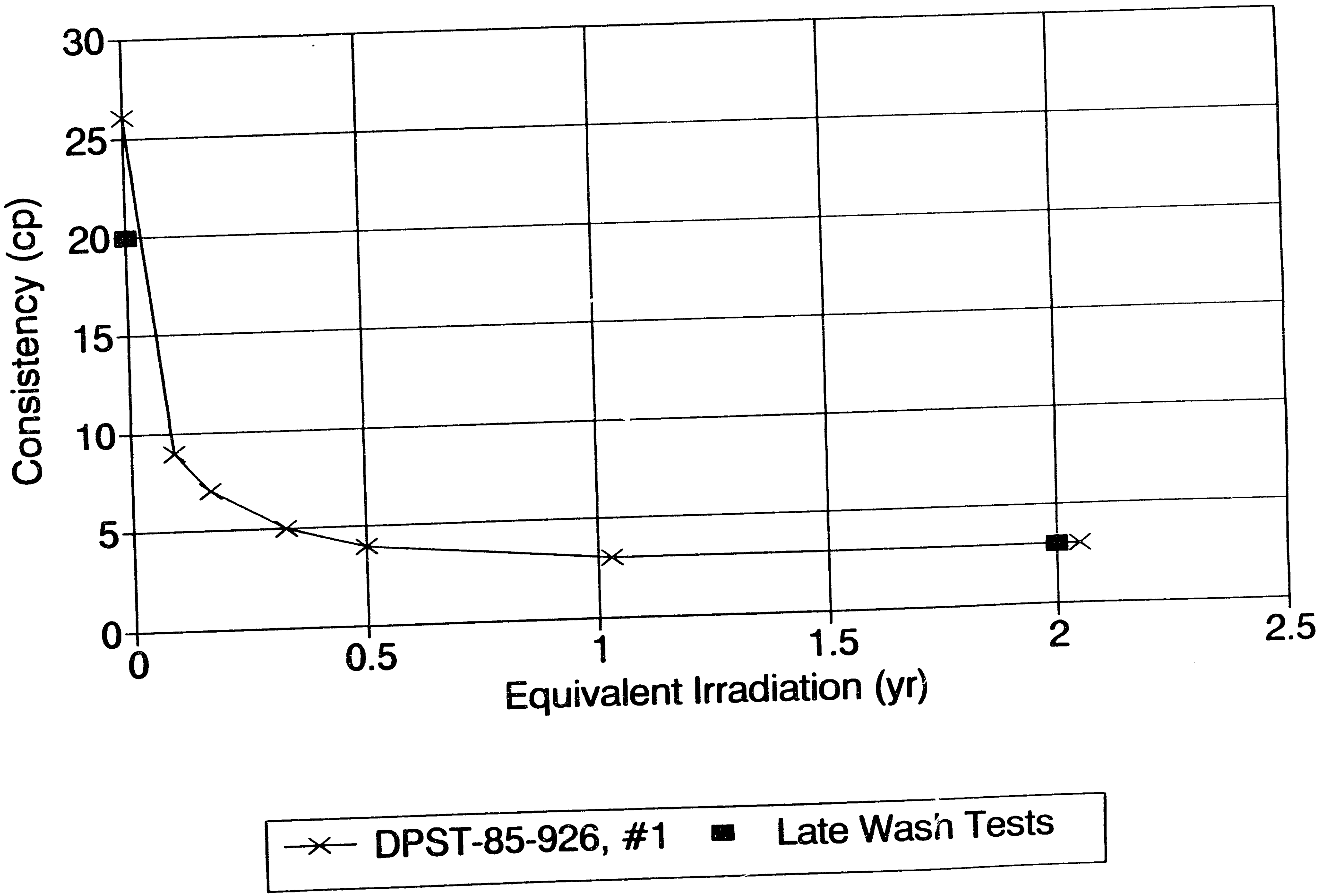


FIGURE 3

Effect of Irradiation

Yield Stress

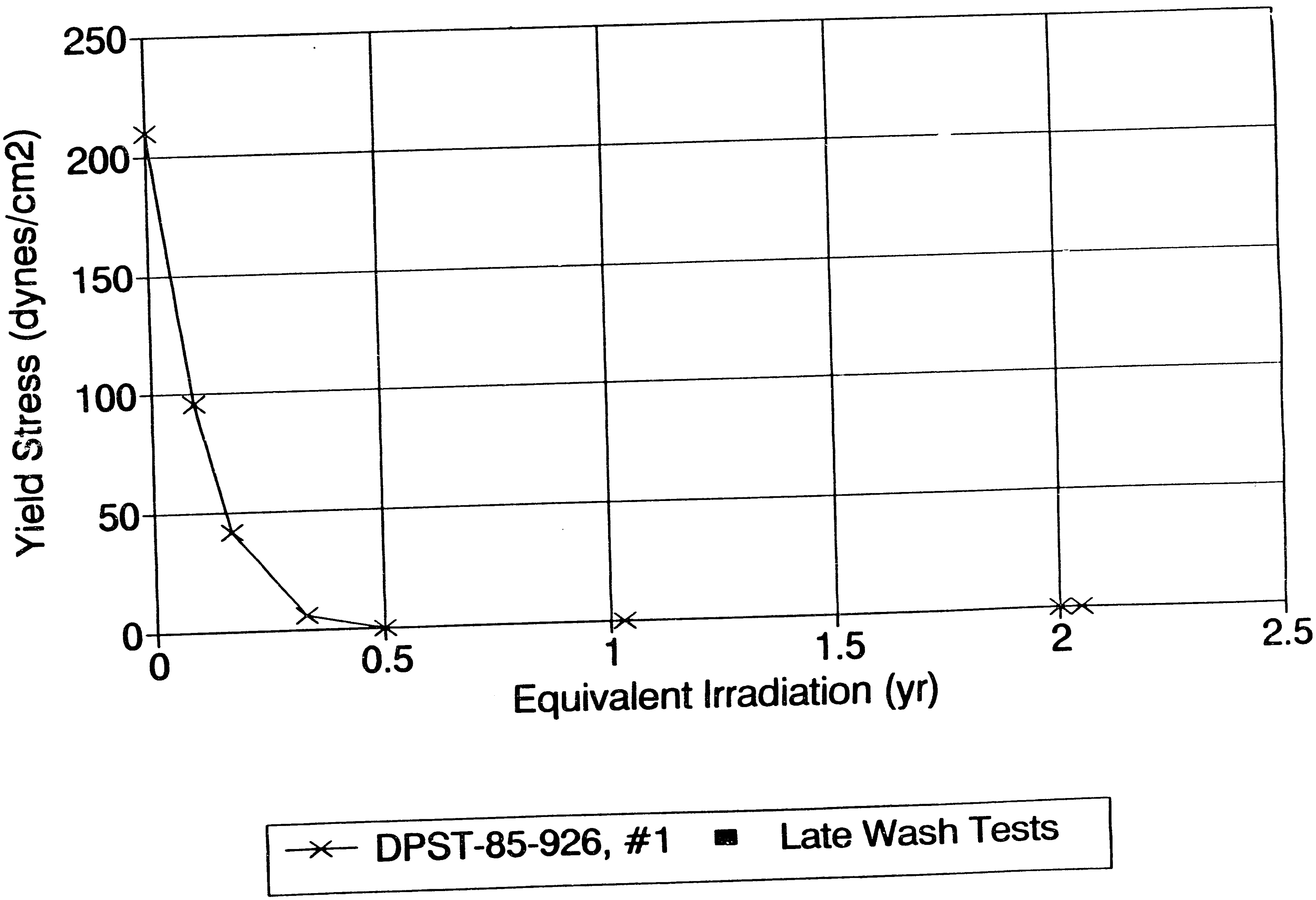
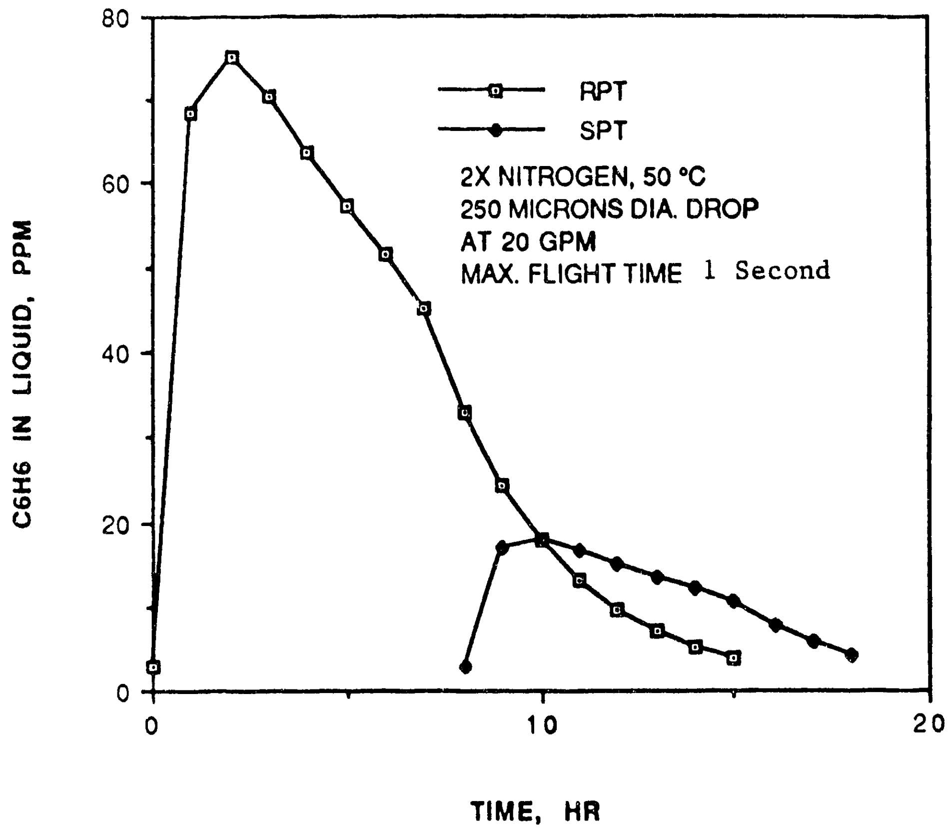


FIGURE 4

C6H6 SPARGING & SPRAYING OF RPT/SPT NO SURFYNOL WITH NaOH



CONDITIONS

Initial C6H6 Concentration - 0.004M
Spent Wash Generation Rate-9.2 gpm
No surfactant
Temperature - 50°C
Sparge Rate - 1.24 scfm/ft2
Bubble Size - 2 mm
Spray Droplet Size - 0.25 mm
Spent Wash Spray Rate - 20 gpm
Maximum Flight Time of a Spray Droplet - 1 sec

FIGURE 5

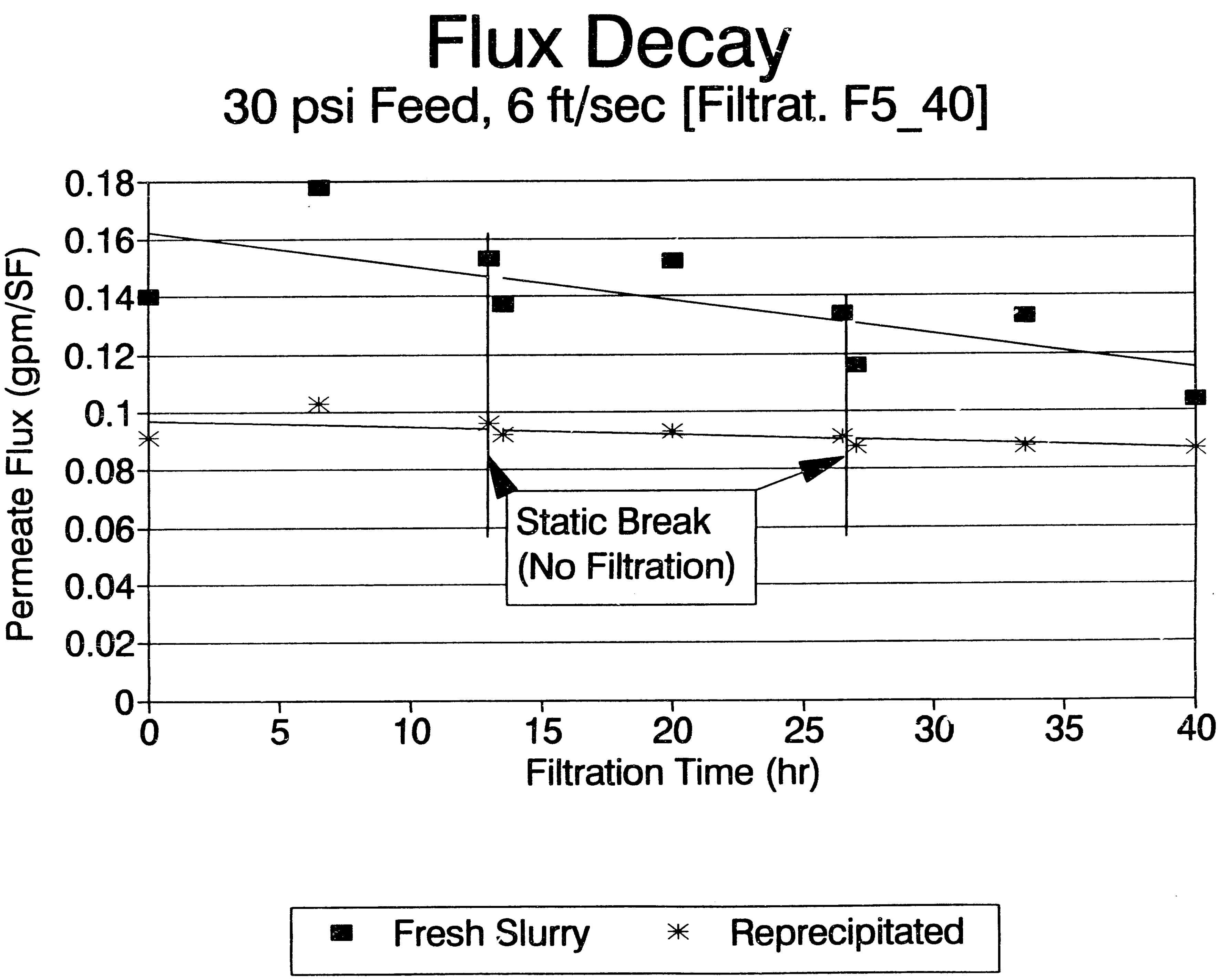

Flux Decay
30 psi Feed, 6 ft/sec [Filtrat. F5_40]
Permeate Flux (gpm/SF)
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0
5
10
15
20
25
30
35
40
Filtration Time (hr)
Static Break
(No Filtration)
Fresh Slurry
Reprecipitated

TABLE I

BATCH SIZES FOR LATE WASH FACILITY
(gallons)

Stream No.[a]	Stream Description	Reference Balance	Maximum Batch Sizes
1	Slurry from Tank 49	3,096[b]	3,091[c]
2	NaTPB	335	335
4	Wash Water	8,269	8,749
5	Spent Wash	8,478	8,953
6	50 wt% NaOH	558	585
7	Inhibited Wash to Tank 22	8,937	9,432
8	Washed Slurry to DWPF	3,429	3,438
9	Atmospheric Benzene Emissions	~7[d]	~7[d]

a - see Figure 1
b - NO2- = 0.134 M
c - NO2- = 0.154 M
d - lbs/cycle

TABLE II

AVERAGE PERMEATE RATE - 40 HOUR FILTRATION (GPM/FT^2)[a]

	Linear Velocity (ft/sec)				
Inlet Pressure, psig	2.0	4.0	6.0	8.0	10.0
			Fresh Slurry, 100 ppm Surfynol		
45			0.181		
40		0.167		0.180	
30	0.113		0.139		0.099
20		0.088		0.094	
15			0.080		
	Average of All Data		**0.127**		
			3-Month Irradiated Slurry		
45			0.144		
40		0.177		0.133	
30	0.090		0.107		0.101
20		0.080		0.08	
15			0.078		
	Average of All Data		**0.103**		
			2-Year Irradiated Slurry		
45			0.061		
40		0.117		0.133	
30	0.039		0.049		0.057
20		0.029		0.040	
15			0.028		
	Average of All Data		**0.048**		
			2-Year Irradiated Slurry, Reprecipitated, 500 ppm Surfynol		
45			0.107		
40		0.085		0.114	
30	0.070		0.092		0.127
20		0.073		0.097	
15			0.079		
	Average of All Data		**0.094**		

a - from Reference 4

APPENDIX A

LATE WASH FACILITY MATERIAL BALANCE

Calculational Bases

In-Tank Precipitation

- Tank 48 slurry temperature - 60°C
- Following the final ITP precipitation and concentration steps, the aqueous fraction of the slurry in Tank 48 is washed to less than 0.20M nitrate while maintaining at least 1.20M free hydroxide by adding 50 wt% NaOH
- Washing is continued, inhibiting with 40 wt% NaNO2 until the following criterion is met:

$$[NO3^-] + [NO2^-] = 0.30M$$

- The target inhibitor concentration is set at 1.5 times that determined by the following algorithm:

$$\log[NO2^-) = -0.984 + 0.0319T + 1.79\log[NO3^-] + 0.472(\log[NO3^-])^2$$

T= slurry temp, °C [2]
$[NO2^-],[NO3^-] = M$

- Washing is continued until the following criterion is met:

$$[NO3^-] + [NO2^-] = 0.30M$$

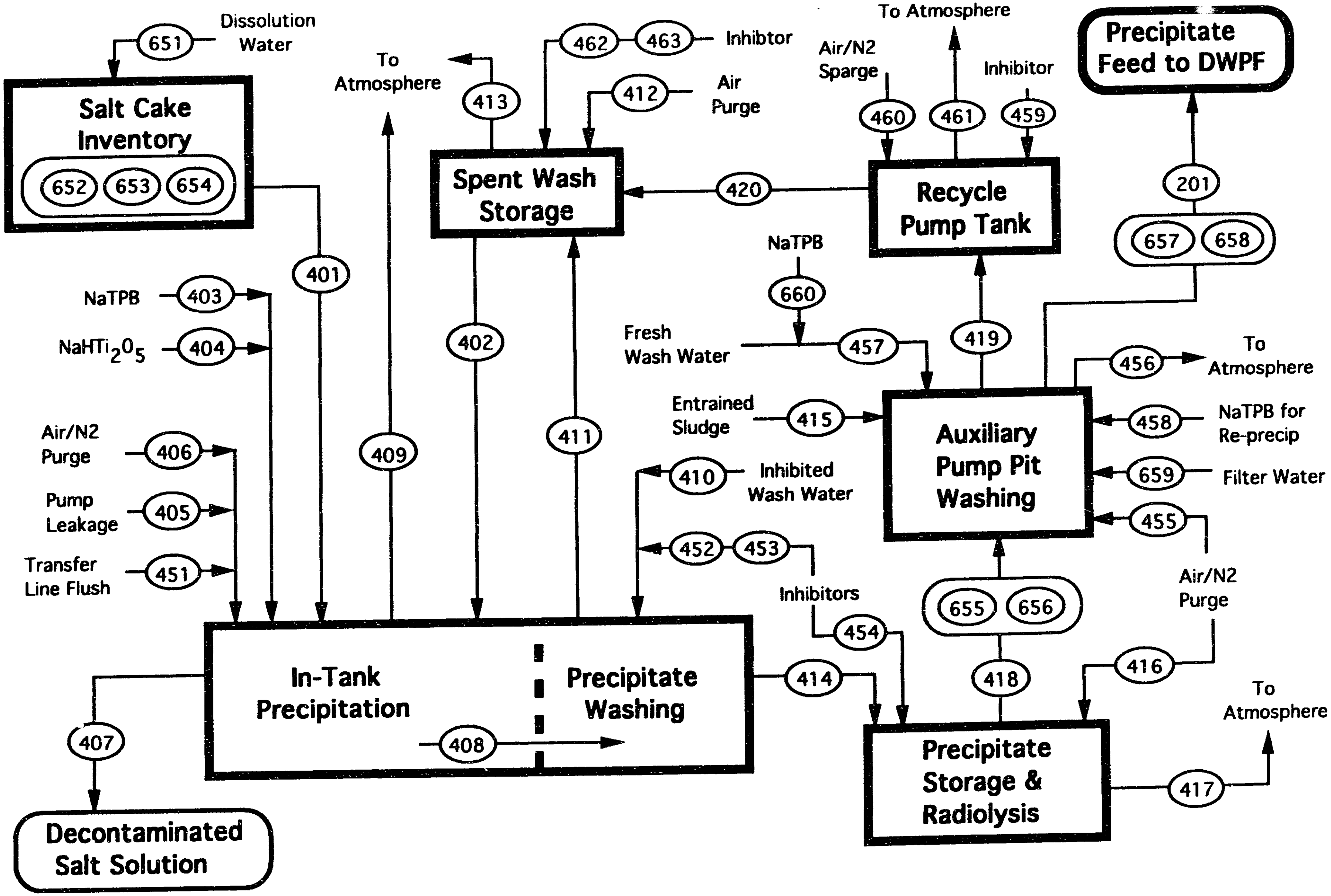
Tank 49 Storage

- Precipitate is stored for 2 years with a Cs-137 concentration of 36 Ci/gal
- Cs/NH4/K solids go into solution at a rate of 6.5% per year.
- Rate of consumption of hydroxide - 0.01M per month
- Rate of radiolytic conversion of nitrate to nitrite - 0.15M per year until the final equilibrium $[NO3^-]$ concentration of 0.002M is reached
- Rate of radiolytic destruction of nitrite - 0.075M per year

Late Washing

- 240 gallons of cross-flow filter "layup" water is drained into the PPT before reprecipitation
- Operating heel in PPT - 650 gallon
- NaTPB addition is based on the stoichiometric amount required to precipitate soluble K^+, $NH4^+$ and Cs^+ plus an excess to adjust the TPB^- concentration in the aqueous fraction to 0.004M or greater.
- The insoluble solids are concentrated to 10 wt% before initiating washing
- Wash water contains 0.004M NaTPB
- Washing endpoint - 0.01M nitrite (aqueous fraction)
- Benzene content of spent wash is stripped into the vessel vent system until the residual benzene content is $\leq$5 ppm. The benzene content in aqueous fraction of slurry batch from Tank 49 is projected to be 0.004M [3]
- Hydroxide content of spent wash is adjusted to 1.2M before transfer to Tank 22
- Instantaneous slurry flow to DWPF = 1.33 gpm based on 10 wt% insoluble solids content

Additional calculational bases are found in WSRC-TR-92-211.



SECTION 1A. IN-TANK PRECIPITATION/SALT DECONTAMINATION

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

STREAM NUMBERS ->	651	652	653	654	401	402	420
STREAM NAME	Salt Cake Slurry Water	Salt Cake fm Invntory	Sludge Proc Salt Cake	DWPF Recycl Salt to ITP	Salt Soln Feed to Prec	Total Spent Wash Recycle	Recycl spent Pmp Pit Wash
COMPONENT FLOWS, LB/HR							
122 (C6H5)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
123 (C6H5)2C6H4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
118 (C6H5)2NH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
133 (C6H5B(OH)2 salt)	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
132 (C6H5B(OH)2)	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
131 (C6H5OH salt)	ZERO	ZERO	ZERO	0.1513E+00	0.1513E+00	0.2214E+01	0.1985E+01
130 (C6H5OH)	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
121 (C6H6)	ZERO	ZERO	ZERO	0.2601E-09	0.2601E-09	0.1561E-03	0.7218E-02
155 (CH3)2CHOH	ZERO	ZERO	ZERO	0.8289E-12	0.8289E-12	0.9477E-05	0.1540E-08
154 (CH3OH)	ZERO	ZERO	ZERO	0.4074E-13	0.4074E-13	0.7343E-06	0.1778E-09
45 Ag	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
116 Ag2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
134 AgNO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
77 Al2O3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
106 B2O3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
9 Ba(OH)2	ZERO	0.1682E+00	0.1841E-01	ZERO	0.1866E+00	0.1239E-06	0.1735E-12
15 BaO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
24 BaSO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
66 CO	ZERO	ZERO	ZERO	0.1429E-15	0.1429E-15	TRACE	TRACE
37 CO2	ZERO	ZERO	ZERO	0.2191E-09	0.2191E-09	0.1286E-15	ZERO
142 CO2 (C14)	ZERO	ZERO	ZERO	0.1196E-18	0.1196E-18	TRACE	TRACE
63 Ca(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
120 Ca(OH)2	ZERO	0.1381E-01	0.1512E-02	ZERO	0.1532E-01	0.5766E-03	0.8085E-05
113 Ca3(PO4)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
20 CaC2O4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
18 CaCO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
64 CaCO3 (C14)	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
78 CaF2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
41 CaO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
19 CaSO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
29 Carbon	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
99 Cement	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
26 Co(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
59 CoO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
98 Cr2O3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
42 Cs2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
53 CsCOOH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
96 CsCl	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
8 CsOH	ZERO	0.2177E+00	0.2383E-01	0.2803E-01	0.2695E+00	0.2124E-03	0.2123E-03
151 CsTPB	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
54 Cu(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
55 CuO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
80 Fe2O3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
101 FeO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
102 Group A	ZERO	0.1432E+00	0.1568E-01	ZERO	0.1589E+00	0.6519E-02	0.6035E-03
103 Group B	ZERO	0.3460E-03	0.3788E-04	ZERO	0.3839E-03	0.2997E-02	0.2876E-02
25 H2	ZERO	ZERO	ZERO	ZERO	ZERO	0.2775E-11	0.9461E-10
158 H2C2O4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

STREAM NUMBERS (CONT'D) ->	651	652	653	654	401	402	420
STREAM NAME	Salt Cake Slurry Water	Salt Cake fm Invntory	Sludge Proc Salt Cake	DWPF Recycl Salt to ITP	Salt Soln Feed to Prec	Total Spent Wash Recycle	Recycl spent Pmp Pit Wash
93 H2SO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
90 H3BO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
34 HCOOH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
43 HCl	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
85 HF	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
49 HNO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
36 Hg	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
129 Hg(C6H5)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
135 Hg(NO3)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
144 Hg2Cl2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
117 Hg2I2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
146 HgCl2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
21 HgO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
97 I2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
39 K2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
51 KCOOH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
157 KMnO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
161 KNO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
10 KOH	ZERO	0.7647E+01	0.8928E+00	0.1095E+00	0.8649E+01	ZERO	ZERO
150 KTPB	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
105 La2O3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
108 Li2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
65 Mg(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
33 MgO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
60 Mn(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
56 MnO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
14 MnO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
145 MoO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
81 N2	ZERO	ZERO	ZERO	0.2062E-08	0.2062E-08	0.5172E-01	0.2899E-01
74 N2O	ZERO	ZERO	ZERO	TRACE	TRACE	0.3783E-10	0.1149E-07
114 NH3OHNO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
52 NH4COOH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
68 NH4OH	ZERO	0.2934E+00	0.3425E-01	0.5486E-05	0.3276E+00	ZERO	ZERO
148 NH4TPB	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
35 NO	ZERO	ZERO	ZERO	0.3342E-15	0.3342E-15	0.1277E-23	TRACE
84 NO2	ZERO	ZERO	ZERO	0.6790E-15	0.6790E-15	0.2594E-23	TRACE
70 Na(HgO(OH))	ZERO	0.3275E+00	0.5094E+00	ZERO	0.8300E+00	0.3069E-04	0.4770E-09
94 Na2B4O7	ZERO	ZERO	ZERO	0.1347E+00	0.1347E+00	0.1088E+01	0.1044E+01
109 Na2C2O4	ZERO	0.1055E+02	0.1155E+01	0.7909E+01	0.1962E+02	0.1647E+01	0.8865E+00
5 Na2CO3	ZERO	0.1707E+03	0.1869E+02	0.2687E-11	0.1894E+03	0.1475E+02	0.7446E+01
143 Na2CO3 (C14)	ZERO	0.1713E-06	0.1876E-07	ZERO	0.1901E-06	0.7155E-08	0.1003E-09
89 Na2CrO4	ZERO	0.5245E+01	0.5742E+00	ZERO	0.5819E+01	0.2191E+00	0.3071E-02
115 Na2MoO4	ZERO	0.8646E+00	0.9465E-01	ZERO	0.9592E+00	0.3611E-01	0.5063E-03
32 Na2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
71 Na2PuO2(OH)4	ZERO	0.1563E-03	0.1711E-04	ZERO	0.1734E-03	0.2086E-06	0.4089E-10
73 Na2RhO4	ZERO	0.2183E-01	0.2390E-02	ZERO	0.2422E-01	0.9118E-03	0.1278E-04
72 Na2RuO4	ZERO	0.9376E-01	0.1026E-01	ZERO	0.1040E+00	0.3915E-02	0.5490E-04
6 Na2SO4	ZERO	0.1946E+03	0.2130E+02	0.2654E+00	0.2162E+03	0.8131E+01	0.1144E+00
88 Na2SiO3	ZERO	0.4578E+01	0.5011E+00	ZERO	0.5079E+01	0.1912E+00	0.2680E-02

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

STREAM NUMBERS (CONT'D) ->	651	652	653	654	401	402	420
STREAM NAME	Salt Cake Slurry Water	Salt Cake fm Invntory	Sludge Proc Salt Cake	DWPF Recycl Salt to ITP	Salt Soln Feed to Prec	Total Spent Wash Recycle	Recycl spent Pmp Pit Wash
87 Na3PO4	ZERO	0.1380E+02	0.1510E+01	0.4040E-03	0.1531E+02	0.5762E+00	0.8112E-02
91 NaAg(OH)2	ZERO	0.7535E-02	0.8249E-03	ZERO	0.8360E-02	0.5570E-06	0.1560E-10
75 NaAl(OH)4	ZERO	0.3306E+03	0.6041E+02	ZERO	0.3910E+03	0.1472E+02	0.2064E+00
50 NaCOOH	ZERO	ZERO	ZERO	0.5664E+00	0.5664E+00	0.2132E-01	0.2990E-03
7 NaCl	ZERO	0.1214E+02	0.1329E+01	0.4535E+00	0.1393E+02	0.5966E+00	0.6609E-01
69 NaF	ZERO	0.6072E+01	0.6647E+00	0.6014E-01	0.6797E+01	0.2561E+00	0.3855E-02
11 NaHCO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
12 NaI	ZERO	0.3072E-02	0.3363E-03	0.1269E-01	0.1609E-01	0.6524E-03	0.5341E-04
3 NaNO2	ZERO	0.4005E+03	0.4384E+02	0.1274E+02	0.4570E+03	0.7160E+02	0.4653E+01
2 NaNO3	ZERO	0.1620E+04	0.1774E+03	0.6037E+01	0.1803E+04	0.6701E+02	0.1029E+00
4 NaOH	0.4025E+01	0.3968E+03	0.7573E+02	0.9404E+02	0.5706E+03	0.1869E+03	0.8417E+02
149 NaTPB	ZERO	ZERO	ZERO	ZERO	ZERO	0.2780E+01	0.2354E+01
160 NaTcO4	ZERO	0.8952E-01	0.9800E-02	ZERO	0.9932E-01	0.3739E-02	0.5242E-04
152 NaTi2O5H	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
61 Ni(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
40 NiO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
82 O2	ZERO	ZERO	ZERO	0.2138E-08	0.2138E-08	0.3027E-01	0.1294E-02
86 PbCO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
67 PbO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
147 PbS	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
28 PbSO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
124 Pd	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
112 Pd(NO3)2	ZERO	0.4996E-05	0.5470E-06	ZERO	0.5543E-05	0.2087E-06	0.2926E-08
110 PdO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
76 PuO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
156 PuO2(NaTi2O5)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
58 Rh	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
22 RhO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
95 Ru	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
79 RuO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
83 RuO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
38 SO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
141 SO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
137 Semi Vol Cs2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
136 Semi Vol CsCl	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
126 Semi Vol Group A	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
140 Semi Vol Na2B4O7	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
138 Semi Vol NaCl	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
139 Semi Vol NaF	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
125 Semi Vol NaI	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
23 Semi Vol RuO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
111 SiO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
48 Sr(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
153 Sr(NaTi2O5)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
127 Sr(OH)2	ZERO	0.2048E-04	0.2242E-05	ZERO	0.2273E-04	0.5301E-08	0.2227E-12
30 SrCO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
46 SrO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
159 TcO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
92 ThO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

STREAM NUMBERS (CONT'D) ->	651	652	653	654	401	402	420
STREAM NAME	Salt Cake Slurry Water	Salt Cake fm Invntory	Sludge Proc Salt Cake	DWPF Recycl Salt to ITP	Salt Soln Feed to Prec	Total Spent Wash Recycle	Recycl spent Pmp Pit Wash
107 TiO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
119 Tritium	ZERO	0.5763E-06	0.6309E-07	0.6876E-11	0.6394E-06	0.2379E-07	0.2883E-09
17 U3O8	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
62 UO2(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
16 UO2(OH)2	ZERO	0.1195E-02	0.1308E-03	ZERO	0.1326E-02	0.4991E-04	0.6998E-06
27 Y(COOH)3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
128 Y(OH)3	ZERO	0.2065E-04	0.2261E-05	ZERO	0.2291E-04	0.2123E-08	0.2122E-12
31 Y2(CO3)3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
47 Y2O3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
100 Zeolite	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
44 Zn(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
57 ZnO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
104 ZrO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
13 hydrate H2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
1 water	0.6705E+04	0.5604E+03	0.7141E+02	0.2168E+02	0.7358E+04	0.3760E+04	0.1699E+04
TOTAL FLOW, LB/HR	0.6709E+04	0.3736E+04	0.4761E+03	0.1442E+03	0.1106E+05	0.4133E+04	0.1802E+04
TEMPERATURE, DEG C	0.2500E+02	0.3500E+02	0.3500E+02	0.1000E+03	0.2739E+02	0.3976E+02	0.3971E+02
PRESSURE, ATM	0.1000E+01	0.1000E+01	0.1000E+01	0.1000E+01	0.1000E+01	0.9656E+00	0.9656E+00
PRESSURE, PSIG	ZERO	ZERO	ZERO	ZERO	ZERO	-0.5055E+00	-0.5055E+00
PRESSURE, MM HG						0.7339E+03	0.7339E+03
ENTHALPY, PCU/HR	0.1683E+06	0.4708E+05	0.6005E+04	0.5949E+04	0.2273E+06	0.1539E+06	0.6882E+05
VAPOR FLOW, CFM							
LIQUID FLOW, GPM	0.1339E+02	0.3508E+01	0.4486E+00	0.1249E+00	0.1747E+02	0.7769E+01	0.3464E+01
DENSITY, LBS/FT3	0.6246E+02	0.1328E+03	0.1323E+03	0.1439E+03	0.7899E+02	0.6632E+02	0.6485E+02
PHASE	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

STREAM NUMBERS ->	403	404	405	406	451	407	408
STREAM NAME	NaTPB Additions	NaTi2O5H Additions	Total Pump Leakage	Gas Purge In-tnk Pptn	Preci Trnsfr Line Flush	Decon SN to Storage	Precipitated Slds Slurry
COMPONENT FLOWS, LB/HR							
122 (C6H5)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
123 (C6H5)2C6H4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
118 (C6H5)2NH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
133 (C6H5B(OH)2 salt)	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.6845E+00
132 (C6H5B(OH)2)	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
131 (C6H5OH salt)	0.4027E+01	ZERO	ZERO	ZERO	ZERO	0.6383E+01	0.2327E+00
130 (C6H5OH)	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
121 (C6H6)	ZERO	ZERO	ZERO	ZERO	ZERO	0.7558E-02	0.2630E-03
155 (CH3)2CHOH	ZERO	0.2274E+00	ZERO	ZERO	ZERO	0.1204E+00	0.1452E-04
154 (CH3OH)	ZERO	0.1218E-01	ZERO	ZERO	ZERO	0.7144E-02	0.1046E-05
45 Ag	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
116 Ag2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.5865E-02
134 AgNO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
77 Al2O3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
106 B2O3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
9 Ba(OH)2	ZERO	ZERO	ZERO	ZERO	ZERO	0.3441E-05	0.1258E-06
15 BaO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
24 BaSO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.2822E+00
66 CO	ZERO	ZERO	ZERO	ZERO	ZERO	0.1432E-19	0.5388E-21
37 CO2	ZERO	ZERO	ZERO	ZERO	ZERO	0.6619E-12	0.2490E-13
142 CO2 (C14)	ZERO	ZERO	ZERO	ZERO	ZERO	0.3611E-21	0.1359E-22
63 Ca(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
120 Ca(OH)2	ZERO	ZERO	ZERO	ZERO	ZERO	0.1532E-01	0.5774E-03
113 Ca3(PO4)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
20 CaC2O4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
18 CaCO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
64 CaCO3 (C14)	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
78 CaF2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
41 CaO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
19 CaSO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
29 Carbon	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
99 Cement	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
26 Co(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
59 CoO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
98 Cr2O3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
42 Cs2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
53 CsCOOH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
96 CsCl	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
8 CsOH	ZERO	ZERO	ZERO	ZERO	ZERO	0.2175E-05	0.8766E-07
151 CsTPB	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.8135E+00
54 Cu(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
55 CuO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
80 Fe2O3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
101 FeO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
102 Group A	ZERO	ZERO	ZERO	ZERO	ZERO	0.1594E+00	0.6007E-02
103 Group B	ZERO	ZERO	ZERO	ZERO	ZERO	0.3259E-02	0.1228E-03
25 H2	ZERO	ZERO	ZERO	ZERO	ZERO	0.4853E-06	0.1595E-07
158 H2C2O4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

STREAM NUMBERS (CONT'D) -> STREAM NAME	403 NaTPB Additions	404 NaTi2O5H Additions	405 Total Pump Leakage	406 Gas Purge In-tnk Pptn	451 Preci Trnsfr Line Flush	407 Decon SN to Storage	408 Precipitated Slds Slurry
93 H2SO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
90 H3BO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
34 HCOOH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
43 HCl	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
85 HF	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
49 HNO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
36 Hg	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
129 Hg(C6H5)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.1147E+01
135 Hg(NO3)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
144 Hg2Cl2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
117 Hg2I2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
146 HgCl2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
21 HgO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
97 I2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
39 K2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
51 KCOOH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
157 KMnO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
161 KNO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
10 KOH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
150 KTPB	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.5525E+02
105 La2O3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
108 Li2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
65 Mg(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
33 MgO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
60 Mn(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
56 MnO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
14 MnO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
145 MoO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
81 N2	ZERO	ZERO	ZERO	0.2207E+04	ZERO	0.1818E+00	0.6839E-02
74 N2O	ZERO	ZERO	ZERO	ZERO	ZERO	0.7162E-13	0.2694E-14
114 NH3OHNO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
52 NH4COOH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
68 NH4OH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
148 NH4TPB	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.3153E+01
35 NO	ZERO	ZERO	ZERO	ZERO	ZERO	0.8133E-19	0.3060E-20
84 NO2	ZERO	ZERO	ZERO	ZERO	ZERO	0.1653E-18	0.6218E-20
70 Na(HgO(OH))	ZERO	ZERO	ZERO	ZERO	ZERO	0.8523E-03	0.3116E-04
94 Na2B4O7	ZERO	ZERO	ZERO	ZERO	ZERO	0.1178E+01	0.4442E-01
109 Na2C2O4	ZERO	ZERO	ZERO	ZERO	ZERO	0.2049E+02	0.7724E+00
5 Na2CO3	ZERO	ZERO	ZERO	ZERO	ZERO	0.1967E+03	0.7415E+01
143 Na2CO3 (C14)	ZERO	ZERO	ZERO	ZERO	ZERO	0.1901E-06	0.7164E-08
89 Na2CrO4	ZERO	ZERO	ZERO	ZERO	ZERO	0.5819E+01	0.2193E+00
115 Na2MoO4	ZERO	ZERO	ZERO	ZERO	ZERO	0.9592E+00	0.3615E-01
32 Na2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
71 Na2PuO2(OH)4	ZERO	ZERO	ZERO	ZERO	ZERO	0.4060E-05	0.2118E-06
73 Na2RhO4	ZERO	ZERO	ZERO	ZERO	ZERO	0.2422E-01	0.9130E-03
72 Na2RuO4	ZERO	ZERO	ZERO	ZERO	ZERO	0.1040E+00	0.3920E-02
6 Na2SO4	ZERO	ZERO	ZERO	ZERO	ZERO	0.2160E+03	0.8141E+01
88 Na2SiO3	ZERO	ZERO	ZERO	ZERO	ZERO	0.5078E+01	0.1914E+00

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

STREAM NUMBERS (CONT'D) ->	403	404	405	406	451	407	408
STREAM NAME	NaTPB Additions	NaTi2O5H Additions	Total Pump Leakage	Gas Purge In-tnk Pptn	Preci Trnsfr Line Flush	Decon SN to Storage	Precipitated Slds Slurry
87 Na3PO4	ZERO	ZERO	ZERO	ZERO	ZERO	0.1531E+02	0.5769E+00
91 NaAg(OH)2	ZERO	ZERO	ZERO	ZERO	ZERO	0.1547E-04	0.5656E-06
75 NaAl(OH)4	ZERO	ZERO	ZERO	ZERO	ZERO	0.3910E+03	0.1474E+02
50 NaCOOH	ZERO	ZERO	ZERO	ZERO	ZERO	0.5664E+00	0.2135E-01
7 NaCl	0.3230E+00	ZERO	ZERO	ZERO	ZERO	0.1431E+02	0.5387E+00
69 NaF	ZERO	ZERO	ZERO	ZERO	ZERO	0.6796E+01	0.2562E+00
11 NaHCO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
12 NaI	ZERO	ZERO	ZERO	ZERO	ZERO	0.1614E-01	0.6083E-03
3 NaNO2	ZERO	0.1642E-02	ZERO	ZERO	ZERO	0.5094E+03	0.1920E+02
2 NaNO3	ZERO	ZERO	ZERO	ZERO	ZERO	0.1803E+04	0.6794E+02
4 NaOH	0.1611E+01	0.4053E-01	0.1112E-01	ZERO	0.1542E-01	0.7384E+03	0.2783E+02
149 NaTPB	0.6891E+02	ZERO	ZERO	ZERO	ZERO	0.1276E+02	0.4332E+00
160 NaTcO4	ZERO	ZERO	ZERO	ZERO	ZERO	0.9932E-01	0.3743E-02
152 NaTi2O5H	ZERO	0.1268E+01	ZERO	ZERO	ZERO	ZERO	0.1268E+01
61 Ni(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
40 NiO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
82 O2	ZERO	ZERO	ZERO	0.1362E+03	ZERO	0.2174E-01	0.8178E-03
86 PbCO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
67 PbO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
147 PbS	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
28 PbSO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
124 Pd	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
112 Pd(NO3)2	ZERO	ZERO	ZERO	ZERO	ZERO	0.5543E-05	0.2089E-06
110 PdO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
76 PuO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
156 PuO2(NaTi2O5)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.2954E-03
58 Rh	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
22 RhO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
95 Ru	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
79 RuO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
83 RuO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
38 SO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
141 SO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
137 Semi Vol Cs2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
136 Semi Vol CsCl	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
126 Semi Vol Group A	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
140 Semi Vol Na2B4O7	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
138 Semi Vol NaCl	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
139 Semi Vol NaF	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
125 Semi Vol NaI	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
23 Semi Vol RuO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
111 SiO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
48 Sr(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
153 Sr(NaTi2O5)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.9021E-04
127 Sr(OH)2	ZERO	ZERO	ZERO	ZERO	ZERO	0.1063E-06	0.5383E-08
30 SrCO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
46 SrO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
159 TcO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
92 ThO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

STREAM NUMBERS (CONT'D) ->	403	404	405	406	451	407	408
STREAM NAME	NaTPB Additions	NaTi2O5H Additions	Total Pump Leakage	Gas Purge In-tnk Pptn	Preci Trnsfr Line Flush	Decon SN to Storage	Precipitated Slds Slurry
107 TiO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
119 Tritium	ZERO	ZERO	ZERO	ZERO	ZERO	0.6353E-06	0.2395E-07
17 U3O8	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
62 UO2(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
16 UO2(OH)2	ZERO	ZERO	ZERO	ZERO	ZERO	0.1326E-02	0.4998E-04
27 Y(COOH)3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
128 Y(OH)3	ZERO	ZERO	ZERO	ZERO	ZERO	0.1081E-06	0.2155E-08
31 Y2(CO3)3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
47 Y2O3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.1840E-04
100 Zeolite	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
44 Zn(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
57 ZnO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
104 ZrO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
13 hydrate H2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.4405E-05
1 water	0.3279E+03	0.9399E+01	0.1852E+02	0.9863E+01	0.2568E+02	0.1103E+05	0.4148E+03
TOTAL FLOW, LB/HR	0.4027E+03	0.1095E+02	0.1853E+02	0.2353E+04	0.2570E+02	0.1497E+05	0.6260E+03
TEMPERATURE, DEG C	0.3500E+02	0.3500E+02	0.2500E+02	0.3500E+02	0.2500E+02	0.3000E+02	0.3000E+02
PRESSURE, ATM	0.1000E+01	0.1000E+01	0.1000E+01	0.1000E+01	0.1000E+01	0.1000E+01	0.1000E+01
PRESSURE, PSIG	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
PRESSURE, MM HG							
ENTHALPY, PCU/HR	0.1153E+05	0.3352E+03	0.4647E+03	0.2742E+05	0.6446E+03	0.3614E+06	0.1360E+05
VAPOR FLOW, CFM				0.5641E+03			
LIQUID FLOW, GPM	0.7897E+00	0.2196E-01	0.3699E-01		0.5130E-01	0.2497E+02	0.1053E+01
DENSITY, LBS/FT3	0.6358E+02	0.6217E+02	0.6246E+02	0.6954E-01	0.6246E+02	0.7476E+02	0.7413E+02
PHASE	LIQUID	LIQUID	LIQUID	VAPOR	LIQUID	LIQUID	LIQUID

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

STREAM NUMBERS ->	409	410	411	452	453	412	413
STREAM NAME	Prc Proc Tnk Vnt to Atmos	Inhibited Wash Water	Spent Wash to Storage	NaOH add'n to TK 48	NaNO2 add'n to TK 48	Spnt Wash Strge Purge	Ppt Wsh Strg Vnt to Atmo
COMPONENT FLOWS, LB/HR							
122 (C6H5)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
123 (C6H5)2C6H4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
118 (C6H5)2NH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
133 (C6H5B(OH)2 salt)	0.2888E-10	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
132 (C6H5B(OH)2)	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
131 (C6H5OH salt)	0.1432E-09	ZERO	0.2292E+00	ZERO	ZERO	ZERO	0.3215E-10
130 (C6H5OH)	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
121 (C6H6)	0.6170E+00	ZERO	0.2590E-03	ZERO	ZERO	ZERO	0.7321E-02
155 (CH3)2CHOH	0.1070E+00	ZERO	0.1430E-04	ZERO	ZERO	ZERO	0.4825E-05
154 (CH3OH)	0.5031E-02	ZERO	0.1030E-05	ZERO	ZERO	ZERO	0.2962E-06
45 Ag	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
116 Ag2O	0.2406E-12	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
134 AgNO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
77 Al2O3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
106 B2O3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
9 Ba(OH)2	0.7712E-16	ZERO	0.1239E-06	ZERO	ZERO	ZERO	0.1799E-17
15 BaO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
24 BaSO4	0.1158E-10	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
66 CO	0.1428E-15	ZERO	0.5306E-21	ZERO	ZERO	ZERO	0.5305E-21
37 CO2	0.2185E-09	ZERO	0.2452E-13	ZERO	ZERO	ZERO	0.2439E-13
142 CO2 (C14)	0.1192E-18	ZERO	0.1338E-22	ZERO	ZERO	ZERO	0.1331E-22
63 Ca(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
120 Ca(OH)2	0.3433E-12	ZERO	0.5686E-03	ZERO	ZERO	ZERO	0.8373E-14
113 Ca3(PO4)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
20 CaC2O4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
18 CaCO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
64 CaCO3 (C14)	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
78 CaF2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
41 CaO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
19 CaSO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
29 Carbon	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
99 Cement	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
26 Co(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
59 CoO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
98 Cr2O3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
42 Cs2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
53 CsCOOH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
96 CsCl	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
8 CsOH	0.4873E-16	ZERO	0.8632E-07	ZERO	ZERO	ZERO	0.3085E-14
151 CsTPB	0.3338E-10	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
54 Cu(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
55 CuO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
80 Fe2O3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
101 FeO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
102 Group A	0.3571E-11	ZERO	0.5916E-02	ZERO	ZERO	ZERO	0.9466E-13
103 Group B	0.7302E-13	ZERO	0.1210E-03	ZERO	ZERO	ZERO	0.4352E-13
25 H2	0.4813E-02	ZERO	0.1571E-07	ZERO	ZERO	ZERO	0.1580E-07
158 H2C2O4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

STREAM NUMBERS (CONT'D) ->	409	410	411	452	453	412	413
STREAM NAME	Prc Proc Tnk Vnt to Atmos	Inhibited Wash Water	Spent Wash to Storage	NaOH add'n to TK 48	NaNO2 add'n to TK 48	Spnt Wash Strge Purge	Ppt Wsh Strg Vnt to Atmo
93 H2SO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
90 H3BO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
34 HCOOH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
43 HCl	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
85 HF	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
49 HNO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
36 Hg	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
129 Hg(C6H5)2	0.4704E-10	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
135 Hg(NO3)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
144 Hg2Cl2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
117 Hg2I2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
146 HgCl2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
21 HgO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
97 I2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
39 K2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
51 KCOOH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
157 KMnO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
161 KNO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
10 KOH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
150 KTPB	0.2267E-08	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
105 La2O3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
108 Li2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
65 Mg(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
33 MgO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
60 Mn(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
56 MnO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
14 MnO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
145 MoO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
81 N2	0.2207E+04	ZERO	0.6735E-02	ZERO	ZERO	0.3607E+03	0.3607E+03
74 N2O	0.3773E-10	ZERO	0.2653E-14	ZERO	ZERO	ZERO	0.1145E-07
114 NH3OHNO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
52 NH4COOH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
68 NH4OH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
148 NH4TPB	0.1294E-09	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
35 NO	0.3341E-15	ZERO	0.3013E-20	ZERO	ZERO	ZERO	0.3012E-20
84 NO2	0.6789E-15	ZERO	0.6123E-20	ZERO	ZERO	ZERO	0.6121E-20
70 Na(HgO(OH))	0.1910E-13	ZERO	0.3069E-04	ZERO	ZERO	ZERO	0.4456E-15
94 Na2B4O7	0.2641E-10	ZERO	0.4374E-01	ZERO	ZERO	ZERO	0.1580E-10
109 Na2C2O4	0.4592E-09	ZERO	0.7606E+00	ZERO	ZERO	ZERO	0.2392E-10
5 Na2CO3	0.4408E-08	ZERO	0.7302E+01	ZERO	ZERO	ZERO	0.2142E-09
143 Na2CO3 (C14)	0.4259E-17	ZERO	0.7055E-08	ZERO	ZERO	ZERO	0.1039E-18
89 Na2CrO4	0.1304E-09	ZERO	0.2160E+00	ZERO	ZERO	ZERO	0.3181E-11
115 Na2MoO4	0.2149E-10	ZERO	0.3560E-01	ZERO	ZERO	ZERO	0.5243E-12
32 Na2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
71 Na2PuO2(OH)4	0.9085E-16	ZERO	0.2086E-06	ZERO	ZERO	ZERO	0.3029E-17
73 Na2RhO4	0.5428E-12	ZERO	0.8991E-03	ZERO	ZERO	ZERO	0.1324E-13
72 Na2RuO4	0.2331E-11	ZERO	0.3861E-02	ZERO	ZERO	ZERO	0.5686E-13
6 Na2SO4	0.4840E-08	ZERO	0.8017E+01	ZERO	ZERO	ZERO	0.1181E-09
88 Na2SiO3	0.1138E-09	ZERO	0.1885E+00	ZERO	ZERO	ZERO	0.2776E-11

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt D contamination

STREAM NUMBERS (CONT'D) ->	409	410	411	452	453	412	413
STREAM NAME	Prc Proc Tnk Vnt to Atmos	Inhibited Wash Water	Spent Wash to Storage	NaOH add'n to TK 48	NaNO2 add'n to TK 48	Spnt Wash Strge Purge	Ppt Wsh Strg Vnt to Atmo
87 Na3PO4	0.3430E-09	ZERO	0.5681E+00	ZERO	ZERO	ZERO	0.8367E-11
91 NaAg(OH)2	0.3467E-15	ZERO	0.5570E-06	ZERO	ZERO	ZERO	0.8088E-17
75 NaAl(OH)4	0.8761E-08	ZERO	0.1451E+02	ZERO	ZERO	ZERO	0.2137E-09
50 NaCOOH	0.1269E-10	ZERO	0.2102E-01	ZERO	ZERO	ZERO	0.3096E-12
7 NaCl	0.3206E-09	ZERO	0.5305E+00	ZERO	ZERO	ZERO	0.8663E-11
69 NaF	0.1523E-09	ZERO	0.2523E+00	ZERO	ZERO	ZERO	0.3719E-11
11 NaHCO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
12 NaI	0.3616E-12	ZERO	0.5990E-03	ZERO	ZERO	ZERO	0.9473E-14
3 NaNO2	0.1142E-07	ZERO	0.6695E+02	ZERO	0.5837E+02	ZERO	0.1040E-08
2 NaNO3	0.4039E-07	ZERO	0.6690E+02	ZERO	ZERO	ZERO	0.9730E-09
4 NaOH	0.1655E-07	0.1221E+01	0.9462E+02	0.6902E+02	ZERO	ZERO	0.2714E-08
149 NaTPB	0.4944E-09	ZERO	0.4266E+00	ZERO	ZERO	ZERO	0.4037E-10
160 NaTcO4	ZERO	ZERO	0.3686E-02	ZERO	ZERO	ZERO	ZERO
152 NaTi2O5H	0.7886E-10	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
61 Ni(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
40 NiO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
82 O2	0.1362E+03	ZERO	0.8054E-03	ZERO	ZERO	0.1090E+03	0.1089E+03
86 PbCO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
67 PbO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
147 PbS	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
28 PbSO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
124 Pd	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
112 Pd(NO3)2	0.1242E-15	ZERO	0.2057E-06	ZERO	ZERO	ZERO	0.3030E-17
110 PdO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
76 PuO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
156 PuO2(NaTi2O5)2	0.1216E-13	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
58 Rh	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
22 RhO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
95 Ru	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
79 RuO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
83 RuO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
38 SO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
141 SO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
137 Semi Vol Cs2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
136 Semi Vol CsCl	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
126 Semi Vol Group A	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
140 Semi Vol Na2B4O7	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
138 Semi Vol NaCl	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
139 Semi Vol NaF	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
125 Semi Vol NaI	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
23 Semi Vol RuO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
111 SiO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
48 Sr(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
153 Sr(NaTi2O5)2	0.3704E-14	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
127 Sr(OH)2	0.2378E-17	ZERO	0.5301E-08	ZERO	ZERO	ZERO	0.7698E-19
30 SrCO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
46 SrO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
159 TcO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
92 ThO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

STREAM NUMBERS (CONT'D) ->	409	410	411	452	453	412	413
STREAM NAME	Prc Proc Tnk Vnt to Atmos	Inhibited Wash Water	Spent Wash to Storage	NaOH add'n to TK 48	NaNO2 add'n to TK 48	Spnt Wash Strge Purge	Ppt Wsh Strg Vnt to Atmo
107 TiO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
119 Tritium	0.3905E-08	ZERO	0.2358E-07	ZERO	ZERO	ZERO	0.8393E-10
17 U3O8	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
62 UO2(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
16 UO2(OH)2	0.2971E-13	ZERO	0.4921E-04	ZERO	ZERO	ZERO	0.7248E-15
27 Y(COOH)3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
128 Y(OH)3	0.2426E-17	ZERO	0.2123E-08	ZERO	ZERO	ZERO	0.3082E-19
31 Y2(CO3)3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
47 Y2O3	0.7544E-15	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
100 Zeolite	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
44 Zn(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
57 ZnO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
104 ZrO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
13 hydrate H2O	0.1806E-15	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
1 water	0.6527E+02	0.2034E+04	0.2058E+04	0.6902E+02	0.8756E+02	0.7891E+01	0.1279E+02
TOTAL FLOW, LB/HR	0.2409E+04	0.2035E+04	0.2319E+04	0.1380E+03	0.1459E+03	0.4776E+03	0.4824E+03
TEMPERATURE, DEG C	0.4000E+02	0.2500E+02	0.2602E+02	0.2500E+02	0.2500E+02	0.3500E+02	0.4000E+02
PRESSURE, ATM	0.9656E+00	0.1000E+01	0.1000E+01	0.1000E+01	0.1000E+01	0.1000E+01	0.9656E+00
PRESSURE, PSIG	-0.5055E+00	ZERO	ZERO	ZERO	ZERO	ZERO	-0.5055E+00
PRESSURE, MM HG	0.7339E+03						0.7339E+03
ENTHALPY, PCU/HR	0.6422E+05	0.5105E+05	0.5553E+05	0.2292E+04	0.2535E+04	0.1002E+05	0.1358E+05
VAPOR FLOW, CFM	0.6155E+03					0.1128E+03	0.1207E+03
LIQUID FLOW, GPM		0.4063E+01	0.4292E+01	0.1805E+00	0.2136E+00		
DENSITY, LBS/FT3	0.6524E-01	0.6246E+02	0.6737E+02	0.9533E+02	0.8519E+02	0.7055E-01	0.6664E-01
PHASE	VAPOR	LIQUID	LIQUID	LIQUID	LIQUID	VAPOR	VAPOR

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

STREAM NUMBERS ->	462	463	414	415	416	417	454
STREAM NAME	50 wt% NaOH addn to TK22	40 wt% NaNO2 addn to TK22	Washed Prec to Storage	Entrnd Sldge in Preci Fd	Prec Strg Tk Air Purge	Precip Strg Vnt to Atmo	40% NaNO2 add to TK49
COMPONENT FLOWS, LB/HR							
122 (C6H5)2	ZERO	ZERO	ZERO	ZERO	ZERO	0.5978E-06	ZERO
123 (C6H5)2C6H4	ZERO	ZERO	ZERO	ZERO	ZERO	0.7239E-07	ZERO
118 (C6H5)2NH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
133 (C6H5B(OH)2 salt)	ZERO	ZERO	0.6845E+00	ZERO	ZERO	0.2549E-09	ZERO
132 (C6H5B(OH)2)	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
131 (C6H5OH salt)	ZERO	ZERO	0.3551E-02	ZERO	ZERO	0.6526E-09	ZERO
130 (C6H5OH)	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
121 (C6H6)	ZERO	ZERO	0.4012E-05	ZERO	ZERO	0.2817E+01	ZERO
155 (CH3)2CHOH	ZERO	ZERO	0.2216E-06	ZERO	ZERO	0.2102E-06	ZERO
154 (CH3OH)	ZERO	ZERO	0.1596E-07	ZERO	ZERO	0.1495E-07	ZERO
45 Ag	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
116 Ag2O	ZERO	ZERO	0.5865E-02	0.2935E-03	ZERO	0.2720E-11	ZERO
134 AgNO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
77 Al2O3	ZERO	ZERO	ZERO	0.4591E+00	ZERO	ZERO	ZERO
106 B2O3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
9 Ba(OH)2	ZERO	ZERO	0.1920E-08	ZERO	ZERO	0.8904E-18	ZERO
15 BaO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
24 BaSO4	ZERO	ZERO	0.2822E+00	0.7330E-02	ZERO	0.1309E-09	ZERO
66 CO	ZERO	ZERO	0.8221E-23	ZERO	ZERO	0.8221E-23	ZERO
37 CO2	ZERO	ZERO	0.3799E-15	ZERO	ZERO	ZERO	ZERO
142 CO2 (C14)	ZERO	ZERO	0.2073E-24	ZERO	ZERO	0.2073E-24	ZERO
63 Ca(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
120 Ca(OH)2	ZERO	ZERO	0.8809E-05	ZERO	ZERO	0.4086E-14	ZERO
113 Ca3(PO4)2	ZERO	ZERO	ZERO	0.3593E-02	ZERO	ZERO	ZERO
20 CaC2O4	ZERO	ZERO	ZERO	0.1665E-01	ZERO	ZERO	ZERO
18 CaCO3	ZERO	ZERO	ZERO	0.6566E-01	ZERO	ZERO	ZERO
64 CaCO3 (C14)	ZERO	ZERO	ZERO	0.5368E-08	ZERO	ZERO	ZERO
78 CaF2	ZERO	ZERO	ZERO	0.2866E-02	ZERO	ZERO	ZERO
41 CaO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
19 CaSO4	ZERO	ZERO	ZERO	0.5343E-02	ZERO	ZERO	ZERO
29 Carbon	ZERO	ZERO	ZERO	0.2373E-02	ZERO	ZERO	ZERO
99 Cement	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
26 Co(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
59 CoO	ZERO	ZERO	ZERO	0.1409E-03	ZERO	ZERO	ZERO
98 Cr2O3	ZERO	ZERO	ZERO	0.6206E-02	ZERO	ZERO	ZERO
42 Cs2O	ZERO	ZERO	ZERO	0.1700E-03	ZERO	ZERO	ZERO
53 CsCOOH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
96 CsCl	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
8 CsOH	ZERO	ZERO	0.1337E-06	ZERO	ZERO	0.1626E-10	ZERO
151 CsTPB	ZERO	ZERO	0.8135E+00	ZERO	ZERO	0.3283E-09	ZERO
54 Cu(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
55 CuO	ZERO	ZERO	ZERO	0.2467E-02	ZERO	ZERO	ZERO
80 Fe2O3	ZERO	ZERO	ZERO	0.5751E+00	ZERO	ZERO	ZERO
101 FeO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
102 Group A	ZERO	ZERO	0.9165E-04	0.3551E-02	ZERO	0.4251E-13	ZERO
103 Group B	ZERO	ZERO	0.1874E-05	0.1965E-01	ZERO	0.8692E-15	ZERO
25 H2	ZERO	ZERO	0.2434E-09	ZERO	ZERO	0.7995E-01	ZERO
158 H2C2O4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

STREAM NUMBERS (CONT'D) ->	462	463	414	415	416	417	454
STREAM NAME	50 wt% NaOH addn to TK22	40 wt% NaNO2 addn to TK22	Washed Prec to Storage	Entrnd Sldge in Preci Fd	Prec Strg Tk Air Purge	Precip Strg Vnt to Atmo	40% NaNO2 add to TK49
93 H2SO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
90 H3BO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
34 HCOOH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
43 HCl	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
85 HF	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
49 HNO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
36 Hg	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
129 Hg(C6H5)2	ZERO	ZERO	0.1147E+01	ZERO	ZERO	0.5318E-09	ZERO
135 Hg(NO3)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
144 Hg2Cl2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
117 Hg2I2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
146 HgCl2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
21 HgO	ZERO	ZERO	ZERO	0.2975E-01	ZERO	ZERO	ZERO
97 I2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
39 K2O	ZERO	ZERO	ZERO	0.4746E-02	ZERO	ZERO	ZERO
51 KCOOH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
157 KMnO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
161 KNO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
10 KOH	ZERO	ZERO	ZERO	ZERO	ZERO	0.5211E-09	ZERO
150 KTPB	ZERO	ZERO	0.5525E+02	ZERO	ZERO	0.2230E-07	ZERO
105 La2O3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
108 Li2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
65 Mg(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
33 MgO	ZERO	ZERO	ZERO	0.5253E-02	ZERO	ZERO	ZERO
60 Mn(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
56 MnO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
14 MnO2	ZERO	ZERO	ZERO	0.1311E+00	ZERO	ZERO	ZERO
145 MoO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
81 N2	ZERO	ZERO	0.1043E-03	ZERO	0.2207E+04	0.2207E+04	ZERO
74 N2O	ZERO	ZERO	0.4111E-16	ZERO	ZERO	0.1821E+01	ZERO
114 NH3OHNO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
52 NH4COOH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
68 NH4OH	ZERO	ZERO	ZERO	ZERO	ZERO	0.1615E-06	ZERO
148 NH4TPB	ZERO	ZERO	0.3153E+01	ZERO	ZERO	0.1272E-08	ZERO
35 NO	ZERO	ZERO	0.4668E-22	ZERO	ZERO	0.4668E-22	ZERO
84 NO2	ZERO	ZERO	0.9487E-22	ZERO	ZERO	0.9487E-22	ZERO
70 Na(HgO(OH))	ZERO	ZERO	0.4755E-06	ZERO	ZERO	0.2205E-15	ZERO
94 Na2B4O7	ZERO	ZERO	0.6776E-03	ZERO	ZERO	0.5278E-09	ZERO
109 Na2C2O4	ZERO	ZERO	0.1178E-01	ZERO	ZERO	0.4480E-09	ZERO
5 Na2CO3	ZERO	ZERO	0.1131E+00	ZERO	ZERO	0.3763E-08	ZERO
143 Na2CO3 (C14)	ZERO	ZERO	0.1093E-09	ZERO	ZERO	0.5070E-19	ZERO
89 Na2CrO4	ZERO	ZERO	0.3346E-02	ZERO	ZERO	0.1552E-11	ZERO
115 Na2MoO4	ZERO	ZERO	0.5516E-03	ZERO	ZERO	0.2558E-12	ZERO
32 Na2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
71 Na2PuO2(OH)4	ZERO	ZERO	0.3231E-08	ZERO	ZERO	0.1499E-17	ZERO
73 Na2RhO4	ZERO	ZERO	0.1393E-04	ZERO	ZERO	0.6461E-14	ZERO
72 Na2RuO4	ZERO	ZERO	0.5981E-04	ZERO	ZERO	0.2774E-13	ZERO
6 Na2SO4	ZERO	ZERO	0.1242E+00	0.2498E-02	ZERO	0.5761E-10	ZERO
88 Na2SiO3	ZERO	ZERO	0.2920E-02	ZERO	ZERO	0.1355E-11	ZERO

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

STREAM NUMBERS (CONT'D) ->	462	463	414	415	416	417	454
STREAM NAME	50 wt% NaOH addn to TK22	40 wt% NaNO2 addn to TK22	Washed Prec to Storage	Entrnd Sldge in Preci Fd	Prec Strg Tk Air Purge	Precip Strg Vnt to Atmo	40% NaNO2 add to TK49
87 Na3PO4	ZERO	ZERO	0.8802E-02	0.2289E-03	ZERO	0.4083E-11	ZERO
91 NaAg(OH)2	ZERO	ZERO	0.8629E-08	ZERO	ZERO	0.4003E-17	ZERO
75 NaAl(OH)4	ZERO	ZERO	0.2248E+00	ZERO	ZERO	0.1043E-09	ZERO
50 NaCOOH	ZERO	ZERO	0.3257E-03	ZERO	ZERO	0.1511E-12	ZERO
7 NaCl	ZERO	ZERO	0.8219E-02	0.2087E-01	ZERO	0.3812E-11	ZERO
69 NaF	ZERO	ZERO	0.3908E-02	0.1830E-02	ZERO	0.1813E-11	ZERO
11 NaHCO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
12 NaI	ZERO	ZERO	0.9280E-05	0.3069E-03	ZERO	0.4304E-14	ZERO
3 NaNO2	ZERO	ZERO	0.1062E+02	ZERO	ZERO	0.2351E-08	ZERO
2 NaNO3	ZERO	ZERO	0.1037E+01	0.5272E-01	ZERO	0.4808E-10	ZERO
4 NaOH	0.8127E+01	ZERO	0.3451E+01	0.7245E-01	ZERO	0.2394E-10	ZERO
149 NaTPB	ZERO	ZERO	0.6610E-02	ZERO	ZERO	ZERO	ZERO
160 NaTcO4	ZERO	ZERO	0.5711E-04	ZERO	ZERO	ZERO	ZERO
152 NaTi2O5H	ZERO	ZERO	0.1268E+01	ZERO	ZERO	0.5881E-09	ZERO
61 Ni(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
40 NiO	ZERO	ZERO	ZERO	0.4898E-01	ZERO	ZERO	ZERO
82 O2	ZERO	ZERO	0.1248E-04	ZERO	0.1007E+03	0.1009E+03	ZERO
86 PbCO3	ZERO	ZERO	ZERO	0.2163E-02	ZERO	ZERO	ZERO
67 PbO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
147 PbS	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
28 PbSO4	ZERO	ZERO	ZERO	0.4882E-02	ZERO	ZERO	ZERO
124 Pd	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
112 Pd(NO3)2	ZERO	ZERO	0.3187E-08	ZERO	ZERO	0.1478E-17	ZERO
110 PdO	ZERO	ZERO	ZERO	0.1027E-02	ZERO	ZERO	ZERO
76 PuO2	ZERO	ZERO	ZERO	0.1094E-02	ZERO	ZERO	ZERO
156 PuO2(NaTi2O5)2	ZERO	ZERO	0.2954E-03	ZERO	ZERO	0.1370E-12	ZERO
58 Rh	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
22 RhO2	ZERO	ZERO	ZERO	0.4956E-03	ZERO	ZERO	ZERO
95 Ru	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
79 RuO2	ZERO	ZERO	ZERO	0.2535E-02	ZERO	ZERO	ZERO
83 RuO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
38 SO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
141 SO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
137 Semi Vol Cs2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
136 Semi Vol CsCl	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
126 Semi Vol Group A	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
140 Semi Vol Na2B4O7	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
138 Semi Vol NaCl	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
139 Semi Vol NaF	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
125 Semi Vol NaI	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
23 Semi Vol RuO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
111 SiO2	ZERO	ZERO	ZERO	0.5851E-01	ZERO	ZERO	ZERO
48 Sr(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
153 Sr(NaTi2O5)2	ZERO	ZERO	0.9021E-04	ZERO	ZERO	0.4184E-13	ZERO
127 Sr(OH)2	ZERO	ZERO	0.8213E-10	ZERO	ZERO	0.3810E-19	ZERO
30 SrCO3	ZERO	ZERO	ZERO	0.3353E-02	ZERO	ZERO	ZERO
46 SrO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
159 TcO2	ZERO	ZERO	ZERO	0.7005E-03	ZERO	ZERO	ZERO
92 ThO2	ZERO	ZERO	ZERO	0.1076E-01	ZERO	ZERO	ZERO

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

STREAM NUMBERS (CONT'D) ->	462	463	414	415	416	417	454
STREAM NAME	50 wt% NaOH addn to TK22	40 wt% NaNO2 addn to TK22	Washed Prec to Storage	Entrnd Sldge in Preci Fd	Prec Strg Tk Air Purge	Precip Strg Vnt to Atmo	40% NaNO2 add to TK49
107 TiO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
119 Tritium	ZERO	ZERO	0.3653E-09	ZERO	ZERO	0.4368E-10	ZERO
17 U3O8	ZERO	ZERO	ZERO	0.1181E+00	ZERO	ZERO	ZERO
62 UO2(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
16 UO2(OH)2	ZERO	ZERO	0.7625E-06	ZERO	ZERO	0.3537E-15	ZERO
27 Y(COOH)3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
128 Y(OH)3	ZERO	ZERO	0.3288E-10	ZERO	ZERO	0.1525E-19	ZERO
31 Y2(CO3)3	ZERO	ZERO	ZERO	0.1304E-02	ZERO	ZERO	ZERO
47 Y2O3	ZERO	ZERO	0.1840E-04	ZERO	ZERO	0.8535E-14	ZERO
100 Zeolite	ZERO	ZERO	ZERO	0.7823E-02	ZERO	ZERO	ZERO
44 Zn(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
57 ZnO	ZERO	ZERO	ZERO	0.4197E-02	ZERO	ZERO	ZERO
104 ZrO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
13 hydrate H2O	ZERO	ZERO	0.4405E-05	0.4647E+00	ZERO	0.2043E-14	ZERO
1 water	0.8127E+01	ZERO	0.5478E+03	ZERO	0.9863E+01	0.1612E+02	ZERO
TOTAL FLOW, LB/HR	0.1625E+02	ZERO	0.6260E+03	0.2223E+01	0.2318E+04	0.2329E+04	ZERO
TEMPERATURE, DEG C	0.2500E+02	0.2500E+02	0.3000E+02	0.6000E+02	0.3500E+02	0.4000E+02	0.2500E+02
PRESSURE, ATM	0.1000E+01	0.1000E+01	0.1000E+01	0.1000E+01	0.1000E+01	0.9656E+00	0.1000E+01
PRESSURE, PSIG	ZERO	ZERO	ZERO	ZERO	ZERO	-0.5055E+00	ZERO
PRESSURE, MM HG						0.7339E+03	
ENTHALPY, PCU/HR	0.2699E+03	ZERO	0.1660E+05	0.1885E+02	0.2742E+05	0.3382E+05	ZERO
VAPOR FLOW, CFM					0.5566E+03	0.5891E+03	
LIQUID FLOW, GPM	0.2126E-01		0.1218E+01	0.1743E-02			
DENSITY, LBS/FT3	0.9533E+02	ZERO	0.6408E+02	0.1590E+03	0.6941E-01	0.6589E-01	ZERO
PHASE	LIQUID	LIQUID	LIQUID	LIQUID	VAPOR	VAPOR	LIQUID

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

STREAM NUMBERS ->	418	655	656	659	458	455	456
STREAM NAME	Prec Storge Tank bottoms	Late Wash Fd Prec Soluble	Late Wash Fd Prec Insolub	X-Flow Filtr H2O Inventry	NaTPB add to Prec Pump Tk	Air/N2 Purge Prec Pump Tk	Prec Pump Tk vnt to Stack
COMPONENT FLOWS, LB/HR							
122 (C6H5)2	0.1289E+01	ZERO	0.1289E+01	ZERO	ZERO	ZERO	0.7042E-07
123 (C6H5)2C6H4	0.1561E+00	ZERO	0.1561E+00	ZERO	ZERO	ZERO	0.8528E-08
118 (C6H5)2NH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
133 (C6H5B(OH)2 salt)	0.5495E+00	ZERO	0.5495E+00	ZERO	ZERO	ZERO	0.3011E-10
132 (C6H5B(OH)2)	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
131 (C6H5OH salt)	0.1407E+01	0.1407E+01	ZERO	ZERO	0.6621E+00	ZERO	0.8976E-10
130 (C6H5OH)	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
121 (C6H6)	0.1876E+00	0.1876E+00	ZERO	ZERO	ZERO	ZERO	0.8187E-08
155 (CH3)2CHOH	0.1140E-07	0.1140E-07	ZERO	ZERO	ZERO	ZERO	0.6780E-08
154 (CH3OH)	0.1016E-08	0.1016E-08	ZERO	ZERO	ZERO	ZERO	0.5528E-09
45 Ag	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
116 Ag2O	0.5865E-02	ZERO	0.5865E-02	ZERO	ZERO	ZERO	0.3230E-12
134 AgNO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
77 Al2O3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.3997E-11
106 B2O3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
9 Ba(OH)2	0.1920E-08	0.1920E-08	ZERO	ZERO	ZERO	ZERO	0.8164E-23
15 BaO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
24 BaSO4	0.2822E+00	ZERO	0.2822E+00	ZERO	ZERO	ZERO	0.1548E-10
66 CO	TRACE	TRACE	ZERO	ZERO	ZERO	ZERO	TRACE
37 CO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
142 CO2 (C14)	TRACE	TRACE	ZERO	ZERO	ZERO	ZERO	TRACE
63 Ca(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
120 Ca(OH)2	0.8809E-05	0.8809E-05	ZERO	ZERO	ZERO	ZERO	0.3804E-15
113 Ca3(PO4)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.3128E-13
20 CaC2O4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.1450E-12
18 CaCO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.5717E-12
64 CaCO3 (C14)	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.4674E-19
78 CaF2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.2496E-13
41 CaO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
19 CaSO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.4652E-13
29 Carbon	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.2066E-13
99 Cement	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
26 Co(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
59 CoO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.1227E-14
98 Cr2O3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.5404E-13
42 Cs2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.1481E-14
53 CsCOOH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
96 CsCl	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
8 CsOH	0.3506E-01	0.3506E-01	ZERO	ZERO	ZERO	ZERO	0.9991E-14
151 CsTPB	0.7077E+00	ZERO	0.7077E+00	ZERO	ZERO	ZERO	0.4441E-10
54 Cu(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
55 CuO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.2148E-13
80 Fe2O3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.5008E-11
101 FeO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
102 Group A	0.9165E-04	ZERO	0.9165E-04	ZERO	ZERO	ZERO	0.2839E-13
103 Group B	0.1874E-05	ZERO	0.1874E-05	ZERO	ZERO	ZERO	0.1353E-12
25 H2	0.3676E-06	0.3676E-06	ZERO	ZERO	ZERO	ZERO	0.2356E-04
158 H2C2O4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

STREAM NUMBERS (CONT'D) ->	418	655	656	659	458	455	456
STREAM NAME	Prec Storge Tank bottoms	Late Wash Fd Prec Soluble	Late Wash Fd Prec Insolub	X-Flow Filtr H2O Inventry	NaTPB add to Prec Pump Tk	Air/N2 Purge Prec Pump Tk	Prec Pump Tk vnt to Stack
93 H2SO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
90 H3BO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
34 HCOOH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
43 HCl	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
85 HF	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
49 HNO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
36 Hg	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
129 Hg(C6H5)2	0.1147E+01	ZERO	0.1147E+01	ZERO	ZERO	ZERO	0.6263E-10
135 Hg(NO3)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
144 Hg2Cl2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
117 Hg2I2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
146 HgCl2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
21 HgO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.2591E-12
97 I2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
39 K2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.4133E-13
51 KCOOH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
157 KMnO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
161 KNO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
10 KOH	0.1123E+01	0.1123E+01	ZERO	ZERO	ZERO	ZERO	ZERO
150 KTPB	0.4807E+02	ZERO	0.4807E+02	ZERO	ZERO	ZERO	0.3019E-08
105 La2O3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
108 Li2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
65 Mg(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
33 MgO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.4574E-13
60 Mn(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
56 MnO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
14 MnO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.1142E-11
145 MoO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
81 N2	0.8347E-02	0.8347E-02	ZERO	ZERO	ZERO	0.2789E+03	0.2789E+03
74 N2O	0.1626E-03	0.1626E-03	ZERO	ZERO	ZERO	ZERO	0.1503E-03
114 NH3OHNO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
52 NH4COOH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
68 NH4OH	0.3482E+00	0.3482E+00	ZERO	ZERO	ZERO	ZERO	ZERO
148 NH4TPB	0.2743E+01	ZERO	0.2743E+01	ZERO	ZERO	ZERO	0.3329E-09
35 NO	TRACE	TRACE	ZERO	ZERO	ZERO	ZERO	TRACE
84 NO2	TRACE	TRACE	ZERO	ZERO	ZERO	ZERO	TRACE
70 Na(HgO(OH))	0.4754E-06	0.4754E-06	ZERO	ZERO	ZERO	ZERO	0.2244E-19
94 Na2B4O7	0.1138E+01	0.1138E+01	ZERO	ZERO	ZERO	ZERO	0.4914E-10
109 Na2C2O4	0.9658E+00	0.9658E+00	ZERO	ZERO	ZERO	ZERO	0.4171E-10
5 Na2CO3	0.8112E+01	0.8112E+01	ZERO	ZERO	ZERO	ZERO	0.3503E-09
143 Na2CO3 (C14)	0.1093E-09	0.1093E-09	ZERO	ZERO	ZERO	ZERO	0.4720E-20
89 Na2CrO4	0.3346E-02	0.3346E-02	ZERO	ZERO	ZERO	ZERO	0.1445E-12
115 Na2MoO4	0.5516E-03	0.5516E-03	ZERO	ZERO	ZERO	ZERO	0.2382E-13
32 Na2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
71 Na2PuO2(OH)4	0.3231E-08	0.3231E-08	ZERO	ZERO	ZERO	ZERO	0.1924E-20
73 Na2RhO4	0.1393E-04	0.1393E-04	ZERO	ZERO	ZERO	ZERO	0.6015E-15
72 Na2RuO4	0.5981E-04	0.5981E-04	ZERO	ZERO	ZERO	ZERO	0.2583E-14
6 Na2SO4	0.1242E+00	0.1242E+00	ZERO	ZERO	ZERO	ZERO	0.5381E-11
88 Na2SiO3	0.2920E-02	0.2920E-02	ZERO	ZERO	ZERO	ZERO	0.1261E-12

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

STREAM NUMBERS (CONT'D) -> STREAM NAME	418 Prec Storge Tank bottoms	655 Late Wash Fd Prec Soluble	656 Late Wash Fd Prec Insolub	659 X-Flow Filtr H2O Inventry	458 NaTPB add to Prec Pump Tk	455 Air/N2 Purge Prec Pump Tk	456 Prec Pump Tk vnt to Stack
87 Na3PO4	0.8802E-02	0.8802E-02	ZERO	ZERO	ZERO	ZERO	0.3817E-12
91 NaAg(OH)2	0.8629E-08	0.8629E-08	0.5720E-15	ZERO	ZERO	ZERO	0.7339E-21
75 NaAl(OH)4	0.2248E+00	0.2248E+00	ZERO	ZERO	ZERO	ZERO	0.9709E-11
50 NaCOOH	0.3257E-03	0.3257E-03	ZERO	ZERO	ZERO	ZERO	0.1407E-13
7 NaCl	0.8219E-02	0.8219E-02	ZERO	ZERO	0.5310E-01	ZERO	0.2820E-11
69 NaF	0.3908E-02	0.3908E-02	ZERO	ZERO	ZERO	ZERO	0.1814E-12
11 NaHCO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
12 NaI	0.9280E-05	0.9280E-05	ZERO	ZERO	ZERO	ZERO	0.2513E-14
3 NaNO2	0.5070E+01	0.5070E+01	ZERO	ZERO	ZERO	ZERO	0.2189E-09
2 NaNO3	0.1037E+00	0.1037E+00	ZERO	ZERO	ZERO	ZERO	0.4840E-11
4 NaOH	0.5162E-01	0.5162E-01	ZERO	ZERO	0.2648E+00	ZERO	0.6648E-10
149 NaTPB	ZERO	ZERO	ZERO	ZERO	0.1133E+02	ZERO	0.4893E-10
160 NaTcO4	0.5711E-04	0.5711E-04	ZERO	ZERO	ZERO	ZERO	ZERO
152 NaTi2O5H	0.1268E+01	ZERO	0.1268E+01	ZERO	ZERO	ZERO	0.6928E-10
61 Ni(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
40 NiO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.4265E-12
82 O2	0.7406E-03	0.7406E-03	ZERO	ZERO	ZERO	0.1634E+02	0.1634E+02
86 PbCO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.1884E-13
67 PbO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
147 PbS	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
28 PbSO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.4251E-13
124 Pd	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
112 Pd(NO3)2	0.3187E-08	0.3187E-08	ZERO	ZERO	ZERO	ZERO	0.1376E-18
110 PdO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.8940E-14
76 PuO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.9528E-14
156 PuO2(NaTi2O5)2	0.2954E-03	ZERO	0.2954E-03	ZERO	ZERO	ZERO	0.1614E-13
58 Rh	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
22 RhO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.4315E-14
95 Ru	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
79 RuO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.2207E-13
83 RuO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
38 SO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
141 SO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
137 Semi Vol Cs2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
136 Semi Vol CsCl	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
126 Semi Vol Group A	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
140 Semi Vol Na2B4O7	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
138 Semi Vol NaCl	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
139 Semi Vol NaF	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
125 Semi Vol NaI	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
23 Semi Vol RuO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
111 SiO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.5095E-12
48 Sr(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
153 Sr(NaTi2O5)2	0.9021E-04	ZERO	0.9021E-04	ZERO	ZERO	ZERO	0.4929E-14
127 Sr(OH)2	0.8213E-10	0.8213E-10	ZERO	ZERO	ZERO	ZERO	0.1048E-22
30 SrCO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.2920E-13
46 SrO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
159 TcO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.6100E-14
92 ThO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.9368E-13

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

STREAM NUMBERS (CONT'D) ->	418	655	656	659	458	455	456
STREAM NAME	Prec Storge Tank bottoms	Late Wash Fd Prec Soluble	Late Wash Fd Prec Insolub	X-Flow Filtr H2O Inventry	NaTPB add to Prec Pump Tk	Air/N2 Purge Prec Pump Tk	Prec Pump Tk vnt to Stack
107 TiO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
119 Tritium	0.3217E-09	0.3217E-09	ZERO	ZERO	ZERO	ZERO	0.3679E-11
17 U3O8	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.1029E-11
62 UO2(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
16 UO2(OH)2	0.7625E-06	0.7625E-06	ZERO	ZERO	ZERO	ZERO	0.3293E-16
27 Y(COOH)3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
128 Y(OH)3	0.3288E-10	0.3288E-10	ZERO	ZERO	ZERO	ZERO	0.9985E-23
31 Y2(CO3)3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.1135E-13
47 Y2O3	0.1840E-04	ZERO	0.1840E-04	ZERO	ZERO	ZERO	0.1005E-14
100 Zeolite	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.6812E-13
44 Zn(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
57 ZnO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	0.3655E-13
104 ZrO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
13 hydrate H2O	0.4405E-05	ZERO	0.4405E-05	ZERO	ZERO	ZERO	0.4046E-11
1 water	0.5412E+03	0.5412E+03	0.3437E-04	0.4657E+02	0.5391E+02	0.1184E+01	0.8227E+01
TOTAL FLOW, LB/HR	0.6163E+03	0.5601E+03	0.5622E+02	0.4657E+02	0.6622E+02	0.2965E+03	0.3035E+03
TEMPERATURE, DEG C	0.3889E+02	0.3889E+02	0.3889E+02	0.3500E+02	0.3500E+02	0.3500E+02	ZERO
PRESSURE, ATM	0.9656E+00	0.9656E+00	0.9656E+00	0.1000E+01	0.1000E+01	0.1000E+01	0.9656E+00
PRESSURE, PSIG	-0.5055E+00	-0.5055E+00	-0.5055E+00	ZERO	ZERO	ZERO	-0.5055E+00
PRESSURE, MM HG	0.7339E+03	0.7339E+03	0.7339E+03				0.7339E+03
ENTHALPY, PCU/HR	0.2129E+05	0.2126E+05	0.2697E+02	0.1634E+04	0.1895E+04	0.3409E+04	0.5090E+04
VAPOR FLOW, CFM						0.7107E+02	0.6767E+02
LIQUID FLOW, GPM	0.1200E+01	0.1098E+01	0.1022E+00	0.9300E-01	0.1298E+00		
DENSITY, LBS/FT3	0.6404E+02	0.6362E+02	0.6856E+02	0.6243E+02	0.6358E+02	0.6952E-01	0.7476E-01
PHASE	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	VAPOR	VAPOR

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

STREAM NUMBERS ->	660	457	419	459	657	658	201
STREAM NAME	NaTPB add to Late Wsh H2O	Late Wsh H2O Adjd w/NaTPB	Filtrate to Recyc Pmp Tk	50% NaOH to Recyc Pmp Tk	Prec Feed Solubles	Prec Feed Insolubles	Wshd Prec Fd frm Tnk Farm
COMPONENT FLOWS, LB/HR							
122 (C6H5)2	ZERO	ZERO	ZERO	ZERO	ZERO	0.1289E+01	0.1289E+01
123 (C6H5)2C6H4	ZERO	ZERO	ZERO	ZERO	ZERO	0.1561E+00	0.1561E+00
118 (C6H5)2NH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
133 (C6H5B(OH)2 salt)	ZERO	ZERO	ZERO	ZERO	ZERO	0.5510E+00	0.5510E+00
132 (C6H5B(OH)2)	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
131 (C6H5OH salt)	0.1284E+00	0.1284E+00	0.1985E+01	ZERO	0.2141E+00	ZERO	0.2141E+00
130 (C6H5OH)	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
121 (C6H6)	ZERO	ZERO	0.1740E+00	ZERO	0.1558E-01	ZERO	0.1558E-01
155 (CH3)2CHOH	ZERO	ZERO	0.4283E-08	ZERO	0.3347E-09	ZERO	0.3347E-09
154 (CH3OH)	ZERO	ZERO	0.4289E-09	ZERO	0.3442E-10	ZERO	0.3442E-10
45 Ag	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
116 Ag2O	ZERO	ZERO	ZERO	ZERO	ZERO	0.6158E-02	0.6158E-02
134 AgNO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
77 Al2O3	ZERO	ZERO	ZERO	ZERO	ZERO	0.4591E+00	0.4591E+00
106 B2O3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
9 Ba(OH)2	ZERO	ZERO	0.1735E-12	ZERO	0.1553E-13	ZERO	0.1553E-13
15 BaO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
24 BaSO4	ZERO	ZERO	ZERO	ZERO	ZERO	0.2895E+00	0.2895E+00
66 CO	ZERO	ZERO	TRACE	ZERO	TRACE	ZERO	TRACE
37 CO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
142 CO2 (C14)	ZERO	ZERO	TRACE	ZERO	TRACE	ZERO	TRACE
63 Ca(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
120 Ca(OH)2	ZERO	ZERO	0.8085E-05	ZERO	0.7237E-06	ZERO	0.7237E-06
113 Ca3(PO4)2	ZERO	ZERO	ZERO	ZERO	ZERO	0.3593E-02	0.3593E-02
20 CaC2O4	ZERO	ZERO	ZERO	ZERO	ZERO	0.1665E-01	0.1665E-01
18 CaCO3	ZERO	ZERO	ZERO	ZERO	ZERO	0.6566E-01	0.6566E-01
64 CaCO3 (C14)	ZERO	ZERO	ZERO	ZERO	ZERO	0.5368E-08	0.5368E-08
78 CaF2	ZERO	ZERO	ZERO	ZERO	ZERO	0.2866E-02	0.2866E-02
41 CaO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
19 CaSO4	ZERO	ZERO	ZERO	ZERO	ZERO	0.5343E-02	0.5343E-02
29 Carbon	ZERO	ZERO	ZERO	ZERO	ZERO	0.2373E-02	0.2373E-02
99 Cement	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
26 Co(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
59 CoO	ZERO	ZERO	ZERO	ZERO	ZERO	0.1409E-03	0.1409E-03
98 Cr2O3	ZERO	ZERO	ZERO	ZERO	ZERO	0.6206E-02	0.6206E-02
42 Cs2O	ZERO	ZERO	ZERO	ZERO	ZERO	0.1700E-03	0.1700E-03
53 CsCOOH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
96 CsCl	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
8 CsOH	ZERO	ZERO	0.2123E-03	ZERO	0.1901E-04	ZERO	0.1901E-04
151 CsTPB	ZERO	ZERO	ZERO	ZERO	ZERO	0.8128E+00	0.8128E+00
54 Cu(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
55 CuO	ZERO	ZERO	ZERO	ZERO	ZERO	0.2467E-02	0.2467E-02
80 Fe2O3	ZERO	ZERO	ZERO	ZERO	ZERO	0.5751E+00	0.5751E+00
101 FeO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
102 Group A	ZERO	ZERO	0.6035E-03	ZERO	ZERO	0.3039E-02	0.3039E-02
103 Group B	ZERO	ZERO	0.2876E-02	ZERO	ZERO	0.1678E-01	0.1678E-01
25 H2	ZERO	ZERO	0.1892E-05	ZERO	0.1037E-09	ZERO	0.1037E-09
158 H2C2O4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

STREAM NUMBERS (CONT'D) -> STREAM NAME	660 NaTPB add to Late Wsh H2O	457 Late Wsh H2O Adjd w/NaTPB	419 Filtrate to Recyc Pmp Tk	459 50% NaOH to Recyc Pmp Tk	657 Prec Feed Solubles	658 Prec Feed Insolubles	201 Wshd Prec Fd frm Tnk Farm
93 H2SO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
90 H3BO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
34 HCOOH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
43 HCl	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
85 HF	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
49 HNO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
36 Hg	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
129 Hg(C6H5)2	ZERO	ZERO	ZERO	ZERO	ZERO	0.1146E+01	0.1146E+01
135 Hg(NO3)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
144 Hg2Cl2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
117 Hg2I2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
146 HgCl2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
21 HgO	ZERO	ZERO	ZERO	ZERO	ZERO	0.2975E-01	0.2975E-01
97 I2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
39 K2O	ZERO	ZERO	ZERO	ZERO	ZERO	0.4746E-02	0.4746E-02
51 KCOOH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
157 KMnO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
161 KNO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
10 KOH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
150 KTPB	ZERO	ZERO	ZERO	ZERO	ZERO	0.5525E+02	0.5525E+02
105 La2O3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
108 Li2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
65 Mg(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
33 MgO	ZERO	ZERO	ZERO	ZERO	ZERO	0.5253E-02	0.5253E-02
60 Mn(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
56 MnO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
14 MnO2	ZERO	ZERO	ZERO	ZERO	ZERO	0.1311E+00	0.1311E+00
145 MoO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
81 N2	ZERO	ZERO	0.1091E-01	ZERO	0.1002E-02	ZERO	0.1002E-02
74 N2O	ZERO	ZERO	0.1220E-04	ZERO	0.1246E-07	ZERO	0.1246E-07
114 NH3OHNO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
52 NH4COOH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
68 NH4OH	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
148 NH4TPB	ZERO	ZERO	ZERO	ZERO	ZERO	0.6093E+01	0.6093E+01
35 NO	ZERO	ZERO	TRACE	ZERO	TRACE	ZERO	TRACE
84 NO2	ZERO	ZERO	TRACE	ZERO	TRACE	ZERO	TRACE
70 Na(HgO(OH))	ZERO	ZERO	0.4770E-09	ZERO	0.4269E-10	ZERO	0.4269E-10
94 Na2B4O7	ZERO	ZERO	0.1044E+01	ZERO	0.9349E-01	ZERO	0.9349E-01
109 Na2C2O4	ZERO	ZERO	0.8865E+00	ZERO	0.7935E-01	ZERO	0.7935E-01
5 Na2CO3	ZERO	ZERO	0.7446E+01	ZERO	0.6665E+00	ZERO	0.6665E+00
143 Na2CO3 (C14)	ZERO	ZERO	0.1003E-09	ZERO	0.8980E-11	ZERO	0.8980E-11
89 Na2CrO4	ZERO	ZERO	0.3071E-02	ZERO	0.2749E-03	0.1842E-10	0.2749E-03
115 Na2MoO4	ZERO	ZERO	0.5063E-03	ZERO	0.4531E-04	ZERO	0.4531E-04
32 Na2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
71 Na2PuO2(OH)4	ZERO	ZERO	0.4089E-10	ZERO	0.3660E-11	ZERO	0.3660E-11
73 Na2RhO4	ZERO	ZERO	0.1278E-04	ZERO	0.1144E-05	ZERO	0.1144E-05
72 Na2RuO4	ZERO	ZERO	0.5490E-04	ZERO	0.4914E-05	ZERO	0.4914E-05
6 Na2SO4	ZERO	ZERO	0.1144E+00	ZERO	0.1024E-01	0.2100E-02	0.1234E-01
88 Na2SiO3	ZERO	ZERO	0.2680E-02	ZERO	0.2399E-03	ZERO	0.2399E-03

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

STREAM NUMBERS (CONT'D) ->	660	457	419	459	657	658	201
STREAM NAME	NaTPB add to Late Wsh H2O	Late Wsh H2O Adjd w/NaTPB	Filtrate to Recyc Pmp Tk	50% NaOH to Recyc Pmp Tk	Prec Feed Solubles	Prec Feed Insolubles	Wshd Prec Fd frm Tnk Farm
87 Na3PO4	ZERO	ZERO	0.8112E-02	ZERO	0.7261E-03	0.1924E-03	0.9186E-03
91 NaAg(OH)2	ZERO	ZERO	0.1560E-10	ZERO	0.1396E-11	ZERO	0.1396E-11
75 NaAl(OH)4	ZERO	ZERO	0.2064E+00	ZERO	0.1847E-01	ZERO	0.1847E-01
50 NaCOOH	ZERO	ZERO	0.2990E-03	ZERO	0.2676E-04	ZERO	0.2676E-04
7 NaCl	0.1030E-01	0.1030E-01	0.6609E-01	ZERO	0.8844E-02	0.1754E-01	0.2639E-01
69 NaF	ZERO	ZERO	0.3855E-02	ZERO	0.3450E-03	0.1538E-02	0.1883E-02
11 NaHCO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
12 NaI	ZERO	ZERO	0.5341E-04	ZERO	0.4780E-05	0.2580E-03	0.2628E-03
3 NaNO2	ZERO	ZERO	0.4653E+01	ZERO	0.4165E+00	ZERO	0.4165E+00
2 NaNO3	ZERO	ZERO	0.1029E+00	ZERO	0.9207E-02	0.4432E-01	0.5352E-01
4 NaOH	0.5135E-01	0.5135E-01	0.1444E+01	0.8273E+02	0.1438E+00	0.6091E-01	0.2047E+00
149 NaTPB	0.2197E+01	0.2197E+01	0.2354E+01	ZERO	0.8353E+00	ZERO	0.8353E+00
160 NaTcO4	ZERO	ZERO	0.5242E-04	ZERO	0.4692E-05	ZERO	0.4692E-05
152 NaTi2O5H	ZERO	ZERO	ZERO	ZERO	ZERO	0.1268E+01	0.1268E+01
61 Ni(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
40 NiO	ZERO	ZERO	ZERO	ZERO	ZERO	0.4898E-01	0.4898E-01
82 O2	ZERO	ZERO	0.1223E-02	ZERO	0.1138E-03	ZERO	0.1138E-03
86 PbCO3	ZERO	ZERO	ZERO	ZERO	ZERO	0.2163E-02	0.2163E-02
67 PbO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
147 PbS	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
28 PbSO4	ZERO	ZERO	ZERO	ZERO	ZERO	0.4882E-02	0.4882E-02
124 Pd	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
112 Pd(NO3)2	ZERO	ZERO	0.2926E-08	ZERO	0.2619E-09	ZERO	0.2619E-09
110 PdO	ZERO	ZERO	ZERO	ZERO	ZERO	0.1027E-02	0.1027E-02
76 PuO2	ZERO	ZERO	ZERO	ZERO	ZERO	0.1094E-02	0.1094E-02
156 PuO2(NaTi2O5)2	ZERO	ZERO	ZERO	ZERO	ZERO	0.2954E-03	0.2954E-03
58 Rh	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
22 RhO2	ZERO	ZERO	ZERO	ZERO	ZERO	0.4956E-03	0.4956E-03
95 Ru	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
79 RuO2	ZERO	ZERO	ZERO	ZERO	ZERO	0.2535E-02	0.2535E-02
83 RuO4	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
38 SO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
141 SO3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
137 Semi Vol Cs2O	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
136 Semi Vol CsCl	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
126 Semi Vol Group A	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
140 Semi Vol Na2B4O7	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
138 Semi Vol NaCl	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
139 Semi Vol NaF	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
125 Semi Vol NaI	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
23 Semi Vol RuO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
111 SiO2	ZERO	ZERO	ZERO	ZERO	ZERO	0.5851E-01	0.5851E-01
48 Sr(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
153 Sr(NaTi2O5)2	ZERO	ZERO	ZERO	ZERO	ZERO	0.9021E-04	0.9021E-04
127 Sr(OH)2	ZERO	ZERO	0.2227E-12	ZERO	0.1993E-13	ZERO	0.1993E-13
30 SrCO3	ZERO	ZERO	ZERO	ZERO	ZERO	0.3353E-02	0.3353E-02
46 SrO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
159 TcO2	ZERO	ZERO	ZERO	ZERO	ZERO	0.7005E-03	0.7005E-03
92 ThO2	ZERO	ZERO	ZERO	ZERO	ZERO	0.1076E-01	0.1076E-01

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

STREAM NUMBERS (CONT'D) ->	660	457	419	459	657	658	201
STREAM NAME	NaTPB add to Late Wsh H2O	Late Wsh H2O Adjd w/NaTPB	Filtrate to Recyc Pmp Tk	50% NaOH to Recyc Pmp Tk	Prec Feed Solubles	Prec Feed Insolubles	Wshd Prec Fd frm Tnk Farm
107 TiO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
119 Tritium	ZERO	ZERO	0.2919E-09	ZERO	0.2610E-10	ZERO	0.2610E-10
17 U3O8	ZERO	ZERO	ZERO	ZERO	ZERO	0.1181E+00	0.1181E+00
62 UO2(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
16 UO2(OH)2	ZERO	ZERO	0.6998E-06	ZERO	0.6264E-07	0.4219E-14	0.6264E-07
27 Y(COOH)3	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
128 Y(OH)3	ZERO	ZERO	0.2122E-12	ZERO	0.1900E-13	ZERO	0.1900E-13
31 Y2(CO3)3	ZERO	ZERO	ZERO	ZERO	ZERO	0.1304E-02	0.1304E-02
47 Y2O3	ZERO	ZERO	ZERO	ZERO	ZERO	0.1840E-04	0.1840E-04
100 Zeolite	ZERO	ZERO	ZERO	ZERO	ZERO	0.7823E-02	0.7823E-02
44 Zn(COOH)2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
57 ZnO	ZERO	ZERO	ZERO	ZERO	ZERO	0.4197E-02	0.4197E-02
104 ZrO2	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO	ZERO
13 hydrate H2O	ZERO	ZERO	ZERO	ZERO	ZERO	0.4647E+00	0.4647E+00
1 water	0.1045E+02	0.1603E+04	0.1635E+04	0.8273E+02	0.6021E+03	ZERO	0.6021E+03
TOTAL FLOW, LB/HR	0.1284E+02	0.1605E+04	0.1656E+04	0.1655E+03	0.6046E+03	0.6905E+02	0.6736E+03
TEMPERATURE, DEG C	0.3500E+02	0.2507E+02	0.2955E+02	0.2500E+02	0.2956E+02	0.2956E+02	0.2956E+02
PRESSURE, ATM	0.1000E+01	0.1000E+01	0.9656E+00	0.1000E+01	0.9656E+00	0.9656E+00	0.9656E+00
PRESSURE, PSIG	ZERO	ZERO	-0.5055E+00	ZERO	-0.5055E+00	-0.5055E+00	-0.5055E+00
PRESSURE, MM HG			0.7339E+03		0.7339E+03	0.7339E+03	0.7339E+03
ENTHALPY, PCU/HR	0.3674E+03	0.4032E+05	0.4860E+05	0.2748E+04	0.1786E+05	0.2958E+02	0.1789E+05
VAPOR FLOW, CFM							
LIQUID FLOW, GPM	0.2517E-01	0.3205E+01	0.3286E+01	0.2164E+00	0.1205E+01	0.1239E+00	0.1329E+01
DENSITY, LBS/FT3	0.6358E+02	0.6244E+02	0.6282E+02	0.9533E+02	0.6253E+02	0.6945E+02	0.6318E+02
PHASE	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

STREAM NUMBERS ->	460	461
STREAM NAME	Air/N2 Sparg Rcycl Pmp Tk	Recyc Pmp Tk Htr HEPA vnt
COMPONENT FLOWS, LB/HR		
122 (C6H5)2	ZERO	ZERO
123 (C6H5)2C6H4	ZERO	ZERO
118 (C6H5)2NH	ZERO	ZERO
133 (C6H5B(OH)2 salt)	ZERO	ZERO
132 (C6H5B(OH)2)	ZERO	ZERO
131 (C6H5OH salt)	ZERO	0.1002E-09
130 (C6H5OH)	ZERO	ZERO
121 (C6H6)	ZERO	0.1668E+00
155 (CH3)2CHOH	ZERO	0.2743E-08
154 (CH3OH)	ZERO	0.2511E-09
45 Ag	ZERO	ZERO
116 Ag2O	ZERO	ZERO
134 AgNO3	ZERO	ZERO
77 Al2O3	ZERO	ZERO
106 B2O3	ZERO	ZERO
9 Ba(OH)2	ZERO	0.8760E-23
15 BaO	ZERO	ZERO
24 BaSO4	ZERO	ZERO
66 CO	ZERO	TRACE
37 CO2	ZERO	ZERO
142 CO2 (C14)	ZERO	TRACE
63 Ca(COOH)2	ZERO	ZERO
120 Ca(OH)2	ZERO	0.4081E-15
113 Ca3(PO4)2	ZERO	ZERO
20 CaC2O4	ZERO	ZERO
18 CaCO3	ZERO	ZERO
64 CaCO3 (C14)	ZERO	ZERO
78 CaF2	ZERO	ZERO
41 CaO	ZERO	ZERO
19 CaSO4	ZERO	ZERO
29 Carbon	ZERO	ZERO
99 Cement	ZERO	ZERO
26 Co(COOH)2	ZERO	ZERO
59 CoO	ZERO	ZERO
98 Cr2O3	ZERO	ZERO
42 Cs2O	ZERO	ZERO
53 CsCOOH	ZERO	ZERO
96 CsCl	ZERO	ZERO
8 CsOH	ZERO	0.1072E-13
151 CsTPB	ZERO	ZERO
54 Cu(COOH)2	ZERO	ZERO
55 CuO	ZERO	ZERO
30 Fe2O3	ZERO	ZERO
101 FeO	ZERO	ZERO
102 Group A	ZERO	0.3046E-13
103 Group B	ZERO	0.1452E-12
25 H2	ZERO	0.1892E-05
158 H2C2O4	ZERO	ZERO

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

STREAM NUMBERS (CONT'D) ->	460	461
STREAM NAME	Air/N2 Sparg Rcycl Pmp Tk	Recyc Pmp Tk Htr HEPA vnt
93 H2SO4	ZERO	ZERO
90 H3BO3	ZERO	ZERO
34 HCOOH	ZERO	ZERO
43 HCl	ZERO	ZERO
85 HF	ZERO	ZERO
49 HNO3	ZERO	ZERO
36 Hg	ZERO	ZERO
129 Hg(C6H5)2	ZERO	ZERO
135 Hg(NO3)2	ZERO	ZERO
144 Hg2Cl2	ZERO	ZERO
117 Hg2I2	ZERO	ZERO
146 HgCl2	ZERO	ZERO
21 HgO	ZERO	ZERO
97 I2	ZERO	ZERO
39 K2O	ZERO	ZERO
51 KCOOH	ZERO	ZERO
157 KMnO4	ZERO	ZERO
161 KNO3	ZERO	ZERO
10 KOH	ZERO	ZERO
150 KTPB	ZERO	ZERO
105 La2O3	ZERO	ZERO
108 Li2O	ZERO	ZERO
65 Mg(COOH)2	ZERO	ZERO
33 MgO	ZERO	ZERO
60 Mn(COOH)2	ZERO	ZERO
56 MnO	ZERO	ZERO
14 MnO2	ZERO	ZERO
145 MoO2	ZERO	ZERO
81 N2	0.7099E+03	0.7098E+03
74 N2O	ZERO	0.1219E-04
114 NH3OHNO3	ZERO	ZERO
52 NH4COOH	ZERO	ZERO
68 NH4OH	ZERO	ZERO
148 NH4TPB	ZERO	ZERO
35 NO	ZERO	TRACE
84 NO2	ZERO	TRACE
70 Na(HgO(OH))	ZERO	0.2408E-19
94 Na2B4O7	ZERO	0.5272E-10
109 Na2C2O4	ZERO	0.4475E-10
5 Na2CO3	ZERO	0.3759E-09
143 Na2CO3 (C14)	ZERO	0.5064E-20
89 Na2CrO4	ZERO	0.1550E-12
115 Na2MoO4	ZERO	0.2556E-13
32 Na2O	ZERO	ZERO
71 Na2PuO2(OH)4	ZERO	0.2064E-20
73 Na2RhO4	ZERO	0.6454E-15
72 Na2RuO4	ZERO	0.2771E-14
6 Na2SO4	ZERO	0.5773E-11
88 Na2SiO3	ZERO	0.1353E-12

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

STREAM NUMBERS (CONT'D) ->	460	461
STREAM NAME	Air/N2 Sparg Rcycl Pmp Tk	Recyc Pmp Tk Htr HEPA vnt
87 Na3PO4	ZERO	0.4095E-12
91 NaAg(OH)2	ZERO	0.7874E-21
75 NaAl(OH)4	ZERO	0.1042E-10
50 NaCOOH	ZERO	0.1509E-13
7 NaCl	ZERO	0.3336E-11
69 NaF	ZERO	0.1946E-12
11 NaHCO3	ZERO	ZERO
12 NaI	ZERO	0.2696E-14
3 NaNO2	ZERO	0.2349E-09
2 NaNO3	ZERO	0.5192E-11
4 NaOH	ZERO	0.4249E-08
149 NaTPB	ZERO	0.1188E-09
160 NaTcO4	ZERO	ZERO
152 NaTi2O5H	ZERO	ZERO
61 Ni(COOH)2	ZERO	ZERO
40 NiO	ZERO	ZERO
82 O2	0.1634E+02	0.1634E+02
86 PbCO3	ZERO	ZERO
67 PbO	ZERO	ZERO
147 PbS	ZERO	ZERO
28 PbSO4	ZERO	ZERO
124 Pd	ZERO	ZERO
112 Pd(NO3)2	ZERO	0.1477E-18
110 PdO	ZERO	ZERO
76 PuO2	ZERO	ZERO
156 PuO2(NaTi2O5)2	ZERO	ZERO
58 Rh	ZERO	ZERO
22 RhO2	ZERO	ZERO
95 Ru	ZERO	ZERO
79 RuO2	ZERO	ZERO
83 RuO4	ZERO	ZERO
38 SO2	ZERO	ZERO
141 SO3	ZERO	ZERO
137 Semi Vol Cs2O	ZERO	ZERO
136 Semi Vol CsCl	ZERO	ZERO
126 Semi Vol Group A	ZERO	ZERO
140 Semi Vol Na2B4O7	ZERO	ZERO
138 Semi Vol NaCl	ZERO	ZERO
139 Semi Vol NaF	ZERO	ZERO
125 Semi Vol NaI	ZERO	ZERO
23 Semi Vol RuO2	ZERO	ZERO
111 SiO2	ZERO	ZERO
48 Sr(COOH)2	ZERO	ZERO
153 Sr(NaTi2O5)2	ZERO	ZERO
127 Sr(OH)2	ZERO	0.1124E-22
30 SrCO3	ZERO	ZERO
46 SrO	ZERO	ZERO
159 TcO2	ZERO	ZERO
92 ThO2	ZERO	ZERO

Table A-1. DWPF Material Balance Tables for the Late Wash Flowsheet
Section 1A. In-Tank Precipitation and Salt Decontamination

STREAM NUMBERS (CONT'D) ->	460	461
STREAM NAME	Air/N2 Sparg Rcycl Pmp Tk	Recyc Pmp Tk Htr HEPA vnt
107 TiO2	ZERO	ZERO
119 Tritium	ZERO	0.3575E-11
17 U3O8	ZERO	ZERO
62 UO2(COOH)2	ZERO	ZERO
16 UO2(OH)2	ZERO	0.3533E-16
27 Y(COOH)3	ZERO	ZERO
128 Y(OH)3	ZERO	0.1071E-22
31 Y2(CO3)3	ZERO	ZERO
47 Y2O3	ZERO	ZERO
100 Zeolite	ZERO	ZERO
44 Zn(COOH)2	ZERO	ZERO
57 ZnO	ZERO	ZERO
104 ZrO2	ZERO	ZERO
13 hydrate H2O	ZERO	ZERO
1 water	0.1184E+01	0.2031E+02
TOTAL FLOW, LB/HR	0.7274E+03	0.7467E+03
TEMPERATURE, DEG C	0.3500E+02	ZERO
PRESSURE, ATM	0.1000E+01	0.9656E+00
PRESSURE, PSIG	ZERO	-0.5055E+00
PRESSURE, MM HG		0.7339E+03
ENTHALPY, PCU/HR	0.7065E+04	0.1227E+05
VAPOR FLOW, CFM	0.1749E+03	0.1671E+03
LIQUID FLOW, GPM		
DENSITY, LBS/FT3	0.6933E-01	0.7447E-01
PHASE	VAPOR	VAPOR

APPENDIX B

BATCHING ALGORITHMS

GENERAL

The following algorithms enable determination of all batch additions during a typical Late Wash Cycle based on the analytical results of the last sample of the washed tetraphenylborate precipitate in Tank 49. A key assumption is that no additions are made to Tank 49 without a sample being obtained for analysis following the addition. It is recommended that a sample of the PPT contents be taken after the concentration cycle and analyzed for nitrite concentration in the aqueous fraction of the slurry and the total insolble solids content. Although the washing cycle should be initiated based the calculated wash water requirement (using the appropriate algorithm), the length of the wash cycle allows the wash water requirement tobe confirmed upon receipt of the analytical results and if necessary, the required wash water volume may be adjusted before the end of the wash cycle.

DEFINITIONS

Parameters

Δt	time elapsed since Tank 49 analysis, days.
SpG_x	specific gravity at time/location x (dimensionless)
L_x	level in Precipitate Pump Tank at time x, gal.
M_x	mass in Precipitate Pump Tank at time x, lbs.
$[K^+]_x$	soluble potassium concentration in aqueous fraction at time/location x, ppm
$[NH_4^+]_x$	soluble ammonium concentration in aqueous fraction at time/location x, ppm
$[Cs^+]_x$	soluble cesium concentration is aqueous fraction at time/location x, ppm
$[NO_2^-]_x$	soluble nitrite concentration in aqueous fraction at time/location x, ppm
$[TPB^-]_x$	tetraphenylborate concentration in precipitate at time/location x, wt%
$[TIS]_x$	total insoluble solids concentration at time/location x, wt%
$[TPB^-_{cf}]$	tetraphenylborate concentration in cold feed NaTPB solution, wt%
SpG_{TPB^-cf}	specific gravity in cold feed NaTPB solution (dimensionless)
FINV	cross-flow filter layup water inventory, gal.
$[OH^-_{cf}]$	hydroxide concentration in cold feed caustic tank, M.
MS_x	mass of insoluble solids in PPT at time/location x, lbs.
MA_x	mass of aqueous fraction in PPT at time/location x, lbs.
MNx	mass of nitrite in PPT at time/location x, lbs.
MTPBS	mass of cold feed sodium tetraphenylborate solution added to the PPT during reprecipitation, lbs.
M_{ww}	mass of wash water, lbs.
V_{ww}	volume of wash water, gal.
LVL	level in tank (other than PPT), gal.
HEEL	residual level in tank before a cycle begins, gal. (normally leftover material from the previous batch)

Time/Location Designators:

1	heel present in the PPT prior to the transfer from Tank 49.
2	contents in PPT after transfer from Tank 49.
3	contents in PPT after Cold Feed NaTPB solution added (i.e. post reprecipitation)

4	contents in PPT after reconcentration to target of 10 wt% total insoluble solids.
5	contents in PPT post-washing
49	contents in Tank 49 sample
ww	wash water
SPT	Sludge Pump Tank
RPT	Recycle Pump Tank
PPT	Precipitate Pump Tank

Conversion Factors

8.345	from g/cm^3 to lb/gal
3.785	from liters to gallons
319.2	formula weight of tetraphenylborate anion, g/g-mol
18	formula weight of ammonium ion, g/g-mol
39.09	formula weight of potassium ion, g/g-mol
133	formula weight of (average) cesium ion, g/g-mol
337.2	formula weight of ammonium tetraphenylborate, g/g-mol
358.3	formula weight of potassium tetraphenylborate, g/g-mol
452.1	formula weight of cesium tetraphenylborate, g/g-mol
1.0xE-06	from ppm by weight to weight fraction

Abbreviations

ppm	parts per million by weight
PPT	Precipitate Pump Tank
SPT	Sludge Pump Tank
RPT	Recycle Pump Tank
cf	cold feed

ALGORITHM

Reprecipitation Calculations

The net addition of cold feed sodium tetraphenylborate solution for reprecipitation is MTPBS where

$$MTPBS = MTPBS_1 + MTPBS_2$$

$$MTPBS_1 = \{(L_2S_pG_2 - L_1S_pG_1)/[TPB^-_{cf}]\} * [0.0015\Delta t[TPB^-]_{49} + (1-0.01[TIS]_{49}) * \{6.814E\text{-}03[K^+]_{49} + 2.00E\text{-}03[Cs^+]_{49} + 1.48E\text{-}02[NH_4^+]_{49}\}]$$

$$MTPBS_2 = \{L_2 - L_1 + FINV + 0.1198*MTPBS_1/SpG_{TPB^-cf}\} / \{0.9386*[TPB^-_{cf}] - 0.1198/SpG_{TPB^-cf}\}$$

These equations are derived as follows:

Calculate mass in PPT prior to transfer from Tank 49:

$$M_1 = L_1S_pG_1(8.345)$$

Calculate mass in PPT after transfer from Tank 49:

$$M_2 = L_2S_pG_2(8.345)$$

Net mass transferred from Tank 49 to PPT :

$$M_2 - M_1 = 8.345\,(L_2S_pG_2 - L_1S_pG_1)$$

Calculate the mass of aqueous fraction transferred into the PPT from Tank 49:

$$MA_{49} = (M_2 - M_1)(1 - 0.01*[TIS]_{49}) = 8.345(L_2S_pG_2 - L_1S_pG_1)(1-0.01*[TIS]_{49})$$

To calculate $MTPBS_1$, the amount of cold feed sodium tetraphenylborate solution to add for re-precipitation, sum two terms, one to precipitate soluble Cs^+, K^+, NH_4^+ and one to replace tetraphenylborate lost by radiolysis (based on the elapsed time period since the Tank 49 analysis). Then calculate $MTPBS_2$ to adjust the aqueous fraction to ≥ 0.004 M tetraphenylborate.

To reprecipitate the soluble Cs^+, K^+, NH_4^+:

$$8.345(L_2S_pG_2-L_1S_pG_1)(1-0.01^*[TIS]_{49})\ (1.0E\text{-}06)\{[K^+]_{49}/39.09 + [Cs^+]_{49}/133 + [NH_4^+]_{49}/18\}$$

$$^*\ \{(319.2)\ (100)\ /[TPB^-_{cf}]\}$$

Mass of NaTPB solution to replace TPB- lost via radiolysis:

$$\frac{6.5\%/yr}{(100)\ (365\ days/yr)}\ (\Delta t,\ days)\ \{(M_2-M_1)[TPB^-]_{49}/100\}\ (100/[TPB^-_{cf}])$$

$$= 0.0015\ (\Delta t)(L_2S_pG_2 - L_1S_pG_1)^*[TPB^-]_{49}/[TPB^-_{cf}]$$

$$MTPBS_1 = \{(L_2S_pG_2 - L_1S_pG_1)/[TPB^-_{cf}]\}\ ^*\ [0.0015\Delta t[TPB^-]_{49} + (1-0.01[TIS]_{49})\ ^*\{6.814E\text{-}03[K^+]_{49} + 2.00E\text{-}03[Cs^+]_{49} + 1.48E\text{-}02[NH_4^+]_{49}\}]$$

Mass of NaTPB solution to obtain excess TPB^- at ≥ 0.004 M TPB^- prior to washing is calculated by rearrangement of the following equation:

$$0.004\ M = \{MTPBS_2\ (0.01[TPB^-_{cf}])(453.59)/319.2\}\ /\ \{(L_2-L_1+FINV+MTPBS_1/8.345/SpG_{TPB^-cf} + MTPBS_2/8.345/SpG_{TPB^-cf})^*3.785\}$$

The net addition of cold feed sodium tetraphenylborate solution for reprecipitation is then

$$MTPBS = MTPBS_1 + MTPBS_2$$

Note that $M_3 = 8.345\ L_2S_pG_2 + MTPBS = 8.345\ L_3S_pG_3$ can be used to cross-check the addition operation.

$M_3 = (8.345)\ L_3S_pG_3$ should be used to calculate net mass in the PPT after reprecipitation.

Calculations for the Reconcentration Step

The slurry should be concentrated until the product of the level and specfic gravity indicators satisfy the relationship shown below:

$$L_4S_pG_4 = (0.1)L_1S_pG_1\ [TIS]_1 + (0.1)\ (L_2S_pG_2 - L_1S_pG_1)[TIS]_{49} - FINV^*SpG_4 + (L_2S_pG_2 - L_1S_pG_1)^*(1 - 0.01[TIS]_{49})^*[9.166E-05[K^+]_{49} + 3.40E-05\ [Cs^+]_{49} + 1.87E-04[NH_4^+]_{49}]$$

This equation is derived as follows:

Mass of Insoluble Solids in PPT after reprecipitation:

This quantity can be calculated from the sum of three solids:

1) The mass of insoluble solids in the PPT before the Tank 49 transfer, MS_1.
2) The mass of solids transferred in from Tank 49, MS_{49}.
3) The mass of insoluble solids generated by reprecipitating the soluble cesium, potassium, and ammonium, MS_{gen}.

$MS_3 = MS_1 + MS_{49} + MS_{gen}$

where $MS_1 = L_1S_pG_1(8.345)(0.01)[TIS]_1$

$MS_{49} = (L_2S_pG_2 - L_1S_pG_1)(8.345)(0.01)[TIS]_{49}$

$MS_{gen} = 8.345(L_2S_pG_2-L_1S_pG_1)(1-0.01*[TIS]_{49})(1.0E-06)*\{[K^+]_{49}*358.3/39.09 + [Cs^+]_{49}*452.1/133 + [NH_4^+]_{49}*337.2/18\}$

Note that $[TIS]_1$ should normally be the target (10 wt%) insoluble solids concentration from the previous late wash cycle.

During reconcentration the layup water inventory in the filter will be returned to the tank. The total mass of fluid in the system is hence M_3 + FINV*8.345 and this value should be used for the total mass to calculate the total insoluble solids concentration (wt%) prior to reconcentration:

$[TIS]_3 = 100* MS_3 /(M_3 + FINV*8.345)$

The target solids is $[TIS]_4$, assumed to be10 wt%. All of the solids present after reprecipitation are assumed to be retained in the PPT and the filter, but the mass of aqueous fraction will change. The total mass of fluid in the system at the start of the reconcentration will be M_4 + FINV*8.345*SpG_4 and this value should be included in the total mass to calculate the endpoint for econcentration:

$0.1 = MS_3 /(M_4+FINV*8.345*SpG_4) = MS_3/\{8.345*S_pG_4 (L_4+FINV)\}$ or $8.345S_pG_4 (L_4+FINV)= 10\ MS_3$

Substituting the terms for MS_3 derived previously,

$L_4S_pG_4 = 1.198[(L_1S_pG_1 (8.345)(0.01)[TIS]_1) + ((L_2S_pG_2 - L_1S_pG_1)(8.345)(0.01)[TIS]_{49})$

$+ 8.345(L_2S_pG_2 - L_1S_pG_1)(1 - 0.01[TIS]_{49})(1.0E-06)\{[K^+]_{49}*358.3/39.09 + [C_s^+]_{49}*452.1/133 + [NH_4^+]_{49}*337.2/18\}] - (FINV*SpG_4)$

Simplifying terms,

$L_4S_pG_4 = (0.1)L_1S_pG_1 [TIS]_1 + (0.1)(L_2S_pG_2 - L_1S_pG_1)[TIS]_{49} - FINV*SpG_4 + (L_2S_pG_2 - L_1S_pG_1)*(1 - 0.01[TIS]_{49})*[9.166E-05[K^+]_{49} + 3.40E-05[C_s^+]_{49} + 1.87E-04[NH_4^+]_{49}]$

Washing Cycle

Calculate the initial nitrite concentration:

Mass of nitrite in PPT prior to transfer from Tank 49 (in lbs):
$MN_1 = 8.345 (L_1S_pG_1)(1 - 0.01[TIS]_1)(1.0E-06)[NO_2^-]_1$

Mass of nitrite transferred into PPT from Tank 49, lbs:
$MN_{49} = 8.345 (L_2S_pG_2 - L_1S_pG_1)(1 - 0.01[TIS]_{49})(1.0E-06)[NO_2^-]_{49}$

Mass of supernate after reprecipitation, lbs:
$MA_3 = 8.345 ((FINV + L_3S_pG_3)(1 -0.01 [TIS]_3))$

Nitrite concentration after reprecipitation, (identical to the initial nitrite concentration for the washing step, is calculated as follows:

$C_i = 1.0E+06*(MN_1 + MN_{49})/MA_3$ or

C_i = 1.0E+06*{[8.345 (L_1SpG_1)(1 - 0.01[TIS]$_1$) (1.0E-06)[NO_2^-]$_1$+8.345 (L_2SpG_2 - L_1SpG_1)* (1 - 0.01[TIS]$_{49}$)*(1.0E-06)[NO_2^-]$_{49}$] / [8.345 (FINV + L_3SpG_3 (1 -0.01 [TIS]$_3$))}

Simplifying terms,

C_i = {L_1SpG_1(1 - 0.01[TIS]$_1$) [NO_2^-]$_1$+ (L_2SpG_2 - L_1SpG_1)(1 - 0.01[TIS]$_{49}$)[NO_2^-]$_{49}$] }/ {FINV + L_3SpG_3 * (1 - 0.01 [TIS]$_3$)]}

C_f = 0.01M, or converting to ppm:
C_f = .01g-mole/liter * 46g /g-mole * [1 liter/(1000 * SpG_5)] * 1.0E+06 = 460/SpG_5 ppm.

Note: The value of SpG_5 from the previous batch may be used to estimate the new final specific gravity.

Calculate mass of aqueous fraction after reconcentration step:
MA_4 = 8.345 L_4SpG_4 (1 - 0.01[TIS]$_4$)

Mass of wash to add = (Mww) = MA_4*ln(C_i/C_f) thus
Mww = 8.345 L_4SpG_4(1 - 0.01[TIS]$_4$) *ln (Ci/Cf)

Where C_i and C_f are as shown previously.

Volume of wash water = Vww
Vww = Mww /{8.345 (SpG_{ww})}

Calculations for the Spent Wash Water Inhibitor Adjustment to ≥ 1.0 M OH^-

Target =1.2M OH^-

Material is 50 wt% NaOH aqueous solution, for which the analysis is in M.

RPTLVL , SPTLVL represent the spent wash water levels in the RPT and SPT, respectively.

Calculate volume in liters: 3.785*RPTLVL or 3.785*SPTLVL

Assume that y gallons of the caustic solution are added to the SPT. Then, accounting for the heel (which should already be adjusted to ≥ 1.0 M hydroxide) the volume to adjust in liters is given by

V = 3.785*(y+SPTLVL-SPTHEEL).

The caustic added (g-moles) is 3.785*y*[OH^-_{cf}]. Then to achieve 1.2 M OH- we desire that

3.785*y*[OH^-_{cf}]/{3.785*(y+SPTLVL-SPTHEEL)} = 1.2 or, solving for y,

y = 1.2*(SPTLVL-SPTHEEL) / {[OH^-_{cf}] - 1.2} or

y = (SPTLVL-SPTHEEL)/{([OH^-_{cf}] /1.2) - 1.2}

The adjustment of the RPT is analogous.

Surfactant Addition
(post concentration step)

Mass in PPT = 8.345 SpG_4L_4

Mass Active ingredient to achieve 500 ppm = (500)(1.0E-06) 8.345 [SpG_4L_4 + FINV]

Mass Surfactant Solution = $\frac{\text{100 lb solution}}{\text{50 lb active ingredient}}$ * (500)(1.0E-06) (8.345) $[S_pG_4L_4 + FINV]$

= (8.345E-03) $[L_4S_pG_4 + FINV]$

Note: If the surfactant is to be added after the reprecipitation step, the equation becomes

(8.345E-03) $[L_3S_pG_3 + FINV]$

NaTPB Adjustment of Wash Water

Target is 0.004 M TPB^-

Add the following volumetric ratio of gallons of cold feed tetraphenylborate solution per gallon of wash water to achieve 0.004 M TPB^-:

$1.0 / \{7.833 * [TPB^-_{cf}]\ SpG_{TPB^-cf} - 1.0\}$ or $\{7.833 * [TPB^-_{cf}]\ SpG_{TPB^-cf} - 1.0\}^{-1}$

END

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