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242-A Campaign 95-1 Post Run Document

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Abstract: The 242-A Evaporator Campaign 95-1 was started on June 6, 1995 and finished July 27, 1995. An overall Waste Volume Reduction (WVR) of 8.18 million liters (2.16 Mgal or 87.6% WVR) was achieved from 9.35 million liters (2.47 Mgal) of processable waste contained in 108-AP, 107-AP, 106-AW and 102-AW. Slurry generated from Campaign 95-1 consisted of 1.05 million liters (278,000 gal) of dilute double-shell slurry feed (DDSSF) with a SpG of approximately 1.34. Total process condensate discharged to LERF was 10.3 million liters (2.72 Mgal), achieving a condensate/WVR efficiency ratio of 1.26. Total throughput for Campaign 95-1 was 18.1 million liters (4.79 Mgal). B Pond discharges from steam condensate and cooling water were 15.8 and 583 million liters (4.17 and 154 Mgal) respectively. Based on 145 hours of unplanned downtime, the 242-A Evaporator maintained an operating efficiency of 86% during the 49 day campaign.

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LIST OF TERMS

ACW	242-A Cooling Water
APC	242-A Process Condensate
ASC	242-A Steam Condensate
DCG	Derived Concentration Guideline
DDSSF	Dilute Double Shell Slurry Feed
DQO	Data Quality Objectives
DSC	Differential Scanning Calorimetry
DST	Double Shell Tank
ETF	Effluent Treatment Facility
FDA	242-A Feed
LERF	Liquid Effluent Retention Facility
MCS	Monitor and Control System
OSD	Operating Specification Document
OSR	Operational Safety Requirement
PCP	Process Control Plan
ppm	parts per million
SAR	Safety Analysis Report
SLY	242-A Slurry
SpG	Specific Gravity
TOC	Total Organic Carbon
TOE	Total Operating Efficiency
TRU	Transuranic
WF	Weight Factor
WVR	Waste Volume Reduction
WVRF	Waste Volume Reduction Factor

DEFINITIONS

WVR = [Initial 242-A Feed Tank(s) Volume - Final feed tank(s) volume]

WVRF = WVR / total feedstock x 100%

THROUGHPUT = Total material transferred through Evaporator feed line

OR:
$$THROUGHPUT = \sum_{n=1}^p \frac{X}{\left(\frac{1}{1-WVRF}\right)^{n-1}} + (w)(t)$$

where t = processing time = throughput/feed rate (min)
 x = feedstock or amount of waste to be processed (gal)
 p = number of evaporator passes
 w = raw water addition rate from seal water (gpm)
 WVRF = waste volume reduction factor per evaporator pass

(this equation is for precampaign throughput estimation only)

1.0 INTRODUCTION

This document summarizes the results of 242-A Evaporator Campaign 95-1 as required per WHC-IP-0842 Section 8.12, subsection 6.2 "Process Evaluation Report".

Campaign 95-1 was the third successful operation of the 242-A Evaporator facility since the Project B-534 upgrade. Dilute waste from 108-AP, 107-AP, and partially concentrated product from Campaign 94-2 were processed. Process condensate generated from the operation was transferred to the Liquid Effluent Retention Facility (LERF) awaiting final disposal by the Effluent Treatment Facility (ETF).

Waste compatibility, radiological source term, criticality, and effluent discharge limit compliance were evaluated prior to Campaign 95-1 startup by WHC-SD-WM-PCP-010, *Process Control Plan for 242-A Evaporator Campaign 95-1* (Le 1995) and will be referred to as the "PCP" in this document.

2.0 SUMMARY

The 242-A Evaporator Campaign 95-1 was started on June 6, 1995 and finished July 27, 1995. An overall Waste Volume Reduction (WVR) of 8.18 million liters (2.16 Mgal or 87.6% WVRF) was achieved from 9.35 million liters (2.47 Mgal) of processable waste contained in 108-AP, 107-AP, 106-AW and 102-AW. Slurry generated from Campaign 95-1 consisted of 1.05 million liters (278,000 gal) of dilute double-shell slurry feed (DDSSF) with a SpG of approximately 1.34. Total process condensate discharged to LERF was 10.3 million liters (2.72 Mgal), achieving a condensate/WVR efficiency ratio of 1.26. Total throughput for Campaign 95-1 was 18.1 million liters (4.79 Mgal). B Pond discharges from steam condensate and cooling water were 15.8 and 583 million liters (4.17 and 154 Mgal) respectively. Based on 145 hours of unplanned downtime, the 242-A Evaporator maintained an operating efficiency of 86% during the 49 day campaign.

3.0 FEED SOURCES

Dilute miscellaneous Hanford facility waste from 107-AP and 106-AP was chosen as feed for Evaporator Campaign 95-1. Additionally, the partially concentrated waste from Evaporator Campaign 94-2 was processed during Campaign 95-1 based on an engineering recommendation (see Appendix K). Because 106-AP is equipped with a flex and float pump, waste in tank 106-AP was transferred to 108-AP to provide blending capability necessary for evaporator process control prior to the run. The feed sources, volumes, and compositions for Campaign 95-1 are summarized in the table below:

TANK	SOURCE	VOLUME
108-AP	Aging waste condensate, flush water from miscellaneous sources, and dilute non-complexed waste from, B-plant, 222-S labs, 300 Area (PNL), and T-Plant	3.52×10^6 liters (338.5 inches)
107-AP	Same as 108-AP plus NCRW waste from Purex	3.66×10^6 liters (351.4 inches)
106-AW 102-AW	Partially concentrated waste from Evaporator Campaign 94-2, flush water, and water generated during the precampaign training run	2.14×10^6 liters (205.7 inches)

4.0 DISCUSSION

The operating performance, process control, safety, and environmental compliance assessment for 242-A Evaporator campaign 95-1 is addressed in this section. Samples were taken from the slurry sampler at the end of the campaign and also from the 106-AW slurry tank to characterize the campaign final slurry product. For conservatism, the slurry product data used for the assessment below is the higher value among the samples.

4.1 OPERATING PERFORMANCE

- 4.1.1 Waste Volume Reduction - The objective of Campaign 95-1 was to concentrate 9.5 million liters (2.51 Mgal) of waste from 108-AP, 107-AP, 106-AW and 102-AW with an overall WVR of 85% - 90% (as specified in the Process Control Plan). The actual run compared closely with the PCP estimates by processing 9.35 million liters (2.47 Mgal) of waste with an overall WVR of 87.6%. This was made possible with precise waste staging, accurate PREDICT waste modeling, and few operational difficulties during the final pass.

Calculations and figures for WVR, WVRF, and total feed are found in Appendix B and C.

- 4.1.2 Throughput - For the purposes of estimating evaporator run duration, throughput for Campaign 95-1 was calculated in the PCP to be 16.2 - 17 million liters (4.3 - 4.5 Mgal). The campaign duration was then estimated to take 41 - 43 days, based on throughput, an assumed operating efficiency, and feed flow rate. Actual throughput was measured to be 18.1 million liters (4.79 Mgal) by summing the evaporator feed totalizer (FQI-CA1-1) for the duration of the campaign. Campaign duration was 49 days. Throughput information is presented in Appendix C.

- 4.1.3 Total Operating Efficiency - Campaign 95-1 consisted of approximately 878 hours (37 days) of actual waste processing, 145 hours of unplanned downtime, and 154 hours of planned outages. Based on unplanned downtime, plant operating efficiency was 86%. Total overall operating efficiency was 75% when both unplanned and scheduled outages are considered in the 49 day campaign. Total operating efficiency calculations are found in Appendix B.

4.2 PROCESS CONTROL EVALUATION

- 4.2.1 Energetics - Differential scanning calorimetry (DSC) analysis was performed on Campaign 95-1 feed and slurry samples to determine if exotherms were present in the waste. All sample analysis indicated that there were no exotherms present. Campaign 95-1 waste is in compliance, having no exotherms reported below the OSD limit of 168 °C (335 °F) and an exotherm/endotherm ratio < 1 (Godfrey 1993, Fowler 1995).
- 4.2.2 Mixing and Compatibility - A precampaign mixing and compatibility study was performed on the composite of Campaign 95-1 waste feed (Beck 1995) and showed no unusual color, temperature, clarity, or other visual determinable characteristic. Feed and slurry samples taken during the actual evaporator operation did not show any unusual characteristics.
- 4.2.3 Corrosivity - Nitrite, nitrate, and hydroxide concentrations are controlled to reduce corrosion rates in the double shell tanks. All slurry samples taken during Campaign 95-1 were well within the double-shell tank corrosion specifications. Appendix E contains graphical comparisons of the slurry results for OH, NO₂, and NO₃ with the associated corrosion limits.
- 4.2.4 Flammable Gas - The Evaporator slurry is limited (Fowler 1995) to a specific gravity (SpG) of less than 1.41 due to a statistical correlation between SpG and flammable gas watch list tanks. Prior to Campaign 95-1, using the SpG correlation in the Evaporator SAR (Lavender 1993) the SpG of slurry product at the end of the campaign was predicted to be 1.23. Analysis was performed on the actual samples confirming that the SpG of slurry product was well below the SpG limit of 1.41. Since the actual SpG of the slurry product was calculated to be 1.34, the potential to create conditions for flammable gas accumulation was not created. The slurry product SpG calculation can be found can be found in Appendix B.

The actual SpG was higher than predicted since the SAR correlation was not derived for the range of current evaporator operation and does not include some important waste components, notably Na₂CO₃ and NaF. For this reason, a new correlation for SpG based on Evaporator Campaigns has

been derived and is described in the "Recommendations" section of this document.

- 4.2.5 Phosphates - The Campaign 95-1 waste was predicted in the PCP to remain well below the formation criteria of the gel-like sodium phosphate matrix (i.e. $[\text{PO}_4^{3-}] > 0.1 \text{ M}$ and $[\text{Na}^+] > 8 \text{ M}$) (Fowler 1995).

Campaign 95-1 slurry sample data ranged from undetected to 0.02 M for $[\text{PO}_4^{3-}]$ and $< 5.5 \text{ M}$ $[\text{Na}^+]$, which is well below the phosphate matrix formation criteria.

- 4.2.6 Organic Complexants - The waste in tanks 108-AP, 107-AP, 102-AW and 106-AW was evaluated in the PCP using the PREDICT computer model to determine if the waste was designated as complex (Allison 1984). Prior to Campaign 95-1, waste in these tanks were classified as non-complex with an exception of 106-AW tank. Tank 106-AW exceeded the 10 g/l TOC of complexed waste screening test when extrapolated to the eight molar caustic limit. However, none of the tanks met the dry 3 wt% TOC definition of complex waste. Review of the 95-1 precampaign boildown studies and historical complexed waste evaporator campaigns indicated that the campaign 95-1 composite feed does not exhibit complex waste characteristics.

Based on lab data results for the slurry product, the estimated TOC concentration is 23.8 g/L when extrapolated to the 8 Molar caustic limit using PREDICT. However, the rapid settling solids and a relatively low viscosity (4 cP) of the slurry product samples indicated that slurry product does not exhibit complex waste behaviors. The PREDICT run on the final slurry product is contained in Table 8 (Appendix E).

- 4.2.7 Transfer Line Plugging - To prevent transfer line plugging, solids volume and Reynolds Number (N_{Re}) for waste transfers are limited to $< 30\%$ and > 20000 respectively (Fowler 1995). If $N_{Re} < 20000$, then the evaporator slurry pump must be operated when the SpG is greater than 1.3 to eliminate the potential for plugging (Nicholson 1991). Using lab data results for viscosity, the final pass evaporator slurry product was transferred to the slurry tank with a calculated N_{Re} of < 20000 , however the slurry pump was operated (instead of gravity flow) to ensure the potential for transfer line plugging did not exist. Based on post-campaign sludge measurements in 106-AW, the slurry product contained approximately 3.4% solids by volume. Transfer line plugging did not occur during Campaign 95-1.

- 4.2.8 Transuranic Waste Segregation - Transuranic waste (TRU), i.e. waste that contains $\geq 100 \text{ nCi/g}$ transuranic elements, must be segregated from non-TRU waste due to additional pretreatment required for final disposal. Campaign 95-1 slurry product was predicted in the PCP to be non-TRU waste. Actual Campaign 95-1 slurry product contains less than 1.04 nCi/g TRU which is classified as non-TRU waste

per DOE 5820.2A. Calculations for TRU can be found in Appendix B.

4.2.9 Heat Generation - Prior to the run, the combined 95-1 feed and sludge heat generation was calculated in the PCP to be below the 2.05×10^5 Watt (70000 BTU/hr) limit. The sludge in the 102-AW and 106-AW had not been sampled prior to Campaign 95-1 and for conservatism was assumed to be equivalent to 106-C sludge when heat generation was calculated. Post campaign tank samples from 106-AW indicated the total heat load of the tank is 1.71×10^3 Watts (5830 BTU/hr) which is well below the 2.05×10^5 Watt (70000 BTU/hr) limit and substantially less than predicted in the PCP. Calculations for tank heat load are contained in Appendix B.

4.2.10 Separable Organic Layers - Separable surface organic layers were not present in tanks 108-AP, 107-AP, 102-AW, and 106-AW as indicated by precampaign sampling. The minimum level in feed tank 102-AW was set at 15 cm (6 inches) throughout the campaign.

The process condensate tank C-100 liquid level was operated at 50% WF during Campaign 95-1 to maximize the detectability of a potentially forming organic layer and to move the interface further from the condensate pump suction. The TK-C100 organic interface indicator LI-C100-1 did not alarm during the campaign indicating no significant organic layer was present. The TK-C100 was overflowed at the end of the campaign to remove potential floating materials and undesirable surface constituents.

4.2.11 Sludge Levels - The sludge level in 106-AW was measured before and after Campaign 95-1 to quantify the volume of solids generated during the campaign and to determine the current operational volume of the tank. Prior to the campaign, the volume of sludge in 102-AW was measured to be 50.8 cm (20 in). Post campaign measurements of 102-AW were not performed at the time of this revision. Prior to the campaign, the volume of sludge in 106-AW ranged between 132 and 254 cm (52 and 100 in.) with an average of 191 cm (79 in.) from 5 different risers. Measurements from the same risers after the completion of the campaign indicated sludge levels between 132 and 287 cm (52 and 113 in.) with an average of 208 cm (82 in.). Sludge measurements for 106-AW can be found in Appendix J.

4.3 SAFETY EVALUATION

4.3.1 Criticality - The criticality prevention specification (WHC 1994) limits the concentration of fissile material for evaporator feed to 0.005 g/L. Evaporator transfers to DST systems are limited to 0.013 g/L fissile material. Actual Campaign 95-1 samples indicated $^{239/240}\text{Pu}$ concentrations from 0.066 to 0.19 uCi/l (1.06×10^{-6} - 3.07×10^{-6} g/L) in feed and 0.13 to 0.91 uCi/l (2.1×10^{-6} - 1.47×10^{-5} g/L) in slurry. Although not measured directly in samples, ^{235}U and ^{233}U were calculated from U_{gross} to be 6.63×10^{-4} and 7.66×10^{-12} g/L respectively. All Campaign 95-1 fissile material was measured or calculated to be below the criticality prevention limits. Total $^{239/240}\text{Pu}$ transferred to 106-AW was 8 grams. Because some Campaign 95-1 feed concentrations were below detection limits, a plutonium material balance was not performed. Fissile calculations can be found in Appendix B.

4.3.2 Evaporator Radiological Source Term - The preliminary assessment of the Campaign 95-1 slurry product in the PCP indicated that it would be in compliance with Evaporator radiological source term (RST). Slurry product samples were taken during the campaign to verify source term compliance. None of the radionuclides exceeded the source term limits (Lavender 1993). Table 11 (Appendix E) contains the source term limits and the associated slurry product analysis.

Because the ^{241}Pu analysis cannot be performed at the 222-S Labs, the slurry product ^{241}Pu concentration was calculated from an equation in WHC-SD-OCD-016 (Tranbarger 1992) and found to be less than 0.1% of its RST limit. The ^{226}Ra concentration was also calculated from WHC-SD-OCD-016 because of poor ^{226}Ra detection levels caused by matrix interference. The slurry ^{226}Ra concentration was found to be 0.1% of its RST limit.

4.3.3 LERF Radiological Limits - The LERF source term limits are based upon maintaining the sum of the ratio of concentration to Derived Concentration Guide (DCG) value for 22 radionuclides at less than 5000 (Aguirre 1994). All process condensate samples taken during Campaign 95-1 were well below the limit of 5000 DCG's.

Process condensate samples were taken on a weekly basis during Campaign 95-1 and analyzed for the predominant contributors AT, TB, I-129, and H3. From these samples, the DCG's were calculated to range from 3 to 21 with an average of 8.

Starting on 7/31/95, samples were collected from LERF Basins 42 and 43 to satisfy the OSR semi-annual sampling requirement (Aguirre 1994) and full characterization for the Effluent Treatment Facility (ETF). The DCGs from these LERF basins were estimated to be 2.90 and 3.80,

respectively. The calculations for the DCGs can be found in Tables 13 and 14 of Appendix F.

- 4.3.4 LERF Ammonia Industrial Hazard Limit - Ammonia/ammonium concentrations are limited to 13,600 mg/L in LERF to prevent toxicological exposure of nonfacility personnel to ammonia vapor (Lavender 1993b). The highest ammonia concentration in process condensate was estimated in the PCP to be 1,950 mg/L. Ammonia concentrations in all of the process condensate samples taken during Campaign 95-1 were well below the limit of 13,600 mg/L. The highest ammonia concentration in the samples was less than 6.0% (796 mg/L) of the limit. Appendix F contains information on process condensate ammonia results.

- 4.3.5 Shield Design Limits - The Cs-137 concentration in feed and slurry streams must be maintained below 0.8 Ci/L to prevent radiation fields which exceed the shielding design criteria of the personnel-occupied areas of the 242-A Evaporator Building (Lavender, 1993).

Analysis of all feed and slurry samples taken during Campaign 95-1, indicated Cs-137 concentrations well below the 0.8 Ci/L limit.

4.4 ENVIRONMENTAL COMPLIANCE EVALUATION

- 4.4.1 Vessel Vent Organic Discharge Limits - Volatile organics are limited in evaporator feed to prevent hanford site organic emissions from exceeding 1.4 kg/hr (3 lbs/hr) or 2800 kg/yr (3.1 ton/yr) (Von Bargaen 1995). This may be controlled via sampling or calculation (process knowledge). To ensure these limits were not exceeded by the vessel discharge, the Campaign 95-1 feed characterization data was analyzed in the PCP and determined to be a small fraction of the limit.

Based on the pre-campaign data evaluation, vessel vent organic samples were not necessary for the campaign. However, the total carbon data results for feed, slurry, and process condensate samples taken simultaneously at steady state equilibrium conditions during the campaign indicated that more than 99.6% of total carbon in the feed stream remained in the slurry stream. Therefore, a negligible amount of organic carbon discharged out the vessel vent.

Based on the pre-campaign characterization data for candidate feed tanks and the methodology documented in 242-A Evaporator Dangerous Waste Permit Application, DOE/RL-90-42, the weighted average organic emission rate for Evaporator Campaign 95-1 was estimated to be 0.19 kg/hr (0.4 lb/hr). The maximum emission rate was estimated to be 0.32 Kg/hr (0.70 lbs/hr), which is well below the 1.4 kg/hr (3.0 lbs/hr) limit. The total estimated organic discharge through the vessel vent system for Campaign 95-1 was 221 Kg

(465 lbs). A copy of the internal letter containing estimation of organic emission rate can be found in Appendix K.

- 4.4.2 Vessel Vent Ammonia - Ammonia discharges from the vessel vent stack are limited to the CERCLA reportable quantity of 45 kgs (100 lbs) in any 24 hour period. Data compiled from the vessel vent ammonia monitor AI-NH3-1 during Campaign 95-1 indicated ammonia discharges from a maximum on 6/25 of 16 kg/day (35 lbs/day) to negligible at the end of the run for an approximate campaign release of 185 kgs (408 lbs). To reduce daily ammonia discharges, waste from 108-AP was blended with 107-AP to maintain ammonia concentrations in the stack below 1000 ppm. Vessel vent ammonia release information, is contained in Appendix G.

- 4.4.3 LERF Liner Limits - Process condensate chemical limits have been established for LERF liner integrity (Von Barga 1995). To ensure these limits were not exceeded, the Campaign 95-1 feed characterization data was analyzed in the PCP and determined to be well below the limits.

The total carbon data results for process control process condensate samples taken during the campaign indicated insignificant amount of organic in the process condensate stream. The highest carbon concentration in the samples was 23 mg/L which is well below the LERF organic screening limit of 1240 mg/L. The data results for all the process condensate samples taken during the campaign were within the discharge limits for pH and ammonia. Total carbon, ammonia, and pH analysis for LERF liner compatibility can be found in Appendix F.

The process condensate RCRA-protocol sampling for liner compatibility was taken at LERF as part of LERF/ETF Waste Analysis Plan on 7/31/95. The organic analyses for samples taken from LERF basin 42 were less than 17 percent of the LERF liner compatibility limits.

- 4.4.4 Process Condensate Ammonia Concentrations - Ammonia concentrations are limited to 1 wt% (0.58 M or 10000 mg/L) in LERF to prevent the waste from classified as "Extremely Hazardous" (Barga 1995). Although the RCRA protocol sampling for ammonia is now taken at LERF as part of LERF and ETF sampling, none of the process control condensate samples taken during Campaign 95-1 approached the limit. Ammonia concentrations in the process condensate samples ranged from 14 to 800 mg/L and an average of 305 mg/L. Appendix F contains information on process condensate ammonia results.

- 4.4.5 Gaseous Radiological Limits - Vessel Vent record samples indicated the airborne radionuclide levels discharged through stack 216-A-22 increased slightly during Campaign 95-1 but were well below the OSD limits (Godfrey 1993). The highest total alpha concentrations were approximately an order of magnitude below the annual average OSD limit.

The highest total beta concentrations were about 2 orders of magnitude below annual OSD limits. Vessel Vent radiological emissions for Campaign 95-1 are shown in Figures 24 and 25. Record sample data was obtained from Automated Bar Coding of Air Samples at Hanford (ABCASH).

A new requirement for gaseous radiological emissions has been imposed per the Environmental Compliance Manual WHC-CM-7-5. The radionuclide emissions in air from the combined stack discharges of all facilities on the Hanford site boundary is limited to 10 mrem/year. The current Evaporator OSD limit for gaseous radiological release should be changed to reflect the new requirement.

- 4.4.6 Steam Condensate Discharge Limits - Steam condensate (ASC) samples were taken each time a steam condensate basin was filled (1-2 basins filled per day). The ASC samples are analyzed for total alpha, total beta, and pH to ensure compliance for discharge to B-pond. Total alpha concentrations ranged from undetected to 1.87×10^{-08} uCi/ml with an average of 8.66×10^{-09} uCi/ml. Total beta concentrations ranged from undetected to 1.82×10^{-07} uCi/ml with an average of 2.12×10^{-08} uCi/ml. The average concentrations are 1 and 2 orders of magnitude below the 6.0×10^{-08} uCi/ml and 2.0×10^{-05} uCi/ml annual OSD limits for total alpha and total beta limits respectively (Godfrey 1993). Most sample results were usually reported as undetected values. Steam condensate ranged between pH 6.58 and 9.19 with an average pH of 7.35, which is within the DQO limits of pH 2 and 12.5 (Von Bargaen 1995). Total campaign steam condensate discharge to B-Pond was 15.8 million liters (4.17 Mgal). Campaign 95-1 steam condensate information is contained in Appendix H.
- 4.4.7 Cooling Water Discharge Limits - Daily cooling water samples (ACW) were taken during Campaign 95-1 and analyzed for total alpha, total beta, and pH to ensure compliance for discharge to B-Pond. The total alpha concentrations ranged from undetected to 5.80×10^{-08} uCi/ml, with an average of 1.07×10^{-08} uCi/ml which is well below the annual average OSD total alpha limit of 6.0×10^{-08} uCi/ml. The total beta concentrations ranged from undetected to 1.34×10^{-07} uCi/ml, with an average of 2.27×10^{-08} uCi/ml which is well below the annual average OSD total beta limit of 2.0×10^{-05} uCi/ml (Godfrey 1993). Most of the sample results for total alpha and total beta were undetected. Cooling water remained well within the DQO limits of pH 2 and 12.5 (Von Bargaen 1995) with a pH ranging from 7.08 to 8.95 and an average of 8.16. Total campaign cooling water discharge was 583 million liters (154 Mgal). Information on cooling water is found in Appendix I.

5.0 PROBLEMS

- 5.1 High Process Condensate Temperature/Poor Vacuum condenser Performance - The condensate transfer line from 242-A to LERF has an operating limit of 120 DegF for structural integrity. Maintaining a process condensate temperature below the alarm point of 110 degF and an overall condensate tank temperature below 120 DegF was difficult during the final pass of the evaporator campaign. Contributing factors included warm summertime (70°) cooling water temperatures, higher waste SpG's with associated higher vapor temperatures, and evaporator operating pressures of $\geq$ 60 TORR. Typical ways to reduce process condensate temperatures are by controlling cooling water flow and controlling vacuum in the evaporator vessel. During campaign 95-1, the cooling water flow was increased in an attempt to decrease condensate temperature, but the changes made had only small effects. One method to reduce condensate temperature would have been by decreasing the operating pressure/temperature of the evaporator, but the operating efficiency (with zero air bleed-in) of the vacuum-condenser system was poor, attaining only 60 TORR operating pressure during the final pass. A 40 or 50 TORR operating pressure would have easily kept the process condensate temperature below 110 DegF during Campaign 95-1. Historical vacuum-condenser system operating pressures were typically in the 40 TORR range. One postulated reason for the observed performance reduction of the vacuum condenser system is hard water fouling in EC2 and EC3. Fouling of the main EC1 condenser has been well documented, but little information exists on EC2 and EC3. Because high condensate temperatures may significantly impact transfers to LERF, a work package has been generated to assess fouling of the EC2 and EC3 condensers prior to the next campaign. Furthermore, the poor performance of EC2 and EC3 may be contributing to the condensation problems with the vessel vent system during the last three campaigns.
- 5.2 Inadvertent Draining of Steam Condensate to 102-AW - On July 10, several adjustments were made to the reboiler steam trap bypass valve to smooth steam flow and pressure instability but were unsuccessful. Later, troubleshooting began which included checking drains and traps on the inlet and outlet side of the reboiler. Upon completion of the investigation, one of the steam traps was left open unintentionally causing a portion of the steam condensate to purge to 102-AW. The daily material balance was performed on the morning of July 11 and did not come within specifications. After an investigation of the material balance discrepancy, the 102-AW liquid intrusion was determined to be coming from the steam condensate. Upon walkdown of the plant, the open trap valve was identified. Approximately 30,000 gallons of steam condensate was transferred to 102-AW, resulting in reduced overall evaporator operating efficiency.
- 5.3 Slurry Sampler Recirculation Line Plugging - On July 21 and 22, slurry samples were taken from the F2 sampler for the evaporator final pass waste evaluation. The slurry samples were found to contain an unusually high percentage of solids (50 Vol%), which did not represent process predictions. Review of the recirculation bypass jumper flowmeter FI-CA1-3 indication over the

duration of the campaign suggested that solids were accumulating in the jumper and occasionally restricting flow. To ensure representative data of the Campaign 95-1 slurry product was obtained, post-campaign samples were taken from the slurry tank 106-AW and sludge measurements were taken to estimate the true solids volume of the slurry product.

The evaporator hot water flush at the end of the campaign appeared to clear the solids in the F-2 slurry sample loop.

The current F-2 slurry sampler arrangement positions the sample head approximately eleven inches below the sampler inlet and outlet connections. Because of this, the area around the sampler head tends to become a solids trap if flow velocities become too low. The main limiting factor to increasing flow velocity is the lack of a motive force. Flow through the sampler is driven by the differential pressure across the P-B-1 recirculation pump. Historical data from the 95-1 campaign indicated that this pressure was less than 4 psid. Hydraulic modeling, using process parameters obtained from the 95-1 campaign, showed that the flow velocity is marginal at keeping solids suspended throughout the entire sample loop.

Engineering is currently evaluating options for improving the ability of the sampler to obtain representative samples. In addition, the reliability of the sample loop flowmeter, FI-CA1-3 will be improved prior to the next campaign. This flowmeter is instrumental in determining if plugging is occurring in the slurry sample loop.

- 5.4 Seal Water/PC Recycle System Problems - A new process condensate recycle system was installed just prior to Campaign 95-1. The system was designed for waste minimization by utilizing process condensate for the CA1 deentrainment sprays and the PB1 and PB2 pump seals, thereby reducing raw water addition to the evaporator process.

The performance of the PC recycle pump (P-C106) began to degrade in the early stages of the campaign, progressively failing to provide adequate pressure for the PB2 pump seals and deentrainment sprays. On 6/17, the deentrainment sprays were shut down in order to gain seal water pressure. Later the PC recycle system was shutdown for troubleshooting and P-C106 was disassembled for inspection. Visual analysis of the P-C106 showed that the majority of breakdown was due to corrosion caused by the incompatibility between the bronze impeller and high ammonia content in the process condensate. Because the existing P-C105 and P-C105A seal water pumps also had bronze impellers, similar degradation was also seen in those pumps. On 7/19, the impeller on P-C106 was replaced and the PC recycle system was operated during the final pass.

A PC recycle design change has been proposed which includes replacement of P-C106 with a higher capacity stainless steel pump. The new pump will provide sufficient pressure to eliminate the need for the seal water booster pumps when operating with process condensate, and will resist corrosion if the process condensate

contains high ammonia. The seal water booster pumps will be operated only when filtered raw water is used for PB1 and PB2 pump seals. The changes are expected to occur prior to the next evaporator campaign.

- 5.5 RC2 Sampler Leakby - During campaign 95-1 the RC-2 sample carboy was observed filling at an accelerated rate compared to normal. Upon further investigation, it was determined that the RC-2 isolock sampler head was allowing raw water to leak by the O-ring seals. At first, this was not deemed a significant problem because the leakby was not severe. The sample frequency for the composite sampler was decreased to compensate for the sample head leak rate. No work could be performed on the isolock sampler head during evaporator operation. As the campaign continued, the leakby increased to a point where it was determined to be a significant problem. The RC-2 carboy was filling so rapidly that a representative composite sample of the used raw water stream was impossible to obtain. Environmental engineering was consulted and agreed to the use of grab samples of the used raw water stream until the sample head could be replaced during the outage planned before the final pass. In addition, the excess used raw water sample being drained was becoming a significant waste addition to tank 102-AW. To address the problem, the overflow drain from the RC-2 carboy was temporarily rerouted to the TK-C-103 (steam condensate). During the planned outage before the campaigns final pass, the RC-2 isolock sampler head was replaced with a new sample head from spare parts. The RC-2 carboy drain line and the RC-2 composite sample frequency was returned to its original configuration/frequency.
- 5.6 Raw Water Flow Indicator Failure - On July 7, 1995, the raw water flow indicator FI-CA1-1A (a metal float and glass housing) ruptured, allowing a water leak to the 242-A condenser room. The flow indicator was immediately isolated to prevent further leakage. The water spray caused several of the facility instruments to read erratically, resulting in a 43 hour facility shutdown. The root cause of flow indicator failure was determined to be excessive operation the raw water valve HV-CA1-6 over the years. This operation caused the piping to vibrate enough that the flow indicator finally failed at some point on the glass housing. During the campaign, the raw water valve was frequently cycled to let slurry valves (HV-CA1-2 and HV-CA1-2A) seat and prevent water leakage into the slurry line. The raw water flow indicator was used as an operational process aid only and will be isolated permanently to prevent recurrent failure.
- 5.7 Erratic LERF Basin 43 Automatic Level Readings - LERF basin 42 routinely received process condensate from the Evaporator Campaign 95-1. Due to concerns that ETF startup could be significantly delayed, the process condensate generated during the final pass was routed to LERF basin 43 in order to use all available LERF capacity, thereby providing adequate space for future campaigns. The automatic liquid level measurement systems for LERF basin 43 provided erroneous readings during warming and cooling periods of the campaign. The liquid level was manually measured to verify compliance with LERF operating specifications.

After extensive troubleshooting, the problem was found to be a bad Probe/Transmitter connection mechanism as supplied by the vendor. The end of the probe had a thermo well type cavity that housed a spring loaded post that pushed against a solder pad on the transmitter. During significant temperature changes, this connection became unstable and caused erratic level outputs from the transmitter. To resolve this problem, the spring loaded pin was removed. The opening of the well was threaded and the wire lead was bolted to the end of the probe. This provided a very solid probe/transmitter connection and resulted in a stable output from the transmitters. A copy of the internal letter addressing the LERF Basins Level Transmitters Troubleshooting can be found in Appendix K.

- 5.8 Loss of Feed due to AW Instrument Air Loss - Instrument air compressors in AW farm shut down several times during the campaign. Since instrument air from AW farm is used to operate the feed valve DOV-02E-1 for the evaporator, loss of AW instrument air will cause the feed valve to fail open, diverting feed flow from Evaporator to the 102-AW feed tank. Loss of feed will result in Evaporator shutdown due to lowering liquid level in the vessel. In addition, significant efforts were required to regain feed flow control after losing instrument air to the feed valve. The Evaporator was shutdown due to AW instrument air loss on one of three occasions during the campaign. To prevent recurrence, a work package has been generated to use instrument air from evaporator compressors for the feed valve operation.

- 5.9 Process Condensate Diversion To Tank 102-AW - On June 20, 1995, a spurious alarm from leak detector LDI-A1 on the process condensate (PC) line between the 242-A Evaporator and the Liquid Effluent Retention Facility (LERF) annunciated in the 242-A Evaporator control room and cleared immediately. As a design of the computer control system, the alarm activated the automatic shutdown mechanism of PC pump (P-C100) and diversion of valve HV-RC3-3 to permit process condensate flow back to the 102-AW Evaporator feed tank. The P-C100 was manually restarted in a few minutes after the alarm annunciated. However, the HV-RC3-3 valve was not repositioned to send the process condensate to LERF. The Evaporator system was unintentionally operating in a non-productive recycle loop for approximately eight hours. This caused 27,000 gallons of PC to be diverted to the feed tank and 2,000 gallons of seal and flush water being added to the system.

A modification to the valve lineup was performed which will divert the PC flow back to TK-C100 if a similar alarm occurs.

- 5.10 Condensate Buildup In Radiation Monitoring Systems - High differential pressure (d/p) across the vessel vent de-entrainer pads occurred several times during the campaign. Typical response in an attempt to lower the high d/p is to reduce the vessel vent stack flow rate and manually adjust air bleed-in valve 3-1. On 6/19/95, while investigating a spurious alarm from vessel vent high alpha radiation monitor, the vessel vent CAMs and record sampler were found to contain water. Water condensation in the vessel vent was due to insufficient air flow and high humidity during a rain storm. The problem was temporary resolved by

draining water out of the CAMs and replacing the record sampler filters. A temporary heater was installed on the vessel vent air inlet to reduce water condensation from high humidity. In the future, a rain cap or permanent inlet heater may be installed to reduce condensation problem in the vessel vent system.

6.0 RECOMMENDATIONS

- 6.1 SPECIFIC GRAVITY MODELING - A precise prediction of specific gravity (SpG) of the slurry waste at the end of an evaporator campaign is vital for evaporator process control strategy and operation. The evaporator slurry is limited to SpG of < 1.41. The SpG limit was chosen because of a statistical correlation between SpG and flammable gas watch list tanks. The pre-campaign boildown SpG is always much higher than the actual slurry SpG mainly due to the suspended and precipitated solids in the boildown flask.

For several years now, the 242-A Evaporator SAR (WHC-SD-WM-SAR-023) has provided the correlation for estimating the final product slurry SpG. However, this SAR SpG correlation was found to be substantially different from the actual sample SpGs taken during evaporator campaigns in 1994 and 1995. The SAR SpG correlation was derived from an equation based on four-component synthetic waste with SpGs ranging from 1.490 to 1.728. This correlation was not derived for the range of current evaporator operation and does not include some important waste components that contribute to SpG such as NaF, Na_3PO_4 , Na_2SO_4 , and Na_2CO_3 which are known to be fairly common among the evaporator wastes. Therefore, it was felt that a new SpG correlation was needed.

The new SpG correlation for the evaporator waste was determined as a function of the concentration sum (moles) of eight major salts which are found abundantly in the waste. The major salts are NaAlO_2 , NaOH, NaNO_3 , NaNO_2 , NaF, Na_3PO_4 , Na_2SO_4 , and Na_2CO_3 . To derive the new SpG correlation, the effect of temperature was neglected, assuming ambient conditions at the labs were the same as in the waste tanks. The data used for the new SpG correlation are based on Evaporator campaigns which are listed in Table 7 of Appendix E.

The following simple equation, valid for SpGs ranging from 0.983 to 1.47 at room temperature was derived from the referenced data with a high coefficient of correlation (R^2) of 0.965, which means 96.5% of the total data variability is expressed by the equation.

$$\text{SpG} = \{0.057998 * \text{Anion Sum (M)}\} - \{0.00169 * [\text{Anion Sum (M)}]^2\} + 0.98041$$

The SAR equation was also compared to the same referenced data and had a correlation $R^2 = 0.82$.

Graphical illustrations of how close the correlations compare to the sample data can be found in the Appendix E.

It is recommended that this equation will be used in the next campaign to determine SpG (as a test case). Based on results of this test and using further data to refine the equation as necessary, a recommendation may be made at that time to incorporate it into the Evaporator Flow Sheet model.

- 6.2 PB1/PB2 Seal Water Modification - At the present time, orifices are used to maintain backpressure of water seals for PB1 and PB2. Because of the small size of these orifices, plugging is a common occurrence. Entries into the pump room (a high radiation zone) have been made frequently to unplug these orifices. To promote ALARA, waste minimization, and eliminate the down-time currently associated with cleaning the orifices, an engineering study (WHC-SD-WM-ES-359) has been completed proposing modifications to redirect the PB1 and PB2 pump seal to TK-C100 instead of 102-AW, and to install accessible needle valves for flow control.
- 6.3 Insufficient Anti-Foam Concentration Results In High De-entrainment Pad dP's - Excessive foaming at the C-A-1 vessel liquid-vapor interface resulted in plant shutdown on five separate occasions during the campaign. During the initial stages of campaign 95-1, the facility was operated using an anti-foam concentration which had proved effective during campaigns 94-1 and 94-2. Anti-foam concentration was increased incrementally after each of the first three successive shutdowns to a concentration of approximately 300 ppm of anti-foam in the C-A-1 vessel at the time of the fourth shutdown. After the fourth shutdown the decision was made to double the anti-foam concentration, which resulted in smooth plant operation until the anti-foam addition was prematurely stopped prior to the end of the campaign (the fifth shutdown).

Much valuable experience was gained during campaign 95-1 concerning the behavior of foam in the evaporator process. The main points are summarized below:

- 1) Boildown studies are valuable tools for predicting foaming potential. During both campaign 94-1 and 95-1, foaming problems occurred at approximately the same WVR as noted during the pre-campaign boildown studies. The boildown study for campaign 94-2 did not predict significant foaming, and in fact the entire campaign was run successfully at a very low anti-foam concentration.
- 2) The evaporator process is very destructive to the anti-foam. Foaming problems encountered during campaign 95-1 were resolved after anti-foam concentration in the C-A-1 vessel was raised to approximately 600 ppm, or three times the maximum concentration recommended by the anti-foam manufacturer.
- 3) Adjustment of process parameters will not cure foaming. During both campaign 94-1 and 95-1, steam, vacuum and level setpoint adjustments were made in an effort to control foaming in the vessel, to no effect. In both cases, the only successful cure for foam was anti-foam chemical addition.

- 4) Filling the vessel with water and restarting will not cure foaming - During both campaign 94-1 and 95-1, C-A-1 was dumped and filled with raw water in an attempt to "wash out" the foam. In both cases foaming problems resumed when the vessel contents returned to the original concentration. This technique is particularly non-beneficial given the negative impact on PC to WVR ratio, a PBI goal.
- 5) Anti-foam chemical does not clog the de-entrainment pads - Review of de-entrainment pad dP data for all three campaigns reveals no upward trend that is associated with scaling or material buildup from beginning to end of campaign.

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APPENDIX A

HISTORY

TABLE 1: EVENT TIMELINE - CAMPAIGN 95-1 (p. 1 of 5)

May 4, 1995

Started a complete tank transfer from 106-AP to 108-AP.

5/8

Completed 106-AP to 108-AP transfer.

5/19

Started and completed a 371,000 gallon (135 in) transfer from 107-AP to the feed tank (102-AW).

5/23

Started and completed a 371,000 gallon (135 in) transfer from 108-AP to feed tank.

6/1

Initiated and completed valving, instrumentation, and electrical lineups.

6/2

Began evaporator prestart procedure.

6/3

Filled evaporator with flush water.
Began troubleshooting low seal water flow to recirculation pump (PB1).

6/7

Replaced what was assumed to be failed PB1 flow transmitter (FIT-CA1-1).
PB1 seal water jumper then assumed to be plugged.

6/8

Cleared PB1 seal water jumper obstruction.
Started plant up for campaign 95-1, achieving boiloff at midnight.

6/12

Obtained process condensate and slurry samples.
Feed sample was not taken due to leaking valve.
Started a 206,000 gallon (75 in) transfer from 107-AP to the feed tank.

6/13

Completed transfer from 107-AP to the feed tank.
Started a 206,000 gallon (75 in) transfer from 108-AP to the feed tank.
Spurious slurry line leak detection (SL167/168) alarms shutdown the slurry pump (PB2) multiple times due to moisture.

6/14

Completed transfer from 108-AP to the feed tank.
Moisture caused SL167/168 alarms to shut down PB2 multiple times.

6/15

Slurry and process condensate samples were taken.
Valving sequence was modified to allow feed samples to be obtained.
Started 275,000 (100 in) 106-AW to feed tank recycle transfer.

6/16

Seal water pressure to PB2 gradually drops off, troubleshooting started.

6/17

Completed 106-AW to 102-AW recycle transfer.
Started a 385,000 gallon (140 in) transfer from 107-AP to the feed tank.
Turned off deentrainment sprays to maintain adequate seal water pressure to PB2.

TABLE 1: EVENT TIMELINE - CAMPAIGN 95-1 (p. 2 of 5)

6/18

Completed transfer from 107-AP to the feed tank.
Vessel vent de-entrainer differential pressure (d/p) began to rise and could not be corrected with air bleed-in adjustment.

6/19

Started vessel vent deentrainment sprays in an attempt to reduce d/p's. Feed, slurry, and process condensate samples were taken.
Rain and high humidity caused condensation to accumulate in the vessel vent CAM's and record sampler.
Started a 275,000 gallon (100 in) recycle transfer from 106-AW to the feed tank.
Moisture caused COB box alarms to shut down the 106-AW transfer pump multiple times.

6/20

Restarted 106-AW recycle transfer after electrical jumper was installed to bypass spurious alarms that were unrelated to the transfer.
LERF leak detection alarms caused an unnoticed 27,000 gallon diversion of PC to the feed tank.
Disassembled process condensate recycle pump (PC-106) and found pump impeller corrosion.

6/21

Spurious SL-167/168 alarms periodically shutdown PB-2.
Seal water pumps (P-C105 & P-C105A) failed and shut down PB2.
Started to slurry out by gravity.
Completed 106-AW recycle transfer.
Started a 358,000 gallon (130 in) transfer from 108-AP to the feed tank.

6/22

Decreased steam flow to match boiloff rate to gravity slurry flow.
Attempted to rebuild P-C105A but pump would not increase seal water pressure.
Compressors in AW farm shutdown, causing loss of feed which also shut down the evaporator due to lowering liquid level.

6/23

Completed shutdown of evaporator.
Gravity slurried most of evaporator contents to 106-AW and dumped remainder to 102-AW.
Completed 108-AP to 102-AW transfer.
Fixed seal water pumps and cleaned PB2 seal water jumper.
AW farm instrument air restarted using a portable air compressor.
Began filling evaporator with feed and proceeded into startup.

6/24

Completed evaporator startup with boiloff at 0622.

6/26

A portable compressor was installed because the ALC compressor shut down.
A larger portable was brought on-line for both AW instrument air and ALC air after the existing ALC portable compressor shut down several times.

6/27

Feed, slurry, and process condensate samples were taken.
Started a 275,000 gallon (100 in) recycle transfer from 106-AW to the feed tank.

TABLE 1: EVENT TIMELINE - CAMPAIGN 95-1 (p. 3 of 5)

6/28

Used raw water sampler (RC2) leakby is causing some used raw water to drain to the feed tank. Completed 106-AW recycle transfer.

6/29

Restarted PC recycle system after new/rebuilt pumps were installed.

6/30

ALC compressor was repaired and placed back in service.

Portable instrument air compressor in AW farm shut down, causing loss of feed valve control.

After air was restored, the feed valve required cycling to regain flow control.

Started a 756,000 gallon (275 in) recycle transfer from 106-AW to the feed tank.

7/1

More air compressor problems in AW farm caused loss of evaporator feed valve control, with significant effort required to regain control.

7/2

Foaming caused evaporator deentrainment pad dP's to climb and eventually shut down the evaporator.

Restarted evaporator after increasing anti-foam chemical addition.

7/3

Deentrainment dP's continued to rise again, despite deentrainer flushing, increased anti-foam addition, and reduced boiloff.

Evaporator later shut down due to high deentrainer dP's.

Dumped evaporator contents and refilled vessel with raw water to help remove foam.

7/4

When initially starting up with raw water, the lower deentrainment pad dP rose again preventing startup.

Deentrainment pad flushing would cause a temporary reduction on the dP's.

Deentrainment transmitter air rotometers were adjusted.

Antifoam chemical was added with a higher makeup concentration over a period of time to bring up vessel antifoam concentration before attempting to restart the plant.

The evaporator eventually reached boiloff without pad dP problems.

7/5

Feed, slurry, and process condensate samples were taken.

RC2 isolock leakby calculated to be 1 gpm.

RC2 carboy overflow drain rerouted to the steam condensate weir to eliminate water addition to the feed tank.

7/6

Deentrainer dP slowly rose forcing a plant shutdown.

Deentrainers were flushed and antifoam makeup concentration was doubled.

A plugged steam strainer prevented restart of the evaporator and the plant was left in recirculation with vacuum.

TABLE 1: EVENT TIMELINE - CAMPAIGN 95-1 (p. 4 of 5)

- 7/7
Completed 106-AW to 102-AW recycle transfer.
Cleaned plugged steam strainer.
Started process condensate recycle system, and completed plant startup.
FI-CA1-1A rotometer (water) ruptured on upper level of the condenser room, wetting down equipment, the basement floor and instrumentation.
Shut down the evaporator and dumped the vessel.
- 7/8
Some instrumentation temporarily showed irregular readings, but most readings returned to normal after instrumentation dried out.
PBI seal water needle valve required adjustment to bring flow into spec during seal water startup.
Filled vessel with feed from 102-AW.
PBI seal water pressure rose and alarmed.
- 7/9
Began using filtered raw water to supply pressure to the seal with seal water pumps shut down.
Proceeded to plant startup and achieved boiloff.
- 7/10
Started seal water pumps.
PC-105 was unable to maintain pressure, so PC-105A was put in use, with PC-105 as backup.
- 7/11
A feed tank material balance discrepancy occurred.
Steam condensate valve 2-14 was discovered to be open allowing approximately 30,000 gallons of steam condensate to be sent to feed tank.
- 7/15
Shut down evaporator and dumped the vessel to the feed tank in preparation for the final pass operation.
Started staging waste from 106-AW to the feed tank.
- 7/17
The waste staging transfer was shut down temporarily due to a material balance discrepancy caused by inconsistent methods of taking liquid level readings.
- 7/18
Partially filled the evaporator vessel so feed samples could be taken.
Dumped the contents to 102-AW.
Sent feed samples to labs for rush analysis.
Rebuilt and installed PC-105. Pump was tested and found to work properly.
- 7/19
Started evaporator prestart procedure.
- 7/20
Completed startup for the final pass.
Started PC recycle system.

TABLE 1: EVENT TIMELINE - CAMPAIGN 95-1 (p. 5 of 5)

- 7/21 Obtained slurry and process condensate samples.
Maintaining process condensate temperature below 110 °F was difficult due to relatively warm raw water supply to condensers and higher specific gravity waste.
- 7/22 Slurry and process condensate samples were taken.
- 7/23 Lower deentrainment pad dP rose again.
Pad flushing did not remedy the problem.
- 7/24 Performed a controlled shutdown due to high deentrainment dP's.
Flushed pads and re-established anti-foam concentration in the vessel.
Proceeded into plant startup without the dP problems.
Overflowed tank C100 to flush out any potential organics in the tank.
ALC compressor shut down.
- 7/25 Started shutting down evaporator for completion of Campaign 95-1.
- 7/26 Slurried most of evaporator contents to 106-AW and dumped the remainder to the feed tank.
Filled evaporator with water for final evaporator vessel flush.
- 7/27 Completed evaporator flush.
Shutdown the plant and dumped the vessel.

TABLE 2: Campaign 95-1 Process Memo's

PM#	Description
EE95-006	242-A Campaign 95-1 Waste Staging
EE95-007	242-A Evaporator Campaign 95-1 Startup/Operation
EE95-008	242-A Campaign 95-1 Feed, Slurry, and Process Condensate Samples Set #1
EE95-009	242-A Campaign 95-1 Waste Staging Strategy #2
EE95-010	242-A Campaign 95-1 Feed, Slurry, and PC Samples Set #2
EE95-012	242-A Campaign 95-1 Waste Staging Strategy #3
EE95-013	242-A Campaign 95-1 Sample Log Data Sheet
EE95-014	242-A Campaign 95-1 Feed, Slurry, and PC Samples Set #3
EE95-015	242-A Campaign 95-1 Waste Staging Strategy #4
EE95-016	242-A Campaign 95-1 Feed, Slurry, and PC Samples Set #4
EE95-017	Temporary Evaporator Shutdown for Maintenance
EE95-018	242-A Evaporator Campaign 95-1 Restart/Operation
EE95-019	242-A Campaign 95-1 Waste Staging Strategy #5
EE95-020	242-A Campaign 95-1 Feed, Slurry, and PC Samples Set #5
EE95-021	Evaporator Shutdown for Final Waste Staging
EE95-022	242-A Campaign 95-1 Waste Staging Strategy #5
EE95-024	242-A Campaign 95-1 Process Condensate Samples
EE95-025	242-A Campaign 95-1 Feed Samples for Final Pass
EE95-026	242-A Evaporator Campaign 95-1 Final Pass Operation
EE95-028	Campaign 95-1 Final Pass Slurry and Process Condensate Samples
EE95-029	Flush 242-A Evaporator Vessel
EE95-032	Post Campaign 95-1 Sludge Measurements (102-AW and 106-AW)

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APPENDIX B

CALCULATIONS

TABLE 3: CAMPAIGN 95-1 WASTE VOLUME REDUCTION CALCULATIONS

Total Processable Feed:

	<u>Start</u>	<u>End</u>	<u>Difference</u>
102-AW	356.75	20	336.75
106-AW	240	100.0	140
107-AP	226.7	10.3	216.4
108-AP	214	10.5	203.5
Total			896.65 inches (2.466 Mgal or 9,330,000 L)

Remaining DSSF product:

	<u>Final</u>	<u>Heel</u>	<u>Difference</u>
102-AW	24.4	20	4.4
106-AW	196.7	100	96.7
Total			101.1 inches (278 Kgal or 1,052,000 L)

Final Evap Flush:

	<u>End</u>	<u>Start</u>	<u>Difference</u>
102-AW	34.35	24.4	9.95
106-AW	196.7	196.7	0
Total			9.95 inches (27 Kgal or 103,600 L)

$$\text{WVRF (before flush)} = \frac{896.65 - 101.1}{896.65} \times 100\% = 88.7\%$$

$$\text{WVRF (after flush)} = \frac{896.65 - 101.1 - 9.95}{896.65} \times 100\% = 87.6\%$$

$$\text{Total Campaign 95-1 WVR} = (896.65 - 101.1 - 9.95) = 785.6 \text{ inches} \\ (2.16 \text{ Mgal or } 8,180,000 \text{ L})$$

TABLE 4: CAMPAIGN 95-1 TOTAL OPERATING EFFICIENCY

Unplanned Outages

<u>Dates</u>	<u>Comments</u>	<u>Total Downtime</u>
6/22-6/24	Seal Water Pump(s) Failure	37 hours
7/2, 7/3-7/4 7/6-7/7, 7/24	Deentrainer Foaming	64.5 hours
7/7-7/9	Condenser room water leak from ruptured rotometer	43 hours
Total		<u>144.5 hours</u>

Planned Outages

7/15-7/20	Final pass waste staging and sampling	118.5 hours
7/25-7/27	Evaporator hot water flush	35.5 hours
Total		<u>154 hours</u>

Operating Efficiency (Based on Unplanned Outages Only)

Campaign duration 6/8-7/27 (49 days)	1176 hours
Planned Outages	<u>- 154 hours</u>
	1022 hours

$$\text{Total Operating Efficiency (TOE)} = (1022 - 144.5) / 1022 \times 100\% = 86\%$$

Overall Operating Efficiency

Campaign duration 6/8-7/27 (49 days)	1176.0 hours
Total downtime (planned and unplanned)	298.5 hours

$$\text{Total Operating Efficiency (TOE)} = (1176 - 298.5) / 1176 \times 100\% = 73\%$$

TABLE 5: CALCULATIONS (TRU, HEAT LOAD, FISSILE)

Slurry Product SpG Estimation (SpG limit < 1.41)

$$\text{SpG} = \% \text{Vol}_{\text{liq}} \times \text{SpG}_{\text{liq}} + \% \text{Vol}_{\text{sol}} \times \text{SpG}_{\text{sol}}$$

Based on the slurry product samples T2270, T2271, and 3.4% solids (estimated from sludge measurements in tank 106-AW), the Campaign 95-1 slurry product is as follows:

$$\text{SpG} = (1 - .034) \times 1.309 + 0.034 \times 2.33 = 1.34$$

Slurry Product TRU Estimation (classified as TRU if ≥ 100 nCi/g)

$$\text{TRU (nCi/g)} = \frac{[^{239}\text{Pu (uCi/ml)} + ^{241}\text{Am (uCi/ml)}] \times 10^3 \text{ (nCi/uCi)}}{\text{SpG (g/ml)}}$$

Using the slurry product data from Table 10, the Campaign 95-1 slurry TRU concentration is as follows:

$$\text{TRU} = \frac{[2.98 \times 10^{-4} + <1.09 \times 10^{-3}] \times 10^3}{1.34} = <1.04 \text{ nCi/g}$$

Slurry Product Heat Generation (total tank limit = 70,000 BTU/hr)

$$\text{BTU/hr} = \frac{[^{137}\text{Cs (uCi/ml)} \times 1.6 \times 10^{-2} \text{ (BTU/hr.Ci)} + ^{90}\text{Sr (uCi/ml)} \times 2.3 \times 10^{-2} \text{ (BTU/hr.Ci)}] \times \text{Volume (gallons)} \times 3.785 \text{ (L/gal)}}{\times 10^{-6} \text{ (Ci/uCi)} \times 10^3 \text{ (ml/L)}}$$

Using the slurry product data from Table 10 and a 106-AW slurry volume of 96.7 inches (266,000 gal), the Campaign 95-1 slurry product heat load is as follows:

$$\begin{aligned} \text{BTU/hr} &= \frac{[1.42 \times 10^2 \times 1.6 \times 10^{-2} + 1.64 \times 10^{-1} \times 2.3 \times 10^{-2}] \times 2.66 \times 10^5 \times 3.785 \times 10^{-6} \times 10^3}{2290 \text{ BTU/hr (671 Watts)}} \end{aligned}$$

Post campaign slurry tank (106-AW) sludge levels ranged from 52" to 113" with an average of 82". For conservatism, the sludge level of 100" was used in determining the sludge heat load. Cs137 and Sr90 values are averaged from post campaign sludge samples 6AW-95-2 and 6AW-95-3 from WHC-SD-WM-DP-149, Rev.0.

$$\begin{aligned} \text{BTU/hr(sludge)} &= [6.16 \times 10^1 \times 1.6 \times 10^{-2} + 1.05 \times 10^2 \times 2.3 \times 10^{-2}] \times 2.75 \times 10^5 \times 3.785 \times 10^{-6} \times 10^3 \\ &= 3540 \text{ BTU/hr (1036 Watts)} \end{aligned}$$

TABLE 5 (Cont.): CALCULATIONS (TRU, HEAT LOAD, FISSILE)

Fissile Calculations (Evaporator limit = 0.005 g/L & DST limit = 0.013 g/L)

$$^{239/240}\text{Pu (g/L)} = \frac{^{239/240}\text{Pu (uCi/ml)} \times 10^3 \text{ (ml/L)}}{6.2 \times 10^{-2} \text{ (Ci/g)} \times 10^6 \text{ (uCi/Ci)}}$$

$$^{235}\text{U (g/L)} = U_{\text{gross}} \text{ (g/L)} \times 9.33 \times 10^{-3}$$

$$^{233}\text{U (g/L)} = U_{\text{gross}} \text{ (g/L)} \times 1.077 \times 10^{-10}$$

For conservatism, the highest $^{239/240}\text{Pu}$ and U_{gross} concentrations came from samples T1986 and 106AW-95-1, respectively. Equations for ^{235}U & ^{233}U are from Pitkoff (1992).

$$^{239/240}\text{Pu (g/L)} = \frac{9.12 \times 10^{-4} \times 10^3}{6.2 \times 10^{-2} \times 10^6} = 1.47 \times 10^{-5} \text{ g/L}$$

$$^{235}\text{U (g/L)} = 7.11 \times 10^{-2} \times 9.33 \times 10^{-3} = 6.63 \times 10^{-4} \text{ g/L}$$

$$^{233}\text{U (g/L)} = 7.11 \times 10^{-2} \times 1.077 \times 10^{-10} = 7.66 \times 10^{-12} \text{ g/L}$$

$$\text{Total Fissile} = 6.78 \times 10^{-4} \text{ g/L}$$

Final Pass $^{239/240}\text{Pu}$ transferred to 106-AW

For final slurry product Pu transferred to 106-AW, the samples (T2270 & T2271) were used in the calculation which consists of 96.6% supernate and 3.4% solids.

$$\text{Total grams Pu in transfer} = ^{239/240}\text{Pu (g/L)} \times \text{volume (gal)} \times 3.785 \text{ L/gal}$$

$$^{239/240}\text{Pu (grams)} = (4.81 \times 10^{-6} \text{ g/L} \times .966 + 9.74 \times 10^{-5} \text{ g/L} \times .034) \times 266000 \text{ gal} \times 3.785 \text{ L/gal}$$

$$^{239/240}\text{Pu (grams)} = 8 \text{ grams Pu}$$

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APPENDIX C

PERFORMANCE

FIGURE 1

Campaign 95-1 Overall Performance

FIGURE 2

Campaign 95-1

PC/WVR Ratio

FIGURE 3

Campaign 95-1 Waste Volume Reduction

FIGURE 4

Campaign 95-1

Tank Liquid Levels

FIGURE 5

Campaign 95-1 Tank Liquid Levels

—▲— 107AP —+— 108AP (106AP waste)

FIGURE 6

LERF Basin 42 and 43 Liquid Levels

* Erratic level due to probe/transmitter problems
(see discussion in Section 5.7)

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APPENDIX D

FEED

FIGURE 7

Campaign 95-1 Daily Throughput

Table 6: 242-A Campaign 95-1 Feed Data

SAMPLE NUMBER		T2014	T2044	T2095	T2150	T2201
DATE		6/15/95	6/19/95	6/27/95	7/5/95	7/18/95
APPR	%solids	< 1	0	< 0.5	< 5	< 1
OTR	mR/hr	375	N/A	N/A	N/A	1000
SET-%SOL	Vol%	1.45	< 0.5	< 0.5	N/A	< 1
DSC	J/g	0	0	0	0	0
F-	M	1.43E-01	2.24E-01	2.14E-01	3.67E-01	3.75E-01
NO2	M	5.76E-02	1.16E-01	1.25E-01	2.63E-01	4.41E-01
NO3	M	1.65E-01	1.88E-01	3.95E-01	4.25E-01	7.43E-01
PO4	M	3.51E-03	6.90E-03	3.51E-03	7.27E-03	< 1.28E-02
SO4-	M	< 4.39E-03	1.50E-02	1.31E-02	2.15E-02	2.57E-02
OH-	M	2.87E-01	2.51E-01	2.97E-01	5.42E-01	1.05E+00
pH	na	13.10	13.02	13.17	13.37	13.66
TIC	M	5.30E-02	1.09E-01	1.02E-01	2.23E-01	4.14E-01
TC	G/L	9.09E-01	1.59E+00	1.84E+00	3.83E+00	6.52E+00
TOC	G/L	2.65E-01	3.74E-01	3.46E-01	1.05E+00	1.67E+00
Al	M	2.19E-02	2.02E-02	2.97E-02	5.26E-02	9.48E-02
Na	M	5.83E-01	8.18E-01	8.57E-01	1.70E+00	2.85E+00
NH3	M	1.78E-02	3.25E-02	1.25E-02	2.53E-03	5.12E-04
SpG	na	1.0290	1.0173	1.0200	1.0720	1.104
TB	uCi/mL	1.33E+01	1.83E+01	1.86E+01	3.53E+01	6.79E+01
AT	uCi/mL	3.76E-04	6.76E-04	< 3.18E-04	< 4.58E-04	8.54E-04
H-3	uCi/mL	N/A	N/A	N/A	N/A	7.20E-03
C-14	uCi/mL	N/A	N/A	N/A	N/A	1.05E-04
Ce-60	uCi/mL	< 1.46E-02	< 2.32E-02	< 3.25E-02	< 2.73E-02	< 3.23E-02
Se-78	uCi/mL	N/A	N/A	N/A	N/A	5.16E-08
Sr-89/90	uCi/mL	7.22E-02	2.26E-01	2.03E-01	3.28E-02	4.19E-02
Nb-94	uCi/mL	< 1.43E-02	< 2.80E-02	< 3.30E-02	< 1.85E-02	< 3.40E-02
Tc-99	uCi/mL	N/A	N/A	N/A	N/A	2.08E-02
RuRh-106	uCi/mL	< 4.46E-01	< 7.16E-01	< 1.12E+00	< 1.13E+00	< 1.92E+00
I-129	uCi/mL	5.91E-06	6.59E-06	9.44E-06	1.79E-05	3.30E-05
Ce-134	uCi/mL	3.65E-02	< 5.06E-02	< 6.21E-02	9.69E-02	1.14E-01
Ce-137	uCi/mL	1.38E+01	1.52E+01	1.70E+01	3.72E+01	6.25E+01
Ce-144	uCi/mL	< 1.25E-01	< 2.68E-01	< 3.62E-01	< 3.95E-01	< 6.25E-01
Eu-154	uCi/mL	< 5.21E-02	< 7.22E-02	< 7.58E-02	< 5.57E-02	< 6.10E-02
Eu-155	uCi/mL	< 5.82E-02	< 1.19E-01	< 1.73E-01	< 1.82E-01	< 3.01E-01
Np-237	uCi/mL	N/A	N/A	N/A	N/A	< 2.21E-05
Pu-238	uCi/mL	< 1.01E-08	< 4.29E-05	< 7.70E-05	1.36E-05	2.03E-05
Pu-239/240	uCi/mL	6.55E-05	7.40E-05	1.67E-04	1.27E-04	1.86E-04
Am-241	uCi/mL	< 3.69E-05	1.45E-04	3.51E-04	< 4.51E-05	< 7.16E-05
Cm-244	uCi/mL	< 3.69E-05	< 3.71E-05	< 2.97E-04	< 4.51E-05	< 7.16E-05
U	g/L	N/A	N/A	N/A	N/A	3.62E-03

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APPENDIX E

SLURRY

FIGURE 8

Campaign 95-1 Daily Slurry Discharge

FIGURE 9

Campaign 95-1

Slurry Hydroxide Concentration

FIGURE 10

Campaign 95-1

Slurry Nitrite Concentration

FIGURE 11

Campaign 95-1

Slurry Nitrate Concentration

FIGURE 12

Campaign 95-1

Feed/Slurry Cs-137 Concentration

FIGURE 13

Campaign 95-1

Feed/Slurry Pu239 Concentration

FIGURE 14

Campaign 95-1

Specific Gravity Comparison

FIGURE 15

FIGURE 16

Proposed Specific Gravity Correlation

FIGURE 17

SAR Specific Gravity Correlation

FIGURE 18

Table 7: Slurry Data used for Specific Gravity Correlation

Cmpgn	Sample Number	[AlO2] (M)	[OH] (M)	[NO3] (M)	[NO2] (M)	[F] (M)	[PO4] (M)	[SO4] (M)	[TIC] (M)	[Na] (M)	LAB SpG
95-1	T2014	2.19e-02	2.87e-01	1.65e-01	5.76e-02	1.43e-01	3.51e-03	4.39e-03	5.30e-02	5.83e-01	1.0290
95-1	T2044	2.02e-02	2.51e-01	1.88e-01	1.16e-01	2.24e-01	6.90e-03	1.50e-02	1.09e-01	8.18e-01	1.0173
95-1	T2096	2.97e-02	2.97e-01	3.95e-01	1.25e-01	2.14e-01	3.51e-03	1.31e-02	1.02e-01	8.75e-01	1.0200
95-1	T2150	5.26e-02	5.42e-01	4.25e-01	2.63e-01	3.67e-01	7.27e-03	2.15e-02	2.23e-01	1.70e+00	1.0720
95-1	T2201	9.48e-02	1.05e+00	7.43e-01	4.41e-01	3.75e-01	1.28e-02	2.57e-02	4.14e-01	2.85e+00	1.1040
95-1	T1986	3.96e-02	4.79e-01	3.35e-01	1.33e-01	3.36e-01	2.23e-02	8.79e-03	1.20e-01	1.20e+00	1.0690
95-1	T2011	4.60e-02	5.76e-01	3.82e-01	1.40e-01	3.10e-01	5.32e-03	8.79e-03	1.12e-01	1.21e+00	1.0580
95-1	T2043	4.45e-02	5.96e-01	4.06e-01	2.55e-01	4.73e-01	1.39e-02	3.00e-02	2.40e-01	1.74e+00	1.0623
95-1	T2096	7.88e-02	6.74e-01	6.52e-01	3.23e-01	4.16e-01	7.15e-03	1.87e-02	2.43e-01	2.26e+00	1.0710
95-1	T2149	1.10e-01	1.08e+00	9.41e-01	5.06e-01	3.82e-01	2.10e-02	4.21e-02	4.30e-01	3.17e+00	1.1520
95-1	T2270	1.96e-01	1.85e+00	1.54e+00	8.81e-01	1.44e-01	1.25e-02	6.02e-02	7.54e-01	5.20e+00	1.3090
94-1	T734	3.07e-02	1.89e-01	2.32e-01	1.04e-01	2.11e-01	2.59e-03	1.66e-02	1.06e-01	1.03e+00	1.0400
94-1	T831	2.15e-02	2.40e-01	1.87e+00	6.35e-02	1.20e-01	3.62e-03	8.03e-03	6.67e-02	6.17e-01	1.1068
94-1	T801	2.91e-02	1.99e-01	2.17e-01	7.94e-02	1.77e-01	4.81e-03	1.80e-03	9.28e-02	8.52e-01	1.0400
94-1	T937	2.90e-02	1.07e-01	1.97e-01	6.97e-02	1.32e-01	2.50e-03	9.30e-03	7.50e-02	5.74e-01	0.9920
94-1	T1057	5.89e-02	1.28e-01	6.56e-01	1.87e-01	4.74e-01	9.20e-04	2.81e-02	2.38e-01	1.88e+00	1.0900
94-2	T1363	5.79e-04	2.13e-02	1.63e-03	6.49e-02	5.31e-04	4.31e-04	4.26e-04	2.19e-02	1.03e-01	0.9910
94-2	T1408	2.52e-04	3.68e-03	5.79e-03	4.16e-02	5.05e-03	2.21e-04	4.52e-04	2.48e-02	9.87e-02	0.9830
94-2	T1446	2.18e-02	1.30e-01	1.89e-01	2.23e-01	8.62e-02	2.12e-03	1.04e-02	1.02e-01	6.94e-01	1.0110
94-2	T1469	5.15e-03	2.62e-02	5.24e-02	4.34e-02	2.94e-02	2.07e-03	3.92e-03	4.28e-02	2.28e-01	1.0040
94-2	T1500	1.07e-02	8.24e-02	9.42e-02	1.60e-01	6.36e-02	1.42e-03	5.30e-03	7.92e-02	4.32e-01	1.0070
94-2	T1512	1.99e-02	9.54e-02	2.20e-01	1.78e-01	1.18e-01	3.62e-03	1.60e-02	1.73e-01	8.96e-01	1.0300
94-2	T1538	4.10e-03	1.63e-02	4.46e-02	4.28e-02	2.08e-02	8.79e-04	2.66e-03	4.48e-02	2.09e-01	1.0050
94-2	T1649	1.79e-02	1.01e-01	3.56e-01	1.50e-01	1.37e-01	3.81e-03	1.14e-02	1.44e-01	8.36e-01	1.0200
94-2	T1364	1.34e-03	7.35e-03	1.98e-02	1.70e-01	3.82e-02	5.36e-04	5.30e-04	5.11e-02	2.40e-01	0.9930
94-2	T1409	2.45e-04	3.68e-03	1.01e-02	9.36e-02	2.11e-03	2.21e-03	6.12e-04	5.36e-02	9.57e-02	1.0080
94-2	T1447	5.09e-02	3.45e-01	4.30e-01	4.63e-01	2.09e-01	1.06e-02	2.58e-02	2.28e-01	1.55e+00	1.0660
94-2	T1468	1.22e-02	6.53e-02	1.20e-01	1.12e-01	6.02e-02	2.77e-03	6.89e-03	1.13e-01	5.39e-01	1.0140
94-2	T1539	1.19e-02	5.40e-02	1.20e-01	1.11e-01	5.95e-02	3.10e-03	8.04e-03	1.12e-01	5.76e-01	1.0340
94-2	T1648	4.12e-02	2.38e-01	5.19e-01	3.34e-01	2.51e-01	8.07e-03	2.78e-02	3.21e-01	1.86e+00	1.0970
Old	R4882	1.03e+00	2.24e+00	2.24e+00	1.35e+00	0.00	1.00e-02	0.00	3.80e-01	9.45e+00	1.3400

Table 7: Slurry Data used for Specific Gravity Correlation

Cmpgn	Sample Number	[AlO2] (M)	[OH] (M)	[NO3] (M)	[NO2] (M)	[F] (M)	[PO4] (M)	[SO4] (M)	[TIC] (M)	[Na] (M)	LAB SpG
Old	R4686	1.01e+00	2.26e+00	2.40e+00	1.20e+00	0.00	1.00e-02	0.00	3.60e-01	8.75e+00	1.3100
Old	R7695	1.80e-01	3.15e+00	2.03e+00	8.80e-01	2.80e-01	2.00e-02	1.00e-01	4.30e-01	5.35e+00	1.2900
Old	T5578	1.86e+00	4.11e+00	2.66e+00	1.80e+00	6.10e-02	1.10e-02	2.90e-02	1.30e-01	1.05e+01	1.4700
Old	T5580	1.72e+00	3.80e+00	2.66e+00	2.12e+00	6.10e-02	1.60e-02	5.00e-03	1.40e-01	1.18e+01	1.3700
Old	T6304	1.51e+00	3.76e+00	2.60e+00	2.02e+00	9.90e-02	1.30e-02	0.00	1.50e+00	1.01e+01	1.4300
Old	R8127	2.90e-01	3.98e+00	2.70e+00	5.80e-01	2.30e-01	3.20e-02	6.70e-02	4.20e-01	7.48e+00	1.3200
Old	T882	2.80e-01	3.87e+00	3.27e+00	1.22e+00	8.00e-02	2.00e-02	1.00e-02	2.40e-01	8.31e+00	1.3200
Old	T621	1.14e+00	4.61e+00	3.16e+00	3.36e+00	9.00e-02	1.00e-02	1.00e-02	2.40e-01	6.65e+00	1.4400
Old	R3208	8.00e-01	3.15e+00	2.71e+00	1.36e+00	0.00	4.00e-02	5.00e-02	4.80e-01	8.79e+00	1.3900
Old	BD84-5	9.00e-01	4.36e+00	3.59e+00	1.92e+00	0.00	3.00e-02	0.00	2.80e-01	1.05e+01	1.4100
Old	R3306	6.90e-01	2.82e+00	2.31e+00	8.30e-01	0.00	3.90e-02	0.00	4.30e-01	6.93e+00	1.3500
Old	T3113	3.78e-01	6.19e-01	2.77e+00	9.78e-01	3.50e-04	4.08e-02	1.31e-01	6.74e-01	7.29e+00	1.3050
Old	T2956	3.15e-01	1.52e+00	1.47e+00	7.41e-01	8.00e-02	2.50e-03	9.56e-02	4.56e-01	4.99e+00	1.2190
Old	T2916	2.39e-01	3.09e-01	1.62e+00	6.17e-01	7.65e-02	1.80e-02	7.59e-02	4.29e-01	4.50e+00	1.2000
Old	R3414	8.00e-01	1.91e+00	2.03e+00	9.00e-01	7.70e-02	2.60e-02	2.89e-01	3.90e-01	5.93e+00	1.2800
Old	B4-5M	3.80e-01	2.27e+00	1.45e+00	7.10e-01	3.10e-01	2.00e-02	2.50e-02	2.40e-01	5.10e+00	1.2000
Old	R3457	7.40e-01	1.82e+00	1.50e+00	1.33e+00	1.10e-01	1.00e-02	0.00	1.10e-01	5.48e+00	1.2500
Old	FD29	5.50e-01	1.74e+00	1.62e+00	5.90e-01	1.00e-01	3.60e-02	0.00	2.30e-01	5.07e+00	1.2000
Old	T1115	5.70e-02	1.55e+00	8.65e-01	2.25e-01	3.17e-01	2.50e-02	4.50e-02	1.30e-01	6.20e+00	1.1500
Old	T1116	1.00e-01	2.45e+00	1.21e+00	3.55e-01	3.78e-01	3.80e-02	8.50e-02	2.15e-01	8.80e+00	1.2300
Old	T198	9.50e-02	1.36e+00	1.13e+00	2.55e-01	2.50e-01	3.40e-02	6.00e-02	1.52e-01	3.96e+00	1.1600
Old	R5898	7.20e-02	1.08e+00	9.35e-01	2.31e-01	3.59e-01	3.80e-02	0.00	1.14e-01	-----	1.1400
Old	R7894	1.00e-01	1.88e+00	1.18e+00	2.40e-01	2.80e-01	1.50e-02	2.00e-02	2.60e-01	3.45e+00	1.1800
Old	R7695	1.80e+00	3.15e+00	2.03e+00	8.80e-01	2.80e-01	2.00e-02	1.00e-01	4.30e-01	5.35e+00	1.2900
Old	T3048	2.00e-01	1.78e+00	8.80e-01	2.60e-01	1.50e-01	2.50e-02	5.40e-02	1.80e-01	4.23e+00	1.1800
Old	T3048	4.20e-01	2.33e+00	1.58e+00	3.50e-01	2.80e-01	3.20e-02	7.30e-02	2.20e-01	4.82e+00	1.2700
Old	R8126	1.50e-01	2.31e+00	1.60e+00	3.50e-01	1.80e-01	1.80e-02	4.10e-02	2.50e-01	3.97e+00	1.1900

FIGURE 19

Campaign 95-1

Slurry Total Organic Carbon

TABLE 8: PREDICT RUN ON CAMPAIGN 95-1 SLURRY PRODUCT

PASS ONE

PASS STOPPED AT 50% WVR LIMIT.

TEMPERATURE 55.0 C 130.9 F

PASS WVR 50.0

PRESSURE 60.0 Torr

TOTAL WVR 50.0

			EVAPORATOR CONDITIONS		TANK CONDITIONS 20.0 C	
	FEED	SLURRY	SUPERNATE	SOLIDS*	SUPERNATE	SOLIDS
VOLUME, gal	.266E+06	.148E+06	.133E+06	.152E+05	.133E+06	.202E+05
HYDROXIDE, M	1.850	3.321	3.700	.000	3.700	.000
ALUMINATE, M	.196	.352	.392	.000	.392	.000
NITRATE, M	1.540	2.764	3.080	.000	2.310	.385
NITRITE, M	.881	1.582	1.762	.000	1.762	.000
CARBONATE, M	.754	1.354	.148	.680	.103	.703
PHOSPHATE, M	.020	.036	.041	.000	.000	.020
SULFATE, M	.060	.108	.120	.000	.120	.000
FLUORIDE, M	.204	.366	.053	.178	.053	.178
ORGANIC, G/L	5.510	9.891	11.020	.000	11.020	.000

PASS TWO

PASS STOPPED AT 50% WVR LIMIT.

TEMPERATURE 75.6 C 168.1 F

PASS WVR 50.0

PRESSURE 60.0 Torr

TOTAL WVR 71.2

			EVAPORATOR CONDITIONS		TANK CONDITIONS 20.0 C	
	FEED	SLURRY	SUPERNATE	SOLIDS*	SUPERNATE	SOLIDS
VOLUME, gal	.113E+06	.586E+05	.564E+05	.220E+04	.564E+05	.122E+05
HYDROXIDE, M	3.700	7.122	7.400	.000	7.400	.000
ALUMINATE, M	.392	.755	.784	.000	.784	.000
NITRATE, M	2.310	4.447	3.943	.339	1.090	1.765
NITRITE, M	1.762	3.392	3.524	.000	1.432	1.046
CARBONATE, M	.103	.198	.055	.075	.006	.100
PHOSPHATE, M	.000	.000	.000	.000	.000	.000
SULFATE, M	.120	.232	.241	.000	.241	.000
FLUORIDE, M	.053	.101	.010	.048	.010	.048
ORGANIC, G/L	11.020	21.213	22.040	.000	22.040	.000

PASS THREE

PASS STOPPED AT 8 MOLAR CAUSTIC LIMIT

TEMPERATURE 60.2 C 140.3 F

PASS WVR 7.5

PRESSURE 60.0 Torr

TOTAL WVR 72.4

			EVAPORATOR CONDITIONS		TANK CONDITIONS 20.0 C	
	FEED	SLURRY	SUPERNATE	SOLIDS*	SUPERNATE	SOLIDS
VOLUME, gal	.442E+05	.409E+05	.409E+05	.000	.409E+05	145.
HYDROXIDE, M	7.400	8.000	8.000	.000	8.000	.000
ALUMINATE, M	.784	.848	.848	.000	.713	.124
NITRATE, M	1.090	1.179	1.179	.000	1.179	.000
NITRITE, M	1.432	1.548	1.548	.000	1.548	.000
CARBONATE, M	.006	.007	.007	.000	.007	.000
PHOSPHATE, M	.000	.000	.000	.000	.000	.000
SULFATE, M	.241	.260	.260	.000	.260	.000
FLUORIDE, M	.010	.010	.010	.000	.010	.000
ORGANIC, G/L	22.040	23.827	23.827	.000	23.827	.000

Table 9: 242-A Campaign 95-1 Slurry Data

SAMPLE NUMBER		T1986	T2011	T2043	T2096	T2149	T2097	T2270	T2271
DATE		6/10/95	6/15/95	6/19/95	6/27/95	7/5/95	7/21/9	7/21/95	7/21/95
APPR	%solid	2	< 1	< 5	N/A	< 1	Comp	Supernate	Solids
OTR	mR/hr	700	400	N/A	N/A	N/A	1700	1250	N/A
SET-%SOL	Vol%	1	1.45	< 5	< 5	N/A	(3.4%)	0	83.8 wt%
DSC	J/g	0	0	0	0	0	N/A	0	0
TGA	%Water	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6.69
F-	M	3.36E-01	3.10E-01	4.73E-01	4.16E-01	3.82E-01	N/A	1.44E-01	2.93E+05
NO2	M	1.33E-01	1.40E-01	2.55E-01	3.23E-01	5.06E-01	N/A	8.81E-01	6.96E+03
NO3	M	3.35E-01	3.82E-01	4.06E-01	6.52E-01	9.41E-01	N/A	1.54E+00	1.63E+04
PO4	M	< 2.23E-02	5.32E-03	1.39E-02	7.15E-03	2.10E-02	N/A	1.25E-02	<5.81E+03
SO4-	M	< 1.06E-01	8.79E-03	3.00E-02	1.87E-02	4.21E-02	N/A	6.02E-02	<6.62E+03
OH-	M	4.79E-01	5.76E-01	5.96E-01	6.74E-01	1.08E+00	N/A	1.85E+00	1.11E+04
pH	na	13.11	13.33	13.37	13.46	13.64	N/A	1.35E+01	1.21E+01
TIC	M	1.20E-01	1.12E-01	2.40E-01	2.43E-01	4.30E-01	N/A	7.54E-01	2.03E+03
TC	G/L	1.98E+00	1.94E+00	3.88E+00	3.73E+00	4.49E+00	N/A	1.26E+01	3.19E+03
TOC	G/L	5.23E-01	5.49E-01	1.28E+00	1.22E+00	1.86E+00	N/A	3.31E+00	8.21E+02
Al	M	3.96E-02	4.60E-02	4.45E-02	7.88E-02	1.10E-01	N/A	1.96E-01	3.51E+03
Na	M	1.20E+00	1.21E+00	1.74E+00	2.26E+00	3.17E+00	N/A	5.20E+00	3.55E+05
NH3	M	7.87E-04	1.53E-03	8.22E-03	1.02E-03	<	N/A	1.73E-04	7.15E+02
SpG	na	1.0690	1.0580	1.0623	1.0710	1.1520	(1.34)	1.309	2.33E+00
TB	uCi/mL	2.72E+01	2.85E+01	4.06E+01	3.20E+01	3.25E+01	N/A	1.44E+02	4.22E+01
AT	uCi/mL	< 1.17E-03	5.34E-04	<	2.79E-03	<	N/A	<	<1.21E-02
H-3	uCi/mL	N/A	N/A	N/A	N/A	N/A	N/A	5.70E-03	<3.58E-04
C-14	uCi/mL	N/A	N/A	N/A	N/A	N/A	N/A	1.74E-04	<2.05E-04

Table 9: 242-A Campaign 95-1 Slurry Data

SAMPLE NUMBER		T1986	T2011	T2043	T2096	T2149	T2097	T2270	T2271
DATE		6/10/95	6/15/95	6/19/95	6/27/95	7/5/95	7/21/95	7/21/95	7/21/95
Co-60	uCi/mL	N/A	<	<	<	N/A	N/A	<	<2.15E+00
Se-79	uCi/mL	N/A	N/A	N/A	N/A	N/A	N/A	8.81E-05	N/A
Sr-89/90	uCi/mL	7.10E-02	1.61E-01	5.50E-01	6.75E-01	9.20E-02	N/A	1.64E-01	7.98E+00
Nb-94	uCi/mL	N/A	<	N/A	<	N/A	N/A	<	<1.81E+00
Tc-99	uCi/mL	N/A	N/A	N/A	N/A	N/A	N/A	2.91E-02	9.62E-03
RuRh-106	uCi/mL	N/A	<	<	<	N/A	N/A	<	<3.46E+01
I-129	uCi/mL	1.13E-05	1.26E-05	1.64E-05	2.00E-05	3.96E-05	N/A	6.00E-05	<1.79E-03
Cs-134	uCi/mL	9.81E-02	9.70E-02	9.50E-02	9.00E-02	1.70E-01	N/A	3.08E-01	<2.03E+00
Cs-137	uCi/mL	3.00E+01	3.12E+01	3.48E+01	4.46E+01	7.98E+01	N/A	1.42E+02	2.60E+01
Ce-144	uCi/mL	N/A	<	N/A	<	N/A	N/A	<	<1.10E+01
Eu-154	uCi/mL	N/A	<	<	8.25E-02	N/A	N/A	<	<4.18E+00
Eu-155	uCi/mL	N/A	<	8.28E-02	<	N/A	N/A	<	<4.74E+00
Ra-226	uCi/mL	N/A	N/A	N/A	N/A	N/A	N/A	<	<3.44E+01
Np-237	uCi/mL	N/A	N/A	N/A	N/A	N/A	N/A	<	<1.73E-03
Pu-238	uCi/mL	< 8.99E-05	N/A	<	<	2.04E-05	N/A	<	N/A
Pu239/240	uCi/mL	9.12E-04	1.27E-04	1.59E-04	1.93E-04	1.85E-04	N/A	2.98E-04	6.04E-03
Am-241	uCi/mL	2.97E-03	<	3.39E-04	<	1.46E-04	N/A	6.52E-04	3.31E-03
Cm-244	uCi/mL	< 5.36E-04	<	<	<	<	N/A	<	N/A
U	g/l	N/A	N/A	N/A	N/A	N/A	N/A	6.72E-02	2.13E+01

Table 10: 242-A Campaign 95-1 Final Slurry Product Data

SAMPLE NUMBER		Evaporator Slurry Data	106-AW Tank Data (6AW-95-1)	Final Slurry Product Data
DATE				
APPR	%solids	3.4 °	0	3.4
OTR	mR/hr	1250	NA	1250
SET-%SOL	Vol%	3.4 °	0	3.4
DSC	J/g	0	0	0
F-	M	1.44E-01	2.04E-01	2.04E-01
NO2	M	8.81E-01	8.11E-01	8.81E-01
NO3	M	1.54E+00	1.50E+00	1.54E+00
PO4	M	1.20E-02	2.03E-02	2.03E-02
SO4-	M	6.02E-02	5.74E-02	6.02E-02
OH-	M	1.85E+00	1.64E+00	1.85E+00
pH	na	1.35E+01	14.90	14.90
TIC	M	7.54E-01	6.98E-01	7.54E-01
TC	G/L	1.36E+01	2.78E+01	2.78E+01
TOC	G/L	3.31E+00	5.51E+00	5.51E+00
Al	M	1.96E-01	1.70E-01	1.96E-01
Na	M	5.20E+00	4.48E+00	5.20E+00
NH3	M	1.73E-04	NA	1.73E-04
SpG	na	(1.34)	1.220	(1.34)
TB	uCi/mL	1.44E+02	9.48E+01	1.44E+02
AT	uCi/mL	< 2.99E-03	< 1.34E-02	< 1.34E-02
H-3	uCi/mL	5.70E-03	1.13E-02	1.13E-02
C-14	uCi/mL	1.74E-04	1.35E-04	1.74E-04
Co-60	uCi/mL	< 1.84E-02	< 4.26E-03	< 1.84E-02
Se-79	uCi/mL	8.81E-05	1.22E-04	1.22E-04
Sr-89/90	uCi/mL	1.64E-01	3.39E-02	1.64E-01
Nb-94	uCi/mL	< 1.57E-02	< 1.32E-02	< 1.57E-02
Tc-99	uCi/mL	2.91E-02	3.52E-02	3.52E-02
RuRh-106	uCi/mL	< 1.17E+00	< 4.29E-01	< 1.17E+00
I-129	uCi/mL	6.00E-05	5.76E-05	6.00E-05
Cs-134	uCi/mL	3.08E-01	2.24E-01	3.08E-01
Cs-137	uCi/mL	1.42E+02	1.12E+02	1.42E+02
Ce-144	uCi/mL	< 3.51E-01	< 2.92E-01	< 3.51E-01
Eu-154	uCi/mL	< 4.46E-02	< 2.26E-02	< 4.46E-02
Eu-155	uCi/mL	< 1.58E-01	< 6.76E-02	< 1.58E-01
Ra-226	uCi/mL	< 1.48E+00	< 6.46E-01	< 1.48E+00
Np-237	uCi/mL	< 2.06E-05	< 2.06E-05	< 2.06E-05
Pu-238	uCi/mL	< 8.57E-05	< 4.84E-05	< 8.57E-05
Pu-239/240	uCi/mL	2.98E-04	1.38E-04	2.98E-04
Am-241	uCi/mL	6.52E-04	< 1.09E-03	< 1.09E-03
Cm-244	uCi/mL	< 3.08E-04	< 1.09E-03	< 1.09E-03
U	g/L	6.72E-02	7.11E-02	7.11E-02

TABLE 11: FINAL SLURRY PRODUCT SOURCE TERM EVALUATION

Radionuclide	Limit ¹ ($\mu\text{Ci/mL}$)	Campaign 95-1 Slurry Product ²	Percent of Source Term Limit
¹⁴ C	0.26	1.74×10^{-4}	< 0.1 %
⁶⁰ Co	1.2	$< 1.84 \times 10^{-2}$	< 1.5 %
⁷⁹ Se	7.8×10^{-2}	1.22×10^{-4}	0.2 %
⁹⁰ Sr	220	1.64×10^{-1}	< 0.1 %
⁹⁴ Nb	9.8×10^{-2}	$< 1.57 \times 10^{-2}$	< 16 %
⁹⁹ Tc	2.0	3.52×10^{-2}	1.8 %
¹⁰⁶ Ru	53	< 1.17	< 2.2 %
¹²⁹ I	2.6×10^{-3}	6.00×10^{-5}	2.3 %
¹³⁴ Cs	15	$< 3.08 \times 10^{-1}$	< 2.1 %
¹³⁷ Cs	1,500	1.42×10^2	9.5 %
¹⁵⁴ Eu	5.0	$< 4.46 \times 10^{-2}$	< 0.9 %
¹⁵⁵ Eu	7.0	$< 1.58 \times 10^{-1}$	< 2.3 %
²²⁶ Ra ³	3.3×10^{-2}	1.64×10^{-6}	< 0.1 %
²³⁸ Pu	1.3×10^{-3}	$< 8.57 \times 10^{-3}$	< 6.6 %
^{239/240} Pu	0.16	2.98×10^{-4}	0.2 %
²⁴¹ Pu ³	15	1.22×10^{-2}	< 0.1 %
²⁴¹ Am	1.0	$< 1.09 \times 10^{-3}$	< 0.1 %
²⁴⁴ Cm	1.3×10^{-2}	$< 1.09 \times 10^{-3}$	< 8.4 %

¹From 242-A FSAR, (Lavender 1993).

²For conservatism, data used for comparison is the higher value between sample T2270 and 6AW-95-1.

³Calculated from equations in WHC-SD-WM-OCD-016 (Tranbarger 1992)

APPENDIX F
PROCESS CONDENSATE

FIGURE 20

Campaign 95-1

Daily Process Condensate Discharge

FIGURE 21

FIGURE 22

Campaign 95-1

APC pH

FIGURE 23

Table 12: Campaign 95-1 Process Condensate Data (APC)

SAMPLE NUMBER	DATE	TB-LIQ (uCi/mL)	AT-LIQ (uCi/mL)	TC (g/L)	TOC (g/L C)	TSS (mg/L)	I-129 (uCi/mL)	NH3 (M)	pH	H3 (uCi/mL)
T1993	12-Jun-95	2.67E-07	1.89E-08	2.26E-02	1.59E-02	< 1	< 3.51E-08	2.79E-02	10.60	5.68E-03
T2013	15-Jun-95	5.17E-07	4.96E-08	1.50E-02	1.40E-02	< 1	< 3.73E-08	4.11E-02	10.44	5.65E-03
T2045	19-Jun-95	5.67E-07	< 6.35E-09	2.30E-02	1.70E-02	< 1	< 4.32E-08	4.68E-02	10.62	5.37E-03
T2102	27-Jun-95	3.17E-07	< 2.73E-08	1.40E-02	N/A	< 0.2	< 5.16E-08	1.62E-02	10.41	7.55E-03
T2151	05-Jul-95	1.34E-06	1.52E-07	1.00E-02	9.90E-03	< 0.2	< 2.91E-08	4.51E-03	9.84	1.24E-03
T2173	11-Jul-95	9.50E-07	7.72E-08	1.70E-02	1.60E-02	0.7	1.61E-08	4.93E-03	9.94	6.76E-03
T2218	21-Jul-95	5.59E-06	3.69E-07	8.50E-03	5.50E-03	< 0.2	< 3.05E-08	8.43E-04	9.68	6.08E-03
T2235	22-Jul-95	2.83E-06	1.54E-07	< 5.50E-03	< 5.50E-03	< 0.2	6.61E-09	1.04E-03	9.77	6.36E-03

Table 13: Comparison of LERF Basin 42 Concentrations to Radiological Limits

RADIONUCLIDE	DCG ¹ ($\mu\text{Ci}/\text{ml}$)	CONCENTRATION ² ($\mu\text{Ci}/\text{ml}$)	CONCENTRATION to DCG RATIO
H-3	2.0E-03	5.21E-03	2.61
C-14	7.0E-05	2.00E-06	2.84E-02
Co-60	5.0E-06	< 5.00E-09	< 1.00E-03
Se-79 ³	2.0E-05	< 1.66E-07	< 8.30E-03
Sr-90	1.0E-06	4.90E-08	4.9E-02
Nb-94	3.0E-05	< 4.17E-09	< 1.39E-04
Tc-99	1.0E-04	< 2.30E-09	< 2.30E-05
Ru-106	6.0E-06	< 9.00E-08	< 1.50E-02
I-129	5.0E-07	< 4.00E-09	< 8.00E-03
Cs-134	2.0E-06	< 5.00E-09	< 2.50E-03
Cs-137	3.0E-06	4.67E-07	1.56E-01
Ce-144	7.0E-06	< 3.03E-08	< 4.33E-03
Eu-154	2.0E-05	< 1.50E-08	< 7.50E-04
Eu-155	1.0E-04	< 1.50E-08	< 1.50E-04
Ra-226	1.0E-07	< 2.00E-10	< 2.00E-03
Np-237	3.0E-08	< 2.07E-10	< 6.90E-03
Pu-238	4.0E-08	2.59E-10	6.48E-03
Pu239/40	3.0E-08	< 1.20E-11	< 4.00E-04
Pu-241 ⁴	2.0E-06	4.92E-10	2.46E-04
Am-241	3.0E-08	< 5.80E-11	< 1.93E-03
Cm-244	6.0E-08	< 1.20E-11	< 2.00E-04
U-gross	5.0E-07	< 2.00E-19	< 4.00E-13
Total (Limit = 5000)			< 2.90

1. From Table 9-3 of WHC-SD-W105-SAR-001, Rev. 0, "Final Safety Analysis Report 242-A Evaporator Liquid Effluent Retention Facility".

2. Liquid Effluent Retention Facility Sampling Report, DOE/RL to Ecology Transmittal LETTER #96-PCA-020, October 25, 1995.

3. No analysis data available. Estimate from WHC-SD-WM-PCP-010, Rev. 0, "Process Control Plan for 242-A Evaporator Campaign 95-1".

4. No analysis data available. Calculated using the formula $4.1 \text{ E}+01 \times \text{Pu-239/240}$, from WHC-SE-WM-OCD-016 (Tranbarger 1992).

Table 14: Comparison of LERF Basin 43 Concentrations to Radiological Limits

RADIONUCLIDE	DCG ¹ ($\mu\text{Ci/ml}$)	CONCENTRATION ² ($\mu\text{Ci/ml}$)	CONCENTRATION to DCG RATIO
H-3	2.0E-03	6.86E-03	3.43
C-14	7.0E-05	2.00E-06	2.93E-02
Co-60	5.0E-06	< 5.00E-09	< 1.00E-03
Se-79 ³	2.0E-05	< 1.66E-07	< 8.30E-03
Sr-90	1.0E-06	4.27E-08	4.27E-02
Nb-94	3.0E-05	< 3.89E-09	< 1.30E-04
Tc-99	1.0E-04	< 3.30E-09	< 3.00E-05
Ru-106	6.0E-06	< 9.00E-08	< 1.50E-02
I-129	5.0E-07	< 3.00E-09	< 6.00E-03
Cs-134	2.0E-06	< 5.00E-09	< 2.50E-03
Cs-137	3.0E-06	6.37E-07	2.12E-01
Ce-144	7.0E-06	< 3.25E-08	< 4.64E-03
Eu-154	2.0E-05	< 1.50E-08	< 7.50E-04
Eu-155	1.0E-04	< 1.50E-08	< 1.50E-04
Ra-226	1.0E-07	< 6.20E-11	< 6.20E-04
Np-237	3.0E-08	< 8.80E-11	< 2.93E-03
Pu-238	4.0E-08	2.24E-10	5.60E-03
Pu239/40	3.0E-08	< 1.32E-10	< 4.40E-03
Pu-241 ⁴	2.0E-06	5.41E-09	2.71E-03
Am-241	3.0E-08	< 6.77E-10	< 2.26E-02
Cm-244	6.0E-08	< 5.71E-10	< 9.52E-03
U-gross	5.0E-07	3.35E-16	6.70E-10
Total (Limit = 5000)			< 3.80

1. From Table 9-3 of WHC-SD-W105-SAR-001, Rev. 0, "Final Safety Analysis Report 242-A Evaporator Liquid Effluent Retention Facility".

2. Liquid Effluent Retention Facility Sampling Report, DOE/RL to Ecology Transmittal LETTER #96-PCA-020, October 25, 1995.

3. No analysis data available. Estimate from WHC-SD-WM-PCP-010, Rev. 0, "Process Control Plan for 242-A Evaporator Campaign 95-1".

4. No analysis data available. Calculated using the formula $4.1 \text{ E}+01 \times \text{Pu-239/240}$, from WHC-SE-WM-OCD-016 (Tranbarger 1992).

Table 15: Comparison of LERF Basin 42 Concentrations
to Organic LERF Liner Compatibility Limit

Analyte	Limit (mg/L)	Average (mg/L)	90% C.I (mg/L)	90% C.I/Limit Ratio
1-Butanol	500,000	1331	1664	0.003
Acetone	200,000	267.1	288.2	0.002
2-Butanone		7.5	10.98	
2-Hexanone		1.071	1.243	
MIBK		0	0	
THF	2,000	142.3	159	0.08
Butoxyethanol	2,000	141.4	148.9	0.074
TBP	2,000	1.786	2.613	0.001
Ammonia	100,000	202.9	213	0.002
Summation of 90% C.I/Limit ratio (limit <1.0)				0.162

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APPENDIX G
VESSEL VENT

FIGURE 24

242-A Vessel Vent Alpha Emissions

FIGURE 25

242-A Vessel Vent Beta Emissions

FIGURE 26

Campaign 95-1

Daily Vessel Vent Ammonia Discharge

FIGURE 27

Campaign 95-1 Daily Vessel Vent Flow

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APPENDIX H

STEAM CONDENSATE

FIGURE 28

Campaign 95-1

Daily Steam Condensate Discharge

FIGURE 29

Campaign 95-1

ASC Total Alpha

FIGURE 30

Campaign 95-1

ASC Total Beta

FIGURE 31

Campaign 95-1 ASC pH

Table 16: 242-A Campaign 95-1 Steam Condensate Data

SAMPLE NUMBER	DATE	TB-LIQ (uCi/mL)	AT-LIQ (uCi/mL)	pH
T1974	09-Jun-95	< 1.69E-08	< 7.86E-09	7.49
T1981	10-Jun-95	< 2.51E-08	1.32E-08	7.08
T1983	10-Jun-95	< 1.84E-08	< 8.02E-09	7.02
T1988	11-Jun-95	< 1.26E-08	< 5.67E-09	9.15
T1991	12-Jun-95	2.14E-08	1.81E-08	7.08
T1994	12-Jun-95	< 1.97E-08	< 2.63E-09	8.24
T1988	13-Jun-95	1.85E-08	< 7.28E-09	7.39
T2000	13-Jun-95	< 2.14E-08	9.08E-09	7.02
T2003	14-Jun-95	< 1.32E-08	< 8.97E-09	7.54
T2007	15-Jun-95	< 1.38E-08	< 1.19E-08	7.28
T2022	16-Jun-95	< 1.39E-08	< 6.06E-09	7.10
T2026	17-Jun-95	< 1.75E-08	< 5.12E-09	7.19
T2028	18-Jun-95	1.82E-07	1.32E-08	7.08
T2032	17-Jun-95	1.52E-08	1.03E-08	8.43
T2034	18-Jun-95	< 2.20E-08	< 8.66E-09	7.31
T2038	19-Jun-95	< 2.24E-08	< 5.75E-09	7.15
T2048	19-Jun-95	< 2.07E-08	< 6.73E-09	7.12
T2053	20-Jun-95	< 2.11E-08	8.19E-09	7.14
T2059	20-Jun-95	2.00E-08	< 7.38E-09	6.84
T2063	21-Jun-95	1.87E-08	< 7.45E-09	7.09
T2072	22-Jun-95	< 1.99E-08	6.04E-09	7.08
T2081	23-Jun-95	< 1.31E-08	6.76E-09	7.78
T2085	25-Jun-95	< 2.21E-08	< 9.21E-09	7.30
T2089	25-Jun-95	< 1.62E-08	5.62E-09	7.53
T2093	27-Jun-95	2.17E-08	7.65E-09	6.58
T2098	27-Jun-95	< 1.48E-08	< 4.61E-09	6.98
T2103	27-Jun-95	< 2.64E-08	< 7.78E-09	6.59
T2112	28-Jun-95	< 1.39E-08	< 9.44E-09	7.15
T2114	29-Jun-95	< 1.34E-08	< 6.98E-09	7.18
T2116	29-Jun-95	< 2.27E-08	< 8.63E-09	7.02

Table 16: 242-A Campaign 95-1 Steam Condensate Data

SAMPLE NUMBER	DATE	TB-LIQ (uCi/mL)	AT-LIQ (uCi/mL)	pH
T2124	30-Jun-95	< 1.55E-08	9.61E-09	6.92
T2127	30-Jun-95	< 2.00E-08	1.87E-08	6.98
T2131	01-Jul-95	< 1.62E-08	7.86E-09	7.40
T2135	02-Jul-95	< 2.16E-08	< 6.10E-09	7.27
T2138	03-Jul-95	< 4.00E-08	< 1.07E-08	8.20
T2143	04-Jul-95	< 2.02E-08	< 6.59E-09	7.25
T2147	05-Jul-95	< 2.48E-08	< 9.80E-09	7.17
T2152	06-Jul-95	< 2.68E-08	< 7.48E-09	7.65
T2157	06-Jul-95	< 1.98E-08	< 1.07E-08	7.63
T2161	09-Jul-95	< 1.31E-08	7.83E-09	8.04
T2167	10-Jul-95	< 1.91E-08	< 4.63E-09	7.73
T2171	11-Jul-95	< 1.80E-08	< 7.32E-09	7.18
T2179	11-Jul-95	< 1.31E-08	< 7.64E-09	7.35
T2183	12-Jul-95	< 1.62E-08	< 6.41E-09	7.29
T2185	13-Jul-95	1.86E-08	< 2.23E-08	6.87
T2189	13-Jul-95	< 1.62E-08	< 3.59E-09	7.46
T2193	14-Jul-95	< 1.41E-08	1.07E-08	7.39
T2196	17-Jul-95	< 1.62E-08	< 5.60E-09	7.23
T2199	17-Jul-95	< 1.62E-08	< 9.45E-09	7.31
T2214	21-Jul-95	< 1.90E-08	< 8.73E-09	7.30
T2219	21-Jul-95	< 1.31E-08	< 1.10E-08	7.24
T2231	22-Jul-95	< 1.31E-08	< 1.11E-08	7.02
T2236	23-Jul-95	< 1.62E-08	< 9.92E-09	7.73
T2240	23-Jul-95	< 2.38E-08	< 8.66E-09	7.07
T2242	24-Jul-95	< 1.29E-08	< 5.60E-09	7.49
T2247	24-Jul-95	< 1.57E-08	< 7.37E-09	7.49
T2256	25-Jul-95	< 1.88E-08	< 1.10E-08	7.78
T2260	27-Jul-95	< 1.45E-08	< 1.19E-08	8.06

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APPENDIX I USED RAW WATER

FIGURE 32

Campaign 95-1

Daily Cooling Water Discharge

FIGURE 33

Campaign 95-1 ACW Total Alpha

FIGURE 34

Campaign 95-1 ACW Total Beta

FIGURE 35

Campaign 95-1 ACW pH

Table 17: 242-A Campaign 95-1 Used Raw Water Data

SAMPLE NUMBER	DATE	TB-LIQ (uCi/mL)	AT-LIQ (uCi/mL)	pH
T1972	09-Jun-95	2.62E-08	8.90E-09	8.75
T1980	10-Jun-95	< 1.26E-08	1.04E-08	8.29
T1985	11-Jun-95	3.89E-08	3.43E-08	8.38
T1990	12-Jun-95	< 2.46E-08	1.85E-08	8.26
T1997	13-Jun-95	< 1.91E-08	4.94E-09	8.13
T2002	14-Jun-95	< 2.38E-08	< 9.94E-09	8.32
T2005	15-Jun-95	6.17E-08	1.60E-08	8.33
T2024	16-Jun-95	< 1.31E-08	1.85E-08	8.24
T2030	18-Jun-95	< 1.66E-08	< 4.63E-09	8.74
T2036	18-Jun-95	2.25E-08	< 1.53E-08	8.09
T2040	19-Jun-95	< 2.53E-08	< 5.25E-09	8.64
T2051	20-Jun-95	< 1.43E-08	5.80E-08	8.95
T2061	21-Jun-95	< 1.42E-08	< 8.58E-09	8.22
T2070	22-Jun-95	1.97E-08	< 7.10E-09	8.20
T2079	23-Jun-95	< 2.49E-08	7.10E-09	8.22
T2083	25-Jun-95	< 2.30E-08	9.26E-09	8.05
T2087	25-Jun-95	< 2.03E-08	< 1.21E-08	8.21
T2091	26-Jun-95	< 1.74E-08	< 7.84E-09	7.80
T2100	27-Jun-95	< 1.31E-08	< 1.05E-08	8.11
T2110	28-Jun-95	< 1.23E-08	< 7.54E-09	8.03
T2118	29-Jun-95	< 2.30E-08	7.48E-09	7.08
T2122	30-Jun-95	< 1.32E-08	< 6.06E-09	7.92
T2129	01-Jul-95	1.75E-08	< 1.26E-08	8.16
T2133	02-Jul-95	< 2.41E-08	< 6.24E-09	7.97
T2137	03-Jul-95	2.74E-08	< 7.78E-09	8.18
T2141	04-Jul-95	< 1.24E-08	< 6.81E-09	8.00
T2145	05-Jul-95	< 1.26E-08	< 7.63E-09	7.91
T2154	06-Jul-95	1.34E-07	< 8.12E-09	8.01
T2159	07-Jul-95	< 1.85E-08	< 8.76E-09	8.12
T2163	10-Jul-95	< 1.99E-08	< 6.09E-09	8.06
T2165	10-Jul-95	1.69E-08	< 6.78E-09	8.06
T2169	11-Jul-95	2.01E-08	1.21E-08	8.25
T2181	12-Jul-95	1.70E-08	< 8.28E-09	7.91
T2187	13-Jul-95	< 1.78E-08	< 9.09E-09	8.01
T2191	14-Jul-95	< 1.69E-08	8.76E-09	8.20
T2197	17-Jul-95	< 1.33E-08	8.54E-09	8.14
T2209	20-Jul-95	< 2.44E-08	< 1.22E-08	7.98
T2216	21-Jul-95	< 1.66E-08	< 9.29E-09	7.95
T2233	22-Jul-95	< 1.66E-08	< 1.12E-08	8.31
T2238	23-Jul-95	2.06E-08	4.84E-09	8.25
T2244	24-Jul-95	< 1.29E-08	< 6.89E-09	8.33
T2249	25-Jul-95	< 1.62E-08	6.22E-09	8.27
T2258	26-Jul-95	< 1.58E-08	5.33E-09	7.90
T2262	27-Jul-95	< 2.80E-08	< 1.12E-08	8.29

APPENDIX J
SLUDGE LEVELS

FIGURE 36

106-AW SLUDGE LEVELS Taken 9/14/95

Riser	Sludge Level
1B	100.5
1C	73.4
16A	112.9
16C	73.4
22A	52.0

APPENDIX K

REFERENCE LETTERS

Westinghouse
Hanford CompanyInternal
Memo

From: Waste Treatment Plant Engineering 71730-95-006
 Phone: 373-1151 RI-43
 Date: February 9, 1995
 Subject: RECOMMENDATION TO REPROCESS EVAPORATOR CAMPAIGN 94-2 SLURRY WITH CAMPAIGN 95-1

To: W. E. Ross S5-07

cc: R. A. Dodd S5-05 E. Q. Le R1-43
 J. E. Geary S5-01 R. J. Nicklas RI-43
 M. D. Guthrie RI-43 J. N. Strode R2-11
 N. W. Kirch R2-11 B. H. Von Bargen RI-43
 G. M. Koreske RI-51

Purpose

The intent of this memo is to recommend further concentration of Evaporator Campaign 94-2 slurry by combining the waste with Campaign 95-1 feed.

Background

Campaign 94-2 was started on September 22, 1994 and completed November 19, 1994. Approximately 3.21 million gallons of dilute waste from 101-AP, 107-AP, 108-AP and tank heels from 102-AW and 106-AW were processed, achieving the Waste Volume Reduction Factor (WVRF) goal of 87% (2.79 Mgal).

The 87% waste volume reduction goal was evaluated and approved by the Process Control Plan (PCP), WHC-SD-WM-PCP-009. The PCP is written and approved prior to the campaign to address waste processability, compatibility, safety and environmental compliance. Limiting factors in determining a WVRF of 87% (3 evaporator passes) for safe operation of the facility included the following:

- Lab boildown studies indicated a rapid increase in SpG from 1.12 to 1.3 at 90% WVRF. Accurate SpG data above 90% WVRF was not available due to the small quantity remaining in the boildown flask.
- The Radiological source term was determined to potentially exceed the Evaporator source term limit at 94% WVRF (4 evaporator passes)

Discussion

During the final week of operation, a slurry sample was taken to characterize the Campaign 94-2 slurry product. From analysis of this slurry sample, low specific gravity indicated the potential for further processing.

Setting SpG goals for Evaporator campaigns is difficult with very dilute wastes partially because of the problems with correlating WVRF and SpG in the boildown analysis. The difference between actual Campaign 94-2 slurry SpG and preliminary boildown analysis was probably due to the suspended

W. E. Ross
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February 9, 1995

71730-95-006

solids in the boildown flask in combination with the size of the apparatus used, the quantities of sample, and the ability to measure the material left in the apparatus above 90% WVR.

In addition to dilute waste boildown inaccuracies, laboratory detection limits of some radionuclides were very close to the Evaporator source term ~~limits~~. Since radiological source-term compliance is based only on radionuclide concentrations, a waste volume reduction factor must be used rather than SpG because there is no good correlation between SpG and radionuclide concentrations when wastes are very dilute. This hindered precise projections of Campaign 94-2 waste volume reduction.

Resampling and reevaluating evaporator slurry product can eliminate the problems associated with boildown analysis and radiological detection limits of very dilute waste, but can also result in significant schedule extensions and operational complications.

Campaign 94-2 did not concentrate the slurry beyond 87% for the following reasons:

- Complete radiochemistry analysis is required for source term evaluation in the PCP, but may take several weeks to obtain
- Additional tank samples would be required for laboratory boildown analysis
- It would be inefficient to keep the campaign "on-hold" for weeks pending the arrival of analytical results and subsequent revision of the PCP

Conclusion

Waste Treatment Plant Engineering is recommending that Campaign 94-2 slurry product in 106-AW be processed as a part of Campaign 95-1 (106-AP and 107-AP) to achieve an additional 200 - 275 Kgal of Waste Volume Reduction (WVR).

In order to complete the 95-1 PCP, two 100 ml samples will be required from 106-AW for boildown analysis. The additional WVR obtained greatly offsets the minimal costs for 106-AW boildown analysis.

For future planning, campaigns utilizing dilute waste as feed may be expected to behave similarly to Campaign 94-2. As in the current scenario, additional processing of the 106-AW heel in the subsequent campaign may be required.

If you have any questions, please contact me at 373-1151 or E. Q. Le at 373-4214.

M. D. Guthrie, Engineer
Waste Treatment Plant Engineering

Westinghouse
Hanford CompanyInternal
Memo

From: Environmental Engineering 77530-95-065
Phone: 373-5247
Date: September 1, 1995
Subject: ESTIMATE OF ORGANIC EMISSIONS DURING EVAPORATOR CAMPAIGN 95-1

To: R. J. Nicklas R1-43
cc: M. W. Bowman R1-52
G. M. Crummel R1-51
L. P. Diediker S3-95
C. J. Geier R2-36
R. D. Gustavson R1-51
M. D. Guthrie R1-43
B. H. Von Bargaen R1-43

- REFERENCES: 1. Meeting Minutes, "242-A Vessel Vent Sampling", on January 12, 1995.
2. Internal Memo, M. W. Bowman to R. D. Gustavson, "Calculated Organic Emissions from 242-A Evaporator Vessel Vent for Campaigns 94-1 and 94-2", 77510-95-021, dated May 10, 1995.
3. DOE/RL-90-42; Rev. 0, "242-A Evaporator Dangerous Waste Permit Application", dated June 28, 1991.
4. WHC-SD-WM-PCP-010, Rev. 0, "Process Control Plan for 242-A Evaporator Campaign 95-1", dated May 18, 1995.
5. 40 CFR Part 265, Subpart AA - Air Emission Standards for Process Vents.

As agreed during the meeting of Reference 1, attached for your incorporation into the Post-Run Document for Campaign 95-1 is an estimate of organic emissions from the 242-A Evaporator Vessel Vent stack. The estimate was prepared using the methodology documented in Reference 2 and Appendix 3F of Reference 3, and is based on the feed concentrations documented in Reference 4. The purpose of incorporating the estimate into the Post-Run Document is to comply with the recordkeeping requirements for process vents (section 265.1035(b)(2)(i) of Reference 5).

A copy of this estimate has also been sent to Effluent Monitoring so compliance with the overall facility (Hanford Site) organic emission limits of 1.4 kg/hr (3 lbs/hr) and 2.8 Mg/yr (3.1 tons/yr) can be evaluated (section 265.1032(a)(1) of Reference 5).

D. D. Bachand,
Advanced Engineer

Attachment

242-A EVAPORATOR VESSEL VENT ORGANIC EMISSIONS

PREPARED: Aug 30, 95 BY: Mr. R. R. R.CHECKED: Sep 1, 1995 BY: Mr. R. R. R.OPERATION PARAMETERS

Duration of Campaign: 47 days
 Tank C-100 Air Flowrate: 150 cfm
 Tank C-100 Pressure: 750 mm Hg
 Off-gas Temperature: 75 deg C
 R (ratio of feed to slurry): 2

CAMPAIGN: 95

DOE/RL-90-42-0
 DOE/RL-90-42-0
 DOE/RL-90-42-0

FEED CONCENTRATIONS

(REFERENCE: WHC-SD-WM-PCP-010-0)

FEED TANK: 100-AP 107-AP 102-AW 100-AW
 VOLUME FRACTION: 39% 40% 6% 16% 0%
 CHECK TOTAL 100.00%

ORGANIC CONSTITUENT

ORGANIC CONSTITUENT	FEED CONC. (ug/L)	FEED CONC. (ug/L)	FEED CONC. (ug/L)	FEED CONC. (ug/L)	FEED CONC. (ug/L)
Acetone	25600.0	4230.0			
Benzyl Alcohol					
Butanal	25000.0	22600.0			
1-Butanol	500.0	500.0			
2-Butanone	244.0	2000.0			
2-Butoxyethanol					
3,5-Dimethylpyridine					
Ethoxytriethyleneglycol	500.0	500.0			
2-Hexanone	500.0	500.0			
Hexone (MIBK)	500.0	500.0			
2-Pentanone					
Phenol					
2-Propanol					
Pyridine	680.0	500.0			
Tetrahydrofuran					
Tetradecane	1390.0	2060.0			
Tributyl Phosphate					
Tridecane					

CALCULATIONS

Tank C-100 Total Pressure: 9.87E-01 atm
 Tank C-100 Temperature: 348 K
 Tank C-100 Air Flowrate: 2.55E+05 L/hr
 Tank C-100 Mole/Hr: 8.81E+03 mol/hr

CONSTANTS

R (ideal gas constant): 0.08206 L²atm/mol²K

242-A EVAPORATOR VESSEL VENT ORGANIC EMISSIONS

PREPARED: Aug 30, '95 BY: Mr. B. J. J.CHECKED: Sept 1, 1995 BY: M. W. BowmanORGANIC EMISSIONS SUMMARYCAMPAIGN: 95-1

ORGANIC CONSTITUENT	FEED TANK 106-AP	FEED TANK 107-AP	FEED TANK 102-AW	FEED TANK 106-AW	FEED TANK
	EMISSION RATES (kg/hr)	EMISSION RATES (kg/hr)	EMISSION RATES (kg/hr)	EMISSION RATES (kg/hr)	EMISSION RATES (kg/hr)
Acetone	1.78E-01	2.94E-02	-	-	-
Benzyl Alcohol	-	-	-	-	-
Butanal	-	-	-	-	-
1-Butanol	6.84E-02	6.18E-02	-	-	-
2-Butanone	5.22E-03	5.22E-03	-	-	-
2-Butoxyethanol	1.56E-03	1.28E-02	-	-	-
3,5-Dimethylpyridine	-	-	-	-	-
Ethoxytriethyleneglycol	-	-	-	-	-
2-Hexanone	7.20E-03	7.20E-03	-	-	-
Hexone (MIBK)	1.85E-02	1.85E-02	-	-	-
2-Pentanone	8.42E-03	8.42E-03	-	-	-
Phenol	-	-	-	-	-
2-Propanol	-	-	-	-	-
Pyridine	-	-	-	-	-
Tetrahydrofuran	2.87E-02	2.11E-02	-	-	-
Tetradecane	-	-	-	-	-
Tributyl Phosphate	8.29E-05	1.23E-04	-	-	-
Tridecane	-	-	-	-	-

EMISSION RATE BY FEED TANK (kg/hr):

3.16E-011.65E-01WEIGHTED AVERAGE
ORGANIC EMISSION RATE:

1.87E-01 kg/hr

(4.12E-01 lb/hr)

TOTAL ORGANIC EMISSIONS:
(based on average organic emission rate and duration of campaign)

211.2 kg

(464.7 lb)

MAXIMUM ORGANIC EMISSION RATE:

3.16E-01 kg/hr

(6.95E-01 lb/hr)

Westinghouse
Hanford CompanyInternal
Memo

From: Waste Treatment Systems Engineering 77310-95-016
Phone: 373-9161 R1-43
Date: September 13, 1995
Subject: LIQUID EFFLUENT RETENTION FACILITY BASINS LEVEL TRANSMITTERS

To: E. Q. Le R1-43
T. M. Galioto R1-43
M. D. Guthrie R1-43

cc: R. J. Nicklas R1-43
RJN File/LB

During the past 18 months, three of the six Liquid Effluent Retention Facility Basin Level Transmitters have provided erratic outputs that occurred each morning and evening. After extensive troubleshooting, the problem was found to be a bad Probe/Transmitter connection mechanism as supplied by the vendor. The end of the probe had a thermo well type cavity that housed a spring loaded post that pushed against a solder pad on the transmitter when assembled. During warming and cooling periods of the day, this connection would become unstable and cause erratic level outputs from the transmitter.

The solution to the problem involved removing the spring loaded pin, threading the opening of the well, and bolting a wire lead to the end of the probe. The other end of the wire was directly soldered to the transmitter board. This provided a very solid Probe/Transmitter connection and resulted in a stable output from the transmitters.

If you have any questions, please call me on 373-9161.

C. M. Towne
Electrical Cog Engineer

Westinghouse
Hanford CompanyInternal
Memo

From: Evaporator Projects
 Phone: 373-4565 S5-07
 Date: September 5, 1995
 Subject: 242-A CAMPAIGN 95-1 -- LESSONS LEARNED

77300-95-023

To: W. E. Ross S5-07

cc: T. L. Bennington S1-57 R. J. Nicklas R1-43
 B. D. Biddle S5-14 D. P. Reber T4-08
 J. L. Blackwell S5-14 C. A. Sams S1-57
 K. A. Buchanan S6-72 B. L. Slettene S5-14
 M. E. Edwards S5-09 D. L. Tubbs S5-06
 J. L. Foster S5-14 B. H. Von Bargaen R1-43
 J. E. Geary S5-07 R. A. Wahlquist R1-43
 S. S. Glover R3-01 K. A. White S5-13
 P. R. Gunter S5-07 M. A. White R1-43
 M. D. Guthrie R1-43 J. H. Wicks S5-07
 D. S. Haring R1-43 C. M. Winkler S5-14
 F. M. Matthews R2-82 A. K. Yoakum S6-71
 G. D. Mickle R3-01 S. U. Zaman R3-08
 R. D. Mitchell R3-01 JEG LB/File

A meeting was conducted on August 10, 1995, to review the strengths and weaknesses/lessons learned of the 242-A Evaporator Campaign 95-1. The attached lists the strengths and lessons learned.

Actionee groups have been assigned items on the weakness/lessons learned lists. Items deemed important for resolution prior to Campaign 96-1 will be placed on the 96-1 outage meeting minutes and statused weekly at the 96-1 outage meetings.

 J. E. Geary
 Assistant Manager

np

Attachment

STRENGTHS

- Installed temporary heater in front of Vessel Vent inlet filter.
- Added alarms to show when SC/PC is diverted. Also changed divert location from 2AW to C-100.
- Trainees found the PC divert valve diverted to 2AW.
- Properly evaluated SN-167 Leak Detection & systematically cleaned. Solved the nuisance alarm problem.
- Received 84,000 gallon transfer from PUREX during busy time at 242-A, without any problems.
- Trainees helped board operator a lot during busy time.
- Production control did an outstanding job, throughout the entire campaign.
- Reduced exposure for Feed/Slurry samples by using remote tools. - ALARA?
- Power operators provided excellent support for AW compressors.
- Shipped EC-1 to T-plant!!
- Anti-Foam works...really!
- Recovery from Condenser Room flood (FI-CA1-1A Failure) was excellent. Restart in 1-1/2 days (on weekend).
- Final Pass sample taken efficiently (i.e., brought in feed to pot then dumped following sample).
- Lab turn around on final pass sample excellent.
- PBI Met!!

LESSONS LEARNED

1. Cannot see/verify Sealwater flow from PB-1 drain. (Engineering)
2. Investigate removing PB-1 Sealwater drain needle valve. (Engineering)
3. Evaluate need for Condenser Room NH₃ monitor. (Engineering)

4. Repair feed sampler. (Engineering/Maintenance)
5. As part of the process control plan, evaluate jumpering LDE's which are not required but may affect operations. (Engineering/Operations)
6. Increase monitoring of PC recycle system (on Rounds Sheets) by backside operator. (Engineering)
7. 102-AW FIC needs to be operated in manual during campaign. (Operations)
8. Evaluate internal inspection and cleaning EC-2 & EC-3. (Engineering/Production Control)
9. Need to get better at "keeping track" of changes made to process parameters, esp. from shift to shift. (Operations)
10. Engineering resolution needed to the condensation problem in the vessel vent system. Permanently installed heater in inlet? (Engineering)
11. Assure all personnel working in facility have adequate HAZCOM training, possibly through safety meetings (HPT's & others who come & go). (Operations)
12. Validate winterization plan to verify all heat traces are covered. (Operations/Maintenance)
13. Verify local Vessel Vent temperature indication vs. MCS indication against the P & ID's. (Engineering)
14. 106-AW and 102-AW pump performance needs to be checked. (Engineering/Operations)
15. RC-2 drain and rest of drain system partially blocked. (Production Control)
16. Check quantity and condition of spare PC-105 pumps. (Engineering)
17. Install low pressure alarm for AW instrument air system. (Engineering)
18. Correct AW/AP air dryer mechanical deficiencies. (Engineering)
19. Start doing PM's on dryers and compressors. (Operations/Maintenance)
20. Evaluate need for backup air supply to DOV at O2E pit on loss of instrument air. (Engineering)
21. PCA to A-3 rounds on blowing condensate out of instrument air lines: hearing protection signs; operator aid. (Operations)

22. Raise funnel on PB-2. (Engineering)
23. Repair leak from nozzle E.
 - a. Evaluate need for flowmeter. (Engineering)
 - b. Generate work package. (Production Control)
 - c. Perform repairs. (Operations/Maintenance)
24. PCA to SC Basin Sampling procedure for local sampling. (Engineering)
25. Train our operators to ship our own samples? (Operations/EWO)
26. Resolve sampling communication and coordination problems between OPS, 222-S, EWO and WSCF. (Operations)
27. Update A-1/A-2 rounds to keep sample logbook up to date. Resolve whether A-1 or A-2 will do this. (Operations)
28. Change ETF procedures so that they are responsible for obtaining their own sample numbers and tags from 222-S. (Operations)
29. Modify SC basin HI and HI-HI setpoints. Change procedures to switch basins when HI is received. (Engineering/Operations)
30. Modify/repair standpipes to correspond to new alarm points. (Operations/Maintenance)
31. 222-S promised 8-hour turnaround on SC samples. Frequently took 12 hrs. or more. (Operations/222-S)
32. Have A-2 periodically check air rotameters in Condenser Room. PCA to backside rounds for a weekly check. (Operations)
33. Investigate CA1-2 leak-by. (Engineering/Operations)
34. Need resolution on FI-CA1-1A. (Engineering/Operations)
35. Transfer pump operational checks. (Engineering/Operations)
36. Resolution on tool counters. (Engineering)
37. Extend condenser room 2nd floor deck grate by the steam traps. (Engineering)
38. Sign at 242-A indicating Total Waste Volume Reduction. (Operations)
39. Leave 102-AW FIC in place and install the ENRAF on a different riser. (Engineering)
40. Resolve FV-EA1-1 Leak by. (Engineering)

DISTRIBUTION COVERSHEET

Author

Addressee

M. D. Guthrie

Subject: 242-A Campaign 95-1 Post Run Document, WHC-SD-WM-PE-055, Rev. 0

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