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September 1993

**IDAHO CHEMICAL PROCESSING PLANT
LIQUID EFFLUENT TREATMENT AND DISPOSAL
FACILITY HOT TEST REPORT**

R. L. Hastings

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September 1993

**Westinghouse Idaho
Nuclear Company, Inc.**

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MASTER

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SUMMARY

Prior to initial operation with radioactive feed or "hot" operation, the Liquid Effluent Treatment and Disposal (LET&D) Facility underwent extensive testing. Major components individually and as an entire process were tested with water during Systems Operability (SO) and Integrated Testing periods. These tests were performed to verify system integrity, to train future operators, and to validate operating procedures.

After LET&D had been tested with water, an integrated test using non-radioactive, "cold", Nitric Acid was performed. The purpose of this test was to verify acid/water separation design criteria, to test the density control system, fine tune system parameters for the acid/water mixture, and to fine tune the operating procedures. A "hot" testing period began on January 21, 1993 after reviews of system readiness.

During the "hot" testing period tests that only could be accomplished using process solutions were performed. These tests included: compliance verification with design criteria of those components found in radioactive solutions, operability verification of some sub-systems of LET&D which had been modified or could only be tested with radioactive solutions, and procedure validation under actual operating conditions.

This report provides a detailed description and analysis of this testing. Testing has determined that LET&D is capable of processing radioactive solutions at the between the design flowrates of 275 gph to 550 gph. Modifications made to prevent condensation on the off-gas HEPA filters, to the process vacuum control, bottoms cooler rupture disks, and feed control system operation were successful.

Unfortunately, two mixers failed prior to "hot" testing due to manufacturer's error which limited operation of the PEW Evaporator System and sampling was not able to prove that design removal efficiencies for Mercury, Cadmium, Plutonium, and Non-Volatile Radionuclides.

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I. INTRODUCTION

The Liquid Effluent Treatment And Disposal (LET&D) Facility was designed to handle Process Equipment Waste (PEW) Evaporator condensates. These condensates were, prior to December 31, 1992, discharged to percolation ponds. Nitric acid in the condensates can be concentrated up to 12 molar in the LET&D acid fractionator bottoms. Water vapor, containing less than 1% of the nitric acid in the feed, is discharged to the atmosphere via the ICPP main stack. The concentrated acid is currently transferred to the Tank Farm Facility. After November, 1993 the acid can also be transferred to the acid recycle tank system so that the acid can be reused at the New Waste Calcination Facility (NWCF).

"Hot" testing of LET&D occurred during the period between January 21, 1993 and July 21, 1993. LET&D does not presently have the capability to sample its off gas. Therefore, during the first three months of this period an attempt was made to verify design removal efficiencies for Mercury, Cadmium, Plutonium, and non-volatile radionuclides by sampling the feed and the bottoms tank and calculating the difference. The difference between the two samples would be the amount leaving LET&D through the off gas.

Also during this period, process subsystems that were modified or could only be tested using radioactive solutions were verified. A detailed analysis of the sampling and verifications is provided in this report.

II. PROCESS DESCRIPTION

A simplified LET&D process flow diagram is shown in Figure 1. Feed solution is pumped from the PEW condensate tanks (VES-WL-106, -107, and -163) to the LET&D gravity feed tank (VES-WLK-197). Solution from this tank is gravity fed to the one of two acid fractionators (FRAC-WLK-171 or FRAC-WLL-170). Each acid fractionator is approximately 25 feet tall and 42 inches in diameter and is constructed entirely of Hastelloy G-30. Each fractionator contains 15 sieve trays. Feed enters the fractionator on tray 11.

To take advantage of the difference in boiling points between water and nitric acid and cause a separation of the two components, the solution in a fractionator is heated by a thermosyphon reboiler (HE-WLK-399 or HE-WLL-398). Each reboiler is approximately 11 feet tall and 22 inches in diameter. They are constructed of 304L stainless steel on the shell side and Hastelloy G-30 on the tube side. Both use 100 psi steam as the heating media. As solution is heated in the reboiler, vapor rises through the sieve trays where it contacts liquid held on each tray. The concentration of nitric acid in the vapor is reduced as it constantly contacts the liquid on the trays. When this contacting occurs the high boiling nitric acid loses its heat and condenses on the tray while water on the tray is boiled after receiving heat from the nitric acid. When the vapor leaves the fractionator it contains less than 1% of the nitric acid that is in the feed. To provide liquid for

FIGURE 1
SIMPLIFIED LET&D PROCESS FLOW

the sieve trays above the feed point part of the vapor leaving the fractionator is condensed in a partial condenser (HE-WLK-397 or HE-WLL-396). The resulting liquid vapor mixture then enters a mist eliminator type separator. The liquid is separated from the vapor and drains back to the top of the fractionator to provide liquid for the upper sieve trays. The vapor exits the separator, is heated to 300°F by a superheater (HE-WLR-395 or HE-WLR-394), filtered by a bank of HEPA filters (F-WLR-177 or F-WLR-176) and is then discharged to the ICPP main stack by a vapor blower (BLO-WLQ-289 or BLO-WLQ-298).

The nitric acid in the bottom of the fractionator can be concentrated to 12 molar. After concentrating to the selected density, the nitric acid is drawn off through a cooler (HE-WLK-392 or HE-WLL-391) to the bottoms tank (VES-WLL-195). From here the acid can be transferred to the Tank Farm Facility (via VES-WL-101), to the PEW Evaporator feed tank (VES-WL-133) or after November 1993 to the Acid Recycle Tank System (VES-NCR-171) for use at NWCF.

Several control loops are used to control the operation of the fractionator. Feed flow is controlled at a setpoint between 4.6 and 9.17 gpm (275 and 550 gph) by a control valve. Level in fractionator is controlled at 25 inches WC by controlling the flow of the condensate leaving the reboiler. Density is controlled at the desired specific gravity by a control valve which adjusts the flow of solution being drawn off to the bottoms tank. Negative

pressure (vacuum) at the top of the fractionator is controlled at 20 inches WC by adjusting a control valve on the inlet of the vapor blower. The reflux flowrate is controlled as a ratio to the feed flowrate by adjusting the cooling water flow to the condenser. The temperature of the off gas entering the HEPA filter bank is controlled at 300°F by controlling the flow of steam condensate from the superheater.

Additional equipment used to control aspects of the LET&D process include the Aluminum Nitrate (ANN) Addition System, the PEW condensate tank mixers, the Humidity Control System and process samplers. The ANN addition system enables the operator to add Aluminum Nitrate to the PEW condensate tanks to complex any free Fluoride ions. The PEW condensate tank mixers ensure the solution in the condensate tank and the ANN are well mixed and representative samples of the tank can be obtained.

The Humidity Control System was designed to inhibit condensation inside the ICPP main stack by taking a side stream of ventilation air headed for the stack, heating it, and then injecting the heated air into the stack to raise the dewpoint. However, due to the available penetrations

into the stack, which resulted in a less than optimum input location the heated air, the Humidity Control System does not completely inhibit condensation from occurring inside the main stack.

Samples can be obtained from various points within the LET&D process. Process sample locations are the fractionator bottoms, the separator drain to the reflux line, the bottoms tank, and trays 1, 2, 4, 6, 8, 10, 12, and 14. All samples are obtained by gravity drain except the bottoms tank which requires the assist of an air jet.

III. HOT TEST BACKGROUND

Several components of the LET&D process could only be tested after receiving approval to process radioactive solutions. Some components needed final connections to existing plant lines completed. Other components were modified prior to or early during the hot test. These components included the filter banks, the bottoms cooler rupture disks, the feed system, the PEW condensate tank mixers, and the process vacuum control system.

Sampling produced some interesting results. Samples were taken during the first six operational run periods 2 hours after feed was started and every 4 hours after that until shutdown. Some operational run periods have only one or two samples taken while others have as many as eight.

A. MODIFICATIONS

1. Filter Bank Modifications

After the integrated test with nitric acid but prior to approval to start up "hot", several water training runs were performed for operator benefit. During these training runs, a problem with damage to the off-gas HEPA filters due to water condensation surfaced. Several modifications were made to prevent this condensation. Most notable of these modifications were: insulation to the filter bank doors, and increase in the "purge and dry" time period, and procedural changes for off-gas vapor flow and differential pressure across the HEPA filters.

During the training runs, a discovery was made that water was condensing on the filter bank access doors. Water was condensing at the first access door and was swept downstream to be captured by the second set of HEPA filters in the filter bank. Once captured, the water would create a high differential pressure across the filters and cause a shutdown due to this condition. To correct this condition, insulation was added to the access doors; increasing the door skin temperature above the dew point to 230°F.

"Purge and dry" is one of five pre-engineered filter modes for the LET&D process. This mode is primarily used after a shutdown to ensure the filters are dried out using 300°F air and ready for the next start up. During the training runs,

the fractionators were shutdown, "purge and dry" was automatically initiated, then the fractionator was restarted as soon as "purge and dry" was completed. This was done to maximize the amount of operator run time.

At this time "purge and dry" was set to last for a period of 30 minutes. This was later determined to be too short a time period and was increased to 60 minutes.

After the discovery of damaged filters, an investigation revealed that off-gas vapor flows greater than 5300 lb/hr for a sustained period could damage the filters. In the LET&D process, the possibility exists for off-gas flows greater than 6000 lb/hr. At LET&D, vapor flow is directly proportional to the feed rate at steady state. To protect the filters, any time the off-gas flow is 5300 lb/hr or greater, the operator will reduce the feed rate until the alarms clears.

Because HEPA filters with a differential pressure of 3 inches water column (WC) will start entraining water, the high differential pressure alarm for each set of HEPA filters was reduced from 5 to 3 inches Water Column (in. WC). Whenever this alarm is received, the operator is to shutdown the process. After shutdown, the filters will be DOP tested and replaced if necessary prior to the next start up.

All modifications to the filters have proven successful in preventing damage to the filters. However, during "hot"

testing, two incidents occurred where a high off-gas vapor flow was created and resulted in an automatic shutdown due to high differential pressure across the filters. In both cases, the operator was restarting the fractionator from total reflux. Total reflux is an operating mode where no feed is supplied to the fractionator, no vapors are being drawn off, and no acid is being removed from the fractionator. In both occurrences, procedural step problems were primarily responsible for the incident. The procedures have been corrected and no further problems have been encountered.

2. Bottoms Cooler Rupture Disks

Rupture disks were installed on the water return lines from each bottoms cooler to protect the coolers from damage. If cooling water were not flowing through the cooler while hot solution was passing through, the water in the cooler would boil and could damage the cooler. The rupture disks serve as a thermal relief to protect against such a scenario.

During initial "hot" start up, the rupture disk on the water return line for bottoms cooler #2 burst on three different occasions for no apparent reason. After the first occasion a pressure recorder was installed to record the supply water pressure on the main water line into the LET&D facility.

Peak pressures as high as 120 psi were seen, but none were high enough to rupture the disks which were set for 150 psi.

An investigation revealed that rupture disks are susceptible to turbulent water flow and will tear easily when such a flow is applied. A check of the configurations for both coolers revealed a design error on bottoms cooler #2. The water return flow leaving bottoms cooler #2 is forced to make a 90° left turn approximately 3 inches in front of the rupture disk. This condition did not exist on bottoms cooler #1.

A call to the manufacturer resulted in the installation of damper disks upstream of the rupture disks. Damper disks are essentially a rupture disks with holes drilled in the rupture area to act like a flow orifice and dampen out any turbulent flow. The damper disks are installed upstream of the rupture disk so that no turbulence is seen on the water side of the rupture disk. After installation of these damper disks, no more rupture incidents have occurred.

Although the disk for bottoms cooler #1 burst once, this incident was attributed to operator error. Valves that allow water flow through the cooler were closed while thermally hot bottoms solution was flowing through the cooler. In this case, the rupture disk worked as designed.

3. Feed System Operation

In the original design for LET&D a recycle line from the PEW condensate tank discharge pump back to each condensate tank was planned. On this line an in-line Fluoride monitor would automatically dose each condensate tank with Aluminum Nitrate to complex the trace Fluorides entering the tank from the PEW Evaporator. Unfortunately such a Fluoride monitor does not exist. When the monitor was deleted so was the recycle line. All that remained was a line from the condensate tank discharge pump to the gravity feed tank at LET&D. A level control valve to maintain the level in the gravity feed tank also remained on this line.

The PEW condensate tank discharge pumps pump solution at a rate of approximately 42 gpm. However, LET&D feed rates can vary only between 4.6 and 9.17 gpm. This means the level control valve must shut to maintain level and "dead head" the condensate discharge pump. This could result in damage to the pumps.

A decision was made to control the level in the gravity feed tank in a range rather than at a set value. The range would be controlled by starting and stopping the condensate pump. The initial control range was 5 to 20 in.

The control logic for this system could only be tested after approval to process radioactive solutions was received. This was because the last connection to be made between existing plant piping and LET&D was the feed line to LET&D.

Also, plant configuration of the condensate discharge pumps allowed testing only with radioactive solutions which required approvals. The logic worked well, however at high feed rates oscillations in the fractionator feed control valve, caused by changing head pressure in the gravity feed tank, would cause oscillations in other process parameters. One parameter of concern was the temperature of the water leaving the condenser. At higher feed rates, this would alarm at 125°F.

Temperature higher than 125°F could significantly increase corrosion rates in the condenser. To limit the large swing in head pressure but still allow for as large an operating range as possible, the range was changed to 8 to 20 in. This change along with a change in the reflux ratio, which increased the amount of cooling water through the condenser, appears to have solved the temperature problem.

4. Mixers

The PEW condensate tank mixers were installed after the operator training runs. Initial set points for the mixers were chosen to start the mixer when the condensate tank was approximately half full. The mixer would then operate for the next six hours. This time period allows the tank to finish filling and allows an additional 2 hour buffer.

Since the mixer shafts were set at 10° from the vertical, starting the mixer at the half way mark allowed the mixer blades to operate at the air/liquid interface. This caused

the blades to skip across the surface of the liquid causing added stress to the shafts that was not accounted for by the manufacturer. The added stress damaged the shaft and gear box on the mixer. The added stress has been solved by using stronger bolts at the point where the shaft couples to the gear box.

A total of 4 mixers were originally purchased. One for each condensate tank and a spare. The damage occurred to 2 mixers before it was discovered. This left only 2 operational mixers available until replacements could be purchased. This situation has limited the operation of the PEW Evaporator greatly. A replacement mixer was installed in mid-July 1993.

Also, a different start point for the mixers was chosen. This new point corresponds to a volume when the tank is approximately $\frac{1}{2}$ full. The run time for each mixer remains 6 hours. Testing of the 2 operational mixers has shown that the contents of the PEW condensate tank are well mixed within 1 hour.

5. Process Vacuum Control System

During initial "hot" testing a slight increase in the bottoms tank volume was noticed. This volume increase occurred primarily during start up. The volume increase was caused by solution being pressurized from the bottom of the fractionator to the bottoms tank via the vessel vent line. The vent line from the bottoms tank to the fractionator

enters the fractionator just below tray 1 in each fractionator.

The pressuring of solution was caused by the fractionator vacuum controller set point being too low. The top of the fractionator was controlled at 14 in. WC vacuum. The pressure drop across all 15 trays was in the 16 to 18 in. WC range. Therefore, the bottom of the fractionator was under a slight pressure during operations. It is believed that solution was in the vent line from previous operations and, at start up, this was pressured to the bottoms tank.

The set point for the top of the fractionator was raised to 20 in. WC vacuum and the volume increase in the bottoms tank has been eliminated.

B. SAMPLES

During the first 6 operating periods (runs) samples were taken from the various sample points at LET&D. Two hours after starting feed to LET&D from a PEW condensate tank samples were taken from each all even numbered trays, the fractionator bottom, and the separator. These samples were then repeated every 4 hours after the initial set of samples until the process was shutdown.

The plan for separator and fractionator bottoms samples was to request the same analyses as the PEW condensate tank. These analyses included: Acid, Chloride, Fluoride,

Flashpoint, Gamma Scan, Gross Alpha, Gross Beta, Strontium - 90, Iodine - 129, Tritium, Mercury, Heavy Metals (EPA List) Volatile Organics, Ph, Sulfate, Aluminum, Nitrates, and Uranium. These samples would be compared to the feed and removal efficiencies would be determined.

Unfortunately, some confusion arose on early fractionator bottoms samples (Runs 1 through 4) as to what to request. Samples for these runs only requested Acid, Specific Gravity, and Chromium. Run Number 5 only lasted long enough to obtain 4 sets of samples. Therefore, Run Number 6 is the most representative of fractionator operation because of the length of the run (38 hours) and the quality of the samples taken.

1. Removal Efficiencies

a. Acid

Nitrate was used as the indicator of Nitric Acid in the PEW condensate tank and on each tray because the method allows for better accuracy at low concentrations than the Acid analysis. The table in Appendix A, page A-2, shows that tray 14 composition versus feed composition indicates better than 99% removal efficiency on 21 out of 23 samples taken. Tray 14 composition was used because not all separator samples requested Nitrate.

The comparison is made at tray 14. Another tray (tray 15) and the separator, which acts as a theoretical stage are in the process above tray 14. The addition of these stages ensures that Nitric Acid removal efficiencies are met and exceeded.

b. Mercury, Cadmium, Plutonium, and Non-Volatile Radionuclides

One of the design criteria for LET&D stated that the fractionators would be capable of 99.9% removal of Mercury, Cadmium, Plutonium, and Non-Volatile Radionuclides. During the first 6 runs, attempts were made to prove this criteria. Due to a variety of reasons ranging from operational problems to process and analytical uncertainties these attempts proved unsuccessful. Two additional operational runs were performed; one at the minimum feed rate of 275 gph and one at the maximum feed rate of 550 gph. In each run, two PEW condensate tanks were processed at the desired feed rate. Then the fractionator was shut down. As the fractionator was drained to the bottoms tank for disposal, samples of the bottoms tank were taken.

The samples of the PEW condensate tanks and the bottoms tank were analyzed for identical components. These analyses included: Mercury, Cadmium, Plutonium, and Non-Volatile Radionuclides. By calculating the amounts fed into LET&D and the amounts remaining, the amount that left LET&D to the ICPP Main Stack was determined. From this determination,

removal efficiencies were calculated.

Unfortunately, not enough Plutonium and Cadmium was present in the PEW condensate tanks to register above analytical detection limits. Removal efficiencies of these materials could not be determined. Mercury and Non-Volatile Radionuclide removal efficiencies were calculated to range from 107 to 3455% (see the tables in Appendix A, pages A-3 through A-6).

Removal efficiencies greater than 100% were due to a combination of process and analytical uncertainties. Volume measurements for the PEW condensate tanks and the bottoms tank have a 2% error. Analytical uncertainty ranged from 1 to 15%. At the 95% confidence interval, the maximum standard deviation allowable for the removal efficiency calculation to prove 99.9% removal is approximately 0.0006 (0.06%). Based on the analytical results for Cesium 137 when processing was performed at the maximum feed rate, the standard deviation for removal efficiency was 0.065 (6.5%).

One method to decrease the uncertainty is to increase the number of samples taken or for Non-Volatile Radionuclides, increase the counting time. Either technique would only improve uncertainty by a factor of 2 to 4. Figure 2 contains an estimate of the number of sample replicates needed to meet the various removal efficiencies at the 95% confidence interval. As shown, greater than 10,000 samples would be needed to prove the 99.9% removal efficiency.

Based on the above statistical analysis, the design criteria removal efficiencies can not be proved without significantly improving volume measurements and analytical techniques.

Assuming analytical techniques could be improved, both improvements would be costly and would be needed only to prove design criteria. Once the design criteria was proven, existing volume measurements and analytical techniques would suffice.

Assume: Overall error of 6.5% (current estimate) and 100% recovery. If the percent recovery is actually less than 100% the number of replicates needed increases significantly.

Required Removal Efficiency	Number of Replicates
99.9%	>10,000
99%	>100
95%	4
90%	1

Assume: Overall error of 1% (result of improved systems - Analytical and Process)

Required Removal Efficiency	Number of Replicates
99.9%	10
99%	1
95%	1
90%	1

Figure 2
Estimates of Sample Replicates Needed

2. Fluorides

Due to their corrosion potential, the collection point of Fluorides was of interest. As seen in the graph in Appendix B, page B-22, the Fluorides in Run Number 6 tended to collect primarily in the fractionator bottoms and on trays 1 and 2. These results indicate any corrosion problems that may occur will be associated with trays 1 and 2, the reboiler, and the bottom section of the fractionator.

3. Chlorides

Because of the potential to exceed State of Idaho Air Toxics and EPA SARA release limits, the behavior of Chlorides in the fractionator is of considerable interest. Using Run Number 6 as closely approximating the fractionator operating profile, the chlorides tend to collect in the fractionator bottoms until the Nitric Acid concentration increases to approximately 5 Molar. At this point, the Chlorides evolve off and exit the LET&D process through the off-gas. Presently, the method of evolution is not fully understood although, it is suspected that the Chlorides convert to Chlorine. The buildup and evolution of Chlorides in Run Number 6 can be seen in the graph in Appendix B, page B-24.

In this particular run, the Nitric Acid did not reach 5 Molar until approximately 14 hours after feed was started. After approximately 14 hours, the Chlorides began evolving off and continued to do so for the next 8 hours. The most

significant release occurs in the first 4 hours after the Nitric Acid reaches 5 Molar. After evolution has occurred, it appears that the Chlorides reach equilibrium on each tray with no further buildup. The table in Appendix A, page A-64

State of Idaho Air Toxics limits relate to the OSHA 24 hour exposure limits at the nearest location that could be occupied by a private residence. For LET&D, this location is the boundary of the INEL. EPA SARA limits relate to the maximum total release to the environment of a controlled chemical (Chlorine). For Chlorine, this limit is 10 lbs. in a 24 hour period.

Both limits relate to a 24 hour period. The release of the collected Chlorides combined with the normal Chloride release rate could cause these limits to be exceeded over a 24 hour period. Once the release has occurred, normal Chloride releases are well below the limits

More testing of the Nitric Acid - Chloride relationship is planned. The primary objective of this testing is to better determine feed Chloride limits to ensure that State of Idaho and EPA limits are not exceeded.

4. Tributyl Phosphate and Hexone

Tributyl Phosphate (TBP) and Hexone were used in the uranium separation processes at ICPP. Because of their widespread use at ICPP small amounts may be found in the PEW Evaporator system. From the PEW Evaporator system, the TBP and Hexone

are fed to LET&D.

The facility safety document for LET&D identified the transfer of relatively large amounts of Hexone (>2000 ppm) or TBP (>80 ppm) to LET&D as having a remote possibility of causing an explosion. The hazards associated with handling concentrated Nitric Acid solutions were the most likely accident scenarios. The next most likely scenario after a Nitric Acid accident was the explosion scenario. Since the probability of an explosion occurring is 10^{-6} occurrences per year if upstream controls are taken into account, this scenario is not likely to occur. To be very conservative concentration limits have been placed on the feed to ensure this scenario does not occur. These limits do not take credit for any volatilization of the Hexone or TBP inside the fractionator and discharge of these chemicals through the off-gas during operation.

The tables in Appendix A on pages A-7, A-8, and A-9 show the results of sampling PEW condensate tanks for TBP and Hexone. Since the process that uses TBP has been shutdown and emptied of all TBP since 1989, not all PEW condensate tanks were sampled for TBP. However as a check on the assumption that there is very little TBP in the PEW Evaporator system some samples were taken. A flashpoint analysis was used for most PEW condensate tanks to indicate that the Hexone concentration is less than the 2000 ppm limit. However, a recent procedural change requires that the Hexone concentration for all PEW condensate tanks be known. Therefore, only recent tanks have been sampled for Hexone

concentration.

During early sampling the method for TBP determination could detect TBP at the 20 ppm level and higher. As can be seen, the maximum TBP concentration was a less than detectable 20 ppm for early samples. Later TBP samples using a better method of determination have the actual TBP concentration. All Hexone results were less than 4 ppm. In both cases, the concentrations are well below the limits. These low results indicate the explosion scenario is an incredible event.

5. Uranium

Uranium at LET&D is a concern as it relates to mass criticality control areas (CCA). Most CCA's are locations where masses of fissionable Uranium could exceed 15 grams and could cause a criticality event if not handled properly. For LET&D, the total mass of Uranium is kept below 15 grams so that these concerns do not apply.

Uranium does not normally carry over from the PEW Evaporator to the PEW condensate tanks. This is seen in the tables in Appendix A on pages A-10 and A-11. All sample results for PEW condensate tanks are at or beneath laboratory detection limits. To be conservative, the detection limit value is assumed to be the Uranium concentration for the PEW condensate tank.

To calculate the mass of Uranium from each PEW condensate tank sent to LET&D, the volume (normally 4000 gallons) is

multiplied by the concentration. As each tank is fed to LET&D, the mass is added to a running total for LET&D. When 14 grams is reached, the fractionator bottoms and bottoms tank are sampled to determine the actual Uranium mass at LET&D.

The tables in Appendix A on pages A-12, A-13, and A-14 show the concentration of Uranium for all bottoms tank and fractionator bottoms samples taken to date. Just as with the PEW condensate tanks, the Uranium results are at or below detection limits. In this case, however, the solutions have been concentrated by a factor of 30. Since all tanks are at or beneath detection limits even after concentrating, the concerns about Uranium mass at LET&D seem to be extremely conservative.

C. Corrosion

Testing by the Materials Development Section of the Applied Technology Department indicated the main cause of accelerated corrosion of Hastelloy G-30 is due to the presence of Cr^{+6} . Hastelloy G-30 is a high Nickel based alloy with numerous other metals, including Chromium. When Hastelloy G-30 is subjected to the mixture of chemicals found in the fractionators (Chlorides, Fluorides, Nitric Acid, and Sulfates) some corrosion is inevitable.

The LET&D fractionators and reboilers were designed for a corrosion rate of 1 mil/month. Testing has found that Cr^{+6} accelerates the corrosion rate beyond design criteria.

Since a Cr^{+6} sample analysis is very difficult, total Cr is used as an indicator of the Cr^{+6} present. Testing has found that to ensure corrosion rates do not increase, the total Cr concentration can not exceed 70 ppm. The graph in Appendix B on page B-25 indicates that, for Run Number 6, the total Cr never exceeded 50 ppm. This corresponds with the finding that Cr^{+6} formation was too slow to accelerate the corrosion process at 8 Molar Nitric Acid. However, corrosion rates increased dramatically when 12 Molar Nitric Acid solutions were used.

Once the fractionator bottoms reached 12 Molar, the concentration of Cr^{+6} increased to levels where corrosion rate were accelerated in only 20 hours. During most of the "hot" test period, the acid molarity of the fractionator bottoms has been limited to approximately 8.5 Molar (1.15 Specific Gravity) to ensure corrosion rates remain at or below design rates.

Chromium solutions exhibit a variety of colors. When the solution contains all Cr^{+3} , the solution has a slight blue-gray tint. When there is a mixture of Cr^{+3} and Cr^{+6} the solution has a green color like mouthwash. When the solution contains mostly Cr^{+6} , the solution is yellow in color.

Plans have been made to find the maximum possible acid molarity that can be made in the fractionator without significantly increasing the corrosion rate using colorimetric comparisons. The fractionator will be allowed

to make as concentrated an acid as possible. Once the fractionator bottoms reach 8 Molar, samples are taken every 2 hours. The sample color is compared to standards. When the sample color matches the green standard indicating a mixture of Cr^{+3} and Cr^{+6} the fractionator is shutdown and emptied. The acid molarity when this occurs is noted and the next test will use a maximum possible acid molarity lower than this value. Testing will continue until the maximum possible acid molarity is found. This value becomes the upper limit for the fractionators.

IV. CONCLUSIONS

Based on the results of the "hot" testing period, the following conclusions were obtained:

1. All modifications made (physical and procedural) to improve operating life of the HEPA filters have been successful.
2. The damper disks for the bottoms coolers has solved the problem of premature bursting of the disk due to turbulent water flow.
3. The feed system operation is adequate for the range of LET&D operations.
4. The PEW condensate tank mixers provide a well mixed solution faster than required by design criteria.
5. Fractionator acid removal efficiencies were proven again using actual PEW condensates.
6. Removal efficiencies for Mercury, Cadmium, Plutonium, and Non-Volatile Radionuclides can not be statistically proven with the present analytical techniques and process volume instrumentation.
7. Fluorides collect in the bottom section of the fractionator.

8. Chlorides collect in the bottom of the fractionator until the acid molarity of the bottoms solution reaches approximately 5 Molar.
9. TBP and Hexone are present in trace quantities only.
10. Uranium does not enter the PEW condensate tanks. Furthermore, it does not enter LET&D in quantities large enough to cause concerns about mass CCA's.
11. The fractionators are not capable of producing the designed 12 Molar Nitric Acid due to higher than expected corrosion rates. An acid molarity of 8.5 has been proven safe to produce without affecting corrosion rates.

V. RECOMMENDATIONS

Based on the results of the "hot" testing period, the following recommendations are made:

1. There is a need to determine the safety and operational impacts of not being able to prove design removal efficiencies for Mercury, Cadmium, Plutonium, and Non-Volatile Radionuclides.
2. Further sampling is needed to confirm the chloride release model.
3. Eliminate the concern over Uranium mass at LET&D. Only insignificant quantities (usually less than detectable limits) are found in the PEW condensate tanks and in the concentrated bottoms at LET&D.
4. Continued testing to determine the maximum possible acid molarity that can be produced without accelerating corrosion rates is needed.

APPENDIX A: SAMPLE RESULT TABLES

Nitric Acid Removal Efficiencies (using NO3 as indicator of HNO3)

	Run No. 1	Run No. 1	Run No. 2	Run No. 3	Run No. 3	Run No. 3	Run No. 4	Run No. 4	Run No. 4	Run No. 4	Run No. 4
Feed Molarity	0.01810	0.01810	6.96000	0.03680	0.03680	0.18830	0.25000	0.25000	0.25000	0.44000	0.44000
Tray 14 Molarity	0.00004	0.00007	0.00154	0.00084	0.00004	0.00041	0.00421	0.00024	0.00205	0.00062	0.00094
% Removal	99.75155	99.58522	99.97787	97.71739	99.89130	99.78226	98.31600	99.90400	99.18000	99.85909	99.78636

	Run No. 5	Run No. 5	Run No. 5	Run No. 5	Run No. 6	Run No. 6	Run No. 6	Run No. 6	Run No. 6	Run No. 6	Run No. 6	Run No. 6
Feed Molarity	0.44000	0.46900	0.46900	0.46900	0.22920	0.22920	0.22920	0.40800	0.40800	0.40800	0.21990	0.21990
Tray 14 Molarity	0.00089	0.00085	0.00029	0.00412	0.00020	0.00008	0.00029	0.00182	0.00092	0.00047	0.00043	0.00182
% Removal	99.79773	99.81876	99.93817	99.12154	99.91274	99.96510	99.87347	99.55392	99.77451	99.88480	99.80446	99.17235

Hg REMOVAL EFFICIENCY CALCULATIONS

A-3

At 275 gph Feed Rate

Tank	WL-106	WL-107	WLL-195	WLL-196
Lab Log No.	93-04184	93-041811	93-042010	93-042212
Volume (gal.)	4035	3974	204.5	56.2
Largest Hg Result (ppm)	0.203	0.391	10	9.7
Analytical Error (ppm)	0.023	0.076	NA	NA

Conversion to Moles of Hg

Moles From	Sample	Error
WL-106	0.0155	0.0018
WL-107	0.0293	0.0057
WLL-195	0.0388	NA
WLL-196	0.0103	NA
Total Moles in Feed	0.0448	0.0075
Total Moles in Bottoms	0.0489	NA

Removal Efficiency Range

Range of Moles in Feed	0.0522	to	0.0373
Range of Removal Efficiency	83.58%	to	130.94%

Hg REMOVAL EFFICIENCY CALCULATIONS

A-4

At 550 gph Feed Rate

Tank	WL-106	WL-107	WLL-195	WLL-195
Lab Log No.	93-04111	93-041112	93-04132	93-041810
Volume (gal.)	4027	4001	206	63.6
Largest Hg Result (ppm)	0.13	0.16	6.8	6.9
Analytical Error (ppm)	NA	NA	NA	NA

Conversion to Moles of Hg

	Moles From	Moles From
Tank	Sample	Error
WL-106	0.0099	NA
WL-107	0.0121	NA
WLL-195	0.0264	NA
WLL-195	0.0083	NA
Total Moles in Feed	0.0220	NA
Total Moles in Bottoms	0.0347	NA

Removal Efficiency

Removal Efficiency	158.09%
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Cs 137 REMOVAL EFFICIENCY CALCULATION

A-5

At 275 gph Feed Rate

Tank	WL-106	WL-107	WLL-195	WLL-195
Lab Log No.	93-04184	93-041811	93-042010	93-042212
Volume (gal.)	4035	3974	204.5	56.2
Largest Cs 137 Result (d/s)	0.0379	0.0744	34	112
Analytical Error (d/s/ml)	0.0016	0.003	10	15

Conversion to d/s Cs 137

	D/s From	D/s From
Tank	Sample	Error
WL-106	578827	24436
WL-107	1119094	45125
WLL-195	26317105	7740325
WLL-195	23824304	3190755
Total d/s Cs 137 in Feed	1697921	69561
Total d/s Cs 137 in Bottom	50141409	10931080

Removal Efficiency Range

Range of d/s Cs 137 in Feed	1767482	to	1628360
Range of d/s Cs 137 in Bottoms	61072489	to	39210329
Range of Removal Efficiency	3455.34%	to	2407.96%

Cs 137 REMOVAL EFFICIENCY CALCULATION

A-6

At 550 gph Feed Rate

Tank	WL-106	WL-107	WLL-195	WLL-195
Lab Log No.	93-04111	93-041112	93-04132	93-041810
Volume (gal.)	4027	4001	206	63.6
Largest Cs 137 Result (d/w)	0.159	0.208	7.6	6.33
Analytical Error (d/w/ml)	0.0056	0.0069	0.25	0.46

Conversion to d/s Cs 137

Tank	D/s From Sample	D/s From Error
WL-106	2423509	85356
WL-107	3149907	104492
WLL-195	5925796	194928
WLL-195	1523796	110734
Total d/s Cs 137 in Feed	5573416	189848
Total d/s Cs 137 in Bottom	7449592	305661

Removal Efficiency Range

Range of d/s Cs 137 in Feed	5763265	to	5383568
Range of d/s Cs 137 in Bottoms	7755253.0	to	7143930.12
Range of Removal Efficiency	134.56%	to	132.70%

PEW CONDENSATE SAMPLE RESULTS

TBP RESULTS

Sample Name	Lab No.	TBP Result (ppm)
WL-10:106	93-01203	<20
WL-WAP:107	93-012012	<20
WL-10:106	93-020612	<20
WL-10:107	93-02073	<20
WL-10:106	93-022318	3.36
WL-10:107	93-02243	3.098
WL-10:106	93-03078	16.195
WL-10:107	93-03152	7.64
WL-10:106	93-03174	6.28
WL-10:107	93-032058	5.42
WL-10:107	93-032320	5.103
WL-10:106	93-032322	4.212
WL-10:107	93-032816	4.11
WL-10:106	93-04111	4.59
WL-10:107	93-041112	4.15
WL-10:106	93-04184	4.22
WL-10:107	93-041811	3.91
WL-10:107	93-050110	3.49
WL-10:107	93-05295	2.8
WL-LETD:107	93-060212	2.2
WL-LETD:106	93-06053	2.3
WL-LETD:107	93-06094	2.3

PEW CONDENSATE SAMPLE RESULTS

TBP RESULTS

Sample Name	Lab No.	TBP Result (ppm)
WL-LETD:106	93-06107	2.9
WL-LETD:107	93-061017	2.2
WL-LETD:106	93-061113	2.58
WL-LETD:107	93-06122	2.55
WL-10:106	93-061517	1.86
WL-LETD:107	93-06162	2.3
WL-LETD:106	93-06183	1.7
WL-LETD:107	93-06305	2.3
WL-LETD:106	93-063011	2.4

PEW CONDENSATE SAMPLE RESULTS

HEXONE RESULTS

Sample Name	Lab No.	Hexone Result (ppm)
WL-LETD:107	93-060212	<4
WL-LETD:106	93-06053	<4
WL-LETD:107	93-06094	<4
WL-LETD:106	93-06107	<4
WL-LETD:107	93-061017	<4
WL-LETD:106	93-061113	<4
WL-LETD:107	93-06122	<4
WL-10:106	93-061517	<4
WL-LETD:107	93-06162	<4
WL-LETD:106	93-06183	<4
WL-LETD:107	93-06305	<4
WL-LETD:106	93-063011	<4

PEW CONDENSATE SAMPLE RESULTS

URANIUM RESULTS

Sample Name	Lab No.	Uranium Result (g/l)
WL-10:106	93-01203	<1.06748E-04
WL-WAP:107	93-012012	<1.06748E-04
WL-10:106	93-020612	<3.23369E-04
WL-10:107	93-02073	<1.63301E-04
WL-10:106	93-022318	<1.63301E-04
WL-10:107	93-02243	<1.63301E-04
WL-10:106	93-03078	<1.10889E-04
WL-10:107	93-03152	<1.10889E-04
WL-10:106	93-03174	<1.10889E-04
WL-10:107	93-032058	<2.21778E-04
WL-LETD:106	93-03218	<1.10889E-04
WL-LETD:107	93-03237	<3.61462E-04
WL-10:107	93-032320	<1.10889E-04
WL-10:106	93-032322	<1.10889E-04
WL-10:107	93-032816	<1.10889E-04
WL-LETD:107	93-04013	<1.80731E-04
WL-LETD:106	93-04023	<1.80731E-04
WL-LETD:107	93-04033	<1.80731E-04
WL-LETD:106	93-04043	<1.80731E-04
WL-10:107	93-04044	<1.80731E-04
WL-10:106	93-04111	<2.08228E-04
WL-10:107	93-041112	<2.08228E-04
WL-10:106	93-04184	<2.08228E-04
WL-10:107	93-041811	<2.08228E-04
WL-LETD:106	93-04231	<2.08228E-04
WL-LETD:107	93-042312	<2.08228E-04
WL-LETD:106	93-042510	<2.08228E-04
WL-LETD:107	93-04262	<2.08228E-04
WL-LETD:106	93-05015	<2.08228E-04
WL-10:107	93-050110	3.2E-04

PEW CONDENSATE SAMPLE RESULTS

URANIUM RESULTS

Sample Name	Lab No.	Uranium Result (g/l)
WL-LETD:106	93-05034	<2.08228E-04
WL-LETD:107	93-05106	<2.08228E-04
WL-LETD:106	93-05127	<2.08228E-04
WL-LETD:107	93-05156	<2.08228E-04
WL-LETD:106	93-051512	<2.08228E-04
WL-LETD:107	93-05184	<2.08228E-04
WL-LETD:106	93-051812	<2.08228E-04
WL-LETD:107	93-052018	<2.08228E-04
WL-LETD:107	93-05265	2.38E-04
WL-LETD:106	93-05283	<2.08228E-04
WL-10:107	93-05295	<2.08228E-04
WL-LETD:106	93-052912	<2.08228E-04
WL-LETD:106	93-06023	<2.08228E-04
WL-LETD:107	93-060212	<2.08228E-04
WL-LETD:106	93-06053	<2.08228E-04
WL-LETD:107	93-06094	<2.08228E-04
WL-LETD:106	93-06107	<2.08228E-04
WL-LETD:107	93-061017	<2.08228E-04
WL-LETD:106	93-061113	<2.08228E-04
WL-LETD:107	93-06122	<2.08228E-04
WL-10:106	93-061517	<3.23389E-04
WL-LETD:107	93-06162	<1.76275E-04
WL-LETD:106	93-06183	<1.76275E-04
WL-LETD:107	93-06305	<1.76275E-04
WL-LETD:106	93-063011	<1.76275E-04
WL-LETD:107	93-071612	<3.53426E-04

BOTTOMS TANK SAMPLE RESULTS

URANIUM RESULTS

Sample Name	Lab No.	Uranium Result (g/g)
WLL-195	93-01213	<2.13497E-04
WLL-195	93-01233	<2.13497E-04
WLL-195	93-01234	<2.13497E-04
WLL-195	93-012622	<3.23369E-04
WLL-195	93-012623	<3.23369E-04
WLL-195	93-01272	<3.23369E-04
WLL-195	93-022011	<1.61684E-04
WLL-195	93-02225	<1.61684E-04
WLL-195	93-03088	2.28E-04
WLL-195-WAP	93-03133	<1.10889E-04
WLL-195	93-03137	<1.10889E-04
WLL-195	93-031438	<2.21778E-04
WLL-195	93-031612	7.3E-04
WLL-195	93-032057	6.9E-04
WLL-195	93-032213	<1.10889E-04
WLL-195	93-032222	<2.21778E-04
WLL-195	93-03231	<2.21778E-04
WLL-195	93-032310	<2.21778E-04
WLL-195	93-03293	<3.61452E-04
WLL-195	93-03302	<3.61452E-04
WLL-195	93-040410	<3.61452E-04
WLL-195	93-040417	<3.61452E-04
WLL-195	93-04076	<2.08228E-04
WLL-195	93-04094	<2.08228E-04
WLL-195	93-04132	<2.08228E-04
WLL-195-WAP	93-041610	<2.08228E-04
WLL-195-WAP	93-042010	<4.16457E-04
WLL-195	93-042212	<4.16457E-04
WLL-195	93-042620	<4.16457E-04
WLL-195	93-04273	<4.16457E-04

BOTTOMS TANK SAMPLE RESULTS

URANIUM RESULTS

Sample Name	Lab No.	Uranium Result (g/l)
WLL-195	93-050315	<2.08228E-04
WLL-195	93-050319	<4.16457E-04
WLL-195	93-05143	<2.08228E-04
WLL-195	93-05145	<4.16457E-04
WLL-195	93-051819	<2.08228E-04
WLL-195	93-051916	<2.08228E-04
WLL-195	93-05202	<2.08228E-04
WLL-195	93-052512	<2.08228E-04
WLL-195	93-052516	<2.08228E-04
WLL-195	93-05301	<2.08228E-04
WLL-195	93-05308	<2.08228E-04
WLL-195	93-060215	<2.08228E-04
WLL-195	93-06034	<2.08228E-04
WLL-195	93-060513	<2.08228E-04
WLL-195	93-061311	<2.08228E-04
WLL-195	93-061313	<2.08228E-04
WLL-195	93-061814	8.7E-04

FRACTIONATOR BOTTOMS SAMPLE RESULTS

URANIUM RESULTS

Sample Name	Lab No.	Uranium Result (g/l)
WL-BOT:171	93-08059	<2.08228E-04
WL-BOT:171	93-061110	<4.16457E-04
WL-BOT:171	93-06137	<2.08228E-04
WL-BOT:171	93-070121	<1.76713E-04
WL-BOT:171	93-070213	1.77E-04

PEW CONDENSATE SAMPLE RESULTS

RUN No.1

(1-21-93)

Sample Name	WL-10:106
Lab No.	93-01203
Batch No.	1
1,1,1-TCE (ppm)	0.00374
ACID (N)	0.00258
Al (M)	0.00526
Arsenic (ppm)	0.17800
Barium (ppm)	0.15490
Benzene (ppm)	0.02440
Cadmium (ppm)	0.22160
Carbon Tet (ppm)	0.00405
Ce 144 (d/s/ml)	NF
CH ₂ Cl ₂ (ppm)	0.19000
Cl (ppm)	12.30000
Chloroform (ppm)	0.00558
Chromium (ppm)	0.18060
Co 60 (d/s/ml)	NF
Cs 134 (d/s/ml)	0.00210
Cs 137 (d/s/ml)	0.13800
Flashpoint (y/n)	N
F (M)	0.00002
Gross Alpha (Pu) (A/s/ml)	0.31200
Gross Beta (B/s/ml)	824.60000

PEW CONDENSATE SAMPLE RESULTS

RUN No.1

(1-21-93)

Sample Name	WL-10:106
Lab No.	92-01203
Batch No.	1
I 129 (d/s/ml)	0.05840
Lead (ppm)	0.18949
Mercury (ppm)	0.09200
Nickel (ppm)	0.20000
Nitrate (ppm)	997.00000
PER-CL-E (ppm)	0.00225
pH	1.80900
Ru 106 (d/s/ml)	0.01930
Sb 125 (d/s/ml)	NF
Selenium (ppm)	0.21600
Silver (ppm)	0.17600
Sulfate (M)	0.00013
TBP (ppm)	20.00000
Toothylene (ppm)	0.00250
Toluene (ppm)	0.01897
Total Sr (d/s/ml)	0.03000
Tritium (d/s/ml)	NA
U (g/l)	0.00011

NA = Not Available

NF = Not Found

SEPARATOR SAMPLE RESULTS

RUN No. 1

(1-21-93)

Sample Name	WL-SEP:171	WL-SEP:171
Lab No.	93-012124	93-012313
Feed Batch No.	1	1
1,1,1-TCE (ppm)	0.00250	NF
ACID (N)	0.15291	0.15291
Arsenic (ppm)	0.17800	0.17800
Barium (ppm)	0.13858	0.13858
Benzene (ppm)	0.13742	NF
Cadmium (ppm)	0.22160	0.22160
Carbon Tet (ppm)	0.00250	NF
Ce 144 (d/s/ml)	NF	NF
CH ₂ Cl ₂ (ppm)	0.12843	NF
Cl (ppm)	6.00000	29.70300
Chloroform (ppm)	0.00430	NF
Chromium (ppm)	0.18070	0.18070
Co 60 (d/s/ml)	NF	NF
Cs 134 (d/s/ml)	NF	NF
Cs 137 (d/s/ml)	NF	NF
Flashpoint (y/n)	N	N
F (ppm)	0.18998	0.18998
Gross Alpha (Pu) (A/s/ml)	0.31200	0.31205
Gross Beta (B/s/ml)	824.60000	824.60000

SEPARATOR SAMPLE RESULTS

RUN No. 1

(1-21-93)

Sample Name	WL-SEP:171	WL-SEP:171
Lab No.	93-012124	93-012313
Feed Batch No.	1	1
I 129 (d/s/ml)	0.05000	0.05840
Lead (ppm)	0.18949	0.18949
Mercury (ppm)	0.01990	0.00257
Nickel (ppm)	0.19996	0.19996
Nitrate (ppm)	NA	NA
PER-CL-E (ppm)	0.00176	NF
pH	NA	NA
Ru 105 (d/s/ml)	NF	NF
Sb 125 (d/s/ml)	NF	NF
Selenium (ppm)	0.21600	0.21600
Silver (ppm)	0.17600	0.17600
Sulfate (M)	NA	NA
TBP (ppm)	NA	NA
Tetraethylene (ppm)	0.00250	NF
Toluene (ppm)	0.01250	NF
Total Sr (d/s/ml)	0.00020	0.00086
Tritium (d/s/ml)	9.07000	9.23000
U (g/l)	NA	NA

NA = Not Available

NF = Not Found

FRACTIONATOR BOTTOMS SAMPLE RESULTS

RUN No. 1

(1-21-93)

Sample Name	WL-BOT:171
Lab No.	93-01228
Feed Batch No.	1
ACID (N)	0.19100
Chromium (ppm)	0.05080
Sp-Gr	1.00700

FRACTIONATOR TRAY RESULTS

RUN No. 1

(1-21-93)

Acid Results By Tray No.

Sample Time	2 Hours	6 Hours
Tray Number	Acid (M)	Acid (M)
14	0.15291	0.15291
12	0.15291	0.15291
10	0.15291	0.15291
8	0.15291	0.15291
6	0.14823	0.15291
4	0.14823	0.15291
2	0.14823	0.15291
1	0.14823	0.21500
FB	0.19100	NA

Chloride Results By Tray No.

Sample Time	2 Hours	6 Hours
Tray Number	Cl (ppm)	Cl (ppm)
14	6.00000	6.00000
12	6.00000	6.00000
10	6.00000	6.70000
8	6.00000	10.20000
6	6.00000	10.50000
4	6.00000	10.30000
2	19.10000	6.20000
1	6.00000	38.00000
FB	NA	NA

FRACTIONATOR TRAY RESULTS

RUN No. 1
(1-21-93)

Fluoride Results By Tray No.

Sample Time	2 Hours	6 Hours
Tray Number	F (ppm)	F (ppm)
14	0.18998	0.18998
12	0.18998	0.18998
10	0.18998	0.42000
8	0.18998	0.46300
6	0.18998	0.49400
4	0.18998	0.49600
2	0.18998	0.51100
1	1.15900	2.01000
FB	NA	NA

Nitrate Results By Tray No.

Sample Time	2 Hours	6 Hours
Tray Number	NO3 (M)	NO3 (M)
14	0.00004	0.00007
12	0.04730	0.00214
10	0.08930	0.03136
8	0.13750	0.03460
6	0.00965	0.03629
4	0.00900	0.03692
2	0.00889	0.04519
1	0.07130	0.12450
FB	NA	NA

FRACTIONATOR TRAY RESULTS

RUN No. 1

(1-21-93)

Aluminum Results By Tray No.

Sample Time	2 Hours	6 Hours
Tray Number	Al (M)	Al (M)
14	0.00526	0.00539
12	0.00526	0.00539
10	0.00526	0.00539
8	0.00526	0.00539
6	0.00526	0.00539
4	0.00526	0.00539
2	0.00526	0.00539
1	0.00670	0.00680
FB	0.00670	0.00680

PEW CONDENSATE SAMPLE RESULTS

RUN NO. 2

(1-26-93)

Sample Name	WL-10:107
Lab No.	93-012012
Batch No.	2
1,1,1-TCE (ppm)	0.00250
ACID (N)	0.18700
Al (M)	0.00528
Arsenic (ppm)	0.17800
Barium (ppm)	0.13858
Benzene (ppm)	0.01734
Cadmium (ppm)	0.22160
Carbon Tet (ppm)	0.00318
Ce 144 (d/s/ml)	NF
CH ₂ Cl ₂ (ppm)	0.14469
Cl (ppm)	30.00000
Chloroform (ppm)	0.00430
Chromium (ppm)	0.18070
Co 60 (d/s/ml)	NF
Ce 134 (d/s/ml)	0.00495
Ce 137 (d/s/ml)	0.39700
Flashpoint (y/n)	N
F (PPM)	0.93500
Gross Alpha (Pu) (A/s/ml)	0.31200
Gross Beta (B/s/ml)	824.60000

PEW CONDENSATE SAMPLE RESULTS

RUN NO. 2
(1-26-93)

Sample Name	WL-10:107
Lab No.	93-012012
Batch No.	2
I 129 (d/s/ml)	0.05000
Lead (ppm)	0.18949
Mercury (ppm)	0.09500
Nickel (ppm)	0.20000
Nitrate (M)	6.96000
PER-CL-E (ppm)	0.00176
pH	1.05500
Ru 106 (d/s/ml)	0.01270
Sb 125 (d/s/ml)	NF
Selenium (ppm)	0.21600
Silver (ppm)	0.17600
Sulfate (M)	0.00018
TBP (ppm)	20.00000
Tocethylene (ppm)	0.00250
Toluene (ppm)	0.01250
Total Sr (d/s/ml)	0.07400
Tritium (d/s/ml)	NA
U (g/l)	0.00011

NA = Not Available

NF = Not Found

SEPARATOR SAMPLE RESULTS

RUN No. 2
(1-26-93)

Sample Name	WL-SEP:171
Lab No.	93-012612
Feed Batch No.	2
1,1,1-TCE (ppm)	NA
ACID (N)	0.15291
Arsenic (ppm)	0.17800
Barium (ppm)	0.13858
Benzene (ppm)	NA
Cadmium (ppm)	0.22160
Carbon Tet (ppm)	NA
Ce 144 (d/s/ml)	NF
CH ₂ Cl ₂ (ppm)	NA
Cl (ppm)	29.70300
Chloroform (ppm)	NA
Chromium (ppm)	0.18070
Co 60 (d/s/ml)	NF
Ce 134 (d/s/ml)	NF
Ce 137 (d/s/ml)	0.03260
Flashpoint (y/n)	N
F (ppm)	25.15000
Gross Alpha (Pu) (A/s/ml)	0.31200
Gross Beta (B/s/ml)	824.60000

SEPARATOR SAMPLE RESULTS

RUN No. 2

(1-26-93)

Sample Name	WL-SEP:171
Lab No.	93-012612
Feed Batch No.	2
I 129 (d/s/ml)	0.05840
Lead (ppm)	0.18949
Mercury (ppm)	0.00280
Nickel (ppm)	0.19996
Nitrate (ppm)	NA
PER-CL-E (ppm)	NA
pH	NA
Ru 106 (d/s/ml)	NF
Sb 125 (d/s/ml)	NF
Selenium (ppm)	0.21600
Silver (ppm)	0.17600
Sulfate (M)	NA
TBP (ppm)	NA
Tetraethylene (ppm)	NA
Toluene (ppm)	NA
Total Sr (d/s/ml)	0.00721
Tritium (d/s/ml)	7.08000
U (g/l)	NA

NA = Not Available

NF = Not Found

FRACTIONATOR BOTTOMS SAMPLE RESULTS

RUN No. 2

(1-21-93)

Sample Name	WL-BOT:171
Lab No.	93-012621
Feed Batch No.	2
ACID (N)	0.70400
Chromium (ppm)	9.00000
Sp-Gr	1.02404

FRACTIONATOR TRAY SAMPLE RESULTS

RUN No. 2

(1-26-93)

Acid Results By Tray No.

Sample Time	2 Hours
Tray Number	Acid (M)
14	0.15291
12	0.15291
10	0.15291
8	0.15291
6	0.14823
4	0.21800
2	0.20200
1	0.21200
FB	0.70400

Chloride Results By Tray No.

Sample Time	2 Hours
Tray Number	Cl (ppm)
14	6.00000
12	6.00000
10	10.10000
8	11.60000
6	41.20000
4	54.90000
2	58.00000
1	59.00000
FB	NA

FRACTIONATOR TRAY SAMPLE RESULTS

RUN No. 2

(1-26-93)

Fluoride Results By Tray No.

Sample Time	2 Hours
Tray Number	F (ppm)
14	0.19000
12	0.19000
10	0.57000
8	0.57000
6	1.90000
4	2.47000
2	2.47000
1	2.66000
FB	NA

Nitrate Results By Tray No.

Sample Time	2 Hours
Tray Number	NO3 (M)
14	0.00154
12	0.00228
10	0.03430
8	0.03550
6	0.12020
4	0.15380
2	0.16450
1	1.84600
FB	NA

FRACTIONATOR TRAY SAMPLE RESULTS

RUN No. 2

(1-26-93)

Aluminum Results By Tray No.

Sample Time	2 Hours
Tray Number	Al (M)
14	0.00539
12	0.00539
10	0.00539
8	0.00539
6	0.00539
4	0.00539
2	0.00539
1	0.00539
FB	NA

PEW CONDENSATE SAMPLE RESULTS

RUN No. 3

(2-19 to 2-20-93)

Sample Name	WL-10:106	WL-10:107
Lab No.	93-020612	93-02073
Batch No.	3	4
1,1,1-TCE (ppm)	0.01102	0.01102
ACID (N)	0.15290	0.22700
Al (M)	0.00495	0.00495
Arsenic (ppm)	0.15468	0.15468
Barium (ppm)	0.15497	0.15497
Benzene (ppm)	0.01820	0.01729
Cadmium (ppm)	0.22285	0.22285
Carbon Tet (ppm)	0.00597	0.00597
Ce 144 (d/s/ml)	NF	NF
CH ₂ Cl ₂ (ppm)	0.17437	0.17437
Cl (ppm)	10.80000	52.90000
Chloroform (ppm)	0.00500	0.00500
Chromium (ppm)	0.14952	0.19699
Co 60 (d/s/ml)	NF	NF
Cs 134 (d/s/ml)	0.00266	0.00649
Cs 137 (d/s/ml)	0.14200	0.37200
Flashpoint (y/n)	N	N
F (M)	0.00002	0.00006
Gross Alpha (Pu) (A/s/ml)	0.31205	0.31205
Gross Beta (B/s/ml)	489.59900	489.59900

PEW CONDENSATE SAMPLE RESULTS

RUN No. 3

(2-19 to 2-20-93)

Sample Name	WL-10:106	WL-10:107
Lab No.	93-020612	93-02073
Batch No.	3	4
I 129 (d/s/ml)	0.05842	0.05842
Lead (ppm)	0.20798	0.20798
Mercury (ppm)	0.11100	0.13200
Nickel (ppm)	0.21538	0.21538
Nitrate (ppm)	0.03680	0.18830
PER-CL-E (ppm)	0.00167	0.00167
pH	1.71700	0.75000
Ru 106 (d/s/ml)	0.02300	0.02670
Sb 125 (d/s/ml)	NF	0.00840
Selenium (ppm)	0.15624	0.15624
Silver (ppm)	0.11185	0.11135
Sulfate (M)	0.00001	0.00002
TBP (ppm)	20.00000	20.00000
Tetrahylene (ppm)	0.00333	0.00333
Toluene (ppm)	0.01667	0.01667
Total Sr (d/s/ml)	22.80000	43.50000
Tritium (d/s/ml)	6.50000	5.81000
U (g/l)	3.23369	3.23369

NA = Not Available

NF = Not Found

SEPARATOR SAMPLE RESULTS

RUN No. 3

(2-19 to 2-20-93)

Sample Name	WL-SEP:171	WL-SEP:171	WL-SEP:171
Lab No.	93-021916	93-021917	93-021928
Feed Batch No.	3	3	4
1,1,1-TCE (ppm)	0.00661	0.00661	0.00661
ACID (N)	0.15290	0.15290	0.15290
Arsenic (ppm)	0.15468	0.15468	0.15468
Barium (ppm)	0.15497	0.21500	0.26000
Benzene (ppm)	0.00800	0.00800	0.00800
Cadmium (ppm)	0.22280	0.22280	0.22280
Carbon Tet (ppm)	0.00321	0.00321	0.00321
Ce 144 (d/s/ml)	NF	NF	NF
CH ₂ Cl ₂ (ppm)	0.11590	0.11590	0.11590
Cl (ppm)	30.00000	30.00000	30.00000
Chloroform (ppm)	0.00300	0.00300	0.00300
Chromium (ppm)	0.14950	0.14950	0.14950
Co 60 (d/s/ml)	NF	NF	NF
Cs 134 (d/s/ml)	NF	NF	NF
Cs 137 (d/s/ml)	NF	NF	NF
Flashpoint (y/n)	N	N	N
Fluoride (M)	0.00001	0.00001	0.00001
Gross Alpha (Pu) (A/s/ml)	0.31200	0.31200	0.31200
Gross Beta (B/s/ml)	651.00000	651.00000	651.00000

SEPARATOR SAMPLE RESULTS

RUN No. 3

(2-19 to 2-20-93)

Sample Name	WL-SEP:171	WL-SEP:171	WL-SEP:171
Lab No.	93-021916	93-021917	93-021928
Feed Batch No.	3	3	4
I 129 (d/s/ml)	0.05845	0.05000	0.05845
Lead (ppm)	0.20798	0.20798	0.20798
Mercury (ppm)	0.00785	0.00280	0.00280
Nickel (ppm)	0.21537	0.21537	0.21537
Nitrate (ppm)	NA	NA	NA
PER-CL-E (ppm)	0.00100	0.00100	0.00100
pH	NA	NA	NA
Ru 106 (d/s/ml)	NF	NF	NF
Sb 125 (d/s/ml)	NF	NF	NF
Selenium (ppm)	0.15600	0.15600	0.15600
Silver (ppm)	0.11800	0.11800	0.11800
Sulfate (M)	NA	NA	NA
TBP (ppm)	NA	NA	NA
Tcethylene (ppm)	0.00250	0.00250	0.00250
Toluene (ppm)	0.01000	0.01000	0.01000
Total Sr (d/s/ml)	3.82000	2.61000	0.06748
Tritium (d/s/ml)	6.68000	8.12000	6.96000
U (g/l)	NA	NA	NA

NA = Not Available

NF = Not Found

FRACTIONATOR BOTTOMS SAMPLE RESULTS

RUN No. 3

(2-19 to 2-20-93)

Sample Name	WL-BOT:171
Lab No.	93-02203
Feed Batch No.	3
ACID (N)	4.69100
Chromium (ppm)	0.04962
Sp-Gr	1.15430

FRACTIONATOR TRAY RESULTS

RUN No. 3

(2-19 to 2-20-93)

Acid Results By Tray No.

Sample Time	2 Hours	6 Hours	10 Hours
Tray Number	Acid (M)	Acid (M)	Acid (M)
14	0.15290	0.15290	0.15290
12	0.15290	0.15290	0.15290
10	0.15290	0.15290	0.15290
8	0.15290	0.15290	0.15290
6	0.15290	0.15290	0.15290
4	0.15290	0.15290	0.15290
2	0.15290	0.15290	0.17100
1	0.15290	1.34600	0.72400
FB	NA	NA	NA

Chloride Results By Tray No.

Sample Time	2 Hours	6 Hours	10 Hours
Tray Number	Cl (ppm)	Cl (ppm)	Cl (ppm)
14	30.00000	30.00000	30.00000
12	30.00000	30.00000	30.00000
10	30.00000	30.00000	35.00000
8	30.00000	30.00000	37.00000
6	30.00000	30.00000	61.00000
4	30.00000	30.00000	33.00000
2	30.00000	30.00000	34.00000
1	30.00000	72.00000	182.00000
FB	NA	NA	NA

FRACTIONATOR TRAY RESULTS

RUN No. 3

(2-19 to 2-20-93)

Fluoride Results By Tray No.

Sample Time	2 Hours	6 Hours	10 Hours
Tray Number	F (ppm)	F (ppm)	F (ppm)
14	3.80000	0.19000	0.19000
12	3.80000	0.19000	0.19000
10	3.80000	0.28310	0.65360
8	3.80000	0.31540	0.82270
6	3.80000	0.33630	0.82840
4	3.80000	0.35720	0.95950
2	3.80000	0.46360	1.14000
1	3.80000	2.86900	5.00840
FB	NA	NA	NA

Nitrate Results By Tray No.

Sample Time	2 Hours	6 Hours	10 Hours
Tray Number	NO3 (M)	NO3 (M)	NO3 (M)
14	0.00084	0.00004	0.00041
12	0.00116	0.00120	0.00873
10	0.01680	0.02101	0.10450
8	0.01900	0.02300	0.11410
6	0.01940	0.02410	0.11760
4	0.01880	0.02370	0.11860
2	0.01830	0.02980	0.12670
1	0.05390	0.21920	0.62700
FB	NA	NA	NA

FRACTIONATOR TRAY RESULTS

RUN No. 3

(2-19 to 2-20-93)

Aluminum Results By Tray No.

Sample Time	2 Hours	6 Hours	10 Hours
Tray Number	Al (M)	Al (M)	Al (M)
14	0.00495	0.00490	0.00490
12	0.00495	0.00490	0.00490
10	0.00495	0.00490	0.00490
8	0.00495	0.00490	0.00490
6	0.00495	0.00490	0.00490
4	0.00495	0.00490	0.00490
2	0.00495	0.00490	0.00490
1	0.00495	0.00690	0.00700
FB	NA	NA	NA

PEW CONDENSATE SAMPLE RESULTS

RUN No. 4

(3-6-93)

Sample Name	WL-10:106	WL-10:107
Lab No.	93-022318	93-02243
Batch No.	5	6
1,1,1-TCE (ppm)	0.01102	0.01102
ACID (N)	0.31900	0.43300
Al (M)	0.00495	0.00495
Arsenic (ppm)	0.15468	0.15468
Barium (ppm)	0.15497	0.15497
Benzene (ppm)	0.01333	0.01410
Cadmium (ppm)	0.22285	0.22285
Carbon Tet (ppm)	0.00439	0.00439
Ce 144 (d/s/ml)	NF	NF
CH ₂ Cl ₂ (ppm)	0.18947	0.18947
Cl (ppm)	34.00000	34.00000
Chloroform (ppm)	0.00682	0.00682
Chromium (ppm)	0.14952	0.14952
Co 60 (d/s/ml)	0.00348	0.00818
Cs 134 (d/s/ml)	0.11300	0.25200
Cs 137 (d/s/ml)	5.13000	11.40000
Flashpoint (y/n)	N	N
F (M)	0.00005	0.00001
Gross Alpha (Pu) (A/s/ml)	0.31205	0.31205
Gross Beta (B/s/ml)	651.00000	1210.00000

PEW CONDENSATE SAMPLE RESULTS

RUN No. 4

(3-6-93)

Sample Name	WL-10:106	WL-10:107
Lab No.	93-022318	93-02243
Batch No.	5	6
I 129 (d/s/ml)	0.05842	0.05479
Lead (ppm)	0.20798	0.20798
Mercury (ppm)	1.14000	2.90000
Nickel (ppm)	0.21538	0.21538
Nitrate (M)	0.25000	0.44000
PER-CL-E (ppm)	0.00167	0.00167
pH	0.68800	0.57300
Ru 106 (d/s/ml)	0.08200	0.09800
Sb 125 (d/s/ml)	0.03300	NF
Selenium (ppm)	0.15624	0.15624
Silver (ppm)	0.11185	0.11185
Sulfate (M)	0.00002	0.00002
TBP (ppm)	3.36000	3.09800
Tcethylene (ppm)	0.00333	0.00333
Toluene (ppm)	0.01667	0.01667
Total Sr (d/s/ml)	1.46000	3.26426
Tritium (d/s/ml)	NA	7.59000
U (g/l)	0.00016	0.00016

NA = Not Available

NF = Not Found

SEPARATOR SAMPLE RESULTS

RUN No. 4

(3-6-93)

Sample Name	WL-SEP:171	WL-SEP:171	WL-SEP:171	WL-SEP:171	WL-SEP:171
Lab No.	93-03068	93-030622	93-030633	93-030643	93-030653
Feed Batch No.	5	5	5	6	6
1,1,1-TCE (ppm)	0.00661	0.00661	0.00661	NA	NA
ACID (N)	0.15290	0.15290	0.15290	0.19024	0.15437
Arsenic (ppm)	0.15468	0.15468	0.15468	0.13784	0.13784
Barium (ppm)	0.15497	0.21500	0.26000	0.15302	0.15302
Benzene (ppm)	0.00800	0.00800	0.00800	NA	NA
Cadmium (ppm)	0.22280	0.22280	0.22280	0.19807	0.19807
Carbon Tet (ppm)	0.00321	0.00321	0.00321	NA	NA
Ce 144 (d/s/ml)	NF	NF	NF	NF	NF
CH ₂ Cl ₂ (ppm)	0.11590	0.11590	0.11590	NA	NA
Cl (ppm)	30.00000	30.00000	30.00000	44.50000	22.20000
Chloroform (ppm)	0.00300	0.00300	0.00300	NA	NA
Chromium (ppm)	0.14950	0.14950	0.14950	0.14508	0.14508
Co 60 (d/s/ml)	NF	NF	NF	NF	NF
Ce 134 (d/s/ml)	NF	NF	NF	0.00274	NF
Ce 137 (d/s/ml)	0.03780	NF	0.01400	0.12800	0.05070
Flashpoint (y/n)	N	N	N	N	N
Fluoride (M)	0.00001	0.00001	0.00001	0.00001	0.00001
Gross Alpha (Pu) (A/s/ml)	0.31200	0.31200	0.31200	0.31200	0.31200
Gross Beta (B/s/ml)	651.00000	651.00000	651.00000	617.51500	617.51500

SEPARATOR SAMPLE RESULTS

RUN No. 4

(3-6-93)

Sample Name	WL-SEP:171	WL-SEP:171	WL-SEP:171	WL-SEP:171	WL-SEP:171
Lab No.	93-03068	93-030622	93-030633	93-030643	93-030653
Feed Batch No.	6	6	6	6	6
I 129 (d/s/ml)	0.05845	0.05000	0.05845	0.05845	0.05390
Lead (ppm)	0.20798	0.20798	0.20798	0.20866	0.20866
Mercury (ppm)	0.00785	0.00280	0.00280	0.00340	0.00550
Nickel (ppm)	0.21537	0.21537	0.21537	0.22141	0.22141
Nitrate (ppm)	NA	NA	NA	NA	NA
PER-CL-E (ppm)	0.00100	0.00100	0.00100	NA	NA
pH	NA	NA	NA	NA	NA
Ru 106 (d/s/ml)	NF	NF	NF	NF	NF
Sb 125 (d/s/ml)	NF	NF	NF	NF	NF
Selenium (ppm)	0.15600	0.15600	0.15600	0.11447	0.11447
Silver (ppm)	0.11800	0.11800	0.11800	0.12455	0.12455
Sulfate (M)	NA	NA	NA	NA	NA
TBP (ppm)	NA	NA	NA	NA	NA
Tcethylene (ppm)	0.00250	0.00250	0.00250	NA	NA
Toluene (ppm)	0.01000	0.01000	0.01000	NA	NA
Total Sr (d/s/ml)	0.01014	0.00087	0.00358	0.03130	1.07500
Tritium (d/s/ml)	7.75000	9.00000	9.70000	8.86000	9.72000
U (g/l)	NA	NA	NA	NA	NA

NA = Not Available

NF = Not Found

Fractionator Bottoms Sample Results

RUN No. 4

(3-6-93)

Sample Name	WL-BOT:171
Lab No.	93-02203
Feed Batch No.	NA
ACID (N)	4.69100
Chromium (ppm)	0.04962
Sp-Gr	1.15431

FRACTIONATOR TRAY RESULTS

RUN No. 4
(3-6-93)

Acid Results By Tray No.

Sample Time	2 Hours	6 Hours	10 Hours	14 Hours	18 Hours
Tray Number	Acid (M)	Acid (M)	Acid (M)	Acid (M)	Acid (M)
14	0.19024	0.19024	0.19024	0.19024	0.15437
12	0.19024	0.19024	0.19024	0.19024	0.15437
10	0.19024	0.19024	0.19024	0.19024	0.15437
8	0.19024	0.19024	0.19024	0.19024	0.15437
6	0.19024	0.19024	0.19024	0.19024	0.15437
4	0.19024	0.19024	0.19024	0.23700	0.35200
2	0.19024	0.19024	0.19000	0.39600	1.10120
1	0.66100	0.93900	1.39200	2.44700	2.79300
FB	NA	NA	NA	NA	NA

Chloride Results By Tray No.

Sample Time	2 Hours	6 Hours	10 Hours	14 Hours	18 Hours
Tray Number	Cl (ppm)	Cl (ppm)	Cl (ppm)	Cl (ppm)	Cl (ppm)
14	6.00000	6.00000	6.00000	54.90000	18.10000
12	6.00000	6.00000	6.00000	18.60000	15.00000
10	15.00000	16.10000	22.30000	54.90000	18.10000
8	15.40000	14.20000	22.90000	54.50000	19.80000
6	27.10000	15.70000	22.70000	55.80000	13.40000
4	15.80000	12.10000	25.60000	61.40000	68.40000
2	27.10000	19.70000	35.00000	82.50000	28.80000
1	93.20000	127.40000	187.40000	276.10000	45.40000
FB	NA	NA	NA	NA	NA

FRACTIONATOR TRAY RESULTS

RUN No. 4

(3-6-93)

Fluoride Results By Tray No.

Sample Time	2 Hours	6 Hours	10 Hours	14 Hours	18 Hours
Tray Number	F (ppm)	F (ppm)	F (ppm)	F (ppm)	F (ppm)
14	0.19000	0.19000	0.19000	0.42219	0.19000
12	0.19000	0.19000	0.19000	1.26656	0.19000
10	0.51300	0.59000	0.37000	0.38800	0.19000
8	0.49500	0.45000	0.55000	0.43700	0.27000
6	0.70200	0.51000	0.50000	0.57900	0.43000
4	0.57300	0.39400	0.66000	NA	0.98000
2	0.87900	0.81000	0.90000	1.32000	1.37000
1	2.86000	3.15000	0.19000	0.37997	0.19000
FB	NA	NA	NA	NA	NA

Nitrate Results By Tray No.

Sample Time	2 Hours	6 Hours	10 Hours	14 Hours	18 Hours
Tray Number	NO3 (M)	NO3 (M)	NO3 (M)	NO3 (M)	NO3 (M)
14	0.00421	0.00024	0.00205	0.00062	0.00094
12	0.00400	0.00261	0.00011	0.00029	0.00490
10	0.11400	0.10700	0.08000	0.11410	0.02560
8	0.14100	0.09400	0.09600	0.14000	0.04740
6	0.14400	0.09990	0.10400	0.15500	0.07700
4	0.14500	0.07300	0.12200	0.19000	0.25600
2	0.20300	0.13500	0.17000	0.28000	0.93400
1	0.75500	0.88200	0.62700	2.00800	2.19000
FB	NA	NA	NA	NA	NA

FRACTIONATOR TRAY RESULTS

RUN No. 4

(3-6-93)

Aluminum Results By Tray No.

Sample Time	2 Hours	6 Hours	10 Hours	14 Hours	18 Hours
Tray Number	Al (M)	Al (M)	Al (M)	Al (M)	Al (M)
14	0.00603	0.00603	0.00603	0.00618	0.00618
12	0.00603	0.00603	0.00603	0.00618	0.00618
10	0.00603	0.00603	0.00603	0.00618	0.00618
8	0.00603	0.00603	0.00603	0.00618	0.00618
6	0.00603	0.00603	0.00603	0.00618	0.00618
4	0.00603	0.00603	0.00603	0.00618	0.00618
2	0.00603	0.00603	0.00603	0.00618	0.00618
1	0.00603	0.00603	0.00603	0.00618	0.00618
FB	NA	NA	NA	NA	NA

PEW CONDENSATE SAMPLE RESULTS

RUN No. 5
(3-13 to 3-14-93)

Sample Name	WL-10:107	WL-10:108
Lab No.	93-02243	93-03078
Batch No.	6	7
1,1,1-TCE (ppm)	0.01102	NA
ACID (N)	0.43300	0.53100
Al (M)	0.00495	0.00803
Arsenic (ppm)	0.15468	0.13784
Barium (ppm)	0.15497	0.15302
Benzene (ppm)	0.01410	NA
Cadmium (ppm)	0.22285	0.19807
Carbon Tet (ppm)	0.00439	NA
Ce 144 (d/s/ml)	NF	NF
CH ₂ Cl ₂ (ppm)	0.18947	NA
Cl (ppm)	34.00000	50.40000
Chloroform (ppm)	0.00682	NA
Chromium (ppm)	0.14952	0.32900
Co 60 (d/s/ml)	0.00818	0.00859
Ce 134 (d/s/ml)	0.25200	0.26200
Ce 137 (d/s/ml)	11.40000	11.70000
Flashpoint (y/n)	N	N
F (M)	0.00001	0.00008
Gross Alpha (Pu) (A/s/ml)	0.31205	0.31205
Gross Beta (B/s/ml)	1210.00000	1380.00000

PEW CONDENSATE SAMPLE RESULTS

RUN No. 5
(3-13 to 3-14-93)

Sample Name	WL-10:107	WL-10:108
Lab No.	93-02243	93-03079
Batch No.	6	7
I 129 (d/s/ml)	0.05479	0.14350
Lead (ppm)	0.20798	0.20888
Mercury (ppm)	2.90000	3.03000
Nickel (ppm)	0.21538	0.22141
Nitrate (M)	0.44000	0.46900
PER-CL-E (ppm)	0.00167	NA
pH	0.68800	0.59400
Ru 106 (d/s/ml)	0.08200	0.14800
Sb 125 (d/s/ml)	0.03300	0.04900
Selenium (ppm)	0.15624	0.11447
Silver (ppm)	0.11185	0.12455
Sulfate (M)	0.00002	0.00012
TBP (ppm)	3.09800	16.19500
Tcethylene (ppm)	0.00333	NA
Toluene (ppm)	0.01667	NA
Total Sr (d/s/ml)	3.26426	3.95327
Tritium (d/s/ml)	7.59000	14.90000
U (g/l)	0.00016	0.00011

NA = Not Available

NF = Not Found

SEPARATOR SAMPLE RESULTS

RUN No. 5
(3-13 to 3-14-93)

Sample Name	WL-SEP:171	WL-SEP:171	WL-SEP:171	WL-SEP:171
Lab No.	93-031314	93-03143	93-031415	93-031425
Feed Batch No.	6	7	8	7
1,1,1-TCE (ppm)	NA	NA	NA	NA
ACID (N)	0.19024	0.19024	0.19024	0.19024
Arsenic (ppm)	0.22973	0.22973	0.22973	0.22973
Barium (ppm)	0.35600	0.41900	0.33500	0.40200
Benzene (ppm)	NA	NA	NA	NA
Cadmium (ppm)	0.33012	0.33012	0.33012	0.33012
Carbon Tet (ppm)	NA	NA	NA	NA
Ce 144 (d/s/ml)	NF	NF	NF	NF
CH ₂ Cl ₂ (ppm)	NA	NA	NA	NA
Cl (ppm)	14.88100	35.40000	22.40000	30.03000
Chloroform (ppm)	NA	NA	NA	NA
Chromium (ppm)	0.24179	0.24179	0.24179	0.24179
Co 60 (d/s/ml)	NF	NF	NF	NF
Ce 134 (d/s/ml)	0.00786	NF	NF	0.00090
Ce 137 (d/s/ml)	0.34000	0.00072	0.02770	0.03410
Flashpoint (y/n)	N	N	N	N
F (ppm)	0.19000	0.19000	0.19000	0.19000
Gross Alpha (Pu) (A/s/ml)	0.32710	0.32710	0.32710	0.32710
Gross Beta (B/s/ml)	617.51500	617.51500	617.51500	617.51500

SEPARATOR SAMPLE RESULTS

RUN No. 5
(3-13 to 3-14-93)

Sample Name	WL-SEP:171	WL-SEP:171	WL-SEP:171	WL-SEP:171
Lab No.	93-031314	93-03143	93-031415	93-031425
Feed Batch No.	6	7	8	7
I 129 (d/s/ml)	0.05845	0.05845	0.06010	0.05845
Lead (ppm)	0.34776	0.34776	0.34776	0.34776
Mercury (ppm)	0.08570	0.01789	0.01789	0.01789
Nickel (ppm)	0.36902	0.36902	0.36902	0.36902
Nitrate (ppm)	NA	NA	NA	NA
PER-CL-E (ppm)	NA	NA	NA	NA
pH	NA	NA	NA	NA
Ru 106 (d/s/ml)	NF	NF	NF	NF
Sb 125 (d/s/ml)	NF	NF	NF	NF
Selenium (ppm)	0.19078	0.19078	0.19078	0.19078
Silver (ppm)	0.20758	0.20758	0.20758	0.20758
Sulfate (M)	NA	NA	NA	NA
TBP (ppm)	NA	NA	NA	NA
Tcethylene (ppm)	NA	NA	NA	NA
Toluene (ppm)	NA	NA	NA	NA
Total Sr (d/s/ml)	0.09900	0.00073	0.00949	0.01153
Tritium (d/s/ml)	6.99000	12.99000	13.41000	1.39000

NA = Not Available

NF = Not Found

FRACTIONATOR BOTTOMS SAMPLE RESULTS

RUN No. 5
(3-13 to 3-14-93)

Sample Name	WL-FB:171	WL-FB:171	WL-FB:171	WL-FB:171
Lab No.	93-031313	93-03142	93-031414	93-031424
Feed Batch No.	6	7	8	7
1,1,1-TCE (ppm)	NA	NA	NA	NA
ACID (N)	1.8600	7.6900	1.0020	1.3170
Arsenic (ppm)	0.2297	0.2297	0.2297	0.2297
Barium (ppm)	0.3470	0.3950	0.3140	0.2580
Benzene (ppm)	NA	NA	NA	NA
Cadmium (ppm)	0.3301	0.5640	0.9600	1.4900
Carbon Tet (ppm)	NA	NA	NA	NA
Ce 144 (d/s/ml)	NF	NF	NF	NF
CH ₂ Cl ₂ (ppm)	NA	NA	NA	NA
Cl (ppm)	145.6000	139.5000	14.8810	30.0300
Chloroform (ppm)	NA	NA	NA	NA
Chromium (ppm)	2.2000	7.9200	22.5000	39.8000
Co 60 (d/s/ml)	0.0351	0.1300	NF	NF
Ce 134 (d/s/ml)	1.2200	4.1900	5.3200	6.7900
Ce 137 (d/s/ml)	55.9000	177.0000	256.0000	304.0000
Flashpoint (y/n)	N	N	N	N
Γ (ppm)	0.2500	0.1900	0.1900	0.1900
Gross Alpha (Pu) (A/s/ml)	0.3271	0.6020	1.1200	1.6200
Gross Beta (B/s/ml)	5380.0000	22280.0000	36400.0000	28340.0000

FRACTIONATOR BOTTOMS SAMPLE RESULTS

RUN No. 5
(3-13 to 3-14-93)

Sample Name	WL-FB:171	WL-FB:171	WL-FB:171	WL-FB:171
Lab No.	93-031313	93-03142	93-031414	93-031424
Feed Batch No.	6	7	8	7
I 129 (d/e/ml)	0.0584	0.0574	0.1328	0.3004
Lead (ppm)	0.3478	0.3478	0.3478	0.3478
Mercury (ppm)	20.6000	42.7000	55.2000	68.0000
Nickel (ppm)	6.4800	21.4900	55.2000	104.6000
Nitrate (M)	1.5040	5.0100	6.1900	7.8500
PER-CL-E (ppm)	NA	NA	NA	NA
pH	0.5000	0.5000	0.5000	0.5000
Ru 106 (d/e/ml)	0.5190	1.7000	3.1100	NF
Sb 125 (d/e/ml)	0.1640	NF	NF	NF
Selenium (ppm)	0.1908	0.1908	0.2100	0.2900
Silver (ppm)	0.2076	0.2076	0.2076	0.2076
Sulfate (M)	0.0007	0.0018	0.0018	0.0020
TBP (ppm)	NA	NA	NA	NA
Tcethylene (ppm)	NA	NA	NA	NA
Toluene (ppm)	NA	NA	NA	NA
Total Sr (d/e/ml)	0.3520	66.5000	90.6000	107.1000
Tritium (d/e/ml)	11.5189	11.5189	11.5189	74.3000
U (g/l)	0.0001	0.0002	0.0002	0.0002

NA = Not Available

NF = Not Found

FRACTIONATOR TRAY RESULTS

RUN No. 5

3-13 to 3-14-93

Acid Results By Tray No.

Sample Time	2 Hours	6 Hours	10 Hours	14 Hours
Tray Number	Acid (M)	Acid (M)	Acid (M)	Acid (M)
14	0.19024	0.19024	0.19024	0.19024
12	0.19024	0.19024	0.19024	0.19024
10	0.20200	0.19024	0.19024	0.19024
8	0.21500	0.19200	0.23600	0.24800
6	0.24000	0.22900	0.32100	0.45500
4	0.25300	0.40300	0.68500	1.30900
2	0.27800	0.72100	1.64600	3.88700
1	0.82600	3.65300	0.19024	4.97900
FB	1.86000	7.69000	1.00200	1.31700

Chloride Results By Tray No.

Sample Time	2 Hours	6 Hours	10 Hours	14 Hours
Tray Number	Cl (ppm)	Cl (ppm)	Cl (ppm)	Cl (ppm)
14	14.88100	31.50000	20.10000	30.03000
12	14.88100	39.40000	22.20000	30.03000
10	16.20000	35.80000	46.40000	35.50000
8	61.60000	40.50000	29.60000	30.60000
6	17.60000	42.00000	32.20000	30.03000
4	18.40000	45.60000	42.40000	37.30000
2	23.10000	61.20000	57.20000	71.60000
1	71.60000	115.90000	74.40000	30.03000
FB	145.60000	139.50000	14.88100	30.03000

FRACTIONATOR TRAY RESULTS

RUN No. 5

3-13 to 3-14-93

Fluoride Results By Tray No.

Sample Time	2 Hours	6 Hours	10 Hours	14 Hours
Tray Number	F (ppm)	F (ppm)	F (ppm)	F (ppm)
14	0.18998	0.18998	0.18998	0.18998
12	0.18998	0.18998	0.18998	0.18998
10	0.55700	0.52000	0.51100	0.52200
8	0.60600	0.68200	0.65000	0.84900
6	0.69400	0.89600	0.99000	1.54000
4	0.75900	1.50000	2.13000	0.18998
2	0.79000	2.33000	0.18998	0.18998
1	2.28000	0.18998	0.18998	0.31664
FB	0.25000	0.19000	0.19000	0.19000

Nitrate Results By Tray No.

Sample Time	2 Hours	6 Hours	10 Hours	14 Hours
Tray Number	NO3 (M)	NO3 (M)	NO3 (M)	NO3 (M)
14	0.00089	0.00085	0.00029	0.00412
12	0.01234	0.00769	0.00869	0.02306
10	0.19560	0.11500	0.12400	0.13550
8	0.21450	0.16600	0.18500	0.20900
6	0.15880	0.18600	0.25600	0.37300
4	0.21900	0.33300	0.57900	1.10000
2	0.20400	0.69400	1.41000	2.93000
1	0.68000	2.44500	4.13600	6.19000
FB	1.50400	5.01000	6.19000	1.62000

FRACTIONATOR TRAY RESULTS

RUN No. 5

3-13 to 3-14-93

Aluminum Results By Tray No.

Sample Time	2 Hours	6 Hours	10 Hours	14 Hours
Tray Number	Al (M)	Al (M)	Al (M)	Al (M)
14	0.00617	0.00617	0.00617	0.00617
12	0.00617	0.00617	0.00617	0.00617
10	0.00617	0.00617	0.00617	0.00617
8	0.00617	0.00617	0.00617	0.00617
6	0.00617	0.00617	0.00617	0.00617
4	0.00617	0.00617	0.00617	0.00617
2	0.00617	0.00617	0.00617	0.00617
1	0.00617	0.00617	0.00617	0.00617

**FRACTIONATOR BOTTOMS
ACID AND CHLORIDE RESULTS**

**RUN No. 5
(3-13 to 3-14-93)**

Sample Time	Acid (M)	Cl (ppm)
2 Hours	1.86000	145.60000
6 Hours	7.69000	139.50000
10 Hours	1.00200	14.88100
14 Hours	1.31700	30.03000

PEW CONDENSATE SAMPLE RESULTS

RUN No. 6

(3-19 to 3-22-93)

Sample Name	WL-10:107	WL-10:108	WL-10:107	WL-LET&D:108
Lab No.	93-03152	93-03174	93-032058	93-03218
Batch No.	8	9	10	11
1,1,1-TCE (ppm)	NA	NA	NA	NA
ACID (N)	0.31300	0.51100	0.27800	0.26100
Al (M)	0.00616	0.00616	0.00616	0.00616
Arsenic (ppm)	0.13784	0.13784	C.17641	NA
Barium (ppm)	0.15302	0.15302	0.15302	NA
Benzene (ppm)	NA	NA	NA	NA
Cadmium (ppm)	0.19807	0.19807	0.19807	NA
Carbon Tet (ppm)	NA	NA	NA	NA
Ce 144 (d/s/ml)	NF	NF	NF	NA
CH ₂ Cl ₂ (ppm)	NA	NA	NA	NA
Cl (ppm)	30.30000	39.80000	29.12200	31.26690
Chloroform (ppm)	NA	NA	NA	NA
Chromium (ppm)	0.43000	0.14508	0.14508	NA
Co 60 (d/s/ml)	0.01010	0.00860	0.00579	NA
Cs 134 (d/s/ml)	0.28100	0.23600	0.13300	NA
Cs 137 (d/s/ml)	12.50000	10.40000	5.87000	NA
Flashpoint (y/n)	N	N	N	N
F (M)	0.00007	0.00007	0.00131	0.00009
Gross Alpha (Pu) (A/s/ml)	0.32710	0.32710	0.32710	NA
Gross Beta (B/s/ml)	1510.00000	1170.00000	730.00000	750.00000

PEW CONDENSATE SAMPLE RESULTS

RUN No. 6

(3-19 to 3-22-93)

Sample Name	WL-10:107	WL-10:106	WL-10:107	WL-LET&D:106
Lab No.	93-03152	93-03174	93-032058	93-03218
Batch No.	8	9	10	11
I 129 (d/s/ml)	0.10380	0.11750	0.09980	NA
Lead (ppm)	0.20866	0.20866	0.20866	NA
Mercury (ppm)	1.52000	3.71000	1.89000	NA
Nickel (ppm)	0.22141	0.22141	0.22141	NA
Nitrate (M)	0.22920	0.40800	0.21990	NA
PER-CL-E (ppm)	NA	NA	NA	NA
pH	0.84300	0.63804	0.68500	NA
Ru 106 (d/s/ml)	0.17700	0.12900	0.12000	NA
Sb 125 (d/s/ml)	0.07790	0.05420	0.05840	NA
Selenium (ppm)	0.23900	0.11447	0.11447	NA
Silver (ppm)	0.12455	0.12455	0.12455	NA
Sulfate (M)	0.00005	0.00005	0.00005	NA
TBP (ppm)	7.64000	6.28000	5.42000	NA
Tcethylene (ppm)	NA	NA	NA	NA
Toluene (ppm)	NA	NA	NA	NA
Total Sr (d/s/ml)	4.18663	1.26000	0.89000	NA
Tritium (d/s/ml)	9.44000	8.10000	6.82000	NA
U (g/l)	0.00011	0.00011	0.00022	0.00011

NA = Not Available

NF = Not Found

SEPARATOR SAMPLE RESULTS

RUN No. 6
(3-19 to 3-22-93)

Sample Name	WL-SEP:171	WL-SEP:171	WL-SEP:171	WL-SEP:171	WL-SEP:171	WL-SEP:171	WL-SEP:171	WL-SEP:171	WL-SEP:171	WL-SEP:171
Lab No.	93-031911	93-031921	93-03202	93-032013	93-032022	93-032037	93-032048	93-032111	93-032122	93-03224
Feed Batch No.	8	8	8	8/9	9	9	9	10	10	10/11
1,1,1-TCE (ppm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ACID (N)	0.19024	0.19024	0.19024	0.19024	0.19024	0.19024	0.19024	0.19024	0.19024	0.19024
Arsenic (ppm)	0.12784	0.13784	0.13784	0.13784	0.13784	0.13784	0.13784	0.13784	0.13784	0.13784
Barium (ppm)	0.24000	0.18800	0.17100	0.29700	0.15302	0.25600	0.31300	0.18800	0.22500	0.25700
Benzene (ppm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium (ppm)	0.19807	0.19807	0.19807	0.19807	0.19807	0.19807	0.19807	0.19807	0.19807	0.19807
Carbon Tet (ppm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ce 144 (d/s/ml)	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
CH2Cl2 (ppm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cl (ppm)	14.88100	6.00000	6.00000	30.20720	26.40000	60.95670	12.17950	12.17950	14.88100	12.17950
Chloroform (ppm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (ppm)	0.14508	0.14508	0.14508	0.14508	0.14508	0.14508	0.14508	0.14508	0.14508	0.14508
Co 60 (d/s/ml)	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
Cs 134 (d/s/ml)	NF	NF	0.00096	NF	NF	NF	NF	NF	NF	NF
Cs 137 (d/s/ml)	0.03790	0.00635	0.03310	0.03780	0.04980	NF	NF	NF	NF	0.04040
Flashpoint (y/n)	N	N	N	N	N	N	N	N	N	N
F (ppm)	0.46000	0.18998	0.18998	0.18998	0.18998	0.18998	0.18998	0.18998	0.18998	0.18998
Gross Alpha (Pu) (A/s/ml)	0.32710	0.32710	0.32710	0.32710	0.32710	0.32710	0.32710	0.32710	0.32710	0.32710
Gross Beta (B/s/ml)	617.51500	617.51500	617.51500	617.51500	617.51500	617.51500	617.51500	617.51500	617.51500	617.51500

SEPARATOR SAMPLE RESULTS

RUN No. 6
(3-19 to 3-22-93)

Sample Name	WL-SEP:171	WL-SEP:171	WL-SEP:171	WL-SEP:171	WL-SEP:171	WL-SEP:171	WL-SEP:171	WL-SEP:171	WL-SEP:171	WL-SEP:171
Lab No.	93-031911	93-031921	93-03202	93-032013	93-032022	93-032037	93-032048	93-032111	93-032122	93-03224
Feed Batch No.	8	8	8	8/9	9	9	9	10	10	10/11
I 129 (d/s/ml)	0.05000	0.05000	0.05845	0.05845	0.05000	0.05845	0.05845	0.05845	0.05845	0.05845
Lead (ppm)	0.20866	0.20866	0.20866	0.20866	0.20866	0.20866	0.20866	0.20866	0.20866	0.20866
Mercury (ppm)	0.01789	0.01789	0.01789	0.01789	0.01789	0.01789	0.01789	0.01789	0.01789	0.01789
Nickel (ppm)	0.22141	0.22141	0.22141	0.22141	0.22141	0.22141	0.22141	0.22141	0.22141	0.22141
Nitrate (ppm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PER-CL-E (ppm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
pH	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ru 106 (d/s/ml)	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
Sb 125 (d/s/ml)	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
Selenium (ppm)	0.11447	0.11447	0.11447	0.11447	0.11447	0.11447	0.11447	0.11447	0.11447	0.11447
Silver (ppm)	0.12455	0.12455	0.12455	0.12455	0.12455	0.12455	0.12455	0.12455	0.12455	0.12455
Sulfate (M)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TBP (ppm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tcethylene (ppm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene (ppm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Sr (d/s/ml)	0.01362	0.00237	0.01094	0.01305	0.01678	0.00182	0.00186	0.00130	0.01200	0.01165
Tritium (d/s/ml)	9.81000	10.58000	11.06000	8.84000	8.13000	8.02000	8.60000	1.32000	7.11000	6.98000

NA = Not Available

NF = Not Found

FRACTIONATOR BOTTOMS SAMPLE RESULTS

RUN No. 6
(3-19 to 3-22-93)

Sample Name	WL-FB:171	WL-FB:171	WL-FB:171	WL-FB:171	WL-FB:171	WL-FB:171	WL-FB:171	WL-FB:171	WL-FB:171	WL-FB:171
Lab No.	93-031910	93-031920	93-03201	93-032012	93-032023	93-032036	93-032047	93-032110	93-032121	93-03223
Feed Batch No.	8	8	8	8/9	9	9	9	10	10	10/11
1,1,1-TCE (ppm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ACID (N)	1.8920	2.4410	4.5320	5.3450	7.9100	7.1500	8.8800	8.7400	8.8400	8.0800
Arsenic (ppm)	0.1378	0.1378	0.1490	0.1756	0.2297	0.2297	0.2297	0.2297	0.2297	0.2297
Barium (ppm)	0.2760	0.3090	0.3570	0.2810	0.2550	0.3180	0.2550	0.2970	0.3330	0.3050
Benzene (ppm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium (ppm)	0.7010	1.0000	1.9600	2.4200	2.6800	1.9100	1.6500	1.5400	1.8000	1.7900
Carbon Tet (ppm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ce 144 (d/s/ml)	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
CH ₂ Cl ₂ (ppm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cl (ppm)	184.9080	257.7260	453.4980	429.9220	122.6930	139.0970	12.1795	87.3000	7.2428	12.1795
Chloroform (ppm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (ppm)	2.9100	3.1810	5.3900	7.3000	12.9000	17.3000	25.7000	40.7000	42.9000	39.5000
Co 60 (d/s/ml)	0.0803	0.0980	0.1590	0.1990	0.2290	0.1660	0.1820	0.1580	0.1740	0.1480
Cs 134 (d/s/ml)	1.9500	2.5900	4.2100	5.4600	6.2000	5.3700	5.3800	4.8000	4.5200	4.4800
Cs 137 (d/s/ml)	83.5000	104.0000	181.0000	227.0000	268.0000	224.0000	229.0000	200.0000	197.0000	186.0000
Flashpoint (y/n)	N	N	N	N	N	N	N	N	N	N
F (ppm)	0.1900	0.1900	0.2515	31.9200	41.6100	38.3800	41.6100	40.0900	53.2000	42.5600
Gross Alpha (Pu) (A/s/ml)	0.5680	0.8730	1.8500	2.0200	2.3300	1.7600	1.0800	1.5700	1.7400	1.4100
Gross Beta (B/s/ml)	7640.0000	10480.0000	20730.0000	25720.0000	29340.0000	26970.0000	27780.0000	24440.0000	23670.0000	22160.0000

FRACTIONATOR BOTTOMS SAMPLE RESULTS

RUN No. 6
(3-19 to 3-22-93)

Sample Name	WL-FB:171	WL-FB:171	WL-FB:171	WL-FB:171	WL-FB:171	WL-FB:171	WL-FB:171	WL-FB:171	WL-FB:171	WL-FB:171
Lab No.	93-031910	93-031920	93-03201	93-032012	93-032023	93-032036	93-032047	93-032110	93-032121	93-03223
Feed Batch No.	8	8	8	8/9	9	9	9	10	10	10/11
I 129 (d/s/ml)	1.3899	1.3899	1.3899	1.3899	1.3899	1.3899	1.3899	1.3899	1.3899	1.3899
Lead (ppm)	0.2087	0.2087	0.2256	0.2658	0.3478	0.3478	0.3478	0.3478	0.3478	0.3478
Mercury (ppm)	9.8000	12.9000	22.5000	26.8000	40.8000	42.9000	43.1000	50.4000	50.2000	48.3000
Nickel (ppm)	9.2600	11.1600	14.7300	19.2500	33.6000	43.4000	63.0000	100.7000	102.7000	95.7000
Nitrate (M)	1.5700	2.1330	4.6060	5.1500	7.7600	5.0400	5.9700	5.6000	6.3500	6.2200
PER-CL-E (ppm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
pH	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000
Ru 106 (d/s/ml)	1.2000	1.3600	2.5400	2.5900	3.2000	2.4000	2.4500	2.6800	2.4300	2.9200
Sb 125 (d/s/ml)	0.3990	0.5600	1.0000	1.4400	1.1600	1.5600	1.2600	NF	1.2500	1.5800
Selenium (ppm)	0.1145	0.1145	0.1238	0.1458	0.1908	0.1908	0.1908	0.1908	0.1908	0.1908
Silver (ppm)	0.1246	0.1246	0.1346	0.1587	0.2076	0.2076	0.2076	0.2076	0.2076	0.2076
Sulfate (M)	0.0011	0.0014	0.0020	0.0018	0.0020	0.0012	0.0012	0.0012	0.0012	0.0012
TBP (ppm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tcethylene (ppm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene (ppm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Sr (d/s/ml)	27.2000	39.3000	69.7000	88.8000	102.7000	86.0000	85.9000	74.4000	76.7000	75.7000
Tritium (d/s/ml)	8.7000	10.1000	10.5000	10.5000	7.9200	7.7400	8.0000	7.5400	8.3300	9.2000
U (g/l)	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002

NA = Not Available

NF = Not Found

FRACTIONATOR TRAY RESULTS

RUN No. 6

3-19 to 3-22-93

Acid Results By Tray No.

Sample Time	2 Hours	6 Hours	10 Hours	14 Hours	18 hours	22 Hours	26 Hours	30 Hours	34 Hours	38 Hours
Tray Number	Acid (M)	Acid (M)	Acid (M)	Acid (M)	Acid (M)	Acid (M)	Acid (M)	Acid (M)	Acid (M)	Acid (M)
14	0.19024	0.19024	0.19024	0.19024	0.19024	0.19024	0.19024	0.19024	0.19024	0.19024
12	0.19024	0.19024	0.19024	0.19024	0.19024	0.19024	0.19024	0.19024	0.19024	0.19024
10	0.19024	0.19024	0.19024	0.19024	0.19024	0.19024	0.19024	0.58300	0.19024	0.19024
8	0.19024	1.29400	0.19024	0.19024	0.19024	0.19024	0.19100	0.19024	0.19024	0.19024
6	0.19024	0.19024	0.19024	0.19024	0.24000	0.19024	0.23800	0.19024	0.19024	0.19024
4	0.19024	0.19024	0.19024	0.22900	0.36300	0.34800	0.44200	0.22100	0.23800	0.25400
2	0.19024	0.19024	0.22400	0.35800	0.71700	0.68100	0.91100	0.63700	0.69500	0.61600
1	1.15800	0.73200	0.62400	2.28600	3.39700	3.12400	3.13100	2.96300	3.16700	2.84300
FB	1.89200	2.44100	4.53200	5.34500	7.91000	7.15000	8.88000	8.74000	8.84000	8.08000

Chloride Results By Tray No.

Sample Time	2 Hours	6 Hours	10 Hours	14 Hours	18 hours	22 Hours	26 Hours	30 Hours	34 Hours	38 Hours
Tray Number	Cl (ppm)	Cl (ppm)	Cl (ppm)	Cl (ppm)	Cl (ppm)	Cl (ppm)	Cl (ppm)	Cl (ppm)	Cl (ppm)	Cl (ppm)
14	14.88100	6.00000	30.20720	60.95870	37.90000	18.70000	12.17950	24.70000	13.80000	14.70000
12	14.88100	6.00000	20.39790	60.95870	31.70000	20.70000	12.17950	26.30000	19.80000	17.10000
10	14.88100	6.12803	24.77590	60.95870	38.00000	26.80000	23.10000	22.60000	18.09800	18.50000
8	14.88100	8.67137	22.96160	60.95870	72.14050	25.60000	26.00000	22.30000	18.09800	21.70000
6	14.88100	8.91854	27.66470	60.95870	42.00000	27.80000	27.90000	21.30000	18.09800	30.80000
4	9.90471	8.63250	31.41850	60.95870	47.20000	37.00000	26.80000	25.70000	19.20000	25.60000
2	14.88100	11.38670	40.36530	60.95870	59.70000	43.90000	27.00000	29.40000	62.10000	31.10000
1	64.75560	78.67680	192.53200	203.65300	99.85540	71.67700	36.00000	56.50000	61.10000	59.40000
FB	184.90800	257.72600	453.49800	429.92200	122.69300	139.09700	12.17950	87.30000	7.24280	12.1795

FRACTIONATOR TRAY RESULTS

RUN No. 6

3-19 to 3-22-93

Fluoride Results By Tray No.

Sample Time	2 Hours	6 Hours	10 Hours	14 Hours	18 hours	22 Hours	26 Hours	30 Hours	34 Hours	38 Hours
Tray Number	F (ppm)	F (ppm)	F (ppm)	F (ppm)	F (ppm)	F (ppm)	F (ppm)	F (ppm)	F (ppm)	F (ppm)
14	0.18998	0.18998	0.18998	0.18998	0.18998	0.18998	0.18998	0.18998	0.18998	0.18998
12	0.18998	0.18998	0.18998	0.18998	0.18998	0.18998	0.18998	0.18998	0.18998	0.18998
10	0.36000	0.33000	0.38400	0.41000	0.18998	0.40800	0.42400	0.42700	0.42500	0.40400
8	0.50000	0.48000	0.55000	0.71600	0.58100	0.59200	0.57200	0.59000	0.18998	0.54200
6	0.50000	0.53000	0.64600	0.86800	0.73900	0.79500	0.77200	0.73000	0.55800	0.66800
4	0.64100	0.59100	0.93100	1.24000	1.37000	1.33000	0.80000	1.29000	0.65800	1.22000
2	0.76000	0.82300	1.44000	1.89000	2.47000	2.55000	0.18998	2.20000	0.18998	0.18998
1	0.18998	3.22000	0.18998	0.18998	0.18998	0.18998	0.18998	0.18998	1.12000	0.18998
FB	0.18998	0.18998	0.18998	31.92000	41.61000	38.38000	41.61000	40.90000	53.20000	42.56000

Nitrate Results By Tray No.

Sample Time	2 Hours	6 Hours	10 Hours	14 Hours	18 hours	22 Hours	26 Hours	30 Hours	34 Hours	38 Hours
Tray Number	NO3 (M)	NO3 (M)	NO3 (M)	NO3 (M)	NO3 (M)	NO3 (M)	NO3 (M)	NO3 (M)	NO3 (M)	NO3 (M)
14	0.00020	0.00008	0.00029	NA	0.00182	0.00092	0.00047	0.00043	0.00182	0.00165
12	0.00229	0.00240	0.00295	0.00490	0.00595	0.00595	0.00743	0.00339	0.02005	0.00613
10	0.04696	0.04630	0.04670	0.07520	0.12500	0.12120	0.07600	0.04892	0.08390	0.06850
8	0.06080	0.04900	0.06200	0.09390	0.16060	0.17310	0.10380	0.06550	0.14040	0.10430
6	0.06470	0.06400	0.06650	0.10370	0.18700	0.20180	0.21700	0.08200	0.14040	0.13330
4	0.06920	0.06780	0.07700	0.11020	0.31400	0.30500	0.39000	0.13200	0.33300	0.08280
2	0.07900	0.07720	0.10200	0.23700	0.64900	0.62800	0.84300	0.55000	0.49200	0.66200
1	1.01600	0.46600	0.48000	2.14700	2.63500	2.55500	2.57000	2.85000	2.88000	2.79900
FB	1.57000	2.13300	4.60600	5.15000	7.76000	5.04000	5.97000	5.60000	6.35000	6.22000

FRACTIONATOR TRAY RESULTS

RUN No. 6

3-19 to 3-22-93

Aluminum Results By Tray No.

Sample Time	2 Hours	6 Hours	10 Hours	14 Hours	18 hours	22 Hours	26 Hours	30 Hours	34 Hours	38 Hours
Tray Number	Al (M)	Al (M)	Al (M)	Al (M)	Al (M)	Al (M)	Al (M)	Al (M)	Al (M)	Al (M)
14	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617
12	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617
10	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617
8	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617
6	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617
4	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617
2	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617
1	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617	0.00617

**FRACTIONATOR BOTTOMS
ACID AND CHLORIDE RESULTS**

RUN No. 6
(3-19 to 3-22-93)

Sample Time	Acid (M)	Cl (ppm)
2 Hours	1.89200	184.90800
6 Hours	2.44100	257.72600
10 Hours	4.53200	453.49800
14 Hours	5.34500	429.92200
18 Hours	7.91000	139.09700
22 Hours	7.15000	139.09700
26 Hours	8.88000	12.17950
30 Hours	8.74000	87.30000
34 Hours	8.84000	7.24280
38 Hours	8.08000	12.17950

**FRACTIONATOR BOTTOMS
CHROMIUM AND ACID RESULTS**

RUN No. 6
(3-19 to 3-22-93)

Sample Time	Cr (ppm)	Acid (M)
2 Hrs.	2.9100	1.8920
6 Hrs.	3.1810	2.4410
10 Hrs.	5.3900	4.5320
14 Hrs.	7.3000	5.3450
18 Hrs.	12.9000	7.9100
22 Hrs.	17.3000	7.1500
26 Hrs.	25.7000	8.8800
30 Hrs.	40.7000	8.7400
34 Hrs.	42.9000	8.8400
38 Hrs.	39.5000	8.0800

APPENDIX B: SAMPLE RESULT GRAPHS

Acid Conc. By Tray Number

Run No. 1
(1-23-93)

Acid (M)

2 Hrs 6 Hrs

*First Sample Taken After 2 Hours
Then Every 4 Hours For Each Additional Sample*

Chloride Conc. By Tray Number

Run No. 1
(1-23-93)

Cl (ppm)

2 Hrs **6 Hrs**
—*— -○-

*First Sample Taken After 2 Hours
Then Every 4 Hours For Each Additional Sample*

Fluoride Conc. By Tray Number

Run No. 1

(1-23-93)

F (ppm)

2 Hrs

6 Hrs

First Sample Taken After 2 Hours

Then Every 4 Hours For Each Additional Sample

Nitrate Conc. By Tray Number

Run No. 1

(1/23/93)

NO₃ (M)

2 Hrs

6 Hrs

First Sample Taken After 2 Hours

Then Every 4 Hours For Each Additional Sample

Acid Conc. By Tray Number

Run No. 3
(2-19 to 2-20-93)

Acid (M)

2 Hrs 6 Hrs 10 Hrs
—*— -○- ...□...

*First Sample Taken After 2 Hours
Then Every 4 Hours For Each Additional Sample*

Chloride Conc. By Tray Number

Run No. 3
(2-19 to 2-20-93)

Cl (ppm)

2 Hrs 6 Hrs 10 Hrs
—*— -○- ...□...

*First Sample Taken After 2 Hours
Then Every 4 Hours For Each Additional Sample*

Fluoride Conc. By Tray Number

Run No. 3
(2-19 to 2-20-93)

*First Sample Taken After 2 Hours
Then Every 4 Hours For Each Additional Sample*

Nitrate Conc. By Tray Number

Run No. 3

(2-19 to 2-20-93)

NO₃ (M)

2 Hrs

6 Hrs

10 Hrs

First Sample Taken After 2 Hours

Then Every 4 Hours For Each Additional Sample

Acid Conc. By Tray Number

Run No. 4

3-6-93 to 3-7-93

Acid (M)

2 Hrs

6 Hrs

10 Hrs

14 Hrs

18 Hrs

First Sample Taken After 2 Hours

Then Every 4 Hours For Each Additional Sample

Chloride Conc. By Tray Number

Run No. 4

3/6/93 to 3/7/93

First Sample Taken After 2 Hours
Then Every 4 Hours For Each Additional Sample

Fluoride Conc. By Tray Number

Run No. 4

3/6/93 to 3/7/93

F (ppm)

2 Hrs 6 Hrs 10 Hrs 14 Hrs 18 Hrs

*First Sample Taken After 2 Hours
Then Every 4 Hours For Each Additional Sample*

Nitrate Conc. By Tray Number

Run No. 4

3/6/93 to 3/7/93

NO₃ (M)

2 Hrs

6 Hrs

10 Hrs

14 Hrs

18 Hrs

First Sample Taken After 2 Hours

Then Every 4 Hours For Each Additional Sample

Acid Conc. By Tray Number

Run No. 5

3/13/93 to 3/14/93

Acid (M)

2 Hrs

6 Hrs

10 Hrs

14 Hrs

First Sample Taken After 2 Hours

Then Every 4 Hours For Each Additional Sample

Chloride Conc. By Tray Number

Run No. 5

3/13/93 to 3/14/93

Cl (ppm)

2 Hrs **6 Hrs** **10 Hrs** **14 Hrs**
—*— -○- ·□· -△-

*First Sample Taken After 2 Hours
Then Every 4 Hours For Each Additional Sample*

Fluoride Conc. By Tray Number

Run No. 5

3/13/93 to 3/14/93

F (ppm)

2 Hrs

6 Hrs

10 Hrs

14 Hrs

First Sample Taken After 2 Hours

Then Every 4 Hours For Each Additional Sample

Nitrate Conc. By Tray Number

Run No. 5

3/13/93 to 3/14/93

NO₃ (M)

2 Hrs

6 Hrs

10 Hrs

14 Hrs

First Sample Taken After 2 Hours

Then Every 4 Hours For Each Additional Sample

Fractionator Bottoms Acid vs. Chloride Conc.

Run No. 5

(3-13 to 3-14-93)

Samples taken two hours after the start of feed
and every 4 hours thereafter.
Acid in Molar. Chloride in PPM.

Frac. Acid Profile

Run No. 6

3/19/93 to 3/22/93

Acid (M)

FB = 4.53 M FB = 5.34 M FB = 7.91 M FB = 7.15 M

FB = 8.88 M FB = 8.74 M FB = 8.84 M FB = 8.08 M

Comparing Fractionator Bottoms Acid Conc.
versus the acid conc. on each tray.
Y-axis is logarithmic.

Acid Conc. By Tray Number

Run No. 6

3/19/93 to 3/22/93

Acid (M)

2 Hrs * 6 Hrs - 10 Hrs □ 14 Hrs △ 18 Hrs ● 22 Hrs ▲ 26 Hrs ○ 30 Hrs ■

First Sample Taken After 2 Hours
Then Every 4 Hours For Each Additional Sample

Chloride Conc. By Tray Number

Run No. 6

3/19/93 to 3/22/93

First Sample Taken After 2 Hours
Then Every 4 Hours For Each Additional Sample

Fluoride Conc. By Tray Number

Run No. 6

3/19/93 to 3/22/93

First Sample Taken After 2 Hours

Then Every 4 Hours For Each Additional Sample

Nitrate Conc. By Tray Number

Run No. 6

3/19/93 to 3/22/93

NO₃ (M)

2 Hrs 6 Hrs 10 Hrs 14 Hrs 18 Hrs 22 Hrs 26 Hrs 30 Hrs

—*— —○— —□— —△— —●— —●— —■— —▲—

First Sample Taken After 2 Hours
Then Every 4 Hours For Each Additional Sample

Fractionator Bottoms Acid vs. Chloride Conc.

Run No. 6

(3-19 to 3-22-93)

Samples taken two hours after the start of feed
and every 4 hours thereafter.
Acid in Molar. Chloride in PPM.

Fractionator Bottoms Acid vs. Chromium Conc.

Run No. 6

(3-19 to 3-22-93)

Samples taken two hours after the start of feed
and every 4 hours thereafter.

DATE

FILMED

5/16/94

END