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LIST OF COMMON ABBREVIATIONS

A-S-H.....	Allen Sherman Hoff
BES	Bulk Entrainment Separator
CRG.....	Clean Raw Gas
CLS	Clear Liquor Scrubbing
DBA.....	Di-Basic Acid
DRG.....	Dirty Raw Gas
ECTC	Environmental Control Technology Center
EDR.....	Electrodialysis Reversal Membrane Unit
ESP.....	Electrostatic Precipator
FF.....	Fabric Filter
FGD	Flue Gas Desulfurization
FLRT	First Loop Reaction Tank
FRP.....	Fiberglass Reinforced Plastic
G/C.....	Gilbert/Commonwealth Inc.
GEESI.....	General Electric Environmental Services Inc.
HME.....	Horizontal Mist Eliminator
HSSD.....	High Sulfur Spray Dryer
HYPAS.....	Hybrid Pollution Abatement System
ID	Induced Draft
L/G.....	Liquid to Gas Ratio, (gal/1000ft ³)
MFT.....	Master Fuel Trip
MRT.....	Main Reaction Tank
NTU.....	Number of Transfer Units
NYSEG.....	New York State Gas & Electric
O&M	Operations & Maintenance
PJFF	Pulse Jet Fabric Filter
RTD.....	Resistance Temperature Detector
RWST.....	Recycle Water Storage Tank
SCBA.....	Scott Air Packs
SDA.....	Spray Dry Absorber
UMIST.....	Univ. of Manchester Inst. of Science & Technology
VME.....	Vertical Mist Eliminator
VSD.....	Variable Speed Drive
WDPF.....	Westinghouse Distributed Process Control System

EXECUTIVE SUMMARY

Operations and maintenance continued this month at the Electric Power Research Institute's Environmental Control Technology Center. Testing on the 4.0 MW Pilot Wet FGD unit this month involved the Trace Element Removal (TER) test block, and the simultaneous testing of the Lime Forced Oxidation process with DBA addition (LDG). Additionally, the second phase of the 1995 Carbon Injection test block began this month with the SDA/PJFF test configuration. At the end of the LDG testing this month, a one-week baseline test was conducted to generate approximately 200 lbs. of magnesium-lime FGD solids for analysis.

On the 1.0 MW Post-FGD Selective Catalytic Reduction (SCR) unit, performance testing was continued this month as measurements were taken for NO_x removal efficiency, residual ammonia slip, and SO₃ generation across the catalysts installed in the reactor. As a result of new directions received from EPRI, this will be the last scheduled month of testing for the SCR unit in 1995. At the completion of this month, the unit will be isolated from the flue gas path and placed in a cold-standby mode for future test activities.

Pilot Testing Highlights

Phase II of the 1995 Carbon Injection Test Block (CI) was completed in August as part of EPRI's overall program for developing control technology options for trace element emissions. The overall objective of this test block is to evaluate mercury removal from utility flue gas streams by injecting activated carbon into the flue gas. Results from Phase II will be used to develop further test conditions to be investigated during Phase III (scheduled for November 1995).

Background

Previous activated carbon injection tests were performed in 1994 using the 4.0 MW pilot spray dryer unit and the pilot particulate removal devices at the ECTC. Three different process configurations were used to evaluate the effect of carbon injection on mercury removal across the particulate removal devices. These configurations consisted of injecting carbon upstream of the pulse jet fabric filter (PJFF), upstream of the electrostatic precipitator (ESP), and between the ESP and the PJFF. Other test variables included the carbon injection rate and the flue gas temperature. The flue gas temperature was controlled by injecting a dilute limestone slurry and additional control water into the spray dryer vessel upstream of the particulate removal device.

The 1994 tests resulted in the following conclusions:

- Flue gas cooling by humidification increased mercury removal.
- The mercury removal efficiency was higher using a PJFF compared with an ESP.
- Under certain operating conditions, very high mercury removal efficiencies were achieved by using an ESP and PJFF in series.

SECTION I FACILITY STATUS

GENERAL

The NYSEG Kintigh Station provided flue gas to the Center 99% of the time during this performance period. As the Kintigh Station operated with a variety of coals, fluctuations in the Center's inlet SO₂ concentrations were experienced. This month, the ECTC was off-line on 8/1 due to a forced outage at the NYSEG Kintigh Station. A boiler trip occurred as a result of a primary air fan problem. Also this month, the Station began a thirty (30) day test burn of various Petroleum Coke/coal fuel blends. This test burn is expected to continue until the Station outage begins in October.

Safety training for the month was conducted by the O&M Supervisor, Maintenance Supervisor and Shift Supervisors. "Heat Stress" was the topic of the month. Inspections of the ECTC Facility and safety equipment (SCR air-packs, fire extinguishers, etc.) were completed and recorded this month. All systems were found to be in good condition. By continuing to emphasize safe work habits at the Center, we have raised the total number of days without a lost time injury to 1183 as of 8/31/95.

The monthly safety meeting with the NYSEG Kintigh Station was postponed this month due to scheduling conflicts with NYSEG and ECTC representatives. It has been rescheduled for 9/13/95; the major discussions from this meeting will be summarized in the September O&M report.

PILOT WET FGD SYSTEM

The equivalent and actual availabilities for the ECTC 4.0 MW Pilot Wet FGD System testing this month were both 50% during this performance period. With the exception of the brief NYSEG outage this month, the Pilot FGD System was available for testing. However, with the Carbon Injection test configuration, the inlet flue gas available to the Pilot System was undesirable. The Pilot Wet FGD System did not operate during the following periods:

- August 1 for 7 hours due to a boiler trip outage at the Kintigh Station.
- August 14 - 29 for 367 hours due to the testing of the SDA/PJFF configuration for Phase II of the Carbon Injection test block.

The LDG test block was completed this month with tests T-19 and T-20. Test T-19 required the use of a sodium formate additive while test T-20 was conducted with a blend of both sodium formate and DBA. The operational parameters for the Pilot Wet Scrubber during this test block included: a flue gas flow of 10,000 scfm; 2300 ppm inlet SO₂; a recycle slurry flow 470 gpm; various oxidation air rates; reaction tank slurry solids concentrations of 25%; a reaction tank level of 8 ft., and an

absorber inlet temperature of 315°F. The Trace Element Removal (TER) tests were conducted simultaneously with the LDG tests this month under the same operational parameters.

A one-week baseline test was conducted at the end of the LDG testing this month to generate approximately 200 lbs. of magnesium-lime FGD solids for analysis. These Mg-lime solids were produced during tests T-21 (forced oxidation) and test T-22 (inhibited oxidation). The operational parameters for the Pilot Wet Scrubber during this test block included: a flue gas flow of 8,250 scfm; 2000 ppm inlet SO₂; a recycle slurry flow 300 gpm; 500 scfm oxidation air; reaction tank slurry solids concentrations of 15%; a reaction tank level of 8 ft., and an absorber inlet temperature of 315°F.

A series of Duct Injection tests were completed this month with test DI-3. For this test, dilute slurries of Bellefonte lime and Beachville limestone were injected into the flue gas flow upstream of the ESP. The objective of this testing was to determine the effectiveness of this injection process for mercury emissions control. The operational parameters for this test block included: a gas flow rate of 10,000 scfm; an ESP inlet temperature of 225°F; a slurry feed rate of 0.81 gpm at 8.85% solids by weight; and the addition of temperature control water.

The following maintenance work was completed on the Pilot Wet Scrubber unit during this performance period:

- The Pilot system was reconfigured the LDG process to the baseline configuration.
- Several electrical components were replaced/upgraded on the VBF system.

POST-FGD SELECTIVE CATALYTIC REDUCTION SYSTEM (SCR)

The equivalent and actual availabilities for the ECTC SCR System testing were 100% and 99% respectively during this period. The SCR system did not operate during the following periods:

- August 1 for 8 hours due to boiler trip outage at the NYSEG Kintigh Station.

Catalyst performance testing continued this month on the SCR unit at baseline temperature conditions. This month, measurements were taken for NO_x removal efficiency, residual ammonia slip, and SO₃ generation across the catalyst layers installed in the SCR reactor. The operational parameters for the SCR unit during this testing included: a gas flow rate of 2000 scfm; a catalyst inlet gas temperature of 650° F; inlet NH₃ pressures of 50 psi; and an NH₃/NO_x ratio of 0.8. All scheduled maintenance work was completed on the SCR system equipment and instrumentation this month.

MISCELLANEOUS

The Ball Mill and Paste Slaker operations were normal this month during the preparation of Beachville limestone and Bellafonte lime. No major equipment problems were experienced this month during reagent preparation activities. The limestone grind prepared for ECTC operations was specified at 93% passing 325 mesh screen. The slaked lime slurry prepared this month for testing was at 25% solids by weight at 190°F. A portion of limestone and slaked lime reagent slurries were used this month in the duct injection testing upstream of the ECTC ESP.

The P-5A demonstration project involving the ECTC, Watson Process Systems, and Environmental Systems Corporation (ESC) continued this month as measurements were conducted to determine droplet carryover and entrained mist exiting the Pilot wet scrubber vertical mist eliminator (VME) section. By tracking the P-5A monitor readings to various ECTC flue gas/operating parameters, relationships will be developed between the P-5A readings and the amount of liquid carryover after the final mist eliminator.

The following maintenance work was completed at the ECTC during this performance period:

- The HCl monitor was inspected and calibrated.
- Several outstanding O&M items from the High Velocity punch list were completed.
- An action plan has been developed to conduct an orderly shutdown/cold-standby of the Post-FGD SCR unit.

FINANCIAL REPORT

The Financial Report for the four Operations and Maintenance contract tasks are summarized below for the month of August 1995, the year to date, and the contract total.

Task Definitions:

Task 100: Operations and Maintenance Labor

Task 200: Purchased Materials

Task 300: Engineering Support

Task 400: Training

Table i.

Monthly Operating Costs by Task

	August	Year to Date	Contract Total
Task 100	\$ 100,246	\$ 837,968	\$ 13,250,659
Task 200	\$ 37,622	\$ 361,893	\$ 7,803,329
Task 300	\$ 4,105	\$ 40,123	\$ 1,110,159
Task 400	\$ 0	\$ 12,998	\$ 47,802
TOTAL	\$ 141,973	\$ 1,252,982	\$ 22,211,949

The attached graph illustrates the budgeted and actual expenses for ECTC O&M activities through August 1995.

Figure i.
1995 Operation & Maintenance Costs

SECTION II PILOT AND MINI-PILOT TEST ACTIVITY

PILOT

Overview

The following progress report discusses the results from the test programs performed in August at EPRI's Environmental Control Technology Center (ECTC). Phase II of the 1995 Carbon Injection (CI) test block and the Duct Injection (DI) tests were completed in August. Phase II of the Lime-DBA-Gypsum (LDG) test block was also completed in August, and the results from both July and August testing are included in this report. The Trace Elements Removal (TER) test block also continued in August. The results for each test series are detailed in separate sections.

1995 Carbon Injection Tests

Phase II of the 1995 Carbon Injection Test Block (CI) was completed in August as part of EPRI's overall program for developing control technology options for trace element emissions. The overall objective of this test block is to evaluate mercury removal from utility flue gas streams by injecting activated carbon into the flue gas. Results from Phase II will be used to develop further test conditions to be investigated during Phase III (scheduled for November 1995).

Background

Previous activated carbon injection tests were performed in 1994 using the 4.0 MW pilot spray dryer unit and the pilot particulate removal devices at the ECTC. Three different process configurations were used to evaluate the effect of carbon injection on mercury removal across the particulate removal devices. These configurations consisted of injecting carbon upstream of the pulse jet fabric filter (PJFF), upstream of the electrostatic precipitator (ESP), and between the ESP and the PJFF. Other test variables included the carbon injection rate and the flue gas temperature. The flue gas temperature was controlled by injecting a dilute limestone slurry and additional control water into the spray dryer vessel upstream of the particulate removal device.

The 1994 tests resulted in the following conclusions:

- Flue gas cooling by humidification increased mercury removal when using each of the three process configurations.
- The mercury removal efficiency was higher using a PJFF compared with an ESP.
- Under certain operating conditions, very high mercury removal efficiencies were achieved by using an ESP and PJFF in series.

Test Block Objectives

Based on the 1994 and 1995 Phase I carbon injection results, 1995 Phase II carbon injection test conditions were developed further to investigate the effects of carbon injection rate and flue gas temperature. Using the PJFF for particulate control, the specific objectives of Phase II were to:

- Determine process conditions required to achieve greater than 90% mercury removal.
- Provide data to support the development of a mathematical model that will predict mercury removal efficiencies for the carbon injection processes.
- Provide more information in the areas where there is a discrepancy between the 1994 carbon injection test data and the 1995 Phase I data.

Summary of Operations

A detailed summary of operations for August is presented in Table 1. During Phase II of the carbon injection test block, seven tests were completed using the spray dryer and PJFF configuration shown in Figure 1. Test conditions and results are summarized in Table 2. Flue gas entering the spray dryer absorber vessel (SDA) was heated to the range of 340°F to 375°F. The higher SDA inlet temperature was required to achieve the 325°F PJFF inlet temperature of test PJFF-6. The lower temperature was sufficient to test at PJFF inlet temperature of 225°F in tests PJFF-9, 10, 11, and 12. Except during the 325°F test (PJFF-6), a dilute limestone slurry (same as 1994 tests, and instead of lime slurry as in Phase I, 1995) was spray dried in the SDA to minimize corrosion from flue gas sulfuric acid condensation. Temperature control water was also injected to control the PJFF inlet gas temperature at the desired test condition. Neither limestone slurry nor cooling water was injected during test PJFF-6 due to the high PJFF inlet gas temperature required, 325°F. Because of problems with the cooling water control during test PJFF-8, the SDA inlet temperature was set at 355°F and the cooling water was shut off, but limestone slurry injection was maintained. After exiting the SDA, the flue gas passed through the PJFF and then through the treated gas return duct.

Dry activated carbon (Darco FGD, marketed by American Norit) was pneumatically injected into the duct downstream of the SDA (upstream of the PJFF). The carbon injection system consisted of the medium-sized screw feeder with a self-contained hopper and a solids injection nozzle. The motor speed of the feeder was set to give the desired solids injection rate. The actual injection rate was determined by measuring the amount of carbon discharged from the feeder during a timed interval. Carbon from the screw feeder fell into a plastic funnel that was connected to a solids injection nozzle within the duct. The carbon was entrained into ambient air and aspirated through the injection nozzle/funnel assembly into the duct because the duct is at a negative pressure at the injection location. The nozzle was positioned in the center of the duct and aligned cocurrently with the flue gas flow.

To determine mercury removal across the PJFF, simultaneous gas samples were collected at the SDA inlet and outlet (upstream of the carbon injection location) and at the outlet of the PJFF (treated gas return duct). Gas samples were collected using a modification of EPA Draft Method 29. Primary modifications included non-isokinetic gas sampling (generally within $\pm 20\%$) at a single point within the duct (i.e., the duct was not traversed) and removal of the water knockout impinger before the peroxide impingers. The acidified peroxide impingers were combined and analyzed separately from the combined acidified permanganate impingers. Probe and nozzle rinses after each gas sampling test were combined and analyzed separately from the particulate filter.

One test condition was completed each day with three gas samples collected at each gas sampling location. The carbon injection rate and other process conditions were established at least 12 hours before gas sampling began. During the evening and midnight shifts, operators checked the carbon flow rate every four hours and made adjustments to keep the flow within $\pm 20\%$ of the set point. During gas sampling, the carbon injection rate was measured before and after each gas sampling run and the average used to represent the injection rate. Fly ash samples were collected at the end of each test from the PJFF and SDA cone. No fly ash from the SDA was present for collection at the end of test PJFF-7 and PJFF-11.

Summary of Carbon Injection Results

During Phase II, seven tests were conducted using the PJFF. Test variables included the PJFF inlet gas temperature and carbon injection ratio (mass of carbon injected to mass of inlet vapor-phase mercury). During tests PJFF-8 and PJFF-10, two parts lime were mixed with one part carbon and injected into the duct. In test PJFF-11 lime was injected into the duct without any carbon injected. For tests conducted at 225°F and 275°F, limestone slurry was continuously sprayed into the spray dryer. No slurry was sprayed during the 325°F test.

Carbon injection ratios of 10,000 and 5,000 were to be tested during the PJFF tests. The carbon injection rate was calculated by assuming flue gas vapor-phase mercury concentration of $6 \mu\text{g}/\text{Nm}^3$. This is an estimate based on testing performed in 1994 and in Phase I 1995, although the actual mercury concentration cannot be accurately predicted beforehand. The average vapor-phase mercury concentration was $11.1 \mu\text{g}/\text{Nm}^3$ during the 1994 test series and was $5.3 \mu\text{g}/\text{Nm}^3$ during Phase I, 1995.

Baseline Test

Baseline carbon injection test results from 1994 and 1995 are plotted in Figure 2. The Phase II baseline test was run at the end of the test series. This differs from the baseline test in Phase I, which was performed at the beginning of that test series. The Phase II baseline shows a high vapor-phase mercury removal, which differs from Phase I and 1994 tests in which the baseline data show no vapor-phase mercury removal. Because the baseline test was run after carbon injection tests, it might be that carbon left on the bags of the PJFF would have affected the baseline

tests. However, this seems unlikely because the baseline test was run 18 hours after the previous test (lime only injection) and 36 hours after the last carbon injection test. Additionally, after the last carbon injection test and after the lime only injection test, on-line continuous pulse cleaning was performed for ten minutes. This included approximately 200 pulses after each test and would have achieved good cleaning of the PJFF bags. The differences in baseline results may be caused by differences in operating conditions at NYSEG which can affect the particulate composition.

325 °F PJFF Inlet Gas Temperature

Data collected from Phase II tests at 325°F are shown in comparison to 1995 Phase I and 1994 tests in Figure 3. The Phase II test showed greater vapor-phase mercury removal with carbon injection than seen in 1994 tests, although less removal than in 1995 Phase I tests. The Phase I test, however, was with lime added. Because the baseline removal value was unexpectedly high in Phase II, drawing conclusions concerning the effects of increasing C:Hg ratios at 325°F is difficult.

275 °F PJFF Inlet Gas Temperature

Phase II tests at 275°F show high vapor-phase mercury removal with and without lime. Figure 4 shows that a C:Hg ratio of 11,250:1 gives similar removal to 7,400:1 C:Hg ratio with lime added. These removals are higher than those obtained at 325°F in Phase II tests and similar to removals seen in Phase I at 275°F. Examining Phase I and Phase II data, there seems to be little effect due to the added lime. Additionally, removal was not increased when testing at greater than 8,000:1 C:Hg ratios. The effect of carbon below 8,000:1 C:Hg ratios has not been explored to date.

225 °F PJFF Inlet Gas Temperature

Figure 5 shows the results from tests run at a PJFF inlet temperature of 225°F. The vapor-phase mercury removals were >90% at the two conditions tested. Phase II removal efficiencies at 225°F were similar to removals seen at 275°F and greater than removals seen in 1995 Phase I. The one data point from 1994 seems to be consistent with the Phase II, 1995 tests. The addition of lime did not have much effect on removal at the C:Hg ratios examined. Also, at the C:Hg ratios studied, there is little gain in removal above a C:Hg ratio of 5,000:1.

Effect of Gas Temperature on Particulate Hg Concentration

The gas temperature effect on particulate Hg concentration is seen in Figure 6. This figure shows that although there is much variation in the amount of Hg associated with the particulate, there is a general decrease in concentration as the temperature of the PJFF inlet flue gas is increased. Also, there is less scatter in the data at the higher temperatures. At this time, the effect of temperature on mercury removal is uncertain, especially at 225°F. There are additional tests scheduled to be run this year to understand this process further.

Trace Element Removal Tests

The Pilot Trace Elements Removal (TER) test block continued in August as part of EPRI's overall program to develop control technology options for trace element emissions. This experimental program investigates mercury removal efficiencies and mercury speciation across a wet scrubber under different operating conditions. The 1995 six-month program is being performed on a 4.0 MW wet FGD pilot unit at EPRI's Environmental Control Technology Center (ECTC).

Background

Wet FGD systems have the ability to remove solid-phase and vapor-phase trace elements present in flue gas streams. With only a limited amount of test data to quantify mercury removal efficiencies across full-scale FGD systems, additional research is needed to better understand the removal mechanisms which may aid in the development of processes to increase the mercury removal efficiencies. Several test programs investigating trace elements removal have been conducted previously by EPRI and others. The most important results from full-scale and pilot-scale testing for trace elements control by wet FGD systems are:

- Mercury is the primary vapor-phase trace element of interest to coal-fired power plants. Preliminary data indicate that the chemical form of mercury can greatly affect the removal efficiency. Mercuric chloride is effectively removed by FGD systems, while elemental mercury is not.
- Mercury removal data collected at the ECTC and elsewhere are difficult to interpret because the currently available mercury speciation methods, especially when used at the FGD inlet location, do not yield successful speciation under all conditions.
- Solid-phase trace elements removal can be approximated by the bulk particulate removal efficiency for the FGD system as long as the mass of condensed sulfuric acid and scrubber carryover are considered.
- Measured bulk particulate removal efficiencies across full-scale FGD systems are generally greater than 50% and are usually greater than theoretical efficiencies. These higher-than-predicted removal efficiencies may be a result of an electrical charge on the inlet particles that causes an attraction to the slurry droplets, thereby improving particulate removal efficiency for the scrubber.

Test Objectives

The 1995 Trace Elements Removal (TER) test block will focus on up to five research areas, depending on experimental results. These areas are:

- Mercury speciation methods
- Effect of FGD system operating variables on mercury removal
- Novel methods for elemental mercury control

- Catalytic methods for converting elemental mercury to oxidized mercury
- Electrostatic charging of particulate material in the FGD inlet flue gas stream

Testing in August included tests concerning mercury speciation methods, duct injection, and mercury removal across FGD systems. One of the overall objectives of the TER testing is to investigate the mercury speciation abilities of EPA Method 29 and to test methods of improvement if possible. The following procedures are used to explore mercury speciation:

- Spiking elemental mercury (Hg^0) into the gas sampling train (intratrain spiking) to determine the percent spike recovery in the various impinger solutions;
- Spiking the inlet flue gas with Hg^0 and HgCl_2 to determine the percent spike recovery in the various impinger solutions; and
- Using novel impinger solutions to investigate the effect of these solutions on speciation capabilities.

Summary of Operations

A detailed summary of operations for August is presented in Table 1. A simplified process flow diagram for the test equipment, as configured for the trace element testing in August, is shown in Figure 7. Figure 8 shows the locations of the mercury spiking and gas sampling ports used during all of the TER test block. Two FGD processes were evaluated with respect to mercury removal.

Shortly before test T18W-N, the main power plant experienced an unplanned outage. Test T18W-N was performed within 24 hours after the facility restarted. The data gathered during this test show an unusually high mercury concentration associated with the particulate fraction. Perhaps this is related to sampling before the whole facility reaches stable operating conditions. Duct injection tests T18L-N, T18S-N, and T18W-N were performed with no mercury spiking.

Summary of TER Results

Duct Injection tests

Lime slurry, limestone slurry, and water were injected into the duct upstream of the ESP to examine their effects on mercury removal. In test T18L-N, a 14% lime slurry was injected into the duct at a rate of 37 lb./hr lime solids. During test T18S-N, limestone slurry was injected at a rate of 40 lb./hr limestone and water was injected in test T18W-N. During all of these tests additional cooling water was used, as needed, to control the ESP gas inlet temperature at 225°F. Mercury removal, as shown in Table 3, is reported with and without particulate data included. The data with the particulate included shows the mercury in the ash removed by the ESP.

Limestone slurry injection had the greatest effect on vapor-phase mercury removal at 12%, although the data were highly variable, ranging from 3 to 21% mercury

removal in T18S-N. During test T18L-N (lime injection), the flue gas received from NYSEG had very low mercury concentrations in the vapor phase and a large quantity of mercury was associated with the particulate phase. Test T18L-N indicated that approximately 8% of the vapor-phase mercury was removed by lime slurry injection. From these limited tests, there appears to be a small effect on vapor-phase mercury removal with lime slurry and limestone slurry injection and no effect with water injection. The variation in particulate-phase mercury concentration bears further investigation.

Tris Impinger Solution

One of the objectives of the TER test block is to determine the speciation capabilities of alternate impinger solutions. Previous laboratory work indicated that both ionic forms of mercury and sulfite could be captured in solutions of high pH without reacting to cause liberation of mercury vapor. In the July tests, a high pH was not maintained by the phosphate impinger solution, and the solubilities of sodium phosphate and sodium carbonate were exceeded on succeeding tests, resulting in solids precipitation. A 1M phosphate concentration (0.5M K_3PO_4 and 0.5M Na_3PO_4) is needed to keep the impinger solution above pH 6.0. At this concentration, phosphate or carbonate solids form during the sampling. An acid rinse can solubilize the solids, but this results in a loss of mercury during the sample recovery probably due to the reaction of sulfite and oxidized mercury yielding elemental mercury and sulfate, as discussed in the July report. During sample recovery and storage time prior to analysis, the elemental mercury would be lost from the sample. Because of these problems, tris(hydroxymethyl)aminomethane (Tris) solution was evaluated in August as an alternate impinger solution. A summary of alternate impinger solutions is presented in Table 4. Tris buffer impinger recovery and testing conditions are described in Table 5.

Baseline Flue Gas Comparison Tests

In addition to the removal studies performed during duct injection tests T18L-N, T18S-N, and T18W-N, trains including impingers of 1M Tris buffer solutions were compared with the regular M29* trains at the CRG location with no mercury spiking. The Tris buffered trains showed some variable comparison recovery to Method 29* trains, ranging from 75 to 112% of the total mercury measured, as shown in Table 6. These tests indicated that Tris solution could be used as an alternate impinger solution, although further evaluation was necessary. Therefore, the use of Tris solution was explored in subsequent testing.

Aqueous Spike Recovery

During T19N-Y, at the wet scrubber inlet, 4 μ g of aqueous mercury standard was spiked into the first Tris buffer impinger. Each Tris impinger was recovered by the addition of 15 grams of potassium permanganate to the sample storage bottle. The spike recoveries from these impingers ranged from 8 to 186%. This wide range of spike recoveries showed that this procedure was not effective.

Four (4) μg of aqueous mercury standard were spiked into Tris impinger 1 before the last run at the CRG location in test T19-EXY. Based on the amount of gas sampled during the run, the aqueous spike of Tris impinger 1 can be calculated as $4.05 \mu\text{g}/\text{Nm}^3$. However, the total capture of mercury (flue gas content plus spike) in Tris impinger 1 was measured at only $2.85 \mu\text{g}/\text{Nm}^3$. The overall capture of the entire Tris train is $9.03 \mu\text{g}/\text{Nm}^3$ versus $6.93 \mu\text{g}/\text{Nm}^3$ average for the Method 29* trains at the CRG location. The total train capture indicates a 52% spike recovery; however, considering tris impinger #1 only, a negative spike recovery is observed. This indicates that the spike migrated during the run or during the recovery process. The recovery process consisted of the addition of 25 mLs of H_2O_2 directly into the first impinger followed by 20 mLs of nitric acid, while drawing ambient air through the impinger solutions. Addition of H_2O_2 has to be performed very slowly with cooling, otherwise the reaction of peroxide and sulfite is vigorous and exceeds 50°C . Additional testing is necessary to determine if Tris samples can be recovered with this technique.

Vapor Spike Recovery

Tests T19-EXY through T20-EC compared sampling trains with Tris buffer in the first two impingers to Method 29* trains by simultaneous gas sampling. Total mercury recoveries comparing Tris impinger trains to peroxide impinger trains are shown in Table 6. During elemental mercury spiking the two methods agreed well, with the Tris impinger train recovering 104% and 106% of total mercury as compared with the peroxide impinger train for tests T19-EXY and T19-E, respectively. However, during mercuric chloride spiking, the Tris train recovered only 75% and 66% compared with the peroxide train for tests T20-C and T20-EC. The Tris samples during T19-E, T20-C, and T20-EC were preserved with 5 grams of potassium permanganate instead of peroxide and nitric acid. The recovery method appears to have been successful for elemental mercury spiking but not for mercuric chloride spiking. Perhaps the peroxide and nitric acid added at the location are needed to yield good total mercury agreement with the peroxide train.

During test T19-EXY and T19-E, elemental mercury vapor was injected into the duct, and gas sampling comparison of Tris and Method 29* was performed at the wet scrubber inlet location. The total spike calculated from an average of the Method 29* trains during T19-EXY was $12.7 \mu\text{g}/\text{Nm}^3$ and during T19-E was $18.3 \mu\text{g}/\text{Nm}^3$. The permanganate impingers in the Tris impinger trains captured an average of $11.8 \mu\text{g}/\text{Nm}^3$ during T19-EXY and $18.0 \mu\text{g}/\text{Nm}^3$ during T19-E. This indicates an average of 93% and 98%, respectively, of the spiked elemental mercury are captured in permanganate, as shown in Table 7. Further testing is necessary to verify the speciation capabilities by Method 29* using Tris buffer as the alternate solution.

Recovery Methods

During all gas sampling with Tris buffer impingers, the pH of impinger number one remained above 6.5 at the completion of gas sampling. The Tris buffer solution remains basic during gas sampling unlike the phosphate solutions tested in July. Immediately after gas sampling during T19-EXY, 25 mLs of peroxide and 20 mLs of

nitric acid were added to the Tris solution to oxidize the sulfite captured from the flue gas and to preserve the sample. This was performed at the gas sampling location in the facility. In addition, 2.5 to 7.5 mLs of hydrochloric acid was also added per impinger before analysis. During all the other tests in August, potassium permanganate was added to the Tris samples to convert sulfite to sulfate, and preserve the sample. Low comparisons between Tris and peroxide, shown in Table 6, indicate that the permanganate addition may not be as effective as addition of peroxide and nitric acid into the impingers at the location immediately following gas sampling. Oxidation of sulfite and preservation of mercury by peroxide and nitric acid addition will be further tested in September.

During August, concentrated hydrochloric acid (HCl) was added to preserve oxidized mercury in the peroxide impinger samples and in the Tris buffer samples to which peroxide and nitric acid had been added. Other researchers and an informal lab test indicated that mercury may be evolving from samples containing peroxide and nitric acid. Typically we do not observe much loss because this appears to be a slow process, and samples are analyzed within 1 to 3 days of gas sampling. Almost all subsequent analyses of those samples indicate a lower level of mercury as days passed. In future testing, we will add 7.5 to 10 mLs of HCl, resulting in approximately 4 to 5% HCl in the sample, to preserve the mercury in peroxide samples. While further intensive study of this phenomenon may be necessary, it will be briefly studied in our testing using some samples already gathered and Tris samples to be gathered in September.

FGD Mercury Removal

Removal of mercury across FGD systems was explored with tests T19-E, T20-C, and T20-EC with respect to a limestone forced oxidation system with formate additive operating at an L/G of 40 and pH of 5.0. Tests T21-N, T21-E, and T21-EC were performed across an FGD magnesium-lime system with forced oxidation, an L/G of 30, and DBA additive operating at a pH of 6.0. Table 8 shows the results from these tests. In the limestone tests, the greatest mercury removal occurred during the spiking of HgCl_2 , with test T19-E ($\text{Hg}(0)$ spiking) giving the lowest total mercury removal. In the magnesium/lime tests, the greatest total mercury removal occurred during the baseline test T12-N. Again, the lowest total mercury removal occurred during elemental mercury spiking. The Mg-Lime system showed less total mercury removal compared with the limestone process with regards to elemental mercury spiking (T19-E and T21-E), and both elemental mercury and mercuric chloride spiking (T20-EC and T21-EC). However, the Mg-lime process was operated with an L/G of 30 compared with 40 in the limestone process (a tray was present in both processes). The difference in L/G and mass transfer capability of the processes should account for the slightly lower mercury removal in the Mg-lime process.

Lime-DBA-Gypsum Tests

The following section discusses the results from the Lime-DBA-Gypsum test program performed during July and August. During this period, the mini-pilot main reaction tank (MRT) was used for the LDG test block in order to simulate the shorter solids residence times of some dual-alkali processes.

Results from the High Calcium Lime with Additives (HCLA) test block, completed on EPRI's 0.4 MW mini pilot FGD system in September 1993, indicated that a forced oxidation lime slurry process with DBA was a potential retrofit alternative for existing Mg lime or Dual alkali FGD systems. Based on these results, six weeks of tests were started in March on EPRI's 4.0 MW pilot FGD system. Results from the 1995 LDG tests with lime reagent showed that full oxidation can be achieved, but the gypsum solids properties are not as good as typical limestone gypsum solids. Because of the encouraging results from the initial 1995 test block, further testing was performed using a magnesium-enhanced lime process in May. Testing in June started an investigation using limestone and DBA under dual-alkali conditions (i.e., low L/G and short solids residence time). This report will discuss testing performed in July and August which continued the use of limestone and DBA under dual-alkali conditions.

Test Block Objectives

The overall objective of the LDG test program is to evaluate the technical and economic feasibility of converting existing Mg-lime and dual-alkali FGD systems to slurry operation with DBA and forced oxidation to produce gypsum. The specific test objective for the LDG test program in July and August was to use the mini-MRT reaction tank to better simulate dual-alkali systems smaller reaction tank, shorter solids residence time, and higher SO₂ pick-up rate. The process parameters examined in July and August included:

- Magnesium and chloride concentrations
- High gas flow rates, L/G ratio, and reaction tank height
- Fine grind limestone reagent
- Sodium formate additive

This testing was designed to determine the appropriate design conditions for a successful operation at a dual-alkali process in the Midwest. In addition, the test results should provide data to more accurately project both the capital and operating costs associated with conversion to this process.

Summary of Operations

A detailed summary of operations for August is presented in Table 1. The testing throughout July and August was a continuation of the test block started in March

1995, with limestone reagent used for the tests performed in this reporting period. A simplified process flow diagram for the pilot LDG process is shown in Figure 7. This figure illustrates the process configuration, which included the mini-pilot MRT as the pilot-unit reaction tank to obtain shorter solids residence times with elevated reaction tank solids concentrations. A 38%-open tray was used in the absorber during all tests to better simulate full-scale, gas-liquid contact area, and slurry was sprayed into the absorber using the upper-most spray nozzles (header #1). The 1700-gallon reaction tank included a sparge ring patterned after the one in the pilot first loop reaction tank. This sparge ring has forty-seven 3/8" diameter holes (four of the holes are on the underside of the ring). The pilot's recirculating pump (Pump 8) was used to recirculate the slurry. Four-inch flexible hoses were used as the recirculation lines from the absorber downcomer to the reaction tank and from the recirculating pump to the spray header.

Summary of LDG Results

The LDG tests were run in parallel with the Trace Element Removal test block. Complete analytical data tables and process data summary reports of all tests completed in July and August are appended to this report. The LDG tests completed in July and August indicated that:

- pH has an effect on limestone utilization and may affect liquid sulfite concentrations.
- Liquid sulfite concentrations can vary throughout an individual test condition, making it difficult to interpret the cause and effect of liquid sulfite concentration on process performance.
- When the magnesium concentration was lowered, the liquid sulfite and CaSO_3 RS values decreased.
- Increasing the L/G ratio from 22 to 30 and reaction tank height from 8 to 9 feet can help the process recover from gas flow rates increased 32% from 10,000 scfm. (The increase in gas flow simulates operation with one module out of service at the full-scale plant considering this process.)
- Fine grind limestone reagent affected SO_2 removal and limestone utilization, but did not affect the solids properties over the range of 93 to 95% passing 325 mesh.
- Use of sodium formate additive resulted in a solids oxidation problem.

Significant results for the LDG tests completed to date have been summarized in Table 9. Test IDs denoted with a "T" prefix indicate that the test was run simultaneously with the Trace element Removal test block.

pH Effect

During the first test in the Phase II series (T9), the pH set point was 5.0; the limestone utilization was only 92%. Since the target utilization value was $\geq 95\%$, the pH was lowered to 4.7 to increase utilization. The effect on the process was an increase in utilization to 97% and a decrease in liquid sulfite concentration from

14 mM to 12 mM. It is difficult to say; however, whether this drop in liquid sulfite concentration is pH dependent or indicative of the usual variation of liquid sulfite concentration seen during this testing.

Liquid Sulfite Concentration

The liquid-phase sulfite concentration had a major effect on DBA consumption during the Phase II LDG tests. During the testing with limestone, the liquid sulfite concentration was seen to change over the course of the individual tests. This large variation in liquid sulfite concentration can be seen in Figures 9 and 10 where liquid sulfite concentration has been plotted with respect to time for tests T11 and T12, respectively. These figures also show the variation in SO_2 removal which reflects the concentration change of DBA. Although the plan was to maintain constant DBA concentration, it was observed that high sulfite concentration resulted in higher DBA consumption rates. Since the liquid sulfite concentration could not be accurately anticipated, the correct DBA flow rate to maintain the desired DBA concentration could not always be set. The variation of DBA consumption with liquid sulfite concentration resulted in changes in DBA concentration and, consequently, SO_2 removal.

The liquid-phase sulfite concentration also had a significant effect on the limestone utilization during the LDG tests. Figure 11 shows the decrease in limestone utilization seen with increasing CaSO_3 relative saturation. Even though the liquid sulfite concentration varied significantly as shown in Figures 9 and 10, the solids were 100% oxidized.

Magnesium and Chloride Effect

The concentrations of magnesium and chloride were decreased from 3000 magnesium and 6500 ppm chloride in Test T9 to 1600 ppm magnesium and 5100 ppm chloride in Test T11 to determine the effect these soluble ions have on process performance. Table 10 shows that, at the lower magnesium and chloride concentrations, the liquid sulfite and CaSO_3 relative saturation values were somewhat lower; however, there was no effect on the solids settling and dewatering properties.

High Gas Flow

The gas flow rate was increased 32% in test T13 (from 10,000 scfm to 13,200 scfm) and the slurry recirculation rate was unchanged. This test simulated operation with one of four modules out of service at the full-scale plant, and resulted in the L/G ratio decreasing from 30 to 22. Oxidation air rate was increased to the maximum that the air compressors could deliver (650 scfm) resulting in an O:SO₂ ratio of 12. The results of this test, of an upset condition where a given absorber may be required to handle a higher gas flow, are shown in Table 11. It can be seen that the SO₂ removal dropped significantly, the liquid sulfite concentration increased, and the solids properties deteriorated. Table 11 also shows the results of T14, where the L/G ratio and the reaction tank height were increased while maintaining the higher gas flow rate. These changes resulted in restoration of the SO₂ removal efficiency, reduction in liquid-phase sulfite concentration, and improvement in the solids dewatering properties. Although not shown in the table, the limestone utilization increased as well. These tests indicate that the process could operate successfully with only three modules in service if some additional margin were provided in L/G and reaction tank height.

Fine Grind Limestone

Test T18 used fine grind limestone (95% <325 mesh) as the reagent feed compared with the limestone used earlier in the test block (i.e., 93% <325 mesh). This grind was the maximum achievable at the ECTC with the present equipment. The effects of the slightly finer grind (Table 12) were relatively small increases in the SO₂ removal and limestone utilization. The solids dewatering properties were unchanged over this range of grind. It is unclear if performance would increase further if a significantly finer grind were used.

Sodium Formate Additive

In Test T19, sodium formate was added to compare process performance with DBA additive tests. Figure 12 shows the effect of the formate over time during this test. As the formate and sodium concentrations increased, the liquid sulfite concentrations increased, and the SO₂ removal and solids oxidation decreased. (Formate has been found to be an oxidation inhibitor in previous bench- and pilot-scale tests.) Thickener unit area increased from 1.0 ft²/ton/day to 1.9 ft²/ton/day, and the vacuum belt weight percent decreased from 88 weight % to 84 weight %. Due to the oxidation problems seen in this test, sodium formate does not appear to be a viable alternative to DBA for this process.

Future Tests

Testing in September will continue with the toxics removal test plan. Metal amalgams will be used to examine mercury removal, and testing of absorber operating conditions effect on mercury removal will also continue.

Figure 1. Simplified Process Flow Diagram for the "PJFF" Configuration for Carbon Injection Testing

Figure 2. Baseline Vapor-Phase Mercury Removal with No Carbon Injection

Figure 3. PJFF Vapor-Phase Mercury Removal at 325°F

Figure 4. PJFF Vapor Phase Mercury Removal at 275°F

Figure 5. PJFF Vapor Phase Mercury Removal at 225°F

Figure 6. Effect of Temperature on Flue Gas Mercury Present in Particulate

Figure 7. Wet FGD Process Flow Diagram for TER and LDG Tests

Figure 8. EPRI ECTC Pilot Wet FGD Toxics Gas Path

Figure 9. Liquid Sulfite Concentration and SO₂ Removal During Test T11

Figure 10. Liquid Sulfite Concentration and SO₂ Removal During Test T12

Figure 11. Effect of Calcium Sulfite Relative Saturation on Limestone Utilization (Phase II)

Figure 12. Concentrations of Sodium, Formate, and Liquid Sulfite over Time in Test T19

Table 1
Operating Conditions

Date	Test Condition	Process Summary	Gas Sampling Summary
Tue. 8/1	T18 10000 scfm L/G=40 Forced Oxid. 3000 ppm DBA Fine grind limestone	NYSEG tripped off-line at 0200. Pilot was back on-line at 0730 and limestone injection into the duct began at 0930.	T18S-N (Duct Inj., 225°F ESP inlet). Gas sampling started at noon due to NYSEG down time. Sampled at the DRG and CRG using M29*. Tris buffer comparison at CRG location. Peroxide and nitric added to the first two impingers after flue gas sampling then ambient air pulled through impingers.
Wed. 8/2		Three drums of gypsum solids were collected from the vacuum belt filter with wash water at maximum (0.37 gpm). Water injection into duct, upstream of ESP, started for Thurs. testing.	
Thur 8/3		Finals samples were taken for T18. Sodium formate was batched and added to the PFLRT at 10 lb./ton SO ₂ removed. DBA conc was allowed to decrease gradually.	
Fri. 8/4	T19 10000 scfm L/G=40 2200 ppm Formate	SO ₂ removal decreased throughout the day. AM samples showed sulfite at 14 mM and sodium at 94 mM. ICE analysis problems with formate and DBA because formate and glutaric acid have similar retention times.	T19-NY; Sampled at the WS inlet using two Tris impinger trains for comparison
Sat. 8/5		Sodium conc. increased to 150 mM. Increasing the formate feed rate.	
Sun. 8/6		Magnesium concentration stabilized at 95 mM. Calcium conc. decreasing as sodium increased to 200 mM. Increased formate feed rate to 14 lb./ton NSL to increase SO ₂ removal.	
Mon. 8/7		Chloride level a little high so blowdown to sump was increased.	T19-EXY; Gas sampling at the WS inlet and the CRG. Ran Tris buffer impinger comparison at the WS Inlet. Also ran Tris impinger solutions at the CRG with mercury spiked into the 1st impinger before the run.
Tue. 8/8		SO ₂ removal continues to decrease (presently at 86%).	
Wed. 8/9		Vacuum belt problems forced a shut-down early in the morning. A formate/DBA mix was fed to the reaction tank to lower the sodium level.	T19-E; Seven gas sampling runs. Used Method 29* at Pilot inlet, outlet and CRG locations. Tris comparison trains at the WS Inlet and Outlet. Permanganate added to the Tris buffer solution during recovery. Peroxide impinger solutions from 2nd run were contaminated with permanganate impinger solution.

**Table 1 (cont.)
Operating Conditions**

Date	Test Condition	Process Summary	Gas Sampling Summary
Thur. 8/10	T20 10000 scfm L/G=40 Fine Grind 2300 ppm DBA	The mini-MRT agitator fell into the reaction tank. Kept system running and used oxidation air to provide mixing inside the reaction tank. Reaction tank slurry samples appeared inhibited and analysis showed nearly 50% calcium sulfite. Centrifuge product at 60 wt%. Oxidation air was increased to 650 scfm and 85 ppm Mn was spiked to increase oxidation. Formate addition was stopped and DBA addition started.	Mercuric chloride injector was installed and spiking started for gas sampling on Friday.
Fri. 8/11		Solids improved during the day and had much lower sulfite levels than Thursday.	T20-C. Seven gas sampling runs completed with mercuric chloride spiking using Method 29* at the WS inlet and outlet and the CRG locations, with Tris buffer comparison trains at the Pilot inlet. Tris trains were sampled for 25 min, peroxide trains at the WS Inlet for 60 min. and peroxides at the WS Outlet for 90 min. After sampling, mercuric chloride and elemental mercury spiking were started for gas sampling on Monday.
Sat. 8/12		Liquid sulfite levels dropping. Filter cake product at 90 wt%. Solid sulfite at 0.2 mmol/g.	
Sun. 8/13		Filter cake wt% and SO ₂ decreased. Suspected that the system was sulfite blinded.	
Mon. 8/14		The FGD system was sulfite blinded. Oxidation air rate was increased again to 650 scfm. The unit was taken off-line after afternoon samples.	T20-EC. Seven gas sampling runs completed with elemental and mercuric chloride spiking using Method 29* at the WS inlet and outlet and the CRG locations, with Tris buffer comparison trains at the Pilot inlet. Tris trains were sampled for 25 min., peroxide trains at the WS Inlet for 60 min. and peroxides at the WS Outlet for 90 min. The injectors were removed from the duct after gas sampling.
Tue. 8/15		Unit down while blanking plates positioned to configure the gas path for duct injection tests.	
Wed. 8/16		Visolite test performed to check PJFF for leaks. Minor leaks found at blanked off bag locations. A location in the ductwork upstream of the ESP required a blanking plate to isolate the PJFF from the ESP.	

**Table 1 (cont.)
Operating Conditions**

Date	Test Condition	Process Summary	Gas Sampling Summary
Thur 8/17		Installed blanking plate and started pulling gas in the morning. On conditions for first duct injection test in early afternoon.	
Fri. 8/18	PJFF-6 4070 scfm 325°F PJFF inlet temp. 1.0 lb./hr carbon injection.	Measured O ₂ at facility outlet while CEM at PJFF being worked on to bring on-line. Ran spray dryer inlet temp. at 375°F with limestone feed off to achieve 325°F at the PJFF inlet. Cleaning pulses averaging 28 pulses/hr to maintain 3.9 in. H ₂ O ΔP.	Gas sampling using Method 29 (two peroxides and two permanganate impinger solutions) recovered in sets. Nine sample trains used (three runs at three locations; spray dryer inlet and outlet, and PJFF outlet).
Sat. 8/19	PJFF-7 4270 scfm; 275°F PJFF inlet temp.; 0.90 lb./hr carbon injection	Spray dryer inlet temp. set at 360°F with limestone feed rate at 0.3 gpm (using 10 wt% limestone slurry). Cleaning pulses averaged 25 pulses/hr.	Gas sampling using Method 29 (two peroxides and two permanganate impinger solutions) recovered in sets. Nine sample trains used (three runs at three locations; spray dryer inlet and outlet, and PJFF outlet).
Sun. 8/20		Started carbon/lime injection for next day's testing. The cooling water to the spray dryer varied to cause 9°F variation at the PJFF inlet so decreased the temperature at the spray dryer inlet and shut off the cooling water.	
Mon. 8/21	PJFF-8 4270 scfm; 275°F PJFF inlet temp.; 0.8 lb./hr carbon inject.; 2:1 Lime:carbon	Spray dryer evacuation system was kept off during the day to accumulate ash for sampling at the end of gas sampling. Cleaning pulses averaged 27 pulses/hr.	Gas sampling using Method 29 (two peroxides and two permanganate impinger solutions) recovered in sets. Nine sample trains used (three runs at three locations; spray dryer inlet and outlet, and PJFF outlet).
Tue. 8/22	PJFF-9 4500 scfm; 225°F PJFF inlet temp.; 0.5 lb./hr carbon injection.	PJFF cleaning at an average of 19 pulses/hr.	Gas sampling at average of 114% isokinetic. SDA inlet closer to isokinetic than SDA outlet or PJFF outlet.
Wed. 8/23	PJFF-10 4500 scfm; 225°F PJFF inlet temp.; 0.6 lb./hr carbon inject.; 2:1 Lime:carbon	Cooling water control problems during run #3 caused variation in PJFF inlet temp. Started using PJFF outlet CEM to measure O ₂ . PJFF cleaning an average of 18 pulses/hr during sampling. Carbon injection screwfeeder drifted to 0.99 lb./hr during the 1st run. It was constant at 0.48 and 0.49 lb./hr during the next two runs. Ten minute on-line pulse cleaning after testing.	Gas sampling using Method 29 (two peroxides and two permanganate impinger solutions) recovered in sets. Nine sample trains used (three runs at three locations; spray dryer inlet and outlet, and PJFF outlet).

Table 1 (cont.)
Operating Conditions

Date	Test Condition	Process Summary	Gas Sampling Summary
Thur 8/24	PJFF-11 4500 scfm; 225°F PJFF inlet temp.; 1.0 lb./hr lime injection.	No SDA bottom ash available at the end of gas sampling for collection. Ash collected at the PJFF. PJFF cleaning at an average of 20 pulses/hr. Ten minute on-line pulse cleaning after testing.	FIMS instrument problems gave low values of standards. Also experienced computer-instrument communication problems
Fri. 8/25	PJFF-12 4500 scfm; 225°F PJFF inlet temp.; Baseline - no carbon nor lime injection.	PJFF cleaning at an average of 18 pulses/hr during gas sampling.	Gas sampling using Method 29 (two peroxides and two permanganate impinger solutions) recovered in sets. Nine sample trains used (three runs at three locations; spray dryer inlet and outlet, and PJFF outlet).
Sat. 8/26		PJFF was pulse-cleaned and gas flow at 300°F was maintained	
Sun. 8/27	Unit Off-line	Facility off flue gas conditions and ductwork allowed to cool for next day's activities to put blanking plates in place. Inspection of the inside of SDA showed vessel to be clean.	
Mon. 8/28		Blanking plates put into position for wet scrubber / ESP operation.	
Tue. 8/29	T21 8250 scfm; 2000 ppm inlet SO ₂ ; pH = 6.0; 12 ft. rxn tank; High Mg and Cl	Flow checked on reagent feed flow meter.	
Wed. 8/30		CEM at pilot inlet was not recognizing the blowback conditions. SO ₂ spiking valve opened quickly during blowback.	T21-N. Three runs of baseline gas sampling.
Thurs. 8/31		ESP fan off and running with FF fan. SO ₂ spiking in manual	T21-E. Three runs of gas sampling with elemental mercury spiking.

Table 2

Summary of Carbon Injection Test Conditions and Results

Test ID	Gas Temp. (°F)	Carbon Injection Ratio (lb:lb)	2 to 1 Carbon:Lime	Reagent Feed to Atomizer (lb/hr)	PJFF Pressure Drop (in. H ₂ O)	Total Hg Removal (%)	Vapor Hg Removal (%)
PJFF-6	325	10000	no	NA ³	3.9	17	33
PJFF-7	275	13000	no	16	3.9	94	95
PJFF-8	275	8300	yes	16	3.9	91	94
PJFF-9	225	5600	no	16	3.9	93	93
PJFF-10	225	8000	yes	16	3.9	88	96
PJFF-11	225	NA ¹	no	16	3.9	85	43
PJFF-12	225	NA ²	no	16	3.9	66	50

¹ Lime only injection.

² Baseline test; no injection.

³ No reagent feed in order to reach high temperature.

Table 3
Vapor Phase Mercury Removal
Duct Injection Tests

Test ID	Other Impinger ($\mu\text{g}/\text{Nm}^3$)		H2O2 Impinger ($\mu\text{g}/\text{Nm}^3$)		KMnO4 Impinger ($\mu\text{g}/\text{Nm}^3$)		Vapor Hg Removal ¹ (%)	Total Hg Removal ² (%)
	DRG	CRG	DRG	CRG	DRG	CRG		
T18L-N	1.93	1.65	0.07	0.17	0.27	0.30	6.6	67.9
	1.88	1.63	0.10	0.10	0.23	0.27	9.5	72.8
<i>Average</i>	1.91	1.64	0.09	0.14	0.25	0.29	8.1	70.4
T18S-N	4.34	4.08	0.15	0.19	0.17	0.24	3.2	39.1
	5.43	4.26	0.23	0.17	0.24	0.20	21.5	43.6
<i>Average</i>	4.89	4.17	0.19	0.18	0.21	0.22	12.4	41.4
T18W-N	6.30	6.85	0.45	0.29	0.48	0.26	-2.4	8.8
	5.74	6.50	0.28	0.25	0.32	0.27	-10.7	13.7
<i>Average</i>	6.02	6.68	0.37	0.27	0.40	0.27	-6.5	11.3

¹ Does not include particulate

² Includes particulate

Table 4
Trace Element Removal Impinger Test Conditions

Test ID	Test Description	Gas Sample Type	Spiking Conditions		Sampling Methods		
			Species Spiked	Spike Location	Method 29 Used?	Method 29* Used?	Sol'n of Extra Imp.
T1-NX	No spiking, method comparison.	CRG	NA	NA	Yes	Yes	Peroxide
T0-IA	Intratrain Hg(0) gas spike with air.	Air	Hg(0)	Before 1st imp.	No	Yes	Peroxide
T4-IY	Intratrain Hg(0) gas spike at inlet.	WS inlet	Hg(0)	Before 1st imp.	No	Yes	Peroxide
T5-IZ	Intratrain Hg(0) gas spike at outlet.	WS outlet	Hg(0)	Before 1st imp.	No	Yes	Peroxide
T6-JZ	Intratrain Hg(0) gas spike at outlet.	WS outlet	Hg(0)	After 2nd imp.	No	Yes	Peroxide
T6-JY	Intratrain Hg(0) gas spike at inlet.	WS inlet	Hg(0)	After 2nd imp.	No	Yes	Peroxide
T7-EY	Flue gas spiking, method comparison.	WS inlet	Hg(0)	Duct Injection	Yes	Yes	Peroxide
T8-E1	Flue gas spiking.	3 Locations	Hg(0)	Duct Injection	No	Yes	Peroxide
T8-E2	Flue gas spiking.	3 Locations	Hg(0)	Duct Injection	Yes	No	NA
T0-JA	Intratrain gas spike with ambient air.	Air	Hg(0)	After 2nd imp.	No	Yes	Peroxide
T9-IX*	CRG sample followed by intratrain gas spike with ambient air.	CRG/Air	Hg(0)	Before 1st imp.	No	Yes	Peroxide
T9-E1	Flue gas spiking with acetate impingers.	3 Locations	Hg(0)	Duct Injection	No	Yes	Acetate
T9-E2	Flue gas spiking with phosphate impingers.	3 Locations	Hg(0)	Duct Injection	No	Yes	Phosphate
T10-N	Baseline measurements with phosphate impingers.	3 Locations	NA	NA	No	Yes	Phosphate
T11-IY	Intratrain Hg(0) gas spike using phosphate impingers.	WS Inlet	Hg(0)	Before 1st imp.	No	Yes	Phosphate
T12-EY	Flue gas spiking, method comparison.	WS Inlet	Hg(0)	Duct Injection	No	Yes	Phosphate
T12-NY	Method comparison without flue gas spiking.	WS Inlet	NA	NA	No	Yes	Phosphate
T13-NY	Method comparison without flue gas spiking.	WS Inlet	NA	NA	No	Yes	Phosphate
T16-EY	Baseline measurements with phosphate impingers.	WS Inlet	Hg(0)	Duct Injection	No	Yes	Phosphate/ Peroxide
T0-KA	Aqueous Hg intratrain spike.	Air	Aq. Hg Std.	In 1st H2O2 & KMnO4 imp.	Yes	No	NA

Table 4
Trace Element Removal Impinger Test Conditions

Test ID	Test Description	Gas Sample Type	Spiking Conditions		Sampling Methods		
			Species Spiked	Spike Location	Method 29 Used?	Method 29* Used?	Sol'n of Extra Imp.
T18L-N	Lime slurry injection upstream of the ESP.	DRG,CRG	NA	NA	No	Yes	Tris
T18S-N	Limestone slurry injection upstream of the ESP.	DRG,CRG	NA	NA	No	Yes	Tris
T18W-N	Water injection upstream of the ESP.	DRG,CRG	NA	NA	No	Yes	Tris
T19-NY	No spiking; Tris comparison at Pilot inlet.	WS Inlet	NA	NA	No	Yes	Tris
T19-EXY	Flue gas spiking; Tris comparison at Pilot inlet.	CRG/WS Inlet	Hg(0)	Duct Injection	No	Yes	Tris
T19-E	Flue gas spiking; Tris comparison at the Pilot inlet	3 Locations	Hg(0)	Duct Injection	No	Yes	Tris
T20-C	Flue gas spiking; Tris comparison at the Pilot inlet	3 Locations	HgCl ₂	Duct Injection	No	Yes	Tris
T20-EC	Flue gas spiking; Tris comparison at the Pilot inlet	3 Locations	Hg (0) and HgCl ₂	Duct Injection	No	Yes	Tris
T21-N	No spiking; Mg-lime wet scrubber conditions, forced oxidation	3 Locations	NA	NA	Yes	No	NA
T21-E	Flue gas spiking; Mg-lime wet scrubber conditions, forced oxidation	3 Locations	Hg(0)	Duct Injection	Yes	No	NA
T21-EC	Flue gas spiking; Mg-lime wet scrubber conditions, forced oxidation	3 Locations	Hg (0) and HgCl ₂	Duct Injection	Yes	No	NA

Table 5
Alternate Impinger Solutions Summary

Test ID	Alternate Impinger Solution	Solution Composition	Sampling Time (min)	Spiking Conditions Species Spiked	Spike Location	Sample Recovery	Observations
T9-E1	Acetate	1 M $\text{NaC}_2\text{H}_3\text{O}_2$, 0.05 M Acetic Acid	60	Hg(0)	Duct Injection	5 ft ³ of air through impingers with DI water rinse (standard peroxide impinger recovery method).	Migration of acetic acid vapor through the train consumed the permanganate in the final impingers.
T9-E2	Phosphate	0.3 M Na_2HPO_4 , 0.2 M KH_2PO_4	60 at Inlet 100 at Outlet	Hg(0)	Duct Injection	5 ft ³ of air through impingers with DI water rinse.	Pilot fan tripped during sampling causing the data to be questionable. The pH in impinger 1 fell below 2. Solids formed in second impinger
T10-N	Phosphate	0.4 M Na_2HPO_4 , 0.3 M KH_2PO_4	60 at Inlet 100 at Outlet	NA	NA	5 ft ³ of air through impingers with DI water rinse.	The pH in impinger 1 fell below 2. Higher total phosphate was used. Solids formed in second impinger.
T11-IY	Phosphate	0.7 M Na_2HPO_4 , 0.3 M KH_2PO_4	60	Hg(0)	Before 1st imp.	5 ft ³ of air through impingers with DI water rinse and 15 ml peroxide.	1M total phosphate species used to increase pH. Solids formed in second impinger during gas sampling.
T12-EY	Phosphate	0.7 M Na_2HPO_4 , 0.3 M KH_2PO_4	60	Hg(0)	Duct Injection	5 ft ³ of air through impingers with DI water rinse and 15 ml peroxide.	The pH of the first impinger solution dropped below 2 after 1 hr of gas sampling. Solids found in second impinger.
T12-NY	Phosphate	0.5 M Na_3PO_4 , 0.5 M K_3PO_4	60	NA	NA	No air purge. 15 ml peroxide and 15 ml nitric added at location. 10% nitric impinger rinse.	Tribasic phosphate used to increase pH. The pH of the first impinger solution dropped below 2 after 1 hr of gas sampling. Solids found in second impinger.
T13-NY	Phosphate	0.5 M Na_3PO_4 , 0.5 M K_3PO_4	20	NA	NA	No air purge. 15 ml peroxide and 15 ml nitric added at location. 10% nitric impinger rinse.	The pH of the first impinger solution remained above 6.5 after only 20 minutes of gas sampling. Solids found in first impinger in some runs.
T13-NY	Phosphate	0.5 M Na_3PO_4 , 0.5 M K_3PO_4	60	NA	NA	No air purge. 15 ml peroxide and 15 ml nitric added at location. 10% nitric impinger rinse.	The pH of the first impinger solution was below 2 after 60 minutes of gas sampling. Solids found in second impinger.

Table 5
Alternate Impinger Solutions Summary

Test ID	Alternate Impinger Solution	Solution Composition	Sampling Time (min)	Spiking Conditions Species Spiked	Spike Location	Sample Recovery	Observations
T16-EY	Phosphate/ Peroxide	0.5 M Na ₃ PO ₄ , 0.5 M K ₃ PO ₄ , 5% peroxide	60	Hg(0)	Duct Injection	No air purge. 5 ml peroxide added. 5 ml nitric added.	Impinger solution very unstable. Peroxide decomposed over time. SO ₂ odor in the impingers after sampling.
T16-EY	Phosphate	0.4 M Na ₃ PO ₄ , 0.4 M K ₃ PO ₄ , 2.5% Bleach	60	Hg(0)	Duct Injection	No air purge. 5 ml peroxide added. 5 ml nitric added.	Could not analyze the impinger solutions, solids formed, offgassed fumes interfered with the FIMS.
T18L-N	Tris	1 M Tris	20	NA	NA	15 ml peroxide in 1st imp. 5 ml peroxide in 2nd imp.	The pH of impinger 1 remained above 6.5.
T18S-N	Tris	1 M Tris	20	NA	NA	After Run #1, 15 ml of 30% peroxide and 7.5 ml of nitric acid were added to first impinger. 5 ml of 30% peroxide and 7.5 ml of nitric acid were added to imp. #2. After Run #2, 8.5 g of potassium permanganate was added to each Tris impinger.	The pH of impinger 1 remained above 6.5.
T18W-N	Tris	1 M Tris	20	NA	NA	8.5 g of potassium permanganate added to first and second Tris solution impingers	The pH of impinger 1 remained above 6.5.
T19-NY	Tris	1 M Tris	60	Aq. Hg Std.	4 µg Hg(II) added to 1st imp. before run	15 g of potassium permanganate added to first and second Tris solution impingers	The pH of impinger 1 remained above 6.5.
T19-EXY	Tris	1 M Tris	30	Hg(0)	duct injection	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	The pH of impinger 1 remained above 7.0
T19-EXY	Tris	1 M Tris	30	Aq. Hg Std. at CRG	4 µg Hg(II) added to 1st imp. before run	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	The pH of impinger 1 remained above 7.0

Table 5
Alternate Impinger Solutions Summary

Test ID	Alternate Impinger Solution	Solution Composition	Sampling Time (min)	Spiking Conditions Species Spiked	Spike Location	Sample Recovery	Observations
T19-E	Tris	1 M Tris	20	Hg(0)	duct injection	5g of potassium permanganate added to each Tris solution impinger	The pH of impinger 1 remained above 7.0
T20-C	Tris	1 M Tris	25	HgCl ₂	duct injection	5g of potassium permanganate added to each Tris solution impinger	The pH of impinger 1 remained above 7.0
T20-EC	Tris	1 M Tris	25	Hg(0) and H ₂ Cl ₂	duct injection	5g of potassium permanganate added to each Tris solution impinger	The pH of impinger 1 remained above 7.0

Table 6
Tris vs. Peroxide as Impinger Solution

Test ID	Solution Composition	Sampling Time (min)	Species Spiked	Total Hg ($\mu\text{g}/\text{Nm}^3$)		Recovery Difference ($\mu\text{g}/\text{Nm}^3$)	Tris Train Recovery (% of Peroxide Train)
				Peroxide Train	Tris Train		
T18 L-N	1 M Tris	20	NA	1.6	1.2	-0.4	75.0
T18S-N	1 M Tris	20	NA	3.5	3.4	-0.1	97.1
T18W-N	1 M Tris	20	NA	5.7	6.4	0.7	112.3
T19-EXY	1 M Tris	30	Hg(0)	17.3	18.4	1.1	106.4
T19-E	1 M Tris	20	Hg(0)	19.7	20.6	0.9	104.6
T20-C	1 M Tris	25	HgCl ₂	18.4	13.8	-4.6	75.0
T20-EC	1 M Tris	25	Hg(0) and HgCl ₂	32.0	21.1	-10.9	65.9

Table 7
Elemental Mercury Spike Capture

Test ID	Alternate Solution Composition	Elemental Mercury Spike ($\mu\text{g}/\text{NM}^3$)	Hg ($\mu\text{g}/\text{NM}^3$) at WS Inlet Location				Permanganate Recovery (% of Spike)
			Impingers 1&2 Alt. Solution	Impingers 3&4 Peroxide	Impingers 5&6 Permanganate	Total	
T19-EXY	1 M Tris	12.73	10.61	0.23	11.84	22.68	93.01
T19-EXY	Peroxide	12.73	14.77	2.96	3.56	21.28	27.93
T19-E	1 M Tris	18.33	10.31	0.54	18.03	28.88	98.39
T19-E	Peroxide	18.33	17.89	3.87	5.50	27.25	29.99

Table 8
Mercury Removal

Test ID	Spiking	Total Hg WS Inlet ($\mu\text{g}/\text{Nm}^3$)	Total Hg WS Outlet ($\mu\text{g}/\text{Nm}^3$)	Total Hg Removal (%)
<i>Formate additive, Forced Oxidation, L/G = 40</i>				
T19-E	Hg(0)	19.7	10.8	47.5
T20-C	HgCl ₂	18.4	1.2	93.7
T20-EC	Hg(0) & HgCl ₂	32.0	8.7	73.6
<i>Mg/Lime, Forced Oxidation, L/G = 30</i>				
T21-N	NA	5.8	0.8	87.3
T21-E	Hg(0)	18.2	11.4	39.8
T21-EC	Hg(0) & HgCl ₂	29.0	13.0	55.6

Table 9
Summary of LDG Test Conditions and Results - Phase I and II

Test ID	Gas Rate (scfm)	Slurry Recirc. Rate (gpm)	L/G (gal/min/scf)	Inlet SO ₂ (ppm)	FLRT pH	Abs. pH	Reaction Tank Slurry (Wt.%)	DBA Conc. (ppm)	SO ₂ Removal (%)	SO ₂ Removal (NTU)	VME ΔP ("H ₂ O)	Tray ΔP ("H ₂ O)	Abs. ΔP ("H ₂ O)	Rxn Tank Level (ft)	Solids Residence Time (hr)	PRISM Gypsum R.S.	SO ₂ Oz. (%)	Thick. Unit Area (ft ² /ton/d)	Form Filtration Rate (lb/hr·ft ²)	O:SO ₂ Ratio	Air Rate (scfm)
Phase I																					
Lime Reagent Tests																					
Screening																					
LDG-1	8,250	300	30	2500	6.0	5.5	15.8	Variable	93.4	2.72	0.53	1.00	2.66	12.0	16.2	1.03	100.0	-	-	11	500
Effect of Solids Residence Time																					
LDG-2	8,250	300	30	2500	6.0	5.1	15.5	2,900	90.5	2.35	0.57	0.99	2.94	12.0	16.8	1.07	99.7	0.9	1150	11	500
LDG-3	8,250	300	30	2500	6.0	5.2	8.1	2,800	90.6	2.37	0.61	0.98	3.30	12.0	8.0	1.05	99.8	1.5	1409	11	500
LDG-4	8,250	300	30	2500	6.0	5.3	4.4	3,600	90.6	2.37	0.66	0.99	3.13	12.0	3.9	1.19	100.0	1.7	42	11	500
Effect of O:SO₂ Ratio																					
LDG-5	8,250	300	30	2000	6.0	5.1	4.3	2,150	91.7	2.49	0.71	1.28	3.39	12.0	4.8	1.08	100.0	3.4	77	14	500
Effect of Tank Level and O:SO₂ Ratio																					
LDG-6	8,250	300	30	2000	6.0	5.2	4.2	1,950	92.3	2.56	0.70	1.27	3.51	8.0	3.2	1.10	99.6	3.6	305	14	500
LDG-7	8,250	300	30	2000	6.0	5.3	4.3	2,300	93.3	2.70	0.71	1.58	3.78	8.0	3.1	1.09	99.7	3.0	1172	11	400
LDG-8	8,250	300	30	2000	6.0	5.0	4.3	2,450	90.7	2.38	0.60	1.05	2.71	8.0	3.2	1.21	100.0	1.8	1732	8	292
LDG-9	8,250	300	30	2000	6.0	5.2	4.2	2,450	92.4	2.58	0.62	1.13	2.74	8.0	3.4	1.19	99.9	2.2	1464	6	210
Effect of pH																					
LDG-10	8,250	300	30	2000	6.5	5.3	4.3	2,900	92.3	2.56	0.61	1.20	2.79	8.0	3.2	1.25	-	-	-	6	217
Effect of Gas Rate																					
LDG-11	11,000	425	32	2000	6.5	5.4	14.0	1,850	92.3	2.56	1.02	1.87	4.60	8.0	8.2	1.08	-	-	1285	10	500
Effect of L/G, Gas Flow Rate, and Inlet SO₂ Concentration																					
LDG-11A	8,250	300	30	2000	6.0	5.2	10.1	2,000	87.7	2.09	0.63	1.17	2.77	8.0	5.5	-	-	-	-	16	550
LDG-11B	8,250	300	30	2000	6.0	4.9	8.2	-	90.6	2.36	0.63	1.16	2.83	8.0	5.8	-	-	-	-	6	217
LDG-11C	8,250	300	30	2000	6.0	5.0	7.2	2,450	90.7	2.37	0.63	1.17	2.80	8.0	5.8	-	-	-	-	8	290
LDG-11D	8,250	300	30	2700	6.1	5.0	8.0	2,750	92.1	2.53	0.63	1.17	2.88	8.0	4.2	1.14	98.9	1.8	1495	6	290
LDG-11E	8,250	400	40	2000	6.0	4.9	7.8	-	95.7	3.14	0.63	1.25	3.08	8.0	5.5	-	-	-	-	6	217
LDG-11F	11,000	400	30	2000	6.0	4.9	10.3	2,200	89.8	2.29	1.07	1.84	4.75	8.0	6.0	1.08	92.9	3.5	440	6	290

Table 9
Summary of LDG Test Conditions and Results - Phase I and II

Test ID	Gas Rate (scfm)	Slurry Recirc. Rate (gpm)	L/G (gal/min/scf)	Inlet SO ₂ (ppm)	FLRT pH	Abs. pH	Reaction Tank Slurry (Wt.%)	DBA Conc. (ppm)	SO ₂ Removal (%)	SO ₂ Removal (NTU)	VME ΔP ("H ₂ O)	Tray ΔP ("H ₂ O)	Abs. ΔP ("H ₂ O)	Rxn Tank Level (ft)	Solids Residence Time (hr)	PRISM Gypsum R.S.	SO ₂ Oz. (%)	Thick. Unit Area (ft ² /ton/d)	Form Filtration Rate (lb/hr-ft ²)	O:SO ₂ Ratio	Air Rate (scfm)
<i>Consumption Tests with High Magnesium Concentration</i>																					
LDG-12	8,250	300	30	2000	6.5	5.8	11.6	3,150	92.7	2.61	0.61	1.10	3.06	12.0	15.0	1.01	100.0	0.7	6653	6	217
T1	8,250	300	30	2000	6.0	5.5	7.2	2,800	92.4	2.58	0.58	1.18	3.03	8.0	5.7	1.09	99.5	4.2	2620	8	291
T2	8,250	300	30	2000	5.9	5.5	12.2	2,800	92.5	2.59	0.58	1.14	3.12	8.0	10.0	1.10	99.7	2.0	2510	8	291
<i>Effect of Elevated Manganese Concentration</i>																					
T3	11,000	400	30	2500	5.5	5.2	12.6	2,550	89.8	2.29	0.93	1.93	5.25	8.0	6.2	1.26	98.2	2.3	2557	9	552
<i>Effect of Reagent Feed Location and Solids Residence Time</i>																					
T4	11,000	400	30	2000	5.5	5.0	26.5	2,450	89.9	2.30	0.18	1.72	3.94	8.0	17.5	1.16	99.8	1.3	1557	12	550
T5	11,000	400	30	2000	5.5	4.7	30.5	2,475	89.5	2.26	0.18	1.83	3.98	8.0	21.8	1.11	99.6	2.2	2934	12	550
<i>Effect of Premix Tank</i>																					
T6	11,000	400	30	2000	5.5	5.0	31.4	2,900	89.8	2.31	0.18	1.93	4.24	8.0	21.8	1.15	99.8	1.3	2841	12	550
<i>Limestone Reagent Tests</i>																					
<i>Effect of Magnesium Concentration</i>																					
T7	11,000	400	30	2000	5.5	5.2	32.0	3,500	87	2.04	0.19	1.95	4.29	8.0	21.9	0.88	100.0	0.7	1797	12	550
T8	11,000	400	30	2000	5.5	4.9	29.0	2,200	87	2.06	0.21	1.89	4.23	8.0	22.1	0.86	99.3	0.8	1353	12	550
<i>Phase II</i>																					
<i>Effect of pH</i>																					
T9	10,000	350	29	2300	5.0	4.8	26.5	2,900	86.6	2.01	0.18	1.34	3.30	8.0	9.2	1.04	99.6	0.9	1284	12	550
T10	10,000	351	29	2300	4.7	4.5	26.9	4,100	85.4	1.92	0.19	1.42	3.32	8.0	9.3	1.04	100.0	1.4	1458	12	550
<i>Effect of Cl and Mg Level</i>																					
T11	10,000	351	30	2300	5.0	4.7	25.2	3,900	90.4	2.35	0.21	1.33	3.37	8.0	9.0	1.05	99.9	0.9	1178	11	550
<i>Effect of O:SO₂ Ratio</i>																					
T12	10,000	351	29	2300	4.8	4.6	24.6	4,000	86.0	1.97	0.23	1.33	3.55	8.0	9.5	1.03	99.9	1.1	969	8	380
<i>Effect of High Gas Rate and L/G</i>																					
T13	13,200	351	22	2300	4.7	4.7	25.2	3,100	75.1	1.40	0.36	2.22	5.77	8.0	8.2	1.19	99.6	1.9	778	12	656
T14	13,200	470	30	2300	4.7	4.5	26.7	3,100	83.8	1.82	0.39	2.47	6.18	9.0	7.4	1.16	99.6	1.2	872	11	650

Table 9
Summary of LDG Test Conditions and Results - Phase I and II

Test ID	Gas Rate (scfm)	Slurry Recirc. Rate (gpm)	L/G (gal/min/scf)	Inlet SO ₂ (ppm)	FLRT pH	Abs. pH	Reaction Tank Slurry (Wt. %)	DBA Conc. (ppm)	SO ₂ Removal (%)	SO ₂ Removal (NTU)	VME ΔP ("H ₂ O)	Tray ΔP ("H ₂ O)	Abs. ΔP ("H ₂ O)	Rxn Tank Level (ft)	Solids Residence Time (hr)	PRISM Gypsum R.S.	SO ₂ Ox. (%)	Thick. Unit Area (ft ² /ton/d)	Form Filtration Rate (lb/hr-ft ²)	O:SO ₂ Ratio	Air Rate (scfm)
T14a	13,200	470	30	2300	4.7	4.5	26.1	3,200	80.7	1.65	0.40	2.50	6.19	9.0	7.2	-	-	-	-	11	645
<i>Effect of Gas Rate, O:SO₂ Ratio and L/G</i>																					
T15	11,000	470	26	2300	4.9	3.6	21.0	3,500	86.9	2.03	0.31	2.05	4.58	9.0	8.5	1.07	99.8	1.0	1053	12	650
T16	10,000	470	40	2300	5.0	4.8	24.8	3,400	94.1	2.84	0.27	2.05	4.29	9.0	9.7	1.00	99.8	1.0	917	13	650
T17	10,000	470	39	2300	5.0	4.7	25.1	3,700	92.9	2.64	0.30	2.22	4.53	9.0	9.8	1.16	99.0	1.6	906	11	550
<i>Fine Grind Limestone Test</i>																					
T18	10,000	470	40	2300	5.0	4.8	26.4	2,500	91.5	2.48	0.39	2.55	4.71	9.0	10.1	0.94	99.8	1.0	1649	11	550
<i>Sodium Formate Test</i>																					
T19	10,000	470	39	2300	5.0	4.8	24.8	2000 *	79.7	1.60	0.49	1.51	4.99	9.0	11.4	0.90	98.9	1.9	475	13	557
<i>DBA Test After Sulfite Precipitation</i>																					
T20	10,000	470	39	2300	5.0	4.7	25.5	2,500	88.4	2.16	0.60	2.38	5.51	9.0	10.3	1.10	99.0	2.0	600	11	516

Table 10. Effect of Magnesium and Chloride Concentration

Test ID	pH	Mg Conc. (ppm)	Cl conc. (ppm)	Liq. SO ₃ conc. (mM)	PRISM CaSO ₃ R.S.	Thickener Unit Area (ft ² /ton/day)	Filter Leaf Cake (wt %)
T9	4.8	2900	6500	10.6	3.93	0.9	84
T11	4.7	1600	5100	7.7	3.81	0.9	85

Table 11. Effect of High Gas Flow, L/G, and Reaction Tank Height

Test ID	GAS Flow (scfm)	L/G	Reaction Tank level (feet)	SO ₂ Removal (%)	Liq. SO ₃ (mM)	Thickener Unit Area (ft ² /ton/day)	Filter Leaf Cake (wt %)
T12	10000	29	8	86	11	1.1	83
T13	13200	22	8	75	23	1.9	81
T14	13200	30	9	84	14	1.2	83

Table 12. Effect of Fine Grind Limestone

Test ID	Limestone Reagent (% < 325)	SO ₂ Removal (%)	Liq. SO ₃ (mM)	Limestone Utilization (%)	Vacuum Belt Solids (wt %)	Thickener Unit Area (ft ² /ton/day)	Filter Leaf Cake (wt %)
T11	93	90.4	7.7	95.4	89	0.9	85
T18	95	91.5	8.1	97.7	88	1.0	85

APPENDIX A
TEST SCHEDULES

EPRI ENVIRONMENTAL CONTROL TECHNOLOGY CENTER TEST CALENDAR

August 1995 (Updated Sept. 11)

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
		1 Trace Element Rem. T18S-N Limestone slurry duct injection	2 Trace Element Rem.	3 Trace Element Rem. T18W-N Water duct injection	4 Trace Element Rem. T19-NY Formate additive Gas sampling at FGD Inlet; Tris comparison	5 Trace Element Rem. T19 10000 scfm pH = 5.0 25 wt%
6 Trace Element Rem. T19	7 Trace Element Rem. T19-EXY Tris comparison at WS inlet	8 Trace Element Rem. T19	9 Trace Element Rem. T19-E Hg(0) spike Tris comparison WS with Formate	10 Trace Element Rem. T20 DBA additive pH = 5.0	11 Trace Element Rem. T20-C Peroxide versus Tris solutions Mercuric chloride spike	12 Trace Element Rem. T20
13 Trace Element Rem. T20	14 Trace Element Rem. T20-EC Elemental and Mercuric chloride spiking	15 Trace Element Rem. Unit down to configure for carbon injection tests	16 Trace Element Rem. Unit down to configure for carbon injection tests	17 Trace Element Rem. Unit down to configure for carbon injection tests	18 Carbon Inj. Phase II PJFF-6 325°F PJFF Inlet 1.0 lb/hr carbon	19 Carbon Inj. Phase II PJFF-7 275°F PJFF Inlet 0.9 lb/hr carbon
20 Carbon Inj. Phase II 275°F PJFF Inlet 0.8 lb/hr carbon	21 Carbon Inj. Phase II PJFF-8 275°F PJFF Inlet 0.8 lb/hr carbon 2:1 lime:carbon	22 Carbon Inj. Phase II PJFF-9 225°F PJFF Inlet 0.5 lb/hr carbon	23 Carbon Inj. Phase II PJFF-10 225°F PJFF Inlet 0.6 lb/hr carbon 2:1 lime:carbon	24 Carbon Inj. Phase II PJFF-11 225°F PJFF Inlet No carbon injection 1.0 lb/hr lime	25 Carbon Inj. Phase II PJFF-12 225°F PJFF Inlet Baseline No carbon nor lime inj.	26 Trace Element Rem. Preparation for Wet Scrubber Operation
27 Trace Element Rem. Preparation for Wet Scrubber Operation	28 Trace Element Rem. Preparation for Wet Scrubber Operation	29 Trace Element Rem. T21 8250 scfm 2000 Inlet SO ₂ ; pH = 6 Mg-lime forced oxid.	30 Trace Element Rem. T21-N Meth.29 sampl. at FGD Inlet, Outlet, and CRG Baseline	31 Trace Element Rem. T21-E Meth.29 sampl. at FGD Inlet, Outlet, and CRG Mercury spike		

EPRI ENVIRONMENTAL CONTROL TECHNOLOGY CENTER TEST CALENDAR

September 1995 (Updated Sept. 11)

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
					Trace Element Rem. T21-EC FGD Inlet, Outlet and CRG	Trace Element Rem. Bringing solids wt% down in PFLRT
Trace Element Rem. T22 Mg-lime inhibited 8250 scfm, pH = 6.5 2000 ppm Thio.	Trace Element Rem. T22 Transition to Inhibited wet scrubber conditions	Trace Element Rem. T22 Transition to Inhibited wet scrubber conditions	Trace Element Rem. T22-N FGD Inlet, Outlet and CRG	Trace Element Rem. T22-E FGD Inlet, Outlet and CRG	Trace Element Rem. T22-EC FGD Inlet, Outlet and CRG Unit down after sampl.	Trace Element Rem. Unit Off-line
Trace Element Rem. T23	Trace Element Rem. T23 Baseline FGD 1600 inlet SO ₂ Forced Oxidation	Trace Element Rem. T23 Gas sampling under pet. coke conditions	Trace Element Rem. T23 Gas sampling under pet. coke conditions	Trace Element Rem. T23	Trace Element Rem. T23 Tris Comparison Wet Scrubber Inlet	Trace Element Rem. Unit Off-line
Trace Element Rem. T23	Trace Element Rem. T23 Metal amalgamation FGD Outlet	Trace Element Rem. T23-E Metal amalgamation FGD Outlet	Trace Element Rem. T23-E Metal amalgamation FGD Outlet	Trace Element Rem. T23-E Metal amalgamation FGD Outlet	Trace Element Rem. T23-E Metal amalgamation FGD Outlet	Trace Element Rem. Unit Off-line
Trace Element Rem. T23	Trace Element Rem. T23	Trace Element Rem. T23-N Metal amalgamation FGD Outlet	Trace Element Rem. T23-E Metal amalgamation FGD Outlet	Trace Element Rem. T23-EC Iodine impregnated carbon	Trace Element Rem. T23-EC Calcium chloride impregnated carbon Unit down after sampl.	Trace Element Rem. Unit Off-line

PILOT

MINI-PILOT

1 9 9 4											
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
UNIT DOWN		SUNCOR	High Velocity Scrubbing	TECO High Vel. Packing	High Velocity Scrubbing (B&W tray testing)	Air Toxics Tests	Outage	Air Toxics Tests			
Limestone CLS Phase II (cont.)	Redox Sulfur testing	LCLS Phase II (cont.)	UNIT DOWN	SUNCOR II	UNIT DOWN						

PILOT

MINI-PILOT

1 9 9 5												
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
High-Velocity FGD Testing	Lime/DBA Gypsum tests	Carbon Injection	Wet FGD Toxics Testing			Lime/DBA	Carbon Injection	Wet FGD Toxics Testing- Pet coke	Outage	Carbon Injection	High-Velocity FGD Testing	Wet FGD Toxics Testing
						Gypsum tests						
						Lime/DBA Gypsum tests						
UNIT DOWN							UNIT DOWN					

PILOT

1 9 9 6											
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
PRDA - Mercury and HAPs Control			High-Velocity FGD Testing			Wet FGD Toxics Testing			PRDA - Clear Liquor FGD Testing		

ECTC Pilot-scale Testing Schedule ('94-'96)

APPENDIX B1

PILOT AND MINI-PILOT DATA - MERCURY GAS SAMPLING RESULTS

T18S-N Process Summary Report
(8/01/95 12:00:00 to 8/01/95 15:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	90.6	93.0	87.5	2.3	3
SO2 Removal (NTU)	2.40	2.66	2.08	0.24	3
L/G Ratio (gal/macf)	40	40	40	0	3
Reaction Tank pH	5.24	5.44	4.96	0.20	3
Absorber pH	4.97	4.99	4.96	0.01	3
Flue Gas Flow Rate (scfm)	10000	10000	9999	1	3
Header 1 Flow (gpm)	470	470	470	0	3
Header 3 Flow (gpm)	0	0	0	0	3
Header 5 Flow (gpm)	0	0	0	0	3
Blowdown to Sump Rate (gpm)	1.07	1.08	1.07	0.00	3
Centrifuge Feed Rate (gpm)	2.76	3.41	2.36	0.46	3
Reagent Feed to FLRT (gpm)	1.59	1.67	1.52	0.06	3
Facility Inlet SO2 Conc. (ppm)	1202	1208	1190	9	3
Inlet SO2 Concentration (ppm)	2256	2303	2181	54	3
Outlet SO2 Concentration (ppm)	203	274	145	54	3
Inlet O2 Concentration (%)	8.87	8.94	8.79	0.06	3
Outlet O2 Concentration (%)	8.77	8.82	8.74	0.04	3
Absorber Gas Velocity (ft/sec)	10.01	10.04	9.99	0.02	3
Inlet Gas Temperature (F)	272	276	268	3	3
Outlet Gas Temperature (F)	125	126	124	1	3
SO2 Absorbed (mmole/L)	13.76	14.04	13.57	0.21	3
Solids Residence Time (hrs)	10.4	10.6	10.2	0.2	3
Slurry Residence Time (min)	4.04	4.04	4.04	0.00	3
Absorber Pressure Drop (in H2O)	4.52	4.57	4.49	0.04	3
Spray Zone Pressure Drop (in H2O)	2.35	2.36	2.33	0.01	3
Tray Pressure Drop (in H2O)	2.01	2.02	1.99	0.01	3
ME Pressure Drop (in H2O)	0.38	0.38	0.37	0.00	3
Oxidation Air to Rxn Tank (scfm)	550	550	550	0	3
DBA Addition Rate (mL/min)	84	84	83	0	3
Inlet HCl Concentration (ppm)	-	-	-	-	-
NYSEG Load (MW)	676	676	675	0	3

T18W-N Process Summary Report
(8/03/95 6:00:00 to 8/03/95 11:00:00)
minus 8-9 AM (spike)

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	92.8	93.6	91.9	0.6	4
SO2 Removal (NTU)	2.64	2.75	2.51	0.09	4
L/G Ratio (gal/macf)	40	40	40	0	4
Reaction Tank pH	4.93	4.97	4.83	0.06	4
Absorber pH	4.72	4.77	4.66	0.05	4
Flue Gas Flow Rate (scfm)	10000	10000	10000	0	4
Header 1 Flow (gpm)	470	470	470	0	4
Header 3 Flow (gpm)	0	0	0	0	4
Header 5 Flow (gpm)	0	0	0	0	4
Blowdown to Sump Rate (gpm)	0.06	0.12	0.00	0.06	4
Centrifuge Feed Rate (gpm)	4.37	4.85	3.94	0.41	4
Reagent Feed to FLRT (gpm)	2.44	2.54	2.36	0.08	4
Facility Inlet SO2 Conc. (ppm)	1228	1358	1061	128	4
Inlet SO2 Concentration (ppm)	2300	2302	2295	2	4
Outlet SO2 Concentration (ppm)	157	178	141	14	4
Inlet O2 Concentration (%)	8.67	9.36	7.90	0.66	4
Outlet O2 Concentration (%)	8.64	9.15	8.03	0.51	4
Absorber Gas Velocity (ft/sec)	9.96	9.98	9.95	0.02	4
Inlet Gas Temperature (F)	265	267	264	1	4
Outlet Gas Temperature (F)	123	124	121	1	4
SO2 Absorbed (mmole/L)	14.37	14.49	14.20	0.11	4
Solids Residence Time (hrs)	10.0	10.1	9.9	0.1	4
Slurry Residence Time (min)	4.04	4.04	4.04	0.00	4
Absorber Pressure Drop (in H2O)	4.70	4.72	4.69	0.02	4
Spray Zone Pressure Drop (in H2O)	2.55	2.57	2.53	0.02	4
Tray Pressure Drop (in H2O)	2.28	2.29	2.27	0.01	4
ME Pressure Drop (in H2O)	0.39	0.40	0.39	0.00	4
Oxidation Air to Rxn Tank (scfm)	550	552	549	1	4
DBA Addition Rate (mL/min)	85	85	85	0	4
Inlet HCl Concentration (ppm)	-	-	-	-	-
NYSEG Load (MW)	614	706	535	79	4

T19-NY Process Summary Report
(8/04/95 6:00:00 to 8/04/95 11:00:00)
minus 9-10 AM (spike)

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	92.3	93.4	89.9	1.4	4
SO2 Removal (NTU)	2.57	2.72	2.29	0.17	4
L/G Ratio (gal/macf)	39	39	39	0	4
Reaction Tank pH	4.93	4.99	4.85	0.05	4
Absorber pH	4.69	4.69	4.69	0.00	4
Flue Gas Flow Rate (scfm)	10000	10000	10000	0	4
Header 1 Flow (gpm)	470	470	470	0	4
Header 3 Flow (gpm)	0	0	0	0	4
Header 5 Flow (gpm)	0	0	0	0	4
Blowdown to Sump Rate (gpm)	0.15	0.16	0.15	0.00	4
Centrifuge Feed Rate (gpm)	4.25	4.27	4.21	0.02	4
Reagent Feed to FLRT (gpm)	2.46	2.56	2.42	0.05	4
Facility Inlet SO2 Conc. (ppm)	1142	1236	1039	89	4
Inlet SO2 Concentration (ppm)	2301	2304	2297	3	4
Outlet SO2 Concentration (ppm)	168	218	143	30	4
Inlet O2 Concentration (%)	8.68	9.87	7.61	0.98	4
Outlet O2 Concentration (%)	8.55	9.48	7.68	0.77	4
Absorber Gas Velocity (ft/sec)	10.15	10.16	10.13	0.01	4
Inlet Gas Temperature (F)	306	308	305	1	4
Outlet Gas Temperature (F)	125	126	124	1	4
SO2 Absorbed (mmole/L)	14.29	14.47	13.91	0.23	4
Solids Residence Time (hrs)	9.8	10.1	9.7	0.2	4
Slurry Residence Time (min)	4.04	4.04	4.04	0.00	4
Absorber Pressure Drop (in H2O)	4.78	4.79	4.77	0.01	4
Spray Zone Pressure Drop (in H2O)	2.55	2.56	2.54	0.01	4
Tray Pressure Drop (in H2O)	2.27	2.27	2.26	0.01	4
ME Pressure Drop (in H2O)	0.41	0.42	0.41	0.00	4
Oxidation Air to Rxn Tank (scfm)	501	550	353	85	4
DBA Addition Rate (mL/min)	149	150	148	1	4
Inlet HCl Concentration (ppm)	-	-	-	-	-
NYSEG Load (MW)	602	700	475	91	4

T19-EXY Process Summary Report
(8/07/95 08:00:00 to 8/07/95 10:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	90.0	90.2	89.8	0.2	2
SO2 Removal (NTU)	2.30	2.32	2.28	0.02	2
L/G Ratio (gal/macf)	39	39	39	0	2
Reaction Tank pH	5.00	5.00	5.00	0.00	2
Absorber pH	4.75	4.75	4.75	0.00	2
Flue Gas Flow Rate (scfm)	10000	10000	10000	0	2
Header 1 Flow (gpm)	470	470	470	0	2
Header 3 Flow (gpm)	0	0	0	0	2
Header 5 Flow (gpm)	0	0	0	0	2
Blowdown to Sump Rate (gpm)	0.49	0.49	0.49	0.00	2
Centrifuge Feed Rate (gpm)	3.86	3.86	3.86	0.00	2
Reagent Feed to FLRT (gpm)	2.20	2.21	2.18	0.02	2
Facility Inlet SO2 Conc. (ppm)	1267	1274	1260	7	2
Inlet SO2 Concentration (ppm)	2301	2302	2301	0	2
Outlet SO2 Concentration (ppm)	217	221	213	4	2
Inlet O2 Concentration (%)	8.74	8.82	8.66	0.08	2
Outlet O2 Concentration (%)	8.53	8.60	8.47	0.06	2
Absorber Gas Velocity (ft/sec)	10.13	10.13	10.13	0.00	2
Inlet Gas Temperature (F)	306	306	306	0	2
Outlet Gas Temperature (F)	124	124	124	0	2
SO2 Absorbed (mmole/L)	13.94	13.97	13.91	0.03	2
Solids Residence Time (hrs)	10.3	10.3	10.3	0.0	2
Slurry Residence Time (min)	4.04	4.04	4.04	0.00	2
Absorber Pressure Drop (in H2O)	4.80	4.81	4.79	0.01	2
Spray Zone Pressure Drop (in H2O)	2.53	2.53	2.53	0.00	2
Tray Pressure Drop (in H2O)	2.26	2.26	2.25	0.00	2
ME Pressure Drop (in H2O)	0.45	0.45	0.45	0.00	2
Oxidation Air to Rxn Tank (scfm)	550	550	550	0	2
DBA Addition Rate (mL/min)	188	188	188	0	2
Inlet HCl Concentration (ppm)	-	-	-	-	-
NYSEG Load (MW)	624	631	618	6	2

T19-E Process Summary Report
(8/09/95 07:00:00 to 8/09/95 12:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	86.7	93.5	80.4	5.2	5
SO2 Removal (NTU)	2.10	2.74	1.63	0.42	5
L/G Ratio (gal/macf)	39	39	39	0	5
Reaction Tank pH	5.31	5.68	5.04	0.24	5
Absorber pH	4.87	4.93	4.82	0.04	5
Flue Gas Flow Rate (scfm)	10007	10038	10000	15	5
Header 1 Flow (gpm)	470	470	470	0	5
Header 3 Flow (gpm)	0	0	0	0	5
Header 5 Flow (gpm)	0	0	0	0	5
Blowdown to Sump Rate (gpm)	0.92	0.97	0.73	0.09	5
Centrifuge Feed Rate (gpm)	3.76	4.42	2.26	0.81	5
Reagent Feed to FLRT (gpm)	1.18	1.58	0.87	0.27	5
Facility Inlet SO2 Conc. (ppm)	1195	1252	1124	49	5
Inlet SO2 Concentration (ppm)	2299	2303	2296	2	5
Outlet SO2 Concentration (ppm)	287	423	139	112	5
Inlet O2 Concentration (%)	9.62	10.15	9.25	0.36	5
Outlet O2 Concentration (%)	9.16	9.50	8.78	0.29	5
Absorber Gas Velocity (ft/sec)	10.13	10.15	10.12	0.01	5
Inlet Gas Temperature (F)	312	314	310	2	5
Outlet Gas Temperature (F)	121	122	121	0	5
SO2 Absorbed (mmole/L)	13.43	14.47	12.42	0.80	5
Solids Residence Time (hrs)	10.5	11.3	9.7	0.6	5
Slurry Residence Time (min)	4.04	4.04	4.04	0.00	5
Absorber Pressure Drop (in H2O)	5.02	5.05	4.98	0.02	5
Spray Zone Pressure Drop (in H2O)	1.65	2.39	1.10	0.45	5
Tray Pressure Drop (in H2O)	1.36	2.12	0.78	0.46	5
ME Pressure Drop (in H2O)	0.51	0.52	0.50	0.01	5
Oxidation Air to Rxn Tank (scfm)	550	551	549	1	5
DBA Addition Rate (mL/min)	137	137	137	0	5
Inlet HCl Concentration (ppm)	47	49	45	2	3
NYSEG Load (MW)	478	553	372	63	5

T20-C Process Summary Report
(8/11/95 07:00:00 to 8/11/95 12:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	87.8	89.0	86.4	1.1	5
SO2 Removal (NTU)	2.11	2.21	2.00	0.09	5
L/G Ratio (gal/macf)	39	39	39	0	5
Reaction Tank pH	5.09	5.12	5.02	0.03	5
Absorber pH	4.82	4.86	4.73	0.05	5
Flue Gas Flow Rate (scfm)	10000	10001	10000	0	5
Header 1 Flow (gpm)	470	470	470	0	5
Header 3 Flow (gpm)	0	0	0	0	5
Header 5 Flow (gpm)	0	0	0	0	5
Blowdown to Sump Rate (gpm)	0.32	0.32	0.32	0.00	5
Centrifuge Feed Rate (gpm)	3.41	3.57	3.28	0.13	5
Reagent Feed to FLRT (gpm)	2.14	2.47	1.95	0.18	5
Facility Inlet SO2 Conc. (ppm)	1350	1390	1262	45	5
Inlet SO2 Concentration (ppm)	2301	2304	2299	2	5
Outlet SO2 Concentration (ppm)	263	294	237	23	5
Inlet O2 Concentration (%)	8.81	9.76	8.26	0.60	5
Outlet O2 Concentration (%)	8.40	8.92	8.15	0.27	5
Absorber Gas Velocity (ft/sec)	10.17	10.18	10.17	0.00	5
Inlet Gas Temperature (F)	314	315	314	0	5
Outlet Gas Temperature (F)	124	125	124	0	5
SO2 Absorbed (mmole/L)	13.60	13.78	13.39	0.15	5
Solids Residence Time (hrs)	10.3	10.5	10.2	0.1	5
Slurry Residence Time (min)	4.04	4.04	4.04	0.00	5
Absorber Pressure Drop (in H2O)	5.24	5.25	5.23	0.01	5
Spray Zone Pressure Drop (in H2O)	2.65	2.65	2.64	0.00	5
Tray Pressure Drop (in H2O)	2.37	2.37	2.36	0.00	5
ME Pressure Drop (in H2O)	0.54	0.55	0.54	0.00	5
Oxidation Air to Rxn Tank (scfm)	595	651	444	80	5
DBA Addition Rate (mL/min)	107	109	106	1	5
Inlet HCl Concentration (ppm)	50	51	48	1	5
NYSEG Load (MW)	630	667	551	44	5

T20-EC Process Summary Report
(8/14/95 08:00:00 to 8/14/95 12:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	88.6	89.5	87.6	0.7	4
SO2 Removal (NTU)	2.17	2.25	2.09	0.06	4
L/G Ratio (gal/macf)	39	39	39	0	4
Reaction Tank pH	4.98	5.02	4.96	0.03	4
Absorber pH	4.77	4.78	4.77	0.00	4
Flue Gas Flow Rate (scfm)	10000	10000	10000	0	4
Header 1 Flow (gpm)	470	470	470	0	4
Header 3 Flow (gpm)	0	0	0	0	4
Header 5 Flow (gpm)	0	0	0	0	4
Blowdown to Sump Rate (gpm)	0.80	0.80	0.79	0.01	4
Centrifuge Feed Rate (gpm)	4.36	5.15	3.91	0.50	4
Reagent Feed to FLRT (gpm)	2.91	3.35	2.62	0.28	4
Facility Inlet SO2 Conc. (ppm)	1238	1318	1154	75	4
Inlet SO2 Concentration (ppm)	2339	2411	2297	43	4
Outlet SO2 Concentration (ppm)	251	280	227	19	4
Inlet O2 Concentration (%)	9.48	10.36	8.56	0.77	4
Outlet O2 Concentration (%)	9.12	9.80	8.45	0.58	4
Absorber Gas Velocity (ft/sec)	10.16	10.18	10.14	0.02	4
Inlet Gas Temperature (F)	313	315	311	1	4
Outlet Gas Temperature (F)	124	125	122	1	4
SO2 Absorbed (mmole/L)	13.95	14.22	13.82	0.16	4
Solids Residence Time (hrs)	10.2	10.3	10.0	0.1	4
Slurry Residence Time (min)	4.04	4.04	4.04	0.00	4
Absorber Pressure Drop (in H2O)	5.71	5.73	5.67	0.02	4
Spray Zone Pressure Drop (in H2O)	2.64	2.66	2.61	0.02	4
Tray Pressure Drop (in H2O)	2.36	2.38	2.33	0.02	4
ME Pressure Drop (in H2O)	0.63	0.63	0.62	0.00	4
Oxidation Air to Rxn Tank (scfm)	598	649	550	48	4
DBA Addition Rate (mL/min)	86	86	86	0	4
Inlet HCl Concentration (ppm)	46	49	44	2	4
NYSEG Load (MW)	518	627	391	92	4

T21-N Process Summary Report
(8/30/95 08:00:00 to 8/30/95 12:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	91.5	92.4	90.9	0.6	5
SO2 Removal (NTU)	2.47	2.58	2.39	0.08	5
L/G Ratio (gal/macf)	30	31	30	0	5
Reaction Tank pH	6.00	6.00	5.99	0.00	5
Absorber pH	5.20	5.20	5.19	0.00	5
Flue Gas Flow Rate (scfm)	8250	8250	8248	1	5
Header 1 Flow (gpm)	300	300	300	0	5
Header 3 Flow (gpm)	0	0	0	0	5
Header 5 Flow (gpm)	0	0	0	0	5
Blowdown to Sump Rate (gpm)	0.22	0.27	0.11	0.06	5
Centrifuge Feed Rate (gpm)	2.49	3.97	1.13	1.22	5
Reagent Feed to FLRT (gpm)	1.29	1.31	1.28	0.01	5
Facility Inlet SO2 Conc. (ppm)	1023	1145	907	90	5
Inlet SO2 Concentration (ppm)	1993	2005	1968	13	5
Outlet SO2 Concentration (ppm)	159	169	143	11	5
Inlet O2 Concentration (%)	9.01	9.27	8.80	0.20	5
Outlet O2 Concentration (%)	8.78	8.98	8.64	0.11	5
Absorber Gas Velocity (ft/sec)	8.36	8.39	8.31	0.03	5
Inlet Gas Temperature (F)	309	314	301	5	5
Outlet Gas Temperature (F)	122	123	120	1	5
SO2 Absorbed (mmole/L)	15.88	16.09	15.56	0.19	5
Solids Residence Time (hrs)	8.6	8.7	8.5	0.1	5
Slurry Residence Time (min)	8.44	8.44	8.43	0.00	5
Absorber Pressure Drop (in H2O)	3.35	3.37	3.33	0.01	5
Spray Zone Pressure Drop (in H2O)	1.77	1.78	1.76	0.01	5
Tray Pressure Drop (in H2O)	1.74	1.99	1.66	0.12	5
ME Pressure Drop (in H2O)	0.40	0.42	0.40	0.01	5
Oxidation Air to Rxn Tank (scfm)	499	500	496	2	5
DBA Addition Rate (mL/min)	55	55	55	0	5
Inlet HCl Concentration (ppm)	53	58	47	4	5
NYSEG Load (MW)	689	691	687	2	5

T21-E Process Summary Report
(8/31/95 08:00:00 to 8/31/95 13:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	91.8	92.8	90.6	0.9	5
SO2 Removal (NTU)	2.50	2.64	2.37	0.11	5
L/G Ratio (gal/macf)	30	30	30	0	5
Reaction Tank pH	6.00	6.01	6.00	0.00	5
Absorber pH	5.16	5.17	5.14	0.01	5
Flue Gas Flow Rate (scfm)	8250	8250	8250	0	5
Header 1 Flow (gpm)	300	300	300	0	5
Header 3 Flow (gpm)	0	0	0	0	5
Header 5 Flow (gpm)	0	0	0	0	5
Blowdown to Sump Rate (gpm)	0.20	0.22	0.19	0.01	5
Centrifuge Feed Rate (gpm)	4.38	4.38	4.38	0.00	5
Reagent Feed to FLRT (gpm)	1.30	1.35	1.26	0.03	5
Facility Inlet SO2 Conc. (ppm)	1500	1549	1440	39	5
Inlet SO2 Concentration (ppm)	1883	2018	1728	107	5
Outlet SO2 Concentration (ppm)	145	168	136	12	5
Inlet O2 Concentration (%)	9.39	10.01	8.54	0.56	5
Outlet O2 Concentration (%)	8.61	8.76	8.43	0.12	5
Absorber Gas Velocity (ft/sec)	8.38	8.39	8.36	0.01	5
Inlet Gas Temperature (F)	309	314	305	4	5
Outlet Gas Temperature (F)	123	124	123	0	5
SO2 Absorbed (mmole/L)	15.03	16.30	13.75	0.95	5
Solids Residence Time (hrs)	9.1	9.9	8.4	0.6	5
Slurry Residence Time (min)	8.43	8.44	8.43	0.00	5
Absorber Pressure Drop (in H2O)	3.36	3.37	3.35	0.01	5
Spray Zone Pressure Drop (in H2O)	1.70	1.71	1.70	0.00	5
Tray Pressure Drop (in H2O)	1.91	2.24	1.68	0.19	5
ME Pressure Drop (in H2O)	0.39	0.39	0.39	0.00	5
Oxidation Air to Rm Tank (scfm)	500	501	499	0	5
DBA Addition Rate (mL/min)	112	112	111	0	5
Inlet HCl Concentration (ppm)	39	40	39	1	5
NYSEG Load (MW)	690	702	678	8	5

T21-EC Process Summary Report
(9/01/95 08:00:00 to 9/01/95 13:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	92.7	92.8	92.7	0.0	5
SO2 Removal (NTU)	2.62	2.63	2.62	0.00	5
L/G Ratio (gal/macf)	30	31	30	0	5
Reaction Tank pH	6.00	6.00	6.00	0.00	5
Absorber pH	5.33	5.34	5.33	0.00	5
Flue Gas Flow Rate (scfm)	8278	8374	8250	48	5
Header 1 Flow (gpm)	300	300	300	0	5
Header 3 Flow (gpm)	0	0	0	0	5
Header 5 Flow (gpm)	0	0	0	0	5
Blowdown to Sump Rate (gpm)	0.25	0.32	0.19	0.06	5
Centrifuge Feed Rate (gpm)	3.21	3.29	3.19	0.04	5
Reagent Feed to FLRT (gpm)	1.30	1.32	1.29	0.01	5
Facility Inlet SO2 Conc. (ppm)	1621	1660	1600	21	5
Inlet SO2 Concentration (ppm)	2000	2003	1998	2	5
Outlet SO2 Concentration (ppm)	137	137	136	1	5
Inlet O2 Concentration (%)	9.45	9.77	9.08	0.30	5
Outlet O2 Concentration (%)	9.21	9.48	8.94	0.23	5
Absorber Gas Velocity (ft/sec)	8.37	8.47	8.34	0.05	5
Inlet Gas Temperature (F)	305	306	303	1	5
Outlet Gas Temperature (F)	121	122	120	0	5
SO2 Absorbed (mmole/L)	16.19	16.38	16.12	0.10	5
Solids Residence Time (hrs)	8.4	8.4	8.3	0.1	5
Slurry Residence Time (min)	8.43	8.44	8.43	0.00	5
Absorber Pressure Drop (in H2O)	3.33	3.35	3.32	0.01	5
Spray Zone Pressure Drop (in H2O)	1.74	1.77	1.67	0.04	5
Tray Pressure Drop (in H2O)	2.09	3.38	1.66	0.66	5
ME Pressure Drop (in H2O)	0.39	0.39	0.38	0.00	5
Oxidation Air to Rm Tank (scfm)	500	500	499	0	5
DBA Addition Rate (mL/min)	76	94	69	9	5
Inlet HCl Concentration (ppm)	34	36	32	2	5
NYSEG Load (MW)	669	701	612	31	5

**ECTC Carbon Injection Testing
Mercury Gas Sampling Results
HSSD Inlet Location
(SDA In)**

Test ID	Date	Start Time	Gas Volume (dscf)	Moisture (% H ₂ O)	SDA Inlet O ₂ (%)	Solid Hg Sample [Hg] (ppm)	H ₂ O ₂ Sample [Hg] (ng/ml)	KMnO ₄ Sample [Hg] (ng/ml)	Solid Hg Sample Mass (g)	H ₂ O ₂ Sample Mass (g)	KMnO ₄ Sample Mass (g)	Solid Hg [Hg] In Gas (µg/Nm ³)	H ₂ O ₂ [Hg] In Gas (µg/Nm ³)	KMnO ₄ [Hg] In Gas (µg/Nm ³)	Total [Hg] In Gas (µg/Nm ³)
Carbon, 325 °F															
PIFF-6	Fri-8/18	09:15	50.80	8.52	5.50	0.05	20.70	1.75	2.48	475.2	412.3	0.10	7.34	0.54	7.97
PIFF-6	Fri-8/18	12:25	56.95	9.30	5.41	0.04	20.65	0.90	2.92	479.5	426.6	0.08	6.59	0.26	6.92
PIFF-6	Fri-8/18	15:20	50.34	8.82	5.37	0.03	18.70	1.63	1.61	536.9	483.4	0.04	7.56	0.59	8.19
Averages												0.1	7.2	0.5	7.7
Carbon, 275 °F															
PIFF-7	Sat-8/19	09:00	48.31	8.68	5.55	< 0.01	15.60	1.16	2.36	497.4	482.6	< 0.02	6.09	0.44	6.54
PIFF-7	Sat-8/19	11:00	50.81	9.05	6.05	< 0.01	18.60	1.21	2.00	467.1	403.3	< 0.01	6.48	0.36	6.86
PIFF-7	Sat-8/19	13:15	48.41	14.40	5.42	0.02	12.90	1.23	2.07	541.1	465.6	0.03	5.46	0.45	5.94
Averages												0.0	6.0	0.4	6.4
Carbon/Lime, 275 °F															
PIFF-8	Mon-8/21	08:00	56.51	7.68	6.59	< 0.01	25.00	1.80	3.44	463.3	412.3	< 0.02	7.77	0.50	8.28
PIFF-8	Mon-8/21	10:30	65.22	8.05	5.75	< 0.01	27.30	1.42	4.74	492.1	431.5	< 0.02	7.80	0.36	8.19
PIFF-8	Mon-8/21	13:00	44.65	8.44	6.19	< 0.01	19.30	1.22	3.27	462.1	436.4	< 0.03	7.57	0.45	8.05
Averages												0.0	7.7	0.4	8.2
Carbon, 225 °F															
PIFF-9	Tue-8/22	08:00	55.26	7.19	7.42	< 0.01	21.00	1.41	5.34	511.0	540.5	< 0.04	7.36	0.52	7.92
PIFF-9	Tue-8/22	10:30	53.06	6.71	8.03	< 0.01	19.30	1.38	0.68	565.7	466.8	< 0.01	7.79	0.46	8.26
PIFF-9	Tue-8/22	13:30	51.09	6.63	8.23	< 0.01	20.60	1.49	4.85	467.1	436.8	< 0.04	7.13	0.48	7.65
Averages												0.0	7.4	0.5	7.9
Carbon/Lime, 225 °F															
PIFF-10	Wed-8/23	08:00	49.81	7.10	8.04	< 0.01	16.00	1.40	5.18	516.5	450.8	< 0.04	6.28	0.48	6.80
PIFF-10	Wed-8/23	10:30	44.91	7.37	6.91	< 0.01	15.17	1.24	5.26	493.4	473.6	< 0.04	6.31	0.50	6.85
PIFF-10	Wed-8/23	12:30	72.51	8.16	5.29	0.03	27.80	1.64	10.10	519.3	459.6	0.14	7.54	0.39	8.08
Averages												0.1	6.7	0.5	7.2
Lime, 225 °F															
PIFF-11	Thu-8/24	09:00	61.59	7.02	6.54	0.08	22.30	1.23	6.03	487.9	480.3	0.29	6.69	0.36	7.34
PIFF-11	Thu-8/24	11:30	62.39	7.89	4.94	0.12	19.85	0.27	8.55	485.7	462.9	0.62	5.85	0.08	6.55
PIFF-11	Thu-8/24	14:00	52.66	7.32	5.85	0.10	18.77	0.63	6.05	465.0	427.4	0.45	6.28	0.19	6.92
Averages												0.5	6.3	0.2	6.9
Baseline, 225 °F															
PIFF-12	Fri-8/25	08:00	50.70	7.02	6.41	0.08	18.10	1.47	6.55	448.1	475.9	0.39	6.06	0.52	6.97
PIFF-12	Fri-8/25	10:00	51.08	7.47	5.84	0.12	15.25	0.58	5.52	493.4	487.7	0.47	5.58	0.21	6.27
PIFF-12	Fri-8/25	12:00	54.85	7.59	6.72	0.08	20.51	1.24	7.80	497.2	455.1	0.43	7.04	0.39	7.86
Averages												0.4	6.2	0.4	7.0

* Boldfaced values indicate mercury values below the low standard.

**ECTC Carbon Injection Testing
Mercury Gas Sampling Results
SDA Outlet Location
(SDA Out)**

Test ID	Date	Start Time	Sample ID	Gas Volume (dscf)	Moisture (% H ₂ O)	SDA Outlet O ₂ (%)	Solid Hg Sample [Hg] (ppm)	H ₂ O ₂ Sample [Hg] (ng/ml)	KMnO ₄ Sample [Hg] (ng/ml)	Solid Hg Sample Mass (g)	H ₂ O ₂ Sample Mass (g)	KMnO ₄ Sample Mass (g)	Solid Hg [Hg] In Gas (µg/Nm ³)	H ₂ O ₂ [Hg] In Gas (µg/Nm ³)	KMnO ₄ [Hg] In Gas (µg/Nm ³)	Total [Hg] In Gas (µg/Nm ³)
Carbon, 325°F																
PIFF-6	Fri-8/18	09:15	R80	51.45	8.41	5.79	0.05	19.60	1.72	2.59	469.7	386.2	0.10	6.78	0.49	7.37
PIFF-6	Fri-8/18	12:25	R83	40.76	8.99	5.68	0.05	14.50	1.31	1.90	453.9	406.1	0.09	6.12	0.49	6.70
PIFF-6	Fri-8/18	15:20	R86	51.37	8.34	5.64	0.03	17.90	1.23	1.28	538.9	490.5	0.03	7.11	0.44	7.59
Averages													0.07	6.67	0.48	7.22
Carbon, 275°F																
PIFF-7	Sat-8/19	09:00	R89	47.73	10.47	6.28	0.24	12.30	0.24	2.73	527.0	468.0	0.52	5.14	0.09	5.75
PIFF-7	Sat-8/19	11:00	R92	50.80	9.56	6.76	0.22	14.20	0.30	3.13	514.8	468.3	0.51	5.45	0.11	6.07
PIFF-7	Sat-8/19	13:15	R95	55.38	9.99	6.14	0.42	12.30	0.07	4.55	535.3	463.1	1.31	4.50	0.02	5.84
Averages													0.78	5.03	0.07	5.89
Carbon/Lime, 275°F																
PIFF-8	Mon-8/21	08:00	R 98	50.31	8.34	7.31	0.13	17.60	0.65	4.89	493.4	432.3	0.49	6.54	0.21	7.24
PIFF-8	Mon-8/21	10:30	R 101	64.63	8.69	6.54	0.25	22.00	0.25	7.09	505.8	427.0	1.05	6.52	0.06	7.64
PIFF-8	Mon-8/21	13:00	R 104	45.87	9.35	6.95	0.21	17.00	0.13	4.70	461.5	440.5	0.82	6.48	0.05	7.35
Averages													0.79	6.51	0.11	7.41
Carbon, 225°F																
PIFF-9	Tue-8/22	08:00	R 107	49.43	9.18	7.93	0.28	13.10	0.16	6.50	563.6	493.4	1.39	5.66	0.06	7.11
PIFF-9	Tue-8/22	10:30	R 110	55.72	8.91	8.40	0.23	16.10	0.12	10.03	515.4	476.6	1.56	5.64	0.04	7.24
PIFF-9	Tue-8/22	13:30	R 113	54.23	9.03	8.59	0.15	17.60	0.49	5.73	508.6	454.3	0.61	6.25	0.16	7.02
Averages													1.19	5.85	0.08	7.12
Carbon/Lime, 225°F																
PIFF-10	Wed-8/23	08:00	R 116	50.67	9.35	8.49	0.22	13.40	0.36	6.57	513.0	488.0	1.06	5.14	0.13	6.33
PIFF-10	Wed-8/23	10:30	R 119	43.83	9.38	7.42	0.35	11.94	0.42	5.99	486.0	469.9	1.82	5.02	0.17	7.01
PIFF-10	Wed-8/23	12:30	R 122	59.29	10.25	5.93	0.57	10.70	0.26	10.87	529.3	498.5	3.97	3.62	0.08	7.67
Averages													2.28	4.59	0.13	7.00
Lime, 225°F																
PIFF-11	Thu-8/24	09:00	R 125	50.30	9.33	7.02	0.68	8.80	0.34	6.13	501.9	456.8	3.14	3.33	0.12	6.58
PIFF-11	Thu-8/24	11:30	R 128	67.92	10.29	5.53	0.85	4.14	< 0.05	12.81	560.4	532.9	6.07	1.29	< 0.01	7.38
PIFF-11	Thu-8/24	14:00	R 131	51.07	9.60	6.37	0.80	3.87	< 0.05	10.34	492.6	435.0	6.13	1.41	< 0.02	7.56
Averages													5.11	2.01	0.05	7.17
Baseline, 225°F																
PIFF-12	Fri-8/25	08:00	R 134	52.07	9.35	6.53	0.33	12.83	0.31	7.20	510.9	450.7	1.71	4.77	0.10	6.58
PIFF-12	Fri-8/25	10:00	R 137	47.45	9.67	6.04	0.78	6.80	0.03	5.07	508.9	455.3	3.17	2.76	0.01	5.94
PIFF-12	Fri-8/25	12:00	R 140	53.28	10.08	6.39	0.47	12.08	0.06	6.83	549.5	452.6	2.29	4.72	0.02	7.02
Averages													2.39	4.08	0.04	6.51

* Italicized values indicate mercury values below the low standard.

**ECTC Carbon Injection Testing
Mercury Gas Sampling Results
HSSD Outlet Location
(PJFF Outlet)**

Test ID	Date	Start Time	Sample ID	Gas Volume (dscf)	Moisture (% H ₂ O)	Outlet O ₂ (%)	Solid Hg Sample [Hg] (ppm)	H ₂ O ₂ Sample [Hg] (ng/ml)	KMnO ₄ Sample [Hg] (ng/ml)	Solid Hg Sample Mass (g)	H ₂ O ₂ Sample Mass (g)	KMnO ₄ Sample Mass (g)	Solid Hg In Gas [Hg] (µg/Nm ³)	H ₂ O ₂ In Gas [Hg] (µg/Nm ³)	KMnO ₄ In Gas [Hg] (µg/Nm ³)	Total In Gas [Hg] (µg/Nm ³)
Carbon, 325°F																
PJFF-6	Fri-8/18	09:15	R81	69.03	6.99	8.28	19.20	19.50	0.66	0.03	509.7	419.4	0.34	5.45	0.15	5.95
PJFF-6	Fri-8/18	12:25	R84	69.51	7.69	8.21	27.50	13.10	0.12	0.06	502.6	422.1	0.89	3.59	0.03	4.51
PJFF-6	Fri-8/18	15:20	R87	47.80	8.65	8.33	18.30	5.32	0.74	0.13	557.8	527.4	1.94	2.35	0.31	4.60
Averages													1.06	3.80	0.16	5.02
Carbon, 275°F																
PJFF-7	Sat-8/19	09:00	R90	61.47	8.54	8.78	2.27	0.52	< 0.05	0.07	489.5	411.7	0.10	0.16	0.01	0.27
PJFF-7	Sat-8/19	11:00	R93	63.68	8.57	9.08	1.78	0.78	< 0.05	0.09	550.6	462.7	0.10	0.26	0.01	0.37
PJFF-7	Sat-8/19	13:15	R96	57.53	8.67	8.55	2.39	0.52	< 0.05	0.07	522.9	467.7	0.12	0.18	0.02	0.31
Averages													0.10	0.20	0.01	0.31
Carbon/Lime, 275°F																
PJFF-8	Mon-8/21	08:00	R 99	54.18	7.40	9.53	4.74	0.85	1.11	0.09	483.3	406.2	0.28	0.29	0.32	0.89
PJFF-8	Mon-8/21	10:30	R 102	56.31	7.69	8.95	3.31	0.47	< 0.05	0.09	461.8	416.6	0.21	0.15	0.01	0.37
PJFF-8	Mon-8/21	13:00	R 105	45.20	7.91	9.22	2.74	0.59	< 0.05	0.07	465.2	483.7	0.16	0.23	0.02	0.41
Averages													0.22	0.22	0.12	0.56
Carbon, 225°F																
PJFF-9	Tue-8/22	08:00	R 108	67.86	8.08	10.14	1.19	0.69	< 0.05	0.17	544.8	498.2	0.12	0.21	0.01	0.34
PJFF-9	Tue-8/22	10:30	R 111	66.84	7.67	10.24	1.29	1.06	< 0.05	0.15	491.2	479.6	0.11	0.30	0.01	0.42
PJFF-9	Tue-8/22	13:30	R 114	64.23	7.98	10.44	1.53	1.58	< 0.05	0.12	505.0	500.2	0.11	0.47	0.01	0.59
Averages													0.11	0.33	0.01	0.45
Carbon/Lime, 225°F																
PJFF-10	Wed-8/23	08:00	R 117	57.19	8.11	10.36	1.79	0.18	0.02	0.12	531.1	489.0	0.15	0.06	0.00	0.22
PJFF-10	Wed-8/23	10:30	R 120	64.22	8.19	9.54	1.52	0.52	0.05	0.14	502.5	475.1	0.13	0.15	0.01	0.29
PJFF-10	Wed-8/23	12:30	R 123	71.10	8.98	8.43	1.80	0.64	0.05	0.14	515.6	431.1	0.13	0.18	0.01	0.32
Averages													0.13	0.13	0.01	0.28
Lime, 225°F																
PJFF-11	Thu-8/24	09:00	R 126	55.50	8.55	8.89	0.1µg	2.91	< 0.05	NA	515.4	462.8	0.03	1.02	0.02	1.07
PJFF-11	Thu-8/24	11:30	R 129	68.00	8.95	7.58	0.82	2.84	< 0.05	0.16	549.0	468.2	0.07	0.87	0.01	0.95
PJFF-11	Thu-8/24	14:00	R 132	58.95	7.95	8.53	1.06	2.16	< 0.05	0.12	503.3	483.7	0.08	0.70	0.02	0.80
Averages													0.06	0.86	0.01	0.94
Baseline, 225°F																
PJFF-12	Fri-8/25	08:00	R 135	64.77	7.85	9.10	0.57	6.20	< 0.05	0.12	525.7	454.5	0.04	1.91	0.01	1.96
PJFF-12	Fri-8/25	10:00	R 138	57.54	8.63	7.90	1.00	4.02	< 0.05	0.12	517.3	452.7	0.08	1.37	0.01	1.46
PJFF-12	Fri-8/25	12:00	R 141	55.34	7.89	8.37	8.75	5.24	< 0.05	0.09	506.8	452.6	0.52	1.82	0.02	2.35
Averages													0.21	1.70	0.01	1.92

* Italicized values indicate mercury values below the low standard.

ECTC Carbon Injection Testing Mercury Gas Sampling Results Summary

(Normalized to 5% O₂)

Test ID	Date	Start Time	Solid P1FF/ESP						H2O2 P1FF/ESP						KMnO4 P1FF/ESP						Total P1FF/ESP						Carbon lb/hr FG Flow (SCFM) Cd(gv) lb/lb		
			SDA Inlet (µg/Nm3)	SDA Outlet (µg/Nm3)	Hg Rem (%)	Outlet SDA [Hg] (µg/Nm3)	Hg Rem. P1FF (%)	Hg Rem. SDA & P1FF (%)	SDA Inlet (µg/Nm3)	SDA Outlet (µg/Nm3)	Hg Rem (%)	Outlet SDA [Hg] (µg/Nm3)	Hg Rem. P1FF (%)	Hg Rem. SDA & P1FF (%)	SDA Inlet (µg/Nm3)	SDA Outlet (µg/Nm3)	Hg Rem (%)	Outlet SDA [Hg] (µg/Nm3)	Hg Rem. P1FF (%)	Hg Rem. SDA & P1FF (%)	SDA Inlet (µg/Nm3)	SDA Outlet (µg/Nm3)	Hg Rem (%)	Outlet SDA [Hg] (µg/Nm3)	Hg Rem. P1FF (%)	Hg Rem. SDA & P1FF (%)			
Carbon, 325°F																													
P1FF-6	Fri-8/18	09:15	0.10	0.11	-3	0.43	-	-316%	7.57	7.13	5.83	6.86	3.8	9%	0.55	0.51	7.10	0.19	62.9	65%	8.23	7.75	5.80	7.48	3.5	9%	1.04	4136	10827
P1FF-6	Fri-8/18	12:25	0.08	0.09	-8	1.12	-1133	-1234%	6.76	6.39	5.53	4.49	29.7	34%	0.26	0.52	-96.93	0.03	93.6	87%	7.11	6.99	1.59	5.64	19.4	21%	0.86	4178	9807
P1FF-6	Fri-8/18	15:20	0.04	0.03	32	2.45	-8776	-5901%	7.73	7.41	4.15	2.97	60.0	62%	0.61	0.46	23.61	0.39	15.7	36%	8.38	7.90	5.70	5.81	26.5	31%	0.98	4145	9781
Averages			0.08	0.07	7	1.3	-4954	-2483%	7.35	6.98	5.17	4.77	31.2	35%	0.47	0.50	-22.07	0.20	57.4	63%	7.90	7.55	4.36	6.31	16.5	20%	0.96	4153	10139
Carbon, 275°F																													
P1FF-7	Sat-8/19	09:00	0.02	0.56	-2829	0.13	-	-563%	6.30	5.59	11.27	0.20	96.4	97%	0.45	0.10	78.78	0.02	82.7	96%	6.77	6.25	7.75	0.35	94.4	95%	1.05	4513	14235
P1FF-7	Sat-8/19	11:00	0.01	0.58	-3913	0.13	78	-802%	6.93	6.12	11.64	0.34	94.4	95%	0.39	0.12	69.41	0.02	84.5	95%	7.33	6.82	7.01	0.49	92.8	93%	0.95	4526	11906
P1FF-7	Sat-8/19	13:15	0.03	1.42	-4150	0.15	90	-346%	5.61	4.85	13.55	0.23	95.3	96%	0.46	0.02	95.18	0.02	10.7	96%	6.10	6.29	-3.01	0.40	93.7	93%	0.82	4525	12756
Averages			0.02	0.85	-3631	0.1	84	-570%	6.28	5.52	12.15	0.26	95.3	96%	0.43	0.08	81.12	0.02	59.3	96%	6.74	6.45	3.92	0.41	93.6	94%	0.94	4521	12966
Carbon/Lime, 275°F																													
P1FF-8	Mon-8/21	08:00	0.02	0.57	-2367	0.39	-	-1614%	8.62	7.64	11.40	0.40	94.7	95%	0.55	0.25	54.95	0.44	-76.7	20%	9.20	8.46	8.06	1.24	85.4	87%	0.89	4519	9071
P1FF-8	Mon-8/21	10:30	0.03	1.16	-4372	0.28	76	-975%	8.19	7.22	11.87	0.19	97.3	98%	0.37	0.07	81.21	0.02	73.6	95%	8.59	8.45	1.61	0.49	94.2	94%	0.81	4635	8278
P1FF-8	Mon-8/21	13:00	0.03	0.94	-3027	0.21	77	-612%	8.17	7.38	9.73	0.31	95.8	96%	0.49	0.05	89.17	0.03	48.1	94%	8.69	8.37	3.74	0.55	93.4	94%	0.69	4485	7400
Averages			0.03	0.89	-3255	0.3	77	-1067%	8.33	7.41	11.00	0.30	95.9	96%	0.47	0.12	75.11	0.16	15.0	70%	8.83	8.42	4.47	0.76	91.0	91%	0.79	4546	8250
Carbon, 225°F																													
P1FF-9	Tue-8/22	08:00	0.04	1.71	-3861	0.17	-	-296%	8.67	6.93	20.08	0.31	95.5	96%	0.62	0.07	87.82	0.02	72.7	97%	9.33	8.71	6.62	0.50	94.2	95%	0.50	4488	6086
P1FF-9	Tue-8/22	10:30	0.01	1.97	-29939	0.17	92	-2423%	9.61	7.16	25.47	0.44	93.9	95%	0.57	0.05	91.44	0.02	58.4	96%	10.19	9.19	9.80	0.62	93.2	94%	0.50	4899	5598
P1FF-9	Tue-8/22	13:30	0.05	0.78	-1642	0.16	79	-257%	8.94	8.06	9.82	0.71	91.2	92%	0.60	0.20	66.91	0.02	88.8	96%	9.59	9.04	5.66	0.90	90.1	91%	0.50	4732	5143
Averages			0.03	1.49	-11814	0.2	86	-992%	9.07	7.38	18.46	0.49	93.5	95%	0.60	0.11	82.06	0.02	73.3	96%	9.70	8.98	7.36	0.67	92.5	93%	0.50	4706	5609
Carbon/Lime, 225°F																													
P1FF-10	Wed-8/23	08:00	0.04	1.35	-2985	0.22	-	-405%	7.76	6.57	15.26	0.10	98.5	99%	0.59	0.17	71.85	0.01	95.6	99%	8.39	8.09	3.61	0.33	96.0	96%	0.74	4782	9285
P1FF-10	Wed-8/23	10:30	0.05	2.15	-4642	0.18	92	-289%	7.16	5.91	17.54	0.21	96.4	97%	0.56	0.20	64.61	0.02	90.2	97%	7.77	8.25	-6.21	0.41	95.0	95%	0.49	4749	6231
P1FF-10	Wed-8/23	12:30	0.15	4.22	-2805	0.17	96	-15%	7.68	3.84	50.00	0.22	94.2	97%	0.40	0.09	78.42	0.01	83.1	96%	8.23	8.14	1.03	0.41	95.0	95%	0.48	4812	8610
Averages			0.08	2.57	-3477	0.2	94	-236%	7.53	5.44	27.60	0.18	96.4	98%	0.52	0.15	71.63	0.01	89.6	97%	8.13	8.16	-0.52	0.38	95.3	95%	0.57	4781	8042
Lime, 225°F																													
P1FF-11	Thu-8/24	09:00	0.32	3.59	-1035	0.05	-	85%	7.40	3.81	48.60	1.35	64.5	82%	0.40	0.14	66.32	0.02	84.6	95%	8.12	7.53	7.30	1.42	81.2	83%	0.00	4781	-
P1FF-11	Thu-8/24	11:30	0.62	6.28	-911	0.09	99	86%	5.83	1.34	77.05	1.04	22.6	82%	0.08	0.02	79.67	0.02	-1.1	79%	6.53	7.63	-16.86	1.14	85.1	83%	0.00	4712	-
P1FF-11	Thu-8/24	14:00	0.47	6.70	-1315	0.11	98	77%	6.63	1.55	76.68	0.90	42.1	86%	0.20	0.02	91.32	0.02	-13.0	90%	7.31	8.27	-13.13	1.02	87.6	86%	0.00	4771	-
Averages			0.47	5.52	-1087	0.1	99	83%	6.62	2.23	67.44	1.09	43.1	83%	0.23	0.06	79.10	0.02	23.5	88%	7.32	7.81	-7.57	1.19	84.6	84%	0.00	4755	-
Baseline, 225°F																													
P1FF-12	Fri-8/25	08:00	0.42	1.89	-346	0.05	97	87%	6.64	5.27	20.70	2.56	51.4	61%	0.57	0.11	80.24	0.02	84.2	97%	7.64	7.27	4.86	2.64	63.7	66%	0.00	4599	-
P1FF-12	Fri-8/25	10:00	0.50	3.39	-576	0.10	97	80%	5.89	2.95	49.82	1.67	43.4	72%	0.22	0.01	94.42	0.02	-46.3	92%	6.61	6.35	3.90	1.79	71.8	73%	0.00	4641	-
P1FF-12	Fri-8/25	12:00	0.48	2.50	-419	0.65	74	-35%	7.89	5.17	34.50	2.30	55.4	71%	0.44	0.02	95.24	0.02	5.6	96%	8.81	7.69	12.68	2.97	61.3	66%	0.00	4409	-
Averages			0.47	2.59	-447	0.3	89	44%	6.81	4.46	35.01	2.18	50.1	68%	0.41	0.05	89.96	0.02	14.5	95%	7.69	7.11	7.15	2.47	65.6	68%	0.00	4550	-

* Italicized values indicate mercury values below the low standard.

ECTC Carbon Injection Testing Mercury Gas Sampling Results Summary (Normalized to 5% O₂)

Test ID	Date	Start Time	C-Hg(lb/hr)	SDA In FG Flow (SCFM)	SDA In T (°F)	SDA Out T (°F)	SDA Out GPM (cfm)	SDA Out Moisture (ppm)	PJ Out FG Flow (SCFM)	SDA In Tot Part. (lb/hr)	SDA Out FG Part. (lb/hr)	SDA Waste		PJ Waste		HSSD Sys Part. (lb/hr)	Hg FO SDA In (lb/hr)	Hg FO SDA Out (lb/hr)	Total Hg In SDA (lb/hr)	Total Hg Out SDA (lb/hr)	Closure SDA Bal (Out/In) (%)	Hg flow PJ out (lb/hr)	Closure PJ Bal (Out/In) (%)		
												Para SDA Out (lb/hr)	[Hg] SDA Bottoms (ppm)	PJ Out FG Part. (lb/hr)	Para PJ Out (lb/hr)									[Hg] PJ Bottoms (ppm)	
Carbon, 325°F																									
PIFF-6	Fri-8/18	09:15	10679	4059	375	350	4136	0.00	4132	4946	23.92	25.19	-1.27	0.00	0.28	25.95	1.97	24.67	1.03E-4	9.74E-5	1.03E-4	9.74E-5	94.31	9.54E-5	150.49
PIFF-6	Fri-8/18	12:25	9680	4107	375	350	4178	0.00	4165	5004	25.21	23.46	1.75	0.00	0.52	23.80	1.97	25.55	9.00E-5	8.88E-5	9.00E-5	8.88E-5	98.75	7.26E-5	134.51
PIFF-6	Fri-8/18	15:20	9747	4072	375	350	4145	0.00	4125	5025	15.66	12.55	3.12	0.00	1.70	11.83	1.97	14.95	1.06E-4	1.01E-4	1.06E-4	1.01E-4	94.80	7.37E-5	96.43
Averages			10035	4079																					
Carbon, 275°F																									
PIFF-7	Sat-8/19	09:00	12957	4232	370	293	4513	0.40	4521	5436	44.93	30.55	14.38	0.00	0.74	30.86	1.88	25.27	8.82E-5	8.10E-5	8.82E-5	8.10E-5	91.89	4.60E-6	77.27
PIFF-7	Sat-8/19	11:00	10898	4245	370	293	4526	0.39	4479	5407	39.65	33.38	6.27	0.00	0.94	33.38	1.88	20.18	9.23E-5	8.67E-5	9.23E-5	8.67E-5	93.91	6.31E-6	79.65
PIFF-7	Sat-8/19	13:15	9884	4244	370	293	4525	0.42	4253	5401	41.57	44.27	-2.69	0.00	0.83	44.26	1.88	20.59	7.53E-5	8.30E-5	7.53E-5	8.30E-5	110.15	5.33E-6	106.72
Averages			11247	4240																					
Carbon/Lime, 275°F																									
PIFF-8	Mon-8/21	08:00	8462	4249	355	295	4519	0.27	4500	5396	45.06	53.26	-8.20	0.19	1.04	54.87	1.78	31.42	1.13E-4	1.05E-4	1.13E-4	1.03E-4	90.92	1.55E-5	108.16
PIFF-8	Mon-8/21	10:30	7139	4350	355	295	4635	0.27	4616	5562	51.95	61.36	-9.41	0.19	1.14	62.63	1.78	38.13	1.14E-4	1.13E-4	1.14E-4	1.11E-4	97.20	6.65E-6	104.76
PIFF-8	Mon-8/21	13:00	6572	4209	355	295	4485	0.27	4477	5349	50.78	55.01	-4.23	0.19	0.99	56.08	1.78	37.00	1.08E-4	1.04E-4	1.08E-4	1.03E-4	95.61	7.00E-6	102.49
Averages			7391	4269																					
Carbon, 225°F																									
PIFF-9	Tue-8/22	08:00	4893	4199	340	241	4488	0.70	4450	5399	84.76	70.81	13.95	0.15	1.68	69.62	1.21	48.62	1.08E-4	1.01E-4	1.08E-4	1.03E-4	95.98	5.89E-6	89.10
PIFF-9	Tue-8/22	10:30	4395	4620	340	241	4899	0.79	4862	5736	46.82	106.19	-59.37	0.15	1.60	105.08	1.21	6.27	1.24E-4	1.13E-4	1.24E-4	1.04E-4	83.37	7.77E-6	119.79
PIFF-9	Tue-8/22	13:30	4697	4474	340	241	4732	0.72	4714	5564	88.42	60.12	28.30	0.15	1.24	59.38	1.21	51.73	1.12E-4	1.05E-4	1.12E-4	1.10E-4	98.36	1.06E-5	78.20
Averages			4662	4431																					
Carbon/Lime, 225°F																									
PIFF-10	Wed-8/23	08:00	7735	4487	340	240	4782	0.75	4753	5620	94.81	74.27	20.54	0.20	1.48	75.01	1.08	56.63	9.89E-5	9.57E-5	9.89E-5	9.98E-5	100.99	3.90E-6	88.52
PIFF-10	Wed-8/23	10:30	4609	4450	340	240	4749	0.74	4710	5627	100.79	77.79	23.00	0.20	1.50	77.75	1.08	62.83	9.85E-5	1.05E-4	9.85E-5	1.10E-4	111.62	5.29E-6	84.61
PIFF-10	Wed-8/23	12:30	4152	4489	340	240	4812	0.75	4776	5771	113.43	104.64	8.79	0.20	1.34	104.74	1.08	75.13	1.16E-4	1.16E-4	1.16E-4	1.17E-4	101.03	5.85E-6	102.64
Averages			5499	4475																					
Lime, 225°F																									
												Ave 8/23 & 8/25													
PIFF-11	Thu-8/24	09:00	-	4498	340	240	4781	0.73	4758	5519	90.66	69.85	20.81	0.19	1.19	70.04	0.97	71.07	1.07E-4	9.95E-5	1.07E-4	1.04E-4	96.71	1.89E-5	108.26
PIFF-11	Thu-8/24	11:30	-	4386	340	240	4712	0.89	4663	5432	117.68	105.39	12.29	0.19	1.53	104.76	0.97	71.72	9.23E-5	1.09E-4	9.23E-5	1.11E-4	120.38	1.65E-5	108.26
PIFF-11	Thu-8/24	14:00	-	4480	340	240	4771	0.74	4745	5596	100.12	115.45	-15.33	0.19	1.42	114.93	0.97	61.75	1.00E-4	1.14E-4	1.00E-4	1.11E-4	110.52	1.43E-5	110.29
Averages			-	4455																					
Baseline, 225°F																									
PIFF-12	Fri-8/25	08:00	-	4432	340	242	4599	0.73	4573	5594	106.85	76.18	30.67	0.19	1.29	74.88	0.82	69.11	1.00E-4	9.57E-5	1.00E-4	1.01E-4	101.16	3.53E-5	101.25
PIFF-12	Fri-8/25	10:00	-	4449	340	242	4641	0.74	4608	5301	95.81	59.16	36.65	0.19	1.37	57.79	0.82	57.49	9.00E-5	8.69E-5	9.00E-5	9.37E-5	104.14	2.48E-5	83.18
PIFF-12	Fri-8/25	12:00	-	4379	340	242	4409	0.72	4387	5100	112.07	67.14	44.92	0.19	0.96	66.18	0.82	75.15	1.11E-4	9.72E-5	1.11E-4	1.06E-4	95.05	3.85E-5	95.64
Averages			-	4420																					

* Italicized values indicate mercury values below the low standard.

ECTC Pilot Trace Elements Removal Testing

Mercury Gas Sampling Results
Pilot Pre-Spiking Inlet Location
(CRG)

Test ID	Date	Start Time	Other Imp. Cont.	ID	Gas Volume (dscf)	Moisture (% H ₂ O)	Other Sample [Hg] (ng/ml)	Other Sample [Hg] (ng/ml)	H ₂ O ₂ Sample [Hg] (ng/ml)	H ₂ O ₂ Sample [Hg] (ng/ml)	KMnO ₄ Sample [Hg] (ng/ml)	Other Sample Mass (g)	Other Sample Mass (g)	H ₂ O ₂ Sample Mass (g)	H ₂ O ₂ Sample Mass (g)	KMnO ₄ Sample Mass (g)	Other [Hg] In Gas (µg/Nm ³)	Other [Hg] In Gas (µg/Nm ³)	H ₂ O ₂ [Hg] In Gas (µg/Nm ³)	H ₂ O ₂ [Hg] In Gas (µg/Nm ³)	KMnO ₄ [Hg] In Gas (µg/Nm ³)	Total [Hg] In Gas (µg/Nm ³)
LS. Inj, DRG, CRG comp.																						
T18S-N	Tue-8/1	12:05	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T18S-N	Tue-8/1	12:05	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T18S-N	Tue-8/1	13:35	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T18S-N	Tue-8/1	13:35	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Water Inj, DRG, CRG comp.																						
T18W-N	Thu-8/3	08:35	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T18W-N	Thu-8/3	08:35	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T18W-N	Thu-8/3	09:55	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T18W-N	Thu-8/3	09:55	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alt Imp. Compar. @ WS In																						
T19-NY	Fri-8/4	07:29	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T19-NY	Fri-8/4	07:31	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T19-NY	Fri-8/4	08:50	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T19-NY	Fri-8/4	08:59	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T19-NY	Fri-8/4	09:55	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T19-NY	Fri-8/4	09:55	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Limestone, FO, Hg Spk, WS In Comp.																						
T19-EXY	Mon-8/7	08:45	H	U153	49.10	7.33	28.90	2.84	0.87	0.52	0.36	271.6	235.4	224.4	221.0	463.9	6.06	0.52	0.15	0.09	0.13	6.94
T19-EXY	Mon-8/7	08:45	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T19-EXY	Mon-8/7	09:50	H	U156	56.26	7.25	33.60	2.99	1.03	0.31	0.31	272.0	228.4	205.0	205.0	511.5	6.15	0.46	0.14	0.04	0.11	6.91
T19-EXY	Mon-8/7	09:50	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T19-EXY	Mon-8/7	11:00	Tris	U159	36.84	10.12	9.03	1.84	0.30	0.44	11.50	306.9	292.0	204.6	208.9	462.6	2.85	0.55	0.06	0.09	5.47	9.03
40 L/G, Hg spk, Formate, Tris Com																						
T19-E	Wed-8/9	07:25	H	U160	60.54	6.41	-	19.70	-	1.09	0.41	-	483.2	-	420.4	564.3	-	5.96	-	0.29	0.14	6.39
T19-E	Wed-8/9	09:35	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T19-E	Wed-8/9	10:10	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T19-E	Wed-8/9	11:25	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages																						
40 L/G, HgCl₂ spk, Formate, Tris Comp																						
T20-C	Fri-8/11	07:30	H	U168	57.08	7.42	-	17.30	-	1.53	0.51	-	437.9	-	523.0	505.5	-	5.03	-	0.53	0.17	5.73
T20-C	Fri-8/11	09:11	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T20-C	Fri-8/11	09:45	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T20-C	Fri-8/11	11:00	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages																						
40 L/G, HgCl₂+Hg spk, Formate, Tris Comp																						
T20-EC	Mon-8/14	08:00	H	U173	58.01	6.90	33.60	13.90	1.85	0.83	0.39	270.3	229.1	204.9	197.9	475.5	5.93	2.08	0.25	0.11	0.12	8.49
T20-EC	Mon-8/14	09:15	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T20-EC	Mon-8/14	01:00	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T20-EC	Mon-8/14	11:35	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages																						

Shaded areas indicate problems with sampling. Italicized areas indicate mercury values below low standard. A=Acetate. H=Peroxide. PH=Phosphate. Tris=Tris Buffer

August 1995

ECTC Pilot Trace Elements Removal Testing
Mercury Gas Sampling Results
Pilot Pre-Spiking Inlet Location
(CRG)

Test ID	Date	Start Time	Other Imp. Cont.	Other ID	Gas Volume (dscf)	Molsture (% H2O)	Other Sample [Hg] (ng/ml)	Other Sample [Hg] (ng/ml)	H2O2 Sample [Hg] (ng/ml)	H2O2 Sample [Hg] (ng/ml)	KMnO4 Sample [Hg] (ng/ml)	Other Sample Mass (g)	Other Sample Mass (g)	H2O2 Sample Mass (g)	H2O2 Sample Mass (g)	KMnO4 Sample Mass (g)	Other [Hg] In Gas (ug/Nm3)	Other [Hg] In Gas (ug/Nm3)	H2O2 [Hg] In Gas (ug/Nm3)	H2O2 [Hg] In Gas (ug/Nm3)	KMnO4 [Hg] In Gas (ug/Nm3)	Total [Hg] In Gas (ug/Nm3)
<i>Mg/Lims FO, baseline</i>																						
T21-N	Wed-8/30	08:00	-	U182	49.84	6.22	-	-	24.10	2.77	0.40	-	-	248.8	220.0	443.3	-	-	4.56	0.46	0.13	5.15
T21-N	Wed-8/30	10:00	-	U185	54.30	6.30	-	-	25.20	3.17	0.61	-	-	271.4	232.9	495.6	-	-	4.77	0.52	0.21	5.50
T21-N	Wed-8/30	11:30	-	U188	52.31	6.61	-	-	24.70	3.15	0.37	-	-	261.7	233.6	468.1	-	-	4.68	0.53	0.12	5.34
<i>Averages</i>																			4.7	0.5	0.2	5.3
<i>Mg/Lims FO, Hg spk</i>																						
T21-B	Thu-8/31	08:00	-	U191	69.08	7.21	-	-	33.63	4.34	0.87	-	-	276.1	233.7	497.6	-	-	5.09	0.56	0.24	5.89
T21-B	Thu-8/31	09:30	-	U194	44.66	7.31	-	-	21.50	2.59	0.57	-	-	278.0	221.3	445.7	-	-	5.07	0.49	0.22	5.77
T21-B	Thu-8/31	11:00	-	U197	46.72	7.26	-	-	25.80	2.76	0.39	-	-	255.2	207.2	523.1	-	-	5.34	0.46	0.17	5.97
<i>Averages</i>																			5.2	0.5	0.2	5.9
<i>Mg/Lims FO, Hg+HgCL2 spk</i>																						
T21-EC	Fri-9/1	08:00	-	U200	44.74	6.19	-	-	22.20	1.71	0.64	-	-	240.0	221.0	412.6	-	-	4.51	0.32	0.22	5.05
T21-EC	Fri-9/1	10:00	-	U203	43.85	6.44	-	-	20.60	1.95	0.62	-	-	224.4	195.2	434.1	-	-	3.99	0.33	0.23	4.56
T21-EC	Fri-9/1	11:30	-	U206	51.30	6.51	-	-	21.20	1.77	0.50	-	-	283.1	274.2	544.5	-	-	4.43	0.36	0.20	4.99
<i>Averages</i>																			4.2	0.3	0.2	4.8

Shaded areas indicate problems with sampling. Italicized areas indicate mercury values below low standard. A=Acetate. H=Peroxide. PH=Phosphate. Tris=Tris Buffer

ECTC Pilot Trace Elements Removal Testing

Mercury Gas Sampling Results
Pilot Post-Spiking Inlet Location
(WS Inlet)

Test ID	Date	Start Time	Other Imp. Cont.	ID	Gas Volume (dscf)	Moisture (% H2O)	Inlet O2 (%)	Solid Hg Sample [Hg] (ppm)	Other Sample [Hg] (ng/ml)	Other Sample [Hg] (ng/ml)	H2O2 Sample [Hg] (ng/ml)	H2O2 Sample [Hg] (ng/ml)	KMnO4 Sample [Hg] (ng/ml)	Solid Hg Sample Mass (g)	Other Sample Mass (g)	Other Sample Mass (g)	H2O2 Sample Mass (g)	H2O2 Sample Mass (g)	KMnO4 Sample Mass (g)	Solid Hg [Hg] In Gas (ug/Nm3)	Other [Hg] In Gas (ug/Nm3)	Other [Hg] In Gas (ug/Nm3)	H2O2 [Hg] In Gas (ug/Nm3)	H2O2 [Hg] In Gas (ug/Nm3)	KMnO4 [Hg] In Gas (ug/Nm3)	Total [Hg] In Gas (ug/Nm3)
L.S. Inj,DRG,CRG comp.					DRG										DRG											
T18S-N	Tue-8/1	12:05	H	U135	44.80	8.73	5.75	0.26	15.40	1.72	0.43	0.38	0.42	11.98	291.8	229.9	211.5	214.6	446.6	2.64	3.80	0.33	0.08	0.07	0.16	7.07
T18S-N	Tue-8/1	12:05	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T18S-N	Tue-8/1	13:35	H	U138	45.85	8.49	5.92	0.26	20.30	1.85	0.72	0.45	0.57	11.16	282.5	250.7	223.3	212.3	483.5	2.42	4.74	0.38	0.13	0.08	0.23	7.98
T18S-N	Tue-8/1	13:35	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Water Inj,DRG,CRG comp.					DRG										DRG											
T18W-N	Thu-8/3	08:35	H	U141	49.44	8.99	5.60	0.09	25.35	3.46	1.58	0.98	1.20	11.78	281.6	223.4	232.7	203.4	504.6	0.85	5.47	0.59	0.28	0.15	0.46	7.81
T18W-N	Thu-8/3	08:35	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T18W-N	Thu-8/3	09:55	H	U144	51.43	9.43	4.49	0.23	25.10	2.51	1.19	0.74	0.93	12.73	297.7	224.2	200.9	200.7	483.9	2.18	5.50	0.41	0.18	0.11	0.33	8.72
T18W-N	Thu-8/3	09:55	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alt Imp. Compar.@WS In																										
T19-NY	Fri-8/4	07:29	Tris	U147	60.46	6.61	9.39	-	16.20	3.38	-	0.60	2.55	-	297.3	261.1	-	435.9	562.1	-	3.02	0.55	-	0.16	0.90	4.63
T19-NY	Fri-8/4	07:31	Tris	U148	62.87	5.93	9.39	-	31.80	3.57	-	0.84	9.45	-	348.5	250.3	-	376.7	534.8	-	6.68	0.54	-	0.19	3.05	10.45
T19-NY	Fri-8/4	08:50	Tris	U149	52.89	5.97	7.81	-	16.20	2.60	-	0.40	2.00	-	315.1	261.7	-	428.1	534.3	-	3.66	0.49	-	0.12	0.77	5.03
T19-NY	Fri-8/4	08:59	Tris	U150	56.24	6.72	7.81	-	17.70	2.94	-	0.84	3.92	-	324.1	263.7	-	430.3	523.6	-	3.86	0.52	-	0.24	1.38	6.01
T19-NY	Fri-8/4	09:55	Tris	U151	-	-	7.61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T19-NY	Fri-8/4	09:55	Tris	U152	45.73	6.55	7.61	-	36.10	2.28	-	0.46	2.50	-	317.1	260.8	-	420.3	561.4	-	9.48	0.49	-	0.16	1.16	11.30
Limestone,FO,Hg Spk,WS In Comp.																										
T19-BXY	Mon-8/7	08:45	H	U154	52.90	7.53	7.67	-	49.00	15.00	9.83	6.48	8.90	-	275.9	233.0	213.5	209.0	458.7	-	9.68	2.50	1.50	0.97	2.92	17.58
T19-BXY	Mon-8/7	08:45	Tris	U155	36.39	10.19	7.67	-	24.02	0.97	0.59	0.37	20.20	-	323.0	266.0	207.3	208.5	450.7	-	8.08	0.27	0.13	0.08	9.48	18.03
T19-BXY	Mon-8/7	09:50	H	U157	58.77	7.61	8.37	-	53.00	15.40	10.10	7.28	9.47	-	274.1	241.1	209.1	204.2	466.0	-	9.37	2.39	1.36	0.96	2.84	16.92
T19-BXY	Mon-8/7	09:50	Tris	U158	36.18	5.56	8.37	-	26.40	1.19	0.32	0.41	20.00	-	308.5	248.1	235.4	202.9	464.0	-	8.53	0.31	0.08	0.09	9.72	18.72
T19-BXY	Mon-8/7	11:00	Tris	-	-	-	8.22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
40 L/G,Hg spk,Formate,Tris Com																										
T19-B	Wed-8/9	07:25	H	U161	63.14	6.76	9.55	-	65.30	19.20	12.60	9.46	11.90	-	250.0	218.0	195.8	196.6	531.4	-	9.80	2.51	1.48	1.12	3.79	18.70
T19-B	Wed-8/9	09:35	Tris	U166	23.90	7.31	9.81	-	17.10	1.27	0.67	0.41	18.55	-	260.8	256.5	194.0	249.9	520.0	-	7.07	0.52	0.20	0.16	15.29	23.24
T19-B	Wed-8/9	10:10	H	U164	64.68	7.18	9.35	-	68.10	22.40	15.10	10.80	13.20	-	266.4	221.0	200.2	193.4	535.6	-	10.63	2.90	1.77	1.22	4.14	20.66
T19-B	Wed-8/9	11:25	Tris	U167	24.72	7.60	9.25	-	19.90	1.43	0.60	0.73	12.30	-	219.9	211.4	203.4	201.4	553.4	-	6.71	0.46	0.19	0.23	10.43	18.01
Averages																										
40 L/G,HgCl2 spk,Formate,Tris Com																										
T20-C	Fri-8/11	07:30	H	U169	70.29	7.77	9.56	-	102.30	8.31	2.50	1.35	0.77	-	294.0	239.4	229.2	226.7	467.5	-	16.21	1.07	0.31	0.16	0.19	17.95
T20-C	Fri-8/11	09:11	Tris	U173	25.12	6.94	8.46	-	29.20	2.54	1.75	1.34	1.35	-	218.2	251.4	224.7	219.8	458.0	-	9.61	0.96	0.59	0.44	0.93	12.54
T20-C	Fri-8/11	09:45	H	U171	59.71	7.81	8.29	-	99.47	7.34	1.94	1.10	0.56	-	272.9	224.2	206.7	203.9	443.1	-	17.22	1.04	0.25	0.14	0.16	18.82
T20-C	Fri-8/11	11:00	Tris	U174	24.93	6.35	8.26	-	33.50	1.31	1.50	1.40	1.23	-	247.0	239.2	228.0	213.2	499.7	-	12.57	0.48	0.52	0.45	0.93	14.96
Averages																										
40 L/G,HgCl2+Hg spk,Formate,Tris																										
T20-EC	Mon-8/14	08:00	H	U176	50.43	6.58	10.35	-	126.10	20.20	12.00	5.88	7.11	-	238.2	206.2	201.9	208.0	495.8	-	22.56	3.13	1.82	0.92	2.65	31.08
T20-EC	Mon-8/14	09:15	Tris	U180	24.91	7.58	10.10	-	33.80	2.71	2.49	1.10	10.30	-	237.7	233.7	203.3	207.2	493.8	-	12.22	0.96	0.77	0.35	7.73	22.03
T20-EC	Mon-8/14	01:00	H	U178	58.14	7.65	8.87	-	139.00	23.95	14.00	7.46	8.89	-	260.7	223.8	210.7	220.3	503.1	-	23.61	3.49	1.92	1.07	2.91	33.01
T20-EC	Mon-8/14	11:35	Tris	U181	25.02	8.02	8.63	-	25.20	4.56	2.33	0.89	11.50	-	246.2	220.8	218.6	214.6	471.2	-	9.40	1.52	0.77	0.29	8.21	20.19
Averages																										

Shaded areas indicate problems with sampling. Italicized areas indicate mercury values below low standard. A=Acetate, H=Hydroxide, PH=Phosphate, Tris=Tris Buffer

ECTC Pilot Trace Elements Removal Testing
Mercury Gas Sampling Results
Pilot Post-Spiking Inlet Location
(WS Inlet)

					Gas	Inlet	Solid Hg	Other	Other	H2O2	H2O2	KMnO4	Solid Hg	Other	Other	H2O2	H2O2	KMnO4	Solid Hg	Other	Other	H2O2	H2O2	KMnO4	Total		
Test		Start	Other		Volume	Moisture	O2	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	[Hg]	[Hg]	[Hg]	[Hg]	[Hg]	[Hg]	[Hg]		
ID	Date	Time	Imp.	ID	(dscf)	(% H2O)	(%)	(ppm)	(ng/ml)	(ng/ml)	(ng/ml)	(ng/ml)	(ng/ml)	(ng/ml)	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)		
Mg/Lime FO, baseline																											
T21-N	Wed-8/30	08:00	-	U183	49.14	6.73	9.23	-	-	-	28.30	1.90	0.28	-	-	-	245.9	243.1	509.8	-	-	-	5.37	0.36	0.11	5.83	
T21-N	Wed-8/30	10:00	-	U186	51.25	6.58	8.80	-	-	-	27.40	2.38	0.23	-	-	-	256.8	220.9	511.4	-	-	-	5.20	0.39	0.09	5.68	
T21-N	Wed-8/30	11:30	-	U189	68.40	6.65	8.66	-	-	-	35.00	3.16	0.40	-	-	-	282.8	222.9	428.7	-	-	-	5.48	0.39	0.10	5.97	
Averages																							5.3	0.4	0.1	5.8	
Mg/Lime FO, Hg spk																											
T21-B	Thu-8/31	08:00	-	U192	51.62	6.86	9.84	-	-	-	46.50	14.40	18.90	-	-	-	279.0	243.5	457.5	-	-	-	9.52	2.57	6.35	18.44	
T21-B	Thu-8/31	09:30	-	U195	52.21	7.33	8.93	-	-	-	49.70	14.60	16.80	-	-	-	269.8	231.2	485.9	-	-	-	9.73	2.45	5.92	18.10	
T21-B	Thu-8/31	11:00	-	U198	53.56	7.48	8.86	-	-	-	54.65	14.80	16.30	-	-	-	255.2	207.2	523.1	-	-	-	9.86	2.17	6.03	18.06	
Averages																								9.7	2.4	6.1	18.2
Mg/Lime FO, Hg+HgCl2 spk																											
T21-EC	Fri-9/1	08:00	-	U201	34.09	6.75	9.61	-	-	-	68.60	4.72	0.95	-	-	-	210.6	211.4	440.5	-	-	-	16.06	1.11	0.47	17.63	
T21-EC	Fri-9/1	10:00	-	U204	37.82	6.67	9.08	-	-	-	77.80	13.80	13.90	-	-	-	244.4	209.4	450.9	-	-	-	19.04	2.89	6.28	28.22	
T21-EC	Fri-9/1	11:30	-	U207	50.76	6.39	9.17	-	-	-	97.40	18.60	19.50	-	-	-	274.8	218.4	460.1	-	-	-	19.97	3.03	6.70	29.70	
Averages																								19.5	3.0	6.5	29.0

[illegible]

Shaded areas indicate problems with sampling. Italicized areas indicate mercury values below low standard. A=Acetate, H= Peroxide, PII=Phosphate, Tris=Tris Buffer

ECTC Pilot Trace Elements Removal Testing
Mercury Gas Sampling Results
Pilot Outlet Location
(WS Outlet)

								Solid Hg	Other	Other	H2O2	H2O2	KMnO4	Solid Hg	Other	Other	H2O2	H2O2	KMnO4	Solid Hg	Other	Other	H2O2	H2O2	KMnO4	Total																				
Test ID	Date	Start Time	Other Imp. Cont.	ID	Gas Volume (dscf)	Moisture (% H2O)	Out O2 (%)	Sample [Hg] (ppm)	Sample [Hg] (ng/ml)	Sample [Hg] (ng/ml)	Sample [Hg] (ng/ml)	Sample [Hg] (ng/ml)	Sample [Hg] (ng/ml)	Sample Mass (g)	Sample Mass (g)	Sample Mass (g)	Sample Mass (g)	Sample Mass (g)	Sample Mass (g)	In Gas [Hg] (µg/Nm3)	In Gas [Hg] (µg/Nm3)	In Gas [Hg] (µg/Nm3)	In Gas [Hg] (µg/Nm3)	In Gas [Hg] (µg/Nm3)	In Gas [Hg] (µg/Nm3)	In Gas [Hg] (µg/Nm3)																				
Mg/Lime FO, baseline																																														
T21-N	Wed-8/30	08:00	-	U184	100.20	12.31	8.64	-	-	-	2.48	1.14	1.60	-	-	-	383.6	256.3	482.4	-	-	-	0.36	0.11	0.29	0.76																				
T21-N	Wed-8/30	10:00	-	U187	94.39	12.58	8.72	-	-	-	2.49	0.86	1.35	-	-	-	402.3	245.0	492.0	-	-	-	0.40	0.08	0.27	0.75																				
T21-N	Wed-8/30	11:30	-	U190	118.11	12.55	8.59	-	-	-	2.69	1.13	1.89	-	-	-	378.9	376.1	467.7	-	-	-	0.33	0.14	0.28	0.75																				
Averages																																														
Mg/Lime FO, Hg spk																																														
T21-B	Thu-8/31	08:00	-	U193	83.48	13.26	8.62	-	-	-	9.56	5.51	39.40	-	-	-	419.9	281.1	507.5	-	-	-	1.82	0.70	9.07	11.60																				
T21-B	Thu-8/31	09:30	-	U196	91.59	13.08	8.70	-	-	-	11.60	7.45	48.00	-	-	-	379.3	269.8	447.8	-	-	-	1.82	0.83	8.89	11.54																				
T21-B	Thu-8/31	11:00	-	U199	104.73	13.18	8.78	-	-	-	12.10	9.24	51.50	-	-	-	387.0	314.8	450.0	-	-	-	1.69	1.05	8.38	11.13																				
Averages																																														
Mg/Lime FO, Hg+HgCL2 spk																																														
T21-EC	Fri-9/1	08:00	-	U202	75.09	12.18	9.34	-	-	-	4.95	2.00	7.37	-	-	-	302.6	295.9	488.6	-	-	-	0.76	0.30	1.82	2.87																				
T21-EC	Fri-9/1	10:00	-	U205	84.27	12.34	8.93	-	-	-	11.70	5.62	45.10	-	-	-	400.6	227.7	494.2	-	-	-	2.11	0.58	10.02	12.70																				
T21-EC	Fri-9/1	11:30	-	U208	72.93	12.52	9.09	-	-	-	10.80	5.64	38.10	-	-	-	446.0	250.1	505.3	-	-	-	2.50	0.73	10.00	13.23																				
Averages																																														

ECTC Pilot Trace Elements Testing
Mercury Gas Sampling Results
Removal Summary
 (Normalized to 5% O₂)

				Other					H2O2					KMnO4					Total Vapor				
Test ID	Date	Start Time	Other Imp. Cont.	Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Hg Spiked	Hg Removal	Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Hg Spiked	Hg Removal	Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Hg Spiked	Hg Removal	Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Total Hg Spiked	Hg Removal
				(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(%)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(%)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)	(µg/Nm3)
L.S. Inf,DRG,CRG comp.				Vapor Only					Vapor Only					Vapor Only					Includes Particulate				
				DRG	CRG				DRG	CRG				DRG	CRG				DRG	CRG			
T18S-N	Tue-8/1	12:05	H	-	4.34	4.08	-	-	-	0.15	0.19	-	-	-	0.17	0.24	-	-	-	7.42	4.52	-	-
T18S-N	Tue-8/1	12:05	Tris	-	-	3.92	-	-	-	-	0.28	-	-	-	-	0.84	-	-	-	-	5.04	-	-
T18S-N	Tue-8/1	13:35	H	-	5.43	4.26	-	-	-	0.23	0.17	-	-	-	0.24	0.20	-	-	-	8.22	4.64	-	-
T18S-N	Tue-8/1	13:35	Tris	-	-	3.11	-	-	-	-	0.34	-	-	-	-	0.56	-	-	-	-	4.01	-	-
Water Inf,DRG,CRG comp.				Vapor Only					Vapor Only					Vapor Only					Includes Particulate				
				DRG	CRG				DRG	CRG				DRG	CRG				DRG	CRG			
T18W-N	Thu-8/3	08:35	H	-	6.30	6.85	-	-	-	0.45	0.29	-	-	-	0.48	0.26	-	-	-	8.11	7.40	-	-
T18W-N	Thu-8/3	08:35	Tris	-	-	7.08	-	-	-	-	0.47	-	-	-	-	1.37	-	-	-	-	8.92	-	-
T18W-N	Thu-8/3	09:55	H	-	5.74	6.50	-	-	-	0.28	0.25	-	-	-	0.32	0.27	-	-	-	8.13	7.02	-	-
T18W-N	Thu-8/3	09:55	Tris	-	-	5.79	-	-	-	-	0.29	-	-	-	-	1.25	-	-	-	-	7.33	-	-
All Imp. Compar.@WS In																							
T19-NY	Fri-8/4	07:29	Tris	-	4.92	-	-	-	-	0.23	-	-	-	-	1.24	-	-	-	-	6.38	-	-	-
T19-NY	Fri-8/4	07:31	Tris	-	9.95	-	-	-	-	0.26	-	-	-	-	4.20	-	-	-	-	14.40	-	-	-
T19-NY	Fri-8/4	08:50	Tris	-	5.03	-	-	-	-	0.15	-	-	-	-	0.93	-	-	-	-	6.10	-	-	-
T19-NY	Fri-8/4	08:59	Tris	-	5.32	-	-	-	-	0.30	-	-	-	-	1.68	-	-	-	-	7.29	-	-	-
T19-NY	Fri-8/4	09:55	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T19-NY	Fri-8/4	09:55	Tris	-	11.92	-	-	-	-	0.19	-	-	-	-	1.39	-	-	-	-	13.50	-	-	-
Limestone,FO,Hg Spk,WS In Comp.																							
T19-EXY	Mon-8/7	08:45	H	7.89	14.63	-	6.74	-	0.29	2.97	-	2.68	-	0.16	3.51	-	3.35	-	8.33	21.10	-	12.77	-
T19-EXY	Mon-8/7	08:45	Tris	-	10.02	-	-	-	-	0.25	-	-	-	-	11.37	-	-	-	-	21.64	-	-	-
T19-EXY	Mon-8/7	09:50	H	8.38	14.90	-	6.52	-	0.23	2.94	-	2.71	-	0.14	3.60	-	3.47	-	8.75	21.44	-	12.69	-
T19-EXY	Mon-8/7	09:50	Tris	-	11.20	-	-	-	-	0.21	-	-	-	-	12.31	-	-	-	-	23.71	-	-	-
T19-EXY	Mon-8/7	11:00	Tris	4.26	-	-	-	-	0.20	-	-	-	-	6.85	-	-	-	-	11.31	-	-	-	-
40 L/G,Hg spk,Formate,Tris Com																							
T19-B	Wed-8/9	07:25	H	8.32	17.20	3.18	8.87	81.5	0.40	3.63	0.40	3.23	89.0	0.20	5.30	10.40	5.10	-96.2	8.93	26.13	13.98	17.20	46.5
T19-B	Wed-8/9	09:35	Tris	-	10.85	-	-	-	-	0.52	-	-	-	-	21.86	-	-	-	-	33.23	-	-	-
T19-B	Wed-8/9	10:10	H	-	18.57	3.65	10.25	80.4	-	4.11	4.24	3.71	-3.1	-	5.69	6.74	5.48	-18.5	-	28.37	14.63	19.45	48.4
T19-B	Wed-8/9	11:25	Tris	-	9.76	-	-	-	-	0.56	-	-	-	-	14.20	-	-	-	-	24.53	-	-	-
Averages				8.3		3.4	9.6	80.9	0.4			3.5	43.0	0.2			5.3	-57.4	8.9		14.3	18.3	47.5
40 L/G,HgCD spk,Formate,Tris Com																							
T20-C	Fri-8/11	07:30	H	7.03	24.17	0.78	17.14	96.8	0.74	0.66	0.21	-0.08	67.9	0.24	0.27	0.65	0.03	-139.6	8.01	25.11	1.65	17.09	93.4
T20-C	Fri-8/11	09:11	Tris	-	13.49	-	-	-	-	1.32	-	-	-	-	1.19	-	-	-	-	16.00	-	-	-
T20-C	Fri-8/11	09:45	H	-	22.99	0.66	15.96	97.1	-	0.50	0.26	-0.24	48.1	-	0.20	0.49	-0.04	-150.6	-	23.69	1.42	15.67	94.0
T20-C	Fri-8/11	11:00	Tris	-	16.39	-	-	-	-	1.22	-	-	-	-	1.17	-	-	-	-	18.78	-	-	-
Averages				7.0		0.7	16.6	96.9	0.7		0.2	-0.2	58.0	0.2		0.6	0.0	-143.1	8.0		1.5	16.4	93.7
40 L/G,HgCD+Hg spk,Formate,Tris																							
T20-EC	Mon-8/14	08:00	H	12.03	38.60	3.10	26.57	92.0	0.53	4.11	0.31	3.58	92.5	0.18	3.98	8.88	3.79	-123.2	12.75	46.69	12.29	33.94	73.7
T20-EC	Mon-8/14	09:15	Tris	-	19.35	-	-	-	-	1.64	-	-	-	-	11.35	-	-	-	-	32.34	-	-	-
T20-EC	Mon-8/14	01:00	H	-	35.75	3.19	23.71	91.1	-	3.95	0.98	3.42	75.1	-	3.84	7.35	3.66	-91.2	-	43.54	11.52	30.79	73.5
T20-EC	Mon-8/14	11:35	Tris	-	14.13	-	-	-	-	1.37	-	-	-	-	10.61	-	-	-	-	26.11	-	-	-
Averages				12.0		3.1	25.1	91.5	0.5		0.6	3.5	83.8	0.2		8.1	3.7	-107.2	12.8		11.9	32.4	73.6

Shaded areas indicate problems with sampling. Italicized areas indicate mercury values below low standard. A=Acetate, H=Peroxide, PH=Phosphate, Tris=Tris Buffer

ECTC Pilot Trace Elements Testing Mercury Gas Sampling Results

Test ID		Date	Start Time	Other Imp. Cont.	Spike Recovery			Spike Capture (By Impinger)					Spiked Mercury Removal Efficiency (By Impinger)					Total Hg Capture (CRG) (By Impinger)					Total Hg Capture (WS Inlet) (By Impinger)					Total Hg Capture (WS Outlet) (By Impinger)				
					Actual Spiked (µg/Nm3)	Spiked Theo Hg (µg/Nm3)	Percent Spike Rec (%)	Other [Hg] (%)	Other [Hg] (%)	H2O2 [Hg] (%)	H2O2 [Hg] (%)	KMnO4 [Hg] (%)	Other (%)	Other (%)	H2O2 (%)	H2O2 (%)	KMnO4 (%)	Other (%)	Other (%)	H2O2 (%)	H2O2 (%)	KMnO4 (%)	Other (%)	Other (%)	H2O2 (%)	H2O2 (%)	KMnO4 (%)	Other (%)	Other (%)	H2O2 (%)	H2O2 (%)	KMnO4 (%)
L.S. Inj, DRG, CRG comp.																																
T18S-N	Tue-8/1	12:05	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	/-----DRG-----/					/-----CRG-----/					
T18S-N	Tue-8/1	12:05	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	53.7	4.7	1.1	1.0	2.2	79.7	10.6	2.8	1.4	5.4	
T18S-N	Tue-8/1	13:35	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	75.0	2.8	3.4	2.2	16.6	
T18S-N	Tue-8/1	13:35	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	59.4	4.8	1.7	1.0	2.8	86.1	5.8	2.2	1.5	4.4	
T18S-N	Tue-8/1	13:35	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	76.7	0.9	4.5	3.9	14.0	
Water Inj, DRG, CRG comp.																																
T18W-N	Thu-8/3	08:35	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	/-----DRG-----/					/-----CRG-----/					
T18W-N	Thu-8/3	08:35	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	70.0	7.6	3.6	1.9	6.0	86.8	5.8	2.5	1.4	3.5	
T18W-N	Thu-8/3	08:35	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	73.3	6.1	3.2	2.1	15.3	
T18W-N	Thu-8/3	09:55	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	63.1	4.8	2.0	1.2	3.8	87.5	5.0	2.4	1.3	3.8	
T18W-N	Thu-8/3	09:55	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	74.3	4.8	1.8	2.1	17.0	
Air Imp. Compar. @ WS In																																
				Aqueous Spike Recovery																												
T19-NY	Fri-8/4	07:29	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	65.2	11.9	-	3.5	19.4	-	-	-	-	-	
T19-NY	Fri-8/4	07:31	Tris	6.07	4.00	151.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	63.9	5.2	-	1.8	29.1	-	-	-	-	-	
T19-NY	Fri-8/4	08:50	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	72.7	9.7	-	2.4	15.2	-	-	-	-	-	
T19-NY	Fri-8/4	08:59	Tris	0.31	4.00	7.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	64.3	8.7	-	4.1	23.0	-	-	-	-	-	
T19-NY	Fri-8/4	09:53	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T19-NY	Fri-8/4	09:55	Tris	7.42	4.00	185.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	83.9	4.4	-	1.4	10.3	-	-	-	-	-	
Limestone, FO, Hg Spk, WS In Comp.																																
T19-EXY	Mon-8/7	08:45	H	10.64	12.60	84.4	34.1	18.7	12.7	8.3	26.2	34.1	28.3	26.9	24.0	87.3	7.4	2.2	1.3	1.9	55.1	14.2	8.5	5.5	16.6	-	-	-	-	-		
T19-EXY	Mon-8/7	08:45	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	44.8	1.5	0.7	0.4	52.6	-	-	-	-	-	
T19-EXY	Mon-8/7	09:50	H	10.02	12.60	79.5	32.1	19.3	12.2	9.1	27.3	32.1	28.4	25.0	25.1	89.1	6.7	2.1	0.6	1.6	55.3	14.1	8.0	5.7	16.8	-	-	-	-	-		
T19-EXY	Mon-8/7	09:50	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	45.6	1.7	0.4	0.5	51.9	-	-	-	-	-	
T19-EXY	Mon-8/7	11:00	Tris	-3.2	4.0 µg	-79.1	-	-	-	-	-	-	-	-	-	-	31.6	6.1	0.7	1.0	60.6	-	-	-	-	-	-	-	-	-		
40 L/G, Hg spk, Formate, Tris Com																																
T19-B	Wed-8/9	07:25	H	12.31	12.60	97.7	-	-	-	-	-	-	-	-	-	-	93.3	-	4.5	2.3	52.4	13.4	7.9	6.0	20.3	-	22.7	-	2.8	74.4		
T19-B	Wed-8/9	09:35	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30.4	2.2	0.9	0.7	65.8	-	-	-	-	-	
T19-B	Wed-8/9	10:10	H	14.27	12.60	113.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	51.4	14.0	8.6	5.9	20.0	-	24.9	-	29.0	46.1	
T19-B	Wed-8/9	11:25	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	37.2	2.6	1.0	1.3	57.9	-	-	-	-	-	
Averages				13.3	12.6	105.5											93.3	4.5	2.3						23.8					15.9	60.2	
40 L/G, HgCl2 spk, Formate, Tris Com																																
T20-C	Fri-8/11	07:30	H	12.22	12.90	94.7	-	-	-	-	-	-	-	-	-	-	87.7	-	9.3	3.0	90.3	6.0	1.7	0.9	1.1	-	47.6	-	12.9	39.5		
T20-C	Fri-8/11	09:11	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	76.6	7.7	4.7	3.5	7.4	-	-	-	-	-	
T20-C	Fri-8/11	09:45	H	13.09	12.90	101.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	91.5	5.5	1.4	0.8	0.8	-	46.8	-	18.3	34.8	
T20-C	Fri-8/11	11:00	Tris	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	84.1	3.2	3.5	3.0	6.2	-	-	-	-	-	
Averages				12.7	12.9	98.1											87.7	9.3	3.0						47.2					15.6	37.2	
40 L/G, HgCl2+Hg spk, Formate, Tris																																
T20-EC	Mon-8/14	08:00	H	22.59	25.50	88.6	73.6	4.6	7.0	3.6	11.2	-	-	-	-	69.9	24.5	2.9	1.3	1.4	72.6	10.1	5.9	3.0	8.5	-	25.3	-	2.5	72.2		
T20-EC	Mon-8/14	09:15	Tris	-	-	-	27.8	-4.9	2.3	1.1	33.7	-	-	-	-	-	-	-	-	-	-	55.5	4.4	3.5	1.6	35.1	-	-	-	-	-	
T20-EC	Mon-8/14	01:00	H	24.52	25.50	96.2	72.1	5.8	6.8	3.9	11.4	-	-	-	-	-	-	-	-	-	-	71.5	10.6	5.8	3.2	8.8	-	27.7	-	8.5	63.8	
T20-EC	Mon-8/14	11:35	Tris	-	-	-	14.1	-2.3	2.1	0.7	33.0	-	-	-	-	-	-	-	-	-	-	46.5	7.6	3.8	1.4	40.7	-	-	-	-	-	
Averages				23.6	25.5	92.4											24.5	1.3	1.4						26.5					5.5	68.0	

Shaded areas indicate problems with sampling. Italicized areas indicate mercury values below low standard. A=Acetate, H=Peroxide, PH=Phosphate, Tris=Tris Buffer

ECTC Pilot Trace Elements Testing Mercury Gas Sampling Results

Test ID		Date	Start Time	Other Imp. Cont.	Spike Recovery			Spike Capture (By Impinger)					Spiked Mercury Removal Efficiency (By Impinger)					Total Hg Capture (CRG) (By Impinger)					Total Hg Capture (WS Inlet) (By Impinger)					Total Hg Capture (WS Outlet) (By Impinger)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
					Actual Spiked (µg/Nm3)	Spiked Theo Hg (µg/Nm3)	Percent Spike Rec (%)	Other (Hg) (%)	Other (Hg) (%)	H2O2 (Hg) (%)	H2O2 (Hg) (%)	KMnO4 (Hg) (%)	Other (%)	Other (%)	H2O2 (%)	H2O2 (%)	Other (%)	Other (%)	H2O2 (%)	H2O2 (%)	KMnO4 (%)	Other (%)	Other (%)	H2O2 (%)	H2O2 (%)	KMnO4 (%)	Other (%)	Other (%)	H2O2 (%)	H2O2 (%)	KMnO4 (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
Mg/Llms FO, baseline					0.68	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-</

Shaded areas indicate problems with sampling. Italicized areas indicate mercury values below low standard. A=Acetate, H=Peroxide, PII=Phosphate, Tris=Tris Buffer

ECTC Pilot Trace Elements Testing
Mercury Gas Sampling Results
Removal Summary
 (Normalized to 5% O₂)

Test ID	Date	Start Time	Other Imp. Cont.	Other					H ₂ O ₂					KMnO ₄					Total Vapor				
				Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Hg Spiked	Hg Removal	Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Hg Spiked	Hg Removal	Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Hg Spiked	Hg Removal	Pre-Spike Inlet	Post-Spike Inlet	Outlet [Hg]	Total Hg Spiked	Hg Removal
				(µg/Nm ³)	(µg/Nm ³)	(µg/Nm ³)	(µg/Nm ³)	(%)	(µg/Nm ³)	(µg/Nm ³)	(µg/Nm ³)	(µg/Nm ³)	(%)	(µg/Nm ³)	(µg/Nm ³)	(µg/Nm ³)	(µg/Nm ³)	(%)	(µg/Nm ³)	(µg/Nm ³)	(µg/Nm ³)	(µg/Nm ³)	(%)
<i>Mg/Lime FO, baseline</i>																							
T21-N	Wed-8/30	08:00	-	-	-	-	-	-	6.82	7.78	0.61	0.95	92.2	0.18	0.15	0.38	-0.03	-150.5	7.01	7.93	0.99	0.92	87.6
T21-N	Wed-8/30	10:00	-	-	-	-	-	-	6.26	7.33	0.63	1.07	91.4	0.95	0.11	0.35	-0.84	-207.1	7.21	7.44	0.98	0.24	86.8
T21-N	Wed-8/30	11:30	-	-	-	-	-	-	6.07	7.61	0.60	1.54	92.2	0.85	0.12	0.37	-0.73	-194.4	6.92	7.74	0.96	0.81	87.5
Averages									6.4	7.6	0.6	1.2	91.9	0.7	0.1	0.4	-0.5	-184.0	7.0	7.7	1.0	0.7	87.3
<i>Mg/Lime FO, Hg spk</i>																							
T21-B	Thu-8/31	08:00	-	-	-	-	-	-	8.10	17.34	3.26	9.24	81.2	0.34	9.10	11.73	8.76	-28.9	8.44	26.44	14.99	18.00	43.3
T21-B	Thu-8/31	09:30	-	-	-	-	-	-	6.72	16.14	3.45	9.42	78.6	0.93	7.85	11.57	6.92	-47.3	7.65	24.00	15.01	16.35	37.4
T21-B	Thu-8/31	11:00	-	-	-	-	-	-	7.04	15.86	3.60	8.82	77.3	0.83	7.95	10.98	7.12	-38.1	7.86	23.81	14.57	15.94	38.8
Averages									7.3	16.4	3.4	9.2	79.1	0.7	8.3	11.4	7.6	-38.1	8.0	24.7	14.9	16.8	39.8
<i>Mg/Lime FO, Hg+HgCL₂ spk</i>																							
T21-EC	Fri-9/1	08:00	-	-	-	-	-	-	6.80	24.15	1.45	17.36	94.0	0.31	0.64	2.49	0.34	-279.3	7.11	24.81	3.94	17.70	84.1
T21-EC	Fri-9/1	10:00	-	-	-	-	-	-	5.36	29.45	3.56	24.09	87.9	0.76	8.43	13.28	7.67	-57.6	6.12	37.88	16.84	31.76	55.5
T21-EC	Fri-9/1	11:30	-	-	-	-	-	-	5.99	31.11	4.35	25.12	86.0	0.76	9.06	13.43	8.30	-48.4	6.75	40.17	17.78	33.42	55.7
Averages									5.7	30.3	4.0	24.6	87.0	0.8	8.7	13.4	8.0	-53.0	6.4	39.0	17.3	32.6	55.6

APPENDIX B2

ANALYTICAL SUMMARY - LDG TEST BLOCK

August 1995

**Pilot FLRT Liquid Analytical Summary:
Lime/DBA/Gypsum Test Block**

Scaling Coupons																								
Hold																								
Tank																								
Absorber																								
Test	Date	Time	FLRT pH	ABS pH	L-Ca++ (mM)	L-Mg++ (mM)	L-Na+ (mM)	L-K+ (ppm)	L-Al (ppm)	L-Fe (ppm)	L-Mn (ppm)	L-Cl- (mM)	L-CO3= (mM)	L-SO3= (mM)	L-SO4= (mM)	ICE DBA (ppm)	ICE Adipic (mM)	ICE Glutaric (mM)	ICE Succinic (mM)	CaSO3 RS	CaSO4 RS	CaCO3 RS	(mg/d/ln) ²	(mg/d/ln) ²
15,000scfm, L/G=30.8ft																								
LDG-1X	Fri 3/03	01:00	-	-	-	-	-	-	-	-	-	-	-	-	-	13273	12.42	67.23	21.91	-	-	-	-	-
LDG-1X	Fri 3/03	08:00	6.66	5.53	141.19	105.40	10.50	51.71	0.10	0.02	5.33	350.67	-	5.49	-	4547	4.79	26.86	2.56	-	-	-	-	-
LDG-1X	Fri 3/03	14:00	-	-	-	-	-	-	-	-	-	-	-	-	-	3109	3.59	18.62	1.08	-	-	-	-	-
LDG-1X	Fri 3/03	15:20	7.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages			6.83	5.53	141.19	105.40	10.50	-	-	-	-	350.67	-	5.49	-	6976	6.93	37.57	8.52	-	-	-	-	-
8250 scfm, L/G=50																								
LDG-0A	Sat 3/04	00:02	-	-	-	-	-	-	-	-	-	-	-	-	-	16838	29.43	7.40	98.00	-	-	-	-	-
LDG-0A	Sat 3/04	08:00	-	-	-	-	-	-	-	-	-	-	-	-	-	4221	21.23	6.72	1.99	-	-	-	-	-
LDG-0A	Sat 3/04	09:20	5.70	5.32	116.96	89.34	8.42	73.31	7.37	0.01	6.10	233.48	-	12.53	-	4542	22.91	6.97	2.35	-	-	-	-	-
LDG-0A	Sat 3/04	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-	4073	18.83	7.41	2.93	-	-	-	-	-
LDG-0A	Sun 3/05	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	2496	12.47	3.65	1.64	-	-	-	-	-
LDG-0A	Sun 3/05	08:00	-	-	-	-	-	-	-	-	-	-	-	-	-	1985	9.45	3.11	1.65	-	-	-	-	-
LDG-0A	Sun 3/05	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-	1828	7.07	3.93	2.35	-	-	-	-	-
LDG-0A	Mon 3/06	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	1386	4.78	3.22	2.23	-	-	-	-	-
LDG-0A	Mon 3/06	08:12	5.67	4.97	69.55	103.18	8.83	-	-	-	-	191.30	0.80	15.27	25.15	1085	3.32	2.61	2.17	16.61	0.97	0.03	-	-
LDG-0A	Mon 3/06	14:35	5.51	-	-	-	-	-	-	-	-	-	-	11.00	-	9845	65.12	0.56	2.23	-	-	-	-	-
Averages			5.63	5.15	93.26	96.26	8.63	-	-	-	-	212.39	0.80	12.93	25.15	4830	19.46	4.56	11.75	16.61	0.97	0.03	-	-
12ft Tank																								
LDG-0B	Tue 3/07	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	6169	39.02	1.62	2.19	-	-	-	-	-
LDG-0B	Tue 3/07	07:45	5.51	5.23	117.81	85.52	10.31	95.19	16.07	0.02	9.01	234.95	0.70	4.47	20.00	6091	37.14	2.98	2.33	5.51	1.08	0.02	-	-
LDG-0B	Tue 3/07	14:35	5.49	-	-	-	-	-	-	-	-	-	-	-	-	7347	41.83	6.98	2.70	-	-	-	-	-
Averages			5.50	5.23	117.81	85.52	10.31	-	-	-	-	234.95	0.70	3.31	20.00	6536	39.33	3.86	2.41	5.51	1.08	0.02	-	-
8250scfm, L/G=30, 12ft																								
LDG-1*	Wed 3/08	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	11562	67.75	9.55	3.47	-	-	-	-	-
LDG-1	Wed 3/08	07:55	5.84	5.48	179.83	123.41	13.24	-	-	-	-	331.12	0.80	5.21	18.74	11639	67.96	9.69	3.71	10.95	1.09	0.10	-	-
LDG-1	Wed 3/08	14:00	6.01	-	165.46	121.28	13.46	-	-	-	-	-	-	6.45	-	10898	66.94	4.62	4.36	-	-	-	-	-
LDG-1	Thu 3/09	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	9858	58.02	6.01	5.03	-	-	-	-	-
LDG-1	Thu 3/09	08:10	5.95	5.34	153.18	130.96	13.98	119.50	1.41	0.00	4.94	315.58	0.84	10.12	18.75	8600	48.16	7.10	5.35	21.37	0.98	0.13	-	-
LDG-1*	Thu 3/09	14:20	5.89	-	-	-	-	-	-	-	-	-	-	9.46	-	6584	32.46	9.49	5.02	-	-	-	-	-
LDG-1*	Thu 3/09	15:10	-	-	-	-	-	-	-	-	-	-	-	-	-	6490	31.86	9.39	5.08	-	-	-	-	-
LDG-1*	Thu 3/09	16:05	-	-	-	-	-	-	-	-	-	-	-	-	-	5818	28.37	8.56	4.63	-	-	-	-	-
LDG-1*	Thu 3/09	17:55	-	-	-	-	-	-	-	-	-	-	-	-	-	4902	23.77	7.34	3.92	-	-	-	-	-
LDG-1*	Thu 3/09	21:20	-	-	-	-	-	-	-	-	-	-	-	-	-	4046	19.49	6.00	3.46	-	-	-	-	-
LDG-1*	Fri 3/10	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	3735	18.09	5.39	3.24	-	-	-	-	-
LDG-1*	Fri 3/10	07:07	6.02	5.23	106.40	103.21	11.05	-	-	-	-	-	-	10.87	-	4002	19.64	5.60	3.35	-	-	-	-	-
LDG-1*	Fri 3/10	14:12	6.07	-	-	-	-	-	-	-	-	-	-	-	-	3420	15.86	5.24	3.50	-	-	-	-	-
Averages			5.93	5.41	166.16	125.22	13.56	-	-	-	-	323.35	0.82	7.26	18.75	10249	60.27	6.86	4.61	16.16	1.03	0.12	-	-
16 hr SRT																								
LDG-2*	Sat 3/11	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	3270	15.07	4.94	3.54	-	-	-	-	-
LDG-2	Sat 3/11	07:25	5.90	5.15	108.36	110.09	12.66	96.20	0.79	0.00	4.89	275.58	0.99	12.40	21.64	2976	13.04	4.85	3.66	22.43	1.05	0.10	-	-
LDG-2	Sat 3/11	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-	2970	13.75	3.85	3.85	-	-	-	-	-
LDG-2	Sun 3/12	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	3028	13.13	4.82	4.02	-	-	-	-	-
LDG-2	Sun 3/12	07:57	5.95	5.01	125.50	123.58	15.05	111.80	0.54	0.00	5.79	341.33	0.97	12.67	20.62	2946	12.80	4.56	4.03	25.57	1.05	0.14	-	-
LDG-2	Sun 3/12	08:00	-	-	-	-	-	-	-	-	-	-	-	-	-	2829	12.08	4.51	3.98	-	-	-	-	-
LDG-2	Sun 3/12	15:15	6.03	5.08	122.06	125.60	15.11	111.80	0.60	0.00	5.90	335.53	0.85	12.21	21.01	2710	11.13	4.51	4.15	25.76	1.12	0.16	-	-
LDG-2	Sun 3/12	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-	2865	11.64	4.88	4.42	-	-	-	-	-
Averages			5.96	5.08	118.64	119.76	14.27	106.60	0.64	0.00	5.53	317.48	0.94	12.43	21.09	2903	12.51	4.57	4.02	24.59	1.07	0.13	-	-

75

**Pilot FLRT Liquid Analytical Summary:
Lime/DBA/Gypsum Test Block**

																							Scaling Coupons	
			FLRT	ABS	L-Ca++	L-Mg++	L-Na+	L-K+	L-Al	L-Fe	L-Mn	L-Cl-	L-CO3=	L-SO3=	L-SO4=	ICE	ICE	ICE	ICE	CaSO3	CaSO4	CaCO3	Hold	Absorber
Test	Date	Time	pH	pH	(mM)	(mM)	(mM)	(ppm)	(ppm)	(ppm)	(ppm)	(mM)	(mM)	(mM)	(mM)	(ppm)	(mM)	(mM)	(mM)	RS	RS	RS	(mg/d/ln*)	(mg/d/ln*)
8 hr SRT																								
LDG-3*	Mon 3/13	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	2782	11.68	4.40	4.20	-	-	-	-	-
LDG-3*	Mon 3/13	08:15	6.10	5.19	110.85	126.28	14.95	-	-	-	-	313.48	0.73	10.13	22.53	2416	10.17	3.90	3.53	23.66	1.19	0.18	-	-
LDG-3*	Mon 3/13	14:15	6.05	-	-	-	-	-	-	-	-	-	-	-	-	2459	10.13	3.92	3.92	-	-	-	-	-
LDG-3*	Tue 3/14	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	2452	10.43	3.65	3.79	-	-	-	-	-
LDG-3	Tue 3/14	06:47	6.02	5.19	101.19	126.79	14.51	128.60	2.39	0.00	7.46	309.48	0.75	10.99	24.37	2345	9.74	3.58	3.82	20.70	1.07	0.12	-	-
LDG-3	Tue 3/14	14:25	6.03	5.27	103.29	136.75	15.21	133.70	1.20	0.00	7.65	317.61	0.78	9.36	24.10	2804	10.02	5.85	4.82	17.58	1.04	0.13	-	-
LDG-3	Wed 3/15	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	2738	8.12	7.00	5.33	-	-	-	-	-
LDG-3	Wed 3/15	08:00	5.98	5.26	98.20	137.98	15.16	138.60	1.00	0.00	7.45	316.42	0.70	7.66	25.65	3212	8.28	9.13	6.76	13.29	1.05	0.09	0.40	-
Averages			6.01	5.24	100.89	133.84	14.96	133.63	1.53	0.00	7.52	314.50	0.74	9.34	24.71	2775	9.04	6.39	5.18	17.19	1.05	0.11	-	-
4 hr SRT																								
LDG-4*	Wed 3/15	14:55	6.00	-	-	-	-	-	-	-	-	-	-	-	-	3080	6.15	10.91	6.29	-	-	-	-	-
LDG-4*	Thu 3/16	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	3110	5.51	11.40	6.79	-	-	-	-	-
LDG-4*	Thu 3/16	07:13	5.98	5.22	111.24	144.86	14.15	-	-	-	-	-	-	6.55	-	3259	5.39	12.07	7.45	-	-	-	-3.04	-
LDG-4	Thu 3/16	10:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-4	Thu 3/16	10:45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-4	Thu 3/16	11:05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-4	Thu 3/16	15:15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-4	Thu 3/16	14:20	6.03	-	108.48	145.47	14.68	123.10	1.12	0.02	6.33	344.80	0.74	4.43	27.04	3378	5.19	12.76	7.93	8.44	1.17	0.12	-	-
LDG-4	Fri 3/17	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	3601	5.15	13.73	8.79	-	-	-	-	-
LDG-4	Fri 3/17	06:15	6.01	5.22	108.61	148.72	14.76	128.10	0.82	0.00	6.22	338.88	0.78	4.71	28.41	3646	4.98	13.93	9.15	8.74	1.21	0.12	-	-
LDG-4	Fri 3/17	14:00	6.03	-	104.70	144.61	14.52	123.90	1.00	0.00	5.93	338.19	0.69	4.53	28.51	3773	4.87	14.52	9.71	8.38	1.19	0.11	-0.90	29.00
Averages			6.02	5.22	107.26	146.27	14.65	125.03	0.98	0.01	6.16	340.62	0.74	4.56	27.99	3600	5.05	13.74	8.90	8.52	1.19	0.12	-0.90	29.00
2000ppm SO2 Inlet, 12ft																								
LDG-5*	Sat 3/18	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	3856	5.10	14.73	9.89	-	-	-	-	-
LDG-5*	Sat 3/18	08:55	6.02	5.35	102.27	146.71	14.81	-	-	-	-	-	-	5.14	-	3706	4.91	14.08	9.58	-	-	-	-	-
LDG-5*	Sat 3/18	09:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-5*	Sat 3/18	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-	3183	3.80	11.97	8.88	-	-	-	-	-
LDG-5*	Sun 3/19	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	2517	2.69	9.31	7.59	-	-	-	-	-
LDG-5*	Sun 3/19	08:30	-	-	-	-	-	-	-	-	-	-	-	-	-	2496	2.59	9.10	7.77	-	-	-	-	-
LDG-5*	Sun 3/19	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-	2432	2.44	8.81	7.74	-	-	-	-	-
LDG-5*	Mon 3/20	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	2204	2.15	7.84	7.25	-	-	-	-	-
LDG-5	Mon 3/20	07:30	5.99	5.17	90.43	152.43	14.35	-	-	-	-	-	-	6.72	-	2384	2.50	8.51	7.59	-	-	-	-0.45	-
LDG-5	Mon 3/20	14:15	6.01	5.17	91.95	134.14	13.83	119.50	1.77	0.00	5.64	265.05	0.76	5.78	26.30	1906	1.91	6.80	6.18	10.18	1.08	0.11	-	32.99
Averages			6.00	5.17	91.19	143.29	14.09	119.50	1.77	0.00	5.64	265.05	0.76	6.25	26.30	2145	2.21	7.66	6.89	10.18	1.08	0.11	-0.45	32.99
0:SO2=14																								
LDG-6*	Tue 3/21	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	1585	1.36	5.45	5.65	-	-	-	-	-
LDG-6	Tue 3/21	07:40	5.97	5.17	87.21	136.88	13.18	-	-	-	-	-	-	6.39	-	1876	1.75	6.83	6.09	-	-	-	-0.21	-
LDG-6	Tue 3/21	14:20	6.00	5.20	87.17	143.41	13.46	126.40	1.60	0.00	6.89	292.73	0.92	6.40	29.17	1856	1.84	6.83	5.81	10.57	1.11	0.12	-	-
LDG-6	Wed 3/22	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	1960	2.00	7.32	5.95	-	-	-	-	-
LDG-6	Wed 3/22	06:58	6.04	5.21	85.32	145.03	13.54	125.30	1.18	0.00	7.07	289.80	0.70	5.80	30.53	2037	1.96	7.65	6.28	9.68	1.13	0.10	-0.27	-
LDG-6	Wed 3/22	14:15	6.05	5.19	94.28	144.33	14.87	142.90	0.90	0.00	7.78	313.02	0.74	5.71	27.14	2061	1.95	7.73	6.41	10.30	1.09	0.12	-	31.88
Averages			6.02	5.19	88.50	142.41	13.76	131.53	1.23	0.00	7.25	298.52	0.79	6.08	28.95	1958	1.90	7.27	6.11	10.18	1.11	0.11	-0.24	31.88

August 1995

**Pilot FLRT Liquid Analytical Summary:
Lime/DBA/Gypsum Test Block**

																						Scaling Coupons		
																						Hold		
																						Tank	Absorbe	
Test	Date	Time	FLRT pH	ABS pH	L-Ca++ (mM)	L-Mg++ (mM)	L-Na+ (mM)	L-K+ (ppm)	L=Al (ppm)	L-Fe (ppm)	L-Mn (ppm)	L-Cl- (mM)	L-CO3= (mM)	L-SO3= (mM)	L-SO4= (mM)	ICE DBA (ppm)	ICE Adipic (mM)	ICE Glutaric (mM)	ICE Succinic (mM)	CaSO3 RS	CaSO4 RS	CaCO3 RS	(mg/d/ln')	(mg/d/ln')
O:S02=11																								
LDG-7*	Thu 3/23	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	2224	2.09	8.43	6.83	-	-	-	-	-
LDG-7	Thu 3/23	08:15	5.98	5.24	91.31	152.07	15.22	-	-	-	-	-	-	5.60	-	2322	2.14	8.82	7.16	-	-	-	-0.19	-
LDG-7	Thu 3/23	14:10	6.01	5.24	89.58	152.65	14.85	144.00	1.21	0.00	8.38	300.64	0.93	5.13	29.50	2309	2.10	8.60	7.35	8.49	1.08	0.12	-	23.65
LDG-7	Fri 3/24	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	2327	2.12	8.75	7.31	-	-	-	-	-
LDG-7	Fri 3/24	06:12	5.99	5.22	86.94	150.43	14.45	143.40	2.49	0.00	8.37	289.06	0.90	4.80	29.50	2331	2.15	8.75	7.31	7.69	1.09	0.11	-	-
LDG-7	Fri 3/24	13:30	6.00	5.12	87.22	140.11	13.87	142.10	2.23	0.00	8.28	296.32	0.87	4.34	28.80	2266	1.88	8.26	7.64	7.19	1.10	0.11	-	18.92
Averages			6.00	5.21	88.76	148.82	14.60	143.17	1.98	0.00	8.34	295.34	0.90	4.97	29.27	2311	2.08	8.64	7.35	7.79	1.09	0.11	-0.19	21.29

**Pilot FLRT Liquid Analytical Summary:
Lime/DBA/Gypsum Test Block**

Test	Date	Time	FLRT pH	ABS pH	L-Ca++ (mM)	L-Mg++ (mM)	L-Na+ (mM)	L-K+ (ppm)	L-Al (ppm)	L-Fe (ppm)	L-Mn (ppm)	L-Cl- (mM)	L-CO3= (mM)	L-SO3= (mM)	L-SO4= (mM)	ICE DBA (ppm)	ICE Adipic (mM)	ICE Glutaric (mM)	ICE Succinic (mM)	CaSO3 RS	CaSO4 RS	CaCO3 RS	Scaling Coupons	
																							Hold Tank (mg/d/In')	Absorber (mg/d/In')
O:SO2=8																								
LDG-8	Mon 3/27	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	2452	6.55	6.23	5.71	-	-	-	-	-
LDG-8	Mon 3/27	08:00	5.99	5.11	101.53	122.85	12.53	-	-	-	-	-	-	3.69	-	2610	6.17	7.27	6.35	-	-	-	-	-
LDG-8	Tue 3/28	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	2586	5.41	7.66	6.65	-	-	-	-	-
LDG-8	Tue 3/28	07:17	6.02	5.20	77.68	95.71	9.63	-	-	-	-	-	-	3.82	-	2583	5.06	7.91	6.78	-	-	-	-0.23	-
LDG-8	Tue 3/28	14:07	6.00	5.08	117.08	120.24	13.66	123.80	1.89	0.00	7.07	350.51	0.99	3.15	23.95	2178	4.07	6.82	5.79	6.58	1.21	0.17	-	21.19
LDG-8	Wed 3/29	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	2305	4.06	7.40	6.23	-	-	-	-	-
LDG-8	Wed 3/29	07:45	6.00	5.16	121.51	126.60	13.95	137.70	2.20	0.00	7.81	383.32	1.05	3.70	24.10	2545	4.25	8.27	7.06	7.76	1.21	0.19	-	-
LDG-8	Wed 3/29	14:05	6.05	5.20	119.09	127.59	13.75	141.20	2.37	0.00	8.07	354.30	0.91	3.75	24.39	2356	3.79	7.86	6.48	8.07	1.21	0.19	-	18.91
Averages			6.01	5.15	107.38	118.60	12.70	134.23	2.15	0.00	7.65	362.71	0.98	3.62	24.15	2452	4.92	7.43	6.38	7.47	1.21	0.18	-0.23	20.05
O:SO2 = 6																								
LDG-9*	Thu 3/30	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	2213	3.37	7.47	6.23	-	-	-	-	-
LDG-9*	Thu 3/30	07:15	6.05	5.33	117.16	132.88	14.17	-	-	-	-	-	-	3.76	-	2175	3.19	7.30	6.32	-	-	-	0.61	-
LDG-9	Thu 3/30	14:08	6.01	5.21	114.41	131.71	13.92	136.20	2.26	0.00	7.68	351.59	1.01	2.88	24.79	2171	3.04	7.41	6.35	5.85	1.19	0.17	-	18.91
LDG-9	Fri 3/31	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	2303	3.01	7.98	6.87	-	-	-	-	-
LDG-9	Fri 3/31	06:15	5.97	5.21	117.85	140.35	14.85	147.60	2.12	0.00	8.09	356.36	0.91	2.87	24.77	2370	2.95	8.25	7.21	5.66	1.18	0.14	1.04	-
LDG-9	Fri 3/31	13:20	6.03	5.30	118.68	141.59	14.58	151.50	1.93	0.00	7.97	370.69	1.03	2.84	25.75	2924	3.71	10.27	8.70	5.83	1.21	0.19	-	18.91
Averages			6.00	5.24	116.98	137.88	14.45	145.10	2.10	0.00	7.91	359.55	0.98	2.86	25.10	2442	3.18	8.48	7.28	5.78	1.19	0.17	1.04	18.91
8250 scfm, pH=6.5																								
LDG-10	Mon 4/03	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	2584	4.17	8.60	7.12	-	-	-	-	-
LDG-10	Mon 4/03	07:25	6.50	5.26	119.40	142.11	14.48	152.90	0.22	0.00	6.65	360.49	1.39	2.66	26.36	3102	4.68	10.53	8.72	6.89	1.24	1.02	0.20	-
LDG-10	Mon 4/03	14:05	6.44	5.29	115.61	144.00	15.40	148.10	0.26	0.00	6.89	370.76	1.23	4.94	27.47	2740	4.01	9.62	7.50	12.29	1.26	0.74	-	18.92
Averages			6.47	5.28	117.51	143.06	14.94	150.50	0.24	0.00	6.77	365.63	1.31	3.80	26.92	2921	4.35	10.08	8.11	9.59	1.25	0.88	0.20	18.92
11000 scfm, 8hr SRT																								
LDG-11	Tue 4/04	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	2199	3.57	9.52	3.57	-	-	-	-	-
LDG-11	Tue 4/04	08:20	6.51	5.26	116.14	158.04	16.65	165.60	0.20	0.00	6.66	405.32	1.35	8.93	24.48	2304	3.43	9.23	4.96	22.22	1.08	0.98	0.42	-
LDG-11	Tue 4/04	16:30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.82
LDG-11	Wed 4/05	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	1699	2.78	7.96	2.05	-	-	-	-	-
LDG-11	Wed 4/05	09:25	6.48	5.26	101.69	144.62	14.09	155.80	0.13	0.00	3.41	-	-	5.58	-	1547	2.54	7.40	1.69	-	-	-	-0.02	-
Averages			6.50	5.26	108.92	151.33	15.37	160.70	0.17	0.00	5.04	405.32	1.35	7.06	24.48	1850	2.92	8.20	2.90	22.22	1.08	0.98	0.20	5.82
8250scfm, 7wt%, O:SO2=15																								
LDG-11A	Wed 4/05	14:00	6.13	-	-	-	-	-	-	-	-	-	-	-	-	1467	2.28	6.89	1.90	-	-	-	-	5.83
LDG-11A	Thu 4/06	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	1712	1.99	7.16	4.04	-	-	-	-	-
LDG-11A	Thu 4/06	08:00	6.00	4.91	105.27	159.28	14.99	161.50	1.96	0.00	5.96	-	-	4.03	-	2213	2.43	9.08	5.59	-	-	-	0.48	-
LDG-11A	Thu 4/06	14:30	5.73	-	-	-	-	-	-	-	-	-	-	3.36	-	2663	2.80	10.90	6.91	-	-	-	-	-
Averages			5.95	4.91	105.27	159.28	14.99	161.50	1.96	0.00	5.96	-	-	3.70	-	2014	2.38	8.51	4.61	-	-	-	0.48	5.83
8250scfm, 7wt%, O:SO2=6																								
LDG-11B	Thu 4/06	15:45	-	-	-	-	-	-	-	-	-	-	-	4.35	-	-	-	-	-	-	-	-	-	-
LDG-11B	Thu 4/06	16:05	-	-	-	-	-	-	-	-	-	-	-	4.39	-	-	-	-	-	-	-	-	-	4.72
LDG-11B	Thu 4/06	16:30	-	-	-	-	-	-	-	-	-	-	-	4.33	-	-	-	-	-	-	-	-	-	-
LDG-11B	Thu 4/06	17:00	-	-	-	-	-	-	-	-	-	-	-	4.37	-	-	-	-	-	-	-	-	-	-
LDG-11B	Thu 4/06	17:40	-	-	-	-	-	-	-	-	-	-	-	4.10	-	-	-	-	-	-	-	-	-	-
Averages			-	-	-	-	-	-	-	-	-	-	-	4.31	-	-	-	-	-	-	-	-	-	4.72

**Pilot FLRT Liquid Analytical Summary:
Lime/DBA/Gypsum Test Block**

Scaling Coupons																								
Test	Date	Time	FLRT pH	ABS pH	L-Ca++ (mM)	L-Mg++ (mM)	L-Na+ (mM)	L-K+ (ppm)	L-Al (ppm)	L-Fe (ppm)	L-Mn (ppm)	L-Cl- (mM)	L-CO3= (mM)	L-SO3= (mM)	L-SO4= (mM)	ICE DBA (ppm)	ICE Adipic (mM)	ICE Glutaric (mM)	ICE Succinic (mM)	CaSO3 RS	CaSO4 RS	CaCO3 RS	Hold	Absorber
																							Tank (mg/d/in')	(mg/d/in')
O:SO2=8																								
LDG-11C FH	4/07	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	2397	2.44	9.75	6.39	-	-	-	-	-
LDG-11C FH	4/07	07:15	6.11	4.98	84.47	118.49	10.70	126.60	4.83	0.00	5.00	-	-	3.74	-	2511	2.46	10.10	6.94	-	-	-	-	-
Averages			6.11	4.98	84.47	118.49	10.70	126.60	4.83	0.00	5.00	-	-	3.74	-	2454	2.45	9.93	6.67	-	-	-	-	-
O:SO2=6, Inlet SO2=2700																								
LDG-11C FH	4/07	08:45	-	-	-	-	-	-	-	-	-	-	-	4.15	-	-	-	-	-	-	-	-	0.40	-
LDG-11C FH	4/07	09:15	-	-	-	-	-	-	-	-	-	-	-	3.86	-	-	-	-	-	-	-	-	-	-
LDG-11C FH	4/07	10:15	-	-	-	-	-	-	-	-	-	-	-	3.44	-	-	-	-	-	-	-	-	-	-
LDG-11C FH	4/07	12:00	-	-	-	-	-	-	-	-	-	-	-	3.76	-	-	-	-	-	-	-	-	-	-
LDG-11C FH	4/07	14:03	6.21	4.97	83.57	118.34	10.70	125.00	1.71	0.00	5.52	262.39	1.18	4.10	28.80	2737	2.89	11.03	7.28	8.00	1.14	0.28	-	4.72
Averages			6.21	4.97	83.57	118.34	10.70	125.00	1.71	0.00	5.52	262.39	1.18	3.86	28.80	2737	2.89	11.03	7.28	8.00	1.14	0.28	0.40	4.72
Inlet SO2=2000, L/G=41																								
LDG-11B FH	4/07	15:30	-	-	-	-	-	-	-	-	-	-	-	3.70	-	-	-	-	-	-	-	-	-	-
Averages			-	-	-	-	-	-	-	-	-	-	-	3.70	-	-	-	-	-	-	-	-	-	-
11000scfm, L/G=30.9.5wt%																								
LDG-11F FH	4/07	16:30	-	-	-	-	-	-	-	-	-	-	-	4.32	-	-	-	-	-	-	-	-	-	-
LDG-11F FH	4/07	17:05	-	-	-	-	-	-	-	-	-	-	-	4.42	-	-	-	-	-	-	-	-	-	-
LDG-11F Sat	4/08	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	2525	2.60	10.24	6.73	-	-	-	-	-
LDG-11F Sat	4/08	08:10	6.01	5.10	93.49	133.05	11.84	146.00	4.40	0.00	7.17	288.86	1.19	7.95	25.29	2960	2.99	11.91	8.06	13.87	1.02	0.16	-	-
LDG-11F Sat	4/08	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-	2399	2.30	10.80	5.40	-	-	-	-	-
LDG-11F Sun	4/09	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	2228	2.17	10.45	4.51	-	-	-	-	-
LDG-11F Sun	4/09	08:00	-	-	-	-	-	-	-	-	-	-	-	-	-	1417	1.63	6.31	2.93	-	-	-	-	-
LDG-11F Sun	4/09	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-	2010	2.07	9.86	3.44	-	-	-	-	-
LDG-11F Mon	4/10	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	2007	2.00	9.71	3.67	-	-	-	-	12.57
LDG-11F Mon	4/10	06:55	5.99	4.90	83.89	140.21	12.03	155.50	2.33	0.00	5.33	283.78	1.10	10.03	29.35	2142	2.12	10.27	4.04	15.89	1.08	0.13	1.17	-
Averages			5.99	4.90	83.89	140.21	12.03	155.50	2.33	0.00	5.33	283.78	1.10	10.03	29.35	1894	1.96	9.04	3.52	15.89	1.08	0.13	1.17	12.57

**Pilot FLRT Liquid Analytical Summary:
Lime/DBA/Gypsum Test Block**

																						Scaling Coupons		
																						Hold Tank	Absorber	
Test	Date	Time	FLRT pH	ABS pH	L-Ca++ (mM)	L-Mg++ (mM)	L-Na+ (mM)	L-K+ (ppm)	L-Al (ppm)	L-Fe (ppm)	L-Mn (ppm)	L-Cl- (mM)	L-CO3= (mM)	L-SO3= (mM)	L-SO4= (mM)	ICE DBA (ppm)	ICE Adipic (mM)	ICE Glutaric (mM)	ICE Succinic (mM)	CaSO3 RS	CaSO4 RS	CaCO3 RS	(mg/d/in')	(mg/d/in')
10000ppm Mg, pH=6.5																								
#####	Mon 4/10	14:00	6.00	-	-	-	-	-	-	-	-	-	-	5.69	-	-	-	-	-	-	-	-	-	-
#####	Tue 4/11	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	2109	2.26	9.24	4.74	-	-	-	-	-
#####	Tue 4/11	08:00	6.37	5.14	26.12	345.67	13.27	-	-	-	-	403.29	-	2.76	-	2199	2.29	9.40	5.29	-	-	-	-1.84	-
#####	Tue 4/11	14:20	6.67	-	23.13	410.99	12.70	-	-	-	-	-	-	2.39	-	1977	1.94	8.60	4.73	-	-	-	-	7.08
#####	Wed 4/12	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	2573	2.52	11.08	6.29	-	-	-	-	-
#####	Wed 4/12	07:15	6.37	5.41	23.93	434.26	13.69	1.41	1.13	0.00	6.41	428.20	1.11	2.48	173.78	2858	2.79	12.05	7.29	1.02	1.03	0.09	-	-
LDG-12	Wed 4/12	14:07	6.61	5.53	23.11	426.11	14.17	142.20	0.59	0.00	6.66	422.04	1.54	2.03	170.45	3160	3.13	13.35	7.97	0.88	0.98	0.23	-	-
LDG-12	Wed 4/12	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-12	Thu 4/13	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	3294	3.20	13.81	8.51	-	-	-	-	-
LDG-12	Thu 4/13	08:00	6.47	5.70	23.06	444.03	13.99	145.90	1.14	0.05	7.41	412.31	1.39	1.96	179.72	3189	3.13	13.19	8.40	0.79	1.01	0.14	-	-
LDG-12	Thu 4/13	14:35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-12	Thu 4/13	14:40	6.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-12	Fri 4/14	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	3445	3.24	14.33	9.16	-	-	-	-	-
LDG-12	Fri 4/14	08:00	-	-	-	-	-	-	-	-	-	-	-	-	-	3384	3.11	14.00	9.17	-	-	-	-	-
LDG-12	Fri 4/14	08:05	6.82	5.90	22.99	453.11	13.64	-	-	-	-	-	-	2.23	-	2937	2.68	12.08	8.06	-	-	-	-	-
LDG-12	Fri 4/14	14:10	6.83	-	-	-	-	-	-	-	-	-	-	-	-	3399	3.18	14.02	9.19	-	-	-	-	-
LDG-12	Sat 4/15	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	3211	2.84	13.23	8.90	-	-	-	-	-
LDG-12	Sat 4/15	08:00	-	-	-	-	-	-	-	-	-	-	-	-	-	3182	2.83	13.01	8.91	-	-	-	-	-
LDG-12	Sat 4/15	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-	3238	2.85	13.19	9.16	-	-	-	-	-
LDG-12	Sun 4/16	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	3030	2.72	12.26	8.60	-	-	-	-	-
LDG-12	Sun 4/16	10:16	-	-	-	-	-	-	-	-	-	-	-	-	-	3027	2.62	12.22	8.74	-	-	-	-	-
LDG-12	Sun 4/16	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-	3086	2.69	12.44	8.91	-	-	-	-	-
LDG-12	Mon 4/17	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	3025	2.60	12.12	8.86	-	-	-	-	-
LDG-12	Mon 4/17	07:25	6.59	5.66	21.64	445.25	13.04	148.40	1.89	0.00	10.48	355.47	1.42	3.05	201.62	2984	2.67	12.09	8.46	1.20	1.05	0.18	0.40	1.57
Averages			6.62	5.70	22.70	442.13	13.71	145.50	1.21	0.02	8.18	396.61	1.45	2.32	183.93	3173	2.90	13.02	8.73	0.96	1.01	0.18	0.40	1.57

**Pilot FLRT Solid Analytical Summary:
Lime/DBA/Gypsum Test Block**

Test	Date	Time	FLRT Wt% Solids	Ca (mmol/g)	Mg (mmol/g)	SO3 (mmol/g)	SO4 (mmol/g)	CO3 (mmol/g)	Inerts (wt%)	Wt Solids Closure (%)	Mol Solids Closure (%)	Solids Ox. (%)	UUL (%)	IR Ox. (%)	UUL (%)	CP Wt%	FC WT%	Thickener Unit Area (ft ² /tpd)	Initial Wt%	Final Settled Wt%	Form Filtration Rate (lb/hr*sqft)	Filter Leaf Cake Wt%
15,000scfm, L/G=30, 8ft																						
LDG-1X	Fri 3/03	01:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-1X	Fri 3/03	08:00	17.14	-	-	1.99	-	-	-	-	-	-	-	65.5	89.5	61.64	-	-	-	-	-	-
LDG-1X	Fri 3/03	14:00	-	-	-	-	-	-	-	-	-	-	-	-	-	62.05	-	-	-	-	-	-
LDG-1X	Fri 3/03	15:20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages			17.14	-	-	1.99	-	-	-	-	-	-	-	65.5	89.5	61.85	-	-	-	-	-	-
8250 scfm, L/G=50																						
LDG-0A	Sat 3/04	00:02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-0A	Sat 3/04	08:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-0A	Sat 3/04	09:20	17.49	-	-	0.16	-	-	-	-	-	-	-	95.3	94.3	76.98	-	-	-	-	-	-
LDG-0A	Sat 3/04	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-0A	Sun 3/05	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-0A	Sun 3/05	08:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-0A	Sun 3/05	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-0A	Mon 3/06	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-0A	Mon 3/06	08:12	15.86	-	-	0.03	-	-	-	-	-	-	-	100.0	94.3	83.35	-	-	-	-	-	-
LDG-0A	Mon 3/06	14:35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages			16.68	-	-	0.10	-	-	-	-	-	-	-	97.7	94.3	80.17	-	-	-	-	-	-
12ft Tank																						
LDG-0B	Tue 3/07	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-0B	Tue 3/07	07:45	15.30	-	-	0.00	-	-	-	-	-	-	-	100.0	97.7	82.50	-	-	-	-	-	-
LDG-0B	Tue 3/07	14:35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages			15.30	-	-	0.00	-	-	-	-	-	-	-	100.0	97.7	82.50	-	-	-	-	-	-
8250scfm, L/G=30, 12ft																						
LDG-1*	Wed 3/08	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-1	Wed 3/08	07:55	15.78	-	-	-	-	0.00	-	-	-	-	-	100.0	97.0	80.31	-	-	-	-	-	-
LDG-1	Wed 3/08	14:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-1	Thu 3/09	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-1	Thu 3/09	08:10	15.82	-	-	0.03	-	-	-	-	-	-	-	-	-	82.81	-	-	-	-	-	-
LDG-1*	Thu 3/09	14:20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-1*	Thu 3/09	15:10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-1*	Thu 3/09	16:05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-1*	Thu 3/09	17:55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-1*	Thu 3/09	21:20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-1*	Fri 3/10	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-1*	Fri 3/10	07:07	17.88	-	-	-	-	-	-	-	-	-	-	-	-	83.31	-	-	-	-	-	-
LDG-1*	Fri 3/10	14:12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages			15.80	-	-	0.03	-	0.00	-	-	-	-	-	100.0	97.0	81.56	-	-	-	-	-	-
16 hr SRT																						
LDG-2*	Sat 3/11	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-2	Sat 3/11	07:25	15.28	5.90	0.01	0.01	5.75	0.01	0.80	1.2	0.5	99.8	99.8	97.2	93.9	81.91	-	0.84	12.35	65.67	1119	83
LDG-2	Sat 3/11	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-2	Sun 3/12	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-2	Sun 3/12	07:57	15.68	5.78	0.01	0.03	5.67	0.01	1.00	0.7	-0.6	99.5	99.8	-	-	84.62	-	0.89	13.91	64.32	1026	84
LDG-2	Sun 3/12	08:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-2	Sun 3/12	15:15	15.66	5.89	0.02	0.02	5.65	0.01	0.90	2.0	-0.6	99.6	99.8	-	-	82.40	-	1.04	11.85	62.69	1298	83
LDG-2	Sun 3/12	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages			15.54	5.86	0.01	0.02	5.69	0.01	0.90	1.29	-0.25	99.6	99.8	97.2	93.9	82.98	-	0.92	12.70	64.23	1148	83

**Pilot FLRT Solid Analytical Summary:
Lime/DBA/Gypsum Test Block**

Test	Date	Time	FLRT Wt% Solids	Ca (mmol/g)	Mg (mmol/g)	SO3 (mmol/g)	SO4 (mmol/g)	CO3 (mmol/g)	Inerts (wt%)	Wt Solids Closure (%)	Mol Solids Closure (%)	Solids Ox. (%)	UHL (%)	IR Ox. (%)	UHL (%)	CP Wt%	FC WT%	Thickener Unit Area (ft ² /pd)	Initial Wt%	Final Settled Wt%	Form Filtration Rate (lb/hr*sqft)	Filter Leaf Cake Wt%
8 hr SRT																						
LDG-3*	Mon 3/13	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-3*	Mon 3/13	08:15	10.57	-	-	-	-	0.01	-	-	-	-	-	100.0	95.1	83.33	-	-	-	-	-	-
LDG-3*	Mon 3/13	14:15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-3*	Tue 3/14	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-3	Tue 3/14	06:47	7.95	5.78	0.03	0.01	5.52	0.01	1.60	2.4	-2.1	99.8	99.8	94.6	90.1	83.42	-	1.62	12.04	57.82	2310	75
LDG-3	Tue 3/14	14:25	8.27	5.66	0.02	0.01	5.58	0.01	1.60	0.7	-1.9	99.8	99.8	-	-	82.19	-	1.73	12.40	53.32	1157	74
LDG-3	Wed 3/15	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-3	Wed 3/15	08:00	8.15	5.65	0.05	0.01	5.43	0.02	2.20	2.2	-3.1	99.8	99.6	100.0	87.4	82.25	-	1.24	12.14	57.76	759	73
Averages			8.12	5.70	0.03	0.01	5.51	0.01	1.80	1.75	-2.38	99.8	99.8	97.3	88.8	82.62	-	1.53	12.19	56.30	1409	74
4 hr SRT																						
LDG-4*	Wed 3/15	14:55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-4*	Thu 3/16	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-4*	Thu 3/16	07:13	4.03	-	-	-	-	-	-	-	-	-	-	100.0	89.5	-	77.12	-	-	-	-	-
LDG-4	Thu 3/16	10:00	-	-	-	-	-	-	-	-	-	-	-	-	-	72.96	70.94	-	-	-	-	-
LDG-4	Thu 3/16	10:45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	76.53	-	-	-	-	-
LDG-4	Thu 3/16	11:05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	74.44	-	-	-	-	-
LDG-4	Thu 3/16	15:15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	76.62	-	-	-	-	-
LDG-4	Thu 3/16	14:20	4.46	5.46	0.09	0.00	5.31	0.01	2.80	2.1	-4.9	100.0	99.8	-	-	-	19.61	1.90	11.37	53.92	55	66
LDG-4	Fri 3/17	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-4	Fri 3/17	06:15	4.48	5.39	0.14	0.00	5.25	0.01	2.90	2.5	-5.8	100.0	99.8	100.0	94.3	80.58	79.08	1.73	11.27	55.74	30	68
LDG-4	Fri 3/17	14:00	4.12	5.50	0.10	0.00	5.25	0.01	3.50	3.1	-4.8	100.0	99.8	-	-	80.71	75.97	1.32	13.67	60.03	41	67
Averages			4.35	5.45	0.11	0.00	5.27	0.01	3.07	2.57	-5.18	100.0	99.8	100.0	94.3	78.08	67.60	1.65	12.10	56.56	42	67
2000ppm SO2 Inlet, 12ft																						
LDG-5*	Sat 3/18	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-5*	Sat 3/18	08:55	3.85	-	-	-	-	-	-	-	-	-	-	100.0	95.7	78.97	-	-	-	-	-	-
LDG-5*	Sat 3/18	09:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-5*	Sat 3/18	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-5*	Sun 3/19	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-5*	Sun 3/19	08:30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-5*	Sun 3/19	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-5*	Mon 3/20	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-5	Mon 3/20	07:30	4.48	-	-	-	-	-	-	-	-	-	-	100.0	96.3	78.56	62.13	-	-	-	-	-
LDG-5	Mon 3/20	14:15	4.11	5.56	0.03	0.00	5.07	0.01	2.82	4.8	-7.8	100.0	99.8	-	-	77.47	58.46	3.38	11.96	47.65	77	59
Averages			4.30	5.56	0.03	0.00	5.07	0.01	2.82	4.77	-7.82	100.0	99.8	100.0	96.3	78.02	60.30	3.38	11.96	47.65	77	59
0:SO2=14																						
LDG-6*	Tue 3/21	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-6	Tue 3/21	07:40	4.09	-	-	0.00	-	-	-	-	-	-	-	100.0	98.5	77.58	56.21	-	-	-	-	-
LDG-6	Tue 3/21	14:20	4.45	5.96	0.04	0.02	5.46	0.01	3.06	4.4	-0.6	99.6	99.8	-	-	76.57	65.39	3.89	12.26	45.06	284	64
LDG-6	Wed 3/22	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-6	Wed 3/22	06:58	4.07	5.80	0.12	0.02	5.39	0.01	2.74	4.4	-2.3	99.6	99.8	92.0	90.3	78.14	61.27	3.70	11.88	45.24	198	60
LDG-6	Wed 3/22	14:15	4.26	5.82	0.11	0.02	5.36	0.01	2.73	4.8	-2.7	99.6	99.8	-	-	77.67	70.20	3.28	11.83	41.73	434	71
Averages			4.22	5.86	0.09	0.02	5.40	0.01	2.84	4.54	-1.89	99.6	99.8	96.0	94.4	77.49	63.27	3.62	11.99	44.01	305	65

August 1995

**Pilot FLRT Solid Analytical Summary:
Lime/DBA/Gypsum Test Block**

Test	Date	Time	FLRT Wt% Solids	Ca (mmol/g)	Mg (mmol/g)	SO3 (mmol/g)	SO4 (mmol/g)	CO3 (mmol/g)	Inerts (wt%)	Wt Solids Closure (%)	Mol Solids Closure (%)	Solids Ox. (%)	UdL (%)	IR Ox. (%)	UdL (%)	CP Wt%	FC WT%	Thickener Unit Area (ft2/lpd)	Initial Wt%	Final Settled Wt%	Form Filtration Rate (lb/hr*sqft)	Filter Leaf Cake Wt%
<i>O:SO2=11</i>																						
LDG-7*	Thu 3/23	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-7	Thu 3/23	08:15	3.85	-	-	-	-	-	-	-	-	-	-	100.0	90.3	78.46	73.10	-	-	-	-	-
LDG-7	Thu 3/23	14:10	4.78	5.76	0.04	0.03	5.50	0.02	2.12	2.2	-1.7	99.5	99.6	-	-	-	67.62	3.37	12.09	48.25	351	66
LDG-7	Fri 3/24	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-7	Fri 3/24	06:12	4.34	5.88	0.02	0.01	5.68	0.01	2.56	1.7	1.3	99.8	99.8	-	-	-	59.41	2.82	11.87	45.75	1412	65
LDG-7	Fri 3/24	13:30	4.20	6.02	0.02	0.01	5.69	0.01	1.01	2.8	0.5	99.8	99.8	-	-	-	69.22	2.74	12.07	47.50	1753	72
Averages			4.29	5.89	0.03	0.02	5.62	0.01	1.90	2.25	0.02	99.7	99.8	100.0	90.3	78.46	67.34	2.98	12.01	47.17	1172	68

**Pilot FLRT Solid Analytical Summary:
Lime/DBA/Gypsum Test Block**

Test	Date	Time	FLRT Wt%	Ca (mmol/g)	Mg (mmol/g)	SO3 (mmol/g)	SO4 (mmol/g)	CO3 (mmol/g)	Inerts (wt%)	Wt Solids Closure (%)	Mol Solids Closure (%)	Solids Ox. (%)	UUL (%)	IR Ox. (%)	UUL (%)	CP Wt%	FC WT%	Thickener Unit Area (ft ² /tpd)	Initial Wt%	Final Settled Wt%	Form Filtration Rate (lb/hr*sqft)	Filter Leaf Cake Wt%
O:SO2=8																						
LDG-8	Mon 3/27	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-8	Mon 3/27	08:00	4.16	-	-	-	-	-	-	-	-	-	-	-	-	-	65.78	-	-	-	-	-
LDG-8	Tue 3/28	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-8	Tue 3/28	07:17	4.58	-	-	-	-	-	-	-	-	-	-	100.0	89.4	-	70.03	-	-	-	-	-
LDG-8	Tue 3/28	14:07	3.97	6.09	0.02	0.00	5.44	0.19	0.60	4.08	-1.97	100.0	96.8	-	-	-	74.11	1.85	12.48	50.96	1950	71
LDG-8	Wed 3/29	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-8	Wed 3/29	07:45	4.05	6.00	0.03	0.00	5.48	0.16	0.59	3.33	-1.97	100.0	97.3	100.0	90.8	-	75.07	1.66	13.04	49.84	1812	74
LDG-8	Wed 3/29	14:05	4.49	5.80	0.02	0.00	5.45	0.10	0.64	2.37	-3.50	100.0	98.2	-	-	-	66.78	1.88	11.82	50.46	1435	67
Averages			4.25	5.96	0.02	0.00	5.46	0.15	0.61	3.26	-2.48	100.0	97.4	100.0	90.1	-	70.35	1.80	12.45	50.42	1732	71
O:SO2 = 6																						
LDG-9*	Thu 3/30	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-9*	Thu 3/30	07:15	4.87	-	-	-	-	-	-	-	-	-	-	100.0	91.1	-	61.48	-	-	-	-	-
LDG-9	Thu 3/30	14:08	4.15	5.97	0.02	0.01	5.46	0.10	0.74	3.63	-2.52	99.8	98.3	-	-	-	72.90	2.10	12.21	50.34	2116	74
LDG-9	Fri 3/31	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-9	Fri 3/31	06:15	4.36	5.97	0.02	0.00	5.46	0.09	0.56	3.80	-2.83	100.0	98.4	100.0	92.6	-	70.87	2.21	11.54	46.25	990	74
LDG-9	Fri 3/31	13:20	4.17	6.03	0.02	0.01	5.42	0.08	0.51	4.67	-3.15	99.8	98.6	-	-	-	69.91	2.20	11.95	46.87	1285	71
Averages			4.23	5.99	0.02	0.01	5.45	0.09	0.60	4.04	-2.83	99.9	98.4	100.0	92.6	-	71.23	2.17	11.90	47.82	1464	73
8250 scfm, pH=6.5																						
LDG-10	Mon 4/03	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-10	Mon 4/03	07:25	4.46	6.07	0.04	0.03	5.49	0.09	0.90	4.23	-1.37	99.4	98.5	-	-	-	77.58	-	-	-	-	-
LDG-10	Mon 4/03	14:05	4.21	6.10	0.04	0.05	5.52	0.08	0.90	4.16	-0.78	99.1	98.6	-	-	-	75.51	-	-	-	-	-
Averages			4.34	6.09	0.04	0.04	5.51	0.09	0.90	4.19	-1.07	99.2	98.6	-	-	-	76.55	-	-	-	-	-
11000 scfm, 8hr SRT																						
LDG-11	Tue 4/04	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-11	Tue 4/04	08:20	12.65	-	-	0.55	-	0.10	-	-	-	-	-	-	-	-	72.95	-	-	-	-	-
LDG-11	Tue 4/04	16:30	13.49	-	-	0.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1285	71
LDG-11	Wed 4/05	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-11	Wed 4/05	09:25	15.70	-	-	2.00	-	0.21	-	-	-	-	-	-	-	-	62.07	-	-	-	-	-
Averages			13.95	-	-	1.08	-	0.16	-	-	-	-	-	-	-	-	67.51	-	-	-	1285	71
8250scfm, 7wt%, O:SO2=15																						
LDG-11A	Wed 4/05	14:00	16.61	-	-	1.64	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-11A	Thu 4/06	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-11A	Thu 4/06	08:00	7.82	-	-	0.07	-	-	-	-	-	-	-	-	-	-	63.99	-	-	-	-	-
LDG-11A	Thu 4/06	14:30	5.73	-	-	-	-	-	-	-	-	-	-	-	-	-	66.11	-	-	-	-	-
Averages			10.05	-	-	0.86	-	-	-	-	-	-	-	-	-	-	65.05	-	-	-	-	-
8250scfm, 7wt%, O:SO2=6																						
LDG-11B	Thu 4/06	15:45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-11B	Thu 4/06	16:05	8.23	-	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-11B	Thu 4/06	16:30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-11B	Thu 4/06	17:00	8.23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-11B	Thu 4/06	17:40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages			8.23	-	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

**Pilot FLRT Solid Analytical Summary:
Lime/DBA/Gypsum Test Block**

			FLRT							Wt	Mol						Thickener				Form	Filter
			Wt%	Ca	Mg	SO3	SO4	CO3	Inerts	Solids	Solids	Solids	UoL	IR	UoL	CP	FC	Unit	Initial	Final	Filtration	Leaf
Test	Date	Time	Solids	(mmol/g)	(mmol/g)	(mmol/g)	(mmol/g)	(mmol/g)	(wt%)	Closure	Closure	Ox.	(%)	Ox.	(%)	WT%	WT%	(ft2/tpd)	Wt%	Wt%	(lb/hr*sqft)	Cake
O:SO2=8																						
LDG-11C Fri	4/07	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-11C Fri	4/07	07:15	7.17	-	-	0.01	-	-	-	-	-	-	-	-	-	-	74.21	-	-	-	-	-
Averages			7.17	-	-	0.01	-	-	-	-	-	-	-	-	-	-	74.21	-	-	-	-	-
O:SO2=6,Inlet SO2=2700																						
LDG-11C Fri	4/07	08:45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-11C Fri	4/07	09:15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-11C Fri	4/07	10:15	7.76	-	-	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-11C Fri	4/07	12:00	8.12	-	-	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-11C Fri	4/07	14:03	8.02	6.07	0.01	0.06	5.51	0.03	0.70	4.11	-1.52	98.9	99.5	-	-	-	69.70	1.84	11.68	51.36	1495	75
Averages			7.97	6.07	0.01	0.04	5.51	0.03	0.70	4.11	-1.52	98.9	99.5	-	-	-	69.70	1.84	11.68	51.36	1495	75
Inlet SO2=2000, L/G=41																						
LDG-11B Fri	4/07	15:30	7.76	-	-	0.02	-	-	-	-	-	-	-	-	-	-	69.70	-	-	-	-	-
Averages			7.76	-	-	0.02	-	-	-	-	-	-	-	-	-	-	69.70	-	-	-	-	-
11000scfm,L/G=30.9.5wt%																						
LDG-11F Fri	4/07	16:30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-11F Fri	4/07	17:05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-11F Sat	4/08	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-11F Sat	4/08	08:10	10.67	5.99	0.01	0.04	5.50	0.03	0.70	3.72	-2.14	99.3	99.5	-	-	-	74.20	2.30	12.02	50.37	1542	75
LDG-11F Sat	4/08	16:00	10.17	-	-	0.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-11F Sun	4/09	00:01	10.22	-	-	0.83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-11F Sun	4/09	08:00	10.71	-	-	0.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-11F Sun	4/09	16:00	10.62	-	-	0.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-11F Mon	4/10	00:01	9.72	-	-	0.52	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-11F Mon	4/10	06:55	9.87	5.63	0.01	0.40	5.22	0.05	0.80	-0.27	-4.03	92.9	99.1	-	-	-	74.70	3.52	11.91	49.66	440	75
Averages			10.23	5.63	0.01	0.61	5.22	0.05	0.80	-0.27	-4.03	92.9	99.1	-	-	-	74.70	3.52	11.91	49.66	440	75

**Pilot FLRT Solid Analytical Summary:
Lime/DBA/Gypsum Test Block**

			FLRT							Wt	Mol							Thickener			Form	Filter
			Wt%	Ca	Mg	SO3	SO4	CO3	Inerts	Solids	Solids	Solids	UuL	IR	UuL	CP	FC	Unit	Initial	Final	Filtration	Leaf
Test	Date	Time	Solids	(mmol/g)	(mmol/g)	(mmol/g)	(mmol/g)	(mmol/g)	(wt%)	Closure	Closure	Ox.	(%)	Ox.	(%)	Wt%	WT%	Area	Wt%	Settled	Rate	Cake
10000ppm Mg, pH=6.5																						
#####	Mon	4/10	14:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
#####	Tue	4/11	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
#####	Tue	4/11	08:00	-	-	-	0.02	-	-	-	-	-	-	-	-	-	71.32	-	-	-	-	-
#####	Tue	4/11	14:20	-	-	-	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
#####	Wed	4/12	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
#####	Wed	4/12	07:15	11.96	5.85	0.03	0.01	5.69	0.01	0.70	1.47	-0.52	99.8	99.8	-	-	79.64	0.73	11.96	62.14	6224	80
LDG-12	Wed	4/12	14:07	11.45	5.83	0.03	0.00	5.79	0.01	0.70	0.51	0.65	100.0	99.8	-	-	76.95	0.62	11.45	55.02	7267	80
LDG-12	Wed	4/12	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-	78.93	-	-	-	-	-
LDG-12	Thu	4/13	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-12	Thu	4/13	08:00	10.94	5.61	0.03	0.00	5.79	0.01	0.80	-1.41	-0.13	100.0	99.8	-	-	82.44	0.69	10.94	60.59	6408	78
LDG-12	Thu	4/13	14:35	10.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-12	Thu	4/13	14:40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-12	Fri	4/14	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-12	Fri	4/14	08:00	-	-	-	-	-	-	-	-	-	-	-	-	-	81.89	-	-	-	-	-
LDG-12	Fri	4/14	08:05	12.03	-	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-12	Fri	4/14	14:10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-12	Sat	4/15	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-12	Sat	4/15	08:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-12	Sat	4/15	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-12	Sun	4/16	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-12	Sun	4/16	10:16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-12	Sun	4/16	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-12	Mon	4/17	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LDG-12	Mon	4/17	07:25	12.66	5.82	0.03	0.00	5.69	0.02	0.60	1.19	-0.74	100.0	-	-	-	86.43	0.91	12.66	58.28	6284	80
Averages			11.57	-	-	0.00	-	0.01	-	0.10	-0.08	100.0	99.8	-	-	-	81.33	0.74	11.68	57.96	6653	79

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**Pilot FLRT Liquid Analytical Summary:
Lime/DBA/Gypsum Test Block**

Gas				FLRT	ABS	L-Ca++	L-Mg++	L-Na+	L-K+	L-Al	L-Fe	L-Mn	L-Cl-	L-F	L-CO3=	L-SO3=	L-SO4=	ICE	ICE	ICE	ICE	ICE	Thio-	CaSO3	CaSO4	CaCO3	%	
Test ID	Sample ID	Date	Time	pH	pH	(mM)	(mM)	(mM)	(ppm)	(ppm)	(ppm)	(ppm)	(mM)		(mM)	(mM)	(mM)	DBA (ppm)	Adipic (mM)	Glutaric (mM)	Succinic (mM)	Formate (ppm)	sulfate (ppm)	RS	RS	RS	SO2 Rem.	
III Mg, pH=6.0, 6hr SRT																												
T1*		Mon 4/17	14:07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2810	2.20	10.58	9.26	-	-	-	-	-	-	
T1*		Tue 4/18	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2732	2.18	10.58	8.62	-	-	-	-	-	-	
T1		Tue 4/18	07:45	6.20	5.58	23.43	431.41	12.85	-	-	-	-	-	-	-	5.20	-	2993	2.42	11.65	9.34	-	-	-	-	-	-	
T1		Tue 4/18	14:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2745	2.31	10.90	8.21	-	-	-	-	-	-	
T1		Wed 4/19	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2806	2.40	11.31	8.16	-	-	-	-	-	-	
T1		Wed 4/19	07:05	5.80	5.48	22.73	431.15	12.54	-	-	-	-	-	-	-	9.13	-	2909	2.53	11.74	8.39	-	-	-	-	-	-	
T1		Wed 4/19	09:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T1		Wed 4/19	14:15	6.18	5.40	21.86	435.75	12.76	137.00	6.45	0.00	12.29	325.11	-	1.21	4.87	204.54	2504	2.24	10.19	7.05	-	-	1.64	1.10	0.05	-	
T1		Thu 4/20	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2590	2.35	10.61	7.17	-	-	-	-	-	-	
T1		Thu 4/20	07:55	6.21	5.63	21.87	442.85	12.86	142.20	9.86	0.00	12.90	323.24	-	1.12	6.60	206.30	2890	2.64	11.82	8.00	-	-	2.22	1.08	0.05	-	
T1		Thu 4/20	11:30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T1		Thu 4/20	14:35	6.01	-	-	-	-	-	-	-	-	-	-	-	-	-	2845	2.36	11.11	8.76	-	-	-	-	-	-	
Averages				6.08	5.52	22.47	435.29	12.75	139.60	8.16	0.00	12.60	324.18	-	1.17	6.45	205.42	2785	2.41	11.17	8.14	-	-	1.93	1.09	0.05	-	
III Mg, 10 hr SRT																												
T2*		Fri 4/21	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2971	2.51	11.65	9.04	-	-	-	-	-	-	
T2*		Fri 4/21	07:10	5.90	5.66	25.35	462.13	13.23	-	-	-	-	-	-	-	21.29	-	2909	2.49	11.46	8.75	-	-	-	-	-	-	
T2*		Fri 4/21	14:39	5.74	-	-	-	-	-	-	-	-	-	-	-	-	-	3108	2.64	12.13	9.50	-	-	-	-	-	-	
T2		Sat 4/22	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3045	2.63	12.43	8.65	-	-	-	-	-	-	
T2		Sat 4/22	08:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2741	2.35	11.11	7.89	-	-	-	-	-	-	
T2		Sat 4/22	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2950	2.54	12.06	8.37	-	-	-	-	-	-	
T2		Sun 4/23	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2704	2.35	11.03	7.67	-	-	-	-	-	-	
T2		Sun 4/23	08:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2883	2.50	11.84	8.09	-	-	-	-	-	-	
T2		Sun 4/23	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2972	2.61	12.26	8.24	-	-	-	-	-	-	
T2		Mon 4/24	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2764	2.40	11.38	7.72	-	-	-	-	-	-	
T2		Mon 4/24	06:42	5.76	5.44	20.85	435.31	12.18	140.00	32.48	0.06	15.96	299.69	-	0.80	10.02	220.02	2935	2.54	12.24	8.04	-	-	2.18	1.10	0.01	-	
T2		Mon 4/24	13:45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2880	2.63	12.09	7.63	-	-	-	-	-	-	
T2		Mon 4/24	14:45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T2		Mon 4/24	15:17	-	-	-	-	-	-	-	-	-	-	-	-	6.93	-	-	-	-	-	-	-	-	-	-	-	
T2		Mon 4/24	15:45	-	-	-	-	-	-	-	-	-	-	-	-	5.35	-	-	-	-	-	-	-	-	-	-	-	
T2		Mon 4/24	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2198	1.99	8.99	6.11	-	-	-	-	-	-	
Averages				5.76	5.44	20.85	435.31	12.18	140.00	32.48	0.06	15.96	299.69	-	0.80	7.43	220.02	2807	2.45	11.54	7.84	-	-	2.18	1.10	0.01	-	
III Mg, 11000scfm, III Mn																												
T3*		Tue 4/25	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2206	2.04	9.05	6.05	-	-	-	-	-	-	
T3		Tue 4/25	08:05	5.00	3.62	24.43	452.12	12.72	-	-	-	-	-	-	-	-	-	2711	2.54	11.22	7.28	-	-	-	-	-	-	
T3		Tue 4/25	14:05	5.61	5.22	23.71	474.14	13.33	156.10	31.18	0.72	50.80	326.82	-	0.66	30.48	236.03	2404	2.34	9.96	6.34	-	-	5.94	1.26	0.005	-	
Averages				5.31	4.42	24.07	463.13	13.03	156.10	31.18	0.72	50.80	326.82	-	0.66	30.48	236.03	2558	2.44	10.59	6.81	-	-	5.94	1.26	0.005	-	
25 wt%																												
T4*		Tue 5/23	07:40	5.61	-	18.94	659.22	13.47	-	-	-	53.00	-	-	-	4.24	-	4499	23.66	4.97	3.29	-	-	-	-	-	-	
T4*		Tue 5/23	14:30	5.50	4.96	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T4*		Wed 5/24	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2772	14.40	2.87	2.46	-	-	-	-	-	-	
T4	IY	Wed 5/24	08:25	5.42	4.82	18.90	465.30	11.22	108.40	44.42	0.00	39.86	352.91	-	0.80	6.22	274.11	1871	9.24	1.98	2.21	-	-	0.76	1.22	0.00	-	
T4	IY	Wed 5/24	14:10	5.43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T4		Thu 5/25	06:49	5.52	5.08	18.94	482.72	11.08	115.50	50.79	0.00	37.09	372.68	-	0.82	6.49	270.68	2984	16.92	1.89	2.24	-	-	0.90	1.16	0.00	-	
T4		Thu 5/25	14:25	5.49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T4	IZ	Fri 5/26	07:35	5.46	4.90	19.15	445.25	10.96	109.00	48.31	0.00	34.48	304.61	-	0.66	4.01	241.02	2460	13.82	1.58	1.98	-	-	0.54	1.11	0.00	-	
Averages				5.46	4.93	19.00	464.42	11.09	110.97	47.84	0.00	37.14	343.40	-	0.76	5.57	261.94	2438	13.33	1.82	2.14	-	-	0.73	1.16	0.001	-	

**Pilot FLRT Liquid Analytical Summary:
Lime/DBA/Gypsum Test Block**

Test ID	Gas Sample ID	Date	Time	FLRT pH	ABS pH	L-Ca++ (mM)	L-Mg++ (mM)	L-Na+ (mM)	L-K+ (ppm)	L-Al (ppm)	L-Fe (ppm)	L-Mn (ppm)	L-Cl- (mM)	L-F (ppm)	L-CO3= (mM)	L-SO3= (mM)	L-SO4= (mM)	ICE DBA (ppm)	ICE Adipic (mM)	ICE Glutaric (mM)	ICE Succinic (mM)	ICE Formate (ppm)	Thio-sulfate (ppm)	CaSO3 RS	CaSO4 RS	CaCO3 RS	% SO2 Rem.
30 wt%																											
T5*		Fri 5/26	14:00	5.52	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T5		Tue 5/30	07:21	5.52	4.90	18.88	454.50	12.02	122.90	49.49	0.02	54.22	287.98	-	0.75	11.84	249.12	2475	13.61	0.78	3.26	-	-	1.67	1.11	0.00	-
Averages																											
Lime Reagent; pre-mix tank																											
T6	JZ	Wed 5/31	07:35	5.36	4.84	19.69	472.91	12.17	-	-	-	-	-	-	-	4.53	-	2894	16.05	0.80	3.77	-	-	-	-	-	-
T6	JZ	Wed 5/31	14:14	5.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T6		Thu 6/01	07:12	5.79	5.08	19.90	459.55	11.16	135.50	35.95	0.00	57.20	284.69	-	0.79	4.26	250.45	2754	14.91	1.84	2.83	-	-	0.90	1.17	0.01	-
T6		Thu 6/01	14:30	5.41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T6		Fri 6/02	07:40	5.50	4.87	19.12	477.64	11.84	144.10	64.03	0.03	56.86	316.14	-	0.70	8.32	258.08	3059	16.89	1.80	3.01	-	-	1.13	1.12	0.00	-
T6	JY	Fri 6/02	14:00	5.21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages				5.43	4.93	19.57	470.03	11.72	139.80	49.99	0.02	57.03	300.42	-	0.75	5.70	254.27	2902	15.95	1.48	3.20	-	-	1.02	1.15	0.01	-
Limestone, 90% Util.																											
T7	EY	Mon 6/05	07:22	4.78	4.55	27.28	292.93	9.14	-	-	-	-	-	-	-	1.90	-	4378	25.67	0.96	4.27	-	-	-	-	-	-
T7	EY	Mon 6/05	14:30	4.81	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T7		Tue 6/06	07:35	4.76	4.50	34.21	250.99	9.09	-	-	-	-	-	-	-	0.98	-	3559	20.41	1.16	3.61	-	-	-	-	-	-
T7		Tue 6/06	14:00	4.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T7		Tue 6/06	15:35	4.67	-	34.62	241.91	8.15	82.97	3.80	0.01	84.54	316.24	-	3.40	0.91	68.11	3502	19.56	1.39	3.92	-	-	0.06	0.88	0.00	-
Averages				4.76	4.53	32.04	261.94	8.79	82.97	3.80	0.01	84.54	316.24	-	3.40	1.26	68.11	3813	21.88	1.17	3.93	-	-	0.06	0.88	0.00	-
Limestone, Lower Mg																											
T8	E	Wed 6/07	07:30	5.61	4.94	39.82	145.76	5.86	-	-	-	-	-	-	-	1.03	-	2720	15.24	1.08	2.99	-	-	-	-	-	-
T8	E	Wed 6/07	14:05	5.65	-	-	-	-	-	-	-	-	-	-	-	1.08	-	-	-	-	-	-	-	-	-	-	-
T8		Thu 6/08	07:40	5.50	-	48.67	146.74	6.68	44.84	1.95	0.00	85.83	227.47	-	3.66	1.01	35.76	2171	10.86	0.85	4.01	-	-	0.58	0.86	0.04	-
T8		Thu 6/08	10:45	5.51	4.72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages				5.57	4.83	44.25	146.25	6.27	44.84	1.95	0.00	85.83	227.47	-	3.66	1.04	35.76	2446	13.05	0.97	3.50	-	-	0.58	0.86	0.04	-
Limestone, pH 5																											
T9*		Fri 6/23	14:00	5.00	4.80	98.55	74.44	4.70	-	-	-	-	159.00	-	-	0.07	-	8689	8.75	43.26	14.42	-	-	-	-	-	-
T9*		Sat 6/24	07:45	-	-	-	-	-	-	-	-	-	-	-	-	0.27	-	4120	3.82	19.88	7.95	-	-	-	-	-	-
T9*		Sun 6/25	03:18	4.99	4.84	60.17	81.67	4.41	-	-	-	-	-	-	-	19.40	-	2331	2.15	11.11	4.67	-	-	-	-	-	-
T9*		Sun 6/25	22:00	-	-	62.54	88.39	4.51	-	-	-	-	-	-	-	0.63	-	2814	2.61	12.93	6.15	-	-	-	-	-	-
T9*		Mon 6/26	07:20	4.90	4.70	61.06	123.45	5.07	18.38	4.40	4.27	59.44	-	-	-	28.99	-	2924	2.72	13.66	6.13	-	-	-	-	-	-
T9*		Mon 6/26	14:00	5.11	-	-	-	-	-	-	-	-	147.08	-	-	15.74	-	-	-	-	-	-	-	-	-	-	-
T9*		Mon 6/26	15:55	-	-	-	-	-	-	-	-	-	-	-	-	19.92	-	-	-	-	-	-	-	-	-	-	-
T9*		Tue 6/27	07:32	4.95	4.70	71.74	121.65	5.92	18.65	4.32	1.24	70.12	206.66	-	-	16.72	-	2856	2.67	13.22	6.11	-	-	-	-	-	-
T9*		Tue 6/27	11:15	6.79	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T9*		Tue 6/27	14:50	4.70	-	-	-	-	-	-	-	-	-	-	-	28.66	-	-	-	-	-	-	-	-	-	-	-
T9		Wed 6/28	06:43	4.99	4.69	26.04	124.72	6.07	17.35	3.52	0.49	63.93	185.40	-	5.18	10.85	29.11	3037	2.81	14.42	6.13	-	-	3.59	1.04	0.01	-
T9		Wed 6/28	13:48	5.05	4.73	67.22	113.98	5.64	16.85	3.24	0.10	60.95	171.82	-	4.79	6.72	28.96	2558	2.86	13.66	2.86	-	-	2.42	1.02	0.01	-
T9		Thu 6/29	07:30	5.05	4.80	80.12	123.54	6.42	23.13	3.23	0.71	65.18	194.48	-	4.49	14.25	27.78	3064	2.98	14.38	6.19	-	-	5.77	1.06	0.01	-
Averages				5.03	4.74	57.79	120.75	6.04	19.11	3.33	0.43	63.35	183.90	-	4.82	10.61	28.62	2886	2.88	14.15	5.06	-	-	3.93	1.04	0.01	-
10000 scfm, 96% Util.																											
T10*		Thu 6/29	14:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T10*		Fri 6/30	07:00	3.91	3.65	76.53	140.96	7.78	-	-	-	-	-	-	-	2.50	-	5724	5.39	27.41	11.18	-	-	-	-	-	-
T10		Fri 6/30	14:00	4.71	-	-	-	-	-	-	-	-	-	-	-	19.08	-	-	-	-	-	-	-	-	-	-	-
T10		Sat 7/01	07:00	4.71	4.52	102.46	123.13	7.45	25.04	7.86	1.81	64.44	218.52	-	4.68	11.89	22.92	4108	3.80	19.17	8.67	-	-	3.01	1.04	0.00	84
Averages				4.71	4.52	102.46	123.13	7.45	25.04	7.86	1.81	64.44	218.52	-	4.68	15.49	22.92	4108	3.80	19.17	8.67	-	-	3.01	1.04	0.00	84

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**Pilot FLRT Liquid Analytical Summary:
Lime/DBA/Gypsum Test Block**

Test ID	Gas Sample		Time	FLRT pH	ABS pH	L-Ca++ (mM)	L-Mg++ (mM)	L-Na+ (mM)	L-K+ (ppm)	L-Al (ppm)	L-Fe (ppm)	L-Mn (ppm)	L-Cl- (mM)	L-F (mM)	L-CO3= (mM)	L-SO3= (mM)	L-SO4= (mM)	ICE DBA (ppm)	ICE Adipic (mM)	ICE Glutaric (mM)	ICE Succinic (mM)	ICE Formate (ppm)	Thio-sulfate (ppm)	CaSO3 RS	CaSO4 RS	CaCO3 RS	% SO2 Rem.	
	ID	Date																										
10000 scfm, Low Mg, Cl																												
T11*	Sun 7/02	07:00	5.02	4.84	88.65	95.90	6.89	-	-	-	-	-	180.62	-	-	9.31	-	2892	2.66	13.16	6.50	-	-	-	-	-	87	
T11*	Thu 7/06	11:15	4.90	4.50	-	-	-	-	-	-	-	-	-	-	-	-	-	3160	2.94	14.58	6.83	-	-	-	-	-	88	
T11*	Fri 7/07	07:30	5.00	4.60	89.15	73.30	5.77	-	-	-	-	-	154.63	-	-	7.67	-	3131	2.98	14.82	6.27	-	-	-	-	-	87	
T11*	Fri 7/07	14:30	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T11	Sat 7/08	06:50	5.00	4.65	83.98	65.80	5.07	-	-	-	-	-	144.61	-	-	5.69	-	3579	3.22	17.43	6.85	-	-	-	-	-	89	
T11	Sun 7/09	14:11	5.01	4.78	83.83	68.13	5.20	17.53	6.88	0.09	46.89	143.24	-	5.52	6.60	19.12	4498	4.08	22.01	8.45	-	-	-	-	-	-	91	
T11	Sun 7/09	18:30	4.98	4.76	83.50	68.07	5.05	14.82	7.20	0.10	49.42	141.82	-	5.51	8.15	21.35	4273	3.93	20.51	8.41	-	-	3.35	1.08	0.01	-		
T11	Mon 7/10	07:05	4.99	4.71	78.61	68.56	5.03	14.23	7.02	0.31	48.88	142.12	-	4.67	10.52	20.80	3333	2.99	15.82	6.85	-	-	4.27	1.02	0.01	88		
Averages			5.00	4.73	82.48	67.64	5.09	15.53	7.03	0.17	48.40	142.95	-	5.23	7.74	20.42	3921	3.56	18.94	7.64	-	-	3.81	1.05	0.01	89		

**Pilot FLRT Liquid Analytical Summary:
Lime/DBA/Gypsum Test Block**

Gas																		ICE	ICE	ICE	ICE	ICE	Thio-				%
Test	Sample	FLRT	ABS	L-Ca++	L-Mg++	L-Na+	L-K+	L=Al	L-Fe	L-Mn	L-Cl-	L-F	L-CO3=	L-SO3=	L-SO4=	DBA	Adipic	Glutaric	Succinic	Formate	sulfate	CaSO3	CaSO4	CaCO3	SO2		
ID	ID Date Time	pH	pH	(mM)	(mM)	(mM)	(ppm)	(ppm)	(ppm)	(ppm)	(mM)		(mM)	(mM)	(mM)	(ppm)	(mM)	(mM)	(mM)	(ppm)	(ppm)	RS	RS	RS	Rem.		
10000 scfm, O:SO2 = 8																											
T12*	Mon 7/10 10:43																										
T12*	Mon 7/10 10:50	-	-	-	-	-	-	-	-	-	-	-	-	11.00	-	-	-	-	-	-	-	-	-	-	-	-	
T12*	Mon 7/10 12:00	-	-	-	-	-	-	-	-	-	-	-	-	19.83	-	-	-	-	-	-	-	-	-	-	-	-	
T12*	Mon 7/10 13:00	-	-	-	-	-	-	-	-	-	-	-	-	21.01	-	-	-	-	-	-	-	-	-	-	-	-	
T12*	Mon 7/10 14:00	4.83	-	-	-	-	-	-	-	-	-	-	-	21.74	-	-	-	-	-	-	-	-	-	-	-	-	
T12*	Mon 7/10 15:15	-	-	-	-	-	-	-	-	-	-	-	-	21.85	-	-	-	-	-	-	-	-	-	-	-	-	
T12*	Tue 7/11 07:35	4.81	4.58	93.08	65.74	5.32	-	-	-	-	-	-	-	11.02	-	3775	3.63	18.05	7.31	-	-	-	-	-	-	87	
T12*	Tue 7/11 13:50	4.89	-	-	-	-	-	-	-	-	-	-	-	6.50	-	3946	3.59	18.89	7.87	-	-	-	-	-	-	-	
T12	Wed 7/12 06:35	4.81	4.53	89.76	62.81	4.71	17.43	7.57	0.37	43.29	129.48	32.24	4.92	7.32	18.22	3656	3.27	17.57	7.28	-	-	2.36	1.01	0.01	87		
T12	Wed 7/12 13:20	4.84	4.57	101.98	67.02	5.26	20.70	8.74	1.60	51.86	141.95	31.28	4.40	16.64	18.22	4138	3.96	19.89	7.92	-	-	6.07	1.04	0.01	-		
T12	Thu 7/13 07:40	4.79	4.53	98.70	63.36	5.00	19.03	7.75	0.62	52.15	135.57	29.79	4.46	9.36	17.95	4222	4.07	20.37	7.96	-	-	3.07	1.03	0.01	88		
T12*	Thu 7/13 14:00	5.17	-	-	-	-	-	-	-	-	-	-	-	10.05	-	4104	3.77	19.33	8.49	-	-	-	-	-	-	-	
Averages		4.81	4.54	96.81	64.40	4.99	19.05	8.02	0.86	49.10	135.67	31.10	4.59	11.11	18.13	4005	3.77	19.28	7.72	-	-	3.83	1.03	0.01	88		
13200 scfm, 8ft, L/G=23																											
T13*	Fri 7/14 07:30	4.47	4.31	124.20	56.91	5.16	18.35	22.68	6.98	38.97	-	-	-	32.12	-	4410	4.19	21.25	8.42	-	-	-	-	-	-	63	
T13*	Fri 7/14 11:45	-	-	-	-	-	-	-	-	-	-	-	-	33.79	-	-	-	-	-	-	-	-	-	-	-	-	
T13*	Fri 7/14 13:30	-	-	-	-	-	-	-	-	-	-	-	-	25.01	-	-	-	-	-	-	-	-	-	-	-	-	
T13	Fri 7/14 14:30	4.60	-	-	-	-	-	-	-	150.23	-	-	-	26.39	-	-	-	-	-	-	-	-	-	-	-	-	
T13	Sat 7/15 08:20	4.78	4.48	111.34	51.79	4.71	15.52	10.80	2.13	51.00	126.21	-	1.13	19.83	18.36	3086	2.91	15.22	5.53	-	-	7.18	1.19	0.01	76		
Averages		4.69	4.48	111.34	51.79	4.71	15.52	10.80	2.13	51.00	138.22	-	1.13	23.11	18.36	3086	2.91	15.22	5.53	-	-	7.18	1.19	0.01	76		
13200 scfm, 9ft, L/G=30																											
T14	Sun 7/16 07:47	4.68	4.46	118.95	71.29	5.29	17.95	11.32	2.29	58.48	169.92	-	0.44	19.72	-	3195	3.02	15.51	5.99	-	-	-	-	-	-	83	
T14	Mon 7/17 08:00	4.69	4.45	116.34	67.58	5.83	18.48	7.70	1.01	59.91	166.65	-	0.12	8.32	18.66	2970	2.81	14.32	5.67	-	-	2.55	1.16	0.00	84		
Averages		4.69	4.46	117.65	69.44	5.56	18.22	9.51	1.65	59.20	168.29	-	0.28	14.02	18.66	3082	2.92	14.92	5.83	-	-	2.55	1.16	0.00	83		
13200 scfm, 9ft, L/G=30																											
T14A	Tue 7/18 06:30	4.61	4.47	113.19	59.43	4.78	-	-	-	-	-	-	-	21.55	-	3190	2.94	15.02	6.59	-	-	-	-	-	-	81	
T14A	Tue 7/18 13:15	4.60	-	-	-	-	-	-	-	-	-	-	-	24.84	-	-	-	-	-	-	-	-	-	-	-	76	
Averages		4.61	4.47	113.19	59.43	4.78	-	-	-	-	-	-	-	23.20	-	3190	2.94	15.02	6.59	-	-	-	-	-	-	79	
11000 scfm, 8ft																											
T15	Wed 7/19 07:40	4.90	4.75	96.46	52.66	4.47	13.22	7.50	0.20	41.57	124.02	-	4.70	5.47	17.60	3499	3.50	16.40	6.98	-	-	2.30	1.07	0.01	86		
Averages																											
10000 scfm, 9ft, pH=5																											
T16	Wed 7/19 14:00	4.98	4.73	80.39	72.09	4.17	12.13	7.11	0.05	58.81	126.54	-	4.30	7.33	20.31	3378	3.37	15.93	6.64	-	-	2.96	1.00	0.01	94		
Averages																											
10000 scfm, 9ft, L/G=40																											
T17*	Sat 7/22 07:40	4.70	4.56	102.75	60.25	4.13	-	-	-	-	-	-	-	25.38	-	3300	3.12	15.83	6.40	-	-	-	-	-	-	85	
T17*	Sun 7/23 10:40	4.63	4.40	119.88	61.68	4.79	-	-	-	-	-	-	-	24.48	-	4364	4.11	21.40	7.96	-	-	-	-	-	-	86	
T17*	Sun 7/23 14:25	3.55	3.38	-	-	-	-	-	-	-	-	-	-	1.59	-	-	-	-	-	-	-	-	-	-	-	46	
T17*	Mon 7/24 07:10	4.71	4.58	99.58	61.27	4.37	-	-	-	-	-	-	-	9.53	-	3549	3.13	16.82	7.39	-	-	-	-	-	-	93	
T17	Mon 7/24 13:45	4.84	4.60	102.20	61.41	4.80	13.19	4.08	1.25	39.63	148.71	24.84	3.83	12.15	18.66	3842	3.87	17.55	8.14	-	-	4.55	1.10	0.01	92		
T17	Tue 7/25 07:45	5.01	4.82	110.08	64.54	4.79	12.36	2.89	0.96	41.49	153.20	23.38	4.13	19.64	17.62	3467	3.39	15.79	7.52	-	-	10.63	1.22	0.01	93		
T17	Tue 7/25 14:05	4.98	-	-	-	-	-	-	-	-	-	-	-	9.48	-	-	-	-	-	-	-	-	-	-	-	88	
Averages		4.94	4.71	106.14	62.98	4.80	12.78	3.49	1.11	40.56	150.96	24.11	3.98	13.76	18.14	3654	3.63	16.67	7.83	-	-	7.59	1.16	0.01	91		

**Pilot FLRT Liquid Analytical Summary:
Lime/DBA/Gypsum Test Block**

Test ID	Gas Sample ID	Date	Time	FLRT pH	ABS pH	L-Ca++ (mM)	L-Mg++ (mM)	L-Na+ (mM)	L-K+ (ppm)	L-Al (ppm)	L-Fe (ppm)	L-Mn (ppm)	L-Cl- (mM)	L-F (mM)	L-CO3= (mM)	L-SO3= (mM)	L-SO4= (mM)	ICE DBA (ppm)	ICE Adipic (mM)	ICE Glutaric (mM)	ICE Succinic (mM)	ICE Formate (ppm)	Thio-sulfate (ppm)	CaSO3 RS	CaSO4 RS	CaCO3 RS	% SO2 Rem.	
Fine Grind Limestone																												
T18*		Thu 7/27	13:45	4.51	4.25	70.90	70.76	8.34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	88
T18L*		Fri 7/28	07:55	5.00	4.75	52.71	53.07	18.96	-	-	-	-	-	-	-	3.20	-	3018	2.86	14.33	6.01	-	-	-	-	-	-	93
T18L*		Fri 7/28	13:55	-	-	-	-	-	-	-	-	-	-	-	-	9.53	-	-	-	-	-	-	-	-	-	-	-	93
T18*		Sat 7/29	07:42	5.20	4.96	69.14	57.78	39.13	-	-	-	-	-	-	-	12.59	-	2429	2.19	11.06	5.50	-	-	-	-	-	-	93
T18*		Sun 7/30	13:50	5.08	4.74	68.79	60.97	50.48	-	-	-	-	-	-	-	5.64	-	2581	2.31	11.62	6.02	-	-	-	-	-	-	93
T18*		Mon 7/31	07:00	4.97	-	79.04	65.28	58.77	15.51	2.31	0.06	44.59	96.92	21.73	4.31	6.87	20.26	2484	2.22	11.16	5.82	-	-	2.77	0.97	0.01	93	
T18*		Mon 7/31	14:00	4.78	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	93
T18S*		Tue 8/01	10:36	5.32	-	60.13	42.61	37.41	-	-	-	-	-	-	-	9.97	-	2364	2.40	10.80	4.98	-	-	-	-	-	-	90
T18S*		Tue 8/01	14:08	5.16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	91
T18		Wed 8/02	07:40	5.02	4.68	60.21	49.68	39.39	10.52	3.51	0.10	32.27	135.75	23.78	4.07	6.69	20.65	2202	1.69	10.87	4.41	-	-	2.54	0.95	0.01	90	
T18		Wed 8/02	14:05	5.06	4.73	59.89	50.57	36.95	9.40	3.05	0.12	33.83	142.17	24.41	4.04	6.97	20.10	2095	1.95	9.98	4.18	-	-	2.85	0.92	0.01	90	
T18W		Thu 8/03	07:13	4.99	4.76	71.85	65.98	50.08	12.79	3.65	0.58	45.45	178.26	25.48	3.94	10.72	21.57	3321	3.00	15.72	6.85	-	-	4.05	0.96	0.01	93	
		Averages		5.02	4.72	63.98	55.41	42.14	10.90	3.40	0.27	37.18	152.06	24.56	4.02	8.13	20.77	2540	2.21	12.19	5.15	-	-	3.15	0.94	0.01	91	
Fine Grind & Formate Additive																												
T19*		Fri 8/04	07:30	4.99	4.72	77.34	82.13	94.64	-	-	-	-	-	-	-	14.09	-	2248	2.02	10.65	4.64	1087	-	-	-	-	-	93
T19*		Fri 8/04	13:45	5.07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	93
T19*		Sat 8/05	08:00	5.02	4.74	64.51	94.16	154.53	-	-	-	-	-	-	-	15.43	-	3411	1.21	20.05	4.98	1732	-	-	-	-	-	92
T19*		Sun 8/06	16:25	4.98	4.78	51.32	95.78	206.84	-	-	-	-	-	-	-	17.66	-	3805	0.06	25.12	4.07	1986	-	-	-	-	-	89
T19*		Mon 8/07	07:14	4.96	4.77	45.06	100.10	264.91	-	-	-	-	329.70	-	-	16.37	-	4091	0.36	28.25	2.62	2343	-	-	-	-	-	90
T19*		Mon 8/07	14:07	5.04	-	-	-	-	-	-	-	-	-	-	-	27.15	-	-	-	-	-	-	-	-	-	-	-	87
T19		Tue 8/08	06:20	5.02	4.76	36.20	86.01	244.13	16.58	3.20	1.59	54.54	270.98	35.61	2.96	26.29	49.39	3368	0.00	23.69	2.04	2240	-	5.06	0.89	0.00	87	
T19		Tue 8/08	14:10	5.01	4.75	37.70	77.44	228.25	12.61	3.12	1.50	48.66	262.42	32.55	2.83	30.60	45.52	3656	0.00	26.08	1.81	2174	-	6.02	0.89	0.00	83	
T19		Wed 8/09	06:50	5.03	4.83	45.20	63.53	202.34	6.30	2.42	2.34	32.15	192.68	29.10	2.96	60.37	37.98	4127	0.00	29.98	1.44	-	-	14.04	0.90	0.00	80	
T19		Wed 8/09	14:00	4.97	-	-	-	-	-	-	-	-	-	-	-	41.07	-	-	-	-	-	-	-	-	-	-	-	76
		Averages		5.01	4.78	39.70	75.66	224.91	11.83	2.91	1.81	45.12	242.03	32.42	2.92	39.58	44.30	3717	0.00	26.58	1.76	2207.25	-	8.37	0.89	0.00	81.39	
Fine Grind & DBA Additive																												
T20*		Thu 8/10	07:40	5.25	4.87	33.17	63.45	132.74	-	-	-	-	-	-	-	25.31	-	2285	1.14	14.43	1.81	1389	-	-	-	-	-	88
T20*		Thu 8/10	14:15	5.07	-	-	-	-	-	-	-	-	-	-	-	31.44	-	-	-	-	-	-	-	-	-	-	-	82
T20*		Fri 8/11	07:40	5.11	4.89	44.37	77.39	104.58	-	-	-	-	-	-	-	30.82	-	2273	2.05	11.20	4.20	1088	-	-	-	-	-	88
T20*		Fri 8/11	14:05	5.08	-	-	-	-	-	-	-	-	-	-	-	30.23	-	-	-	-	-	-	-	-	-	-	-	88
T20*		Sat 8/12	07:15	4.99	4.74	53.60	82.80	77.13	-	-	-	-	-	-	-	20.55	-	2291	2.22	11.02	4.34	-	-	-	-	-	-	89
T20		Sun 8/13	09:00	4.98	4.69	71.22	76.29	57.50	12.12	2.77	1.44	28.35	165.83	24.44	1.90	34.65	26.67	2098	1.97	10.08	4.07	-	-	12.07	1.10	0.00	88	
T20		Mon 8/14	06:59	4.96	4.76	74.13	76.20	57.18	12.49	3.32	1.16	31.24	170.55	25.04	6.21	28.95	25.64	2424	2.24	11.61	4.78	-	-	10.08	1.09	0.01	90	
T20		Mon 8/14	11:20	5.01	4.78	75.85	74.05	54.70	12.44	3.55	1.05	33.11	168.34	26.78	2.49	28.76	25.76	2485	2.37	11.87	4.85	-	-	11.29	1.12	0.01	87	
		Averages		4.98	4.74	73.73	75.51	56.46	12.35	3.21	1.22	30.90	168.24	25.42	3.53	30.79	26.02	2336	2.19	11.19	4.57	-	-	11.15	1.11	0.01	88.29	

**Pilot FLRT Solid Analytical Summary:
Lime/DBA/Gypsum Test Block**

Gas Sample			FLRT	Ca	Mg	SO3	SO4	CO3	Inerts	Wt Solids	Mol Solids	Solids	UdL	CO3 Est.	CP	FC	Thickener	Initial	Final	Form	Filter	
Test ID	Sample ID	Date	Time	Wt% Solids	(mmol/g)	(mmol/g)	(mmol/g)	(mmol/g)	(wt%)	Closure (%)	Closure (%)	(%)	(%)	UdL (%)	WT%	WT%	Unit Area (ft2/tpd)	Wt%	Settled Wt%	Filtration Rate (lb/hr*sqft)	Leaf Cake Wt%	
III Mg, pH=6.0, 6hr SRT																						
T1*		Mon 4/17	14:07	5.82	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T1*		Tue 4/18	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T1		Tue 4/18	07:45	6.89	-	-	0.01	-	-	-	-	-	-	-	-	61.47	-	-	-	-	-	
T1		Tue 4/18	14:00	-	-	-	-	-	-	-	-	-	-	-	-	59.26	-	-	-	-	-	
T1		Wed 4/19	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T1		Wed 4/19	07:05	7.31	-	-	0.02	-	-	-	-	-	-	-	-	61.08	-	-	-	-	-	
T1		Wed 4/19	09:00	-	-	-	-	-	-	-	-	-	-	-	-	77.61	-	-	-	-	-	
T1		Wed 4/19	14:15	7.49	5.80	0.02	0.03	5.46	0.03	0.40	2.65	-3.79	99.5	99.5	-	72.99	3.81	11.85	47.87	2468	71	
T1		Thu 4/20	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T1		Thu 4/20	07:55	6.89	5.63	0.02	0.02	5.40	0.02	0.40	1.89	-5.41	99.6	99.6	-	65.17	4.48	12.56	44.26	2771	74	
T1		Thu 4/20	11:30	-	-	-	-	-	-	-	-	-	-	-	-	75.51	-	-	-	-	-	
T1		Thu 4/20	14:35	-	-	-	-	-	-	-	-	-	-	-	-	76.41	-	-	-	-	-	
Averages				7.15	5.72	0.02	0.02	5.43	0.03	0.40	2.27	-4.60	99.5	99.6	-	-	68.69	4.15	12.21	46.07	2620	73
III Mg, 10 hr SRT																						
T2*		Fri 4/21	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T2*		Fri 4/21	07:10	11.78	-	-	0.04	-	-	-	-	-	-	-	-	87.58	-	-	-	-	-	
T2*		Fri 4/21	14:39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T2		Sat 4/22	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T2		Sat 4/22	08:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T2		Sat 4/22	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T2		Sun 4/23	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T2		Sun 4/23	08:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T2		Sun 4/23	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T2		Mon 4/24	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T2		Mon 4/24	06:42	12.16	6.21	0.01	0.02	5.60	0.02	0.80	4.9	-0.1	99.6	99.7	-	75.17	1.98	12.16	55.27	2510	79	
T2		Mon 4/24	13:45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T2		Mon 4/24	14:45	-	6.17	0.01	0.01	5.53	0.03	0.83	5.2	-1.1	99.8	99.5	-	80.00	-	-	-	-	-	
T2		Mon 4/24	15:17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T2		Mon 4/24	15:45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T2		Mon 4/24	16:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Averages				12.16	6.19	0.01	0.02	5.57	0.03	0.82	5.0	-0.6	99.7	99.6	-	-	77.59	1.98	12.16	55.27	2510	79
III Mg, 11000scfm, III Mn																						
T3*		Tue 4/25	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T3		Tue 4/25	08:05	11.59	-	-	0.07	-	-	-	-	-	-	-	-	76.40	-	-	-	-	-	
T3		Tue 4/25	14:05	13.50	5.94	0.01	0.10	5.47	0.02	0.72	3.1	-2.3	98.2	99.7	-	74.92	2.27	13.50	53.67	2557	79	
Averages				12.55	5.94	0.01	0.09	5.47	0.02	0.72	3.12	-2.27	98.2	99.7	-	-	75.66	2.27	13.50	53.67	2557	79
25 wt%																						
T4*		Tue 5/23	07:40	16.29	-	-	-	-	-	-	-	-	-	-	-	81.91	-	-	-	-	-	
T4*		Tue 5/23	14:30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T4*		Wed 5/24	00:01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T4	IY	Wed 5/24	08:25	30.15	6.07	0.01	0.01	5.49	0.01	0.90	4.9	-2.1	99.8	99.8	-	87.11	0.99	13.05	58.51	1197	84	
T4	IY	Wed 5/24	14:10	26.69	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T4		Thu 5/25	06:49	24.87	5.96	0.00	0.01	5.50	0.01	0.90	3.8	-2.5	99.8	99.8	-	82.31	1.28	12.22	57.88	1666	82	
T4		Thu 5/25	14:25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T4	IY	Fri 5/26	07:35	24.19	5.95	0.00	0.02	5.51	0.02	0.80	3.5	-2.3	99.6	99.7	-	81.70	1.66	13.00	56.71	1808	79	
Averages				26.48	5.99	0.00	0.01	5.50	0.01	0.87	4.08	-2.30	99.8	99.8	-	-	83.71	1.31	12.76	57.70	1557	82

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**Pilot FLRT Solid Analytical Summary:
Lime/DBA/Gypsum Test Block**

Gas Sample				FLRT	Ca	Mg	SO3	SO4	CO3	Inerts	Wt Solids	Mol Solids	Solids	CO3	CP	FC	Thickener		Final	Form	Filter	
Test ID	Sample ID	Date	Time	Wt% Solids	(mmol/g)	(mmol/g)	(mmol/g)	(mmol/g)	(mmol/g)	(wt%)	Closure (%)	Closure (%)	Ox. (%)	UdL (%)	Est UdL (%)	WT%	Unit Area (ft2/tpd)	Initial Wt%	Settled Wt%	Filtration Rate (lb/hr*sqft)	Leaf Cake Wt%	
30 wt%																						
T5*		Fri 5/26	14:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T5		Tue 5/30	07:21	27.46	5.91	0.01	0.02	5.44	0.02	0.60	3.9	-3.6	99.6	99.6	-	-	80.70	2.23	15.26	51.40	2934	75
Averages																						
Lime Reagent; pre-mix tank																						
T6	JZ	Wed 5/31	07:35	31.29	-	-	-	-	-	-	-	-	-	-	-	84.14	-	-	-	-	-	
T6	JZ	Wed 5/31	14:14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T6		Thu 6/01	07:12	30.09	6.01	0.02	0.00	5.47	0.01	0.50	4.8	-3.1	100.0	99.8	99.8	-	83.78	1.45	12.30	57.73	3038	80
T6		Thu 6/01	14:30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T6		Fri 6/02	07:40	32.69	6.05	0.01	0.00	5.43	0.01	0.40	5.4	-3.6	100.0	99.8	99.8	-	83.57	1.21	14.04	61.10	2644	80
T6	JY	Fri 6/02	14:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Averages				31.36	6.03	0.02	0.00	5.45	0.01	0.45	5.08	-3.32	99.98	99.8	99.8	-	83.83	1.33	13.17	59.42	2841	80
Limestone, 90% UdL																						
T7	EY	Mon 6/05	07:22	32.72	-	-	0.00	-	-	-	-	-	-	-	-	91.42	-	-	-	-	-	
T7	EY	Mon 6/05	14:30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T7		Tue 6/06	07:35	30.97	-	-	-	-	-	-	-	-	-	-	-	93.22	-	-	-	-	-	
T7		Tue 6/06	14:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T7		Tue 6/06	15:35	32.85	5.95	0.04	0.00	5.54	0.28	0.50	1.4	-0.7	100.0	95.3	95.2	-	91.48	0.66	13.48	70.07	1797	86
Averages				32.18	5.95	0.04	0.00	5.54	0.28	0.50	1.43	-0.73	99.98	95.3	95.2	-	92.04	0.66	13.48	70.07	1797	86
Limestone, Lower Mg																						
T8	B	Wed 6/07	07:30	31.50	-	-	-	-	-	-	-	-	-	-	-	91.70	-	-	-	-	-	
T8	B	Wed 6/07	14:05	31.37	-	-	-	-	-	-	-	-	-	-	-	91.07	-	-	-	-	-	
T8		Thu 6/08	07:40	28.63	6.00	0.02	0.04	5.50	0.15	0.50	2.8	-1.6	99.3	97.4	97.4	-	89.59	0.77	12.62	70.35	1793	86
T8		Thu 6/08	10:45	29.21	-	-	-	-	-	-	-	-	-	-	-	90.60	0.79	12.67	71.32	914	85	
Averages				30.18	6.00	0.02	0.04	5.50	0.15	0.50	2.82	-1.55	99.28	97.4	97.4	-	90.74	0.78	12.65	70.84	1353	86
Limestone, p11 5																						
T9*		Fri 6/23	14:00	8.42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T9*		Sat 6/24	07:45	30.32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T9*		Sun 6/25	03:18	22.79	-	-	-	-	-	-	-	-	-	-	-	79.38	-	-	-	-	-	
T9*		Sun 6/25	22:00	25.77	-	-	-	-	-	-	-	-	-	-	-	83.29	-	-	-	-	-	
T9*		Mon 6/26	07:20	30.07	-	-	0.00	-	2.05	-	-	-	-	-	69.0	80.54	-	-	-	-	-	
T9*		Mon 6/26	14:00	28.61	-	-	-	-	-	-	-	-	-	-	-	-	85.68	-	-	-	-	
T9*		Mon 6/26	15:55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T9*		Tue 6/27	07:32	28.12	-	-	0.05	-	0.46	-	-	-	-	-	92.3	-	88.85	-	-	-	-	
T9*		Tue 6/27	11:15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T9*		Tue 6/27	14:50	-	-	-	-	-	-	-	-	-	-	-	-	-	86.89	-	-	-	-	
T9		Wed 6/28	06:43	26.04	5.91	0.03	0.02	5.65	0.21	0.20	0.5	0.0	99.6	96.4	96.4	-	89.30	0.81	14.09	69.44	1421	85
T9		Wed 6/28	13:48	25.90	5.80	0.03	0.01	5.68	0.19	0.40	-	-	-	-	96.7	-	90.40	0.74	14.77	68.32	1453	85
T9		Thu 6/29	07:30	27.54	6.24	0.04	0.03	5.46	0.47	0.30	2.6	0.6	99.5	92.3	92.1	-	89.42	1.15	15.46	67.20	979	83
Averages				26.49	5.98	0.03	0.02	5.60	0.29	0.30	1.56	0.27	99.55	94.4	95.1	-	89.71	0.90	14.77	68.32	1284	84
10000 scfm, 96% UdL																						
T10*		Thu 6/29	14:00	-	-	-	-	-	0.27	-	-	-	-	-	-	-	-	-	-	-	-	
T10*		Fri 6/30	07:00	26.69	-	-	-	-	0.06	-	-	-	-	-	99.0	-	86.65	-	-	-	-	
T10		Fri 6/30	14:00	-	-	-	-	-	0.42	-	-	-	-	-	92.9	-	86.03	-	-	-	-	
T10		Sat 7/01	07:00	26.88	5.90	0.03	0.00	5.67	0.16	1.30	0.8	0.8	100.0	97.3	97.3	-	83.96	1.41	12.37	60.71	1458	80
Averages				26.88	5.90	0.03	0.00	5.67	0.29	1.30	0.84	0.84	99.98	97.3	95.1	-	85.00	1.41	12.37	60.71	1458	80

Pilot FLRT Solid Analytical Summary:
Lime/DBA/Gypsum Test Block

Test	Sample	ID	Date	Time	FLRT	Wt%	Solids	Ca	Mg	SO3	SO4	CO3	Inerts	Wt	Mol	Solids	Closure	Solids	Closure	Ull	Ull	CO3	Thickener	Initial	Sealed	Final	Form	Leaf	Cake	Filler	
T11*			Sun 7/02	07:00	24.46	-	-	-	-	-	-	0.28	-	-	-	-	-	-	-	95.2	-	90.43	-	-	-	-	-	-	-	-	
T11*			Thu 7/06	11:15	24.56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T11*			Fri 7/07	07:30	25.90	-	-	-	-	-	-	0.21	-	-	-	-	-	-	-	96.4	-	86.64	-	-	-	-	-	-	-	-	-
T11*			Fri 7/07	14:30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T11			Sat 7/08	06:50	24.49	-	-	-	-	-	-	0.17	-	-	-	-	-	-	-	97.1	-	89.51	-	-	-	-	-	-	-	-	-
T11			Sun 7/09	14:11	26.14	5.76	0.04	0.01	0.01	0.04	5.78	0.23	0.70	1.7	99.8	96.1	99.8	99.8	99.8	96.1	95.4	95.8	-	89.05	0.94	14.96	71.60	1163	85	-	
T11			Sun 7/09	18:30	25.08	6.07	0.04	0.01	0.01	0.04	5.86	0.26	0.80	4.2	99.8	95.8	99.8	99.8	99.8	95.8	94.3	94.2	-	89.59	0.95	12.96	66.58	1109	85	-	
T11			Mon 7/10	07:05	25.18	5.97	0.04	0.00	0.04	5.65	5.76	0.25	0.79	-0.62	2.47	99.88	100.0	99.88	99.88	95.4	95.8	-	89.05	0.94	13.23	68.55	1178	85	-	-	
Averages					25.22	5.93	0.04	0.01	0.01	5.76	5.78	0.23	0.70	-1.9	1.7	99.8	100.0	99.88	99.88	95.4	95.8	-	89.05	0.94	13.23	68.55	1178	85	-	-	

**Pilot FLRT Solid Analytical Summary:
Lime/DBA/Gypsum Test Block**

Test ID	Gas Sample ID	Date	Time	FLRT Wt% Solids	Ca (mmol/g)	Mg (mmol/g)	SO3 (mmol/g)	SO4 (mmol/g)	CO3 (mmol/g)	Inerts (wt%)	Wt Solids Closure (%)	Mol Solids Closure (%)	Solids Ox. (%)	UUL (%)	CO3 Est. UUL (%)	CP Wt%	FC WT%	Thickener Unit Area (ft ² /tpd)	Initial Wt%	Final Settled Wt%	Form Filtration Rate (lb/hr*sqft)	Filter Leaf Cake Wt%
10000 scfm, O:SO2 = 8																						
T12*	Mon 7/10	10:43																				
T12*	Mon 7/10	10:50		-	-	-	-	-	-	-	-	-	-	-	-	-	87.69	-	-	-	-	-
T12*	Mon 7/10	12:00		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T12*	Mon 7/10	13:00		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T12*	Mon 7/10	14:00		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T12*	Mon 7/10	15:15		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T12*	Tue 7/11	07:35	23.69	-	-	-	-	-	0.19	-	-	-	-	-	96.8	-	88.32	-	-	-	-	-
T12*	Tue 7/11	13:50	25.51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T12	Wed 7/12	06:35	24.24	5.87	0.03	0.00	5.90	0.14	1.50	-1.1	3.8	100.0	97.7	97.7	-	-	88.25	0.99	12.86	67.43	893	83
T12	Wed 7/12	13:20	26.01	6.13	0.04	0.00	5.71	0.44	1.40	0.2	4.1	100.0	92.9	92.6	-	-	88.96	1.19	13.93	66.73	766	82
T12	Thu 7/13	07:40	23.53	6.14	0.04	0.01	5.87	0.16	1.40	1.2	4.6	99.8	97.4	97.3	-	-	85.92	1.16	12.94	64.10	1248	84
T12*	Thu 7/13	14:00	24.93	-	-	-	-	-	1.57	-	-	-	-	-	75.5	-	-	-	-	-	-	-
Averages				24.59	6.05	0.04	0.00	5.83	0.24	1.43	0.1	4.2	99.9	96.0	95.9	-	87.71	1.11	13.24	66.09	969	83
13200 scfm, 8ft, L/G=23																						
T13*	Fri 7/14	07:30	-	-	-	0.00	-	1.57	-	-	-	-	-	-	75.6	-	65.50	-	-	-	-	-
T13*	Fri 7/14	11:45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T13*	Fri 7/14	13:30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T13	Fri 7/14	14:30	26.16	-	-	-	-	-	-	-	-	-	-	-	-	-	78.16	-	-	-	-	-
T13	Sat 7/15	08:20	24.19	6.35	0.05	0.02	4.90	1.13	1.15	2.8	-1.6	99.6	81.8	81.8	-	-	89.53	1.92	13.03	64.20	778	81
Averages				25.18	6.35	0.05	0.02	4.90	1.13	1.15	2.8	-1.6	99.6	81.8	81.8	-	83.85	1.92	13.03	64.20	778	81
13200 scfm, 9ft, L/G=30																						
T14	Sun 7/16	07:47	29.03	-	-	-	-	0.44	-	-	-	-	-	-	92.7	-	86.84	-	-	-	-	-
T14	Mon 7/17	08:00	24.32	5.80	0.03	0.02	5.53	0.12	1.00	1.4	-1.8	99.6	97.9	97.9	-	-	88.10	1.21	13.20	65.35	872	83
Averages				26.68	5.80	0.03	0.02	5.53	0.28	1.00	1.4	-1.8	99.6	97.9	95.3	-	87.47	1.21	13.20	65.35	872	83
13200 scfm, 9ft, L/G=30																						
T14A	Tue 7/18	06:30	26.12	-	-	-	-	-	-	-	-	-	-	-	-	-	82.96	-	-	-	-	-
T14A	Tue 7/18	13:15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages				26.12	-	-	-	-	-	-	-	-	-	-	-	-	82.96	-	-	-	-	-
11000 scfm, 8ft																						
T15	Wed 7/19	07:40	21.02	5.91	0.04	0.01	5.79	0.21	1.00	-0.5	2.6	99.8	96.5	96.4	-	-	88.63	0.97	13.06	66.45	1053	84
Averages																						
10000 scfm, 9ft, pH=5																						
T16	Wed 7/19	14:00	24.78	5.98	0.04	0.01	5.79	0.23	0.90	-0.1	2.9	99.8	96.2	96.1	-	-	87.46	1.04	12.23	67.40	917	83
Averages																						
10000 scfm, 9ft, L/G=40																						
T17*	Sat 7/22	07:40	-	-	-	-	-	0.53	-	-	-	-	-	-	91.1	-	72.61	-	-	-	-	-
T17*	Sun 7/23	10:40	-	-	-	-	-	0.35	-	-	-	-	-	-	94.1	-	89.82	-	-	-	-	-
T17*	Sun 7/23	14:25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T17*	Mon 7/24	07:10	25.86	-	-	-	-	0.11	-	-	-	-	-	-	98.1	-	83.99	-	-	-	-	-
T17	Mon 7/24	13:45	26.85	6.10	0.01	0.04	5.55	0.17	0.40	2.9	-0.5	99.3	97.1	-	-	-	86.58	1.64	11.13	64.11	1175	83
T17	Tue 7/25	07:45	26.02	6.38	0.02	0.06	4.82	1.22	0.50	2.4	-2.4	98.8	80.5	80.5	-	-	87.21	1.46	12.71	68.65	638	82
T17	Tue 7/25	14:05	22.37	-	-	-	-	0.20	-	-	-	-	-	-	96.6	-	88.29	-	-	-	-	-
Averages				25.08	6.24	0.02	0.05	5.19	0.53	0.45	2.7	-1.5	99.0	88.8	88.5	-	87.36	1.55	11.92	66.38	906	83

**Pilot FLRT Solid Analytical Summary:
Lime/DBA/Gypsum Test Block**

Gen				FLRT							Wt Solids	Mol Solids	Solids	CO3		Thickener				Form	Filter	
Test	Sample			Wt%	Ca	Mg	SO3	SO4	CO3	Inerts	Closure	Closure	Ox.	UoL	Est.	CP	FC	Unit	Initial	Final	Filtration	Leaf
ID	ID	Date	Time	Solids	(mmol/g)	(mmol/g)	(mmol/g)	(mmol/g)	(mmol/g)	(wt%)	(%)	(%)	(%)	(%)	(%)	Wt%	WT%	Area	Wt%	Settled	Rate	Cake
Fine Grind Limestone																						
T18*	Thu 7/27	13:45	24.86	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T18L*	Fri 7/28	07:55	25.66	-	-	-	-	-	0.07	-	-	-	-	-	98.8	-	87.08	-	-	-	-	
T18L*	Fri 7/28	13:55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T18*	Sat 7/29	07:42	23.06	-	-	-	-	-	0.58	-	-	-	-	-	90.3	-	87.78	-	-	-	-	
T18*	Sun 7/30	13:50	24.02	-	-	-	-	-	0.12	-	-	-	-	-	97.9	-	91.58	-	-	-	-	
T18*	Mon 7/31	07:00	23.74	5.99	0.03	0.05	5.38	0.13	0.80	4.0	-2.9	99.1	97.8	97.8	-	89.10	1.01	12.14	67.04	1222	85	
T18*	Mon 7/31	14:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T18S*	Tue 8/01	10:36	23.25	-	-	-	-	-	0.72	-	-	-	-	-	88.1	-	88.81	-	-	-	-	
T18S*	Tue 8/01	14:08	26.77	-	-	-	-	-	0.19	-	-	-	-	-	96.7	-	-	-	-	-	-	
T18	Wed 8/02	07:40	24.98	6.09	0.03	0.02	5.58	0.12	0.60	3.4	-0.4	99.6	98.0	97.9	82.71	-	0.87	12.81	69.39	1642	85	
T18	Wed 8/02	14:05	25.12	6.16	0.03	0.01	5.70	0.13	0.60	2.9	1.5	99.8	97.8	97.8	-	87.94	1.07	11.96	69.63	1815	85	
T18W	Thu 8/03	07:13	29.05	6.17	0.03	0.01	5.62	0.17	0.59	3.3	0.7	99.8	97.2	97.1	81.97	-	1.15	11.15	67.60	1490	84	
	Averages		26.38	6.14	0.03	0.01	5.63	0.14	0.60	3.2	0.6	99.8	97.7	97.6	-	87.94	1.03	11.97	68.87	1649	85	
Fine Grind & Formate Additive																						
T19*	Fri 8/04	07:30	24.78	-	-	-	-	-	0.26	-	-	-	-	-	95.6	-	90.28	-	-	-	-	
T19*	Fri 8/04	13:45	-	-	-	-	-	-	0.48	-	-	-	-	-	91.9	-	-	-	-	-	-	
T19*	Sat 8/05	08:00	23.64	-	-	-	-	-	0.25	-	-	-	-	-	95.7	-	89.94	-	-	-	-	
T19*	Sun 8/06	16:25	24.17	-	-	-	-	-	0.20	-	-	-	-	-	96.6	-	90.91	-	-	-	-	
T19*	Mon 8/07	07:14	25.59	-	-	-	-	-	0.16	-	-	-	-	-	97.3	-	90.33	-	-	-	-	
T19*	Mon 8/07	14:07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T19	Tue 8/08	06:20	25.89	5.53	0.04	0.02	5.48	0.30	0.70	-2.0	-2.7	99.6	94.7	94.9	-	90.02	1.03	12.92	69.61	1304	85	
T19	Tue 8/08	14:10	24.10	5.88	0.04	0.00	5.46	0.38	0.60	0.7	-1.4	100.0	93.5	93.6	-	90.69	0.60	17.16	68.92	1625	86	
T19	Wed 8/09	06:50	24.96	6.50	0.05	0.05	4.54	1.87	0.70	0.7	-1.5	98.9	71.3	71.4	-	83.53	1.87	13.55	60.77	475	81	
T19	Wed 8/09	14:00	24.76	-	-	-	1.57	-	0.12	-	-	-	-	-	97.9	-	-	-	-	-	-	
	Averages		24.93	5.97	0.04	0.41	5.16	0.67	0.67	-0.22	-1.88	99.51	86.50	89.45	-	88.08	1.17	14.54	66.43	1135	84	
Fine Grind & DBA Additive																						
T20*	Thu 8/10	07:40	23.24	-	-	3.60	-	0.17	-	-	-	-	-	-	97.1	62.82	-	-	-	-	-	
T20*	Thu 8/10	14:15	23.58	-	-	2.69	-	0.22	-	-	-	-	-	-	96.2	65.93	-	-	-	-	-	
T20*	Fri 8/11	07:40	27.66	-	-	0.69	-	0.36	-	-	-	-	-	-	93.9	80.75	-	-	-	-	-	
T20*	Fri 8/11	14:05	26.19	-	-	0.56	-	0.32	-	-	-	-	-	-	94.6	-	-	-	-	-	-	
T20*	Sat 8/12	07:15	25.42	-	-	0.28	-	0.20	-	-	-	-	-	-	96.6	-	89.88	-	-	-	-	
T20	Sun 8/13	09:00	27.29	6.86	0.05	0.07	4.67	1.76	0.80	3.1	1.2	98.5	73.7	72.9	-	83.27	1.58	13.45	68.55	801	82	
T20	Mon 8/14	06:59	24.57	6.49	0.05	0.07	4.93	1.21	0.60	2.6	-0.3	98.6	81.0	80.7	-	86.07	1.51	12.26	66.65	717	83	
T20	Mon 8/14	11:20	25.50	6.71	0.05	0.04	4.73	1.57	0.80	3.2	0.0	99.2	76.0	75.5	-	81.41	2.03	11.24	65.54	600	81	
	Averages		25.79	6.69	0.05	0.06	4.78	1.51	0.73	2.95	0.31	98.76	76.91	76.35	-	83.58	1.71	12.32	66.91	706	82	

Lime-DBA-Gypsum Additive Consumption Results

	LDG-2	LDG-3	LDG-4	LDG-6	LDG-7	LDG-8	LDG-9	LDG-10	LDG-11	LDG-12	T1	T2	T4
Test Duration (hr):	16hr SRT	8hr SRT	4hr SRT	14 O-SO2	11 O-SO2	8 O-SO2	6 O-SO2	6.5 pH	13 wt%	High Mg	High Mg	High Mg	Feed Loc.
	32	32	29	29	22	23	25	13	18	51	47	59	43
System Conditions													
Fine Gas Flow, scfm	8250	8243	8250	8250	8257	8258	8249	8261	11046	8248	8251	8261	11001
Inlet SO2, ppm	2498	2499	2500	2500	1999	2000	2000	2000	2000	2000	2001	1997	2000
SO2 Removal, %	90.5	90.6	99.5	99.5	93.3	90.7	92.4	92.3	92.3	92.7	92.4	92.5	89.9
Sulfite Oxidation, %	99.7	99.8	100.0	99.6	99.7	100.0	99.9	99.2	65.5	100.0	99.5	99.7	99.8
Lime Utilization, %	99.8	99.8	99.8	99.8	99.8	97.4	98.4	98.6	98.0	99.8	99.6	99.6	99.8
System Volume, gal	7900	7900	10600	8700	8700	8700	8700	8700	8700	10500	8700	8700	8700
Reaction Tank Solids, wt. %	15.5	8.12	4.4	4.22	4.29	4.25	4.23	4.34	13.95	11.57	7.15	12.16	26.48
Waste Solids Conc., wt. %	82.98	82.62	79.8	79.4	67.34	70.35	68.79	76.55	67.51	79.66	68.69	77.59	83.71
Centrifuge Feed, gpm	13.14	8.47	10.7	0.00	10.2	9.35	9.47	9	7.42	11.19	7.42	5.28	3.16
Rec Water Blowdown, gpm	0.00	0.00	0.00	0.00	0.31	0.00	0.00	0.00	0.08	0.15	0.01	0.11	0.11
Reagent Feed Rate (gpm)	1.76	1.78	1.75	1.35	1.38	1.26	1.30	1.46	2.03	1.28	1.2	1.22	1.79
Reagent Solids Conc., wt. %	23.5	23.5	23.5	23.1	22.5	24.6	23.3	21.4	22.7	25.1	25.4	25.8	25.8
Liquor Adipic Conc., mM	1251	9.04	5.05	1.90	2.08	4.92	3.18	4.35	2.92	2.90	2.41	2.45	13.33
Liquor Glutaric Conc., mM	4.57	6.39	13.74	7.27	8.64	7.43	8.48	10.08	8.20	13.02	11.17	11.54	1.82
Liquor Succinic Conc., mM	4.02	5.18	8.90	6.11	7.35	6.38	7.28	8.11	2.90	8.73	8.14	7.84	2.14
Total Liquor DBA, ppm	2904	2775	3601	1958	2311	2452	2443	2923	1851	3172	2787	2806	2439
Adipic Feed Rate, g/hr	625	750	0	0	0	0	0	0	0	0	0	0	965
Adipic Feed Conc., mM	0	0	220	193	176	224	198	207	207	243	246	237	0
Glutaric Feed Conc., mM	0	0	901	865	1085	988	864	872	872	977	1055	1033	0
Succinic Feed Conc., mM	0	0	420	395	532	452	396	400	400	443	482	474	0
DBA Feed Rate, ml/min	0	0	118	49	43	52	57	64	57	58	69	69	0
Ad Accumulation, mM/hr	-0.1006	-0.0739	-0.0143	0.0068	-0.0061	-0.0455	-0.0242	-0.1005	-0.0366	-0.0043	0.0013	-0.0024	-0.1240
Gl Accumulation, mM/hr	0.0266	0.1780	0.0720	0.0340	-0.0124	0.0202	0.1136	-0.1364	-0.0748	-0.0096	-0.0036	-0.0150	-0.0124
Su Accumulation, mM/hr	0.0175	0.0923	0.0743	0.0143	0.0120	0.0096	0.0952	0.1829	-0.1377	0.0069	-0.0138	-0.0196	-0.0104
Waste Sludge Liquid, gpm	0.45	0.16	0.13	0.00	0.23	0.18	0.20	0.13	0.54	0.36	0.26	0.20	0.18
CP Waste Sludge Solids, lb/hr	1119	378	256	0	240	218	220	215	569	711	291	353	460
SO2 Pickup, mole/hr	1342	1343	1477	1477	1108	1078	1097	1097	1467	1100	1098	1098	1423
SO2 P Waste Sludge Solids, lb/hr	430	431	474	473	355	358	359	358	467	353	353	353	457
SO2 P Waste Sludge Liquid, gpm	0.17	0.18	0.23	0.24	0.34	0.30	0.32	0.21	0.44	0.18	0.32	0.20	0.17
Accumulation Adjustment													
Ad Accumulation Adjust, %	-44.3	-31.7	-30.7	95.2	-57.5	-80.3	-64.1	-85.0	-76.9	-21.3	5.5	-8.9	-41.5
Gl Accumulation Adjust, %	-81.6	-95.4	104.7	109.0	-21.1	34.6	-267.1	-61.1	-55.0	-13.7	-3.2	-12.5	-140.4
Su Accumulation Adjust, %	-76.8	-93.0	-617.7	131.6	-384.4	47.8	-135.8	-123.3	-81.6	45.3	-24.6	-31.4	-167.5
DBA Accumulation Adjust, %	-32.9	-374.9	128.1	112.0	-9.9	-11.6	-246.6	-28.0	-70.7	-6.5	-8.4	-17.7	-46.8
Feed Rate Calculations													
Adipic Added, mole/hr	4.28	5.14	1.56	0.57	0.45	0.70	0.68	0.79	0.71	0.85	1.02	0.98	6.61
Glutaric Added, mole/hr	0.00	0.00	6.38	2.54	2.80	3.08	2.95	3.35	2.98	3.40	4.37	4.28	0.00
Succinic Added, mole/hr	0.00	0.00	2.97	1.16	1.37	1.41	1.35	1.54	1.37	1.54	2.00	1.96	0.00
DBA Added, lb/ton SO2	14.5	17.4	30.0	11.7	16.8	19.6	18.5	21.0	14.0	21.4	27.3	26.7	21.2
Soln Loss Calculations													
Ad Soln Loss - Sludge, m/hr	0.49	0.36	0.27	0.10	0.16	0.33	0.23	0.21	0.29	0.12	0.17	0.11	0.53
Gl Soln Loss - Sludge, m/hr	0.18	0.26	0.73	0.40	0.66	0.50	0.61	0.49	0.82	0.52	0.80	0.52	0.07
Su Soln Loss - Sludge, m/hr	0.16	0.21	0.47	0.33	0.56	0.43	0.53	0.40	0.29	0.35	0.58	0.36	0.08
Ad Soln Loss - RW BD, m/hr	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.05	0.10	0.01	0.06	0.33
Gl Soln Loss - RW BD, m/hr	0.00	0.00	0.00	0.00	0.61	0.00	0.00	0.00	0.15	0.44	0.03	0.29	0.05
Su Soln Loss - RW BD, m/hr	0.00	0.00	0.00	0.00	0.52	0.00	0.00	0.00	0.05	0.30	0.02	0.20	0.05
Total Ad Soln Loss, mole/hr	0.49	0.36	0.27	0.10	0.31	0.33	0.23	0.21	0.35	0.22	0.18	0.17	0.86
Total Gl Soln Loss, mole/hr	0.18	0.26	0.73	0.40	1.27	0.50	0.61	0.49	0.97	0.97	0.82	0.81	0.12
Total Su Soln Loss, mole/hr	0.16	0.21	0.47	0.33	1.08	0.43	0.53	0.40	0.34	0.65	0.60	0.55	0.14
Tot. Soln Loss, lb/ton SO2	2.7	2.6	4.1	2.3	9.6	4.8	5.0	4.1	4.7	6.7	5.9	5.6	3.5
Accumulation Calculations													
Ad Accumulation, moles/hr	-3.01	-2.21	-0.57	0.23	-0.20	-1.50	-0.80	-3.31	-1.21	-0.17	0.04	-0.08	-4.08
Gl Accumulation, moles/hr	0.79	5.32	2.89	1.12	-0.41	0.66	3.74	-4.49	-2.46	-0.39	-0.12	-0.49	-0.41
Su Accumulation, moles/hr	0.52	2.76	2.98	0.47	0.39	0.32	3.14	6.02	-4.53	0.28	-0.46	-0.65	-0.34
Non-soln Loss Calculations													
Ad Non-Soln. Loss, mole/hr	6.80	6.98	1.86	0.24	0.35	1.87	1.24	3.89	1.57	0.80	0.80	0.89	9.83
Gl Non-Soln. Loss, mole/hr	-0.97	-5.58	2.76	1.03	1.94	1.92	-1.40	7.35	4.48	2.82	3.66	3.96	0.29
Su Non-Soln. Loss, mole/hr	-0.68	-2.97	-0.48	0.36	-0.10	0.66	-2.31	-4.88	5.56	0.62	1.85	2.06	0.20
Ad NSL, lb/ton SO2	23.09	23.70	5.74	0.73	1.44	7.89	5.17	16.17	4.87	3.32	3.31	3.68	31.49
Gl NSL, lb/ton SO2	-2.99	-17.13	7.70	2.87	7.20	7.34	-5.26	27.60	12.57	10.56	13.74	14.85	0.84
Su NSL, lb/ton SO2	-1.87	-8.14	-1.20	0.89	-0.34	2.27	-7.75	-16.39	13.96	2.06	6.21	6.90	0.53
TOTAL NSL, lb/ton SO2	18.2	-1.6	12.2	4.5	8.3	17.5	-7.8	27.4	31.4	15.9	23.3	25.4	32.9
TOTAL NSL, mol/ton SO2	0.1197	-0.0364	0.0874	0.0343	0.0615	0.1289	-0.0702	0.1809	0.2469	0.1202	0.1794	0.1963	0.2266

Lime-DBA-Gypsum Additive Consumption Results

	T6	T9	T11	T18	T19	T20
	Premix	L.S., PII	Low Cl	Fine Grind	NaHCOO	Fine Grind
Test Duration (hr):	24	28	38	31	17	44
System Conditions						
Flue Gas Flow, acfm	11000	10000	10000	10000	10000	10000
Inlet SO ₂ , ppm	1999	2299	2300	2300	2300	2300
SO ₂ Removal, %	89.8	86.6	90.4	91.5	79.7	88.4
Sulfite Oxidation, %	100	99.6	100	99.8	99.5	99
Lime Utilization, %	99.8	94.4	97.3	97.7	90	80
System Volume, gal	8700	2000	2000	2000	2000	2000
Reaction Tank Solids, wt. %	31.36	26.49	25.22	26.38	25	25
Waste Solids Conc., wt. %	83.83	98.71	89.05	87.94	90.5	83
Centrifuge Feed, gpm	6.6	2.92	3.87	3.47	3.6	3.94
Rec Water Blowdown, gpm	0.27	0.34	0.63	0.77	0.92	0.78
Reagent Feed Rate (gpm)	1.65	1.53	1.53	2.39	2.34	2.64
Reagent Solids Conc., wt. %	25.8	25.8	25.8	20	20	20
Liquor Adipic Conc., mM	15.95	2.88	3.56	2.21	48.89	2.37
Liquor Glutaric Conc., mM	1.48	14.15	18.94	12.19	0	11.87
Liquor Succinic Conc., mM	3.2	5.06	7.64	5.15	0	4.85
Total Liquor DBA, ppm	2902	2885	3921	2539	2200	2485
Adipic Feed Rate, g/hr	965	0	0	0	0	0
Adipic Feed Conc., mM	0	242	237	183	4390	235
Glutaric Feed Conc., mM	0	1155	1033	1082	0	1178
Succinic Feed Conc., mM	0	377	474	342	0	387
DBA Feed Rate, ml/min	0	75	95	85	157	86
Ad Accumulation, mM/hr	0.0825	0.0068	-0.0661	0.0433	0.0000	0.0028
Gl Accumulation, mM/hr	-0.0017	0.0067	-0.3633	-0.1483	0.0000	0.0189
Su Accumulation, mM/hr	0.0075	0.0386	-0.1005	-0.3833	0.0000	0.0112
Waste Sludge Liquid, gpm	0.43	0.01	0.13	0.14	0.10	0.22
CP Waste Sludge Solids, lb/hr	1137	425	536	503	494	541
SO ₂ Pickup, mole/hr	1421	1433	1496	1514	1319	1463
SO ₂ P Waste Sludge Solids, lb/hr	456	495	497	503	501	647
SO ₂ P Waste Sludge Liquid, gpm	0.17	0.01	0.12	0.14	0.10	0.26
Accumulation Adjustment						
Ad Accumulation Adjust, %	118.6	6.4	-40.2	217.3	0.0	3.3
Gl Accumulation Adjust, %	58.5	1.3	-30.8	-27.2	-	4.6
Su Accumulation Adjust, %	-43.5	29.3	-35.2	-80.9	-	11.0
DBA Accumulation Adjust, %	178.6	6.8	-45.5	-47.0	0.0	5.5
Feed Rate Calculations						
Adipic Added, mole/hr	6.61	1.09	1.35	0.93	41.35	1.21
Glutaric Added, mole/hr	0.00	5.20	5.89	5.52	0.00	6.08
Succinic Added, mole/hr	0.00	1.70	2.70	1.74	0.00	2.00
DBA Added, lb/ton SO ₂	21.2	22.8	27.0	22.1	44.0	25.9
Soln Loss Calculations						
Ad Soln Loss - Sludge, m/hr	0.62	0.01	0.10	0.07	1.14	0.14
Gl Soln Loss - Sludge, m/hr	0.06	0.04	0.51	0.37	0.00	0.70
Su Soln Loss - Sludge, m/hr	0.13	0.01	0.21	0.16	0.00	0.29
Ad Soln Loss - RW BD, m/hr	0.98	0.22	0.51	0.39	10.21	0.42
Gl Soln Loss - RW BD, m/hr	0.09	1.09	2.71	2.13	0.00	2.10
Su Soln Loss - RW BD, m/hr	0.20	0.39	1.09	0.90	0.00	0.86
Total Ad Soln Loss, mole/hr	1.60	0.23	0.61	0.45	11.36	0.56
Total Gl Soln Loss, mole/hr	0.15	1.13	3.22	2.51	0.00	2.80
Total Su Soln Loss, mole/hr	0.32	0.41	1.30	1.06	0.00	1.15
Tot. Soln Loss, lb/ton SO ₂	6.4	5.0	13.9	10.8	39.3	12.5
Accumulation Calculations						
Ad Accumulation, moles/hr	2.72	0.05	-0.50	0.33	0.00	0.02
Gl Accumulation, moles/hr	-0.05	0.05	-2.75	-1.12	0.00	0.14
Su Accumulation, moles/hr	0.25	0.29	-0.76	-2.90	0.00	0.08
Non-soln Loss Calculations						
Ad Non-Soln. Loss, mole/hr	2.29	0.81	1.25	0.15	29.99	0.63
Gl Non-Soln. Loss, mole/hr	-0.09	4.01	5.41	4.14	0.00	3.13
Su Non-Soln. Loss, mole/hr	-0.57	1.00	2.16	3.59	0.00	0.77
Ad NSL, lb/ton SO ₂	7.35	2.57	3.79	0.45	31.95	1.97
Gl NSL, lb/ton SO ₂	-0.27	11.55	14.91	11.25	0.00	8.83
Su NSL, lb/ton SO ₂	-1.47	2.57	5.32	8.73	0.00	1.93
TOTAL NSL, lb/ton SO ₂	5.6	16.7	24.0	20.4	31.9	12.7
TOTAL NSL, mol/ton SO ₂	0.0358	0.1268	0.1841	0.1623	0.7099	0.0967

APPENDIX C

WET SCRUBBER QA/QC SUMMARY DATA

EPRI ECTC WET PROCESS QA/QC RECORD
JULY/AUGUST 1995

	Date	Actual	Instrument Reading	% Error	Actual	Instrument Reading	% Error	Point ID
<i>PILOT</i>								
Service Water to RWWT (gpm)	7/11	4.19	4.19	-0.10				PAI004
Recycle Water to RWWT (gpm)	7/11	1.60	1.58	-1.56				PAI021
VME Wash Header #1 (gpm)	7/11	35.97	37.70	4.81				PAI022
VME Wash Header #2 (gpm)	7/11	35.28	35.80	1.47				PAI023
Velocity Traverse (scfm)	7/13	10000	10146	1.46				
Quench (gpm)	7/18	2.97	2.96	-0.17				PAI003
Blowdown to Sump (gpm)	7/18	2.00	2.09	4.55				PAI039
Centrifuge Blowdown- Pump 7 (gpm)	7/18	4.50	4.63	2.80				PAI032
Reagent Feed- Pump 16 (gpm)	7/18	2.15	2.24	3.81				PAI020
Cooling Water Feed (gpm)	7/21	0.50	0.71	42.00	0.50	0.72	43.20	SAI018
Cooling Water Feed (gpm)	7/21	0.99	0.93	-5.18	1.06	1.01	-5.32	SAI018
Cooling Water Feed (gpm)	7/21	2.02	2.01	-0.45				SAI018
Lime Feed (gpm)	7/21	0.60	0.60	-0.67				
Lime Feed (gpm)	7/21	0.99	0.96	-2.94				
Cooling Water Feed (gpm)	7/21	0.99	0.93	-5.18	1.06	1.01	-5.32	SAI018
Cooling Water Feed (gpm)	7/21	2.02	2.01	-0.45				SAI018
P-RSST Level (ft.)	7/31	12.67	11.52	-9.08				PAI049
ME-RWWT Level (ft.)	7/31	4.04	4.03	-0.32				PAI024
M-MRT Level (ft.)	7/31	11.17	10.42	-6.72				MAI004
P-RWST Level (ft.)	7/31	4.17	4.28	2.64				PAI035
Limestone Injection Nozzle (gpm)	8/1	0.50	0.49	-2.40				SAI017
Blowdown to Sump (gpm)	8/7	1.11	1.20	7.73	1.13	1.20	6.40	PAI039
Cooling Water to S.D. (gpm)	8/16	0.16	0.16	0.63	0.50	0.50	0.80	SAI013
Velocity Traverse (scfm)	8/17	4269	4070	-4.66				
DBA flow to pilot (gpm)	8/24	0.02	0.02	0.40				PAI014
Reagent Feed (gpm)	8/29	1.46	1.44	-1.47				PAI020
Blowdown to Sump (gpm)	8/30	0.66	0.75	14.18				PAI039
Polymer Pump to Thickener	8/30	0.02	0.02	-6.25				
Blowdown to Sump (gpm)	9/1	0.58	0.64	10.34	0.55	0.75	36.36	PAI039
Blowdown to Sump (gpm)	9/1	0.67	0.75	11.34				PAI039
Blowdown to Sump (gpm)	9/5	0.76	0.84	10.26				PAI039
Blowdown to Sump (gpm)	9/6	0.86	0.85	-0.81				PAI039

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