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ENVIRONMENTAL CONTROL TECHNOLOGY CENTER

REPORT TO THE STEERING COMMITTEE

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CAUTIONS TO USE OF THIS REPORT

This report is a compilation of monthly progress reports by EPRI contractors (Radian International, Parsons Power) connected with the Environmental Control Technology Center (ECTC). This report is intended to provide timely information regarding the status of testing and research to the ECTC co-sponsoring organizations.

All data, results, and remarks contained in this report should be considered preliminary based on the information available to date. Any speculation or conclusions discussed in this report are subject to change as additional information becomes available.

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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 continued this month with the Carbon Injection System and the Trace Element Removal test blocks. With this testing, the mercury measurement (Method 29) studies also continued with impinger capture solutions.

The 4.0 MW Spray Dryer Absorber System (Carbon Injection System) was utilized in the TER test configuration this month. The B&W/CHX Heat Exchanger unit is being installed utilizing the Mini Pilot Flue Gas System. The 1.0 MW Cold-Side Selective Catalytic Reduction (SCR) unit remained idle this month in a cold-standby mode. Monthly inspections were conducted for all equipment in cold-standby, as well as for the fire safety systems, and will continue to be conducted by the ECTC Operations and Maintenance staff.

PILOT TESTING HIGHLIGHTS

The Pilot Trace Elements Removal (TER) test block continued through February as part of EPRI's overall program to develop control technology options for trace element emissions. This experimental program investigates mercury removal and mercury speciation under different operating conditions. The 1996 program is being performed on the 4.0 MW wet FGD pilot unit and the spray dryer pilot unit at EPRI's Environmental Control Technology Center (ECTC). This progress report includes test results from January 29 to February 29, 1996.

The 1996 Trace Elements Removal (TER) test block is a continuation of the 1995 TER test block and 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; and
- Electrostatic charging of particulate material in the FGD inlet flue gas stream.

In February, testing focused on evaluating oxidation of elemental mercury in the duct and comparing the new Tris speciation method to Method 29. At the ECTC, elemental mercury spiked into the flue gas is easily oxidized. Testing in February showed that as the residence time of the elemental mercury spike in the system increases, the fraction of elemental mercury oxidized increases. When passing through either the ESP or SDA/PJFF, over 90% of the elemental mercury spike is oxidized. Oxidation appears to be independent of the particulate loading at residence times up to four seconds and is not affected by pilot heater operation or SO₂ spiking.

The total flue gas mercury concentration measured using the new Tris speciation method (Method 29T) was compared to Method 29 in February. Based on eleven comparisons, the total concentration using Method 29T was about 2% lower than that obtained with Method 29. This difference is well within expected variability and indicates Method 29T yields accurate total mercury concentrations. Method 29T will be used for all future mercury sampling at the ECTC.

SECTION I FACILITY STATUS

GENERAL

The NYSEG Kintigh Station provided flue gas to the Center 100% 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.

Safety training for the month was conducted by the O&M Superintendent, Maintenance Supervisor and Shift Supervisors. "FGD Plant Safety" 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 1365 as of 2/29/96.

The monthly safety meeting with the NYSEG Kintigh Station was postponed due to a conflict of schedules with NYSEG and ECTC representatives.

PILOT WET FGD SYSTEM

The equivalent and actual availabilities for the ECTC 4.0 MW Pilot Wet FGD System testing this month were both 89% during this period. The Pilot Wet FGD System did not operate during the following periods this month:

- February 5 for 12 hours due to Flue gas system reconfiguration
- February 8 through 9 for 30 hours due to Fabric Filter Fan repairs.
- February 29 for 13 hours due to Flue Gas System reconfiguration.

The Trace Element Removal test block continued this month with tests TER-51; TER-52; TER-53. The operational parameters for the Pilot Wet Scrubber during this test block included: gas flows of 5,900; 8,900; 9,000; 13,000 scfm; 1600 ppm inlet SO₂; recycle slurry flows of 650 and 1300 gpm; 440 scfm oxidation air; absorber inlet temperatures of 270 to 300°F.

Mercury measurement and control studies were conducted using the EPA Method 29 for testing several impinger capture solutions while elemental mercury (Hg⁰) was injected into the facility gas stream. The following TER tests were conducted this month: T-58-E; T-48; T-64; T-58R; T-59; T-60; T-61. These tests were conducted with the injection of Mercury into the Dirty Raw Gas or Booster Fan inlet ducts with gas sampling at various locations.

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

- There were several Flue Gas System duct reconfigurations to support mercury injection and sampling activities.
- The outboard bearing on the ESP fan wheel failed causing damage to the shaft.
- This will be repaired by removing a shaft from an old assembly and replacing the damaged shaft on the current wheel in service.
- Relocating the control system for mercury injection to various locations.

CARBON INJECTION SYSTEM

The equivalent and actual availabilities for the ECTC Carbon Injection System testing this month were both 100% during this period.

The Trace Element Removal (TER), mercury injection, with the PJFF were completed this month with tests T51-PJFF; T52-PJFF; T53-PJFF; T54-PJFF; T63-PJFF. These mercury removal tests were conducted with the injection of mercury into the Dirty Raw Gas (DRG) duct, SDA inlet duct or Booster Fan inlet duct with gas sampling at the PJFF inlet and outlet or SDA inlet and outlet locations. A Low Temperature test, atomizing a dilute limestone slurry, was also completed. The operational parameters for the PJFF during this test block included: gas flows of 4,000 and 8,000 scfm; the SO₂ concentration as received in NYSEG flue gas, PJFF inlet temperature of 300°F.

B&W/CHX HEAT EXCHANGER PROJECT

The Heat Exchanger installation for the B&W/CHX Project is in progress. Jim Carrigan from Condensing Heat Exchanger Corporation inspected the CHX installation progress.

The CHX representative inspected the unit on 2/21/96. There were some minor concerns which have been resolved. There were also discussions relating to the need for particulate loading monitoring equipment installation prior to the CHX unit. The B&W and CHX representatives have been scheduled to visit the ECTC during the second week of March to inspect the unit and take initial measurements before start-up commences.

The following maintenance work was completed on the CHX unit during this performance period:

- The booster fan inlet duct was inspected and cleaned.

MISCELLANEOUS

The Ball Mill operation was normal this month during the preparation of Beachville limestone. The limestone grind prepared for ECTC operations was 90% passing 325 mesh screen.

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

- Regularly scheduled maintenance was completed on various ECTC equipment.
- The Waste Silo Fluidizing Blower was replaced with a new unit.

FINANCIAL REPORT

The Financial Report for the four Operations and Maintenance contract tasks are summarized below for the month of February 1996, the year to date, and the contract total. All expenses reported below are expressed in terms of U. S. currency dollars.

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

	February	Year to Date	Contract Total
Task 100	\$ 87,240	\$ 181,691	\$ 13,860,233
Task 200	\$ 7,070	\$ 34,998	\$ 8,006,122
Task 300	\$ 4,144	\$ 9,052	\$ 1,149,417
Task 400	\$ 616	\$ 1,021	\$ 52,764
TOTAL	\$ 99,070	\$ 226,762	\$ 23,068,536

The attached graph illustrates the budgeted and actual expenses for ECTC O&M activities through February 1996.

Figure i.
1996 Operation & Maintenance Costs

SECTION II PILOT AND MINI-PILOT TEST ACTIVITY

PILOT

Overview

The Pilot Trace Elements Removal (TER) test block continued through February as part of EPRI's overall program to develop control technology options for trace element emissions. This experimental program investigates mercury removal and mercury speciation under different operating conditions. The 1996 program is being performed on the 4.0 MW wet FGD pilot unit and the spray dryer pilot unit at EPRI's Environmental Control Technology Center (ECTC). This progress report includes test results from January 29 to February 29, 1996.

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The total flue gas mercury concentration measured using the new Tris speciation method (Method 29T) was compared to Method 29 in February. Based on eleven comparisons, the total concentration using Method 29T was about 2% lower than that obtained with Method 29. This difference is well within expected variability and indicates Method 29T yields accurate total mercury concentrations. Method 29T will be used for all future mercury sampling at the ECTC.

Summary of Operations

A detailed summary of operations for February is presented in Table 1. Simplified flow diagrams of the wet FGD toxics gas path and the spray dryer/pulse jet fabric filter gas path used during the February testing are shown in Figures 1 and 2, respectively.

The gas path shown in Figure 1 was used during the ESP tests in which gas flowed from the dirty raw gas (DRG) duct, through the ESP, and to the wet scrubber. The ESP fan (see Figure 1) malfunctioned in January so testing from January 29 through February 2 was conducted using only the pilot booster fan. With only the pilot booster fan in operation, the facility duct pressure was negative from the facility inlet to the pilot booster fan inlet. With the clean raw gas (CRG) duct under negative pressure, the mercury concentrations measured at the CRG pre-spike location were found to be as high as the post-spike concentrations. These unexpected measurements have not been explained but are believed to be related to the negative duct pressure. Such high pre-spike concentrations have never been measured with a positive CRG duct pressure.

On February 5, the gas path flow configuration was changed to remove the ESP from operation and include the spray dryer absorber (SDA) and pulse-jet fabric filter (PJFF) as shown in Figure 2. This change was made primarily to eliminate the negative CRG duct pressure. With both the fabric filter fan and pilot booster fan now in operation, the gas recirculation problem discussed above was eliminated by creating a positive CRG pressure. This gas path was used until February 21 at which time ESP operation was reestablished (see Figure 1) with two fans in operation by substituting the fabric filter fan for the ESP fan.

In addition to changing the gas path in February, the mercury injection location and the gas sampling locations were changed several times to investigate the effect of gas residence time and facility equipment on elemental mercury oxidation. In December, flue gas measurements at the inlet and outlet of the ESP indicated that ninety percent of the elemental mercury spiked into the flue gas upstream of the ESP was oxidized. Tests were performed in February to further quantify elemental mercury oxidation within the gas ducts and across specific facility equipment by moving the mercury injection location.

The mercury injector was placed at several different locations both upstream (high particulate loading) and downstream (low particulate loading) of the particulate removal devices. While operating with the ESP, the injector was located at the DRG duct upstream of the ESP. By varying the gas rate and sampling locations, the effect of residence time in the duct and residence time in the ESP on elemental oxidation were measured. While operating with the SDA and PJFF, the injector was located at the SDA inlet. Again, by varying the gas rate and sampling locations, the effect of residence time in the SDA and PJFF on elemental oxidation was determined. The injector was also located at the inlet of the fabric filter fan, downstream of either the ESP or PJFF. At this location, the effect of residence time in the duct, pilot heater

operation, and SO₂ spiking on elemental mercury oxidation were determined.

In addition to investigating elemental mercury oxidation, evaluation of the new mercury sampling method (Method 29T) continued. In Method 29T, the two peroxide/nitric impingers used in Method 29 are replaced by two Tris impingers. During several tests in February, the total mercury concentration measured using Method 29T was compared to that obtained using Method 29. When sampling using both methods, a clean solids filter was installed at the beginning of the first run of the day. This filter remained in place during subsequent samples while fresh sets of impinger solutions were installed at the beginning of each run. The use of only one filter per day was adopted in order to perform more gas sampling runs (Method 29 and Method 29T simultaneously) each day.

Summary of Results

Results obtained from January 29 through February 29 are discussed below. TER test conditions and results during this time are summarized in Table 2. Complete analytical data tables and process data summary reports for the tests completed in February are appended to this report.

Oxidation of Elemental Mercury Spike

During previous TER testing, measurements have indicated that some of the elemental mercury spiked into the flue gas duct is oxidized while in the duct. The exact cause of this oxidation is not known, but it is probably related to residence time and contact between the mercury and fly ash. During February, elemental mercury oxidation was further investigated to determine what factors affect oxidation. Variables investigated included residence time in the duct (both high and low particulate loading), residence time in the particulate removal device (both ESP and PJFF), pilot heater operation, and SO₂ concentration.

The effect of residence time on elemental mercury oxidation in the dirty raw gas and the clean raw gas are shown in Figures 3, 4, and 5. Figure 3 shows the effect of residence time in dirty raw gas and through the particulate removal devices on elemental mercury oxidation. The short residence time was obtained by sampling at two locations within the DRG duct, upstream of any particulate control device. When sampling across the particulate removal devices (ESP or SDA/PJFF), the residence time increases significantly. When operating at 4000 scfm through the SDA venturi (baseline flow), the residence time is approximately 26 seconds through the spray dryer and 16 seconds through the PJFF. At 9000 scfm through the pilot venturi (baseline flow), the residence time through the ESP is estimated to be 30 seconds. This ESP residence time value is preliminary, and a more accurate number will be included in next month's progress report.

As shown in Figure 3, residence times greater than about 35 seconds result in greater than 90% oxidation of the elemental mercury spike. Variations in the residence

time through the particulate control devices were achieved by adjusting the gas rate. The ESP and PJFF do not significantly differ in their effect on the oxidation of the mercury spike. Oxidation decreases dramatically at short residence times.

The effect of residence time in clean raw gas is shown in Figure 4. Variations in residence time were obtained by moving the sampling location. With residence times between 1.6 and 4.0 seconds, the effect of residence time in clean raw gas is within analytical variability. However, oxidation of elemental mercury in clean gas (low particulate) is essentially equal to that in dirty gas (high particulate) at the same residence time. Figure 4 also shows that there is no effect of the pilot heater or of the SO₂ concentration on the oxidation of the elemental mercury spike over the ranges tested. The pilot heater element temperatures ranged from 230°F when the heater was off (T59-EXY) to approximately 1000°F when the heater was on at 90% output (T58R-EXY). The SO₂ concentration ranged from 1400 ppm (T60-EXY) to 3000 ppm (T61-EXY).

Figure 5 combines all of the data collected and shows that increasing residence time increases the oxidation of the elemental mercury spike. Since all of the data appear to follow the same trend, elemental oxidation appears to be independent of particulate loading (dirty gas vs. clean gas at residence times up to four seconds) and particulate control device (ESP vs. SDA/PJFF). This result is surprising and suggests that some other factor is important to elemental mercury oxidation.

Comparison of Method 29 with Method 29T

In February, direct comparison of Tris Method 29 (Method 29T) to EPA Method 29 continued. Figure 6 compares the total mercury concentration measured using both methods. EPA Method 29 was recently validated for measurement of total mercury in flue gas. The data show that the total mercury capture measured using Method 29T is on average 2.2% below that measured with Method 29. Of the eleven comparative samples, the total mercury concentration measured using Method 29T was below that of Method 29 six times, equal to that of Method 29 once, and greater than that of Method 29 four times. These data indicate no consistent difference between the two methods. Based on these good comparison data and the speciation capabilities of Method 29T (discussed in January 1996 progress report), Method 29T will be used for future mercury removal testing.

Mercury Contamination Testing

Several test runs showing high mercury concentrations at different sampling locations (including pre-spike locations) caused concern of possible mercury contamination. In order to determine if there were leaks in the mercury injection system, ambient air was sampled from the surroundings of the Hg injector port and from the discharge of the safety vent for the mercury injection system. This safety vent is typically exhausted outside the building. Additionally, a field blank and impinger blank were run. For the field blank, solutions were poured into the impingers, which were assembled into the gas train at a sampling location, leak

checked, disassembled, and recovered as routine samples. For the impinger blank test, solutions were poured into the impingers which remained in the lab for a normal gas sampling length of time, and then were recovered as routine samples.

Results from the above tests showed that there was $<0.2 \mu\text{g}/\text{Nm}^3$ elemental mercury found in the ambient air sample and $<1.1 \mu\text{g}/\text{Nm}^3$ elemental mercury found in the safety vent exhaust. The ambient air results indicate that air in the building is not the contamination source, and since the safety vent is normally vented outside of the building, $1.1 \mu\text{g}/\text{Nm}^3$ is not an appreciable contamination level. The field blank and the impinger blank showed very low elemental mercury quantities of <0.21 and $<0.16 \mu\text{g}/\text{Nm}^3$ respectively, assuming 30 scf gas volume sampled. These results show that the ambient air or impinger solutions are not significant contamination sources.

High Mercury Concentrations in Wet Scrubber Slurry Liquid

During test T48-EYZ, in which the gas velocity was increased to study the effect of reduced residence time across the ESP and through the DRG duct, the wet scrubber was operated at conditions similar to those used during the high velocity test block. This was done to see if high mercury concentrations found in the liquid slurry during the high velocity test block could be duplicated. The parameters for test T48-EYZ were 13 ft/s absorber gas velocity, $L/G = 42$, solids residence time of 6.8 hours, and $\text{O}_2:\text{SO}_2$ ratio of 10. The mercury concentration was 21.6 ng/ml in the slurry liquid prior to test T48-EYZ, and the concentration increased to 221.3 ng/ml during T48-EYZ. The next day when the absorber parameters (Test T64-EDRG) were set to 9 ft/s gas velocity, $L/G = 123$, solids residence time of 8.9 hours, and an $\text{O}_2:\text{SO}_2$ ratio of 16, the mercury concentration decreased to 5.14 ng/ml. The reason for this increase and subsequent decrease in mercury concentration has not been determined.

Fly Ash Effect on Gas Sampling Filters

During testing in February, one gas sampling filter was used during the three runs of a day's testing, and over the course of three runs, fly ash accumulated on the filter. Figure 7 shows that the mercury concentration in the permanganate impingers decreased with subsequent runs when sampling at prespike locations in dirty raw gas. This shows that the buildup of fly ash causes some oxidation of elemental mercury across the gas sampling filter. The effect of fly ash on the oxidation of elemental mercury was seen in January's testing (T62-E showed 10000:1 fly ash:mercury ratio resulted in a 15% decrease in the mercury caught in the permanganate impingers). Because of this effect, the gas sampling is now performed with the nozzles turned cocurrent with the gas flow to minimize the accumulation of ash on the gas sampling filter.

Future Tests

The Trace Elements Removal Test Block will stop at the end of February 1996 and continue at a later date. The Hazardous Air Pollutant (HAP) removal test block will begin in March. This test block is being funded by DOE and EPRI as a DOE PRDA project and will investigate mercury removal by wet flue gas desulfurization systems using different catalysts which will be injected onto the PJFF bags.

Table 1

February Process Operating Conditions Summary

Date		Gas Sampling Summary	Process Summary
Mon		Elemental mercury spiking was started at the DRG.	Pilot heater was set to 90% output. This results in surface temp. of approx. 1000°F. Heater sheath is Incoloy 800.
1/29			
Tue	T56-EXY	Gas sampling at the DRG, and before and after the pilot heater (CRG, and WS inlet). Gas path through the ESP.	Operating with only the pilot booster fan. All ductwork from the facility inlet to the pilot booster fan under negative pressure.
1/30	Hg ⁰ spiking in DRG.		
Wed	T57-EXY	Gas sampling at the DRG (pre-spike), CRG, and WS inlet.	Pilot heater off. Gas temp. across the heater location was approx. 230°F. ESP inlet temp. at 295-300°F and outlet temp of 250-260°F.
1/31	Hg ⁰ spiking in DRG.		
2/1	T58-EXY	Elemental mercury injection moved to the CRG duct to test pilot heater effect with the heater on. Sampling in the DRG, CRG (prespike), and WS inlet. The prespike location is approx. 5 feet upstream of the Hg ⁰ injection.	CRG duct under negative pressure in current operating configuration using only the pilot booster fan. Pilot heater on.
	Hg ⁰ spiking in CRG.		
Fri		Elemental mercury concentrations at the CRG (prespike) were as great as the post spike location. Operating with a negative pressure in the CRG must be causing some recirculation of flue gas. Switching to SDA/PJFF configuration with fabric filter fan and pilot booster fan will return to the ESP tests when we can run with positive pressure in the CRG.	
2/2			
Sat-Sun			
2/3-4			
Mon		Pilot down to reconfigure for SDA - PJFF - Wet Scrubber. Fabric filter and pilot booster fans in use. Hg ⁰ injection started at the SDA inlet.	PJFF opacity monitor installed and calibrated.
2/5			
Tue 2/6			No spiking at the SDA inlet. Pilot SO ₂ conc. set at 1600 ppm. Maintenance on the SDA inlet SO ₂ CEM. 4000 scfm at SDA venturi.

Table 1

February Process Operating Conditions Summary

Date		Gas Sampling Summary	Process Summary
Wed 2/7	T52-EXZP Hg ⁰ spiking in DRG.	Hg ⁰ injection at the SDA inlet. Sampling at the SDA inlet(prespikes), CRG, and WS outlet.	At end of test day, noticed fan noise at 4000 scfm. When fan speed was increased in preparation for next test, noise increased. Facility taken off-line.
Thur -Fri 2/8-9			Fabric filter fan inspected, and the wheel was rebalanced with weights attached to the fan blade. Facility came back on line Friday afternoon.
Sat-Sun 2/10-11			4000 scfm gas flow maintained over the weekend, bypassing the PJFF.
Mon 2/12		Increased gas flow to 6500 scfm at the SDA venturi. Set PJFF cleaning mode to clean at 8.0 in. H ₂ O with one pulse/clean cycle. Elemental mercury injection started at the SDA inlet.	Work on the ESP fan continues.
Tue 2/13	T53-EXZP Hg ⁰ spiking in DRG.	Testing with higher gas flow through PJFF (6500 scfm). Sampling at the SDA inlet (prespikes), CRG, and WS outlet. An additional gas train was run to sample the discharge from the blower that vents surrounding air from the mercury injector location.	Gas path is DRG to SDA to PJFF to Wet Scrubber.
Wed 2/14	T54-EXZP Hg ⁰ spiking in DRG.	Testing to explore the effect of lower PJFF outlet temperature (225°F as compared to 260°F in previous tests). Sampling at the SDA inlet (prespikes), CRG, and WS outlet. Hg(0) spiking at the SDA inlet.	A dilute (11wt%) limestone slurry was fed to the SDA atomizer to provide cooling.
Thur 2/15	T51-EXZP1 Hg ⁰ spiking in CRG.	Elemental mercury injection at the fabric fan inlet. Testing the oxidation of the spike downstream of the PJFF. The mercury injector heater burned out at the end of the test day. The spare injector was put into service at the end of the day. Sampling at the SDA inlet (prespikes), CRG, and WS outlet.	

Table 1

February Process Operating Conditions Summary

Date		Gas Sampling Summary	Process Summary
Fri 2/16	T51-EXZP2 Hg ⁰ spiking in CRG.	Continuation of T51-EXZP1. This test began with a new mercury injection location (fabric fan inlet). Previous tests showed some variation in mercury concentration between runs when a new location was used. This second day of testing performed to see if the gas sampling results are repeatable. Sampling at the SDA inlet (prespike), CRG, and WS outlet.	Mercury vessel temperature was below setpoint at beginning of testing. The rotometer setting was increased to compensate for the lower vessel temp. to achieve the target mercury spike.
Sat-Sun 2/17-18			Elemental mercury injector moved to the SDA inlet and mercury injection was continued throughout the weekend.
Mon 2/19	T63-ESD Hg ⁰ spiking in DRG.	Sampling across the SDA to determine the effect of SDA on oxidation of the elemental mercury spike. Sampling at SDA inlet (prespike) and SDA outlet.	After sampling, the pilot was taken offline.
Tue 2/20		Mercury injector moved to DRG duct.	Configuring for the new gas path: ESP-ESP fan housing (blade removed)-FF fan-CRG-Pilot fan-Wet Scrubber.
Wed 2/21			Facility came online after completion of gas path changes.
Thur 2/22	T48-EYZ Hg ⁰ spiking in DRG.	Testing in the DRG duct. Sampling at the facility inlet (prespike), WS inlet, and WS outlet.	13000 scfm at the pilot venturi.
2/23	T64-EDRG Hg ⁰ spiking in DRG.	Testing in the DRG duct. Sampling at the facility inlet (prespike, DRG#1), and DRG (post spike, DRG#4) to examine the oxidation of the spike in the high ash duct. At the completion of gas sampling, the mercury injector was moved to the fabric filter inlet. Hg(0) spiking at DRG#2.	9000 scfm at the pilot venturi.
Sat-Sun 2/24-25			Pilot absorber was off-line over the weekend. Mercury injection continued-flue gas bypassed.

Table 1

February Process Operating Conditions Summary

Date		Gas Sampling Summary	Process Summary
Mon 2/26	T58R-EXY Hg ⁰ spiking in CRG.	Mercury injection downstream of the ESP. Sampling at the DRG, CRG, and WS inlet. This test explores the oxidation across the pilot heater with the heater on.	
Tue 2/27	T59-EXY Hg ⁰ spiking in CRG.	Mercury injection at the FF fan inlet. Sampling at the DRG, CRG, and WS inlet. Testing the effect of the pilot heater on the Hg ⁰ spike with the pilot heater off.	
Wed 2/28	T60-EXY Hg ⁰ spiking in CRG.	Mercury injection at the FF fan inlet. Sampling at the DRG, CRG, and WS inlet. No SO ₂ spike. SO ₂ conc. approx. 1400 ppm. Testing the effect of SO ₂ spiking on the Hg ⁰ spike.	
Thur 2/29	T61-EXY Hg ⁰ spiking in CRG.	Mercury injection at the FF fan inlet. Sampling at the DRG, CRG, and WS inlet. SO ₂ spike at 3000 ppm. Testing the effect of SO ₂ spiking on the Hg ⁰ spike.	

Table 2
Trace Element Removal Test Conditions and Results

Test ID	Test Description	Impinger Soln.	Prespike KMnO4 (µg/Nm3)	Post Spike Hg Concentrations			Method 29 Total (µg/Nm3)	% Difference Tris Method 29 and Method 29 (µg/Nm3)	Spike Location	Sample Location	Spike (µg/Nm3)	% Spike Oxidized	Spk Res. Time (s)
				Tris (µg/Nm3)	KMnO4 (µg/Nm3)	Total (µg/Nm3)							
T56-EXY	Effect of Pilot Heater. Heater On. Flow Across ESP.	TE1	2.37	22.96	4.04	27.00	23.77	13.6%	DRG Duct Location #2	WS Inlet	18.04 (a)	91%	43.0
T57-EXY	Effect of Pilot Heater. Heater Off. Flow Across ESP.	TE3	1.48	17.68	2.98	20.66	21.43	-3.6%	DRG Duct Location #2	WS Inlet	13.33 (a)	89%	43.0
T58-EXY	Effect of Pilot Heater on Mercury Spike. Heater On.	TE3	1.18	11.05	27.35	38.40	38.02	1.0%	CRG Duct	WS Inlet	31.25 (a)	16%	2.5
T48-EYZ	Effect of Gas Velocity Flow Across ESP. (13000 scfm)	TE3	3.62	33.64	7.47	41.11	-	-	DRG Duct Location #2	WS Inlet	22.29 (a)	83%	30.0
T64-EDRG	Effect of Residence Time (Duct Length) on Mercury Spike. (8000 scfm at Pilot Venturi)	TE3	3.49	11.53	12.86	24.39	-	-	Fac. Inlet, DRG Duct	DRG Duct	11.06	15%	3.1
T58R-EXY	Effect of Pilot Heater. Heater On.	TE3	2.86	16.03	15.03	31.06	-	-	FF Fan Inlet	WS Inlet	19.95 (a)	39%	4.1
		TE3	-	-	-	-	-	-	FF Fan Inlet	CRG Duct	19.95 (a)	29%	1.6
T59-EXY	Effect of Pilot Heater. Heater Off.	TE3	2.74	14.14	15.00	29.14	-	-	FF Fan Inlet	WS Inlet	19.02 (a)	36%	4.0
		TE3	-	-	-	-	-	-	FF Fan Inlet	CRG Duct	19.02 (a)	31%	1.6

TE3=Tris/10 mM EDTA, TE1=Tris/1 mM EDTA. Mercury concentration values are normalized to 5% O₂. PIFF outlet temp.=260F unless noted. 9000 scfm pilot absorber/ESP and 4000 scfm across PIFF unless noted.

Table 2
Trace Element Removal Test Conditions and Results

Test ID	Test Description	Impinger Soln.	Prespike KMnO4 (µg/Nm3)	Post Spike Hg Concentrations				% Difference		Spike Location	Sample Location	Spike (µg/Nm3)	% Spike Oxidized	Spk Res. Time (s)
				Tris Method 29			Method 29	Tris Method 29 and Method 29						
				Tris (µg/Nm3)	KMnO4 (µg/Nm3)	Total (µg/Nm3)	Total (µg/Nm3)	(µg/Nm3)						
T60-EXY	Effect of SO2 Spiking. SO2 Spiking Off.	TE3	1.58	13.86	15.98	29.84	-	-	FF Fan Inlet	WS Inlet	19.57 (a)	26%	4.1	
		TE3		-	-	-	-	-	FF Fan Inlet	CRG Duct	19.57 (a)	23%	1.6	
T61-EXY	Effect of SO2 Spiking. SO2 Spiking at 3000 ppm.	TE3	2.26	15.54	17.59	33.13	-	-	FF Fan Inlet	WS Inlet	21.42 (a)	28%	4.1	
		TE3		-	-	-	-	-	FF Fan Inlet	CRG Duct	21.42 (a)	25%	1.6	
T52-EXZP	Effect of PJFF on Mercury Spike.	TE3	0.57	21.49	1.23	22.72	-	-	SDA Inlet (DRG)	CRG Duct	15.01	96%	52.0	
T53-EXZP	Effect of Gas Velocity Flow Across PJFF. (6000	TE3	0.90	22.37	1.96	24.33	-	-	SDA Inlet (DRG)	CRG Duct	16.1	93%	33.0	
T54-EXZP	Effect of Lower PJFF Outlet Temperature. (225F)	TE3	0.54	22.28	2.29	24.57	-	-	SDA Inlet (DRG)	CRG Duct	18.44	91%	52.0	
T51-EXZP1	Residence Time Effect. Downstream of the PJFF.	TE3	0.58	12.16	11.31	23.47	-	-	FF Fan Inlet	CRG Duct	17.29	38%	3.0	
T51-EXZP2	Residence Time Effect. Downstream of the PJFF.	TE3	0.55	13.6	21.13	34.73	-	-	FF Fan Inlet	CRG Duct	28.15	27%	3.0	
T63-ESD	Effect of SDA Residence Time. Flow Through	TE3	1.2	24.99	11.12	36.11	-	-	SDA Inlet (DRG)	SDA Outlet	24.88	60%	29.0	

TE3=Tris/10 mM EDTA, TE1=Tris/1 mM EDTA. Mercury concentration values are normalized to 5% O2. PJFF outlet temp =260F unless noted. 9000 scfm pilot absorber/ESP and 4000 scfm across PJFF unless noted.

Figure 1. EPRI ECTC Pilot Wet FGD Toxics Gas Path

Figure 2. Simplified Process Flow Diagram for the "PJFF" Configuration for Toxics Testing

Figure 3: Oxidation of Elemental Mercury Spike in DRG Duct vs. Residence Time Between Injection and Sampling Locations

Figure 4. Oxidation of Elemental Mercury Spike in CRG Duct vs. Residence Time Between Injection and Sampling Locations

Figure 5. Oxidation of Elemental Mercury Spike vs. Residence Time Between Injection and Sampling Locations

Figure 6. Total Mercury Concentration Comparison Between Method 29 and Tris Method 29 (Values Normalized to 5% O₂)

Figure 7. Elemental Mercury Concentration in Permanganate Impingers vs. Sampling Run When Using One Filter for All Runs

APPENDIX A
TEST SCHEDULES

EPRI ENVIRONMENTAL CONTROL TECHNOLOGY CENTER TEST CALENDAR

February 1996 (Updated Mar 20, 1996)

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
				1 Trace Element Rem. T58-EXY Pilot Heater Effect Hg ⁰ Injection in CRG	2 Trace Element Rem.	3 Trace Element Rem.
4 Trace Element Rem.	5 Trace Element Rem. Change Gas Path to Run SDA/PJFF/Wet Scrubber	6 Trace Element Rem. Install Hg injector at SDA Inlet	7 Trace Element Rem. T52-EXZP Hg ⁰ Injection in the DRG Fabric Filter Fan Down	8 Trace Element Rem. Maintenance on Fabric Filter Fan	9 Trace Element Rem. Fabric Filter Fan Balancing	10 Trace Element Rem.
11 Trace Element Rem.	12 Trace Element Rem. Hg ⁰ Injection Installed and Started at the SDA Inlet	13 Trace Element Rem. T53-EXZP 6500 scfm at SDA PJFF Outlet Temp. at 260 F	14 Trace Element Rem. T54-EXZP 4000 scfm at SDA PJFF Outlet Temp. at 225 F	15 Trace Element Rem. T51-EXZP-1 Hg ⁰ Injection at the Fabric Filter Fan Inlet	16 Trace Element Rem. T51-EXZP-2 Hg ⁰ Injection at the Fabric Filter Fan Inlet	17 Trace Element Rem. Hg ⁰ Injection at the Fabric Filter Fan Inlet
18 Trace Element Rem. Hg ⁰ Injection at the Fabric Filter Fan Inlet	19 Trace Element Rem. T63-ESD Hg ⁰ Injection at the SDA Inlet Sample Across SDA	20 Trace Element Rem. Reconfigure Gas Path for ESP - CRG - Wet Scrubber	21 Trace Element Rem. Reconfigure Gas Path for ESP - CRG - Wet Scrubber Hg ⁰ Injection at DRG	22 Trace Element Rem. T48-EZY 13000 scfm at WS Inlet L/G = 43; 6.3 min. Slurry residence time	23 Trace Element Rem. T64-EDRG Hg ⁰ Injection at DRG and Sampling in DRG	24 Trace Element Rem. Hg ⁰ Injection at Fabric Filter Fan Inlet
25 Trace Element Rem. Hg ⁰ Injection at Fabric Filter Fan Inlet	26 Trace Element Rem. T58R-EXY Pilot Heater Effect Hg ⁰ Injection at Fabric Filter Fan Inlet	27 Trace Element Rem. T59-EXY Pilot Heater Effect	28 Trace Element Rem. T60-EXY Effect of SO ₂ Spiking Off	29 Trace Element Rem. T61-EXY Effect of SO ₂ Spiking at 3000 ppm		

EPRI ENVIRONMENTAL CONTROL TECHNOLOGY CENTER TEST CALENDAR

March 1996 (Updated Mar 20, 1996)

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
					1 Haz Air Pollutants Configure Gas Path for HAP Testing SDA/PJFF/WS	2 Haz Air Pollutants HAP-1 Comp. of Tris Imp. and Wet Scrubber Oxid. Hg Removal
3 Haz Air Pollutants HAP-1	4 Haz Air Pollutants HAP-1	5 Haz Air Pollutants HAP-1	6 Haz Air Pollutants Reconfigure Gas Path to Run ESP/SDA/PJFF	7 Haz Air Pollutants HAP-2 PJFF Baseline Cond. No Fly Ash Nor Catalyst	8 Haz Air Pollutants HAP-3 Bulk Fly Ash as Catalyst	9 Haz Air Pollutants HAP-2R PJFF Baseline Cond. No Fly Ash Nor Catalyst
10 Haz Air Pollutants HAP-2R	11 Haz Air Pollutants HAP-2R	12 Haz Air Pollutants HAP-4 Ryton and Acrylic Bag Material	13 Haz Air Pollutants HAP-5	14 Haz Air Pollutants HAP-5 Clean PJFF Bags High Hg(0) Spike 29 µg/Nm ³	15 Haz Air Pollutants HAP-6A Clean PJFF Bags Low Hg(0) Spike 11 µg/Nm ³	16 Haz Air Pollutants HAP-6B Fine Fly Ash (Mat'l Passing Through ESP)
17 Haz Air Pollutants HAP-6B	18 Haz Air Pollutants HAP-6B Fine Fly Ash (Mat'l Passing Through ESP)	19 Haz Air Pollutants HAP-7 "Conditioned" Ryton and Used Acrylic Bag Materials	20 Haz Air Pollutants HAP-8 Gore-tex on Fiberglass and Fiberglass Bag Materials	21 Haz Air Pollutants HAP-5R Clean PJFF Bags	22 Haz Air Pollutants HAP-9 "Conditioned" Gore-tex on Fiberglass Bag Material	23 Haz Air Pollutants
24 Haz Air Pollutants	25 Haz Air Pollutants HAP-10A	26 Haz Air Pollutants HAP-10B	27 Haz Air Pollutants HAP-11	28 Haz Air Pollutants HAP-11A	29 Haz Air Pollutants HAP-11B	30 Haz Air Pollutants HAP-11C
31 Haz Air Pollutants HAP-11C	Darco Carbon on PJFF Day 1	Darco Carbon on PJFF Day 2	Baseline Test after Pulse Clean Carbon Catalyst	Fine Fly Ash Accumulation	Fine Fly Ash Accumulation	Fine Fly Ash Accumulation

PILOT

MINI-PILOT

1994											
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

1995											
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 Gypsum tests	Carbon injection	Wet FGD Toxics Testing- Pet coke	Outage	Carbon injection	High-Velocity FGD Testing
UNIT DOWN					Lime/DBA Gypsum tests	UNIT DOWN					

PILOT

MINI-PILOT

1996											
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Wet FGD Toxics Testing		PRDA - Mercury and HAPs Control			Wet FGD Toxics Testing			PRDA - Clear Liquor FGD Testing			
UNIT DOWN		PRDA - Condensing Heat Exchanger (CHX) Testing									

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

APPENDIX B

PILOT TESTING PROCESS SUMMARY REPORTS

T56-EXY Process Summary Report
01/30/96 07:00:00 to 01/30/96 13:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	79.3	79.7	78.8	0.3	6
SO2 Removal (NTU)	1.57	1.60	1.55	0.02	6
L/G Ratio (gal/macf)	123	123	123	0	6
Reaction Tank pH	5.50	5.51	5.49	0.01	6
Absorber pH	4.25	4.78	3.38	0.61	6
Flue Gas Flow Rate (scfm)	9000	9002	8998	1	6
Header 1 Flow (gpm)	650	650	650	0	6
Header 3 Flow (gpm)	650	650	650	0	6
Header 5 Flow (gpm)	0	0	0	0	6
Blowdown to Sump Rate (gpm)	0.07	0.07	0.07	0.00	6
Centrifuge Feed Rate (gpm)	5.51	5.58	5.46	0.04	6
Reagent Feed to FLRT (gpm)	0.88	0.93	0.85	0.03	6
Facility Inlet SO2 Conc. (ppm)	1538	1730	1265	165	6
Inlet SO2 Concentration (ppm)	1598	1607	1585	7	6
Outlet SO2 Concentration (ppm)	314	322	307	6	6
Inlet O2 Concentration (%)	9.70	10.23	9.12	0.34	6
Outlet O2 Concentration (%)	9.38	9.94	8.82	0.34	6
Absorber Gas Velocity (ft/sec)	8.96	8.97	8.95	0.01	6
Inlet Gas Temperature (F)	274	276	273	1	6
Outlet Gas Temperature (F)	115	116	115	0	6
SO2 Absorbed (mmole/L)	2.78	2.79	2.76	0.01	6
Solids Residence Time (hrs)	24.8	24.9	24.6	0.1	6
Slurry Residence Time (min)	1.95	1.95	1.95	0.00	6
Absorber Pressure Drop (in H2O)	2.95	2.96	2.94	0.01	6
Spray Zone Pressure Drop (in H2O)	1.47	1.47	1.46	0.00	6
ME Pressure Drop (in H2O)	0.09	0.09	0.09	0.00	6
Oxidation Air to Rxn Tank (scfm)	440	440	440	0	6
NYSEG Load (MW)	641	683	578	43	6

T57-EXY Process Summary Report
01/31/96 07:00:00 to 01/31/96 13:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	79.8	80.1	79.6	0.1	7
SO2 Removal (NTU)	1.60	1.61	1.59	0.01	7
L/G Ratio (gal/macf)	125	125	124	0	7
Reaction Tank pH	5.50	5.50	5.50	0.00	7
Absorber pH	4.80	4.92	4.62	0.09	7
Flue Gas Flow Rate (scfm)	9000	9001	8999	1	7
Header 1 Flow (gpm)	650	650	650	0	7
Header 3 Flow (gpm)	650	650	650	0	7
Header 5 Flow (gpm)	0	0	0	0	7
Blowdown to Sump Rate (gpm)	0.07	0.07	0.07	0.00	7
Centrifuge Feed Rate (gpm)	5.70	5.79	5.61	0.05	7
Reagent Feed to FLRT (gpm)	0.86	0.87	0.85	0.00	7
Facility Inlet SO2 Conc. (ppm)	1629	1791	1537	100	7
Inlet SO2 Concentration (ppm)	1600	1606	1594	4	7
Outlet SO2 Concentration (ppm)	309	312	303	3	7
Inlet O2 Concentration (%)	9.44	9.67	9.03	0.20	7
Outlet O2 Concentration (%)	9.15	9.35	8.78	0.18	7
Absorber Gas Velocity (ft/sec)	8.86	8.87	8.85	0.00	7
Inlet Gas Temperature (F)	250	251	249	0	7
Outlet Gas Temperature (F)	114	114	113	0	7
SO2 Absorbed (mmole/L)	2.80	2.80	2.79	0.00	7
Solids Residence Time (hrs)	24.1	24.2	24.1	0.0	7
Slurry Residence Time (min)	1.95	1.95	1.95	0.00	7
Absorber Pressure Drop (in H2O)	2.95	2.96	2.95	0.00	7
Spray Zone Pressure Drop (in H2O)	1.46	1.47	1.46	0.00	7
ME Pressure Drop (in H2O)	0.09	0.09	0.09	0.00	7
Oxidation Air to Rxn Tank (scfm)	440	440	440	0	7
NYSEG Load (MW)	698	700	695	2	7

T58-EXY Process Summary Report
02/01/96 07:00:00 to 02/01/96 13:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	79.3	79.7	78.8	0.3	6
SO2 Removal (NTU)	1.57	1.60	1.55	0.02	6
L/G Ratio (gal/macf)	123	123	123	0	6
Reaction Tank pH	5.50	5.51	5.49	0.01	6
Absorber pH	4.25	4.78	3.38	0.61	6
Flue Gas Flow Rate (scfm)	9000	9002	8998	1	6
Header 1 Flow (gpm)	650	650	650	0	6
Header 3 Flow (gpm)	650	650	650	0	6
Header 5 Flow (gpm)	0	0	0	0	6
Blowdown to Sump Rate (gpm)	0.07	0.07	0.07	0.00	6
Centrifuge Feed Rate (gpm)	5.51	5.58	5.46	0.04	6
Reagent Feed to FLRT (gpm)	0.88	0.93	0.85	0.03	6
Facility Inlet SO2 Conc. (ppm)	1538	1730	1265	165	6
Inlet SO2 Concentration (ppm)	1598	1607	1585	7	6
Outlet SO2 Concentration (ppm)	314	322	307	6	6
Inlet O2 Concentration (%)	9.70	10.23	9.12	0.34	6
Outlet O2 Concentration (%)	9.38	9.94	8.82	0.34	6
Absorber Gas Velocity (ft/sec)	8.96	8.97	8.95	0.01	6
Inlet Gas Temperature (F)	274	276	273	1	6
Outlet Gas Temperature (F)	115	116	115	0	6
SO2 Absorbed (mmole/L)	2.78	2.79	2.76	0.01	6
Solids Residence Time (hrs)	24.8	24.9	24.6	0.1	6
Slurry Residence Time (min)	1.95	1.95	1.95	0.00	6
Absorber Pressure Drop (in H2O)	2.95	2.96	2.94	0.01	6
Spray Zone Pressure Drop (in H2O)	1.47	1.47	1.46	0.00	6
ME Pressure Drop (in H2O)	0.09	0.09	0.09	0.00	6
Oxidation Air to Rxn Tank (scfm)	440	440	440	0	6
NYSEG Load (MW)	641	683	578	43	6

T52-EXZP Process Summary Report
02/07/96 07:00:00 to 02/07/96 13:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	88.5	93.3	85.8	2.3	6
SO2 Removal (NTU)	2.19	2.71	1.95	0.24	6
L/G Ratio (gal/macf)	189	191	188	1	6
Reaction Tank pH	5.31	5.56	5.08	0.16	6
Absorber pH	4.65	4.76	4.47	0.10	6
Flue Gas Flow Rate (scfm)	5929	5980	5879	42	6
Header 1 Flow (gpm)	650	650	650	0	6
Header 3 Flow (gpm)	650	650	650	0	6
Header 5 Flow (gpm)	0	0	0	0	6
Blowdown to Sump Rate (gpm)	0.00	0.00	0.00	0.00	6
Centrifuge Feed Rate (gpm)	1.59	3.52	0.00	1.34	6
Reagent Feed to FLRT (gpm)	0.47	0.61	0.15	0.19	6
Facility Inlet SO2 Conc. (ppm)	1083	1216	797	141	6
Inlet SO2 Concentration (ppm)	1408	1606	785	304	6
Outlet SO2 Concentration (ppm)	160	216	50	53	6
Inlet O2 Concentration (%)	11.49	11.64	11.28	0.11	6
Outlet O2 Concentration (%)	11.25	11.42	10.81	0.20	6
Absorber Gas Velocity (ft/sec)	5.83	5.89	5.79	0.04	6
Inlet Gas Temperature (F)	257	258	255	1	6
Outlet Gas Temperature (F)	111	111	109	1	6
SO2 Absorbed (mmole/L)	1.79	2.03	1.07	0.35	6
Solids Residence Time (hrs)	14.4	22.9	12.0	3.9	6
Slurry Residence Time (min)	1.95	1.95	1.95	0.00	6
Absorber Pressure Drop (in H2O)	1.87	1.89	1.85	0.01	6
Spray Zone Pressure Drop (in H2O)	1.03	1.04	1.03	0.00	6
ME Pressure Drop (in H2O)	0.01	0.02	0.01	0.00	6
Oxidation Air to Rxn Tank (scfm)	230	230	230	0	6
NYSEG Load (MW)	641	692	590	41	6

T53-EXZP Process Summary Report
02/13/96 07:00:00 to 02/13/96 13:00:00

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	87.3	88.1	86.7	0.5	6
SO2 Removal (NTU)	2.06	2.13	2.02	0.04	6
L/G Ratio (gal/macf)	131	132	130	1	6
Reaction Tank pH	2.37	2.40	2.34	0.02	6
Absorber pH	5.05	5.35	4.71	0.21	6
Flue Gas Flow Rate (scfm)	8502	8547	8436	33	6
Header 1 Flow (gpm)	650	650	650	0	6
Header 3 Flow (gpm)	650	650	650	0	6
Header 5 Flow (gpm)	0	0	0	0	6
Blowdown to Sump Rate (gpm)	0.23	0.25	0.20	0.02	6
Centrifuge Feed Rate (gpm)	6.79	6.79	6.78	0.01	6
Reagent Feed to FLRT (gpm)	1.33	1.53	1.06	0.17	6
Facility Inlet SO2 Conc. (ppm)	1263	1346	1204	49	6
Inlet SO2 Concentration (ppm)	1602	1613	1593	7	6
Outlet SO2 Concentration (ppm)	193	203	179	9	6
Inlet O2 Concentration (%)	10.08	10.43	9.74	0.22	6
Outlet O2 Concentration (%)	9.70	10.03	9.36	0.23	6
Absorber Gas Velocity (ft/sec)	8.44	8.50	8.38	0.03	6
Inlet Gas Temperature (F)	274	276	273	1	6
Outlet Gas Temperature (F)	114	114	114	0	6
SO2 Absorbed (mmole/L)	2.89	2.91	2.86	0.02	6
Solids Residence Time (hrs)	8.4	8.5	8.4	0.0	6
Slurry Residence Time (min)	1.95	1.95	1.95	0.00	6
Absorber Pressure Drop (in H2O)	2.80	2.83	2.78	0.02	6
Spray Zone Pressure Drop (in H2O)	1.41	1.41	1.40	0.00	6
ME Pressure Drop (in H2O)	0.11	0.14	0.10	0.02	6
Oxidation Air to Rxn Tank (scfm)	441	442	440	1	6
NYSEG Load (MW)	703	708	699	2	6

T54-EXZP Process Summary Report
02/14/96 07:00:00 to 02/14/96 13:00:00

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	93.1	93.3	93.0	0.1	6
SO2 Removal (NTU)	2.68	2.70	2.66	0.01	6
L/G Ratio (gal/macf)	195	196	194	1	6
Reaction Tank pH	5.50	5.50	5.49	0.00	6
Absorber pH	6.39	6.40	6.37	0.01	6
Flue Gas Flow Rate (scfm)	5793	5847	5765	29	6
Header 1 Flow (gpm)	650	650	650	0	6
Header 3 Flow (gpm)	650	650	650	0	6
Header 5 Flow (gpm)	0	0	0	0	6
Blowdown to Sump Rate (gpm)	0.00	0.00	0.00	0.00	6
Centrifuge Feed Rate (gpm)	3.32	4.06	3.03	0.41	6
Reagent Feed to FLRT (gpm)	0.70	0.72	0.68	0.01	6
Facility Inlet SO2 Conc. (ppm)	1391	1467	1357	36	6
Inlet SO2 Concentration (ppm)	1600	1602	1597	2	6
Outlet SO2 Concentration (ppm)	105	107	103	1	6
Inlet O2 Concentration (%)	11.53	11.68	11.16	0.17	6
Outlet O2 Concentration (%)	11.39	11.54	11.02	0.18	6
Absorber Gas Velocity (ft/sec)	5.65	5.70	5.63	0.02	6
Inlet Gas Temperature (F)	236	237	233	1	6
Outlet Gas Temperature (F)	110	111	110	0	6
SO2 Absorbed (mmole/L)	2.10	2.11	2.09	0.01	6
Solids Residence Time (hrs)	11.6	11.7	11.5	0.1	6
Slurry Residence Time (min)	1.95	1.95	1.95	0.00	6
Absorber Pressure Drop (in H2O)	1.83	1.84	1.82	0.01	6
Spray Zone Pressure Drop (in H2O)	1.00	1.00	0.99	0.00	6
ME Pressure Drop (in H2O)	0.02	0.02	0.01	0.00	6
Oxidation Air to Rxn Tank (scfm)	440	441	439	0	6
NYSEG Load (MW)	668	698	640	19	6

T51-EXZP Process Summary Report
02/15/96 08:00:00 to 02/16/96 13:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	91.5	92.7	90.3	0.6	22
SO2 Removal (NTU)	2.47	2.61	2.33	0.07	22
L/G Ratio (gal/macf)	193	198	190	2	22
Reaction Tank pH	5.50	5.53	5.47	0.01	22
Absorber pH	5.10	6.17	4.90	0.26	22
Flue Gas Flow Rate (scfm)	5803	5895	5670	60	22
Header 1 Flow (gpm)	650	650	650	0	22
Header 3 Flow (gpm)	650	650	650	0	22
Header 5 Flow (gpm)	0	0	0	0	22
Blowdown to Sump Rate (gpm)	0.11	0.28	0.00	0.10	22
Centrifuge Feed Rate (gpm)	3.21	4.48	2.85	0.50	22
Reagent Feed to FLRT (gpm)	0.51	0.57	0.25	0.07	22
Facility Inlet SO2 Conc. (ppm)	1363	1488	1207	95	22
Inlet SO2 Concentration (ppm)	1600	1608	1593	4	22
Outlet SO2 Concentration (ppm)	129	148	112	9	22
Inlet O2 Concentration (%)	11.94	12.69	11.54	0.29	22
Outlet O2 Concentration (%)	11.73	12.48	11.31	0.29	22
Absorber Gas Velocity (ft/sec)	5.71	5.79	5.59	0.06	22
Inlet Gas Temperature (F)	260	262	257	1	22
Outlet Gas Temperature (F)	110	111	109	0	22
SO2 Absorbed (mmole/L)	2.07	2.10	2.03	0.02	22
Solids Residence Time (hrs)	11.8	12.0	11.6	0.1	22
Slurry Residence Time (min)	1.95	1.95	1.95	0.00	22
Absorber Pressure Drop (in H2O)	1.84	1.85	1.81	0.01	22
Spray Zone Pressure Drop (in H2O)	1.02	1.03	1.00	0.01	22
ME Pressure Drop (in H2O)	0.02	0.03	0.01	0.00	22
Oxidation Air to Rxn Tank (scfm)	440	441	439	0	22
NYSEG Load (MW)	657	705	513	56	22

T63-ESD Process Summary Report
02/19/96 07:00:00 to 02/19/96 12:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	89.0	89.4	88.6	0.3	5
SO2 Removal (NTU)	2.21	2.24	2.17	0.02	5
L/G Ratio (gal/macf)	198	199	198	0	5
Reaction Tank pH	5.50	5.51	5.49	0.01	5
Absorber pH	4.80	4.96	4.34	0.23	5
Flue Gas Flow Rate (scfm)	5625	5635	5610	9	5
Header 1 Flow (gpm)	650	650	650	0	5
Header 3 Flow (gpm)	650	650	650	0	5
Header 5 Flow (gpm)	0	0	0	0	5
Blowdown to Sump Rate (gpm)	0.00	0.00	0.00	0.00	5
Centrifuge Feed Rate (gpm)	3.24	4.56	2.48	0.90	5
Reagent Feed to FLRT (gpm)	0.57	0.58	0.54	0.01	5
Facility Inlet SO2 Conc. (ppm)	1319	1358	1293	25	5
Inlet SO2 Concentration (ppm)	1599	1601	1595	2	5
Outlet SO2 Concentration (ppm)	167	173	161	4	5
Inlet O2 Concentration (%)	11.08	11.29	10.82	0.19	5
Outlet O2 Concentration (%)	10.81	11.06	10.46	0.24	5
Absorber Gas Velocity (ft/sec)	5.56	5.58	5.55	0.01	5
Inlet Gas Temperature (F)	267	269	266	1	5
Outlet Gas Temperature (F)	111	112	111	0	5
SO2 Absorbed (mmole/L)	1.95	1.96	1.94	0.01	5
Solids Residence Time (hrs)	12.5	12.6	12.5	0.1	5
Slurry Residence Time (min)	1.95	1.95	1.95	0.00	5
Absorber Pressure Drop (in H2O)	1.85	1.85	1.84	0.01	5
Spray Zone Pressure Drop (in H2O)	1.00	1.00	1.00	0.00	5
ME Pressure Drop (in H2O)	0.02	0.02	0.02	0.00	5
Oxidation Air to Rxn Tank (scfm)	440	440	439	0	5
NYSEG Load (MW)	682	684	676	3	5

T48-EYZ Process Summary Report
02/22/96 08:00:00 to 02/22/96 13:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	47.4	48.9	46.5	1.1	5
SO2 Removal (NTU)	0.64	0.67	0.63	0.02	5
L/G Ratio (gal/macf)	42	42	42	0	5
Reaction Tank pH	5.50	5.52	5.49	0.01	5
Absorber pH	4.03	4.59	2.77	0.69	5
Flue Gas Flow Rate (scfm)	13001	13004	12998	2	5
Header 1 Flow (gpm)	0	0	0	0	5
Header 3 Flow (gpm)	650	650	650	0	5
Header 5 Flow (gpm)	0	0	0	0	5
Blowdown to Sump Rate (gpm)	0.02	0.03	0.00	0.03	5
Centrifuge Feed Rate (gpm)	0.00	0.00	0.00	0.00	5
Reagent Feed to FLRT (gpm)	0.68	0.72	0.66	0.02	5
Facility Inlet SO2 Conc. (ppm)	1291	1320	1256	23	5
Inlet SO2 Concentration (ppm)	1600	1607	1592	5	5
Outlet SO2 Concentration (ppm)	790	806	765	17	5
Inlet O2 Concentration (%)	8.47	8.74	8.26	0.19	5
Outlet O2 Concentration (%)	8.07	8.33	7.87	0.18	5
Absorber Gas Velocity (ft/sec)	13.08	13.11	13.04	0.03	5
Inlet Gas Temperature (F)	305	310	301	4	5
Outlet Gas Temperature (F)	120	121	119	0	5
SO2 Absorbed (mmole/L)	4.80	4.93	4.71	0.10	5
Solids Residence Time (hrs)	6.8	6.9	6.6	0.1	5
Slurry Residence Time (min)	2.60	2.60	2.60	0.00	5
Absorber Pressure Drop (in H2O)	3.40	3.46	3.34	0.05	5
Spray Zone Pressure Drop (in H2O)	0.92	0.97	0.88	0.04	5
ME Pressure Drop (in H2O)	0.21	0.22	0.21	0.00	5
Oxidation Air to Rxn Tank (scfm)	300	300	299	0	5
NYSEG Load (MW)	692	697	687	4	5

T64-EDRG Process Summary Report
02/23/96 07:00:00 to 02/23/96 11:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	78.1	78.3	77.9	0.1	4
SO2 Removal (NTU)	1.52	1.53	1.51	0.01	4
L/G Ratio (gal/macf)	123	123	123	0	4
Reaction Tank pH	5.50	5.51	5.50	0.00	4
Absorber pH	4.76	4.82	4.70	0.04	4
Flue Gas Flow Rate (scfm)	9002	9006	9000	3	4
Header 1 Flow (gpm)	650	650	650	0	4
Header 3 Flow (gpm)	650	650	650	0	4
Header 5 Flow (gpm)	0	0	0	0	4
Blowdown to Sump Rate (gpm)	0.29	0.52	0.00	0.19	4
Centrifuge Feed Rate (gpm)	0.00	0.00	0.00	0.00	4
Reagent Feed to FLRT (gpm)	0.75	0.76	0.73	0.01	4
Facility Inlet SO2 Conc. (ppm)	1154	1274	1027	102	4
Inlet SO2 Concentration (ppm)	1601	1607	1596	4	4
Outlet SO2 Concentration (ppm)	331	334	327	3	4
Inlet O2 Concentration (%)	9.96	10.76	9.41	0.57	4
Outlet O2 Concentration (%)	9.54	10.36	8.96	0.58	4
Absorber Gas Velocity (ft/sec)	8.98	9.00	8.97	0.02	4
Inlet Gas Temperature (F)	286	291	280	5	4
Outlet Gas Temperature (F)	116	117	115	1	4
SO2 Absorbed (mmole/L)	2.74	2.75	2.74	0.00	4
Solids Residence Time (hrs)	8.9	8.9	8.9	0.0	4
Slurry Residence Time (min)	1.95	1.95	1.95	0.00	4
Absorber Pressure Drop (in H2O)	2.82	2.85	2.80	0.02	4
Spray Zone Pressure Drop (in H2O)	1.46	1.47	1.46	0.01	4
ME Pressure Drop (in H2O)	0.07	0.08	0.07	0.01	4
Oxidation Air to Rxn Tank (scfm)	440	441	439	1	4
NYSEG Load (MW)	563	649	495	66	4

T58R-EXY Process Summary Report
02/26/96 07:00:00 to 02/26/96 13:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	80.1	80.5	79.7	0.3	6
SO2 Removal (NTU)	1.61	1.64	1.59	0.01	6
L/G Ratio (gal/macf)	123	123	122	0	6
Reaction Tank pH	5.50	5.50	5.49	0.00	6
Absorber pH	4.85	5.17	4.60	0.18	6
Flue Gas Flow Rate (scfm)	9001	9009	8998	4	6
Header 1 Flow (gpm)	650	650	650	0	6
Header 3 Flow (gpm)	650	650	650	0	6
Header 5 Flow (gpm)	0	0	0	0	6
Blowdown to Sump Rate (gpm)	0.04	0.21	0.00	0.08	6
Centrifuge Feed Rate (gpm)	1.12	5.45	0.00	1.99	6
Reagent Feed to FLRT (gpm)	0.73	0.76	0.65	0.04	6
Facility Inlet SO2 Conc. (ppm)	1492	1575	1353	76	6
Inlet SO2 Concentration (ppm)	1600	1602	1598	2	6
Outlet SO2 Concentration (ppm)	302	308	294	4	6
Inlet O2 Concentration (%)	9.74	10.54	9.24	0.45	6
Outlet O2 Concentration (%)	9.32	10.10	8.85	0.43	6
Absorber Gas Velocity (ft/sec)	8.97	9.01	8.95	0.02	6
Inlet Gas Temperature (F)	282	290	277	4	6
Outlet Gas Temperature (F)	116	117	115	1	6
SO2 Absorbed (mmole/L)	2.81	2.82	2.79	0.01	6
Solids Residence Time (hrs)	8.7	8.7	8.6	0.0	6
Slurry Residence Time (min)	1.95	1.95	1.95	0.00	6
Absorber Pressure Drop (in H2O)	2.85	2.86	2.84	0.01	6
Spray Zone Pressure Drop (in H2O)	1.45	1.46	1.45	0.00	6
ME Pressure Drop (in H2O)	0.07	0.08	0.07	0.00	6
Oxidation Air to Rxn Tank (scfm)	440	441	439	1	6
NYSEG Load (MW)	627	689	517	64	6

T59-EXY Process Summary Report
02/27/96 07:00:00 to 02/27/96 10:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	79.9	79.9	79.9	0.0	3
SO2 Removal (NTU)	1.60	1.60	1.60	0.00	3
L/G Ratio (gal/macf)	125	125	125	0	3
Reaction Tank pH	5.50	5.50	5.50	0.00	3
Absorber pH	6.87	7.06	6.49	0.27	3
Flue Gas Flow Rate (scfm)	9009	9022	9001	9	3
Header 1 Flow (gpm)	650	650	650	0	3
Header 3 Flow (gpm)	650	650	650	0	3
Header 5 Flow (gpm)	0	0	0	0	3
Blowdown to Sump Rate (gpm)	0.00	0.00	0.00	0.00	3
Centrifuge Feed Rate (gpm)	0.00	0.00	0.00	0.00	3
Reagent Feed to FLRT (gpm)	0.62	0.63	0.62	0.00	3
Facility Inlet SO2 Conc. (ppm)	1549	1562	1542	9	3
Inlet SO2 Concentration (ppm)	1600	1602	1598	1	3
Outlet SO2 Concentration (ppm)	307	307	307	0	3
Inlet O2 Concentration (%)	9.99	10.45	9.41	0.43	3
Outlet O2 Concentration (%)	9.62	10.11	9.05	0.43	3
Absorber Gas Velocity (ft/sec)	8.85	8.86	8.84	0.01	3
Inlet Gas Temperature (F)	254	257	251	3	3
Outlet Gas Temperature (F)	113	114	112	1	3
SO2 Absorbed (mmole/L)	2.80	2.81	2.80	0.01	3
Solids Residence Time (hrs)	8.7	8.7	8.7	0.0	3
Slurry Residence Time (min)	1.95	1.95	1.95	0.00	3
Absorber Pressure Drop (in H2O)	2.83	2.84	2.83	0.00	3
Spray Zone Pressure Drop (in H2O)	1.44	1.45	1.44	0.00	3
ME Pressure Drop (in H2O)	0.08	0.08	0.08	0.00	3
Oxidation Air to Rxn Tank (scfm)	440	440	439	0	3
NYSEG Load (MW)	573	619	524	39	3

T60-EXY Process Summary Report
02/28/96 07:00:00 to 02/28/96 12:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	82.1	82.8	81.7	0.4	4
SO2 Removal (NTU)	1.72	1.76	1.70	0.02	4
L/G Ratio (gal/macf)	123	123	122	0	4
Reaction Tank pH	5.50	5.52	5.49	0.01	4
Absorber pH	4.77	4.83	4.62	0.09	4
Flue Gas Flow Rate (scfm)	9047	9080	9017	23	4
Header 1 Flow (gpm)	650	650	650	0	4
Header 3 Flow (gpm)	650	650	650	0	4
Header 5 Flow (gpm)	0	0	0	0	4
Blowdown to Sump Rate (gpm)	0.00	0.00	0.00	0.00	4
Centrifuge Feed Rate (gpm)	0.00	0.00	0.00	0.00	4
Reagent Feed to FLRT (gpm)	0.41	0.45	0.39	0.02	4
Facility Inlet SO2 Conc. (ppm)	1495	1528	1429	39	4
Inlet SO2 Concentration (ppm)	1074	1092	1028	27	4
Outlet SO2 Concentration (ppm)	182	189	173	6	4
Inlet O2 Concentration (%)	9.28	9.76	9.06	0.28	4
Outlet O2 Concentration (%)	8.91	9.35	8.72	0.25	4
Absorber Gas Velocity (ft/sec)	8.99	9.02	8.97	0.02	4
Inlet Gas Temperature (F)	277	283	274	4	4
Outlet Gas Temperature (F)	115	117	115	1	4
SO2 Absorbed (mmole/L)	1.94	1.99	1.87	0.05	4
Solids Residence Time (hrs)	12.6	13.1	12.3	0.3	4
Slurry Residence Time (min)	1.95	1.95	1.95	0.00	4
Absorber Pressure Drop (in H2O)	2.86	2.87	2.84	0.01	4
Spray Zone Pressure Drop (in H2O)	1.45	1.46	1.45	0.00	4
ME Pressure Drop (in H2O)	0.08	0.08	0.08	0.00	4
Oxidation Air to Rxn Tank (scfm)	440	440	440	0	4
NYSEG Load (MW)	689	692	684	3	4

T61-EXY Process Summary Report
02/29/96 06:00:00 to 02/29/96 11:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
SO2 Removal (%)	72.7	73.3	72.1	0.5	5
SO2 Removal (NTU)	1.30	1.32	1.27	0.02	5
L/G Ratio (gal/macf)	125	131	123	3	5
Reaction Tank pH	5.51	5.56	5.49	0.02	5
Absorber pH	4.56	4.63	4.45	0.08	5
Flue Gas Flow Rate (scfm)	8839	9002	8195	322	5
Header 1 Flow (gpm)	646	650	631	8	5
Header 3 Flow (gpm)	646	650	630	8	5
Header 5 Flow (gpm)	0	0	0	0	5
Blowdown to Sump Rate (gpm)	0.00	0.00	0.00	0.00	5
Centrifuge Feed Rate (gpm)	0.00	0.00	0.00	0.00	5
Reagent Feed to FLRT (gpm)	1.18	1.23	1.09	0.05	5
Facility Inlet SO2 Conc. (ppm)	1486	1505	1464	15	5
Inlet SO2 Concentration (ppm)	2937	3005	2686	125	5
Outlet SO2 Concentration (ppm)	758	794	681	41	5
Inlet O2 Concentration (%)	9.71	9.78	9.59	0.07	5
Outlet O2 Concentration (%)	9.22	9.31	9.11	0.07	5
Absorber Gas Velocity (ft/sec)	8.82	8.99	8.17	0.32	5
Inlet Gas Temperature (F)	280	280	279	0	5
Outlet Gas Temperature (F)	117	117	117	0	5
SO2 Absorbed (mmole/L)	4.63	4.83	4.05	0.29	5
Solids Residence Time (hrs)	5.3	6.2	5.1	0.4	5
Slurry Residence Time (min)	1.96	2.01	1.95	0.02	5
Absorber Pressure Drop (in H2O)	2.85	2.90	2.67	0.09	5
Spray Zone Pressure Drop (in H2O)	1.45	1.48	1.37	0.04	5
ME Pressure Drop (in H2O)	0.08	0.09	0.07	0.01	5
Oxidation Air to Rxn Tank (scfm)	430	440	388	21	5
NYSEG Load (MW)	662	685	615	24	5

T52-EXZP Process Summary Report
02/07/96 07:00:00 to 02/07/96 13:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
Flue Gas Flow Rate (scfm)	4005	4050	3986	21	6
Facility Inlet SO2 Conc. (ppm)	1083	1216	797	141	6
Facility Outlet SO2 Conc.(ppm)	155	208	51	49	6
SDA Inlet SO2 Conc. (ppm)	1124	1193	1067	45	6
SDA Outlet SO2 Conc. (ppm)	1106	1168	1037	48	0
PJFF Outlet SO2 Conc. (ppm)	854	908	801	41	6
SDA Inlet O2 Conc. (%)	8.00	8.29	7.72	0.21	6
SDA Outlet O2 Conc. (%)	8.34	8.59	8.11	0.17	6
PJFF Outlet O2 Conc. (%)	10.98	11.18	10.85	0.11	6
SDA Inlet Temp. (F)	367	370	364	2	6
SDA Outlet Temp. (F)	340	342	338	1	6
PJFF Inlet Temp. (F)	275	276	274	1	6
PJFF Outlet Temp. (F)	262	263	261	1	6
PJFF Air/Cloth Ratio	4.5	4.5	4.5	0.0	6
PJFF Cleaning Pulses/Hour	17	17	17	0	6
PJFF Delta P (in H2O)	3.85	3.86	3.84	0.01	6
NYSEG Load (MW)	641	692	590	41	6

T53-EXZP Process Summary Report
02/13/96 07:00:00 to 02/13/96 13:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
Flue Gas Flow Rate (scfm)	6501	6523	6478	14	6
Facility Inlet SO2 Conc. (ppm)	1263	1346	1204	49	6
Facility Outlet SO2 Conc.(ppm)	189	200	176	9	6
SDA Inlet SO2 Conc. (ppm)	1514	1730	1253	209	6
SDA Outlet SO2 Conc. (ppm)	1221	1316	1143	55	6
PJFF Outlet SO2 Conc. (ppm)	964	1034	908	42	6
SDA Inlet O2 Conc. (%)	6.51	7.15	6.03	0.36	6
SDA Outlet O2 Conc. (%)	7.08	7.61	6.59	0.31	6
PJFF Outlet O2 Conc. (%)	8.96	9.54	8.44	0.34	6
SDA Inlet Temp. (F)	347	356	344	4	6
SDA Outlet Temp. (F)	326	332	324	3	6
PJFF Inlet Temp. (F)	273	277	272	2	6
PJFF Outlet Temp. (F)	262	265	261	1	6
PJFF Air/Cloth Ratio	6.7	6.7	6.6	0.0	6
PJFF Cleaning Pulses/Hour	30	30	30	0	6
PJFF Delta P (in H2O)	7.81	7.81	7.80	0.01	6
NYSEG Load (MW)	703	708	699	2	6

T54-EXZP Process Summary Report
02/14/96 07:00:00 to 02/14/96 13:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
Flue Gas Flow Rate (scfm)	4006	4034	3982	15	6
Facility Inlet SO2 Conc. (ppm)	1391	1467	1357	36	6
Facility Outlet SO2 Conc.(ppm)	111	113	110	1	6
SDA Inlet SO2 Conc. (ppm)	1257	1331	1223	35	6
SDA Outlet SO2 Conc. (ppm)	1264	1333	1224	34	6
PJFF Outlet SO2 Conc. (ppm)	951	1000	929	24	6
SDA Inlet O2 Conc. (%)	7.52	7.81	6.86	0.32	6
SDA Outlet O2 Conc. (%)	8.37	8.63	7.83	0.26	6
PJFF Outlet O2 Conc. (%)	10.83	11.08	10.22	0.28	6
SDA Inlet Temp. (F)	356	360	353	3	6
SDA Outlet Temp. (F)	293	295	290	2	6
PJFF Inlet Temp. (F)	236	237	232	2	6
PJFF Outlet Temp. (F)	225	226	221	2	6
PJFF Air/Cloth Ratio	4.2	4.2	4.1	0.0	6
PJFF Cleaning Pulses/Hour	15	15	15	0	6
PJFF Delta P (in H2O)	3.82	3.84	3.79	0.02	6
NYSEG Load (MW)	668	698	640	19	6

T51-EXZP-1 Process Summary Report
02/15/96 08:00:00 to 02/15/96 13:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
Flue Gas Flow Rate (scfm)	3998	4014	3968	16	5
Facility Inlet SO2 Conc. (ppm)	1430	1479	1342	52	5
Facility Outlet SO2 Conc.(ppm)	123	128	118	4	5
SDA Inlet SO2 Conc. (ppm)	1408	1466	1352	41	5
SDA Outlet SO2 Conc. (ppm)	1294	1330	1238	34	5
PJFF Outlet SO2 Conc. (ppm)	979	1007	937	26	5
SDA Inlet O2 Conc. (%)	7.85	8.39	7.30	0.38	5
SDA Outlet O2 Conc. (%)	8.82	9.31	8.48	0.29	5
PJFF Outlet O2 Conc. (%)	11.30	11.80	10.99	0.31	5
SDA Inlet Temp. (F)	380	380	380	0	5
SDA Outlet Temp. (F)	339	340	338	1	5
PJFF Inlet Temp. (F)	272	274	269	2	5
PJFF Outlet Temp. (F)	259	261	256	2	5
PJFF Air/Cloth Ratio	4.8	4.8	4.7	0.0	5
PJFF Cleaning Pulses/Hour	15	15	15	0	5
PJFF Delta P (in H2O)	3.81	3.84	3.79	0.02	5
NYSEG Load (MW)	660	694	603	32	1

T51-EXZP-2 Process Summary Report
02/16/96 07:00:00 to 02/16/96 13:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
Flue Gas Flow Rate (scfm)	4001	4020	3991	10	5
Facility Inlet SO2 Conc. (ppm)	1269	1358	1207	61	6
Facility Outlet SO2 Conc.(ppm)	145	149	141	3	6
SDA Inlet SO2 Conc. (ppm)	1371	1593	1184	142	5
SDA Outlet SO2 Conc. (ppm)	1148	1225	1097	48	6
PJFF Outlet SO2 Conc. (ppm)	859	924	815	42	6
SDA Inlet O2 Conc. (%)	7.81	8.09	7.39	0.23	6
SDA Outlet O2 Conc. (%)	8.79	9.02	8.56	0.18	6
PJFF Outlet O2 Conc. (%)	11.34	11.61	11.08	0.21	6
SDA Inlet Temp. (F)	386	386	386	0	6
SDA Outlet Temp. (F)	343	344	343	1	6
PJFF Inlet Temp. (F)	273	275	272	1	6
PJFF Outlet Temp. (F)	260	262	258	1	6
PJFF Air/Cloth Ratio	4.7	4.8	4.7	0.0	6
PJFF Cleaning Pulses/Hour	15	15	15	0	6
PJFF Delta P (in H2O)	3.84	3.87	3.80	0.02	6
NYSEG Load (MW)	695	705	673	13	6

T63-ESD Process Summary Report
02/19/96 07:00:00 to 02/19/96 12:00:00)

Process Variable	Average	Max	Min	Std.Dev.	Points
Flue Gas Flow Rate (scfm)	3991	3995	3987	3	5
Facility Inlet SO2 Conc. (ppm)	1319	1358	1293	25	5
Facility Outlet SO2 Conc.(ppm)	171	180	164	5	5
SDA Inlet SO2 Conc. (ppm)	1198	1365	1022	144	5
SDA Outlet SO2 Conc. (ppm)	1292	1391	1213	61	5
PJFF Outlet SO2 Conc. (ppm)	943	971	920	21	5
SDA Inlet O2 Conc. (%)	6.94	7.29	6.48	0.32	5
SDA Outlet O2 Conc. (%)	8.16	8.46	7.75	0.28	5
PJFF Outlet O2 Conc. (%)	10.24	10.57	9.83	0.29	5
SDA Inlet Temp. (F)	381	381	380	0	5
SDA Outlet Temp. (F)	340	340	339	0	5
PJFF Inlet Temp. (F)	275	276	273	1	5
PJFF Outlet Temp. (F)	262	263	261	1	5
PJFF Air/Cloth Ratio	4.5	4.5	4.5	0.0	5
PJFF Cleaning Pulses/Hour	13	13	13	0	5
PJFF Delta P (in H2O)	3.83	3.85	3.81	0.01	5
NYSEG Load (MW)	682	684	676	3	1

APPENDIX C
ANALYTICAL SUMMARY RESULTS

Trace Element Removal Test Conditions and Results

Test ID	Test Description	Impinger Soln.	Prespike KMnO4 (µg/Nm3)	Post Spike Hg Concentrations			Method 29 Total (µg/Nm3)	% Difference Tris Method 29 and Method 29 (µg/Nm3)	Spike Location	Sample Location	Spike (µg/Nm3)	% Spike Oxidized	Spk Res. Time (s)
				Tris Method 29									
				Tris (µg/Nm3)	KMnO4 (µg/Nm3)	Total (µg/Nm3)							
T41-EXY	Tris Method 29 and Method 29 Comparison.	TE3	-	8	12.83	20.83	21.61	-3.6	Pilot Fan Inlet	WS Inlet	13.4	-	1.5
T42-N	Tris Method 29 and Method 29 Comparison with No Spiking.	TE3	-	6.02	0.71	6.73	7.08	-4.9	NA	WS Inlet	-	-	-
T43-E	Tris Method 29 and Method 29 Comparison with Hg(0) Spiking.	TE3	1.68	7.88	16.94	24.82	26.85	-7.6	Pilot Fan Inlet	WS Inlet	16.35	7%	1.5
T44-C	Tris Method 29 and Method 29 Comparison with HgCl ₂ Spiking.	TE3	0.61	18.79	1.11	19.9	19.87	0.2	Pilot Fan Inlet	WS Inlet	13.77	96%	1.5
T45-E	Mercury Oxidation with Hg(0) Spiking Downstream of ESP.	TE2	1.85	10.45	10.69	21.14	21.49	-1.6	ESP Fan Inlet	WS Inlet	12.51	29%	4.6
T47-E	Residence Time Effect on Hg(0) Oxidation. 11000 scfm through Pilot Venturi.	TE1	1.58	17.31	4.02	21.33	20.82	2.4	DRG Duct #3	WS Inlet	11.53	79%	35.0
T49-E	ESP Effect on Hg(0) Oxidation. One ESP Field.	TE1	1.99	21.91	3.37	25.28	27.32	-7.5	DRG Duct #3	WS Inlet	12.42	89%	43.0
T50-E	ESP Effect on Hg(0) Oxidation. Five ESP Fields.	TE1	2.52	26.39	3.34	29.73	28.69	3.6	DRG Duct #3	WS Inlet	17.29	95%	43.0

TE3=Tris/10 mM EDTA, TE2=Tris/2 mM EDTA, TE1=Tris/1 mM EDTA. Mercury concentration values are normalized to 5% O₂. 9000 scfm pilot absorber/ESP unless noted.

Trace Element Removal Impinger Test Conditions

Test ID	Test Description	Gas Sample Source	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
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

Trace Element Removal Impinger Test Conditions

Test ID	Test Description	Gas Sample Source	Spiking Conditions		Sampling Methods		
			Species Spiked	Spike Location	Method 29 Used?	Method 29* Used?	Sol'n of Extra Imp.
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
T22-N	No spiking; Mg-lime wet scrubber conditions, inhibited oxidation.	3 Locations	NA	NA	Yes	No	NA
T22-E	Flue gas spiking; Mg-lime wet scrubber conditions, inhibited oxidation.	3 Locations	Hg(0)	Duct Injection	Yes	No	NA
T22-EC	Flue gas spiking; Mg-lime wet scrubber conditions, inhibited oxidation.	3 Locations	Hg (0) and HgCl ₂	Duct Injection	Yes	No	NA
T23-EY1	Tris comparison test	WS inlet	Hg(0)	Duct Injection	No	Yes	Tris
T23-EZ1	Gold amalgamation with full filter area used during gas sampling.	WS outlet	Hg(0)	Duct Injection	Yes	No	NA
T23-EZ2	Copper amalgamation with full filter area used during gas sampling.	WS outlet	Hg(0)	Duct Injection	Yes	No	NA
T23-EZ3	Aluminum amalgamation with full filter area used during gas sampling.	WS outlet	Hg(0)	Duct Injection	Yes	No	NA
T23-EZ4	Sulfur amalgamation with full filter area used during gas sampling.	WS outlet	Hg(0)	Duct Injection	Yes	No	NA
T23-EZ5	Silver amalgamation with full filter area used during gas sampling.	WS outlet	Hg(0)	Duct Injection	Yes	No	NA
T23-EZ6	Zinc amalgamation with full filter area used during gas sampling.	WS outlet	Hg(0)	Duct Injection	Yes	No	NA

Trace Element Removal Impinger Test Conditions

Test ID	Test Description	Gas Sample Source	Spiking Conditions		Sampling Methods		
			Species Spiked	Spike Location	Method 29 Used?	Method 29* Used?	Sol'n of Extra Imp.
T23-EZ7	Gold amalgamation with increased gas:metal contact area.	WS outlet	Hg(0)	Duct Injection	Yes	No	NA
T23-EZ8	Lead amalgamation with increased gas:metal contact area.	WS outlet	Hg(0)	Duct Injection	Yes	No	NA
T23-EZ9	Silver amalgamation with increased gas:metal contact area.	WS outlet	Hg(0)	Duct Injection	Yes	No	NA
T23-EZ10	Iron amalgamation with increased gas:metal contact area.	WS outlet	Hg(0)	Duct Injection	Yes	No	NA
T23-EY2	Gold amalgamation with increased gas:metal contact area.	WS inlet	Hg(0)	Duct Injection	Yes	No	NA
T23-EY3	Copper amalgamation with increased gas:metal contact area.	WS inlet	Hg(0)	Duct Injection	Yes	No	NA
T23-EY4	Silver amalgamation with increased gas:metal contact area.	WS inlet	Hg(0)	Duct Injection	Yes	No	NA
T23-EY5	Aluminum amalgamation with increased gas:metal contact area.	WS inlet	Hg(0)	Duct Injection	Yes	No	NA
T23-EY6	Iodated carbon (3400:1 C:Hg ratio)	WS inlet	Hg(0)	Duct Injection	Yes	No	NA
T23-EY7	Iodated carbon (11300:1 C:Hg ratio)	WS inlet	Hg(0)	Duct Injection	Yes	No	NA
T23-EY8	Calcium chloride impregnated carbon (2800:1 C:Hg ratio)	WS inlet	Hg(0)	Duct Injection	Yes	No	NA
T23-EY9	Calcium chloride impregnated carbon (9500:1 C:Hg ratio)	WS inlet	Hg(0)	Duct Injection	Yes	No	NA
T24-N	No spiking; High velocity scrubber conditions, forced oxidation	3 Locations	NA	NA	Yes	No	NA
T24-E	Elemental mercury spiking; High velocity scrubber conditions, forced oxidation	3 Locations	Hg(0)	Duct Injection	Yes	No	NA
T24-C	Mercuric chloride spiking; High velocity scrubber conditions, forced oxidation	3 Locations	HgCl ₂	Duct Injection	Yes	No	NA
T25-NY	Aqueous mercury spike; Tris comparison at the Pilot inlet	WS inlet	Aq. Hg Std.	Before 1st impinger	No	Yes	Tris
T26-C	Mercuric chloride spike; Tris comparison at the Pilot inlet	3 Locations	HgCl ₂	Duct Injection	No	Yes	Tris
T27-C	Mercuric chloride spike; Tris comparison at the Pilot inlet	3 Locations	HgCl ₂	Duct Injection	No	Yes	Tris/EDTA
T28-E	Elemental mercury spiking; Tris comparison at the Pilot inlet	3 Locations	Hg(0)	Duct Injection	No	Yes	Tris

Trace Element Removal Impinger Test Conditions

Test ID	Test Description	Gas Sample Source	Spiking Conditions		Sampling Methods		
			Species Spiked	Spike Location	Method 29 Used?	Method 29* Used?	Sol'n of Extra Imp.
T29-IY*	Flue gas constituents effect in peroxide/nitric acid impinger solution with different gas sampling amounts.	WS inlet	Hg(0)	Before 1st impinger	No	Yes	NA
T30-IY*	Flue gas constituents effect in peroxide/nitric acid impinger solution with different spiking amounts	WS inlet	Hg(0)	Before 1st impinger	No	Yes	NA
T31-IX	Tris solution evaluation with intratrain elemental mercury spiking.	CRG	Hg(0)	Before 1st impinger	No	Yes	Tris and Tris/EDTA
T31-NX	Tris solution evaluation with aqueous mercury spike.	CRG	Aq. Hg Std.	Before 1st impinger	No	Yes	Tris/EDTA
T32-PJFF	Mercury conversion and removal across PJFF with Darco carbon on bags. (Approx. 10000:1 C:Hg)	SDA outlet and PJFF outlet	Hg(0)	Duct Injection	Yes	No	NA
T33-PJFF	Mercury conversion and removal across PJFF with Darco carbon on bags.	SDA outlet and PJFF outlet	Hg(0)	Duct Injection	Yes	No	NA
T34-PJFF	Mercury conversion and removal across PJFF with Darco carbon on bags. (Approx. 20000:1 C:Hg)	SDA outlet and PJFF outlet	Hg(0)	Duct Injection	Yes	No	NA
T35-PJFF	Mercury conversion and removal across PJFF with CaCl ₂ -impregnated carbon on bags.	SDA outlet and PJFF outlet	Hg(0)	Duct Injection	Yes	No	NA
T36-EY1	Darco carbon sandwiched on filters. 2000:1 carbon:mercury	WS inlet	Hg(0)	Pilot fan inlet	Yes	No	NA
T36-EY2	Darco carbon sandwiched on filters. 10000:1 carbon:mercury	WS inlet	Hg(0)	Pilot fan inlet	Yes	No	NA
T37-EY1	Ground coal sandwiched on filters. 2000:1 coal:mercury	WS inlet	Hg(0)	Pilot fan inlet	Yes	No	NA
T37-EY2	Ground coal sandwiched on filters. 10000:1 coal:mercury	WS inlet	Hg(0)	Pilot fan inlet	Yes	No	NA
T38-EY1	Sodium sulfide sandwiched on filters. 2000:1 sodium sulfide:mercury	WS inlet	Hg(0)	Pilot fan inlet	Yes	No	NA
T38-EY2	Sodium sulfide sandwiched on filters. 10000:1 sodium sulfide:mercury	WS inlet	Hg(0)	Pilot fan inlet	Yes	No	NA
T39-EY1	Ferric chloride sandwiched on filters. 2000:1 ferric chloride:mercury	WS inlet	Hg(0)	Pilot fan inlet	Yes	No	NA
T39-EY2	Ferric chloride sandwiched on filters. 10000:1 ferric chloride:mercury	WS inlet	Hg(0)	Pilot fan inlet	Yes	No	NA
T62-EY1	Fly ash sandwiched on filters. 2000:1 fly ash:mercury	WS inlet	Hg(0)	Pilot fan inlet	Yes	No	NA

Trace Element Removal Impinger Test Conditions

Test ID	Test Description	Gas Sample Source	Spiking Conditions		Sampling Methods		
			Species Spiked	Spike Location	Method 29 Used?	Method 29* Used?	Sol'n of Extra Imp.
T62-EY2	Fly ash sandwiched on filters. 10000:1 fly ash:mercury	WS inlet	Hg(0)	Pilot fan inlet	Yes	No	NA
T40-EY1	Potassium chromate sandwiched on filters. 2000:1 potassium chromate:mercury	WS inlet	Hg(0)	Pilot fan inlet	Yes	No	NA
T40-EY2	Potassium chromate sandwiched on filters. 10000:1 potassium chromate:mercury	WS inlet	Hg(0)	Pilot fan inlet	Yes	No	NA
Tests T41-EXY to T49-E used two Tris impingers and two permanganate impingers in the gas sampling train. The Tris impingers were recovered separately in T41-E, T42-N, T43-E, and T44-C. The rest of the tests recovered the two Tris impinger solutions together.							
T41-EXY	Tris-KMnO ₄ and M29 comparison to evaluate Tris-KMnO ₄ train	CRG and WS inlet	Hg(0)	Pilot fan inlet	No	No	1 M Tris with 10 mM EDTA ¹
T42-N	Baseline test with Tris and 10 mM EDTA. Start of test to examine 10 mM EDTA effect on mercury capture	DRG, WS inlet and WS outlet	NA	NA	No	No	1 M Tris with 10 mM EDTA
T43-E	Elemental mercury spike test with Tris and 10 mM EDTA	CRG, WS inlet and WS outlet	Hg(0)	Pilot fan inlet	No	No	1 M Tris with 10 mM EDTA
T44-E	Mercuric chloride spike test with Tris and 10 mM EDTA	CRG, WS inlet and WS outlet	HgCl ₂	Pilot fan inlet	No	No	1 M Tris with 10 mM EDTA
T45-E	Establish baseline for ESP effect on elemental mercury. This test spiked after the ESP.	DRG, WS inlet and WS outlet	Hg(0)	ESP fan inlet	No	No	1 M Tris with 2 mM EDTA
T46-E	Test effect of ESP on elemental mercury spike into the high ash gas. (9000 scfm at pilot venturi)	DRG, WS inlet and WS outlet	Hg(0)	DRG duct	No	No	1 M Tris with 1 mM EDTA
T47-E	Test effect of residence time in the high ash gas on the oxidation of elemental mercury. (11000 scfm at pilot venturi)	DRG, WS inlet and WS outlet	Hg(0)	DRG duct	No	No	1 M Tris with 1 mM EDTA
T48-E	Test effect of ESP fields on the oxidation of elemental mercury. This test ran with 1 ESP field (A field). (9000 scfm at pilot venturi)	DRG, WS inlet and WS outlet	Hg(0)	DRG duct	No	No	1 M Tris with 1 mM EDTA
T49-E	Test effect of ESP fields on the oxidation of elemental mercury. This test ran with 5 ESP fields. (9000 scfm at pilot venturi)	DRG, WS inlet and WS outlet	Hg(0)	DRG duct	No	No	1 M Tris with 1 mM EDTA

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 NaC2H3O2, 0.05 M Acetic Acid	60	Hg(0)	Duct Injection	5 ft3 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 Na2HPO4, 0.2 M KH2PO4	60 at Inlet 100 at Outlet	Hg(0)	Duct Injection	5 ft3 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 Na2HPO4, 0.3 M KH2PO4	60 at Inlet 100 at Outlet	NA	NA	5 ft3 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 Na2HPO4, 0.3 M KH2PO4	60	Hg(0)	Before 1st imp.	5 ft3 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 Na2HPO4, 0.3 M KH2PO4	60	Hg(0)	Duct Injection	5 ft3 of air through impingers with DI water rinse and 15 ml peroxide.	The pH of the 1st impinger solution dropped below 2 after 1 hour of gas sampling. Solids found in second impinger.
T12-NY	Phosphate	0.5 M Na3PO4, 0.5 M K3PO4,	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 1st impinger solution dropped below 2 after 1 hour of gas sampling. Solids found in second impinger.
T13-NY	Phosphate	0.5 M Na3PO4, 0.5 M K3PO4,	20	NA	NA	No air purge. 15 ml peroxide and 15 ml nitric added at location. 10% nitric impinger rinse.	The pH of the 1st 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 Na3PO4, 0.5 M K3PO4,	60	NA	NA	No air purge. 15 ml peroxide and 15 ml nitric added at location. 10% nitric impinger rinse.	The pH of the 1st impinger solution was below 2 after 60 minutes of gas sampling. Solids found in second impinger.
T16-EY	Phosphate/ Peroxide	0.5 M Na3PO4, 0.5 M K3PO4, 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. SO2 odor in the impingers after sampling.
T16-EY	Phosphate	0.4 M Na3PO4, 0.4 M K3PO4, 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 the 1st 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.

Alternate Impinger Solutions Summary

Test ID	Alternate Impinger Solution	Solution Composition	Sampling Time (min)	Spiking Species	Conditions Spike Location	Sample Recovery	Observations
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
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	HgCl2	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 HgCl2	duct injection	5g of potassium permanganate added to each Tris solution impinger	The pH of impinger 1 remained above 7.0
T23-EY1	Tris	1 M Tris	30	Hg(0)	duct injection	25 mls of 30% peroxide and 20 mls HNO3 were added to the first two impingers after gas sampling, but before removing from the sampling location. 2.5 mls HCl was added during recovery.	
T23-EY1	Tris	1 M Tris	40	Hg(0)	duct injection	25 mls of 30% peroxide and 20 mls HNO3 were added to the first two impingers after gas sampling, but before removing from the sampling location. 2.5 mls HCl was added during recovery.	
T23-EY1	Tris	1 M Tris	50	Hg(0)	duct injection	25 mls of 30% peroxide and 20 mls HNO3 were added to the first two impingers after gas sampling, but before removing from the sampling location. 2.5 mls HCl was added during recovery.	
T25-NY	Tris	1 M Tris	20	Aq. Hg Std.	4 µg Hg(II) added to 1st impinger before run.	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	

Alternate Impinger Solutions Summary

Test ID	Alternate Impinger Solution	Solution Composition	Sampling Time (min)	Spiking Conditions Species Spiked	Spike Location	Sample Recovery	Observations
T25-NY	Tris	1 M Tris	25	Aq. Hg Std.	4 µg Hg(II) added to 1st impinger before run.	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	
T25-NY	Tris	1 M Tris	30	Aq. Hg Std.	4 µg Hg(II) added to 1st impinger before run.	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	
T25-NY	Tris	1 M Tris	40	Aq. Hg Std.	4 µg Hg(II) added to 1st impinger before run.	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	
T26-C	Tris	1 M Tris	20	HgCl ₂	Duct injection	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	
T26-C	Tris	1 M Tris	25	HgCl ₂	Duct injection	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	
T26-C	Tris	1 M Tris	30	HgCl ₂	Duct injection	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	
T26-C	Tris	1 M Tris	38	HgCl ₂	Duct injection	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	
T27-C	Tris	1 M Tris	20	HgCl ₂	Duct injection	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	
T27-C	Tris/EDTA	1mM EDTA in 1 M Tris	30	HgCl ₂	Duct injection	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	
T27-C	Tris/EDTA	1mM EDTA in 1 M Tris	37	HgCl ₂	Duct injection	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	
T28-E	Tris	1 M Tris	20	Hg(0)	Duct injection	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	
T28-E	Tris	1 M Tris	25	Hg(0)	Duct injection	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	
T28-E	Tris	1 M Tris	35	Hg(0)	Duct injection	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	

Alternate Impinger Solutions Summary

Test ID	Alternate Impinger Solution	Solution Composition	Sampling Time (min)	Spiking Conditions		Sample Recovery	Observations
				Species Spiked	Spike Location		
T28-E	Tris	1 M Tris	43	Hg(0)	Duct injection	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	
T31-IX	Tris	1 M Tris	30	Hg(0)	Intratrain spike before the 1st impinger	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	
T31-IX	Tris/EDTA	1mM EDTA in 1M Tris	30	Hg(0)	Intratrain spike before the 1st impinger	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	
T31-NX	Tris/EDTA	1mM EDTA in 1M Tris	30	Aq. Hg Std.	4 µg Hg(II) added to 1st impinger before run.	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	
T31-NX	Tris/EDTA	1mM EDTA in 1M Tris	40	Aq. Hg Std.	4 µg Hg(II) added to 1st impinger before run.	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	
T41-EXY	Tris/EDTA	1 M Tris with 10 mM EDTA	24	Hg (0)	Pilot fan inlet	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	
T41-EXY	Tris/EDTA	1 M Tris with 10 mM EDTA	31	Hg (0)	Pilot fan inlet	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	
T41-EXY	Tris/EDTA	1 M Tris with 10 mM EDTA	40	Hg (0)	Pilot fan inlet	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	
T41-EXY	Tris/EDTA	1 M Tris with 10 mM EDTA	45	Hg (0)	Pilot fan inlet	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	
T43-E	Tris/EDTA	1 M Tris with 10 mM EDTA	30	Hg (0)	Pilot fan inlet	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	
T44-C	Tris/EDTA	1 M Tris with 10 mM EDTA	30	HgCl ₂	Pilot fan inlet	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	
T45-E	Tris/EDTA	1 M Tris with 2 mM EDTA	17	Hg (0)	ESP fan inlet	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	

Alternate Impinger Solutions Summary

Test ID	Alternate Impinger Solution	Solution Composition	Sampling Time (min)	Spiking Conditions		Sample Recovery	Observations
				Species Spiked	Spike Location		
T45-E	Tris/EDTA	1 M Tris with mM EDTA	2	35	Hg (0) ESP fan inlet	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	
T46-E	Tris/EDTA	1 M Tris with mM EDTA	1	35	Hg (0) DRG Duct	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	
T47-E	Tris/EDTA	1 M Tris with mM EDTA	1	35	Hg (0) DRG Duct	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	
T49-E	Tris/EDTA	1 M Tris with mM EDTA	1	30	Hg (0) DRG Duct	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	
T50-E	Tris/EDTA	1 M Tris with mM EDTA	1	30	Hg (0) DRG Duct	25 ml of 30% peroxide and 20 ml of nitric acid added to 1st and 2nd Tris impinger solutions.	

**Pilot FLRT Liquid Analytical Summary:
Trace Element Removal Test Block**

Gas																	ICE	ICE	ICE	ICE	ICE						
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	CaSO3	CaSO4	CaCO3		
ID	ID	Date	Time	pH	pH	(mM)	(mM)	(mM)	(ppm)	(ppm)	(ppm)	(ppm)	(mM)		(mM)	(mM)	(mM)	(ppm)	(mM)	(mM)	(mM)	(ppm)	RS	RS	RS		
Baseline Conditions																											
T44		Wed 1/17	07:45	5.56	4.75	149.02	138.15	18.27	-	-	-	-	-	-	-	0.25	-	-	-	-	-	-	-	-	-	-	
T44	C	Wed 1/17	14:25	5.50	4.85	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T45	E	Thu 1/18	08:10	5.55	4.93	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T45		Mon 1/22	08:00	5.55	-	143.62	136.74	18.10	-	-	-	-	-	-	-	0.47	-	-	-	-	-	-	-	-	-	-	
T45		Mon 1/22	14:15	5.52	5.08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T46	E	Tue 1/23	07:40	5.41	5.26	141.13	140.51	17.97	34.20	1.01	0.00	39.20	517.40	-	1.98	0.13	17.12	-	-	-	-	-	0.16	0.96	0.05		
T47	E	Wed 1/24	08:25	5.51	4.94	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T58	EXY	Thu 2/01	09:40	5.50	4.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T58		Fri 2/02	08:25	5.46	4.85	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T52	EXZP	Wed 2/07	08:05	5.44	4.93	125.35	105.56	13.96	-	-	-	-	-	-	-	1.02	-	-	-	-	-	-	-	-	-	-	
T52		Mon 2/12	08:40	5.60	-	119.04	106.18	14.33	-	-	-	-	-	-	-	0.27	-	-	-	-	-	-	-	-	-	-	
T53	EXZP	Tue 2/13	08:45	5.42	5.08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T51	EXZP	Thu 2/15	08:30	5.55	5.26	123.06	108.46	15.46	-	-	-	-	-	-	-	0.15	-	-	-	-	-	-	-	-	-	-	
T51	EXZP	Fri 2/16	08:55	5.54	4.94	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T51		Fri 2/16	13:10	5.50	4.89	117.20	107.03	14.94	33.39	4.62	0.00	52.96	351.87	-	1.46	0.02	16.59	-	-	-	-	-	0.03	0.92	0.05		
T63	ESD	Mon 2/19	07:50	5.49	4.86	99.11	89.42	12.38	-	-	-	-	-	-	-	0.08	-	-	-	-	-	-	-	-	-	-	
13000 scfm																											
T52		Wed 2/21	14:15	5.46	4.42	128.68	87.38	14.34	30.46	6.71	0.00	35.20	354.32	-	1.88	0.00	15.43	-	-	-	-	-	0.00	0.96	0.06		
T48	EYZ	Thu 2/22	09:10	5.56	4.44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	0.96	0.08		
Baseline Conditions																											
T64	EDRO	Fri 2/23	09:08	5.50	4.71	104.67	71.22	11.11	25.30	1.79	0.00	15.43	284.27	-	2.27	0.05	14.76	-	-	-	-	-	0.07	0.89	0.07		
T58R	EXY	Mon 2/26	08:40	5.50	4.60	99.75	72.66	11.44	-	-	-	-	-	-	-	0.07	-	-	-	-	-	-	-	-	-	-	
T59	EXY	Tue 2/27	09:15	5.49	4.78	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T60	EXY	Wed 2/28	10:05	5.41	4.55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T61	EXY	Thu 2/29	07:35	5.60	4.68	110.05	89.43	12.42	25.98	1.30	0.00	35.23	325.42	-	2.45	0.33	16.22	-	-	-	-	-	0.49	0.93	0.11		

**Pilot FLRT Solid Analytical Summary:
Trace Element Removal Test Block**

											Wt Solids	Mol Solids	Solids		CO3 Est.	Thickener			Final	Form	Filter	
Gas	Test	Sample		FLRT	Ca	Mg	SO3	SO4	CO3	Inerts	Closure	Closure	Ox.	Util.	Util.	CP	FC	Unit	Initial	Settled	Filtration	Leaf
ID	ID	Date	Time	Wt% Solids	(mmol/g)	(mmol/g)	(mmol/g)	(mmol/g)	(mmol/g)	(wt%)	(%)	(%)	(%)	(%)	(%)	Wt%	WT%	Area (ft2/tpd)	Wt%	Wt%	Rate (lb/hr*sqft)	Cake Wt%
Baseline Conditions																						
T44		Wed 1/17	07:45	11.20	-	-	-	-	-	-	-	-	-	-	-	80.20	-	-	-	-	-	-
T44	C	Wed 1/17	14:25	-	-	-	-	-	-	-	-	-	-	-	-	82.84	-	-	-	-	-	-
T45	E	Thu 1/18	08:10	12.45	-	-	-	-	-	-	-	-	-	-	-	82.43	-	-	-	-	-	-
T45		Mon 1/22	08:00	11.89	-	-	-	-	-	-	-	-	-	-	-	84.12	-	-	-	-	-	-
T45		Mon 1/22	14:15	-	-	-	-	-	-	-	-	-	-	-	-	80.36	-	-	-	-	-	-
T46	E	Tue 1/23	07:40	11.93	6.09	0.03	0.01	5.48	0.16	1.00	-	-	-	-	97.3	81.95	-	-	-	-	-	-
T47	E	Wed 1/24	08:25	12.31	-	-	-	-	-	-	-	-	-	-	-	82.27	-	-	-	-	-	-
T58	EXY	Thu 2/01	09:40	12.82	-	-	-	-	-	-	-	-	-	-	-	80.20	-	-	-	-	-	-
T58		Fri 2/02	08:25	14.03	-	-	-	-	-	-	-	-	-	-	-	82.84	-	-	-	-	-	-
T52	EXZP	Wed 2/07	08:05	12.37	-	-	-	-	-	-	-	-	-	-	-	82.43	-	-	-	-	-	-
T52		Mon 2/12	08:40	12.02	-	-	-	-	-	-	-	-	-	-	-	84.12	-	-	-	-	-	-
T53	EXZP	Tue 2/13	08:45	13.61	-	-	-	-	-	-	-	-	-	-	-	80.36	-	-	-	-	-	-
T51	EXZP	Thu 2/15	08:30	12.31	-	-	-	-	-	-	-	-	-	-	-	81.95	-	-	-	-	-	-
T51	EXZP	Fri 2/16	08:55	11.70	-	-	-	-	-	-	-	-	-	-	-	82.27	-	-	-	-	-	-
T51		Fri 2/16	13:10	11.71	5.86	0.04	0.01	5.65	0.34	0.90	-0.8	1.2	99.8	94.3	94.2	82.14	-	-	-	-	-	-
T63	ESD	Mon 2/19	07:50	13.47	-	-	-	-	-	-	-	-	-	-	-	81.79	-	-	-	-	-	-
13000 scfm																						
T52		Wed 2/21	14:15	11.17	-	-	-	-	-	-	-	-	-	-	-	81.37	-	-	-	-	-	-
T48	EYZ	Thu 2/22	09:10	11.24	5.79	0.03	0.00	5.60	0.29	1.40	-0.6	0.4	100.0	95.0	95.1	84.55	-	-	-	-	-	-
Baseline Conditions																						
T64	EDRG	Fri 2/23	09:08	13.24	-	-	-	-	-	-	-	-	-	-	-	81.64	-	-	-	-	-	-
T58R	EXY	Mon 2/26	08:40	12.50	-	-	-	-	-	-	-	-	-	-	-	81.46	-	-	-	-	-	-
T59	EXY	Tue 2/27	09:15	11.75	-	-	-	-	-	-	-	-	-	-	-	80.71	-	-	-	-	-	-
T60	EXY	Wed 2/28	10:05	10.13	-	-	-	-	-	-	-	-	-	-	-	82.33	-	-	-	-	-	-
T61	EXY	Thu 2/29	07:35	12.15	5.90	0.03	0.00	5.87	0.27	0.90	-1.7	3.7	100.0	95.5	95.4	82.41	-	-	-	-	-	-

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)	DRG O ₂ (%)	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)
Hg(0) spk DRG, P-Heater On																							
T56-EXY	Tue-1/30	08:00	TE1	U633	29.16	-	6.18	-	19.50	-	-	15.00	-	539.4	-	-	456.2	DRG	DRG	DRG	DRG	DRG	DRG
T56-EXY	Tue-1/30	10:00	TE1	U636	25.87	-	6.72	-	7.00	-	-	3.60	-	565.6	-	-	459.8	-	5.80	-	-	2.42	8.22
T56-EXY	Tue-1/30	11:30	TE1	U639	30.04	-	5.85	-	8.23	-	-	3.82	-	601.4	-	-	465.0	-	6.24	-	-	2.24	8.48
T56-EXY	Tue-1/30	09:30	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T56-EXY	Tue-1/30	12:15	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages																			8.57	-	-	4.52	13.09
Hg(0) spk DRG, P-Heater Off																							
T57-EXY	Wed-1/31	08:00	TE3	U644	26.59	-	5.30	-	7.26	-	-	2.88	-	586.1	-	-	502.5	DRG	DRG	DRG	DRG	DRG	DRG
T57-EXY	Wed-1/31	10:00	TE3	U647	25.85	-	5.47	-	7.23	-	-	2.07	-	577.0	-	-	491.3	-	6.11	-	-	1.49	7.60
T57-EXY	Wed-1/31	11:30	TE3	U650	27.09	-	5.82	-	5.82	-	-	1.05	-	592.8	-	-	510.9	-	4.82	-	-	0.75	5.57
T57-EXY	Wed-1/31	09:30	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T57-EXY	Wed-1/31	12:15	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages																			6.1	-	-	1.8	7.9
Hg(0) spk CRG, P-Heater On																							
T58-EXY	Thu-2/1	08:00	TE3	U655	30.87	-	6.18	-	7.81	-	-	2.87	-	507.8	-	-	460.6	DRG	DRG	DRG	DRG	DRG	DRG
T58-EXY	Thu-2/1	10:00	TE3	U658	28.79	-	6.72	-	7.96	-	-	1.40	-	557.5	-	-	495.1	-	5.84	-	-	0.91	6.75
T58-EXY	Thu-2/1	11:30	TE3	U661	27.22	-	5.57	-	7.71	-	-	1.07	-	550.2	-	-	492.4	-	5.91	-	-	0.73	6.64
T58-EXY	Thu-2/1	09:30	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T58-EXY	Thu-2/1	12:15	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages																			5.54	-	-	1.09	6.62
Hg(0) spk @ SDA In:(DRG)																							
T52-EXZP	Wed-2/7	08:00	TE3	U693	33.29	-	6.20	-	8.46	-	-	1.11	-	604.0	-	-	517.5	SDA In	SDA In	SDA In	SDA In	SDA In	SDA In
T52-EXZP	Wed-2/7	09:30	TE3	U696	41.08	-	6.60	-	10.70	-	-	1.12	-	692.6	-	-	520.7	-	6.83	-	-	0.54	7.37
T52-EXZP	Wed-2/7	11:30	TE3	U699	35.86	-	6.80	-	10.80	-	-	0.76	-	585.6	-	-	449.6	-	6.68	-	-	0.36	7.04
Averages																			6.44	-	-	0.52	6.96
Plant air sample (near injector)																							
FB-1	Wed-2/7	13:00	TE3	FB-1	36.32	-	5.00	-	<0.25	-	-	0.06	-	588.6	-	-	538.8	SDA In	SDA In	SDA In	SDA In	SDA In	SDA In
																			<0.15	-	-	0.03	0.19
Hg(0) spk @ SDA In:(DRG)																							
T53-EXZP	Tue-2/13	09:00	TE3	U702	32.16	-	5.06	-	9.26	-	-	2.62	-	607.0	-	-	500.4	SDA In	SDA In	SDA In	SDA In	SDA In	SDA In
T53-EXZP	Tue-2/13	10:45	TE3	U705	33.88	-	4.72	-	10.10	-	-	1.41	-	599.3	-	-	479.0	-	6.62	-	-	1.54	8.16
T53-EXZP	Tue-2/13	12:30	TE3	U708	33.96	-	5.47	-	12.70	-	-	0.69	-	596.2	-	-	499.1	-	6.77	-	-	0.76	7.52
Averages																			7.28	-	-	0.89	8.17
Plant air sample (injector vent)																							
FB-2	Tue-2/13	08:00	TE3	FB-2	29.98	-	5.00	-	1.23	-	-	0.31	-	579.6	-	-	456.0	SDA In	SDA In	SDA In	SDA In	SDA In	SDA In
																			0.90	-	-	0.18	1.08
Hg(0) spk @ SDA In:(DRG), low temp																							
T54-EXZP	Wed-2/14	07:45	TE3	U711	31.59	-	5.15	-	6.39	-	-	1.18	-	586.8	-	-	535.1	SDA In	SDA In	SDA In	SDA In	SDA In	SDA In
T54-EXZP	Wed-2/14	09:30	TE3	U714	34.91	-	6.10	-	9.03	-	-	0.75	-	592.9	-	-	493.3	-	5.81	-	-	0.40	6.21
T54-EXZP	Wed-2/14	11:45	TE3	U717	30.22	-	6.17	-	7.32	-	-	0.58	-	603.7	-	-	543.6	-	5.54	-	-	0.39	5.93
Averages																			5.28	-	-	0.52	5.80

*Shaded areas indicate sampling problems H=Peroxide TE1=Tris/EDTA(1mM) TE3=Tris/EDTA(10mM) a=Spike total calculated from WS In and DRG. b=Removal calculated from CRG and WS Out c=gas volumes assumed.

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 (% H2O)	DRG O2 (%)	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 (µg/Nm3)	Other [Hg] In Gas (µg/Nm3)	H2O2 [Hg] In Gas (µg/Nm3)	H2O2 [Hg] In Gas (µg/Nm3)	KMnO4 [Hg] In Gas (µg/Nm3)	Total [Hg] In Gas (µg/Nm3)		
Hg(0) spk @PJFF Fan																			SDA In	SDA In	SDA In	SDA In	SDA In	SDA In	
T51-EXZP1	Thu-2/15	07:45	TE3	U720	32.77	-	5.64	-	7.18	-	-	1.21	-	592.6	-	-	493.5	-	4.92	-	-	0.69	5.61		
T51-EXZP1	Thu-2/15	09:45	TE3	U723	29.46	-	6.94	-	6.24	-	-	0.60	-	574.1	-	-	510.6	-	4.61	-	-	0.40	5.00		
T51-EXZP1	Thu-2/15	11:50	TE3	U726	28.32	-	5.99	-	8.10	-	-	0.75	-	556.4	-	-	528.8	-	6.03	-	-	0.53	6.56		
Averages																				5.19				0.54	5.72
Hg(0) spk @PJFF Fan																			SDA In	SDA In	SDA In	SDA In	SDA In	SDA In	
T51-EXZP2	Fri-2/16	08:30	TE3	U729	33.01	-	5.84	-	7.91	-	-	1.31	-	535.0	-	-	479.9	-	4.86	-	-	0.72	5.58		
T51-EXZP2	Fri-2/16	10:30	TE3	U732	30.75	-	6.28	-	8.08	-	-	0.72	-	597.9	-	-	474.9	-	5.95	-	-	0.42	6.37		
T51-EXZP2	Fri-2/16	12:30	TE3	U735	30.01	-	5.67	-	8.46	-	-	0.65	-	581.5	-	-	516.1	-	6.21	-	-	0.42	6.63		
Averages																				5.67				0.52	6.19
Hg(0) spk @SDA In																			SDA In	SDA In	SDA In	SDA In	SDA In	SDA In	
T63-ESD	Mon-2/19	08:00	TE3	U738	35.00	-	6.34	-	14.80	-	-	2.15	-	571.6	-	-	429.2	-	9.16	-	-	1.00	10.16		
T63-ESD	Mon-2/19	09:00	TE3	U740	28.23	-	6.27	-	14.00	-	-	1.90	-	565.4	-	-	442.0	-	10.62	-	-	1.13	11.75		
T63-ESD	Mon-2/19	10:15	TE3	U742	33.07	-	5.99	-	14.60	-	-	2.03	-	570.1	-	-	506.3	-	9.53	-	-	1.18	10.71		
T63-ESD	Mon-2/19	11:30	TE3	U744	29.21	-	5.41	-	10.50	-	-	2.04	-	602.4	-	-	448.9	-	8.20	-	-	1.19	9.39		
Averages																				9.38				1.12	10.50
Field Blank																									
FB-3	Mon-2/19	13:00	TE3	FB-3	30.00 c	-	5.00	-	<0.25	-	-	<0.05	-	579.6	-	-	456.0	-	<0.18 c	-	-	<0.03 c	<0.21 c		
Implinger Blank																									
Imp-1	Mon-2/19	13:00	TE3	Imp-3	30.00 c	-	5.00	-	0.18	-	-	<0.05	-	579.6	-	-	456.0	-	0.13 c	-	-	<0.03 c	0.16 c		
Hg(0) spk @DRG, PHV simulation																			DRG	DRG	DRG	DRG	DRG	DRG	
T48-EYZ	Thu-2/22	08:00	TE3	U666	28.13	-	4.19	-	54.50	-	-	25.35	-	589.7	-	-	497.5	-	43.29	-	-	16.99	60.28		
T48-EYZ	Thu-2/22	09:30	TE3	U669	31.19	-	4.59	-	22.40	-	-	6.23	-	600.1	-	-	537.8	-	16.33	-	-	4.07	20.40		
T48-EYZ	Thu-2/22	11:30	TE3	U672	29.54	-	4.57	-	20.60	-	-	5.56	-	562.8	-	-	471.2	-	14.87	-	-	3.36	18.23		
Averages																				15.60				3.72	19.31
Hg(0) spk @DRG																			DRG#1	DRG#1	DRG#1	DRG#1	DRG#1	DRG#1	
T64-EDRG	Fri-2/23	08:00	TE3	U746	28.17	-	7.62	-	11.11	-	-	5.16	-	598.6	-	-	483.1	-	8.94	-	-	3.35	12.29		
T64-EDRG	Fri-2/23	09:00	TE3	U748	27.94	-	6.57	-	11.24	-	-	4.83	-	603.8	-	-	560.4	-	9.20	-	-	3.67	12.87		
T64-EDRG	Fri-2/23	09:45	TE3	U750	29.16	-	5.96	-	11.90	-	-	5.18	-	541.7	-	-	449.0	-	8.38	-	-	3.02	11.40		
T64-EDRG	Fri-2/23	10:30	TE3	U752	28.78	-	5.36	-	10.95	-	-	4.04	-	648.7	-	-	488.9	-	9.35	-	-	2.60	11.95		
Averages																				8.97				3.16	12.13
Hg(0) spk @FF Fan (post ESP)																			DRG	DRG	DRG	DRG	DRG	DRG	
T58R-EXY	Mon-2/26	08:00	TE3	U754	31.45	-	7.11	-	8.73	-	-	6.28	-	585.9	-	-	504.2	-	6.16	-	-	3.81	9.97		
T58R-EXY	Mon-2/26	09:00	TE3	U757	38.60	-	5.96	-	13.05	-	-	4.05	-	600.7	-	-	593.8	-	7.69	-	-	2.36	10.05		
T58R-EXY	Mon-2/26	10:00	TE3	U760	30.58	-	5.21	-	12.81	-	-	2.60	-	589.5	-	-	512.8	-	9.35	-	-	1.65	11.01		
Averages																				7.74				2.61	10.34
Hg(0) spk @FF Fan, Heater On																			DRG	DRG	DRG	DRG	DRG	DRG	
T59-EXY	Tue-2/27	08:00	TE3	U763	29.16	-	5.30	-	8.89	-	-	4.42	-	585.3	-	-	531.5	-	6.76	-	-	3.05	9.81		
T59-EXY	Tue-2/27	08:45	TE3	U766	29.83	-	5.30	-	9.70	-	-	3.94	-	581.9	-	-	490.7	-	7.17	-	-	2.46	9.62		
T59-EXY	Tue-2/27	09:30	TE3	U769	27.19	-	5.30	-	9.87	-	-	3.33	-	567.0	-	-	554.3	-	7.80	-	-	2.57	10.37		
Averages																				7.24				2.69	9.93

*Shaded areas indicate sampling problems. H=Peroxide. TE1=Tris/EDTA(1mM). TE3=Tris/EDTA(10mM). a=Spike total calculated from WS In and DRG. b=Removal calculated from CRG and WS Out. c=gas volumes assumed.

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)	DRG O ₂ (%)	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)
<i>Hg(0) spk @FF Fan, SO₂ Low</i>																							
T60-EXY	Wed-2/28	08:00	TE3	U772	30.38	-	5.87	-	10.90	-	-	3.72	-	597.5	-	-	513.8	DRG	DRG	DRG	DRG	DRG	DRG
T60-EXY	Wed-2/28	08:45	TE3	U775	32.30	-	4.61	-	12.90	-	-	2.24	-	594.1	-	-	517.2	-	8.12	-	-	2.38	10.50
T60-EXY	Wed-2/28	09:30	TE3	U778	30.62	-	4.55	-	11.90	-	-	1.45	-	606.3	-	-	510.9	-	8.99	-	-	1.36	10.35
Averages																			8.68			1.55	10.23
<i>Hg(0) spk @FF Fan, SO₂ High</i>																							
T61-EXY	Thu-2/29	06:40	TE3	U781	31.65	-	5.60	-	11.80	-	-	4.44	-	600.7	-	-	511.4	DRG	DRG	DRG	DRG	DRG	DRG
T61-EXY	Thu-2/29	07:20	TE3	U784	32.55	-	5.45	-	12.30	-	-	4.13	-	594.3	-	-	473.7	-	8.48	-	-	2.72	11.20
T61-EXY	Thu-2/29	08:00	TE3	U787	31.71	-	5.87	-	14.60	-	-	2.52	-	586.0	-	-	506.3	-	8.51	-	-	2.28	10.78
T61-EXY	Thu-2/29	08:45	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.22	-	-	1.52	11.74
T61-EXY	Thu-2/29	09:45	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Averages																			9.07			2.17	11.24

*Shaded areas indicate sampling problems. H=Peroxide. TE1=Tris/EDTA(1mM). TE3=Tris/EDTA(10mM). a=Spike total calculated from WS In and DRG. b=Removal calculated from CRG and WS Out. c=gas volumes assumed.

ECTC Pilot Trace Elements Removal Testing

Mercury Gas Sampling Results

Pilot Post-Spiking Inlet Location

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 (µg/Nm3)	Other [Hg] In Gas (µg/Nm3)	Other [Hg] In Gas (µg/Nm3)	H2O2 [Hg] In Gas (µg/Nm3)	H2O2 [Hg] In Gas (µg/Nm3)	KMnO4 [Hg] In Gas (µg/Nm3)	Total [Hg] In Gas (µg/Nm3)
Hg(0) spk DRG, P-Heater On																										
T56-EXY	Tue-1/30	08:00	TE1	U634	47.72	-	9.84	-	-	58.30	-	-	39.60	-	-	599.6	-	-	470.1	CRG	CRG	CRG	CRG	CRG	CRG	CRG
T56-EXY	Tue-1/30	10:00	TE1	U637	39.01	-	10.23	-	-	40.40	-	-	14.30	-	-	571.8	-	-	482.1	-	-	27.75	-	-	14.78	42.53
T56-EXY	Tue-1/30	11:30	TE1	U640	35.84	-	9.54	-	-	30.60	-	-	11.50	-	-	601.6	-	-	446.7	-	-	22.43	-	-	6.69	29.13
T56-EXY	Tue-1/30	09:30	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T56-EXY	Tue-1/30	12:15	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Averages																					23.21			8.97	32.18	
Hg(0) spk DRG, P-Heater Off																										
T57-EXY	Wed-1/31	08:00	TE3	U645	35.95	-	9.35	-	-	27.20	-	-	8.55	-	-	603.1	-	-	486.4	CRG	CRG	CRG	CRG	CRG	CRG	CRG
T57-EXY	Wed-1/31	10:00	TE3	U648	28.66	-	9.40	-	-	20.15	-	-	5.62	-	-	580.0	-	-	483.3	-	-	17.29	-	-	4.38	21.67
T57-EXY	Wed-1/31	11:30	TE3	U651	28.58	-	9.62	-	-	24.19	-	-	34.60	-	-	598.3	-	-	495.1	-	-	15.45	-	-	3.59	19.04
T57-EXY	Wed-1/31	09:30	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T57-EXY	Wed-1/31	12:15	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Averages																					16.4			4.0	20.4	
Hg(0) spk CRG, P-Heater On																										
T58-EXY	Thu-2/1	08:00	TE3	U656	29.81	-	9.96	-	-	11.19	-	-	30.11	-	-	574.9	-	-	543.5	CRG	CRG	CRG	CRG	CRG	CRG	CRG
T58-EXY	Thu-2/1	10:00	TE3	U659	30.91	-	9.64	-	-	9.61	-	-	13.17	-	-	503.0	-	-	459.1	-	-	8.18	-	-	20.80	28.97
T58-EXY	Thu-2/1	11:30	TE3	U662	30.91	-	9.91	-	-	15.42	-	-	37.05	-	-	496.6	-	-	485.2	-	-	5.92	-	-	7.41	13.33
T58-EXY	Thu-2/1	09:30	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T58-EXY	Thu-2/1	12:15	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Averages																					8.78			21.41	30.19	
Hg(0) spk @ SDA In:(DRG)																										
T52-EXZP	Wed-2/7	08:00	TE3	U694	35.10	-	11.28	-	-	26.70	-	-	14.50	-	-	590.9	-	-	516.3	CRG	CRG	CRG	CRG	CRG	CRG	CRG
T52-EXZP	Wed-2/7	09:30	TE3	U697	32.86	-	11.48	-	-	19.30	-	-	1.38	-	-	604.8	-	-	518.1	-	-	17.03	-	-	8.08	25.11
T52-EXZP	Wed-2/7	11:30	TE3	U700	39.14	-	11.60	-	-	21.40	-	-	1.28	-	-	577.6	-	-	508.1	-	-	13.46	-	-	0.82	14.28
Averages																					12.71			0.73	13.44	
Plant air sample (near injector)																										
FB-1	Wed-2/7	13:00	TE3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	CRG	CRG	CRG	CRG	CRG	CRG	CRG
Hg(0) spk @SDA In:(DRG)																										
T53-EXZP	Tue-2/13	09:00	TE3	U703	27.25	-	9.96	-	-	20.70	-	-	1.85	-	-	568.2	-	-	512.9	CRG	CRG	CRG	CRG	CRG	CRG	CRG
T53-EXZP	Tue-2/13	10:45	TE3	U706	32.32	-	9.69	-	-	19.60	-	-	1.46	-	-	570.9	-	-	535.8	-	-	16.35	-	-	1.32	17.67
T53-EXZP	Tue-2/13	12:30	TE3	U709	29.56	-	10.16	-	-	24.40	-	-	3.37	-	-	538.6	-	-	419.7	-	-	13.12	-	-	0.92	14.03
Averages																					15.44			1.35	16.79	
Plant air sample (injector vent)																										
FB-2	Tue-2/13	08:00	TE3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	CRG	CRG	CRG	CRG	CRG	CRG	CRG
Hg(0) spk @SDA In:(DRG), low temp																										
T54-EXZP	Wed-2/14	07:45	TE3	U712	29.74	-	11.16	-	-	17.75	-	-	2.12	-	-	575.7	-	-	583.8	CRG	CRG	CRG	CRG	CRG	CRG	CRG
T54-EXZP	Wed-2/14	09:30	TE3	U715	38.40	-	11.59	-	-	24.60	-	-	2.45	-	-	569.7	-	-	471.1	-	-	13.02	-	-	1.58	14.59
T54-EXZP	Wed-2/14	11:45	TE3	U718	31.41	-	11.63	-	-	19.00	-	-	2.01	-	-	566.3	-	-	571.4	-	-	13.83	-	-	1.14	14.96
Averages																					13.27			1.37	14.64	

*Shaded areas indicate sampling problems. H=Peroxide. TE1=Tris/EDTA(1mM). TE3=TriVEDTA(10mM). a=Spike total calculated from WS In and DRG. b=Removal calculated from CRG and WS Out. c=gas volumes assumed.

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

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 In Gas [Hg] (µg/Nm3)	Other In Gas [Hg] (µg/Nm3)	Other In Gas [Hg] (µg/Nm3)	H2O2 In Gas [Hg] (µg/Nm3)	H2O2 In Gas [Hg] (µg/Nm3)	KMnO4 In Gas [Hg] (µg/Nm3)	Total [Hg] In Gas (µg/Nm3)					
Hg(0) spk @PJFF Fan																									CRG	CRG	CRG	CRG	CRG	CRG	CRG
T51-EXZP1	Thu-2/15	07:45	TE3	U721	28.31	-	11.72	-	-	10.00	-	-	9.07	-	-	586.1	-	-	472.2	-	-	7.84	-	-	5.73	13.57					
T51-EXZP1	Thu-2/15	09:45	TE3	U724	25.78	-	12.11	-	-	7.04	-	-	9.78	-	-	580.2	-	-	492.2	-	-	6.00	-	-	7.07	13.08					
T51-EXZP1	Thu-2/15	11:50	TE3	U727	28.93	-	11.70	-	-	7.46	-	-	7.47	-	-	585.7	-	-	491.3	-	-	5.72	-	-	4.81	10.53					
Averages																						6.92			6.40	13.33					
Hg(0) spk @PJFF Fan																									CRG	CRG	CRG	CRG	CRG	CRG	CRG
T51-EXZP2	Fri-2/16	08:30	TE3	U730	31.80	-	11.73	-	-	12.20	-	-	19.40	-	-	564.9	-	-	528.3	-	-	8.21	-	-	12.21	20.42					
T51-EXZP2	Fri-2/16	10:30	TE3	U733	34.71	-	12.06	-	-	12.20	-	-	23.60	-	-	582.1	-	-	481.0	-	-	7.75	-	-	12.39	20.14					
T51-EXZP2	Fri-2/16	12:30	TE3	U736	27.47	-	11.55	-	-	9.25	-	-	16.30	-	-	590.9	-	-	528.9	-	-	7.54	-	-	11.89	19.43					
Averages																						7.83			12.16	20.00					
Hg(0) spk @SDA In																									SDA Out	SDA Out	SDA Out	SDA Out	SDA Out	SDA Out	SDA Out
T63-ESD	Mon-2/19	08:00	TE3	U739	28.33	-	10.96	-	-	21.50	-	-	13.80	-	-	545.0	-	-	448.0	-	-	15.67	-	-	8.27	23.94					
T63-ESD	Mon-2/19	09:00	TE3	U741	29.48	-	10.90	-	-	25.10	-	-	9.09	-	-	562.7	-	-	425.5	-	-	18.15	-	-	4.97	23.12					
T63-ESD	Mon-2/19	10:15	TE3	U743	26.81	-	10.77	-	-	21.30	-	-	13.00	-	-	557.5	-	-	435.0	-	-	16.78	-	-	7.99	24.77					
T63-ESD	Mon-2/19	11:30	TE3	U745	27.76	-	10.41	-	-	17.10	-	-	11.90	-	-	567.4	-	-	445.3	-	-	13.24	-	-	7.23	20.47					
Averages																						15.96			7.12	23.08					
Field Blank																															
FB-3	Mon-2/19	13:00	TE3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
Impinger Blank																															
Imp-1	Mon-2/19	13:00	TE3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
Hg(0) spk @DRG, PHV simulation																									WS In	WS In	WS In	WS In	WS In	WS In	WS In
T48-EYZ	Thu-2/22	08:00	TE3	U667	31.94	-	11.72	-	-	48.50	-	-	77.70	-	-	598.0	-	-	463.3	-	-	34.40	-	-	42.69	77.09					
T48-EYZ	Thu-2/22	09:30	TE3	U670	31.88	-	11.62	-	-	27.00	-	-	7.72	-	-	590.7	-	-	536.6	-	-	18.95	-	-	4.92	23.87					
T48-EYZ	Thu-2/22	11:30	TE3	U673	34.37	-	11.95	-	-	32.80	-	-	6.08	-	-	546.9	-	-	553.4	-	-	19.77	-	-	3.71	23.48					
Averages																						19.36			4.31	23.67					
Hg(0) spk @DRG																									DRG2	DRG2	DRG2	DRG2	DRG2	DRG2	DRG2
T64-EDRG	Fri-2/23	08:00	TE3	U747	30.20	-	7.62	-	-	15.20	-	-	15.40	-	-	579.1	-	-	573.4	-	-	11.04	-	-	11.08	22.12					
T64-EDRG	Fri-2/23	09:00	TE3	U749	28.99	-	6.57	-	-	12.30	-	-	21.10	-	-	585.2	-	-	450.2	-	-	9.41	-	-	12.41	21.82					
T64-EDRG	Fri-2/23	09:45	TE3	U751	30.00	-	5.96	-	-	14.50	-	-	24.80	-	-	573.2	-	-	430.1	-	-	10.50	-	-	13.47	23.97					
T64-EDRG	Fri-2/23	10:30	TE3	U753	29.84	-	5.36	-	-	14.40	-	-	14.50	-	-	605.0	-	-	536.5	-	-	11.06	-	-	9.87	20.93					
Averages																						10.50			11.71	22.21					
Hg(0) spk @FF Fan (post ESP)																									CRG	CRG	CRG	CRG	CRG	CRG	CRG
T58R-EXY	Mon-2/26	08:00	TE3	U755	27.42	-	10.54	-	-	12.13	-	-	16.40	-	-	560.2	-	-	498.1	-	-	9.39	-	-	11.29	20.67					
T58R-EXY	Mon-2/26	09:00	TE3	U758	28.08	-	10.00	-	-	12.05	-	-	16.50	-	-	594.4	-	-	521.9	-	-	9.66	-	-	11.62	21.28					
T58R-EXY	Mon-2/26	10:00	TE3	U761	28.01	-	9.81	-	-	11.54	-	-	16.95	-	-	603.8	-	-	525.0	-	-	9.42	-	-	12.03	21.46					
Averages																						9.49			11.65	21.14					
Hg(0) spk @FF Fan, Heater On																									CRG	CRG	CRG	CRG	CRG	CRG	CRG
T59-EXY	Tue-2/27	08:00	TE3	U764	27.00	-	9.45	-	-	13.05	-	-	16.20	-	-	579.2	-	-	523.8	-	-	10.61	-	-	11.91	22.51					
T59-EXY	Tue-2/27	08:45	TE3	U767	28.72	-	9.75	-	-	12.10	-	-	19.40	-	-	546.8	-	-	456.1	-	-	8.73	-	-	11.67	20.40					
T59-EXY	Tue-2/27	09:30	TE3	U770	33.51	-	10.17	-	-	14.70	-	-	20.00	-	-	565.2	-	-	528.5	-	-	9.39	-	-	11.95	21.34					
Averages																						9.57			11.84	21.42					

*Shaded areas indicate sampling problems. H=Peroxide. TE1=Tris/EDTA(1mM). TE3=Tri/EDTA(10mM). a=Spike total calculated from WS In and DRG. b=Removal calculated from CRG and WS Out. c=gas volumes assumed.

ECTC Pilot Trace Elements Removal Testing

Mercury Gas Sampling Results

Pilot Post-Spiking Inlet Location

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 (µg/Nm3)	Other [Hg] In Gas (µg/Nm3)	Other [Hg] In Gas (µg/Nm3)	H2O2 [Hg] In Gas (µg/Nm3)	H2O2 [Hg] In Gas (µg/Nm3)	KMnO4 [Hg] In Gas (µg/Nm3)	Total [Hg] In Gas (µg/Nm3)															
Hg(0) spk @FF Fan, SO2 Low																				CRG	CRG	CRG	CRG	CRG	CRG	CRG															
T60-EXY	Wed-2/28	08:00	TE3	U773	29.95	-	9.76	-	-	14.80	-	-	21.10	-	-	594.5	-	-	473.3	-	-	11.13	-	-	12.63	23.76															
T60-EXY	Wed-2/28	08:45	TE3	U776	33.68	-	9.47	-	-	14.30	-	-	22.30	-	-	588.8	-	-	512.1	-	-	9.47	-	-	12.85	22.32															
T60-EXY	Wed-2/28	09:30	TE3	U779	29.33	-	9.18	-	-	11.70	-	-	18.30	-	-	590.8	-	-	554.6	-	-	8.93	-	-	13.11	22.04															
Averages																																				9.84			12.86	22.70	
Hg(0) spk @FF Fan, SO2 High																				CRG	CRG	CRG	CRG	CRG	CRG	CRG															
T61-EXY	Thu-2/29	06:40	TE3	U782	28.20	-	9.73	-	-	14.30	-	-	19.20	-	-	579.9	-	-	535.5	-	-	11.14	-	-	13.81	24.96															
T61-EXY	Thu-2/29	07:20	TE3	U785	27.66	-	9.74	-	-	13.90	-	-	15.70	-	-	548.4	-	-	576.7	-	-	10.44	-	-	12.40	22.84															
T61-EXY	Thu-2/29	08:00	TE3	U788	28.12	-	9.82	-	-	13.20	-	-	17.40	-	-	572.2	-	-	561.5	-	-	10.18	-	-	13.16	23.34															
T61-EXY	Thu-2/29	08:45	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-															
T61-EXY	Thu-2/29	09:45	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-															
Averages																																					10.59			13.13	23.71

*Shaded areas indicate sampling problems. H=Peroxide. TE1=Tris/EDTA(1mM). TE3=Tris/EDTA(10mM). a=Spike total calculated from WS In and DRG. b=Removal calculated from CRG and WS Out. c=gas volumes assumed.

ECTC Pilot Trace Elements Removal Testing

Mercury Gas Sampling Results

Pilot Outlet Location

Test ID	Date	Start Time	Other Imp. Cont.	ID	Gas Volume (dscf)	Moisture (% H2O)	Out 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 (µg/Nm3)	Other [Hg] In Gas (µg/Nm3)	Other [Hg] In Gas (µg/Nm3)	H2O2 [Hg] In Gas (µg/Nm3)	H2O2 [Hg] In Gas (µg/Nm3)	KMnO4 [Hg] In Gas (µg/Nm3)	Total [Hg] In Gas (µg/Nm3)	
Hg(0) spk DRG, P-Heater On																					WS In	WS In	WS In	WS In	WS In	WS In	WS In
T56-EXY	Tue-1/30	08:00	TE1	U635	34.13	-	9.84	-	-	47.20	-	-	43.50	-	-	567.0	-	-	441.5	-	-	29.70	-	-	21.31	51.02	
T56-EXY	Tue-1/30	10:00	TE1	U638	31.30	-	10.23	-	-	26.20	-	-	5.88	-	-	519.2	-	-	459.6	-	-	16.46	-	-	3.27	19.73	
T56-EXY	Tue-1/30	11:30	TE1	U641	27.21	-	9.54	-	-	24.00	-	-	4.46	-	-	492.1	-	-	466.3	-	-	16.44	-	-	2.90	19.34	
T56-EXY	Tue-1/30	09:30	H	U642	44.27	5.73	9.32	-	-	-	71.50	7.30	3.18	-	-	-	240.7	187.2	474.3	-	-	-	14.73	1.17	1.29	17.19	
T56-EXY	Tue-1/30	12:15	H	U643	42.83	5.94	9.36	-	-	-	74.30	6.89	3.09	-	-	-	226.0	205.7	491.4	-	-	-	14.85	1.25	1.34	17.45	
Averages																					-	-	16.44	14.79	1.21	2.90	19.34
Hg(0) spk DRG, P-Heater Off																					WS In	WS In	WS In	WS In	WS In	WS In	WS In
T57-EXY	Wed-1/31	08:00	TE3	U646	30.34	-	9.35	-	-	19.82	-	-	3.98	-	-	541.5	-	-	492.7	-	-	13.40	-	-	2.45	15.85	
T57-EXY	Wed-1/31	10:00	TE3	U649	35.38	-	9.40	-	-	21.61	-	-	3.78	-	-	532.5	-	-	499.5	-	-	12.32	-	-	2.02	14.34	
T57-EXY	Wed-1/31	11:30	TE3	U652	29.79	-	9.62	-	-	16.31	-	-	2.82	-	-	604.4	-	-	555.3	-	-	12.54	-	-	1.99	14.53	
T57-EXY	Wed-1/31	09:30	H	U653	54.13	5.70	9.03	-	-	-	65.30	6.68	3.57	-	-	-	296.5	238.6	445.2	-	-	-	13.55	1.12	1.11	15.78	
T57-EXY	Wed-1/31	12:15	H	U654	65.52	5.63	9.47	-	-	-	88.90	8.26	4.11	-	-	-	260.0	233.9	507.0	-	-	-	13.36	1.12	1.20	15.69	
Averages																					-	-	12.9	13.5	1.1	2.2	15.1
Hg(0) spk CRG, P-Heater On																					WS In	WS In	WS In	WS In	WS In	WS In	WS In
T58-EXY	Thu-2/1	08:00	TE3	U657	30.46	-	9.96	-	-	11.63	-	-	26.61	-	-	562.8	-	-	535.3	-	-	8.14	-	-	17.71	25.85	
T58-EXY	Thu-2/1	10:00	TE3	U660	34.46	-	9.64	-	-	12.70	-	-	37.09	-	-	513.2	-	-	457.8	-	-	7.17	-	-	18.67	25.83	
T58-EXY	Thu-2/1	11:30	TE3	U663	29.06	-	9.91	-	-	10.32	-	-	35.16	-	-	580.3	-	-	455.2	-	-	7.81	-	-	20.86	28.67	
T58-EXY	Thu-2/1	09:30	H	U664	47.43	-	9.87	-	-	-	52.80	21.30	30.01	-	-	-	257.1	209.2	507.3	-	-	-	10.84	3.56	12.16	26.56	
T58-EXY	Thu-2/1	12:15	H	U665	43.42	-	9.52	-	-	-	56.80	14.80	25.18	-	-	-	245.7	249.7	535.4	-	-	-	12.18	3.22	11.76	27.16	
Averages																					-	-	7.70	11.51	3.39	19.08	26.78
Hg(0) spk @ SDA In:(DRG)																					WS Out	WS Out	WS Out	WS Out	WS Out	WS Out	WS Out
T52-EXZP	Wed-2/7	08:00	TE3	U695	78.61	-	10.81	-	-	9.80	-	-	37.20	-	-	669.2	-	-	542.1	-	-	3.16	-	-	9.72	12.88	
T52-EXZP	Wed-2/7	09:30	TE3	U698	82.35	-	11.28	-	-	1.62	-	-	5.62	-	-	820.9	-	-	519.4	-	-	0.61	-	-	1.34	1.95	
T52-EXZP	Wed-2/7	11:30	TE3	U701	75.17	-	11.34	-	-	1.11	-	-	3.44	-	-	779.5	-	-	523.3	-	-	0.44	-	-	0.91	1.34	
Averages																					-	-	0.52	-	-	1.13	1.65
Plant air sample (near injector)																					WS Out	WS Out	WS Out	WS Out	WS Out	WS Out	WS Out
FB-1	Wed-2/7	13:00	TE3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Hg(0) spk @SDA In:(DRG)																					WS Out	WS Out	WS Out	WS Out	WS Out	WS Out	WS Out
T53-EXZP	Tue-2/13	09:00	TE3	U704	92.11	-	9.77	-	-	3.91	-	-	4.39	-	-	786.3	-	-	527.6	-	-	1.26	-	-	0.95	2.22	
T53-EXZP	Tue-2/13	10:45	TE3	U707	85.17	-	9.50	-	-	1.34	-	-	3.05	-	-	823.3	-	-	556.9	-	-	0.49	-	-	0.76	1.25	
T53-EXZP	Tue-2/13	12:30	TE3	U710	90.63	-	9.97	-	-	2.51	-	-	7.61	-	-	622.0	-	-	429.7	-	-	0.65	-	-	1.37	2.02	
Averages																					-	-	0.80	-	-	1.02	1.83
Plant air sample (injector vent)																					WS Out	WS Out	WS Out	WS Out	WS Out	WS Out	WS Out
FB-2	Tue-2/13	08:00	TE3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Hg(0) spk @SDA In:(DRG), low temp																					WS Out	WS Out	WS Out	WS Out	WS Out	WS Out	WS Out
T54-EXZP	Wed-2/14	07:45	TE3	U713	80.23	-	11.17	-	-	1.02	-	-	4.69	-	-	796.4	-	-	588.8	-	-	0.38	-	-	1.30	1.69	
T54-EXZP	Wed-2/14	09:30	TE3	U716	79.19	-	11.38	-	-	1.22	-	-	4.82	-	-	734.1	-	-	517.4	-	-	0.43	-	-	1.19	1.62	
T54-EXZP	Wed-2/14	11:45	TE3	U719	72.23	-	11.47	-	-	1.13	-	-	4.21	-	-	754.2	-	-	595.0	-	-	0.45	-	-	1.31	1.76	
Averages																					-	-	0.42	-	-	1.27	1.69

*Shaded areas indicate sampling problems. H=Peroxide. TE1=Tris(EDTA)(1mM). TE3=Tris(EDTA)(10mM). a=Spike total calculated from WS In and DRG. b=Removal calculated from CRG and WS Out. c=gas volumes assumed.

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

Test ID	Date	Start Time	Other Imp. Cont.	ID	Gas Volume (dscf)	Moisture (% H2O)	Out 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 (μg/Nm3)	Other [Hg] In Gas (μg/Nm3)	Other [Hg] In Gas (μg/Nm3)	H2O2 [Hg] In Gas (μg/Nm3)	H2O2 [Hg] In Gas (μg/Nm3)	KMnO4 [Hg] In Gas (μg/Nm3)	Total [Hg] In Gas (μg/Nm3)	
Hg(0) spk @PJFF Fan																					WS Out	WS Out	WS Out	WS Out	WS Out	WS Out	WS Out
T51-EXZP1	Thu-2/15	07:45	TE3	U722	91.29	-	11.50	-	-	5.21	-	-	25.95	-	-	751.0	-	-	494.8	-	-	1.62	-	-	5.33	6.95	
T51-EXZP1	Thu-2/15	09:45	TE3	U725	90.26	-	11.89	-	-	1.26	-	-	32.55	-	-	743.4	-	-	484.3	-	-	0.39	-	-	6.62	7.01	
T51-EXZP1	Thu-2/15	11:50	TE3	U728	77.22	-	11.47	-	-	1.02	-	-	9.56	-	-	734.4	-	-	517.8	-	-	0.37	-	-	2.43	2.80	
Averages																								1.01		5.97	6.98
Hg(0) spk @PJFF Fan																					WS Out	WS Out	WS Out	WS Out	WS Out	WS Out	WS Out
T51-EXZP2	Fri-2/16	08:30	TE3	U731	82.25	-	11.56	-	-	6.51	-	-	47.30	-	-	682.5	-	-	481.3	-	-	2.05	-	-	10.49	12.53	
T51-EXZP2	Fri-2/16	10:30	TE3	U734	91.27	-	11.75	-	-	1.31	-	-	49.20	-	-	742.2	-	-	498.7	-	-	0.40	-	-	10.18	10.59	
T51-EXZP2	Fri-2/16	12:30	TE3	U737	76.41	-	11.15	-	-	0.75	-	-	34.90	-	-	663.2	-	-	543.4	-	-	0.25	-	-	9.40	9.65	
Averages																								0.90		10.02	10.92
Hg(0) spk @SDA In																											
T63-ESD	Mon-2/19	08:00	TE3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T63-ESD	Mon-2/19	09:00	TE3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T63-ESD	Mon-2/19	10:15	TE3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T63-ESD	Mon-2/19	11:30	TE3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Averages																											
Field Blank																											
FB-3	Mon-2/19	13:00	TE3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Impinger Blank																											
Imp-1	Mon-2/19	13:00	TE3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Hg(0) spk @DRG, PHV simulation																					WS Out	WS Out	WS Out	WS Out	WS Out	WS Out	WS Out
T48-EYZ	Thu-2/22	08:00	TE3	U668	89.25	-	11.51	-	-	5.76	-	-	22.00	-	-	754.8	-	-	507.3	-	-	1.85	-	-	4.74	6.58	
T48-EYZ	Thu-2/22	09:30	TE3	U671	91.06	-	11.62	-	-	4.22	-	-	18.20	-	-	786.3	-	-	529.8	-	-	1.38	-	-	4.01	5.39	
T48-EYZ	Thu-2/22	11:30	TE3	U674	104.08	-	11.47	-	-	5.08	-	-	18.20	-	-	793.8	-	-	509.5	-	-	1.47	-	-	3.38	4.84	
Averages																								1.42		3.69	5.12
Hg(0) spk @DRG																											
T64-EDRG	Fri-2/23	08:00	TE3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T64-EDRG	Fri-2/23	09:00	TE3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T64-EDRG	Fri-2/23	09:45	TE3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T64-EDRG	Fri-2/23	10:30	TE3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Averages																											
Hg(0) spk @FF Fan (post ESP)																					WS In	WS In	WS In	WS In	WS In	WS In	WS In
T58R-EXY	Mon-2/26	08:00	TE3	U756	29.91	-	10.54	-	-	14.73	-	-	15.70	-	-	590.6	-	-	491.7	-	-	11.02	-	-	9.78	20.80	
T58R-EXY	Mon-2/26	09:00	TE3	U759	29.62	-	10.00	-	-	13.77	-	-	16.40	-	-	605.3	-	-	495.1	-	-	10.66	-	-	10.38	21.04	
T58R-EXY	Mon-2/26	10:00	TE3	U762	28.95	-	9.81	-	-	14.92	-	-	15.90	-	-	563.6	-	-	505.2	-	-	11.00	-	-	10.51	21.51	
Averages																								10.89		10.22	21.12
Hg(0) spk @FF Fan, Heater On																					WS In	WS In	WS In	WS In	WS In	WS In	WS In
T59-EXY	Tue-2/27	08:00	TE3	U765	29.72	-	9.45	-	-	14.00	-	-	16.60	-	-	573.2	-	-	491.3	-	-	10.23	-	-	10.40	20.62	
T59-EXY	Tue-2/27	08:45	TE3	U768	30.12	-	9.75	-	-	15.80	-	-	18.30	-	-	514.5	-	-	467.2	-	-	10.23	-	-	10.75	20.98	
T59-EXY	Tue-2/27	09:30	TE3	U771	32.42	-	10.17	-	-	14.20	-	-	16.30	-	-	559.7	-	-	543.5	-	-	9.29	-	-	10.35	19.64	
Averages																								9.91		10.50	20.41

*Shaded areas indicate sampling problems. H=Peroxide. TE1=Tris/EDTA(1mM). TE3=Tris/EDTA(10mM). a=Spike total calculated from WS In and DRG. b=Removal calculated from CRG and WS Out. c=gas volumes assumed.

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

Test ID	Date	Start Time	Other Imp. Cont.	ID	Gas Volume (dscf)	Moisture (% H ₂ O)	Out O ₂ (%)	Solid Hg Sample [Hg] (ppm)	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)	Solid Hg Sample Mass (g)	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)	Solid Hg In Gas [Hg] (µg/Nm ³)	Other In Gas [Hg] (µg/Nm ³)	Other In Gas [Hg] (µg/Nm ³)	H ₂ O ₂ 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)
<i>Hg(0) spk @FF Fan, SO₂ Low</i>																					WS In	WS In	WS In	WS In	WS In	WS In
T60-EXY	Wed-2/28	08:00	TE3	U774	27.80	-	9.76	-	-	12.20	-	-	16.10	-	-	576.1	-	-	517.2	-	-	9.58	-	-	11.35	20.92
T60-EXY	Wed-2/28	08:45	TE3	U777	27.77	-	9.47	-	-	12.50	-	-	16.70	-	-	604.5	-	-	507.7	-	-	10.31	-	-	11.57	21.87
T60-EXY	Wed-2/28	09:30	TE3	U780	27.85	-	9.18	-	-	12.10	-	-	14.30	-	-	612.0	-	-	597.2	-	-	10.07	-	-	11.62	21.69
<i>Averages</i>																						9.99			11.51	21.50
<i>Hg(0) spk @FF Fan, SO₂ High</i>																					WS In	WS In	WS In	WS In	WS In	WS In
T61-EXY	Thu-2/29	06:40	TE3	U783	15.08	-	9.73	-	-	7.76	-	-	9.98	-	-	560.0	-	-	518.7	-	-	10.92	-	-	13.01	23.93
T61-EXY	Thu-2/29	07:20	TE3	U786	19.71	-	9.72	-	-	10.20	-	-	10.70	-	-	559.8	-	-	552.5	-	-	10.97	-	-	11.36	22.34
T61-EXY	Thu-2/29	08:00	TE3	U789	21.26	-	9.82	-	-	10.50	-	-	14.10	-	-	581.2	-	-	506.0	-	-	10.88	-	-	12.72	23.59
T61-EXY	Thu-2/29	08:45	H	U790	43.76	-	9.74	-	-	-	56.00	14.20	13.80	-	-	-	264.3	260.7	556.8	-	-	-	12.81	3.20	6.65	22.67
T61-EXY	Thu-2/29	09:45	H	U791	40.41	-	9.64	-	-	-	55.15	15.80	12.70	-	-	-	242.7	223.6	511.5	-	-	-	12.55	3.31	6.09	21.95
<i>Averages</i>																						10.92			12.36	23.29

*Shaded areas indicate sampling problems. H=Peroxide. TE1=Tris/EDTA(1mM). TE3=Tris/EDTA(10mM). a=Spike total calculated from WS In and DRG. b=Removal calculated from CRG and WS Out. c=gas volumes assumed

ECTC Pilot Trace Elements Testing Mercury Gas Sampling Results Removal Summary

			Other										H2O2					KMnO4					Total Vapor				
Test ID	Date	Start Time	Other Imp. Cont.	Pre-Spike Inlet (µg/Nm3)	Post-Spike Inlet (µg/Nm3)	Outlet [Hg] (µg/Nm3)	Hg Spiked (µg/Nm3)	Hg Removal (%)	Pre-Spike Inlet (µg/Nm3)	Post-Spike Inlet (µg/Nm3)	Outlet [Hg] (µg/Nm3)	Hg Spiked (µg/Nm3)	Hg Removal (%)	Pre-Spike Inlet (µg/Nm3)	Post-Spike Inlet (µg/Nm3)	Outlet [Hg] (µg/Nm3)	Hg Spiked (µg/Nm3)	Hg Removal (%)	Pre-Spike Inlet (µg/Nm3)	Post-Spike Inlet (µg/Nm3)	Outlet [Hg] (µg/Nm3)	Total Hg Spiked (µg/Nm3)	Hg Removal (%)				
Hg(0) spk @PJFF Fan				SDA In	CRG	WS Out								SDA In	CRG	WS Out			SDA In	CRG	WS Out						
T51-EXZP1	Thu-2/15	07:45	TE3	5.12	13.52	2.73	8.40	79.8b	-	-	-	-	-	0.72	9.88	8.97	9.16	9.2b	5.84	23.40	11.71	17.56	50.0b				
T51-EXZP1	Thu-2/15	09:45	TE3	5.24	10.80	0.69	5.56	93.6b	-	-	-	-	-	0.45	12.73	11.62	12.28	8.7b	5.69	23.54	12.31	17.84	47.7b				
T51-EXZP1	Thu-2/15	11:50	TE3	6.43	9.84	0.62	3.42	93.7b	-	-	-	-	-	0.56	8.27	4.08	7.71	50.7b	6.99	18.12	4.69	11.13	74.1b				
Averages				5.60	12.16	1.71	6.98	86.7b						0.58	11.31	10.30	10.72	9.0b	6.18	23.47	12.01	17.70	48.8b				
Hg(0) spk @PJFF Fan				SDA In	CRG	WS Out								SDA In	CRG	WS Out			SDA In	CRG	WS Out						
T51-EXZP2	Fri-2/16	08:30	TE3	5.13	14.17	3.47	9.05	75.5b	-	-	-	-	-	0.76	21.08	17.77	20.32	15.7b	5.88	35.25	21.24	29.36	39.7b				
T51-EXZP2	Fri-2/16	10:30	TE3	6.47	13.87	0.70	7.40	95.0b	-	-	-	-	-	0.46	22.17	17.62	21.71	20.5b	6.93	36.04	18.31	29.12	49.2b				
T51-EXZP2	Fri-2/16	12:30	TE3	6.48	12.76	0.40	6.28	96.9b	-	-	-	-	-	0.44	20.13	15.27	19.69	24.1b	6.92	32.89	15.67	25.97	52.3b				
Averages				6.03	13.60	1.52	7.58	89.1b						0.55	21.13	16.89	20.57	20.1b	6.58	34.73	18.41	28.15	47.1b				
Hg(0) spk @SDA In				SDA In	SDA Out	-								SDA In	SDA Out	-			SDA In	SDA Out	-						
T63-ESD	Mon-2/19	08:00	TE3	9.99	24.97	-	14.98	-	-	-	-	-	-	1.09	13.18	-	12.09	-	11.08	38.15	-	27.06	-				
T63-ESD	Mon-2/19	09:00	TE3	11.54	28.75	-	17.22	-	-	-	-	-	-	1.22	7.87	-	6.65	-	12.76	36.63	-	23.87	-				
T63-ESD	Mon-2/19	10:15	TE3	10.16	26.25	-	16.08	-	-	-	-	-	-	1.26	12.50	-	11.24	-	11.42	38.75	-	27.33	-				
T63-ESD	Mon-2/19	11:30	TE3	8.42	20.00	-	11.58	-	-	-	-	-	-	1.22	10.92	-	9.71	-	9.64	30.93	-	21.29	-				
Averages				10.03	24.99		14.97							1.20	11.12		9.92		11.23	36.11		24.89					
Field Blank																											
FB-3	Mon-2/19	13:00	TE3	<0.18 c	-	-	-	-	-	-	-	-	-	<0.03 c	-	-	-	-	<0.21 c	-	-	-	-				
Implinger Blank																											
Imp-1	Mon-2/19	13:00	TE3	0.13 c	-	-	-	-	-	-	-	-	-	<0.03 c	-	-	-	-	0.16 c	-	-	-	-				
Hg(0) spk @DRG, PHV simulation				DRG	WS In	WS Out								DRG	WS In	WS Out			DRG	WS In	WS Out						
T48-EYZ	Thu-2/22	08:00	TE3	41.20	59.30	3.11	18.10	94.8	-	-	-	-	-	16.17	73.61	7.99	57.44	89.1	57.37	132.91	11.10	75.54	91.6				
T48-EYZ	Thu-2/22	09:30	TE3	15.92	32.32	2.35	16.40	92.7	-	-	-	-	-	3.97	8.39	6.84	4.42	18.5	19.89	40.72	9.20	20.83	77.4				
T48-EYZ	Thu-2/22	11:30	TE3	14.48	34.95	2.46	20.47	92.9	-	-	-	-	-	3.27	6.56	5.67	3.28	13.6	17.75	41.51	8.13	23.75	80.4				
Averages				15.20	33.64	2.41	18.44	92.83						3.62	7.47	6.25	3.85	16.01	18.82	41.11	8.66	22.29	78.9				
Hg(0) spk @DRG				DRG#1	DRG#2	-								DRG#1	DRG#2	-			DRG#1	DRG#2	-						
T64-EDRG	Fri-2/23	08:00	TE3	10.69	13.21	-	2.52	-	-	-	-	-	-	4.01	13.25	-	9.24	-	14.70	26.45	-	11.76	-				
T64-EDRG	Fri-2/23	09:00	TE3	10.20	10.43	-	0.23	-	-	-	-	-	-	4.07	13.77	-	9.70	-	14.27	24.20	-	9.93	-				
T64-EDRG	Fri-2/23	09:45	TE3	8.91	11.17	-	2.26	-	-	-	-	-	-	3.21	14.33	-	11.12	-	12.13	25.50	-	13.37	-				
T64-EDRG	Fri-2/23	10:30	TE3	9.57	11.31	-	1.75	-	-	-	-	-	-	2.66	10.10	-	7.44	-	12.23	21.42	-	9.19	-				
Averages				9.84	11.53		1.69							3.49	12.86		9.37		13.33	24.39		11.06					
Hg(0) spk @FF Fan (post ESP)				DRG	CRG	WS In								DRG	CRG	WS In			DRG	CRG	WS In						
T58R-EXY	Mon-2/26	08:00	TE3	7.10	14.36	16.86	7.26	-	-	-	-	-	-	4.39	17.26	14.96	12.87	-	11.49	31.62	31.81	20.13	-				
T58R-EXY	Mon-2/26	09:00	TE3	8.18	14.06	15.50	5.87	-	-	-	-	-	-	2.51	16.90	15.10	14.39	-	10.70	30.96	30.61	20.26	-				
T58R-EXY	Mon-2/26	10:00	TE3	9.48	13.47	15.73	3.99	-	-	-	-	-	-	1.67	17.21	15.03	15.53	-	11.15	30.68	30.76	19.53	-				
Averages				8.25	13.96	16.03	5.71							2.86	17.12	15.03	14.27		11.11	31.09	31.06	19.97					
Hg(0) spk @FF Fan, Heater On				DRG	CRG	WS In								DRG	CRG	WS In			DRG	CRG	WS In						
T59-EXY	Tue-2/27	08:00	TE3	6.89	14.69	14.17	7.80	-	-	-	-	-	-	3.11	16.50	14.40	13.39	-	10.00	31.19	28.57	21.19	-				
T59-EXY	Tue-2/27	08:45	TE3	7.31	12.41	14.54	5.11	-	-	-	-	-	-	2.50	16.60	15.30	14.10	-	9.81	29.01	29.84	19.20	-				
T59-EXY	Tue-2/27	09:30	TE3	7.95	13.87	13.72	5.93	-	-	-	-	-	-	2.62	17.65	15.29	15.03	-	10.57	31.53	29.01	20.96	-				
Averages				7.38	13.66	14.14	6.28							2.74	16.92	15.00	14.17		10.12	30.57	29.14	20.45					

*Shaded areas indicate sampling problems. H=Peroxide. TE1=Tris/EDTA(1mM). TE3=Tris/EDTA(10mM). a=Spike total calculated from WS In and DRG. b=Removal calculated from CRG and WS Out. c=gas volumes assumed.

ECTC Pilot Trace Elements Testing
Mercury Gas Sampling Results
Removal Summary

			Other					H2O2					KMnO4					Total Vapor						
Test ID	Date	Start Time	Other Imp. Cont.	Pre-Spike Inlet (µg/Nm3)	Post-Spike Inlet (µg/Nm3)	Outlet [Hg] (µg/Nm3)	Hg Spiked (µg/Nm3)	Hg Removal (%)	Pre-Spike Inlet (µg/Nm3)	Post-Spike Inlet (µg/Nm3)	Outlet [Hg] (µg/Nm3)	Hg Spiked (µg/Nm3)	Hg Removal (%)	Pre-Spike Inlet (µg/Nm3)	Post-Spike Inlet (µg/Nm3)	Outlet [Hg] (µg/Nm3)	Hg Spiked (µg/Nm3)	Hg Removal (%)	Pre-Spike Inlet (µg/Nm3)	Post-Spike Inlet (µg/Nm3)	Outlet [Hg] (µg/Nm3)	Total Hg Spiked (µg/Nm3)	Hg Removal (%)	
Hg(0) spk @FF Fan, SO2 Low																								
T60-EXY	Wed-2/28	08:00	TE3	DRG	CRG	WS In								DRG	CRG	WS In			DRG	CRG	WS In			
				8.59	15.84	13.63	7.25	-	-	-	-	-	-	2.52	17.98	16.15	15.46	-	11.11	33.82	29.78	22.71	-	
T60-EXY	Wed-2/28	08:45	TE3	8.77	13.14	14.30	4.37	-	-	-	-	-	-	1.33	17.83	16.05	16.50	-	10.10	30.97	30.35	20.87	-	
T60-EXY	Wed-2/28	09:30	TE3	8.68	12.09	13.64	3.40	-	-	-	-	-	-	0.89	17.74	15.73	16.85	-	9.57	29.83	29.36	20.26	-	
Averages				8.68	13.69	13.86	5.01							1.58	17.85	15.98	16.27		10.26	31.54	29.83	21.28		
Hg(0) spk @FF Fan, SO2 High																								
T61-EXY	Thu-2/29	06:40	TE3	DRG	CRG	WS In								DRG	CRG	WS In			DRG	CRG	WS In			
				8.81	15.82	15.50	7.00	-	-	-	-	-	-	2.82	19.61	18.47	16.79	-	11.64	35.43	33.97	23.79	-	
T61-EXY	Thu-2/29	07:20	TE3	8.75	14.84	15.57	6.08	-	-	-	-	-	-	2.34	17.62	16.12	15.28	-	11.10	32.46	31.68	21.37	-	
T61-EXY	Thu-2/29	08:00	TE3	10.81	14.56	15.57	3.76	-	-	-	-	-	-	1.61	18.84	18.20	17.23	-	12.42	33.40	33.76	20.98	-	
T61-EXY	Thu-2/29	08:45	H	-	-	-	-	-	-	-	22.76	-	-	-	-	9.45	-	-	-	-	-	32.21	-	-
T61-EXY	Thu-2/29	09:45	H	-	-	-	-	-	-	-	22.34	-	-	-	-	8.58	-	-	-	-	-	30.91	-	-
Averages				9.46	15.07	15.54	5.62							2.26	18.69	17.59	16.43		11.72	33.77	33.14	22.05		

*Shaded areas indicate sampling problems. H=Peroxide. TE1=Tris/EDTA(1mM). TE3=Tris/EDTA(10mM). a=Spike total calculated from WS In and DRG. b=Removal calculated from CRG and WS Out. c=gas volumes assumed.

Test	ID	Date	Start Imp.	Time Cont.	Other	Actual	Spike Recovery	Spike Capture	Removal Efficiency	Total Hg Capture (CRG)	Total Hg Capture (WIS Inlet)	Total Hg Capture (WIS Outlet)
Spike Recovery	T56-EXY	Tue-1/30	08:00	TE1	34.0a	13.70	248.4a	57.0a	43.0a	73.6	21.8	85.0
		Tue-1/30	08:00	TE1	13.5a	13.70	98.8a	89.3a	10.7a	60.6	34.7	58.2
		Tue-1/30	09:30	TE1	12.9a	13.70	94.3a	90.7a	9.3a	73.6	21.8	85.0
		Tue-1/30	09:30	TE1	12.9a	13.70	94.3a	90.7a	9.3a	73.6	21.8	85.0
		Tue-1/30	09:30	TE1	12.9a	13.70	94.3a	90.7a	9.3a	73.6	21.8	85.0
		Tue-1/30	09:30	TE1	12.9a	13.70	94.3a	90.7a	9.3a	73.6	21.8	85.0
		Tue-1/30	09:30	TE1	12.9a	13.70	94.3a	90.7a	9.3a	73.6	21.8	85.0
		Tue-1/30	09:30	TE1	12.9a	13.70	94.3a	90.7a	9.3a	73.6	21.8	85.0
		Tue-1/30	09:30	TE1	12.9a	13.70	94.3a	90.7a	9.3a	73.6	21.8	85.0
		Tue-1/30	09:30	TE1	12.9a	13.70	94.3a	90.7a	9.3a	73.6	21.8	85.0
Spike Capture	T56-EXY	Tue-1/30	08:00	TE1	9.8a	13.70	71.7a	90.7a	9.3a	73.6	21.8	85.0
		Tue-1/30	08:00	TE1	9.8a	13.70	71.7a	90.7a	9.3a	73.6	21.8	85.0
		Tue-1/30	08:00	TE1	9.8a	13.70	71.7a	90.7a	9.3a	73.6	21.8	85.0
		Tue-1/30	08:00	TE1	9.8a	13.70	71.7a	90.7a	9.3a	73.6	21.8	85.0
		Tue-1/30	08:00	TE1	9.8a	13.70	71.7a	90.7a	9.3a	73.6	21.8	85.0
		Tue-1/30	08:00	TE1	9.8a	13.70	71.7a	90.7a	9.3a	73.6	21.8	85.0
		Tue-1/30	08:00	TE1	9.8a	13.70	71.7a	90.7a	9.3a	73.6	21.8	85.0
		Tue-1/30	08:00	TE1	9.8a	13.70	71.7a	90.7a	9.3a	73.6	21.8	85.0
		Tue-1/30	08:00	TE1	9.8a	13.70	71.7a	90.7a	9.3a	73.6	21.8	85.0
		Tue-1/30	08:00	TE1	9.8a	13.70	71.7a	90.7a	9.3a	73.6	21.8	85.0
Removal Efficiency	T56-EXY	Tue-1/30	08:00	TE1	9.8a	13.70	71.7a	90.7a	9.3a	73.6	21.8	85.0
		Tue-1/30	08:00	TE1	9.8a	13.70	71.7a	90.7a	9.3a	73.6	21.8	85.0
		Tue-1/30	08:00	TE1	9.8a	13.70	71.7a	90.7a	9.3a	73.6	21.8	85.0
		Tue-1/30	08:00	TE1	9.8a	13.70	71.7a	90.7a	9.3a	73.6	21.8	85.0
		Tue-1/30	08:00	TE1	9.8a	13.70	71.7a	90.7a	9.3a	73.6	21.8	85.0
		Tue-1/30	08:00	TE1	9.8a	13.70	71.7a	90.7a	9.3a	73.6	21.8	85.0
		Tue-1/30	08:00	TE1	9.8a	13.70	71.7a	90.7a	9.3a	73.6	21.8	85.0
		Tue-1/30	08:00	TE1	9.8a	13.70	71.7a	90.7a	9.3a	73.6	21.8	85.0
		Tue-1/30	08:00	TE1	9.8a	13.70	71.7a	90.7a	9.3a	73.6	21.8	85.0
		Tue-1/30	08:00	TE1	9.8a	13.70	71.7a	90.7a	9.3a	73.6	21.8	85.0
Total Hg Capture (CRG)	T56-EXY	Tue-1/30	08:00	TE1	9.8a	13.70	71.7a	90.7a	9.3a	73.6	21.8	85.0
		Tue-1/30	08:00	TE1	9.8a	13.70	71.7a	90.7a	9.3a	7		

Spike Recovery										Spike Capture (By Impinger)					Removal Efficiency (By Impinger)					Total Hg Capture (CRG)					Total Hg Capture (WS Inlet)					Total Hg Capture (WS Outlet)				
Test ID	Date	Start Time	Other Imp. Cont.	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 (%)				
Hg(0) spk @PJFF Fan																(By Impinger)					(By Impinger)					(By Impinger)								
T51-EXZP1	Thu-2/15	07:45	TE3	10.19	11.81	86.2	-	47.8	-	-	52.2	-	-	-	-	SDA In	SDA In	SDA In	SDA In	SDA In	CRG	CRG	CRG	CRG	CRG	WS Out	WS Out	WS Out	WS Out	WS Out				
T51-EXZP1	Thu-2/15	09:45	TE3	9.91	11.81	83.9	-	31.2	-	-	68.8	-	-	-	-	87.7	-	-	12.3	-	57.8	-	-	42.2	-	23.4	-	-	76.6					
T51-EXZP1	Thu-2/15	11:50	TE3	6.47	11.81	54.8	-	30.7	-	-	69.3	-	-	-	-	92.1	-	-	7.9	-	45.9	-	-	54.1	-	5.6	-	-	94.4					
Averages				10.0		85.1		39.5			60.5					91.9			8.1		54.3			45.7		13.1			86.9					
Hg(0) spk @PJFF Fan																(By Impinger)					(By Impinger)					(By Impinger)								
T51-EXZP2	Fri-2/16	08:30	TE3	17.01	15.06	113.0	-	30.8	-	-	69.2	-	-	-	-	SDA In	SDA In	SDA In	SDA In	SDA In	CRG	CRG	CRG	CRG	CRG	WS Out	WS Out	WS Out	WS Out	WS Out				
T51-EXZP2	Fri-2/16	10:30	TE3	16.27	15.06	108.0	-	25.4	-	-	74.6	-	-	-	-	87.1	-	-	12.9	-	40.2	-	-	59.8	-	16.3	-	-	83.7					
T51-EXZP2	Fri-2/16	12:30	TE3	15.34	15.06	101.8	-	24.2	-	-	75.8	-	-	-	-	93.4	-	-	6.6	-	38.5	-	-	61.5	-	3.8	-	-	96.2					
Averages				16.2		107.6		26.8			73.2					93.6			6.4		38.8			61.2		2.6	-	-	97.4					
Hg(0) spk @SDA In																(By Impinger)					(By Impinger)					(By Impinger)								
T63-ESD	Mon-2/19	08:00	TE3	16.98	14.74	115.2	-	55.3	-	-	44.7	-	-	-	-	SDA In	SDA In	SDA In	SDA In	SDA In	SDA Out	SDA Out	SDA Out	SDA Out	SDA Out	WS Out	WS Out	WS Out	WS Out	WS Out				
T63-ESD	Mon-2/19	09:00	TE3	15.07	14.74	102.2	-	72.1	-	-	27.9	-	-	-	-	90.2	-	-	9.8	-	65.5	-	-	34.5	-	-	-	-	-					
T63-ESD	Mon-2/19	10:15	TE3	17.47	14.74	118.5	-	58.9	-	-	41.1	-	-	-	-	90.4	-	-	9.6	-	78.5	-	-	21.5	-	-	-	-	-					
T63-ESD	Mon-2/19	11:30	TE3	14.09	14.74	95.6	-	54.4	-	-	45.6	-	-	-	-	89.0	-	-	11.0	-	67.7	-	-	32.3	-	-	-	-	-					
Averages				15.9		107.9		60.2			39.8					87.4			12.6		64.7			35.3		-	-	-	-					
Field Blank																																		
FB-3	Mon-2/19	13:00	TE3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Impinger Blank																																		
Imp-1	Mon-2/19	13:00	TE3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Hg(0) spk @DRG, PHV simulation																(By Impinger)					(By Impinger)					(By Impinger)								
T48-EYZ	Thu-2/22	08:00	TE3	43.81	8.72	502.4	-	24.0	-	-	76.0	-	-	-	-	DRG	DRG	DRG	DRG	DRG	WS In	WS In	WS In	WS In	WS In	WS Out	WS Out	WS Out	WS Out	WS Out				
T48-EYZ	Thu-2/22	09:30	TE3	12.21	8.72	140.0	-	78.8	-	-	21.2	-	-	-	-	71.8	-	-	28.2	-	44.6	-	-	55.4	-	28.0	-	-	72.0					
T48-EYZ	Thu-2/22	11:30	TE3	13.44	8.72	154.1	-	86.2	-	-	13.8	-	-	-	-	80.0	-	-	20.0	-	79.4	-	-	20.6	-	25.6	-	-	74.4					
Averages				12.8		147.0		82.5			17.5					81.6			18.4		84.2			15.8		30.3	-	-	69.7					
Hg(0) spk @DRG																(By Impinger)					(By Impinger)					(By Impinger)								
T64-EDRG	Fri-2/23	08:00	TE3	9.83	14.74	66.7	-	21.4	-	-	78.6	-	-	-	-	DRG#1	DRG#1	DRG#1	DRG#1	DRG#1	DRG#2	DRG#2	DRG#2	DRG#2	DRG#2	WS In	WS In	WS In	WS In	WS In				
T64-EDRG	Fri-2/23	09:00	TE3	8.95	14.74	60.7	-	2.3	-	-	97.7	-	-	-	-	72.7	-	-	27.3	-	49.9	-	-	50.1	-	-	-	-	-					
T64-EDRG	Fri-2/23	09:45	TE3	12.57	14.74	85.3	-	16.9	-	-	83.1	-	-	-	-	71.5	-	-	28.5	-	43.1	-	-	56.9	-	-	-	-	-					
T64-EDRG	Fri-2/23	10:30	TE3	8.98	14.74	60.9	-	19.0	-	-	81.0	-	-	-	-	73.5	-	-	26.5	-	43.8	-	-	56.2	-	-	-	-	-					
Averages				10.1		68.4		14.9			85.1					78.2			21.8		52.8			47.2		-	-	-	-					
Hg(0) spk @FF Fan (post ESP)																(By Impinger)					(By Impinger)					(By Impinger)								
T58R-EXY	Mon-2/26	08:00	TE3	13.16	13.71	96.0	-	36.1	-	-	63.9	-	-	-	-	DRG	DRG	DRG	DRG	DRG	CRG	CRG	CRG	CRG	CRG	WS In	WS In	WS In	WS In	WS In				
T58R-EXY	Mon-2/26	09:00	TE3	13.93	13.71	101.6	-	29.0	-	-	71.0	-	-	-	-	61.8	-	-	38.2	-	45.4	-	-	54.6	-	53.0	-	-	47.0					
T58R-EXY	Mon-2/26	10:00	TE3	13.66	13.71	99.6	-	20.5	-	-	79.5	-	-	-	-	76.5	-	-	23.5	-	45.4	-	-	54.6	-	50.7	-	-	49.3					
Averages				13.58		99.08		28.50			71.50					85.0			15.0		43.9			56.1		51.1	-	-	48.9					
Hg(0) spk @FF Fan, Heater On																(By Impinger)					(By Impinger)					(By Impinger)								
T59-EXY	Tue-2/27	08:00	TE3	15.30	12.34	124.0	-	36.8	-	-	63.2	-	-	-	-	DRG	DRG	DRG	DRG	DRG	CRG	CRG	CRG	CRG	CRG	WS In	WS In	WS In	WS In	WS In				
T59-EXY	Tue-2/27	08:45	TE3	13.50	12.34	109.4	-	26.6	-	-	73.4	-	-	-	-	68.9	-	-	31.1	-	47.1	-	-	52.9	-	49.6	-	-	50.4					
T59-EXY	Tue-2/27	09:30	TE3	14.19	12.34	115.0	-	28.3	-	-	71.7	-	-	-	-	74.5	-	-	25.5	-	42.8	-	-	57.2	-	48.7	-	-	51.3					
Averages				14.33		116.11		30.57			69.43					75.2			24.8		44.0			56.0		47.3	-	-	52.7					

*Shaded areas indicate sampling problems. H=Peroxide. TE1=Tris/EDTA(1mM). TE3=Tris/EDTA(10mM). a=Spike total calculated from WS In and DRG. b=Removal calculated from CRG and WS Out. c=gas volumes assumed.

Test ID	Date	Start Time	Other Imp. Cont.	Spike Recovery			Spike Capture (By Impinger)					Removal Efficiency (By Impinger)				Total Hg Capture (CRG)					Total Hg Capture (WS Inlet)					Total Hg Capture (WS Outlet)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
				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 (%)	(By Impinger)				(By Impinger)				(By Impinger)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
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APPENDIX D
QA/QC SUMMARY REPORT

WET SCRUBBER QA/QC SUMMARY

The objective of the wet scrubber QA/QC program is to ensure the accuracy of key process instrumentation used on the pilot , mini-pilot , and spray dryer systems. Flow control flow meters, pump flow meters, tank level monitors, and flue gas flow rates are checked approximately once per month. Errors greater than 5% generally indicate that the instrument in question should be recalibrated or cleaned. The wet-scrubber continuous emission monitors (CEMs), used to measure inlet and outlet SO₂ and O₂ levels for the pilot and mini-pilot units, are checked daily with span errors over 5% requiring an adjustment of the span potentiometer. The spray dryer CEMs are checked weekly with span errors over 5% requiring an adjustment of the span potentiometer. During tests using the spray dryer, the CEMs are checked daily. A status update for each QA/QC point out of calibration is presented below. A complete record of the process QA/QC for January and February is presented at the end of this section.

JANUARY/FEBRUARY 1996

Velocity Traverse

Several velocity traverses were performed during this two month period. The first velocity traverse completed on February 1st had an error of 7.2%, and the I&C department was notified. The differential pressure and the duct pressure were each in turn calibrated but ensuing velocity traverses showed no noticeable effect on the outcome. The I&C department then changed the throat differential pressure factor and a subsequent calibration flow check showed that the WDPF reading was within the acceptable 5% range, with an error of 2.7%.

Pilot Quench Header/Nozzle

A flow check on the pilot recycle water to the quench was completed on February 6. The first flow check revealed that the actual flow rate was low by approximately 6.8%. The second flow check verified this error by giving an actual flow rate approximately 6.3% lower than the flowmeter reading. The I&C department was notified and subsequently found a blockage in the flowmeter. After the flowmeter was cleared, another flow check was performed, yielding an acceptable error of around 2.9%.

EPRI ECTC WET PROCESS QA/QC RECORD
January/February 1995

	Date	Actual	Instrument Reading	% Error	Actual	Instrument Reading	% Error	Point ID
PILOT								
Service Water to RWWT (gpm)	1/5	2.08	2.02	-2.65				PAI004
P-RSST Level (ft.)	1/6	8.88	8.84	-0.45				PAI049
ME-RWWT Level (ft.)	1/6	3.96	3.94	-0.51				PAI024
Reagent Feed Pump (gpm)	1/9	1.03	1.02	-1.36				PAI020
P-RWST Level (ft.)	1/9	4.42	4.27	-3.51				PAI035
Velocity Traverse (scfm)	1/10	16686	16387	-1.79				
Quench (gpm)	1/13	2.20	2.19	-0.59				PAI003
Recycle Water to RWWT (gpm)	1/13	1.62	1.67	3.22				PAI021
Centrifuge Blowdown (gpm)	1/13	4.03	4.00	-0.62				PAI012
VME Wash Header #1 (gpm)	1/13	35.00	36.60	4.57				PAI022
VME Wash Header #2 (gpm)	1/13	35.28	35.80	1.47				PAI023
Velocity Traverse (scfm)	1/17	14360	14900	3.76				
Reagent Feed Pump (gpm)	1/20	1.31	1.27	-2.60				PAI020
Velocity Traverse (scfm)	1/20	10568	11300	6.93				
Velocity Traverse (scfm)	1/23	9378	9800	4.50				
P-FLRT Level(ft.)	1/30	12.42	12.18	-1.88				PAI013
Reagent Feed Pump (gpm)	1/30	1.25	1.21	-2.63	1.26	1.21	-4.13	PAI020
Velocity Traverse (scfm)	2/1	13900	14900	7.19	14052	14900	6.03	
Velocity Traverse (scfm)	2/1	13735	14900	8.48				
Velocity Traverse (scfm)	2/2	13983	14900	6.56	14470	14900	2.97	
Velocity Traverse (scfm)	2/3	12656	13000	2.72				
Quench (gpm)	2/6	3.00	3.21	6.83	3.13	3.32	6.27	PAI003
Service Water to RWWT (gpm)	2/6	2.31	2.25	-2.30				PAI004
Recycle Water to RWWT (gpm)	2/6	2.89	3.02	4.60				PAI021
Velocity Traverse (scfm)	2/7	11170	11300	1.16				
Reagent Feed Pump (gpm)	2/7	1.03	0.99	-3.84				PAI020
Blowdown to Sump (gpm)	2/10	1.05	1.00	-4.94				PAI039
Quench (gpm)	2/13	3.14	3.23	2.94				PAI003
P-FLRT Level(ft.)	2/27	11.80	11.90	0.85				PAI013
P-RWST Level (ft.)	2/27	4.21	4.17	-0.86				PAI035
ME-RWWT Level (ft.)	2/27	4.01	4.03	0.45				PAI024
Centrifuge Blowdown (gpm)	2/28	5.08	5.00	-1.67				PAI012
P-RSST Level (ft.)	2/28	5.08	5.22	2.74				PAI049

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