**Evaluation of Control Strategies to Effectively
Meet 70–90% Mercury Reduction on an Eastern
Bituminous Coal Cyclone Boiler with SCR**

Final Scientific/Technical Report for
Public Service of New Hampshire's Merrimack Station, Unit 2
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Principal Author: Tom Campbell

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ADA-ES, Inc.
8100 SouthPark Way, Unit B
Littleton, Colorado 80120
(303) 734-1727

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ABSTRACT

This is the final site report for testing conducted at Public Service of New Hampshire's (PSNH) Merrimack Unit 2 (MK2). This project was funded through the DOE/NETL Innovations for Existing Plants program. It was a Phase III project with the goal to develop mercury control technologies that can achieve 50–70% mercury capture at costs 25–50% less than baseline estimates of \$50,000–\$70,000/lb of mercury removed. While results from testing at Merrimack indicate that the DOE goal was partially achieved, further improvements in the process are recommended.

Merrimack burned a test blend of eastern bituminous and Venezuelan coals, for a target coal sulfur content of 1.2%, in its 335-MW Unit 2. The blend ratio is approximately a 50/50 split between the two coals. Various sorbent injection tests were conducted on the flue gas stream either in front of the air preheater (APH) or in between the two in-series ESPs. Initial mercury control evaluations indicated that, without SO₃ control, the sorbent concentration required to achieve 50% control would not be feasible, either economically or within constraints specific to the maximum reasonable particle loading to the ESP. Subsequently, with SO₃ control via trona injection upstream of the APH, economically feasible mercury removal rates could be achieved with PAC injection, excepting balance-of-plant concerns. The results are summarized along with the impacts of the dual injection process on the air heater, ESP operation, and particulate emissions.

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INTRODUCTION

Public Service of New Hampshire (PSNH) has worked with the New Hampshire (NH) Legislature and the NH Department of Environmental Services (DES) to review the technical feasibility and costs associated with different levels of mercury control at the company's coal-fired power plants. NH House Bill 1673, signed into law by the Governor of New Hampshire, requires by July 1, 2013, an 80% reduction of mercury emissions from PSNH's coal-fired power plants. The law provides incentives to achieve mercury reductions prior to July 1, 2013, and additional reductions after 2013. Because of early reduction language in the state regulation bill, PSNH chose to proactively address issues that many plants across the country will face over the next few years. In addition to the state rules, PSNH will have to deal with the complexity of planning for uncertain and changing federal regulations.

For instance, on February 8, 2008, the U.S. Court of Appeals for the District of Columbia (D.C.) vacated the Clean Air Mercury Rule (CAMR)¹ promulgated by EPA in March of 2005, thus removing any federal regulations that require monitoring or control of mercury from electric generating units (EGUs). Furthermore, on July 11, 2008, the D.C. Circuit vacated EPA's Clean Air Interstate Rule (CAIR). CAIR was established to permanently cap emissions of sulfur dioxide (SO₂) and nitrogen oxides (NO_x) in the eastern United States. Although CAIR was temporarily reinstated on December 23, 2008, the program will need to be revised due to the court's finding of "fundamental flaws" in the CAIR cap-and-trade provisions. The status of CAMR and CAIR, in combination with new and pending mercury control regulations, creates uncertainty in the regulatory landscape, leaving open the possibility of even more stringent mercury control requirements. Therefore, the data from this site provides additional information on options to remove mercury from plants with higher levels of SO₂ and sulfur trioxide (SO₃).

PSNH's Merrimack Station Unit 2 (MK2) is a very difficult yet important application for mercury reduction technology for a number of reasons. MK2 has a selective catalytic reduction (SCR) system for NO_x control, which has a side effect of converting some SO₂ into SO₃. Thus, the flue gas stream, which is generated from the combustion of a medium-sulfur (1.2% sulfur target) test blend coal supply, resembles that of a higher-sulfur flue gas stream in terms of the SO₃ content. In addition, typical flue gas temperatures range from 330 to 350 °F, which is in the range that detrimentally impacts activated carbon performance.

Prior to implementing the permanent compliance strategy of installing a wet scrubber in 2013, it is important to gather data and assess whether PSNH can economically achieve the early mercury reductions allowed under NH House Bill 1673 while both meeting guiding principles that include 1) integrating environmental quality, public health and safety, and economic vitality; 2) facilitating scientifically and technically sound, cost-effective, and environmentally appropriate solutions; and 3) protecting fuel diversity, and supporting PSNH's commitment to generate the low-cost, reliable energy necessary to meet customer demand.

ADA-ES, Inc., (ADA-ES) and PSNH began work on a Cooperative Agreement with the Department of Energy (DOE) in April 2006 to fully evaluate sorbent injection for mercury control at MK2. Activated carbon injection (ACI) is a relatively low capital-cost mercury control option for many electric generating units (EGU); however, the economic effectiveness

of utilizing the ACI system for EGUs that fire medium- to high-sulfur coals can be greatly reduced if high injection concentrations of sorbent are required to effectively lower mercury levels. Additionally, high sorbent injection rates can increase particulate emissions and can reduce the ability of the plant to utilize/dispose of the fly ash–activated carbon mixtures. The addition of sorbents/reagents to reduce SO_3 also adds to the particulate emissions concerns and increases the difficulty of ash disposal.

Full-scale sorbent injection tests were performed at MK2 following two approaches: the injection of a powdered activated carbon (PAC) sorbent designed to operate in an SO_3 flue gas environment and a co-benefit approach with a dual injection system designed to first limit the SO_3 levels in the flue gas and then remove the mercury via more conventional activated carbon injection. This report presents results from the evaluation test program at MK2, including 1) the effectiveness of injecting treated and untreated sorbents to control mercury, 2) co-benefits obtained through the mitigation of SO_3 , and 3) the impacts of the dual injection process on the air heater, ESP operation, and particulate emissions.

EXECUTIVE SUMMARY

The overall objective of this project was to assess the potential for significant mercury control, between 50 and 90% above baseline, by sorbent injection for the challenging technical process configuration at Public Service of New Hampshire Merrimack Station Unit 2. The primary emphasis of this project was to evaluate the performance of sorbent injection for mercury control, including the effect of co-benefits from SO₃ mitigation. This program also assessed the performance capabilities of mercury measurement techniques in a challenging flue-gas environment and the impact of activated carbon injection on fly ash disposal options.

This test program:

1. Provided the necessary data to make a well-informed decision on the levels of mercury control possible with sorbent injection:
 - a. Newly developed powdered activated carbon (PAC) sorbents do not yet have the ability to achieve high mercury removal rates, with the highest removals at 25%, in the presence of SCR-generated SO₃.
 - b. The performance of PAC can be enhanced when levels of SO₃ in the flue gas are decreased, specifically below 10 ppm, with parametric (short-term; nine hours in this case) results achieving mercury removal rates of over 70% with SO₃ at < 5 ppm.
2. Observed that long-term operation of a mercury control system with a cyclone boiler can present balance-of-plant issues that must be addressed:
 - a. Due to the low levels of fly ash generated by a cyclone boiler, injecting PAC between the ESPs can result in high levels of LOI in the ash collected, a contributing factor to ash auto-ignition.
 - b. Introducing SO₃ reduction sorbents can adversely impact the performance of a tubular air pre-heater (APH), such as potentially increasing the differential pressure across the APH.
3. Provided operating experience with a new generation of mercury continuous emissions monitors (CEMs), the Thermo Fisher Mercury Freedom System™, in a very challenging flue gas environment.
4. Enabled Public Service of New Hampshire to determine a cost-effective means to dispose of the PAC–ash mixture.
5. Analyzed the performance of two SO₃ sorbents, trona and magnesium oxide (MgO), neither of which was able to be injected long term due to balance-of-plant concerns:
 - Injection of 500 lb/hr of trona reduced the SO₃ concentration by 50%, to 7–10 ppmv measured downstream of the APH. Injection of trona at a rate of 1000 lb/hr decreased the SO₃ concentration downstream of the APH further to about 5 ppmv.
 - Injection of MgO appeared (qualitatively) to reduce SO₃ concentrations downstream of the APH.

- Injection of MgO at 180 lb/hr increased opacity from about 11% to about 17% at normal temperatures. When the cold-end average temperature was reduced, giving a stack temperature of 315 °F, the opacity decreased to about 13% at 180 lb/hr.
- Injection of trona at 500 lb/hr did not have a noticeable impact on opacity; at 625 lb/hr, there was a slight increase.

Over the course of testing from October 2006 to April 2008, the amount of mercury removed from the flue gas as a direct result of PAC and SO₃ sorbent–PAC injection was calculated to be 10.7 lbs. This removal occurred over the course of 60+ days of sorbent injection (some days are partial injection days due to parametric testing) with an average mercury removal of approximately 50% during those test days. The mercury removals calculated by year were:

- 2006: 0.2 lbs
- 2007: 6.0 lbs
- 2008: 4.5 lbs

PROJECT OBJECTIVES AND TECHNICAL APPROACH

The purpose of this project was to evaluate the long-term mercury removal capability, long-term mercury emissions variability, and O&M costs associated with sorbent injection at Public Service of New Hampshire's Merrimack Station Unit 2 (MK2). PSNH has invested in studies and a short-term (three-week), full-scale test of a brominated sorbent (July 2005). This early work suggested that mercury capture using standard and brominated carbons at MK2 would be challenging and indicated that a long-term test would be necessary to determine the capability and costs of continuous activated carbon injection. The technical challenges include high flue-gas temperature and selective catalytic reduction (SCR)-generated SO₃ concentration, both of which impede mercury capture.

For the testing at Merrimack the project objective was to assess the potential for significant mercury control, between 50 and 90% above baseline. This range was defined by the DOE Phase II Round 3 goal of achieving 50–70% capture, and the PSNH project aim of economically and effectively achieving mercury control of at least 70–90% beyond baseline capture. In support of this objective, a study was undertaken to determine if process-based changes (e.g., combustion, SCR, ESP) could be implemented to reduce sorbent requirements and improve mercury capture. Co-control of mercury and SO₃ through dual injection was evaluated, including the additional benefit of injecting SO₃ control sorbents upstream of the air pre-heater (APH) to reduce corrosion and stack flue gas temperature. CFD modeling of the PAC injection location was carried out to ensure adequate dispersion of the sorbent. Additional efforts included an assessment of the impacts of the dual injection process on the air heater, ESP operation, and particulate emissions, the impact of activated carbon injection on fly ash disposal options, and the performance capabilities of mercury measurement techniques in a challenging flue-gas environment.

To effectively accomplish the objectives and perform long-term testing at the optimum conditions, the work plan included the following series of technical tasks that are described later:

- Site Coordination, Kickoff Meetings, Develop Test Plan, and QA/QC Plan
- Design, Procure, and Install Equipment
- Field Testing
- Data Analysis
- Coal, Ash, and By-Product Sample Evaluation
- Economic Analysis
- Technology Transfer
- Management and Reporting

Importance of Testing at Merrimack Unit 2

Testing at MK2 provided important information concerning the mercury removal capability of sorbent injection in a challenging flue gas and plant configuration for which scant mercury control data exist. Specifically, testing at MK2 provided the opportunity to

increase the knowledge base in six different areas. These areas and the compelling reasons to support investment in testing at this site are identified in Table 1. The MK2 test plans are contained in Appendix A.

Table 1. Areas of Interest Tested.

Data Gap Description	Compelling Reasons for Testing
Testing of Cyclone Boiler	<ul style="list-style-type: none"> • No publicly available sorbent injection test data were available on this type of boiler firing a bituminous coal. • Represents ~ 8% of existing boilers ~ 33 GW of generation Boiler sizes: 33–1246 MW
SCR-Generated Concentration of SO ₃	<ul style="list-style-type: none"> • Test results indicated that SCR-generated SO₃ concentrations inhibit performance of conventional activated carbon;² therefore, it was important to evaluate options to counterbalance this flue gas constituent. • Results from this site will apply to boilers firing medium- and high-sulfur bituminous coals, and/or boilers with SCRs. • PSNH is evaluating technologies for SO₃ reduction that, when combined with sorbent injection, may be synergistic, resulting in co-control of mercury and SO₃.
SCR	<ul style="list-style-type: none"> • As more SCRs are put into service, it is important to gather additional information on how mercury control is affected by SCRs. • SCR-generated SO₃ concentration is very similar to the increased SO₃ seen on other units firing high-sulfur coals.
High Flue Gas Temperatures	<ul style="list-style-type: none"> • Operating temperatures entering the ESP are occasionally stratified to > 350 °F. Previous test results show that performance of untreated activated carbons on bituminous coals is negatively impacted at these temperatures. This project provided an opportunity to evaluate whether sorbents developed for SCR-generated SO₃ flue gases are effective at higher temperatures. • The combination of high temperature and SCR-generated SO₃ is particularly challenging because both result in a decrease in capacity of untreated activated carbons.
ESP	<ul style="list-style-type: none"> • Sorbent was injected between the original ESP (ESP 1) and the Supplemental ESP (ESP 2). The SCA of the supplemental (i.e., treated) ESP is 230 ft²/kacfm.
Treated Activated Carbons	<ul style="list-style-type: none"> • Testing of activated carbons treated with bromine show that activated carbons could be effective at temperatures up to 600 °F.³ It is of interest to evaluate the long-term effectiveness of these sorbents when temperatures are > 350 °F.

Merrimack Site Description

General Description of Unit 2

PSNH's Merrimack Station is located in Bow, New Hampshire. The Unit 2 boiler is a 336 MW Babcock & Wilcox (B&W) cyclone-fired unit that is firing a test blend of medium-sulfur eastern bituminous and Venezuelan coals to maintain a target goal of 1.2% S for SO₂ and mercury control. MK2 has an SCR system utilizing anhydrous ammonia injection for NO_x reduction, which is operated year-round and results in year-round NO_x emissions of 0.15 lb/MMBtu. A side effect of the SCR is the conversion of SO₂ to SO₃, which effectively creates a flue gas stream more closely resembling that created by a high-sulfur coal. The air pre-heater is a tubular, cold-side/hot-side design. Downstream of the APH, the unit is equipped with two ESPs in series for particulate control. The first, original, ESP (ESP 1) is a weighted-wire design that has a specific collection area (SCA) of 120 ft²/kacfm and has been retrofitted with Research-Cottrell rigid-discharge electrodes (RDE). The second, supplemental ESP (ESP 2), is a Southern Environmental RDE design installed in 1999 with an SCA of 230 ft²/kacfm. Flue gas is pushed through the ESPs via forced draft (FD) fans and the natural draft of the stack. The flue gas temperature is kept elevated to ensure that SO₃ does not condense and foul the APH. Flue gas temperatures are 330 to 350 °F during full load operations at the inlet to ESP 1. Figure 1 shows the Unit 2 configuration along with the injection and sampling locations. The port layout for injection and sampling is depicted in Figure 2. Testing was conducted across the full unit. Table 2 summarizes key descriptive features of MK2. A schematic of the TR sets for ESP 1 and ESP 2 is given in Figure 3 and Figure 4, respectively.

Figure 1. Layout Sketch of Merrimack Unit 2.

Figure 2. Port Layout at PSNH Merrimack Unit 2.

Figure 3. TR Setup for Original ESP (ESP 1). Each Set has Two Collection Hoppers Beneath It.

Figure 4. TR Sets for Supplemental ESP (ESP 2).

Table 2. Merrimack Key Operating Parameters.

Unit	2
Size (MW _G)	336
Test Portion (MW _G)	336
Coal	Medium-sulfur test blend of eastern bituminous and Venezuelan coals
Heating Value (as received) (BTU/lb)	13,000
Sulfur (% by weight as received)	1.2
Chlorine (ppm dry)	1000
Mercury (ppm dry)*	0.07
Particulate Control	Two cold-side ESPs in series SCA = 350 ft ² /kacfm
NO _x Control	SCR
Sulfur Control	Coal blend
Ash Reuse	Cyclone furnace reinjection or off-site beneficial reuse (concrete additive, flowable fill)

*The mercury ratio in the coal is for the typical test blend 1/1 eastern bituminous/Venezuelan.

Sorbent and Additive Injection Equipment and Location

The mercury sorbent injection system included a silo for sorbent storage, a metering system, sorbent distributors, injection grids, and interconnecting piping. The sorbent delivery system is described in greater detail in Appendix B.

Several locations for the PAC injection point were evaluated, including at the Original ESP (ESP 1) inlet, directly at the outlet of ESP 1, at the narrow duct section in between the ESPs, and at the APH inlet. Reaction Engineering International (REI) provided support to determine the best locations for the injection. Based on the CFD modeling and estimated analysis of the flue gas SO₃ levels, it was decided that the PAC injection would work best at the narrowest section of the duct run between the Original and Supplemental ESPs (ports 24 and 30–33 in Figure 2). Some parametric tests included injecting activated carbon in ports located upstream of the APH (Figure 1). The PAC sorbent injection ports were installed at the plant as part of this mercury control test program. An additional port (number 45 in Figure 2) was installed in 2Q07 to evaluate whether improving sorbent distribution would increase the mercury removal.

There were two PAC injection lance designs used at Merrimack Station. Both lance designs were located between the Original and Supplemental ESPs. Since the duct at this point was narrow (12 feet) and deep (25 feet), a typical open-ended, single lance per port design would not provide sufficient sorbent distribution along the depth of the duct. Two lance designs were evaluated during this program. In the initial design, each lance had multiple discharge nozzles (multi-hole design). Two lances were installed in each port; the first with nozzles placed to cover the upper section of the duct and the second with nozzles placed to cover the deeper section of the duct. Due to operability problems with the multi-hole design, a simpler design less prone to pluggage was later installed. The dual lance design was kept, but the ends of the multi-hole lances were cut off to prevent pluggage. The result was effectively a typical open-ended design with two lances installed in each port. The lance lengths were offset to provide better sorbent coverage.

Four injection lances to inject alkali materials for SO₃ control were located at the outlet of the SCR (two lances per side wall), upstream of the APH. New lances were installed in 2Q07 to improve sorbent distribution. These lances were installed in ports previously used by Merrimack for SO₃ control testing.

Monitoring Equipment and Locations

Two Thermo Fisher Mercury Freedom System™ continuous mercury emission monitoring systems (CEMS) were used to provide real-time feedback for the entire baseline, parametric, and extended injection test program at MK2. Additional mercury measurements were made using the Ontario Hydro (OH) method, the modified Appendix K sorbent trap method (STM), EPA Method 29 multi-metal test procedure, and EPA Method 30A instrumental reference method. Full reports from the manual testing are available in Appendix C. Descriptions of the Mercury Freedom System™ and STM techniques are provided for reference in Appendix D. Quality Assurance and Quality Control systems data are available in Appendix E.

SO₃ concentrations in the flue gas were measured by E.ON U.S. using modified EPA Method 8A controlled condensation, a manual sampling method. In addition, an in-situ monitoring device developed and supplied by Breen Energy Solutions was used to give a real-time indication of SO₃ concentration. This instrument provides real-time measurements of acid dew point temperatures and, indirectly, SO₃ concentration. This instrument is described in Appendix F.

For the test program, flue gas extraction probes for the mercury CEMS were inserted at the ESP 2 inlet (port 29) and outlet (port 37), with additional sampling for mercury conducted at various port locations from downstream of the APH to the stack. SO₃ measurements were conducted at the APH outlet, ESP 2 inlet, and ESP 2 outlet.

Sorbent Screening Device

ADA-ES has developed a sorbent screening device (SSD) that allows simultaneous comparison of several sorbents, provides an indication of the mercury removal achievable with a particular sorbent, and provides an estimate of the amount of sorbent required to achieve various mercury removal levels in a full-scale application. This device was used to screen sorbents, including developmental materials, for the co-control of mercury and SO₃ and is described in Appendix G.

CFD Modeling

REI performed a series of computational fluid dynamics (CFD) simulations to evaluate the impact of the specific injection approach on the distribution of sorbent in the duct and on the in-flight mercury removal. This evaluation guided optimization of proposed injection strategies. The computational grid used for the CFD modeling began at the outlet plenum of ESP 1 and extended to the inlet plenum of ESP 2 and included the baffles in the ESPs as well as the series of turning vanes in the transitional duct between the two ESPs. In the CFD simulations, several different configurations of injection lances were evaluated. The sorbent capacities and temperatures used in the model were chosen to correspond to conditions with and without trona injection. Further details of the methodology are in Appendix H.

Description of Field-Testing Subtasks

Field-testing of sorbent injection for mercury control covered a period of 15 months, and included in-situ mercury sorbent screening tests, co-benefit testing, baseline measurements, parametric tests, and long-term continuous injection tests. Performance was measured by obtaining plant data, such as combustion parameters; back-end plant parameters; and flue gas measurements, including real-time and periodic mercury measurements and solids samples.

Sorbent Selection and Description

During the sorbent selection phase of the project, only a few commercial sorbent producers were developing activated carbon sorbents for use in flue gas with SCR-generated SO₃ concentrations. Several sorbents were selected based on results from previous full-scale tests with similar flue gas conditions. The sorbents included the following:

- Norit DARCO[®] Hg, the benchmark, lignite-based activated carbon that has been used in most mercury sorbent injection testing to date.
- Norit DARCO[®] Hg-LH, a lignite-based activated carbon treated with bromine for improved effectiveness in low-halogen flue gases. DARCO[®] Hg-LH was selected for two reasons: it has shown a higher temperature tolerance than DARCO[®] Hg, and it has outperformed the standard PAC at previous sites with similar or higher levels of SO₃.
- Norit DARCO[®] Hg-E25c, an experimental lignite-based activated carbon treated with alkaline materials to protect the carbon from SO₃ in the flue gas.
- Norit DARCO[®] Hg-E26, an experimental lignite-based activated carbon treated with bromine for improved effectiveness in low-halogen flue gases, and alkaline materials to protect the carbon from SO₃ in the flue gas. Two versions of this sorbent were tested. Norit recommended testing the sorbent to evaluate the upper limits of performance in an SO₃ environment and assured the test team that it would be commercially available if the test results supported long-term testing using this approach.
- Norit DARCO[®] Hg-E12, an experimental lignite-based activated carbon chemically treated with basic materials to provide buffering against SO₃ condensation.
- Calgon FLUEPAC[®]-MC PLUS, a bituminous-based activated carbon treated with bromine to enhance mercury capture in the flue gas.
- Frontier GeoSciences, Inc., FGS-1, an activated carbon.

Sorbent Screening Tests

The team conducted a series of sorbent screening tests on selected mercury sorbents and SO₃ additives from October 13–25, 2006. Each test was two hours in duration. The sorbents were tested at baseline conditions and while flue gas temperatures and SO₃ mitigation injection rates were varied. Sorbent screening is conducted by running flue gas extracted from the duct through fixed beds of the selected sorbents. Results of this method of sorbent screening are good indications of full-scale performance, and allow selection of the most promising sorbents for subsequent tests.

Sample and Data Coordination

Collecting, analyzing, and archiving samples and plant operating data are key aspects of any field test program. A copy of the Sample and Data Management Plan is included in Appendix I. Table 3 presents an example of samples and data collected during testing. Solid samples of coal were collected during test days and submitted for analysis that included ultimate, proximate, and calorific analyses as well as mercury and chlorine content. Grab samples of ash were collected from the ESP hoppers each day of testing for analysis and to determine the impact on fly ash quality and quantity, as well as disposal. Ash samples from all non-ESP hopper collection devices were also collected and analyzed throughout the testing period. Ash samples were analyzed for mercury content and LOI. Samples were collected in accordance with DOE/NETL requirements. All samples analysis results are available in Appendix J.

Table 3. Data Collected during Field-Testing.

Parameter	Sample/Signal/Test	Baseline	Parametric
Coal	Batch sample	Yes	Yes
Coal	burn rate (lb/hr) quality (lb/MMBTU, % ash)	Yes	Yes
Fly Ash	Batch sample	Yes	Yes
Unit Operation	Plant signals: boiler load, etc.	Yes	Yes
Temperature	Plant signal at AH inlet and ESP inlet/outlet	Yes	Yes
Temperature	Full traverse at ESP inlet/outlet	Yes	No
Duct Gas Velocity	Full traverse at ESP inlet/outlet	Yes	No
Mercury (total and speciated)	Hg Monitors at ESP inlet/outlet	Yes	Yes
Mercury (total and speciated)	ASTM M6784-02 (Ontario Hydro) at ESP inlet/outlet	Yes (1 set)	No
Mercury (total)	STM	Yes	Yes
Particulate Emissions	EPA Method 17	Yes	No
HBr, HCl, HF, Br ₂ , Cl ₂	EPA Method 26a at ESP inlet/outlet	Yes	No
SO ₃	Controlled Condensation at ESP inlet	Yes	No
Sorbent Injection Rate	PLC, lb/min	No	Yes
Plant CEM data (NO _x , SO ₂ , CO)	Plant data – stack	Yes	Yes
Stack Opacity	Plant data – stack	Yes	Yes
Pollution Control Equipment	Plant data (Sec mA, Sec Voltage, Sparks, etc.)	Yes	Yes

Dual Injection Approach

One technique for improving mercury removal in SCR-generated SO₃ gas streams is using two sorbents: one to reduce the SO₃ concentration and one to remove mercury. This dual injection approach was especially appealing for PSNH MK2 as the plant uses a tubular APH, which limits the ability of the plant to lower flue gas temperatures due to the potential condensation of SO₃ and subsequent corrosion and fouling of the air heater. A sorbent designed to reduce SO₃ levels in the flue gas was injected upstream of the APH. A direct co-benefit of lowering SO₃ levels in the flue gas was the ability of the plant to lower the APH cold-end average (CEA) temperature by as much as 30 °F, which results in a measurable improvement in plant efficiency. In this scenario, the potential effectiveness of the PAC to lower mercury emissions is greatly enhanced because of both the lower flue gas temperatures and the lower SO₃ levels in the flue gas. Particulate emissions and ESP operation was monitored during testing to determine if injection of the sorbents affected operation.

As part of an ongoing corrosion mitigation program, PSNH has conducted short-term evaluations with several dry additives to reduce SO₃, including powdered limestone, magnesium oxide (MgO), and hydrated lime.

Reaction Engineering International led the effort to develop the test plan for evaluating the co-benefit of injecting sorbents upstream of the APH to lower SO₃ concentrations. Two SO₃-reduction sorbents were chosen for full-scale testing: MgO and sodium sesquicarbonate (trona). These two sorbents were selected based on performance criteria identified by the DOE project team. Trona was selected because it was the most effective of the carbonate-based sorbents and MgO was selected because previous tests at MK2 showed that it is an effective SO₃ reduction sorbent and is relatively benign for ash disposal. In addition to SO₃ mitigation effectiveness, a critical consideration for PSNH in selecting an SO₃-reduction sorbent was the ability of the plant to accommodate the collected sorbent with their existing plant coal combustion by-product utilization stream. With a cyclone boiler, the amount of fly ash produced is less than a pulverized coal-fired boiler; therefore, the levels of sodium in the fly ash would be significantly increased with trona injection. This would potentially present a disposal issue for the plant. However, trona was included in the test program because of its proven ability to reduce SO₃ with a minimal impact on ESP performance. No wet additives were evaluated due to the potential for deposition in the ductwork. Dual injection testing began in October 2006 and field-testing finished in March 2008. Reaction Engineering's full report is available in Appendix K.

Pre-Baseline Testing

In April 2006, the team conducted a preliminary two-day test funded by PSNH to evaluate the effect of lower flue gas temperature on SO₃ and mercury concentrations at MK2. SO₃ and mercury concentrations were measured at baseline (normal) and "lowered" flue gas temperature conditions on April 13 and April 14, respectively. Flue gas temperatures were decreased by nominally 30 °F by lowering the APH cold-end average temperatures. Mercury concentrations were measured using a modified 40CFR Part 75 Appendix K procedure. The two modifications to the procedure were to 1) use a shorter time frame to measure vapor-phase mercury than that recommended in the procedure and 2) to use a two-section STM trap as opposed to the three-section spiked trap called for in the procedure. SO₃ was measured using a series of triplicate EPA Method 8A Controlled Condensation Method tests. Coal samples and hopper samples were also taken to measure sulfur and mercury coal-bound levels and estimate native removal rates. The complete test report is available in Appendix L.

To check for stratification across the duct, temperature and velocity measurements were made in the sampling ports between the APH and the stack. Measurements were made in 36 of the 44 ports prior to baseline testing in late September 2006.

A complete traverse of the ductwork from the APH outlet to the stack using modified Appendix K sorbent traps was conducted prior to baseline testing to determine whether additional sampling would be required. The results of that testing indicated that there was good flue gas mixing downstream of ESP 1. The complete report is available in Appendix M.

Baseline Testing

Prior to the commencement of the parametric test series, a series of baseline tests was conducted the week of October 2, 2006, to characterize native mercury capture across the ESP without sorbent injection. There was no injection of any chemical additive related to the DOE test program. However, the plant continued to inject a vermiculite additive, GE FS3955, for SHRH fouling control during all test periods. Unit operation was set at conditions expected during the parametric tests. Boiler load was held constant at full-load and the air pollution equipment was operated under standard full-load conditions. Testing included:

- Controlled condensation SO_3 measurements at three locations: ESP 1 inlet (ports 5, 10, and 16), the inter-ESP duct just upstream of the inlet Hg CEM (port 28), and upstream of the outlet Hg CEM (port 35) on the stack inlet duct (see Figure 2) (Appendix N).
- Ontario Hydro (OH) mercury, modified 40CFR Part 75 Appendix K mercury, M17 particulate, and M26A halogens measurements. Test locations for the OH tests were upstream of ESP 1 (ports 1-8) and downstream of the ACI injection location, on the stack (ports 41-44). M17 and M26A tests were conducted at the same locations.
- Real-time mercury measurements using the Thermo Fisher Scientific Mercury CEMS.
- Modified Appendix K traps run in conjunction with the OH measurements.
- Coal and ash sampling.

Parametric Testing

Parametric tests were conducted at full-load conditions by directly injecting a given mercury sorbent into the flue gas ductwork upstream of ESP 2. Mercury CEMS were used to measure mercury removal. If at any time the performance of the existing pollution control equipment or outlet emissions exceeded acceptable operating limits, testing was halted. Acceptable limits were discussed and agreed upon prior to beginning injection.

Parametric test conditions are summarized in Table 4. The number of tests and parameters to be evaluated evolved as results were obtained and new information learned from other test sites. For example, based on the positive results from the sorbent screening tests with SO_3 control, several sets of parametric testing were conducted in conjunction with sorbent injection for SO_3 mitigation. The tests were divided into four conditions (I–IV):

- I. Carbon injection only, injection location between the two ESPs.
- II. Dual injection with trona for SO_3 control.
- III. Carbon injection only, upstream of the APH (recent DOE or industry tests showed some of the impacts from SO_3 could be mitigated when the injection location was moved to upstream of the APH).
- IV. Dual injection with MgO for SO_3 control.

On each parametric injection test day, one to five injection rates (or combinations of injection rates for dual injection) were tested. Once steady mercury concentrations were achieved, the results were evaluated and new injection parameters established.

Table 4. Summary of Parametric Test Conditions.

Test ID	Dates	Carbon ID	SO ₃ Sorbent	Cold-End Ave. Temp	ACI Location
I – 1	Nov. 2006	DARCO [®] Hg-LH	None	Normal	Between ESPs
I – 2	Dec. 2006	DARCO [®] Hg-LH, E-26	None	Normal	Between ESPs
I – 3	Jan. 2007	DARCO [®] Hg-LH, E-26 (Batch 2)	None	(-) 30 °F	Between ESPs
II – 1	Jan. 2007	DARCO [®] Hg	Trona	(-) 30 °F	Between ESPs
II – 2	Jan. 2007	DARCO [®] Hg-LH	Trona	(-) 30 °F	Between ESPs
III – 1	Jan. 2007	DARCO [®] Hg-LH	None	Normal	Upstream APH
IV – 1	Feb. 2007	DARCO [®] Hg-LH	MgO	Normal	Between ESPs
IV – 2	Feb. 2007	Calgon FLUEPAC [®] -MC PLUS	MgO	Normal	Between ESPs
IV – 1	Mar. 2007	DARCO [®] Hg	MgO (milled)	(-) 30 °F	Between ESPs
IV – 2	Mar. 2007	DARCO [®] Hg	MgO	(-) 30 °F	Between ESPs

Parametric testing also included an assessment of the balance-of-plant impacts related to the air heater, ESP performance, and opacity. The plant did not have the capability of automatically monitoring ESP parameters and these were not logged automatically during these tests. Instead, all ESP data were taken manually several times a day, with more frequent visual checks if parameters appeared to be changing.

Balance-of-Plant Testing

The parametric tests results were used to formulate a balance-of-plant test that consisted of a short-term continuous injection period prior to a plant outage scheduled for mid-April 2007. This approach provided the opportunity to assess the proof-of-concept of the intended long-term test regime and, if necessary, make system modifications during the outage. Three additional focal points of this continuous injection test period were to:

1. Determine any additional enhancements to mercury removal, particularly while using MgO as an SO₃ mitigation sorbent.
2. Determine the need to improve distribution of the SO₃ injection sorbent.
3. Determine the need for any changes to the new PAC injection system.

Continuous dual injection commenced March 30, 2007, with MgO and DARCO[®] Hg first followed by MgO and DARCO[®] Hg-LH. A pin milling system was leased and brought on site to evaluate the effect of milled MgO. Milling decreases particle size and increases the surface area, potentially increasing SO₃ removal effectiveness. The pin milling system was also used to evaluate milled trona with DARCO[®] Hg-LH. This test period included a short pause to allow the plant to complete source testing for New Hampshire House Bill 1673, the New Hampshire mercury reduction legislation.

Long-Term Testing

Upon completion of the parametric and balance-of-plant test series, ADA-ES compiled an informal report summarizing the results and conclusions of the testing to date. This report provided the data and analysis necessary to guide the project team and DOE in choosing the system parameters for the long-term test. The decision was complicated by the significant improvements in mercury removal performance observed during a short-term test of milled trona. Unfortunately, the on-site pin mill technology was not designed to support long-term continuous injection; therefore, milling of trona was not a viable option for long-term testing.

After approval from the DOE COR and the NH DES, Norit's DARCO[®] Hg-LH was selected as the long-term test sorbent. The initial scenario was for the test to be run continuously with injection of trona and PAC into the flue gas for a six-month period. Long-term testing was to be conducted at the optimum settings as determined by the project team based upon results from parametric tests and other considerations such as material cost and plant impacts. It was the intent of DOE that these settings represent the most cost-effective condition for mercury removal. The goal of this task was to obtain sufficient operational data on removal efficiency over an extended period, the effects on the particulate control device, effects on byproducts, and impacts to the balance-of-plant equipment to prove viability of the process and determine the process economics.

Prior to the long-term test scheduled start date of early July 2007, DOE/NETL was unable to commit to the full funding of the final phase of the program. The long-term test period was reduced in duration. The actual long-term test phase was composed of three continuous injection periods: November/December 2007, January 2008, and March 2008.

- The first continuous injection period began on November 30, 2007, and continued until December 27, 2007.
- On January 9, 2008, a short test with PAC only was conducted to evaluate a new PAC injection grid.
- On January 18, 2008, trona injection was reestablished to evaluate whether increasing or decreasing trona injection rates would affect the rate of increase of APH differential pressure.
- The second continuous injection period began on January 23, 2008, and continued until January 31, 2008.
- The third continuous injection period began on March 12, 2008, and continued until March 31, 2008. Manual testing was performed the week of March 24 and included EPA M5 particulate measurements, M26A halogen measurements (Appendix O), EPA M8A Controlled Condensation measurements of SO₃ concentrations (Appendix P), modified M30A validations of the inlet and outlet mercury CEM measurements, and modified M30B sorbent traps.

MERRIMACK UNIT 2 TEST RESULTS

The field-testing at MK2 was divided into three periods: baseline, parametric, and extended testing, including two separate test periods prior to the baseline testing. During baseline testing, no sorbent was injected into the flue gas. In between baseline and parametric testing, five sorbents were screened to evaluate their potential effectiveness for mercury control during full-scale tests. Due to technical difficulties experienced during the sorbent screening tests, results obtained were inconclusive and are not covered in detail. During parametric testing, the performance of four mercury sorbents was evaluated when these were injected between the original and supplemental ESP and when one was injected upstream of the APH. During the extended test period, the performance of one mercury sorbent was evaluated during three distinct continuous injection intervals. In addition, injection of sorbents for the reduction of SO₃ was evaluated to gain better insight into the effect of SO₃ mitigation on mercury removal. Results from each test series are included in this section. The generic calculation methodology is available in Appendix Q.

In addition to field-tests, CFD modeling studies were undertaken during field-testing to determine sorbent distribution. Results from these efforts are summarized below. Also discussed are the performance capabilities of mercury measurement techniques in challenging flue-gas environments and the impact of dual injection on the ESPs, balance-of-plant equipment, and fly ash disposal options.

Pre-Baseline Testing

Stratification Profiles

Apart from the previously discussed challenges to mercury removal due to SCR-generated levels of SO₃ and high flue gas temperatures, another concern at Merrimack was whether the ducting configuration between the ESPs would allow adequate mixing of the mercury sorbent in the flue gas and whether mercury removal would be further hindered due to significant temperature stratification. While equipment set-up, installation, and operational check-out were in progress prior to the baseline test sequence in October 2006, Air Sampling Associates, Inc., conducted a preliminary set of tests using EPA Methods 1 and 2 to establish a velocity–temperature–mercury profile at the inlet to and outlet of ESP 1, between the ESPs, at the inlet to ESP 2, at the inlet to the stack, and in the stack (see Figure 2 for port locations referenced in this section). The data were used to assure the mercury CEM extraction locations were at representative locations and to assess whether the injection grid was designed properly for good sorbent distribution.

Temperature and Velocity Profiles

Temperature and velocity traverses were conducted across the inlet and outlet of both ESPs to determine the extent of temperature and flow stratification in the duct and to determine the appropriate injection and measurement locations.

Upstream of the inlet to ESP 1, a split duct 67 feet wide by 6 feet deep, showed greater variation between ports than at different depths of a given port. Temperatures tended to be lower midway along the duct (Figure 5). This finding was confirmed by the in-situ

plant temperature monitors installed directly upstream at the APH outlet. A tubular APH, with significant air leakage (estimated at 13%) as was experienced at Merrimack, would have temperature stratification. The temperature stratification was not as high as that experienced prior to plant efforts to correct larger temperature variations during the April 2006 outage. Velocity tended to increase at greater depths, especially midway along the duct (Figure 5).

Figure 5. Temperature and Velocity Traverse at Inlet to ESP 1.

Temperatures at the outlet of ESP 1 also tended to be warmer in ports near the outlet edges of ESP 1 and cooler deeper in the duct (270 inches from the port opening), as shown in Figure 6. The average velocity at the outlet was less variable than at the inlet to ESP 1; 17.5 ± 4.3 ft/s vs. 44.9 ± 8.6 ft/s, respectively (Figure 6). A sketch of the port configuration at the outlet of ESP 1 is included in Figure 7 for reference.

Figure 6. Temperature and Velocity Traverse at the Outlet of Original ESP (ESP 1).

Figure 7. Port Configuration at the Outlet of ESP 1.

Temperatures tended to increase near the top of the duct (30–150 inches from the opening) from ports 28 to 25 (Figure 8). The velocity at 90–120 inches from the opening was fairly consistent in ports 25 through 28, with lower velocities at shallower and deeper depths as shown in Figure 8.

Figure 8. Temperature and Velocity Traverse along Duct between the ESPs.

Flue gas temperature remained cooler toward the bottom of the duct in ports 30 through 33, with the coolest temperatures near the bottom of the duct in ports 32 and 33. Velocities increased from port 30 to port 33, with the highest velocity midway down the duct (150 inches from the port opening) in port 33. These data are presented in Figure 9.

Figure 9. Temperature and Velocity Traverse at the Inter-ESP Injection Ports. Upstream of the Supplemental ESP (ESP 2).

Temperatures along the duct to the inlet to the stack were relatively uniform, though were lower at the greatest depth measured (Figure 10). The velocity profile along the duct to the stack is shown in Figure 10. Port references are included in Figure 2.

Figure 10. Temperature and Velocity Traverse along Duct to Stack.

Temperature and velocity profiles at the stack are shown in Figure 11. The temperature variation at the stack was less than 3% and the velocity variation was less than 5%.

Figure 11. Temperature and Velocity Traverse at Stack.

Sorbent Trap Measurements (STM)

Traverses were conducted by Air Sampling Associates, Inc., (ASA) and ADA-ES during pre-baseline testing using sorbent traps to determine if there was mercury stratification in the duct. ASA collected simultaneous co-located samples from selected ports at the inlet to ESP 1 at the stack at a single point in each port. Dual samples were collected as a quality assurance measure. Multiple ports were sampled to determine stratification. ADA-ES collected samples using a similar quality assurance technique (dual, co-located samples collected simultaneously) and also conducted some measurements with traps located at two locations and sampled simultaneously to determine stratification within ports.

The average mercury concentrations at different sample locations and depths are summarized in Table 5. The average mercury concentration at the inlet of ESP 1 differed from that at the stack by less than 4%. The average mercury concentration of all the STM traps (not all STM traps are listed below in Table 5) along the ducting from inlet to outlet was $7.51 \pm 0.66 \mu\text{g}/\text{m}^3$.

Table 5. Pre-Baseline Mercury Level Traversal from Inlet of ESP 1 to Stack.

Location	Date and Time	Depth (ft)	Hg ($\mu\text{g}/\text{dsm}^3$)
ESP 1 inlet (port 3)	9/29/06; 20:13–20:43	NA	7.69
ESP 1 inlet (port 7)	9/29/06; 21:16–21:46	NA	9.77
ESP 1 outlet (port 19)	9/29/06; 12:55–13:55	NA	8.17
ESP 1 outlet (port 23)	9/29/06; 07:52–08:52	NA	8.62
Inter-ESPs (port 33)	9/28/06; 15:03–16:03	5	7.37
Inter-ESPs (port 33)	9/28/06; 15:03–16:03	14	6.98
Inter-ESPs (port 32)	9/28/06; 17:28–18:28	10	7.76
Inter-ESPs (port 32)	9/28/06; 17:28–18:28	20	8.05
Inter-ESPs (port 28)	9/29/06; 11:17–12:17	NA	8.11
Stack inlet (port 36)	9/28/06; 17:21–18:21	NA	8.13
Stack inlet (port 38)	9/28/06; 15:46–16:46	NA	7.91
Stack inlet (port 37)	9/29/06; 10:29–11:29	NA	7.38
Stack	9/28/06; 11:17–12:17	NA	8.35

Note: If depth (feet) is NA, the mercury reading is an average of two traps. If a depth is indicated, the mercury reading is a single trap.

In general, the STM readings were in agreement with the inlet CEM located at the port directly upstream of the ACI ports. Some STM traps used at the inlet to ESP 1 became plugged with ash during testing and the resultant mercury concentrations were lower than expected. When the sampling run times were shortened from one hour to one-half hour, subsequent mercury measurements were consistent with the inlet mercury CEM. The majority of sorbent traps, including those taken next to the outlet CEM, read lower than the outlet CEM. The outlet CEM was biased high during several periods, as will be discussed in this report.

Thermo Fisher Mercury CEMS Performance

In September 2006, the operation of the Thermo Fisher Mercury Freedom Systems™ (Thermo CEMS) was not as well understood as it is now. Even today, in 2009, there are still operational issues that need to be addressed, although the instruments are more robust than when first placed in service. The mercury CEMS used at MK2 were first generation builds by Thermo. The two instruments were lacking the nitrogen generators, upgraded optics, improved insulation, and improved controls for pressure and temperature control that are now standard shelf items. Because of these issues, there were some consistent operational issues with the Thermo CEMS throughout the test.

The most basic issue throughout the test was the disparity in readings between the inlet and outlet CEMS. Without correction, the outlet CEMS, located at the stack inlet breeching, would consistently read higher than the inlet CEMS, located on the ducting between the two ESP units. Sorbent traps, Ontario Hydros, and Method 29 mercury measurements all demonstrated that the outlet CEMS was reading high. The calibration of the outlet CEMS changed the magnitude of the correction required, but every test over a period of two years required a correction to the outlet CEMS reading. The corrections were consistently analyzed to be a magnitude correction, most often between 0.5 to 2.0 µg/wscm. When estimating mercury removals as a result of parametric or continuous injection, the same corrective factor could be applied to the measurement from one calibration test to another. The data referenced below demonstrate the correlation between the inlet and outlet mercury CEMS during PAC injection upstream of the APH, and therefore, upstream of both CEMS sampling ports.

Figure 12. Uncorrected Mercury Outlet Data.

Figure 13. Corrected Mercury Outlet Data.

As can be viewed in Figure 12 and Figure 13, the outlet mercury CEMS was reading above the inlet mercury CEMS. Sorbent trap readings from the previous day had established a correction factor, $(-0.7 \mu\text{g/wscm})$, that appeared to correlate the data. This correction factor worked well until the next manual calibration of the system.

As time has progressed, ADA has developed much better controls on the Thermo CEMS data. ADA has developed troubleshooting algorithms to download the raw Thermo data and identify potential operational issues. In the case of PSNH, the mercury CEMS start up did not proceed as smoothly as anticipated, with losses of power and air pressure occurring during start up. These two failures probably introduced a level of contamination into the calibration line that caused a shift in calibration dependent upon calibration line humidity, ambient temperature, and supplied air pressure. As a result, the initial system calibration read low and this error followed through the program.

ADA believes that based upon the number of sorbent traps, Ontario Hydros, and M29 mercury measurements run in conjunction with the outlet mercury CEMS during the test, that the outlet mercury CEMS adjusted readings are accurate enough to provide a sound basis for developing the mercury removal levels presented in this report.

All mercury outlet CEMS readings presented in this report are adjusted mercury levels.

Baseline Mercury Removal

The initial step in the test program was to establish baseline mercury and SO₃ levels. Baseline native mercury removal across ESP 2 was less than 10% (Table 6, Figure 14). The mercury measurements were performed using two Thermo CEMS, one at the inlet to ESP 2 and one at the outlet of ESP 2, and confirmed using STM and Ontario Hydro (OH) measurements.

Figure 14 is a compilation of the pre-baseline and baseline test mercury levels. From the figure it is evident that 1) the native removal of the ash at Merrimack Unit 2 is low, generally running less than 10%; and 2) there was good correlation between the mercury CEM units, sorbent traps, and the Ontario Hydro runs. Also of note are the low elemental levels of mercury. Because MK2 has an SCR and tubular APH, the expectation was that the oxidized mercury would be the major component of the vapor-phase mercury. At MK2, oxidized mercury consistently ran well above 80%.

Two of the Ontario Hydro runs, one at the inlet and one at the outlet, are less than 6 µg/nm³ and lower than expected. The test crew experienced equipment issues at the start of both of these runs, which may have introduced error into the measurement process. However, the tests were considered valid and point out the variability that can occur with these manual measurements.

The removal data are supported by low mercury content in the fly ash samples, typically 10 ppb. This translates to an estimated mercury concentration in the flue gas of nominally 0.1 µg/m³.

Table 6. Total Baseline Mercury Measurements.

	Inlet (µg/m ³)				Outlet (µg/m ³)			
Date and Time	OH ^a	STM ^a	Coal ^b	CEM ^b	OH ^a	STM ^a	CEM ^b	CEM Corrected
10/05/06 1410-1636	7.4	7.3	8.4	8.1	4.5	7.1	9.8	8.1
10/06/06 0940-1154	7.3	7.3	NA	8.5	6.9	6.6	9.7	8.0
10/07/06 0845-1159	5.7	7.3	NA	7.1	7.4	7.7	9.7	8.0
Average	6.8	7.3	NA	7.9	6.3	7.1		8.0
Average Mercury Removal					7.3%	2.7%		0%

^a Ontario Hydro and STM measurements are µg/dscm.

^b Thermo Fisher Scientific Hg CEM measurements are µg/wscm. Coal is calculated as µg/wscm.

^c “CEM Corrected” indicates that a manual correction technique was applied because of a high bias on the Outlet mercury CEM.

Pre-Baseline and Baseline

Figure 14. Baseline Mercury Levels.

Co-Benefits Analysis

Full-scale testing has shown that SO₃ significantly impacts the performance of activated carbons for mercury control.³ At MK2, there are two sources of SO₃. The first source is the normal production from coal combustion. MK2 coordinates their test coal blend to maintain sulfur levels of approximately 1.2%. About one percent of the coal-released sulfur is converted through combustion to SO₃. The other source of SO₃ is from the SCR. When used to reduce NO_x emissions from coal-fired power plants, SCR technology can result in a fraction of the SO₂ in the flue gas being oxidized into SO₃. SO₃ can adversely affect plant operations, which can lead to air heater fouling and/or ductwork surface corrosion. Additionally, the presence of SO₃ in the flue gas can lead to the formation of visible plumes. As a result of the fouling issues, MK2 maintains a relatively high AH flue gas outlet temperature to prevent SO₃ condensation. However, the higher temperature flue gas impacts the ability of fly ash and injected PAC to remove vapor-phase mercury.³

To minimize the SO₃ production from the SCR, MK2 is replacing the current SCR catalyst beds with a newer catalyst that is designed to minimize the oxidization of SO₂ to SO₃. Another means of reducing SO₃ is to inject a sorbent into the flue gas that reacts with the SO₃.

Following baseline testing, tests were conducted to evaluate the effectiveness of alkaline sorbent injection for reducing SO₃ and improving the performance of activated carbon for mercury removal. Two sorbents were evaluated: magnesium oxide (MgO) and sodium sesquicarbonate (trona). Although the primary objective of the alkaline sorbent injection was to reduce SO₃ to improve mercury capture by activated carbon, reducing SO₃ could provide a benefit to the plant of increasing overall efficiency by allowing the APH to operate with a lower cold-end average (CEA) temperature. The impact on the ESP is discussed in the “Balance-of-Plant Impacts” section.

Sorbent Selection

MgO was selected for testing based on previous testing at Merrimack Station that indicated positive reduction in SO₃ levels. Trona was chosen as the second sorbent because it was a sodium-based compound that potentially had beneficial effects on ESP performance. Further comparison of MgO and trona includes a consideration of their properties and cost, in addition to their effectiveness at reducing SO₃. MgO is a dry sorbent with a relatively low density (25 lb/ft³). As such, it is easily handled by standard bulk conveying equipment. MgO is specified to be delivered with a particle size under 5 microns. The field test team observed that the material appears to agglomerate in transit, which could mean that the particle size delivered was larger than specified. This could potentially explain the positive effects of milling MgO in April 2007. An advantage of using MgO is that it does not limit the ability of the plant to reinject the MgO-fly ash mixture into the cyclone boiler combustion process for by-product sales. Normal means of disposal and utilization do not have a low magnesium content limit.

Trona is a dry sorbent with a higher density than MgO (75 lb/ft³). Material of this density is more difficult for standard bulk conveying equipment and required either a system specifically designed for higher density material or 24-hour coverage of the standard system. As delivered, trona has an average particle size of 30 microns. Decreasing particle size

would result in higher exposed surface area and hence increased surface capacity for adsorption. Thus, some tests were conducted with reduced particle size, achieved by milling the material. The trona injection contractor, O'Brien & Gere, selected a pin milling system capable of milling trona to below 15 microns. The milling process transferred heat from the mill to the conveying system, resulting in trona buildup and the need to stop the mill and remove hardened deposits of trona every 12 hours. Trona injection for SO₃ control limits the options for ash by-product utilization because it increases the sodium content of the fly ash. Neither the trona nor the PAC can be reinjected back to the cyclones. However, trona was less expensive than MgO to treat an equivalent amount of flue gas for SO₃ mitigation.

Lowered Flue Gas Temperature Tests

On April 13, 2006, SO₃ and mercury concentrations were measured at baseline conditions. On the following day, flue gas temperatures were decreased by nominally 30 °F by lowering the APH CEA. There were two exceptions to normal operating conditions during the test:

- The SCR setpoint was lowered from 0.35 lb NO_x/MMBtu to as low as 0.15 lb NO_x/MMBtu from 07:00 to 18:00 on April 13 due to an existing SCR operational concern. The 0.15 lb NO_x/MMBtu control point is a setpoint that is typically used, and is within SCR standard operational procedures. Higher ammonia injection rates may lead to higher ammonia slip rates.
- The fly ash reinjection system that usually operated was secured. During normal operating conditions, mercury that was entrained in the fly ash might be released during the reinjection process, thus serving as an additional source of mercury to that present in the coal being burned concurrently.

To determine whether lowering the temperature resulted in higher baseline mercury capture, the mercury measured in the coal was compared to the vapor-phase mercury measured at the stack and the mercury concentration of collected fly ash. These results are shown in Table 7. The data indicate that lowering the temperature did not result in an increase in the baseline mercury removal.

Table 7. Coal to Stack Mercury Removal at Normal and Low Temperatures.

Mercury Balance for Testing					
		Coal	Ash	STM (stack)	% Differential from Coal to Stack plus Ash
Day 1 (4/13/06) Normal Temp	lb/TBtu	5.32	0.05	5.61	-6.6
Day 2 (4/14/06) Low Flue Gas Temp	lb/TBtu	5.32*	0.04	6.28	-15.9

*Coal mercury not analyzed for 4/14/06 sample. The 4/13/07 value used for comparison.

A potential co-benefit of reducing the temperature and SO₃ levels was that the native mercury removal would increase. This was not observed and of the potential causes for failure to increase the native capture of the MK2 system may have been that the overall SO₃ levels were still too high. As discussed later in this report, measurements of SO₃ using different measurement techniques suggest that the absolute level is between 10 and 20 ppm at baseline conditions.

Effect of Alkaline Sorbents on SO₃ in Flue Gas

In 2006, E.ON Engineering used a manual sampling method to measure vapor-phase SO₃ at Unit 2. The method was a modified Controlled Condensation Method, similar to EPA Method 8A, except that the impingers for measuring SO₂ were not used, the dry gas meter was replaced by a wet gas meter, and a sampling ESP was used instead of a quartz filter. The modifications were made to allow measurement in wet stacks or where reactive (alkaline) ashes might be present in the flue gas. The ESP had a tubular design and was heated so that sulfuric-acid aerosols in the flue gas would evaporate in it and enter the impingers as gaseous SO₃. The impinger was analyzed for SO₃, which was reported on a dry basis at 3% O₂. Appendix N contains the full report.

In 2008, Platt Environmental Services measured SO₃ in the flue gas on Unit 2 during trona injection. Measurement locations included SCR inlet, SCR outlet, air preheater outlet, ESP 1 outlet, and ESP 2 outlet. The Consol Controlled Condensation Method⁴ was used to measure SO₃ and SO₂. The flue gas passed through a hot, water-cooled condenser (140 °F) loosely packed with quartz wool, and then through impingers in series that removed SO₂ and subsequently SO₃. The quartz wool in the condenser was rinsed and analyzed for SO₃ (particulate SO₃). Gaseous SO₃ was obtained from analyzing the impinger. The flue gas O₂ concentration and the flue gas temperature were not recorded by Platt. The measured SO₃ was reported on a dry basis at actual O₂ concentration.

In 2006 and 2007, Breen Energy Systems installed a modified dewpoint meter (AbSensor SO₃), which records both the initial condensation temperature and the evaporation temperature of condensable vapors in the flue gas; these temperatures can be related to the SO₃ concentration in the flue gas.

Table 8 presents the average SO₃ concentrations as reported by E.ON during baseline testing (October 2, 2006) and injection of trona (October 31, 2006 and November 1, 2006). The baseline SO₃ concentration between the two ESPs (ESP 1 outlet) was in the range of 13 to 20 ppmv SO₃ (dry, at 3% O₂). Injection of 500 lb/hr of trona reduced the SO₃ concentration between the two ESPs to 7 to 10 ppmv SO₃ (dry, at 3% O₂). With a lower SO₃ concentration the CEA was able to be reduced, which resulted in a 20°F lower stack temperature. However, the lower flue gas temperature did not result in any additional reduction in SO₃ between the ESPs.

Table 8. Average SO₃ Concentrations Measured by Modified Controlled Condensation Method in 2006.

Date	Location	Average Temp. °F	No. of Tests	Avg. SO ₃ , dry, ppmv at 3% O ₂	Comments
10/02/06	APH outlet	344	12	12.9	Baseline
10/02/06	ESP 1 outlet	331	7	15.2	Baseline
10/02/06	ESP 2 outlet	327	7	13.9	Baseline
10/31/06	ESP 1 outlet	--	3	14.8	Baseline
10/31/06	ESP 1 outlet	334*	3	10.2	500 lb/hr trona, normal CEA temperature
11/01/06	ESP 1 outlet	326*	4	7.3	500 lb/hr trona, normal temperature
11/01/06	ESP 1 outlet	313*	2	8.8	500 lb/hr trona, lower CEA temperature
11/01/06	ESP 1 outlet	315*	6	8.5	625 lb/hr trona, lower CEA temperature
11/01/06	ESP 1 outlet	333*	2	20.2	Baseline

* Stack temperature.

Table 9 shows the average SO₃ concentrations as reported by Platt Environmental Services during injection on March 26–28, 2008. Trona was injected downstream of the SCR (upstream of the APH). Activated carbon was also injected between ESP 1 and ESP 2 during this time at a rate of 5 lb/MMacf. The load on Unit 2 was kept steady at 336 MW during this time. The average temperature at the APH exit was 334 °F, which is similar to the “normal” CEA stack temperature for the 2006 SO₃ measurements shown in

Table 8.

The sum of the particulate and gaseous SO₃ is reported in the table, averaged for each run. The results in

Table 8 cannot be compared quantitatively to those in

Table 9 because the concentrations in the latter have not been corrected for the O₂ content of the flue gas. Qualitatively, however, the impact of trona injection on SO₃ is similar in both sets of measurements. During the 2008 manual SO₃ sampling measurements, trona injection at 500 lb/hr resulted in SO₃ concentrations decreasing from nominally 15 ppm to 9.5 ppm (dry, at actual O₂), while 1000 lb/hr of trona injection reduced the SO₃ concentration to nominally 5 ppm SO₃ (dry, actual O₂).

One unexpected result was that the SO₃ level measurement was lower at the SCR outlet compared to the inlet. The sampling test team reported problems with this sampling location as the test was progressing, and thus the results at the SCR outlet are in error.

Table 9. Average SO₃ Concentrations Measured by Controlled Condensation Method in 2008.

Date	Location	No. of Tests	Avg. SO ₃ , dry, ppmv at actual O ₂	Comments
03/28/08	SCR inlet	3	16.4	500 lb/hr trona injection
03/27/08	SCR outlet	3	14.2*	500 lb/hr trona injection
03/27/08	APH outlet	3	10.6	500 lb/hr trona injection
03/26/08	ESP 1 outlet	3	9.3	500 lb/hr trona injection
03/26/08	ESP 2 outlet	2	9.5	500 lb/hr trona injection
03/28/08	ESP 2 outlet	3	5.1	1,000 lb/hr trona injection

* Measurement error

Figure 15 is a comparison between the E.ON manual method and the Breen dewpoint measurement, where measurements were taken simultaneously in 2006. The SO₃ concentration has been calculated from an assumed water content in the flue gas of 7.6 vol% using the standard formula. Breen recommended using the average of the initial condensation (dewpoint or DP) temperature and the top temperature (or evaporation temperature). This is shown in Figure 15, along with the SO₃ concentration calculated only from the initial condensation temperature (at actual flue gas O₂). The SO₃ concentrations from the manual method fall in between the two concentrations calculated from the dewpoint data. There appears to be a correlation between the methods with R² values of 0.85 and 0.83 for the initial dewpoint and the average dewpoint, respectively.

Figure 15. Comparison of Manual and Dewpoint SO₃ Concentration (at actual O₂) Measured at Exit of ESP 2.

Figure 16 and Figure 17 show the SO₃ concentration during baseline and trona injection testing, respectively. The Breen instrument appeared responsive to trona injection (Figure 17). The Breen instrument required that the instrument be removed from the flue gas on a frequent basis, especially while injecting trona or MgO, to clean the sensing lens. The high peaks in the data in Figure 16 and Figure 17 are results of the Breen probe requiring cleaning after an injection period.

Figure 16. SO₃ Concentration Measured with the AbSensor-SO₃ and Modified Controlled Condensation Method (actual O₂) during October 2006 Baseline Test.

Figure 17. SO₃ Concentration (actual O₂) during October and November 2006 Trona Injection.

Figure 18 shows a decrease in SO₃ concentrations between the ESPs with the trona injection in 2006. Trona injection was carried out at both normal cold-end average temperature and reduced temperatures, corresponding to stack temperatures of about 333 °F and 315 °F, respectively. Trona injection reduced the SO₃ concentration by 50% at 500 lb/hr injection rate and by 64% at 625 lb/hr injection rate.

Figure 18. SO₃ Measured with the Modified Controlled Condensation Method between ESPs (at 3% O₂) as a function of Trona Injection Rate.

The Breen dewpoint SO₃ measurement initially appeared to correlate with the manual method, and responded to trona injection in the November 1, 2006, testing. Subsequently, the instrument did not appear to respond to sorbent injection (November 2006 and January 2007, respectively), nor did the calculated SO₃ concentration appear to be reasonable. The dewpoint monitor may have become fouled with some of the alkaline sorbent.

Injection of MgO was carried out in October 2006 and February 2007. Manual SO₃ measurements were not made during MgO injection. During October, the Breen instrument showed a similar response to MgO injection. During the February 2007 testing of MgO injection, the Breen SO₃ measurements did not appear to be accurate.

Sorbent Screening Testing

A sorbent screening device is designed to measure mercury uptake through a fixed bed over time. The total mercury adsorbed by the sample over time gives an indication of how well a sorbent can be expected to perform in the sampled flue gas conditions. The sorbents screened at MK2 were Norit's DARCO[®] Hg, DARCO[®] Hg-LH, an experimental Norit carbon E25C, DARCO[®] Hg E-12, and Frontier GeoSciences FGS-1. Two-hour screening tests were conducted using a modified procedure with respect to that described in Appendix G. With this procedure, a small bed of the test material was inserted into the sample line of a Thermo analyzer. These tests were conducted using the outlet CEM. Removal across the bed was then monitored real-time by the analyzer.

Testing consisted of two to three sorbent screening tests per day while varying the parameters of flue gas temperatures and injection rates of MgO for SO₃ mitigation. A sorbent screen with DARCO[®] Hg-LH was run every day to establish a relative performance curve. During October 16 to 18, 2006, the performance of Hg-LH varied with changing test conditions. As expected, Hg-LH performed best at higher MgO injection rates and a lowered flue gas outlet temperature. The high flue gas temperature had a greater impact on relative performance than the reduced injection rate of MgO. Although the Frontier GeoSciences FGS-1 sorbent consistently demonstrated the best performance, it was not available in sufficient quantities for full-scale testing.

A single screening test with DARCO[®] Hg-LH was conducted during trona injection on November 1, 2006. The breakthrough time on the screening bed was approximately two hours. The relatively long time for breakthrough suggests that dual injection with trona would enhance the performance capability of Hg-LH.

Parametric Mercury Removal

Parametric testing was performed in order to select sorbents that would later be tested for long-term sustainability. One of the goals of the program was to assess new sorbents that were marketed as SO₃-tolerant. At the time of testing, Norit was the only sorbent manufacturer that was producing a sorbent identified as SO₃-tolerant. Previous DOE/NETL testing at AEP's Conesville and Ameren's Labadie plants had demonstrated that mercury removal was affected, sometimes significantly, as a result of SO₃.³ At Conesville, where SO₃ levels were typically above 20 ppm, the effectiveness of sorbents for mercury control was limited with none attaining mercury removal of 30%. Labadie has an SO₃ injection system for flue gas conditioning and typically runs at 5 to 10 ppm. During testing at Labadie, the Norit SO₃-tolerant sorbent DARCO[®] E26 provided incrementally better mercury removal than standard sorbents.

Based on the DOE test results from Conesville and Labadie, and the lack of any new SO₃-tolerant sorbent development in the intervening months, the decision was made to proceed with the available sorbents. The PAC sorbents selected for the parametric tests were:

- Norit's DARCO[®] Hg, a standard PAC
- Norit's DARCO[®] Hg-LH, a brominated PAC

- Norit's DARCO[®] E26, a brominated SO₃-tolerant PAC
- Calgon's FLUEPAC[®]-MC PLUS, a brominated PAC.

The sorbents chosen included the standard PAC, Norit's DARCO[®] Hg because of the high fraction of oxidized mercury at Merrimack (greater than 80%). DARCO[®] Hg is more sensitive to high flue gas temperature than the brominated sorbents.³ Therefore, brominated sorbents from Norit and Calgon were included in the program. DARCO[®] E-26 was included because of promising performance at Labadie.

Excepting long-term sustainability, the co-benefit full-scale testing during October 2006 had demonstrated that injection of alkaline sorbents could significantly reduce SO₃ levels, and sorbent screening during SO₃ mitigation suggested improved mercury removal could be achieved with dual injection. Malfunction of the trona injection system prior to scheduled parametric tests prevented dual injection testing. While waiting for the trona injection system to be repaired, it was decided to begin parametric tests. Two sorbents were selected: DARCO[®] Hg-LH was evaluated on November 30 and DARCO[®] E-26 on December 1. The results from these tests can be seen in Figure 19, which shows inlet and outlet mercury concentrations, mercury removal, and sorbent injection concentration. At injection concentrations up to 8 lb/MMacf, neither sorbent was able to achieve greater than 20% mercury removal. These results confirmed previous testing results. E-26 provided no benefit over the base brominated sorbent at SO₃ flue gas levels greater than 10 ppm.

Figure 20 presents data from a later parametric test period with dual injection. These graphs include inlet and outlet mercury, mercury removal, and carbon injection concentration, and CEA temperature.

Figure 19. Trend Data, Parametric Testing December 2006.

Figure 20. Trend Data, Parametric Testing February 28, 2007.

The performance of the PAC sorbents was affected by both the SO_3 concentration and the outlet temperature of the APH. The importance of temperature was identified by changing the set point for the APH CEA temperature. Without modification of either the CEA temperature or the native SO_3 concentration, the mercury removal was limited to less than 22% at injection concentrations up to 8 lb/MMacf for all sorbents tested.

Because Norit was in the process of developing the E-26 sorbent, a second test was conducted with the sorbent produced using a different production process. The injection location remained the same, but CEA temperatures were lowered by 30 °F. Vapor-phase mercury removal rates increased to approximately 30%. The reduction in CEA without SO_3 mitigation is not a normal plant operating parameter and cannot be sustained, but occurred simultaneously with the second round of E-26 testing. The increase in removal during testing with the second batch of E-26 was probably not due to the new production process, but to the decrease in temperature.

Other DOE test sites have shown improved PAC performance when the PAC injection location was upstream of the APH and SO_3 sorbent injection³. It was of interest to determine if a similar benefit would be seen at MK2. The injection location for PAC was changed to upstream of the APH, using the existing ports located for SO_3 sorbent mitigation injection. When corrected to stack temperature concentrations, the removal using Norit's DARCO[®] Hg-LH was identical to the removal when injection was downstream of the APH. Vapor-phase mercury removal was 20% above baseline at approximately 8 lb/MMacf injection concentration.

Significant improvement in mercury removal effectiveness of PAC was achieved when the SO₃ concentrations were lowered by sorbent injection. As discussed earlier, two SO₃ sorbents were tested during dual injection trials: trona and MgO. Testing showed that of the two SO₃ mitigation sorbents, dual injection with trona appeared to be more effective at increasing the mercury removal effectiveness of PAC. For example, when injecting DARCO[®] Hg-LH at 5 lb/MMacf, mercury removal with trona was more effective than MgO at a similar injection rate. At normal CEA temperatures, 45% mercury removal was achieved using dual injection with trona versus 30% mercury removal with MgO injection. Even higher mercury removal was achieved at a lowered CEA temperature—50% removal with dual injection of PAC and trona versus 40% removal with PAC and MgO injection. These data are included in Figure 21, the summary of parametric testing.

Figure 21. Summary of Parametric Test Results.

The highest mercury removal achieved during parametric testing was 65% removal. This was achieved with dual injection of trona and DARCO[®] Hg at approximately 8 lb/MMacf PAC, and lowered CEA temperatures. Again, it should be noted that parametric testing is short-term only, and does not demonstrate long-term sustainability.

The injection of PAC upstream of the APH has been demonstrated as an effective means to increase mercury removal effectiveness at units that inject SO_3 for flue gas conditioning or at plants with low levels of native SO_3 .³ Therefore, a test was conducted at MK2 to determine whether improved performance could be achieved by moving the injection location to upstream of the APH. Moving the injection location did not result in improved mercury removal. With injection concentrations approaching 12 lb/MMacf (corrected to stack temperatures), mercury removal did not reach 50%, as shown in Figure 22. At an injection concentration of 12 lb/MMacf, PAC injection rates were close to 800 lb/hr. This amount of injected PAC sorbent was both uneconomical and would have an impact on the quality and safety of the ash collection systems as discussed later in this report. Note that the mercury removal for the APH inlet injection tests was estimated by calculating the change in the mercury concentration measured during testing compared to immediately prior to injection, or $8.3 \mu\text{g/wscm}$. This technique was necessary for these tests because the inlet mercury CEMS was located downstream of the PAC injection point.

Figure 22. Hg-LH Injection Upstream of the APH Parametric Injection Results.

Examination of the Hg CEM data revealed that the outlet mercury concentration gradually returned to pre-injection levels when PAC injection ceased. The observed lag time was between 20 and 75 minutes. This phenomenon has also been noted during parametric carbon injection tests at many other sites.

CFD Modeling Results

REI modeled five sorbent injection design cases using CFD to assist the project team in assessing an effective mercury control scheme for MK2. The complete CFD report is contained in Appendix H and is summarized here.

Mercury removal can be estimated based on the assumed capacity of the activated carbon, the carbon loading, and the actual mercury concentration in the flue gas, assuming that there are no limitations on mixing or mass transfer. The adsorption capacity can be estimated based on the surface area of the sorbent, the temperature, and the concentrations of HCl and SO₃. The maximum removal was predicted to be 67% at a sorbent injection of 5 lb/MMacf and a sorbent capacity of 1249 µg/g. This capacity corresponds to DARCO® Hg sorbent at 300 °F with low SO₃ in the flue gas. The capacity of the sorbent imposes an upper bound on mercury removal at MK2. Sorbent capacity could be increased by lowering the CEA temperature, by further lowering the SO₃ in the duct, or by using a different sorbent.

The best CFD modeling case predicted only 40% removal. Limitations on mass transfer, on residence time, and on distribution of sorbent along the flue gas path could contribute to the difference between maximum and predicted removal.

- For all cases, the predicted removal of Hg⁰ was higher than HgCl₂, which suggests that mass transfer to the sorbent particle surface was a factor in the limitations on mercury sorption. Reducing the mass mean diameter of the sorbent could produce improvement in mercury sorption.
- Simulation of the gas velocity in the ductwork indicates that the flow rate at the outside of the first turn after ESP 1 is higher than at the inside of the first turn, a finding that continued through the transitional duct (Figure 23).
- Simulation of the distribution of injected sorbent indicates that particle residence times are 3 to 4 seconds. Sorbent is more concentrated and particle residence time is longer on one side of inlet to the Supplemental ESP. Uniformity could be improved by biasing sorbent flow to select ports.
- The turning vanes in the transitional duct limit the mixing of the sorbent across the width of the duct. The gap between the lowest injection nozzle and the floor of the duct results in little sorbent in the region that is two to three feet from the bottom of the duct.

Based on the model results, it was recommended that additional injection ports near the outside wall and floor of the outlet plenum of ESP 1 be installed. Another injection port (number 45 in Figure 2) was installed to improve sorbent dispersion.

Figure 23. Velocity Distribution in Transition Duct.

Continuous Dual Injection for Mercury Removal

During balance-of-plant tests conducted prior to the mid-April 2007 plant outage, an evaluation of continuous dual injection of sorbents for mercury control (DARCO[®] Hg-LH and DARCO[®] Hg) and SO₃ mitigation (MgO and trona) was undertaken. Parametric testing had demonstrated that short duration, dual injection of trona and PAC was superior to MgO and PAC for mercury removal from the flue gas. Further testing was required to provide a more comprehensive assessment of the dual injection sorbent combinations.

An initial test run was made with milled MgO (injected upstream of the APH) and DARCO[®] Hg (injected between the two ESPs). The results, presented in Figure 24, indicated that injecting 2.5 lb/MMacf milled MgO with 5 lb/MMacf DARCO[®] Hg resulted in nominally 35% to 40% mercury removal. Although a direct comparison of unmilled MgO and DARCO[®] Hg was not conducted to determine the effectiveness of milling, and indirect comparison was possible through comparisons with previous data. Previous test results with DARCO[®] Hg and DARCO[®] Hg-LH showed that the brominated DARCO[®] Hg-LH slightly outperformed DARCO[®] Hg. In addition, previous results with unmilled MgO and 5 lb/MMacf DARCO[®] Hg-LH resulted in 30% mercury removal. Therefore, it appears that milling the MgO favorably impacted mercury removal. This result was unexpected because MgO is relatively small, less than 20 microns, and the milling was done with a pin mill, which should not have reduced the size of the MgO significantly below 20 microns. However, the milling process increases the conveying air, which may have resulted in better distribution within the duct upstream of the APH. Thus, it is not clear whether the improved performance is a result of milling, deagglomeration of the delivered product, or a change in distribution of the MgO in the duct.

Figure 24. MgO-PAC Continuous Injection Results, Day 1.

During dual injection with MgO, opacity quickly increased to unacceptable levels. MgO appeared to cause a degradation of the ESP power levels, which dropped significantly from an average of 15kW to an average of 5 to 7 kW. During the second day of milling MgO, it was not possible to maintain PAC and MgO injection concentrations from the previous day due to degradation of the power levels of ESP 1. With a milled MgO injection concentration of 2 lb/MMacf instead of 2.5 lb/MMacf resulted in less than 30% mercury removal at a DARCO[®] Hg injection at 5 lb/MMacf. Although SO₃ was not measured during this test, the data suggest through the reduction in PAC effectiveness more SO₃ was present in the flue gas. A trend graph showing mercury and sorbent injection concentrations is presented in Figure 25.

Figure 25. MgO-PAC Continuous Injection Results, Day 2.

Injecting milled MgO was not sustainable because of the impact on opacity. Thus, subsequent tests were conducted with unmilled MgO.

MgO injection continued for a week while separate tests were conducted with DARCO[®] Hg and DARCO[®] Hg-LH. Less than 40% mercury removal was achieved, which is within the expected levels based on parametric results. These results are presented in Figure 26. Mercury removal was calculated as the change in outlet mercury CEM measurements with supporting data from sorbent trap measurements because the inlet CEM was out of service during this test. Coal mercury numbers were also used to check inlet mercury concentrations.

Figure 26. MgO–PAC Injection Results, April 2007

Following testing with MgO, the plant injected trona continuously for several days. PAC sorbents were more effective during co-injection with trona, which suggested that trona was more effective than MgO at SO_3 removal. Since trona had a relatively large delivered particle size, 35 microns, milling was expected to increase the efficiency of trona even further. In addition, as was described with the MgO tests, more conveying air used to carry the milled trona may have resulted in better distribution of the milled trona. During this round of tests, trona was injected upstream of the APH, milled to less than 15 microns, and the unmilled DARCO[®] Hg-LH was injected in between ESP 1 and ESP 2. In addition, the APH CEA temperature was reduced 30 °F for comparison with previous parametric testing.

Dual injection of milled trona and DARCO[®] Hg-LH over a period of 36 hours exceeded the mercury removal performance of the MgO or unmilled trona. A trend graph showing test results is presented in Figure 27 and a comparison of test results using several sorbent combinations is presented in Figure 28. However, this operating condition was not sustainable at MK2 because of operational issues:

- 1) plugging in the pin mill and
- 2) an increase in the pressure drop across the APH.

A pin mill was used to grind the trona to a smaller size. Pin mills heat the material being ground. Heating trona created a sticky deposit that required the operators to shut down the mill and clean the internal components. Once the trona enters the duct, it reacts with flue gas SO_2 and SO_3 . If the concentration of trona is too low, sodium bisulfate, a sticky substance, can form. This is a particularly challenging issue to manage at MK2 because existing ports were used to inject trona and the distribution was not fully optimized. In addition, the plant uses a tubular APH that does not have the same self-cleaning performance as a regenerative-style APH.

Figure 27. Milled Trona–PAC Injection, April 2007.

Figure 28. Comparison of Parametric Test Results of Mercury Removal at MK2.

As can be seen in Figure 28, the mercury removal achieved during milled trona injection was higher than that achieved with unmilled trona injection. The milling demonstration was run for 36 hours, with several stops to repair/maintain the milling system for the trona. However, air heater pluggage concerns, and the fact that long-term milling of trona was not sustainable, led to the team's decision that trona milling was not a currently viable option for commercial mercury control at PSNH MK2.

Long-Term Mercury Removal

Long-term testing was scheduled to begin early in July 2007. Three separate issues arose that caused a delay in the scheduled start: 1) unacceptable opacity levels during sorbent injection, 2) unresolved problem of how to make use of fly ash containing PAC and trona, and 3) DOE-allocated funds for this phase of the project were reduced from that in the original awarded budget.

The first item to impact the start date was the inability to control opacity when injecting either trona or PAC during the initial long-term testing tests. This arose as the final checkout was occurring for the newly installed commercial silo. During the last week of June and the first week of July 2007, every attempt to start either PAC injection or trona injection was met by an increase in stack opacity. Several test runs were performed to rule out that injection modifications to the PAC and/or the SO₃ silo were the cause. The plant had repaired the tubular APH during the scheduled maintenance period in April–May 2007.

The second issue to impact long-term testing was the negotiations between PSNH and the end user of the ash by-products from PSNH. The injection of either trona or PAC reduces the options available to the plant for beneficial ash utilization and MK2's location in the northeastern portion of the United States further limits options. As such, PSNH explored alternative ash utilization avenues before it procured and installed an ash conditioning unit that allowed the utilization of ash for the duration of testing and beyond.

The third issue was the reduction in the project budget by DOE. The originally proposed extended test period of six months was reduced to a target two-month test.

During an outage following tests in January 2008, smoldering PAC-ash mixture was discovered in the ESP 2 hoppers. Before the long-term tests could be restarted after the January 2008 outage, a plan to address APH differential increase and smoldering ash was developed. The plan to manage APH differential increase was to reduce the risk to plant operations by conducting the tests just prior to a scheduled outage. Knowing an outage was imminent, it was possible to allow the pressure differential to increase to normally unacceptable levels. To prevent buildup of PAC-ash in the hoppers, PAC injection would be stopped 24 hours prior to the scheduled shutdown to allow the ESP 2 hoppers to empty into the ash storage silo and minimize the chances of any substantial volumes of PAC-ash being exposed to transient conditions during a shutdown.

Long-term testing was restarted on March 12, 2008. Trona injection was set at 500 lb/hr and PAC injection at 300 lb/hr. Manual testing was performed the week of March 24 and included EPA M5 particulate measurements, M26A halogen measurements, EPA M8A Controlled Condensation measurements of SO₃ concentrations, modified M30A validations of the inlet and outlet mercury CEM measurements, and modified M30B sorbent traps. On March 28, 2008, the trona injection rate was increased from 500 to 1000 lb/hr, to assess the ability to lower SO₃ levels in the flue gas and any impact on APH differential pressure. On the final day of PAC injection, March 31, the injection rate was increased for the last three hours of testing from 300 to 400 lb/hr (4.5 to 6.0 lb/MMacf) to determine if a higher rate would increase mercury removal. Trona injection was stopped on April 1, 2008.

November–December 2007

Long-term testing began on November 30, 2007. During the first few days of this test period, trona was injected for SO₃ control at a rate of 625 lb/hr (9.3 lb/MMacf APH outlet equivalent) and DARCO[®] Hg-LH for mercury control was targeted at a rate of 400 lb/hr (6 lb/MMacf). Due to opacity issues, the initial PAC injection rate was lower than the target rate of 6 lb/MMacf (400 lb/hr), running at approximately 4 lb/MMacf for the first three days of testing. Trona was injected between the SCR and the APH via four lances (two per side wall). PAC was injected between the Original and Supplemental ESPs via five ports, each with two lances that had multiple vertical holes to cover the 25-foot-deep duct.

When the PAC injection concentration was increased to 6 lb/MMacf, mercury removal initially spiked to 70%, as shown in Figure 29, but began to decline. Back pressure on the PAC eductors began to increase on December 12, and soon after, the lances were incapable of continuous injection. On December 13, 2007, PAC injection was interrupted when the injection lances plugged.

PAC injection lances had been installed since October 2006. In April 2007, the lances were replaced when the small DOE-style PAC silo was replaced with a large commercial silo. During this change out, some lower injection ports on the lances were observed to be partially plugged, but the interior of the lances was clear. The initial lances were operated intermittently prior to this point for approximately 25 days. In between parametric injection sessions, the lances were left installed with no conveying air. After the silo change out, the lances were inspected in October 2007 and partially cleaned due to build up. After that cleaning, the lances were left with PAC conveying air left on continuously. The PAC lances were pulled the week of December 31, 2007. Inspection revealed that they were plugged.

To prevent plugging, the PAC injection lances were modified to an open-ended, single nozzle style from the multi-nozzle design. To evaluate whether this new design provided adequate distribution of PAC, a short test with PAC only was conducted on January 9, 2008.

Trona injection alone continued until December 27, 2007, when it was determined that the APH differential pressure was increasing at an unacceptable rate. Trona injection was reestablished on January 18 to evaluate whether increasing or decreasing trona injection rates would affect the rate of increase of APH differential pressure. Trona injection was held steady at approximately 500 lb/hr and then decreased to 300 lb/hr on January 21. Long-term testing was restarted on January 23, 2008. At this time, trona injection was increased to 600 to 700 lb/hr and PAC injection was set at 300 lb/hr (4.5 lb/MMacf). Due to increasing APH differential pressure, trona injection was lowered to 500 lb/hr on January 29, 2008. On January 31, 2008, testing was ceased due to a plant outage. During the outage, it was discovered that the PAC-ash mixture in the ESP 2 hoppers was smoldering. This issue is discussed later in this report under the heading “Ash/Carbon/Trona Auto-Ignition Test Results.”

In Figure 29, it can be seen that the inlet CEM also failed on December 12, 2007. The inlet analyzer was returned to service during the week of December 17, 2007. Prior to the inlet CEM coming off-line, the average mercury capture was 48% and increased to an average of 55% during the interval of higher PAC injection.

Figure 29. Long-Term Testing, December 2007.

January 2008

One day of PAC-only injection testing was conducted on January 9, 2008, to test the new PAC injection grid. Total vapor-phase mercury removal was limited to 20%, which was similar to PAC-only injection testing in December 2006. It is difficult to determine whether the PAC distribution was retained with the new lance design at these low removal conditions. Additionally, opacity spiking occurred with a PAC injection concentration of 6 lb/MMacf.

When long-term testing was resumed, PAC injection had to be limited to 4.5 lb/MMacf or lower for the rest of the tests to limit particulate emissions. During this time, trona injection was operated at 700 lb/hr (10.4 lb/MMacf) and APH differential pressure continued to increase. With this trona injection rate and the highest PAC injection concentration (4.5 lb/MMacf), mercury removal was limited to less than 50%, as shown in the trend graph in Figure 30. Due to increasing APH differential pressure, trona injection was lowered to 500 lb/hr on January 29, 2008. On January 30, 2008, testing was halted due to a plant outage.

Figure 30. Long-Term Testing at MK2, January 2008.

The post-shutdown inspection revealed that two of the four trona injection lances were plugged. During the previous shutdowns, the trona injection system was placed in standby, which resulted in areas of stagnant, unheated flue gas in the lances, a prime condition for deposition to occur. It is possible that the lances were partially plugged throughout the January tests. Moreover, existing ports had been used and these did not provide optimal lance placement for sorbent distribution. Thus, the trona dispersion was biased to the top half of the SCR outlet duct. These conditions would have exacerbated problems with increasing pressure drop across the APH and resulted in poor SO_3 removal near the lower half of the duct. Lower than expected SO_3 removal in portions of the duct would have contributed to the lower PAC mercury removal effectiveness observed during this test period.

March 2008

The primary goal of the final weeks of testing was to conduct dual injection continuously for two to three weeks to obtain longer-term data for DOE/NETL, industry, and PSNH. A trend graph showing available mercury measurements along with trona and PAC injection concentrations during this period is presented in Figure 31.

Figure 31. Mercury Removal Trends for March 2008.

On March 28, 2008, the trona injection rate was increased from 500 to 1000 lb/hr to determine impact on both 1) the mercury removal effectiveness of the PAC (lower SO_3 levels) and 2) the APH differential pressure. The increased mercury removal effectiveness of the PAC as a function of trona injection is apparent in both Figure 31 and Figure 32 as an increase in mercury removal from 50% at 500 lb/hr trona to an average of 71% at 1000 lb/hr trona at a DARCO[®] Hg-LH injection concentration of 4.5 lb/MMacf. These short-term results show that optimizing the trona injection lances for better distribution could improve both SO_3 and mercury removal, but the data are insufficient to determine long-term balance-of-plant impacts or sustainability. During this test period, SO_3 measurements were conducted. The results from these tests are summarized in the “Co-Benefits Analysis” section.

Variation in the mercury removal while injecting trona at a target rate of 1000 lb/hr can be attributed to variations in the actual trona injection rate. The trona silo was a test unit that had a rotary valve at the bottom of the silo to control feedrate. The rotary valve speed was controlled by frequency, not loss in weight. Therefore, as the silo level decreased, the rate of discharge for the trona dropped. An increase in mercury removal can be seen when a load of trona was delivered on Friday, March 28, 2008, and again Sunday, March 30, 2008, even though the feedrate setting was not changed. With a full silo, calibrations showed that trona injection was 1000 lb/hr. This injection rate held for approximately 24 hours and then began to decrease. As the silo emptied, the actual trona injection rate dropped to approximately 800 lb/hr, which adversely affected mercury removal, presumably due to an increase in SO_3 levels.

PAC injection was increased for the last three hours of testing on March 31 from 300 to 400 lb/hr (4.5 to 6.0 lb/MMacf) to determine if higher injection rates would increase mercury removal. A slight increase was seen coincident with the increased injection rate (see Figure 32); however, the increase was well within the variability observed during the higher trona injection rate period. PAC injection was stopped at 1:00 p.m. on March 31, 2008. Trona injection was stopped at 2:00 p.m. on April 1, 2008. The data are insufficient to determine long-term balance-of-plant impacts or sustainability.

Figure 32. Mercury Measurements for March 28–April 1, 2008.

Collecting data on mercury levels for an extended test period required obtaining reliable CEM measurements. Even though the inlet CEM was located downstream of ESP 1, it was challenged by the high SO₃ concentrations and particulate loading. Previous testing at PSNH and at other sites with different instruments in similar flue gas conditions confirms that this flue gas is very challenging for any mercury monitor. Although the Thermo mercury CEM outperformed the other monitors in reliability and maintenance requirements, the test team was unable to collect reliable mercury measurements over an extended period.

Both the inlet and outlet CEMS failed calibration and were not operational on the first day of testing, March 12, 2008. PSNH was performing testing for the New Hampshire HB1673, which provided EPA M29 and EPA M30B mercury measurements prior to and after the start of injection. ADA-ES was also measuring total vapor-phase mercury via sorbent traps. The outlet CEM was returned to service on March 13, the inlet CEM on March 22. As can be seen in Figure 31, the outlet CEM functioned for the majority of the test. The figure also indicates that mercury removal gradually increased before leveling off at approximately 50% at a trona injection rate of 500 lb/hr (7.4 lb/MMacf) and a DARCO[®] Hg-LH injection rate of 4.5 lb/MMacf. There was an 18-hour gap in injection on March 18 because of a late arrival of a trona shipment, but other than that, continuous dual injection over a period of 20 days was achieved.

A prototype CEM system configured as an Instrumental Reference Method (IRM) according to requirements identified in EPA Method 30A was used to verify the Thermo mercury CEMS. Variations from the actual method included the location of the tests (in a duct instead of the stack) and not performing a dynamic spike calibration of oxidized mercury.

Actual measurements during the tests are presented in Figure 33 (inlet) and Figure 34 (outlet) and show that there was good correlation between the IRM and the inlet CEM, with a difference of only 4.4% and 5.8% on the two days, respectively. The outlet measurements also showed good correlation, with a deviation of 5.6%. These numbers fall well within the required accuracy requirements for validation of +/- 20% for a mercury monitor.

Figure 33. Inlet Mercury IRM-CEM Comparison.

Figure 34. Outlet Mercury IRM–CEM Comparison.

Sorbent traps were also used during dual injection testing to measure total vapor-phase mercury in the flue gas. The results are summarized in Table 10.

Table 10. Comparison of STM, IRM, and CEM Measurements during Extended Dual Injection Testing at MK2.

Date and Time	Trona (lb/hr)	PAC (lb/ MMacf)	Inlet of ESP 2 ($\mu\text{g}/\text{wscm}$)			Outlet of ESP 2 ($\mu\text{g}/\text{wscm}$)			% Removal (CEM)
			STM ^a	IRM ^b	CEM ^b	STM	IRM	CEM	
12/04/07, 10:30	500	1.3	NA	NA	4.61	6.56	NA	3.08	33
12/04/07, 14:31	500	1.3	6.08	NA	4.54	NA	NA	3.36	26
12/04/07, 16:33	500	1.3	8.89	NA	4.68	NA	NA	3.45	26
03/27/08, 15:16	500	4.5	NA	NA	8.13	5.26	3.33	3.16	61
03/28/08, 16:23	1000	4.5	9.09	NA	7.95	NA	NA	1.95	76

^a STM is an average of two trap measurements run at the same time. Values assume 10% moisture.

^b IRM and CEM are hour averages corresponding to the same time period as the STM was run. The outlet CEM value has been corrected using a bias correction technique for March.

The mercury removal performance results from the continuous injection tests are shown for comparison with the earlier test sequences in Figure 35 and mercury removal results from MK2 with other published data from tests on bituminous coals with high SO_3 concentrations are compared in Figure 36.

Figure 35. Mercury Removal Comparison of Different Test Sequences at MK2.

High-Sulfur Bituminous Coals: DARCO[®] Hg - Exception MK2 DARCO[®] Hg-LH

Figure 36. Comparison of Merrimack Mercury Removal Rates with Other Sites.

Ash–Carbon–Trona Auto-Ignition Test Results

During the January 2008 post-shutdown inspection, smoldering PAC–ash was discovered in the hoppers of ESP 2. Parametric testing may have been too short in duration to reveal this side effect previously. Smoldering PAC–ash mixtures have been reported in the hoppers of systems in the TOXECON™ baghouse and occur when mixtures with a high percentage of PAC are left in a hot hopper for an extended period.^{5,6} Although this phenomenon has not been reported with an ESP particulate collection system, laboratory studies indicate that fly ash containing high concentrations of PAC may begin to smolder if heated.⁶ In these studies, the PAC DARCO® Hg (carbon content of 75%) was mixed with fly ash from Presque Isle Power Plant (PIPP) Units 7–9 ESP (LOI < 1%) to form mixtures that varied in carbon content. The various mixtures were placed in test beds of different diameters and heated until the mixture ignited. The results are summarized in Figure 37 and Figure 38. For a given test mixture, critical oven temperature decreases as bed diameter increases. For a given bed diameter, critical oven temperature decreases as carbon content (given by % LOI) increases. In general, shorter bed diameter mixtures tend to ignite sooner than longer ones. Although not shown here, the results from these studies indicate that once auto-ignition begins, very high temperatures can be reached.

Figure 37. Relation between DARCO® Hg PAC–Ash Mixture Bed Diameter and Critical Oven Temperature for Auto-Ignition.

Figure 38. Relation between DARCO® Hg PAC-Ash Mixture Bed Diameter and Induction Time for Auto-Ignition.

As is discussed further in the following section, ash analysis was conducted on samples collected from the ESP hoppers at MK2 to determine the carbon content. The average carbon content (as measured by % LOI) of ash samples collected from the ESP hoppers during baseline conditions and during continuous dual injection of PAC and alkaline sorbents is presented in Table 11. These results show that the carbon content of the ESP 2 hopper ash could have been as high as 40%. During dual injection, an alkaline sorbent was injected upstream of ESP 1 (AH) while PAC was injected between the ESPs.

Table 11. Comparison of Average Carbon Content of Ash Samples from Original (ESP 1) and Supplemental (ESP 2).

	ESP 1	ESP 2
Baseline 2006	16.93 ± 5.12	20.52 ± 5.97
Baseline 2007	4.98 ± 3.13	7.91 ± 2.40
Trona/Hg-LH ^a	16.37 ± 4.9	40.16 ± 9.51
MgO/Hg ^b	14.37 ± 4.06	22.81 ± 6.92

Note: Carbon content is measured using a loss on ignition (LOI) analyzer.

^a Samples from extended continuous dual injection tests of trona and DARCO® Hg-LH in late 2007 and 2008.

^b Samples from continuous dual injection tests of MgO and DARCO® Hg in March–April 2007.

The notable difference in average carbon content of ash samples collected during baseline conditions in 2006 and 2007 may be attributed to different combustion parameters employed during the plant during these times. Despite the differences, it is clear that the average carbon content of ash samples collected during dual injection testing was higher in samples collected from ESP 2 than from ESP 1. This increase can be attributed to PAC injection as most of the fly ash has been collected upstream of the PAC injection location. The cyclone boiler configuration at MK2 captures the majority of the ash as bottom ash. The Original (ESP 1, upstream) ESP removes greater than 90% of the remaining fly ash.

Although four PAC–ash samples from ESP 2 had an LOI of greater than 50% (the maximum was 56%), flue gas temperatures were lower than those determined as critical for auto-ignition during the laboratory studies. Moreover, ash samples taken during testing exhibited no signs of overheating, smoldering, or sparklers. Thus, something outside of normal operations may have generated conditions that gave rise to the smoldering PAC–ash mixture discovered in January 2007. For example, it is possible that smoldering started when oxygen levels increased to 21% during cool down.

Another factor that may have influenced the initiation of auto-ignition of the PAC–ash mixture was the injection of trona upstream of the ESPs. Reactions between flue gas and the sodium sorbent could take place in the PAC–ash–sodium mixture, including the decomposition of sesquicarbonate to bicarbonate and hydration reactions, both of which are exothermic. These reactions could increase the “bed” temperature of the mixture. A summary of separate laboratory tests to evaluate the effect of trona on auto-ignition temperatures of PAC–ash–trona mixtures is included here.

Effect of Trona on Auto-Ignition Temperatures

This section summarizes laboratory testing to date to evaluate the effect of trona on auto-ignition temperatures of PAC–ash–trona mixtures performed for EPRI under a separate contract. The key goal of the project is to determine if trona reactants will have an effect on the auto-ignition properties of PAC–ash mixtures.

Based on the work started under the Clean Coal Program Initiative project at PIPP, ADA-ES performed a series of tests in the laboratory to determine if trona reactants (primarily sodium carbonate) would lower the auto-ignition temperatures of the ash from a combined PAC and trona injection scenario. The initial test mixture was created by mixing the PAC DARCO[®] Hg (75% carbon) with fly ash from PIPP Units 7–9 ESP (LOI < 01%), and decomposed trona. The ratio of the mixture was:

- 50% from PAC
- 30% ash (contribution from PIPP ESP ash and from PAC)
- 20% decomposed trona

Trona from 2007 testing at PIPP was used to create the sodium carbonate that would typically be found in ash from trona injection. The trona was heated in an oven at 350 °F for 48 hours to allow complete reaction from the sesquicarbonate form to sodium carbonate. This material was pulverized and mixed with PAC and ash from the PIPP ESP, the same blend used in all the tests to date.

This mixture was tested in 4-inch and 6-inch beds and the auto-ignition characteristics compared with PAC-only and PAC–ash mixtures from PIPP. These initial tests were performed with room air and no additional moisture so that a direct comparison with data from PIPP could be obtained. In order to predict the auto-ignition temperatures for two bed sizes with 50% carbon, the two equations for the curves from the 75% carbon PAC and 43% carbon PAC–ash tests were used.

The results from the initial tests can be seen in Figure 39. The predicted critical temperatures for a 50% carbon mixture were 509 °F for the 4-inch bed and 469 °F for the 6-inch bed. The actual critical temperature for a 50% carbon mixture of PAC–ash–trona for the 4-inch bed was 498 °F and 467 °F for the 6-inch bed. These temperatures were slightly lower than the predicted temperatures but were not significant enough to make a conclusion that the reacted trona affects the auto-ignition temperature.

Figure 39. Bed Size Versus Critical Oven Temperature.

Additional tests were completed to test the same mixture and bed sizes, but with the addition of air into the oven containing 10% moisture to determine if any heat of hydration or adsorption will affect the auto-ignition temperature. There was not a statistical impact on the auto-ignition temperature due to the addition of moisture.

Characterization of Process Solids and Liquids

Several types of process samples were collected during mercury control testing at Merrimack. Analyses conducted included ultimate, proximate, mercury, and chlorine for select coal samples; mercury analyses of most of the fly ash samples collected; and stability determinations of select fly ash samples through leaching tests and thermal desorption tests. The LOI carbon content of several ash samples was also determined.

Coal Analysis

Coal samples were collected throughout the test period. Analyses included ultimate (45), proximate (13), chlorine (7), mercury (51), and elemental (11). The coal quality throughout the program was fairly consistent. The results of coal analyses for a subset of nine samples where both ultimate and proximate tests were conducted are shown in Table 12. As shown, all results except mercury are fairly consistent for these samples.

Table 12. Results from Select Coal and Ash Analyses.

ID		5531	6544	6786	6814	6945	12195	12199	12207	12331
Date		04/13/06	10/05/06	10/14/06	10/19/06	10/31/06	03/12/08	03/13/08	03/27/08	03/28/08
Ash	wt%	7.35	7.30	6.50	5.91	8.41	7.21	7.79	6.88	7.31
S	wt%	1.40	1.85	1.07	0.96	1.26	1.28	1.33	1.41	1.35
C	wt%	77.95	80.05	80.55	80.96	77.36	77.76	77.43	78.25	77.87
H	wt%	5.11	4.93	5.02	4.96	4.85	4.91	4.71	4.88	4.93
N	wt%	1.45	1.31	1.35	1.28	1.44	1.46	1.49	1.46	1.45
O	wt%	6.74	4.56	5.51	5.93	6.68	7.38	7.25	7.12	7.09

HHV	BTU/lb	13959	14173	14276	14220	13803	13812	13828	13974	13895
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Cl	ppmd	822	812	NA	NA	NA	838	894	901	855
Hg	ng/g	74.3	86.5	91.7	62.2	103.0	61.2	67.3	89.2	68.2
Hg	lb/TBtu	5.32	6.10	6.42	4.37	7.46	4.43	4.87	6.38	4.91

Note: All results are on a dry basis.

The variation in mercury concentration in the coal is presented in Figure 40. As shown, the mercury is typically between 4 and 8 lb/TBtu. However, there were periods with significantly more variation, such as in late January 2007. Two Unit 2 coal samples were collected per day from January 28–31. These were analyzed for mercury and a proximate analysis was conducted. These results are presented in Table 13. There was also variability in the coal sulfur levels (1.38 wt% to 2.29 wt%, dry), but not to the extent of mercury variability (63.1 to 207 ng/g).

Figure 40. Mercury in Coal Samples Collected During Program.

Table 13. Coal Ultimate and Mercury Analyses, January 28–31, 2007.

ID		7890	7891	7892	7893	7596	7597	7600	7601
Date		01/28/07	01/28/07	01/29/07	01/29/07	01/30/07	01/30/07	01/31/07	01/31/07
		Unit 2 Sys2 AM	Unit 2 Sys2 PM	Unit 2 Sys2 AM	Unit 2 Sys2 PM	Unit 2 AM	Unit 2 PM	Unit 2 AM	Unit 2 PM
Ash	wt%	9.36	6.96	7.95	8.12	8.13	7.77	6.81	7.98
S	wt%	1.50	1.38	1.84	1.80	2.10	2.29	1.50	2.16
C	wt%	76.04	77.74	77.09	76.88	76.71	76.55	79.33	76.63
H	wt%	4.80	5.02	5.03	4.98	5.01	5.05	5.01	4.92
N	wt%	1.15	1.15	1.19	1.18	1.19	1.21	1.15	1.20
O	wt%	7.59	7.92	7.22	7.36	7.28	7.45	6.47	7.32
Hg	ng/g	70.5	63.1	91.3	207	118	168	174	130

Note: All results are on a dry basis.

During the tests at the end of January, no PAC was injected and little mercury removal was expected. The coal mercury compared to the STM measurements at the stack and the CEM measurements at the inlet are presented in Figure 41. The outlet CEM was not functioning properly during this period and no outlet CEM data are available for comparison. As shown, the coal mercury matches the STM measurements at the stack. The CEM concentration is up to 25% different from the coal and STM measurements. The test log indicated that there were some operational problems with the inlet CEM at this time that may have contributed to the discrepancy.

Figure 41. Comparison of Coal, STM, and CEM measurements.

Coal analyses are used when converting mercury measurements made by the CEM in $\mu\text{g}/\text{dsm}^3$ to lb/TBtu . This calculation is per the methodology described in Appendix Q.

Carbon and Mercury in Ash

The carbon content of several ash samples collected at MK2 was analyzed by comparing the weight difference between a dried sample and a sample heated to 800°C for two hours. This is the typical technique used to measure unburned carbon and it is reported here as LOI in reference to the analysis technique. For samples containing activated carbon, the value is a measure of both the unburned carbon and the activated carbon injected into the system. For very low levels of carbon, there can be a difference between the actual carbon content measured with a carbon analyzer and the change in weight from combustion using an LOI analysis. The carbon content of most samples evaluated from MK2 testing was well above this level and an LOI analysis should be a good representation of the carbon content of the ash.

Samples from hoppers within the same ESP field were typically combined for analysis. Analysis of samples indicates that the carbon content was considerably higher in the samples collected during baseline conditions in 2006 and those collected during baseline conditions in 2007 in both ESP 1 and ESP 2 (Figure 42 and Figure 43, respectively). Owing to this difference, it is difficult to compare carbon content of samples collected during baseline conditions and those collected during continuous injection of either trona or MgO upstream of ESP 1. However, it is clear that samples collected from ESP 2 during dual injection of trona upstream of ESP 1 and PAC in between the ESPs had significantly increased carbon content compared to those collected during either baseline period. As can be seen in the figures, carbon content was not uniform across a row of hoppers.

Samples taken from hoppers beneath each row of ESP 1: Row A–Inlet; C–Outlet. Alkaline sorbent injected upstream of ESP 1; PAC injected downstream.

Figure 42. Fly Ash Carbon Content (% LOI) during Baseline, Continuous Injection of DARCO® Hg-LH and Trona, and Continuous Injection of DARCO® Hg and MgO.

Samples taken from hoppers beneath both rows of ESP 2 (ESP 2): Row 1–Inlet, 2–Outlet. Alkaline sorbent and PAC injected upstream of ESP 2.

Figure 43. Fly Ash Carbon Content (%LOI) during Baseline, Continuous Injection of DARCO® Hg-LH and Trona, and Continuous Injection of DARCO® Hg and MgO.

Some forms of LOI carbon can be effective at mercury capture. When large variations in LOI exist, large fluctuations in the fractions of vapor- and particulate-phase mercury may result. In addition to carbon content, fly ash samples were analyzed for mercury concentration. The variation in mercury concentration relative to carbon content during the baseline tests is shown in Figure 44 and during the continuous dual injection in Figure 45. Most of the ash is collected in ESP 1. During dual injection, PAC was injected between the two ESPs. While the mercury concentrations are high in the downstream ESP (ESP 2), the ash in these hoppers represents a small fraction of the total ash and would have contained a high percentage of PAC.

Original ESP: ESP 1–A Inlet, ESP 1–C Outlet; Supplemental ESP: ESP 2-1 Inlet; ESP 2-2 Outlet.

Figure 44. Fly Ash Carbon Content (%LOI) Versus Mercury in Fly Ash in Samples Collected during Baseline Testing in 2006 and 2007.

Alkaline sorbents injected upstream of ESP 1; PAC injected between the ESPs; Original ESP: ESP 1-A inlet, ESP 1-C outlet; Supplemental ESP: ESP 2-1 inlet; ESP 2-2 outlet.

Figure 45. Fly Ash Carbon Content (%LOI) Versus Mercury in Fly Ash in Samples Collected during Continuous Injection of DARCO® Hg-LH and Trona, and Continuous Injection of DARCO® Hg and MgO.

Leaching Stability

As part of the coal by-product analysis, select ash samples collected during the baseline and long-term testing phases were tested to determine the stability of mercury, bromine, arsenic, selenium, chlorine, and fluorine. Three leaching procedures were conducted: Method 1311, Toxicity Characteristic Leaching Procedure (TCLP); the Synthetic Groundwater Leaching Procedure (SGLP); and the Synthetic Precipitation Leaching Procedure (SPLP). The TCLP procedure measures potential metal mobility in a sanitary landfill. Only As, Hg, and Se were analyzed using the TCLP procedure.

The TCLP extraction fluid recipes were developed by computer modeling to simulate a worst-case scenario where the waste is co-disposed with municipal solid waste. For highly alkaline samples, a solution with a pH of 4.93, buffered using sodium hydroxide is used. TCLP is the only leaching procedure approved for characterizing hazardous waste under the Resource Conservation and Recovery Act (RCRA).

The TCLP results from fly ash samples collected throughout the testing period are presented in Table 14. Except for one instance, pH tended to decrease in samples collected from hoppers further downstream.

The SGLP procedure was developed by Hassett at EERC to better simulate the pH of groundwater to determine if mercury will leach from the samples under conditions designed to simulate actual field conditions, and addresses the incorporation of species into insoluble molecular matrices in a more static and arid environment. The SGLP consists of a 100-g sample dissolved into 2000 milliliters of distilled de-ionized water (or synthetic ground water) to achieve a liquid-to-solids ratio (L/S) of 20:1. The sample is rotated end-over-end, at 30 revolutions per minute, for 18 hours. The leachate is then filtered to remove all solids greater than 0.45 micrometers. For 30-day samples, the above treatment process is repeated. The SPLP procedure is similar except the pH of the solution is adjusted to 4.20 ± 0.05 by adding drop wise a 60/40 weight percent mixture of sulfuric and nitric acids prior to the 18 hour mix.

The SGLP samples were collected during the long-term tests that ended prior to the 2008 spring outage at Merrimack. Due to the high sodium content caused by trona injection during long-term testing, fly ash from both precipitators was sequestered in a dedicated silo, conditioned in a pug mill for volume reduction, and trucked to a landfill. Therefore, a composite sample was created by combining fly ash taken from both the original and supplemental ESPs. The results for fly ash are presented in Table 15. An analysis of each element contained in the sample is included as "Total in Sample," along with the percent of each element leaching from the sample. Because mercury concentrations were below the detection limit of the primary analysis laboratory, SGLP samples were sent to Frontier GeoSciences, Inc., for a trace level mercury analysis. The mercury concentrations were 0.091 mg/L in the baseline sample and 25.2×10^{-6} mg/L in the leachate samples. A very small amount of arsenic leaching was measured, but a significant fraction of the halogen and selenium leached from the sample. For every element tested, quantities were higher after the 30-day leach relative to the 18-day leach.

Table 14. TCLP Results from Merrimack (mg/L).

Test Period	Baseline	Baseline	Baseline	Baseline	Baseline	Baseline	MgO	MgO	MgO
ID	6726	6727	6728	6729	6730	6756	6757	6758	
Location	ESP 1 Row A	ESP 1 Row B	ESP 1 Row C	ESP 2 Rows 1–6	ESP 2 Rows 7–12	ESP 1 Row B	ESP 1 Row C	ESP 2 Rows 1–6	
Date	10/11/06	10/11/06	10/11/06	10/11/06	10/11/06	10/14/06	10/14/06	10/14/06	
Arsenic	0.01	0.02	0.04	0.08	0.21	0.03	0.14	0.05	
Mercury	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	
Selenium	< 0.01	< 0.01	< 0.01	< 0.01	0.02	0.06	0.12	0.07	
pH	8.83	8.27	7.45	3.92	3.83	9.23	9.35	8.71	

Test Period	MgO	Hg-LH Trona	Hg-LH Trona	Hg-LH Trona	Hg-LH Trona	Hg-LH Trona
ID	6759	7418	7419	7420	12233–12236	
Location	ESP 2 Rows 7–12	ESP 1 Row A	ESP 1 Row B	ESP 1 Row C	ESP 1/ESP 2 Comp	
Date	10/14/06	01/11/07	01/11/07	01/11/07	03/29/08	
Arsenic	0.03	0.04	0.04	0.04	0.03	
Mercury	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	
Selenium	0.02	0.51	0.35	0.29	0.3	
pH	4.84	9.83	10.1	8.48		

Table 15. SGLP Results from Merrimack (mg/L) during Long-Term Testing while Injecting Carbon Upstream of ESP 2; Trona Upstream of APH.

Test Period	Long-Term Hg-LH Trona					
ID	12261					
Location	ESP 1/ESP 2 Comp					
Date	03/29/08					
	Total in Sample (µg/g)	Total in Sample (mg/L)	18-Hour (mg/L)	30-Day (mg/L)	% of Total in Sample 18-Hour	% of Total in Sample 30-Day
As	170	8.5	0.27	0.58	3.2	6.8
Hg	1.82	0.091	< 5.49E-06	25.2E-06	< 0.006	0.03
Se	50	2.5	0.98	1.55	39	62
Br	710	35.5	16	17	45	48
Cl	3400	170.0	150	150	88	88
F	470	23.5	10	12	42	51

The SPLP samples were collected during parametric testing in July 2007 under similar conditions as the long-term tests: trona injection upstream of the APH and Hg-LH injection upstream of ESP 2. The results for fly ash collected in ESPs 1 and 2 are presented in Table 16 and Table 17 respectively. An analysis of each element contained in the sample is included as “Total in Sample,” along with the percent of each element leaching from the sample. SPLP leachate solutions were sent to Frontier GeoSciences, Inc., for a trace level mercury analysis.

For all elements included in the analysis except chlorine, the concentration was higher in the ash sample containing activated carbon (ESP 2). A significant fraction of the halogens leached from the ash collected in both ESP 1 and ESP 2; however, the fraction of chlorine and fluorine leaching from the sample containing Hg-LH was much lower (ESP 2 compared to ESP 1). This is also true for selenium, where more than 60% leached from the ash collected in ESP 1 and less than 0.5% from the ash collected in ESP 2. The presence of activated carbon also resulted in a lower fraction of arsenic leaching from the ash sample (more than 4% compared to less than 1%). Very little mercury leached from either sample, and a lower fraction leached from the sample containing activated carbon (less than 0.03% from ESP 1 and less than 0.003% from ESP 2).

Table 16. SPLP Results from Merrimack ESP 1 (mg/L) during Parametric Testing while Injecting Carbon Upstream of ESP 2; Trona Upstream of APH.

Test Period	Original ESP Ash with Trona					
ID	9517					
Location	ESP 1					
Date	07/13/07					
	Total in Sample (µg/g)	Total in Sample (mg/L)	18-Hour (mg/L)	30-Day (mg/L)	% of Total in Sample 18-Hour	% of Total in Sample 30-Day
As	170	8.5	0.36	0.62	4.2	7.3
Hg	0.166	0.0083	2.11E-06	1.57E-06	0.03	0.02
Se	16	0.8	0.49	0.68	61	85
Br	60	3	1.26	1.37	42	46
Cl	2300	115	116	114	101	99
F	120	6	2.05	3.26	34	54

Table 17. SPLP Results from Merrimack ESP 2 (mg/L) during Parametric Testing while Injecting Carbon Upstream of ESP 2; Trona Upstream of APH.

Test Period	Supplemental ESP Ash + Hg-LH					
ID	9518					
Location	ESP 2					
Date	07/13/07					
	Total in Sample (µg/g)	Total in Sample (mg/L)	18-Hour (mg/L)	30-Day (mg/L)	% of Total in Sample 18-Hour	% of Total in Sample 30-Day
As	660	33	0.23	0.04	0.7	0.1
Hg	2.04	0.1015	3.30E-06	1.67E-06	0.003	0.002
Se	120	6	< 0.01	0.02	< 0.2	0.3
Br	1600	80	64.32	36.56	80	46
Cl	1000	50	16	16	32	32
F	760	38	0.58	6.82	2	18

Halide Measurements

To determine the halogen and hydrogen halide concentration in the flue gas, triplicate runs of the EPA Method 26a were conducted at the inlet of ESP 1 and at the stack during baseline testing (October 2006) and during continuous injection of DARCO[®] Hg-LH and trona (March 2008). The full M26a test reports are included in Appendices N and O, with the former conducted in 2006 by Air Sampling Associates and the latter in 2008 by Eastmount Environmental Services. Results are summarized in Figure 46. No Br₂ was detected during baseline testing. No data are available for Cl₂ and Br₂ during the dual injection long-term testing.

HCl measurements indicated that the average HCl emissions increased 11% from the inlet to the outlet during baseline testing and 35% during continuous dual injection. The average HF emissions also increased from the inlet to the outlet during baseline and long-term testing. Since chlorine and fluorine were not being added to the system, these data are questionable. HCl emissions at the inlet to ESP 1 differed by 36% between the baseline and long-term measurements. The HF concentration also increased from baseline to long-term testing (154%) at the inlet to ESP 1 during long-term testing compared to baseline. For reference, there was approximately 758 µg/g Cl in the coal sampled during baseline testing and 839 µg/g Cl during long-term testing.

The average HBr emissions increased 17% from the inlet to the outlet during baseline testing and 407% during long-term testing, from 509 lb/TBtu at the inlet of ESP 1 to 2,582 lb/TBtu at the stack. There was also an increase in HBr emissions (26%) at the inlet to ESP 1 during long-term testing compared to baseline. The PAC injected during the dual injection continuous test period was treated with bromine compounds. The increase in HBr could be a result of a fraction of the bromine compounds released from the sorbent particle once injected into the flue gas stream.

Figure 46. Results of EPA Method 26A Measurements during Baseline and Long-Term Testing.

Balance-of-Plant Impacts

This project included an evaluation of the effects of the dual injection process on plant operations. The evaluation focused on the collection efficiency and operation of the ESPs and opacity levels and is presented here. The sorbents for SO₃ mitigation were injected upstream of the APH. The impact of these alkaline materials on the differential pressure across the APH is also discussed here. The effectiveness of these materials for reducing SO₃ levels in the flue gas is discussed in the “Co-Benefits Analysis” section. The sorbents for mercury control were primarily injected between the two ESPs. The performance of these sorbents has been discussed earlier. An unexpected balance-of-plant impact was the occurrence of smoldering PAC-ash in ESP 2 hoppers. This issue is discussed separately in the “Ash-Carbon-Trona Auto-Ignition Test Results” section.

Effect of Sorbents on APH Differential Pressure

The APH differential pressure at MK2 is a long-standing concern for PSNH. MK2 operates with a tubular APH without soot blowers. The tubular design decreases flue gas velocity (i.e., increases transit time) through the APH and has a slower flue gas quench rate than a regenerative APH. During full load conditions, approximately 6700 lb/hr of fly ash transits the APH. At lower temperatures, SO₃ can combine with ammonia slip from the SCR system to form ammonia bisulfate, which can deposit on heater surfaces and cause plugging and an increase in pressure differential. Throughout the test period, increases in APH differential pressure were observed during injection of trona. In the available public documentation on hot-side trona injection, testing has been performed with a regenerative APH. These previous tests with a regenerative APH did not show any appreciable increase in APH differential pressure due to trona injection provided that the plant avoided the formation of sodium bisulfates. Some plants had to modify the original design to increase the soot blowing across the APH to prevent degeneration of the APH (temperature and differential pressure), probably due to the formation of bisulfates. This section focuses on changes in APH differential pressure observed during the continuous dual injection tests.

For the four-month period prior to the initial phase of continuous dual injection testing in late November, the mean APH differential pressure was 6.91 ± 0.17 in. w.c. Figure 47 shows a plot of APH differential pressure and load for the trona injection period, from November 30 to December 27, 2007. For most of this time period, trona was injected at 550 lb/hr. As can be seen in the figure, the APH differential pressure gradually increased during the injection period. During the final week of testing (December 23–27, 2007), the mean differential pressure had increased to 7.71 ± 0.52 in. w.c.

Figure 47. APH Differential Pressure during Trona Injection, December 2007.

Trona injection was reestablished on January 18 to evaluate whether increasing or decreasing trona injection rates would affect the rate of increase of APH differential pressure. Trona injection was held steady at approximately 500 lb/hr and then decreased to 300 lb/hr on January 21. As seen in Figure 48, there was no significant change in the APH differential pressure rate of change relative to trona injection concentration. Observations during the December 2007 test period, however, suggest that sustained changes in APH differential pressure may result after prolonged injection. Thus, the relatively short-term test of the effects of different injection rates may not reflect changes that would be observed during a longer test period.

Figure 48. APH Differential Pressure during Trona Injection, January 2008.

As discussed previously, the inspection following the January 2008 shutdown revealed that half of the trona injection lances were plugged, which in turn likely resulted in biased SO₃ removal. The unexpected APH differential pressure increase observed in December 2007 and January 2008 may have been partially the result of the biased sorbent dispersion leading to the formation of bisulfates in the low-trona-concentration regions of the flue gas flow that would stick to the APH surfaces.

In an effort to identify the cause of the APH differential pressure increase, samples of the buildup on the APH surfaces were removed for analyses. Initial results identified the presence of bisulfate deposition. Further analysis is required to determine whether the bisulfates are sodium or ammonia based. In either case, the biased trona distribution may have increased the rate of deposition on the APH tubes.

A plot of APH differential pressure, load, and sorbent injection rate during the final phase of continuous dual injection in March 2008 is shown in Figure 49. During the two days prior to injection, the mean APH differential pressure was 7.81 ± 0.14 in. w.c. During the initial injection period (March 12–17, 2008), there was little change in the mean differential pressure (7.80 ± 0.25 in. w.c.). However, as can be seen in the figure, the differential pressure began to increase after trona injection was restarted on March 18. From March 26 until the injection rate increased on March 28, the mean differential pressure was 8.53 ± 0.14 in. w.c. and did not change significantly during the remaining four days of the test at double the rate of trona injection.

Figure 49. APH Differential Pressure During Trona Injection, March 2008.

Effect of Sorbents on ESP Operations

ESP parameters were not logged automatically during the test program. During baseline and parametric test periods, ESP data (including spark rate and power) were taken manually several times a day, with more frequent visual checks if parameters appeared to be changing. Sorbents for SO₃ mitigation were injected upstream of ESP 1 (see Figure 3 for a schematic of the ESP 1 TR sets.) SO₃ concentration affects the resistivity of the fly ash and

the resulting behavior of the ESP as ash is collected. The effect of SO₃ on resistivity trends towards zero as the temperature approaches 350 °F, with an insignificant effect at temperatures greater than 350 °F. Although temperatures at the inlet to ESP 1 were not collected consistently, temperatures taken upstream at the outlet to the APH suggest that flue gas temperatures were generally less than 350 °F.

The relative difference in the average spark rate during sorbent injection compared to the average spark rate during baseline conditions for the electrical fields of ESP 1 is shown in Figure 50 and Figure 51 for trona and MgO, respectively. Although there is considerable variation in the data, these figures suggest that sorbent injection tends to slightly decrease spark rate relative to baseline conditions. However, examination of the spread of the raw data suggests that neither MgO nor trona had a significant impact on ESP spark rate at the injection rates tested. For example, during base conditions TR set C-north had a mean spark rate of 33.6 ± 11.82 sparks per minute and during MgO injection at a rate of 35 lb/hr, the mean was 44 ± 1 , and during injection of trona at 600 lb/hr the mean rate was 38.3 ± 4.51 .

Figure 50. Relative Difference in Spark Rate in Original ESP during Trona Injection (TR Sets A-Inlet, C-outlet).

Figure 51. Relative Difference in Spark Rate in ESP 1 during MgO Injection (TR Sets A-Inlet, C-Outlet).

A reduction in power was noted on several TR sets of ESP 1 during sorbent injection. This is shown in Figure 52 and Figure 53, where the data are presented as a percent of baseline power, for the injection of trona and MgO, respectively. In general, reduction in power levels tends to be less during the injection of trona than MgO at the injection rates tested.

Figure 52. Relative ESP Power during Trona Injection (TR sets of ESP 1: A-Inlet, C-Outlet).

Figure 53. Relative ESP Power during MgO Injection (TR Sets of ESP 1: A-Inlet, C-Outlet).

Effect of Sorbents on Stack Opacity

Addition of particles to the flue gas upstream of the ESPs can affect the performance of the ESPs and the resulting particulate emissions. During the injection of both SO₃ remediation sorbents (trona, MgO) and activated carbon, the stack opacity was measured.

During MgO injection, stack opacity increased (Figure 54), although not consistently. In the October 2006, testing (up to 180 lb/hr) opacity increased from about 11% to about 17% at normal cold-end average temperature (~ 333 °F stack temperature), although there was considerable scatter in the opacity data. Lowering the temperature (~ 315 °F stack temperature) decreased the opacity at 180 lb/hr injection from about 17% to about 13%. In the February 2007 testing, however, MgO injection did not markedly alter opacity, and the opacity was lower overall than in the October 2006 testing.

Figure 54. Stack Opacity as a Function of MgO Injection Rate.

Injection of trona, in contrast to MgO, had much less effect on stack opacity, as shown in Figure 55. Opacity increased from about 11% to about 13% at a trona injection rate of 625 lb/hr. At 500 lb/hr there did not appear to be a significant impact on opacity. There was little effect of temperature on the opacity during trona injection.

Figure 55. Stack Opacity as a Function of Trona Injection Rate.

Activated carbon injection could also have an effect on opacity, since carbon particles can be difficult to collect. Figure 56 shows that at normal stack temperatures, both DARCO[®] Hg-LH and DARCO[®] E-26 injection resulted in increases in opacity. Injection of DARCO[®] E-26 at lower temperature, however, had little impact on opacity. Injection of DARCO[®] Hg-LH upstream of the APH did not result in a significant increase in opacity, presumably because most of the carbon was caught in ESP 1, thus reducing the added burden on ESP 2.

Figure 56. Stack Opacity as a Function of Activated Carbon Injection Rate.

Particulate Emissions

Results from EPA Method 17 tests conducted during baseline conditions (October 2006) at the inlet to ESP 1 indicated average particulate loading of 1.28 gr/dscf, while those at the stack averaged 0.05 gr/dscf, for a particulate removal of 96%. A different testing firm conducted EPA Method 5 tests during continuous dual injection of DARCO[®] Hg-LH and trona in March 2008 at the same locations. The results of these tests indicated average particulate loadings of 1.35 gr/dscf and of 0.01 gr/dscf at the inlet and outlet, respectively, for a particulate removal of 99%. These data suggest that dual injection of Hg-LH and trona did not adversely impact particulate emissions. The full M17 and M5 test reports are included in Appendices N and O.

Ash Sales

Prior to testing, fly ash that was not reinjected in the boiler was disposed of at the Carbon Burn-Out (CBO) unit located at the Brayton Point Station. The CBO operates at approximately 1200 °F, which implies that the mercury captured by the PAC would be driven off the Merrimack fly ash stream in the CBO. There is testing at a CBO to support the recapture of mercury during the cool down of the flue gas at the exit of the stream, but it was a complication for the CBO utilization. An additional problem was the addition of trona into the fly ash stream at PSNH. Trona, due to its sodium content, prevents the reinjection of fly ash into the boiler as well as the easy disposal of fly ash to the CBO unit. Trona also impacts the usability of the fly ash stream in land reclamation projects due to sodium concentrations. Thus, an alternative means of disposal was required during testing. During the course of testing, PSNH acquired an ash-conditioning unit that allowed the utilization of ash for the duration of testing and beyond. The pretreatment of the fly ash allowed the most cost-effective means of beneficial land fill use.

ECONOMIC ANALYSES

This section omits consideration for resolution of balance-of-plant concerns, and is therefore theoretical. After completion of testing and analysis of the data, the requirements and costs for full-scale, permanent commercial implementation of the necessary equipment for mercury control using sorbent injection technology at the 336-MW Merrimack Generating Station Unit 2 were determined. The cost of process equipment sized and designed based on the long-term test results for approximately 50% mercury control, and on the plant-specific requirements (sorbent storage capacity, plant arrangement, retrofit issues, winterization, controls interface, etc.) has been estimated. The system design was based on the criteria listed in Table 18.

Table 18. System Design Criteria for Mercury Control System at Merrimack Unit 2 (6.0 lb/MMacf Injection, 70% Mercury Control.)

Parameter	Activated Carbon	Trona
Number of silos	1	1
Number of injection trains	2 operating, 1 spare	2 operating, 1 spare
Design feed capacity/train (lb/hr)	1000	1000
Operating feed capacity/train (lb/hr)	660	660
Sorbent storage capacity (lbs)	200,000	450,000
Conveying distance (ft)	250	150
Sorbent	DARCO [®] Hg-LH	Trona
Aerated Density (lb/ft ³)	18	49
Settled Density (lb/ft ³)	28	69
Particle MMD (microns)	18	34

The estimated uninstalled cost for both an activated carbon and a trona injection system and storage silo for the 336-MW Unit 2 is \$1,255,000 each. Costs were estimated based on a long-term activated carbon injection concentration of 4.5 lb/MMacf and trona injection concentration of 7.5 lb/MMacf. For Merrimack Unit 2, this would require an injection rate of nominally 300 lb/hr for activated carbon and 500 lb/hr for trona at full load. Assuming a unit capacity factor of 85% and a delivered cost of \$1.05/lb for DARCO[®] Hg-LH sorbent and \$0.105/lb for trona, the annual sorbent cost for injecting both sorbents into the existing ESP would be about \$2,346,000 for DARCO[®] Hg-LH and \$387,000 for trona, for a total of about \$2,733,000. This corresponds to a nominal sorbent cost of \$21,450 per pound of mercury removed (50% mercury removal).

Results from the field tests conducted to date indicate that different levels of mercury removal can be achieved depending on the air pollution control equipment and different flue gas conditions. Data collected from the Phase I DOE tests at E.C. Gaston Generating Plant

indicate that mercury removal levels of up to 90% were obtained with COHPAC[®] (a baghouse installed downstream of an ESP) and DARCO[®] Hg sorbent injection. At Pleasant Prairie, 50–70% removal while injecting DARCO[®] Hg was the maximum achievable mercury control, with the configuration of an ESP collecting PRB ash. At Brayton Point, mercury removal levels of up to 90% were obtained with an ESP collecting bituminous ash with DARCO[®] Hg sorbent injection.^{7,8} DOE Phase II testing at Holcomb showed mercury removal levels of 90% were obtained with an SDA and FF while injecting DARCO[®] Hg-LH.⁹ Data from Merrimack and six other sites are summarized in Table 19.

Table 19. Summary of Mercury Removal Efficiencies and Costs for Different APC Configurations, Coals, and Sorbents.

Plant	APC Equipment	Coal	Sorbent	Removal %	Sorbent Cost (mills/kWh)
Gaston	COHPAC [®]	Bituminous	DARCO [®] Hg	90	0.43
Pleasant Prairie	ESP	PRB	DARCO [®] Hg	67	1.2
Brayton Point	ESP	Bituminous	DARCO [®] Hg	90	2.4
Holcomb	SDA + FF	PRB	DARCO [®] Hg-LH	90	0.44
Meramec	ESP	PRB	DARCO [®] Hg-LH	90	0.74
Independence	ESP	PRB	DARCO [®] Hg-LH	80	1.14
Merrimack	ESP	Bituminous	DARCO [®] Hg-LH with trona	50*	1.10

* Mercury removal was not sustainable with the installed test equipment at Merrimack because of balance-of-plant issues.

The results from Merrimack indicate that mercury removal was not sustainable due to balance-of-plant impacts when using 4.5 lb/MMacf DARCO[®] Hg-LH in combination with 7.5 lb/MMacf trona. The sorbent costs for this removal level were 1.10 mills/kWhr. Costs shown in Table 19 are specific to sorbent and do not include equipment O&M. Higher mercury removal was achieved at times during testing at Merrimack and if engineering issues can be resolved, and the PAC injection ratio can be increased, it may be possible to achieve higher mercury removal.

System Description

The permanent commercial activated carbon injection system for Merrimack Unit 2 will consist of two bulk storage silos, one for activated carbon and another for trona. Each silo will have three dilute-phase pneumatic conveying systems. DARCO[®] Hg-LH sorbent will be received in 40,000-pound batches delivered by self-unloading pneumatic bulk tanker trucks. The silo is equipped with a pulse jet type bin vent filter to contain dust during the loading process. The silo is a shop-built, dry-welded tank with three mass flow discharge cones equipped with air fluidizing pads and nozzles to promote sorbent flow. Point level probes and weigh cells monitor sorbent level and inventory. Silo sizing was based on the

capacity to hold approximately five truckloads of DARCO® Hg-LH sorbent, sufficient for 17 days of operation at the design injection rate. The silo for trona storage is designed to match the activated carbon silo and has a capacity to hold approximately 28 days worth of material at the design injection rate.

The sorbent is fed from the discharge cones by rotary valves into feeder hoppers. From the hoppers the sorbent is metered into the conveying lines by volumetric feeders. Conveying air supplied by regenerative blowers passes through a venturi eductor, which provides suction to draw the sorbent into the conveying piping and carry it to distribution manifolds, where it splits equally to multiple injection lances. The blowers and feeder trains are contained beneath the silo within the skirted enclosure.

A programmable logic controller (PLC) is used to control all aspects of system operation. The PLC and other control components will be mounted in a NEMA 4 control panel. The control panel, motor control centers (MCCs), and disconnects will be housed in a prefabricated power and control building located adjacent to the silo.

Cost and Economic Methodology

Costs for the sorbent storage and injection equipment were provided by ADA-ES based on the design requirements in Table 18. ADA-ES has built and installed many similar systems at coal-fired power plants for mercury control. Estimated costs for the distribution manifold, piping and injection lances, installation man-hour and crane-hour estimates, and an estimate for foundations including pilings are also included. As construction costs are rising rapidly, these costs are tentative and very dependent upon local labor conditions as well as current national demand for related equipment.

EPRI TAG methodology was used to determine the indirect costs. A project contingency of 15% was used. Since the technology is relatively simple and well proven on similar scale, the process contingency was set at 5%. Based upon requested guarantee language, that contingency may increase to cover anticipated risks for a newer technology. ACI equipment can be installed in a few months; therefore, no adjustment was made for interest during construction, a significant cost factor for large construction projects lasting several years.

Operating costs include sorbent costs, electric power, operating labor, maintenance (labor and materials), and spare parts. An average incremental operating labor requirement of one hour per day per injection system was estimated to cover the incremental labor to operate and monitor the ACI and trona injection systems. The annual maintenance costs were based on 5% of the uninstalled equipment cost.

Levelized costs were developed based on a twenty-year book life and are presented in constant dollars.

Capital Costs

The uninstalled activated carbon and trona storage and feed equipment costs are estimated at \$1,255,000 for each system for a total of \$2,510,000. The estimated cost for each sorbent injection system and storage silo installed on the 336-MW Unit 2 is \$2,082,000 for a total of \$4,164,000 for both systems and includes all process equipment, foundations, support steel, plant modifications utility interfaces, engineering, taxes, overhead, and contingencies. The capital and O&M costs are summarized in Table 20 with no ash disposal costs included.

Table 20. Capital and Operating & Maintenance Cost Estimate Summary for Activated Carbon and Trona Systems on Merrimack Unit 2. Annual Basis 2008.

Capital Costs Summary	Hg-LH	Trona	TOTAL
Equipment, FOB Merrimack	\$1,075,000	\$1,075,000	\$2,150,000
Site Integration (materials and labor)	\$180,000	\$180,000	\$360,000
Installation (ACI silo and process equipment, foundations)	\$220,000	\$220,000	\$440,000
Taxes (6%)	\$75,000	\$75,000	\$150,000
Indirects/Contingencies	\$532,000	\$532,000	\$1,064,000
Total Capital Required	\$2,082,000	\$2,082,000	\$4,164,000
\$/kW	\$ 6.22	\$6.22	\$12.43
Operating and Maintenance Costs Summary			
Sorbent @ \$1.05/lb Hg-LH; \$0.105/lb trona	\$2,346,500	\$387,000	\$2,733,500
Power, labor, maintenance	\$126,000	\$126,000	\$252,000
Variable O&M for 2008 (\$/kW)	\$7.81	\$1.17	\$8.98
Variable Mills/kW-hr	1.05	0.16	1.21

Operating and Levelized Costs

The following analysis is solely theoretical due to AH fouling and smoldering PAC precluding sustainable long-term operation. With the exception of the waste disposal costs that are discussed below, and balance-of-plant concerns, the most significant operational cost of sorbent injection for mercury control is the DARCO® Hg-LH sorbent. Sorbent costs were estimated for an average of 50% mercury control based on the long-term sorbent injection concentration of 4.5 lb/MMacf for activated carbon and 7.5 lb/MMacf for trona. For Merrimack Unit 2, this would require an injection rate of nominally 300 lb/hr of activated carbon and 500 lb/hr of trona at full load. Assuming a unit capacity factor of 85% and a delivered activated carbon cost of \$1.05/lb and trona cost of \$0.105, the twenty-year levelized annual cost of injecting sorbent at the ESP inlet would be \$4,314,500 (\$5,680,000 assuming lost ash sales and disposal). Included in this is other annual operating levelized costs including electric power, operating labor, and maintenance.

Based on the test program results and assuming that sorbent injection at the ESP inlet for mercury control is sustainable, mercury control can be attained at Merrimack Unit 2 for an initial capital investment of \$4,164,000, with first-year operating costs of \$10.93/kW (\$14.09/kW), or annual twenty-year constant-dollar levelized costs of \$11.42/kW (\$15.45/kW). This information is summarized in Table 21.

The levelized costs reported in Table 21 are specific to Merrimack Unit 2. The levelized cost summary uses the following factors:

1. Ash Sales: \$3/ton
2. Ash Disposal: \$40/ton
3. Ash Production Rate: 6,700 lb/hr

In the case presented below, the disposal costs are for the entire unit, as if PAC were injected upstream of ESP 1.

Table 21. Levelized Costs Summary.

Twenty-Year Levelized Costs Summary—\$ Constant		
	Lost Ash Sales Revenue and Disposal Costs Included	Lost Ash Sales Revenue and Disposal Costs Not Included
Fixed Costs	\$487,000	\$487,000
Variable O&M	\$5,193,000	\$3,827,500
Total	\$5,680,000	\$4,314,500
Fixed Levelized Costs \$/kW	1.45	1.45
First-Year Operating Levelized Costs \$/kW	12.19	8.98
Total Twenty-Year Levelized Costs \$/kW	15.45	11.42
First-Year Operating Levelized Costs mills/kW-hr	1.63	1.21
Total Twenty-Year Levelized Costs mills/kW-hr	2.27	1.73
Total Twenty-Year Levelized Cost \$/lb Hg removed	44,500	33,800

OBSERVATIONS AND CONCLUSIONS

MK2 proved to be a very difficult application for mercury control using activated carbon injection primarily because of the SCR-generated SO₃. Thus, although the coal fired during the test program was medium-sulfur (1.2% sulfur target) bituminous, the SO₃ content resembled that of a higher-sulfur flue gas. In addition, typical flue gas temperatures ranged from 330 to 350 °F, which is in the range that detrimentally impacts activated carbon performance.

The overall objective of this project was to assess the potential for significant mercury control, between 50 and 90% above baseline by sorbent injection in order to meet the goals established by the DOE Program of 50 to 70% mercury removal and NH House Bill 1673 that requires an 80% reduction by July 1, 2013. Initial mercury control evaluations indicated that, without SO₃ control, mercury reductions were limited to 15 to 20%. Subsequently, with SO₃ control via trona injection upstream of the APH, up to 50% mercury capture could be achieved during the program but was not sustainable due to balance-of-plant impacts. Specific balance-of-plant issues that prevented sustainable operation mercury removal were air preheater pluggage from trona injection and periodic instances of smoldering PAC in ESP 2. A summary of results supporting these conclusions are shown below.

Specific Challenges of Particular Significance

- Balance-of-plant issues that made mercury removal unsustainable.
 - Air preheater operation: the pressure drop across the air preheater increased during all periods of trona injection, an indication of deposition in the air preheater and a risk of eventual pluggage. An injection grid designed specifically for MK2 may improve the trona distribution and subsequently reduce the pluggage issues. However, long-term testing would be required to assess whether deposition could be eliminated.
 - Smoldering PAC: The PAC–ash mixture in ESP 2 periodically began to smolder. This has been observed at other sites with high concentrations of PAC in ash. Normal operating conditions at MK2 were outside of the expected smoldering range and it is, therefore, uncertain whether the smoldering ash was the result of a long-term operational issue or a result of transient flue gas conditions during unit shutdowns. PAC injection upstream of ESP 1 should eliminate issues with smoldering PAC–ash by decreasing the fraction of PAC in the mixture.
- Operation of test equipment.
 - Mercury CEMS required additional maintenance and were often off-line because they failed daily QA checks. The outlet CEMS had a measurement bias during much of the tests.
 - SO₃ measurements: E.ON measured SO₃ using a Controlled Condensation method that they developed and these results were within expected levels. EPA Method 8A provided inconsistent and questionable results. Measurements made using the

Breen probe were intermittently successful; however, the equipment did not survive in the flue gas atmosphere.

- Injection lances, both for PAC and trona/MgO, plugged at least once during the test program.
- The fixed-bed sorbent screening device was unreliable at this site, likely due to the high acid dewpoint temperature and subsequent deposition of sulfuric acid in the system.
- Additional challenges were encountered because test equipment was not specifically designed for this site. For example, the same equipment was used to inject trona and MgO, which have different feed characteristics. The injection locations were also in existing ports rather than custom ports with locations chosen specifically to optimize distribution. These choices were made because of the budget limitation of the program.
- Degree of difficulty in obtaining mercury removal in this application.
 - SO₃ had to be controlled to lower levels before any meaningful mercury removal could be obtained.
 - Choice of SO₃ sorbent proved more complicated because of ash disposal, recycle, ESP performance, APH pressure drop, delivery of product, cost, and equipment design issues.
 - High flue gas temperatures added another challenge for PAC performance. This is related to the SO₃ levels because high SO₃ concentrations cause higher acid dewpoint temperatures.

Summary of Results

- Baseline testing.
 - Baseline native mercury removal across the ESPs was less than 10%.
 - Oxidized mercury was consistently well above 80%.
- Co-benefits.
 - Both MgO and trona demonstrated effectiveness at reducing the SO₃ concentration. Reducing SO₃, if it had been sustainable, would have allowed the plant to increase operating efficiency by recovering additional heat in the APH.
 - With 500 lb/hr of trona, SO₃ was 7 to 10 ppmv (~ 50% reduction from baseline)
1000 lb/hr of trona, SO₃ was ~ 5 ppmv.
 - MgO injection appeared (qualitatively) to reduce SO₃ concentrations downstream of the APH.
- Parametric and long-term testing: mercury removal.
 - No “sulfur tolerant” sorbents were identified or evaluated that were more effective than standard PAC sorbents.

- Without modification of either the CEA temperature or the native SO₃ concentration, the mercury removal was limited to less than 20% at injection concentrations up to 8 lb/MMacf for all mercury sorbents tested. This scenario was not long-term tested.
- Injecting PAC upstream of the APH did not result in improved mercury removal performance compared to APH outlet injection.
- The performance of PAC can be enhanced when levels of SO₃ in the flue gas are decreased, specifically below 10 ppm. The following scenarios were not long-term tested:
 - DARCO[®] Hg-LH at 5 lb/MMacf and 1000 lb/hr trona: 45% mercury removal.
 - DARCO[®] Hg-LH at 5 lb/MMacf and 150 lb/hr MgO: 30% mercury removal.
- Lowering the APH cold-end average temperature by an average of 20–30 °F improved the effectiveness of PAC alone or when either trona or MgO was injected to control SO₃. The following scenarios were not long-term tested:
 - DARCO[®] Hg-LH at 5 lb/MMacf and 1000 lb/hr trona: 55% mercury removal.
 - DARCO[®] Hg-LH at 5 lb/MMacf and 150 lb/hr MgO: 40% mercury removal.
- Balance-of plant impacts.
 - Smoldering PAC–ash was discovered in the ESP 2 hoppers during outages. High PAC–ash mixtures collected in hoppers must be managed to prevent auto-ignition. Because the fly ash concentration exiting a cyclone boiler is relatively low, the percentage of PAC to ash will be higher at MK2, especially if PAC is injected downstream of the first ESP.
 - Trona injection upstream of the APH resulted in an increase in the pressure drop across the tubular APH. Optimization of sorbent distribution and injection rates may minimize this issue.
 - Trona injection at 500 lb/hr did not have a noticeable impact on opacity. Injection at 625 lb/hr resulted in a slight increase in opacity.
 - MgO injection, particularly when milled, was limited due to impacts on ESP operation and resulting opacity. Injection of unmilled MgO at 180 lb/hr increased opacity from the baseline of ~ 11% to ~ 17% at normal temperatures and ~ 13% at 315 °F.
 - Public Service of New Hampshire determined a means to dispose of the PAC–ash mixture. The avenues explored by PSNH were use of a Carbon Burn-Out unit, land reclamation, dry landfill disposal, and wet landfill disposal. The best avenue for fly ash disposal was the installation of a fly ash preconditioning system to allow the pretreatment of the ash for beneficial landfill use.
- CFD modeling.
 - The maximum removal was predicted to be 67% at a sorbent injection of 5 lb/MMacf and a sorbent capacity of 1249 µg/g. This capacity corresponds to DARCO[®] Hg sorbent at 300 °F with low SO₃ in the flue gas. The actual mercury removal measured during short-term tests during SO₃ mitigation and temperature

management approached the modeled prediction, averaging 55 to 60% under the optimal controlled circumstances. This may indicate that small improvements in mercury removal could be achieved with better distribution of the PAC.

- Economic
 - To achieve 50% mercury capture at MK2, nominally 300 lb/hr of activated carbon and 500 lb/hr of trona would be required at full load. Assuming balance-of-plant issues are resolved, a unit capacity factor of 85% and a delivered activated carbon cost of \$1.05/lb and trona cost of \$0.105, the twenty-year levelized annual cost of injecting sorbent at the ESP inlet would be \$4,315,000 (\$5,680,000 assuming lost ash sales and disposal).

The evaluation of mercury removal performance of injected sorbents in the presence of SO₃ at MK2 extends the findings from DOE/NETL Phase II Round I testing at Conesville Station and results from similar sites that contain SO₃ in the flue gas. The ACI test program conducted at MK2 demonstrated that up to 50% mercury removal could be achieved with carbon sorbents during short-term testing by lowering flue gas SO₃ levels and flue gas temperatures at the APH outlet. However, balance-of-plant impacts precluded maintaining these levels of removal at PSNH MK2.

Support from DOE/NETL was critical to the success of this field program. Due to the significant challenges encountered during this test program, and in general at sites with SCR-generated SO₃ in the flue gas, this support resulted in additional options for mercury control that had not been developed or tested prior to the project.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACI	Activated carbon injection
APH	Air preheater
B&W	Babcock & Wilcox
CAMR	Clean Air Mercury Rule
CBO	Carbon Burn-Out
CEA	Cold end average
CEM	Continuous emission monitor
CVAAS	Cold-vapor atomic absorption spectrometer
CVAFS	Cold-vapor atomic fluorescence spectroscopy
DARCO [®] Hg	Sorbent manufactured by Norit Americas. Formerly known as DARCO [®] FGD.
DARCO [®] Hg-LH	Sorbent manufactured by Norit Americas. Formerly known as DARCO [®] FGD-E3.
DARCO [®] Hg-E26	Sorbent manufactured by Norit Americas
DES	Department of Environmental Services
DOE	Department of Energy
EC	Equivalent sorbent injection concentration
ESP	Electrostatic precipitator
FF	Fabric filter
FGD	Flue gas desulfurization
ICR	Information Collection Request
kacfm	Thousand actual cubic feet per minute
kW	Kilowatt
LOI	Loss on ignition
MK2	Merrimack Station Unit 2
MW	Megawatt
NETL	National Energy Technology Laboratory
O&M	Operating and Maintenance
PLC	Programmable logic controller
PAC	Powdered activated carbon
PSNH	Public Service of New Hampshire
SCA	Specific collection area

SCR	Selective catalytic reduction
SCEM	Semi-continuous emission monitor
SDA	Spray dryer absorber
SGLP	Synthetic Groundwater Leaching Procedure
SIS	Sorbent injection system
SPLP	Synthetic Precipitation Leaching Procedure
SSD	Sorbent screening device
TCLP	Toxicity Characteristic Leaching Procedure

APPENDIX A: Test Plans

Date: October 5, 2006

From: Connie Senior

To: Art Auclair, Jean Bustard, Tom Campbell, Harold Keyes, Paul Raichle

Re: Sorbent injection for co-benefit testing at MK2 REVISED

The goals of the co-benefits testing at Merrimack Unit 2 (MK2) are to reduce SO_3 concentrations sufficiently to enable efficient use of activated carbon for mercury control and to reduce the air preheater cold-end average temperature. Two sorbents are being considered for the testing: MgO and Trona ($\text{Na}_2\text{CO}_3\text{-NaHCO}_3\text{-}2\text{H}_2\text{O}$). MgO has previously been tested at MK2 for SO_3 reduction, while Trona has not been tested.

In previous testing of MgO in 2004, 120-180 lb/hr were injected through four injectors at the SCR outlet duct. An injection rate of 180 lb/hr represented approximately 1:1 MgO: SO_3 (molar basis) for a post-SCR SO_3 concentration of 46 ppm, which is what was measured by E.ON in 2004. At 180 lb/hr and a reduced cold-end temperature of 230°F, SO_3 removal across the APH in 2004 was 50-60%. In 2002, SO_3 concentrations were measured as lower (34 ppm average at SCR outlet) because the SCR exit temperature was lower in 2002 than in 2004.

Higher injection rates of MgO than 180 lb/hr caused problems in the ESP. Trona injection will result in the formation of sodium compounds, which should not challenge the ESP as much as the MgO sorbent. It was noted by AEP that injection of Trona at Plant Gavin improved ESP performance.

Table 1 gives an example of the calculation of sorbent flow rate needed for 1:1 Oxide: SO_3 (molar basis) at 33 ppm SO_3 at the SCR exit. Trona injection rates are 4.5 times higher than MgO rates for a 1.2:1 stoichiometry.

The MgO injection rate of 140 lb/hr corresponds to 1.7 tpd for continuous injection. The existing silo holds approximately 14 tons. Therefore, the silo has enough capacity for about six days of MgO injection at that rate. The Trona injection rate of 625 lb/hr corresponds to 7.5 tpd; the silo has enough capacity for about two days of Trona injection at that rate. We might consider not injecting Trona continuously or injecting it at a low rate (100-200 lb/hr) overnight.

Assuming that 60% SO_3 removal is possible with the sorbent injection rates in Table 1, there will be an increase in MgO, Na_2O , and sulfate in the fly ash collected in both the old and new ESPs. Table 2 estimates the impact of the sorbents on fly ash composition.

Table 1. Assumptions for estimation of SO₃ sorbent flow rates for mid-sulfur coal.

Assumptions:		
Output, MW		333
Coal, klb/hr		247
% Bottom ash		0.7
% LOI		0.09
% Fly ash recycle		No
% Inleakage, APH		0.06
% Removal in ESP 1		0.8
% Removal in ESP 2		0.96
% SO ₂ conversion - boiler		1.00%
% SO ₂ conversion - SCR		1.70%
% SO ₃ removal across APH		9.40%
% SO ₃ removal across ESP1		10.00%
Coal Hg content, ug/g dry		0.13
Coal ash MgO, wt%		1.0%
Coal ash Na ₂ O, wt%		1.0%
Conditions at SCR Outlet:		
Temperature, F		700
Gas flow rate, klb/hr		3,101
Gas flow rate, acf/min		1,472,619
Fly ash, klb/hr		6.46
% O ₂		2.47%
% H ₂ O		8.45%
SO ₂ , ppm		1,176
SO ₃ , ppm		33
Molar Oxide/SO₃		
SO ₃ , lb/hr		277
MgO, lb/hr	1	139
Trona, lb/hr	1.2	625

Table 2. Estimate of fly ash compositions for 60% SO₃ removal and sorbent flow rates as given in Table 1.

With MgO injection	
Ash collected in ESP 1, lb/hr	4,874
Carbon content, wt%	8.5%
<i>**wt% MgO, carbon-free basis</i>	3.4%
<i>**wt% SO₃, carbon-free basis</i>	3.0%
Ash collected in ESP 2, lb/hr	1,187
Carbon content, wt%	8.6%
<i>**wt% MgO, carbon-free basis</i>	3.4%
<i>**wt% SO₃, carbon-free basis</i>	2.9%
With Trona injection	
Ash collected in ESP 1, lb/hr	5,297
Carbon content, wt%	7.9%
<i>**wt% Na₂O, carbon-free basis</i>	5.1%
<i>**wt% SO₃, carbon-free basis</i>	2.7%
Ash collected in ESP 2, lb/hr	1,230
Carbon content, wt%	8.3%
<i>**wt% Na₂O, carbon-free basis</i>	5.3%
<i>**wt% SO₃, carbon-free basis</i>	2.8%

Table 3 presents a preliminary schedule for co-benefits testing. Several assumptions have been made that require explanation.

- Previous testing with MgO suggested that at least 8 to 10 hours of injection was needed to stabilize SO₃ concentrations downstream of the air preheater. Therefore, sorbent injection should be started the day before any mercury sorbent testing with the sorbent screening device (SSD) commences.
- A dewpoint meter should be used to make stack SO₃ measurements during sorbent injection in order to provide a qualitative assessment of SO₃ levels.
- CFD modeling of MgO injection showed that the sorbent was not well-distributed with the four-nozzle configuration. It was noted by E.ON during the 2004 program that different behavior was observed in the North and South ducts during MgO injection, suggesting that the MgO sorbent was not evenly distributed in the duct. CFD modeling of injection by B&W confirmed that there was maldistribution of the sorbent for the four-nozzle case. Also the differences in residence time between the North and South ducts from the split to the air preheater inlet might account for the observation of different behavior. It was obvious that the sorbent did not penetrate the gas flow at the injection location. The lances only extended into the duct about a foot. If the lances could be inserted farther into the flow, there might be more opportunity to mix the sorbent into the gas before the North and South ducts split.

- It was noted at AEP's Gavin plant that at temperatures between about 350°F-360°F, a sticky deposit formed in the duct. At Gavin, Trona was injected downstream of the air heater, but flue gas temperatures ranged from 300°F to 400°F. Injection of Trona at MK2 should proceed cautiously with pressure drop across the air preheater monitored during Trona injection.
- The high rates of Trona injection (for 1.2:1 stoichiometry) mean that the 14-ton silo will have to be refilled every other day, if Trona is injected continuously. Continuous injection of Trona may not be practical. Injection of a lower flow rate of Trona overnight could be tried.
- It's been noted by AEP that care must be taken with the Trona injection system to keep the carrier air dry, otherwise feeding problems will result.

With these considerations in mind, I have put together a proposed schedule for co-benefit testing in Table 3.

DEPARTMENT OF ENERGY EVALUATION
OF CONTROL STRATEGIES TO
EFFECTIVELY MEET 70-90% MERCURY
REDUCTION ON AN EASTERN
BITUMINOUS COAL, CYCLONE BOILER
WITH SCR FIELD EVALUATION

*Evaluation of Lowered Temperature Co-Benefits for
Mercury Control at PSNH Merrimack Generating Station
Unit 2*

DOE Test PS26-05NT42510-02

Test Plan dated April 10, 2006

For:
PSNH
Platt Environmental Services

By:
ADA Environmental Solutions, Inc.
8100 SouthPark Way, Unit B
Littleton, CO 80120

April 10, 2006

**Test Plan for Merrimack
Lowered Flue Gas Temperature Co-Benefit Study
Revision 1
April 10, 2006**

Based on conversations during the team meeting between ADA-ES and PSNH held in Manchester and Bow, NH on Monday and Tuesday, March 6-7, 2006, and follow on conversations, the idea of evaluating the co-benefit effects of lowered flue gas temperatures was considered a topic of interest. Several factors play into the consideration of lowering flue gas temperatures:

1. Increased ability to lower mercury emissions through increased enhancement of native removal mechanisms. This test will also provide an indication of the potential to increase the efficiency of ACI due to lower SO₃ concentrations as well as lower temperatures.
2. Increased efficiency for the unit due to lowered stack flue gas temperatures and less thermal emissions. Increased efficiency will lead to less physical emissions per megawatt produced.
3. Lowered SO₃ emissions.

The test conditions for the plant will be normal operating conditions. The plant will be using the current 1.1% S blend of coal. Economizer and SCR inlet hopper re-injection will continue throughout the test. The ESP flyash re-injection is currently scheduled for stoppage the morning of April 13, prior to testing. With the current plant configuration, lowering flue gas temperatures will result in increased fouling of the air pre-heaters, which are tubular and partitioned into a hot and cold side. As a result, the only opportunity to test the effects of flue gas temperatures without unduly impacting the ability of the Merrimack Station to produce power is just prior to a scheduled outage, minimizing the effect of an impaired air pre-heater. The only near term outage for PSNH Merrimack Unit 2 is April 18, 2006.

With the opportunity of the plant outage on April 18, 2006, it was decided to conduct the co-benefit test of lowered flue gas temperature on April 13-14, 2006.

Platt Environmental Services was chosen as the source test firm. All testing by Platt will be performed at the stack test locations. Physical samples; fly ash, coal, and others; will be collected by Merrimack plant personnel.

ADA-ES has set the following schedule for sampling and testing.

Sunday	Monday	Tuesday	Wed	Thursday	Friday	Saturday
Apr 9	10	11	12 Platt Env Travel to site Set up Equip	13 Baseline – Full Load: 3 Dual AppK, SO ₃ Tests Coal, Ash	14 Low Temp – Full Load 3 Dual AppK, SO ₃ Tests Coal, Ash	15 Demob
Apr 16	17	18 Scheduled Outage	19	19	20	21

Team Responsibilities:

Platt Environmental:

1. Proper, operational test equipment to complete testing on schedule
2. Proper safety equipment to complete testing in a positive pressure, high SO₃ environment
3. To the extent possible, perform concurrent, or near concurrent, test runs of App K and SO₃ methods.
4. Schedule and complete lab analysis results of test runs. Include an analysis of possible complications due to faulty equipment or improper operation to test results. Upon completion of the above tests, send results to ADA-ES.
5. Demobilize equipment.
6. Notify ADA-ES and PSNH of conditions which may impact test results.
7. Include Method protocol documentation as an attachment to report.

Merrimack Plant

1. Provide safe environment at work location: stable platform, proper safety railings, etc.
2. Provide working hoist to test platform. Plant personnel should be available on Wednesday afternoon and Thursday morning to operate hoist or instruct Platt in proper operation of the hoist. Plant personnel, dependent upon hoist operation agreement, should be available for demobilization on Friday afternoon and Saturday morning.
3. Monitor plume visibility for SO₃ on both days of testing and photograph.
4. Collect representative coal samples of coal fired during test conditions for Thursday and Friday, April 13 and 14, 2006.
5. Collect representative ash samples of fly ash present during test conditions for Thursday and Friday, April 13 and 14, 2006. Requested fly ash sample collection format is one combined sample from each row of each ESP: total five samples per day. Request that at the start of each test (one normal temperature and the other

- low temperature), hoppers be emptied and then isolated for a duration of time during the test sequence to allow representative ash to be collected during the test.
6. Collect other physical grab samples on a daily basis from:
 - a. SCR hoppers
 - b. Economizer hoppers
 - c. Slag Sluice
 - d. Air Heater hoppers
 7. Provide re-injection rates for re-injected materials.
 8. Collect plant data per detailed list provided by ADA-ES.
 9. Provide full load conditions 3-hrs prior to start of test runs to allow stabilization of plant conditions. Continue full load conditions during testing.
 10. Provide most recent AH leakage test values.
 11. Notify ADA-ES of conditions which may impact test results.

ADA-ES

1. Coordinate testing. If either Platt or Merrimack notify ADA-ES of parameters outside requested conditions, ADA-ES, in coordination with PSNH, will determine whether testing will continue.
2. Coordinate data collection.
3. Provide detailed list of plant operating parameters desired for thorough analysis of data.
4. Provide Draft Report to PSNH. Current schedule is two weeks after return of all sample analysis to ADA-ES. Coal sample results usually returned 6 weeks after shipment from ADA-ES. Allow one week after testing for shipment of samples from ADA-ES for preparation. Expected draft report to be issued first week of June 2006.
5. Issue Final Report to PSNH and DOE after comments from participants.

Plant Parameters

DATE/Time			Date and Time
Gross Unit MW	Gross	Gross Unit MW	MW
Stack NOx Emissions		NOX	ppm or lbs/mmbtu
Stack SO2 Emissions		SO2	Ppm or lbs/mmbtu
Stack CO2 Emissions		CO2	%
Stack Opacity		6-min average	%
10 Sec Opacity		10 sec	%
Stack Flow		Stack Flow	scfh
Stack Temp		Stack Temp	Deg F
Ambient Air Temp		AMBIENT AIR TEMPERATURE	DEGF
Barometric Press		ATMOS PRESS	INHGA
All Air Heater Air Inlet Temp			DEGF
All Air Heater Air Outlet Temp			DEGF
Air Heater Gas Inlet Temp		FLUEGAS TO AIRHTR TEMP	DEGF
Air Heater Gas Outlet Temp		FLU GAS FM AIRHTR TEMP	DEGF
All Economizer O2		1-3 east, 1-3 west	% O2
Total Coal Flow		TOTAL BOILER COAL FLOW	KLB/HR
No. of Feeders I/S		NUM OF FEEDERS IN SERVICE	
All TR Cabinet		POWER	KW
All TR Cabinet		SECONDARY CURRENT	MA
All TR Cabinet		SPARKS PER MINUTE	SPARKS
All TR Cabinet		SECONDARY VOLTAGE	KV
Other pertinent ESP data		As Available	
Pertinent SCR Information			
SCR INLET TEMP			F
SCR Out			F
SCR NH ₃ Flow			Lb/hr
SCR Gas Temps			F
SCR Catalyst Temps			F

Table 3. Preliminary schedule for co-benefit testing.

Day/Date		Activity	Sorbent Flow Rate, lb/hr	Meas.	Comments
Wk.1/Day 1	Mon, Oct 2	Install silo			MgO delivered this week
Wk 1/Day 2	Tues, Oct 3	Install silo			
Wk 1/Day 3	Wed, Oct 4	Install silo			
Wk 1/Day 4	Thurs, Oct 5	Fill Silo (MgO)			
Wk 1/Day 5	Fri, Oct 6				
Wk 2/Day 1	Mon, Oct 9	Begin injection	130-180 [1]	Dewpt.	Dewpt. meas. in stack
Wk 2/Day 2	Tues, Oct 10	MgO injection	130-180	Dewpt., SSD	SSD=Sorbent screening device
Wk 2/Day 3	Wed, Oct 11	MgO injection, lower APH cold-end T	130-180	Dewpt., SSD	
Wk 2/Day 4	Thurs, Oct 12	MgO injection, lower APH cold-end T	130-180	Dewpt., SSD	
Wk 2/Day 5	Fri, Oct 13	MgO injection, lower APH cold-end T	130-180	Dewpt., SSD	Run out MgO over weekend?
Wk 3/Day 1	Mon, Oct 16	Fill silo (Trona)		Dewpt.	Trona delivered
Wk 3/Day 2	Tues, Oct 17	Trona injection	Low [2]	Dewpt.	
Wk 3/Day 3	Wed, Oct 18	Trona injection	High [3]	Dewpt., SSD	
Wk 3/Day 4	Thurs, Oct 19	Fill silo, Trona injection	Optimized	Dewpt., SSD	
Wk 3/Day 5	Fri, Oct 20	Trona injection	Optimized	Dewpt., SSD	Trona delivered?
Wk 4/Day 1	Mon, Oct 23	Fill silo, Trona injection	Optimized		
Wk 4/Day 2	Tues, Oct 24	Trona injection, lower APH cold-end T	Optimized	Dewpt., SSD	
Wk 4/Day 3	Wed, Oct 25	Fill silo, Trona injection, lower APH cold-end T	Optimized	Dewpt., SSD	Trona delivered?
Wk 4/Day 4	Thurs, Oct 26	Trona injection, lower APH cold-end T	Optimized	Dewpt., SSD	
Wk 4/Day 5	Fri, Oct 27				

Notes: 1. Depending on SO₃ concentration
2. 200-300 lb/hr, lower injection rate overnight
3. ~650 lb/hr, lower injection rate overnight

DEPARTMENT OF ENERGY EVALUATION OF
CONTROL STRATEGIES TO EFFECTIVELY MEET
70-90% MERCURY REDUCTION ON AN EASTERN
BITUMINOUS COAL, CYCLONE BOILER WITH SCR
FIELD EVALUATION

***Long Term Evaluation of Mercury Control at PSNH
Merrimack Generating Station Unit 2***

***DOE Test DE-FC26-06NT42870* Test Plan**

Prepared for:
PSNH
DOE NETL

Prepared by:
ADA Environmental Solutions, Inc.
8100 SouthPark Way, Unit B
Littleton, CO 80120

November 13, 2007

Revision 1

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Project Objectives

The overall objective of this project is to assess the potential for significant mercury control by sorbent injection upstream of an electrostatic precipitator (ESP). The primary emphasis of this program is to evaluate the performance of mercury sorbent injection. In addition, the effect of co-benefits from SO₃ mitigation on mercury control will also be explored. Merrimack Station is located in Bow, NH. Testing will be conducted on Unit 2 (MK2), which has a cyclone boiler and fires a test blend of Venezuelan and eastern bituminous coal. Tests are planned for the entire 335 MW Unit 2.

This test plan lays out a framework for conducting Long Term testing to meet the desired objectives.

Project Overview

Public Service of New Hampshire (PSNH) has worked with the New Hampshire (NH) Legislature and the NH Department of Environmental Services (DES) to review the technical feasibility and costs associated with different levels of mercury control at the company's coal fired power plants. NH House Bill 1673, signed into law by the Governor of New Hampshire, requires by July 1, 2013 an 80% reduction of mercury emissions from PSNH's coal-fired power plants. The law provides incentives to achieve mercury reductions prior to July 1, 2013. This law also prohibits PSNH from participating in a proposed federal mercury cap and trade system to comply with the NH reductions.

In addition, PSNH will have to comply with the Clean Air Mercury Rule (CAMR) recently promulgated by the EPA, and meet specific reductions in 2010. Because of early reduction language in the state regulation bill, PSNH is addressing issues now that many plants across the country will face over the next few years. MK2 is a very difficult yet important application for a number of reasons. MK2 has a Selective Catalytic Reduction (SCR) system that generates SO₃, a species that is detrimental to mercury capture even with sorbent injection.

Prior to implementing a compliance strategy, it is important to gather data and assess whether PSNH can achieve the reductions being considered by the State while meeting guiding principles that include (1) integrating environmental quality, public health and safety, and economic vitality, (2) facilitating scientifically and technically sound, cost effective, and environmentally appropriate solutions, and (3) protecting fuel diversity and PSNH's ability to generate low-cost, reliable energy necessary to meet New Hampshire customer demand.

MK2 was chosen to host this evaluation because it fires a medium sulfur test blend of eastern bituminous and Venezuelan coals and is configured with an SCR followed by an ESP. This combination will allow an evaluation of the effects of coal producing medium sulfur levels on the mercury removal performance of injected sorbents and the impact of injected sorbents on the performance of the ESP. During Long Term

testing, various co-benefits; including: reduced flue gas temperatures and SO₃ control reagents injected into the flue gas downstream of the SCR is scheduled. The Long Term test phase will determine balance of plant issues as well as allow a long term evaluation of mercury emission reductions.

Host Site Description: Merrimack Unit 2

PSNH's Merrimack Station is located in Bow, NH. The Unit 2 boiler is a 335 MW B&W cyclone fired unit that will fire a test blend of medium sulfur eastern bituminous and Venezuelan coal for the DOE/NETL test. A hot side SCR treats the flue gas for NO_x reduction. A side effect of the SCR is the conversion of SO₂ to SO₃, which effectively creates a flue gas stream more closely resembling that created by a high sulfur coal. The Air Pre-Heater (APH) is a tubular, cold-side/hot-side design. Downstream of the APH, the unit is equipped with two cold-side ESPs. The ESP units are set up in series, with the original ESP being the upstream unit with a specific collection area (SCA) of 120 ft²/kacfm and the Supplemental ESP, the downstream unit, with an SCA of 230 ft²/kacfm. For the purposes of reporting, the ESP units will also be referred to as ESP1 and ESP2. As a forced draft positive pressure unit, flue gas is pushed through the ESPs via two FD fans and the natural draft of the stack. The flue gas temperature is normally kept elevated to ensure that vapor phase SO₃ does not corrode or foul the air heater. Flue gas temperatures are 330 – 350°F during full load operations at the inlet to ESP1. A sketch of the unit layout is presented in Figure 1. Key operating parameters are covered in Table 1. Testing is planned for the entire 335 MW unit.

Figure 1: Layout Sketch of Merrimack Unit 2

Table 1: Merrimack Key Operating Parameters

Unit	2
Size (MW _G)	335
Test Portion (MW _G)	335
Coal	Medium sulfur test blend of Eastern Bituminous and Venezuelan Coal
Heating Value (as received)	13,000
Sulfur (% by weight as received)	1.2
Chlorine (ppm dry)	1000
Mercury (ppm dry)*	0.07
Particulate Control	2 Cold Side ESPs in series SCA = 350 ft ² /kacfm
NO _x Control	SCR
Sulfur Control	Coal Blend
Ash Reuse	Cyclone Furnace Re-injection or off-site beneficial reuse (concrete additive, flowable fill, landfill cover)

*This mercury ratio in the coal is for the current 1/1 eastern bituminous/Venezuelan test blend.

Technical Approach

Activities are divided into the several tasks. The specific tasks to accomplish Long Term testing are described below.

Task 1. Site Coordination and QA/QC Plan

Efforts within this task include planning the tests with PSNH and DOE/NETL. The quality assurance/quality control plan will be updated, finalizing the site-specific scope for each of the team members, and putting subcontracts in place for manual (Ontario Hydro, M26a, etc.) sampling services.

Additional communications between ADA-ES and PSNH personnel will be conducted to discuss topics such as the plant operation, silo operations, and host site/ADA-ES responsibilities.

As part of the proposed scope, Quality Assurance and Quality Control (QA/QC) will be documented and specific procedures adhered to. The primary objectives of the QA/QC effort will be to control, evaluate, and document data quality to ensure that data generated are of sufficient quality to meet program objectives. Specific key parts of the

QA/QC plan will include:

- QA/QC in sample collection, analytical and data analysis
- Integral performance evaluation and verification of Hg removal
- Procedural remedies for identified data deficiencies

Task 2. Design, Procure, and Install Equipment

Task 2.1. System Design and Procurement

Major equipment needed for this test includes a sorbent storage and injection system and mercury analyzers. PSNH has installed a larger PAC silo to support long term test requirements. A temporary SO₃ sorbent injection system is installed as well. Two Thermo Scientific Mercury Freedom CEM systems are installed to monitor mercury upstream and downstream of the PAC injection location.

The plant has installed an additional port during the outage in spring 2007 to improve PAC injection. The SO₃ injection lances were also upgraded during the outage. Additional site support includes compressed air, electrical power, wiring plant signals including boiler load to the injection skids, and balance of plant engineering. PSNH will be responsible for all permitting and any variance requirements.

ADA-ES will perform a system checkout of the mercury control and measurement equipment prior to the commencement of Long Term testing.

See Figure 2 for details of the injection and CEM monitoring points.

Figure 2: Test Injection and Hg Monitoring

Task 2.2. Installation

A scope of work has been developed and installation responsibilities will be divided between ADA-ES and PSNH.

Task 3. Field Testing

Long Term field testing of sorbent injection for mercury control shall cover up to a period of six months. Performance will be measured by obtaining plant data; such as combustion parameters, back-end parameters, and CEMS data; and flue gas measurements including real time and periodic mercury measurements and solids samples.

The nature of all sorbents to be tested under this project shall be provided to the DOE Project Officer prior to testing. The proprietary nature of such data shall be protected by DOE/NETL. All sorbents must receive approval by the DOE Project Officer prior to being tested under this project. Per request of the New Hampshire Dept. of Environmental Services (NH DES), the nature of all sorbents shall be provided to the NH DES. The NH DES has a copy of the DOE Flow Down clauses regarding the proprietary nature of such data and the rights of the patent holder. All sorbents must be approved by the NH DES in addition to the DOE Project Officer to be tested.

Task 3.5. Choose Long Term Test Parameters

ADA-ES will present to the test team the results of Parametric and Co-Benefit testing. From this data, the recommended Long Term test parameters will be set.

Task 3.6. Long Term Test

After approval from the DOE COR (Contract Officer's Representative) and the NH DES, the selected sorbents from Task 3.5 will be continuously injected into the flue gas for a period of up to six months. This shall be done in conjunction with any operating changes or SO₃ mitigating technologies agreed to in Task 3.5. This test period shall evaluate whether the mercury control scheme develops any long-term operational problems and whether mercury emission control is sustainable. Potential operational impacts that will be monitored include degradation of ESP performance, injection system performance, contamination of fly ash, and disposition of the fly-ash/sorbent combustion by-products.

Long-term testing will be conducted at the "optimum" settings as determined by the project team based upon results from parametric tests and other considerations such as material cost and plant impacts. It is the intent of DOE that these settings represent the most cost effective condition for mercury removal. The goal of this task is to obtain sufficient operational data on removal efficiency over an extended period, the effects on the particulate control device, effects on byproducts, and impacts to the balance of plant equipment to prove viability of the process and determine the process economics.

Long-term test measurements shall include a full suite of flue gas and solid sample measurements. These shall include one ESP inlet and outlet Ontario Hydro mercury measurement (or Instrument Reference Method (IRM) tests if approved), as well as measurements for SO₃, particulate, halogens, and ammonia at the ESP inlet and outlet. PSNH has requested further SO₃ test locations will be outside the scope of this project but may be run in conjunction with this testing. Two further test runs of EPA Method 30B Dry Sorbent Trap Mercury Measurements will also be conducted to ensure measurement accuracy.

Further manual test data collected will include modified Method 30B tests to ensure back up results to CEM mercury measurements. Dependent upon availability, the Breen in-situ SO₃ monitor will be installed to provide continuous measurement of SO₃ levels.

Task 3.7. Data Analysis and Final Test Report

A summary of the possible test sequence discussed above is shown in Table 2. Dates and test conditions will be finalized as the project proceeds and additional information is gathered.

Table 2: Proposed Full-Scale Test Sequence for Merrimack Unit 2

Test Description	Start Date	Parameters			Comments	Boiler Load
		ACI Concentration lb/MMacf	ACI Sorbent	SO ₃ Sorbent		
Review Long Term Test Parameters	November 2007	Review Results from Parametric and Balance of Plant Tests Define Operating Conditions for Long Term Tests				
Long Term Test	November 2007	6	Brominated Carbon	Trona 500lb/hr**		Load Follow
	Nov 2007 Week 3	6	Brominated Carbon	Trona 500lb/hr	Method 30B	Full Load
	Dec 2007	6	Brominated Carbon	Trona 500lb/hr		Load Follow
	Dec 2007 Week 5	6	Brominated Carbon	Trona 500lb/hr	Manual Testing*	Full Load
	Dec 2007	6	Brominated Carbon	Trona 500lb/hr		Load Follow
	Jan 2008 Week 7	6	Brominated Carbon	Trona 500lb/hr	Method 30B	Full Load
	To Completion	6	Brominated Carbon	Trona 500lb/hr		Load Follow

* Manual Sampling will include: ASTM M6784-02 Ontario Hydro (mercury), EPA draft M30B (mercury), EPA M17 (particulate), EPA M26A (halogens – Cl, F, Br), Controlled Condensation Method (SO₃)

** 500lb/hr is full load boiler rate.

Many signals typically archived by the plant will be monitored to determine if any correlation exists between changes in mercury concentration with measured plant operation. A correlation is not unusual between temperature and load, for example. A list of plant parameters and measurements to be collected can be seen in Table 3.

Table 3: Data Collected During Field Testing

Parameter	Sample/signal/test	Long-Term
Coal	Batch sample	Yes
Coal	Plant signals: burn rate (lb/hr) quality (lb/MMBTU, % ash)	Yes
Fly ash	Batch sample	Yes
SCR	SCR Signals	Yes
Unit operation	Plant signals: boiler load, coal firing rate, excess O ₂ , etc.	Yes

Temperature	Plant signal: AH inlet and ESP inlet/outlet,	Yes
Temperature	Full traverse ESP inlet, single port traverse from each ESP outlet duct	No
Duct Gas Velocity	Full traverse at ESP inlet/outlet	No
Mercury (total and speciated)	Hg Monitors at ESP inlet/outlet	Yes
Mercury (total and speciated)	ASTM M6784-02 (Ontario Hydro) or IRM at ESP inlet/outlet	Yes (3 sets)
Mercury (total)	STM EPA draft M30Bm at ESP inlet/outlet	Yes
Particulate Emissions	EPA Method 17	Yes
HCl, HF, Br	EPA Method 26A at ESP inlet/outlet	Yes
SO ₃	Controlled Condensation Method at SCR outlet (upstream of trona injection) and Original ESP outlet (upstream of PAC injection)	Yes
Sorbent Injection Rate	PLC, lbs/min	Yes
Plant CEM data	Plant signals: NO _x , SO ₂ , flow, opacity	Yes
ESP Electrical Conditions	Plant signals: Sec mA, Sec. Voltage, Sparks, etc. (manual collection)	Yes

Upon completion of the field testing and receipt of the subsequent laboratory analyses, ADA-ES will issue a formal test report. The report will summarize testing activities, results, economic analyses and conclusions.

Task 4. Coal, Ash, and By-Product Evaluation

In conjunction with the long term tests, solid samples of coal and ash will be taken. Select samples will be analyzed to help determine the impact on fly ash quality and quantity, as well as disposal. PSNH and ADA-ES will define responsibilities for obtaining samples of coal, fly ash, and other solid and liquid samples during testing. Figure 3 shows the hopper configuration for ESP's 1 and 2. Table 4 presents a typical schedule for collecting samples.

Table 4: Tentative Sample Collection Schedule

Test Condition	Type	Frequency	Comments
Long-Term	Coal	Daily	1 liter
	ESP Ash	Daily: One composite sample each row	1 liter
		1 sample per week: All Inlet Hoppers	1 liter
		Once: Composite of Inlet Hoppers from both ESP units (per DOE guidance for Lehigh Univ.)	5 gallon - Sample
	Bottom Ash	Monthly	1 liter
	APH, SCR Hoppers	Monthly	1 liter

Four sets of coal samples will be analyzed for ultimate and proximate, calorific value, mercury, elemental and chlorine analyses. The coal samples will correlate with the OH and M30B sample times as well as the first week of testing. The ash will be analyzed for mercury and other tests such as alkalinity, pH, size distribution, chlorine and fluorine, and metals such as selenium and arsenic (two complete analysis from each hopper row). Mercury content and LOI will be analyzed 3 times per week for ash. The other samples will be twice during the test time frame, one period to coordinate with the OH manual testing and the second to correlate with the M30B test time frame. Additional tests will be conducted to determine the environmental stability of the samples. These tests include Toxicity Characteristic Leaching Procedure (TCLP, SW846-1311), synthetic groundwater leaching procedure (SGLP), synthetic precipitation leaching procedure (SPLP), and thermal stability tests. As a chemically treated sorbent has been chosen for long-term tests, leaching of the chemical used in the treatment process will be reviewed. Tests are also being discussed to determine the potential of microbial activity on mercury release. A sample of the analyses included is presented Table 5. In addition to the collection and analysis of samples needed for this project, samples shall be collected in accordance with DOE/NETL requirements. Such samples shall be made available for analysis at DOE/NETL's discretion.

Although previous tests from other DOE programs have shown that the byproducts mixed with activated carbon are highly stable, it is important to continue evaluating these byproducts for each condition using well-established and documented techniques, and new techniques designed to perform even more robust analyses of the byproducts. Additional ash will be collected and archived for other tests, including tests requested by EPA, DOE, and independent companies approved by DOE and PSNH.

ADA-ES has a Sample and Data Management System (SDMS) that will store test data from the evaluation. These data can be used to generate reports, track sample history, and input results from laboratory analyses.

For data control and security, access to the sample database is limited to the ADA-ES project manager, site manager, and sample manager. Operators collecting samples will be able to upload information to the database and print sample labels and Chain-of-Custody forms. ADA-ES will include results with regularly issued reports to the test team.

Table 5: Summary of Byproduct and Waste Characterization Testing

Series	Test Purpose	Test Method	Comments
1	Ash Disposal	TCLP (SW846-1311)	Measures leachable Hg, As, Ba, Cd, Cr, Pb, Se, Ag
2	Environmental Stability – Leaching	SGLP	Measures leachable Hg at 18 hours, 2 weeks, and 4 weeks
3	Ash Disposal Environmental Stability – Leaching	SPLP	Synthetic Precipitation Leaching Protocol – Similar to SGLP but uses an acidic leaching solution.
	Special Testing	Various	As needed for troubleshooting or site-specific information needs. Per request, Total Metals (ppm) and Vanadium (ppm) content to be tested.

Note: Hopper numbering is not entirely consistent with plant numbering scheme. The Original ESP will be designated with an “O” in front of the hopper number and the Supplemental ESP hoppers will be designated with an “S”.

Figure 3: ESP1 and ESP2 Hopper Diagram for Sampling

Task 6. Management and Reporting

Periodic meetings with DOE and the test team to discuss progress will be held and obtain overall direction of the program from the DOE project manager.

Project Funding

The status of project funding is shown in Table 6.

Table 6: Project Funding

	Original Funding	Current Funding	Current Expenditures
DOE	2,500,000.00	2,169,000.00	1,674,126.09
PSNH	1,499,504.48	1,301,175.85	1,004,764.04
ADA-ES	306,465.52	265,889.48	205,048.00
Total	4,305,970.00	3,736,065.34	2,883,938.13
Trona/SO₃	207,000.00		1,020,170.00

The current expenditures reflect approximate costs as of November 1, 2007.

The trona/SO₃ expenditures covers the expenses for Solvay (chemical), Mineral Processing Services (silo), O'Brien & Gere (silo), Breen (SO₃ monitoring), Clean Harbors (field support), Martin Marietta (chemical), and E.ON Engineering (measurement services). The original funding for the SO₃ effort was covered under Task 3.1 Process Optimization and Co-Benefit analysis with additional funding for one SO₃ analysis test. As can be seen, the efforts to solve the issues of SO₃ to allow significant mercury reduction efforts to occur have been more expensive than planned.

The project funding expenditures does not reflect the additional efforts PSNH and Merrimack Station have put forward as far as in-kind services and funding for services and structures to support testing. The funding that is not directly covered by the DOE project scope expended by PSNH is equal or greater than the current PSNH expenditures under the project.

Key Personnel

Key personnel for the Merrimack tests are identified in Table 6.

Table 7: Key Project Personnel for Merrimack Mercury Field Evaluation

Name	Company	Role	Phone #	E-MAIL/Cell Phone
Andrew O’Palko	DOE/NETL	DOE/NETL Project Manager	304-285-4715	andrew.opalko@netl.doe.gov
Paul Raichle	PSNH Merrimack	Operations Manager	603-224- 4081x182	raichpr@nu.com
Art Auclair	PSNH Merrimack	Senior Environmtl Coordinator	603-224- 4081x234	auclaaa@nu.com ; pager 603-564-2334
Harold Keyes	PSNH Merrimack	Station Manager	603-224- 4081x130	keyeshe@nu.com
Bill Smagula	PSNH Manchester	Director, PSNH Generation	603-634-2851	smaguwh@nu.com
Jean Bustard	ADA-ES	Program Manager	303-734-1727	jeanb@adaes.com
Tom Campbell	ADA-ES	Project Manager	303-791-7889	tomc@adaes.com; 303- 981-7287
Travis Starns	ADA-ES	Systems Manager	303-339-8857	traviss@adaes.com 303-921-8150
Sharon Sjostrom	ADA-ES	Hg Monitors and Technical Expert	303-339-8841	sharons@adaes.com 303-919-8538
Richard Schlager	ADA-ES	Contracts	303-339-8855	Richards@adaes.com
Connie Senior	Reaction Engineering	Tech Expert: Coal and Byproducts, Flow Modeling	801-364-6925 ext 37	senior@reaction-eng.com
Rich Miller	ADA-ES	Technical Expert	610-760-1555	richm@adaes.com
Paul Brignac	ADA-ES	Site Manager	205-281-0311	paulb@adaes.com

DEPARTMENT OF ENERGY EVALUATION OF
CONTROL STRATEGIES TO EFFECTIVELY MEET
70-90% MERCURY REDUCTION ON AN EASTERN
BITUMINOUS COAL, CYCLONE BOILER WITH SCR
FIELD EVALUATION

***Evaluation of Lowered Temperature Co-Benefits for
Mercury Control at PSNH Merrimack Generating Station
Unit 2***

DOE Test DE-FC26-06NT42780

Addendum 1 to Test Plan dated Sept 19, 2006

Prepared for:
PSNH
DOE NETL

Prepared by:
ADA Environmental Solutions, Inc.
8100 SouthPark Way, Unit B
Littleton, CO 80120
September 19, 2006

**Detailed Scheduling
For
Co-Benefit, Baseline and Parametric
Test Phases**

A-1: Test Schedule:

1. Sept 18 – 22:
 - a. Bids for Parametric silo foundation to be received the week of Sept 18th by PSNH Paul Raichle
 - b. FAT testing for ACI Parametric silo
 - c. Release of Detailed Test Plan
2. Sept 25 – 29:
 - a. MK2 ready for testing – Tuesday, September 26
 - b. Temperature – Velocity Traverses by Air Sampling Associates (ASA)
 - c. STM traverses by both ADA-ES and ASA
 - d. Breen Technologies on site to demonstrate prototype Land Instrument SO₃ acid dew point monitor
 - e. Begin sorbent screening evaluation
3. Oct 2 – 6:
 - a. Baseline Manual Measurements – OH (Hg), M26A (halogen), M5/17 (particulate) – scheduled for Thursday – Friday: Oct 5 - 6
 - b. E.ON Engineering – SO₃ monitoring – Oct 2 - 5
 - c. Continue Breen Tech SO₃ monitor testing
 - d. SO₃ sorbent injection silo available from MPS –install
 - e. ACI Parametric silo installation - Dependent upon ACI silo foundation completion
 - f. Continue sorbent screening evaluation
4. Oct 9 – 13:
 - a. Complete SO₃ sorbent injection silo installation
 - b. Complete ACI Parametric silo installation
 - c. Begin Co-Benefit testing – proposed MgO – injection scheduled for 5 days, 24hrs per day
5. Oct 16 – 20
 - a. SO₃ silo start up and test
 - b. Tuesday – begin Co-Benefit testing – proposed Trona – injection scheduled 24hrs per day
 - c. ACI silo start up and test
 - d. Sorbent screening
 - e. E.ON on site for SO₃ measurements – possible dependent upon Breen Tech results
6. Oct 23 – 27:
 - a. Continue Co-Benefit testing – proposed Trona – injection proposed 24hrs per day
 - b. Sorbent screening
 - c. E.ON on site - possible

7. Oct 30 – Nov 3:
 - a. Evaluate Co-Benefit data
 - b. Continue Co-Benefit testing on an as needed basis
8. Nov 6 – 10
 - a. Parametric testing – no proposed Co-Benefit injection, only mercury sorbent evaluation
 - b. Test Darco Hg (2 days), Darco Hg-LH (3 days)
 - c. Replacement testing is particular sorbent identified during Co-Benefit testing appears promising
9. Nov 13 – 17
 - a. Parametric testing – proposed dual injection – mercury and CoBenefit testing
10. Nov 20 – 24:
 - a. Thanksgiving holidays – no testing
 - b. Begin Parametric evaluation
11. Nov 27 – Dec 1 and Dec 4 – 8:
 - a. Continue Parametric testing on an as needed basis
 - b. Begin Long Term testing protocol evaluation

A-2: Co-Benefit Schedule

Week/Day	Date	Activity	Sorbent Flow Rate, lb/hr	Meas. (4)	Comments
Week1/Day1	Sept 25	Thermo Hg Analysis		Hg CEM	
Day 2	Sept 26	Thermo Hg Analysis		Hg CEM	
Day 3	Sept 27	Stratification Testing		Hg CEM, Temp, Velocity, STM, SO ₃ , SSD	Modified Land Dew Pt SO ₃ Meas.
Day 4	Sept 28	Stratification Testing		Hg CEM, Temp, Velocity, STM, SO ₃ , SSD	Modified Land Dew Pt SO ₃ Meas.
Day 5	Sept 29	Stratification Testing		Hg CEM, Temp, Velocity, STM, SO ₃ , SSD	Modified Land Dew Pt SO ₃ Meas.
Day 6 –7	Sept 30 – Oct 1			Hg CEM	
Week2/Day1	Oct 2	Baseline, install silo		Hg CEM, SSD	
Day 2	Oct 3	Baseline, install silo		Hg CEM, EON SO ₃ , SSD	
Day 3	Oct 4	Baseline, install silo		Hg CEM, EON SO ₃	
Day 4	Oct 5	Baseline, test silo		Hg CEM, EON SO ₃ , OH, M5, M26A, STM	MgO delivery

Day 5	Oct 6	Baseline, test silo		Hg CEM, EON SO ₃ , OH, M5, M26A, STM	
Day 6 –7	Oct 7 – 8			Hg CEM	
Week3/Day1	Oct 9	MgO Injection	180	Hg CEM, modLDP, SSD	
Day 2	Oct 10	MgO Injection	180	Hg CEM, modLDP, SSD	
Day 3	Oct 11	MgO Injection, Lower APH Outlet T	180	Hg CEM, modLDP, SSD	
Day 4	Oct 12	MgO Injection, Lower APH Outlet T	180	Hg CEM, modLDP, SSD, outlet STM	
Day 5	Oct 13	MgO Injection, Lower APH Outlet T	180	Hg CEM, modLDP, SSD, outlet STM	
Day 6 –7	Oct 14 – 15		180	Hg CEM	Continue MgO Injection until depleted
Week4/Day1	Oct 16			Hg CEM	Trona delivery

Day 2	Oct 17	Trona injection	Low (1)	Hg CEM, modLDP	Monitor APH pressure drop (3)
Day 3	Oct 18	Trona injection	High (2)	Hg CEM, modLDP	
Day 4	Oct 19	Trona injection	Optimized	Hg CEM, modLDP, outlet STM	Trona delivery
Day 5	Oct 20	Trona injection	Optimized	Hg CEM, modLDP, outlet STM	
Day 6 –7	Oct 21 – 22	Trona injection	Low	Hg CEM, modLDP	
Week5/Day1	Oct 23	Trona injection	Optimized	Hg CEM, modLDP	Trona delivery
Day 2	Oct 24	Trona injection, lower APH outlet T	Optimized	Hg CEM, modLDP, outlet STM	
Day 3	Oct 25	Trona injection, lower APH outlet T	Optimized	Hg CEM, modLDP, outlet STM	
Day 4	Oct 26	Trona injection, lower APH outlet T	Optimized	Hg CEM, modLDP, outlet STM	
Day 5	Oct 27				Data Analysis
Day 6 –7	Oct 28 – 29				

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DOE Test DE-FC26-06NT42780

Test Plan

Prepared for:
PSNH
DOE NETL

Prepared by:
ADA Environmental Solutions, Inc.
8100 SouthPark Way, Unit B
Littleton, CO 80120

September 19, 2006

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Project Objectives

The overall objective of this project is to assess the potential for significant mercury control, between 70 and 90% above baseline, by sorbent injection into an electrostatic precipitator (ESP). The primary emphasis of this program is to evaluate the performance of mercury sorbent injection. In addition, the effect of co-benefits from SO₃ mitigation on mercury control will also be explored. Merrimack Station is located in Bow, NH. Testing will be conducted on Unit 2 (MK2), which has a cyclone boiler and fires a blend of Venezuelan and eastern bituminous coal. Tests are planned for the entire 335 MW Unit 2.

This test plan lays out a framework to meet both project and team objectives. More detailed plans will be developed for specific elements of the plan as testing proceeds.

Project Overview

Public Service of New Hampshire (PSNH) worked with the New Hampshire (NH) Legislature and the NH Department of Environmental Services (DES) to review the technical feasibility and costs associated with different levels of mercury control at the company's coal fired power plants. NH House Bill 1673, signed into law by the Governor of New Hampshire, requires by July 1, 2013 an 80% reduction of mercury emissions from PSNH's coal-fired power plants. The law provides incentives to achieve mercury reductions prior to July 1, 2013 and additional reductions after 2013. This law also prohibits PSNH from participating in a proposed federal mercury cap and trade system to comply with the NH reductions. In addition, PSNH will have to comply with the Clean Air Mercury Rule (CAMR) recently promulgated by the EPA, and meet specific reductions as an initial phase in 2010. Because of early reduction language in the state regulation bill, PSNH is having to address issues now that many plants across the country will face over the next few years. MK2 is a very difficult yet important application for a number of reasons. MK2 has a Selective Catalytic Reduction (SCR) system that generates SO₃, a species that is detrimental to mercury capture even with sorbent injection. Therefore, it is necessary to develop and test sorbents, which will achieve high levels (70 – 90%) of mercury removal to meet CAMR as well as state regulations.

Prior to implementing a compliance strategy, it is important to gather data and assess whether PSNH can achieve the reductions being considered by the State while meeting guiding principles that include (1) integrating environmental quality, public health and safety, and economic vitality, (2) facilitating scientifically and technically sound, cost effective, and environmentally appropriate solutions, and (3) protecting fuel diversity, and PSNH's ability to generate low-cost, reliable energy necessary to meet customer demand.

MK2 was chosen to host this evaluation since it fires a medium sulfur blend of eastern bituminous and Venezuelan coals and is configured with an SCR followed by an ESP. This combination will allow an evaluation of the effects of coal producing medium

sulfur levels on the mercury removal performance of injected sorbents and the impact of injected sorbents on the performance of the ESP. During testing, investigating various co-benefits; including: reduced flue gas temperatures, SO₃ control reagents injected into both the furnace and flue gas, as well as potentially firing an altered blend of coal; are scheduled to determine if the native mercury removal or mercury removal with injected sorbents can be improved.

Host Site Description: Merrimack Unit 2

PSNH's Merrimack Station is located in Bow, NH. The Unit 2 boiler is a 335 MW B&W cyclone fired unit that normally fires a blend of medium sulfur eastern bituminous and Venezuelan coal. A hot side SCR treats the flue gas for NO_x reduction. A side effect of the SCR is the conversion of SO₂ to SO₃, which effectively creates a flue gas stream more closely resembling that created by a high sulfur coal. The Air Heater (AH) is a tubular, cold-side/hot-side design. Downstream of the AH, the unit is equipped with cold-side ESPs. The ESP units are set up in series, with the original ESP being the upstream unit with a specific collection area (SCA) of 120 ft²/kacfm and the Supplemental ESP, the downstream unit, with an SCA of 230 ft²/kacfm. For the purposes of reporting, the ESP units will be referred to as ESP1 and ESP2. As a forced draft positive pressure unit, flue gas is pushed through the ESPs via FD fans and the natural draft of the stack. The flue gas temperature is kept elevated to ensure vapor phase SO₃ does not condense into sulfuric acid as well as preventing the AH from being fouled. Flue gas temperatures are 330 – 350°F during full load operations at the inlet to ESP1. A sketch of the unit layout is presented in Figure 1. Testing is planned for the entire 335 MW unit.

Figure 1: Layout Sketch of Merrimack Unit 2

Table 1: Merrimack Key Operating Parameters

Unit	2
Size (MW _G)	335
Test Portion (MW _G)	335
Coal	Medium sulfur blend of Eastern Bituminous and Venezuelan Coal
Heating Value (as received)	13,000
Sulfur (% by weight as received)	1.2
Chlorine (ppm dry)	1000
Mercury (ppm dry)*	0.07
Particulate Control	2 Cold Side ESPs in series SCA = 350 ft ² /kacfm
NO _x Control	SCR
Sulfur Control	Coal Blend
Ash Reuse	Cyclone Furnace Re-injection or off-site beneficial reuse (concrete additive, flowable fill)

*This mercury ratio in the coal is for the current 1/1 eastern bituminous/Venezuelan blend.

General Technical Approach

Activities are divided into the seven tasks shown in Table 2. These tasks provide the framework for the test plan.

Table 2: Site-Specific Tasks

Task	Description
1	Site Coordination, Kick-Off Meetings, Develop Test Plan and QA/QC Plan
2	Design, Procure and Install Equipment
2.1	System Design and Procurement
2.2	Installation
3	Field Tests
3.1	Process Optimization and SO ₃ Co-Benefits Analysis
3.2	Sorbent Screening Tests
3.3	Baseline tests
3.4	Parametric tests
3.5	Choosing Long Term Test Parameters
3.6	Long-term Test

3.7	Final Test Report
4	Coal, Ash, and By-Product Sample Evaluation
5	Technology Transfer
6	Management and Reporting

Task 1. Site Coordination, Kick-Off Meetings, Develop Test Plan and QA/QC Plan

Efforts within this task include planning the tests with PSNH and DOE/NETL. The planning process includes meeting with plant, corporate, and environmental personnel to discuss and agree upon the overall scope of the program for the site, the potential impact on plant equipment and operation, and to gather preliminary information necessary to develop a detailed draft test plan and scope of work. The host site agreement has been finalized, and the installation document and test plan will be finalized during the Site Kick-Off Meeting. Other efforts include developing a quality assurance/quality control plan, identifying any permit requirements, finalizing the site-specific scope for each of the team members, and putting subcontracts in place for manual (Ontario Hydro, M26a, etc.) sampling services. A site kickoff meeting is scheduled for July/August 2006.

ADA-ES visited the site on March 7, 2006 and discussed potential equipment and port locations. Additional communications between ADA-ES and PSNH personnel have been conducted to discuss topics such as the plant operation, port and silo installation, and host site agreements.

The host site is responsible for preparing sampling and injection ports prior to testing. A document describing the new port locations and port specifications has been delivered to plant personnel and was finalized following a duct inspection during the outage in April/May 2006. Installation of the new test ports was completed during the outage.

As part of the proposed scope, Quality Assurance and Quality Control (QA/QC) will be documented and specific procedures adhered to. The primary objectives of the QA/QC effort will be to control, evaluate, and document data quality to ensure that data generated are of sufficient quality to meet program objectives. Specific key parts of the QA/QC plan will include:

- QA/QC in sample collection, analytical and data analysis
- Integral performance evaluation and verification of Hg removal
- Procedural remedies for identified data deficiencies

Task 2. Design, Procure, and Install Equipment

Task 2.1. System Design and Procurement

Major equipment needed for this test includes a sorbent storage and injection system and mercury analyzers. A system for injecting SO₃ sorbents will also be required. The sorbent injection system for mercury control must be of sufficient size to inject up to 1000 lbs/hr for an extended period. Options being considered for this system include a transportable silo that has been used at previous DOE test sites and a larger silo/feeder system that would be much more practical for the long term testing.

Required site support includes installation of the injection and sampling ports (if not available), installation of required platforms and scaffolding, compressed air, electrical power, wiring plant signals including boiler load to the injection skid and control trailer, and balance of plant engineering information. ADA-ES engineers will work with plant engineers to develop an installation and contractor bid package for installation activities, and work with the installation contractors. PSNH will be responsible for all permitting and any variance requirements.

ADA-ES will install and perform a system checkout of the mercury control and measurement equipment. The actual installation of the sorbent injection equipment, not including preparation tasks, is estimated to take three weeks.

Task 2.2. Installation

A scope of work has been developed and installation responsibilities will be divided between ADA-ES and PSNH. The proposed work split is shown in Table 1.

Table 3: Proposed Scope of Work Split Between ADA-ES and PSNH

PSNH	ADA-ES
Install the Sorbent Injection System (SIS) foundation	Prepare site installation document
Install the SIS	Oversee installation of SIS, PLC Controls, Sorbent Distribution Manifolds, Injection Lances, Conveying Hose
Install and/or inspect Sampling Ports	Install and monitor mercury analyzers (CEMs)
Provide utilities (power, air) (Note 1)	Install office trailers (2)
Arrange for safe access to sorbent injection and mercury sampling locations	
Provide access to plant data	

NOTE (1): Plant has limited compressed air capacity so additional air compressors may be purchased/leased to support testing uses.

Feeder and Analyzer Descriptions

A transportable carbon injection system, shown installed at Sunflower Electric's Holcomb Station in Figure 2, consists of a bulk-storage silo and twin blower/feeder trains. PAC is delivered via bulk pneumatic trucks and loaded into the silo, which is equipped with a bin vent bag filter. From the discharge section of the silo, sorbent is metered by variable speed screw feeders into eductors that provide the motive force to carry the sorbent to the injection point. Blowers provide the conveying air. A Programmable Logic Controller (PLC) is used to control system operation and adjust injection rates. The silo is approximately 50 feet high and 10 feet in diameter and has an empty weight of 10 tons. The silo holds 20 tons of sorbent. Flexible hose carries the sorbent from the feeders to distribution manifolds located on the flue gas ducts, feeding the injection probes. Each manifold supplies up to six/eight injectors.

Figure 2: Carbon Injection Storage Silo and Feeder Trains Installed at Holcomb

Two Thermo Electron Mercury Freedom™ system analyzers will be used during this testing program to provide real-time feedback during baseline and sorbent injection testing. Mercury measurements will be monitored at the ESP1 inlet (or outlet depending

on mercury stratification test results and sorbent injection location – the ESP1 outlet being the preferred location) and either in the stack or the stack inlet duct.

The Mercury Freedom™ CEM has four key components: the sample extraction probe, sample pretreatment and conversion, the mercury analyzer, and the calibration module. These components are described briefly below and presented in Figure 2, a schematic of the entire system showing the key components and other supporting instrumentation.

- **Sample Extraction Probe.** An inertial filter is used to separate a particulate-free vapor-phase sample while minimizing the interactions with fly ash, which can cause sampling artifacts. The filter is heated and there is a blowback for the inlet stinger. The sample is immediately diluted with pre-heated dilution air to minimize mercury reactions with other flue gas species.
- **Sample Pretreatment and Conversion.** A dry, thermal converter is used to convert oxidized mercury to elemental mercury. The converter must be replaced periodically.
- **Mercury Analyzer.** Mercury is measured directly in the analyzer using Cold Vapor Atomic Fluorescence Spectroscopy (CVAFS). There is no cross interference from SO₂ with CVAFS. Because the sample is diluted, it has low moisture, is relatively non-reactive and therefore has minimal interference from other gases. The analyzer detection limit is currently 1 ng/m³ (~0.1 ppt)
- **Calibration Module.** The calibrator module is used to calibrate directly to the analyzer and the probe. It is also used to check dilution ratio. The calibrator incorporates Peltier Cooler/vapor pressure control and mass flow controllers. It can deliver mercury in concentrations from 1 to 50 µg/m³. The operator can program the calibrator to deliver zero or span gas to the analyzer, to the sample port between the inertial filter and the critical orifice, or upstream of the inertial filter.

Figure 3: Thermo Electron Mercury CEM.

The analyzer is capable of measuring both total vapor-phase mercury and elemental vapor-phase mercury. The analyzer determines total vapor-phase mercury concentrations by reducing all of the oxidized mercury to the elemental form near the extraction location. To measure elemental mercury, the oxidized mercury is removed while allowing elemental mercury to pass through without being altered.

Task 3. Field Testing

Field testing of sorbent injection for mercury control will cover a period of 13 months, and shall include in-situ mercury sorbent screening tests, baseline measurements, parametric tests, and long term tests. Performance will be measured by obtaining plant data; such as combustion parameters, back-end parameters, and CEMS data; as well as flue gas measurements including real time and periodic mercury measurements and solids samples.

The nature of the sorbents to be tested under this project shall be provided to the DOE Project Officer prior to testing. The proprietary nature of such data shall be protected by DOE/NETL. All sorbents must receive approval by the DOE Project Officer prior to being tested under this project. Per request of the New Hampshire Dept.

of Environmental Services (NH DES), the nature of all sorbents shall be provided to the NH DES. The NH DES has a copy of the DOE Flow Down clauses regarding the proprietary nature of such data and the rights of the patent holder. All sorbents must be approved by the NH DES in addition to the DOE Project Officer to be tested.

Task 3.1. Process Optimization and SO₃ Co-Benefits Analysis

Methods to improve baseline mercury capture and optimize sorbent usage by changes to plant operating practices and additives to reduce SO₃ will be evaluated. Process-based changes include combustion settings, SCR operation, and temperature.

As part of an ongoing corrosion mitigation program, PSNH has conducted short-term evaluations on several dry additives to reduce SO₃, including powdered limestone, magnesium oxide, and hydrated lime. Previous dry additives for SO₃ reduction were added with the flyash reinjection system. The project team will further investigate the potential of both wet and dry additives that can be injected either in the duct or into the boiler.

Task 3.2. Sorbent Screening Tests

The team shall conduct a series of sorbent screening tests on selected mercury sorbents and SO₃ additives. The sorbent screening device (SSD) is an extractive system designed to predict mercury removal performance in a full-scale ESP. A sketch showing major components and plant requirements is shown in Figure 4, and Figure 5 shows the internal components of probe box. The test apparatus consists mainly of the probe box and two stack sampling boxes. The probe box contains an inertial filter, gas eductor and two sorbent test trains each consisting of a test bed and an activated carbon trap.

The test beds consist of sand mixed with sorbent and ash in amounts representative of the ESP inlet particulate loading at the host site. The inertial separation probe separates the native fly ash from the sampled flue gas stream prior to the test beds. The sorbent traps are located downstream of the test beds and are used to collect any mercury not trapped by the test beds. Once the test trains are installed and leak checked, the assembly is heated (*the inertial filter is maintained at 400°F and the tests beds are maintained at the flue gas temperature at the test location*) and flue gas is drawn through the assembly for a test period that typically lasts two hours for ESP studies. Upon subsequent analyses, the mercury collected in the test beds and carbon traps can be used to determine the mercury removal efficiency of the sorbent.

Plant Requirements

1. 4" Flanged Sample Port
2. 2 x 20 Amp, 120V Power Lines
3. Plant Air (60 lpm, 10 psi)

Figure 4: SSD Components and Power Requirements

Figure 5: Sketch of SSD Probe

Several different sorbents will be evaluated. DARCO Hg, a lignite-derived activated carbon supplied by NORIT (formerly known as DARCO FGD), is considered the benchmark for these tests because of its wide use in DOE and EPRI-sponsored testing. Potential alternative sorbents include those that may be more effective than DARCO Hg, or sorbents that are as effective but cost less per pound. Examples that have demonstrated improved effectiveness on high sulfur sites will be considered. Sorbent vendors and developers are invited to submit proposals for inclusion of their sorbents in this program. Sorbents will be selected for screening based upon a review of the proposals by the project team to determine potential performance and the relative sorbent costs. Sorbents will be chosen for parametric testing based upon results from screening tests.

Task 3.3. Baseline Tests

Upon completion of Tasks 3.1 and 3.2, and just prior to the commencement of the parametric test series, a series of baseline tests will be conducted to characterize native mercury capture across the ESP without sorbent injection. There shall be no injection of either mercury sorbent or other chemical additive related to the DOE test program. The plant will continue to inject their GE FS3955 vermiculite additive for flux control during all test periods. Unit operation will be set at conditions expected during the parametric tests. It is anticipated that boiler load will be held constant at full-load and the air pollution equipment will be operated under standard full-load conditions. In addition to continuous mercury measurements from the CEMs, baseline measurements shall include one set of a full suite of flue gas and solid sample measurements. These shall include ESP inlet and outlet Ontario Hydro mercury measurements, as well as measurements for SO₃, particulate, halogens, and ammonia.

Task 3.4. Parametric Tests

The goal of parametric testing is to evaluate the best candidate sorbents under similar operating conditions. Parametric tests occur at full scale by directly injecting the identified sorbent into the flue gas ductwork upstream of ESP2. If at any time the performance of the existing pollution control equipment or outlet emissions exceed acceptable operating limits, testing will be halted. Acceptable limits will be discussed and agreed upon prior to beginning injection.

Parameters to be varied include:

- Mercury sorbents
- Mercury sorbent injection concentrations
- Unit combustion parameters
- SO₃ sorbents

The mercury CEM systems will be the basis for measuring mercury removal for all parametric tests.

Four weeks of parametric testing are planned. The parametric tests will be conducted at full-load conditions to minimize variables. During parametric tests, sorbents will be injected at various rates to develop a relationship between sorbent injection concentration and mercury removal efficiency across the ESP. In addition to sorbent injection, the effects of coal blending on mercury control potentially will be evaluated.

The first two weeks of parametric testing will evaluate the effects of sorbent injection for control of mercury in stack emissions. The schedule allows for several different sorbents, including the benchmark sorbent DARCO-Hg. The other sorbents tested will be determined based upon results from the sorbent screening tests.

PSNH has conducted tests on SO₃ mitigation. SO₃ has been shown to influence the mercury removal effectiveness of native fly ash and mercury control sorbents. A series of tests to evaluate the co-benefits of SO₃ mitigation on sorbent performance will be considered, based on results from efforts in Task 3.1.

Task 3.5. Choose Long Term Test Parameters

Upon completion of the parametric test series, ADA-ES will compile an informal report summarizing the results and conclusions of the testing to date. This report will provide the data and analysis necessary to guide the project team and DOE in choosing the system parameters for the long-term test.

Task 3.6. Long Term Test

After approval from the DOE COR and the NH DES, the selected sorbent from Task 3.5 will be continuously injected into the flue gas over a period of six months. This shall be done in conjunction with any operating changes or SO₃ mitigating technologies agreed to in Task 3.5. This test period shall evaluate whether the mercury control scheme develops any long-term operational problems and whether mercury emission control is sustainable. Potential operational impacts that will be monitored include degradation of ESP performance, injection system performance, and contamination of fly ash.

Long-term testing will be conducted at the “optimum” settings as determined by the project team based upon results from parametric tests and other considerations such as material cost and plant impacts. It is the intent of DOE that these settings represent the most cost effective condition for mercury removal. The goal of this task is to obtain sufficient operational data on removal efficiency over a 6-month period, the effects on the particulate control device, effects on byproducts, and impacts to the balance of plant equipment to prove viability of the process and determine the process economics.

Long-term test measurements shall include a full suite of flue gas and solid sample measurements. These shall include at least three ESP inlet and outlet Ontario Hydro mercury measurements, as well as measurements for SO₃, particulate, halogens, and ammonia.

Task 3.7. Data Analysis and Final Test Report

A summary of the possible test sequence discussed above is shown in Table 4. Dates and test conditions will be finalized as the project proceeds and additional information is gathered.

Table 4: Proposed Full-Scale Test Sequence for Merrimack Unit 2

Test Description	Start Date	Parameters/Comments	Boiler Load
Process Optimization and SO ₃ Co-Benefits Analysis	June 2006	Low Flue Gas Temperature Testing (Completed-April 2006 due to Operational Concerns) SCR Bed Change Out Effects (Started April 2006) Thermo CEM Installation – August 2006 August 2006: Vel/Temp/STM Traverses of ESP1 and ESP2 Inlet and Outlet Ducts, Stack vs Stack Inlet Duct to Analyze for Stratification and Test Port Locations Week 1: Dry SO ₃ Additives – Furnace Week 2: Dry SO ₃ Additives – SCR Outlet, Low Flue Gas Temperature Test Week 3: Combustion Changes, Liquid SO ₃ Additives Week 4: Coal Changes	Full Load During Test Periods
Sorbent Screening Tests	August -Oct 2006	Sorbent Screening and Analysis	Full Load During Test Periods
Baseline	Nov 2006	Day 1 - Test crew set-up no restrictions on boiler load Day 2 – Measure flow at full and low load Day 3 – Manual Sampling ^a Day 4 – Manual Sampling Day 5 - Manual Sampling	Full Load 24 hours per day except Day 2
Parametric Sorbent Injection Testing Week 2	Nov/ Dec 2006 Week 1	Day 1 – Check out feeder Day 2 – DARCO Hg, 1 lb/MMacf Day 3 – DARCO Hg, 3 lb/MMacf Day 4 – DARCO Hg, 6 lb/MMacf Day 5 – Change Sorbents/Contingency	Full Load 6AM-6PM
Parametric Sorbent Injection Testing Week 3	Dec 2006 Week 2	Day 1 – Alt Sorbent 1, Rate TBD Day 2 – Alt Sorbent 1, Rate TBD Day 3 – Change Sorbents/Contingency Day 4 – Alt Sorbent 2, Rate TBD Day 5 – Alt Sorbent 2, Rate TBD	Full Load 6AM-6PM
SO ₃ Mitigation Testing	Dec 2006 Week 3	Test Co-Benefits of Sorbent Injection and Positive Results from SO ₃ Co-Benefits Analysis	Full Load 6AM-6PM
Choose Long Term Test Parameters	Jan 2007	Review Results from Parametric Tests Define Operating Conditions for Long-Term Tests	
Long-term Test	Feb-Jul 2007	Operate at consistent injection concentration 24 hours a day, 6 months, while load following. Conduct Manual Sampling tests during week 4, 12, and 20. Sorbent and rate TBD.	Full Load only during Manual Sampling

^a Manual Sampling includes: ASTM M6784-02 (mercury), EPA draft M324 (mercury), EPA M5 or 17 (particulate), EPA M26a (halogens), Controlled Condensate (SO₃), EPA M29 (Multi-Metals), CTM – 27 (Ammonia)

Many signals typically archived by the plant will be monitored to determine if any correlation exists between changes in mercury concentration with measured plant operation. A correlation is not unusual between temperature and load, for example. A sample list of plant parameters and measurements to be collected can be seen in Table 5.

Table 5: Data Collected During Field Testing

Parameter	Sample/signal/test	Baseline	Parametric/ Long-Term
Coal	Batch sample	Yes	Yes
Coal	Plant signals: burn rate (lb/hr) quality (lb/MMBTU, % ash)	Yes	Yes
Fly ash	Batch sample	Yes	Yes
SCR	SCR Signals	Yes	Yes
Unit operation	Plant signals: boiler load, coal firing rate, excess O ₂ , etc.	Yes	Yes
Temperature	Plant signal: AH inlet and ESP inlet/outlet,	Yes	Yes
Temperature	Full traverse ESP inlet, single port traverse from each ESP outlet duct	Yes	No
Duct Gas Velocity	Full traverse at ESP inlet/outlet	Yes	No
Mercury (total and speciated)	Hg Monitors at ESP inlet/outlet	Yes	Yes
Mercury (total and speciated)	ASTM M6784-02 (Ontario Hydro) at ESP inlet/outlet	Yes (1 set)	No/Yes (2 sets)
Multi-Metals Emissions	Method 29 at ESP inlet/outlet	Yes, outlet	No/Yes, outlet
Particulate Emissions	EPA Method 5	Yes	Yes
HCl, HF, Br	EPA Method 26A at ESP inlet/outlet	Yes	Yes
SO ₃	Controlled Condensate	Yes	Yes
Sorbent Injection Rate	PLC, lbs/min	No	Yes
Plant CEM data	Plant signals: NO _x , SO ₂ , flow, opacity	Yes	Yes

ESP Electrical Conditions	Plant signals: Sec mA, Sec. Voltage, Sparks, etc.	Yes	Yes
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Upon completion of field testing and receipt of the subsequent laboratory analyses, ADA-ES will issue a formal test report. The report will summarize testing activities, results, economic analyses and conclusions.

Task 4. Coal, Ash, and By-Product Evaluation

In conjunction with baseline, parametric and long term tests, solid samples of coal and ash will be taken. Select samples will be analyzed to help determine the impact on fly ash quality and quantity, as well as disposal. PSNH and ADA-ES will define responsibilities for obtaining samples of coal, fly ash, and other solid and liquid samples during testing. Figure 6 depicts the hopper configuration for ESP's 1 and 2. Table 6 presents a typical schedule for collecting samples.

Table 6: Tentative Sample Collection Schedule

Test Condition	Type	Frequency	Comments
Baseline	Coal	Daily	1 liter
	ESP Ash	Daily: One Hopper Each Field, Middle Row (e.g. 4,12,20,28)	1 liter
		2 samples per week: Four Inlet Hoppers (e.g. 1,3,5,7)	1 liter
		Weekly: One Inlet Hopper	5 gallon-Samples
	SCR, Econ, AH Hoppers	Daily	1 liter
	Bottom Ash*	2 samples per week	1 liter
Parametric	Coal	Daily	1 liter
	ESP Ash	Daily: One Hopper Each Field, Middle Row collected at end of test day	1 liter
	Other Hoppers	Daily	1 liter
Long-Term	Coal	Daily	1 liter
	ESP Ash	Daily: One Hopper Each Field, Middle Row	1 liter
		2 samples per week: All Inlet Hoppers	1 liter
		Weekly: One Inlet Hopper	5 gallon - Samples
	Bottom Ash*	2 samples per week	1 liter
	Other Hoppers	Daily	1 liter

* If sample collection is possible

Ultimate and proximate, calorific value, mercury, and chlorine analyses will be performed on coal samples. The ash will be analyzed for mercury and other tests such as alkalinity, size distribution, chlorine and fluorine, and metals such as selenium and arsenic will be considered. Additional tests will be conducted to determine the environmental stability of the samples. These tests include Toxicity Characteristic Leaching Procedure (TCLP, SW846-1311), synthetic groundwater leaching procedure (SGLP) and thermal stability tests. If a chemically treated sorbent is chosen for long-term tests, leaching of the chemical used in the treatment process will be reviewed. Tests are also being discussed to determine the potential of microbial activity on mercury release. A sample of the analyses included is presented Table 7. In addition to the collection and analysis of samples needed for this project, samples shall be collected in accordance with DOE/NETL requirements. Such samples shall be made available for analysis at DOE/NETL's discretion.

Although previous tests from other DOE programs have shown that the byproducts mixed with activated carbon are highly stable, it is important to continue evaluating these byproducts for each condition using well-established and documented techniques, and new techniques designed to perform even more robust analyses of the byproducts. Additional ash will be collected and archived for other tests, including tests requested by EPA, DOE, and independent companies approved by DOE and PSNH.

Sample and data management is essential to track the large quantity of samples from various process streams at PSNH's Merrimack Station. ADA-ES has developed a Sample and Data Management System (SDMS) that will store test data from the evaluation. These data can be used to generate reports, track sample history, and input results from laboratory analyses.

For data control and security, access to the sample database is limited to the ADA-ES project manager, site manager, and sample manager. Operators collecting samples will be able to upload information to the database and print sample labels and Chain-of-Custody forms. ADA-ES will include results with regularly issued reports to the test team.

Table 7: Summary of Byproduct and Waste Characterization Testing

Series	Test Purpose	Test Method	Comments
1	Ash Disposal	TCLP (SW846-1311)	Measures leachable Hg, As, Ba, Cd, Cr, Pb, Se, Ag
2	Environmental Stability – Leaching	SGLP	Measures leachable Hg at 18 hours, 2 weeks, and 4 weeks
3	Special Testing	Various	As needed for troubleshooting or site-specific information needs. Per request, Total Metals (ppm) and Vanadium (ppm) content to be tested.

Tests will also be conducted to determine the potential effect of activated carbon injection on scrubber performance. In particular, tests will be conducted on simulated samples to determine changes in settling and dewatering performance as a result of carbon injection. The specific tests will be identified following discussions with PSNH laboratory personnel.

Note: Hopper numbering is not entirely consistent with plant numbering scheme. The Old ESP will be designated with an “O” in front of the hopper number and the Supplemental ESP hoppers will be designated with an “S” .

Figure 6: ESP1 and ESP2 Hopper Diagram for Sampling

Task 5. Technology Transfer

Presentations will be made at selected conferences, with DOE approval, to increase exposure of the test results and receive comments on the applicability of the technology to the industry. Transferring the information generated during this program to the coal-fired utility customers will be an important part of the program. The ultimate goal of technology transfer is to make results available to the public as quickly, comprehensively and accurately as possible. ADA-ES will work with PSNH and DOE/NETL in determining and supporting the key meetings, presentations and publications. This test may also include technology transfer activities to New Hampshire public officials and other stakeholders.

Task 6. Management and Reporting

This task provides time for overall program management, and preparation of financial and administrative reports. This task will also support periodic meetings with DOE to discuss progress and obtain overall direction of the program from the DOE project manager.

A. Critical Path Milestones (Milestone Plan/Status)

A Milestone Plan will be used as a planning tool to establish the time schedule for accomplishing the planned work. The Milestone Plan serves as the baseline for tracking performance of the project and identifies critical path project milestones (no less than 2 per calendar year) for the entire project. The initial Milestone Plan is listed below in Table 8. Any changes required as the project advances will be submitted to the DOE Project Officer for review and approval.

Milestones	Target Date
1. Design, Procure, and Install Equipment.	October 2006
2. Complete Baseline Tests.	December 2006
3. Complete Parametric Tests.	February 2007
4. Complete Long-Term Testing.	November 2007
5. Submit Final Report.	Within 90 days of completion of project

Table 8: Milestone Plan

During project performance, the Recipient will report the Milestone Status as part of the required quarterly Progress Report as prescribed under US Dept of Energy “Notice

Of Financial Assistance Award”, Cooperative Agreement DE-FC26-06NT42780, Attachment 4, Reporting Requirements Checklist, Section 4.A.7-Progress Report. The Milestone Status will present actual performance in comparison with Milestone Plan, and include:

- The actual status and progress of the project,
- Specific progress made toward achieving the project’s critical path milestones, and
- Any proposed changes in the projects schedule required to complete critical path milestones.

B. Deliverables

Deliverables for this project will be submitted in accordance with the requirements of the “Federal Assistance Reporting Checklist”, which will be in the Cooperative Agreement.

In addition to the required submittals listed above, the following technical plans and reports will be issued:

- Task 1 – Draft Test Plan
- Task 1 – Final Test Plan
- Task 1 – Draft QA/QC Plan
- Task 1 – Final QA/QC Plan
- Task 3.7 – Draft Scientific/Technical Report

C. Briefings and Technical Presentations

ADA-ES will provide project updates as necessary at the designated DOE/NETL facility. Additionally ADA-ES will present a technical paper at the DOE/NETL Annual Contractors’ Review Meeting. ADA-ES may also present project updates and results to New Hampshire officials and other stakeholders.

Key Personnel

Key personnel for the Merrimack tests are identified in Table 9.

Table 9: Key Project Personnel for Merrimack Mercury Field Evaluation

Name	Company	Role	Phone #	E-MAIL/Cell Phone
Andrew O’Palko	DOE/NETL	DOE/NETL Project Manager	304 285-4715	andrew.opalko@netl.doe.gov
Paul Raichle	PSNH Merrimack	Operations Manager	603-224- 4081x182	raichpr@nu.com
Art Auclair	PSNH Merrimack	Senior Environmtl Coordinator	603-224- 4081x234	auclaaa@nu.com ; pager 603-564-2334
Harold Keyes	PSNH Merrimack	Station Manager	603-224- 4081x130	keyeshe@nu.com
Bill Smagula	PSNH Manchester	Director, PSNH Generation	603-634-2851	smaguwh@nu.com
Jean Bustard	ADA-ES	Program Manager	303-734-1727	jeanb@adaes.com
Tom Campbell	ADA-ES	Project Manager	303-791-7889	tomc@adaes.com ; 303- 981-7287
Travis Starns	ADA-ES	Systems Manager	303-339-8857	traviss@adaes.com 303-921-8150
Sharon Sjostrom	ADA-ES	Hg Monitors and Technical Expert	303-339-8841	sharons@adaes.com 303-919-8538
Richard Schlager	ADA-ES	Contracts	303-339-8855	Richards@adaes.com
Connie Senior	Reaction Engineering	Tech Expert: Coal and Byproducts, Flow Modeling	801-364-6925 ext 37	senior@reaction-eng.com
Rich Miller	ADA-ES	Technical Expert	610-760-1555	richm@adaes.com

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Note 1: 200 – 300lb/hr, low injection rate at night.

Note 2: 650lb/hr, low injection rate at night.

Note 3: Trona injection planned for upstream of APH, monitoring APH pressure drop will continue during testing.

Note 4: ESP parameters will be monitored during testing.

The table below has been set up a guideline for the testing and sampling the week of October 30th. A couple of notes to add on to the testing:

1. Charles and Steve will have days. Both have experience with the Sorbent Screening Device and Charles saw how we were operating the unit the week of Oct 23rd. Paul Brignac will cover nights.
2. E.ON Engineering will be setting up on Monday, October 30th. I expect Paul and Charles (assuming you have one car, if not, only one has to stop) to stop by the plant on Monday after arrival to check on the status of the E.ON set up.
3. E.ON sample port to be port 28, the port just upstream of the inlet ESP.
4. On Tuesday, I want E.ON to take one sample in the morning to verify their SO₃ numbers from last test. Start Trona injection after the E.ON test, but no later than 12pm. There is a written procedure for starting up injection system laying in the CEM trailer next to the fax machine. Have Paul stop by Tuesday morning to walk Charles and Steve through the procedure, since he was there for the last start up.
5. E.ON will run a series of tests on Tuesday afternoon after Trona injection is established and then a series of tests on Wednesday after the plant has lowered flue gas temperatures and plant parameters has stabilized. E.ON move off day is scheduled for Thursday.
6. Our man lift has been parked south of the Supplemental ESP.
7. There may be two changes to the schedule:
 - a. Friday is scheduled to drop injection rate to 525lb/hr. We will discuss that plan with plant prior to dropping injection rate.
 - b. Saturday is scheduled to test until silo is empty. We may delay emptying silo and hold 6,000lb of Trona in silo for a one day test with ACI injection after the parametric silo is installed.
8. Silo installation has been delayed for one week. So if you see Dave Graham out there looking lost, it's because I was unable to contact him prior to his departure.
9. Saturday testing, if it occurs, will test at normal injection rate of 625lb/hr of Trona with normal plant temperatures.
10. Goal of testing is to test a full suite of SSD traps with Trona at 625lb/hr and lowered APH outlet temperatures. Follow on testing will test an Hg-LH trap and one to two other sorbents each day.
11. One safety note with Trona: Trona has the unplanned side effect of forming sodium bisulfates when injected at a lower rate than a 1:1 molar ratio. This will plug the air heater. That will occur when Trona drops below approximately 525 – 550lb/hr. So if we cannot maintain above that, stop injection and reevaluate.
12. Ensure we talk to the plant operator prior to swapping his screens to take manual logs.

							COAL
Day1	Mon 10/30			Hg CEM, modLDP	E.ON set up	Fly Ash: ESP1 Row A – each hopper, other samples by row	1/1
Day 2	Tues	Trona Injection	625	Hg CEM, modLDP, SSD, E.ON	E.ON sample prior to Trona, after Trona	Fly Ash: ESP1 Row A – each hopper, other samples by row	1/1
Day 3	Wed	Trona Injection, Lower APH Outlet T	625	Hg CEM, modLDP, SSD, E.ON	Fly Ash Sample to Headwater, E.ON sample after lower APH outlet T	Fly Ash: ESP1 Row A – each hopper, other samples by row	1/1
Day 4	Thur	Trona Injection, Lower APH Outlet T	625	Hg CEM, modLDP, SSD, outlet STM		Fly Ash: ESP1 Row A – each hopper, other samples by row	1/1
Day 5	Fri	Trona Injection	525(1)	Hg CEM, modLDP, SSD		Fly Ash: ESP1 Row A – each hopper, other samples by row	1/1
Day 6	Sat	Trona Injection	625	Hg CEM, modLDP, SSD	Continue Trona Injection until depleted	Fly Ash: ESP1 Row A – each hopper, other samples by row	1/1
Day 7	Sun			Hg CEM, modLDP,	Baseline SSD	Fly Ash: by row	1/1

1. Trona injection at 525lb/hr will be discussed with the plant. Whether we drop temperatures or not on that day will also be discussed.

							COAL
Week4/Day1	Mon 10/16	MgO Injection Lower APH Outlet T	180	Hg CEM, modLDP, outlet STM, SSD		Fly Ash: ESP1 Row A – each hopper, other samples by row	1/1
Day 2	Tues	MgO Injection Lower APH Outlet T	120	Hg CEM, modLDP, outlet STM, SSD		Fly Ash: ESP1 Row A – each hopper, other samples by row	1/1
Day 3	Wed	MgO Injection,	180	Hg CEM, modLDP, outlet STM, SSD	Continue MgO Injection until depleted	Fly Ash: by row	1/1
Day 4	Thur	MgO Injection,	180	Hg CEM, modLDP,		Fly Ash: by row	1/1/1
Day 5	Fri	MgO Injection,	180	Hg CEM, modLDP,	Silo Load Cell Installation	Fly Ash: by row	1/1/1
Day 6	Sat			Hg CEM, modLDP,		Fly Ash: by row	1/1/1
Day 7	Sun			Hg CEM, modLDP, outlet STM, SSD	Baseline SSD	Fly Ash: by row	1/1

							COAL
Week5/Day1	Mon 10/23	Trona	600	Hg CEM, modLDP,	Baseline SSD, Load Trona, Begin Injection	Fly Ash: by row	1/1
Day 2	Tues	Trona	600	Hg CEM, modLDP	Stop injection, sample and wait	Fly Ash: ESP1 Row A – each hopper, other samples by row	1/1
Day 3	Wed			Hg CEM, modLDP			1/1/1
Day 4	Thur			Hg CEM, modLDP,			1/1/1
Day 5	Fri			Hg CEM, modLDP,			1/1/1
Day 6 –7	Sat-Sun			Hg CEM, modLDP			1/1/1

							Coal
Week6/Day1	Mon 10/30			Hg CEM, modLDP	Assume decision on ash disposal		1/1/1
Day 2	Tues	Trona	600	Hg CEM, modLDP		Fly Ash: ESP1 Row A – each hopper, other samples by row	1/1
Day 3	Wed	Trona	Optimize	Hg CEM, modLDP		Fly Ash: by row	1/1
Day 4	Thur	Trona Lower APH Outlet T	Optimized	Hg CEM, modLDP, SSD, outlet STM	Load Trona	Fly Ash: ESP1 Row A – each hopper, other samples by row	1/1
Day 5	Fri	Trona Lower APH Outlet T	Optimized	Hg CEM, modLDP, SSD, outlet STM		Fly Ash: ESP1 Row A – each hopper, other samples by row	1/1
Day 6	Sat	Trona	Optimized	Hg CEM, modLDP, SSD, outlet STM		Fly Ash: by row	1/1
Day 7	Sun	Trona	Optimized	Hg CEM, modLDP, SSD, outlet STM	Continue Trona Injection until depleted	Fly Ash: by row	1/1

Week3/Day1	Wed	MgO Injection	180	Hg CEM, modLDP		Fly Ash: ESP1 Row A – each hopper, other samples by row	
Day 2	Thur	MgO Injection	180	Hg CEM, modLDP		Fly Ash: ESP1 Row A – each hopper, other samples by row	
Day 3	Friday	MgO Injection, Lower APH Outlet T	180	Hg CEM, modLDP		Fly Ash: ESP1 Row A – each hopper, other samples by row	
Day 4	Sat	MgO Injection, Lower APH Outlet T	180	Hg CEM, modLDP, SSD, outlet STM		Fly Ash: by row	
Day 5	Sun	MgO Injection, Lower APH Outlet T	180	Hg CEM, modLDP, SSD, outlet STM		Fly Ash: by row	
Day 6 –7	Mon-Tues		180	Hg CEM	Continue MgO Injection until depleted	Fly Ash: ESP1 Row A – each hopper, other samples by row	

APPENDIX B: Silo Description

16071-DL-130

Powdered Activated Carbon Injection System Description – Control Philosophy

Prepared For: **Public Service Company of New Hampshire**

Project: **Merrimack Station Unit 2
Mercury Control System
PSNH PO # 02230244**

Prepared By: **ADA-ES, Inc. & NORIT Americas**

Revision 0: **March 12, 2007**

System Overview

I. INTRODUCTION

The NORIT Americas, Inc. Powdered Activated Carbon (PAC) dosing system is designed to receive, store and feed dry bulk PAC from a storage silo through an adjustable feed rate system into a flue gas stream for removal of mercury and other contaminants. The system utilizes three (3) each 50% feed trains, with an in-place spare, to feed a maximum of approximately 1100 pounds of PAC per hour into the dual gas streams of Public Service of New Hampshire's Merrimack Station Unit 2 in Bow, New Hampshire.

II. DESCRIPTION OF THE SYSTEM

Dry PAC is pneumatically unloaded from a bulk truck transport trailer, utilizing the truck's compressor and hoses to transport the dry PAC through a carbon steel pipeline, tangentially, into a welded carbon steel storage silo. The dry PAC is stored in the silo until moved into the volumetric feed system. Specially designed air fluidization nozzles, located in the conical discharge sections of the silo, pulse compressed air into the bulk of the carbon, promoting mass flow from the flanged connections at the bottom of the silo discharge cones. PAC is fed from the silo discharge flange, through an isolation valve and expansion joint, into the volumetric feeder hopper by a rotary valve. The PAC remains in the feeder hopper until conveyed by the feeder discharge screw into the eductor inlet for transportation to the injection manifold. The amount of carbon dropped into the eductor inlet is directly proportional to the feeder screw rpm. A variable speed AC drive motor provides a wide range of carbon feed rates from the screw.

The carbon is fed from the feeder discharge auger through a drop tube vertically into the eductor inlet located directly below the feeder discharge. The passing of a motive air stream, provided by a regenerative blower, through the eductor nozzle produces a slight vacuum in the eductor inlet, which helps draw the carbon into the mixing zone directly downstream of the eductor mouth. The carbon is transported by the air stream, through the piping system, to the injection manifold.

A programmable logic controller (PLC), with input from remote sensors, controls the sequence of events throughout the system. In addition, provides alarms and interlocks to annunciate problems and to protect the system. Operator interface with the control system is via a touch-screen Operator Interface Terminal (OIT) with screens that display operational modes, equipment status, alarms and system control functions. The system is configured to feed PAC at a constant rate in pounds per hour or to feed zero to 100 percent of feeder capacity based on a 4-20 mA remote input signal. During normal operation, operator attention is not required, as the system will operate automatically once the mode of operation and the feed rate has been selected.

III. SYSTEM OPERATION

The PAC dosing system consists of three (3) independent control loops: (1) silo level monitoring and filling; (2) feeder hopper level monitoring and filling; and (3) carbon feed/injection (three (3) individual trains).

A. SILO LEVEL MONITORING AND FILLING.

1. The PAC level in the storage silo is monitored by a reflex radar level transmitter. The transmitter provides a level signal to the PLC for indication on the PanelView OIT. This level indication should be utilized on a regular basis to insure that the point level probes actuate when expected.
2. The PAC level in the storage silo is also monitored at three points by “tuning fork” type level switches. When ample volume exists in the silo to accept a complete truckload of PAC (40,000 pounds), the silo low point level switch is uncovered by the PAC, changing the state of the switch. The contact opening is sensed by the PLC and will alarm “PAC SILO LEVEL LOW” on the PanelView OIT. It will also illuminate the SILO LEVEL LOW - OK TO FILL alarm light on the truck-unloading panel. If additional PAC is not provided, the silo low low point level switch will be uncovered by the PAC when the level is critically low, changing the state of the switch. The contact opening is sensed by the PLC and will alarm the “PAC SILO LEVEL LOW LOW” on the PanelView OIT. The silo low low point level switch does not terminate operation of the PAC feed system, which operates independently of the PAC level in the silo.
3. The PAC storage silo will be filled by pneumatic road tankers that use a trailer mounted blower to pneumatically transfer the PAC from the tanker into the silo. If the PAC level covers the silo high point level switch, the switch will change states. The PLC senses the contact opening and alarms PAC SILO LEVEL HIGH on the PanelView OIT. It also illuminates the SILO LEVEL HIGH - STOP FILL alarm light on the truck-unloading control panel and sound the alarm horn to notify the operator that filling should be terminated.
4. During silo filling, the air that is utilized to pneumatically convey the PAC into the silo is vented to the atmosphere through a cartridge type silo vent filter mounted on top of the PAC storage silo. The conveying air contains dust that is collected on the exterior of the cartridges as the air passes through the cartridge fabric and into the atmosphere. The cartridges are cleaned by pulses of air flowing in the reverse direction through the cartridges removing the PAC from the exterior surface of the cartridge, which then falls into the interior of the silo. The cartridges are cleaned sequentially, one (1) row of cartridges approximately every twenty (20) seconds. The dust collector timer cleaning sequence, both frequency and duration, is adjustable on the timer board located in the vent filter electrical panel mounted on the vent filter. The vent filter has only two (2) operating modes: OFF or ON. The vent filter is placed in operation by placing the VENT FILTER selector switch, located on

the truck unloading control panel, in the ON position. The selector switch should remain in the OFF position until the silo filling operation begins and should remain in the ON position while the PAC is being unloaded.

5. When the VENT FILTER selector switch is placed in the ON position, the dust collector timer board is immediately energized and begins to continuously, sequentially pulse the rows of cartridges with cleaning air as long as the selector switch remains in the ON position. The Vent Filter Sequencing indicating light located on the truck unloading panel is illuminated and the Vent Filter Sequencing indication on the OIT changes to amber when the vent filter timer board is energized.
6. The PLC monitors the time that the vent filter high differential pressure switch is actuated and if high differential pressure exists continuously for fifteen (15) seconds, the PLC initiates a SILO VENT FILTER DP HIGH alarm and sounds the horn on the truck unloading control panel and on the PanelView OIT. The SILO VENT FILTER DP HIGH alarm does not terminate the unloading of PAC, although the unloading process should be terminated until the reason for the high differential is determined and the problem is corrected.
7. The cleaning air, which should be at approximately 100 psig, is supplied from a compressed air header on the filter unit through a series of solenoid valves activated by the timer board located in the filter control panel.
8. There is not a system for detection of excessive discharge of PAC from the silo filter, which would indicate a filter cartridge failure. The operator and truck driver are encouraged to occasionally check the vent filter for excessive PAC discharge, which would indicate a problem.

B. Feeder Hopper Filling Operation

This write-up addresses a single train only. The other two trains are virtually the same.

1. A manual knife gate mounted between the silo and the rotary valve is used to isolate the silo from the feed system for maintenance. A rotary valve is mounted below this knife gate to feed PAC into the feeder hopper. The rotary valve has a rotational speed of 10 rpm and feeds carbon at a rate of 60 pounds per minute.
2. A point level switch, mounted in the feeder hopper, is the hopper HIGH LEVEL input to the control system and controls the operation of the rotary valve. When the hopper is filling, the high level probe is used to stop the rotary valve. As the feeder removes carbon from the hopper, the high level probe will clear and the PLC will start a delay timer that will start the rotary valve after a predetermined setpoint has been met. During a fill cycle, the controls will provide information to the operator that the ROTARY VALVE is RUNNING.

3. The silo discharge cones are fitted with high pressure (HP) and low pressure (LP) fluidizing nozzles to insure mass flow of the PAC in the silo. Each silo discharge is fitted with 3 LP NORIT fluidizing nozzles to fluidize the PAC when the rotary valve begins operation. The air pressure for the LP nozzles at the lower section of the cone is set to 30 psig. The 12 HP fluidizing nozzles located in the upper cone pulse on a predetermined time as long as any of the volumetric feeders are running. The fluidizing air pressure for the HP nozzles located in the upper section of the cone is set to 60 psig. With multiple rotary valves, the control system program will recognize that a fluidizing cycle is active and will not double pulse these nozzles. During a fill cycle, the OIT will provide information to the operator that the FLUIDIZING SYSTEM is in OPERATION.
4. A Low Point Level switch is also mounted in the feeder hopper. This level switch is used to alarm a Low Level condition in the feeder hopper and to stop the feeder from operating. If the feeder hopper Low level switch is uncovered, the OIT will annunciate a FEEDER HOPPER LOW LEVEL alarm.
5. A vent line from the top of each feeder hopper is connected to the eductor suction line to allow air to be drawn into the hopper as the carbon is removed by the volumetric feeder. Otherwise, a partial vacuum would occur in the hopper. Also, during the filling process, the vent line allows the air displaced by the filling carbon to escape from the feeder hopper.

C. PAC Feed System

1. General
 - a. PAC is transported through a pipeline with pressurized air from the feed system to the Purchaser's injection point. The quantity of PAC injected into the boiler exhaust gas stream is maintained utilizing a volumetric, screw type feeder with programmable speed (feed rate) control. The predetermined quantity (pounds per hour) of PAC is discharged from the feeder auger into the inlet side of an eductor, where the PAC is mixed with motive air at approximately 8 psig, provided by a regenerative blower located below the feeder. The motive air passing through a nozzle in the eductor forms a vacuum in the inlet side of the eductor that pulls air and PAC into the motive air stream for mixing and transportation to the injection point.
 - b. The system may be operated in either of two (2) modes: PACED or NON-PACED. The feed rate may be set on the Operator Interface Terminal when the system is in the NON-PACED mode. When the system is operated in the PACED mode, the dosing rate will follow a pacing signal provided by the Purchaser.
 - c. The motive air system may be operated in a flush mode (without feeding carbon) by simply placing the FEEDER selector in the OFF position. Check-out, start-up and flushing of the motive air system

should be performed with the FEEDER selector in the OFF position, prior to opening any of the silo discharge knife-gate valves and introducing PAC into the feeder hopper and feeder.

1. Transport System Operation

- a. Three (3) complete, independent PAC feed trains are provided to feed PAC to two (2) boiler flue gas streams. Generally, train 1 will feed manifold 1 and train 2 will feed manifold 2 and train 3 will remain as a spare capable of feeding either manifold.
- b. Switching PAC dosing from trains 1 or 2 to train 3 is accomplished simply by removing train 1 or 2 from service, changing the appropriate PAC transport hose and placing train 3 in service. Limit switches located at the hose connection fitting insure that a train cannot be started without the discharge hose connected.

2. Motive Air System Operation

- a. Motive air is provided for eductor operation and for transportation of the PAC to the injection point by a dedicated regenerative air blower located on each feed train skid. Operation of the blower is initiated by depressing the SYSTEM START selector on the Train screen on the OIT. The blower on the selected feed train will start and the blower discharge pressure should be approximately 8 psig as indicated on the blower discharge pressure transducer located on each feed train.
- b. Two (2) parameters are monitored to insure that the motive air system is performing as designed: the blower discharge air pressure and the eductor inlet pressure. The control system allows five (5) seconds after a blower start is initiated for the blower pressure and eductor inlet pressure to stabilize before an alarm is possible. Low blower discharge air pressure is set approximately 1 psig below normal operating pressure and indicates that the blower inlet is restricted or that the eductor nozzle is too large. High blower discharge pressure is set about 1 psig above normal operating pressure and indicates that the eductor or the blower discharge line is restricted. Low eductor inlet pressure indicates excessive blower pressure or inadequate air flow into the eductor inlet. The eductor inlet pressure should operate at approximately negative two (2) inches of water column. The 2" gate valve located near the top of the hopper should be adjusted to maintain -2 iwc eductor inlet pressure during normal operation. High eductor suction pressure indicates a worn eductor or a PAC transport line restriction. Any of these circumstances will trip the motive air system and provide a specific alarm on the main control panel OIT. However, the motive air pressure low and the eductor suction pressure low alarms will stop the feeder and allow the blower to run for 20 seconds before stopping the blower.

- c. Operation of the feeder is not necessary for operation of the blower. The blower air system will operate indefinitely without feeding any PAC by simply placing the FEEDER selector in the OFF position.
- d. The blower (system) may be stopped by selecting the LOCAL STOP function on the TRAIN screen on the OIT.

3. Feeder Operation

- a. PAC is fed into the eductor inlet at a constant or varying rate by a volumetric, auger type feeder. The rotational speed of the auger is controlled by a motor speed controller (VFD) located in the main control panel.
- b. The feeder may be operated in the PACED or NON-PACED mode. When the SYSTEM MODE selector is placed in the NON-PACED mode, the feeder will operate at a constant feed rate (in pounds per hour) set on the TRAIN OIT screen in the main control panel. When the SYSTEM MODE selector switch is placed in the PACED position, the feeder drive motor controller follows a pacing signal, provided by the Purchaser, which represents 0% to 100% of the feed capacity of the volumetric feeder.
- c. The constant (NON-PACED) feed rate is input by the operator from the TRAIN OIT screen. The feed rate may be set between approximately 27.5 to 550 pounds of PAC per hour. To set the feed rate, simply enter a feed rate on the touch-screen and press the enter pushbutton on the OIT keypad. The feed rate will be displayed on the TRAIN screen. To change the feed rate, simply enter a new feed rate and press ENTER.
- d. The feeder may be operated for checking rotation by placing the FEEDER selector in the ON position. The feeder ON function is not a maintained signal, therefore the feeder will only run in the ON mode when it is held down by the operator. When the ON button is released, the feeder will stop running.
- e. Normal operation of the feeder may be initiated by placing the FEEDER selector in the AUTO position and selecting the LOCAL START function on the OIT control screen. The blower will start, establishing air flow through the system. FEEDER RUNNING will be indicated for the appropriate train on the OIT control screen.
- f. The system will operate at the set feed rate or dosing rate unattended until the PAC level in the silo is expended or until the system is manually stopped or trips due to a malfunction.

IV. ALARMS and PILOT LIGHTS

The alarm sequence operates essentially the same for all alarms. When an alarm is initiated, the alarm light or indicator will blink until the alarm is acknowledged by depressing the ACKNOWLEDGE pushbutton on the panel. In some cases the alarm condition will also sound the alarm horn on the control panel and on the truck unloading panel. When the alarm acknowledge pushbutton is depressed, the alarm horns will be silenced, the blinking alarm lights will stop blinking but will remain illuminated until the alarm is cleared. For critical alarms, system operation is “locked out” until the alarm is cleared from the PLC. The alarm is listed on the OIT alarm log screen until it is displaced by alarms that are more current.

A. Silo Level High (Do Not Fill):

The silo level high alarm is initiated on the OIT screen and on the truck unloading control panel when the silo high level switch is covered with PAC, and filling operations should be terminated. This alarm will also sound the alarm horn on the local control panel to alert the unloading operator. This alarm does not have any effect on the filling operations or normal system operation, other than to provide an alarm, and will clear once the PAC level in the silo has fallen below the high point level probe. This alarm will automatically clear once the PAC level in the silo has fallen below the high point level probe.

B. Silo Level Low (OK To Fill):

The silo level low alarm is initiated on the OIT screen and on truck unloading control panel when the PAC level in the storage silo has falls below the low point level probe. This level the storage silo has sufficient volume to receive a bulk trailer load of PAC and plans should be made to order PAC. The alarm will clear once the PAC level in the silo has covered the low level probe.

C. Silo Level Low Low:

The silo level low low alarm is initiated on the OIT screen when the PAC level in the storage silo falls below the low low point level probe and indicates that the PAC level is approximately twelve (12) inches above the top of the silo cone. The low low level alarm will clear once the low low point level probe is covered with PAC.

D. Silo Vent Filter DP High:

The high differential pressure alarm is initiated on the OIT screen and on the truck unloading control panel when the differential pressure switch remains in the high differential state (approximately 4 inches of water differential pressure) for a period of fifteen (15) seconds. This alarm will also sound the alarm horn on the local control panel to alert the unloading operator. This alarm does not effect the filling operation or normal system operation and will automatically clear when the differential pressure returns to normal.

E. Feeder Hopper Fill Malfunction:

The feeder hopper fill malfunction alarm is initiated on the OIT screen if the time to cover the feeder hopper high level probe, after the rotary valve run has been initiated, exceeds thirty (30) seconds or the feeder hopper low level probe is uncovered. The feeder hopper fill malfunction alarm terminates operation of the feeder, the rotary valve and the low pressure fluidization system. The system may be restarted after the alarm is reset from the OIT screen.

F. Motive Air Pressure High:

The motive air pressure high alarm is initiated on the OIT screen when the air pressure at the eductor inlet has risen above a pre-set pressure (approximately 9 psig) for a period of two (2) seconds, five (5) seconds after the blower has started. The alarm will terminate operation of the feed train. The system may be restarted after the alarm is reset from the OIT screen. After being reset, the blower should be checked and observed during restart.

G. Motive Air Pressure Low:

The motive air pressure low alarm is initiated on the OIT screen when the air pressure at the eductor inlet has fallen below a pre-set pressure (approximately 7 psig) for a period of two (2) seconds, five (5) seconds after the blower has started. The alarm will immediately stop operation of the feeder, but the blower will continue to run for 20 seconds to remove the PAC from the transport pipeline. The system may be restarted after the alarm is reset from the OIT screen.

H. Eductor Inlet Pressure High:

The eductor inlet pressure high alarm is initiated on the OIT screen when the pressure in the drop tube rises to a level where the PAC and air are not being drawn into the eductor inlet for a period of two (2) seconds, five (5) seconds after the blower has started. The alarm will terminate operation of the feed train. The system may be restarted after the alarm is reset from the OIT screen.

I. Eductor Inlet Pressure Low:

The eductor inlet pressure low alarm is initiated on the OIT screen when the pressure in the drop tube falls to a level where the PAC could be drawn from the feeder in excessive amounts (approximately -4 iwc) for a period of two (2) seconds, five (5) seconds after the blower has started. The alarm will immediately stop operation of the feeder, but the blower will continue to run for 20 seconds to remove the PAC from the transport pipeline. The system may be restarted after the alarm is cleared from the OIT screen.

J. Feeder Malfunction:

The feeder malfunction alarm is initiated on the OIT screen if the feeder drive motor VFD faults or the drive motor fails to start. The alarm will stop operation of the feeder, but the blower will continue to operate. The feeder will restart after the alarm is reset from the OIT screen.

K. Compressed Air Pressure Low – Stop Fill :

A pressure switch mounted on the air receiver will monitor the air system pressure continuously. The system controls will initiate a compressed air pressure low alarm on the OIT and on the truck-unloading panel when the air pressure has fallen below a pre-set pressure. Alarm horns will alert the unloading operator that the cleaning air pressure to the vent filter is not adequate and unloading should terminate. The alarm acknowledge push button and the compressed air pressure low alarm light are on the truck unloading panel. The light will blink when the alarm comes in and will remain on when acknowledged. When the air pressure has recovered, the alarm light will go out. The low air pressure alarm will automatically clear when adequate air pressure is restored and the alarm has been acknowledged.

L. Feeder Hopper Level Low :

The control system will initiate a feeder hopper level low alarm when the feeder hopper low level probe is uncovered. The alarm will immediately terminate operation of the blower and rotary valve. The feeder hopper level low alarm will stop operation of the feeder until the alarm is cleared. The alarm will automatically clear when the feeder low-level switch is covered with PAC.

M. Feeder Hopper Level High :

A feeder hopper level high signal will stop operation of the rotary valve until the high level probe in the hopper is uncovered and a time delay of (45) seconds has been met. The feeder hopper level high signal will not trigger an alarm in the OIT and is used strictly as an interlock in the standard operating sequence of the rotary valve.

END OF DOCUMENT

Silo Descriptions

Transportable Silo for Co-Benefit and Parametric Testing

The initial PAC silo installed for Parametric and Co-Benefit testing at PSNH Merrimack was a transportable carbon injection system, shown installed at PSNH Merrimack Station in Figure 1. The silo consists of a bulk-storage silo and twin blower/feeder trains. PAC is delivered via bulk pneumatic trucks and loaded into the silo, which is equipped with a bin vent bag filter. From the discharge section of the silo, sorbent is metered by variable speed screw feeders into eductors that provide the motive force to carry the sorbent to the injection point. Blowers provide the conveying air. A Programmable Logic Controller (PLC) is used to control system operation and adjust injection rates. The silo is approximately 50 feet high and 10 feet in diameter and has an empty weight of 10 tons. The silo holds 20 tons of sorbent. Flexible hose carries the sorbent from the feeders to distribution manifolds located on the flue gas ducts, feeding the injection probes. Each manifold supplies up to six/eight injectors.

This silo was purchased as scrap from the Brayton Point plant and refurbished locally in New England. The silo was then transferred to Hardin, MT to support further DOE Phase II mercury testing.

Figure 1: Test Silo at PSNH Merrimack Station

APPENDIX C: Manual Test Results

Final Report

Particulate and Halide Removal Efficiency Testing during Trona and Carbon Injection - MK2

Prepared for . . .

ADA-ES, Inc.
Littleton, CO

Prepared by . . .

Eastmount Environmental Services, LLC
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1.0 INTRODUCTION AND SUMMARY OF RESULTS

1.1 General Overview

Eastmount Environmental Services, LLC of Newburyport, Massachusetts was retained by ADA-ES, Inc. of Littleton, CO to conduct non-compliance emission testing on their behalf at Public Service of New Hampshire's (PSNH's) Merrimack Station. Testing was conducted in order to determine MK2 emission rates as well as Removal Efficiency (RE) for Particulate Matter (PM) and halides (HCl, HF, HBr) while Trona and carbon were being injected. A summary of the primary parties involved in this test program is presented in Table 1-1.

1.2 Test Program Summary

Emission testing consisted of one set of three 60-minute test runs conducted concurrently at the air pre-heater outlet (old ESP inlet) and the MK2 outlet stack platform. Each test run was comprised of measurements for PM and halides at both test locations. All measurements were conducted in accordance with EPA Methods 1 through 5 and 26A for PM and halides, respectively. The average particulate removal efficiency for the test program was 99.13% while all three halides experienced a negative removal efficiency. A complete summary of the air preheater outlet and MK2 outlet emission rates and removal efficiencies for each test run are presented in Tables 1-2 and 1-3, respectively.

1.3 Final Report Organization

The remainder of this Final Report is divided into three additional sections. Section 2 provides a facility/source and sampling location description. Section 3 provides a description of the flue gas monitoring procedures, while Section 4 addresses the quality assurance/quality control aspects of the program. Copies of all supporting emission calculations and field data sheets for the air preheater and stack outlets are presented in Appendices A1 and A2, respectively; while all M5 and M26A laboratory analyses are presented in Appendices B1 and B2, respectively. Additionally, facility process data is presented in Appendix C, while equipment certification sheets are presented in Appendix D.

Table 1-1 Test Program Informational Summary

Station/Source Information
Facility Name: PSNH / Merrimack Station Facility Address: 97 River Rd. Bow, NH 03304 Facility Contact: Mr. Roger Deshaies Phone: (603) 224-4081 x173
Client Information
Name: ADA-ES, Inc. Address: 8100 South Park Way, Unit B Littleton, CO 80120 Primary Contact: Mr. Tom Campbell Phone: (303) 981-7287
Test Firm Information
Test Organization: Eastmount Environmental Services, LLC Address: 65 Parker Street, Unit 3 Newburyport, MA 01950 Contact: Mr. David Caron Title: Vice President/Monitoring Services Phone: (978) 499-9300 x11 FAX: (978) 499-9303

Table 1-2 Air Pre-heater Outlet Emission Summary – MK2

- Summary of Emissions Parameters - PSNH Merrimack Unit 2 Air Pre-Heater Outlet -					
Parameter	Units	Run 1	Run 2	Run 3	Average
Particulate Matter	gr/dscf	1.63	1.33	1.08	1.35
	lb/hr	9744.0	8999.0	6339.9	8361.0
Hydrogen Chloride	ppm	33.09	22.77	41.88	32.58
	lb/hr	130.18	101.45	162.13	131.26
Hydrogen Fluoride	ppm	4.52	3.23	5.56	4.44
	lb/hr	9.76	7.89	11.82	9.82
Hydrogen Bromide	ppm	0.17	0.11	0.19	0.16
	lb/hr	1.48	1.13	1.65	1.42
- General Run Information -					
Parameter	Units	Run 1	Run 2	Run 3	Average
Test Date	MM/DD/YY	3/27/2008	3/27/2008	3/27/2008	-
Start Time	HH:MM	8:35	11:55	15:10	-
End Time	HH:MM	9:59	14:42	17:27	-
Stack Flow	dscfh	41,684,806	47,201,164	41,019,929	43,301,966
Stack Temp	F	340.3	351.2	340.3	343.9
Stack Moist.	%	5.2%	6.8%	8.0%	6.6%
Stack Velocity	ft/sec	42.9	50.5	43.9	45.7
Oxygen	%	7.30	5.30	3.50	5.37
Carbon Dioxide	%	11.50	14.00	14.20	13.23
Isokinetic Rate	%	92.2	96.8	99.2	96.1

Table 1-3 Stack Outlet Emission Summary – MK2

- Summary of Compliance Parameters - PSNH Merrimack Unit 2 Stack -					
Parameter	Units	Run 1	Run 2	Run 3	Average
Particulate Matter	gr/dscf	0.0172	0.0116	0.0081	0.0123
	lb/hr	104.32	69.85	48.46	74.21
	%RE	98.93	99.22	99.24	99.13
Hydrogen Chloride	ppm	39.22	35.10	38.47	37.60
	lb/hr	156.57	139.34	150.90	148.94
	%RE	-20.27	-37.35	6.93	-16.90
Hydrogen Fluoride	ppm	4.76	4.37	4.75	4.63
	lb/hr	10.44	9.52	10.21	10.06
	%RE	-6.90	-20.67	13.55	-4.67
Hydrogen Bromide	ppm	0.84	0.74	0.77	0.78
	lb/hr	7.46	6.50	6.73	6.90
	%RE	-403.97	-476.87	-308.33	-396.39
- General Run Information -					
Parameter	Units	Run 1	Run 2	Run 3	Average
Test Date	MM/DD/YY	3/27/2008	3/27/2008	3/27/2008	-
Start Time	HH:MM	8:35	11:55	15:10	-
End Time	HH:MM	9:59	14:42	17:27	-
Stack Flow	dscfh	42,295,317	42,057,113	41,560,073	41,970,834
Stack Temp	F	339.3	339.3	339.3	339.3
Stack Moist.	%	5.5%	6.4%	7.3%	6.4%
Stack Velocity	ft/sec	93.1	93.4	93.1	93.2
Oxygen	%	7.70	7.50	7.00	7.40
Carbon Dioxide	%	11.00	11.50	11.50	11.33
Isokinetic Rate	%	93.5	100.0	100.1	97.9

2.0 FACILITY / SOURCE DESCRIPTION AND SAMPLING POINT LOCATIONS SUMMARY

2.1 Facility Description

Merrimack Station is a fossil fuel fired electric generating facility located in Bow, New Hampshire. Merrimack Station is PSNH's prime base load plant, capable of generating 475 net megawatts of electricity. Merrimack Station is comprised of two coal-fired cyclone utility boilers (MK1 and MK2), two combustion turbines presently operating as load shaving units (CT1 and CT2), an emergency boiler, an emergency generator, primary and secondary coal crushers, and the necessary support equipment to generate electricity.

2.2 Source Description – MK2

Unit 2 is a multiple cyclone (7) coal-fired utility boiler rated at 320 MW net. The emission controls for the unit consist of two Electrostatic Precipitators (ESPs), operated in series, for reduction of particulate emissions and a Selective Catalytic Reduction (SCR) system for reduction of NO_x emissions. Unit 2 is equipped with a dilution based CEMS located on the exhaust stack. The CEMS measures and reports opacity, CO₂, SO₂, NO_x and gas flow rate in accordance with Part 75 requirements.

2.3 Sampling Configuration – MK2 Air Pre-Heater Outlet

Simultaneously with stack sampling, Eastmount conducted testing in accordance with EPA Method 1-5 and 26A at the air pre-heater outlet (old ESP inlet). This location consists of two horizontal breechings that are each 33' 10" wide and 6' 4" deep. Each breeching has multiple sampling ports. Eastmount selected four ports on each breeching and conducted a preliminary velocity traverse in accordance with Method 1 point selection at three traverse points per port, for a total of 24 traverse points. From the preliminary traverse, ports B, D and G were selected as being the most representative and one test run was conducted via a three point traverse during each test run. A schematic detailing the duct configuration and associated traverse points is presented in Figure 2-1.

2.4 Sampling Configuration – MK2 Stack

During the test program, Eastmount conducted measurements at the stack platform location in accordance with the requirements of EPA Methods 1-5 and 26A. Due to the large nature of the stack Eastmount utilized all four test ports (located at 90 degrees to each other) during each test run. A schematic detailing the stack configuration as well as the applicable traverse points is presented in Figure 2-2.

Figure 2-1 Sampling Configuration/Traverse Point Selection – MK2 Air Pre-Heater Outlet

Stack Configuration (Per Breaching)		
Description	Distance	Equivalent Diameters
Upstream (A)	6'	n/a
Downstream (B)	n/a	n/a
Width (C)	33' 10"	NA
Depth (D)	6' 4"	NA
Equivalent Diameter	10.7'	
Number of Ports / Breaching	4	
Traverse Points (per diameter)		
Traverse Points	% of diameter	Distance (inches)
1	n/a	12.7
2	n/a	38.0
3	n/a	63.3
Note: Fixed gases were determined via Fyrite (Method 3) analysis of integrated bags collected from points selected in accordance with EPA Method 1.

Figure 2-2 Sampling Configuration/Traverse Point Selection – MK2 Stack Outlet

3.0 TEST PROCEDURES

3.1 Overview

This section provides in depth detail to each of the components that as a whole comprised the compliance test program.

3.2 Methods 1-2 (Velocity and Temperature Profile)

All mass based emission limits during this test program required Eastmount to conduct velocity traverses in accordance with EPA Methods 1-2, 40CFR60, Appendix A. The system components necessary to conduct this testing are detailed below.

- **Pitot Tube** - A Type "S" pitot tube was used to measure all gas velocities during the compliance test program. The pitot tubes met all of the dimensional criteria set forth in Method 2, therefore a coefficient of 0.84 was used.
- **Pitot Lines** - The pitot tube was connected to a manometer via leak free Tygon and/or teflon tubing.
- **Manometer** - An inclined manometer capable of measuring up to ten inches of water column pressure drop was used.
- **Thermocouple** - A "K" type thermocouple was used to monitor the stack temperature at each traverse point.
- **Static Pressure** – One static pressure measurement was conducted during each test run by rotating the pitot tubes perpendicular to the direction of flow, disconnecting the negative pitot (if positive) and recording the deflection of the manometer.
- **Barometric Pressure** - The barometric pressure was determined on-site using an aneroid barometer that is previously calibrated at Eastmount's laboratory using a NIST traceable mercury barometer.
- **Gas Molecular Weight Determination** - The O₂ and CO₂ content of the sample gas was determined via Fyrite analysis conducted in accordance with EPA Method 3, 40CFR60, Appendix A. Prior to analysis, the sample was collected via a multipoint integrated collection procedure. The sample was collected from the exhaust port of the Method 5/26A sampling train dry gas meter which allows a portion of the stream to be diverted through a rotameter and into a flexible (tedlar bag).

3.3 Method 4 (Moisture)

Moisture from each isokinetic sampling train (Method 5/26A) was determined in accordance with procedures delineated in Section 2 (Reference Method) of EPA Method 4, 40 CFR 60, Appendix A. A synopsis of the procedure is presented below.

1. **Sample Train Preparation** – Sample train preparation consisted of the following:
 - Initially load train in accordance with Method 26A absorbing solutions (total of 200ml).
 - Place 200 grams of silica gel in the last impinger.
 - Record Initial volumes and weights on the field data for each impinger.
 - Assemble entire sampling train.
2. **Pre-Test Leak Check** - The system was leak checked at fifteen inches of vacuum (15"Hg). A leak rate of less than 0.02 CFM was achieved prior to the start of sampling.
3. **Sampling** – Collected a sample at an approximate rate of 0.75 dscfm. Recorded sample gas volume, system vacuum and dry gas meter temperatures (in and out) at regular intervals for the duration of each test run.
4. **Post-Test Leak Check** - Upon completion of each test run, the system was leak checked at or above the highest vacuum recorded during that run. All leak checks had to be less than 0.02 CFM to be considered acceptable.
5. **Sample Recovery** - The impingers were recovered quantitatively for determination of net condensate gain.

3.4 Method 5 (Particulate Matter)

Particulate matter was measured using EPA Methods 1 through 5. Particulate was measured in conjunction with the EPA Method 26A train. Method 5 measurements include the determination of the proper number of sampling points and their locations in the stack (RM1), stack velocity and volumetric flow rate (RM2), stack gas molecular weight (RM3) and stack gas moisture content (RM4). The train was an EPA Method 5-type isokinetic sampling train. Sampling was conducted isokinetically for a period of 60 minutes per run, collecting a minimum of 30 dry standard cubic feet.

The sampling train consisted of a metals nozzle, Teflon-coated stainless steel union, graphite ferrule, heated glass-lined probe, a glass filter holder, heated quartz glass filter, Teflon filter support, and a series of impingers. Please refer to Section 3.5 for a description of the impinger configuration. All glassware was thoroughly cleaned and sealed as per EPA Methods 5 and 26A prior to mobilization.

All filters and beakers were weighed before and after sampling in strict accordance with the Method and the EPA Quality Assurance Handbook. They were desiccated for at least 24 hours, and then weighed at six-hour intervals until two consecutive weighings demonstrated a constant weight, $\pm$ 0.5 milligrams.

Prior to sampling, the K-factor was established, the train was assembled and leak checked. After the probe and filter box reached the desired operating temperature, the probe was placed in the stack, and isokinetic sampling took place.

At the completion of isokinetic sampling, the train was leaked checked, disassembled, and sealed. All train recovery procedures were be conducted in accordance with EPA Method 5. The filter was carefully removed from the filter holder, placed in a labeled petri dish and stored in a portable desiccator. The nozzle, probe and filter holder front half were thoroughly brushed and rinsed with acetone into a container labeled for identification. Volumes were noted and liquid levels marked.

A set of reagent blanks were also taken for analysis along with the samples. The impinger condensate was measured in a graduated cylinder for determination of moisture in the flue gas.

Particulate samples were analyzed gravimetrically at Eastmount Environmental in accordance with the method. The acetone rinses were evaporated to dryness in tared beakers. All filters and beakers were desiccated before and after sampling for 24 hours, and weighed at 6-hour intervals until two consecutive weights were within ± 0.5 mg. Additional information can be found in the Quality Control Procedures section of this report.

3.5 Hydrogen Chloride, Hydrogen Fluoride, and Hydrogen Bromide - EPA Method 26A

HCl, HF and HBr emissions were measured utilizing EPA Method 26A at the back half of the EPA Method 5 train. This method utilizes a Method 5-type isokinetic sampling train with a glass nozzle, Teflon union (or Teflon-coated stainless steel union), glass-lined probe, a glass filter holder, heated quartz filter with Teflon support frit and five impingers. The first and second impingers were each loaded with 0.1N sulfuric acid (H_2SO_4). The third was empty. The fifth impinger contained a known amount of silica gel.

Prior to mobilization, all glass and Teflon train components were thoroughly cleaned in hot soapy water, thoroughly rinsed with DI water, allowed to dry, and sealed with parafilm.

In accordance with the method, all four impingers were measured before and after sampling and the data recorded. The first and second impinger solutions were quantitatively recovered from the train using deionized water, and transferred to a glass sample bottle with a Teflon-lined lid. These

impingers and their connecting glassware were rinsed three times with deionized water into the sample jar. Impinger 3 was measured for moisture gain, and the contents along with three DI H₂O rinses were added to the sample jar. The contents of impinger four were weighed and discarded.

Samples were analyzed via ion chromatography by Maxxam Analytics of Burlington, Ontario.

4.0 QUALITY ASSURANCE/QUALITY CONTROL

4.1 Overview

Strict QA/QC protocols were followed during all phases of this project. These protocols included:

- QA objectives for measurement data;
- Data reduction;
- Internal QC;
- Calibration of equipment;
- Corrective action, if necessary; and
- Use of standardized field data sheets.

The following sections summarize specific aspects of the compliance program.

4.2 Volumetric Flow Rate

The reference method sample trains were leak-checked prior to and following each test run. This ensured that a representative sample from the stack was drawn during each run.

Reference Method 1 was used for the selection of traverse points. Method 2 was used for the determination of volumetric flow. Method 3 was used for the collection of fixed gases during each test run and Method 4 was used for the determination of moisture.

4.2.1 Methods Equipment Calibrations

Eastmount's meter boxes, pitot tubes, thermocouples and barometers are maintained in accordance with specifications set forth in EPA "Quality Assurance Handbook for Air Pollution Measurement Systems - Volume III Stationary Source Specific Methods" Section 3.3.5 dated January 15, 1980 and with manufactures suggested procedures. A summary is presented below:

- **Dry Gas Meter and Orifice Meter/EPA Method 5** – All dry gas meters are calibrated using calibrated critical orifices, according to CFR 40, Part 60, Appendix A, Method 5, Section 16.2. The orifice meters in the meter control boxes are calibrated against the calibrated critical orifices and checked against the dry gas meters to which they are attached.
- **Balance** - All analytical balances are calibrated against Class M weights. A daily onsite check is also conducted using a Class S weight.

- **Thermocouples** - All type K thermocouples are calibrated against ASTM mercury in glass thermometers at three points. The first point is in an ice bath (0°C), the second point is in boiler water (100°C) and the third point is in heated oil (~220°C).
- **Pitot Tubes** - All Type "S" stainless steel pitot tubes are designed to meet the dimensional criteria set forth in Method 2, therefore a coefficient of 0.84 (Type "S") was used.

APPENDIX A – M5/26A Emission Calculations and Field Data Sheets – MK2

Indices	1 - M5/26A Emission Calculations and Field Data Sheets – MK2, Inlet
	2 - M5/26A Emission Calculations and Field Data Sheets – MK2, Outlet

A1 - M5/26A Emission Calculations and Field Data Sheets – MK2, Inlet

PARTICULATE EMISSION CALCULATION SHEET

Facility / Site: **PSNH Merrimack**
Source: **Unit 2 Inlet**

Run No.: **U2-M5/26A-R1-IN**
Date: **27-Mar-08**

		SAMPLE		BLANKS	
		<u>FILTER</u>	<u>BEAKER</u>	<u>FILTER</u>	<u>ACETONE</u>
NUMBER :		9717	98-22	9718	00-7
FINAL :		0.9971	107.3354	0.3872	80.6121
TARE :		<u>0.3869</u>	<u>104.6521</u>	<u>0.3870</u>	<u>80.6120</u>
NET :		0.6102	2.6833	0.0002	0.0001
VOLUME BLANK RINSE					100
VOLUME OF RINSE					200

Mn - Ar = Mn	O2 =	7.30 %
	CO2 =	11.50 %
Mn = 3293.500 mg	Vs =	42.91 ft/sec
Ar = <u>0.200 mg</u>	As =	428.33 ft2
	Vm std =	31.07 DSCF
Mn = 3293.300 mg	Ffactor =	1852

Qs =	3600(1-Bwo)(Vs)(As)(17.64)(Ps/Ts) =	41684806 DSCFH
	3600 (Vs) (As)	= 66169662 ACFH
	ACFH / 60	= 1102828 ACFM
Cs =	(2.205 E-6) (Mn) / (Vm Std)	= 2.34E-04 LB/SCF
Cs' =	0.0154 (Mn) / (VmStd)	= 1.6326 GRAINS/SCF
Cs' @ 1% CO2 =	0.0154 Mn / VmStd	= 0.1420 GRAINS/SCF @1
PMR =	Qs x Cs	= 9744.031 LB/HR
E =	Cs x F FACTOR x (100 / CO2)	= 3.764 LB/MMBtu

PARTICULATE EMISSION CALCULATION SHEET

Facility / Site: **PSNH Merrimack**
Source: **Unit 2 Inlet**

Run No.: **U2-M5/26A-R2-IN**
Date: **27-Mar-08**

	SAMPLE		BLANKS	
	<u>FILTER</u>	<u>BEAKER</u>	<u>FILTER</u>	<u>ACETONE</u>
NUMBER :	9719	622	9718	00-7
FINAL :	1.7796	102.747	0.3872	80.6121
TARE :	<u>0.3951</u>	<u>100.938</u>	<u>0.3870</u>	<u>80.6120</u>
NET :	1.3845	0 1.809	0.0002	0.0001
VOLUME BLANK RINSE				100
VOLUME OF RINSE				200

Mn - Ar = Mn	O2 =	5.30 %
	CO2 =	14.00 %
Mn = 3193.500 mg	Vs =	50.46 ft/sec
Ar = <u>0.200 mg</u>	As =	428.33 ft2
	Vm std=	36.93 DSCF
Mn = 3193.300 mg	Ffactor =	1852

Qs = 3600 (1-Bwo)(Vs)(As)(17.64)(Ps/Ts) =	47201164 DSCFH
3600 (Vs) (As)	= 77812861.68 ACFH
ACFH / 60	= 1296881 ACFM
Cs = (2.205 E-6) (Mn) / (Vm Std)	= 1.91E-04 LB/SCF
Cs' = 0.0154 (Mn) / (VmSTD)	= 1.3315 GRAINS/SCF
Cs' @ 1% CO2 = 0.0154 Mn / Vm std	= 0.0951 GRAINS/SCF @1%
PMR = Qs x Cs	= 8998.960 LB/HR
E = Cs x F FACTOR x (100 / CO2)	= 2.522 LB/MMBtu

PARTICULATE EMISSION CALCULATION SHEET

Facility / Site: **PSNH Merrimack**
Source: **Unit 2 Inlet**

Run No.: **U2-M5/26A-R3-IN**
Date: **27-Mar-08**

SAMPLE			BLANKS	
	<u>FILTER</u>	<u>BEAKER</u>	<u>FILTER</u>	<u>ACETONE</u>
NUMBER :	9721	00-105	9718	00-7
FINAL :	0.9074	102.9937	0.3872	80.6121
TARE :	<u>0.3917</u>	<u>101.2021</u>	<u>0.3870</u>	<u>80.6120</u>
NET :	0.5157	1.7916	0.0002	0.0001
VOLUME BLANK RINSE				100
VOLUME OF RINSE				200

Mn - Ar = Mn	O2 =	3.50 %
	CO2 =	14.20 %
Mn = 2307.300 mg	Vs =	43.86 ft/sec
Ar = <u>0.200 mg</u>	AS =	428.33 ft2
	Vm std=	32.91 DSCF
Mn = 2307.100 mg	Ffactor =	1852

Qs = 3600 (1-Bwo)(Vs)(As)(17.64)(Ps/Ts) =	41019929 DSCFH
3600 (Vs) (As)	= 67634755.42 ACFH
ACFH / 60	= 1127246 ACFM
Cs = (2.205 E-6) (Mn) / (Vm Std)	= 1.55E-04 LB/SCF
Cs' = 0.0154 (Mn) / (VmSTD)	= 1.0794 GRAINS/SCF
Cs' @ 1% CO2 = 0.0154 Mn / VmSTD	= 0.0760 GRAINS/SCF @1%
PMR = Qs x Cs	= 6339.933 LB/HR
E = Cs x F FACTOR x (100 / CO2)	= 2.016 LB/MMBtu

ISOKINETIC CALCULATION SHEET

Facility/Site:	PSNH - Merrimack	Run No. :	U2-M5/26A-R1-IN
Source:	Unit 2 Inlet	Date:	27-Mar-08

Ts (°F) =	334.5	% CO2 =	11.50	Vm (CF) =	30.734
Ts (°R) =	794.5	% O2 =	7.30	DELTA H (ABS) =	29.60
Tm (°F) =	68.7	% CO =	0	Ps (ABS) =	29.91
Tm (°R) =	528.7	% N2 =	81.20	SQRT DELTA P =	0.6297
VI (TOT) =	35.9	Cp =	0.84	Y =	1.0230
VI (adj) =	NA	TIME =	60	An =	0.000346

Vm std =	$\frac{(528/29.92) (Vm)(Y)(DELTA H ABS)}{(Tm)}$	=	31.066 DSCF
Vw std =	$.04707 (VI TOT)$	=	1.690 CF
Bwo =	$Vw std / (Vw std) + (Vm std)$	=	0.052
Bwo =	by steam tables	=	NA
1 - Bwo =	1 - Bwo	=	0.948
Md (DRY)=	$0.44 (\% CO2) +$ $0.32 (\% O2) +$ $0.28 (\% CO) +$ $0.28 (\% N2)$	=	30.132 LB/LB MOLE
Ms (WET)=	$MD (1-Bwo) + 18 (Bwo)$	=	29.506 LB/LB MOLE
G =	$SQRT (Ts/Ps/Ms)$	=	0.949
Vs =	$85.49 (Cp) (G) (SQRT DELTA P)$	=	42.912 FPS
Qs =	$3600 (1-Bwo)(Vs)(As)(528/29.92))(Ps/Ts)$	=	41684806 DSCFH
% ISO =	$\frac{100 (Ts) (Vm std) (Pstd)}{60 (Tstd) (Vs) (Time) (An) (Ps) (1-Bwo)}$	=	92.2

ISOKINETIC CALCULATION SHEET

Facility/Site:	PSNH - Merrimack	Run No. :	U2-M5/26A-R2-IN
Source:	Unit 2 Inlet	Date:	27-Mar-08

Ts (°F) =	351.2	% CO2 =	14.00	Vm (CF) =	36.974
Ts (°R) =	811.2	% O2 =	5.30	DELTA H (ABS) =	29.63
Tm (°F) =	75.5	% CO =	0	Ps (ABS) =	29.91
Tm (°R) =	535.5	% N2 =	80.70	SQRT DELTA P =	0.7342
VI (TOT) =	56.9	Cp =	0.84	Y =	1.023
VI (adj) =	NA	TIME =	60	An =	0.000346

Vm std =	$\frac{(528/29.92) (Vm)(Y)(DELTA H ABS)}{(Tm)}$	=	36.932 DSCF
Vw std =	$.04707 (VI TOT)$	=	2.678 CF
Bwo =	$Vw std / (Vw std) + (Vm std)$	=	0.068
Bwo =	by steam tables	=	NA
1 - Bwo =	1 - Bwo	=	0.932
Ms (WET)=	$0.44 (\% CO2) +$ $0.32 (\% O2) +$ $0.28 (\% CO) +$ $0.28 (\% N2)$	=	30.452 LB/LB MOLE
Ms (WET)=	$MD (1-Bwo) + 18 (Bwo)$	=	29.610 LB/LB MOLE
G =	$SQRT (Ts/Ps/Ms)$	=	0.957
Vs =	$85.49 (Cp) (G) (SQRT DELTA P)$	=	50.462 FPS
Qs =	$3600 (1-Bwo)(Vs)(As)(528/29.92))(Ps/Ts)$	=	47201164 DSCFH
% ISO =	$\frac{100 (Ts) (Vm std) (Pstd)}{60 (Tstd) (Vs) (Time) (An) (Ps) (1-Bwo)}$	=	96.8

ISOKINETIC CALCULATION SHEET

Facility/Site:	PSNH - Merrimack	Run No. :	U2-M5/26A-R3-IN
Source:	Unit 2 Inlet	Date:	27-Mar-08

Ts (°F) =	340.3	% CO2 =	14.20	Vm (CF) =	32.914
Ts (°R) =	800.3	% O2 =	3.50	DELTA H (ABS) =	29.61
Tm (°F) =	74.5	% CO =	0	Ps (ABS) =	29.89
Tm (°R) =	534.5	% N2 =	82.30	SQRT DELTA P =	0.6403
VI (TOT) =	60.7	Cp =	0.84	Y =	1.023
VI (adj) =	NA	TIME =	60	An =	0.000346

Vm std =	$\frac{(528/29.92) (Vm)(Y)(DELTA H ABS)}{(Tm)}$	=	32.914 DSCF
Vw std =	$.04707 (VI TOT)$	=	2.857 CF
Bwo =	$Vw std / (Vw std) + (Vm std)$	=	0.080
Bwo =	by steam tables	=	NA
1 - Bwo =	1 - Bwo	=	0.920
Ms (WET) =	$0.44 (\% CO2) +$ $0.32 (\% O2) +$ $0.28 (\% CO) +$ $0.28 (\% N2)$	=	30.412 LB/LB MOLE
Ms (WET) =	$MD (1-Bwo) + 18 (Bwo)$	=	29.421 LB/LB MOLE
G =	$SQRT (Ts/Ps/Ms)$	=	0.954
Vs =	$85.49 (Cp) (G) (SQRT DELTA P)$	=	43.862 FPS
Qs =	$3600 (1-Bwo)(Vs)(As)(528/29.92))(Ps/Ts)$	=	41019929 DSCFH
% ISO =	$\frac{100 (Ts) (Vm std) (Pstd)}{60 (Tstd) (Vs) (Time) (An) (Ps) (1-Bwo)}$	=	99.2

INPUT DATA SHEET

Facility/Site:	PSNH Merrimack	Run No.: U2-M5/26A-R1-IN
Source	Unit 2 Inlet	Date: 27-Mar-08

As (SQFT) :	428.332
Dn (INCHES)	0.252
PITOT COEFFICIENT:	0.84

IMP-1 (INT) :	100
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IMP-2 (INT) :	100
---------------	-----

IMP-3 (INT) :	0
---------------	---

IMP-4 (INT) :	200.0
---------------	-------

IMP-1 (FIN) :	128
---------------	-----

IMP-2 (FIN) :	100
---------------	-----

IMP-3 (FIN) :	0
---------------	---

IMP-4 (FIN) :	207.9
---------------	-------

% CO2 (OUT):	11.50
--------------	-------

% O2 (OUT) :	7.30
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% CO (OUT) :	0
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Pbar	29.53
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Pstack	5.1
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NUMBER OF POINTS	3
------------------	---

TEST LENGTH	60
-------------	----

FINAL METER	146.974
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INITIAL METER	116.240
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BEGIN TIME	8:57
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END TIME	9:57
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TRAVERSE POINT	VELOCITY HEAD	SQUARE ROOT	DELTA H	DRY GAS METER		STACK TEMP (F)
				IN	OUT	
D1	0.45	0.67	1.08	56	54	350
1	0.45	0.67	1.08	67	56	350
1	0.45	0.67	1.08	70	57	352
1	0.45	0.67	1.08	73	59	352
2	0.40	0.63	.96	75	62	353
2	0.37	0.61	.89	76	64	328
2	0.38	0.62	.91	77	65	328
2	0.38	0.62	.91	78	67	329
3	0.36	0.60	.86	79	67	318
3	0.36	0.60	.86	79	68	318
3	0.36	0.60	.86	80	69	318
3	0.36	0.60	.86	80	70	318

AVERAGE:

0.40	0.63	0.95	74.2	63.2	334.5
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INPUT DATA SHEET

Facility/Site: PSNH Merrimack
Source Unit 2 Inlet

Run No.: U2-M5/26A-R2-IN
Date: 27-Mar-08

As (SQFT) : 428.332
Dn (INCHES) 0.252
PITOT COEFFICIENT: 0.84

IMP-1 (INT) : 100

IMP-2 (INT) : 100

IMP-3 (INT) : 0

IMP-4 (INT) : 200.0

IMP-1 (FIN) : 140

IMP-2 (FIN) : 108

IMP-3 (FIN) : 0

IMP-4 (FIN) : 208.9

% CO2 (OUT): 14.00

% O2 (OUT): 5.30

% CO (OUT): 0

Pbar 29.53

Pstack 5.10

NUMBER OF POINTS 3

TEST LENGTH 60

FINAL METER 184.972

INITIAL METER 147.998

BEGIN TIME 10:48

END TIME 11:48

TRAVERSE POINT	VELOCITY HEAD	SQUARE ROOT	DELTA H	DRY GAS METER		STACK TEMP (F)
				IN	OUT	
B1	0.61	0.78	1.46	71	69	394
1	0.61	0.78	1.46	75	70	394
1	0.60	0.77	1.44	79	70	392
1	0.60	0.77	1.44	80	71	393
2	0.51	0.71	1.22	81	71	339
2	0.51	0.71	1.22	81	71	334
2	0.51	0.71	1.28	81	71	336
2	0.51	0.71	1.28	82	72	335
3	0.50	0.71	1.25	82	72	326
3	0.50	0.71	1.25	82	72	324
3	0.51	0.71	1.28	82	72	325
3	0.51	0.71	1.28	82	72	322

AVERAGE:

0.54 0.73 1.32 79.8 71.1 351.2

INPUT DATA SHEET

Facility/Site: PSNH Merrimack
Source Unit 2 Inlet

Run No.: U2-M5/26A-R3-IN
Date: 27-Mar-08

As (SQFT) : 428.332
Dn (INCHES) : 0.252
PITOT COEFFICIENT: 0.84

IMP-1 (INT) : 100

IMP-2 (INT) : 100

IMP-3 (INT) : 0

IMP-4 (INT) : 200.0

IMP-1 (FIN) : 147

IMP-2 (FIN) : 106

IMP-3 (FIN) : 1

IMP-4 (FIN) : 206.7

% CO2 (OUT): 14.20

% O2 (OUT) : 3.50

% CO (OUT) : 0

Pbar 29.53

Pstack 4.90

NUMBER OF POINTS 3

TEST LENGTH 60

FINAL METER 218.022

INITIAL METER 185.108

BEGIN TIME 12:35

END TIME 13:35

TRAVERSE POINT	VELOCITY HEAD	SQUARE ROOT	DELTA H	DRY GAS METER		STACK TEMP (F)
				IN	OUT	
G1	0.42	0.65	1.05	73	71	360
1	0.42	0.65	1.05	76	71	360
1	0.42	0.65	1.05	77	71	360
1	0.42	0.65	1.05	79	71	360
2	0.40	0.63	1.00	79	71	334
2	0.40	0.63	1.00	79	71	335
2	0.40	0.63	1.00	79	71	335
2	0.40	0.63	1.00	79	71	333
3	0.41	0.64	1.03	79	71	326
3	0.41	0.64	1.03	79	71	327
3	0.41	0.64	1.03	79	71	326
3	0.41	0.64	1.03	78	70	327

AVERAGE:

0.41 0.64 1.03 78.0 70.9 340.3

TRAVERSE DATA SHEET

Facility/Site: PSNH - Merrimack		Run No.: U2-M5/26A-R1-Inlet	
Source: U2 - Inlet & Air Pre-heater Outlet		Date: 3/27/08	

Impinger Volumes (ml):		Sampling Parameters										
		Traverse Point	Delta P (H ₂ O)	Delta H (H ₂ O)	Dry Gas Meter		Stack Temp (F)	Meter Reading (CF)	Probe Temp (F)	Filter Temp (F)	Impinger Temp (F)	Vacuum (H _g)
					In (F)	Out (F)						
1 - Initial	100	01	0.45	1.08	56	54	350	119.3	251	253	56	2
2 - Initial	100	1	0.45	1.08	67	56	350	121.8	253	249	51	2
3 - Initial	0	1	0.45	1.08	70	57	352	124.5	250	251	51	2
4 - Initial	200	1	0.45	1.08	73	59	352	127.7	250	248	51	2
5 - Initial		2	0.40	0.98	75	62	353	129.8	250	253	51	2
6 - Initial		2	0.37	0.89	76	64	328	132.2	251	253	50	2
7 - Initial		2	0.38	0.91	77	65	328	134.6	250	250	51	2
1 - Final	128	2	0.38	0.91	78	67	329	137.3	251	253	52	3
2 - Final	100	3	0.36	0.86	79	67	318	139.6	248	249	52	3
3 - Final	0	3	0.36	0.86	79	68	318	141.9	251	256	53	3
4 - Final	207.9	3	0.36	0.86	80	69	318	144.7	251	253	54	3
5 - Final		3	0.36	0.86	80	70	318	146.7	250	244	55	4
6 - Final												
7 - Final												

Pstack (H₂O): **5.1**

Bar. Pres. (H_g): **29.53**

Run Time (min.): **60**

Final Meter (CF): **146.974**

Initial Meter (CF): **116.240**

Start Time: **0857**

End Time: **0957**

9717 PC

Filter Information:		Leak Checks:				Sampling Train Information:			
ID:	9717	Train-pre:	0.00	@	10	"H _g	Test Method:	M5/26A	
Tare (g):	0.3869	Train-mid:		@		"H _g	Meter Box No.:	BE-4	
		Train-post:	0.00	@	10	"H _g	Delta H:	1.810	
Trap Information:		Pitot-pre:	02	@	73	"H ₂ O	Y:	1.0230	
ID:		Pitot-post:	04	@	73	"H ₂ O	K-factor:	2.4	
Field Team Members:						Nozzle ID / Nozzle Diameter:			
1) JB 2) BS 3) BU						10.252			
						Probe ID:			
						P-5-3			

Comments: **Fynite O₂ - 7.3**
CO₂ - 11.5

TRAVERSE DATA SHEET

Facility/Site: PSNH - Merrimack		Run No.: U2-M5/26A-R2-1, 1, 4	
Source: U2-Inlet (Air Pre-heater Outlet)		Date: 3/27/08	

Impinger Volumes (ml):		Sampling Parameters										
		Traverse	Delta P	Delta H	Dry Gas Meter		Stack	Meter	Probe	Filter	Impinger	Vacuum
		Point	(H ₂ O)	("H ₂ O)	In (F)	Out (F)	Temp (F)	Reading (CF)	Temp (F)	Temp (F)	Temp (F)	("Hg)
1 - Initial	100	B 1	0.61	1.46	71	69	394	151.4	250	250	65	4
2 - Initial	100	1	0.61	1.46	75	70	394	154.6	253	255	51	4
3 - Initial	0	1	0.60	1.44	79	70	392	157.7	248	251	52	4
4 - Initial	200	1	0.60	1.44	80	71	393	161.1	250	254	52	5
5 - Initial		2	0.51	1.22	81	71	339	163.8	251	249	53	5
6 - Initial		2	0.51	1.22	81	71	334	166.8	249	246	54	5
7 - Initial		K 2	0.51	1.28	81	71	336	169.9	251	253	54	6
1 - Final	140	2	0.51	1.28	82	72	335	173.2	250	247	55	7
2 - Final	108	3	0.50	1.25	82	72	326	176.3	252	253	56	7
3 - Final	0	3	0.50	1.25	82	72	324	179.0	246	251	58	7
4 - Final	208.9	3	0.51	1.28	82	72	325	181.8	250	250	58	7
5 - Final		3	0.51	1.28	82	72	322		250	250	68	7
6 - Final												
7 - Final												

Pstack ("H₂O): **5-1**

Bar. Pres. ("Hg): **29.53**

Run Time (min.): **60**

Final Meter (CF): **184.972**

Initial Meter (CF): **147.998**

Start Time: **1048**

End Time: **1148**

Filter Information:		Leak Checks:				Sampling Train Information:			
ID:	9719	Train-pre:	0.001	@	10	"Hg	Test Method:	M5/26A	
Tare (g):	0.3951	Train-mid:	—	@	—	"Hg	Meter Box No.:	15-4	
		Train-post:	0.000	@	15	"Hg	Delta H:	1.810	
Trap Information:		Pitot-pre:	0h	@	73	"H ₂ O	Y:	1.0230	
ID:	—	Pitot-post:	0L	@	73	"H ₂ O	K-factor:	2.4/2.5	
Field Team Members:						Nozzle ID: /Nozzle Diameter:			
1) JB 2) AS 3) PC						10.252			
						Probe ID: R5-3			

Comments: **Point One is all the way out. 5.3% O₂**
***Change K to 2.5 14.0% CO₂**

TRAVERSE DATA SHEET

Facility/Site: <u>PSNH - Merrimack</u>		Run No.: <u>U2-M5/26A-R2-Inlet</u>	
Source: <u>42-Inlet (Air Pre-heater Outlet)</u>		Date: <u>3/27/08</u>	

Impinger Volumes (ml):		Sampling Parameters										
		Traverse Point	Delta P (H ₂ O)	Delta H (H ₂ O)	Dry Gas Meter		Stack Temp (F)	Meter Reading (CF)	Probe Temp (F)	Filter Temp (F)	Impinger Temp (F)	Vacuum (H _g)
					In (F)	Out (F)						
1 - Initial	100	61	0.42	1.05	73	71	360	187.8	253	240	52	2
2 - Initial	100	1	0.42	1.05	76	71	360	190.6	250	255	48	3
3 - Initial	0	1	0.42	1.05	77	71	360	193.3	249	250	48	4
4 - Initial	200.0	1	0.42	1.05	79	71	360	196.2	252	251	49	4
5 - Initial	-	2	0.40	1.00	79	71	334	199.0	250	245	49	4
6 - Initial	-	2	0.40	1.00	79	71	335	201.7	250	250	49	5
7 - Initial	-	2	0.40	1.00	79	71	335	204.3	250	248	49	5
1 - Final	147	2	0.40	1.00	79	71	333	207.0	251	254	49	5
2 - Final	106	3	0.41	1.03	79	71	326	209.7	251	249	49	6
3 - Final	1	3	0.41	1.03	79	71	327	212.5	250	252	49	7
4 - Final	206.7	3	0.41	1.03	79	71	326	215.3	250	250	49	7
5 - Final	-	3	0.41	1.03	78	70	327	218.0	250	250	50	7
6 - Final	-											
7 - Final	-											

P-stack (H₂O): 4.9
 Bar. Pres. (H_g): 29.53
 Run Time (min.): 80
 Final Meter (CF): 218.022
 Initial Meter (CF): 185.108
 Start Time: 1235
 End Time: 1335

Filter Information:		Leak Checks:		Sampling Train Information:	
ID:	<u>9721</u>	Train-pre:	<u>0.004</u>	@	<u>15</u> "Hg
Tare (g):	<u>0.2917</u>	Train-mid:	<u>-</u>	@	<u>-</u> "Hg
		Train-post:	<u>0.006</u>	@	<u>15</u> "Hg
Trap Information:		Pitot-pre:	<u>0.1</u>	@	<u>73</u> "H ₂ O
ID:	<u>-</u>	Pitot-post:	<u>0.4</u>	@	<u>73</u> "H ₂ O
		Field Team Members:			Nozzle ID / Nozzle Diameter:
		1) <u>JD</u>	2) <u>AS</u>	3) <u>DC</u>	<u>10.252</u>
					Probe ID:
					<u>P-5-3</u>

Comments: → Point 1 is furthest out.
% O₂ = 3.5
% CO₂ = 14.2

TRAVERSE DATA SHEET

Facility/Site: PSNH - U2		Run No.: Prelim Flow Traverse	
Source: Air preheater outlet		Date: 3/26/08	

Impinger Volumes (ml):		Sampling Parameters											
		Traverse Point	Delta P (H ₂ O)	Delta H ("H ₂ O)	Dry Gas Meter		Stack Temp (F)	Meter Reading (CF)	Probe Temp (F)	Filter Temp (F)	Impinger Temp (F)	Vacuum ("Hg)	Dwell Time
					In (F)	Out (F)							
1 - Initial		A1	0.74				365						
2 - Initial		2	0.47				350						
3 - Initial		3	0.87				380						
4 - Initial		B1	0.59				325						
5 - Initial		2	0.56				338						
6 - Initial		3	0.76				381						
7 - Initial		C1	0.47				317						
1 - Final		2	0.52				334						
2 - Final		3	0.94				364						
3 - Final		D1	0.46				324						
4 - Final		2	0.42				326						
5 - Final		3	0.47				352						
6 - Final		E1	0.58				322						
7 - Final		2	0.54				327						
Pstack ("H ₂ O): +5.1		3	0.64				364						
Bar. Pres. ("Hg):		F1	0.47				317						
Run Time (min.):		2	0.03 *				341						
Final Meter (CF):		3	0.74				339						
Initial Meter (CF):		G1	0.52				321						
Start Time: 1445		2	0.41				332						
End Time: 1510		3	0.48				368						
		H1	0.50				320						
		2	0.33				317						
		3	0.46				374						

Fyrite Analysis
 O₂ - 5.3
 CO₂ - 14.0

Filter Information:		Leak Checks:				Sampling Train Information:			
ID:		Train-pre:	☒	@	73"	Test Method:	1-2		
Tare (g):		Train-mid:	☒	@	73"	Meter Box No.:	-		
		Train-post:	☒	@	73"	Delta H:	-		
Trap Information:		Pitot-pre:	☒	@	73"	Y:	-		
ID:		Pitot-post:	☒	@	73"	K-factor:	-		
		Field Team Members:				Nozzle ID / Nozzle Diameter:			
		1) 2) 3)				Probe ID: S-8-1			

Comments: pl all the way in Port A → All the way North
 3 near wall H → South
 * - double checked this value
 used all ports with 2 short 3/8" ss tubes mounted to them
 1 run in ports B, D & G

HYDROGEN CHLORIDE EMISSION CALCULATION SHEET

Facility / Site: PSNH Merrimack	Run Nos.: 1-3
Source: Unit 2 Inlet	Date: 27-Mar-08

RESULTS:

Run #	Mass mg	Blank mg	Vm Std DSCF	Cs lb/SCF	PPMv	Diluents		PPMv @ 7% O2	PPMv @ 1% CO2	Qs DSCFH	PMR	
						O2 %	CO2 %				lb/MMBtu	lb/hr
1	44.00	ND	31.066	3.12E-06	33.089	7.30	11.50	33.82	2.877	41,684,806	5.03E-02	130.185
2	36.00	ND	36.932	2.15E-06	22.772	5.30	14.00	20.29	1.627	47,201,164	2.84E-02	101.451
3	59.00	ND	32.914	3.95E-06	41.877	3.50	14.20	33.45	2.949	41,019,929	5.15E-02	162.133

EQUATIONS:

lb/SCF	$(2.205E-6) (Mg) / (VmStd)$
mg/DSCM	$(Mn)/(DSCF* .02832)$
PPMv	$(lbs/SCF)(1E+6)/(MW/386.3)$
PPMv @ 7%O2	$PPMv (20.9-7)/(20.9-O2)$
PPMv @ 12%CO2	$(PPMv) (12)/(%CO2)$
E Fd	$(lbs/SCF)(Fd)(20.9/(20.9-O2))$
E Fc	$(lbs/SCF)(Fc)(100/%CO2)$

Data:

Mw =	36.461
Fc	1852

HYDROGEN FLUORIDE EMISSION CALCULATION SHEET

Facility / Site: PSNH Merrimack	Run Nos.: 1-3
Source: Unit 2 Inlet	Date: 27-Mar-08

RESULTS:

Run #	Mass mg	Blank mg	Vm Std DSCF	Cs lb/SCF	PPMv	Diluents O ₂ %	CO ₂ %	PPMv @ 7% O ₂	PPMv @ 1% CO ₂	Qs DSCFH	PMR lb/MMBtu	lb/hr
1	3.30	ND	31.066	2.34E-07	4.522	7.30	11.50	4.62	0.393	41,684,806	3.77E-03	9.764
2	2.80	ND	36.932	1.67E-07	3.227	5.30	14.00	2.88	0.231	47,201,164	2.21E-03	7.891
3	4.30	ND	32.914	2.88E-07	5.561	3.50	14.20	4.44	0.392	41,019,929	3.76E-03	11.816

EQUATIONS:

lb/SCF	(2.205E-6) (Mg) / (VmStd)
mg/DSCM	(Mn)/(DSCF*.02832)
PPMv	(lbs/SCF)(1E+6)/(MW/386.3)
PPMv @ 7%O2	PPMv (20.9-7)/(20.9-O2)
PPMv @ 12%CO2	PPMv (12)/(1%CO2)
E Fd	(lbs/SCF)(Fd)(20.9/(20.9-O2))
E Fc	(lbs/SCF)(Fc)(100/%CO2)

Data:

Mw =	20.01
Fc	1852

A2 - M5/26A Emission Calculations and Field Data Sheets – MK2, Outlet

PARTICULATE EMISSION CALCULATION SHEET

Facility / Site: PSNH Merrimack	Run No.: U2-M5/26A-R1-Out
Source: Unit 2 Stack (Outlet)	Date: 27-Mar-08

	SAMPLE		BLANKS	
	<u>FILTER</u>	<u>BEAKER</u>	<u>FILTER</u>	<u>ACETONE</u>
NUMBER:	9732	726	9718	00-7
FINAL :	0.3725	105.8480	0.3872	80.6121
TARE :	<u>0.3591</u>	<u>105.8193</u>	<u>0.3870</u>	<u>80.6120</u>
NET :	0.0134	0.0287	0.0002	0.0001
		VOLUME BLANK RINSE		100
		VOLUME OF RINSE		125

Mn - Ar = Mn	O2 =	7.70 %
	CO2 =	11.00 %
Mn = 42.100 mg	Vs =	93.13 ft/sec
Ar = <u>0.125 mg</u>	As =	205.27 ft2
	Vm std =	37.53 DSCF
Mn = 41.975 mg	Ffactor =	1852

Qs = 3600(1-Bwo)(Vs)(As)(17.64)(Ps/Ts) =	42295317 DSCFH
3600 (Vs) (As)	= 68822067 ACFH
ACFH / 60	= 1147034 ACFM
Cs = (2.205 E-6) (Mn) / (Vm Std)	= 2.47E-06 LB/SCF
Cs' = 0.0154 (Mn) / (VmStd)	= 0.0172 GRAINS/SCF
Cs' @ 1% CO2 = 0.0154 Mn / VmStd	= 0.0016 GRAINS/SCF @1
PMR = Qs x Cs	= 104.316 LB/HR
E = Cs x F FACTOR x (100 / CO2)	= 0.042 LB/MMBtu

PARTICULATE EMISSION CALCULATION SHEET

Facility / Site: PSNH Merrimack	Run No.: U2-M5/26A-R2-Out
Source: Unit 2 Stack (Outlet)	Date: 27-Mar-08

SAMPLE		BLANKS	
	<u>FILTER</u>	<u>BEAKER</u>	<u>FILTER</u> <u>ACETONE</u>
NUMBER :	9720	00-27	9718 00-7
FINAL :	0.4061	105.0820	0.3872 80.6121
TARE :	<u>0.3927</u>	<u>105.0652</u>	<u>0.3870</u> <u>80.6120</u>
NET :	0.0134	0.0168	0.0002 0.0001
VOLUME BLANK RINSE			100
VOLUME OF RINSE			125

Mn - Ar = Mn	O2 =	7.50 %
	CO2 =	11.50 %
Mn = 30.200 mg	Vs =	93.40 ft/sec
Ar = <u>0.125 mg</u>	As =	205.27 ft2
	Vm std=	39.93 DSCF
Mn = 30.075 mg	Ffactor =	1852

Qs = 3600 (1-Bwo)(Vs)(As)(17.64)(Ps/Ts) =	42057113 DSCFH
3600 (Vs) (As)	= 69019140.1 ACFH
ACFH / 60	= 1150319 ACFM
Cs = (2.205 E-6) (Mn) / (Vm Std)	= 1.66E-06 LB/SCF
Cs' = 0.0154 (Mn) / (VmSTD)	= 0.0116 GRAINS/SCF
Cs' @ 1% CO2 = 0.0154 Mn / Vm std	= 0.0010 GRAINS/SCF @1%
PMR = Qs x Cs	= 69.845-LB/HR
E = Cs x F FACTOR x (100 / CO2)	= 0.027 LB/MMBtu

PARTICULATE EMISSION CALCULATION SHEET

Facility / Site: PSNH Merrimack	Run No.: U2-M5/26A-R3-Out
Source: Unit 2 Stack (Outlet)	Date: 27-Mar-08

SAMPLE		BLANKS	
	<u>FILTER</u>	<u>BEAKER</u>	<u>FILTER</u> <u>ACETONE</u>
NUMBER :	9733	496	9718 00-7
FINAL :	0.3782	103.7231	0.3872 80.6121
TARE :	<u>0.3646</u>	<u>103.7157</u>	<u>0.3870</u> <u>80.6120</u>
NET :	0.0136	0.0074	0.0002 0.0001
VOLUME BLANK RINSE			100
VOLUME OF RINSE			125

Mn - Ar = Mn	O2 =	7.00 %
	CO2 =	11.50 %
Mn = 21.000 mg	Vs =	93.15 ft/sec
Ar = <u>0.125 mg</u>	AS =	205.27 ft2
	Vm std=	39.47 DSCF
Mn = 20.875 mg	Ffactor =	1852

Qs = 3600 (1-Bwo)(Vs)(As)(17.64)(Ps/Ts) =	41560073 DSCFH
3600 (Vs) (As)	= 68832701.8 ACFH
ACFH / 60	= 1147212 ACFM
Cs = (2.205 E-6) (Mn) / (Vm Std)	= 1.166E-06 LB/SCF
Cs' = 0.0154 (Mn) / (VmSTD)	= 0.0081 GRAINS/SCF
Cs' @ 1% CO2 = 0.0154 Mn / VmSTD	= 0.0007 GRAINS/SCF @1%
PMR = Qs x Cs	= 48.463 LB/HR
E = Cs x F FACTOR x (100 / CO2)	= 0.019 LB/MMBtu

ISOKINETIC CALCULATION SHEET

Facility/Site: PSNH - Merrimack	Run No.: U2-M5/26A-R1-Out
Source: Unit 2 Stack	Date: 27-Mar-08

Ts (°F) =	340.1	% CO2 =	11.00	Vm (CF) =	38.284
Ts (°R) =	800.1	% O2 =	7.70	DELTA H (ABS) =	29.62
Tm (°F) =	59.5	% CO =	0	Ps (ABS) =	29.49
Tm (°R) =	519.5	% N2 =	81.30	SQRT DELTA P =	1.3501
VI (TOT) =	46.5	Cp =	0.84	Y =	0.9740
VI (adj) =	NA	TIME =	60	An =	0.000195

Vm std =	$\frac{(528/29.92) (Vm)(Y)(DELTA H ABS)}{(Tm)}$	=	37.527 DSCF
Vw std =	.04707 (VI TOT)	=	2.189 CF
Bwo =	$Vw std / (Vw std) + (Vm std)$	=	0.055
Bwo =	by steam tables	=	NA
1 - Bwo =	1 - Bwo	=	0.945
Md (DRY)=	$0.44 (\% CO2) +$ $0.32 (\% O2) +$ $0.28 (\% CO) +$ $0.28 (\% N2)$	=	30.068 LB/LB MOLE
Ms (WET)=	$MD (1-Bwo) + 18 (Bwo)$	=	29.403 LB/LB MOLE
G =	$SQRT (Ts/Ps/Ms)$	=	0.961
Vs =	$85.49 (Cp) (G) (SQRT DELTA P)$	=	93.131 FPS
Qs =	$3600 (1-Bwo)(Vs)(As)(528/29.92))(Ps/Ts)$	=	42295317 DSCFH
% ISO =	$\frac{100 (Ts) (Vm std) (Pstd)}{60 (Tstd) (Vs) (Time) (An) (Ps) (1-Bwo)}$	=	93.5

ISOKINETIC CALCULATION SHEET

Facility/Site: PSNH - Merrimack	Run No. : U2-M5/26A-R2-Out
Source: Unit 2 Stack	Date: 27-Mar-08

Ts (°F) =	339.3	% CO2 =	11.50	Vm (CF) =	41.322
Ts (°R) =	799.3	% O2 =	7.50	DELTA H (ABS) =	29.63
Tm (°F) =	67.0	% CO =	0	Ps (ABS) =	29.49
Tm (°R) =	527.0	% N2 =	81.00	SQRT DELTA P =	1.3536
VI (TOT) =	58.0	Cp =	0.84	Y =	0.974
VI (adj) =	NA	TIME =	60	An =	0.000195

$Vm\ std = \frac{(528/29.92) (Vm)(Y)(DELTA\ H\ ABS)}{(Tm)} = 39.931\ DSCF$

$Vw\ std = .04707 (VI\ TOT) = 2.730\ CF$

$Bwo = Vw\ std / (Vw\ std) + (Vm\ std) = 0.064$

$Bwo = \text{by steam tables} = NA$

$1 - Bwo = 1 - Bwo = 0.936$

$Ms\ (WET) = 0.44\ (\% CO2) + 0.32\ (\% O2) + 0.28\ (\% CO) + 0.28\ (\% N2) = 30.140\ LB/LB\ MOLE$

$Ms\ (WET) = MD (1-Bwo) + 18 (Bwo) = 29.363\ LB/LB\ MOLE$

$G = SQRT (Ts/Ps/Ms) = 0.961$

$Vs = 85.49 (Cp) (G) (SQRT\ DELTA\ P) = 93.398\ FPS$

$Qs = 3600 (1-Bwo)(Vs)(As)(528/29.92))(Ps/Ts) = 42057113\ DSCFH$

$\% ISO = \frac{100 (Ts) (Vm\ std) (Pstd)}{60 (Tstd) (Vs) (Time) (An) (Ps) (1-Bwo)} = 100.0$

ISOKINETIC CALCULATION SHEET

Facility/Site: PSNH - Merrimack	Run No. : U2-M5/26A-R3-Out
Source: Unit 2 Stack	Date: 27-Mar-08

Ts (°F) =	339.3	% CO2 =	11.50	Vm (CF) =	40.668
Ts (°R) =	799.3	% O2 =	7.00	DELTA H (ABS) =	29.63
Tm (°F) =	64.7	% CO =	0	Ps (ABS) =	29.49
Tm (°R) =	524.7	% N2 =	81.50	SQRT DELTA P =	1.3472
VI (TOT) =	65.6	Cp =	0.84	Y =	0.974
VI (adj) =	NA	TIME =	60	An =	0.000195

$Vm\ std = \frac{(528/29.92) (Vm)(Y)(DELTA\ H\ ABS)}{(Tm)} = 39.473\ DSCF$

$Vw\ std = .04707 (VI\ TOT) = 3.088\ CF$

$Bwo = Vw\ std / (Vw\ std) + (Vm\ std) = 0.073$

$Bwo = \text{by steam tables} = NA$

$1 - Bwo = 1 - Bwo = 0.927$

$Ms\ (WET) = 0.44 (\% CO2) + 0.32 (\% O2) + 0.28 (\% CO) + 0.28 (\% N2) = 30.120\ LB/LB\ MOLE$

$Ms\ (WET) = MD (1-Bwo) + 18 (Bwo) = 29.241\ LB/LB\ MOLE$

$G = SQRT (Ts/Ps/Ms) = 0.963$

$Vs = 85.49 (Cp) (G) (SQRT\ DELTA\ P) = 93.145\ FPS$

$Qs = 3600 (1-Bwo)(Vs)(As)(528/29.92)(Ps/Ts) = 41560073\ DSCFH$

$\% ISO = \frac{100 (Ts) (Vm\ std) (Pstd)}{60 (Tstd) (Vs) (Time) (An) (Ps) (1-Bwo)} = 100.1$

INPUT DATA SHEET

Facility/Site:	PSNH Merrimack	Run No.: U2-M5/26A-R1-Out
Source	Unit 2 Stack (Outlet)	Date: 27-Mar-08

As (SQFT) :	205.273
Dn (INCHES)	0.189
PITOT COEFFICIENT:	0.84
IMP-1 (INT) :	100
IMP-2 (INT) :	100
IMP-3 (INT) :	0
IMP-4 (INT) :	200.0
IMP-1 (FIN) :	120
IMP-2 (FIN) :	114
IMP-3 (FIN) :	4
IMP-4 (FIN) :	208.5
% CO2 (OUT):	11.00
% O2 (OUT):	7.70
% CO (OUT):	0
Pbar	29.53
Pstack	-0.57
NUMBER OF POINTS	12
TEST LENGTH	60
FINAL METER	611.446
INITIAL METER	573.162
BEGIN TIME	8:57
END TIME	10:08

AVERAGE:

TRAVERSE POINT	VELOCITY HEAD	SQUARE ROOT	DELTA H	DRY GAS METER		STACK TEMP (F)
				IN	OUT	
A1	1.90	1.38	1.33	52	50	340
2	1.90	1.38	1.33	55	50	340
3	1.60	1.26	1.12	58	51	339
B1	1.80	1.34	1.26	56	54	341
2	1.80	1.34	1.26	62	54	340
3	1.60	1.26	1.12	64	55	341
C1	1.90	1.38	1.33	61	56	340
2	2.00	1.41	1.40	67	57	340
3	1.80	1.34	1.26	70	58	340
D1	2.00	1.41	1.40	66	60	341
2	1.90	1.38	1.33	73	61	340
3	1.70	1.30	1.19	74	63	339
AVERAGE:				63.2	55.8	340.1

INPUT DATA SHEET

Facility/Site:	PSNH Merrimack	Run No.: U2-M5/26A-R2-Out
Source	Unit 2 Stack (Outlet)	Date: 27-Mar-08

As (SQFT) : 205.273
 Dn (INCHES) : 0.189
 PITOT COEFFICIENT: 0.84

IMP-1 (INT) : 100

IMP-2 (INT) : 100

IMP-3 (INT) : 0

IMP-4 (INT) : 200.0

IMP-1 (FIN) : 130

IMP-2 (FIN) : 114

IMP-3 (FIN) : 4

IMP-4 (FIN) : 210.0

% CO2 (OUT): 11.50

% O2 (OUT) : 7.50

% CO (OUT) : 0

Pbar 29.53

Pstack -0.57

NUMBER OF POINTS 12

TEST LENGTH 60

FINAL METER 654.431

INITIAL METER 613.109

BEGIN TIME 10:48

END TIME 11:58

AVERAGE:

TRAVERSE POINT	VELOCITY HEAD	SQUARE ROOT	DELTA H	DRY GAS METER		STACK TEMP (F)
				IN	OUT	
D1	1.90	1.38	1.43	67	66	340
2	1.90	1.38	1.43	68	65	340
3	1.70	1.30	1.28	70	63	340
C1	1.90	1.38	1.43	67	63	339
2	1.90	1.38	1.43	71	64	339
3	1.80	1.34	1.35	72	64	339
B1	1.90	1.38	1.43	67	63	339
2	1.90	1.38	1.43	72	63	339
3	1.70	1.30	1.28	73	63	339
A1	1.90	1.38	1.43	70	64	340
2	1.80	1.34	1.35	73	64	339
3	1.70	1.30	1.28	73	64	339

1.83	1.35	1.38	70.3	63.8	339.3
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INPUT DATA SHEET

Facility/Site: PSNH Merrimack
Source: Unit 2 Stack (Outlet)

Run No.: U2-M5/26A-R3-Out
Date: 27-Mar-08

As (SQFT) : 205.273
Dn (INCHES) : 0.189
PITOT COEFFICIENT: 0.84

IMP-1 (INT) : 100
IMP-2 (INT) : 100
IMP-3 (INT) : 0
IMP-4 (INT) : 200.0
IMP-1 (FIN) : 144
IMP-2 (FIN) : 110
IMP-3 (FIN) : 4
IMP-4 (FIN) : 207.6

% CO2 (OUT): 11.50
% O2 (OUT): 7.00
% CO (OUT): 0

Pbar 29.53
Pstack -0.57

NUMBER OF POINTS 12
TEST LENGTH 60
FINAL METER 695.318
INITIAL METER 654.650
BEGIN TIME 12:35
END TIME 13:46

AVERAGE:

TRAVERSE POINT	VELOCITY HEAD	SQUARE ROOT	DELTA H	DRY GAS METER		STACK TEMP.(F)
				IN	OUT	
A1	1.90	1.38	1.43	61	60	339
2	1.90	1.38	1.43	65	60	339
3	1.60	1.26	1.20	69	60	340
B1	1.90	1.38	1.43	63	60	340
2	2.00	1.41	1.50	70	61	339
3	1.70	1.30	1.28	72	62	339
C1	1.80	1.34	1.35	68	62	340
2	1.80	1.34	1.35	70	62	340
3	1.70	1.30	1.28	73	63	339
D1	1.90	1.38	1.43	65	62	339
2	1.90	1.38	1.43	66	63	339
3	1.70	1.30	1.28	73	63	339
AVERAGE:						
	1.82	1.3472	1.36	67.92	61.50	339.33

TRAVERSE DATA SHEET

Facility/Site: FSNH-MERZIMACK					Run No.: U2-MS/26A-OUTLET-R1				
Source: UNIT 2 OUTLET					Date: 3-27-08				

Impinger Volumes (ml):		Sampling Parameters											
		Traverse Point	Delta P (H ₂ O)	Delta H ("H ₂ O)	Dry Gas Meter		Stack Temp (F)	Meter Reading (CF)	Probe Temp (F)	Filter Temp (F)	Impinger Temp (F)	Vacuum ("Hg)	TIME
					In (F)	Out (F)							
1 - Initial	100	A1	1.9	1.33	52	50	340	573.162	251	231	51	3	0
2 - Initial	100	2	1.9	1.33	55	50	340	576.43	250	253	47	3	5
3 - Initial	0	3	1.6	1.12	58	51	339	579.08	250	252	47	3	10
4 - Initial	200	B1	1.8	1.26	56	54	341	582.186	252	246	45	3	15
5 - Initial	/	2	1.8	1.26	62	54	340	585.43	252	265	46	3	20
6 - Initial	/	3	1.6	1.12	64	55	341	588.59	252	256	48	3	25
7 - Initial	/	C1	1.9	1.33	61	56	340	591.725	251	251	48	3	30
1 - Final	120	2	2.0	1.40	67	57	340	594.98	253	243	49	3	35
2 - Final	114	3	1.8	1.26	70	58	340	598.35	251	252	52	3	40
3 - Final	4	D1	2.0	1.40	66	58	341	601.508	252	250	53	3	45
4 - Final	208.5	2	1.9	1.33	73	61	340	604.89	254	233	55	3	50
5 - Final		3	1.7	1.19	74	63	339	608.30	252	249	56	3	55
6 - Final								611.446					60
7 - Final													

Pstack ("H₂O): **-0.57**

Bar. Pres. ("Hg): **29.53**

Run Time (min.): **60**

Final Meter (CF): **611.446**

Initial Meter (CF): **573.162**

Start Time: **0857**

End Time: **1008**

Filter Information:		Leak Checks:				Sampling Train Information:			
ID:	9732	Train-pre:	2.001	@	15	"Hg	Test Method:	MS/26A	
Tare (g):		Train-mid:	—	@	—	"Hg	Meter Box No.:	EE2	
		Train-post:	1.001	@	6	"Hg	Delta H:	1.744	
Trap Information:		Pitot-pre:	✓	@	7	"H ₂ O	Y:	0.9740	
ID:	N/A	Pitot-post:	✓	@	12	"H ₂ O	K-factor:	0.7	
Field Team Members:						Nozzle ID: /Nozzle Diameter:			
1) SA 2) CC 3)						10.189			
						Probe ID:			
						P8-3			

Comments: TEST CHANGES
0912 to 0915
0930 to 0934

0949 to 0952 Fyrite
0297.7
CO₂ 911.0

ALL TIMES RECORDED IN REALTIME, NOT CEM TIME.

TRAVERSE DATA SHEET

Facility/Site: PSNH-MERZIMACK		Run No.: 02-M5/26A-OUTLET-22	
Source: UNIT 2 OUTLET		Date: 3-27-08	

Impinger Volumes (ml):		Sampling Parameters											
		Traverse Point	Delta P (H ₂ O)	Delta H (H ₂ O)	Dry Gas Meter		Stack Temp (F)	Meter Reading (CF)	Probe Temp (F)	Filter Temp (F)	Impinger Temp (F)	Vacuum (H _g)	Time
					In (F)	Out (F)							
1 - Initial	100												
2 - Initial	100												
3 - Initial	0	D1	1.9	1.43	67	66	340	613.109	251	249	48	3	0
4 - Initial	200	2	1.9	1.43	68	65	340	617.14	251	252	53	3	5
5 - Initial	—	3	1.7	1.28	70	63	340	620.49	250	251	56	3	10
6 - Initial	—	C1	1.9	1.43	67	63	339	623.864	263	254	58	3	15
7 - Initial	—	2	1.9	1.43	71	64	339	627.30	252	247	52	3	20
		3	1.8	1.35	72	64	339	630.71	254	236	51	3	25
1 - Final	130	B1	1.9	1.43	67	63	339	634.091	255	256	49	3	30
2 - Final	114	2	1.9	1.43	72	63	339	637.49	252	239	51	3	35
3 - Final	4	3	1.7	1.28	73	63	339	640.87	252	242	53	3	40
4 - Final	216	A1	1.9	1.43	70	64	340	644.196	251	251	53	3	45
5 - Final		2	1.8	1.35	73	64	339	647.70	250	248	55	3	50
6 - Final		3	1.7	1.28	73	64	339	651.10	254	234	56	3	55
7 - Final								654.431					60

P _{stack} (H ₂ O):	-0.57
Bar. Pres. (H _g):	29.53
Run Time (min.):	60
Final Meter (CF):	654.431
Initial Meter (CF):	613.109
Start Time:	1048
End Time:	1158

Filter Information:		Leak Checks:				Sampling Train Information:	
ID:	9720	Train-pre:	2.001	@	15	Test Method:	M5/26A
Tare (g):	3927	Train-mid:	—	@	—	Meter Box No.:	EE2
		Train-post:	2.001	@	7	Delta H:	1.744
Trap Information:		Pitot-pre:	✓	@	6	Y:	0.9740
ID:	N/A	Pitot-post:	✓	@	6	K-factor:	0.95
Field Team Members:						Nozzle ID: /Nozzle Diameter:	
1) SW 2) CC 3)						Probe ID: P8-3	

Comments: PORT CHANGES
1103 to 1107 1140 to 1143
1122 to 1125

Fyrite
O₂-7.5
CO₂-11.5

ALL TIMES ARE REALTIME, NOT CEMS TIME.

TRAVERSE DATA SHEET

Facility/Site: PSNH-MERIDIAN				Run No.: U2-M5126A-OUTLET-R3									
Source: UNIT 2 OUTLET				Date: 3-27-08									
Impinger Volumes (ml):		Sampling Parameters											
1 - Initial	100	Traverse Point	Delta P (H ₂ O)	Delta H (H ₂ O)	Dry Gas Meter (In (F) Out (F))		Stack Temp (F)	Meter Reading (CF)	Probe Temp (F)	Filter Temp (F)	Impinger Temp (F)	Vacuum (H _g)	TIME
2 - Initial	100	A1	1.9	1.43	61	60	339	654.650	253	231	46	5	0
3 - Initial	0	2	1.9	1.43	65	60	339	658.12	252	250	43	5	5
4 - Initial	200	3	1.6	1.20	69	60	340	661.57	257	261	45	5	10
5 - Initial	/	B1	1.9	1.43	63	60	340	664.785	251	251	51	5	15
6 - Initial	/	2	2.0	1.50	70	61	339	668.18	248	234	47	5	20
7 - Initial	/	3	1.7	1.28	72	62	339	671.68	251	229	47	5	25
1 - Final	144	C1	1.8	1.35	68	62	340	675.041	249	250	48	5	30
2 - Final	110	2	1.8	1.35	70	62	340	678.38	250	251	48	5	35
3 - Final	4	3	1.7	1.28	73	63	339	681.77	250	252	49	5	40
4 - Final	207.6	D1	1.9	1.43	65	62	339	685.063	252	253	52	5	45
5 - Final		2	1.9	1.43	66	63	339	688.43	249	251	49	5	50
6 - Final		3	1.7	1.28	73	63	339	691.99	252	250	51	5	55
7 - Final								695.318					60
Pstack (H ₂ O): -0.57													
Bar. Pres. (H _g): 29.53													
Run Time (min.): 60													
Final Meter (CF): 695.318													
Initial Meter (CF): 654.650													
Start Time: 1235													
End Time: 1346													
Filter Information:		Leak Checks:						Sampling Train Information:					
ID:	9733	Train-pre:	<.001	@	15	"Hg	Test Method:	M5126A					
Tare (g):	0.3646	Train-mid:	—	@	—	"Hg	Meter Box No.:	EE2					
		Train-post:	<.001	@	10	"Hg	Delta H:	1.744					
Trap Information:		Pitot-pre:	✓	@	6	"H₂O	Y:	0.9740					
ID:	N/A	Pitot-post:	✓	@	6	"H₂O	K-factor:	.75					
Field Team Members:						Nozzle ID: /Nozzle Diameter:						1.189	
1) SH 2) CC 3)						Probe ID:						P8-3	
Comments: POINT CHANGES 1250 to 1253 1327 to 1331 1308 to 1312													
ALL TIMES ARE REALTIME, NOT CEMTIME. 9.0% O₂ 11.5% CO₂ 7.0% 11.5%													

HYDROGEN CHLORIDE EMISSION CALCULATION SHEET

Facility / Site: PSNH Merrimack	Run Nos.: 1-3
Source: Unit 2 Stack (Outlet)	Date: 27-Mar-08

RESULTS:

Run #	Mass mg	Blank mg	Vm Std DSCF	Cs lb/SCF	PPMv	Diluents O ₂ %	CO ₂ %	PPMv @ 7% O ₂	PPMv @ 1% CO ₂	Qs DSCFH	PMR lb/MMBtu	lb/hr
1	63.00	ND	37.527	3.7E-06	39.220	7.70	11.00	41.30	3.565	42,295,317	6.23E-02	156.567
2	60.00	ND	39.931	3.31E-06	35.103	7.50	11.50	36.41	3.052	42,057,113	5.34E-02	139.343
3	65.00	ND	39.473	3.63E-06	38.470	7.00	11.50	38.47	3.345	41,560,073	5.85E-02	150.903

EQUATIONS:

lb/SCF	(2.205E-6) (Mg) / (VmStd)
mg/DSCM	(Mn)/(DSCF* 0.2832)
PPMv	(lbs/SCF)(1E+6)/(MW/386.3)
PPMv @ 7%O ₂	PPMv (20.9-7)/(20.9-O ₂)
PPMv @ 12%CO ₂	PPMv (12)/(12-CO ₂)
E Fd	(lbs/SCF)(Fd)(20.9/(20.9-O ₂))
E Fc	(lbs/SCF)(Fc)(100/%CO ₂)

Data:

Mw =	36.461
Fc	1852

HYDROGEN FLUORIDE EMISSION CALCULATION SHEET

Facility / Site: PSNH Merrimack	Run Nos.: 1-3
Source: Unit 2 Stack (Outlet)	Date: 27-Mar-08

RESULTS:

Run #	Mass mg	Blank mg	Vm Std DSCF	Cs lb/SCF	PPMv	Diluents		PPMv @ 7% O ₂	PPMv @ 1% CO ₂	Qs DSCFH	PMR	
						O ₂ %	CO ₂ %				lb/MMBtu	lb/hr
1	4.20	NID	37.527	2.47E-07	4.764	7.70	11.00	5.02	0.433	42,295,317	4.15E-03	10.438
2	4.10	NID	39.931	2.26E-07	4.371	7.50	11.50	4.53	0.380	42,057,113	3.65E-03	9.522
3	4.40	NID	39.473	2.46E-07	4.745	7.00	11.50	4.75	0.413	41,560,073	3.96E-03	10.215

EQUATIONS:

lb/SCF	(2.205E-6) (Mg) / (VmStd)
mg/DSCM	(Mn)/(DSCF* .02832)
PPMv	(lbs/SCF)(1E+6)/(MW/386.3)
PPMv @ 7%O ₂	PPMv (20.9-7)/(20.9-O ₂)
PPMv @ 12%CO ₂	PPMv (12)/(100-CO ₂)
E Fd	(lbs/SCF)(Fd)(20.9/(20.9-O ₂))
E Fc	(lbs/SCF)(Fc)(100/(100-CO ₂))

Data:

Mw =	20.01
Fc	1852

HYDROGEN BROMIDE EMISSION CALCULATION SHEET

Facility / Site: PSNH Merrimack Run Nos.: 1-3
 Source: Unit 2 Stack (Outlet) Date: 27-Mar-08

RESULTS:

Run #	Mass mg	Blank mg	Vm Std DSCF	Cs lb/SCF	PPMv	Diluents O ₂ %	CO ₂ %	PPMv @ 7% O ₂	PPMv @ 1% CO ₂	Qs DSCFH	PMR lb/MMBtu	lb/hr
1	3.00	ND	37.527	1.76E-07	0.842	7.70	11.00	0.89	0.077	42,295,317	2.97E-03	7.456
2	2.80	ND	39.931	1.55E-07	0.738	7.50	11.50	0.77	0.064	42,057,113	2.49E-03	6.503
3	2.90	ND	39.473	1.62E-07	0.773	7.00	11.50	0.77	0.067	41,560,073	2.61E-03	6.733

EQUATIONS:

lb/SCF	(2.205E-6) (Mg) / (VmStd)
mg/DSCM	(Mn)/(DSCF* .02832)
PPMv	(lbs/SCF)(1E+6)/(MW/386.3)
PPMv @ 7%O ₂	PPMv (20.9-7)/(20.9-O ₂)
PPMv @ 12%CO ₂	PPMv (12)/(CO ₂)
E Fd	(lbs/SCF)(Fd)/(20.9/(20.9-O ₂))
E Fc	(lbs/SCF)(Fc)/(100/%CO ₂)

Data:

Mw	=	80.912
Fc		1852

APPENDIX B – Laboratory Analytical Data

Indices	1	-	M5 Analytical Data – MK2, Inlet and Outlet
	2	-	M26A Analytical Data – MK2, Inlet and Outlet

B1 - M5 Analytical Data – MK2, Inlet and Outlet

PARTICULATE LABORATORY RESULTS

PLANT:	PSNH - Merrimack
LOCATION:	Unit 2 Inlet
TEST DATE:	27-Mar-08

METHOD 5					
	BLANK	RUN 1	RUN 2	RUN 3	
FILTER #	9718	9717	9719	9721	
FINAL	0.3872	0.9971	1.7796	0.9074	
TARE	0.3870	0.3869	0.3951	0.3917	
NET	0.0002	0.6102	1.3845	0.5157	
	BLANK	RUN 1	RUN 2	RUN 3	
BEAKER #	00-7	98-22	622	00-105	
FINAL	80.6121	107.3354	102.7470	102.9937	
TARE	80.6120	104.6521	100.9380	101.2021	
NET	0.0001	2.6833	1.809	1.7916	
VOLUME	100	200	200	200	

PARTICULATE LABORATORY RESULTS

PLANT:	PSNH - Merrimack
LOCATION:	Unit 2 Stack
TEST DATE:	27-Mar-08

METHOD 5					
	BLANK	RUN 1	RUN 2	RUN 3	
FILTER #	9718	9732	9720	9733	
FINAL	0.3872	0.3725	0.4061	0.3782	
TARE	0.3870	0.3591	0.3927	0.3646	
NET	0.0002	0.0134	0.0134	0.0136	
	BLANK	RUN 1	RUN 2	RUN 3	
BEAKER #	00-7	726	00-27	496	
FINAL	80.6121	105.8480	105.0820	103.7231	
TARE	80.6120	105.8193	105.0652	103.7157	
NET	0.0001	0.0287	0.0168	0.0074	
VOLUME	100	125	125	125	

Eastmount Environmental Services, LLC

Job Name: PSMH
Project #: 08-049

Location: Merrimack, N.H.
Source: Unit 2 Inlet / Outlet

Weighing's
Date: 3/31/08 Time: 0930
2 4/2/08 1000
3

Filters

Sample Date	Run ID #	Filter #	Tare Weight	Wt. #1	Wt. #2	Wt. #3	Final Weight	Total mg
3/27/08	U2-In-R1	9717	0.3869	0.9971	0.9969		0.9971	
3/27/08	U2-In-R2	9719	0.3451	0.7796	1.7791		1.7796	
3/27/08	U2-In-R3	9721	0.3917	0.9074	0.9071		0.9074	
3/27/08	U2-Out-R1	9732	0.3591	0.3725	0.3723		0.3725	
3/27/08	U2-Out-R2	9720	0.3927	0.4058	0.4061		0.4061	
3/27/08	U2-Out-R3	9733	0.3646	0.3782	0.3778		0.3782	
3/27/08	Blank	9718	0.3870	0.3872	0.3869		0.3872	

Weighted By: Joseph Brady

Signature: Joe Brady

Eastmount Environmental Services, LLC

Job Name: PSNH

Project #: 08-099

Location: Merrimack, N.H.

Source: Inlet Outlet - Unit-2

Weighing's

Date

Time

1 3/3/08 0930

2 3/3/08 1015

3

Beakers

Run ID #	Beaker #	Vol (mL)	Tare Weight	Wt. #1	Wt. #2	Wt. #3	Final Weight	Total mg
02-In-A1	98-22	200	104.6521	107.3354	107.3354		107.3354	
02-In-A2	622	200	100.9380	102.7468	102.7470		102.7470	
02-In-A3	00-105	200	101.2021	102.9933	102.9937		102.9937	
02-Out-A1	726	125	105.8193	105.8476	105.8480		105.8480	
02-Out-A2	00-27	125	105.0652	105.0816	105.0820		105.0820	
02-Out-A3	496	125	102.7157	103.7229	103.7231		103.7231	
Blank	00-7	100	80.6120	80.6119	80.6121		80.6121	

Weighted By:

Joseph Brady

Signature:

Joseph Brady

B2 - M26A Analytical Data – MK2, Inlet and Outlet

Driven by Service and Science

Prepared for: Eastmount Environmental Services

Project: 08-049

Bow, NH

Analytical Data Package

Analysis: Method 26A

Maxxam Job #: A31010

Maxxam Analytics Inc.
5555 North Service Rd
Burlington, Ontario, Canada
L7L 5H7
1-800-668-0639
www.maxxamanalytics.com

Driven by Service and Science

I hereby certify that to the best of my knowledge all analytical data presented in this report:

- Has been checked for completeness.
- Is accurate, legible and error free.
- Has been conducted in accordance with approved SOP's and that all deviations are clearly listed in the Case Narrative.
- This report has been generated in .pdf format.

Review Performed By:

Digitally signed by
Mike Challis
Location: Maxxam
Analytics,
Burlington
Date: 2008.04.15
16:32:01 -04'00'

Maxxam Analytics Inc.
5555 North Service Rd
Burlington, Ontario, Canada
L7L 5H7
1-800-668-0639
www.maxxamanalytics.com

Glossary of Terms

- **MDL** represents the Minimum Detection Limit below which the laboratory cannot confirm the presence of the analyte to the 95% confidence level.
- **RDL** represents the Reportable Detection Limit and is usually set at a value equivalent to the lowest calibration standard.
- **Acceptance Criteria** are values used by the laboratory to determine that a process is in control.
- **Accuracy** is the degree of agreement of a measured value with the true or expected value.
- **Calibration Standards** are a set of solutions containing the analytes of interest at a specified concentration.
- **Calibration Verification Standard** consists of a calibration standard solution of intermediate concentration (mid-point initial calibration level) used to assess whether the initial calibration is still valid.
- **Certified Reference Material** is a stable homogenous material that is certified by repetitive analysis from a supplier who is certified to generate said materials.
- **Internal Standard** a deuterated or ^{13}C -labelled analyte that is added to a sample extract prior to instrumental analysis to compensate for injection variability.
- **Isomer** is a member of a group of compounds that differ from each other only in the locations of a specific number of common substituent atoms or groups of atoms on the parent compound.
- **Method Blank** is a laboratory control sample using reagents that are known to be free of contamination.
- **Precision** is the degree of agreement between the data generated from repetitive measurements under specific conditions.
- **Quality Assurance** is a system of activities whose purpose is to provide the producer or user of a product with the assurance that the product meets a defined standard of quality.
- **Quality Control** is the overall system of activities whose purpose is to control the quality of a product so that it meets the needs of the end user.
- **RSD** is the relative standard deviation.
- **Blank Spike** is a laboratory control sample that has been fortified with native analytes of interest.
- **Window Defining Mixture** is a solution containing only the earliest and latest eluting congeners within each homologous group of target analytes on a specified GC column.
- **RPD** or Relative Percent Difference. A measure used to compare duplicate sample analysis.
- **EMPC/NDR** – Peak detected does not meet ratio criteria and has resulted in a higher detection limit.

Driven by Service and Science

1.0 Project Narrative

Maxxam Analytics Inc.
5555 North Service Rd
Burlington, Ontario, Canada
L7L 5H7
1-800-668-0639
www.maxxamanalytics.com

PROJECT NARRATIVE

Maxxam Analytics (Burlington ON)
Maxxam Job #: A831010

Client: Eastmount Environmental Services
Client Project: 08-049 BOW, NH

I. SAMPLE RECEIPT/ANALYSIS

a) Sample Listing

Maxxam ID	Client Sample ID	Date Sampled	Date Received	Date Prepped	Date Run
Hydrogen Halides in H2SO4 Imp. (M26A)					
X85361	M26A-BLANK DIH2O	2008/03/27	2008/03/28	2008/04/09	2008/04/09
X85362	M26A-BLANK H2SO4	2008/03/27	2008/03/28	2008/04/09	2008/04/09
X85363	U2-M5/26A-IN-R1	2008/03/27	2008/03/28	2008/04/09	2008/04/09
X85364	U2-M5/26A-IN-R2	2008/03/27	2008/03/28	2008/04/09	2008/04/09
X85365	U2-M5/26A-IN-R3	2008/03/27	2008/03/28	2008/04/09	2008/04/09
X85366	U2-M5/26A-OUT-R1	2008/03/27	2008/03/28	2008/04/09	2008/04/09
X85367	U2-M5/26A-OUT-R2	2008/03/27	2008/03/28	2008/04/09	2008/04/09
X85368	U2-M5/26A-OUT-R3	2008/03/27	2008/03/28	2008/04/09	2008/04/09

Run Date is defined as the date of injection of the last calibration standard (12 hours or less) prior to the samples analyzed within that run sequence. Therefore the time of calibration injection that defines the run date is always within 12 hours of the time of sample injection.

b) Shipping Problems: none encountered

c) Documentation Problems: none encountered

II. SAMPLE PREP:

No problems encountered

III. SAMPLE ANALYSIS:

See also comments within the appropriate Certificate of Analysis

a) Hold Times: all within recommended hold times

b) Instrument Calibration: all within control limits

c) Quality Control: All applicable QC meets control criteria, except where otherwise noted.

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for other than the conditions detailed above.

In addition, I certify, that to the best of my knowledge and belief, the data as reported are true and accurate. Release of the data contained in this data package has been authorized by the cognizant laboratory official or his/her designee, as verified by this signature.

A handwritten signature in black ink, appearing to read "M. Challis".

Mike Challis, Customer Service Manager

2008/04/15

Date

Driven by Service and Science

2.0 Summary Report

Maxxam Analytics Inc.
5555 North Service Rd
Burlington, Ontario, Canada
L7L 5H7
1-800-668-0639
www.maxxamanalytics.com

Your Project #: 08-049
Site: BOW, NH**Attention: Dave Caron**
Eastmount Environmental Services
65 Parker St/ Unit 3
Seaport Industrial Park
Newburyport, MA
USA 1950

Report Date: 2008/04/14

CERTIFICATE OF ANALYSIS**MAXXAM JOB #: A831010**
Received: 2008/03/28, 19:30Sample Matrix: Impinger Solution
Samples Received: 8

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Hydrogen Halides in H ₂ SO ₄ Imp. (M26A)	8	2008/04/09	2008/04/09	BRL SOP-00104	EPA Method 26A
Final Volume of Impinger	8	2008/04/09	2008/04/10		

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

MAXXAM ANALYTICS INC.

Total cover pages: 1

Maxxam Job #: A831010
Report Date: 2008/04/14

Eastmount Environmental Services
Client Project #: 08-049
Project name: BOW, NH
Sampler Initials:

RESULTS OF ANALYSES OF IMPINGER SOLUTION

Maxxam ID		X85361	X85362		X85363		
Sampling Date		2008/03/27	2008/03/27		2008/03/27		
	Units	M26A-BLANK DIH2O	M26A-BLANK H2SO4	RDL	U2-M5/26A-IN-R1	RDL	QC Batch

Volume	ml	180	200	1	520	1	1490220
Hydrobromic Acid	ug	<400	<400	400	500	400	1490958
Hydrochloric Acid	ug	<200	<200	200	44000	1000	1490958
Hydrofluoric Acid	ug	<200	<200	200	3300	200	1490958

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		X85363	X85364	X85365	X85366		
Sampling Date		2008/03/27	2008/03/27	2008/03/27	2008/03/27		
	Units	U2-M5/26A-IN-R1 Lab-Dup	U2-M5/26A-IN-R2	U2-M5/26A-IN-R3	U2-M5/26A-OUT-R1	RDL	QC Batch

Volume	ml	N/A	490	410	380	1	1490220
Hydrobromic Acid	ug	500	<400	600	3000	400	1490958
Hydrochloric Acid	ug	44000	36000	59000	63000	1000	1490958
Hydrofluoric Acid	ug	3300	2800	4300	4200	200	1490958

N/A = Not Applicable
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		X85367	X85368		
Sampling Date		2008/03/27	2008/03/27		
	Units	U2-M5/26A-OUT-R2	U2-M5/26A-OUT-R3	RDL	QC Batch

Volume	ml	400	450	1	1490220
Hydrobromic Acid	ug	2800	2900	400	1490958
Hydrochloric Acid	ug	60000	65000	1000	1490958
Hydrofluoric Acid	ug	4100	4400	200	1490958

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: A831010
Report Date: 2008/04/14

Eastmount Environmental Services
Client Project #: 08-049
Project name: BOW, NH
Sampler Initials:

Test Summary

Maxxam ID X85361
Sample ID M26A-BLANK DIH2O
Matrix Impinger Solution
Collected 2008/03/27
Shipped
Received 2008/03/28

Test Description	Instrumentation	Batch	Prepared	Analyzed	Analyst
Hydrogen Halides in H2SO4 Imp. (M26A)	IC/SPEC	1490958	2008/04/09	2008/04/09	A S
Final Volume of Impinger		1490220	2008/04/10	2008/04/10	A S

Maxxam ID X85362
Sample ID M26A-BLANK H2SO4
Matrix Impinger Solution
Collected 2008/03/27
Shipped
Received 2008/03/28

Test Description	Instrumentation	Batch	Prepared	Analyzed	Analyst
Hydrogen Halides in H2SO4 Imp. (M26A)	IC/SPEC	1490958	2008/04/09	2008/04/09	A S
Final Volume of Impinger		1490220	2008/04/10	2008/04/10	A S

Maxxam ID X85363
Sample ID U2-M5/26A-IN-R1
Matrix Impinger Solution
Collected 2008/03/27
Shipped
Received 2008/03/28

Test Description	Instrumentation	Batch	Prepared	Analyzed	Analyst
Hydrogen Halides in H2SO4 Imp. (M26A)	IC/SPEC	1490958	2008/04/09	2008/04/09	A S
Final Volume of Impinger		1490220	2008/04/10	2008/04/10	A S

Maxxam ID X85363 Dup
Sample ID U2-M5/26A-IN-R1
Matrix Impinger Solution
Collected 2008/03/27
Shipped
Received 2008/03/28

Test Description	Instrumentation	Batch	Prepared	Analyzed	Analyst
Hydrogen Halides in H2SO4 Imp. (M26A)	IC/SPEC	1490958	2008/04/09	2008/04/09	A S

Maxxam ID X85364
Sample ID U2-M5/26A-IN-R2
Matrix Impinger Solution
Collected 2008/03/27
Shipped
Received 2008/03/28

Test Description	Instrumentation	Batch	Prepared	Analyzed	Analyst
Hydrogen Halides in H2SO4 Imp. (M26A)	IC/SPEC	1490958	2008/04/09	2008/04/09	A S
Final Volume of Impinger		1490220	2008/04/10	2008/04/10	A S

Maxxam ID X85365
Sample ID U2-M5/26A-IN-R3
Matrix Impinger Solution
Collected 2008/03/27
Shipped
Received 2008/03/28

Test Description	Instrumentation	Batch	Prepared	Analyzed	Analyst
Hydrogen Halides in H2SO4 Imp. (M26A)	IC/SPEC	1490958	2008/04/09	2008/04/09	A S
Final Volume of Impinger		1490220	2008/04/10	2008/04/10	A S

Maxxam Job #: A831010
Report Date: 2008/04/14

Eastmount Environmental Services
Client Project #: 08-049
Project name: BOW, NH
Sampler Initials:

Test Summary

Maxxam ID X85366
Sample ID U2-M5/26A-OUT-R1
Matrix Impinger Solution
Collected 2008/03/27
Shipped
Received 2008/03/28

Test Description	Instrumentation	Batch	Prepared	Analyzed	Analyst
Hydrogen Halides in H2SO4 Imp. (M26A)	IC/SPEC	1490958	2008/04/09	2008/04/09	A S
Final Volume of Impinger		1490220	2008/04/10	2008/04/10	A S

Maxxam ID X85367
Sample ID U2-M5/26A-OUT-R2
Matrix Impinger Solution
Collected 2008/03/27
Shipped
Received 2008/03/28

Test Description	Instrumentation	Batch	Prepared	Analyzed	Analyst
Hydrogen Halides in H2SO4 Imp. (M26A)	IC/SPEC	1490958	2008/04/09	2008/04/09	A S
Final Volume of Impinger		1490220	2008/04/10	2008/04/10	A S

Maxxam ID X85368
Sample ID U2-M5/26A-OUT-R3
Matrix Impinger Solution
Collected 2008/03/27
Shipped
Received 2008/03/28

Test Description	Instrumentation	Batch	Prepared	Analyzed	Analyst
Hydrogen Halides in H2SO4 Imp. (M26A)	IC/SPEC	1490958	2008/04/09	2008/04/09	A S
Final Volume of Impinger		1490220	2008/04/10	2008/04/10	A S

Maxxam Job #: A831010
Report Date: 2008/04/14

Eastmount Environmental Services
Client Project #: 08-049
Project name: BOW, NH
Sampler Initials:

GENERAL COMMENTS

Results relate only to the items tested.

Eastmount Environmental Services
Attention: Dave Caron
Client Project #: 08-049
P.O. #:
Project name: BOW, NH

Quality Assurance Report
Maxxam Job Number: GA831010

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	%Recovery	Units	QC Limits
1490958 A_S	MATRIX SPIKE (X85363)	Hydrobromic Acid	2008/04/09	0, RDL=400	98	ug	80 - 120
		Hydrochloric Acid	2008/04/09	0, RDL=1000	102	ug	80 - 120
		Hydrofluoric Acid	2008/04/09	0, RDL=200	101	ug	80 - 120
	Spiked Blank	Hydrobromic Acid	2008/04/09	0, RDL=400	92	ug	90 - 110
		Hydrochloric Acid	2008/04/09	0, RDL=200	94	ug	90 - 110
		Hydrofluoric Acid	2008/04/09	0, RDL=200	93	ug	90 - 110
	Method Blank	Hydrobromic Acid	2008/04/09	<400		ug	
		Hydrochloric Acid	2008/04/09	<200		ug	
		Hydrofluoric Acid	2008/04/09	<200		ug	
	RPD	Hydrobromic Acid	2008/04/09	NC		%	20
		Hydrochloric Acid	2008/04/09	0.03		%	20
		Hydrofluoric Acid	2008/04/09	0.2		%	20

NC = Non-calculable
RPD = Relative Percent Difference
SPIKE = Fortified sample

Driven by Service and Science

3.0 Sample Custody

Maxxam Analytics Inc.
5555 North Service Rd
Burlington, Ontario, Canada
L7L 5H7
1-800-668-0639
www.maxxamanalytics.com

**EASTMOUNT ENVIRONMENTAL SERVICES, LLC
FIELD LOG / CHAIN OF CUSTODY**

PROJECT NAME: PSNH Merrimack Station - Unit No. 2 Inlet/Outlet HCl, HBr, HF

Site: Bow, NH

PROJECT NO.: 08-049

SAMPLED BY: Creeden/Hall/Stratton/Caron/Brady

Sample Date	FIELD LOG#	SAMPLE ID	FRACTION	ANALYTES
03/27/08	1	U2-M5/26A-IN-R1-imps	impinger catch and associated rinses	HCl, HBr, HF via M26A
03/27/08	2	U2-M5/26A-IN-R2-imps	impinger catch and associated rinses	HCl, HBr, HF via M26A
03/27/08	3	U2-M5/26A-IN-R3-imps	impinger catch and associated rinses	HCl, HBr, HF via M26A
03/27/08	4	U2-M5/26A-OUT-R1-imps	impinger catch and associated rinses	HCl, HBr, HF via M26A
03/27/08	5	U2-M5/26A-OUT-R2-imps	impinger catch and associated rinses	HCl, HBr, HF via M26A
03/27/08	6	U2-M5/26A-OUT-R3-imps	impinger catch and associated rinses	HCl, HBr, HF via M26A
03/27/08	7	DIH2O-Blank	DIH2O blank	HCl, HBr, HF via M26A
03/27/08	8	0.1N H2SO4-Blank	0.1N H2SO4 blank	HCl, HBr, HF via M26A

Relinquished By: *[Signature]*

Date: 3/28/08

Received By: *[Signature]*

Date: 08/03/28

SAMPLE RECEIPT LOG

Lab Name: Maxxam Analytics Inc., Burlington Laboratory	
Pickup/received by (Name):	<u>EYAN JONES</u>
Pickup/received by (Signature):	<u>[Signature]</u> Date: <u>3-28-8</u> Time: <u>7:30</u>
Client Project ID:	
Where Applicable:	
Shipment:	
Courier Company:	FEDEX ☐ UPS ☐ DHL ☐ Purolator ☐ BAX ☐ Other ☒
Waybill #:	
Assigned job#:	A <u>EASTMOANT</u>
Client Name:	
Client Contact:	
REMARKS:	Condition of Sample(s) Shipment - Comments
Driver Documentation	
Samples Packed in Coolers?	Yes ☒ No ☒ N/A ☐
Cooler Contains ice?	Yes ☒ No ☒ N/A ☐
Custody seal(s) on cooler?	Yes ☐ No ☒ N/A ☐
Sample Reception Documentation	
Date & Time received at Lab?	Yes ☒ No ☐ N/A ☐
Chain of Custody (CoC) present?	Yes ☒ No ☐ N/A ☐
Cooler Temperature measured?	Yes ☒ No ☒ N/A ☐
Containers intact?	Yes ☒ No ☐ N/A ☐
Correct containers used?	Yes ☒ No ☐ N/A ☐
CoC agrees with samples?	Yes ☒ No ☐ N/A ☐
Headspace present in VOC vials?	Yes ☐ No ☐ N/A ☐
Samples rec'd after hold time?	Yes ☐ No ☐ N/A ☐
Project Mgr contacted via SIF?	Yes ☐ No ☐ N/A ☐
Project Manager Documentation	
Client contacted if discrepancies in shipment are observed	Yes ☐ No ☐ N/A ☐
Client acceptance of deficiencies (if observed at sample receipt)	Yes ☐ No ☐ N/A ☐
Cooler temperatures upon receipt	
Cooler ID: <u>1</u>	Temp. <u>10.0</u>
Cooler ID:	Temp.
Cooler ID:	Temp.

CONFIRMATION-RECEPTION OF SAMPLES FOR ANALYSIS

MAXXAM JOB NUMBER	GA831010	NUMBER OF SAMPLES	8	TODAY'S DATE	2008/04/01
PROJECT NUMBER:	08-049	LOCATION:	BOW, NH	PO #	
SAMPLE RECEIPT DATE	2008/03/28	CLIENT CONFIRMATION	2008/03/28	REPORT DELIVERY	2008/04/21
THE REPORT WILL BE SENT TO :					
NAME	Dave Caron	COMPANY	Eastmount Environmental Services		
MAILING ADDRESS	65 Parker St/Unit 3 Seaport Industrial Park	CITY	Newburyport	PC	1950
EMAIL	dcaron@eastmount.com	PHONE:	(978) 99-9300	FAX:	(978) 99-9303
INVOICE WILL BE SENT TO :					
NAME	Lee MacWilliams	COMPANY	Eastmount Environmental Services		
MAILING ADDRESS	65 Parker St/Unit 3 Seaport Industrial Park	CITY	Newburyport	PC	1950
EMAIL	lmacwilliams@eastmount.com	PHONE:		FAX:	

WE RECEIVED THE FOLLOWING SAMPLES. THE ANALYSES REQUESTED ARE LISTED BELOW. AN ADDITIONAL FEE OF APPROXIMATELY \$20 PER SAMPLE SHALL BE CHARGED TO THE CLIENT FOR DISPOSAL OF HAZARDOUS SAMPLES IF NOT STATED ON THE COC TO RETURN THE SAMPLES FOR DISPOSAL BY THE CLIENT. SHOULD YOU REQUIRE FURTHER DETAILS PLEASE CONTACT OUR TECHNICAL SERVICE DEPARTMENT AT (905) 332-8788 OR 1-800-668-0639, REFERENCING THE REPORT #. PLEASE NOTE THAT, UNLESS SPECIAL STORAGE ARRANGEMENTS ARE MADE, ALL SAMPLES WILL BE DISCARDED 45 DAYS AFTER RECEPTION OF SAMPLES. NON-REGULAR SAMPLES ARE FLAGGED AS (C)OMPOSITE BY LAB, (H)OLD, OR (L)EACHATE TO BE PERFORMED.

SAMPLE #	X85361	SAMPLE IDENTIFICATION	M26A-BLANK DIH2O	COC #	
SAMPLED DATE	2008/03/27	SAMPLE CONDITION	GOOD CONDITION		
MATRIX:	IMPINGER SOLUTION				
TEST PROFILE		TEST CONDITION	REPORT DELIVERY		
DATA PACKAGE - LEVEL 3 WET CHEM		GOOD CONDITION	2008/04/21		
HYDROGEN HALIDES IN H2SO4 IMP. (M26A)		GOOD CONDITION	2008/04/14		
FINAL VOLUME OF IMPINGER		GOOD CONDITION	2008/04/14		

SAMPLE #	X85362	SAMPLE IDENTIFICATION	M26A-BLANK H2SO4	COC #	
SAMPLED DATE	2008/03/27	SAMPLE CONDITION	GOOD CONDITION		
MATRIX:	IMPINGER SOLUTION				
TEST PROFILE		TEST CONDITION	REPORT DELIVERY		
HYDROGEN HALIDES IN H2SO4 IMP. (M26A)		GOOD CONDITION	2008/04/14		
FINAL VOLUME OF IMPINGER		GOOD CONDITION	2008/04/14		

SAMPLE #	X85363	SAMPLE IDENTIFICATION	U2-M5/26A-IN-R1	COC #	
SAMPLED DATE	2008/03/27	SAMPLE CONDITION	GOOD CONDITION		
MATRIX:	IMPINGER SOLUTION				
TEST PROFILE		TEST CONDITION	REPORT DELIVERY		
HYDROGEN HALIDES IN H2SO4 IMP. (M26A)		GOOD CONDITION	2008/04/14		
FINAL VOLUME OF IMPINGER		GOOD CONDITION	2008/04/14		

SAMPLE #	X85364	SAMPLE IDENTIFICATION	U2-M5/26A-IN-R2	COC #	
SAMPLED DATE	2008/03/27	SAMPLE CONDITION	GOOD CONDITION		
MATRIX:	IMPINGER SOLUTION				
TEST PROFILE		TEST CONDITION	REPORT DELIVERY		
HYDROGEN HALIDES IN H2SO4 IMP. (M26A)		GOOD CONDITION	2008/04/14		
FINAL VOLUME OF IMPINGER		GOOD CONDITION	2008/04/14		

SAMPLE #	X85365	SAMPLE IDENTIFICATION	U2-M5/26A-IN-R3	COC #	
SAMPLED DATE	2008/03/27	SAMPLE CONDITION	GOOD CONDITION		
MATRIX:	IMPINGER SOLUTION				
TEST PROFILE		TEST CONDITION	REPORT DELIVERY		
HYDROGEN HALIDES IN H2SO4 IMP. (M26A)		GOOD CONDITION	2008/04/14		
FINAL VOLUME OF IMPINGER		GOOD CONDITION	2008/04/14

SAMPLE #	X85366	SAMPLE IDENTIFICATION	U2-M5/26A-OUT-R1	COC #	
SAMPLED DATE	2008/03/27	SAMPLE CONDITION	GOOD CONDITION		
MATRIX:	IMPINGER SOLUTION				
	TEST PROFILE		TEST CONDITION		REPORT DELIVERY
	HYDROGEN HALIDES IN H2SO4 IMP. (M26A)		GOOD CONDITION		2008/04/14
	FINAL VOLUME OF IMPINGER		GOOD CONDITION		2008/04/14

SAMPLE #	X85367	SAMPLE IDENTIFICATION	U2-M5/26A-OUT-R2	COC #	
SAMPLED DATE	2008/03/27	SAMPLE CONDITION	GOOD CONDITION		
MATRIX:	IMPINGER SOLUTION				
	TEST PROFILE		TEST CONDITION		REPORT DELIVERY
	HYDROGEN HALIDES IN H2SO4 IMP. (M26A)		GOOD CONDITION		2008/04/14
	FINAL VOLUME OF IMPINGER		GOOD CONDITION		2008/04/14

SAMPLE #	X85368	SAMPLE IDENTIFICATION	U2-M5/26A-OUT-R3	COC #	
SAMPLED DATE	2008/03/27	SAMPLE CONDITION	GOOD CONDITION		
MATRIX:	IMPINGER SOLUTION				
	TEST PROFILE		TEST CONDITION		REPORT DELIVERY
	HYDROGEN HALIDES IN H2SO4 IMP. (M26A)		GOOD CONDITION		2008/04/14
	FINAL VOLUME OF IMPINGER		GOOD CONDITION		2008/04/14

PARAMETERS FOR ANALYSIS REQUESTED

(FOR ALL SAMPLES SUITABLE FOR TESTING)

SAMPLE #	X85361-IMPINGER SOLUTION - M26A-BLANK DIH2O	X85362-IMPINGER SOLUTION - M26A-BLANK H2SO4	
	X85363-IMPINGER SOLUTION - U2-M5/26A-IN-R1	X85364-IMPINGER SOLUTION - U2-M5/26A-IN-R2	
	X85365-IMPINGER SOLUTION - U2-M5/26A-IN-R3	X85366-IMPINGER SOLUTION - U2-M5/26A-OUT-R1	
	X85367-IMPINGER SOLUTION - U2-M5/26A-OUT-R2	X85368-IMPINGER SOLUTION - U2-M5/26A-OUT-R3	
LOCATION	MaxxamAnalyticsBurlington	TESTPROFILE	HYDROGEN HALIDES IN H2SO4 IMP. (M26A)
Hydrofluoric Acid	Hydrobromic Acid	Hydrochloric Acid	
LOCATION	MaxxamAnalyticsBurlington	TESTPROFILE	FINAL VOLUME OF IMPINGER
Volume			

APPENDIX C – Facility Process Data

MK2, Run 1 – DAS Time 07:57 – 09:08

Average Values Report

Generated: 5/2/2008 12:00

Company: PSNH Merrimack Station

Plant: 97 River Rd.

City/St: Bow, NH 03304

Source: CTRL, UNIT2

Period Start: 3/27/2008 07:57

Period End: 3/27/2008 09:08

Validation Type: 1/1 min

Averaging Period: 1 min

Type: Block Avg

Period Start:	Average UnitLoad_2 MW	Average Coal_Flow2 Kpph	Average Stk_Flow_2 kscofm	Average StackTemp2 DegF	Average Opac6min_2 %	Average CO2_2 %	Average NOx_2 ppm	Average SO2_2 ppm
03/27/2008 07:57	334.4	242.8	792.8	343.5	5.5	13.67	121	798
03/27/2008 07:58	333.9	241.9	795.4	343.3	5.5	13.69	120	799
03/27/2008 07:59	334.3	241.2	797.5	343.0	5.5	13.71	118	803
03/27/2008 08:00	334.3	242.4	795.4	343.0	5.7	13.64	104	800
03/27/2008 08:01	334.1	242.5	780.6	343.0	5.7	13.65	105	798
03/27/2008 08:02	334.6	242.5	798.7	343.0	5.7	13.69	126	801
03/27/2008 08:03	334.4	243.1	790.7	343.0	5.7	13.72	137	803
03/27/2008 08:04	334.5	242.5	801.3	342.8	5.7	13.74	145	803
03/27/2008 08:05	334.6	242.4	796.4	342.8	5.7	13.79	150	805
03/27/2008 08:06	334.6	242.3	792.8	342.7	5.5	13.76	140	807
03/27/2008 08:07	335.1	241.8	796.0	342.5	5.5	13.74	135	807
03/27/2008 08:08	334.9	241.9	796.6	342.5	5.5	13.78	132	809
03/27/2008 08:09	334.4	242.2	796.8	342.5	5.5	13.83	138	810
03/27/2008 08:10	334.6	241.2	797.5	342.5	5.5	13.84	134	812
03/27/2008 08:11	334.4	241.4	783.4	342.5	5.5	13.81	132	810
03/27/2008 08:12	334.2	241.8	785.4	342.5	5.6	13.74	126	808
03/27/2008 08:13	334.6	242.0	786.3	342.5	5.6	13.81	128	810
03/27/2008 08:14	334.4	242.3	787.5	342.5	5.6	13.84	133	813
03/27/2008 08:15	333.9	241.6	792.0	342.5	5.6	13.87	134	817
03/27/2008 08:16	334.6	241.2	791.2	342.5	5.6	13.89	133	821
03/27/2008 08:17	334.7	241.8	789.7	342.5	5.6	13.82	128	822
03/27/2008 08:18	334.6	241.9	795.6	342.5	5.2	13.79	126	821
03/27/2008 08:19	334.1	241.3	785.2	342.5	5.2	13.83	131	824
03/27/2008 08:20	334.9	240.8	791.1	342.5	5.2	13.83	126	823
03/27/2008 08:21	334.4	241.8	792.6	342.5	5.2	13.77	115	818
03/27/2008 08:22	334.3	241.4	797.9	342.5	5.2	13.73	111	815
03/27/2008 08:23	334.4	241.8	785.9	342.5	5.2	13.79	116	816
03/27/2008 08:24	334.2	241.9	795.6	342.5	5.5	13.78	116	817
03/27/2008 08:25	333.8	241.1	789.5	342.5	5.5	13.78	117	818
03/27/2008 08:26	334.2	241.9	797.0	342.5	5.5	13.79	116	823
03/27/2008 08:27	333.8	241.8	796.2	342.5	5.5	13.71	97	823
03/27/2008 08:28	334.1	241.7	795.4	342.5	5.5	13.77	98	823
03/27/2008 08:29	334.3	241.8	793.2	342.5	5.5	13.78	102	824
03/27/2008 08:30	334.3	241.5	798.1	342.5	5.3	13.73	97	820
03/27/2008 08:31	334.4	242.2	798.5	342.5	5.3	13.73	102	816

Period Start:	Average UnitLoad_2 MW	Average Coal_Flow2 Kpph	Average Stk_Flow_2 kscfm	Average StackTemp2 DegF	Average Opac6min_2 %	Average CO2_2 %	Average NOx_2 ppm	Average SO2_2 ppm
03/27/2008 08:32	335.0	242.1	796.8	342.5	5.3	13.65	93	817
03/27/2008 08:33	335.2	241.8	796.4	342.5	5.3	13.67	94	817
03/27/2008 08:34	335.0	242.2	788.3	342.5	5.3	13.76	105	822
03/27/2008 08:35	335.3	242.2	792.6	342.5	5.3	13.73	113	825
03/27/2008 08:36	335.3	241.9	797.3	342.5	5.7	13.75	138	825
03/27/2008 08:37	335.7	242.5	787.9	342.5	5.7	13.71	149	822
03/27/2008 08:38	335.3	242.7	790.5	342.5	5.7	13.65	136	822
03/27/2008 08:39	334.9	242.4	796.1	342.5	5.7	13.68	138	822
03/27/2008 08:40	334.7	241.6	807.8	342.5	5.7	13.67	135	821
03/27/2008 08:41	334.7	241.5	800.7	342.5	5.7	13.65	116	817
03/27/2008 08:42	334.7	242.4	803.8	342.5	5.3	13.59	91	812
03/27/2008 08:43	335.0	243.3	797.8	342.5	5.3	13.54	92	809
03/27/2008 08:44	334.6	242.8	805.0	342.5	5.3	13.57	117	809
03/27/2008 08:45	334.6	242.3	809.0	342.5	5.3	13.61	129	810
03/27/2008 08:46	334.9	242.4	800.1	342.5	5.3	13.60	124	808
03/27/2008 08:47	335.1	242.4	795.0	342.5	5.3	13.58	110	803
03/27/2008 08:48	334.9	242.1	797.0	342.3	5.3	13.61	107	808
03/27/2008 08:49	335.3	241.8	791.6	342.5	5.3	13.66	118	814
03/27/2008 08:50	335.3	242.0	789.3	342.4	5.3	13.59	118	809
03/27/2008 08:51	335.8	242.0	790.5	342.5	5.3	13.59	114	804
03/27/2008 08:52	335.3	243.2	796.2	342.5	5.3	13.57	118	806
03/27/2008 08:53	335.2	242.6	800.1	342.4	5.3	13.59	125	811
03/27/2008 08:54	334.7	241.9	808.0	342.4	5.3	13.56	140	812
03/27/2008 08:55	334.4	241.9	809.4	342.4	5.3	13.60	154	815
03/27/2008 08:56	334.5	241.3	799.9	342.3	5.3	13.56	147	814
03/27/2008 08:57	334.4	242.5	787.1	342.0	5.3	13.60	164	817
03/27/2008 08:58	334.2	242.5	791.0	342.0	5.3	13.53	190	813
03/27/2008 08:59	333.7	242.0	793.6	342.1	5.3	13.57	205	811
03/27/2008 09:00	334.2	241.9	784.9	342.0	5.4	13.64	214	813
03/27/2008 09:01	334.3	241.8	794.8	342.0	5.4	13.64	195	812
03/27/2008 09:02	334.4	241.4	792.2	342.0	5.4	13.62	181	808
03/27/2008 09:03	334.5	241.0	788.5	342.0	5.4	13.66	171	809
03/27/2008 09:04	335.2	241.2	792.6	342.1	5.4	13.67	151	812
03/27/2008 09:05	335.1	241.9	804.8	342.0	5.4	13.65	131	814
03/27/2008 09:06	334.6	241.6	782.6	342.0	5.1	13.69	125	814
03/27/2008 09:07	334.2	241.4	784.1	342.0	5.1	13.78	120	818
03/27/2008 09:08	334.2	241.5	782.8	342.0	5.1	13.72	110	818
Daily Average*	334.6	242.0	794.2	342.5	5.4	13.70	129	813
Maximum*	335.8	243.3	809.4	343.5	5.7	13.89	214	825
	03/27/2008 8:51	03/27/2008 8:43	03/27/2008 8:55	03/27/2008 7:57	03/27/2008 8:41	03/27/2008 8:16	03/27/2008 9:00	03/27/2008 8:36
Minimum*	333.7	240.8	780.6	342.0	5.1	13.53	91	798
	03/27/2008 8:59	03/27/2008 8:20	03/27/2008 8:01	03/27/2008 9:08	03/27/2008 9:08	03/27/2008 8:58	03/27/2008 8:42	03/27/2008 8:01

Period Start:	Average UnitLoad_2 MW	Average Coal_Flow2 Kpph	Average Stk_Flow_2 kscfm	Average StackTemp2 DegF	Average Opac6min_2 %	Average CO2_2 %	Average NOx_2 ppm	Average SO2_2 ppm
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* Does not include Invalid Averaging Periods ("N/A")

MK2, Run 2 – DAS Time 09:48 – 10:58

Average Values Report
Generated: 5/2/2008 11:55

Company: PSNH Merrimack Station
Plant: 97 River Rd.
City/St: Bow, NH 03304
Source: CTRL, UNIT2

Period Start: 3/27/2008 09:48
Period End: 3/27/2008 10:58
Validation Type: 1/1 min
Averaging Period: 1 min
Type: Block Avg

Period Start:	Average UnitLoad_2 MW	Average Coal Flow2 Kpph	Average Stk Flow_2 kscfm	Average StackTemp2 DegF	Average Opac6min_2 %	Average CO2_2 %	Average NOx_2 ppm	Average SO2_2 ppm
03/27/2008 09:48	334.1	242.2	795.0	343.7	5.5	13.73	118	807
03/27/2008 09:49	334.1	241.5	791.2	343.5	5.5	13.72	112	807
03/27/2008 09:50	334.1	241.2	795.4	343.5	5.5	13.72	95	804
03/27/2008 09:51	334.7	242.0	787.3	343.5	5.5	13.65	84	800
03/27/2008 09:52	334.1	242.6	796.2	343.4	5.5	13.65	82	797
03/27/2008 09:53	333.5	241.9	785.1	343.0	5.5	13.72	98	799
03/27/2008 09:54	334.4	241.7	788.7	343.0	5.5	13.79	104	806
03/27/2008 09:55	334.1	241.8	797.4	343.0	5.5	13.69	89	806
03/27/2008 09:56	333.8	241.3	800.9	342.6	5.5	13.66	87	803
03/27/2008 09:57	333.8	241.2	795.4	342.5	5.5	13.72	105	807
03/27/2008 09:58	333.9	241.4	788.3	342.5	5.5	13.75	129	808
03/27/2008 09:59	334.1	241.5	788.7	342.5	5.5	13.73	136	806
03/27/2008 10:00	334.4	241.8	787.5	342.3	5.8	13.73	132	805
03/27/2008 10:01	334.3	241.9	786.9	342.1	5.8	N/A	N/A	N/A
03/27/2008 10:02	333.5	241.6	784.4	342.0	5.8	N/A	N/A	N/A
03/27/2008 10:03	333.4	240.6	794.6	342.0	5.8	N/A	N/A	N/A
03/27/2008 10:04	333.9	241.0	789.1	342.0	5.8	N/A	N/A	N/A
03/27/2008 10:05	334.5	242.2	792.0	342.0	5.5	N/A	N/A	N/A
03/27/2008 10:06	334.2	242.3	788.9	342.0	5.5	N/A	N/A	N/A
03/27/2008 10:07	334.5	241.5	790.3	342.0	5.5	N/A	N/A	N/A
03/27/2008 10:08	334.1	241.4	789.9	342.0	5.5	N/A	N/A	N/A
03/27/2008 10:09	334.3	240.8	791.1	342.0	5.5	N/A	N/A	N/A
03/27/2008 10:10	335.2	241.6	791.5	342.0	5.5	N/A	N/A	N/A
03/27/2008 10:11	334.9	242.5	794.8	342.0	5.5	13.30	95	786
03/27/2008 10:12	334.4	241.5	792.0	341.8	5.5	13.34	101	784
03/27/2008 10:13	334.3	240.7	792.0	341.6	5.7	13.47	109	789
03/27/2008 10:14	333.9	240.5	790.5	341.6	5.7	13.50	119	794
03/27/2008 10:15	334.6	241.3	796.0	341.6	5.7	13.46	111	795
03/27/2008 10:16	334.3	241.5	797.2	341.8	5.7	13.46	100	793
03/27/2008 10:17	334.3	241.5	787.9	341.5	5.7	13.46	102	792
03/27/2008 10:18	334.5	241.6	787.5	341.5	5.7	13.54	123	795
03/27/2008 10:19	334.7	241.8	789.5	341.5	5.6	13.62	140	799
03/27/2008 10:20	335.1	241.9	801.3	341.5	5.6	13.65	142	803
03/27/2008 10:21	334.9	242.2	793.8	341.4	5.6	13.61	121	805
03/27/2008 10:22	335.2	242.4	789.7	341.5	5.6	13.61	112	808
03/27/2008 10:22	335.1	241.9	796.0	341.5	5.6	13.64	127	808

Period Start:	Average UnitLoad_2 MW	Average Coal_Flow2 Kpph	Average Stk_Flow_2 kscfm	Average StackTemp2 DegF	Average Opac6min_2 %	Average CO2_2 %	Average NOx_2 ppm	Average SO2_2 ppm
03/27/2008 10:23	335.3	241.9	784.1	341.5	5.6	13.69	144	807
03/27/2008 10:24	335.5	241.7	792.8	341.4	5.5	13.71	155	809
03/27/2008 10:25	335.2	241.3	792.2	341.5	5.5	13.67	153	808
03/27/2008 10:26	335.3	241.2	789.9	341.3	5.5	13.65	151	808
03/27/2008 10:27	335.2	241.4	800.5	341.3	5.5	13.66	145	806
03/27/2008 10:28	335.3	241.7	807.2	341.1	5.5	13.67	137	806
03/27/2008 10:29	335.2	241.9	797.1	341.3	5.5	13.73	140	812
03/27/2008 10:30	333.9	241.6	803.3	341.3	5.5	13.70	137	811
03/27/2008 10:31	334.1	240.8	804.8	341.0	5.5	13.68	131	812
03/27/2008 10:32	334.9	241.2	801.5	341.0	5.5	13.68	128	812
03/27/2008 10:33	334.7	241.5	793.2	341.0	5.5	13.66	117	811
03/27/2008 10:34	334.8	241.8	793.2	341.0	5.5	13.70	118	812
03/27/2008 10:35	335.1	241.8	808.8	341.0	5.5	13.72	128	813
03/27/2008 10:36	335.5	241.4	795.8	341.0	5.4	13.67	128	809
03/27/2008 10:37	335.4	241.7	803.5	341.0	5.4	13.67	130	810
03/27/2008 10:38	335.1	241.8	796.6	341.0	5.4	13.65	127	809
03/27/2008 10:39	334.9	241.6	807.4	341.0	5.4	13.71	131	811
03/27/2008 10:40	334.5	241.8	800.9	341.0	5.4	13.73	132	810
03/27/2008 10:41	334.6	242.1	791.8	341.0	5.4	13.69	134	810
03/27/2008 10:42	334.9	241.9	791.2	341.0	5.2	13.72	139	812
03/27/2008 10:43	335.3	241.4	800.9	341.0	5.2	13.68	141	808
03/27/2008 10:44	335.3	241.6	791.4	341.0	5.2	13.74	140	807
03/27/2008 10:45	334.8	242.3	790.0	341.0	5.2	13.77	143	807
03/27/2008 10:46	334.4	241.5	786.1	341.0	5.2	13.79	143	813
03/27/2008 10:47	334.3	241.4	793.2	341.0	5.2	13.74	141	816
03/27/2008 10:48	333.3	241.1	784.9	341.0	5.3	13.74	130	812
03/27/2008 10:49	334.2	240.5	791.3	341.0	5.3	13.73	121	808
03/27/2008 10:50	334.7	241.7	785.9	341.0	5.3	13.74	128	809
03/27/2008 10:51	334.2	242.1	789.7	341.0	5.3	13.75	127	810
03/27/2008 10:52	334.3	241.7	798.7	341.0	5.3	13.74	125	808
03/27/2008 10:53	333.9	240.8	794.8	341.0	5.3	13.77	122	807
03/27/2008 10:54	334.0	240.8	807.0	341.0	5.3	13.76	122	806
03/27/2008 10:55	333.4	241.2	797.5	341.0	5.3	13.76	119	807
03/27/2008 10:56	332.4	240.8	798.1	341.0	5.3	13.75	125	808
03/27/2008 10:57	332.6	240.5	793.0	341.0	5.3	13.73	131	808
03/27/2008 10:58	332.8	241.2	793.4	341.1	5.3	13.70	123	807
Daily Average*	334.4	241.5	793.9	341.6	5.5	13.67	124	806
Maximum*	335.5	242.6	808.8	343.7	5.8	13.79	155	816
	03/27/2008	03/27/2008	03/27/2008	03/27/2008	03/27/2008	03/27/2008	03/27/2008	03/27/2008
	10:36	9:52	10:35	9:48	10:05	10:46	10:24	10:47
Minimum*	332.4	240.5	784.1	341.0	5.2	13.30	82	784
	03/27/2008	03/27/2008	03/27/2008	03/27/2008	03/27/2008	03/27/2008	03/27/2008	03/27/2008
	10:56	10:57	10:23	10:57	10:47	10:10	9:52	10:11

Average UnitLoad_2 MW	Average Coal_Flow2 Kpph	Average Stk_Flow_2 kscfm	Average StackTemp2 DegF	Average Opac6min_2 %	Average CO2_2 %	Average NOx_2 ppm	Average SO2_2 ppm
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Period Start:

* Does not include Invalid Averaging Periods ("N/A")

MK2, Run 3 – DAS Time 11:35 – 12:46

Average Values Report

Generated: 5/2/2008 12:18

Company: PSNH Merrimack Station

Plant: 97 River Rd.

City/St: Bow, NH 03304

Source: CTRL, UNIT2

Period Start: 3/27/2008 11:35

Period End: 3/27/2008 12:46

Validation Type: 1/1 min

Averaging Period: 1 min

Type: Block Avg

Period Start:	Average UnitLoad_2 MW	Average Coal_Flow2 Kpph	Average Stk_Flow_2 kscfm	Average StackTemp2 DegF	Average Opac6min_2 %	Average CO2_2 %	Average NOx_2 ppm	Average SO2_2 ppm
03/27/2008 11:35	334.5	241.8	801.1	342.0	5.6	13.66	127	789
03/27/2008 11:36	335.3	241.9	789.5	342.0	5.9	13.71	125	790
03/27/2008 11:37	335.5	242.4	790.5	342.0	5.9	13.72	118	794
03/27/2008 11:38	335.9	241.7	791.6	342.0	5.9	13.68	112	795
03/27/2008 11:39	336.1	241.9	810.3	342.0	5.9	13.71	111	797
03/27/2008 11:40	335.9	241.5	N/A	N/A	5.9	13.71	113	798
03/27/2008 11:41	335.1	241.8	N/A	N/A	5.9	13.75	118	799
03/27/2008 11:42	333.9	241.6	N/A	N/A	5.5	13.75	121	800
03/27/2008 11:43	333.7	240.1	N/A	N/A	5.5	13.75	124	797
03/27/2008 11:44	333.7	240.6	N/A	N/A	5.5	13.73	132	798
03/27/2008 11:45	333.3	240.7	N/A	N/A	5.5	13.73	134	800
03/27/2008 11:46	333.6	240.5	N/A	N/A	5.5	13.75	143	801
03/27/2008 11:47	333.8	240.9	786.7	343.5	5.5	13.72	150	801
03/27/2008 11:48	334.2	241.1	778.7	343.5	5.6	13.66	144	797
03/27/2008 11:49	334.1	240.3	794.2	343.5	5.6	13.67	147	799
03/27/2008 11:50	334.6	240.2	786.9	343.5	5.6	13.66	147	799
03/27/2008 11:51	334.4	240.5	786.3	343.5	5.6	13.68	155	801
03/27/2008 11:52	333.8	239.8	788.5	343.2	5.6	13.65	155	798
03/27/2008 11:53	333.4	239.5	777.1	343.0	5.6	13.68	155	797
03/27/2008 11:54	332.6	240.1	781.0	343.0	5.3	13.64	147	800
03/27/2008 11:55	332.8	239.9	782.0	343.0	5.3	13.65	143	798
03/27/2008 11:56	333.4	239.8	780.0	342.5	5.3	13.70	152	805
03/27/2008 11:57	333.6	240.0	788.9	342.5	5.3	13.69	148	806
03/27/2008 11:58	333.9	240.4	791.9	342.5	5.3	13.69	142	801
03/27/2008 11:59	334.1	240.2	785.1	342.5	5.3	13.68	136	798
03/27/2008 12:00	334.2	240.6	794.2	342.5	5.5	13.68	132	797
03/27/2008 12:01	333.9	240.3	785.1	342.5	5.5	13.68	128	799
03/27/2008 12:02	333.2	238.9	784.7	342.3	5.5	13.66	128	798
03/27/2008 12:03	333.1	238.4	778.3	342.0	5.5	13.70	136	800
03/27/2008 12:04	332.3	239.0	785.7	342.0	5.5	13.65	129	801
03/27/2008 12:05	332.5	239.9	786.1	342.0	5.5	13.64	132	797
03/27/2008 12:06	333.2	240.6	789.3	342.0	5.5	13.73	144	800
03/27/2008 12:07	333.9	240.8	794.4	342.0	5.5	13.71	146	799
03/27/2008 12:08	333.8	241.2	780.0	342.0	5.5	13.73	143	801
03/27/2008 12:09	334.5	240.3	794.4	342.0	5.5	13.66	141	802

Period Start:	Average UnitLoad_2 MW	Average Coal_Flow2 Kpph	Average Stk_Flow_2 kscfm	Average StackTemp2 DegF	Average Opac6min_2 %	Average CO2_2 %	Average NOx_2 ppm	Average SO2_2 ppm
03/27/2008 12:10	334.9	239.9	787.3	342.0	5.5	13.61	138	802
03/27/2008 12:11	335.2	239.9	789.1	342.0	5.5	13.55	125	798
03/27/2008 12:12	334.7	240.4	789.1	342.0	5.5	13.48	111	790
03/27/2008 12:13	333.5	239.6	796.8	342.0	5.5	13.53	116	789
03/27/2008 12:14	333.5	239.1	785.7	342.0	5.5	13.54	118	793
03/27/2008 12:15	333.4	239.8	801.3	342.0	5.5	13.52	110	794
03/27/2008 12:16	333.4	239.4	789.9	342.0	5.5	13.48	100	789
03/27/2008 12:17	333.6	239.3	804.2	342.0	5.5	13.54	109	789
03/27/2008 12:18	333.9	239.9	784.0	342.0	5.6	13.59	114	790
03/27/2008 12:19	334.0	240.5	800.5	342.0	5.6	13.60	116	792
03/27/2008 12:20	333.9	240.2	787.9	342.0	5.6	13.61	120	795
03/27/2008 12:21	333.9	239.8	788.3	342.0	5.6	13.64	124	798
03/27/2008 12:22	334.3	239.3	781.2	342.0	5.6	13.64	124	802
03/27/2008 12:23	334.3	240.9	789.5	342.0	5.6	13.65	120	801
03/27/2008 12:24	333.9	240.9	806.0	342.0	5.6	13.61	121	799
03/27/2008 12:25	333.9	240.3	802.7	342.0	5.6	13.64	129	796
03/27/2008 12:26	333.6	240.6	794.8	342.0	5.6	13.65	130	795
03/27/2008 12:27	334.1	240.0	795.4	342.0	5.6	13.62	124	794
03/27/2008 12:28	334.1	239.4	798.9	342.0	5.6	13.63	122	796
03/27/2008 12:29	334.5	240.3	794.4	342.0	5.6	13.63	121	796
03/27/2008 12:30	334.7	240.6	799.9	342.0	5.6	13.65	123	796
03/27/2008 12:31	334.6	240.8	800.9	342.0	5.6	13.70	146	806
03/27/2008 12:32	333.9	240.5	793.2	342.0	5.6	13.72	158	812
03/27/2008 12:33	334.2	240.0	794.4	342.0	5.6	13.74	154	814
03/27/2008 12:34	334.1	240.4	799.9	342.0	5.6	13.73	149	810
03/27/2008 12:35	334.1	240.2	793.8	342.0	5.6	13.66	131	801
03/27/2008 12:36	333.9	240.3	796.4	342.0	5.5	13.69	129	799
03/27/2008 12:37	334.1	240.5	802.1	342.0	5.5	13.72	133	798
03/27/2008 12:38	334.1	240.5	793.6	342.0	5.5	13.69	136	795
03/27/2008 12:39	334.4	240.6	796.0	342.0	5.5	13.77	145	802
03/27/2008 12:40	335.3	240.7	793.0	342.0	5.5	13.82	144	805
03/27/2008 12:41	335.0	241.0	790.6	342.0	5.5	13.80	143	802
03/27/2008 12:42	334.2	240.5	799.1	342.0	5.6	13.83	138	795
03/27/2008 12:43	333.9	239.5	794.6	342.0	5.6	13.87	131	797
03/27/2008 12:44	333.8	239.4	770.2	342.0	5.6	13.87	128	802
03/27/2008 12:45	333.7	239.8	785.7	342.0	5.6	13.84	129	802
03/27/2008 12:46	333.7	240.3	792.4	342.0	5.6	13.86	130	803
Daily Average*	334.1	240.3	791.2	342.2	5.6	13.68	132	798
Maximum*	336.1	242.4	810.3	343.5	5.9	13.87	158	814
	03/27/2008 11:39	03/27/2008 11:37	03/27/2008 11:39	03/27/2008 11:51	03/27/2008 11:41	03/27/2008 12:44	03/27/2008 12:32	03/27/2008 12:33
Minimum*	332.3	238.4	770.2	342.0	5.3	13.48	100	789
	03/27/2008 12:04	03/27/2008 12:03	03/27/2008 12:44	03/27/2008 12:46	03/27/2008 11:59	03/27/2008 12:16	03/27/2008 12:16	03/27/2008 12:17

Period Start:	Average UnitLoad_2 MW	Average Coal_Flow2 Kpph	Average Stk_Flow_2 kscfm	Average StackTemp2 DegF	Average Opac6min_2 %	Average CO2_2 %	Average NOx_2 ppm	Average SO2_2 ppm
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* Does not include Invalid Averaging Periods ("N/A")

APPENDIX D - Equipment Certification Sheets

EASTMOUNT ENVIRONMENTAL

Air Quality Specialists

Method 5 Module Pre-Calibration Using Critical Orifices

Module: EE4
 Cal. Date: 1/4/2008 Exp. Date: 7/4/2008 Technician: Stephen Hall

Orifice Number	UJ-40	UJ-48	UJ-55	UJ-63	UJ-73
Orifice Coefficient, K'	0.2371	0.3492	0.4442	0.6022	0.8216
Meter Volume (cf)					
Initial	776.105	765.435	754.618	743.859	733.412
Final	786.608	776.105	765.435	754.618	743.859
Total Volume, V_m (cf)	10.503	10.670	10.817	10.759	10.447
DGM Inlet Temp. (°F)					
Initial	77	74	74	78	73
Final	76	77	74	74	78
DGM Outlet Temp. (°F)					
Initial	72	70	68	71	65
Final	74	72	70	68	71
Avg. DGM Temp., T_m (°F)	74.8	73.3	71.5	72.8	71.8
Ambient Temp., T_{amb} (°F)	80	73	71	71	70
Bar. Pressure, P_{bar} (in. Hg)	30.42	30.42	30.42	30.42	30.42
ΔH	0.31	0.66	1.10	2.00	3.70
Vacuum (in. Hg)	24.0	22.5	21.0	19.0	16.5
Time, θ (min.)	35.00	24.00	19.00	14.00	10.00
Std. Meter Vol., $V_{m(std)}$ (dscf)	10.552	10.759	10.954	10.894	10.641
Std. Or. Vol., $V_{cr(std)}$ (dscf)	10.863	11.043	11.142	11.130	10.856
Y	1.0295	1.0264	1.0171	1.0217	1.0202
$\Delta H@$	1.821	1.772	1.829	1.813	1.816
Y Error (+/- .02)	0.006	0.003	-0.006	-0.001	-0.003
$\Delta H@$ Error (+/- .05)	0.006	-0.021	0.010	0.001	0.003

Average Y 1.0230
 Average $\Delta H@$ 1.810

Y Pass/Fail PASS
 $\Delta H@$ Pass/Fail PASS

$$V_{cr(std)} = K' \cdot P_{bar} \cdot \theta / \sqrt{(T_{amb} + 460)}$$

$$Y = V_{cr(std)} / V_{m(std)}$$

$$V_{m(std)} = 17.64 \cdot V_m \cdot (P_{bar} + \Delta H / 13.6) / (T_m + 460)$$

$$\Delta H@ = 0.039 \cdot \Delta H \cdot (T_m + 460) \cdot \theta^2 / (P_{bar} Y^2 V_m^2)$$

EASTMOUNT ENVIRONMENTAL

Air Quality Specialists

Method 5 Module Pre-Calibration Using Critical Orifices

Module: EE2
 Cal. Date: 1/4/2008 Exp. Date: 7/4/2008 Technician: Stephen Hall

Orifice Number	UJ-40	UJ-48	UJ-55	UJ-63	UJ-73
Orifice Coefficient, K'	0.2371	0.3492	0.4442	0.6022	0.8216
Meter Volume (cf)					
Initial	90.967	56.009	77.296	66.792	42.756
Final	101.247	66.256	90.967	77.296	56.009
Total Volume, V_m (cf)	10.280	10.247	13.671	10.504	13.253
DGM Inlet Temp. (°F)					
Initial	68	81	74	71	75
Final	67	72	73	74	81
DGM Outlet Temp. (°F)					
Initial	68	72	70	71	72
Final	67	71	70	70	72
Avg. DGM Temp., T_m (°F)	67.5	74.0	71.8	71.5	75.0
Ambient Temp., T_{amb} (°F)	72	73	76	75	75
Bar. Pressure, P_{bar} (in. Hg)	30.42	30.42	30.42	30.42	30.42
ΔH	0.30	0.64	1.05	1.90	3.55
Vacuum (in. Hg)	16.0	15.5	14.0	12.5	10.0
Time, θ (min.)	33.00	22.00	23.00	13.00	12.00
Std. Meter Vol., $V_{m(std)}$ (dscf)	10.469	10.317	13.836	10.658	13.412
Std. Or. Vol., $V_{cr(std)}$ (dscf)	10.319	10.123	13.424	10.296	12.967
Y	0.9857	0.9811	0.9702	0.9660	0.9668
$\Delta H@$	1.760	1.716	1.761	1.738	1.747
Y Error (+/- .02)	0.012	0.007	-0.004	-0.008	-0.007
$\Delta H@$ Error (+/- .05)	0.009	-0.016	0.009	-0.004	0.002

Average Y 0.9740
 Average $\Delta H@$ 1.744

Y Pass/Fail PASS
 $\Delta H@$ Pass/Fail PASS

$$V_{cr(std)} = K' \cdot P_{bar} \cdot \theta / \sqrt{(T_{amb} + 460)}$$

$$Y = V_{cr(std)} / V_{m(std)}$$

$$V_{m(std)} = 17.64 \cdot V_m \cdot (P_{bar} + \Delta H / 13.6) / (T_m + 460)$$

$$\Delta H@ = 0.039 \cdot \Delta H \cdot (T_m + 460) \cdot \theta^2 / (P_{bar} Y^2 V_m^2)$$

Eastmount Environmental Services

Pitot Calibration Data Input Sheet

Technician: J. Fisher
 Date Calibrated: 1/7/2008

Pitot ID:
 Probe ID: P-5-3

0.375	Dt (between 0.188 and 0.375 in.)
1.320	X (greater than or equal to 3/4 in.)
0.500	Dn (must use 1/2 in. nozzle)

0.477	Pa
0.477	Pb

Pa must = Pb

A	
0.864	Y (must be > 3/4 in.)

or

B	
N/A	Y (must be > 2 in.)

3.754	Z (must be > 3 in.)
-------	---------------------

* All calibrations are in accordance with CFR Pt.60, App.A, Meth.2, sect4.1.2 (Type S Pitot Calibration)

Eastmount Environmental Services**Pitot Calibration Data Input Sheet** Degrees

4	a1
2	a2

a1 and a2 must be < 10 degrees

2	b1
1	b2

b1 and b2 must be < 5 degrees

5	α
---	----------

c must be < 0.125 in. (1/8in.)
where: $c = (Pa + Pb) \times \sin \alpha$

1	Θ
---	----------

d must be < 0.03125 in (1/32in)
where: $d = (Pa + Pb) \times \sin \Theta$

Eastmount Environmental Services

Pitot Calibration Data Input Sheet

Technician: J. Fisher
Date Calibrated: 1/7/2008

Pitot ID:
Probe ID: P-8-3

0.375	Dt (between 0.188 and 0.375 in.)
0.919	X (greater than or equal to 3/4 in.)
0.500	Dn (must use 1/2 in. nozzle)

0.472	Pa
0.472	Pb

Pa must = Pb

A
1.869 Y (must be > 3/4 in.)

or

B
N/A Y (must be > 2 in.)

AND
3.495 Z (must be > 3 in.)

* All calibrations are in accordance with CFR Pt.60, App.A, Meth.2, sect4.1.2 (Type S Pitot Calibration)

Eastmount Environmental Services Pitot Calibration Data Input Sheet

Degrees

2	a1
1	a2

a1 and a2 must be < 10 degrees

3	b1
2	b2

b1 and b2 must be < 5 degrees

2	c
---	---

c must be < 0.125 in. (1/8in.)
where: $c = (Pa + Pb) \times \sin \alpha$

1	Θ
---	----------

d must be < 0.03125 in (1/32in)
where: $d = (Pa + Pb) \times \sin \Theta$

STACK SAMPLING REPORT
FOR
MERCURY AND FLOW RATE TESTING
ON THE
PUBLIC SERVICE OF NEW HAMPSHIRE
MERRIMACK STATION UNIT NO. 2

PROJECT NO. 06-054

SEPTEMBER 2006

PREPARED FOR:
ADA-ES, INC.
8100 SOUTHPARK WAY, UNIT B
LITTLETON, COLORADO 80120

PREPARED BY:
AIR SAMPLING ASSOCIATES, INC.
P.O. BOX 1175
LEWISVILLE, TEXAS 75067

(Total Number of Pages Including Cover: 153)

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EXECUTIVE SUMMARY

Air Sampling Associates, Inc. conducted source testing on the Public Service of New Hampshire (PSNH), Merrimack Station, Unit No. 2, located in Bow, New Hampshire. The testing was conducted for a Department of Energy (DOE) mercury control technology evaluation project. The purpose of the test was to characterize the flow rate and determine the mercury concentrations at the Inlet of the Original Electrostatic Precipitator (ESP), Outlet of the Original ESP, Inlet to the Supplemental ESP, Mid Duct to the Supplemental ESP, Stack Inlet from the Supplemental ESP, and the Stack sampling locations. The testing was conducted on September 26 through September 29, 2006.

The sampling team consisted of Mr. Gary Goldman, Mr. Patrick Selakovich, and Mr. Scot Jackson. Mr. Goldman was the test team leader.

The procedures set forth in Title 40 of the Code of Federal Regulations, Part 60 (40CFR60), Appendix A, Test Methods 1, 2, 3, and 4; and Proposed EPA Test Method 324 were followed during testing.

Billy J. Mullins, Jr. P.E., Q.E.P., D.E.E.

SUMMARY OF RESULTS

Table 1: Summary of EPA Method Tests 1, 2, 3, and 4 Sampling Results

<i>Run No.</i>	<i>Stack</i>	<i>Stack Inlet from the Supplemental ESP (Port D)</i>	<i>Stack Inlet from the Supplemental ESP (Port B)</i>	<i>Stack Inlet from the Supplemental ESP (Port C)</i>	<i>Stack Inlet from the Supplemental ESP (Port A)</i>
<i>Test Date</i>	09/28/06	09/28/06	09/28/06	09/28/06	09/28/06
<i>Test Time</i>	1109-1139	1530-1540	1555-1625	1625-1635	1730-1740
<i>Flow Rate – DSCFIM*</i>	678,754	539,643	374,287	357,206	321,077
<i>Stack Temp. - ° F</i>	330	334	333	332	332
<i>O₂ - %Vol. (dry)</i>	12.7	13.0	5.3	13.0	13.0
<i>CO₂ - %Vol. (dry)</i>	6.3	5.3	13.0	5.3	5.3
<i>Percent Excess Air</i>	41.5	32.4	32.4	32.4	32.4
<i>Moisture Content - %</i>	8.74	6.45	6.45	6.45	6.45

* 29.92" Hg, 68° F (760 mm Hg, 20 °C)

SUMMARY OF RESULTS

Table 2: Summary of EPA Method Tests 1, 2, 3, and 4 Sampling Results

Run No.	Mid Duct to Supplemental ESP (Port A)	Mid Duct to Supplemental ESP (Port B)	Mid Duct to Supplemental ESP (Port C)	Mid Duct to Supplemental ESP (Port D)	Outlet from the Original ESP	Inlet A to the Original ESP	Inlet B to the Original ESP	Inlet to Supplemental ESP
Test Date	09/29/06	09/29/06	09/29/06	09/29/06	09/29/06	09/29/06	09/29/06	09/29/06
Test Time	0940-0950	0950-0958	0958-1008	1008-1018	1120-1150	1723-1800	1805-1835	1833-1903
Flow Rate – DSCFM*	413,145	465,170	494,633	661,884	1,409,266	357,832	367,855	703,379
Stack Temp. - ° F	341	342	340	335	334	344	345	335
O ₂ - %Vol. (dry)	4.7	4.7	4.7	4.7	4.7	11.1	11.1	4.7
CO ₂ - %Vol. (dry)	14.3	14.3	14.3	14.3	14.3	8.9	8.9	14.3
Percent Excess Air	28.0	28.0	28.0	28.0	28.0	109.9	109.9	28.0
Moisture Content - %	9.15	9.15	9.15	9.15	9.15	5.02	5.02	9.15

* 29.92" Hg, 68° F (760 mm Hg, 20 °C)

SUMMARY OF RESULTS

Table 3: Summary of Proposed Test Method 324 Sampling Results

Date	Time	Sampling Location	Trap ID	Sample Volume (L at EPA-STP)	ng of Hg on Section # 1	ng of Hg on Section # 2	Hg Concentration ug/m3	Comments
09/28/06	1117-1217	Stack	OL-26221	18.98	136	<5	7.17	
			OL-26222	19.49	166	<5	8.52	
09/28/06	1546-1646	Stack Inlet from the Supplemental ESP (Port D)	OL-26223	21.73	163		7.50	Section 2 lost due to breakage
			OL-26224	14.92	110	<5	7.37	
09/28/06	1721-1821	Stack Inlet from the Supplemental ESP (Port B)	OL-26225	21.03	158	<5	7.51	
			OL-26226	20.38	158	<5	7.75	
09/29/06	0752-0852	Inlet to the Supplemental ESP (Port C)	OL-26229	19.75	132	<5	6.68	
			OL-26230	17.23	120	<5	6.96	
09/29/06	0929-1029	Outlet from the Original ESP (Port G)	OL-26231	17.32	136	<5	7.85	
			OL-26232	18.22	149	<5	8.18	
09/29/06	1117-1217	Mid Duct to the Supplemental ESP (Port A)	OL-26233	19.58	142	<5	7.25	
			OL-26234	17.04	133	<5	7.81	
09/29/06	1255-1355	Outlet from the Original ESP (Port C)	OL-26235	21.02	157	<5	7.47	Section 2 not present at analysis
			OL-26236	22.65	174		7.68	
09/29/06	1655-1735	Inlet B of the Original ESP (Port F)	OL-26237	6.27	37	<5	5.90	Trap clogged due to excessive soot
			OL-26238		<5	<5	<0.03	Trap broke during sampling
09/29/06	1831-1931	Inlet B of the Original ESP (Port B)	OL-26239	9.15	38	<5	4.15	Trap clogged due to excessive soot
			OL-26241	9.22	32.9	5	3.57	Trap clogged due to excessive soot
09/29/06	2013-2044	Inlet A of the Original ESP (Port C)	OL-26242	5.15	36	<5	6.99	
			OL-26243	5.03	37	<5	7.36	
09/29/06	2116-2146	Inlet A of the Original ESP (Port G)	OL-26245	6.7	58	<5	8.66	
			OL-26246	5.98	57	<5	9.53

DISCUSSION OF SAMPLING RESULTS

Flow Rate

The tests for flow rate, using EPA Test Methods 1, 2, 3, and 4, appeared to be an accurate representation of the actual emissions during the tests. All leak checks performed on the reference method sampling train and pitot tubes showed no leaks before or after testing.

Mercury

The eleven tests for mercury using Proposed EPA Test Method 324 appeared to be an accurate representation of the actual emissions during the tests. All leak checks performed on the reference method sampling trains showed no leaks before or after testing.

DESCRIPTION OF SAMPLING LOCATION

The sampling ports on the Unit No. 2 Stack are approximately 232 feet 3 inches above the ground. The sampling ports are located 157 feet 3 inches (9.97 stack diameters) downstream from the inlet to the stack and 84 feet 1 inch (5.33 stack diameters) upstream from the outlet to the stack.

The sampling ports on the Stack Inlet from the Supplemental ESP are approximately 75 feet above the ground. The sampling ports are located in a transition zone in the duct.

The sampling ports on the Mid Duct to the Supplemental ESP are approximately 75 feet above the ground. The sampling ports are located in a transition zone in the duct.

The sampling ports on the Inlet to the Supplemental ESP are approximately 75 feet above the ground. The sampling ports are located in a transition zone in the duct.

The sampling ports on the Outlet to the Original ESP are approximately 75 feet above the ground. The sampling ports are located in a transition zone in the duct.

The sampling ports on the Inlet to the Original ESP are approximately 60 feet above the ground. The sampling ports are located in a transition zone in the duct.

DESCRIPTION SAMPLING LOCATION

Figure 1: Unit No. 2

SAMPLING AND ANALYTICAL PROCEDURES

The procedures set forth in the Code of Federal Regulations, Title 40, Chapter 1, Part 60, Appendix A, Test Methods 1, 2, 3, and 4; and Proposed EPA Test Method 324 were followed during testing.

Flow Rate

Velocity traverses were made according to EPA Test Method 2 at each port at the Stack, Stack Inlet from the Supplemental ESP (Port D), Stack Inlet from the Supplemental ESP (Port B), Inlet to the Supplemental ESP (Port C), Outlet from the Original ESP (Port G), Mid Duct to the Supplemental ESP (Port A), Outlet from the Original ESP (Port C), Inlet B of the Original ESP (Port F) Inlet B of the Original ESP (Port B), Inlet A of the Original ESP (Port C), and Inlet A of the Original ESP (Port G) sampling locations in order to determine the uniformity and magnitude of the flow. Multiple traverse points were sampled from each port. Diagrams of the sample points for each sampling location are provided in Appendix A.

The pitot tube lines were checked for leaks before and after each test under a vacuum and a pressure. The lines were also checked for clearance and the manometer was zeroed before each test.

Moisture samples were taken according to EPA Test Method 4 at the Stack, Stack Inlet from the Supplemental ESP, Inlet to the Supplemental ESP, and Inlet to the Original ESP sampling locations. For each run, samples of 30 minute duration were taken at a single traverse point. Data was recorded at 5-minute intervals.

The sampling train was leak-checked at the end of the sampling probe at 15" of mercury vacuum before each test, and again at the conclusion of each test at the highest vacuum recorded during sampling. This was done to predetermine the possibility of a diluted sample.

The 'front-half' of the sampling train contained the following components:

In-stack filter

Heated Stainless Steel probe @ $248^{\circ}\text{F} \pm 25^{\circ}\text{F}$

Heated Teflon line @ $248^{\circ}\text{F} \pm 25^{\circ}\text{F}$

The 'back-half' of the sampling train contained the following components:

Table 4: EPA Method 4 Condenser/Absorbing System

Impinger No.	Impinger Type	Absorbing Solution
1	Modified	100 ml H ₂ O
2	Greenburg-Smith	100 ml H ₂ O
3	Modified	Empty
4	Modified	~200 g silica gel

Grab ORSAT samples were taken according to EPA Test Method 3 at the Stack, Stack Inlet from the Supplemental ESP, Inlet to the Supplemental ESP, and Inlet to the Original ESP sampling locations to determine flue gas molecular weight.

Figure 2: EPA Test Methods 2 and 4 Sampling Train

Mercury

Mercury samples were taken according to Proposed EPA Test Method 324. Samples of 60 minute duration were taken from a single traverse point at the Stack, Stack Inlet from the Supplemental ESP (Port D), Stack Inlet from the Supplemental ESP (Port B), Inlet to the Supplemental ESP (Port C), Outlet from the Original ESP (Port G), Mid Duct to the Supplemental ESP (Port A), Outlet from the Original ESP (Port C), Inlet B of the Original ESP (Port F) Inlet B of the Original ESP (Port B) sampling locations. Samples of 30 minute duration were taken from a single traverse point at the Inlet A of the Original ESP (Port C) and Inlet A of the Original ESP (Port G) sampling locations. The reduced sampling duration at the Inlet A of the Original ESP (Port C) and Inlet A of the Original ESP (Port G) sampling locations was due to the high dust loading at those locations. Data was recorded manually at the beginning of each run and again at the conclusion of each run.

The sampling train was leak-checked at the end of the sampling probes at 15" of mercury vacuum before and after each test. This was done to predetermine the possibility of diluted samples.

The sampling train consisted of paired sorbent traps, dual heated sample probes, dual Teflon samples lines, and dual moisture removal systems.

Figure 3: Proposed Test Method 324 Sampling Train

TEST NARRATIVE

Air Sampling Associates, Inc. personnel arrived at the Public Service of New Hampshire, Merrimack Station, located in Bow, New Hampshire, at 10:15 a.m., on Tuesday, September 26, 2006. All times are reported as Eastern Standard Time. After meeting with plant personnel, the test trailer was set in place. The sampling equipment was moved onto the Unit No. 2 Stack and secured. Personnel departed the plant at 7:00 p.m.

Personnel returned to the plant at 7:30 a.m. on Wednesday, September 27, 2006. The sampling equipment was prepared for testing. Testing was postponed due to unit operational problems. The equipment was secured for the night and personnel departed the plant at 1:15 p.m.

Personnel returned to the plant at 7:30 a.m. on Thursday, September 28, 2006. The sampling equipment was prepared for testing. The first test for flow rate on the Unit No. 2 Stack began at 11:09 a.m. and was completed at 11:39 a.m. The first test for mercury on the Unit No. 2 Stack began at 11:17 a.m. and was completed at 12:17 a.m. The sorbent tubes were recovered and analyzed.

The sampling equipment was moved to the Stack Inlet from the Supplemental ESP and was prepared for testing. The first test for flow rate on the Stack Inlet from the Supplemental ESP began at 3:55 p.m. and was completed at 5:40 p.m. The first test for mercury on the Stack Inlet from the Supplemental ESP began at 3:46 p.m. Testing continued until the completion of the second test at 6:21 p.m. The sorbent tubes were recovered and analyzed. The sampling equipment was moved to the Mid Duct to the Supplemental ESP and secured for the night. Personnel departed the plant at 7:30 p.m.

Personnel returned to the plant at 7:00 a.m. on Friday, September 29, 2006. The sampling equipment was prepared for testing. The first test for flow rate on the Mid Duct to the Supplemental ESP began at 9:40 a.m. and was completed at 10:18 a.m. The sampling equipment was moved to the Outlet from the Original ESP and prepared for testing. The first test for flow rate on the Outlet from the Original ESP began at 11:20 a.m. and was completed at 11:50 a.m. The sampling equipment was moved to the Inlet to the Original ESP and prepared for testing. The first test for flow rate at the Inlet to the Original ESP began at 5:23 p.m. and was completed at 6:35 p.m. The sampling equipment was moved to the Inlet to the Supplemental ESP and prepared for testing. The first test for flow rate on the Inlet to the Supplemental ESP began at 6:33 p.m. and was completed at 7:03 p.m.

The first test for mercury on the Inlet to the Supplemental ESP began at 7:52 a.m. and was completed at 8:52 a.m. The sorbent tubes were recovered and analyzed. The sampling equipment was moved to the Outlet from the Original ESP and prepared for testing. The first test for mercury on the Outlet from the Original ESP began at 9:29 a.m. and was completed at 10:29 a.m. The sorbent tubes were recovered and analyzed. The sampling equipment was moved to the Mid Duct to the Supplemental ESP and prepared for testing. The first test for mercury on the Mid Duct to the Supplemental ESP began at 11:17 a.m. and was completed at 12:17 p.m. The sorbent tubes were recovered and analyzed. The sampling equipment was moved to the Outlet from the Original ESP and prepared for testing. The first test for mercury on the Outlet from the Original ESP began at 12:55 p.m. and was completed at 1:55 p.m. The sorbent tubes were recovered and analyzed. The sampling equipment was moved to the Inlet of the Original ESP and prepared for testing. The first test for mercury on the Inlet of the Original ESP began at 4:55 p.m. Testing continued until the completion of the fourth test at 9:46 p.m. The sorbent tubes were recovered and analyzed.

The sampling equipment was moved off of the sampling locations and loaded into the test trailer. The data was transported to Air Sampling Associates, Inc.'s office in Lewisville, Texas for further review.

Operations at the Public Service of New Hampshire, Merrimack Station, located in Bow, New Hampshire, for ADA-ES, Inc. were completed at 10:45 p.m. on Friday, September 29, 2006.

APPENDICES

Appendix A: Location of Traverse Points

Appendix B: Nomenclature and Equations for Calculation of Source Emissions

Appendix C: Calibration Data

Appendix D: EPA Test Methods 2, 3, and 4 Field Data

Appendix E: Proposed EPA Test Method 324 Field Data

Appendix F: Proposed EPA Test Method 324 Analytical Data

Appendix G: Resumes of Test Personnel

Appendix A:
Location of Traverse Points

Appendix A

Location of Traverse Points

Merrimack Unit No. 2 Stack

The sampling ports are located 157 feet 3 inches (9.97 stack diameters) downstream from the inlet to the stack and 84 feet 1 inch (5.33 stack diameters) upstream from the outlet to the stack. The locations of the traverse points were calculated as follows:

Table 5: Stack Location Traverse Points

Port & Wall Thickness = 40 1/16 inches		
Inside Stack Diameter = 189 3/16 inches		
Point Number*	Percent of Stack Diameter	Distance from Wall
1	4.4	8 5/16"
2	14.6	27 5/8"
3	29.6	56"

* Calculated as one-half of a six point traverse.

Appendix A

Figure 4: Unit No. 2 Stack Sampling Traverse Points

Not to scale.

Appendix A

Location of Traverse Points

Merrimack Unit No. 2 Stack Inlet from the Supplemental ESP

The sampling ports on the Stack Inlet from the Supplemental ESP are approximately 75 feet above the ground. The sampling ports are located in a transition zone in the duct.

**Figure 5: Stack Inlet from the Supplemental ESP
Location of Traverse Points (Ports A and B)**

Appendix A

**Figure 6: Stack Inlet from the Supplemental ESP
Location of Traverse Points (Port C)**

Appendix A

**Figure 7: Stack Inlet from the Supplemental ESP
Location of Traverse Points (Port D)**

Appendix A

Location of Traverse Points

Merrimack Unit No. 2 Inlet to the Supplemental ESP

The sampling ports on the Inlet to the Supplemental ESP are approximately 75 feet above the ground. The sampling ports are located in a transition zone in the duct.

Figure 8: Inlet to the Supplemental ESP Location of Traverse Points

Appendix A

Location of Traverse Points

Merrimack Unit No. 2 Mid Duct to the Supplemental ESP

The sampling ports on the Mid Duct to the Supplemental ESP are approximately 75 feet above the ground. The sampling ports are located in a transition zone in the duct.

**Figure 9: Stack Inlet from the Supplemental ESP
Location of Traverse Points (Port A)**

Appendix A

**Figure 10: Stack Inlet from the Supplemental ESP
Location of Traverse Points (Port B)**

Appendix A

**Figure 11: Stack Inlet from the Supplemental ESP
Location of Traverse Points (Port C)**

Appendix A

**Figure 12: Stack Inlet from the Supplemental ESP
Location of Traverse Points (Port D)**

Appendix A

Location of Traverse Points

Merrimack Unit No. 2 Outlet from the Original ESP

The sampling ports on the Outlet from the Original ESP are approximately 75 feet above the ground. The sampling ports are located in a transition zone in the duct.

Figure 13: Outlet from the Original ESP Location of Traverse Points

Appendix A

Location of Traverse Points

Merrimack Unit No. 2 Inlet to the Original ESP (Duct A)

The sampling ports on the Inlet to the Original ESP are approximately 60 feet above the ground. The sampling ports are located in a transition zone in the duct.

Figure 14: Inlet to the Original ESP (Duct A) Location of Traverse Points

Appendix A

Location of Traverse Points

Merrimack Unit No. 2 Inlet to the Original ESP (Duct B)

The sampling ports on the Inlet to the Original ESP are approximately 60 feet above the ground. The sampling ports are located in a transition zone in the duct.

Figure 15: Inlet to the Original ESP (Duct B) Location of Traverse Points

Appendix B:

Nomenclature and Equations for Calculation of Source Emissions

Nomenclature For Flow Rate and Moisture Calculations

<u>Symbol</u>	<u>English Units</u>	<u>Metric Units</u>	<u>Description</u>
A_s	in. ²	m ²	Stack Area
C_{an}	gr/dscf*	g/dscm*	Particulate – probe, cyclone, and filter
C_{ao}	gr/dscf*	g/dscm*	Particulate –total
C_{at}	gr/CF @ stack conditions	g/m ³	Particulate – probe, cyclone, and filter
C_{au}	gr/CF @ stack conditions	g/m ³	Particulate – total
C_{aw}	lbs/hr	kg/hr	Particulate – probe, cyclone, and filter
C_{ax}	lbs/hr	kg/hr	Particulate - total
C_p			Pitot Tube Calibration Factor
D_n	in.	m	Sampling Nozzle Diameter
%EA			Percent Excess Air at Sampling Point
g	32.2 ft/sec ²		Acceleration of gravity
%I			Percent Isokinetic
%M			Percent Moisture in the Stack Gas by Volume
M_d			Mole Fraction of Dry Gas
m_f	mg	mg	Particulate – probe, cyclone, and filter
mt	mg	mg	Particulate – total
M_{water}	18 lb/lb-mole		Molecular Weight of Water
MW	lb/lb-mole	g/g-mole	Molecular Weight of Stack Gas
MW_{air}	28.84 lb/lb-mole		Molecular Weight of Air

<u>Symbol</u>	<u>English Units</u>	<u>Metric Units</u>	<u>Description</u>
MW _d	lb/lb-mole	g/g-mole	Molecular Weight of Dry Stack Gas
P _b	"Hg Absolute	mm Hg	Barometric Pressure
P _m	"H ₂ O	mm H ₂ O	Orifice Pressure drop
P _s	"Hg Absolute	mm Hg	Stack Pressure
ΔP	"H ₂ O	mm H ₂ O	Velocity Head of Stack Gas
P _{std}	29.92" Hg	760 mm Hg	Standard Barometric Pressure
Q _a	ACFM	m ³ /hr	Stack Gas Volume at Actual Stack Conditions
Q _s	DSCFM*	dscm/hr*	Stack Gas Volume at 29.92" Hg, 528° R, dry
R	21.83" Hg-ft ³ /lb-mole °R		Universal Gas Constant
T _m	°F	°C	Average Gas Meter Temperature
T _t	min	min	Net Time of Test
T _s	°F	°C	Stack Temperature
T _{std}	528 °R	293 °K	Standard Temperature
V _m	ft ³	m ³	Volume of Dry Gas Sampled @ Meter Conditions
V _{mstd}	dscf*	dscm*	Volume of Dry Gas Sampled @ Standard Conditions
V _s	fpm	m/sec	Stack Velocity @ Stack Conditions
V _w	ml	ml	Total Water Collected in Impingers and Silica Gel
V _{wgas}	scf*	scm*	Volume of Water Vapor Collected @ Standard Conditions
ρ _{air}	0.0748 lbs/ft ³		Density of Air

<u>Symbol</u>	English <u>Units</u>	Metric <u>Units</u>	<u>Description</u>
ρ_{water}	1 g/ml		Density of Water
ρ_{man}	62.32 lbs/ft ³		Density of Manometer Oil
			(Inches of Water)

Standard Conditions: 29.92" Hg, 68° F (760 mm Hg, 20 °C)

EXAMPLE CALCULATIONS

1. Volume of dry gas sampled at standard conditions. *

$$V_{mstd} = V_m \left(\frac{T_{std}}{T_m + 460} \right) \left[\frac{P_b + \frac{P_m}{13.6}}{P_{std}} \right]$$

$$V_{mstd} = 17.65 V_m \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460} \right] = \text{dscf}$$

$$V_{mstd} = \text{dscf} \times 0.028317 = \text{dscm}$$

2. Volume of water vapor collected at standard conditions. *

$$V_{Wgas} = \frac{(V_w - \text{gms } SO_2 - \text{gms } H_2S) \rho_{water} RT_{std}}{P_{std} M_{water} 453.6}$$

$$V_{Wgas} = 0.0472 (V_w - \text{gms } SO_2 - \text{gms } H_2S) = \text{scf}$$

$$V_{Wgas} = \text{scf} \times 0.028317 = \text{scm}$$

3. Percent moisture in stack gas.

$$\%M = \frac{V_{Wgas}}{V_{mstd} + V_{Wgas}} \times 100 = \%$$

* 29.92" Hg, 68° F (760 mm Hg, 20 °C)

4. Mole fraction of dry gas.

$$M_d = \frac{100 - \%M}{100}$$

5. Average molecular weight of dry stack gas.

$$MW_d = \left[\%CO_2 \times \frac{44}{100} \right] + \left[\%O_2 \times \frac{32}{100} \right] + \left[\%N_2 \times \frac{28}{100} \right] + \left[\%CO \times \frac{28}{100} \right] = lb/lb - mole$$

$$= g/g - mole$$

6. Molecular weight of stack gas.

$$MW = MW_d \times M_d + 18 (1 - M_d) = \frac{lb}{lb - mole} = g/g - mole$$

7. Percent excess air at sampling point.

$$\%EA = \frac{100 [\%O_2 - (0.5 \%CO)]}{0.265 (\%N_2) - [\%O_2 - (0.5 \%CO)]}$$

8. Stack Pressure.

$$P_s = P_b + \frac{\text{Stack Pressure " H}_2\text{O}}{13.6} = \text{" Hg Absolute}$$

$$P_s = \text{" Hg Abs.} \times 25.4 = mm Hg$$

9. Stack velocity at stack conditions.

$$V_s = C_p 60 \left[\frac{2g \times \rho_{man} \times P_{std} \times MW_{air} \times (T_s + 460) \times \Delta P}{12 \times \rho_{air} \times P_s \times MW \times T_{std}} \right]^{1/2}$$

$$V_s = 5,123.8 C_p \left[\frac{(T_s + 460)}{P_s \times MW} \right]^{1/2} \sqrt{\Delta P} \text{ average} = fpm$$

$$V_s = fpm \times 0.00508 = m/sec$$

10. Dry stack gas volume at standard conditions. *

$$Q_s = \frac{1}{144} V_s \times A_s \times M_d \times \frac{T_{std}}{T_s + 460} \times \frac{P_s}{P_{std}}$$

$$Q_s = \frac{0.123 V_s \times A_s \times M_d \times P_s}{T_s + 460} = DSCFM$$

$$Q_s = DSCFM \times 1.6990 = dscm/hr$$

11. Actual stack gas volume at stack conditions.

$$Q_a = \frac{V_s \times A_s}{144} = ACFM$$

$$Q_a = ACFM \times 1.6990 = m^3/hr$$

12. Percent Isokinetic

$$\%I = \frac{V_{mstd} \times (T_s + 460) \times P_{std} \times 100 \times 144 \text{ in.}^2 / \text{ft}^2}{M_d \times T_{std} \times P_s \times T_t \times V_s \left(\frac{\pi \times D_n^2}{4} \right)}$$

$$\%I = \frac{1039 \times V_{mstd} \times (T_s + 460)}{M_d \times P_s \times T_t \times V_s \times D_n^2}$$

* 29.92" Hg, 68° F (760 mm Hg, 20 °C)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Stack

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
DATE			09/28/06		
BEGIN TIME			1109		
END TIME			1139		
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.76 (756.00)		
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	2.000 (50.800)		
	DGM CALIBRATION FACTOR		0.985		
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	22.690 (0.643)		
	LEAK CHECK VOLUME	ft.^3	0.000		
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	64 (18)		
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	22.857 (0.647)		
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	46.4		
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	2.190 (0.062)		
%M	MOISTURE IN STACK GAS BY VOLUME	%	8.74		
Md	MOL FRACTION OF DRY GAS		0.9126		
Tt	NET TIME OF TEST	MINUTES	30		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Stack

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
CO2		%	12.7		
O2		%	6.3		
CO		%	0.0		
N2		%	81.0		
%EA	EXCESS AIR @ SAMPLING POINT	%	41.5		
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.28 (30.28)		
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.21 (29.21)		
Cp	PITOT TUBE CALIBRATION		0.825		
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	2.013 (51.100)		
DELTA P ^{^(1/2)}		"H2O	1.419		
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	330 (166)		
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	29.69 (754.00) -0.90		
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	5,725 (29)		
As	STACK AREA	(SQ.INCHES) (SQ.METERS)	28,104 (18)		
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	678,754 (1,153,203)		
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	1,117,318 (1,898,323)		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Stack Inlet from Supplemental ESP (Moisture)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
DATE			09/28/06		
BEGIN TIME			1555		
END TIME			1625		
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.80 (757.00)		
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)		
	DGM CALIBRATION FACTOR		0.985		
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	22.100 (0.626)		
	LEAK CHECK VOLUME	ft.^3	0.000		
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	73 (23)		
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	21.911 (0.620)		
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	32.0		
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	1.510 (0.043)		
%M	MOISTURE IN STACK GAS BY VOLUME	%	6.45		
Md	MOL FRACTION OF DRY GAS		0.9355		
Tt	NET TIME OF TEST	MINUTES	30		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054

JOB NAME: ADA-ES

LOCATION: Bow, New Hampshire

UNIT TESTED: Merrimack Unit No. 2 Stack Inlet from Supplemental ESP (Moisture)

[illegible]

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Stack Inlet from Supplemental ESP (Port D)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
DATE			09/28/06		
BEGIN TIME			1530		
END TIME			1540		
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.80 (757.00)		
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)		
	DGM CALIBRATION FACTOR		0.985		
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	22.100 (0.626)		
	LEAK CHECK VOLUME	ft.^3	0.000		
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	73 (23)		
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	21.911 (0.620)		
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	32.0		
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	1.510 (0.043)		
%M	MOISTURE IN STACK GAS BY VOLUME	%	6.45		
Md	MOL FRACTION OF DRY GAS		0.9355		
Tt	NET TIME OF TEST	MINUTES	10		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Stack Inlet from Supplemental ESP (Port D)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
CO2		%	13.0		
O2		%	5.3		
CO		%	0.0		
N2		%	81.7		
%EA	EXCESS AIR @ SAMPLING POINT	%	32.4		
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.29 (30.29)		
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.50 (29.50)		
Cp	PITOT TUBE CALIBRATION		0.825		
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	1.160 (29.500)		
DELTA P ^{^(1/2)}		"H2O	1.076		
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	334 (168)		
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	30.02 (763.00) 3.00		
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	4,307 (22)		
As	STACK AREA	(SQ.INCHES) (SQ.METERS)	28,800 (19)		
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	539,643 (916,853)		
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	861,355 (1,463,442)		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Stack Inlet from Supplemental ESP (Port B)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
DATE			09/28/06		
BEGIN TIME			1610		
END TIME			1620		
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.80 (757.00)		
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)		
	DGM CALIBRATION FACTOR		0.985		
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	22.100 (0.626)		
	LEAK CHECK VOLUME	ft.^3	0.000		
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	73 (23)		
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	21.911 (0.620)		
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	32.0		
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	1.510 (0.043)		
%M	MOISTURE IN STACK GAS BY VOLUME	%	6.45		
Md	MOL FRACTION OF DRY GAS		0.9355		
Tt	NET TIME OF TEST	MINUTES	10		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Stack Inlet from Supplemental ESP (Port B)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
CO2		%	13.0		
O2		%	5.3		
CO		%	0.0		
N2		%	81.7		
%EA	EXCESS AIR @ SAMPLING POINT	%	32.4		
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.29 (30.29)		
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.50 (29.50)		
Cp	PITOT TUBE CALIBRATION		0.825		
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	0.854 (21.700)		
DELTA P ^{^(1/2)}		"H2O	0.918		
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	333 (167)		
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	30.02 (763.00) 3.00		
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	3,672 (19)		
As	STACK AREA	(SQ. INCHES) (SQ. METERS)	23,400 (15)		
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	374,287 (635,914)		
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	596,709 (1,013,809)		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Stack Inlet from Supplemental ESP (Port C)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
DATE			09/28/06		
BEGIN TIME			1625		
END TIME			1635		
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.80 (757.00)		
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)		
	DGM CALIBRATION FACTOR		0.985		
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	22.100 (0.626)		
	LEAK CHECK VOLUME	ft.^3	0.000		
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	73 (23)		
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	21.911 (0.620)		
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	32.0		
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	1.510 (0.043)		
%M	MOISTURE IN STACK GAS BY VOLUME	%	6.45		
Md	MOL FRACTION OF DRY GAS		0.9355		
Tt	NET TIME OF TEST	MINUTES	10		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Stack Inlet from Supplemental ESP (Port C)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
CO2		%	13.0		
O2		%	5.3		
CO		%	0.0		
N2		%	81.7		
%EA	EXCESS AIR @ SAMPLING POINT	%	32.4		
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.29 (30.29)		
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.50 (29.50)		
Cp	PITOT TUBE CALIBRATION		0.825		
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	0.696 (17.700)		
DELTA P ^{^(1/2)}		"H2O	0.813		
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	332 (167)		
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	30.02 (763.00) 3.00		
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	3,250 (17)		
As	STACK AREA	(SQ.INCHES) (SQ.METERS)	25,200 (16)		
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	357,206 (606,893)		
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m ^{^3} /HR)	568,749 (966,305)		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Stack Inlet from Supplemental ESP (Port A)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
DATE			09/28/06		
BEGIN TIME			1730		
END TIME			1740		
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.80 (757.00)		
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)		
	DGM CALIBRATION FACTOR		0.985		
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	22.100 (0.626)		
	LEAK CHECK VOLUME	ft.^3	0.000		
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	73 (23)		
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	21.911 (0.620)		
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	32.0		
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	1.510 (0.043)		
%M	MOISTURE IN STACK GAS BY VOLUME	%	6.45		
Md	MOL FRACTION OF DRY GAS		0.9355		
Tt	NET TIME OF TEST	MINUTES	10		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Stack Inlet from Supplemental ESP (Port A)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
CO2		%	13.0		
O2		%	5.3		
CO		%	0.0		
N2		%	81.7		
%EA	EXCESS AIR @ SAMPLING POINT	%	32.4		
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.29 (30.29)		
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.50 (29.50)		
Cp	PITOT TUBE CALIBRATION		0.825		
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	0.626 (15.900)		
DELTA P ^{^(1/2)}		"H2O	0.787		
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	332 (167)		
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	30.02 (763.00) 3.00		
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	3,146 (16)		
As	STACK AREA	(SQ. INCHES) (SQ. METERS)	23,400 (15)		
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	321,077 (545,510)		
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	511,235 (868,588)		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Inlet to Supplemental ESP (Moisture)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
DATE			09/29/06		
BEGIN TIME			0822		
END TIME			0852		
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.61 (752.00)		
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)		
	DGM CALIBRATION FACTOR		0.985		
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	21.971 (0.622)		
	LEAK CHECK VOLUME	ft.^3	0.000		
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	65 (18)		
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	21.974 (0.622)		
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	46.9		
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	2.214 (0.063)		
%M	MOISTURE IN STACK GAS BY VOLUME	%	9.15		
Md	MOL FRACTION OF DRY GAS		0.9085		
Tt	NET TIME OF TEST	MINUTES	30		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Inlet to Supplemental ESP (Moisture)

[illegible]

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Mid Duct To Supplemental ESP (Port A)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
DATE			09/29/06		
BEGIN TIME			0940		
END TIME			0950		
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.61 (752.00)		
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)		
	DGM CALIBRATION FACTOR		0.985		
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	21.971 (0.622)		
	LEAK CHECK VOLUME	ft.^3	0.000		
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	65 (18)		
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	21.974 (0.622)		
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	46.9		
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	2.214 (0.063)		
%M	MOISTURE IN STACK GAS BY VOLUME	%	9.15		
Md	MOL FRACTION OF DRY GAS		0.9085		
Tt	NET TIME OF TEST	MINUTES	10		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Mid Duct To Supplemental ESP (Port A)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
CO2		%	14.3		
O2		%	4.7		
CO		%	0.0		
N2		%	81.0		
%EA	EXCESS AIR @ SAMPLING POINT	%	28.0		
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.48 (30.48)		
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.33 (29.33)		
Cp	PITOT TUBE CALIBRATION		0.825		
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	0.594 (15.100)		
DELTA P ^{^(1/2)}		"H2O	0.757		
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	341 (172)		
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	29.88 (759.00) 3.70		
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	3,059 (16)		
As	STACK AREA	(SQ.INCHES) (SQ.METERS)	32,400 (21)		
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	413,145 (701,933)		
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	688,326 (1,169,466)		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Mid Duct To Supplemental ESP (Port B)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
DATE			09/29/06		
BEGIN TIME			0950		
END TIME			0958		
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.61 (752.00)		
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)		
	DGM CALIBRATION FACTOR		0.985		
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	21.971 (0.622)		
	LEAK CHECK VOLUME	ft.^3	0.000		
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	65 (18)		
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	21.974 (0.622)		
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	46.9		
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	2.214 (0.063)		
%M	MOISTURE IN STACK GAS BY VOLUME	%	9.15		
Md	MOL FRACTION OF DRY GAS		0.9085		
Tt	NET TIME OF TEST	MINUTES	8		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Mid Duct To Supplemental ESP (Port B)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
CO2		%	14.3		
O2		%	4.7		
CO		%	0.0		
N2		%	81.0		
%EA	EXCESS AIR @ SAMPLING POINT	%	28.0		
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.48 (30.48)		
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.33 (29.33)		
Cp	PITOT TUBE CALIBRATION		0.825		
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	0.672 (17.100)		
DELTA P ^{^(1/2)}		"H2O	0.808		
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	342 (172)		
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	29.88 (759.00) 3.70		
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	3,267 (17)		
As	STACK AREA	(SQ. INCHES) (SQ. METERS)	34,200 (22)		
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	465,170 (790,324)		
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	776,000 (1,318,424)		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Mid Duct To Supplemental ESP (Port C)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
DATE			09/29/06		
BEGIN TIME			0958		
END TIME			1008		
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.61 (752.00)		
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)		
	DGM CALIBRATION FACTOR		0.985		
V(m)	VOLUME DRY GAS SAMPLED	ft.^3	21.971		
	@ METER CONDITIONS	(m^3)	(0.622)		
	LEAK CHECK VOLUME	ft.^3	0.000		
T(m)	AVERAGE GAS METER	DEG.F	65		
	TEMPERATURE	(DEG.C)	(18)		
V(m[std])*	VOLUME DRY GAS SAMPLED	DSCF	21.974		
	@ STANDARD CONDITIONS*	(DSCM)	(0.622)		
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	46.9		
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	2.214 (0.063)		
%M	MOISTURE IN STACK GAS BY VOLUME	%	9.15		
Md	MOL FRACTION OF DRY GAS		0.9085		
Tt	NET TIME OF TEST	MINUTES	10		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Mid Duct To Supplemental ESP (Port C)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
CO2		%	14.3		
O2		%	4.7		
CO		%	0.0		
N2		%	81.0		
%EA	EXCESS AIR @ SAMPLING POINT	%	28.0		
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.48 (30.48)		
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.33 (29.33)		
Cp	PITOT TUBE CALIBRATION		0.825		
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	0.672 (17.100)		
DELTA P ^{^(1/2)}		"H2O	0.815		
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	340 (171)		
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	29.88 (759.00) 3.70		
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	3,292 (17)		
As	STACK AREA	(SQ.INCHES) (SQ.METERS)	36,000 (23)		
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	494,633 (840,381)		
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	822,891 (1,398,092)		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Mid Duct To Supplemental ESP (Port D)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
DATE			09/29/06		
BEGIN TIME			1008		
END TIME			1018		
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.61 (752.00)		
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)		
	DGM CALIBRATION FACTOR		0.985		
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	21.971 (0.622)		
	LEAK CHECK VOLUME	ft.^3	0.000		
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	65 (18)		
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	21.974 (0.622)		
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	46.9		
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	2.214 (0.063)		
%M	MOISTURE IN STACK GAS BY VOLUME	%	9.15		
Md	MOL FRACTION OF DRY GAS		0.9085		
Tt	NET TIME OF TEST	MINUTES	10		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Mid Duct To Supplemental ESP (Port D)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
CO2		%	14.3		
O2		%	4.7		
CO		%	0.0		
N2		%	81.0		
%EA	EXCESS AIR @ SAMPLING POINT	%	28.0		
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.48 (30.48)		
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.33 (29.33)		
Cp	PITOT TUBE CALIBRATION		0.825		
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	0.828 (21.000)		
DELTA P ^{^(1/2)}		"H2O	0.906		
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	335 (168)		
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	29.88 (759.00) 3.70		
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	3,648 (19)		
As	STACK AREA	(SQ.INCHES) (SQ.METERS)	43,200 (28)		
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	661,884 (1,124,541)		
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	1,094,291 (1,859,200)		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Outlet from Original ESP (Flow Rate)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER	
			1	
DATE			09/29/06	
BEGIN TIME			1120	
END TIME			1150	
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.61 (752.00)	
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)	
	DGM CALIBRATION FACTOR		0.985	
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	21.971 (0.622)	
	LEAK CHECK VOLUME	ft.^3	0.000	
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	65 (18)	
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	21.974 (0.622)	
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	46.9	
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	2.214 (0.063)	
%M	MOISTURE IN STACK GAS BY VOLUME	%	9.15	
Md	MOL FRACTION OF DRY GAS		0.9085	
Tt	NET TIME OF TEST	MINUTES	30	

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Outlet from Original ESP (Flow Rate)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
CO2		%	14.3		
O2		%	4.7		
CO		%	0.0		
N2		%	81.0		
%EA	EXCESS AIR @ SAMPLING POINT	%	28.0		
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.48 (30.48)		
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.33 (29.33)		
Cp	PITOT TUBE CALIBRATION		0.825		
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	0.072 (1.800)		
DELTA P ^{^(1/2)}		"H2O	0.260		
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	334 (168)		
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	29.85 (758.00) 3.20		
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	1,047 (5)		
As	STACK AREA	(SQ.INCHES) (SQ.METERS)	320,400 (207)		
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	1,409,266 (2,394,343)		
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	2,328,796 (3,956,624)		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Inlet A to Original ESP

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
DATE			09/29/06		
BEGIN TIME			1723		
END TIME			1800		
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.54 (750.00)		
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)		
	DGM CALIBRATION FACTOR		0.985		
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS LEAK CHECK VOLUME	ft.^3 (m^3) ft.^3	22.623 (0.641) 0.000		
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	80 (27)		
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	21.946 (0.621)		
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	24.6		
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	1.161 (0.033)		
%M	MOISTURE IN STACK GAS BY VOLUME	%	5.02		
Md	MOL FRACTION OF DRY GAS		0.9498		
Tt	NET TIME OF TEST	MINUTES	37		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Inlet A to Original ESP

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
CO2		%	8.9		
O2		%	11.1		
CO		%	0.0		
N2		%	80.0		
%EA	EXCESS AIR @ SAMPLING POINT	%	109.9		
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.87 (29.87)		
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.27 (29.27)		
Cp	PITOT TUBE CALIBRATION		0.825		
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	0.452 (11.500)		
DELTA P ^{^(1/2)}		"H2O	0.658		
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	344 (173)		
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	29.97 (761.00) 5.90		
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	2,663 (14)		
As	STACK AREA	(SQ.INCHES) (SQ.METERS)	30,856 (20)		
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	357,832 (607,957)		
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	570,588 (969,429)		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Inlet B to Original ESP

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER	
			1	
DATE			09/29/06	
BEGIN TIME			1805	
END TIME			1835	
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.54 (750.00)	
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)	
	DGM CALIBRATION FACTOR		0.985	
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS LEAK CHECK VOLUME	ft.^3 (m^3) ft.^3	22.623 (0.641) 0.000	
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	80 (27)	
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	21.946 (0.621)	
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	24.6	
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	1.161 (0.033)	
%M	MOISTURE IN STACK GAS BY VOLUME	%	5.02	
Md	MOL FRACTION OF DRY GAS		0.9498	
Tt	NET TIME OF TEST	MINUTES	30	

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Inlet B to Original ESP

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
CO2		%	8.9		
O2		%	11.1		
CO		%	0.0		
N2		%	80.0		
%EA	EXCESS AIR @ SAMPLING POINT	%	109.9		
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.87 (29.87)		
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.27 (29.27)		
Cp	PITOT TUBE CALIBRATION		0.825		
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	0.471 (12.000)		
DELTA P ^{^(1/2)}		"H2O	0.677		
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	345 (174)		
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	29.97 (761.00) 5.80		
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	2,741 (14)		
As	STACK AREA	(SQ.INCHES) (SQ.METERS)	30,856 (20)		
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	367,855 (624,986)		
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	587,429 (998,042)		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Inlet to Supplemental ESP (Flow Rate)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
DATE			09/29/06		
BEGIN TIME			1833		
END TIME			1903		
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.61 (752.00)		
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)		
	DGM CALIBRATION FACTOR		0.985		
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	21.971 (0.622)		
	LEAK CHECK VOLUME	ft.^3	0.000		
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	65 (18)		
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	21.974 (0.622)		
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	46.9		
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	2.214 (0.063)		
%M	MOISTURE IN STACK GAS BY VOLUME	%	9.15		
Md	MOL FRACTION OF DRY GAS		0.9085		
Tt	NET TIME OF TEST	MINUTES	30		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Inlet to Supplemental ESP (Flow Rate)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
CO2		%	14.3		
O2		%	4.7		
CO		%	0.0		
N2		%	81.0		
%EA	EXCESS AIR @ SAMPLING POINT	%	28.0		
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.48 (30.48)		
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.33 (29.33)		
Cp	PITOT TUBE CALIBRATION		0.825		
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	0.984 (25.000)		
DELTA P ^{^(1/2)}		"H2O	0.963		
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	335 (168)		
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	29.87 (759.00) 3.50		
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	3,878 (20)		
As	STACK AREA	(SQ.INCHES) (SQ.METERS)	43,200 (28)		
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	703,379 (1,195,041)		
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	1,163,332 (1,976,501)		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

Appendix C:

Calibration Data

Appendix C

Table 6: Calibration Data

Pre-Test:

<u>Equipment</u>	<u>Calibration Factor</u>	<u>Calibration Date</u>
Dry Gas Meter 1-1	0.985	09/19/06
Digital Temperature Indicator 2-1		09/19/06
Dry Gas Meter 2-1 Orifice		09/19/06
Pitot Tube 1-1	0.825	09/20/06
Barometer 1	NIST Traceable	09/10/06

Post-Test:

<u>Equipment</u>	<u>Calibration Factor</u>	<u>Calibration Date</u>
Dry Gas Meter 1-1	0.989	10/27/06
Pitot Tube 1-1	0.823	11/06/06
Barometer 1	NIST Traceable	10/13/06

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-1
Date Calibration Performed: 09/19/06

ΔH Setting (" H ₂ O)	C _{DG}
0.50	0.984
1.00	0.986
1.50	0.985
2.00	0.987
3.00	0.984
4.00	0.983
Average	0.985

Variation +: 0.20%
Variation -: -0.20%

Certified by: Gary B. Goldman 09/19/06

Calibrator (Signature / Date)

Bill Hefley 09/19/06

QA Officer (Signature / Date)

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-1
Date Calibration Performed: 09/19/06

Run 1 at 0.5" ΔH Pb = 29.80 " Hg
Wet Test Meter C_f = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0								Dry Gas Meter					
Meter								Temperature					
	Time	Reading		Temp.	P _m			Reading	In	Out	P _m		
End	13:27	5.238	cf	83 °F	-0.1	" H ₂ O		913.384	cf	82 °F	83 °F	0.50	" H ₂ O
Start	13:14	0.000	cf	83 °F	-0.1	" H ₂ O		907.982	cf	82 °F	81 °F	0.50	" H ₂ O
Average		5.238	cf	83 °F	-0.1	" H ₂ O		5.402	cf	82 °F	82 °F	0.50	" H ₂ O

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{5.164} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{5.249} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{0.984}$$

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-1
Date Calibration Performed: 09/19/06

Run 1 at 1.0" ΔH Pb = 29.80 " Hg
Wet Test Meter Cf = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0

Meter						
Time	Reading		Temp.		P _m	
End 13:40	5.015	cf	83	°F	-0.4	" H ₂ O
Start 13:31	0.000	cf	83	°F	-0.4	" H ₂ O
Average	5.015	cf	83	°F	-0.4	" H ₂ O

Dry Gas Meter

Meter		Temperature					
Reading		In	Out		P _m		
918.875	cf	86	°F	83	°F	1.00	" H ₂ O
913.712	cf	83	°F	82	°F	1.00	" H ₂ O
5.163	cf	85	°F	83	°F	1.00	" H ₂ O

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{4.940} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{5.009} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{0.986}$$

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-1
Date Calibration Performed: 09/19/06

Run 1 at 1.5" ΔH Pb = 29.80 " Hg
Wet Test Meter Cf = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0							Dry Gas Meter						
Meter							Temperature						
	Time	Reading	Temp.		P _m		Reading	In	Out		P _m		
End	14:00	10.038	cf	83	°F	-0.6	" H ₂ O	91	°F	84	°F	1.50	" H ₂ O
Start	13:45	0.000	cf	83	°F	-0.6	" H ₂ O	86	°F	83	°F	1.50	" H ₂ O
Average		10.038	cf	83	°F	-0.6	" H ₂ O	89	°F	84	°F	1.50	" H ₂ O

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{9.884} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{10.034} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{0.985}$$

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-1
Date Calibration Performed: 09/19/06

Run 1 at 2.0" ΔH Pb = 29.80 " Hg
Wet Test Meter Cf = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0

	Meter					
	Time	Reading	Temp.		P _m	
End	14:16	10.020	cf	83 °F	-0.7	" H ₂ O
Start	14:03	0.000	cf	83 °F	-0.7	" H ₂ O
Average		10.020	cf	83 °F	-0.7	" H ₂ O

Dry Gas Meter

	Meter		Temperature				P _m	
	Reading		In	Out				
	940.927	cf	94 °F	86 °F			2.00	" H ₂ O
	930.552	cf	90 °F	85 °F			2.00	" H ₂ O
	10.375	cf	92 °F	86 °F			2.00	" H ₂ O

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{9.863} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{9.993} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{0.987}$$

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-1
Date Calibration Performed: 09/19/06

Run 1 at 3.0" ΔH Pb = 29.80 " Hg
Wet Test Meter C_f = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0							Dry Gas Meter						
Meter							Temperature						
	Time	Reading		Temp.	P _m			Reading	In	Out	P _m		
End	14:29	10.407	cf	84 °F	-1.0	" H ₂ O		952.083	cf	97 °F	87 °F	3.00	" H ₂ O
Start	14:18	0.000	cf	84 °F	-1.0	" H ₂ O		941.298	cf	92 °F	86 °F	3.00	" H ₂ O
Average		10.407	cf	84 °F	-1.0	" H ₂ O		10.785	cf	95 °F	87 °F	3.00	" H ₂ O

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{10.218} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{10.381} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{0.984}$$

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-1
Date Calibration Performed: 09/19/06

Run 1 at 4.0" ΔH Pb = 29.80 " Hg
Wet Test Meter Cf = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0							Dry Gas Meter						
Meter							Temperature						
	Time	Reading		Temp.	P _m			Reading	In	Out	P _m		
End	14:42	10.864	cf	84 °F	-1.3	" H ₂ O		963.826	cf	98 °F	88 °F	4.00	" H ₂ O
Start	14:32	0.000	cf	84 °F	-1.3	" H ₂ O		952.552	cf	87 °F	96 °F	4.00	" H ₂ O
Average		10.864	cf	84 °F	-1.3	" H ₂ O		11.274	cf	93 °F	92 °F	4.00	" H ₂ O

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{10.659} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{10.843} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{0.983}$$

Calibration Data
Digital Temperature Indicator Calibration

DTI Unit No. ASAI 1-1
Date Calibration Performed: 09/19/06

Reference Point	Time	ASTM	DTI
		Reference Thermometer (°F)	(°F)
Ice Bath	11:43	33° F	32° F
Ambient Air	11:39	82° F	82° F
Boiling Water	12:10	210° F	210° F
Oven	11:55	251° F	252° F
Oven	11:58	298° F	299° F
Oven	12:08	348° F	348° F
Oven	12:02	389° F	389° F

Meter Adjusted? No

ASTM Reference Thermometer:	SN: 5963	Range: +18+89°F
	SN: 1853	Range: +205+310°F
	SN: 992	Range: +295+400°F

Certified by: Gary B. Goldman 09/19/06
Calibrator (Signature / Date)

Bill Hefley 09/19/06
QA Officer (Signature / Date)

Orifice Curve ASAI 1-1 09/19/06

CALIBRATION DATA PITOT TUBE CALIBRATION DATA

Date: 09/20/06
I.D. # ASAI 1-1
C_{pstd}: 0.990

Time: 10:20
T_s: 78 °F
Pb: 29.73 " Hg

fps Mark	Desired Calibration Standard	Calibration Standard		√ Standard Average	High	√ High	Cal. Factor	Low	√ Low	Cal. Factor
Start	End									
20	0.09	0.09	0.09	0.300	0.13	0.361	0.824	0.13	0.361	0.824
30	0.20	0.20	0.20	0.447	0.29	0.539	0.822	0.29	0.539	0.822
40	0.36	0.36	0.36	0.600	0.52	0.721	0.824	0.52	0.721	0.824
50	0.56	0.56	0.56	0.748	0.80	0.894	0.828	0.80	0.894	0.828
60	0.80	0.80	0.80	0.894	1.15	1.072	0.826	1.15	1.072	0.826
70	1.09	1.10	1.10	1.049	1.60	1.265	0.821	1.60	1.265	0.821
80	1.43	1.40	1.40	1.183	2.00	1.414	0.828	2.00	1.414	0.828
90	1.81	1.80	1.80	1.342	2.60	1.612	0.824	2.60	1.612	0.824
50	0.56	0.56	0.56	0.748	0.80	0.894	0.828	0.80	0.894	0.828
50	0.56	0.56	0.56	0.748	0.80	0.894	0.828	0.80	0.894	0.828
Average							0.825			0.825

Summary of Results:

Normal high side calibration factor: 0.825
variation +: 0.36%
variation -: -0.48%
Normal low side calibration factor: 0.825
variation +: 0.36%
variation -: -0.48%

Certification:

I certify that the Type S pitot tube, the standard type pitot tube, and the calibration setup meet or exceed all specifications, criteria and/or applicable design features and hereby assign a pitot tube calibration factor C_p of: 0.825

Certified by: Patrick Selakovich 09/20/06
Calibrator (Signature/Date)

Bill Hefley 09/20/06
QA Officer (Signature/Date)

Calibration Data

Barometer Calibration Data

Date:	<u>09/10/2006</u>	Time:	<u>1310</u>
I.D. #:	<u>ASAI - 1</u>	Temperature:	<u>94</u>

Mercury Barometer ASAI - 0 Reading:	29.65" Hg
Aneroid Barometer Reading:	29.71" Hg
Difference:	0.06" Hg
Barometer Adjusted?	YES

Certified by:	<u>Billy J. Mullins, Jr. 09/10/06</u>	<u>Bill Hefley 09/10/06</u>
	Calibrator (Signature/Date)	QA Officer (Signature/Date)

Post-test Calibration Data:

METHOD 5 DRY GAS METER CALIBRATION USING CRITICAL ORIFICES

ENVIRONMENTAL SUPPLY COMPANY

- 1) Select three critical orifices to calibrate the dry gas meter which bracket the expected operating range.
- 2) Record barometric pressure before and after calibration procedure.
- 3) Run at tested vacuum (from Orifice Calibration Report), for a period of time necessary to achieve a minimum total volume of 5 cubic feet.
- 4) Record data and information in the GREEN cells, YELLOW cells are calculated.

ASAI 1-1 10-27-2006

DATE: 10/27/2006		METER SERIAL #: 1508		CRITICAL ORIFICE SET SERIAL #: 1426s		INITIAL		FINAL		AVG (P _{bar})		IF Y VARIATION EXCEEDS 2.00%, ORIFICE SHOULD BE RECALIBRATED							
METER PART #: C-5000-SO						BAROMETRIC PRESSURE (in Hg):		29.56		29.56									
ORIFICE #	RUN #	K' FACTOR (AVG)	TESTED VACUUM (in Hg)	DGM READINGS (FT ³)		TEMPERATURES °F				ELAPSED TIME (MIN)	DGM ΔH (in H ₂ O)	(1) V _m (STD)	(2) V _{cr} (STD)	(3) Y	VARIATION (%)	ΔH _e			
				INITIAL	FINAL	AMBIENT	DGM INLET	DGM INLET	DGM OUTLET								DGM OUTLET	DGM AVG	
24	1	0.6583	15	28.204	33.360	64	67	67	66	66	66.5	2.35	5.1393	5.1020	0.993		1.82		
	2	0.6583	15	33.360	38.525	64	67	68	66	66	66.75	2.35	5.1458	5.1020	0.991		1.82		
	3	0.6583	15	38.525	43.693	64	68	68	66	67	67.25	2.35	5.1439	5.1020	0.992		1.82		
												AVG =		0.992		0.32			
19	1	0.5066	18	11.903	17.241	64	69	68	65	66	67	1.40	5.3032	5.2351	0.987		1.83		
	2	0.5066	18	17.241	22.590	64	68	67	66	66	66.75	1.40	5.3166	5.2351	0.985		1.83		
	3	0.5066	18	22.590	27.934	64	67	67	66	66	66.5	1.40	5.3142	5.2351	0.985		1.83		
												AVG =		0.986		-0.32			
	1										0								
	2										0								
	3										0								
												AVG =							

USING THE CRITICAL ORIFICES AS CALIBRATION STANDARDS:

The following equations are used to calculate the standard volumes of air passed through the DGM, V_m (std), and the critical orifice, V_{cr} (std), and the DGM calibration factor, Y. These equations are automatically calculated in the spreadsheet above.

$$(1) \quad V_{m(std)} = K_1 * V_m * \frac{P_{bar} + (\Delta H / 13.6)}{T_m} = \text{Net volume of gas sample passed through DGM, corrected to standard conditions}$$

K₁ = 17.64 °R/in. Hg (English), 0.3858 °K/mm Hg (Metric)

T_m = Absolute DGM avg. temperature (°R - English, °K - Metric)

$$(2) \quad V_{cr(std)} = K' * \frac{P_{bar} * \Theta}{\sqrt{T_{amb}}} = \text{Volume of gas sample passed through the critical orifice, corrected to standard conditions}$$

T_{amb} = Absolute ambient temperature (°R - English, °K - Metric)

K' = Average K' factor from Critical Orifice Calibration

= DGM calibration factor

$$(3) \quad Y = \frac{V_{cr(std)}}{V_{m(std)}} = \text{DGM calibration factor}$$

AVERAGE DRY GAS METER CALIBRATION FACTOR, Y = **0.989**

AVERAGE ΔH_e = **1.82**

$$\Delta H_e = \left(\frac{0.75 \theta}{V_{cr(std)}} \right)^2 \Delta H \left(\frac{V_{m(std)}}{V_m} \right)$$

**CALIBRATION DATA
PITOT TUBE CALIBRATION DATA**

Date: 11/06/06
I.D. # ASAI 1-1
C_{pstd}: 0.990

Time: 14:40
T_s: 70 °F
Pb: 29.62 " Hg

fps Mark	Desired Calibration Standard	Calibration Standard		v Standard Average	High	v High	Cal. Factor	Low	v Low	Cal. Factor
		Start	End							
20	0.09	0.09	0.09	0.300	0.13	0.361	0.824	0.13	0.361	0.824
30	0.20	0.20	0.20	0.447	0.29	0.539	0.822	0.29	0.539	0.822
40	0.36	0.36	0.36	0.600	0.52	0.721	0.824	0.52	0.721	0.824
50	0.56	0.56	0.56	0.748	0.82	0.906	0.818	0.81	0.900	0.823
60	0.81	0.80	0.80	0.894	1.15	1.072	0.826	1.15	1.072	0.826
70	1.10	1.10	1.10	1.049	1.60	1.265	0.821	1.60	1.265	0.821
80	1.44	1.40	1.40	1.183	2.00	1.414	0.828	2.00	1.414	0.828
90	1.83	1.80	1.80	1.342	2.60	1.612	0.824	2.60	1.612	0.824
50	0.56	0.56	0.56	0.748	0.82	0.906	0.818	0.81	0.900	0.823
50	0.56	0.56	0.56	0.748	0.82	0.906	0.818	0.81	0.900	0.823
Average							0.823			0.824

Summary of Results:

Normal high side calibration factor: 0.823
variation +: 0.61%
variation -: -0.61%
Normal low side calibration factor: 0.824
variation +: 0.49%
variation -: -0.36%

Certification:

I certify that the Type S pitot tube, the standard type pitot tube, and the calibration setup meet or exceed all specifications, criteria and/or applicable design features and hereby assign a pitot tube calibration factor C_p of: 0.823

Certified by:

Patrick Selakovich 11/06/06

Calibrator (Signature/Date)

Bill Hefley 11/06/06

QA Officer (Signature/Date)

Calibration Data
Barometer Calibration Data

Date:	10/13/2006	Time:	1640
I.D. #:	ASAI – 1	Temperature:	73

Mercury Barometer ASAI – 0 Reading:	29.74" Hg
Aneroid Barometer Reading:	29.71" Hg
Difference:	0.03" Hg
Barometer Adjusted?	YES

Certified by:	<u>Bill Hefley 10/13/06</u>	<u>Billy J. Mallins, Jr. 10/13/06</u>
	Calibrator (Signature/Date)	QA Officer (Signature/Date)

Appendix D:
EPA Test Methods 2, 3, and 4 Field Data

06-054

Job Number

ADA-ES

Job Name

UNIT NO. 2 STACK

Run Number

9/28/06

Unit

GOWAN/JACKSON

Date

Meter Box No. (1-1)

Operator

Sample Box No. 1-1

P_m

Moisture / Velocity Field Data

Read and record at the start of each test point.

Purge to:

Purge time:

Pilot Leak Check Initial

Final

Ambient Temp. °F

Assumed Moisture %

Probe Length

C Factor

Initial Leak @ 15.0" Hg = 0.002 cfm

Final Leak @ 3.5" Hg = 0.000 cfm

T_m

Point	Clock Time	Dry Gas Meter, CF	"Pilot" H ₂ O	Orifice ΔH H ₂ O Desired	Orifice ΔH H ₂ O Actual	Pump Vacuum "Hg Gauge	Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Remarks
D2	1109	61.136	1.95	2.00	2.00	0.50	328	259	260	60	63	61	C3 1109-
	1114	65.00	2.00	2.00	2.00	0.50	330	264	258	60	64	61	C2
	1119	68.935	2.00	2.00	2.00	0.50	330	266	258	56	66	61	C1
	1124	72.700	—	2.00	2.00	0.50	—	267	258	55	67	62	
	1129	76.47	2.00	2.00	2.00	0.50	326	267	256	56	69	63	B3
	1134	80.315	2.00	2.00	2.00	0.50	330	269	260	58	69	63	B2
	1139	84.172	2.00	—	—	—	334	—	—	—	—	—	B1
	END		—				—						
			2.05				331						A3
			2.00				332						A2
			2.00				332						A1
			—				—						
			2.00				329						D3
			2.10				331						D2
			2.05				332						D1
	1148		—				—						
	END												

Pilot Tube Calibration Factor C, 0.825

Volume Collected V_m 22.690 ft³Water Collected V_w 46.4 mlTime of Test T_i 30 min.Stack Pressure P_s -0.90 "H₂O

Pilot Tube No. 1-1

Baro. Press. P_b 29.76 "HgProbe Tip Dia. D_p — in.% CO₂ 6.7 % CO 0.0% O₂ 6.3 % N₂ 81.0Area Stack A_s 28104 in²

Barometer No. 1

Total Volume of Leak Checks After Start: 0.000 ft³V_m X Dry Gas Meter Calibration Factor 0.985 X 23.036[Dry Gas Meter Reading — ft³ - (T_i — min. X Leak Rate — cfm)]

Barometer No. 1

Probe Tip No. NA

Total Volume of Leak Checks After Start: 0.000 ft³V_m X Dry Gas Meter Calibration Factor 0.985 X 23.036[Dry Gas Meter Reading — ft³ - (T_i — min. X Leak Rate — cfm)]

PRELIMINARY VELOCITY TRAVERSE DATA
AND
SAMPLING LOCATION DATA

Job Number 06-054

Job Name ADA-ES

Sampling Location UNIT NO. 2 STACK

Date 9/26/06 Time 1109-1148

Stack Height 317 ft.

Sampling Port Height Above Ground 272' 11" ft.

	Port A	Port B	Port C	Port D	Average
Port & Inside Diameter (in.)	237.665	236.915	219.54	222.79	229.2275
Port & Wall Thickness (in.)	49.75	46.5	31.625	32.375	40.0625
Inside Stack Diameter (in.)	187.915	190.415	187.915	190.415	189.165

Sampling Ports are 157 ft. 3 in.

9.98 stack diameters) downstream from disturbance
(inlet, constriction, bend, expansion)

Sampling Ports are 84 ft. 1 in.

5.33 stack diameters) upstream from disturbance
(outlet, constriction, bend, expansion)

Point Number	Percent Diameter	Distance from Ref. Point (decimal in.)	Distance from Ref. Point (fractional in.)	Port A $\Delta P/T/\alpha$	Port B $\Delta P/T/\alpha$	Port C $\Delta P/T/\alpha$	Port D $\Delta P/T/\alpha$
1	4.4	8.323	8 5/16	2.00332+7	2.001331-3	2.008301 0	2.058321 0
2	14.6	27.618	27 5/8	2.003321 0	2.003301+3	2.001281 5	2.101331+7
3	29.6	55.993	56	2.058391+5	2.003361+5	1.958241-2	2.003291+3
4				1 1	1 1	1 1	1 1
5				1 1	1 1	1 1	1 1
6	3.2	6.053	6 1/4	1 1	1 1	1 1	1 1
7	10.5	19.862	19 7/8	1 1	1 1	1 1	1 1
8	19.4	36.698	36 11/16	1 1	1 1	1 1	1 1
9	32.3	61.100	61 1/8	1 1	1 1	1 1	1 1
10				1 1	1 1	1 1	1 1
11				1 1	1 1	1 1	1 1
12				1 1	1 1	1 1	1 1
13				1 1	1 1	1 1	1 1
14				1 1	1 1	1 1	1 1
15				1 1	1 1	1 1	1 1
16				1 1	1 1	1 1	1 1
17				1 1	1 1	1 1	1 1
18				1 1	1 1	1 1	1 1
19				1 1	1 1	1 1	1 1
20				1 1	1 1	1 1	1 1
21				1 1	1 1	1 1	1 1
22				1 1	1 1	1 1	1 1
23				1 1	1 1	1 1	1 1
24				1 1	1 1	1 1	1 1

Pitot Tube No. 1-1

$C_p = 0.825$
 $P_b = 29.76$ "Hg
 $P_s = -0.90$ "H₂O 29.69 "Hg
 $A_s = 28.04$ in.²

Average ΔP 2.013 ✓
 Average $\Delta P^{1/2}$ 1.419 ✓
 Average T_x 330 °F ✓
 Average α 3.33 degrees ✓

$$C = 2\pi r$$

$$r = \frac{C}{2\pi}$$

$$r = 134.645$$

Outside
Circumference

AB	211 1/2
BC	211 1/2
CD	211 1/2
DA	211 1/2

846

	PORT		
33 A	39 1/4	6 1/4	16 3/4
29.825 B	36 1/8	6 1/4	16 8/8
14.5 C	19 7/8	5 3/8	17 1/8
15.875 D	22 8/8	6 3/4	16 1/2

AC	39.25	29.5625
	19.875	
BD	36.125	29.375
	22.625

A	B	C	D
36.125	19.875	22.625	
16.625	17.125	16.5	
- 6.25	- 5.375	6.75	
10.375	11.75	9.75	
+ 36.125	+ 19.875	+ 22.625	
46.5	31.625	32.375	10.540

$$269.29 - (2 \cdot 29.5625) = 362.89$$

$$423 - (2 \cdot 29.375) = 364.25$$

$$\bar{X} = 364.06$$

$$AC (49.75 + 31.625) = 187.915$$

$$BD (46.5 + 32.375) = 190.415$$

$$OD = 269.29 \times 189.165 = 50952.9$$

$$A_s = \pi r^2$$

$$= \pi \left(\frac{189.165}{2} \right)^2$$

$$= 20104 \text{ in}^2$$

Impinger Box No. 1-1

Impinger 1	Final Weight	<u>785.8</u>	<u>Water Weight Gain</u> 9/20/06	Impinger 1	<u>26.0</u>
	Initial Weight	<u>759.8</u>			
	Increase	26.0			
Impinger 2	Final Weight	<u>761.6</u>	9/20/06	Impinger 2	<u>1.6</u>
	Initial Weight	<u>760.0</u>			
	Increase	1.6			
Impinger 3	Final Weight	<u>633.0</u>	$V_w =$ $g SO_2 =$ $V_w =$	Impinger 3	<u>0.2</u>
	Initial Weight	<u>632.8</u>			
	Increase	0.2			
Impinger 4	Final Weight	<u>980.7</u>		Impinger 4	<u>4.2</u>
	Initial Weight	<u>976.5</u>			
	Increase	4.2			
Total					<u>32.0</u> = V_w

Impinger 5	Final Weight	_____	$P_b =$ <u>29.80</u> ✓	$\%CO_2 =$ <u>13.0</u> ✓
	Initial Weight	_____	$V_m =$ <u>22.100</u> ✓	$\%O_2 =$ <u>5.3</u> ✓
	Increase	_____	$V_w =$ <u>32.0</u> ✓	$\%CO =$ <u>0.0</u> ✓
Impinger 6	Final Weight	_____	$P_m =$ <u>1.900</u> ✓	$\%N_2 =$ <u>81.7</u> ✓
	Initial Weight	_____	Avg $\Delta P =$ _____	$A_n =$ _____
	Increase	_____	Avg $\sqrt{\Delta P} =$ _____	$D_n =$ _____
Impinger 7	Final Weight	_____	$C_p =$ <u>0.825</u>	$T_i =$ <u>30</u> ✓
	Initial Weight	_____	$P_s =$ _____	
	Increase	_____	$T_m =$ <u>73</u> ✓ °F	$T_s =$ _____ °F

Moisture Content: $\%M =$ 6.45 ✓ $M_d =$ 0.9355 ✓ $MW_c =$ 30292 ✓ $MW =$ 29.50 ✓

$$Vm_{std} = 17.65 Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460} \right] = 17.65 \times 22.100 \left[\frac{29.80 + \frac{1.900}{13.6}}{73 + 460} \right] = \frac{24.911}{0.730} \frac{sft^3}{scfm}$$

$$V_{w_{gas}} = 0.0472 \times V_w = 0.0472 \times 32.0 = 1.510 \text{ sft}^3$$

$$\% \text{ Moisture} = \frac{V_{w_{gas}}}{Vm_{std} + V_{w_{gas}}} \times 100 = \frac{1.510}{24.911 + 1.510} \times 100 = 6.45\% \text{ ✓}$$

$$V_s = 5123.8 \times 0.825 \times \frac{1}{x} \times \frac{1}{x} = \text{_____ tpm}$$

$$\%I = \frac{1.039 \times x}{x \times x \times x \times x} = \text{_____ \%}$$

ACFM: _____

SCFM: _____

$\%EA:$ 32.4 ✓

PRELIMINARY VELOCITY TRAVERSE DATA
AND
SAMPLING LOCATION DATA

Job Number 06-054

Job Name ADA-ES

Sampling Location STACK INLET

Date 9/26/06 Time 1530 - 1736
9/28/06

Stack Height _____ ft.

Sampling Port Height Above Ground _____ ft.

	Port A	Port B	Port C	Port D	Average
Port & Inside Diameter (in.)					
Port & Wall Thickness (in.)	<u>30 3/8</u>	<u>30 1/2</u>	<u>28 1/4</u>	<u>19 3/8</u>	
Inside Stack Diameter (in.)	<u>300</u>	<u>300</u>	<u>300</u>	<u>300</u>	

Sampling Ports are _____ ft. _____ in.

(_____ stack diameters) downstream from disturbance
(inlet, constriction, bend, expansion)

Sampling Ports are _____ ft. _____ in.

(_____ stack diameters) upstream from disturbance
(outlet, constriction, bend, expansion)

Point Number	Percent Diameter	Distance from Ref. Point (decimal in.)	Distance from Ref. Point (fractional in.)	1730 Port A $\Delta P/T, \alpha$	1610 Port B $\Delta P/T, \alpha$	1625 Port C $\Delta P/T, \alpha$	1530 Port D $\Delta P/T, \alpha$
1		30		0.75 B37 10	1.25 B35 10	1.40 B36 15	0.99 B31 B
2		90		0.74 B36 15	0.83 B36 15	0.85 B35 15	1.25 B36 18
3		150		0.65 B34 15	0.71 B35 10	0.54 B39 20	1.30 B37 10
4		210		0.40 B32 20	0.71 B33 15	0.59 B32 20	1.10 B32 15
5		270		0.59 B20 15	0.77 B25 8	0.50 B22 10	X 1 1
6				1 1	1 1	1 1	1 1
7				1 1	1 1	1 1	1 1
8				1 1	1 1	1 1	1 1
9				1 1	1 1	1 1	1 1
10				1 1	1 1	1 1	1 1
11				1 1	1 1	1 1	1 1
12				1 1	1 1	1 1	1 1
13				1 1	1 1	1 1	1 1
14				1 1	1 1	1 1	1 1
15				1 1	1 1	1 1	1 1
16				1 1	1 1	1 1	1 1
17				1 1	1 1	1 1	1 1
18				1 1	1 1	1 1	1 1
19				1 1	1 1	1 1	1 1
20				1 1	1 1	1 1	1 1
21				1 1	1 1	1 1	1 1
22				1 1	1 1	1 1	1 1
23				1 1	1 1	1 1	1 1
24				1 1	1 1	1 1	1 1

Pitot Tube No. 1-1

$C_p =$ 0.825

$P_b =$ 29.80 "Hg

$P_a =$ +3.00 "H₂O 30.02 "Hg

$A_s =$ _____ in.²

Average ΔP 0.817

Average $\Delta P^{1/2}$ 0.889

Average T_x 333 °F

Average α 12 degrees

X = unable to mark point

ports located
in transition
zone
depth = 25' for
all

Impinger Box No. 1-1

Impinger 1	Final Weight	<u>823.1</u>
	Initial Weight	<u>785.8</u>
	Increase	<u>37.3</u>
Impinger 2	Final Weight	<u>764.0</u>
	Initial Weight	<u>761.3</u>
	Increase	<u>2.7</u>
Impinger 3	Final Weight	<u>634.1</u>
	Initial Weight	<u>633.0</u>
	Increase	<u>1.1</u>
Impinger 4	Final Weight	<u>986.1</u>
	Initial Weight	<u>980.3</u>
	Increase	<u>5.8</u>

Water Weight Gain

Impinger 1	<u>37.3</u>
Impinger 2	<u>2.7</u>
Impinger 3	<u>1.1</u>
Impinger 4	<u>5.8</u>
Impinger 5	_____
Impinger 6	_____
Impinger 7	_____
Total	<u>46.9</u> = V_w

Impinger 5	Final Weight	_____
	Initial Weight	_____
	Increase	_____
Impinger 6	Final Weight	_____
	Initial Weight	_____
	Increase	_____
Impinger 7	Final Weight	_____
	Initial Weight	_____
	Increase	_____

$V_w =$ _____
 $g SO_2 =$ _____
 $V_w =$ _____

$P_b =$ <u>29.61</u> ✓	%CO ₂ = <u>14.3</u> ✓
$V_m =$ <u>21.971</u> ✓	%O ₂ = <u>4.7</u> ✓
$V_w =$ <u>46.9</u> ✓	%CO = <u>0.0</u> ✓
$P_m =$ <u>1.900</u> ✓	%N ₂ = <u>81.0</u> ✓
Avg $\Delta P =$ _____	$A_s =$ _____
Avg $\sqrt{\Delta P} =$ _____	$D_n =$ _____
$C_p =$ _____	$T_i =$ <u>30</u> ✓
$P_s =$ _____	
$T_m =$ <u>65</u> ✓ °F	<u>525</u> ✓ °R
$T_s =$ _____ °F	_____ °R

Moisture Content:

%M = 9.15 ✓ $M_d =$ 0.9085 ✓ $MW_c =$ 30.476 ✓ $MW =$ 29.33 ✓

$$Vm_{std} = 17.65 Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460} \right] = 17.65 \times 21.971 \left[\frac{29.61 + \frac{1.900}{13.6}}{65 + 460} \right] = \frac{21.974}{0.732} \frac{sft^3}{scfm}$$

$$V_{w_{gas}} = 0.0472 \times V_w = 0.0472 \times 46.9 = 2.214 \frac{sft^3}{scfm}$$

$$\% \text{ Moisture} = \frac{V_{w_{gas}}}{Vm_{std} + V_{w_{gas}}} \times 100 = \frac{2.214}{2.214 + 21.974} \times 100 = 9.15 \%$$

$$V_s = 5123.8 \times \frac{V_{w_{gas}}}{V_{w_{gas}} + Vm_{std}} \times \frac{1}{\sqrt{\frac{P_b + \frac{P_m}{13.6}}{T_m + 460}}} = \text{_____} \text{ fpm}$$

ACFM: _____

SCFM: _____

$$\%I = \frac{1.039 \times \text{_____} \times \text{_____} \times \text{_____} \times \text{_____}}{\text{_____}^2} = \text{_____} \%$$

%EA: 28.0 ✓

PRELIMINARY VELOCITY TRAVERSE DATA
AND
SAMPLING LOCATION DATA

Job Number 06-054

Job Name ADA-ES

Sampling Location MID INLET DUCT TO SUPP. ESP

Date 9/26/06 Time 0940-1000

9/29/06

Stack Height _____ ft.

Sampling Port Height Above Ground _____ ft.

	Port A	Port B	Port C	Port D	Average
Port & Inside Diameter (in.)					
Port & Wall Thickness (in.)	<u>34 1/2</u>	<u>36 1/4</u>	<u>36 1/2</u>	<u>36 3/4</u>	
Inside Stack Diameter (in.)	<u>300</u>	<u>300</u>	<u>300</u>	<u>300</u>	<u>300</u>

Sampling Ports are _____ ft. _____ in.

(_____ stack diameters) downstream from disturbance
(inlet, constriction, bend, expansion)

Sampling Ports are _____ ft. _____ in.

(_____ stack diameters) upstream from disturbance
(outlet, constriction, bend, expansion)

Point Number	Percent Diameter	Distance from Ref. Point (decimal in.)	Distance from Ref. Point (fractional in.)	0940 Port A $\Delta P/T, \alpha$	0950 Port B $\Delta P/T, \alpha$	0958 Port C $\Delta P/T, \alpha$	1008 Port D $\Delta P/T, \alpha$
1		30		0.483510	0.483515	0.4834610	0.683530
2		90		0.883485	0.8834915	0.8034610	0.913425
3		150		0.863515	0.9534610	0.8534415	1.053395
4		210		0.4133510	0.6633210	0.6733510	0.8533110
5		270		0.3735010	0.3935010	0.5732910	0.6532210
6				8324	8339		
7				11	11	11	11
8				11	11	11	11
9				11	11	11	11
10				11	11	11	11
11				11	11	11	11
12				11	11	11	11
13				11	11	11	11
14				11	11	11	11
15				11	11	11	11
16				11	11	11	11
17				11	11	11	11
18				11	11	11	11
19				11	11	11	11
20				11	11	11	11
21				11	11	11	11
22				11	11	11	11
23				11	11	11	11
24				11	11	11	11

Pitot Tube No. 1-1

$C_p =$ 0.825

$P_b =$ 29.61 "Hg

$P_a =$ +3.70 "H₂O 29.88 "Hg

$A_s =$ _____ in.²

Average ΔP 0.692

Average $\Delta P^{1/2}$ 0.822

Average T_x 340 °F

Average α 6 degrees

CO₂ 13.7

O₂ 4.7

N₂ 81.6

MWD = 30.38

PRELIMINARY VELOCITY TRAVERSE DATA
AND
SAMPLING LOCATION DATA

Job Number 06-054

Job Name ADA-ES

Sampling Location OUTLET FROM ORIGINAL ESP

Date 9/29/06 Time 1100 - 1400

Stack Height _____ ft.

Sampling Port Height Above Ground _____ ft.

	Port A	B	Port C	D	Port E	F	Port G	H	Average
Port & Inside Diameter (in.)	332 1/2	332 1/2	337	330 1/4	332 3/8	340 1/2	340	340 5/8	335.5625
Port & Wall Thickness (in.)	32 1/2	32 3/4	32 3/8	32 1/4	32 3/8	40 1/2	40	40 5/8	35.5625
Inside Stack Diameter (in.)	300	300	300	300	300	300	300	300	300

Sampling Ports are _____ ft. _____ in.

(_____ stack diameters) downstream from disturbance
(inlet, constriction, bend, expansion)

Sampling Ports are _____ ft. _____ in.

(_____ stack diameters) upstream from disturbance
(outlet, constriction, bend, expansion)

Point Number	Percent Diameter	Distance from Ref. Point (decimal in.)	Distance from Ref. Point (fractional in.)	1120 Port A $\Delta P/T_x/\alpha$	1133 Port B $\Delta P/T_x/\alpha$	1142 Port C $\Delta P/T_x/\alpha$	1150 Port D $\Delta P/T_x/\alpha$
1		30"		0.073480	0.0333610	0.0633510	0.0732430
2		90"		0.0934715	0.123520	0.0333610	0.06323150
3		150"		0.053470	0.0113510	0.0733510	0.11223140
4		210"		0.0634710	0.073490	0.0432510	0.12314140
5		270"		0.053470	0.1034510	0.0334910	0.14301110
6				1112	111	111	111
7				111	111	111	111
8				111	111	111	111
9				13101	1330	1343	1350
10				PORT E	PORT F	PORT G	PORT H
11		30		0.053025	0.0332610	0.023650	---
12		90		0.0533435	0.1113275	0.1036510	---
13		150		0.0733110	0.1232515	0.0935215	0.05362
14		210		0.1130810	0.0732410	0.0834210	0.08357
15		270		0.142940	0.0630215	0.0733510	0.0534610
16				111	111	111	111
17				111	111	111	111
18				111	111	111	111
19				111	111	111	111
20				111	111	111	111
21				111	111	111	111
22				111	111	111	111
23				111	111	111	111
24				111	111	111	111

Pitot Tube No. 1-1

$C_p = 0.025$
 $P_b = 29.54$ "Hg
 $P_s = +3.20$ "H₂O 29.78 "Hg
 $A_s = 320,400$ in.²

Average ΔP 0.072 X = unable to traverse
 Average $\Delta P^{1/2}$ 0.260 CO₂ 13.0
 Average T_x 334 °F O₂ 6.0
 Average α 7 degrees N₂ 81.0
 MWA = 30.32

PRELIMINARY VELOCITY TRAVERSE DATA
AND
SAMPLING LOCATION DATA

Job Number 06-054

Job Name ADA-ES

Sampling Location INLET TO SUPP. ESP

Date 7/26/06 Time 1800-1910
9/28/06

Stack Height _____ ft.

Sampling Port Height Above Ground _____ ft.

	Port A	Port B	Port C	Port D	Average
Port & Inside Diameter (in.)					
Port & Wall Thickness (in.)	<u>40 1/2</u>	<u>40 1/2</u>	<u>40 1/2</u>	<u>40 1/2</u>	
Inside Stack Diameter (in.)	<u>300</u>	<u>300</u>	<u>300</u>	<u>300</u>	

Sampling Ports are _____ ft. _____ in.

(_____ stack diameters) downstream from disturbance
(inlet, constriction, bend, expansion)

Sampling Ports are _____ ft. _____ in.

(_____ stack diameters) upstream from disturbance
(outlet, constriction, bend, expansion)

Point Number	Percent Diameter	Distance from Ref. Point (decimal in.)	Distance from Ref. Point (fractional in.)	1833 Port A $\Delta P/T/\alpha$	1800 Port B $\Delta P/T/\alpha$	1847 Port C $\Delta P/T/\alpha$	1859 Port D $\Delta P/T/\alpha$
1		30.000	30"	0.6733210	0.5533915	1.3033210	1.0533445
2		90.000	90"	0.39334310	0.8233615	1.35332915	1.85335110
3		150.000	150"	0.41334115	0.9133618	0.98332715	1.70336115
4		210.000	210"	0.32333915	0.82335115	1.60332918	1.65333215
5		270.000	270"	0.41333115	0.70332130	0.98331810	1.60333015
6				11	11	11	11
7				11	11	11	11
8				11	11	11	11
9				11	11	11	11
10				11	11	11	11
11				11	11	11	11
12				11	11	11	11
13				11	11	11	11
14				11	11	11	11
15				11	11	11	11
16				11	11	11	11
17				11	11	11	11
18				11	11	11	11
19				11	11	11	11
20				11	11	11	11
21				11	11	11	11
22				11	11	11	11
23				11	11	11	11
24				11	11	11	11

Pitot Tube No. 1-1
 $C_p = 0.825$
 $P_b = 29.80$ "Hg
 $P_s = +3.50$ "H₂O
 $A_s = 90,000$ in.²
43,200

Average ΔP 0.984
 Average $\Delta P^{1/2}$ 0.963
 Average T_x 335 °F
 Average α 13 degrees

4x5 grid
20pt.

Impinger Box No. 1-1

Impinger 1 Final Weight 836.2
 Initial Weight 822.7
 Increase

Impinger 2 Final Weight 766.1
 Initial Weight 763.5
 Increase

Impinger 3 Final Weight 635.6
 Initial Weight 633.7
 Increase

Impinger 4 Final Weight 990.1
 Initial Weight 983.5
 Increase

Impinger 5 Final Weight _____
 Initial Weight _____
 Increase

Impinger 6 Final Weight _____
 Initial Weight _____
 Increase

Impinger 7 Final Weight _____
 Initial Weight _____
 Increase

Water Weight Gain

Impinger 1 13.5

Impinger 2 2.6

Impinger 3 1.9

Impinger 4 6.6

Impinger 5 _____

Impinger 6 _____

Impinger 7 _____

Total 24.6 = V_w

$V_w =$
 $g\ SO_2 =$
 $V_w =$

$P_b = 29.57$
 $V_m = 22.623$
 $V_w = 24.6$
 $P_m = 1.900$

Avg $\Delta P =$

Avg $\sqrt{\Delta P} =$

$C_p =$
 $P_s = +5.80$
 $T_m = 80$
 $T_s =$

%CO₂ = 8.9
 %O₂ = 11.1
 %CO = 0.0
 %N₂ = 80.0
 $A_s =$
 $D_n =$
 $T_1 = 30$

29.97 °Hg
 _____ °R
 _____ °R

Moisture Content:

%M = 5.02 $M_d = 0.9498$ $MW_c = 29.868$ $MW = 29.27$

$$Vm_{std} = 17.65 \ Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460} \right] = 17.65 \times 22.623 \left[\frac{29.57 + \frac{1.900}{13.6}}{80 + 460} \right] = \frac{21.946}{0.732} \frac{sft^3}{scfm}$$

$$Vw_{gas} = 0.0472 \times Vw = 0.0472 \times 24.6 = 1.161 \text{ sft}^3$$

$$\% \text{ Moisture} = \frac{Vw_{gas}}{Vm_{std} + Vw_{gas}} \times 100 = \frac{1.161}{21.946 + 1.161} \times 100 = 5.02 \%$$

$$V_s = 5123.8 \times \frac{\sqrt{\quad}}{\quad} \times \quad = \quad \text{tpm}$$

ACFM: _____

SCFM: _____

$$\%I = \frac{1.039 \times \quad \times \quad \times \quad \times \quad}{\quad} = \quad \%$$

%EA: _____

PRELIMINARY VELOCITY TRAVERSE DATA
AND
SAMPLING LOCATION DATA

Job Number 06-054

Job Name ADA-ES

Sampling Location ESP "A" INLET / ESP "B" INLET

Date 9/26/08 Time 1723-1800

9/29/08

Port & Inside Diameter (in.)

Port & Wall Thickness (in.)

Inside Stack Diameter (in.)

Port A	B	Port C	D	Port E	F	Port G	H	Average
87 3/4	X	87 3/4	X	87 3/4	X	87 3/4	X	
11 3/4	X	11 3/4	X	11 3/4	X	11 3/4	X	
76	X	76	X	76	X	76	X	

Sampling Ports are 22 ft. 3 in.

2.09 stack diameters) downstream from disturbance
(inlet, constriction, bend, expansion)

Sampling Ports are 3 ft. 0 in.

0.28 stack diameters) upstream from disturbance
(outlet, constriction, bend, expansion)

128.033

Point Number	Percent Diameter	Distance from Ref. Point (decimal in.)	Distance from Ref. Point (fractional in.)	1723 Port A $\Delta P/T/\alpha$	Port B $\Delta P/T/\alpha$	1735 Port C $\Delta P/T/\alpha$	Port D $\Delta P/T/\alpha$
1		6.333	6 5/16	0.3934910	X	0.213680	X
2		19.000	19	0.4334710	X	0.4714625	X
3		31.667	31 1/16	0.3513125	X	0.0313600	X
4		44.333	44 5/16	0.3835410	X	0.2435115	X
5		57.000	57	0.5035910	X	0.4135710	X
6		69.667	69 1/16	0.7736410	X	0.4835310	X
7				11	11	11	11
8				1750	11	1755	11
9				Port E	Port F	Port G	Port H
10			6 5/16"	0.4613480	X	0.4613710	X
11			19	0.3933710	X	0.3213070	X
12			31 1/16	0.5633410	X	0.3633085	X
13			44 5/16	0.4833410	X	0.5033010	X
14			57	0.5334710	X	0.5633455	X
15			69 1/16	0.683445	X	0.7833420	X
16				11	11	11	11
17				11	11	11	11
18				11	11	11	11
19				11	11	11	11
20				11	11	11	11
21				11	11	11	11
22				11	11	11	11
23				11	11	11	11
24				11	11	11	11

Pitot Tube No. 1-1

$C_p =$ 0.825

$P_b =$ 29.54 "Hg

$P_a =$ +5.90 "H₂O 29.97 "Hg

$A_s =$ 30.856 in.²

Average ΔP 0.452

Average $\Delta P^{1/2}$ 0.658

Average T_x 344 °F

Average α 2 degrees

X - unable to access ports

PRELIMINARY VELOCITY TRAVERSE DATA
AND
SAMPLING LOCATION DATA

Job Number 06-054

Job Name ADA-ES

Sampling Location ESP "B" INLET DUCT

Date 9/26/06 Time 1805-1835

Stack Height _____ ft.

Sampling Port Height Above Ground _____ ft.

Port & Inside Diameter (in.)

Port & Wall Thickness (in.)

Inside Stack Diameter (in.)

Port A	B	Port C	D	Port E	F	Port G	H	Average
X	87 3/4	X	87 3/4	X	87 3/4	X	87 3/4	
X	11 3/4	X	11 3/4	X	11 3/4	X	11 3/4	
X	76	X	76	X	76	X	76	

Sampling Ports are 22 ft. 3 in.

(2.09 stack diameters) downstream from disturbance

(inlet, constriction, bend, expansion)

Sampling Ports are 3 ft. 0 in.

(0.281 stack diameters) upstream from disturbance

(outlet, constriction, bend, expansion)

Point Number	Percent Diameter	Distance from Ref. Point (decimal in.)	Distance from Ref. Point (fractional in.)	1805 Port A $\Delta P/T_s/\alpha$	Port B $\Delta P/T_s/\alpha$	Port C $\Delta P/T_s/\alpha$	1813 Port D $\Delta P/T_s/\alpha$
1		6.373	6 5/16	X	X	X	X
2		19.000	19	X	0.493061 0	X	X
3		31.667	31 11/16	X	0.4413031 0	X	0.421331.5
4		44.333	44 5/16	X	0.4413051 5	X	0.413351.5
5		57.000	57	X	0.5713081 5	X	0.433541 0
6		69.667	69 11/16	X	1.1013191 5	X	0.5613511 0
7				X	X	X	X
8				X	X	X	X
9				X	X	X	X
10				X	X	X	X
11			6 5/16	X	X	X	0.4213661 5
12			19	X	X	X	0.4913611 0
13			31 11/16	X	0.3113601 0	X	0.371368 5
14			44 5/16	X	0.4013651 0	X	0.401370 0
15			57	X	0.2513681 0	X	0.571368 5
16			69 11/16	X	0.4013601 10	X	0.7013601 5
17				X	X	X	X
18				X	X	X	X
19				X	X	X	X
20				X	X	X	X
21				X	X	X	X
22				X	X	X	X
23				X	X	X	X
24				X	X	X	X

Pitot Tube No. 1-1

$C_p = 0.825$
 $P_b = 29.54$ "Hg
 $P_s = +5.80$ "H₂O 29.97 "Hg
 $A_s = 30,856$ in.²

Average ΔP 0.471
 Average $\Delta P^{1/2}$ 0.677
 Average T_s 345 °F
 Average α 3 degrees

X - unable to access port and/or point

$$\begin{bmatrix} A & B & C & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \quad \begin{matrix} A \text{ Input} \\ \\ \\ \\ \\ \end{matrix}$$

$$\begin{bmatrix} A & B & C & D & E & F & G & H \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \quad \begin{matrix} B \text{ Input} \\ \\ \\ \\ \\ \end{matrix}$$

2nd pot center

Sample ports are ~ 36" $\uparrow$ stream from X500 zone
 Sample ports are ~ 26 7/8" $\downarrow$ stream from

valuable to
 (2, 4, 6, 8, 9, 11, 13)
 15

not of bottom of region and 2nd zone

Appendix E:
Proposed EPA Test Method 324 Field Data

APPENDIX K (PART 75 CAMR)

Plant/Source: Merrimack Station Power Plant Test Location: Unit #2 Stack (Bow, NH)Test ID: "A" Train Carbon Trap ID: OL ^{↓26221} A TrainSpiked At: _____ QA/QC Signature: "A"Sampled By: ASA Sampling Console Ser# 1568 Cal. Factor: 1.006Test Start (Date/Time): 9/28/06 1117 Leak Check (Pass/Fail) 0.000 Test End (Date/Time): 9/28/06 1217 Leak Check (Pass/Fail) 0.000

Date	Time	STACK	INLET/OUTLET		Flow Rate ($\frac{L}{min}$)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
		DUCT Temp (°F or °C)	Meter Temp (°F or °C)					
9/28/06	1117	163	16/16		0.35	8420.311		DGM Pressure: 5.2"
9/28/06	1217	163	21/21		0.33		8439.165	SAMPLE VACUUM: 23" Hg
							18.854	PROBE: 162°C FILTER: 167°C
Total/Average								

Chain of Custody

Relinquished by: <u>Peter S. [Signature]</u>	Date: <u>9/28/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR)

Plant/Source: Manumach Station Power Plant Test Location: Unit #2 Stack (Bow, NH)Test ID: "B" Train Carbon Trap ID: OL ^{↓26222 B Train}Spiked At: _____ QA/QC Signature: "g"Sampled By: ASA1 Sampling Console Ser# 1567 Cal. Factor: 0.989Test Start (Date/Time): 9/28/06 1117 Leak Check Pass/Fail 0.000 Test End (Date/Time): 9/28/06 1217 Leak Check Pass/Fail 0.000

Date	Time	STACK	INLET/OUTLET	Flow Rate (cc/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
		DUCT Temp (°F or °C)	Meter Temp (°F or °C)				
9/28/06	1117	163	14/14	0.34	5449.872		DGM Pressure: 5.4"
9/28/06	1217	163	19/18	0.32		5469.388	SAMPLE VACUUM: 22.5" Hg
						19.516	PROBE: 162°C FILTER: 167°C

Total/Average							
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Chain of Custody

Relinquished by: <u>Patricia Schell</u>	Date: <u>9/28/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR)

Plant/Source: Merrimack Station Power Plant Test Location: STACK INLET "D" (Bow, NH)
FROM SUP. ESP
Test ID: "A" Train Carbon Trap ID: OL ↓26223 "A" TRAIN

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASA1 Sampling Console Ser# 1568 (Cal.: 1.006)

Test Start (Date/Time): 9/28/06 1546 Leak Check Pass/Fail 0.000 Test End (Date/Time): 9/28/06 1646 Leak Check Pass/Fail 0.000

INLET/OUTLET							
Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (cc/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/28/06	1546	166	21/21	0.40	8446.390	-	DGM PRESSURE: 5.7" SAMPLE VAC: 22.5" Hg
9/28/06	1646	167	22/22	0.38	-	8468.179	DGM PRESSURE: 5.6" SAMPLE VAC: 22" Hg
						21.789	PROBE: 164°C FILTER: 170°C
Total/Average							

Chain of Custody

Relinquished by: <u>Peter Schult</u>	Date: <u>9/28/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR)

Plant/Source: Merion Station Power Plant Test Location: STACK INLET "D" (BOW, NH)
FROM SUP. ESP ↓26224 "B" TRAIN
Test ID: "B" Train Carbon Trap ID: OL

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASA1 Sampling Console Ser# 1567 (Cal.: 0.989)

Test Start (Date/Time): 9/28/06 1546 Leak Check Pass/Fail 0.000 Test End (Date/Time): 9/28/06 1646 Leak Check Pass/Fail 0.000

		INLET/OUTLET					
Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (sc/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/28/06	1546	166	19/19	0.27	5476.230	—	DGM PRESSURE: 4.5" SAMPLE VAC: 23" P6
9/28/06	1646	167	20/20	0.25	—	5491.390	DGM PRESSURE: 4.4" SAMPLE VAC: 23" P6
						15.160	

Total/Average						
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Chain of Custody

Relinquished by: <u>Peter Selbach</u>	Date: <u>9/28/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR)

Plant/Source: Municipal Station Power Plant Test Location: STACK Duct "B" FROM SUPP. BSP ^{INLET}Test ID: "A" Train Carbon Trap ID: OL ↓26225

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASA1 Sampling Console Ser# 1568 (Cal.: 1.006)Test Start (Date/Time): 9/28/06 1721 Leak Check Pass/Fail 0.000 Test End (Date/Time): 9/28/06 1821 Leak Check Pass/Fail 0.000

		INLET/OUTLET					
Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (d/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/28/06	1721	166	22/23	0.38	8470.579	—	DGM PRESS: 5.6 SAMPL VAC: 23"
9/28/06	1821	166	22/22	0.38	—	8491.701	DGM PRESS: 5.6 SAMPL VAC: 22.5"
						21.122	PROBE: 164°C FILTER: 170°C
Total/Average							

Chain of Custody

Relinquished by: <u>Patricia Selch</u>	Date: <u>9/28/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR)

Plant/Source: Merrimack Station Power Plant Test Location: STACK INLET DUCT "B" FROM SUPP. ESPTest ID: "B" TRAIN Carbon Trap ID: OL ↓26226

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASA1 Sampling Console Ser# 1567 (CAL 0.989)Test Start (Date/Time): 9/28/06 1721 Leak Check (Pass/Fail) 0.000 Test End (Date/Time): 9/28/06 1821 Leak Check (Pass/Fail) 0.000

INLET/OUTLET							
Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (cc/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/28/06	1721	166	21/21	0.35	5492.878	—	DGM PRESS: 15.5" SAMP. VAC: 22.5"
9/28/06	1821	166	20/20	0.34	—	5513.607	DGM PRESS: 5.6" SAMP. VAC: 21.5"
						20.729	
Total/Average							

Chain of Custody

Relinquished by: <u>Patricia Selig</u>	Date: <u>9/28/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR)

Plant/Source: Memmach Station Power Plant Test Location: "A" INLET TO SUPP. ESPTest ID: "A" Train Carbon Trap ID: OL ^{↓26229}

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASA1 Sampling Console Ser# 1568 (Cal: 4.406)Test Start (Date/Time): 9/29/06 7:52 Leak Check Pass/Fail 0.000 Test End (Date/Time): 9/29/06 8:52 Leak Check Pass/Fail 0.000

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (SC/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	7:52	163	20/20	0.39	8495.541	-	06m: 5.6" SAM VAC: 23"
9/29/06	8:52	163	24/24	0.34	-	8515.395	06m: 5.1" SAM VAC: 23"
							Probe: 165°C Filter: 172°C

Total/Average							
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Chain of Custody

Relinquished by: <u>Patricia Selbach</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR) ^C ~~P~~Plant/Source: Merrimack Station Power Plant Test Location: "B" INLET TO SUPP. ESPTest ID: "B" Train Carbon Trap ID: OL ^{↓26230}

Spiked At: _____

QA/QC Signature: _____

Sampled By: ASA1Sampling Console Ser# 1567 (Cal: 0.989)

Test Start

(Date/Time): 9/29/06 752

Leak Check

(Pass/Fail) 0.000

Test End

(Date/Time): 9/29/06 852

Leak Check

(Pass/Fail) 0.000

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate ($\frac{L}{min}$)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	7:52	163	19/19	0.35	5517.389	-	DGM: 5.3" SAM VAC: 22.5"
9/29/06	8:52	163	22/22	0.26	-	5534.940	DGM: 4.6" SAM VAC: 23"

Total/Average

Chain of Custody

Relinquished by: <u>Patricia Salas</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR)

From orig. ESP

Plant/Source: Merrimack Station Power Plant Test Location: Outlet "G" to Supp. ESPTest ID: "A" Train Carbon Trap ID: OL ↓26231

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASR1 Sampling Console Ser# 1568 (Cal: 1.006)Test Start (Date/Time): 9/29/06 9:29 Leak Check Pass/Fail 0.000 Test End (Date/Time): 9/29/06 10:29 Leak Check Pass/Fail 0.000

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (sc/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	9:29	183	23/23	0.34	8516.647	—	DGM: 4.6 SAM VAC: 23.0
9/29/06	10:29	182	24/25	0.29	—	8534.210	DGM: 4.5 SAM VAC: 23.5
Total/Average							

Chain of Custody

Relinquished by: <u>Peter Seibert</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR)

from orig SP

Plant/Source: Minumach Station Power Plant Test Location: Outlet "G" to Supp ESPTest ID: "B" Train Carbon Trap ID: OL ↓26232

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASAI Sampling Console Ser# 1567 (Cal: 0.989)Test Start (Date/Time): 9/29/06 9:29 Leak Check Pass/Fail 6.000 Test End (Date/Time): 9/29/06 10:29 Leak Check Pass/Fail 0.000

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (sc/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	9:29	183	21/21	0.31	5535.921	-	D6m: 5.0 5.0m VAC: 22.5
9/29/06	10:29	182	22/22	0.29	-	5554.531	D6m: 4.9 5.0m VAC: 22.5
Total/Average							

Chain of Custody

Relinquished by: <u>Patricia Seligson</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR)

(PS)

Plant/Source: Merrimack Station Power Plant Test Location: "A" Midduct to Supp ESP
Outlet "C" to Supp. ESPTest ID: "A" Train Carbon Trap ID: OL ↓26233

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASA Sampling Console Ser# 1568 (cal: 1.006)Test Start (Date/Time): 9/29/06 1117 Leak Check (Pass/Fail) 0.000 Test End (Date/Time): 9/29/06 1217 Leak Check (Pass/Fail) 0.000

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (sc/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	1117	172	23/23	0.40	8535.001	—	DGM: 5.6" SAM. VAC: 20"
9/29/06	1217	171	24/25	0.34	—	8554.813	DGM SAM. VAC: Probe: 165°C Filter: 170°C

Total/Average							
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Chain of Custody

Relinquished by: <u>Patricia Jelenc</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR)

(P3)

"A" Mudduct to Supp ESP

Plant/Source: Manumail Station Power Plant Test Location: Outlet "C" to Supp. ESP

↓26234

Test ID: "B" Train Carbon Trap ID: OL

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASA1 Sampling Console Ser# 1567 (cal: 0.989)Test Start (Date/Time): 9/29/06 1117 Leak Check (Pass/Fail) 0.000 Test End (Date/Time): 9/29/06 1217 Leak Check (Pass/Fail) 0.000

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (sc/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	1117	172	20/20	0.34	5555.518	-	DGM: 5.2" SAM. VAC: 21.5"
9/29/06	1217	171	23/22	0.28	-	5572.881	DGM: SAM. VAC:

Total/Average							
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Chain of Custody

Relinquished by: <u></u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR)

(from orig. EPS)

Plant/Source: Nemacolin Station Power Plant Test Location: Outlet "C" to Supp. ESPTest ID: "A" Train Carbon Trap ID: OL ↓26235

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASAJ Sampling Console Ser# 1568 (Cal: 1.006)Test Start (Date/Time): 9/29/06 1255 Leak Check Pass/Fail 0.000 Test End (Date/Time): 9/29/06 1355 Leak Check Pass/Fail

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (SC/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	1255	164	23/23	0.42	8556.731	-	DGM: 5.6" SAM VAC: 23"
9/29/06	1355	164		0.39	-	8577.910	DGM: SAM VAC:
Total/Average							

Chain of Custody

Relinquished by: <u>Patricia Selig</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR)

(from orig. ESP)

Plant/Source: Merrimack Station Power Plant Test Location: Outlet "C" to Supp ESPTest ID: "B" Train Carbon Trap ID: OL ↓26236

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASA Sampling Console Ser# 1567 (Cal: 0.989)Test Start (Date/Time): 9/29/06 1255 Leak Check (Pass/Fail) 0.000 Test End (Date/Time): 9/29/06 1355 Leak Check (Pass/Fail) _____

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (SC/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	1255	164	21/21	0.40	5574.739	-	DGM: 6.0" SAMP VAC: 22.5"
9/29/06	1355	164		0.36	-	5597.771	DGM: SAMP VAC:
Total/Average							

Chain of Custody

Relinquished by: <u>Patricia Selat</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR)

Plant/Source: Memorial Station Power Plant Test Location: Belted Duct (Port "F")Test ID: "A" Train Carbon Trap ID: OL ↓26237

Spiked At: _____

QA/QC Signature: _____

Sampled By: ASA1Sampling Console Ser# 1568 (Cal: 1.006)Test Start (Date/Time): 9/29/06 1655 Leak Check Pass/Fail 0.000 Test End (Date/Time): 9/29/06 1735 Leak Check Pass/Fail 0.000

		INLET/OUTLET						Comments
Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (cc/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final		
9/29/06	1655	181	22/21	0.39	8582.635	—		06m '5.6' 5Am VAC: 24'
9/29/06	1735	181	26/26	*0.05	—	8588.980	* *	06m '0' 5Am VAC: 0030'
	40 minutes							Probe: 163°C Filter: 168°C

Total/Average							
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Ⓢ 06m Fell off dramatically @ 1705 and 5am Vac increased
Ⓢ Tube became plugged

Chain of Custody

Relinquished by: <u>Patricia Seibert</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

Analysis contact us at 330-405-0837

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APPENDIX K (PART 75 CAMR)

Plant/Source: Memorial Station Power Plant Test Location: Bleed Duct (Port "F")Test ID: "B" Train Carbon Trap ID: OL ↓26238

Spiked At: _____ QA/QC Signature: _____

Sampled By: _____ Sampling Console Ser# 1567 (cal: 0.989)Test Start (Date/Time): 9/29/06 1655 Leak Check Pass/Fail 0.000 Test End (Date/Time): 9/29/06 1755 Leak Check Pass/Fail 0.026
0.850
0.876

Date	Time	DUCT Temp (°F or °C)	INLET/OUTLET		Flow Rate (cc/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
			Meter Temp (°F or °C)					
9/29/06	1655	181	21/21		0.45	5603.079	—	0.6m ³ b. 7" SAM. VAC: 22"
9/29/06	1755	181	25/25		0.48	—	5621.111	0.6m ³ b. 2 SAM VAC: 22"
	*40 minutes							
	* Tips of trap broken when pulled out. Possibly by debris (particulate in duct)							

Total/Average							
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Chain of Custody

Relinquished by: <u>Patricia Sel...</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

For Analysis contact us at 330-405-0837

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APPENDIX K (PART 75 CAMR)

Plant/Source: Merrimack Test Location: B Outlet Duct (Port "B")Test ID: "A" Train Carbon Trap ID: OL ↓26239

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASA Sampling Console Ser# 1568 (Cal: 1.006)Test Start (Date/Time) 9/29/06 1831 Leak Check (Pass/Fail) 0.000 Test End (Date/Time) 9/29/06 1931 Leak Check (Pass/Fail) 0.000

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (SC/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	1831	158	27/27	0.45	8591.929	-	DGM PRES: 6.0 SAM VAC: 23.5
9/29/06	1901	158	27/27	⊗ 0.19	8598.650		DGM PRES: 26.1 SAM VAC: 25.1
9/29/06	1931	158	26/27	0.15	-	8601.310	Probe: 162°C Filter: 167°C DGM: 2.1" SAM VAC 24"

Total/Average							
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⊗ Thirty minutes into sampling, flow is dropping below 0.20 L/min
Chain of Custody

Relinquished by: <u>Peter Schuch</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR)

Plant/Source: Merrimack Test Location: Belt Duct (Port "B")Test ID: "B" Train Carbon Trap ID: OL ↓26241

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASA1 Sampling Console Ser# 1567 (Cal: 0.989)Test Start (Date/Time): 9/29/06 1831 Leak Check (Pass/Fail) 0.000 Test End (Date/Time): 9/29/06 1931 Leak Check (Pass/Fail) 0.000

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (cc/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	1831	158	28/28	0.40	5624.550	—	DGM PRES: 5.9 SAM. VAC: 23"
9/29/06	1901	158	28/28	0.18	5636.780		DGM PRES: 2.2 SAM. VAC: 24"
9/29/06	1931	158	27/27	0.13	—	5634.202	DGM: 1.6 SAM: 25.5"

Total/Average							
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⊗ Thirty minutes into sampling, flow is dropping below 0.20 l/min.
Chain of Custody

Relinquished by: <u>Patricia S. [Signature]</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR)

Plant/Source: Merrimack Station Power Plant Test Location: "A" inlet Duct (Port C)Test ID: "A" Train Carbon Trap ID: OL ↓26242

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASA1 Sampling Console Ser# 1568 (Cal: 1.006)Test Start (Date/Time): 9/29/06 / 2013 Leak Check Pass/Fail 0.000 Test End (Date/Time): 9/29/06 / 2043 Leak Check Pass/Fail 0.000

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (cc/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	2013	178°	25/25	0.50	8603.549	—	DGM PRESS: 5.6 SAM VAC: 24"
"	2023	178	24/25	0.40	8606.270	—	DGM PRESS: 2.7 SAM VAC: 25
"	2033	178	25/25	0.30	8607.58	—	DGM PRESS: 2.1 SAM VAC: 25.5
"	2044	178	25/26	0.30	8608.80	→	DGM PRESS: 1.9 SAM VAC: 26.0
							Probe: 164°C Filter: 173°C

Total/Average							
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Chain of Custody

Relinquished by: <u>Peter Selander</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

For Analysis contact us at 330-405-0837

Ohio Lumex Co., Inc. 9263 Ravenna Road Unit A-3, Twinsburg, OH 44087 USA
330-405-0837 Fax 330-405-0847 US Toll Free: 888-876-2611

APPENDIX K (PART 75 CAMR)

Plant/Source: Merumel Station Power Plant Test Location: "A" inlet Duct (Port C)Test ID: "B" Train Carbon Trap ID: OL ↓26243

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASA1 Sampling Console Ser# 1567 (Cal: 0.989)Test Start (Date/Time): 9/29/06 / 2013 Leak Check Pass/Fail 0.000 Test End (Date/Time): 9/29/06 / 2043 Leak Check Pass/Fail 0.000

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (sc/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	2013	178°	24/24	0.46	5636.269	—	DGM PRESS: 5.5 SAMR VAC: 23
"	2023	178	24/24	0.40	5639.100	—	DGM PRESS 3.7 SAMR VAC 24
"	2033	178	24/23	0.21	5640.45	—	DGM PRESS 2.6 SAMR VAC 24
"	2044	178	24/24	0.20	5641.47	—	DGM PRESS 2.4 SAMR VAC 24.0

Total/Average							
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Chain of Custody

Relinquished by: <u>Peter Schmitt</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

For Analysis contact us at 330-405-0837

Ohio Lumex Co., Inc. 9263 Ravenna Road Unit A-3, Twinsburg, OH 44087 USA

330-405-0837 Fax 330-405-0847 US Toll Free: 888-876-2611

APPENDIX K (PART 75 CAMR)

Plant/Source: MERRIMACK STATION POWER PLANT Test Location: "A" INLET DUCT (PORT G)Test ID: "A" TRAIN Carbon Trap ID: OL ↓26245

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASAI Sampling Console Ser# 1568 (CAL: 1.006)Test Start (Date/Time): 9/29/06 | 2116 Leak Check Pass/Fail Test End (Date/Time): 9/29/06 | 2146 Leak Check Pass/Fail 6.000

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (<u>scf</u> /min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	2116	172	26/26	0.40	8609.860		DGM PRESS: 5.6 SAM. VAC.: 23.0
9/29/06	2126	171	26/26	0.40	8612.540		DGM PRESS: 5.0 SAM. VAC.: 23.5
9/29/06	2136	171	25/25	0.40	8614.865		DGM PRESS: 3.7 SAM. VAC.: 24.0
9/29/06	2146	171	25/25	0.40	8616.695		DGM PRESS: 2.9 SAM. VAC.: 25
							FILTER: 170 °C PROBE: 164 °C

Total/Average						
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Chain of Custody

Relinquished by: <u>[Signature]</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

For Analysis contact us at 330-405-0837

Ohio Lumex Co., Inc. 9263 Ravenna Road Unit A-3, Twinsburg, OH 44087 USA
330-405-0837 Fax 330-405-0847 US Toll Free: 888-876-2611

APPENDIX K (PART 75 CAMR)

Plant/Source: MERRIMACK STATION POWER PLANT Test Location: "A" INLET DUCT (PORT G)Test ID: "B" TRAIN Carbon Trap ID: OL ↓26246

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASA1 Sampling Console Ser# 1567 (CAL: 0.989)Test Start (Date/Time): 9/29/06 / 2116 Leak Check Pass/Fail Test End (Date/Time): 9/29/06 / 2146 Leak Check Pass/Fail 0.000

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (L/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	2116	172	23/23	0.28	5641.879		DGM PRESS: 4.7 SAM. VAC.: 23.0
9/29/06	2126	171	22/22	0.30	5643.870		DGM PRESS: 4.5 SAM. VAC.: 23.5
9/29/06	2136	171	22/22	0.30	5646.130		DGM PRESS: 3.8 SAM. VAC.: 23.5
9/29/06	2146	171	22/21	0.30	5648.010		DGM PRESS: 3.5 SAM. VAC.: 24
							PROBE: 164°C FILTER: 170°C

Total/Average						
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Chain of Custody

Relinquished by: <u>[Signature]</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

For Analysis contact us at 330-405-0837

Ohio Lumex Co., Inc. 9263 Ravenna Road Unit A-3, Twinsburg, OH 44087 USA

330-405-0837 Fax 330-405-0847 US Toll Free: 888-876-2611

Appendix F:

Proposed EPA Test Method 324 Analytical Data

Ohio Lumex Trap Analyses, Merrimack Generating Station Bow New Hampshire

Date	Trap ID	Sample Volume (L at EPA-STP)	ng of Hg on Section # 1	ng of Hg on Section # 2	Hg Concentration ug/m3	Comments
September 28, 2006	OL-26221	18.98	136	<5	7.17	
	OL-26222	19.49	166	<5	8.52	
	OL-26223	21.73	163		7.50	Section 2 lost due to breakage
	OL-26224	14.92	110	<5	7.37	
September 29, 2006	OL-26225	21.03	158	<5	7.51	
	OL-26226	20.38	158	<5	7.75	
	OL-26229	19.75	132	<5	6.68	
	OL-26230	17.23	120	<5	6.96	
	OL-26231	17.32	136	<5	7.85	
	OL-26232	18.22	149	<5	8.18	
	OL-26233	19.58	142	<5	7.25	
	OL-26234	17.04	133	<5	7.81	
	OL-26235	21.02	157	<5	7.47	
	OL-26236	22.65	174		7.68	Section 2 not present at analysis
	OL-26237	6.27	37	<5	5.90	Trap clogged due to excessive soot
	OL-26238		<5	<5	<0.03	Trap broke during sampling
	OL-26239	9.15	38	<5	4.15	Trap clogged due to excessive soot
	OL-26241	9.22	32.9	5	3.57	Trap clogged due to excessive soot
	OL-26242	5.15	36	<5	6.99	
	OL-26243	5.03	37	<5	7.36	
	OL-26245	6.7	58	<5	8.66	
	OL-26246	5.98	57	<5	9.53	

ADA-ES Traps

Date	Trap ID	Sample Volume (L <u>not</u> EPA-STP)	ng of Hg on Section # 1	ng of Hg on Section # 2	Hg Conc. ug/m3 uncorrected !!	Comments
September 28, 2006	S3384	20.4	151	<5	7.40	
	S3385	22.7	171	<5	7.53	
	S3391	21.9	157	<5	7.17	
	S3392	23	163	<5	7.09	
	S3389	21	142	319 X	6.76	Section 2 too high to be breakthrough
	S3390	21.4	153	<5	7.15	
	S3387	19.7	149	<5	7.56	
	S3388	18.5	144	8	7.78	
September 29, 2006	S3386	21.4	156	<5	7.29	
	S3393	19.7	141	<5	7.16	
	S3394	22.4	164	<5	7.32	
	S3395	20.8	148	<5	7.12	
	S3396	21.9	150	<5	6.85	
	S3398	21.7	151	<5	6.96	

2017

2017

2017

Trap#	Sect. 1 Area	Sect. 1 mg Hg	Sect. 2 Area	Sect. 2 mg	L sampled	Sample Temp F°/K°	Sample Pressure ps	L Corrected	mg/m
S 3384	18700	151	-17	<5	20.4	76°/29.740	29.96	20.1	7.51
S 3385	21200	171	309	<5	22.7	76°/29.740	29.96	22.4	7.63
S 3391	19500	157	453	<5	21.9	7.2			
S 3392	20200	163	93	<5	23.0	7.1			
L 26221	16900	136	-270	<5	18.85	15.5°/1.003	5.2°/1.003	18.977	7.11
L 26222	20500	166	206	<5	19.516	8.5	5.4°/1.003	19.489	8.46
S 3389	17600	142	39500	3190	21.0	6.8			
S 3390	19000	153	-7	<5	21.4	7.1			
L 26223	20200	163	60	5	21.789	7.5	5.65°/1.005	21.732	7.44
L 26224	13700	110	-55	<5	15.160	7.5	4.45°/1.001	14.92	7.32
S 3387	18448	149	50	<5	19.7	7.6			
S 3388	17900	144	935	7.6	18.5	7.8			
L 26225	19600	158	531	<5	21.122	7.5	5.6°/1.004	21.03	7.46
L 26226	19600	158	216	<5	20.729	7.6	5.55°/1.004	20.38	7.69
S 3386	19700	156	-420	<5	21.4	7.3			
S 3393	17900	141	-100	<5	19.7	7.2			
L 26229	16700	132	-100	<5	19.854	6.6	5.35°/1.007	19.75	6.68
L 26230	15200	130	-82	<5	17.551	6.8	4.95°/1.002	17.23	6.96
L 26231	17200	136	-140	<5	17.563	7.2	4.55°/1.014	17.32	7.8
L 26232	18863	149	-310	<5	18.610	8.0	4.95°/1.005	18.22	8.18

Trap #	Section 1 Area	Set 1 Wg (H ₂)	Section 2 Area	Set 2 Wg	Liters Sampled	Temp F @ No	Temp (Vs. Pressure) (Vs 29.92)	Relative Humidity (corrected)	Wg/m
DL 26233	18000	142	387	<5	19.812 7.2	240C	5.6" (1.014) (.9964)	19.58	7.25
DL 26234	16900	133	-310	<5	17.363 7.7	210C	5.2" (1.003) (.9954)	17.04	7.81
S 3394	20200	164	30	<5	22.4 7.3				
S 3395	18700	148	24	<5	20.8 7.1				
DL 26235	19900	157	34	<5	21.179 7.4	230C	5.6" (1.010) (.9964)	21.02	7.47
DL 26236	22000	174	Not Present		23.032 7.6	210C	6.0" (1.003) (.9974)	22.65	7.68
S 3396	19000	150	173	<5	21.9 6.8				
S 3398	19100	151	-39	<5	21.7 7.0				
DL 26237	41700	37	68	<5	6.345 17.321 Broken 240C 230C	240C (1.014) (.9964)	5.6" (1.014) (.9964)	6.27	5.90
DL 26238	87	<5	476	<5	9.381 heavy soil 270C	270C (1.024)	4.05" (1.9926)	9.15	4.15
DL 26239	41800	38	278	<5	9.652	280C	3.75" (0.9918)	9.22	3.57
DL 26241	4259	32.9	673	5.3	5.251	250C	3.75" (0.9918)	5.15	6.99
DL 26242	4600	36	363	<5	5.201	240C	3.95" (1.017)	5.03	7.35
DL 26243	4760	37	0	<5	6.835	25.50C	4.75" (1.014)	6.70	8.66
DL 26245	7350	58	-110	<5	6.131	230C (1.019)	4.15" (1.007)	5.98	9.54
DL 26246	7200	57	369	<5					

sp#	Sect. 1 Area	Sect 1 mg Hg	Sect 2 Area	Sect 2 mg	L sample	Sample Temp F°/K°	Sample Pressure Vs. 29.92	L Corrected	X (X Calib) 0.989 mg/m ³
3384	18700	151	-17	<5	20.4	76°/297.40	29.96	20.1	7.51
3385	21200	171	309	<5	22.7	76°/292.40(5)	29.96	22.4	7.63
3391	19500	157	453	<5	21.9 7.2				
3392	20200	163	93	<5	23.0 7.1				
26221	16900	136	-270	<5	18.85 6.2	18.5°C 1.003	5.2° .9954	18.977	7.11
26222	20500	166	206	<5	19.51 6.8	16°C 1.003	5.4° .9959	19.489	8.46
3389	17600	142	39500	3190	21.0 6.8				
3390	19000	153	-7	<5	21.4 7.1				
26223	20200	163	L 0	5 T	21.78 7.5	21.5°C 1.005	5.65° 1.004	21.732	7.44
26224	13700	110	-55	<5	15.16 7.3	19.5°C .9983	4.45° 1.001	14.92	7.32
3387	18448	149	50	<5	19.7 7.6				
3388	17900	144	935	7.6	18.5 7.8				
26225	19600	158	531	<5	21.122 7.5	22°C 1.007	5.65° 1.004	21.03	7.46
26226	19600	158	216	<5	20.729 7.6	20.5°C 1.002	5.55° 1.004	20.38	7.69
3386	19700	156	-420	<5	21.4 7.3				
3393	17900	141	-100	<5	19.7 7.2				
26229	16700	132	-100	<5	19.854 6.6	22°C 1.007	5.35° .9958	19.75	6.68
26230	15200	120	-82	<5	17.551 6.8	20.5°C 1.002	4.95° .9948	17.23	6.96
26231	17200	136	-140	<5	17.563 7.7	24°C 1.014	4.55° .9938	17.32	7.85
26232	18863	149	-310	<5	18.610 8.0	21.5°C 1.005	4.95° .9948	18.22	8.18

Trap #	Section 1 Area	Section 1 Ng (%)	Section 2 Area	Section 2 Ng	Liters Sampled	Temp (Vib. F/°C)	Temp Pressure (Vib. 29.92)	Wave (cm/sec)	ms/m ³
26733	18000	142	387	<5	19.812 7.2	24°C	5.6 [±] (1.014)	19.58	7.25
26234	16900	133	-310	<5	17.363 7.7	21°C	5.2 [±] (1.003)	17.04	7.81
3394	20200	164	30	<5	22.4 7.3				
3395	18700	148	24	<5	20.8 3.1				
26235	19900	157	341	<5	21.179 7.4	23°C	5.6 [±] (1.010)	21.02	7.47
26736	22000	174	Not Present		23.032 7.6	21°C	6.0 [±] (1.003)	22.65	7.68
3396	19000	150	173	<5	21.9 6.8				
3398	19100	151	-39	<5	21.7 7.0				
26237	41700	37	68	<5	6.345 17.321 24°C 22°C	24°C 22°C	5.6 [±] (1.014) 6.45 [±]	6.27	5.90 <0.3
26238	87	<5	476	<5	Broken 9.381 27°C	27°C	4.05 [±] (1.024) 3.75 [±]	9.15	4.15
26239	41800	38	278	<5	Heavy Soil 9.652 28°C	28°C	0.9926 0.9918	9.22	3.57
26241	4259	32.9	673	5.3	5.251	25°C	3.75 [±] (1.027) 0.9918	5.15	6.99
26242	4600	36	363	<5	5.201	24°C	3.95 [±] (1.017) 1.014	5.03	7.35
26243	41760	37	8	<5	6.835	25.5°C	4.25 [±] (1.019) 1.019	6.70	8.66
26245	7350	58	-110	<5	6.131	22°C	4.13 [±] (1.007) 1.007	5.98	9.54
26246	7200	57	369	<5					

Trap#	Sect. 1 Area	Sect 1 mg Hg	Sect 2 Area	Sect 2 mg	L sampled	Sample Temp F°/K° (68/293)	Sample Pressure (Vs. 29.92)	X (X calib)	L Corrected	mg/m
S 3384	18700	151	-17	<5	20.4	76°/297.40	29.96		20.1	7.5
S 3385	21200	171	309	<5	22.7	76°/297.40	29.96		22.4	7.6
S 3391	19500	157	453	<5	21.9	7.2				
S 3392	20200	163	93	<5	23.0	7.1				
L 26221	16900	136	-270	<5	18.85	18.5°C 1.003	5.2°C (9954)		18.977	7.11
L 26222	20500	166	206	<5	19.516	8.5	16°C (1.003)	5.4°C (9959)	19.489	8.41
S 3389	17600	142	39500	3190	21.0	6.8				
S 3390	19000	153	-7	<5	21.4	7.1				
L 26223	20200	163	60	57	21.789	21.5°C 1.005	5.65°C (1.004)		21.732	7.41
L 26224	13700	110	-55	<5	15.160	19.5°C .9983	4.45°C (1.001)		14.92	7.3
S 3387	18448	149	50	<5	19.7	7.6				
S 3388	17900	144	935	7.6	18.5	7.8				
L 26225	19600	158	531	<5	21.122	22°C 1.007	5.6°C (1.004)		21.03	7.46
L 26226	19600	158	216	<5	20.729	20.5°C 1.002	5.55°C (1.004)		20.38	7.6
3386	19700	156	-420	<5	21.4	7.3				
3393	17900	141	-100	<5	19.7	7.2				
L 26229	16700	132	-100	<5	19.854	22°C 1.007	5.35°C (9958)		19.75	6.6
L 26230	15200	120	-82	<5	17.551	20.5°C 1.002	4.95°C (9948)		17.23	6.0
L 26231	17200	136	-140	<5	17.563	24°C 1.014	4.55°C (9938)		17.32	7.8
L 26232	18863	149	-310	<5	18.610	21.5°C 1.005	4.95°C (9948)		18.22	8.13

Appendix G:
Resumes of Test Personnel

BILLY J. MULLINS, JR.; President

Education Post Graduate Study Environmental Engineering at Southern Methodist University; Dallas, Texas 1970.

M.S. 1969, New York University; New York, New York, in Civil Engineering (Air Resources).

B.S. 1968, Texas Tech University; Lubbock, Texas, in Civil Engineering (Water Resources). Studies in Engineering at the U.S. Naval Academy; Annapolis, Maryland, 1963-1964

Professional Training Courses Attended Short Course on Air Pollution Engineering at the University of Texas at Austin, February 1970.

Attended four-week management course presented by the American Management Association, 1976.

Certification Registered Professional Engineer
Certified Visible Emissions Evaluator
Licensed Private Pilot (Multi-Engine-Land, Instrument)
Diplomat in the American Academy of Environmental Engineers
Inductee into the Stack Sampling Hall of Fame
Certified as Qualified Environmental Professional (QEP)

Professional Memberships **Air & Waste Management Association** – Past Chairman, Past Vice Chairman, and Past Board of Directors of North Texas Chapter and Southwest Section; Past Chairman, Consultants Committee; Past Chairman, Source Measurement Committee

Source Evaluations Society – Past President, Past Board of Directors

American Management Association

MULLINS (p. 2)

Publications

Authored "Real World Experience with USEPA's New Sampling and Analytical Methods for Conducting Risk Burn," May 1998.

Co-authored "Sulfur Compound Emissions of the Petroleum Production Industry," December 1974.

Co-authored "Field Procedure for Stabilizing Hydrogen Sulfide Samples to be Analyzed Using Modified Methylene Blue Technique," presented at the Conference on Ambient Air Quality Measurements, Austin, Texas, March 1975.

Co-authored "Atmospheric Emissions Survey of the Sour Gas Industry," October 1975.

Co-authored "Technique for Insuring the Validity of Samples for High Concentrations of Sulfur Dioxide Using the EPA Method 5 Sampling Train," presented at the Third National Conference on Energy and the Environment, College Corner, Ohio, September 1975.

Teaching
Experience

Conducted training seminars on sampling methods periodically since 1974 to present.

Conducted a one-day seminar on Part 75 Testing over ten times in 1993 and 1994.

Served as a lecturer in the Environmental Protection Agency's (EPA) training course number 450, "Source Sampling for Particulate Pollutants," for two years from January 1974 to October 1975 and March, 1992.

Conducted a two-day training course entitled "technical Assistance in Source Sampling" at Iowa State University, Ames, Iowa, for the Environmental Protection Agency (EPA), October 1974.

Conducted Environmental Protection Agency's (EPA) training course number 450, "Source Sampling for Particulate Pollutants," at Research Triangle Park, North Carolina, September 1975.

MULLINS (p. 3)

Teaching
Experience
(Cont'd)

Conducted a two-day short course entitled "Performing and Observing Source Sampling," Dallas, Texas, July 1976, May 1977, October 1977, November 1987 and November 1988; Lake Charles, Louisiana, May 1977; Casper Wyoming, May 1977; Point Comfort, Texas, November 1992.

Served as a lecturer in the Environmental Protection Agency's two-day seminar entitled "Asphalt Industry Environmental Solutions," presented in Dallas, Texas, March 21-22, 1979.

Conducted a two-day short course entitled "Performing and Observing Source Sampling," Phoenix, Arizona, August, 1990, for the State of Arizona, Department of Environmental Quality; Lincoln, Nebraska, March 1980, for the State of Nebraska, Air Quality Control Division.

Technical
Experience

Directed and performed stack sampling on over 2000 sources of which over 500 were sampled simultaneously using more than one sampling train at several points in the flue gas stream; 1972-present.

Directed and performed over 200 short-term ambient air studies using mobile sampling vans and various ambient air sampling equipment; 1972-present.

Designed, directed and operated over 20 permanent ambient air networks of various size and duration for a variety of parameters; 1972-present.

Designed surface and underground drainage systems for residential subdivisions, public works projects, and shopping centers; 1969-1972.

Designed several residential subdivisions including lot layout, street design, drainage design, and utility design; 1969-1972.

MULLINS (p. 4)

Research
Projects

Supervised and conducted a study made by the Hawaiian Sugar Planters' Association to characterize the emissions for several bagasse-fired boilers, April-May 1976.

Supervised and conducted a study made by the Rio Grande Valley Sugar Growers, Inc. to determine the area affected by the burning of sugarcane fields prior to harvesting, November 1974-April 1975.

Supervised and conducted a study by a lightweight aggregate manufacturer to develop a material balance around the process through sampling and analysis of several parameters, November 1973.

Conducted a study in New York City to attempt to develop a correlation in the ambient air between carbon dioxide and sulfur dioxide to provide a tool for predicting air pollution predicting air pollution episodes, January-May 1969.

Related
Projects

Served as Chairman of the Engineering Foundation Conference on Stack Sampling and Source Evaluation in Destin, Florida, 2002, and Santa Barbara, California, 1985.

Served as Co-Chairman of the Engineering Foundation Conference on Stack Sampling and Source Evaluation in Destin, Florida, 2001.

Served as Session Chairman at the Engineering Foundation Conference on Stack Sampling and Source Evaluation in Hershey, Pennsylvania, 1984; San Diego, California, 1993; and in Palm Coast, Florida, 1994.

GARY B. GOLDMAN; Associate

Education

B.S. 1993, University of Texas at Arlington; Arlington, Texas, in Geology.

Professional Training

Attended 40-hour Occupational and Environmental Training Program on Hazardous Materials (CFR 1910.120) Dallas, Texas, April 1993.

Attended HAZWOPER 8-hour refresher course, 1994-2005.

Attended the following Environmental Protection Agency (EPA) Courses:

- Course 345, Emission Capture and Gas Handling System Inspection
- Course 380, Fugitive Source Inspection
- Course 400, Introduction to Hazardous Air Pollutants
- Course 413, Control of Particulate Emissions
- Course 415, Control of Gaseous Emissions
- Course 418, Control of Nitrogen Oxide Emissions
- Course 427, Combustion Evaluation
- Course 444, Air Pollution Field Enforcement
- Course 445, Inspection of Particle Control Devices
- Course 446, Inspection Safety Procedures
- Course 450, Source Sampling for Particulate Pollutants
- Course 452, Principles and Practice of Air Pollution Control
- Course 455, Inspection of Gas Control Devices and Selected Industries
- Course 474, Continuous Emission Monitoring
- Course 482, Sources and Control of Volatile Organic Air Pollutants

Attended the following California Air Resources Board (CARB) Courses

- Course 221, Continuous Emission Monitoring
- Course 233, Solvent Cleaning: Degreasing Operations
- Course 242, Hot Mix Asphalt Facilities
- Course 245, Cement Plants
- Course 270, Incinerators

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Certification

Certified Visible Emissions Evaluator

Technical
Experience

Senior Emissions Evaluator with the Texas Commission on Environmental Quality, responsible for oversight of all source testing activities within the State of Texas, Region 4, which encompasses 19 counties in the North Texas region, 1999-2005.

Participated in the sampling of over 750 sources, including several of which were sampled simultaneously utilizing more than one sampling train, 1994-1999.

Thoroughly trained in all EPA testing procedures specified in Title 40 of the Code of Federal Regulations, Part 60.

Thoroughly trained in Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 0010 Through 0100 Series.

Participated in EPA's 3-D probe study. May – August 1997.

Experienced in the analysis of commercial calibration gas cylinders for NO_x, SO₂, CO₂, and O₂.

Experienced with calibration techniques for all field testing equipment.

Thoroughly trained in the operation and routine maintenance of the following:

Anarad Model AR50-C Carbon Dioxide Analyzer
Anarad Model AR880 Oxides of Nitrogen Analyzer
Anarad Model AR23 Oxygen Analyzer
Anarad Model AR30C2 Sulfur Dioxide Analyzer
California Analytical Model 300-HFID Total Hydrocarbon Analyzer
Servomex Model 1440 Carbon Dioxide Analyzer
Servomex Model 1440 Oxygen Analyzer
Teledyne Model 326 Oxygen Analyzer
Thermo Environmental Model 10AR/S Oxides of Nitrogen Analyzer

GOLDMAN (p.3)

Thermo Electron Model 46C Oxides of Nitrogen Analyzer
Thermo Electron Model 48C Oxides of Nitrogen Analyzer
Western Research Model 721A Sulfur Dioxide Analyzer

PATRICK SELAKOVICH; Associate

<u>Education</u>	B.S.B.A. 1992, University of Arkansas; Fayetteville, Arkansas, in General Business.
<u>Professional Training</u>	<p>Attended 24-hour Occupational and Environmental Training Program on Hazardous Materials (CFR 1910.120) Dallas, Texas, April 1997.</p> <p>Attended 40-hour Occupational and Environmental Training Program on Hazardous Materials (CFR 1910.120) & 'Train the Trainer', Gettysburg, Pennsylvania, July 1998.</p> <p>Also attended an 8-hour refresher course January 2000, January 2001, and May 2004.</p> <p>Attended OSHA General Industry Safety and Health Training, May 1999.</p>
<u>Professional Memberships</u>	Society For Human Resource Management
<u>Technical Experience</u>	<p>Participated in the sampling of over 150 sources, including several of which were sampled simultaneously using more than one sampling train. Thoroughly trained in all EPA testing procedures, 1996-present.</p> <p>Participated in EPA's 3-D probe study. May – August 1997.</p> <p>Experience with calibration techniques for all field testing equipment.</p> <p>Thoroughly trained in the operation and routine maintenance of the following:</p> <p>California Analytical Model 300-HFID Total Hydrocarbon Analyzer Servomex Model 1440 Carbon Dioxide Analyzer Servomex Model 1440 Oxygen Analyzer Thermo Electron Model 46C Oxides of Nitrogen Analyzer Thermo Electron Model 48C Oxides of Nitrogen Analyzer Western Research Model 721A Sulfur Dioxide Analyzer</p>

STACK SAMPLING REPORT
FOR
MERCURY SPECIATION, PARTICULATE MATTER, AND HALIDE TESTING
ON THE
PUBLIC SERVICE OF NEW HAMPSHIRE
MERRIMACK STATION
UNIT NO. 2 STACK AND
INLET TO ORIGINAL PRECIPITATOR (DUCT A)

PROJECT NO. 06-056

OCTOBER 2006

PREPARED FOR:
ADA-ES
8100 SOUTHPARK WAY
LITTLETON, CO 80120

PREPARED BY:
AIR SAMPLING ASSOCIATES, INC.
P.O. BOX 1175
LEWISVILLE, TEXAS 75067

(Total Number of pages including cover: 696)

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EXECUTIVE SUMMARY

Air Sampling Associates, Inc. of Lewisville, Texas conducted stack testing at the Public Service of New Hampshire, Merrimack Station, located in Bow, New Hampshire. The purpose of the stack testing was to determine speciated mercury emissions, particulate matter emissions, and halogen emissions at the Inlet to the Original Electrostatic Precipitator (Duct A) and at the Stack of Unit No. 2. The testing was conducted on October 5, 6, and 7, 2006.

The sampling team consisted of Mr. Bill Mullins, Mr. Bill Hefley, Mr. Gary Goldman, Mr. Patrick Selakovich and Mr. Scot Jackson. Mr. Mullins was the test team leader.

Mr. Tom Campbell of ADA-ES was the project manager.

The procedures set forth in the Code of Federal Regulations, Title 40, Chapter I, Part 60, Appendix A, Test Methods 1, 2, 3B, 4, 17, and 26A; and the Ontario Hydro Mercury Speciation Method (ASTM D6784-02) were followed during testing.

Triplicate samples for speciated mercury were collected from the Unit No. 2 Inlet to the Original Electrostatic Precipitator (Duct A). The sampling results indicated that the average total mercury was equal to 5.054 lbs/10¹² Btu. The average total mercury was 95.13% oxidized mercury.

Triplicate samples for halogens were also collected from the Unit No. 2 Inlet to the Original Electrostatic Precipitator (Duct A). The sampling results indicated that the average concentration of Hydrogen Bromide was equal to 0.50 mg/dscm and that the average concentration of Bromine was below the detectable limit of the sampling procedure. The sampling results indicated that the average concentration of Hydrogen Chloride was equal to 37.70 mg/dscm and that the average concentration of Chlorine

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was equal to 0.16 mg/dscm. The sampling results indicated that the average concentration of Hydrogen Fluoride was equal to 1.51 mg/dscm and that the average concentration of Fluoride was below the detectable limit of the sampling procedure.

In conjunction with the samples for speciated mercury and halogens collected from the Unit No. 2 Inlet to the Original Electrostatic Precipitator (Duct A), samples were taken for particulate matter. The six samples collected for particulate matter indicated an average of 4189.42 pounds per hour.

Triplicate samples for speciated mercury were collected from the Unit No. 2 Stack. The sampling results indicated that the average total mercury was equal to 4.965 lbs/10¹² Btu. The average total mercury was 97.21% oxidized mercury.

Triplicate samples for halogens were also collected from the Unit No. 2 Stack. The sampling results indicated that the average concentration of Hydrogen Bromide was equal to 0.56 mg/dscm and that the average concentration of Bromine was below the detectable limit of the sampling procedure. The sampling results indicated that the average concentration of Hydrogen Chloride was equal to 40.08 mg/dscm and that the average concentration of Chlorine was equal to 0.30 mg/dscm. The sampling results indicated that the average concentration of Hydrogen Fluoride was equal to 4.01 mg/dscm and that the average concentration of Fluoride was below the detectable limit of the sampling procedure.

In conjunction with the samples for speciated mercury and halogens collected from the Unit No. 2 Stack, samples were taken for particulate matter. The six samples collected for particulate matter indicated an average of 289.01 pounds per hour.

Billy J. Mullins, Jr. P.E., Q.E.P., D.E.E.

SUMMARY OF RESULTS

Table 1: Unit No. 2 Inlet to the Original ESP (Duct A)
Particulate Matter and Bromine Sampling Results

Run No.	1	2	3	Average
Test Date	10/05/06	10/06/06	10/06/06	-----
Test Time	1720-1919	1320-1435	1542-1657	-----
Flow Rate – DSCFM*	379,390	376,522	375,192	377,035
Stack Temp. - °F	338	333	337	336
O₂ - %Vol. (dry)	4.6	5.0	5.1	4.9
CO₂ - %Vol. (dry)	14.0	13.7	13.8	13.8
Percent Excess Air	27.1	30.2	31.1	29.5
Moisture Content - %	8.00	8.38	7.78	8.05
Percent Isokinetic	99.0	99.5	98.8	99.1
Sample Volume – DSCM	1.254	1.250	1.237	1.247
Particulate Matter – gr/dscf - Front Half	1.3498	1.7269	1.0962	1.3910
Particulate Matter – lbs/hr - Front Half	4,388.85	5,572.21	3,524.71	4495.26
Bromine - mg	ND	ND	ND	ND
- mg/dscm	ND	ND	ND	ND
Hydrogen Bromide - mg	0.503	0.759	0.611	0.624
- mg/dscm	0.40	0.61	0.49	0.50

* 29.92" Hg, 68° F (760 mm Hg, 20 °C)

SUMMARY OF RESULTS

Table 2: Unit No. 2 Stack

Particulate Matter and Bromine Summary of Sampling Results

Run No.	1	2	3	Average
Test Date	10/05/06	10/06/06	10/06/06	-----
Test Time	1720-1837	1320-1435	1542-1655	-----
Flow Rate – DSCFM*	687,042	707,393	699,862	698,099
Stack Temp. - °F	341	339	339	340
O₂ - %Vol. (dry)	5.8	6.4	6.5	6.2
CO₂ - %Vol. (dry)	13.2	13.2	13.2	13.2
Percent Excess Air	37.0	42.9	44.0	41.3
Moisture Content - %	7.27	7.63	6.97	7.29
Percent Isokinetic	99.6	99.7	99.3	99.5
Sample Volume – DSCM	1.206	1.243	1.224	1.224
Particulate Matter – gr/dscf - Front Half	0.0491	0.0401	0.0678	0.0523
Particulate Matter – lbs/hr - Front Half	289.01	242.92	406.56	312.83
Bromine - mg	ND	ND	ND	ND
- mg/dscm	ND	ND	ND	ND
Hydrogen Bromide - mg	0.600	0.798	0.660	0.687
- mg/dscm	0.50	0.64	0.54	0.56

* 29.92" Hg, 68° F (760 mm Hg, 20 °C)

SUMMARY OF RESULTS

Table 3: Unit No. 2 Inlet to the Original ESP (Duct A)

Particulate Matter and Speciated Mercury Summary of Sampling Results

Run No.	1	2	3	Average
Test Date	10/05/07	10/06/06	10/07/06	-----
Test Time	1410-1620	0940-1143	0845-1048	-----
Flow Rate – DSCFM*	386,783	384,254	383,221	384,753
Stack Temp. - °F	337	338	339	338
O₂ - %Vol. (dry)	4.6	5.1	5.0	4.9
CO₂ - %Vol. (dry)	14.0	13.7	13.6	13.8
Percent Excess Air	27.1	31.1	30.2	29.5
Moisture Content - %	8.00	7.76	7.89	7.88
Percent Isokinetic	99.1	99.5	101.0	99.9
Sample Volume – DSCM	2.148	2.142	2.169	2.153
Particulate Matter – gr/dscf - Front Half	1.0976	1.1787	1.2579	1.1781
Particulate Matter – lbs/hr - Front Half	3,638.23	3,881.45	4,131.08	3883.59
Particle Bound Mercury – µg	0.0780	0.1200	0.0940	0.0973
– µg/dscm	0.0363	0.0560	0.0433	0.0452
– lbs/10 ¹² Btu	0.026	0.040	0.032	0.033
Oxidized Mercury – µg	15.6000	14.9000	11.8000	14.1000
– µg/dscm	7.2626	6.9561	5.4403	6.5530
– lbs/10 ¹² Btu	5.238	5.175	4.022	4.812
Elemental Mercury – µg	0.4000	0.7800	0.6500	0.6100
– µg/dscm	0.1862	0.3641	0.2997	0.2833
– lbs/10 ¹² Btu	0.134	0.271	0.222	0.209
Total Mercury – µg	16.0780	15.8000	12.5440	14.8073
– µg/dscm	7.4851	7.3763	5.7833	6.8816
– lbs/10 ¹² Btu	5.399	5.487	4.275	5.054

* 29.92" Hg, 68° F (760 mm Hg, 20 °C)

SUMMARY OF RESULTS

Table 4: Unit No. 2 Stack

Particulate Matter and Speciated Mercury Summary of Sampling Results

Run No.	1	2	3	Average
Test Date	10/05/06	10/06/06	10/07/06	-----
Test Time	1410-1636	0940-1154	0845-1059	-----
Flow Rate – DSCFM*	708,269	713,543	715,379	712,397
Stack Temp. - °F	337	336	337	337
O₂ - %Vol. (dry)	6.2	5.4	6.5	6.0
CO₂ - %Vol. (dry)	13.2	13.2	12.4	12.9
Percent Excess Air	40.9	33.4	43.4	39.2
Moisture Content - %	7.48	7.24	7.42	7.38
Percent Isokinetic	97.6	98.8	99.0	98.5
Sample Volume – DSCM	2.436	2.486	2.497	2.473
Particulate Matter – gr/dscf - Front Half	0.0445	0.0424	0.0435	0.0435
Particulate Matter – lbs/hr - Front Half	269.88	259.20	266.49	265.19
Particle Bound Mercury - µg - µg/dscm - lbs/10 ¹² Btu	ND ND ND	ND ND ND	ND ND ND	ND ND ND
Oxidized Mercury - µg - µg/dscm - lbs/10 ¹² Btu	10.7000 4.3924 3.512	16.6000 6.6774 5.064	18.1000 7.2487 5.917	15.1333 6.1062 4.831
Elemental Mercury - µg - µg/dscm - lbs/10 ¹² Btu	0.3400 0.1396 0.112	0.6600 0.2655 0.201	0.2700 0.1081 0.088	0.4233 0.1711 0.134
Total Mercury - µg - µg/dscm - lbs/10 ¹² Btu	11.0400 4.5320 3.623	17.2600 6.9429 5.266	18.3700 7.3568 6.005	15.5567 6.2772 4.965

* 29.92" Hg, 68° F (760 mm Hg, 20 °C)

DISCUSSION OF SAMPLING RESULTS

Particulate Matter and Bromine

The three tests for particulate matter and bromine on the Unit No. 2 Inlet to the Original ESP (Duct A) appeared to be an accurate representation of the actual emissions during the tests. All leak checks performed on the reference method sampling train and pitot tubes showed no leaks before or after testing. The indicative parameters of the tests were in close agreement. The measured moisture contents (%M) were within 4.1% of the mean value. The measured flow rates (DSCFM) were within 0.6% of the mean value. The rates of sampling for the tests were within the specified limits (90% to 110% isokinetic). The greatest deviation from 100% isokinetic was 1.2%.

The concentrations (mg/dscm) of Bromine for the three tests taken at the Unit No. 2 Inlet to the Original ESP (Duct A) were below the minimum reporting limit of the reference method. The concentrations (mg/dscm) of Hydrogen Bromide for the three tests taken at the Unit No. 2 Inlet to the Original ESP (Duct A) showed a range of -20.0% to +22.0% variation from the mean value of 0.50 mg/dscm.

The concentrations (gr/dscf – Front Half) of particulate matter for the three tests taken at the Unit No. 2 Inlet to the Original ESP (Duct A) showed a range of -21.2 percent to +24.2 percent variation from the mean value of 1.3910 gr/dscf – Front Half.

The three tests for particulate matter and bromine on the Unit No. 2 Stack appeared to be an accurate representation of the actual emissions during the tests. All leak checks performed on the reference method sampling train and pitot tubes showed no leaks before or after testing. The indicative parameters of the tests were in close agreement. The measured moisture contents (%M) were within 4.7% of the mean value. The measured flow rates (DSCFM) were within 1.6% of the mean value. The rates of

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sampling for the tests were within the specified limits (90% to 110% isokinetic). The greatest deviation from 100% isokinetic was 0.7%.

The concentrations (mg/dscm) of Bromine for the three tests taken at the Unit No. 2 Stack were below the minimum reporting limit of the reference method. The concentrations (mg/dscm) of Hydrogen Bromide for the three tests taken at the Unit No. 2 Stack showed a range of -10.7% to +14.3% variation from the mean value of 0.56 mg/dscm.

The concentrations (gr/dscf – Front Half) of particulate matter for the three tests taken at the Unit No. 2 Stack showed a range of -23.4 percent to +29.6 percent variation from the mean value of 0.0523 gr/dscf – Front Half.

Particulate Matter and Speciated Mercury

The three tests for speciated mercury and particulate matter on the Unit No. 2 Inlet to the Original ESP (Duct A) appeared to be valid representations of the actual emissions during the tests. All leak checks performed on the sampling train and the pitot tubes indicated no leaks before or after each test. The indicative parameters calculated from the field data were in reasonable agreement. The measured moisture contents for the three runs were within 1.6% of the mean value. The measured flow rates (DSCFM) for the tests were within 0.5% of the mean value. The rates of sampling for the three tests were within the specified limits (90 to 110 percent isokinetic). The greatest deviation from 100% isokinetic was 1.0%.

The calculated emissions (lbs/10¹² Btu) of total mercury for the three tests on the Unit No. 2 Inlet to the Original ESP (Duct A) indicated a range of -15.4% to +8.6% deviation from the mean value of 5.054 lbs/10¹² Btu.

The concentrations (gr/dscf – Front Half) of particulate matter for the three tests taken at the Unit No. 2 Inlet to the Original ESP (Duct A) showed a range of -6.8 percent to +6.8 percent variation from the mean value of 1.1781 gr/dscf – Front Half.

The three tests for speciated mercury on the Unit No. 2 Stack appeared to be valid representations of the actual emissions during the tests. All leak checks performed on the sampling train and the pitot tubes indicated no leaks before or after each test. The indicative parameters calculated from the field data were in reasonable agreement. The measured moisture contents for the three runs were within 1.9% of the mean value. The measured flow rates (DSCFM) for the tests were within 0.6% of the mean value. The rates of sampling for the three tests were within the specified limits (90 to 110 percent isokinetic). The greatest deviation from 100% isokinetic was 2.4%.

The calculated emissions (lbs/10¹² Btu) of total mercury for the three tests on the Unit No. 2 Stack indicated a range of -27.0% to +21.0% deviation from the mean value of 4.965 lbs/10¹² Btu.

The concentrations (gr/dscf – Front Half) of particulate matter for the three tests taken at the Unit No. 2 Stack showed a range of -2.5 percent to +2.4 percent variation from the mean value of 0.0435 gr/dscf – Front Half.

DESCRIPTION OF SAMPLING LOCATIONS

The sampling ports on the Unit No. 2 Inlet to the Original ESP (Duct A) are approximately 60 feet above the ground. The sampling ports are located in a transition zone in the duct.

The sampling ports on the Unit No. 2 Stack are approximately 232 feet 3 inches above the ground. The sampling ports are located 157 feet 3 inches (9.97 stack diameters) downstream from the inlet to the stack and 84 feet 1 inch (5.33 stack diameters) upstream from the outlet to the stack.

SAMPLING LOCATION

Figure 1: Merrimack Unit No. 2 Stack

SAMPLING AND ANALYTICAL PROCEDURES

The procedures set forth in the Code of Federal Regulations, Title 40, Chapter I, Part 60, Appendix A, Test Methods 1, 2, 3B, 4, 17 and 26A; and the Ontario Hydro Mercury Speciation Method (ASTM D6784-02) were followed during testing.

Bromine

Bromine and particulate matter samples were taken according to EPA Methods 1, 2, 3B, 4, 17 and 26A. For each run on the Unit No. 2 Inlet to the Original ESP (Duct A), samples of 3 minute duration were taken at each of twenty-four traverse points for a total test time of 72 minutes. Data was recorded at 3-minute intervals. For each run on the Unit No. 2 Stack samples of 5 minute duration were taken at each of twelve traverse points for a total test time of 60 minutes. Data was recorded at 5-minute intervals.

The sampling trains were leak-checked at the end of the sampling probe at 15" of mercury vacuum before each test, and again at the conclusion of each test at the highest vacuum recorded during sampling. This was done to predetermine the possibility of a diluted sample.

The 'front-half' of the sampling train on the Unit No. 2 Inlet to the Original ESP (Duct A) contained the following components:

- Glass nozzle
- Fiberglass Thimble
- Heated glass lined probe @ $248^{\circ}\text{F} \pm 25^{\circ}\text{F}$
- Heated Teflon line @ $248^{\circ}\text{F} \pm 25^{\circ}\text{F}$

The 'front-half' of the sampling train on the Unit No. 2 Stack contained the following components:

Glass nozzle

Heated glass lined probe @ $248^{\circ}\text{F} \pm 25^{\circ}\text{F}$

Heated fiberglass filter @ $248^{\circ}\text{F} \pm 25^{\circ}\text{F}$

The 'back-half' of the sampling trains contained the following components:

Table 5: EPA Method 26A Condenser/Absorbing System

Impinger No.	Impinger Type	Absorbing Solution
1	Greenburg-Smith	100 ml 0.1N H_2SO_4
2	Greenburg-Smith	100 ml 0.1N H_2SO_4
3	Modified	100 ml 0.1N NaOH
4	Modified	100 ml 0.1N NaOH
5	Modified	~200 g silica gel

An integrated Orsat sample was collected and analyzed according to EPA Method 3B during each run.

Figure 2: EPA Method 26A Inlet Duct Sampling Train

Figure 3: EPA Method 26A Stack Sampling Train

Speciated Mercury

A preliminary velocity traverse was also made at each of the four sample ports at the sampling location on the stack in order to determine the uniformity and magnitude of the flow prior to testing. Three traverse points were checked from each of the four ports for cyclonic flow and the average angle was equal to 5.5 degrees. Alternate procedures would be required if the angle of cyclonic flow was greater than 20 degrees.

Triplicate samples for speciated mercury were taken. For each run on the Unit No. 2 Inlet to the Original ESP (Duct A), samples of 5 minute duration were taken at each of twenty-four traverse points for a total test time of 120 minutes. Data was recorded at 5-minute intervals. For each run on the Unit No. 2 Stack, samples of 10 minute duration were taken at each of the 12 traverse points for a total sampling time of 120 minutes. Data was recorded at 5 minute intervals.

The pitot tube lines were checked for leaks before and after each test under a vacuum and a pressure. The lines were also checked for clearance and the manometer was zeroed before each test.

The sampling trains for speciated mercury were leak checked at the end of the sampling nozzle at 15" of mercury vacuum before each test, and again at the conclusion of each test at the highest vacuum recorded during sampling. This was done to predetermine the possibility of a diluted sample.

The 'front-half' of the sampling train on the Unit No. 2 Inlet to the Original ESP (Duct A) contained the following components:

Glass nozzle
 Fiberglass Thimble
 Heated glass lined probe @ 248°F ± 25°F
 Heated Teflon line @ 248°F ± 25°F

The 'front-half' of the sampling train on the Unit No. 2 Stack contained the following components:

Glass nozzle
 Fiberglass Thimble
 Heated glass lined probe @ 248°F ± 25°F

The 'back-half' of the sampling trains, contained the following components:

Table 6: Condenser/Absorbing System

Impinger No.	Impinger Type	Absorbing Solution
1	Modified	100 ml 1 N KCl
2	Modified	100 ml 1 N KCl
3	Greenburg-Smith	100 ml 1 N KCl
4	Modified	100 ml 5% v/v HNO_3 , 10% v/v H_2O_2
5	Modified	100 ml 4% w/v H_2SO_4 , 10% v/v KMnO_4
6	Modified	100 ml 4% w/v H_2SO_4 , 10% v/v KMnO_4
7	Greenburg-Smith	100 ml 4% w/v H_2SO_4 , 10% v/v KMnO_4
8	Modified	~200 g silica gel

Integrated Orsat samples were collected at each sampling location during each test. The samples were analyzed according to EPA Method 3B to determine the stack gas molecular weight.

**Figure 4: Ontario Hydro Speciated Mercury Inlet Duct Sampling Train
(ASTM D6784-02)**

**Figure 5: Ontario Hydro Speciated Mercury Stack Sampling Train
(ASTM D6784-02)**

TEST NARRATIVE

Personnel from Air Sampling Associates, Inc. arrived at the Public Service of New Hampshire, Merrimack Station, located in Bow, New Hampshire, at 7:30 a.m., on Thursday, October 5, 2006. The sampling equipment was moved onto the Unit No. 2 Inlet to the Original ESP (Duct A) and onto the Unit No. 2 Stack. The first simultaneous test for mercury and particulate matter, using the Ontario Hydro sampling procedure, began at 2:10 p.m. and continued until the completion of the test on the stack at 4:36 p.m. The first simultaneous test for halides and particulate matter began at 5:20 p.m. and continued until the completion of the test on the inlet duct at 7:19 p.m. The test on the inlet duct was delayed for 44 minutes due to a melted pitot tube line. The samples were recovered and personnel departed the plant at 9:30 p.m.

On Friday, October 6, 2006, personnel returned to the plant at 7:15 a.m. The sampling equipment was prepared for testing and the second simultaneous test for mercury and particulate matter, using the Ontario Hydro sampling procedure, began at 9:40 a.m. Testing continued until the completion of the test on the stack at 11:54 a.m. The second simultaneous test for particulate matter and halides began at 1:20 p.m. and continued until the completion of the test on the inlet duct at 2:35 p.m. The third simultaneous test for particulate matter and halides began at 3:42 p.m. and continued until the completion of the test on the inlet duct at 4:57 p.m. The samples were recovered and personnel departed the plant at 7:15 p.m.

On Saturday October 7, 2006, personnel returned to the plant at 7:00 a.m. The sampling equipment was prepared for testing and the third simultaneous test for mercury and particulate matter, using the Ontario Hydro sampling procedure, began at 8:45 a.m. Testing continued until the completion of the test on the stack at 10:59 a.m.

The samples were recovered and taken to Severn Trent Laboratories in Knoxville, Tennessee for analyses. The sampling equipment was moved off of the Unit No. 2 Stack and the Unit No. 2 Inlet to the Original ESP (Duct A) and loaded into the sampling trailer.

Operations at the Public Service of New Hampshire, Merrimack Station, located in Bow, New Hampshire, were completed at 3:00 p.m. on Saturday October 7, 2006.

APPENDICES

Appendix A: Location of Traverse Points

Appendix B: Nomenclature and Equations for Calculation of Source Emissions

Appendix C: Calibration Data

Appendix D: Field Data

Appendix E: Particulate Matter and Mercury Speciation Analytical Data

Appendix F: Particulate Matter and Halides Speciation Analytical Data

Appendix G: Chain of Custodies

Appendix H: Resumes of Test Personnel

Appendix A:
Location of Traverse Points

Appendix A

Location of Traverse Points

Merrimack Unit No. 2 Inlet to the Original ESP (Duct A)

The sampling ports on the Inlet to the Original ESP are approximately 60 feet above the ground. The sampling ports are located in a transition zone in the duct.

Figure 6: Inlet to the Original ESP (Duct A) Location of Traverse Points

Note: Only 5 of 6 sample points were traversed in Ports A, C, E, and G. Sample point No. 6 was not traversed due to sampling equipment limitations. Ports B, D, F, and H were not traverse due to physical limitations preventing access to the ports.

Appendix A

Location of Traverse Points

Merrimack Unit No. 2 Stack

The sampling ports on the Unit No. 2 Stack are approximately 232 feet 11 inches above the ground. The sampling ports are located 157 feet 3 inches (9.98 stack diameters) downstream from the inlet to the stack and 84 feet 1 inch (5.33 stack diameters) upstream from the outlet to the stack. The locations of the traverse points were calculated as follows:

Table 7: Stack Location Traverse Points

Port & Wall Thickness = 40 1/16inches		
Inside Stack Diameter = 189 3/16 inches		
Point Number*	Percent of Stack Diameter	Distance from Wall
1	4.4	8 5/16"
2	14.6	27 5/8"
3	29.6	56"

* Calculated as one-half of a six point traverse.

Appendix A

Figure 7: Unit No. 2 Stack Sampling Traverse Points

Not to scale.

Appendix B:

Nomenclature and Equations for Calculation of Source Emissions

Nomenclature For Flow Rate and Moisture Calculations

<u>Symbol</u>	<u>English Units</u>	<u>Metric Units</u>	<u>Description</u>
A_s	in. ²	m ²	Stack Area
C_{an}	gr/dscf*	g/dscm*	Particulate – probe, cyclone, and filter
C_{ao}	gr/dscf*	g/dscm*	Particulate –total
C_{at}	gr/CF @ stack conditions	g/m ³	Particulate – probe, cyclone, and filter
C_{au}	gr/CF @ stack conditions	g/m ³	Particulate – total
C_{aw}	lbs/hr	kg/hr	Particulate – probe, cyclone, and filter
C_{ax}	lbs/hr	kg/hr	Particulate - total
C_p			Pitot Tube Calibration Factor
D_n	in.	m	Sampling Nozzle Diameter
%EA			Percent Excess Air at Sampling Point
g	32.2 ft/sec ²		Acceleration of gravity
%I			Percent Isokinetic
%M			Percent Moisture in the Stack Gas by Volume
M_d			Mole Fraction of Dry Gas
m_f	mg	mg	Particulate – probe, cyclone, and filter
mt	mg	mg	Particulate -total
M_{water}	18 lb/lb-mole		Molecular Weight of Water
MW	lb/lb-mole	g/g-mole	Molecular Weight of Stack Gas
MW_{air}	28.84 lb/lb-mole		Molecular Weight of Air
MW_d	lb/lb-mole	g/g-mole	Molecular Weight of Dry Stack Gas

<u>Symbol</u>	<u>English Units</u>	<u>Metric Units</u>	<u>Description</u>
P_b	"Hg Absolute	mm Hg	Barometric Pressure
P_m	"H ₂ O	mm H ₂ O	Orifice Pressure drop
P_s	"Hg Absolute	mm Hg	Stack Pressure
ΔP	"H ₂ O	mm H ₂ O	Velocity Head of Stack Gas
P_{std}	29.92" Hg	760 mm Hg	Standard Barometric Pressure
Q_a	ACFM	m ³ /hr	Stack Gas Volume at Actual Stack Conditions
Q_s	DSCFM*	dscm/hr*	Stack Gas Volume at 29.92" Hg, 528° R, dry
R	21.83" Hg- ft ³ /lb-mole °R		Universal Gas Constant
T_m	°F	°C	Average Gas Meter Temperature
T_t	min	min	Net Time of Test
T_s	°F	°C	Stack Temperature
T_{std}	528 °R	293 °K	Standard Temperature
V_m	ft ³	m ³	Volume of Dry Gas Sampled @ Meter Conditions
$V_{m_{std}}$	dscf*	dscm*	Volume of Dry Gas Sampled @ Standard Conditions
V_s	fpm	m/sec	Stack Velocity @ Stack Conditions
V_w	ml	ml	Total Water Collected in Impingers and Silica Gel
VW_{gas}	scf*	scm*	Volume of Water Vapor Collected @ Standard Conditions

<u>Symbol</u>	<u>English Units</u>	<u>Metric Units</u>	<u>Description</u>
ρ_{air}	0.0748 lbs/ft ³		Density of Air
ρ_{water}	1 g/ml		Density of Water
ρ_{man}	62.32 lbs/ft ³		Density of Manometer Oil (Inches of Water)
Standard Conditions: 29.92" Hg, 68° F (760 mm Hg, 20 °C)

EXAMPLE CALCULATIONS

1. Volume of dry gas sampled at standard conditions. *

$$V_{mstd} = V_m \left(\frac{T_{std}}{T_m + 460} \right) \left[\frac{P_b + \frac{P_m}{13.6}}{P_{std}} \right]$$

$$V_{mstd} = 17.65 V_m \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460} \right] = \text{dscf}$$

$$V_{mstd} = \text{dscf} \times 0.028317 = \text{dscm}$$

2. Volume of water vapor collected at standard conditions. *

$$V_{W_{gas}} = \frac{(V_w - \text{gms } SO_2 - \text{gms } H_2S) \rho_{water} RT_{std}}{P_{std} M_{water} 453.6}$$

$$V_{W_{gas}} = 0.0472 (V_w - \text{gms } SO_2 - \text{gms } H_2S) = \text{scf}$$

$$V_{W_{gas}} = \text{scf} \times 0.028317 = \text{scm}$$

3. Percent moisture in stack gas.

$$\%M = \frac{V_{W_{gas}}}{V_{mstd} + V_{W_{gas}}} \times 100 = \%$$

*

29.92" Hg, 68° F (760 mm Hg, 20 °C)

4. Mole fraction of dry gas.

$$M_d = \frac{100 - \%M}{100}$$

5. Average molecular weight of dry stack gas.

$$MW_d = \left[\%CO_2 \times \frac{44}{100} \right] + \left[\%O_2 \times \frac{32}{100} \right] + \left[\%N_2 \times \frac{28}{100} \right] + \left[\%CO \times \frac{28}{100} \right] = lb/lb - mole$$

$$= g/g - mole$$

6. Molecular weight of stack gas.

$$MW = MW_d \times M_d + 18 (1 - M_d) = \frac{lb}{lb - mole} = g/g - mole$$

7. Percent excess air at sampling point.

$$\%EA = \frac{100 [\%O_2 - (0.5 \%CO)]}{0.265 (\%N_2) - [\%O_2 - (0.5 \%CO)]}$$

8. Stack Pressure.

$$P_s = P_b + \frac{\text{Stack Pressure " H}_2\text{O}}{13.6} = \text{" Hg Absolute}$$

$$P_s = \text{" Hg Abs.} \times 25.4 = mm Hg$$

9. Stack velocity at stack conditions.

$$V_s = C_p 60 \left[\frac{2g \times \rho_{man} \times P_{std} \times MW_{air} \times (T_s + 460) \times \Delta P}{12 \times \rho_{air} \times P_s \times MW \times T_{std}} \right]^{1/2}$$

$$V_s = 5,123.8 C_p \left[\frac{(T_s + 460)}{P_s \times MW} \right]^{1/2} \sqrt{\Delta P} \text{ average} = fpm$$

$$V_s = fpm \times 0.00508 = m/sec$$

10. Dry stack gas volume at standard conditions. *

$$Q_s = \frac{1}{144} V_s \times A_s \times M_d \times \frac{T_{std}}{T_s + 460} \times \frac{P_s}{P_{std}}$$

$$Q_s = \frac{0.123 V_s \times A_s \times M_d \times P_s}{T_s + 460} = DSCFM$$

$$Q_s = DSCFM \times 1.6990 = dscm/hr$$

11. Actual stack gas volume at stack conditions.

$$Q_a = \frac{V_s \times A_s}{144} = ACFM$$

$$Q_a = ACFM \times 1.6990 = m^3/hr$$

12. Percent Isokinetic

$$\%I = \frac{V_{mstd} \times (T_s + 460) \times P_{std} \times 100 \times 144 \text{ in.}^2 / \text{ft}^2}{M_d \times T_{std} \times P_s \times T_t \times V_s \left(\frac{\pi \times D_n^2}{4} \right)}$$

$$\%I = \frac{1039 \times V_{mstd} \times (T_s + 460)}{M_d \times P_s \times T_t \times V_s \times D_n^2}$$

* 29.92" Hg, 68° F (760 mm Hg, 20 °C)

13. Particulate – Probe, cyclone, and filter.

$$C_{an} = \frac{m_f}{V_{mstd}} \times \frac{1 \text{ gr}}{64.8 \text{ mg}}$$

$$C_{an} = 0.0154 \times \frac{m_f}{V_{mstd}} \text{ gr/dscf}^*$$

$$C_{an} = \text{gr/dscf} \times 2.290 = \text{g/dscm}^*$$

14. Particulate total.

$$C_{ao} = 0.0154 \times \frac{m_t}{V_{mstd}} = \text{gr / dscf}^*$$

$$C_{ao} = \text{gr/dscf} \times 2.290 = \text{g/dscm}^*$$

15. Particulate – probe, cyclone, and filter at stack conditions.

$$C_{at} = C_{an} \times \frac{P_s}{P_{std}} \times \frac{(T_{std})}{(T_s + 460)} \times M_d$$

$$C_{at} = \frac{17.65 \times C_{an} \times P_s \times M_d}{T_s + 460} = \text{gr/CF}$$

$$C_{at} = \text{gr/CF} \times 2.290 = \text{g/m}^3$$

16. Particulate – total, at stack conditions.

$$C_{au} = \frac{17.65 \times C_{ao} \times P_s \times M_d}{T_s + 460} = \text{gr/CF}$$

$$C_{au} = \text{gr/CF} \times 2.290 = \text{g/m}^3$$

* 29.92" Hg, 68° F (760 mm Hg, 20 °C)

17. Particulate – probe, cyclone, and filter.

$$C_{aw} = C_{an} \times Q_s \times \frac{60 \text{ min.}}{1 \text{ hr}} \times \frac{1 \text{ lb}}{7,000 \text{ gr}}$$

$$C_{aw} = 0.00857 \times C_{an} \times Q_s = \text{lbs/hr}$$

$$C_{aw} = \text{lbs/hr} \times 0.4536 = \text{kg/hr}$$

18. Particulate – total.

$$C_{ax} = 0.00857 \times C_{ao} \times Q_s = \text{lbs/hr}$$

$$C_{ax} = \text{lbs/hr} \times 0.4536 = \text{kg/hr}$$

19. Mercury - $\mu\text{g/dscm}$

$$\mu\text{g/dscm} = \mu\text{g} \div (V_{\text{mstd}} \times 0.028317 \text{ m}^3/\text{ft}^3)$$

*29.92" Hg, 68° F (760 mm Hg, 20 °C)

Summary of Results
Halide Calculations
PSNH Merrimack Station
Unit No. 2 Inlet to the Original ESP (Duct A)

Run No.	1	2	3	
Test Date:	10/5/2006	10/6/2006	10/6/2006	
Test Time:	1720-1919	1320-1435	1542-1657	Average
<i>Volume of Dry Gas Sampled @ Standard Conditions</i>				
dscm	1.254	1.25	1.237	1.247
<i>Hydrogen Bromide</i>				
mgs	0.503	0.759	0.611	0.624
mg/dscm	0.40	0.61	0.49	0.50
<i>Bromine</i>				
mgs	ND	ND	ND	ND
mg/dscm	ND	ND	ND	ND
<i>Hydrogen Chloride</i>				
mg	45.700	46.600	48.700	47.000
mg/dscm	36.44	37.28	39.37	37.70
<i>Chlorine</i>				
mg	0.3490	ND	0.2380	0.1960
mg/dscm	0.28	ND	0.19	0.16
<i>Hydrogen Fluoride</i>				
mg	1.880	1.930	1.850	1.887
mg/dscm	1.50	1.54	1.50	1.51
<i>Hydrogen Fluoride</i>				
mg	ND	ND	ND	ND
mg/dscm	ND	ND	ND	ND

Summary of Results
Halide Calculations
PSNH Merrimack Station
Unit No. 2 Stack

Run No.	1	2	3	
Test Date:	10/5/2006	10/6/2006	10/6/2006	
Test Time:	1720-1837	1320-1435	1542-1655	Average
Volume of Dry Gas Sampled @ Standard Conditions				
dscm	1.206	1.243	1.224	1.224
Hydrogen Bromide				
mgs	0.600	0.798	0.662	ND
mg/dscm	0.50	0.64	0.54	0.56
Bromine				
mgs	ND	ND	ND	ND
mg/dscm	ND	ND	ND	ND
Hydrogen Chloride				
mg	45.200	53.300	48.800	49.100
mg/dscm	37.48	42.88	39.87	40.08
Chlorine				
mg	0.494	0.221	0.376	0.364
mg/dscm	0.41	0.18	0.31	0.30
Hydrogen Fluoride				
mg	4.460	5.260	5.010	4.910
mg/dscm	3.70	4.23	4.09	4.01
Hydrogen Fluoride				
mg	ND	ND	ND	ND
mg/dscm	ND	ND	ND	ND

Summary of Results
Mercury Speciation Results
PSNH Merrimack Station
Unit No. 2 Inlet to the Original ESP (Duct A)

Run No.	1	2	3	
Test Date:	10/5/2006	10/6/2006	10/7/2006	
Test Time:	1410-1620	0940-1143	0845-1048	Average
Volume of Dry Gas Sampled @ Standard Conditions				
dscm	2.148	2.142	2.169	2.153
dscf	75.84	75.648	76.597	76.028
Oxygen				
% volume	4.6	5.1	5.0	4.9
Particulate Mercury				
µg	0.0780	0.1200	0.0940	0.0973
µg/dscf	0.0010	0.0016	0.0012	0.0013
µg/dscm	0.0363	0.0560	0.0433	0.0452
lbs/10 ¹² Btu	0.026	0.040	0.032	0.033
% of total Hg	0.49%	0.74%	0.75%	0.66%
Oxidized Mercury				
µg	15.6000	14.9000	11.8000	14.1000
µg/dscf	0.2057	0.1970	0.1541	0.1856
µg/dscm	7.2626	6.9561	5.4403	6.5530
lbs/10 ¹² Btu	5.238	5.175	4.022	4.812
% of total Hg	97.03%	94.30%	94.07%	95.13%
Elemental Mercury				
µg	0.4000	0.7800	0.6500	0.6100
µg/dscf	0.0053	0.0103	0.0085	0.0080
µg/dscm	0.1862	0.3641	0.2997	0.2833
lbs/10 ¹² Btu	0.134	0.271	0.222	0.209
% of total Hg	2.49%	4.94%	5.18%	4.20%
Total Mercury				
µg	16.0780	15.8000	12.5440	14.8073
µg/dscf	0.2120	0.2089	0.1638	0.1949
µg/dscm	7.4851	7.3763	5.7833	6.8816
lbs/10 ¹² Btu	5.399	5.487	4.275	5.054
Oxygen based F factor				
	9,007.2	9,007.2	9,007.2	9,007.2
Fuel Analysis				
lbs/10 ¹² Btu	8.16	8.16	8.16	8.16

Summary of Results
Mercury Speciation Results
PSNH Merrimack Station
Unit No. 2 Stack

Run No.	1	2	3	
Test Date:	10/5/2006	10/6/2006	10/7/2006	
Test Time:	1410-1636	0940-1154	0845-1059	Average
Volume of Dry Gas Sampled @ Standard Conditions				
dscm	2.436	2.486	2.497	2.473
dscf	86.036	87.779	88.182	87.332
Oxygen				
% volume	6.2	5.4	6.5	6.0
Particulate Mercury				
µg	ND	ND	ND	ND
µg/dscf	ND	ND	ND	ND
µg/dscm	ND	ND	ND	ND
lbs/10 ¹² Btu	ND	ND	ND	ND
% of total Hg	0.00%	0.00%	0.00%	0.00%
Oxidized Mercury				
µg	10.7000	16.6000	18.1000	15.1333
µg/dscf	0.1244	0.1891	0.2053	0.1729
µg/dscm	4.3924	6.6774	7.2487	6.1062
lbs/10 ¹² Btu	3.512	5.064	5.917	4.831
% of total Hg	96.92%	96.18%	98.53%	97.21%
Elemental Mercury				
µg	0.3400	0.6600	0.2700	0.4233
µg/dscf	0.0040	0.0075	0.0031	0.0048
µg/dscm	0.1396	0.2655	0.1081	0.1711
lbs/10 ¹² Btu	0.112	0.201	0.088	0.134
% of total Hg	3.08%	3.82%	1.47%	2.79%
Total Mercury				
µg	11.0400	17.2600	18.3700	15.5567
µg/dscf	0.1283	0.1966	0.2083	0.1778
µg/dscm	4.5320	6.9429	7.3568	6.2772
lbs/10 ¹² Btu	3.623	5.266	6.005	4.965
Oxygen based F factor				
	9,007.2	9,007.2	9,007.2	9,007.2
Fuel Analysis				
lbs/10 ¹² Btu	8.36	8.36	8.36	8.36

SOURCE EMISSION SURVEY

JOB NUMBER: 06-056
 JOB NAME: ADA-ES
 LOCATION: Bow, NH
 UNIT TESTED: Unit No. 2 Inlet to Original Precip. (Ontario Hydro)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1	2	3
DATE			10/05/06	10/06/06	10/07/06
BEGIN TIME			1410	0940	0845
END TIME			1620	1143	1048
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	30.09 (764.00)	30.35 (771.00)	30.36 (771.00)
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.254 (31.900)	1.235 (31.400)	1.231 (31.300)
	DGM CALIBRATION FACTOR		1.002	1.002	1.002
V(m)	VOLUME DRY GAS SAMPLED	ft.^3	75.738	73.919	73.540
	@ METER CONDITIONS	(m^3)	(2.145)	(2.093)	(2.082)
	LEAK CHECK VOLUME	ft.^3	0.000	0.000	0.000
T(m)	AVERAGE GAS METER	DEG.F	72	65	56
	TEMPERATURE	(DEG.C)	(22)	(18)	(13)
V(m[std])*	VOLUME DRY GAS SAMPLED	DSCF	75.840	75.648	76.597
	@ STANDARD CONDITIONS*	(DSCM)	(2.148)	(2.142)	(2.169)
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	139.7	134.8	139.1
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	6.594 (0.187)	6.363 (0.180)	6.566 (0.186)
%M	MOISTURE IN STACK GAS BY VOLUME	%	8.00	7.76	7.89
Md	MOL FRACTION OF DRY GAS		0.9200	0.9224	0.9211
Tt	NET TIME OF TEST	MINUTES	120	120	120

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-056
 JOB NAME: ADA-ES
 LOCATION: Bow, NH
 UNIT TESTED: Unit No. 2 Inlet to Original Precip. (Ontario Hydro)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1	2	3
CO2		%	14.0	13.7	13.6
O2		%	4.6	5.1	5.0
CO		%	0.0	0.0	0.0
N2		%	81.4	81.2	81.4
%EA	EXCESS AIR @ SAMPLING POINT	%	27.1	31.1	30.2
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.42 (30.42)	30.40 (30.40)	30.38 (30.38)
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.43 (29.43)	29.43 (29.43)	29.40 (29.40)
Cp	PITOT TUBE CALIBRATION		0.818	0.818	0.818
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	0.538 (13.700)	0.526 (13.400)	0.524 (13.300)
DELTA P ^{^(1/2)}		"H2O	0.732	0.723	0.722
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	337 (169)	338 (170)	339 (171)
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	30.57 (776.00) 6.50	30.82 (783.00) 6.40	30.83 (783.00) 6.40
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	2,888 (15)	2,842 (14)	2,841 (14)
As	STACK AREA	(SQ.INCHES) (SQ.METERS)	30,856 (20)	30,856 (20)	30,856 (20)
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	386,783 (657,144)	384,254 (652,848)	383,221 (651,092)
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m ³ /HR)	618,757 (1,051,268)	609,047 (1,034,771)	608,797 (1,034,346)
Dn	SAMPLING NOZZLE DIAM.	IN. (m)	0.255 (0.006)	0.255 (0.006)	0.255 (0.006)
%I	PERCENT ISOKINETIC	%	99.1	99.5	101.0

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-056
 JOB NAME: ADA-ES
 LOCATION: Bow, NH
 UNIT TESTED: Unit No. 2 Inlet to Original Precip. (Ontario Hydro)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1	2	3
Mf	PARTICULATE - PROBE, CYCLONE AND FILTER	mg	5,405.3	5,789.9	6,256.4
Mt	PARTICULATE - TOTAL	mg	5,405.3	5,789.9	6,256.4
Can	PARTICULATE - PROBE, CYCLONE AND FILTER	gr/DSCF* (g/DSCM)	1.0976 (2.5135)	1.1787 (2.6992)	1.2579 (2.8805)
Cao	PARTICULATE - TOTAL	gr/DSCF* (g/DSCM)	1.0976 (2.5135)	1.1787 (2.6992)	1.2579 (2.8805)
Cat	PARTIC.-PROBE, CYCLONE AND FILTER @ STACK COND.	gr/CF (g/m3)	0.6836 (1.5654)	0.7411 (1.6971)	0.7891 (1.8070)
Cau	PARTICULATE - TOTAL @ STACK CONDITIONS	gr/CF (g/m3)	0.6836 (1.5654)	0.7411 (1.6971)	0.7891 (1.8070)
Caw	PARTICULATE - PROBE, CYCLONE AND FILTER	LBS/HR (Kg/HR)	3,638.23 (1,650.30)	3,881.45 (1,760.62)	4,131.08 (1,873.86)
Cax	PARTICULATE - TOTAL	LBS/HR (Kg/HR)	3,638.23 (1,650.30)	3,881.45 (1,760.62)	4,131.08 (1,873.86)

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-056
 JOB NAME: ADA-ES
 LOCATION: Bow, NH
 UNIT TESTED: Unit No. 2 Inlet to Original Precip.(EPA 26A)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1	2	3
DATE			10/05/06	10/06/06	10/06/06
BEGIN TIME			1720	1320	1542
END TIME			1919	1435	1657
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	30.06 (764.00)	30.34 (771.00)	30.34 (771.00)
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.202 (30.500)	1.190 (30.200)	1.171 (29.700)
	DGM CALIBRATION FACTOR		1.002	1.002	1.002
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	44.091 (1.249)	43.817 (1.241)	43.587 (1.234)
	LEAK CHECK VOLUME	ft.^3	0.000	0.000	0.000
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	70 (21)	73 (23)	76 (24)
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	44.267 (1.254)	44.150 (1.250)	43.670 (1.237)
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	81.6	85.5	78.0
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	3.852 (0.109)	4.036 (0.114)	3.682 (0.104)
%M	MOISTURE IN STACK GAS BY VOLUME	%	8.00	8.38	7.78
Md	MOL FRACTION OF DRY GAS		0.9200	0.9162	0.9222
Tt	NET TIME OF TEST	MINUTES	72	72	72

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-056
 JOB NAME: ADA-ES
 LOCATION: Bow, NH
 UNIT TESTED: Unit No. 2 Inlet to Original Precip.(EPA 26A)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1	2	3
CO2		%	14.0	13.7	13.8
O2		%	4.6	5.0	5.1
CO		%	0.0	0.0	0.0
N2		%	81.4	81.3	81.1
%EA	EXCESS AIR @ SAMPLING POINT	%	27.1	30.2	31.1
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.42 (30.42)	30.39 (30.39)	30.41 (30.41)
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.43 (29.43)	29.35 (29.35)	29.45 (29.45)
Cp	PITOT TUBE CALIBRATION		0.824	0.818	0.818
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	0.515 (13.100)	0.508 (12.900)	0.501 (12.700)
DELTA P ^{^(1/2)}		"H2O	0.714	0.710	0.706
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	338 (170)	333 (167)	337 (169)
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	30.52 (775.00) 6.30	30.81 (783.00) 6.40	30.81 (783.00) 6.40
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	2,841 (14)	2,787 (14)	2,773 (14)
As	STACK AREA	(SQ. INCHES) (SQ. METERS)	30,856 (20)	30,856 (20)	30,856 (20)
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	379,390 (644,584)	376,522 (639,711)	375,192 (637,451)
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	608,848 (1,034,433)	597,128 (1,014,520)	594,248 (1,009,627)
Dn	SAMPLING NOZZLE DIAM.	IN. (m)	0.254 (0.006)	0.254 (0.006)	0.254 (0.006)
%I	PERCENT ISOKINETIC	%	99.0	99.5	98.8

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-056
 JOB NAME: ADA-ES
 LOCATION: Bow, NH
 UNIT TESTED: Unit No. 2 Inlet to Original Precip.(EPA 26A)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1	2	3
Mf	PARTICULATE - PROBE, CYCLONE AND FILTER	mg	3,880.1	4,950.7	3,108.5
Mt	PARTICULATE - TOTAL	mg	3,880.1	4,950.7	3,108.5
Can	PARTICULATE - PROBE, CYCLONE AND FILTER	gr/DSCF* (g/DSCM)	1.3498 (3.0911)	1.7269 (3.9545)	1.0962 (2.5103)
Cao	PARTICULATE - TOTAL	gr/DSCF* (g/DSCM)	1.3498 (3.0911)	1.7269 (3.9545)	1.0962 (2.5103)
Cat	PARTIC.-PROBE, CYCLONE AND FILTER @ STACK COND.	gr/CF (g/m3)	0.8383 (1.9197)	1.0850 (2.4847)	0.6897 (1.5794)
Cau	PARTICULATE - TOTAL @ STACK CONDITIONS	gr/CF (g/m3)	0.8383 (1.9197)	1.0850 (2.4847)	0.6897 (1.5794)
Caw	PARTICULATE - PROBE, CYCLONE AND FILTER	LBS/HR (Kg/HR)	4,388.85 (1,990.78)	5,572.21 (2,527.56)	3,524.71 (1,598.81)
Cax	PARTICULATE - TOTAL	LBS/HR (Kg/HR)	4,388.85 (1,990.78)	5,572.21 (2,527.56)	3,524.71 (1,598.81)

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-056
 JOB NAME: ADA-ES
 LOCATION: Bow, NH
 UNIT TESTED: Unit No. 2 Stack (Ontario Hydro)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1	2	3
DATE			10/05/06	10/06/06	10/07/06
BEGIN TIME			1410	0940	0845
END TIME			1636	1154	1059
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.92 (760.00)	30.18 (767.00)	30.19 (767.00)
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.815 (46.100)	1.831 (46.500)	1.844 (46.800)
	DGM CALIBRATION FACTOR		0.985	0.985	0.985
V(m)	VOLUME DRY GAS SAMPLED	ft.^3	86.451	85.309	85.176
	@ METER CONDITIONS	(m^3)	(2.448)	(2.416)	(2.412)
	LEAK CHECK VOLUME	ft.^3	0.000	0.000	0.000
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	73 (23)	60 (16)	57 (14)
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	86.036 (2.436)	87.779 (2.486)	88.182 (2.497)
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	147.3	145.1	149.7
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	6.953 (0.197)	6.849 (0.194)	7.066 (0.200)
%M	MOISTURE IN STACK GAS BY VOLUME	%	7.48	7.24	7.42
Md	MOL FRACTION OF DRY GAS		0.9252	0.9276	0.9258
Tt	NET TIME OF TEST	MINUTES	120	120	120

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-056
 JOB NAME: ADA-ES
 LOCATION: Bow, NH
 UNIT TESTED: Unit No. 2 Stack (Ontario Hydro)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1	2	3
CO2		%	13.2	13.2	12.4
O2		%	6.2	5.4	6.5
CO		%	0.0	0.0	0.0
N2		%	80.6	81.4	81.1
%EA	EXCESS AIR @ SAMPLING POINT	%	40.9	33.4	43.4
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.36 (30.36)	30.33 (30.33)	30.24 (30.24)
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.44 (29.44)	29.44 (29.44)	29.34 (29.34)
Cp	PITOT TUBE CALIBRATION		0.825	0.825	0.825
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	2.154 (54.700)	2.154 (54.700)	2.169 (55.100)
DELTA P ^{^(1/2)}		"H2O	1.468	1.468	1.473
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	337 (169)	336 (169)	337 (169)
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	29.88 (759.00) -0.55	30.14 (766.00) -0.53	30.14 (766.00) -0.65
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	5,907 (30)	5,877 (30)	5,911 (30)
As	STACK AREA	(SQ.INCHES) (SQ.METERS)	28,104 (18)	28,104 (18)	28,104 (18)
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	708,269 (1,203,349)	713,543 (1,212,310)	715,379 (1,215,429)
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	1,152,784 (1,958,580)	1,147,080 (1,948,889)	1,153,671 (1,960,087)
Dn	SAMPLING NOZZLE DIAM.	IN. (m)	0.193 (0.005)	0.193 (0.005)	0.193 (0.005)
%I	PERCENT ISOKINETIC	%	97.6	98.8	99.0

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-056
 JOB NAME: ADA-ES
 LOCATION: Bow, NH
 UNIT TESTED: Unit No. 2 Stack (Ontario Hydro)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1	2	3
Mf	PARTICULATE - PROBE, CYCLONE AND FILTER	mg	248.4	241.6	248.9
Mt	PARTICULATE - TOTAL	mg	248.4	241.6	248.9
Can	PARTICULATE - PROBE, CYCLONE AND FILTER	gr/DSCF* (g/DSCM)	0.0445 (0.1018)	0.0424 (0.0971)	0.0435 (0.0995)
Cao	PARTICULATE - TOTAL	gr/DSCF* (g/DSCM)	0.0445 (0.1018)	0.0424 (0.0971)	0.0435 (0.0995)
Cat	PARTIC.-PROBE, CYCLONE AND FILTER @ STACK COND.	gr/CF (g/m3)	0.0272 (0.0623)	0.0263 (0.0602)	0.0269 (0.0616)
Cau	PARTICULATE - TOTAL @ STACK CONDITIONS	gr/CF (g/m3)	0.0272 (0.0623)	0.0263 (0.0602)	0.0269 (0.0616)
Caw	PARTICULATE - PROBE, CYCLONE AND FILTER	LBS/HR (Kg/HR)	269.88 (122.42)	259.20 (117.57)	266.49 (120.88)
Cax	PARTICULATE - TOTAL	LBS/HR (Kg/HR)	269.88 (122.42)	259.20 (117.57)	266.49 (120.88)

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-056
 JOB NAME: ADA-ES
 LOCATION: Bow, NH
 UNIT TESTED: Unit No. 2 Stack (EPA 26A)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1	2	3
DATE			10/05/06	10/06/06	10/06/06
BEGIN TIME			1720	1320	1542
END TIME			1837	1435	1655
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.95 (761.00)	30.17 (766.00)	30.36 (771.00)
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.742 (44.200)	1.833 (46.600)	1.779 (45.200)
	DGM CALIBRATION FACTOR		0.985	0.985	0.985
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	42.344 (1.199)	43.326 (1.227)	42.578 (1.206)
	LEAK CHECK VOLUME	ft.^3	0.000	0.000	0.000
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	68 (20)	68 (20)	70 (21)
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	42.575 (1.206)	43.890 (1.243)	43.234 (1.224)
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	70.7	76.8	68.6
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	3.337 (0.094)	3.625 (0.103)	3.238 (0.092)
%M	MOISTURE IN STACK GAS BY VOLUME	%	7.27	7.63	6.97
Md	MOL FRACTION OF DRY GAS		0.9273	0.9237	0.9303
Tt	NET TIME OF TEST	MINUTES	60	60	60

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-056
 JOB NAME: ADA-ES
 LOCATION: Bow, NH
 UNIT TESTED: Unit No. 2 Stack (EPA 26A)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1	2	3
CO2		%	13.2	13.2	13.2
O2		%	5.8	6.4	6.5
CO		%	0.0	0.0	0.0
N2		%	81.0	80.4	80.3
%EA	EXCESS AIR @ SAMPLING POINT	%	37.0	42.9	44.0
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.34 (30.34)	30.37 (30.37)	30.37 (30.37)
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.45 (29.45)	29.42 (29.42)	29.51 (29.51)
Cp	PITOT TUBE CALIBRATION		0.822	0.822	0.822
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	2.042 (51.900)	2.158 (54.800)	2.079 (52.800)
DELTA P ^{^(1/2)}		"H2O	1.429	1.469	1.441
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	341 (172)	339 (171)	339 (171)
Ps	STACK PRESSURE	"Hg Abs. (mm Hg)	29.92 (760.00)	30.14 (766.00)	30.32 (770.00)
		"H2O	-0.46	-0.45	-0.58
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	5,738 (29)	5,873 (30)	5,735 (29)
As	STACK AREA	(SQ.INCHES) (SQ.METERS)	28,104 (18)	28,104 (18)	28,104 (18)
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	687,042 (1,167,284)	707,393 (1,201,861)	699,862 (1,189,066)
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m ³ /HR)	1,119,940 (1,902,778)	1,146,230 (1,947,445)	1,119,329 (1,901,740)
Dn	SAMPLING NOZZLE DIAM.	IN. (m)	0.193 (0.005)	0.193 (0.005)	0.193 (0.005)
%I	PERCENT ISOKINETIC	%	99.6	99.7	99.3

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-056
 JOB NAME: ADA-ES
 LOCATION: Bow, NH
 UNIT TESTED: Unit No. 2 Stack (EPA 26A)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1	2	3
Mf	PARTICULATE - PROBE, CYCLONE AND FILTER	mg	135.7	114.2	190.3
Mt	PARTICULATE - TOTAL	mg	135.7	114.2	190.3
Can	PARTICULATE - PROBE, CYCLONE AND FILTER	gr/DSCF* (g/DSCM)	0.0491 (0.1124)	0.0401 (0.0918)	0.0678 (0.1552)
Cao	PARTICULATE - TOTAL	gr/DSCF* (g/DSCM)	0.0491 (0.1124)	0.0401 (0.0918)	0.0678 (0.1552)
Cat	PARTIC.-PROBE, CYCLONE AND FILTER @ STACK COND.	gr/CF (g/m3)	0.0300 (0.0687)	0.0246 (0.0563)	0.0422 (0.0966)
Cau	PARTICULATE - TOTAL @ STACK CONDITIONS	gr/CF (g/m3)	0.0300 (0.0687)	0.0246 (0.0563)	0.0422 (0.0966)
Caw	PARTICULATE - PROBE, CYCLONE AND FILTER	LBS/HR (Kg/HR)	289.01 (131.09)	242.92 (110.19)	406.56 (184.42)
Cax	PARTICULATE - TOTAL	LBS/HR (Kg/HR)	289.01 (131.09)	242.92 (110.19)	406.56 (184.42)

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

Appendix C:
Calibration Data

Appendix C

Table 8: Calibration Data

Pre-Test Calibrations:

<u>Equipment</u>	<u>Calibration Factor</u>	<u>Calibration Date</u>
Dry Gas Meter 1-1	0.985	09/19/06
Digital Temperature Indicator 1-1		09/19/06
Dry Gas Meter 1-1 Orifice		09/19/06
Dry Gas Meter 1-2	1.002	06/27/06
Digital Temperature Indicator 1-2		06/27/06
Dry Gas Meter 1-2 Orifice		06/28/06
Pitot Tube 1-1	0.825	09/20/06
Pitot Tube 1-4	0.818	09/08/06
Pitot Tube 2-1	0.822	09/08/06
Pitot Tube 2-4	0.824	01/24/06
Nozzle 5-2	0.193	01/25/06
Nozzle 5-3	0.255	01/25/06
Nozzle 7-2	0.193	09/19/06
Nozzle 7-3	0.254	09/19/06
Barometer No. 1	NIST Traceable	09/10/06

Post-Test Calibrations:

<u>Equipment</u>	<u>Calibration Factor</u>	<u>Calibration Date</u>
Dry Gas Meter 1-1	0.980	10/27/06
Dry Gas Meter 1-2	0.993	10/23/06
Digital Temperature Indicator 1-2		10/23/06
Dry Gas Meter 1-2 Orifice		10/23/06
Pitot Tube 1-1	0.823	11/06/06
Pitot Tube 1-4	0.824	11/06/06
Pitot Tube 2-1	0.825	11/06/06
Pitot Tube 2-4	0.825	11/06/06
Nozzle 5-2	0.192	10/27/06
Nozzle 5-3	0.253	10/23/06
Nozzle 7-2	0.192	10/27/06
Nozzle 7-3	-----	Broken during recovery.
Barometer No. 1	NIST Traceable	10/23/06

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-1
Date Calibration Performed: 09/19/06

ΔH Setting (" H ₂ O)	C _{DG}
0.50	0.984
1.00	0.986
1.50	0.985
2.00	0.987
3.00	0.984
4.00	0.983
Average	0.985

Variation +: 0.20%
Variation -: -0.20%

Certified by: Gary B. Goldman 09/19/06

Calibrator (Signature / Date)

Bill Hefley 09/19/06

QA Officer (Signature / Date)

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-1
Date Calibration Performed: 09/19/06

Run 1 at 0.5" ΔH Pb = 29.80 " Hg
Wet Test Meter C_f = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0

	Meter					
	Time	Reading		Temp.	P _m	
End	13:27	5.238	cf	83 °F	-0.1	" H ₂ O
Start	13:14	0.000	cf	83 °F	-0.1	" H ₂ O
Average		5.238	cf	83 °F	-0.1	" H ₂ O

Dry Gas Meter

	Meter		Temperature				P _m	
	Reading		In	Out				
	913.384	cf	82 °F	83 °F			0.50	" H ₂ O
	907.982	cf	82 °F	81 °F			0.50	" H ₂ O
	5.402	cf	82 °F	82 °F			0.50	" H ₂ O

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{5.164} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{5.249} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{0.984}$$

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-1
Date Calibration Performed: 09/19/06

Run 1 at 1.0" ΔH Pb = 29.80 " Hg
Wet Test Meter Cf = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0

		Meter						
	Time	Reading		Temp.	P _m			
End	13:40	5.015	cf	83 °F	-0.4	" H ₂ O		
Start	13:31	0.000	cf	83 °F	-0.4	" H ₂ O		
Average		5.015	cf	83 °F	-0.4	" H ₂ O		

Dry Gas Meter

		Meter		Temperature				
	Reading			In	Out	P _m		
	918.875	cf		86 °F	83 °F	1.00	" H ₂ O	
	913.712	cf		83 °F	82 °F	1.00	" H ₂ O	
	5.163	cf		85 °F	83 °F	1.00	" H ₂ O	

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{4.940} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{5.009} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{0.986}$$

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-1
Date Calibration Performed: 09/19/06

Run 1 at 1.5" ΔH Pb = 29.80 " Hg
Wet Test Meter Cf = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0								Dry Gas Meter							
Meter								Temperature							
	Time	Reading		Temp.	P _m			Reading	In	Out	P _m				
End	14:00	10.038	cf	83 °F	-0.6	" H ₂ O		930.182	cf	91 °F	84 °F	1.50	" H ₂ O		
Start	13:45	0.000	cf	83 °F	-0.6	" H ₂ O		919.804	cf	86 °F	83 °F	1.50	" H ₂ O		
Average		10.038	cf	83 °F	-0.6	" H ₂ O		10.378	cf	89 °F	84 °F	1.50	" H ₂ O		

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{9.884} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{10.034} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{0.985}$$

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-1
Date Calibration Performed: 09/19/06

Run 1 at 2.0" ΔH Pb = 29.80 " Hg
Wet Test Meter C_f = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0

	Meter					
	Time	Reading	Temp.		P _m	
End	14:16	10.020 cf	83 °F	-0.7	" H ₂ O	
Start	14:03	0.000 cf	83 °F	-0.7	" H ₂ O	
Average		10.020 cf	83 °F	-0.7	" H ₂ O	

Dry Gas Meter

	Meter		Temperature				P _m	
	Reading		In	Out				
	940.927 cf	94	°F	86 °F	2.00	" H ₂ O		
	930.552 cf	90	°F	85 °F	2.00	" H ₂ O		
	10.375 cf	92	°F	86 °F	2.00	" H ₂ O		

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{9.863} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{9.993} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{0.987}$$

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-1
Date Calibration Performed: 09/19/06

Run 1 at 3.0" ΔH Pb = 29.80 " Hg
Wet Test Meter Cf = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0

Meter						
	Time	Reading	Temp.		P _m	
End	14:29	10.407 cf	84 °F	-1.0	" H ₂ O	
Start	14:18	0.000 cf	84 °F	-1.0	" H ₂ O	
Average		10.407 cf	84 °F	-1.0	" H ₂ O	

Dry Gas Meter

Temperature				P _m	
	In	Out			
	97 °F	87 °F	3.00	" H ₂ O	
	92 °F	86 °F	3.00	" H ₂ O	
	95 °F	87 °F	3.00	" H ₂ O	

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{10.218} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{10.381} \text{ dcsf}$$

$$\text{Calibration Factor (C}_{DG}\text{)} = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{0.984}$$

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-1
Date Calibration Performed: 09/19/06

Run 1 at 4.0" ΔH Pb = 29.80 " Hg
Wet Test Meter Cf = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0

	Meter					
	Time	Reading		Temp.	P _m	
End	14:42	10.864	cf	84 °F	-1.3	" H ₂ O
Start	14:32	0.000	cf	84 °F	-1.3	" H ₂ O
Average		10.864	cf	84 °F	-1.3	" H ₂ O

Dry Gas Meter

	Meter		Temperature				P _m	
	Reading		In	Out				
	963.826	cf	98 °F	88 °F	4.00	"	H ₂ O	
	952.552	cf	87 °F	96 °F	4.00	"	H ₂ O	
	11.274	cf	93 °F	92 °F	4.00	"	H ₂ O	

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{10.659} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{10.843} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{0.983}$$

Calibration Data
Digital Temperature Indicator Calibration

DTI Unit No. ASAI 1-1
Date Calibration Performed: 09/19/06

<u>Reference Point</u>	<u>Time</u>	ASTM	DTI
		Reference Thermometer (°F)	(°F)
Ice Bath	11:43	33° F	32° F
Ambient Air	11:39	82° F	82° F
Boiling Water	12:10	210° F	210° F
Oven	11:55	251° F	252° F
Oven	11:58	298° F	299° F
Oven	12:08	348° F	348° F
Oven	12:02	389° F	389° F

Meter Adjusted? No

ASTM Reference Thermometer:	<u>SN: 5963</u>	Range: <u>+18+89°F</u>
	<u>SN: 1853</u>	Range: <u>+205+310°F</u>
	<u>SN: 992</u>	Range: <u>+295+400°F</u>

Certified by: Gary B. Goldman 09/19/06
Calibrator (Signature / Date)

Bill Hefley 09/19/06
QA Officer (Signature / Date)

Orifice Curve ASAI 1-1 09/19/06

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-2
Date Calibration Performed: 06/27/06

ΔH Setting (" H ₂ O)	C _{DG}
0.50	1.004
1.00	1.000
1.50	1.006
2.00	1.001
3.00	0.999
4.00	1.000
Average	1.002

Variation +: 0.40%
Variation -: -0.30%

Certified by: Gary B. Goldman 06/27/06

Calibrator (Signature / Date)

Bill Hefley 06/27/06

QA Officer (Signature / Date)

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-2
Date Calibration Performed: 06/28/06

Run 1 at 0.5" ΔH Pb = 29.84 " Hg
Wet Test Meter Cf = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0							Dry Gas Meter					
Meter							Temperature					
	Time	Reading	Temp.		P _m		Reading	In	Out		P _m	
End	10:21	5.363	cf	86	-0.2	" H ₂ O	453.212	cf	99 °F	93 °F	0.50	" H ₂ O
Start	10:08	0.000	cf	85	-0.2	" H ₂ O	447.678	cf	99 °F	93 °F	0.50	" H ₂ O
Average		5.363	cf	86	-0.2	" H ₂ O	5.534	cf	99 °F	93 °F	0.50	" H ₂ O

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{5.269} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{5.249} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{1.004}$$

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-2
Date Calibration Performed: 06/28/06

Run 1 at 1.0" ΔH Pb = 29.84 " Hg
Wet Test Meter Cf = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0							Dry Gas Meter						
Meter							Temperature						
	Time	Reading		Temp.	P _m			Reading	In	Out	P _m		
End	9:04	5.173	cf	84 °F	-0.3	" H ₂ O		401.195	cf	88 °F	85 °F	1.00	" H ₂ O
Start	8:55	0.000	cf	84 °F	-0.3	" H ₂ O		395.950	cf	82 °F	80 °F	1.00	" H ₂ O
Average		5.173	cf	84 °F	-0.3	" H ₂ O		5.245	cf	85 °F	83 °F	1.00	" H ₂ O

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{5.095} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{5.093} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{1.000}$$

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-2
Date Calibration Performed: 06/28/06

Run 1 at 1.5" ΔH Pb = 29.84
Wet Test Meter Cf = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0							Dry Gas Meter				
Meter							Temperature				
	Time	Reading		Temp.	P _m		Meter Reading	In	Out	P _m	
End	9:22	10.413 cf	85	°F	-0.4	" H ₂ O	412.003 cf	95	°F 88	°F 1.50	" H ₂ O
Start	9:07	0.000 cf	84	°F	-0.4	" H ₂ O	401.422 cf	88	°F 86	°F 1.50	" H ₂ O
Average		10.413 cf	85	°F	-0.4	" H ₂ O	10.581 cf	92	°F 87	°F 1.50	" H ₂ O

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{10.243} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{10.184} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{1.006}$$

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-2
Date Calibration Performed: 06/28/06

Run 1 at 2.0" ΔH Pb = 29.84 " Hg
Wet Test Meter C_f = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0

	Meter					
	Time	Reading		Temp.	P _m	
End	9:41	11.980 cf	85 °F	-0.5	" H ₂ O	
Start	9:26	0.000 cf	85 °F	-0.5	" H ₂ O	
Average		11.980 cf	85 °F	-0.5	" H ₂ O	

Dry Gas Meter

	Meter		Temperature				P _m	
	Reading		In	Out				
	424.810 cf	100 °F	90 °F	2.00	" H ₂ O			
	412.518 cf	93 °F	89 °F	2.00	" H ₂ O			
	12.292 cf	97 °F	90 °F	2.00	" H ₂ O			

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{11.771} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{11.765} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{1.001}$$

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-2
Date Calibration Performed: 06/28/06

Run 1 at 3.0" ΔH Pb = 29.84 " Hg
Wet Test Meter C_f = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0							Dry Gas Meter						
Meter							Temperature						
	Time	Reading		Temp.	P _m				In	Out	P _m		
End	9:54	10.700	cf	85 °F	-0.7 " H ₂ O		436.298	cf	102 °F	92 °F	3.00 " H ₂ O		
Start	9:43	0.000	cf	85 °F	-0.7 " H ₂ O		425.287	cf	97 °F	90 °F	3.00 " H ₂ O		
Average		10.700	cf	85 °F	-0.7 " H ₂ O		11.011	cf	100 °F	91 °F	3.00 " H ₂ O		

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{10.508} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{10.522} \text{ dcsf}$$

$$\text{Calibration Factor (C}_{DG}\text{)} = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{0.999}$$

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-2
Date Calibration Performed: 06/28/06

Run 1 at 4.0" ΔH Pb = 29.84 " Hg
Wet Test Meter Cf = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0

	Meter					
	Time	Reading		Temp.	P _m	
End	10:05	10.050	cf	85 °F	-0.9	" H ₂ O
Start	9:56	0.000	cf	85 °F	-0.9	" H ₂ O
Average		10.050	cf	85 °F	-0.9	" H ₂ O

Dry Gas Meter

	Meter		Temperature				P _m	
	Reading		In	Out				
	447.134	cf	104 °F	94 °F	4.00	" H ₂ O		
	436.769	cf	104 °F	94 °F	4.00	" H ₂ O		
	10.365	cf	104 °F	94 °F	4.00	" H ₂ O		

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{9.865} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{9.862} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{1.000}$$

Calibration Data
Digital Temperature Indicator Calibration

DTI Unit No. ASAI 1-2
Date Calibration Performed: 06/27/06

		ASTM Reference Thermometer	DTI
<u>Reference Point</u>	<u>Time</u>	<u>(°F)</u>	<u>(°F)</u>
Ice Bath	<u>16:10</u>	<u>33° F</u>	<u>32° F</u>
Ambient Air	<u>8:47</u>	<u>82° F</u>	<u>82° F</u>
Boiling Water	<u>16:03</u>	<u>211° F</u>	<u>211° F</u>
Oven	<u>15:44</u>	<u>223° F</u>	<u>223° F</u>
Oven	<u>15:30</u>	<u>259° F</u>	<u>260° F</u>
Oven	<u>15:32</u>	<u>275° F</u>	<u>276° F</u>
Oven	<u>15:34</u>	<u>298° F</u>	<u>299° F</u>

Meter Adjusted? No

ASTM Reference Thermometer:	<u>SN: 5963</u>	Range: <u>+18+89°F</u>
	<u>SN: 1853</u>	Range: <u>+205+310°F</u>
	<u>SN: 992</u>	Range: <u>+295+400°F</u>

Certified by: Gary B. Goldman 06/27/06
Calibrator (Signature / Date)

Bill Hefley 06/27/06
QA Officer (Signature / Date)

Orifice Curve ASAI 1-2 06/28/06

CALIBRATION DATA PITOT TUBE CALIBRATION DATA

Date: 09/20/06
I.D. # ASAI 1-1
C_{pstd}: 0.990

Time: 10:20
T_s: 78 °F
Pb: 29.73 " Hg

fps Mark	Desired Calibration Standard	Calibration Standard		√ Standard Average	High	√ High	Cal. Factor	Low	√ Low	Cal. Factor
Start	End									
20	0.09	0.09	0.09	0.300	0.13	0.361	0.824	0.13	0.361	0.824
30	0.20	0.20	0.20	0.447	0.29	0.539	0.822	0.29	0.539	0.822
40	0.36	0.36	0.36	0.600	0.52	0.721	0.824	0.52	0.721	0.824
50	0.56	0.56	0.56	0.748	0.80	0.894	0.828	0.80	0.894	0.828
60	0.80	0.80	0.80	0.894	1.15	1.072	0.826	1.15	1.072	0.826
70	1.09	1.10	1.10	1.049	1.60	1.265	0.821	1.60	1.265	0.821
80	1.43	1.40	1.40	1.183	2.00	1.414	0.828	2.00	1.414	0.828
90	1.81	1.80	1.80	1.342	2.60	1.612	0.824	2.60	1.612	0.824
50	0.56	0.56	0.56	0.748	0.80	0.894	0.828	0.80	0.894	0.828
50	0.56	0.56	0.56	0.748	0.80	0.894	0.828	0.80	0.894	0.828
Average							0.825			0.825

Summary of Results:

Normal high side calibration factor: 0.825
variation +: 0.36%
variation -: -0.48%
Normal low side calibration factor: 0.825
variation +: 0.36%
variation -: -0.48%

Certification:

I certify that the Type S pitot tube, the standard type pitot tube, and the calibration setup meet or exceed all specifications, criteria and/or applicable design features and hereby assign a pitot tube calibration factor C_p of: 0.825

Certified by: Patrick Selakovich 09/20/06
Calibrator (Signature/Date)

Bill Hefley 09/20/06
QA Officer (Signature/Date)

CALIBRATION DATA

Date: 09/08/06

I.D. # ASAI 1-4

C_{pstd}: 0.990

Time: 19:50 $T_s: 90^\circ\text{F}$

Pb: 29.52 " Hg

fps Mark	Desired Calibration Standard	Calibration Standard		√ Standard Average	High	√ High	Cal. Factor	Low	√ Low	Cal. Factor
		Start	End							
20	0.09	0.09	0.09	0.300	0.13	0.361	0.824	0.13	0.361	0.824
30	0.19	0.20	0.20	0.447	0.29	0.539	0.822	0.29	0.539	0.822
40	0.35	0.35	0.35	0.592	0.51	0.714	0.820	0.51	0.714	0.820
50	0.54	0.54	0.54	0.735	0.80	0.894	0.813	0.80	0.894	0.813
60	0.78	0.78	0.78	0.883	1.15	1.072	0.815	1.15	1.072	0.815
70	1.06	1.05	1.05	1.025	1.55	1.245	0.815	1.55	1.245	0.815
80	1.39	1.40	1.40	1.183	2.05	1.432	0.818	2.05	1.432	0.818
90	1.75	1.75	1.75	1.323	2.55	1.597	0.820	2.55	1.597	0.820
50	0.54	0.54	0.54	0.735	0.80	0.894	0.813	0.80	0.894	0.813
50	0.54	0.54	0.54	0.735	0.80	0.894	0.813	0.80	0.894	0.813
Average							0.818			0.818

Summary of Results:

Normal high side calibration factor: 0.818

variation +: 0.73%

variation - : -0.61%

Normal low side calibration factor: 0.818

variation +: 0.73%

variation - : -0.61%

Certification:

I certify that the Type S pitot tube, the standard type pitot tube, and the calibration setup meet or exceed all specifications, criteria and/or applicable design features and hereby assign a pitot tube calibration factor C_p of: 0.818

Certified by:

Gary B. Goldman 9/08/06

Calibrator (Signature/Date)

Bill Hefley 9/08/06

QA Officer (Signature/Date)

CALIBRATION DATA PITOT TUBE CALIBRATION DATA

Date: 09/08/06
I.D. # ASAI 2-1
C_{pstd}: 0.990

Time: 19:25
T_s: 90 °F
Pb: 29.52 " Hg

fps Mark	Desired Calibration Standard	Calibration Standard		√ Standard Average	High	√ High	Cal. Factor	Low	√ Low	Cal. Factor
		Start	End							
20	0.09	0.09	0.09	0.300	0.13	0.361	0.824	0.13	0.361	0.824
30	0.19	0.20	0.20	0.447	0.29	0.539	0.822	0.29	0.539	0.822
40	0.35	0.35	0.35	0.592	0.51	0.714	0.820	0.51	0.714	0.820
50	0.54	0.54	0.54	0.735	0.79	0.889	0.818	0.79	0.889	0.818
60	0.78	0.78	0.78	0.883	1.15	1.072	0.815	1.15	1.072	0.815
70	1.06	1.05	1.05	1.025	1.50	1.225	0.828	1.50	1.225	0.828
80	1.39	1.40	1.40	1.183	2.00	1.414	0.828	2.00	1.414	0.828
90	1.75	1.75	1.75	1.323	2.55	1.597	0.820	2.55	1.597	0.820
50	0.54	0.54	0.54	0.735	0.79	0.889	0.818	0.79	0.889	0.818
50	0.54	0.54	0.54	0.735	0.79	0.889	0.818	0.79	0.889	0.818
Average							0.822			0.822

Summary of Results:

Normal high side calibration factor: 0.822
variation +: 0.73%
variation -: -0.85%
Normal low side calibration factor: 0.822
variation +: 0.73%
variation -: -0.85%

Certification:

I certify that the Type S pitot tube, the standard type pitot tube, and the calibration setup meet or exceed all specifications, criteria and/or applicable design features and hereby assign a pitot tube calibration factor C_p of: 0.822

Certified by:

Gary B. Goldman 9/08/06
Calibrator (Signature/Date)

Bill Hefley 9/08/06
QA Officer (Signature/Date)

**CALIBRATION DATA
PITOT TUBE CALIBRATION DATA**

Date: 01/24/06
I.D. # ASAI 2-4
C_{pstd}: 0.990

Time: 8:05
T_s: 53 °F
Pb: 29.86 " Hg

fps Mark	Desired Calibration Standard	Calibration Standard		√ Standard Average	High	√ High	Cal. Factor	Low	√ Low	Cal. Factor
20	0.09	0.09	0.09	0.300	0.13	0.361	0.824	0.13	0.361	0.824
30	0.21	0.21	0.21	0.458	0.30	0.548	0.828	0.30	0.548	0.828
40	0.38	0.38	0.38	0.616	0.55	0.742	0.823	0.55	0.742	0.823
50	0.59	0.59	0.59	0.768	0.87	0.933	0.815	0.85	0.922	0.825
60	0.85	0.85	0.85	0.922	1.25	1.118	0.816	1.25	1.118	0.816
70	1.15	1.15	1.15	1.072	1.65	1.285	0.826	1.65	1.285	0.826
80	1.50	1.50	1.50	1.225	2.15	1.466	0.827	2.15	1.466	0.827
90	1.90	1.90	1.90	1.378	2.70	1.643	0.830	2.70	1.643	0.830
50	0.59	0.59	0.59	0.768	0.86	0.927	0.820	0.85	0.922	0.825
50	0.59	0.59	0.59	0.768	0.86	0.927	0.820	0.85	0.922	0.825
Average							0.824			0.825

Summary of Results:

Normal high side calibration factor: 0.824
variation +: 0.73%
variation -: -1.09%
Normal low side calibration factor: 0.825
variation +: 0.61%
variation -: -1.09%

Certification:

I certify that the Type S pitot tube, the standard type pitot tube, and the calibration setup meet or exceed all specifications, criteria and/or applicable design features and hereby assign a pitot tube calibration factor C_p of: 0.824

Certified by:

Scot Jackson 01/24/06
Calibrator (Signature/Date)

Bill Hefley 01/24/06
QA Officer (Signature/Date)

Calibration Data
Nozzle Calibration

Nozzle Set No. ASAI - 5
Date Calibration Performed: 01/25/06

	-1	-2	-3	-4	-5	-6	-7	-8
Measurement 1	<u> </u>	<u>0.193</u>	<u>0.255</u>	<u>0.309</u>	<u> </u>	<u>0.437</u>	<u>0.488</u>	<u>0.155</u>
Measurement 2	<u> </u>	<u>0.192</u>	<u>0.254</u>	<u>0.309</u>	<u> </u>	<u>0.437</u>	<u>0.488</u>	<u>0.154</u>
Measurement 3	<u> </u>	<u>0.192</u>	<u>0.256</u>	<u>0.310</u>	<u> </u>	<u>0.439</u>	<u>0.488</u>	<u>0.153</u>
Measurement 4	<u> </u>	<u>0.191</u>	<u>0.254</u>	<u>0.309</u>	<u> </u>	<u>0.437</u>	<u>0.490</u>	<u>0.154</u>
Measurement 5	<u> </u>	<u>0.193</u>	<u>0.255</u>	<u>0.311</u>	<u> </u>	<u>0.437</u>	<u>0.490</u>	<u>0.154</u>
Measurement 6	<u> </u>	<u>0.194</u>	<u>0.255</u>	<u>0.312</u>	<u> </u>	<u>0.437</u>	<u>0.490</u>	<u>0.153</u>
Measurement 7	<u> </u>	<u>0.192</u>	<u>0.254</u>	<u>0.312</u>	<u> </u>	<u>0.437</u>	<u>0.489</u>	<u>0.153</u>
Measurement 8	<u> </u>	<u>0.193</u>	<u>0.256</u>	<u>0.309</u>	<u> </u>	<u>0.438</u>	<u>0.489</u>	<u>0.155</u>
Measurement 9	<u> </u>	<u>0.193</u>	<u>0.256</u>	<u>0.310</u>	<u> </u>	<u>0.438</u>	<u>0.491</u>	<u>0.154</u>
Measurement 10	<u> </u>	<u>0.193</u>	<u>0.253</u>	<u>0.309</u>	<u> </u>	<u>0.438</u>	<u>0.489</u>	<u>0.154</u>
Average		0.193	0.255	0.310		0.438	0.489	0.154

Gary B. Goldman 1/25/06

Calibrator (Signature / Date)

Bill Hefley 1/25/06

QA Officer (Signature / Date)

Calibration Data
Nozzle Calibration

Nozzle Set No. ASAI - 7
Date Calibration Performed: 09/19/06

	-1	-2	-3	-4	-5	-6	-7	-8
Measurement 1	<u>0.114</u>	<u>0.192</u>	<u>0.255</u>	<u>0.308</u>	<u>0.375</u>	<u>0.426</u>	<u> </u>	<u>0.154</u>
Measurement 2	<u>0.115</u>	<u>0.193</u>	<u>0.253</u>	<u>0.307</u>	<u>0.378</u>	<u>0.424</u>	<u> </u>	<u>0.155</u>
Measurement 3	<u>0.114</u>	<u>0.192</u>	<u>0.254</u>	<u>0.308</u>	<u>0.375</u>	<u>0.425</u>	<u> </u>	<u>0.155</u>
Measurement 4	<u>0.113</u>	<u>0.194</u>	<u>0.252</u>	<u>0.306</u>	<u>0.375</u>	<u>0.424</u>	<u> </u>	<u>0.155</u>
Measurement 5	<u>0.115</u>	<u>0.193</u>	<u>0.254</u>	<u>0.308</u>	<u>0.377</u>	<u>0.426</u>	<u> </u>	<u>0.153</u>
Measurement 6	<u>0.113</u>	<u>0.192</u>	<u>0.254</u>	<u>0.310</u>	<u>0.376</u>	<u>0.427</u>	<u> </u>	<u>0.153</u>
Measurement 7	<u>0.113</u>	<u>0.193</u>	<u>0.253</u>	<u>0.307</u>	<u>0.375</u>	<u>0.424</u>	<u> </u>	<u>0.152</u>
Measurement 8	<u>0.115</u>	<u>0.192</u>	<u>0.254</u>	<u>0.308</u>	<u>0.377</u>	<u>0.426</u>	<u> </u>	<u>0.153</u>
Measurement 9	<u>0.114</u>	<u>0.193</u>	<u>0.254</u>	<u>0.309</u>	<u>0.376</u>	<u>0.426</u>	<u> </u>	<u>0.155</u>
Measurement 10	<u>0.112</u>	<u>0.192</u>	<u>0.252</u>	<u>0.307</u>	<u>0.377</u>	<u>0.426</u>	<u> </u>	<u>0.153</u>
Average	0.114	0.193	0.254	0.308	0.376	0.425		0.154

Gary B. Goldman 9/19/06

Calibrator (Signature / Date)

Bill Hefley 9/19/06

QA Officer (Signature / Date)

Calibration Data
Barometer Calibration Data

Date:	09/10/2006	Time:	1310
I.D. #:	ASAI – 1	Temperature:	94

Mercury Barometer ASAI – 0 Reading:	29.65" Hg
Aneroid Barometer Reading:	29.71" Hg
Difference:	0.06" Hg
Barometer Adjusted?	YES

Certified by:	<i>Billy J. Mullins, Jr.</i> 09/10/06	<i>Bill Hefley</i> 09/10/06
	Calibrator (Signature/Date)	QA Officer (Signature/Date)

Post-test Calibration Data

METHOD 5 DRY GAS METER CALIBRATION USING CRITICAL ORIFICES

- 1) Select three critical orifices to calibrate the dry gas meter which bracket the expected operating range.
- 2) Record barometric pressure before and after calibration procedure.
- 3) Run at tested vacuum (from Orifice Calibration Report), for a period of time necessary to achieve a minimum total volume of 5 cubic feet.
- 4) Record data and information in the GREEN cells, YELLOW cells are calculated.

ASAI 1-1 10-27-2006

DATE: 10/27/2006		METER SERIAL #: 1508		BAROMETRIC PRESSURE (in Hg):		INITIAL		FINAL		AVG (P _{amb})		IF Y VARIATION EXCEEDS 2.00%, ORIFICE SHOULD BE RECALIBRATED					
METER PART #: C-5000-SO		CRITICAL ORIFICE SET SERIAL #: 1426s															
ORIFICE #	RUN #	K' FACTOR (AVG)	TESTED VACUUM (in Hg)	DGM READINGS (FT ³)		TEMPERATURES °F				ELAPSED TIME (MIN)	DGM ΔH (in H ₂ O)	(1) V _m (STD)	(2) V _{cr} (STD)	(3) Y	Y VARIATION (%)	ΔH _g	
				INITIAL	FINAL	AMBIENT	DGM INLET	DGM OUTLET	DGM AVG								
24	1	0.6583	15	28.204	33.360	54	67	67	66	66	66.5	6.00	2.35	5.1393	5.1020	0.993	1.82
	2	0.6583	15	33.360	38.525	64	67	68	66	66	66.75	6.00	2.35	5.1458	5.1020	0.991	1.82
	3	0.6583	15	38.525	43.693	64	68	68	66	67	67.25	6.00	2.35	5.1439	5.1020	0.992	1.82
19	1	0.5066	18	11.903	17.241	64	69	68	65	66	67	8.00	1.40	5.3032	5.2351	0.987	1.83
	2	0.5066	18	17.241	22.590	64	68	67	66	66	66.75	8.00	1.40	5.3166	5.2351	0.985	1.83
	3	0.5066	18	22.590	27.934	64	67	67	66	66	66.5	8.00	1.40	5.3142	5.2351	0.985	1.83
	1										0						
	2										0						
	3										0						

USING THE CRITICAL ORIFICES AS CALIBRATION STANDARDS:

The following equations are used to calculate the standard volumes of air passed through the DGM, V_g (std), and the critical orifice, V_{cr} (std), and the DGM calibration factor, Y. These equations are automatically calculated in the spreadsheet above.

$$(1) \quad V_{m(std)} = K_1 * V_m * \frac{P_{bar} + (\Delta H / 13.6)}{T_m}$$

= Net volume of gas sample passed through DGM, corrected to standard conditions
 $K_1 = 17.64 \text{ } ^\circ\text{R/in. Hg (English), } 0.3858 \text{ } ^\circ\text{K/mm Hg (Metric)}$
 $T_m = \text{Absolute DGM avg. temperature (} ^\circ\text{R - English, } ^\circ\text{K - Metric)}$

$$(2) \quad V_{cr(std)} = K' * \frac{P_{bar} * \Theta}{\sqrt{T_{amb}}}$$

= Volume of gas sample passed through the critical orifice, corrected to standard conditions
 $T_{amb} = \text{Absolute ambient temperature (} ^\circ\text{R - English, } ^\circ\text{K - Metric)}$
 $K' = \text{Average K' factor from Critical Orifice Calibration}$

$$(3) \quad Y = \frac{V_{cr(std)}}{V_{m(std)}}$$

= DGM calibration factor

AVERAGE DRY GAS METER CALIBRATION FACTOR, Y = **0.989**

AVERAGE ΔH_g = **1.82**

$$\Delta H_g = \left(\frac{0.75 \Theta}{V_{cr(std)}} \right)^2 \Delta H \left(\frac{V_m(std)}{V_m} \right)$$

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-2
Date Calibration Performed: 10/23/06

ΔH Setting (" H ₂ O)	C _{DG}
0.50	0.995
1.00	0.994
1.50	0.995
2.00	0.995
3.00	0.992
4.00	0.988
Average	0.993

Variation +: 0.20%
Variation -: -0.50%

Certified by: Patrick Selakovich 10/23/06

Calibrator (Signature / Date)

Bill Hefley 10/23/06

QA Officer (Signature / Date)

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-2
Date Calibration Performed: 10/23/06

Run 1 at 0.5" ΔH Pb = 29.95 " Hg
Wet Test Meter Cf = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0

	Meter					
	Time	Reading		Temp.	P _m	
End	11:17	5.324 cf		65	-0.4	" H ₂ O
Start	11:04	0.000 cf		65 °F	-0.4	" H ₂ O
Average		5.324 cf		65 °F	-0.4	" H ₂ O

Dry Gas Meter

	Meter		Temperature				P _m	
	Reading		In	Out				
	960.188 cf		72 °F	68 °F			0.50	" H ₂ O
	954.709 cf		70 °F	68 °F			0.50	" H ₂ O
	5.479 cf		71 °F	68 °F			0.50	" H ₂ O

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{5.452} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{5.477} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{0.995}$$

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-2
Date Calibration Performed: 10/23/06

Run 1 at 1.0" ΔH Pb = 29.95 " Hg
Wet Test Meter Cf = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0

	Meter					
	Time	Reading	Temp.	P _m		
End	11:30	5.082 cf	65 °F	-0.6	" H ₂ O	
Start	11:21	0.000 cf	65 °F	-0.6	" H ₂ O	
Average		5.082 cf	65 °F	-0.6	" H ₂ O	

Dry Gas Meter

	Meter		Temperature				P _m	
	Reading		In	Out				
	966.457 cf		75 °F	69 °F			1.00	" H ₂ O
	961.214 cf		71 °F	68 °F			1.00	" H ₂ O
	5.243 cf		73 °F	69 °F			1.00	" H ₂ O

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{5.201} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{5.235} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{0.994}$$

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-2
Date Calibration Performed: 10/23/06

Run 1 at 1.5" ΔH Pb = 29.95
Wet Test Meter Cf = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0

Meter						
	Time	Reading		Temp.	P _m	
End	11:48	10.148 cf	66	°F	-0.8	" H ₂ O
Start	11:33	0.000 cf	65	°F	-0.8	" H ₂ O
Average		10.148 cf	66	°F	-0.8	" H ₂ O

Dry Gas Meter

Meter		Temperature				
	Reading	In	Out	P _m		
	977.623 cf	80 °F	71 °F	1.50	" H ₂ O	
	967.127 cf	75 °F	70 °F	1.50	" H ₂ O	
	10.496 cf	78 °F	71 °F	1.50	" H ₂ O	

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{10.372} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{10.428} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{0.995}$$

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-2
Date Calibration Performed: 10/23/06

Run 1 at 2.0" ΔH Pb = 29.94 " Hg
Wet Test Meter C_f = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0

		Meter					
	Time	Reading		Temp.	P _m		
End	12:06	10.091	cf	66 °F	-0.8	" H ₂ O	
Start	11:52	0.000	cf	66 °F	-0.8	" H ₂ O	
Average		10.091	cf	66 °F	-0.8	" H ₂ O	

Dry Gas Meter

	Meter			Temperature			
	Reading			In	Out	P _m	
	989.182	cf		83 °F	73 °F	2.00	" H ₂ O
	978.711	cf		78 °F	75 °F	2.00	" H ₂ O
	10.471	cf		81 °F	74 °F	2.00	" H ₂ O

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{10.300} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{10.350} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{0.995}$$

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-2
Date Calibration Performed: 10/23/06

Run 1 at 3.0" ΔH Pb = 29.94 " Hg
Wet Test Meter C_f = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0

	Meter					
	Time	Reading		Temp.	P_m	
End	12:20	10.431 cf	66 °F	-1.0	" H ₂ O	
Start	12:09	0.000 cf	66 °F	-1.0	" H ₂ O	
Average		10.431 cf	66 °F	-1.0	" H ₂ O	

Dry Gas Meter

	Meter		Temperature				P_m	
	Reading		In	Out				
	1001.373 cf	85 °F	75 °F	3.00	" H ₂ O			
	990.507 cf	82 °F	74 °F	3.00	" H ₂ O			
	10.866 cf	84 °F	75 °F	3.00	" H ₂ O			

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{10.642} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{10.732} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{0.992}$$

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-2
Date Calibration Performed: 10/23/06

Run 1 at 4.0" ΔH Pb = 29.94 " Hg
Wet Test Meter Cf = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0							Dry Gas Meter						
Meter							Temperature						
	Time	Reading		Temp.	P _m			Reading	In	Out	P _m		
End	12:34	10.882	cf	67 °F	-1.1	" H ₂ O		13.866	cf	87 °F	75 °F	4.00	" H ₂ O
Start	12:24	0.000	cf	67 °F	-1.1	" H ₂ O		2.519	cf	83 °F	75 °F	4.00	" H ₂ O
Average		10.882	cf	67 °F	-1.1	" H ₂ O		11.347	cf	85 °F	75 °F	4.00	" H ₂ O

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{11.078} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{11.213} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{0.988}$$

Calibration Data
Digital Temperature Indicator Calibration

DTI Unit No. ASAI 1-2
Date Calibration Performed: 10/23/06

		ASTM Reference Thermometer	DTI
<u>Reference Point</u>	<u>Time</u>	<u>(°F)</u>	<u>(°F)</u>
Ice Bath	<u>10:06</u>	<u>32° F</u>	<u>32° F</u>
Ambient Air	<u>8:20</u>	<u>60° F</u>	<u>59° F</u>
Boiling Water	<u>9:50</u>	<u>211° F</u>	<u>211° F</u>
Oven	<u>9:23</u>	<u>252° F</u>	<u>256° F</u>
Oven	<u>9:10</u>	<u>304° F</u>	<u>304° F</u>
Oven	<u>9:01</u>	<u>353° F</u>	<u>353° F</u>
Oven	<u>8:43</u>	<u>402° F</u>	<u>402° F</u>

Meter Adjusted? No

ASTM Reference Thermometer:	<u>SN: 5963</u>	Range: <u>+18+89°F</u>
	<u>SN: 1853</u>	Range: <u>+205+310°F</u>
	<u>SN: 992</u>	Range: <u>+295+400°F</u>

Certified by: Patrick Selakovich 10/23/06
Calibrator (Signature / Date)

Bill Hefley 10/23/06
QA Officer (Signature / Date)

Orifice Curve ASAI 1-2 10/23/06

CALIBRATION DATA PITOT TUBE CALIBRATION DATA

Date: 11/06/06
I.D. # ASAI 1-1
C_{pstd}: 0.990

Time: 14:40
T_s: 70 °F
Pb: 29.62 " Hg

fps Mark	Desired Calibration Standard	Calibration Standard		v Standard Average	High	v High	Cal. Factor	Low	v Low	Cal. Factor
		Start	End							
20	0.09	0.09	0.09	0.300	0.13	0.361	0.824	0.13	0.361	0.824
30	0.20	0.20	0.20	0.447	0.29	0.539	0.822	0.29	0.539	0.822
40	0.36	0.36	0.36	0.600	0.52	0.721	0.824	0.52	0.721	0.824
50	0.56	0.56	0.56	0.748	0.82	0.906	0.818	0.81	0.900	0.823
60	0.81	0.80	0.80	0.894	1.15	1.072	0.826	1.15	1.072	0.826
70	1.10	1.10	1.10	1.049	1.60	1.265	0.821	1.60	1.265	0.821
80	1.44	1.40	1.40	1.183	2.00	1.414	0.828	2.00	1.414	0.828
90	1.83	1.80	1.80	1.342	2.60	1.612	0.824	2.60	1.612	0.824
50	0.56	0.56	0.56	0.748	0.82	0.906	0.818	0.81	0.900	0.823
50	0.56	0.56	0.56	0.748	0.82	0.906	0.818	0.81	0.900	0.823
Average							0.823			0.824

Summary of Results:

Normal high side calibration factor: 0.823
variation +: 0.61%
variation -: -0.61%
Normal low side calibration factor: 0.824
variation +: 0.49%
variation -: -0.36%

Certification:

I certify that the Type S pitot tube, the standard type pitot tube, and the calibration setup meet or exceed all specifications, criteria and/or applicable design features and hereby assign a pitot tube calibration factor C_p of: 0.823

Certified by:

Patrick Selakovich 11/06/06

Calibrator (Signature/Date)

Bill Hefley 11/06/06

QA Officer (Signature/Date)

CALIBRATION DATA PITOT TUBE CALIBRATION DATA

Date: 11/06/06
I.D. # ASAI 2-1
C_{pstd}: 0.990

Time: 15:20
T_s: 71 °F
Pb: 29.63 " Hg

fps Mark	Desired Calibration Standard	Calibration Standard		v Standard Average	High	v High	Cal. Factor	Low	v Low	Cal. Factor
		Start	End							
20	0.09	0.09	0.09	0.300	0.13	0.361	0.824	0.13	0.361	0.824
30	0.20	0.20	0.20	0.447	0.29	0.539	0.822	0.29	0.539	0.822
40	0.36	0.36	0.36	0.600	0.52	0.721	0.824	0.52	0.721	0.824
50	0.56	0.56	0.56	0.748	0.80	0.894	0.828	0.80	0.894	0.828
60	0.81	0.81	0.81	0.900	1.15	1.072	0.831	1.15	1.072	0.831
70	1.10	1.10	1.10	1.049	1.60	1.265	0.821	1.60	1.265	0.821
80	1.44	1.40	1.40	1.183	2.00	1.414	0.828	2.00	1.414	0.828
90	1.82	1.80	1.80	1.342	2.60	1.612	0.824	2.60	1.612	0.824
50	0.56	0.56	0.56	0.748	0.80	0.894	0.828	0.80	0.894	0.828
50	0.56	0.56	0.56	0.748	0.80	0.894	0.828	0.80	0.894	0.828
Average							0.825			0.825

Summary of Results:

Normal high side calibration factor: 0.825
variation +: 0.73%
variation -: -0.48%
Normal low side calibration factor: 0.825
variation +: 0.73%
variation -: -0.48%

Certification:

I certify that the Type S pitot tube, the standard type pitot tube, and the calibration setup meet or exceed all specifications, criteria and/or applicable design features and hereby assign a pitot tube calibration factor C_p of: 0.825

Certified by:

Patrick Selakovich 11/06/06
Calibrator (Signature/Date)

Bill Hefley 11/06/06
QA Officer (Signature/Date)

**AIR
SAMPLING
ASSOCIATES, INC.**

Time: 15:45
 T_s : 72 °F
 Pb: 29.63 " Hg

fps Mark	Desired Calibration Standard	Calibration Standard		v Standard Average	High	v High	Cal. Factor	Low	v Low	Cal. Factor
		Start	End							
20	0.09	0.09	0.09	0.300	0.13	0.361	0.824	0.13	0.361	0.824
30	0.20	0.20	0.20	0.447	0.29	0.539	0.822	0.29	0.539	0.822
40	0.36	0.36	0.36	0.600	0.52	0.721	0.824	0.52	0.721	0.824
50	0.56	0.56	0.56	0.748	0.81	0.900	0.823	0.81	0.900	0.823
60	0.81	0.81	0.81	0.900	1.15	1.072	0.831	1.15	1.072	0.831
70	1.10	1.10	1.10	1.049	1.60	1.265	0.821	1.60	1.265	0.821
80	1.44	1.50	1.50	1.225	2.15	1.466	0.827	2.15	1.466	0.827
90	1.82	1.80	1.80	1.342	2.60	1.612	0.824	2.60	1.612	0.824
50	0.56	0.56	0.56	0.748	0.81	0.900	0.823	0.81	0.900	0.823
50	0.56	0.56	0.56	0.748	0.81	0.900	0.823	0.81	0.900	0.823
Average							0.825			0.825

Summary of Results:

Normal high side calibration factor:	0.825
variation +:	0.73%
variation -:	-0.48%
Normal low side calibration factor:	0.825
variation +:	0.73%
variation -:	-0.48%

Certification:

I certify that the Type S pitot tube, the standard type pitot tube, and the calibration setup meet or exceed all specifications, criteria and/or applicable design features and hereby assign a pitot tube calibration factor C_p of: 0.825

Bill Hefley 11/06/06
QA Officer (Signature/Date)

Calibration Data
Nozzle Calibration

Nozzle Set No. ASAI - 5
Date Calibration Performed: 10/27/06

	-1	-2	-3	-4	-5	-6	-7	-8
Measurement 1	<u> </u>	<u>0.193</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Measurement 2	<u> </u>	<u>0.190</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Measurement 3	<u> </u>	<u>0.192</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Measurement 4	<u> </u>	<u>0.192</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Measurement 5	<u> </u>	<u>0.192</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Measurement 6	<u> </u>	<u>0.193</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Measurement 7	<u> </u>	<u>0.193</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Measurement 8	<u> </u>	<u>0.191</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Measurement 9	<u> </u>	<u>0.192</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Measurement 10	<u> </u>	<u>0.193</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Average		0.192						

Patrick Selakovich 10/27/06

Calibrator (Signature / Date)

Bill Hefley 10/27/06

QA Officer (Signature / Date)

Calibration Data
Nozzle Calibration

Nozzle Set No. ASAI - 5
Date Calibration Performed: 10/23/06

	-1	-2	-3	-4	-5	-6	-7	-8
Measurement 1	_____	_____	<u>0.254</u>	_____	_____	_____	_____	_____
Measurement 2	_____	_____	<u>0.252</u>	_____	_____	_____	_____	_____
Measurement 3	_____	_____	<u>0.252</u>	_____	_____	_____	_____	_____
Measurement 4	_____	_____	<u>0.253</u>	_____	_____	_____	_____	_____
Measurement 5	_____	_____	<u>0.253</u>	_____	_____	_____	_____	_____
Measurement 6	_____	_____	<u>0.254</u>	_____	_____	_____	_____	_____
Measurement 7	_____	_____	<u>0.254</u>	_____	_____	_____	_____	_____
Measurement 8	_____	_____	<u>0.255</u>	_____	_____	_____	_____	_____
Measurement 9	_____	_____	<u>0.253</u>	_____	_____	_____	_____	_____
Measurement 10	=====	=====	<u>0.254</u>	=====	=====	=====	=====	=====
Average			0.253					

Patrick Selakovich 10/23/06

Calibrator (Signature / Date)

Bill Hefley 10/23/06

QA Officer (Signature / Date)

Calibration Data
Nozzle Calibration

Nozzle Set No. ASAI - 7
Date Calibration Performed: 10/27/06

	-1	-2	-3	-4	-5	-6	-7	-8
Measurement 1	<u> </u>	<u>0.191</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Measurement 2	<u> </u>	<u>0.190</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Measurement 3	<u> </u>	<u>0.192</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Measurement 4	<u> </u>	<u>0.193</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Measurement 5	<u> </u>	<u>0.191</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Measurement 6	<u> </u>	<u>0.193</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Measurement 7	<u> </u>	<u>0.193</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Measurement 8	<u> </u>	<u>0.192</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Measurement 9	<u> </u>	<u>0.192</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Measurement 10	<u> </u>	<u>0.192</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Average		0.192						

Patrick Selakovich 10/27/06

Calibrator (Signature / Date)

Bill Hefley 10/27/06

QA Officer (Signature / Date)

Calibration Data
Barometer Calibration Data

Date:	10/13/2006	Time:	1640
I.D. #:	ASAI – 1	Temperature:	73

Mercury Barometer ASAI – 0 Reading:	29.74" Hg
Aneroid Barometer Reading:	29.71" Hg
Difference:	0.03" Hg
Barometer Adjusted?	YES

Certified by:	<i>Bill Hefley 10/13/06</i>	<i>Billy J. Mullins, Jr. 10/13/06</i>
	Calibrator (Signature/Date)	QA Officer (Signature/Date)

Appendix D:

Field Data

Job Number

Job Name

Run Number

Unit

Date

Operator

Sample Box No.

Meter Box No.

ΔP_s

06-056

ADA-ES Bow, NH

Unit No. 2 Inlet to Original Precip

5 Oct 2006

Hefley, Selskovich

1-2

1-2

1-2

1-2

Ontario Hydro Field Data

Read and record at the start of each test point.

Purge to: —

Purge time: —

Pilot Leak Check Initial

Final

✓

✓

✓

Ambient Temp. °F 66

Assumed Moisture % 7.1

Probe Length 23.5

C Factor 23.5 to reference

Initial Leak @ 18.0 °Hg = 0.005 cfm

Final Leak @ 16.0 °Hg = 0.000 cfm

T_mT_sP_m

Point	Clock Time	Dry Gas Meter, CF	"Pilot" H ₂ O	Orifice ΔH H ₂ O Desired	Orifice ΔH H ₂ O Actual	Pump Vacuum "Hg Gauge	Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Remarks
1-6	1410	557.620	0.54	1.25	1.25	2.5	353	263	253	51	66	67	
5	1415	560.79	0.53	1.25	1.25	2.0	355	263	255	44	66	67	
4	1420	563.91	0.44	1.05	1.05	2.5	340	261	259	42	68	67	
3	1425	566.93	0.42	1.05	1.05	2.5	340	257	258	43	70	67	
2	1430	569.81	0.49	1.15	1.15	3.0	349	253	254	44	72	68	
1	1435	572.80	0.46	1.10	1.10	3.0	350	249	251	44	73	68	
END	1440	575.731	—	—	—	—	—	—	—	—	—	—	(0.082)
5-6	1448	575.823	0.50	1.20	1.20	3.5	341	261	250	52	71	68	*Port #3 (ch. 16A)
5	1453	578.85	0.62	1.40	1.40	4.5	341	266	256	44	72	69	Was unaccessible
4	1458	582.14	0.49	1.15	1.15	4.5	330	258	259	43	74	69	due to high and
3	1503	585.21	0.54	1.25	1.25	5.0	338	254	259	44	75	69	angle iron.
2	1508	588.34	0.58	1.35	1.35	5.5	342	252	253	45	76	70	
1	1513	592.57	0.56	1.30	1.30	5.5	351	252	254	45	76	70	
END	1518	594.730	—	—	—	—	—	—	—	—	—	—	
5-6	1519	594.730	0.62	1.45	1.45	6.5	341	261	255	46	76	71	
5	1524	598.13	0.63	1.45	1.45	2.0	339	263	257	46	77	71	
4	1528	601.47	0.53	1.25	1.25	7.0	329	261	260	46	77	71	
3	1534	604.65	0.56	1.30	1.30	2.5	340	255	259	47	77	72	

Pilot Tube Calibration Factor C_p 0.818Volume Collected V_m 75.738 ft³Water Collected V_w 139.7 mlTime of Test T₁ 120 min.Slack Pressure P_s +6.5 °H₂O

Pilot Tube No. 1-4

Baro. Press. P_b 30.09 °HgProbe Tip Dia. D_n 0.255 in.% CO₂ 14.0 % CO 0.0% O₂ 4.6 % N₂ 81.4Area Slack A_s 30,856 in²

Barometer No. 1166 1104

Total Volume of Leak Checks After Start: — ft³V_m X Dry Gas Meter Calibration Factor 75.587 X 1.002 ✓[Dry Gas Meter Reading — ft³ - (T₁ - min. X Leak Rate — cfm)]

Probe Tip No. 5-3

Impinger Box No. 1-2 (M-3)

Water Weight Gain

Impinger 1 Final Weight 817.8
Initial Weight 727.7
Increase 90.1

Impinger 1 90.1

Impinger 2 20.1

Impinger 2 Final Weight 800.6
Initial Weight 780.5
Increase 20.1

Impinger 3 5.9

Impinger 4 6.8

Impinger 3 Final Weight 808.1
Initial Weight 802.2
Increase 5.9

Impinger 5 0.1

Impinger 6 0.4

Impinger 4 Final Weight 792.7
Initial Weight 785.9
Increase 6.8

Impinger 7 0.1

Imp 8 16.2

Total 139.7 = V_w

Impinger 5 Final Weight 814.1
Initial Weight 814.0
Increase 0.1

Imp. No. 8 FW 927.1
IW 910.9
Inc. 16.2

Thimble No. 42

$P_b = \frac{30.09}{\checkmark}$

$V_m = \frac{75.738}{\checkmark}$

$V_w = \frac{139.7}{\checkmark}$

$P_m = \frac{1.254}{\checkmark}$

Avg $\Delta P = \frac{0.538}{\checkmark}$

Avg $\sqrt{\Delta P} = \frac{0.732}{\checkmark}$

$C_p = \frac{0.818}{\checkmark}$

$P_s = \frac{+6.5}{\checkmark}$ °F

$T_m = \frac{72}{\checkmark}$ °F

$T_s = \frac{337}{\checkmark}$ °F

%CO₂ = 14.0 ✓

%O₂ = 4.6 ✓

%CO = 0.0 ✓

%N₂ = 81.4 ✓

A_s = 30.856 ✓

D_n = 0.255 ✓

T_t = 120 ✓

Impinger 6 Final Weight 813.4
Initial Weight 813.0
Increase 0.4

Impinger 7 Final Weight 794.1
Initial Weight 794.0
Increase 0.1

Moisture Content: %M = 8.00 ✓ M_d = 0.9200 ✓ MW_c = 30.424 ✓ MW = 29.43 ✓

$$Vm_{std} = 17.65 Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460} \right] = 17.65 \times 75.738 \left[\frac{30.09 + \frac{1.254}{13.6}}{72 + 460} \right] = \frac{75.840}{0.632} \frac{sft^3}{scfm}$$

$$VW_{gas} = 0.0472 \times V_w = 0.0472 \times \frac{139.7}{\checkmark} = \frac{6.594}{\checkmark} sft^3$$

$$\% \text{ Moisture} = \frac{VW_{gas}}{Vm_{std} + VW_{gas}} \times 100 = \frac{6.594}{75.840 + 6.594} \times 100 = \frac{8.00}{\checkmark} \%$$

$$V_s = 5123.8 \times \frac{0.818}{\checkmark} \sqrt{\frac{797}{29.43 \times 30.57}} \times 0.732 = \frac{2888}{\checkmark} fpm$$

ACFM: 618.757 ✓

SCFM: 386.783 ✓

$$\%I = \frac{1.039 \times 75.840 \times 797}{0.9200 \times 30.57 \times 2888 \times 120 \times (0.255)^2} = \frac{99.1}{\checkmark} \%$$

%EA: 27.1 ✓

Job Number

06-056

Job Name

ADA-ES (B&W, NH)

Run Number

2

Unit

Unit No. 2 Inlet to Original Precip

Date

10/6/06

Operator

Selakovic / Hefley

Sample Box No. 1-2 (m-j)

Meter Box No. 1-2

 ΔP_s P_m T_s T_m

Point	Clock Time	Dry Gas Meter, CF	"Pilot" H_2O	Orifice ΔH H_2O Desired	Orifice ΔH H_2O Actual	Pump Vacuum Hg Gauge	Slack Temp $^{\circ}F$	Probe Temp $^{\circ}F$	Oven Temp $^{\circ}F$	Effluent Temp $^{\circ}F$	Dry Gas Temp. $^{\circ}F$ Inlet	Dry Gas Temp. $^{\circ}F$ Outlet	Remarks
7-6	0940	680.332	0.59	1.40	1.40	0.5	328	237	248	42	58	57	
5	0945	683.59	0.66	1.40	1.40	0.5	331	239	247	38	59	58	
4	0950	686.86	0.60	1.40	1.40	0.5	315	238	247	38	62	58	
3	0955	690.13	0.39	0.95	0.95	0.5	301	236	244	39	64	59	
2	1000	692.89	0.41	0.95	0.95	0.5	310	234	242	39	65	59	
1	1005	695.61	0.48	1.15	1.15	1.0	329	233	242	39	67	60	
END	1010	698.550	-	-	-	-	-	-	-	-	-	-	
5-6	1011	698.550	0.55	1.30	1.30	2.0	337	237	242	39	68	60	
5	1016	701.69	0.55	1.30	1.30	2.5	335	241	248	40	69	61	
4	1021	704.83	0.44	1.05	1.05	2.0	332	240	251	41	69	61	
3	1026	707.71	0.57	1.35	1.35	3.0	341	233	251	42	70	62	
2	1031	710.87	0.64	1.50	1.50	4.0	343	234	250	41	70	63	
1	1036	714.25	0.58	1.35	1.35	4.0	352	232	247	41	71	63	
END	1041	717.445	-	-	-	-	-	-	-	-	-	-	
5-6	1042	717.445	0.56	1.30	1.30	4.0	332	236	246	41	70	63	
5	1047	720.62	0.56	1.30	1.30	5.0	333	244	248	42	71	63	
4	1052	723.77	0.51	1.20	1.20	5.0	332	240	247	43	70	63	
3	1057	726.82	0.54	1.25	1.25	5.5	341	235	245	43	70	64	

Pilot Tube Calibration Factor C_p 0.818Volume Collected V_m 23.919 ft^3 Water Collected V_w 134.8 mlTime of Test T_t 120 min.Slack Pressure P_s 6.4 in^2 H_2O

Pilot Tube No. 20.13

Baro. Press. P_b 30.35 Hg Probe Tip Dia. D_p 0.255 in.% CO_2 13.7 % CO 0.0% O_2 5.1 % N_2 81.2Area Slack A_s 30,856 in^2

Barometer No. 1

Total Volume of Leak Checks After Start: ft^3 $V_m \times$ Dry Gas Meter Calibration Factor 73.771 $\times$ 1.002 ft^3

Probe Tip No. 5-3

[Dry Gas Meter Reading $ft^3 - (T_t - \text{min. } X \text{ Leak Rate } - \text{cfm})$]

Ontario Hydro Field Data

Ambient Temp. $^{\circ}F$ 60

Assumed Moisture % 7%

Probe Length 7'

C Factor 23.5 to reference

Initial Leak @ 15.0 in^2 $Hg = 0.004$ cfmFinal Leak @ 10.0 in^2 $Hg = 0.004$ cfm

Impinger Box No. 1-2 (M-3)

Water Weight Gain

Impinger 1	Final Weight	<u>819.6</u>
	Initial Weight	<u>729.1</u>
	Increase	<u>90.5</u>
Impinger 2	Final Weight	<u>743.3</u>
	Initial Weight	<u>728.8</u>
	Increase	<u>14.5</u>
Impinger 3	Final Weight	<u>758.5</u>
	Initial Weight	<u>754.4</u>
	Increase	<u>4.1</u>
Impinger 4	Final Weight	<u>738.5</u>
	Initial Weight	<u>731.3</u>
	Increase	<u>7.2</u>
Impinger 5	Final Weight	<u>762.4</u>
	Initial Weight	<u>761.6</u>
	Increase	<u>0.8</u>
Impinger 6	Final Weight	<u>754.9</u>
	Initial Weight	<u>754.3</u>
	Increase	<u>0.6</u>
Impinger 7	Final Weight	<u>738.9</u>
	Initial Weight	<u>738.8</u>
	Increase	<u>0.1</u>

Impinger 1	<u>90.5</u>
Impinger 2	<u>14.5</u>
Impinger 3	<u>4.1</u>
Impinger 4	<u>7.2</u>
Impinger 5	<u>0.8</u>
Impinger 6	<u>0.6</u>
Impinger 7	<u>0.1</u>
Imp 8	<u>17.0</u>
Total	<u>134.8</u> = V_w

$V_w =$
 $g SO_2 =$
 $V_w =$
 Imp 8 Fw 868.0
 IN 851.0
 Inc 17.0
 Theville No. 43

$P_b =$	<u>30.35</u> ✓	%CO ₂ =	<u>13.7</u> ✓
$V_m =$	<u>73.919</u> ✓	%O ₂ =	<u>5.1</u> ✓
$V_w =$	<u>134.8</u> ✓	%CO =	<u>0.0</u> ✓
$P_m =$	<u>1.235</u> ✓	%N ₂ =	<u>81.2</u> ✓
Avg $\Delta P =$	<u>0.526</u> ✓	$A_s =$	<u>30.856</u> ✓
Avg $\sqrt{\Delta P} =$	<u>0.723</u> ✓	$D_n =$	<u>0.255</u> ✓
$C_p =$	<u>0.818</u> ✓	$T_i =$	<u>120</u> ✓
$P_s =$	<u>+6.4</u> ✓		
$T_m =$	<u>65</u> ✓ °F		
$T_s =$	<u>338</u> ✓ °F		

<u>30.82</u> ✓	°Hg
<u>525</u> ✓	°R
<u>798</u> ✓	°R

Moisture Content:

$\%M =$ 7.76 ✓ $M_d =$ 0.9224 ✓ $MW_c =$ 30.396 ✓ $MW =$ 29.43 ✓

$$Vm_{std} = 17.65 Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460} \right] = 17.65 \times 73.919 \left[\frac{30.35 + \frac{1.235}{13.6}}{65 + 460} \right] = \frac{75.648}{0.630} \frac{ft^3}{scfm}$$

$V_{w_{gas}} = 0.0472 \times V_w = 0.0472 \times \underline{134.8} = \underline{6.363} ✓ $ft^3$$

$\% \text{ Moisture} = \frac{V_{w_{gas}}}{Vm_{std} + V_{w_{gas}}} \times 100 = \frac{6.363}{75.648 + 6.363} \times 100 = \underline{7.76} ✓ %$

$V_s = 5123.8 \times \frac{0.818}{\sqrt{29.43 \times 30.82}} \times \frac{798}{798} \times 0.723 = \underline{2842} ✓ $ft^3$$

$\%I = \frac{1.039 \times 75.648 \times 798}{0.9224 \times 30.82 \times 2842 \times 120 \times (0.255)^2} = \underline{99.5} ✓ %$

ACFM: 609.04 ✓
 SCFM: 384.253 ✓
 %EA: 31.1 ✓

0.65
 10/6/06

Run Number 2
Unit No 2 chert to Original Recipe.
Date 10/6/06

Run Number 2

Unit No 2 related to Original Pre-cip.

Date 6/6/06

FIELD DATA

Ontario Hydro

D-7

Job Number 06-056
 Job Name ADAGES (Bowl, NH)
 Run Number 3
 Unit Unit No. 2 Inlet to Original Regio
 Date 10/7/06
 Operator Silkehart/1466
 Sample Box No. M-3 Meter Box No. 1-2

Outside-Hydro Field Data
 Read and record at the start of each test point.
 Purge lo:
 Purge time:
 Pilot Leak Check Initial ✓ Final ✓

Ambient Temp. °F 42
 Assumed Moisture % 7%
 Probe Length 1'
 C Factor 23.5 to reference
 Initial Leak @ 15.0 "Hg = 0.006 cfm
 Final Leak @ 12.0 "Hg = 0.009 cfm

Point	Clock Time	Dry Gas Meter, CF	"Pilot" H ₂ O	Orifice ΔH H ₂ O Desired	Orifice ΔH H ₂ O Actual	Pump Vacuum "Hg Gauge	Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Remarks
7-6	0845	848.841	0.60	1.40	1.40	0.5	333	286	225	35	43	44	Blank Train
5	0850	852.15	0.62	1.45	1.45	0.5	335	264	224	33	46	44	Taken
4	0855	855.43	0.59	1.40	1.40	0.5	319	259	224	34	49	44	
3	0900	858.66	0.47	1.00	1.00	0.5	302	251	226	35	52	45	
2	0905	861.58	0.39	0.95	0.95	0.5	309	251	227	35	54	46	
1	0910	864.27	0.49	1.15	1.15	0.5	328	251	228	35	55	47	
GND	0915	867.197	-	-	-	-	-	-	-	-	-	-	
5-6	0916	867.197	0.55	1.30	1.30	1.0	335	254	230	35	56	48	
5	0921	870.43	0.56	1.30	1.30	2.0	340	260	232	35	58	49	
4	0926	873.55	0.50	1.20	1.20	2.0	333	257	236	37	59	50	
3	0931	876.56	0.53	1.25	1.25	2.5	341	252	237	37	60	51	
2	0936	879.61	0.64	1.50	1.50	4.5	344	252	236	37	60	52	
1	0941	882.89	0.57	1.35	1.35	5.0	354	250	235	37	62	52	
GND	0946	886.111	-	-	-	-	-	-	-	-	-	-	
5-6	0947	886.111	0.52	1.25	1.25	4.5	333	254	234	38	61	53	
5	0952	889.22	0.51	1.20	1.20	5.0	335	260	235	38	63	54	
4	0957	892.26	0.49	1.15	1.15	5.0	333	258	237	38	63	54	
3	1002	895.23	0.52	1.25	1.25	6.0	341	254	239	39	63	55	

Pilot Tube No. 1-4 Barometer No. 1 Probe Tip No. S-3
 Baro. Press. P_b 30.36 "Hg Total Volume of Leak Checks After Start: 0 ft³
 Probe Tip Dia. D_n 0.255 in. V_m X Dry Gas Meter Calibration Factor 73.393 X 1.002
 % CO₂ 13.6 % CO 0.0 [Dry Gas Meter Reading ft³ - (T₁ min. X Leak Rate cfm)]
 % O₂ 5.0 % N₂ 81.4
 Area Stack A_s 30,856 in²

Impinger Box No. M-83

Water Weight Gain

Impinger 1 Final Weight 825.4
Initial Weight 732.1
Increase 93.3

Impinger 1 93.3

Impinger 2 Final Weight 746.4
Initial Weight 729.9
Increase 16.5

Impinger 2 16.5

Impinger 3 Final Weight 761.1
Initial Weight 758.2
Increase 2.9

Impinger 3 2.9

Impinger 4 7.1

Impinger 4 Final Weight 741.3
Initial Weight 734.2
Increase 7.1

Impinger 5 1.5

Impinger 6 1.0

Impinger 7 0.5

Imp 8 16.3

Total 139.1 = V_w

Impinger 5 Final Weight 766.3
Initial Weight 764.8
Increase 1.5

Impinger 6 Final Weight 759.8
Initial Weight 758.8
Increase 1.0

Impinger 7 Final Weight 743.5
Initial Weight 743.0
Increase 0.5

$V_w =$
 $g SO_2 =$
 $V_w =$
Imp 8 FW 869.1
IW 852.8
Inc. 16.3
Thimble No. 44

$P_b = 30.36$
 $V_m = 73.540$
 $V_w = 139.1$
 $P_m = 1.231$
Avg $\Delta P = 0.524$
Avg $\sqrt{\Delta P} = 0.722$
 $C_p = 0.818$
 $P_s = +6.4$
 $T_m = 56$
 $T_s = 339$

%CO₂ = 13.6
%O₂ = 5.0
%CO = 0.0
%N₂ = 81.4
 $A_s = 30.856$
 $D_n = 0.255$
 $T_i = 120$
 30.83 °Hg
 516 °R
 799 °R

Moisture Content: %M = 7.89 $M_d = 0.9211$ $MW_c = 30.376$ $MW = 29.40$

$$Vm_{std} = 17.65 Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460} \right] = 17.65 \times 73.540 \left[\frac{30.36 + \frac{1.231}{13.6}}{56 + 460} \right] = \frac{76.597}{0.638} \frac{sft^3}{scfm}$$

$$Vw_{gas} = 0.0472 \times Vw = 0.0472 \times 139.1 = 6.566 \text{ sft}^3$$

$$\% \text{ Moisture} = \frac{Vw_{gas}}{Vm_{std} + Vw_{gas}} \times 100 = \frac{6.566}{76.597 + 6.566} \times 100 = 7.89 \%$$

$$V_s = 5123.8 \times \frac{0.818}{\sqrt{29.40 \times 30.83}} \times \frac{799}{799} \times 0.722 = 2841 \text{ fpm}$$

ACFM: 608,797

SCFM: 383,221

$$\%I = \frac{1.039 \times 76.597 \times 799}{0.9211 \times 30.83 \times 2841 \times 120 \times (0.255)^2} = 101.0 \%$$

%EA: 30.2

Ontario Hydro FIELD DATA

Ontario Hydro FIELD DATA

Ontario Hydro FIELD DATA

Ontario Hydro FIELD DATA

Ontario Hydro FIELD DATA

Job Number
Job Name
Run Number
Unit
Date
Operator
Sample Box No.

06-056
ADA-ES (BOW, NH)
Unit No. 2, sheet to Original Recipe
Sela kovach/Ky 6
Meter Box No. 1-2

EPA Method 26A Field Data
Read and record at the start of each test point.
Purge to: ---
Purge time: ---
Pilot Leak Check Initial ☒ Final ☒

Ambient Temp. °F 68
Assumed Moisture % 7%
Probe Length 7'
C Factor 23.5 to reference
Initial Leak @ 15.0 "Hg = 0.003 cfm
Final Leak @ 10.0 "Hg = 0.001 cfm

T_m

T_s

P_m

ΔP_s

Point	Clock Time	Dry Gas Meter, CF	"Pilot" H ₂ O	Orifice ΔH H ₂ O Desired	Orifice ΔH H ₂ O Actual	Pump Vacuum "Hg Gauge	Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Remarks
7-6	1720	634.316	0.60	1.40	1.40	5.0	334	262	237	59	67	68	
5	1723	636.11	0.62	1.40	1.40	5.0	335	279	242	53	67	67	
4	1726	638.34	0.61	1.40	1.40	5.0	319	283	244	49	68	67	
3	1729	640.35	0.42	1.00	1.00	3.0	303	264	247	45	69	67	
2	1732	642.10	0.41	1.00	1.00	2.5	310	262	248	43	70	67	
1	1735	643.82	0.52	1.20	1.20	4.0	328	261	249	43	72	68	
END	1738	645.653	---	---	---	---	---	---	---	---	---	---	
5-6	1740	645.653	0.56	1.30	1.30	5.0	338	264	249	44	72	68	
5	1743	642.48	0.58	1.30	1.30	5.0	337	281	249	41	73	68	
4	1746	642.38	0.67	1.55	1.55	6.0	331	281	249	41	74	69	
3	1749	652.39	0.64	1.50	1.50	6.5	342	280	250	40	74	69	
2	1752	653.43	0.54	1.25	1.25	7.0	345	289	251	40	75	69	
1	1755	655.35	0.59	1.40	1.40	7.0	349	241	251	40	75	69	
END	1758	657.325	---	---	---	---	---	---	---	---	---	---	Port 3 is
5-6	1759	657.325	0.56	1.30	1.30	6.5	337	285	252	42	75	69	unacceptable
5	1802	659.33	0.54	1.28	1.28	7.0	335	265	252	41	75	70	
4	1805	662.21	0.56	1.30	1.30	7.0	330	274	253	41	75	70	
3	1808	663.09	0.49	1.15	1.15	7.0	339	259	254	42	76	70	

Pilot Tube Calibration Factor C₀ 0.824
Volume Collected V_m 44.091 ft³
Water Collected V_w 81.6 ml
Time of Test T₁ 72 min.
Stack Pressure P_s 16.3 "H₂O

Pilot Tube No. 2-4
Baro. Press. P_b 30.06 "Hg
Probe Tip Dia. D_n 0.254 in.
% CO₂ 14.0 % CO 0.0
% O₂ 4.6 % N₂ 81.4
Area Stack A_s 30,856 in²

Barometer No. 1 Probe Tip No. 7-3
Total Volume of Leak Checks After Start: --- ft³
V_m X Dry Gas Meter Calibration Factor 44.091 X 6.002
[Dry Gas Meter Reading - (T₁ - min. X Leak Rate - cfm)]

Impinger Box No. 1-3

Water Weight Gain

Impinger 1 Final Weight 789.5
Initial Weight 737.3
Increase

Impinger 1 52.2

Impinger 2 Final Weight 748.8
Initial Weight 736.3
Increase

Impinger 2 12.5

Impinger 3 Final Weight 766.6
Initial Weight 742.4
Increase

Impinger 3 4.2

Impinger 4 2.4

Impinger 5 10.3

Impinger 6

Impinger 4 Final Weight 737.7
Initial Weight 735.3
Increase

Impinger 7

Total 81.6 = V_w

Impinger 5 Final Weight 954.4
Initial Weight 944.1
Increase

Impinger 6 Final Weight
Initial Weight
Increase

Impinger 7 Final Weight
Initial Weight
Increase

Thimble: 36

$P_b = 30.06$ ✓
 $V_m = 44.091$ ✓
 $V_w = 81.6$ ✓
 $P_m = 1.202$ ✓
Avg $\Delta P = 0.515$ ✓
Avg $\sqrt{\Delta P} = 0.714$ ✓
 $C_p = 0.824$ ✓
 $P_s = 16.3$ ✓
 $T_m = 70$ ✓
 $T_s = 338$ ✓

%CO₂ = 14.0 ✓
%O₂ = 4.6 ✓
%CO = 6.0 ✓
%N₂ = 81.4 ✓
 $A_s = 30.856$ ✓
 $D_n = 0.254$ ✓
 $T_i = 72$ ✓

30.52 °Hg
530 °R
530.793 °R

Moisture Content:

%M = 8.00 ✓ $M_d = 0.9200$ ✓ $MW_c = 30.424$ ✓ $MW = 29.43$ ✓

$$Vm_{std} = 17.65 Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460} \right] = 17.65 \times 44.091 \left[\frac{30.06 + \frac{1.202}{13.6}}{70 + 460} \right] = \frac{44.267}{0.615} \frac{sft^3}{scfm}$$

$$V_{w_{gas}} = 0.0472 \times V_w = 0.0472 \times 81.6 = 3.852 \text{ sft}^3$$

$$\% \text{ Moisture} = \frac{V_{w_{gas}}}{Vm_{std} + V_{w_{gas}}} \times 100 = \frac{3.852}{44.267 + 3.852} \times 100 = 8.00\%$$

$$V_s = 5123.8 \times \frac{0.824}{798} \times 0.714 = 2841 \text{ ppm}$$

$$\%I = \frac{1.039 \times 798 \times 44.267}{2841 \times 0.9200 \times 30.52 \times 72 \times (0.254)^2} = 99.8\%$$

ACFM: 600948 ✓
SCFM: 379390 ✓
%EA: 27.1 ✓

Run Number 1
Unit No. 2 shelved to Original Recypts.
Date 10/5/06

D-13

Job Number

06-056

EPA Method 26A Field Data

Job Name

ADA-ES Baw, NH

Run Number

2

Unit

Unit No. 2 Inlet to Orig. Precip

Date

10/6/06

Operator

Sedakov, W. / Hufner

Sample Box No.

2-1

Meter Box No. 1-2

 ΔP_s P_n T_s T_m

Read and record at the start of each test point.

Purge lo: _____

Purge time: _____

Pilot Leak Check Initial ☒ Final ☒Ambient Temp. °F 63Assumed Moisture % 7%Probe Length 7'C Factor 23.5 to referenceInitial Leak @ 15.0 "Hg = 0.004 cfmFinal Leak @ 9.0 "Hg = 0.000 cfm

Point	Clock Time	Dry Gas Meter, CF	"Pilot" "H ₂ O"	Orifice ΔH "H ₂ O" Desired	Orifice ΔH "H ₂ O" Actual	Pump Vacuum "Hg Gauge	Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Remarks
7-6	1320	759.307	0.63	6.45	6.45	0.5	331	239	254	46	64	64	
5	1323	761.26	0.63	6.45	6.45	0.5	330	244	260	43	65	64	
4	1326	763.31	0.59	6.35	6.35	0.5	312	241	265	41	67	64	
3	1329	765.26	0.40	0.85	0.85	0.5	298	239	267	41	70	64	
2	1332	766.93	0.37	0.85	0.85	0.5	300	238	268	42	71	65	
1	1335	768.47	0.39	0.95	0.95	0.5	296	236	268	41	73	65	
END	1338	770.103	-	-	-	-	-	-	-	-	-	-	
5-6	1339	770.103	0.48	6.20	6.10	1.0	328	239	266	43	74	66	
5	1342	771.93	0.46	6.10	6.00	6.0	329	244	266	42	76	67	
4	1345	773.65	0.46	6.20	6.10	6.5	338	240	266	42	77	68	
3	1348	775.98	0.50	6.20	6.20	2.5	337	236	264	43	78	69	
2	1351	777.18	0.61	6.40	6.40	3.5	340	237	262	43	79	69	
1	1354	779.15	0.58	6.35	6.35	3.5	349	236	260	42	79	70	
END	1357	780.070	-	-	-	-	-	-	-	-	-	-	
5-6	1358	782.070	0.54	6.25	6.25	3.0	335	238	259	43	79	70	
5	1401	782.94	0.49	6.15	6.15	3.0	333	244	259	43	79	71	
4	1404	784.72	0.51	6.20	6.20	4.0	328	243	260	43	79	71	
3	1407	786.55	0.45	6.05	6.05	4.0	336	238	261	44	79	71	

Pilot Tube Calibration Factor C_p 0.818Volume Collected V_m 43.817 ft³Water Collected V_w 85.5 mlTime of Test T_1 72 min.Stack Pressure P_s 16.4 "H₂OPilot Tube No. 6-4Baro. Press. P_b 30.34 "HgProbe Tip Dia. D_n 0.254 in.% CO₂ 13.7 % CO 0.0% O₂ 5.0 % N₂ 81.3Area Stack A_s 30,856 in²Barometer No. 1Total Volume of Leak Checks After Start: 43.730 ft³ $V_m \times \text{Dry Gas Meter Calibration Factor}$ 43.730 X 0.002[Dry Gas Meter Reading 1 ft³ - (T_1 - min. X Leak Rate 1 cfm)]Probe Tip No. 2-3

Impinger Box No. 2-1

Water Weight Gain

Impinger 1 Final Weight 778.8
 Initial Weight 723.3
 Increase 55.5

Impinger 1 55.5

Impinger 2 Final Weight 748.2
 Initial Weight 737.3
 Increase 10.9

Impinger 2 10.9

Impinger 3 Final Weight 759.3
 Initial Weight 755.3
 Increase 4.0

Impinger 3 4.0

Impinger 4 Final Weight 740.1
 Initial Weight 738.1
 Increase 2.0

Impinger 4 2.0

Impinger 5 Final Weight 961.1
 Initial Weight 948.0
 Increase 13.1

Impinger 5 13.1

Impinger 6 Final Weight _____
 Initial Weight _____
 Increase _____

Impinger 6 _____

Impinger 7 Final Weight _____
 Initial Weight _____
 Increase _____

Impinger 7 _____

Total 85.5 = V_w

$V_w =$
 $g\ SO_2 =$
 $V_w =$

$P_b = 30.34$ ✓
 $V_m = 43.817$ ✓
 $V_w = 85.5$ ✓
 $P_m = 1.190$ ✓
 $Avg\ \Delta P = 0.508$ ✓
 $Avg\ \sqrt{\Delta P} = 0.710$ ✓
 $C_p = 0.818$ ✓
 $P_s = 30.81$ ✓
 $T_m = 73$ °F
 $T_s = 33.3$ °F

%CO₂ = 13.7 ✓
 %O₂ = 5.0 ✓
 %CO = 0.0 ✓
 %N₂ = 81.3 ✓
 $A_s = 30.856$ ✓
 $D_n = 0.254$ ✓
 $T_t = 72$ ✓
 30.81 °Hg
 533 °R
 793 °R

Moisture Content:

%M = 8.38 ✓ $M_d = 0.9162$ ✓ $MW_c = 30.392$ ✓ $MW = 29.35$ ✓

$$Vm_{std} = 17.65\ Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460} \right] = 17.65 \times 43.817 \left[\frac{30.34 + \frac{1.190}{13.6}}{73 + 460} \right] = \frac{44.150\ sft^3}{0.613\ scfm}$$

$$VW_{gas} = 0.0472 \times Vw = 0.0472 \times 85.5 = 4.036\ sft^3$$

$$\% \text{ Moisture} = \frac{VW_{gas}}{Vm_{std} + VW_{gas}} \times 100 = \frac{4.036}{44.150 + 4.036} \times 100 = 8.38\ \%$$

$$V_s = 5123.8 \times \frac{0.818}{\sqrt{30.81 \times 29.35}} \times \frac{793}{72} = 2787\ tpm$$

$$\%I = \frac{1.039 \times 44.150 \times 793}{0.9162 \times 30.81 \times 2787 \times 72 \times (0.254)^2} = 99.5\ \%$$

ACFM: 597,128 ✓

SCFM: 376,522 ✓

%EA: 30.2 ✓

Run Number 2
Unit No. 2 Subject to Original Recorp.
Date 10/6/06

Run Number

Method 26A

FIELD DATA

[illegible]

Job Number

06-056

Job Name

ADAES (Row, NH)

Run Number

3

Unit

Unit No. 2 Inlet to Original Precip

Date

10/6/06

Operator

Schubert / Ref Coy

Sample Box No.

1-3

Meter Box No.

1-2

 ΔP_s

EPA Method 26A Field Data

Read and record at the start of each test point.

Purge to:

—

Purge time:

—

Pilot Leak Check Initial

Final

✓

 T_s P_m ΔP_s

Point	Clock Time	Dry Gas Meter, CF	"Pilot" H_2O	Orifice ΔH H_2O Desired	Orifice ΔH H_2O Actual	Pump Vacuum Hg Gauge	Stack Temp $^{\circ}F$	Probe Temp $^{\circ}F$	Oven Temp $^{\circ}F$	Effluent Temp $^{\circ}F$	Dry Gas Temp. $^{\circ}F$ Inlet	Dry Gas Temp. $^{\circ}F$ Outlet	Remarks
2-6	1542	803.350	0.51	1.20	1.20	5.0	354	246	223	52	67	67	
5	1545	805.18	0.52	1.20	1.20	5.0	351	248	224	43	67	67	
4	1548	807.05	0.41	0.95	0.95	3.5	342	243	230	40	69	67	
3	1551	808.71	0.42	1.00	1.00	4.0	340	238	235	40	70	67	
2	1554	810.36	0.45	1.05	1.05	4.5	348	237	241	40	72	68	
1	1557	812.08	0.44	1.05	1.05	4.5	350	236	246	40	74	68	
End	1600	813.840	—	—	—	—	—	—	—	—	—	—	
5-6	1601	813.840	0.49	1.15	1.15	5.0	332	244	255	40	76	70	
5	1604	815.51	0.50	1.15	1.15	5.5	332	247	258	40	77	70	
4	1607	817.280	0.47	1.10	1.10	5.5	330	246	261	40	79	71	
3	1610	819.00	0.55	1.30	1.30	7.0	338	240	263	41	80	72	
2	1613	820.87	0.58	1.35	1.35	8.0	343	237	262	42	81	72	
1	1616	822.82	0.53	1.25	1.25	8.0	351	237	263	41	82	73	
End	1619	824.700	—	—	—	8.0	—	—	—	—	—	—	
5-6	1620	824.700	0.54	1.25	1.25	7.5	337	238	264	41	82	74	
5	1623	826.48	0.56	1.30	1.30	8.0	340	244	266	42	83	74	
4	1626	828.85	0.43	1.00	1.00	7.0	331	240	268	43	83	75	
3	1629	830.60	0.52	1.20	1.20	7.5	339	239	266	43	83	75	

 T_m Pilot Tube Calibration Factor C_p 0.818Volume Collected V_m 43.587 ft^3 Water Collected V_w 78.0 mlTime of Test T_1 72 min.Stack Pressure P_s 6.4 in^2 H_2O

Pilot Tube No. 6-4

Baro. Press. P_b 30.34 Hg Probe Tip Dia. D_n 0.254 in.% CO_2 13.8 % CO 8.1-0.0% O_2 5.1 % N_2 81.1Area Stack A_s 30.856 in^2

Barometer No. 1

Total Volume of Leak Checks After Start: ft^3 $V_m \times$ Dry Gas Meter Calibration Factor 43.506 $\times$ 1.000[Dry Gas Meter Reading $ft^3 - (T_1 - T_2) \times$ min. $\times$ Leak Rate $—$ cfm]

Probe Tip No. 7-3

Impinger Box No. 1-3

Water Weight Gain

Impinger 1
Final Weight 793.4
Initial Weight 739.8
Increase 53.6

Impinger 1 53.6

Impinger 2 9.6

Impinger 2
Final Weight 743.4
Initial Weight 733.8
Increase 9.6

Impinger 3 3.9

Impinger 4 2.2

Impinger 3
Final Weight 762.6
Initial Weight 758.7
Increase 3.9

$V_w =$
 $g\ SO_2 =$
 $V_w =$

Impinger 5 8.7

Impinger 6

Impinger 4
Final Weight 737.3
Initial Weight 735.1
Increase 2.2

Impinger 7

Total 78.0 = V_w

Impinger 5
Final Weight 962.4
Initial Weight 953.7
Increase 8.7

Thermbale No: 45

$P_b = 30.34$
 $V_m = 43.587$
 $V_w = 78.0$
 $P_m = 1.171$
Avg $\Delta P = 0.501$

%CO₂ = 13.8
%O₂ = 5.1
%CO = —
%N₂ = 81.1
 $A_s = 30.856$
 $D_n = 0.254$
 $T_i = 72.72$

Impinger 6
Final Weight
Initial Weight
Increase

Avg $\sqrt{\Delta P} = 0.706$
 $C_p = 0.818$
 $P_s = 16.4$
 $T_m = 76$
 $T_s = 337$

Impinger 7
Final Weight
Initial Weight
Increase

30.811
 536
 797

Moisture Content: %M = 7.77 $M_d = 0.9223$ $MW_c = 30.412$ $MW = 29.45$

$$V_{m_{std}} = 17.65 V_m \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460} \right] = 17.65 \times 43.587 \left[\frac{30.34 + \frac{1.171}{13.6}}{76 + 460} \right] = \frac{43.670}{0.607} \frac{ft^3}{scfm}$$

$$V_{w_{gas}} = 0.0472 \times V_w = 0.0472 \times 78.0 = 3.682 \frac{ft^3}{scfm}$$

$$\% \text{ Moisture} = \frac{V_{w_{gas}}}{V_{m_{std}} + V_{w_{gas}}} \times 100 = \frac{3.682}{43.670 + 3.682} \times 100 = 7.77\%$$

$$V_s = 5123.8 \times 0.818 \times \frac{797}{30.81} \times 0.706 = 2773 \text{ tpm}$$

$$ACFM: 594.248$$

$$SCFM: 37.5232$$

$$\%I = 1.039 \times \frac{797}{2773} \times \frac{43.670}{0.9223 \times 30.81 \times 29.45 \times 72 \times (0.254)^2} = 98.8\%$$

$$\%EA: 31.11$$

Run Number

Run Number 3
Unit No. 2 chubot to Angelical Recip.

Date 10/6/06

67A Method 26A FIELD DATA

[illegible]

Job Number 06-056
 Job Name ANA-ES
 Run Number 1-1 (M-1)
 Unit Stack
 Date 10/05/06
 Operator COLMAN/JACKSON
 Sample Box No. 1-1 Meter Box No. 1-1

Oxterio Hydro Field Data
 Read and record at the start of each test point.
 Purge to: T
 Purge time: —
 Pilot Leak Check Initial ✓ Final ✓

Ambient Temp. °F 54
 Assumed Moisture % 9
 Probe Length 9'
 C Factor 85 to reference
 Initial Leak @ 16.0 "Hg = 0.002 cfm
 Final Leak @ 5.5 "Hg = 0.003 cfm

Point	Clock Time	Dry Gas Meter, CF	"Pilot" H ₂ O	Orifice ΔH H ₂ O Desired	Orifice ΔH H ₂ O Actual	Pump Vacuum "Hg Gauge	Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Remarks
D3	1410	581.282	2.15	1.82	1.80	0.5	337	247	250	57	66	65	INTERFERED ON SA
3	1415	584.95	2.20	1.85	1.85	0.5	338	241	248	56	66	65	
2	1420	588.51	2.20	1.85	1.85	0.5	338	247	250	54	69	66	
2	1425	592.14	2.20	1.85	1.85	1.0	338	237	250	53	71	67	
1	1430	595.81	2.10	1.78	1.80	1.0	338	236	245	54	73	68	
1	1435	599.46	2.10	1.78	1.80	1.0	337	240	248	55	75	69	
END	1440	603.121	—	—	—	—	—	—	—	—	—	—	
A3	1453	603.121	2.00	1.70	1.70	1.0	336	236	235	55	75	72	A3
3	1458	606.66	2.10	1.78	1.80	1.0	337	246	241	44	75	72	
2	1503	610.29	2.10	1.78	1.80	1.0	337	242	250	37	77	73	
2	1508	614.02	2.15	1.82	1.80	1.0	337	244	248	36	78	73	
1	1513	617.56	2.15	1.82	1.80	1.0	337	244	249	36	79	74	
1	1518	621.245	2.15	1.82	1.80	1.5	337	245	246	37	80	74	
END	1523	624.925	—	—	—	—	—	—	—	—	—	—	
B3	1530	624.925	2.15	1.82	1.80	1.0	337	250	249	46	78	75	
3	1535	628.555	2.15	1.82	1.80	1.0	337	256	244	39	78	75	
2	1540	632.24	2.20	1.85	1.85	1.5	337	249	245	39	78	75	
2	1545	635.93	2.20	1.85	1.85	1.5	337	257	253	41	78	75	

Pilot Tube Calibration Factor C. 0.825
 Volume Collected V_m 86.45 ft³
 Water Collected V_w 147.3 ml
 Time of Test T₁ 120 min.
 Slack Pressure P₁ 0.55 "H₂O

Pilot Tube No. 1-1
 Baro. Press. P_b 29.92 "Hg
 Probe Tip Dia. D_n 0.193 in.
 % CO₂ 13.2 % CO 0.0
 % O₂ 6.2 % N₂ 80.6
 Area Slack A₁ 28104 in²

Barometer No. 1
 Total Volume of Leak Checks After Start: — ft³
 V_m X Dry Gas Meter Calibration Factor 0.985 X 87.768
 [Dry Gas Meter Reading — ft³ - (T₁ - min. X Leak Rate — cfm)]

Probe Tip No. 5-2

Impinger Box No. 1-1 (M-1)

Water Weight Gain

Impinger 1
Final Weight 837.1
Initial Weight 739.0
Increase

Impinger 1 98.1
Impinger 2 21.0

Impinger 2
Final Weight 822.3
Initial Weight 801.3
Increase

Impinger 3 4.7
Impinger 4 5.7

Impinger 3
Final Weight 793.6
Initial Weight 788.9
Increase

$V_w =$
 $g SO_2 =$
 $V_w =$

Impinger 5 1.1
Impinger 6 0.1

Impinger 4
Final Weight 824.5
Initial Weight 818.8
Increase

Imp #8 FW 952.0
IW 935.8
Inc. 16.2

Impinger 7 0.4
Impinger 8 16.2
Total 147.3 = V_w

Impinger 5
Final Weight 788.0
Initial Weight 786.9
Increase

Thimble No. 33

$P_b =$ 29.92 ✓
 $V_m =$ 86.45 ✓
 $V_w =$ 147.3 ✓
 $P_m =$ 1.815 ✓

%CO₂ = 13.2 ✓
%O₂ = 6.2 ✓
%CO = 0.0 ✓
%N₂ = 80.6 ✓

Impinger 6
Final Weight 789.1
Initial Weight 789.0
Increase

Avg $\Delta P =$ 2.154 ✓
Avg $\sqrt{\Delta P} =$ 1.468 ✓

$A_s =$ 28.104 ✓
 $D_n =$ 0.193 ✓
 $T_i =$ 120 ✓

Impinger 7
Final Weight 796.6
Initial Weight 796.2
Increase

$C_p =$ 0.825 ✓
 $P_s =$ -0.55 ✓
 $T_m =$ 73 ✓
 $T_s =$ 37 ✓

29.88 °Hg
533 °R
797 °R

Moisture Content:

%M = 7.48 ✓
 $M_s =$ 0.9252 ✓
 $MW_c =$ 30.360 ✓
 $MW =$ 32.360 ✓
29.44 ✓

$$V_{m_{std}} = 17.65 V_m \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460} \right] = 17.65 \times 86.45 \left[\frac{29.92 + \frac{1.815}{13.6}}{73 + 460} \right] = \frac{86.036}{0.717} \frac{sft^3}{scfm}$$

$$V_{W_{gas}} = 0.0472 \times V_w = 0.0472 \times 147.3 = 6.953 \text{ sft}^3$$

$$\% \text{ Moisture} = \frac{V_{W_{gas}}}{V_{m_{std}} + V_{W_{gas}}} \times 100 = \frac{6.953}{86.036 + 6.953} \times 100 = 7.48 \%$$

$$V_s = 5123.8 \times \frac{0.825}{29.88 \times 29.88} \times \frac{1.468}{797} = 5907 \text{ tpm}$$

$$\%I = \frac{1.039 \times 5907 \times 0.9252 \times 120 \times 29.88 \times (0.193)^2}{797 \times 86.036} = 97.6 \%$$

ACFM: 1152.784 ✓
SCFM: 708.269 ✓
%EA: 40.9 ✓

Run Number 1
Unit UNIT NO. 2 STALK
Date 10/5/06

D-22

Job Number
Job Name
Run Number
Unit
Date
Operator
Sample Box No.

06-056

ADA-ES

2

Unit No. 2 Stacks

10/06/06

GOLDMAN/JACKSON

1-1

Meter Box No.

1-1

ΔP_s

1-1

1-1

1-1

1-1

1-1

1-1

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1-1

1-1

Ontario Hydro Field Data

Read and record at the start of each test point.

Purge to:

Purge time:

Pilot Leak Check Initial

Final

✓

✓

✓

✓

✓

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✓

✓

✓

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✓

✓

Ambient Temp. °F

45

Assumed Moisture %

9.8

Probe Length

8.5

C Factor

15.0

Initial Leak

0.002

Final Leak

0.002

to reference

clm

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ΔP_s

ΔP_s

Point	Clock Time	Dry Gas Meter, CF	"Pilot" H ₂ O	Orifice ΔH H ₂ O Desired	Orifice ΔH H ₂ O Actual	Pump Vacuum "Hg Gauge	Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp °F Inlet	Dry Gas Temp °F Outlet	Remarks
D3	0940	713.685	2.10	1.85	1.85	0.5	334	254	245	41	47	45	INTEGRATED 0.05 FT
3	0945	717.275	2.20	1.87	1.85	0.5	336	254	249	40	48	46	
2	0950	720.85	2.10	1.70	1.70	0.5	336	254	251	39	51	46	
2	0955	724.24	2.20	1.87	1.85	0.5	336	255	253	40	53	47	
1	1000	727.82	2.10	1.70	1.70	0.5	336	255	254	40	55	48	
1	1005	731.225	2.10	1.70	1.70	0.5	335	253	256	40	57	49	
END	1010	734.617	—	—	—	—	—	—	—	—	—	—	
A3	1016	734.617	2.20	1.87	1.85	0.5	331	255	234	43	57	57	
3	1021	738.215	2.15	1.85	1.85	0.5	337	253	249	42	60	52	
2	1026	741.845	2.15	1.85	1.85	0.5	337	252	252	41	62	53	
2	1031	745.485	2.15	1.85	1.85	0.5	337	249	246	42	64	55	
1	1036	749.20	2.15	1.85	1.85	0.5	337	248	249	43	65	56	
1	1041	752.745	2.15	1.85	1.85	0.5	337	245	257	43	67	57	
END	1046	756.367	—	—	—	—	—	—	—	—	—	—	
B3	1050	756.367	2.15	1.85	1.85	0.5	333	246	254	45	66	59	
3	1055	759.975	2.15	1.85	1.85	0.5	337	248	257	45	68	60	
2	1100	763.65	2.15	1.85	1.85	0.5	337	252	253	46	69	61	
2	1105	767.40	2.15	1.85	1.85	0.5	338	255	249	47	70	62	

Pilot Tube Calibration Factor C_p 0.825

Volume Collected V_m 85.309 ft³

Water Collected V_w 145.1 ml

Time of Test T₁ 120 min.

Stack Pressure P_s -0.53 "H₂O

Pilot Tube No. 1-1

Baro. Press. P_b 30.18 "Hg

Probe Tip Dia. D_n 0.193 in.

% CO₂ 13.2

% CO 0.0

% O₂ 5.4

% N₂ 81.4

Barometer No. 1

Total Volume of Leak Checks After Start: 0.985 ft³

V_m X Dry Gas Meter Calibration Factor 0.985 X 86.608

[Dry Gas Meter Reading ft³ - (T₁ min. X Leak Rate clm)]

Probe Tip No. 5-2

Probe Tip No. 5-2

Probe Tip No. 5-2

Probe Tip No. 5-2

Probe Tip No. 5-2

Probe Tip No. 5-2

Probe Tip No. 5-2

Impinger Box No. 1-1

Water Weight Gain

Impinger 1 Final Weight 836.1
Initial Weight 741.5
Increase 94.6

Impinger 1 94.6

Impinger 2 Final Weight 773.2
Initial Weight 753.7
Increase 19.5

Impinger 2 19.5

Impinger 3 Final Weight 746.5
Initial Weight 740.7
Increase 5.8

Impinger 3 5.8

Impinger 4 Final Weight 776.4
Initial Weight 769.1
Increase 7.3

Impinger 4 7.3

Impinger 5 Final Weight 733.8
Initial Weight 733.5
Increase 0.3

Impinger 5 0.3

Impinger 6 Final Weight 743.7
Initial Weight 742.9
Increase 0.8

Impinger 6 0.8

Impinger 7 Final Weight 746.8
Initial Weight 746.7
Increase 0.1

Impinger 7 0.1

$V_w =$
 $g\ SO_2 =$
 $V_w =$
Imp 8 Fw 967.8
IW 951.1
Inc. 16.7

Imp 8 16.7
Total 145.1 = V_w

Thimble: 34

$P_b = 30.18$
 $V_m = 85.309$
 $V_w = 145.1$
 $P_m = 1.831$
Avg $\Delta P = 2.154$
Avg $\sqrt{\Delta P} = 1.468$
 $C_p = 0.825$
 $P_s = 0.53$
 $T_m = 60$
 $T_s = 336$

%CO₂ = 13.2 ✓
%O₂ = 5.4 ✓
%CO = 0.0 ✓
%N₂ = 81.4 ✓
 $A_n = 28.104$ ✓
 $D_n = 0.193$ ✓
 $T_i = 120$ ✓

Moisture Content: %M = 7.24 ✓ $M_d = 0.9276$ ✓ $MW_d = 30.328$ (PS) ✓ $MW = 29.44$ (PS) ✓

$$Vm_{std} = 17.65 Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460} \right] = 17.65 \times 85.309 \left[\frac{30.18 + \frac{1.831}{13.6}}{60 + 460} \right] = \frac{87.777}{0.731} \text{ scfm}$$

$$V_{w_{gas}} = 0.0472 \times V_w = 0.0472 \times 145.1 = 6.849 \text{ sft}^3$$

$$\% \text{ Moisture} = \frac{V_{w_{gas}}}{Vm_{std} + V_{w_{gas}}} \times 100 = \frac{6.849}{87.777 + 6.849} \times 100 = 7.24\%$$

$$V_s = 5123.8 \times \frac{0.825}{30.14 \times 29.44} \times 1.468 = 5877 \text{ fpm}$$

$$\%I = \frac{1.039 \times 796 \times 87.777}{0.9276 \times 5877 \times 30.14 \times 120 \times (0.193)^2} = 98.8\%$$

ACFM: 1147080 ✓
SCFM: 713543 ✓
%EA: 33.4 ✓

Job Number

Job Name

Run Number

Unit

Date

Operator

Sample Box No. 1-1 Meter Box No. 1-1 ΔP_s 06-056AP-A-53Unit No. 2 Stack10/07/06GOWMAN JACKSON P_m ΔP_s T_s T_m T_m

Point	Clock Time	Dry Gas Meter, CF	"Pilot" H_2O	Orifice ΔH H_2O Desired	Orifice ΔH H_2O Actual	Pump Vacuum Hg Gauge	Stack Temp $^{\circ}F$	Probe Temp $^{\circ}F$	Oven Temp $^{\circ}F$	Effluent Temp $^{\circ}F$	Dry Gas Temp $^{\circ}F$ Inlet	Dry Gas Temp $^{\circ}F$ Outlet	Remarks
D3	0845	890.654	2.20	1.87	1.85	0.5	337	245	249	32	36	33	INTERMEDIATE CHECK
3	0850	894.22	2.20	1.87	1.85	0.5	337	243	254	35	38	34	
2	0855	897.73	2.20	1.87	1.85	0.5	337	245	257	35	40	34	
2	0900	901.30	2.20	1.87	1.85	0.5	337	248	257	37	45	36	
1	0905	904.87	2.20	1.87	1.85	0.5	336	246	254	38	49	38	
1	0910	908.50	2.15	1.85	1.85	0.5	336	247	254	39	53	40	
END	0915	912.25	-	-	-	-	-	-	-	-	-	-	
A3	0921	912.25	2.15	1.85	1.85	0.5	331	249	257	39	53	44	
3	0926	915.40	2.10	1.80	1.80	0.5	338	249	253	43	56	45	
2	0931	918.95	2.10	1.80	1.80	0.5	338	249	253	44	59	47	
2	0936	922.55	2.15	1.85	1.85	0.5	338	253	255	46	61	50	
1	0941	926.13	2.15	1.85	1.85	0.5	338	257	258	48	63	51	
1	0946	929.70	2.10	1.80	1.80	0.5	339	250	262	49	65	53	
END	0957	933.317	-	-	-	-	-	-	-	-	-	-	
B3	0956	937.317	2.20	1.87	1.85	0.5	333	255	246	47	66	55	
3	1001	936.97	2.15	1.85	1.85	0.5	338	257	257	53	65	56	
2	1006	940.50	2.20	1.87	1.85	0.5	338	253	244	54	67	58	
2	1011	944.15	2.20	1.87	1.85	0.5	338	255	256	53	70	59	

Pilot Tube Calibration Factor C_p 0.925Volume Collected V_m 0.5176 ft^3 Water Collected V_w 149.7 mlTime of Test T_1 120 min.Stack Pressure P_s -0.65 H_2O Pilot Tube No. 1-1Baro. Press. P_b 20.19 Hg Probe Tip Dia. D_n 0.193 in.% CO_2 12.4 % CO 0.0% O_2 6.5 % N_2 81.1Area Stack A_s 28,104 in^2 Barometer No. 1Total Volume of Leak Checks After Start: 0 ft^3 $V_m \times$ Dry Gas Meter Calibration Factor 0.985 $\checkmark$ 96.473Probe Tip No. 5-2min. X Leak Rate cfm

Impinger Box No. M-2

Water Weight Gain

Impinger 1	Final Weight	<u>794.4</u>		Impinger 1	<u>54.3</u>
	Initial Weight	<u>740.1</u>		Impinger 2	<u>45.6</u>
	Increase	<u>54.3</u>		Impinger 3	<u>16.3</u>
Impinger 2	Final Weight	<u>797.2</u>		Impinger 4	<u>8.4</u>
	Initial Weight	<u>751.6</u>		Impinger 5	<u>3.2</u>
	Increase	<u>45.6</u>		Impinger 6	<u>1.2</u>
Impinger 3	Final Weight	<u>755.7</u>		Impinger 7	<u>0.7</u>
	Initial Weight	<u>739.4</u>		Imp 8	<u>20.0</u>
	Increase	<u>16.3</u>		Total	<u>149.7 = V_w</u>
Impinger 4	Final Weight	<u>779.2</u>			
	Initial Weight	<u>770.8</u>			
	Increase	<u>8.4</u>			
Impinger 5	Final Weight	<u>735.2</u>			
	Initial Weight	<u>732.0</u>			
	Increase	<u>3.2</u>			
Impinger 6	Final Weight	<u>742.1</u>			
	Initial Weight	<u>740.9</u>			
	Increase	<u>1.2</u>			
Impinger 7	Final Weight	<u>749.6</u>			
	Initial Weight	<u>748.9</u>			
	Increase	<u>0.7</u>			

$V_w =$
 $g SO_2 =$
 $V_w =$
 Imp 8 FW 933.6
 IW 913.6
 Inc. 20.0
 Therable Ab: 35

$P_b = 30.19$ ✓
 $V_m = 85.176$ ✓
 $V_w = 149.7$ ✓
 $P_m = 1.344$ ✓
 $Avg \Delta P = 2.169$ ✓
 $Avg \sqrt{\Delta P} = 1.473$ ✓
 $C_p = 0.825$ ✓
 $P_s = -0.65$ ✓
 $T_m = 57$ ✓
 $T_s = 337$ ✓

$\%CO_2 = 12.4$ ✓
 $\%O_2 = 6.5$ ✓
 $\%CO = 0.0$ ✓
 $\%N_2 = 81.1$ ✓
 $A_s = 28.104$ ✓
 $D_n = 0.193$ ✓
 $T_i = 120$ ✓
 30.14 ✓
 517 ✓
 797 ✓

Moisture Content:

$\%M = 7.42$ ✓
 $M_d = 0.9258$ ✓
 $MW_d = 30.244$ ✓
 $MW = 29.34$ ✓

$$Vm_{std} = 17.65 Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460} \right] = 17.65 \times 85.176 \left[\frac{30.19 + \frac{1.344}{13.6}}{57 + 460} \right] = \frac{88.182}{0.738} \frac{ft^3}{scfm}$$

$$V_{w_{gas}} = 0.0472 \times V_w = 0.0472 \times 149.7 = 7.066 \text{ ft}^3$$

$$\% \text{ Moisture} = \frac{V_{w_{gas}}}{Vm_{std} + V_{w_{gas}}} \times 100 = \frac{7.066}{88.182 + 7.066} \times 100 = 7.42 \%$$

$$V_s = 5123.8 \times \frac{0.825}{30.14} \times \frac{797}{29.34} \times 1.473 = 5911 \text{ fpm}$$

$$\%I = \frac{1.039 \times 797 \times 88.182}{0.9258 \times 30.14 \times 120 \times 5911 \times \frac{30.14 \times (0.193)^2}{1.0171 \times 10^6}} = 99.0 \%$$

ACFM: 1,153,671 ✓
 SCFM: 715,379 ✓
 %EA: 43.4 ✓

Ontario Hydro

FIELD DATA

Run Number

Unit UNIT No. 2 STACK

Date 10/07/06[illegible]

Job Number
Job Name
Run Number
Unit
Date
Operator
Sample Box No.

06-056
AIA-ES

Unit No. 2 Stack
10/5/06
GULONAR JAKAR

Meter Box No. 1-1

ΔP_s

EPA Method 20A Field Data

Read and record at the start of each test point.

Purge to:

Purge time:

Pilot Leak Check Initial Final

Ambient Temp. °F 58
Assumed Moisture % 9%
Probe Length 91
C Factor 8.5 to reference
Initial Leak @ 15.0 "Hg = 0.004 cfm
Final Leak @ 5.0 "Hg = 0.000 cfm

T_m

T_s

P_m

Point	Clock Time	Dry Gas Meter, CF	"Pilot" H ₂ O	Orifice ΔH H ₂ O Desired	Orifice ΔH H ₂ O Actual	Pump Vacuum "Hg Gauge	Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Remarks
D3	1720	669.575	2.00	1.70	1.70	0.5	341	249	252	57	68	68	INTERVAL 0.575
2	1725	673.115	2.10	1.80	1.80	0.5	342	254	259	56	68	68	
1	1730	676.75	2.00	1.70	1.70	0.5	341	257	257	53	69	68	
END	1735	680.334	—	—	—	—	—	—	—	—	—	—	
A3	1743	680.334	2.10	1.80	1.80	0.5	338	253	254	52	68	68	
2	1748	683.965	2.00	1.70	1.70	0.5	341	253	256	50	69	68	
1	1753	687.48	2.00	1.70	1.70	0.5	341	255	256	49	71	68	
END	1756	691.067	—	—	—	—	—	—	—	—	—	—	
B3	1803	691.067	2.00	1.70	1.70	0.5	340	255	253	50	68	67	
2	1808	694.59	2.10	1.80	1.80	0.5	340	256	260	49	69	67	
1	1813	698.25	2.10	1.80	1.80	0.5	341	255	253	48	70	67	
END	1818	701.953	—	—	—	—	—	—	—	—	—	—	
C3	1822	701.953	2.10	1.80	1.80	0.5	339	250	251	49	68	66	
2	1827	705.55	2.00	1.70	1.70	0.5	341	252	270	49	69	66	
1	1832	709.10	2.00	1.70	1.70	0.5	341	255	255	49	69	66	
END	1837	712.564	—	—	—	—	—	—	—	—	—	—	

Pilot Tube Calibration Factor C_p 0.822
Volume Collected V_m 42.34 ft³
Water Collected V_w 70.7 ml
Time of Test T_1 60 min.
Stack Pressure P_s -0.46 "H₂O

Pilot Tube No. 10410500 2-1
Baro. Press. P_b 29.95 "Hg
Probe Tip Dia. D_n 0.193 in.
% CO₂ 13.2 % CO 0.0
% O₂ 5.8 % N₂ 81.0
Area Stack A_s 28.104 in²

Barometer No. 1
Total Volume of Leak Checks After Start: 0.985 ft³
 $V_m \times$ Dry Gas Meter Calibration Factor 42.989
Probe Tip No. 72
[Dry Gas Meter Reading — ft³ - (T_1 min. $\times$ Leak Rate — cfm)]

Impinger Box No. 1-1

Water Weight Gain

Impinger 1
Final Weight 799.4
Initial Weight 760.7
Increase

Impinger 1 38.7
Impinger 2 13.4

Impinger 2
Final Weight 755.2
Initial Weight 741.8
Increase

Impinger 3 5.2
Impinger 4 2.6

Impinger 3
Final Weight 741.7
Initial Weight 736.5
Increase

$V_w =$
 $g\ SO_2 =$
 $V_w =$

Impinger 5 10.8
Impinger 6

Impinger 4
Final Weight 744.5
Initial Weight 741.9
Increase

Impinger 7
Total 70.7 = V_w

Filter No: A089

Impinger 5
Final Weight 882.5
Initial Weight 871.7
Increase

$P_b = 29.95$ ✓
 $V_m = 42.344$ ✓
 $V_w = 70.7$ ✓
 $P_m = 2.042$ ✓
Avg $\Delta P = 2.042$ ✓
Avg $\sqrt{\Delta P} = 1.429$ ✓
 $C_p = 0.822$ ✓
 $P_s = 0.46$ ✓
 $T_m = 68$ ✓
 $T_s = 341$ ✓

%CO₂ = 13.2 ✓
%O₂ = 5.8 ✓
%CO = 0.0 ✓
%N₂ = 81.0 ✓
 $A_s = 28.104$ ✓
 $D_n = 0.193$ ✓
 $T_i = 120.60$ (10/8/06)

Impinger 6
Final Weight
Initial Weight
Increase

Impinger 7
Final Weight
Initial Weight
Increase

Moisture Content: %M = 7.27 ✓
 $M_d = 0.9273$ ✓
 $MW_c = 30.344$ ✓
 $MW = 29.45$ ✓

$$Vm_{std} = 17.65 Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460} \right] = 17.65 \times 42.344 \left[\frac{29.95 + \frac{1.742}{13.6}}{68 + 460} \right] = \frac{42.575}{0.710} \frac{ft^3}{scfm}$$

$$V_{w_{gas}} = 0.0472 \times V_w = 0.0472 \times 70.7 = 3.337 \frac{ft^3}{scfm}$$

$$\% \text{ Moisture} = \frac{V_{w_{gas}}}{Vm_{std} + V_{w_{gas}}} \times 100 = \frac{3.337}{7.337 + 42.575} \times 100 = 7.27\%$$

$$V_s = 5123.8 \times \frac{0.822}{29.92 \times 29.45} \times \frac{1.429}{801} = 5738 \frac{tpm}{scfm}$$

$$\%I = \frac{1.039 \times 42.575 \times 801}{0.9273 \times 5738 \times 29.92 \times 60 \times (0.193)^2} = 99.6\%$$

ACFM: 1119.940 ✓
SCFM: 687.042 ✓
%EA: 37.0 ✓

Job Number
Job Name
Run Number
Unit
Date
Operator
Sample Box No.

06-056
ADA-ES
2
Unit No. 2 Stack
1016106
GALONAN/ADSON

EPA Method 26A Field Data

Read and record at the start of each test point.

Purge to: _____
Purge time: _____
Pilot Leak Check Initial ☒ Final ☒

Ambient Temp. °F 61
Assumed Moisture % 89
Probe Length 9'
C Factor 8.5 to reference
Initial Leak @ 15.0 "Hg = 0.005 cfm
Final Leak @ 5.5 "Hg = 0.002 cfm

Point	Clock Time	Dry Gas Meter, CF	Pilot "H ₂ O"	Orifice ΔH "H ₂ O" Desired	Orifice ΔH "H ₂ O" Actual	Pump Vacuum "Hg Gauge	Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Remarks
D3	1320	800.714	2.15	1.85	1.85	0.5	340	260	254	61	64	64	INTERFERED ON START
2	1325	804.38	2.15	1.85	1.85	0.5	341	263	254	59	63	64	
1	1330	808.05	2.05	1.75	1.75	0.5	341	263	255	60	65	64	
END	1335	811.611	—	—	—	—	—	—	—	—	—	—	
A2	1341	811.611	2.15	1.85	1.85	0.5	339	261	249	61	67	64	
2	1346	815.27	2.20	1.87	1.85	0.5	338	262	244	60	69	65	
1	1351	818.935	1.90	1.60	1.60	0.5	338	262	252	60	70	65	
END	1356	822.389	—	—	—	—	—	—	—	—	—	—	
B3	1401	822.389	2.15	1.85	1.85	0.5	335	261	257	56	73	68	
2	1406	826.075	2.20	1.87	1.85	0.5	337	258	249	60	72	68	
1	1411	829.785	2.30	1.95	1.95	0.5	338	261	253	66	73	69	
END	1416	833.583	—	—	—	—	—	—	—	—	—	—	
C3	1420	837.583	2.20	1.87	1.85	0.5	337	261	257	65	73	70	
2	1425	837.22	2.25	1.90	1.90	0.5	339	260	250	63	75	71	
1	1430	840.97	2.20	1.87	1.95	0.5	339	261	254	60	76	71	
END	1435	844.700	—	—	—	—	—	—	—	—	—	—	

Pilot Tube Calibration Factor C_p 0.822
Volume Collected V_m 43.326 ft³
Water Collected V_w 76.8 ml
Time of Test T_1 60 min.
Stack Pressure P_s -0.45 "H₂O

Pilot Tube No. 2-1
Baro. Press. P_b 30.17 "Hg
Probe Tip Dia. D_p 0.193 in.
% CO₂ 13.2 % CO 0.0
% O₂ 6.4 % N₂ 80.4
Area Stack A, 28.104 in²

Barometer No. 1
Total Volume of Leak Checks After Start: 0.985 ft³
 $V_m \times \text{Dry Gas Meter Calibration Factor}$ 43.986
Probe Tip No. 72
[Dry Gas Meter Reading ft³ - (T₁ min. X Leak Rate cfm)]

Impinger Box No. 2-21-1

Water Weight Gain

Impinger 1	Final Weight Initial Weight Increase	<u>803.6</u> <u>739.8</u> <u>759.4</u> 44.2	Impinger 1	<u>44.2</u>
Impinger 2	Final Weight Initial Weight Increase	<u>753.9</u> <u>739.6</u> <u>741.7</u> 12.2	Impinger 2	<u>12.2</u>
Impinger 3	Final Weight Initial Weight Increase	<u>742.5</u> <u>740.6</u> <u>738.5</u> 4.0	Impinger 3	<u>4.0</u>
Impinger 4	Final Weight Initial Weight Increase	<u>740.1</u> <u>737.3</u> <u>737.7</u> 2.4	Impinger 4	<u>2.4</u>
Impinger 5	Final Weight Initial Weight Increase	<u>895.5</u> <u>881.5</u> <u>891.5</u> 14.0	Impinger 5	<u>14.0</u>
Impinger 6	Final Weight Initial Weight Increase	_____ _____ _____	Impinger 6	_____
Impinger 7	Final Weight Initial Weight Increase	_____ _____ _____	Impinger 7	_____
Total			Total	<u>76.8</u> = V_w
$P_b = 30.17$ $V_m = 43.326$ $V_w = 76.8$ $P_m = 1.833$ $Avg \Delta P = 2.158$ $Avg \sqrt{\Delta P} = 1.469$ $C_p = 0.822$ $P_s = 0.45$ $T_m = 68$ $T_s = 339$			$\%CO_2 = 13.2$ $\%O_2 = 6.4$ $\%CO = 0.0$ $\%N_2 = 80.4$ $A_s = 28.104$ $D_n = 0.193$ $T_i = 60$	
			$H_2O = 30.14$ $^{\circ}R = 528$ $^{\circ}F = 799$	

Moisture Content: $\%M = 7.63$ $M_d = 0.9237$ $MW_d = 30.368$ $MW = 29.42$

$$Vm_{std} = 17.65 Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460} \right] = 17.65 \times 43.326 \left[\frac{30.17 + \frac{1.833}{13.6}}{68 + 460} \right] = \frac{43.890}{0.732} \frac{ft^3}{scfm}$$

$$Vw_{gas} = 0.0472 \times Vw = 0.0472 \times 76.8 = 3.625 \text{ ft}^3$$

$$\% \text{ Moisture} = \frac{Vw_{gas}}{Vm_{std} + Vw_{gas}} \times 100 = \frac{3.625}{43.890 + 3.625} \times 100 = 7.63 \%$$

$$V_s = 5123.8 \times \frac{0.822}{29.42 \times 30.14} \times \frac{799}{1.469} = 5073 \text{ tpm}$$

$$\%I = \frac{1.039 \times 799 \times 43.890}{0.9237 \times 5073 \times 60 \times 30.14 \times (0.193)^2} = 99.7 \%$$

$$\begin{aligned} \text{ACFM: } & 1146230 \\ \text{SCFM: } & 707393 \\ \%EA: & 42.9 \end{aligned}$$

Job Number
Job Name
Run Number
Unit
Date
Operator
Sample Box No. 1-2 Meter Box No. 1-1

D6-056
ADA-E3
3

Unit No. 2 Stack
10/06/06
Gordon (Tucker)

EPA Method 26A Field Data

Read and record at the start of each test point.

Purge to:
Purge line:
Pilot Leak Check Initial ☒ Final ☒

Ambient Temp. °F 57
Assumed Moisture % 82
Probe Length 9' to reference
C Factor 8.5
Initial Leak @ 15.2 °Hg 0.022 cfm
Final Leak @ 5.0 °Hg 0.020 cfm

Point	Clock Time	Dry Gas Meter, CF	"Pilot" H ₂ O	Orifice ΔH H ₂ O Desired	Orifice ΔH H ₂ O Actual	Pump Vacuum "Hg Gauge	Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Remarks
C3	1542	845.104	2.00	1.70	1.70	0.5	339	262	257	60	69	70	NEGATIVE 0.031
2	1547	848.63	2.20	1.70	1.70	0.5	339	262	257	54	70	70	
1	1552	852.30	1.90	1.60	1.60	0.5	339	259	258	50	70	70	
END	1557	855.592	—	—	—	—	—	—	—	—	—	—	
B3	1600	855.592	2.10	1.80	1.80	0.5	336	261	257	53	70	69	
2	1605	859.22	2.10	1.80	1.80	0.5	338	260	257	48	70	70	
1	1610	862.91	2.20	1.90	1.90	0.5	339	263	256	47	71	69	
END	1615	866.575	—	—	—	—	—	—	—	—	—	—	
A3	1620	866.575	2.15	1.85	1.85	0.5	336	263	266	57	69	69	
2	1625	870.22	2.15	1.85	1.85	0.5	339	263	259	47	69	69	
1	1630	873.97	1.90	1.60	1.60	0.5	341	260	258	46	72	69	
END	1635	877.372	—	—	—	—	—	—	—	—	—	—	
D3	1640	877.372	2.15	1.85	1.85	0.5	341	262	256	52	70	69	
2	1645	880.995	2.20	1.90	1.90	0.5	341	261	259	49	71	69	
1	1650	884.66	2.10	1.80	1.80	0.5	341	263	255	51	71	69	
END	1655	888.330	—	—	—	—	—	—	—	—	—	—	

Pilot Tube Calibration Factor C_p 0.822
Volume Collected V_m 42.578 ft³
Water Collected V_w 68.6 ml
Time of Test T₁ 60 min.
Slack Pressure P_s -0.58 °H₂O

Pilot Tube No. 2-1
Baro. Press. P_b 30.36 °Hg
Probe Tip Dia. D_t 0.193 in.
% CO₂ 13.2 % CO 0.0
% O₂ 6.5 % N₂ 80.3
Area Slack A_s 23.104 in²

Barometer No. 1 Probe Tip No. 7-2
Total Volume of Leak Checks After Start: ft³
V_m X Dry Gas Meter Calibration Factor 0.985 X 43.226
[Dry Gas Meter Reading — ft³ - (T₁ — min. X Leak Rate — cfm)]

Impinger Box No. 2 + 1-2

		Water Weight Gain			
Impinger 1	Final Weight	784.4		Impinger 1	44.6
	Initial Weight	2 759.4	739.8	Impinger 2	9.1
	Increase	44.6		Impinger 3	3.9
Impinger 2	Final Weight	748.7		Impinger 4	1.0
	Initial Weight	2 741.7	739.6	Impinger 5	10.0
	Increase	9.1		Impinger 6	
Impinger 3	Final Weight	744.5		Impinger 7	
	Initial Weight	2 738.5	740.6	Total	68.6 = V _w
	Increase	3.9			
Impinger 4	Final Weight	738.3			
	Initial Weight	2 737.1	737.3		
	Increase	1.0			
Impinger 5	Final Weight	905.4			
	Initial Weight	2 881.5	895.4		
	Increase	10.0			
Impinger 6	Final Weight				
	Initial Weight				
	Increase				
Impinger 7	Final Weight				
	Initial Weight				
	Increase				

Moisture Content: %M = 6.97 ✓ M_d = 0.9303 ✓ MW_c = 30.372 ✓ MW = 29.51 ✓

$$Vm_{std} = 17.65 Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460} \right] = 17.65 \times 12.578 \left[\frac{30.36 + \frac{1.800}{13.6}}{70 + 460} \right] = \frac{43.236}{0.720} \frac{ft^3}{scfm}$$

$$Vw_{gas} = 0.0472 \times Vw = 0.0472 \times 68.6 = 3.238 \text{ ft}^3$$

$$\% \text{ Moisture} = \frac{Vw_{gas}}{Vm_{std} + Vw_{gas}} \times 100 = \frac{3.238}{43.236 + 3.238} \times 100 = 6.97 \%$$

$$V_s = 5123.8 \times \frac{0.002}{29.51 \times 30.32} \times \frac{799}{1.441} = 5735 \text{ tpm}$$

$$\%I = \frac{1.039 \times 43.236 \times 799}{5735 \times 0.9303 \times 30.32 \times 60 \times (0.193)^2} = 99.3 \%$$

ACFM: 1.119329 ✓
SCFM: 699.862 ✓
%EA: 44.0 ✓

Appendix E:
Particulate Matter and Mercury Speciation Analytical Data

Air Sampling Associates, Inc.

Particulate Analysis Summary

Project Number: 06-056

Date Analysis Completed: 10/27/06

Project Name: ADA-ES

Unit Tested: Unit No. 2 Inlet to Original
ESP (Duct A)

Project Location: Bow, NH

Ontario Hydro Train

Run Number:

1 2 3

Particulate Matter on Filter (mg):

5,143.1 5,653.9 6,161.1

Particulate Matter in Front Wash (mg):

262.2 136.0 95.3

Total Particulate Matter in "Front-Half" – MF (mg):

5,405.3 5,789.9 6,256.4

Particulate Matter in "Back-Half" (mg):

— — —

Total Particulate Matter in Sample – MT (mg):

— — —

STL

Analyst

Billy J. Mullins Date: 11/3/06

Data Checked By

Particulate Analysis EPA Method 17
Stack Filters

Ontario Hydro Train

Project No. 06-056
Project Name APA-ES

Location Bow, NH.
Unit Tested Inlet to Original ESP (Duct A)
Unit No. 2

Desiccator Time In					
Desiccator Time Out					

Run No.	<u>1</u>	Filter No.	<u>42</u>	Sample I.D.	
Filter & Particulate (g)					

Filter & Particulate Average (g) 7.9290
Initial Filter Weight (g) 2.7859
Total Particulate (mg) 5,143.1

Run No.	<u>2</u>	Filter No.	<u>43</u>	Sample I.D.	
Filter & Particulate (g)					

Filter & Particulate Average (g) 8.3344
Initial Filter Weight (g) 2.6805
Total Particulate (mg) 5,653.9

Run No.	<u>3</u>	Filter No.	<u>44</u>	Sample I.D.	
Filter & Particulate (g)					

Filter & Particulate Average (g) 8.8163
Initial Filter Weight (g) 2.6552
Total Particulate (mg) 6,161.1

Billy J. Mullins, Jr.
Analyst

Air Sampling Associates, Inc.

Particulate Analysis Summary

Project Number: 06-056

Date Analysis Completed: 10/27/06

Project Name: APA-ES

Unit Tested: Unit No. 2 Stack.

Project Location: Bow, NH

Ontario Hydro Train

Run Number:

1 2 3

Particulate Matter on Filter (mg):

245.9 239.4 246.6

Particulate Matter in Front Wash (mg):

2.5 2.2 2.3

Total Particulate Matter in "Front-Half" – MF (mg):

248.4 241.6 248.9

Particulate Matter in "Back-Half" (mg):

— — —

Total Particulate Matter in Sample – MT (mg):

— — —

STL

Analyst

Sally J. Mullins Date: 11/03/06

Data Checked By

Particulate Analysis EPA Method 17

Stack Filters

Project No. 06-056 Location Bow, NH
Project Name ADA-ES Unit Tested Unit No. 2 Stack
Ontario Hydro Train

Desiccator Time In					
Desiccator Time Out					

Run No.	<u>1</u>	Filter No.	<u>33</u>	Sample I.D.	
Filter & Particulate (g)					

Filter & Particulate Average (g) 3.1589
Initial Filter Weight (g) 2.9130
Total Particulate (mg) 245.9

Run No.	<u>2</u>	Filter No.	<u>34</u>	Sample I.D.	
Filter & Particulate (g)					

Filter & Particulate Average (g) 3.0071
Initial Filter Weight (g) 2.7677
Total Particulate (mg) 239.4

Run No.	<u>3</u>	Filter No.	<u>35</u>	Sample I.D.	
Filter & Particulate (g)					

Filter & Particulate Average (g) 2.9988
Initial Filter Weight (g) 2.7522
Total Particulate (mg) 246.6

Patty J. Mullins, Jr.
Analyst

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STL

STL Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Tel: 865 291 3000 Fax: 865 584 4315
www.stl-inc.com

ANALYTICAL REPORT

PROJECT NO. 06-056

New Hampshire

Lot #: H6J100152

Bill Hefley

Air Sampling Associates, Inc.
407-2B Holford's Prairie Road
Lewisville, TX 75056

SEVERN TRENT LABORATORIES, INC.

A handwritten signature in black ink, appearing to read "Terry Wasmund".

Terry Wasmund
Project Manager

October 27, 2006

ANALYTICAL METHODS SUMMARY

H6J100152

<u>PARAMETER</u>	<u>ANALYTICAL METHOD</u>
Mercury (Ontario Hydro)	ASTM D6784-02
Particulate Emissions	CFR60A 5

References:

ASTM Annual Book Of ASTM Standards.

CFR60A "Test Methods", 40 CFR, Part 60, Appendix A, July 1, 1993.

QC DATA ASSOCIATION SUMMARY

H6J100152

Sample Preparation and Analysis Control Numbers

<u>SAMPLE#</u>	<u>MATRIX</u>	<u>ANALYTICAL METHOD</u>	<u>LEACH BATCH #</u>	<u>PREP BATCH #</u>	<u>MS RUN#</u>
001	AIR	CFR60A 5		6285361	
002	AIR	CFR60A 5		6285361	
003	AIR	ASTM D6784-02		6284187	
004	AIR	ASTM D6784-02		6284189	
005	AIR	ASTM D6784-02		6284188	
006	AIR	ASTM D6784-02		6284189	
007	AIR	CFR60A 5		6285361	
008	AIR	CFR60A 5		6285361	
009	AIR	ASTM D6784-02		6284187	
010	AIR	ASTM D6784-02		6284189	6284117
011	AIR	ASTM D6784-02		6284188	6284114
012	AIR	ASTM D6784-02		6284189	6284115
013	AIR	CFR60A 5		6285361	
014	AIR	CFR60A 5		6285361	
015	AIR	ASTM D6784-02		6284187	
016	AIR	ASTM D6784-02		6284189	
017	AIR	ASTM D6784-02		6284188	
018	AIR	ASTM D6784-02		6284189	
019	AIR	ASTM D6784-02		6284189	
020	AIR	ASTM D6784-02		6284188	
021	AIR	ASTM D6784-02		6284189	

(Continued on next page)

QC DATA ASSOCIATION SUMMARY

H6J100152

Sample Preparation and Analysis Control Numbers

<u>SAMPLE#</u>	<u>MATRIX</u>	<u>ANALYTICAL METHOD</u>	<u>LEACH BATCH #</u>	<u>PREP BATCH #</u>	<u>MS RUN#</u>
022	AIR	CFR60A 5		6285361	
023	AIR	CFR60A 5		6285361	
024	AIR	ASTM D6784-02		6284187	
025	AIR	ASTM D6784-02		6284189	
026	AIR	ASTM D6784-02		6284188	
027	AIR	ASTM D6784-02		6284189	
028	AIR	CFR60A 5		6285361	
029	AIR	CFR60A 5		6285361	
030	AIR	ASTM D6784-02		6284187	
031	AIR	ASTM D6784-02		6284189	
032	AIR	ASTM D6784-02		6284188	
033	AIR	ASTM D6784-02		6284189	
034	AIR	CFR60A 5		6285361	
035	AIR	CFR60A 5		6285361	
036	AIR	ASTM D6784-02		6284187	
037	AIR	ASTM D6784-02		6284189	
038	AIR	ASTM D6784-02		6284188	
039	AIR	ASTM D6784-02		6284189	
040	AIR	ASTM D6784-02		6284189	
041	AIR	ASTM D6784-02		6284188	
042	AIR	ASTM D6784-02		6284189	

(Continued on next page)

QC DATA ASSOCIATION SUMMARY

H6J100152

Sample Preparation and Analysis Control Numbers

<u>SAMPLE#</u>	<u>MATRIX</u>	<u>ANALYTICAL METHOD</u>	<u>LEACH BATCH #</u>	<u>PREP BATCH #</u>	<u>MS RUN#</u>
043	AIR	ASTM D6784-02		6284189	
044	AIR	ASTM D6784-02		6284188	
045	AIR	ASTM D6784-02		6284189	
046	AIR	ASTM D6784-02		6284187	
047	AIR	ASTM D6784-02		6284187	
048	AIR	ASTM D6784-02		6284187	
049	AIR	ASTM D6784-02		6284187	

SAMPLE SUMMARY

H6J100152

WO #	SAMPLE#	CLIENT SAMPLE ID	SAMPLED DATE	SAMP TIME
JF3PX	001	UNIT NO.2 STACK RUN 1 THIMBLE	10/05/06	20:25
JF3P5	002	UNIT NO.2 STACK RUN 1 ACETONE	10/05/06	20:30
JF3P7	003	UNIT NO.2 STACK RUN 1 FH	10/05/06	20:32
JF3QP	004	UNIT NO.2 STACK RUN 1 KCL	10/05/06	20:40
JF3QT	005	UNIT NO.2 STACK RUN 1 HNO3/H2O2	10/05/06	20:24
JF3QW	006	UNIT NO.2 STACK RUN 1 KMNO4	10/05/06	20:35
JF3Q9	007	UNIT NO.2 STACK RUN 2 THIMBLE	10/06/06	18:20
JF3RR	008	UNIT NO.2 STACK RUN 2 ACETONE	10/06/06	18:23
JF3RW	009	UNIT NO.2 STACK RUN 2 FH	10/06/06	18:24
JF3R1	010	UNIT NO.2 STACK RUN 2 KCL	10/06/06	18:36
JF3R3	011	UNIT NO.2 STACK RUN 2 HNO3/H2O2	10/06/06	18:09
JF3R4	012	UNIT NO.2 STACK RUN 2 KMNO4	10/06/06	18:19
JF3R5	013	UNIT NO.2 STACK RUN 3 THIMBLE	10/07/06	12:35
JF3R7	014	UNIT NO.2 STACK RUN 3 ACETONE	10/07/06	12:38
JF3R8	015	UNIT NO.2 STACK RUN 3 FH	10/07/06	12:39
JF3TC	016	UNIT NO.2 STACK RUN 3 KCL	10/07/06	13:09
JF3TE	017	UNIT NO.2 STACK RUN 3 HNO3/H2O2	10/07/06	12:57
JF3TH	018	UNIT NO.2 STACK RUN 3 KMNO4	10/07/06	12:55
JF3TN	019	UNIT NO.2 STACK BLANK KCL	10/07/06	13:31
JF3TW	020	UNIT NO.2 STACK BLANK HNO3/H2O2	10/07/06	13:23
JF3TX	021	UNIT NO.2 STACK BLANK KMNO4	10/07/06	13:20
JF3V4	022	UNIT NO.2 INLET TO ORIG RUN 1 THIMBLE	10/05/06	17:50
JF3WC	023	UNIT NO.2 INLET TO ORIG RUN 1 ACETONE	10/05/06	17:55
JF3WF	024	UNIT NO.2 INLET TO ORIG RUN 1 FH	10/05/06	18:00
JF3WM	025	UNIT NO.2 INLET TO ORIG RUN 1 KCL	10/05/06	19:57
JF3WT	026	UNIT NO.2 INLET TO ORIG RUN 1 HNO3/H2O2	10/05/06	19:50
JF3WX	027	UNIT NO.2 INLET TO ORIG RUN 1 KMNO4	10/05/06	20:02
JF3W1	028	UNIT NO.2 INLET TO ORIG RUN 2 THIMBLE	10/06/06	14:45
JF3W2	029	UNIT NO.2 INLET TO ORIG RUN 2 ACETONE	10/06/06	14:48
JF3W4	030	UNIT NO.2 INLET TO ORIG RUN 2 FH	10/06/06	16:50
JF3W9	031	UNIT NO.2 INLET TO ORIG RUN 2 KCL	10/06/06	16:45
JF3XC	032	UNIT NO.2 INLET TO ORIG RUN 2 HNO3/H2O2	10/06/06	17:10
JF3XL	033	UNIT NO.2 INLET TO ORIG RUN 2 KMNO4	10/06/06	17:20
JF3XQ	034	UNIT NO.2 INLET TO ORIG RUN 3 THIMBLE	10/07/06	11:31
JF3XW	035	UNIT NO.2 INLET TO ORIG RUN 3 ACETONE	10/07/06	11:33
JF3XX	036	UNIT NO.2 INLET TO ORIG RUN 3 FH	10/07/06	11:34

(Continued on next page)

SAMPLE SUMMARY

H6J100152

WO #	SAMPLE#	CLIENT SAMPLE ID	SAMPLED DATE	SAMP TIME
JF3X0	037	UNIT NO.2 INLET TO ORIG RUN 3 KCL	10/07/06	11:56
JF3X6	038	UNIT NO.2 INLET TO ORIG RUN 3 HNO3/H2O2	10/07/06	11:41
JF3X9	039	UNIT NO.2 INLET TO ORIG RUN 3 KMNO4	10/07/06	11:49
JF30D	040	UNIT NO.2 INLET TO ORIG BLANK KCL	10/07/06	12:24
JF30E	041	UNIT NO.2 INLET TO ORIG BLANK HNO3/H2O2	10/07/06	12:15
JF30G	042	UNIT NO.2 INLET TO ORIG BLANK KMNO4	10/07/06	12:13
JF30P	043	UNIT NO.2 REAGENT BLANK KCL	10/07/06	10:42
JF30T	044	UNIT NO.2 REAGENT BLANK HNO3/H2O2	10/07/06	10:43
JF301	045	UNIT NO.2 REAGENT BLANK KMNO4/HYD	10/07/06	10:44
JF302	046	UNIT NO.2 REAGENT BLANK THIMBLE #47	10/07/06	10:45
JF303	047	UNIT NO.2 REAGENT BLANK THIMBLE #48	10/07/06	10:45
JF305	048	UNIT NO.2 REAGENT BLANK THIMBLE #49	10/07/06	10:45
JF34C	049	UNIT NO.2 REAGENT BLANK 0.1N HNO3	10/07/06	10:39

NOTE(S) :

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

PROJECT NARRATIVE

H6J100152

The results reported herein are applicable to the samples submitted for analysis only.

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The original chain of custody documentation is included with this report.

Sample Receipt

Custody seals were not present upon sample receipt at STL Knoxville.

The chain of custody documentation was received without the analysis listed on the chain of custody documentation for all the Reagent Blank samples. The laboratory processed the samples using the information on the container labels.

Quality Control and Data Interpretation

Unless otherwise noted, all holding times and QC criteria were met and the test results shown in this report meet all applicable NELAC requirements.

Metals

These stack gas samples were prepared and analyzed using STL Knoxville standard operating procedure KNOX-IP-0006 which is based on ASTM Method D6784-02, "Standard Test Method for Elemental, Oxidized, Particle-Bound and Total Mercury in Flue Gas Generated from Coal-Fired Stationary Sources (Ontario Hydro Method)" with modifications from EPA Method 29. SW-846 Method 7470A, as incorporated in STL Knoxville standard operating procedure KNOX-MT-0009, was used to perform the final instrument analysis.

Thimbles were received instead of filters for the front half samples. Each thimble was divided in half because the digestion vessels are not large enough for the entire thimble. Acid digestion was performed on each half of the front half particulate thimbles and the nitric acid probe rinse fractions separately using HNO₃, HCl and HF. An extra 3 mL of

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PROJECT NARRATIVE

H6J100152

HF was used due to the size of the thimbles. Heating was done by microwave. After digestion, the probe rinse digestate was combined with one of the thimble fractions. For each of the two digestates, the HF was sequestered using H_3BO_3 followed by another microwave cycle. These digestates were combined to a final volume of 100 mL and a portion was digested for CVAA analysis in order to determine the particle-bound mercury. Results were calculated using the following equation:

$$Hg, ug = (Hg, ug/L) * (Micr. Digestate Volume, L) * \left(\frac{Final Volume Hg Digestate (mL)}{Volume Micr. Digestate Used (mL)} \right) * Bench Dilution$$

Please note that the dilution factor reported on the sample result form for the front half samples is actually a combination of preparation factors and bench dilution factors.

For the 5% HNO_3 /10% H_2O_2 impinger samples, a 10 milliliter portion of the sample as received was processed for mercury. The KCl and 4% $KMnO_4$ /10% H_2SO_4 impinger samples were treated with hydroxylamine hydrochloride, followed by removal of a 25 mL portion of sample for mercury processing. Results were calculated using the equation listed below. For the KCl and 4% $KMnO_4$ /10% H_2SO_4 impinger samples, the sample volume includes the volume of hydroxylamine hydrochloride added to the sample.

$$Hg, ug = (Hg, ug/L) * (Sample Volume, L) * \left(\frac{Final Volume Hg Digestate (mL)}{Volume Sample Digested (mL)} \right) * Bench Dilution$$

Please note that the dilution factor reported on the sample result form for the back half impingers is actually the combination of preparation factors (not just a dilution factor) required by the method to convert the Hg reporting limits and method detection limits in concentration units from ug/L to a total ug unit:

$$DilutionFactor = (Volume, L) * \left(\frac{Final Volume Hg Digestate (mL)}{Volume Sample Digested (mL)} \right) * Bench Dilution$$

The matrix spike/matrix spike duplicate recoveries for sample UNIT NO.2 STACK RUN 2 KCL were outside control limits for mercury because the native analyte concentration in

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PROJECT NARRATIVE

H6J100152

the sample was at least four times greater than the spike level. The laboratory control sample showed acceptable results indicating that the analysis was in control.

Physical Testing

Total Particulates:

The measurement of the mass of particulate matter trapped by the particulate filter and probe rinse derived from an M-5 sampling train was performed using SOP number KNOX-WC-0006 (based on EPA Methods 0050 and 5). Microfiber filters, Petri dishes, and 150 mL beakers are carefully inspected and tare weighed to constant weight. After sample collection, the filters are dried, and then carefully weighed to constant weight to determine the mass of particulate matter trapped on the filters. The acetone probe rinse solution is evaporated to dryness, and then weighed to constant weight to determine the total particulate mass collected in the rinse. The total particulate mass collected by an M-5 train is the sum of the particulate filter and the acetone probe rinse residue weights.

Filter thimbles were submitted for analysis that were not prepared and tared by STL Knoxville. The reported weight is the gross weight, which includes the total weight of the filter thimble and the entrained particulate material. Unfortunately, the laboratory information system will not report sufficient digits to obtain a precise net particulate weight when the tare weight is subtracted from the gross weight. The actual raw data is tabulated below for the user's convenience.

Lot-Sample Number	Work Order Number	Client ID	Gross Weight Average (mg)
H6J100152-001	JF3PX1AA	UNIT N0.2 STACK RUN 1 THIMBLE	3158.8
H6J100152-007	JF3Q91AA	UNIT N0.2 STACK RUN 2 THIMBLE	3007.0
H6J100152-013	JF3R51AA	UNIT N0.2 STACK RUN 3 THIMBLE	2998.8

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PROJECT NARRATIVE
H6J100152

H6J100152-022	JF3V41AA	UNIT N0.2 INLET TO ORIG RUN 1 THIMBLE	7929.0
H6J100152-028	JF3W11A A	UNIT N0.2 INLET TO ORIG RUN 2 THIMBLE	8334.4
H6J100152-034	JF3XQ1A A	UNIT N0.2 INLET TO ORIG RUN 3 THIMBLE	8816.3

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Sample Data Summary

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK RUN 1 FH

TOTAL Metals

Lot-Sample #...: H6J100152-003

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284187						
Mercury	ND	0.010	ug	ASTM D6784-02	10/11-10/25/06	JF3P71AA
		Dilution Factor: 0.1		Analysis Time...: 12:21	MDL.....: 0.0060	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK RUN 1 KCL

TOTAL Metals

Lot-Sample #...: H6J100152-004

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284189						
Mercury	10.7	0.80	ug	ASTM D6784-02	10/12/06	JF3QP1AA
		Dilution Factor: 7.95		Analysis Time...: 16:44	MDL.....: 0.48	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK RUN 1 HNO3/H2O2

TOTAL Metals

Lot-Sample #...: H6J100152-005

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284188						
Mercury	ND	0.093	ug	ASTM D6784-02	10/11-10/25/06	JF3QT1AA
		Dilution Factor: 0.93		Analysis Time...: 13:25	MDL.....: 0.056	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK RUN 1 KMNO4

TOTAL Metals

Lot-Sample #...: H6J100152-006

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284189						
Mercury	0.34	0.12	ug	ASTM D6784-02	10/12/06	JF3QW1AA
		Dilution Factor: 1.25		Analysis Time..: 14:30	MDL.....: 0.075	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK RUN 2 FH

TOTAL Metals

Lot-Sample #...: H6J100152-009

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284187						
Mercury	ND	0.010	ug	ASTM D6784-02	10/11-10/25/06	JF3RW1AA
		Dilution Factor: 0.1		Analysis Time...: 12:25	MDL.....: 0.0060	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK RUN 2 KCL

TOTAL Metals

Lot-Sample #...: H6J100152-010

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284189						
Mercury	16.6	1.3	ug	ASTM D6784-02	10/12/06	JF3R11AA
		Dilution Factor: 12.9		Analysis Time...: 16:51	MDL.....: 0.77	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK RUN 2 HNO3/H2O2

TOTAL Metals

Lot-Sample #...: H6J100152-011

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284188						
Mercury	ND	0.070	ug	ASTM D6784-02	10/11-10/25/06	JF3R31AA
		Dilution Factor: 0.7		Analysis Time...: 13:27	MDL.....: 0.042	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK RUN 2 KMNO4

TOTAL Metals

Lot-Sample #...: H6J100152-012

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284189						
Mercury	0.66	0.094	ug	ASTM D6784-02	10/12/06	JF3R41AA
		Dilution Factor: 0.94		Analysis Time...: 14:37	MDL.....: 0.056	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK RUN 3 FH

TOTAL Metals

Lot-Sample #...: H6J100152-015

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284187						
Mercury	ND	0.010	ug	ASTM D6784-02	10/11-10/25/06	JF3R81AA
		Dilution Factor: 0.1		Analysis Time...: 12:27	MDL.....: 0.0060	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK RUN 3 KCL

TOTAL Metals

Lot-Sample #...: H6J100152-016

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284189						
Mercury	18.1	0.70	ug	ASTM D6784-02	10/12/06	JF3TC1AA
		Dilution Factor: 6.95		Analysis Time.: 16:59	MDL.....: 0.42	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK RUN 3 HNO3/H2O2

TOTAL Metals

Lot-Sample #...: H6J100152-017

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION~</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284188						
Mercury	ND	0.075	ug	ASTM D6784-02	10/11-10/25/06	JF3TE1AA
		Dilution Factor: 0.75		Analysis Time...: 13:33	MDL.....: 0.045	

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 3 KMNO4

TOTAL Metals

Lot-Sample #...: H6J100152-018

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284189						
Mercury	0.27	0.093	ug	ASTM D6784-02	10/12/06	JF3TH1AA
		Dilution Factor: 0.93		Analysis Time...: 14:53	MDL.....: 0.056	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK BLANK KCL

TOTAL Metals

Lot-Sample #...: H6J100152-019

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284189						
Mercury	ND	0.088	ug	ASTM D6784-02	10/12/06	JF3TN1AA
		Dilution Factor: 0.88		Analysis Time...: 14:55	MDL.....: 0.053	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK BLANK HNO3/H2O2

TOTAL Metals

Lot-Sample #...: H6J100152-020

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...	6284188					
Mercury	ND	0.068	ug	ASTM D6784-02	10/11-10/25/06	JF3TW1AA
		Dilution Factor: 0.68		Analysis Time...: 11:31	MDL.....: 0.041	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK BLANK KMNO4

TOTAL Metals

Lot-Sample #...: H6J100152-021

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284189						
Mercury	ND	0.093	ug	ASTM D6784-02	10/12/06	JF3TX1AA
		Dilution Factor: 0.93		Analysis Time...: 14:57	MDL.....: 0.056	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG RUN 1 FH

TOTAL Metals

Lot-Sample #...: H6J100152-024

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284187						
Mercury	0.078	0.010	ug	ASTM D6784-02	10/11-10/25/06	JF3WF1AA
		Dilution Factor: 0.1		Analysis Time...: 12:29	MDL.....: 0.0060	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG RUN 1 KCL

TOTAL Metals

Lot-Sample #...: H6J100152-025

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...	6284189					
Mercury	15.6	0.82	ug	ASTM D6784-02	10/12/06	JF3WM1AA
		Dilution Factor: 8.2		Analysis Time...: 17:10	MDL.....: 0.49	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG RUN 1 HNO3/H2O2

TOTAL Metals

Lot-Sample #...: H6J100152-026

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...	6284188					
Mercury	ND	0.12	ug	ASTM D6784-02	10/11-10/25/06	JF3WT1AA
		Dilution Factor: 1.25		Analysis Time...: 13:35	MDL.....: 0.075	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG RUN 1 KMNO4

TOTAL Metals

Lot-Sample #...: H6J100152-027

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284189						
Mercury	0.40	0.15	ug	ASTM D6784-02	10/12/06	JF3WX1AA
		Dilution Factor: 1.52		Analysis Time...: 15:01	MDL.....: 0.091	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG RUN 2 FH

TOTAL Metals

Lot-Sample #...: H6J100152-030

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 6284187						
Mercury	0.12	0.010	ug	ASTM D6784-02	10/11-10/25/06	JF3W41AA
		Dilution Factor: 0.1		Analysis Time...: 12:31	MDL.....: 0.0060	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG RUN 2 KCL

TOTAL Metals

Lot-Sample #...: H6J100152-031

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284189						
Mercury	14.9	0.52	ug	ASTM D6784-02	10/12/06	JF3W91AA
		Dilution Factor: 5.25		Analysis Time...: 16:10	MDL.....: 0.32	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG RUN 2 HNO3/H2O2

TOTAL Metals

Lot-Sample #...: H6J100152-032

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284188						
Mercury	ND	0.090	ug	ASTM D6784-02	10/11-10/25/06	JF3XC1AA
		Dilution Factor: 0.9		Analysis Time...: 13:37	MDL.....: 0.054	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG RUN 2 KMNO4

TOTAL Metals

Lot-Sample #...: H6J100152-033

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...	6284189					
Mercury	0.78	0.13	ug	ASTM D6784-02	10/12/06	JF3XL1AA
		Dilution Factor: 1.33		Analysis Time...: 15:05	MDL.....: 0.080	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG RUN 3 FH

TOTAL Metals

Lot-Sample #...: H6J100152-036

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 6284187						
Mercury	0.094	0.010	ug	ASTM D6784-02	10/11-10/25/06	JF3XX1AA
		Dilution Factor: 0.1		Analysis Time...: 12:32	MDL.....: 0.0060	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG RUN 3 KCL

TOTAL Metals

Lot-Sample #...: H6J100152-037

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received..: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...	6284189					
Mercury	11.8	0.43	ug	ASTM D6784-02	10/12/06	JF3X01AA
		Dilution Factor: 4.29		Analysis Time..: 16:12	MDL.....: 0.26	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG RUN 3 HNO3/H2O2

TOTAL Metals

Lot-Sample #...: H6J100152-038

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284188						
Mercury	ND	0.073	ug	ASTM D6784-02	10/11-10/25/06	JF3X61AA
		Dilution Factor: 0.73		Analysis Time...: 13:39	MDL.....: 0.044	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG RUN 3 KMNO4

TOTAL Metals

Lot-Sample #...: H6J100152-039

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284189						
Mercury	0.65	0.092	ug	ASTM D6784-02	10/12/06	JF3X91AA
		Dilution Factor: 0.92		Analysis Time...: 15:09	MDL.....: 0.055	

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET TO ORIG BLANK KCL

TOTAL Metals

Lot-Sample #...: H6J100152-040

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284189						
Mercury	ND	0.093	ug	ASTM D6784-02	10/12/06	JF30D1AA
		Dilution Factor: 0.93		Analysis Time...: 15:15	MDL.....: 0.056	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG BLANK HNO3/H2O2

TOTAL Metals

Lot-Sample #...: H6J100152-041

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 6284188						
Mercury	ND	0.073	ug	ASTM D6784-02	10/11-10/25/06	JF30E1AA
		Dilution Factor: 0.73		Analysis Time...: 11:37	MDL.....: 0.044	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG BLANK KMNO4

TOTAL Metals

Lot-Sample #...: H6J100152-042

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284189						
Mercury	ND	0.090	ug	ASTM D6784-02	10/12/06	JF30G1AA
		Dilution Factor: 0.9		Analysis Time...: 15:17	MDL.....: 0.054	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 REAGENT BLANK KCL

TOTAL Metals

Lot-Sample #...: H6J100152-043

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284189						
Mercury	ND	0.010	ug	ASTM D6784-02	10/12/06	JF30P1AA
		Dilution Factor: 0.1		Analysis Time...: 15:19	MDL.....: 0.0060	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 REAGENT BLANK HNO3/H2O2

TOTAL Metals

Lot-Sample #...: H6J100152-044

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...	6284188					
Mercury	ND	0.030	ug	ASTM D6784-02	10/11-10/25/06	JF30T1AA
		Dilution Factor: 0.3		Analysis Time...: 11:39	MDL.....: 0.018	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 REAGENT BLANK KMNO4/HYD

TOTAL Metals

Lot-Sample #...: H6J100152-045

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284189						
Mercury	ND	0.0090	ug	ASTM D6784-02	10/12/06	JF3011AA
		Dilution Factor: 0.09		Analysis Time...: 15:21	MDL.....: 0.0054	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 REAGENT BLANK THIMBLE #47

TOTAL Metals

Lot-Sample #...: H6J100152-046

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284187						
Mercury	ND	0.010	ug	ASTM D6784-02	10/11-10/25/06	JF3021AA
		Dilution Factor: 0.1		Analysis Time...: 11:21	MDL.....: 0.0060	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 REAGENT BLANK THIMBLE #48

TOTAL Metals

Lot-Sample #...: H6J100152-047

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...	6284187					
Mercury	ND	0.010	ug	ASTM D6784-02	10/11-10/25/06	JF3031AA
		Dilution Factor: 0.1		Analysis Time...: 11:24	MDL.....: 0.0060	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 REAGENT BLANK THIMBLE #49

TOTAL Metals

Lot-Sample #...: H6J100152-048

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284187						
Mercury	ND	0.010	ug	ASTM D6784-02	10/11-10/25/06	JF3051AA
		Dilution Factor: 0.1		Analysis Time...: 11:26	MDL.....: 0.0060	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 REAGENT BLANK 0.1N HNO3

TOTAL Metals

Lot-Sample #...: H6J100152-049

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...	6284187					
Mercury	ND	0.010	ug	ASTM D6784-02	10/11-10/25/06	JF34C1AA
		Dilution Factor: 0.1		Analysis Time...: 11:29	MDL.....: 0.0060	

METHOD BLANK REPORT

TOTAL Metals

Client Lot #...: H6J100152

Matrix.....: AIR

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
MB Lot-Sample #: H6J110000-187 Prep Batch #...: 6284187						
Mercury	ND	0.010	ug	ASTM D6784-02	10/11-10/25/06	JF5TV1AA
		Dilution Factor: 0.1				
		Analysis Time..: 10:49				
MB Lot-Sample #: H6J110000-188 Prep Batch #...: 6284188						
Mercury	ND	0.025	ug	ASTM D6784-02	10/11-10/25/06	JF5TX1AA
		Dilution Factor: 0.25				
		Analysis Time..: 10:56				
MB Lot-Sample #: H6J110000-189 Prep Batch #...: 6284189						
Mercury	ND	0.010	ug	ASTM D6784-02	10/12/06	JF5T21AA
		Dilution Factor: 0.1				
		Analysis Time..: 14:22				
Mercury	ND	0.010	ug	ASTM D6784-02	10/12/06	JF5T21AD
		Dilution Factor: 0.1				
		Analysis Time..: 14:22				

NOTE(S) :

 Calculations are performed before rounding to avoid round-off errors in calculated results.

LABORATORY CONTROL SAMPLE EVALUATION REPORT

TOTAL Metals

Lot-Sample #...: H6J100152

Matrix.....: AIR

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD RPD	RPD LIMITS	METHOD	PREPARATION- ANALYSIS DATE	PREP- BATCH #
Mercury	104	(80 - 120)			ASTM D6784-02	10/11-10/25/06	6284187
	117	(80 - 120)	11	(0-20)	ASTM D6784-02	10/11-10/25/06	6284187
			Dilution Factor: 0.1		Analysis Time...: 10:51		

NOTE(S) :

 Calculations are performed before rounding to avoid round-off errors in calculated results.

LABORATORY CONTROL SAMPLE DATA REPORT

TOTAL Metals

Lot-Sample #...: H6J100152

Matrix.....: AIR

PARAMETER	SPIKE AMOUNT	MEASURED AMOUNT	UNITS	PERCNT RECVRY	RPD	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Mercury	0.500	0.521	ug	104		ASTM D6784-02	10/11-10/25/06	6284187
	0.500	0.583	ug	117	11	ASTM D6784-02	10/11-10/25/06	6284187

Dilution Factor: 0.1 Analysis Time..: 10:51

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

LABORATORY CONTROL SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: H6J100152

Matrix.....: AIR

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
LCS Lot-Sample#:	H6J110000-188	Prep Batch #...:	6284188		
Mercury	85	(80 - 120)	ASTM D6784-02	10/11-10/25/06	JF5TX1AC
		Dilution Factor: 0.25	Analysis Time...:	10:58	
LCS Lot-Sample#:	H6J110000-189	Prep Batch #...:	6284189		
Mercury	101	(80 - 120)	ASTM D6784-02	10/12/06	JF5T21AC
		Dilution Factor: 0.1	Analysis Time...:	14:25	
Mercury	101	(80 - 120)	ASTM D6784-02	10/12/06	JF5T21AE
		Dilution Factor: 0.1	Analysis Time...:	14:25	

NOTE(S) :

 Calculations are performed before rounding to avoid round-off errors in calculated results.

LABORATORY CONTROL SAMPLE DATA REPORT

TOTAL Metals

Client Lot #...: H6J100152

Matrix.....: AIR

PARAMETER	SPIKE AMOUNT	MEASURED AMOUNT	UNITS	PERCNT RECVRY	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
LCS Lot-Sample#: H6J110000-188 Prep Batch #...: 6284188							
Mercury	1.25	1.06	ug	85	ASTM D6784-02	10/11-10/25/06	JF5TX1AC
				Dilution Factor: 0.25		Analysis Time...: 10:58	
LCS Lot-Sample#: H6J110000-189 Prep Batch #...: 6284189							
Mercury	0.500	0.504	ug	101	ASTM D6784-02	10/12/06	JF5T21AC
				Dilution Factor: 0.1		Analysis Time...: 14:25	
Mercury	0.500	0.504	ug	101	ASTM D6784-02	10/12/06	JF5T21AE
				Dilution Factor: 0.1		Analysis Time...: 14:25	

NOTE(S) :

 Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: H6J100152

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD LIMITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
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MS Lot-Sample #: H6J100152-011 Prep Batch #...: 6284188

Mercury	89	(80 - 120)		ASTM D6784-02	10/11-10/25/06	JF3R31AC
	93	(80 - 120)	4.3 (0-20)	ASTM D6784-02	10/11-10/25/06	JF3R31AD

Dilution Factor: 0.7

Analysis Time..: 13:29

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE SAMPLE DATA REPORT

TOTAL Metals

Client Lot #...: H6J100152

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	AMOUNT	SAMPLE SPIKE AMT	MEASRD AMOUNT	UNITS	PERCNT RECVRY	RPD	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
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MS Lot-Sample #: H6J100152-011 Prep Batch #...: 6284188

Mercury

ND	0.700	0.622	ug	89			ASTM D6784-02	10/11-10/25/06	JF3R31AC
ND	0.700	0.650	ug	93	4.3		ASTM D6784-02	10/11-10/25/06	JF3R31AD

Dilution Factor: 0.7

Analysis Time..: 13:29

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: H6J100152

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD LIMITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
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MS Lot-Sample #: H6J100152-010 Prep Batch #...: 6284189

Mercury	NC,MSB	(80 - 120)		ASTM D6784-02	10/12/06	JF3R11AC
	NC,MSB	(80 - 120)	(0-20)	ASTM D6784-02	10/12/06	JF3R11AD

Dilution Factor: 12.9

Analysis Time...: 16:55

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

NC The recovery and/or RPD were not calculated.

MSB The recovery and RPD were not calculated because the sample amount was greater than four times the spike amount.

MATRIX SPIKE SAMPLE DATA REPORT

TOTAL Metals

Client Lot #...: H6J100152

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	AMOUNT	SPIKE AMT	MEASRD AMOUNT	UNITS	PERCNT RECVRY	RPD	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
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MS Lot-Sample #: H6J100152-010 Prep Batch #...: 6284189

Mercury

16.6	1.29	16.4	ug				ASTM D6784-02	10/12/06	JF3R11AC
		Qualifiers: NC,MSB							
16.6	1.29	16.8	ug				ASTM D6784-02	10/12/06	JF3R11AD
		Qualifiers: NC,MSB							
		Dilution Factor: 12.9							
		Analysis Time...: 16:55							

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

NC The recovery and/or RPD were not calculated.

MSB The recovery and RPD were not calculated because the sample amount was greater than four times the spike amount.

MATRIX SPIKE SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: H6J100152

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>	<u>RPD RPD</u>	<u>RPD LIMITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>WORK ORDER #</u>
MS Lot-Sample #:	H6J100152-012		Prep Batch #...	6284189			
Mercury	104	(80 - 120)			ASTM D6784-02	10/12/06	JF3R41AC
	96	(80 - 120)	4.7	(0-20)	ASTM D6784-02	10/12/06	JF3R41AD

Dilution Factor: 0.94

Analysis Time...: 14:39

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE SAMPLE DATA REPORT

TOTAL Metals

Client Lot #...: H6J100152

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	AMOUNT	SAMPLE SPIKE AMT	MEASRD AMOUNT	UNITS	PERCNT RECVRY	RPD	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
-----------	--------	---------------------	------------------	-------	------------------	-----	--------	-------------------------------	-----------------

MS Lot-Sample #: H6J100152-012 Prep Batch #...: 6284189

Mercury

0.66	0.940	1.64	ug	104			ASTM D6784-02	10/12/06	JF3R41AC
0.66	0.940	1.56	ug	96	4.7		ASTM D6784-02	10/12/06	JF3R41AD

Dilution Factor: 0.94

Analysis Time...: 14:39

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

STL Knoxville**Mercury Data Reporting Form****Post Digestion Spike****Units:** ug/L (ppb)**Instrument ID:** Leeman HydraAA Hg**Data File Name:** H101206. PRN

Element	PDS JF3QPA	Original Sample JF3QP	Spike Added	Percent Recovery
Hg	2.24	1.22	1.0	102

STL Knoxville**Mercury Data Reporting Form****Post Digestion Spike****Units:** ug/L (ppb)**Instrument ID:** Leeman HydraAA Hg**Data File Name:** H101206.PRN

Element	PDS JF3R1A	Original Sample JF3R1	Spike Added	Percent Recovery
Hg	2.18	1.16	1.0	102

STL Knoxville**Mercury Data Reporting Form****Post Digestion Spike****Units:** ug/L (ppb)**Instrument ID:** Leeman HydraAA Hg**Data File Name:** H101206. PRN

Element	PDS JF3TCA	Original Sample JF3TC	Spike Added	Percent Recovery
Hg	3.33	2.35	1.0	98

STL Knoxville**Mercury Data Reporting Form****Post Digestion Spike****Units:** ug/L (ppb)**Instrument ID:** Leeman HydraAA Hg**Data File Name:** H101206, PRN

Element	PDS JF3WMA	Original Sample JF3WM	Spike Added	Percent Recovery
Hg	2.72	1.71	1.0	101

STL Knoxville**Mercury Data Reporting Form****Post Digestion Spike****Units:** ug/L (ppb)**Instrument ID:** Leeman HydraAA Hg**Data File Name:** H101206. PRN

Element	PDS JF3W9A	Original Sample JF3W9	Spike Added	Percent Recovery
Hg	3.62	2.56	1.0	106

STL Knoxville**Mercury Data Reporting Form****Post Digestion Spike****Units:** ug/L (ppb)**Instrument ID:** Leeman HydraAA Hg**Data File Name:** H101206. PRN

Element	PDS JF3X0A	Original Sample JF3X0	Spike Added	Percent Recovery
Hg	3.55	2.48	1.0	107

Sample Data Summary

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 1 THIMBLE

General Chemistry

Lot-Sample #...: H6J100152-001

Work Order #...: JF3PX

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Particulates (total)	3160	0.50	mg	CFR60A 5	10/11-10/13/06	6285361
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 1 ACETONE

General Chemistry

Lot-Sample #...: H6J100152-002 Work Order #...: JF3P5 Matrix.....: AIR
Date Sampled...: 10/05/06 Date Received..: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Particulates (total)	2.5	0.50	mcg	CFR60A 5	10/11-10/13/06	6285361
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 2 THIMBLE

General Chemistry

Lot-Sample #...: H6J100152-007

Work Order #...: JF3Q9

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Particulates (total)	3010	0.50	mg	CFR60A 5	10/11-10/13/06	6285361
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 2 ACETONE

General Chemistry

Lot-Sample #....: H6J100152-008

Work Order #....: JF3RR

Matrix.....: AIR

Date Sampled....: 10/06/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Particulates (total)	2.2	0.50	mg	CFR60A 5	10/11-10/13/06	6285361
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 3 THIMBLE

General Chemistry

Lot-Sample #...: H6J100152-013

Work Order #...: JF3R5

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Particulates (total)	3000	0.50	mg	CFR60A 5	10/11-10/13/06	6285361
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 3 ACETONE

General Chemistry

Lot-Sample #...: H6J100152-014

Work Order #...: JF3R7

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Particulates (total)	2.3	0.50	mg	CFR60A 5	10/11-10/13/06	6285361
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET TO ORIG RUN 1 THIMBLE

General Chemistry

Lot-Sample #...: H6J100152-022

Work Order #...: JF3V4

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Particulates (total)	7930	0.50	mg	CFR60A 5	10/11-10/13/06	6285361
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET TO ORIG RUN 1 ACETONE

General Chemistry

Lot-Sample #....: H6J100152-023

Work Order #....: JP3WC

Matrix.....: AIR

Date Sampled....: 10/05/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Particulates (total)	262	0.50	mg	CFR60A 5	10/11-10/13/06	6285361
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET TO ORIG RUN 2 THIMBLE

General Chemistry

Lot-Sample #....: H6J100152-028

Work Order #...: JF3W1

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Particulates (total)	8330	0.50	mg	CFR60A 5	10/11-10/13/06	6285361
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET TO ORIG RUN 2 ACETONE

General Chemistry

Lot-Sample #...: H6J100152-029

Work Order #...: JF3W2

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Particulates (total)	136	0.50	mg	CPR60A 5	10/11-10/13/06	6285361
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET TO ORIG RUN 3 THIMBLE

General Chemistry

Lot-Sample #...: H6J100152-034

Work Order #...: JF3XQ

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Particulates (total)	8820	0.50	mg	CFR60A 5	10/11-10/13/06	6285361
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET TO ORIG RUN 3 ACETONE

General Chemistry

Lot-Sample #...: H6J100152-035

Work Order #...: JF3XW

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Particulates (total)	95.3	0.50	mg	CFR60A 5	10/11-10/13/06	6285361
		Dilution Factor: 1		MDL.....: 0.50		

Sample Receipt Documentation

**AIR
SAMPLING
ASSOCIATES, INC.**

1765100152

Chain of Custody Record

Client		Project No.		Page		of		Analysis		
Address		Unit No.		Lab		Lab Contact		Part. Matter		
City		Project Manager		Lab Phone No.		Lab		Part. Matter		
Run No.		Test Method		Absorbing Solution		No. of Containers		Comments		
ADA-ES	06-056	Unit No. 2 Stack	Bill Mullins	Anterior Hydro						
Public Service of NH										
City	State	Zip Code								
Bow	NH									
Sample I.D.	Date	Time								
Container No. 1	10/5/06	2025	Thimble	1"						
Container No. 2A	10/5/06	2030	Acetone FW	1"						
Container No. 2	10/5/06	2032	HNO ₃ FW	1"						
Container No. 3	10/5/06	2040	KCl, Temp 12.3	1"						
Container No. 4	10/5/06	2024	HNO ₃ /H ₂ O ₂ , Temp 4	1"						
Container No. 5	10/5/06	2035	KNO ₃ , Temp 36.7	1"						
					HAND DELIVERED					
					NO CUSTODY SEALS					
					REFUSED AT AMBIENT TEMP					
					BKG 10-4-06					
Special Instructions:										
Turn Around Time Required: ☒ Normal ☐ Rush ☐ Return to ASAI ☒ Disposal By Lab ☒ Archive For 6 Months										
1. Recovered By		Date		Time		Date		Time		
Billy J. Mullins		10/5/06		2040		Billy J. Mullins		10/7/06 1420		
2. Received By		Date		Time		Date		Time		
B. J. Mullins		10/7/06		1420		B. J. Mullins		10/9/06 1427		
3. Received By		Date		Time		Date		Time		
William C. Anderson		10/9/06		1427		William C. Anderson		10/9/06 1427		
Comments:

46510152

Chain of Custody Record

[illegible]

1465100152

Chain of Custody Record

Client		Project No.		Page		Analysis	
Address		Unit No.		Lab		Part. Matter	
City		Project Manager		Lab Contact		Part. Hg	
Run No.		Test Method		Lab Phone No.		Toxic Hg	
Sample I.D.		Absorbing Solution		No. of Containers		Elemental Hg	
Date		Time		Comments			
Container No. 1	10/7/06	1235	Thimble	1-			
Container No. 2A	10/13/06	1238	Acetone FW	1-			
Container No. 2	10/13/06	1239	HNO3 FW	1-			
Container No. 3	10/13/06	1309	KCl, Impl, 2, 3	1-			
Container No. 4	10/13/06	1257	HNO3 H2O, Impl 4	1-			
Container No. 5	10/17/06	1255	KNO3, Impl 5, 6, 7	1-			
Special Instructions:							
Turn Around Time Required:		☒ Normal		☐ Rush		Sample Disposal:	
1. Recovered By		10/7/06		1309		1. Relinquished By	
2. Received By		10/9/06		1427		2. Relinquished By	
3. Received By		10/9/06		1427		3. Relinquished By	
Comments:

**AIR
SAMPLING
ASSOCIATES, INC.**

465100152

Chain of Custody Record

Client		Project No.		Page	of	Analysis	
Address		Unit No.	Unit No.	Lab	Lab Contact	Lab Phone No.	Analysis
City	State	Zip Code	Project Manager	Lab Contact	Lab Contact	Lab Phone No.	Analysis
Run No.	Sample I.D.	Date	Time	Absorbing Solution	No. of Containers	Comments	Analysis
1	Container No. 1	10/7/06		Thamille	1		Part. Matter
2	Container No. 2A	10/7/06		Acetone FW	1		Part. Matter
3	Container No. 2	10/7/06		THNDS FW	1		Part. Matter
4	Container No. 3	10/7/06	1331	KCl, Imp, 133	1		Part. Matter
5	Container No. 4	10/7/06	1323	HNA, H ₂ O, Imp 4	1		Part. Matter
6	Container No. 5	10/7/06	1320	KMnO ₄ , Imp 5, 6, 7	1		Part. Matter
Special Instructions:							
Turn Around Time Required:		☒ Normal	☐ Rush	Sample Disposal:		☐ Return to ASAI	☒ Disposal By Lab
1. Recovered By		Bill Wylly	10/7/06	1331	1. Relinquished By	Bill Wylly	10/9/06
2. Received By		Bill Wylly	10/7/06	1331	2. Relinquished By	Bill Wylly	10/9/06
3. Received By		Bill Wylly	10/7/06	1331	3. Relinquished By	Bill Wylly	10/9/06
Comments:

**AIR
SAMPLING
ASSOCIATES, INC.**

H165100152

Chain of Custody Record

Client ADA-ES	Project No. 06-056	Page 1	of 16	Analysis
Address Public Service of NH	Unit No. Unit No. 2 Inlet to Orig. ESP	Lab Severn Trent		
City Bow	State NH	Lab Contact Billy Anderson		
Run No. 1	Test Method Ontaria Hydro	Lab Phone No. 		
Sample I.D.	Date	Time	Absorbing Solution	No. of Containers
Container No. 1	10/5/06	1750	Thimble	1
Container No. 2 A	10/5/06	1755	Acetone FW	1
Container No. 2	10/5/06	1800	HNO ₃ FW	1
Container No. 3	10/5/06	1957	KCl, Imp 1, 3, 3	1
Container No. 4	10/5/06	1950	HNO ₃ /H ₂ O ₂ Imp 1	1
Container No. 5	10/5/06	2002	KMnO ₄ Imp 5, 6, 7	1
Special Instructions:				
Turn Around Time Required: ☒ Normal ☐ Rush	Sample Disposal: Date Time	☐ Return to ASAI ☒ Disposal By Lab ☒ Archive For	6	Months
1. Received By Billy Mullins	10/5/06 2005	1. Relinquished By Billy Mullins	10/7/06 1420	Time
2. Received By Billy Mullins	10/7/06 1420	2. Relinquished By Billy Mullins	10/9/06 1427	Time
3. Received By Billy Mullins	10/9/06 1427	3. Relinquished By Billy Mullins		Time
Comments:

1405100/52

Chain of Custody Record

Client	Project No.	Page	of		
ADA-ES	06-056	5	16		
Address Public Service of NH	Unit No. Unit No. 2 Inlet to Enig. ESP	Lab Savern Trent	Analysis Part. Matter		
City Bow	State NH	Lab Contact Billy Anderson	Part. Hg		
Run No. Z	Test Method Ontario Hydro	Lab Phone/No.	Tonic Hg		
Sample I.D.	Date	Absorbing Solution	No. of Containers		
Container No. 1	10/6/06	Thimble	1 -		
Container No. 2	10/6/06	HNO ₃ FW	1 -		
Container No. 3	10/6/06	KCl, Imp 1, 2, 3	1 -		
Container No. 4	10/6/06	HNO ₃ /H ₂ O, Imp 4	1 -		
Container No. 5	10/6/06	KMnO ₄ , Imp 5, 6, 7	1 -		
Container No. 2A	10/6/06	Acetone FW	1 -		
Special Instructions:					
Turn Around Time Required:	Normal	Rush	Sample Disposal:		
1. Received By Billy J. Mullins, Jr.	10/6/06	1720	1. Relinquished By Billy J. Mullins, Jr.	10/7/06	1420
2. Received By Paul R. Pyly	10/7/06	1420	2. Relinquished By Paul R. Pyly	10/9/06	1427
3. Received By William C. Anderson	10/9/06	1427	3. Relinquished By		
Comments:

**AIR
SAMPLING
ASSOCIATES, INC.**

H65100152

Chain of Custody Record

Client		ADA-ES		Project No.		06-056		Page 13 of 16		Analysis	
Address		Public Service of NH		Unit No.		Unit No. 2 Inlet to Orig. ESP		Lab		Severn Trent	
City		Bow		State		NH		Lab Contact		Billy Anderson	
Run No.		3		Test Method		Ontario Hydro		Lab Phone No.			
Sample I.D.		Date		Time		Absorbing Solution		No. of Containers		Comments	
Container No. 1		10/7/06		1131		Thimble		1			
Container No. 2A		10/7/06		1133		Acetone FW		1			
Container No. 2		10/7/06		1134		H2O3 FW		1			
Container No. 3		10/7/06		1156		KCl, Imp 1, 2, 3		1			
Container No. 4		10/7/06		1156 1141		H2O3 H2O2 Imp 4		1			
Container No. 5		10/7/06		1149		KMnO4 Imp 5, 6, 7		1			
Special Instructions:											
Turn Around Time Required:				☒ Normal ☐ Rush		Sample Disposal:		☐ Return to ASAI ☒ Disposal By Lab ☐ Archive For		6 Months	
1. Recovered By				10/7/06		1156		1. Relinquished By		10/9/06 1427	
2. Received By				10/9/06		1427		2. Relinquished By		10/9/06 1427	
3. Received By				10/9/06		1427		3. Relinquished By		10/9/06 1427	
Comments:

1465100152

Chain of Custody Record

[illegible]

**AIR
SAMPLING
ASSOCIATES, INC.**

HV5100152

Chain of Custody Record

Client	Project No.	Page	of	Analysis
ADA-ES	06-056	16	16	
Address Public Service of NH	Unit No. 2	Lab Sereny Trant		
City Bow	State NH	Lab Contact Billy Anderson		
Run No.	Test Method Ontario Hydro	Lab Phone No.		
Sample I.D.	Date	Absorbing Solution	No. of Containers	Comments
Container No. 7	10/7/06	0.1N HNO ₃	1	OK (BA) Conf 7 is recovered
Container No. 8	10/7/06	1N KCl	1	
Container No. 9	10/7/06	5% HNO ₃ - 10% H ₂ O ₂	1	
Container No. 10	10/7/06	H ₂ SO ₄ - KMnO ₄	1	
Container No. 11	10/7/06	10% Hydroxylamine	1	
Container No. 12	10/7/06	Thimble No. 49	3	
A, B, C		4847	10/7/06	
Special Instructions:				
Turn Around Time Required:	☒ Normal	☐ Rush	Sample Disposal:	☐ Return to ASAI ☒ Disposal By Lab ☒ Archive For
1. Recovered By Billy Mullins	10/7/06	10/7/06	1. Relinquished By Billy Mullins	10/7/06 1430
2. Received By Billy Mullins	10/7/06	1430	2. Relinquished By Billy Mullins	10/7/06 1430
3. Received By Billy Mullins	10/7/06	1427	3. Relinquished By Billy Mullins	10/7/06 1427
Comments:				

STL KNOXVILLE SAMPLE RECEIPT/CONDITION UPON RECEIPT ANOMALY CHECKLIST

Client: AIR SAMPLING ASSOC. Project: 15a

Lot Number: H65100152

Review Items	Yes	No	NA	If No, what was the problem?	Comments/Actions Taken
1. Do sample container labels match COC? (IDs, Dates, Times)	☒			☐ 1a Do not match COC ☐ 1b Incomplete information ☐ 1c Marking smeared ☐ 1d Label torn ☐ 1e No label ☐ 1f COC not received ☐ 1g Other:	15a) Recent blanks received for outland Hydro, No analysis listed on COC
2. Is the cooler temperature within limits? (> freezing temp. of water to 6 °C; NC, 1668, 1613B: 0-4°C; VOST: 10°C; MA: 2-6 °C)			☒	☐ 2a Temp Blank = ☐ 2b Cooler Temp = ☐ 3a Sample preservative =	
3. Were samples received with correct chemical preservative (excluding Encore)?			☒	☐ 3a Sample preservative =	
4. Were custody seals present/intact on cooler and/or containers?		☒		☒ 4a Not present ☐ 4b Not intact ☐ 4c Other:	
5. Were all of the samples listed on the COC received?	☒			☐ 5a Samples received-not on COC ☐ 5b Samples not received-on COC	
6. Were all of the sample containers received intact?	☒			☐ 6a Leaking ☐ 6b Broken	
7. Were VOA samples received without headspace?	☒		☒	☐ 7a Headspace (VOA only)	
8. Were samples received in appropriate containers?	☒			☐ 8a Improper container	
9. Did you check for residual chlorine, if necessary?			☒	☐ 9a Could not be determined due to matrix interference	
10. Were samples received within holding time?	☒			☐ 10a Holding time expired	
11. For rad samples, was sample activity info. provided?			☒	☐ Incomplete information	
12. For SOG water samples (1613B, 1668A, 8290, LR PAHs), do samples have visible solids present?			☒	If yes & appears to be >1%, was SOG notified?	
13. Are the shipping containers intact?	☒			☐ 13a Leaking ☐ 13b Other:	
14. Was COC relinquished? (Signed/Dated/Timed)	☒			☐ 14a Not relinquished	
15. Are tests/parameters listed for each sample?		☒		☒ 15a Incomplete information	
16. Is the matrix of the samples noted?	☒			☐ 15a Incomplete information	
17. Is the date/time of sample collection noted?	☒			☐ 15a Incomplete information	
18. Is the client and project name/# identified?	☒			☐ 15a Incomplete information	
19. Was the sampler identified on the COC?	☒			☐ 15a Incomplete information	
Quote #: <u>72504</u> PM Instructions:					

Sample Receiving Associate: [Signature]

Date: 10/9/06

QA026R18.doc, 1/30/06

Metals

Sample Results

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK RUN 1 FH

TOTAL Metals

Lot-Sample #...: H6J100152-003

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received..: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284187						
Mercury	ND	0.010	ug	ASTM D6784-02	10/11-10/25/06	JF3P71AA
		Dilution Factor: 0.1		Analysis Time..: 12:21	MDL.....: 0.0060	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK RUN 1 KCL

TOTAL Metals

Lot-Sample #...: H6J100152-004

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...	6284189					
Mercury	10.7	0.80	ug	ASTM D6784-02	10/12/06	JF3QP1AA
		Dilution Factor: 7.95		Analysis Time..: 16:44	MDL.....: 0.48	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK RUN 1 HNO3/H2O2

TOTAL Metals

Lot-Sample #...: H6J100152-005

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...	6284188					
Mercury	ND	0.093	ug	ASTM D6784-02	10/11-10/25/06	JF3QT1AA
		Dilution Factor: 0.93		Analysis Time...: 13:25	MDL.....: 0.056	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK RUN 1 KMNO4

TOTAL Metals

Lot-Sample #...: H6J100152-006

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 6284189						
Mercury	0.34	0.12	ug	ASTM D6784-02	10/12/06	JF3QW1AA
		Dilution Factor: 1.25		Analysis Time...: 14:30	MDL.....: 0.075	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK RUN 2 FH

TOTAL Metals

Lot-Sample #...: H6J100152-009

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284187						
Mercury	ND	0.010	ug	ASTM D6784-02	10/11-10/25/06	JF3RW1AA
		Dilution Factor: 0.1		Analysis Time...: 12:25	MDL.....: 0.0060	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK RUN 2 KCL

TOTAL Metals

Lot-Sample #...: H6J100152-010

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 6284189						
Mercury	16.6	1.3	ug	ASTM D6784-02	10/12/06	JF3R11AA
		Dilution Factor: 12.9		Analysis Time...: 16:51	MDL.....: 0.77	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK RUN 2 HNO3/H2O2

TOTAL Metals

Lot-Sample #...: H6J100152-011

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...	6284188					
Mercury	ND	0.070	ug	ASTM D6784-02	10/11-10/25/06	JF3R31AA
		Dilution Factor: 0.7		Analysis Time...: 13:27	MDL.....: 0.042	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK RUN 2 KMNO4

TOTAL Metals

Lot-Sample #...: H6J100152-012

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284189						
Mercury	0.66	0.094	ug	ASTM D6784-02	10/12/06	JF3R41AA
		Dilution Factor: 0.94		Analysis Time...: 14:37	MDL.....: 0.056	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK RUN 3 PH

TOTAL Metals

Lot-Sample #...: H6J100152-015

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284187						
Mercury	ND	0.010	ug	ASTM D6784-02	10/11-10/25/06	JF3R81AA
		Dilution Factor: 0.1		Analysis Time...: 12:27	MDL.....: 0.0060	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK RUN 3 KCL

TOTAL Metals

Lot-Sample #...: H6J100152-016

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 6284189						
Mercury	18.1	0.70	ug	ASTM D6784-02	10/12/06	JF3TC1AA
		Dilution Factor: 6.95		Analysis Time...: 16:59	MDL.....: 0.42	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK RUN 3 HNO3/H2O2

TOTAL Metals

Lot-Sample #...: H6J100152-017

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284188						
Mercury	ND	0.075	ug	ASTM D6784-02	10/11-10/25/06	JF3TE1AA
		Dilution Factor: 0.75		Analysis Time...: 13:33	MDL.....: 0.045	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK RUN 3 KMNO4

TOTAL Metals

Lot-Sample #...: H6J100152-018

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received..: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 6284189						
Mercury	0.27	0.093	ug	ASTM D6784-02	10/12/06	JF3TH1AA
		Dilution Factor: 0.93		Analysis Time..: 14:53	MDL.....: 0.056	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK BLANK KCL

TOTAL Metals

Lot-Sample #...: H6J100152-019

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284189						
Mercury	ND	0.088	ug	ASTM D6784-02	10/12/06	JF3TN1AA
		Dilution Factor: 0.88		Analysis Time...: 14:55	MDL.....: 0.053	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK BLANK HNO3/H2O2

TOTAL Metals

Lot-Sample #...: H6J100152-020

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...	6284188					
Mercury	ND	0.068	ug	ASTM D6784-02	10/11-10/25/06	JF3TW1AA
		Dilution Factor: 0.68		Analysis Time...: 11:31	MDL.....: 0.041	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK BLANK KMNO4

TOTAL Metals

Lot-Sample #...: H6J100152-021

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 6284189						
Mercury	ND	0.093	ug	ASTM D6784-02	10/12/06	JF3TX1AA
		Dilution Factor: 0.93		Analysis Time...: 14:57	MDL.....: 0.056	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG RUN 1 PH

TOTAL Metals

Lot-Sample #...: H6J100152-024

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...	6284187					
Mercury	0.078	0.010	ug	ASTM D6784-02	10/11-10/25/06	JF3WF1AA
		Dilution Factor: 0.1		Analysis Time...: 12:29	MDL.....: 0.0060	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG RUN 1 KCL

TOTAL Metals

Lot-Sample #...: H6J100152-025

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284189						
Mercury	15.6	0.82	ug	ASTM D6784-02	10/12/06	JF3WM1AA
		Dilution Factor: 8.2		Analysis Time...: 17:10	MDL.....: 0.49	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG RUN 1 HNO3/H2O2

TOTAL Metals

Lot-Sample #...: H6J100152-026

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...	6284188					
Mercury	ND	0.12	ug	ASTM D6784-02	10/11-10/25/06	JF3WT1AA
		Dilution Factor: 1.25		Analysis Time...: 13:35	MDL.....: 0.075	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG RUN 1 KMNO4

TOTAL Metals

Lot-Sample #...: H6J100152-027

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 6284189						
Mercury	0.40	0.15	ug	ASTM D6784-02	10/12/06	JF3WX1AA
		Dilution Factor: 1.52		Analysis Time...: 15:01	MDL.....: 0.091	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG RUN 2 FH

TOTAL Metals

Lot-Sample #...: H6J100152-030

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 6284187						
Mercury	0.12	0.010	ug	ASTM D6784-02	10/11-10/25/06	JF3W41AA
		Dilution Factor: 0.1		Analysis Time...: 12:31	MDL.....: 0.0060	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG RUN 2 KCL

TOTAL Metals

Lot-Sample #...: H6J100152-031

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284189						
Mercury	14.9	0.52	ug	ASTM D6784-02	10/12/06	JF3W91AA
		Dilution Factor: 5.25		Analysis Time...: 16:10	MDL.....: 0.32	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG RUN 2 HNO3/H2O2

TOTAL Metals

Lot-Sample #...: H6J100152-032

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...	6284188					
Mercury	ND	0.090	ug	ASTM D6784-02	10/11-10/25/06	JF3XC1AA
		Dilution Factor: 0.9		Analysis Time...: 13:37	MDL.....: 0.054	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG RUN 2 KMNO4

TOTAL Metals

Lot-Sample #...: H6J100152-033

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 6284189						
Mercury	0.78	0.13	ug	ASTM D6784-02	10/12/06	JF3XL1AA
		Dilution Factor: 1.33		Analysis Time...: 15:05	MDL.....: 0.080	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG RUN 3 FH

TOTAL Metals

Lot-Sample #...: H6J100152-036

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...	6284187					
Mercury	0.094	0.010	ug	ASTM D6784-02	10/11-10/25/06	JF3XX1AA
		Dilution Factor: 0.1		Analysis Time...: 12:32	MDL.....: 0.0060	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG RUN 3 KCL

TOTAL Metals

Lot-Sample #...: H6J100152-037

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284189						
Mercury	11.8	0.43	ug	ASTM D6784-02	10/12/06	JF3X01AA
		Dilution Factor: 4.29		Analysis Time...: 16:12	MDL.....: 0.26	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG RUN 3 HNO3/H2O2

TOTAL Metals

Lot-Sample #...: H6J100152-038

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284188						
Mercury	ND	0.073	ug	ASTM D6784-02	10/11-10/25/06	JF3X61AA
		Dilution Factor: 0.73		Analysis Time...: 13:39	MDL.....: 0.044	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG RUN 3 KMNO4

TOTAL Metals

Lot-Sample #...: H6J100152-039

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...: 6284189						
Mercury	0.65	0.092	ug	ASTM D6784-02	10/12/06	JF3X91AA
		Dilution Factor: 0.92		Analysis Time...: 15:09	MDL.....: 0.055	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG BLANK KCL

TOTAL Metals

Lot-Sample #...: H6J100152-040

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284189						
Mercury	ND	0.093	ug	ASTM D6784-02	10/12/06	JF30D1AA
		Dilution Factor: 0.93		Analysis Time...: 15:15	MDL.....: 0.056	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG BLANK HNO3/H2O2

TOTAL Metals

Lot-Sample #...: H6J100152-041

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284188						
Mercury	ND	0.073	ug	ASTM D6784-02	10/11-10/25/06	JF30E1AA
		Dilution Factor: 0.73		Analysis Time...: 11:37	MDL.....: 0.044	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG BLANK KMNO4

TOTAL Metals

Lot-Sample #...: H6J100152-042

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...	6284189					
Mercury	ND	0.090	ug	ASTM D6784-02	10/12/06	JF30G1AA
		Dilution Factor: 0.9		Analysis Time...: 15:17	MDL.....: 0.054	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 REAGENT BLANK KCL

TOTAL Metals

Lot-Sample #...: H6J100152-043

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
Prep Batch #...	6284189					
Mercury	ND	0.010	ug	ASTM D6784-02	10/12/06	JF30P1AA
		Dilution Factor: 0.1		Analysis Time...: 15:19	MDL.....: 0.0060	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 REAGENT BLANK HNO3/H2O2

TOTAL Metals

Lot-Sample #...: H6J100152-044

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284188						
Mercury	ND	0.030	ug	ASTM D6784-02	10/11-10/25/06	JF30T1AA
		Dilution Factor: 0.3		Analysis Time...: 11:39	MDL.....: 0.018	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 REAGENT BLANK KMNO4/HYD

TOTAL Metals

Lot-Sample #....: H6J100152-045

Matrix.....: AIR

Date Sampled....: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #....: 6284189						
Mercury	ND	0.0090	ug	ASTM D6784-02	10/12/06	JF3011AA
		Dilution Factor: 0.09		Analysis Time.: 15:21	MDL.....: 0.0054	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 REAGENT BLANK THIMBLE #47

TOTAL Metals

Lot-Sample #...: H6J100152-046

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284187						
Mercury	ND	0.010	ug	ASTM D6784-02	10/11-10/25/06	JF3021AA
		Dilution Factor: 0.1		Analysis Time...: 11:21	MDL.....: 0.0060	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 REAGENT BLANK THIMBLE #48

TOTAL Metals

Lot-Sample #...: H6J100152-047

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284187						
Mercury	ND	0.010	ug	ASTM D6784-02	10/11-10/25/06	JF3031AA
		Dilution Factor: 0.1		Analysis Time...: 11:24	MDL.....: 0.0060	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 REAGENT BLANK THIMBLE #49

TOTAL Metals

Lot-Sample #...: H6J100152-048

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING</u> <u>LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>WORK</u> <u>ORDER #</u>
Prep Batch #...: 6284187						
Mercury	ND	0.010	ug	ASTM D6784-02	10/11-10/25/06	JF3051AA
		Dilution Factor: 0.1		Analysis Time...: 11:26	MDL.....: 0.0060	

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 REAGENT BLANK 0.1N HNO3

TOTAL Metals

Lot-Sample #...: H6J100152-049

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING LIMIT</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>WORK ORDER #</u>
Prep Batch #...: 6284187						
Mercury	ND	0.010	ug	ASTM D6784-02	10/11-10/25/06	JF34C1AA
		Dilution Factor: 0.1		Analysis Time...: 11:29	MDL.....: 0.0060	

QC Summary

METHOD BLANK REPORT

TOTAL Metals

Client Lot #...: H6J100152

Matrix.....: AIR

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
MB Lot-Sample #: H6J110000-187 Prep Batch #...: 6284187						
Mercury	ND	0.010	ug	ASTM D6784-02	10/11-10/25/06	JF5TV1AA
		Dilution Factor: 0.1				
		Analysis Time...: 10:49				
MB Lot-Sample #: H6J110000-188 Prep Batch #...: 6284188						
Mercury	ND	0.025	ug	ASTM D6784-02	10/11-10/25/06	JF5TX1AA
		Dilution Factor: 0.25				
		Analysis Time...: 10:56				
MB Lot-Sample #: H6J110000-189 Prep Batch #...: 6284189						
Mercury	ND	0.010	ug	ASTM D6784-02	10/12/06	JF5T21AA
		Dilution Factor: 0.1				
		Analysis Time...: 14:22				
Mercury	ND	0.010	ug	ASTM D6784-02	10/12/06	JF5T21AD
		Dilution Factor: 0.1				
		Analysis Time...: 14:22				

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

LABORATORY CONTROL SAMPLE EVALUATION REPORT

TOTAL Metals

Lot-Sample #...: H6J100152

Matrix.....: AIR

<u>PARAMETER</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>	<u>RPD</u>	<u>RPD LIMITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP- BATCH #</u>
Mercury	104	(80 - 120)			ASTM D6784-02	10/11-10/25/06	6284187
	117	(80 - 120)	11	(0-20)	ASTM D6784-02	10/11-10/25/06	6284187
			Dilution Factor: 0.1		Analysis Time...: 10:51		

NOTE(S) :

 Calculations are performed before rounding to avoid round-off errors in calculated results.

LABORATORY CONTROL SAMPLE DATA REPORT

TOTAL Metals

Lot-Sample #...: H6J100152

Matrix.....: AIR

PARAMETER	SPIKE AMOUNT	MEASURED AMOUNT	UNITS	PERCNT RECVRY	RPD	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Mercury	0.500	0.521	ug	104		ASTM D6784-02	10/11-10/25/06	6284187
	0.500	0.583	ug	117	11	ASTM D6784-02	10/11-10/25/06	6284187

Dilution Factor: 0.1 Analysis Time..: 10:51

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

LABORATORY CONTROL SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: H6J100152

Matrix.....: AIR

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
LCS Lot-Sample#:	H6J110000-188	Prep Batch #...	6284188		
Mercury	85	(80 - 120)	ASTM D6784-02	10/11-10/25/06	JF5TX1AC
		Dilution Factor: 0.25	Analysis Time...	10:58	
LCS Lot-Sample#:	H6J110000-189	Prep Batch #...	6284189		
Mercury	101	(80 - 120)	ASTM D6784-02	10/12/06	JF5T21AC
		Dilution Factor: 0.1	Analysis Time...	14:25	
Mercury	101	(80 - 120)	ASTM D6784-02	10/12/06	JF5T21AE
		Dilution Factor: 0.1	Analysis Time...	14:25	

NOTE(S) :

 Calculations are performed before rounding to avoid round-off errors in calculated results.

LABORATORY CONTROL SAMPLE DATA REPORT

TOTAL Metals

Client Lot #...: H6J100152

Matrix.....: AIR

PARAMETER	SPIKE AMOUNT	MEASURED AMOUNT	UNITS	PERCNT RECVRY	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
LCS Lot-Sample#: H6J110000-188 Prep Batch #...: 6284188							
Mercury	1.25	1.06	ug	85	ASTM D6784-02	10/11-10/25/06	JF5TX1AC
				Dilution Factor: 0.25		Analysis Time...: 10:58	
LCS Lot-Sample#: H6J110000-189 Prep Batch #...: 6284189							
Mercury	0.500	0.504	ug	101	ASTM D6784-02	10/12/06	JF5T21AC
				Dilution Factor: 0.1		Analysis Time...: 14:25	
Mercury	0.500	0.504	ug	101	ASTM D6784-02	10/12/06	JF5T21AE
				Dilution Factor: 0.1		Analysis Time...: 14:25	

NOTE(S) :

 Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: H6J100152

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD LIMITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
MS Lot-Sample #:	H6J100152-011 Prep Batch #...: 6284188					
Mercury	89	(80 - 120)		ASTM D6784-02	10/11-10/25/06	JF3R31AC
	93	(80 - 120)	4.3 (0-20)	ASTM D6784-02	10/11-10/25/06	JF3R31AD

Dilution Factor: 0.7

Analysis Time...: 13:29

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE SAMPLE DATA REPORT

TOTAL Metals

Client Lot #...: H6J100152

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	AMOUNT	SAMPLE SPIKE AMT	MEASRD AMOUNT	UNITS	PERCNT RECVRY	RPD	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
-----------	--------	---------------------	------------------	-------	------------------	-----	--------	-------------------------------	-----------------

MS Lot-Sample #: H6J100152-011 Prep Batch #...: 6284188

Mercury

ND	0.700	0.622	ug	89			ASTM D6784-02	10/11-10/25/06	JF3R31AC
ND	0.700	0.650	ug	93	4.3		ASTM D6784-02	10/11-10/25/06	JF3R31AD

Dilution Factor: 0.7

Analysis Time...: 13:29

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: H6J100152

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD LIMITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
-----------	---------------------	--------------------	---------------	--------	-------------------------------	-----------------

MS Lot-Sample #: H6J100152-010 Prep Batch #...: 6284189

Mercury	NC,MSB	(80 - 120)		ASTM D6784-02	10/12/06	JF3R11AC
	NC,MSB	(80 - 120)	(0-20)	ASTM D6784-02	10/12/06	JF3R11AD

Dilution Factor: 12.9

Analysis Time...: 16:55

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

NC The recovery and/or RPD were not calculated.

MSB The recovery and RPD were not calculated because the sample amount was greater than four times the spike amount.

MATRIX SPIKE SAMPLE DATA REPORT

TOTAL Metals

Client Lot #...: H6J100152

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	AMOUNT	SAMPLE SPIKE AMT	MEASRD AMOUNT	UNITS	PERCNT RECVRY	RPD	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
MS Lot-Sample #: H6J100152-010 Prep Batch #...: 6284189									
Mercury									
	16.6	1.29	16.4	ug			ASTM D6784-02	10/12/06	JF3R11AC
			Qualifiers: NC,MSB						
	16.6	1.29	16.8	ug			ASTM D6784-02	10/12/06	JF3R11AD
			Qualifiers: NC,MSB						
			Dilution Factor: 12.9						
			Analysis Time...: 16:55						

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

NC The recovery and/or RPD were not calculated.

MSB The recovery and RPD were not calculated because the sample amount was greater than four times the spike amount.

MATRIX SPIKE SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: H6J100152

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD LIMITS	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
MS Lot-Sample #:	H6J100152-012 Prep Batch #...: 6284189					
Mercury	104	(80 - 120)		ASTM D6784-02	10/12/06	JF3R41AC
	96	(80 - 120)	4.7 (0-20)	ASTM D6784-02	10/12/06	JF3R41AD

Dilution Factor: 0.94

Analysis Time...: 14:39

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE SAMPLE DATA REPORT

TOTAL Metals

Client Lot #...: H6J100152

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	AMOUNT	SAMPLE SPIKE AMT	MEASRD AMOUNT	UNITS	PERCNT RECVRY	RPD	METHOD	PREPARATION- ANALYSIS DATE	WORK ORDER #
-----------	--------	---------------------	------------------	-------	------------------	-----	--------	-------------------------------	-----------------

MS Lot-Sample #: H6J100152-012 Prep Batch #...: 6284189

Mercury

0.66	0.940	1.64	ug	104			ASTM D6784-02	10/12/06	JF3R41AC
0.66	0.940	1.56	ug	96	4.7		ASTM D6784-02	10/12/06	JF3R41AD

Dilution Factor: 0.94

Analysis Time..: 14:39

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

STL Knoxville**Mercury Data Reporting Form****Post Digestion Spike****Units:** ug/L (ppb)**Instrument ID:** Leeman HydraAA Hg**Data File Name:** H101206. PRN

Element	PDS JF3QPA	Original Sample JF3QP	Spike Added	Percent Recovery
Hg	2.24	1.22	1.0	102

STL Knoxville**Mercury Data Reporting Form****Post Digestion Spike****Units:** ug/L (ppb)**Instrument ID:** Leeman HydraAA Hg**Data File Name:** H101206.PRN

Element	PDS JF3R1A	Original Sample JF3R1	Spike Added	Percent Recovery
Hg	2.18	1.16	1.0	102

STL Knoxville**Mercury Data Reporting Form****Post Digestion Spike****Units:** ug/L (ppb)**Instrument ID:** Leeman HydraAA Hg**Data File Name:** H101206. PRN

Element	PDS JF3TCA	Original Sample JF3TC	Spike Added	Percent Recovery
Hg	3.33	2.35	1.0	98

STL Knoxville**Mercury Data Reporting Form****Post Digestion Spike****Units:** ug/L (ppb)**Instrument ID:** Leeman HydraAA Hg**Data File Name:** H101206. PRN

Element	PDS JF3WMA	Original Sample JF3WM	Spike Added	Percent Recovery
Hg	2.72	1.71	1.0	101

STL Knoxville**Mercury Data Reporting Form****Post Digestion Spike****Units:** ug/L (ppb)**Instrument ID:** Leeman HydraAA Hg**Data File Name:** H101206. PRN

Element	PDS JF3W9A	Original Sample JF3W9	Spike Added	Percent Recovery
Hg	3.62	2.56	1.0	106

STL Knoxville**Mercury Data Reporting Form****Post Digestion Spike****Units:** ug/L (ppb)**Instrument ID:** Leeman HydraAA Hg**Data File Name:** H101206.PRN

Element	PDS JF3X0A	Original Sample JF3X0	Spike Added	Percent Recovery
Hg	3.55	2.48	1.0	107

Quality Control Results Mercury

STL Knoxville
Mercury Data Reporting Form

Initial Calibration Verification**Units:** ug/L (ppb)**Instrument ID:** Leeman HydraAA Hg An**Data File Name:** h101206.PRN

Elem	True Conc	Ck2icv 10/12/2006 2:12 PM									
		Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec
Hg	2.5	2.51	100.4								

STL Knoxville

Mercury Data Reporting Form

Continuing Calibration Verification

Units: ug/L (ppb)

Instrument ID: Leeman HydraAA Hg An

Data File Name: h101206.PRN

Elem	True Conc	Ck3ccv 10/12/2006 2:18 PM		Ck3ccv 10/12/2006 2:45 PM		Ck3ccv 10/12/2006 3:11 PM		Ck3ccv 10/12/2006 3:23 PM		Ck3ccv 10/12/2006 4:14 PM		Ck3ccv 10/12/2006 4:47 PM	
		Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec
Hg	5.0	5.28	105.6	5.26	105.2	5.20	104.0	5.23	104.6	5.22	104.4	5.14	102.8

STL Knoxville

Mercury Data Reporting Form

Continuing Calibration Verification

Units: ug/L (ppb)

Instrument ID: Leeman HydraAA Hg An

Data File Name: h101206.PRN

Elem	True Conc	Ck3ccv 10/12/2006 5:14 PM		Ck3ccv 10/12/2006 5:24 PM									
		Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec
Hg	5.0	5.11	102.2	5.15	103.0								

STL Knoxville

Mercury Data Reporting Form

Contract Required Detection Limit Standard(s)

Units: ug/L (ppb)

Instrument ID: Leeman HydraAA Hg An

Data File Name: h101206.PRN

		CRA 10/12/2006 2:16 PM									
Elem	True Conc	Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec
Hg	0.2	0.18	92.0								

STL Knoxville

Mercury Data Reporting Form

Initial Calibration Blank(s)

Units: ug/L (ppb)

Instrument ID: Leeman HydraAA Hg An

Data File Name: h101206.PRN

		ICB 10/12/2006 2:14 PM							
Elem	Reporting Limit	Found	Flag	Found	Flag	Found	Flag	Found	Flag
Hg	0.1	0.06	U						

STL Knoxville

Mercury Data Reporting Form

Continuing Calibration Blank(s)

Units: ug/L (ppb)

Instrument ID: Leeman HydraAA Hg Ana

Data File Name: h101206.PRN

Elem	Reporting Limit	Ck1ccb 10/12/2006 2:20 PM		Ck1ccb 10/12/2006 2:49 PM		Ck1ccb 10/12/2006 3:14 PM		Ck1ccb 10/12/2006 3:25 PM		Ck1ccb 10/12/2006 4:16 PM		Ck1ccb 10/12/2006 4:50 PM	
		Found	Flag	Found	Flag	Found	Flag	Found	Flag	Found	Flag	Found	Flag
Hg	0.1	0.06	U	0.06	U	0.06	U	0.06	U	0.06	U	0.06	U

STL Knoxville

Mercury Data Reporting Form

Continuing Calibration Blank(s)

Units: ug/L (ppb)

Instrument ID: Leeman HydraAA Hg An

Data File Name: h101206.PRN

Elem	Reporting Limit	Ck1ccb 10/12/2006 5:16 PM		Ck1ccb 10/12/2006 5:25 PM							
		Found	Flag	Found	Flag	Found	Flag	Found	Flag	Found	Flag
Hg	0.1	0.06	U	0.06	U						

STL Knoxville**Mercury Data Reporting Form****Post Digestion Spike****Units:** ug/L (ppb)**Instrument ID:** Leeman HydraAA Hg**Data File Name:** H101206. PRN

Element	PDS JF3QPA	Original Sample JF3QP	Spike Added	Percent Recovery
Hg	2.24	1.22	1.0	102

STL Knoxville**Mercury Data Reporting Form****Post Digestion Spike****Units:** ug/L (ppb)**Instrument ID:** Leeman HydraAA Hg**Data File Name:** H101206. PRN

Element	PDS JF3R1A	Original Sample JF3R1	Spike Added	Percent Recovery
Hg	2.18	1.16	1.0	102

STL Knoxville**Mercury Data Reporting Form****Post Digestion Spike****Units:** ug/L (ppb)**Instrument ID:** Leeman HydraAA Hg**Data File Name:** H101206.PRN

Element	PDS JF3TCA	Original Sample JF3TC	Spike Added	Percent Recovery
Hg	3.33	2.35	1.0	98

STL Knoxville**Mercury Data Reporting Form****Post Digestion Spike****Units:** ug/L (ppb)**Instrument ID:** Leeman HydraAA Hg**Data File Name:** H101206.PRN

Element	PDS JF3WMA	Original Sample JF3WM	Spike Added	Percent Recovery
Hg	2.72	1.71	1.0	101

STL Knoxville**Mercury Data Reporting Form****Post Digestion Spike****Units:** ug/L (ppb)**Instrument ID:** Leeman HydraAA Hg**Data File Name:** H101206. PRN

Element	PDS JF3W9A	Original Sample JF3W9	Spike Added	Percent Recovery
Hg	3.62	2.56	1.0	106

STL Knoxville**Mercury Data Reporting Form****Post Digestion Spike****Units:** ug/L (ppb)**Instrument ID:** Leeman HydraAA Hg**Data File Name:** H101206. PRN

Element	PDS JF3X0A	Original Sample JF3X0	Spike Added	Percent Recovery
Hg	3.55	2.48	1.0	107

STL Knoxville**Mercury Data Reporting Form****Instrument Detection Limits****Units:** ug/L (ppb)**IDL Completion Date:**12/8/2005**Instrument ID:** Leeman HydraAA Hg An**Data File Name:** h101206.PRN

Element	Wavelength (nm)	Reporting Limit	IDL
Hg	253.70	0.1	0.06

STL Knoxville

Sample ID Nomenclature

The sample ID consists of 5 alpha-numeric characters followed by a suffix in the 6th position that designates the sample type:

<u>Suffix</u>	<u>Sample Type:</u>
B	Method Blank
C	Laboratory Control Sample
L	Laboratory Control Sample Duplicate
S	Matrix Spike
D	Matrix Spike Duplicate
X	Sample Duplicate
P	Serial Dilution
A	Post Digestion Spike
Z#	Dilution; # = Dilution Factor

STL Knoxville

Mercury Data Reporting Form

Initial Calibration Verification

Units: ug/L (ppb)

Instrument ID: Leeman HydraAA Hg An

Data File Name: H102506A.PRN

		Ck2icv 10/25/2006 10:36 AM									
Elem	True Conc	Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec
Hg	2.5	2.37	94.8								

STL Knoxville

Mercury Data Reporting Form

Continuing Calibration Verification

Units: ug/L (ppb)

Instrument ID: Leeman HydraAA Hg An

Data File Name: H102506A.PRN

Elem	True Conc	Ck3ccv 10/25/2006 10:41 AM		Ck3ccv 10/25/2006 11:05 AM		Ck3ccv 10/25/2006 11:33 AM		Ck3ccv 10/25/2006 11:41 AM		Ck3ccv 10/25/2006 12:11 PM		Ck3ccv 10/25/2006 12:36 PM	
		Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec
Hg	5.0	4.94	98.8	4.90	98.0	4.94	98.8	4.90	98.0	4.93	98.6	4.93	98.6

STL Knoxville

Mercury Data Reporting Form

Continuing Calibration Verification

Units: ug/L (ppb)

Instrument ID: Leeman HydraAA Hg An

Data File Name: H102506A.PRN

Elem	True Conc	Ck3ccv 10/25/2006 1:14 PM		Ck3ccv 10/25/2006 1:41 PM		Ck3ccv 10/25/2006 2:12 PM		Ck3ccv 10/25/2006 3:05 PM			
		Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec
Hg	5.0	4.86	97.2	4.94	98.8	4.89	97.8	4.89	97.8		

STL Knoxville

Mercury Data Reporting Form

Contract Required Detection Limit Standard(s)

Units: ug/L (ppb)

Instrument ID: Leeman HydraAA Hg An

Data File Name: H102506A.PRN

Elem	True Conc	CRA 10/25/2006 10:40 AM									
		Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec
Hg	0.2	0.17	87.0								

STL Knoxville

Mercury Data Reporting Form

Initial Calibration Blank(s)

Units: ug/L (ppb)

Instrument ID: Leeman HydraAA Hg An

Data File Name: H102506A.PRN

Elem	Reporting Limit	ICB 10/25/2006 10:38 AM									
		Found	Flag	Found	Flag	Found	Flag	Found	Flag	Found	Flag
Hg	0.1	0.06	U								

STL Knoxville

Mercury Data Reporting Form

Continuing Calibration Blank(s)

Units: ug/L (ppb)

Instrument ID: Leeman HydraAA Hg Ana

Data File Name: H102506A.PRN

Elem	Reporting Limit	Ck1ccb 10/25/2006 10:43 AM		Ck1ccb 10/25/2006 11:08 AM		Ck1ccb 10/25/2006 11:35 AM		Ck1ccb 10/25/2006 11:43 AM		Ck1ccb 10/25/2006 12:13 PM		Ck1ccb 10/25/2006 12:38 PM	
		Found	Flag	Found	Flag	Found	Flag	Found	Flag	Found	Flag	Found	Flag
Hg	0.1	-0.09	B	0.06	U	0.06	U	-0.08	B	0.06	U	0.06	U

STL Knoxville

Mercury Data Reporting Form

Continuing Calibration Blank(s)

Units: ug/L (ppb)

Instrument ID: Leeman HydraAA Hg An

Data File Name: H102506A.PRN

Elem	Reporting Limit	Ck1ccb 10/25/2006 1:16 PM		Ck1ccb 10/25/2006 1:43 PM		Ck1ccb 10/25/2006 2:14 PM		Ck1ccb 10/25/2006 3:06 PM			
		Found	Flag	Found	Flag	Found	Flag	Found	Flag	Found	Flag
Hg	0.1	0.06	U	-0.06	B	0.06	U	-0.06	B		

STL Knoxville**Mercury Data Reporting Form****Instrument Detection Limits****Units:** ug/L (ppb)**IDL Completion Date:** 12/8/2005**Instrument ID:** Leeman HydraAA Hg An**Data File Name:** H102506A.PRN

Element	Wavelength (nm)	Reporting Limit	IDL
Hg	253.70	0.1	0.06

STL Knoxville

Sample ID Nomenclature

The sample ID consists of 5 alpha-numeric characters followed by a suffix in the 6th position that designates the sample type:

<u>Suffix</u>	<u>Sample Type:</u>
B	Method Blank
C	Laboratory Control Sample
L	Laboratory Control Sample Duplicate
S	Matrix Spike
D	Matrix Spike Duplicate
X	Sample Duplicate
P	Serial Dilution
A	Post Digestion Spike
Z#	Dilution; # = Dilution Factor

Raw Data Mercury

STL Knoxville **Mercury Analysis Cover Sheet**

Analyst	<i>BNC</i>	Instrument	Leeman Hydra AA Mercury Analyzer
Run Date	<i>10/20/06</i>	Chart Name	<i>H10/20/06.prm</i>

Daily Maintenance		As Needed Maintenance	
☒	Check tubing.	☐	Adjust/change Hg lamp.
☒	Check maintenance schedule flags.	☐	Clean or replace optical cell.
		☐	Lubricate pump and autosampler arm.
		☐	Change the drying tube.

Ontario Hydro

STL Knoxville

Method Information

Method Name: Ontario Hydro

Element: Hg

Chart Number: h101206.PRN

Instrument Calibrated Every ? Hours: 24

Number of Calibration Standards: 6

Correlation Coefficient >=: 0.995

Run ICV Immediately After Calibration?: Yes

CRA Required?: Yes

Number of Samples Between CCVs: 10

Duplicate RPD: 20

Calculate Duplicates by CLP or SW-846?: SW-846 Protocol

CRA Recovery Range: 30

CRA Conc. (ug/L): 0.2

ICV Recovery Range: 10.5

ICV Conc. (ug/L): 2.5

CCV Recovery Range: 20.5

CCV Conc. (ug/L): 5

LCS Recovery Range: 20.5

LCS Spike Level (ug/L): 5

MS/MSD Recovery Range: 20.5

MS Spike Level (ug/L): 1

Letter to Signify Blanks: B

Position to Signify Blanks: 6

Letter to Signify LCS's: C

Position to Signify LCS's: 6

Letter to Signify LCSD's: L

Position to Signify LCSD's: 6

Letter to Signify Dilutions: Z

Position to Signify Dilutions: 6

Letter to Signify Duplicates: X

Position to Signify Duplicates: 6

Letter to Signify MS's: S

Position to Signify MS's: 6

Letter to Signify MSD's: D

Position to Signify MSD's: 6

Letters to Signify MSA's: MSA+

Position to Signify MSA's: 6

Number of Additions: 3

Calibration Standard Concentrations (ug/L)

Standard 1 Conc: 0.1

Standard 2 Conc: 0.2

Standard 3 Conc: 0.5

Standard 4 Conc: 1

Standard 5 Conc: 5

Standard 6 Conc: 10

Standard 7 Conc: 0

Standard 8 Conc: 0

ICB/CCB Check Level (ug/L): 0.099

Prep Blank Check Level (ug/L): 0.099

Reporting Limit (ug/L): 0.1

IDL (ug/L): 0.06

Date of IDL: 12/8/2005

STL Knoxville Mercury Data Review Checklist

Method: 7pt.std/SW-846 7470A/7471A/0.2 RL

Analyst:	BNC			Instrument:	Leeman Hydra AA Mercury Analyzer		
Run Date:	Oct-12-06	Calibration Number:	1	Chart Name:	h101206.PRN	Element:	Hg

A. Calibration/Instrument Run QC	N/A	Yes	No	Comments
1. Instrument calibrated every 24 hours?		X		Calibration was 3 hours and 26 minutes long
2. Instrument calibrated using a minimum of a blank and 5 standards?		X		
3. Do standard absorbances increase as standard concentrations increase?		X		
4. Instrument calibrated with standards at the SOP levels		X		
5. Correlation coefficient greater than or equal to 0.995?		X		Correlation coefficient was 0.9999
6. ICV analyzed directly after calibration?		X		
7. ICV within specified control limits?		X		
8. ICB analyzed immediately after ICV?		X		
9. ICB within acceptable range?		X		
10. CRA analyzed at the beginning of the run?		X		
11. CRA results within acceptable range?		X		
12. All CCV's within specified control limits?		X		
13. All CCB's within acceptable range?		X		
14. All CCB's analyzed immediately after CCV's?		X		

B. Client Sample and QC Sample Results

1. Were all sample results within the linear range of the instrument?			X	See Comments on Next Page
2. Were there any samples with results more negative than Report Limit?			X	
3. Were samples analyzed within the holding time?		X		

C. Preparation/Matrix QC

1. Was one method blank prepared for each batch?		X		
2. Were all method blanks less than the specified level?		X		
3. Was an LCS prepared for each batch?		X		
4. Were all LCS recoveries within QC limits?		X		
5. Were matrix spikes, sample duplicates and/or post-digestion spikes run at required frequency?		X		
6. Were all matrix spike recoveries within QC limits?			X	See Comments on Next Page
7. Were post-digestion spike recoveries within QC limits?			X	1
8. Were duplicate RPDs within QC limits?		X		

D. Other

1. Current IDL data on file?		X		
2. Current MDL data on file?		X		
3. Are all nonconformances documented appropriately?	X			
4. Were all project specific instructions followed?		X		NCM#:

Question

Number: Problem(s) Found:

- B1 Sample JF3R1S at 10/12/2006 2:34:01 PM exceeded linear range and an acceptable dilution was NOT found.
- B1 Sample JF3R1D at 10/12/2006 2:35:54 PM exceeded linear range and an acceptable dilution was NOT found.
- C6 Matrix spike sample JF3R1S at 10/12/2006 2:34:01 PM had -19.9% recovery.
- C6 Matrix spike sample JF3R1D at 10/12/2006 2:35:54 PM had 0% recovery.
- C6 Matrix spike sample JF3R1SZ3 at 10/12/2006 4:00:21 PM had 3.000% recovery.
- C6 Matrix spike sample JF3R1DZ3 at 10/12/2006 4:02:12 PM had 7.000% recovery.

STL Knoxville Mercury Data Review Checklist

C6 Matrix spike sample JF3R1SZ10 at 10/12/2006 4:55:48 PM had -2% recovery.

C6 Matrix spike sample JF3R1DZ10 at 10/12/2006 4:57:50 PM had 1% recovery.

Analyst: BNC Date: 10/30/06

Analyst Comments: Dilutions made on digestates exceeding linear range revealed matrix issues associated with non-blank KCl runs. PDS studies were performed on all KCl fractions as well as non-blank KMnO₄ fens to find the optimum dilution factor for analysis. No matrix issues were observed in KMnO₄ digestates. PDS's were performed by mixing 1ml 10ppb std. digestate with 9ml sample digestate. Re: JF3R1, specifically: while dilution eliminated matrix effect, MS/MSD results were still affected by OS > 4x matrix spike.

STL KNOXVILLE

INTERMEDIATE STANDARD – VERIFICATION

Stock Std Name: ICP-080
 Element: Hg
 Stock Source: Ultra
 Stock Std Lot #: F00424
 Stock Std Expiration Date: 08-31-08
 Stock Conc.: 1000 ppm
 Acid Lot: B24037

Stock Vol (ml)/100ml: 1.0 ml
 Date Prepared: 100306
 Expiration Date: 110306 IVER3426-3 = 10ppm
 QC Check: H100306.ppm
 Initials: BNC
 Matrix: 2% HNO₃

WORKING STANDARD – VERIFICATION

1 ml Intermediate Standard/100 ml 0.15 % Concentrated Nitric Acid IVER-3426-3-X = 100ppb

1. I-VER -3426-3-1	Initials <u>BNC</u>	Date: <u>100306</u> Exp. Date: <u>100406</u> HN03 Lot: <u>B24037</u>
2. I-VER -3426-3-2	Initials <u>BNC</u>	Date: <u>100906</u> Exp. Date: <u>101006</u> HN03 Lot: <u>1</u>
3. I-VER -3426-3-3	Initials <u>BNC</u>	Date: <u>101106</u> Exp. Date: <u>101206</u> HN03 Lot: <u>1</u>
4. I-VER -3426-3-4	Initials <u>BNC</u>	Date: <u>101206</u> Exp. Date: <u>101306</u> HN03 Lot: <u>1</u>
5. I-VER	Initials	Date: Exp. Date: HN03 Lot:
6. I-VER	Initials	Date: Exp. Date: HN03 Lot:
7. I-VER	Initials	Date: Exp. Date: HN03 Lot:
8. I-VER	Initials	Date: Exp. Date: HN03 Lot:
9. I-VER	Initials	Date: Exp. Date: HN03 Lot:
10. I-VER	Initials	Date: Exp. Date: HN03 Lot:
11. I-VER	Initials	Date: Exp. Date: HN03 Lot:
12. I-VER	Initials	Date: Exp. Date: HN03 Lot:
13. I-VER	Initials	Date: Exp. Date: HN03 Lot:
14. I-VER	Initials	Date: Exp. Date: HN03 Lot:
15. I-VER	Initials	Date: Exp. Date: HN03 Lot:
16. I-VER	Initials	Date: Exp. Date: HN03 Lot:
17. I-VER	Initials	Date: Exp. Date: HN03 Lot:
18. I-VER	Initials	Date: Exp. Date: HN03 Lot:
19. I-VER	Initials	Date: Exp. Date: HN03 Lot:
20. I-VER	Initials	Date: Exp. Date: HN03 Lot:
21. I-VER	Initials	Date: Exp. Date: HN03 Lot:
22. I-VER	Initials	Date: Exp. Date: HN03 Lot:
23. I-VER	Initials	Date: Exp. Date: HN03 Lot:
24. I-VER	Initials	Date: Exp. Date: HN03 Lot:
25. I-VER	Initials	Date: Exp. Date: HN03 Lot:

STL KNOXVILLE

INTERMEDIATE STANDARD - CALIBRATION

Stock Std Name: PLH64-24
 Element: Hg
 Stock Source: Spex
 Stock Std Lot #: 12-43HG
 Stock Std Expiration Date: 04-30-07
 Stock Conc.: 1000 ppm
 HNO₃ Lot: B24037

Stock Vol (ml)/100ml: 1ml
 Date Prepared: 10-03-06
 Expiration Date: 11-03-06 ICA23425-3 = 10ppm
 QC Check: H100306.ppm
 Initials: BNC
 Matrix: 2% HNO₃

WORKING STANDARD - CALIBRATION

One ml Intermediate Standard/100ml 0.15% Concentrated Nitric Acid ICA23425-3-x = 100ppb

1. I-CAL	<u>-3425-3-1</u>	Initials	<u>BNC</u>	Date:	<u>100306</u>	Exp. Date:	<u>100406</u>	HN03 Lot:	<u>B24037</u>
2. I-CAL	<u>-3425-3-2</u>	Initials	<u>BNC</u>	Date:	<u>100906</u>	Exp. Date:	<u>101006</u>	HN03 Lot:	<u>1</u>
3. I-CAL	<u>-3425-3-3</u>	Initials	<u>BNC</u>	Date:	<u>101106</u>	Exp. Date:	<u>101206</u>	HN03 Lot:	<u>1</u>
4. I-CAL	<u>-3425-3-4</u>	Initials	<u>BNC</u>	Date:	<u>101206</u>	Exp. Date:	<u>101306</u>	HN03 Lot:	<u>1</u>
5. I-CAL		Initials		Date:		Exp. Date:		HN03 Lot:	
6. I-CAL		Initials		Date:		Exp. Date:		HN03 Lot:	
7. I-CAL		Initials		Date:		Exp. Date:		HN03 Lot:	
8. I-CAL		Initials		Date:		Exp. Date:		HN03 Lot:	
9. I-CAL		Initials		Date:		Exp. Date:		HN03 Lot:	
10. I-CAL		Initials		Date:		Exp. Date:		HN03 Lot:	
11. I-CAL		Initials		Date:		Exp. Date:		HN03 Lot:	
12. I-CAL		Initials		Date:		Exp. Date:		HN03 Lot:	
13. I-CAL		Initials		Date:		Exp. Date:		HN03 Lot:	
14. I-CAL		Initials		Date:		Exp. Date:		HN03 Lot:	
15. I-CAL		Initials		Date:		Exp. Date:		HN03 Lot:	
16. I-CAL		Initials		Date:		Exp. Date:		HN03 Lot:	
17. I-CAL		Initials		Date:		Exp. Date:		HN03 Lot:	
18. I-CAL		Initials		Date:		Exp. Date:		HN03 Lot:	
19. I-CAL		Initials		Date:		Exp. Date:		HN03 Lot:	
20. I-CAL		Initials		Date:		Exp. Date:		HN03 Lot:	
21. I-CAL		Initials		Date:		Exp. Date:		HN03 Lot:	
22. I-CAL		Initials		Date:		Exp. Date:		HN03 Lot:	
23. I-CAL		Initials		Date:		Exp. Date:		HN03 Lot:	
24. I-CAL		Initials		Date:		Exp. Date:		HN03 Lot:	
25. I-CAL		Initials		Date:		Exp. Date:		HN03 Lot:	


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:      Instrument Upload                      Run Log - Page 1 :
:      Started Fri Oct 13 06:26:39 2006 by CROMBIEB          :
:      Data File: UPL$KNX_DATA_ROOT:<LHG>H101206.PRN;1      :
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#	WorkOrder	Dilution	Date	Time	Batch	Lot	Instrument
1	CK2ICV	1.00	12-OCT-2006	14:12:41			HG
2	ICB	1.00	12-OCT-2006	14:14:28			HG
3	CRA	1.00	12-OCT-2006	14:16:46			HG
4	CK3CCV	1.00	12-OCT-2006	14:18:34			HG
5	CK1CCB	1.00	12-OCT-2006	14:20:21			HG
6	JF5T2B	0.10	12-OCT-2006	14:22:30	6284189	H6J110000	HG
7	JF5T2C	0.10	12-OCT-2006	14:25:18	6284189	H6J110000	HG
8	JF3QP	1.00	12-OCT-2006	14:27:04	6284189	H6J100152	HG
9	JF3QW	1.25	12-OCT-2006	14:30:13	6284189	H6J100152	HG
10	JF3R1	1.00	12-OCT-2006	14:32:14	6284189	H6J100152	HG
11	JF3R1S	1.00	12-OCT-2006	14:34:01	6284189	H6J100152	HG
12	JF3R1D	1.00	12-OCT-2006	14:35:54	6284189	H6J100152	HG
13	JF3R4	0.94	12-OCT-2006	14:37:40	6284189	H6J100152	HG
14	JF3R4S	0.94	12-OCT-2006	14:39:59	6284189	H6J100152	HG
15	JF3R4D	0.94	12-OCT-2006	14:43:27	6284189	H6J100152	HG
16	CK3CCV	1.00	12-OCT-2006	14:45:46			HG
17	CK1CCB	1.00	12-OCT-2006	14:49:05			HG
18	JF3TC	1.00	12-OCT-2006	14:51:05	6284189	H6J100152	HG
19	JF3TH	0.93	12-OCT-2006	14:53:01	6284189	H6J100152	HG
20	JF3TN	0.88	12-OCT-2006	14:55:20	6284189	H6J100152	HG
21	JF3TX	0.93	12-OCT-2006	14:57:17	6284189	H6J100152	HG
22	JF3WM	1.00	12-OCT-2006	14:59:27	6284189	H6J100152	HG
23	JF3WX	1.52	12-OCT-2006	15:01:25	6284189	H6J100152	HG
24	JF3W9	1.00	12-OCT-2006	15:03:15	6284189	H6J100152	HG
25	JF3XL	1.33	12-OCT-2006	15:05:24	6284189	H6J100152	HG
26	JF3X0	1.00	12-OCT-2006	15:07:53	6284189	H6J100152	HG
27	JF3X9	0.92	12-OCT-2006	15:09:41	6284189	H6J100152	HG
28	CK3CCV	1.00	12-OCT-2006	15:11:48			HG
29	CK1CCB	1.00	12-OCT-2006	15:14:00			HG
30	JF30D	0.93	12-OCT-2006	15:15:58	6284189	H6J100152	HG
31	JF30G	0.90	12-OCT-2006	15:17:48	6284189	H6J100152	HG
32	JF30P	0.10	12-OCT-2006	15:19:44	6284189	H6J100152	HG
33	JF301	0.09	12-OCT-2006	15:21:31	6284189	H6J100152	HG
34	CK3CCV	1.00	12-OCT-2006	15:23:21			HG
35	CK1CCB	1.00	12-OCT-2006	15:25:14			HG
36	JF3R1Z3	1.00	12-OCT-2006	15:58:33	6284189	H6J100152	HG
37	JF3R1SZ3	1.00	12-OCT-2006	16:00:21	6284189	H6J100152	HG
38	JF3R1DZ3	1.00	12-OCT-2006	16:02:12	6284189	H6J100152	HG
39	JF3R1Z3A	1.00	12-OCT-2006	16:04:58	6284189	H6J100152	HG
40	JF3TCZ3	1.00	12-OCT-2006	16:06:47	6284189	H6J100152	HG
41	JF3WMZ3	1.00	12-OCT-2006	16:08:35	6284189	H6J100152	HG
42	JF3W9Z3	5.25	12-OCT-2006	16:10:22	6284189	H6J100152	HG
43	JF3X0Z3	4.29	12-OCT-2006	16:12:09	6284189	H6J100152	HG
44	CK3CCV	1.00	12-OCT-2006	16:14:17			HG

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:      Instrument Upload                      Run Log - Page  2  :
:      Started Fri Oct 13 06:26:39 2006 by CROMBIEB           :
:      Data File: UPL$KNX_DATA_ROOT:<LHG>H101206.PRN;1       :
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#	WorkOrder	Dilution	Date	Time	Batch	Lot	Instrument
45	CK1CCB	1.00	12-OCT-2006	16:16:05			HG
46	JF3TCZ3A	1.00	12-OCT-2006	16:20:43	6284189	H6J100152	HG
47	JF3WMZ3A	1.00	12-OCT-2006	16:22:32	6284189	H6J100152	HG
48	JF3W9Z3A	1.00	12-OCT-2006	16:24:31	6284189	H6J100152	HG
49	JF3X0Z3A	1.00	12-OCT-2006	16:26:37	6284189	H6J100152	HG
50	JF3TNA	1.00	12-OCT-2006	16:40:38	6284189	H6J100152	HG
51	JF30DA	1.00	12-OCT-2006	16:42:27	6284189	H6J100152	HG
52	JF3QPZ5	7.95	12-OCT-2006	16:44:16	6284189	H6J100152	HG
53	JF3QPZ5A	1.00	12-OCT-2006	16:46:05	6284189	H6J100152	HG
54	CK3CCV	1.00	12-OCT-2006	16:47:52			HG
55	CK1CCB	1.00	12-OCT-2006	16:50:08			HG
56	JF3R1Z10	12.90	12-OCT-2006	16:51:58	6284189	H6J100152	HG
57	JF3R1Z10A	1.00	12-OCT-2006	16:53:59	6284189	H6J100152	HG
58	JF3R1SZ10	12.90	12-OCT-2006	16:55:48	6284189	H6J100152	HG
59	JF3R1DZ10	12.90	12-OCT-2006	16:57:50	6284189	H6J100152	HG
60	JF3TCZ5	6.95	12-OCT-2006	16:59:42	6284189	H6J100152	HG
61	JF3TCZ5A	1.00	12-OCT-2006	17:02:19	6284189	H6J100152	HG
62	JF3WMZ5	8.20	12-OCT-2006	17:10:30	6284189	H6J100152	HG
63	JF3WMZ5A	1.00	12-OCT-2006	17:12:38	6284189	H6J100152	HG
64	CK3CCV	1.00	12-OCT-2006	17:14:39			HG
65	CK1CCB	1.00	12-OCT-2006	17:16:25			HG
66	JF3WXA	1.00	12-OCT-2006	17:18:41	6284189	H6J100152	HG
67	JF3XLA	1.00	12-OCT-2006	17:20:27	6284189	H6J100152	HG
68	JF3X9A	1.00	12-OCT-2006	17:22:18	6284189	H6J100152	HG
69	CK3CCV	1.00	12-OCT-2006	17:24:05			HG
70	CK1CCB	1.00	12-OCT-2006	17:25:57			HG

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----- End of Report -----

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WinHg Database 1.215

-|□|×

File Utility Help

RN↓

RN↑

Protocol 7ptcurve

Dataset/Proto h101206 /7ptcurve

Protocol | Line info | Cal Curve | Report | Ctrl Chart | Viewer

Reset

Calib Coeffs

A

☒ CalibratedRel. Abs.
1307771

New Cal

B

7.66036e-6

☒ Accepted

Accepted

Update Coeffs

C

-3.67379e-2

Accept

New

Spike Coeffs

rho .999974

Type Linear

Include S1 Rep 1 ☒ 2 ☐ 3 ☐ 4 ☐ 5 ☐

Conc. 10.0

S	Conc.	Calc.	Dev.	Mean	SD or %RSD	Rep 1	Rep 2	Rep 3	
01	.00000	-.013	-.013	3153	0	3153			
02	.10000	.084	-.016	15735	0%	15734			
03	.20000	.178	-.022	28084	0%	28084			
04	.50000	.543	.043	75703	0%	75702			
05	1.0000	.991	-.009	134115	0%	134115			
06	5.0000	5.04	.035	662121	0%	662121			

Ready

WinHg Database 1.215

-|□|×

File Utility Help

RN↓

RN↑

Protocol 7ptcurve

Dataset/Proto h101206 /7ptcurve

Protocol | Line info | Cal Curve | Report | Ctrl Chart | Viewer

Reset

Calib Coeffs

A

☒ CalibratedRel. Abs.
1307771

New Cal

B

7.66036e-6

☒ Accepted

Accepted

Update Coeffs

C

-3.67379e-2

Accept

New

Spike Coeffs

rho .999974

Type Linear

Include S1 Rep 1 ☒ 2 ☐ 3 ☐ 4 ☐ 5 ☐

Conc. 10.0

S	Conc.	Calc.	Dev.	Mean	SD or %RSD	Rep 1	Rep 2	Rep 3	
02	.10000	.084	-.016	15735	0%	15734			
03	.20000	.178	-.022	28084	0%	28084			
04	.50000	.543	.043	75703	0%	75702			
05	1.0000	.991	-.009	134115	0%	134115			
06	5.0000	5.04	.035	662121	0%	662121			
07	10.000	9.98	-.019	1307771	0%	1307771			

Ready

Line	Conc.	Units	SD/RSD	1	2	3	4	5
*** Standard: 1 Rep: 1				Seq: 0		13:59:05 12 Oct 06		HG
Hg	.000	ppb	3153					
*** Standard: 2 Rep: 1				Seq: 1		14:00:52 12 Oct 06		HG
Hg	.100	ppb	15734					
*** Standard: 3 Rep: 1				Seq: 2		14:02:50 12 Oct 06		HG
Hg	.200	ppb	28084					
*** Standard: 4 Rep: 1				Seq: 3		14:05:09 12 Oct 06		HG
Hg	.500	ppb	75702					
*** Standard: 5 Rep: 1				Seq: 4		14:07:13 12 Oct 06		HG
Hg	1.00	ppb	134115					
*** Standard: 6 Rep: 1				Seq: 5		14:09:03 12 Oct 06		HG
Hg	5.00	ppb	662121					
*** Standard: 7 Rep: 1				Seq: 6		14:10:51 12 Oct 06		HG
Hg	10.0	ppb	1307771					
*** Check Standard: 2 Ck2icv				Seq: 7		14:12:41 12 Oct 06		HG
Line Flag %Rcv. Found True Units SD/RSD								
Hg	101.		2.51 2.50	ppb		.000 %		
*** Sample ID: ICB				Seq: 8		14:14:28 12 Oct 06		HG
Hg	-.041	ppb	ICB .000 % -.041					
*** Sample ID: CRA				Seq: 9		14:16:46 12 Oct 06		HG
Hg	.184	ppb	CRA .000 % .184					
*** Check Standard: 3 Ck3ccv				Seq: 10		14:18:34 12 Oct 06		HG
Line Flag %Rcv. Found True Units SD/RSD								
Hg	106.		5.28 5.00	ppb		.000 %		
*** Check Standard: 1 Ck1ccb				Seq: 11		14:20:21 12 Oct 06		HG
Line Flag Found Range(+/-) Units SD/RSD								
Hg	-.045		.059	ppb		.000 %		
*** Sample ID: JF5T2B				Seq: 12		14:22:30 12 Oct 06		HG
Hg	-.025	ppb	6284189 .000 % -.025					
*** Sample ID: JF5T2C				Seq: 13		14:25:18 12 Oct 06		HG
Hg	5.04	ppb	.000 % 5.04					
*** Sample ID: JF3QP				Seq: 14		14:27:04 12 Oct 06		HG
Hg	6.56	ppb	.000 % 6.56					
*** Sample ID: JF3QW				Seq: 15		14:30:13 12 Oct 06		HG
Hg	.276	ppb	.000 % .276					

Line	Conc.	Units	SD/RSD	1	2	3	4	5
*** Sample ID: JF3R1				Seq: 16	14:32:14 12 Oct 06	HG		
Hg	12.7	ppb	.000 %	12.7				
*** Sample ID: JF3R1S				Seq: 17	14:34:01 12 Oct 06	HG		
Hg	12.5	ppb	.000 %	12.5				
*** Sample ID: JF3R1D				Seq: 18	14:35:54 12 Oct 06	HG		
Hg	12.7	ppb	.000 %	12.7				
*** Sample ID: JF3R4				Seq: 19	14:37:40 12 Oct 06	HG		
Hg	.704	ppb	.000 %	.704				
*** Sample ID: JF3R4S				Seq: 20	14:39:59 12 Oct 06	HG		
Hg	1.74	ppb	.000 %	1.74				
*** Sample ID: JF3R4D				Seq: 21	14:43:27 12 Oct 06	HG		
Hg	1.66	ppb	.000 %	1.66				
*** Check Standard: 3 Ck3ccv				Seq: 22	14:45:46 12 Oct 06	HG		
Line Flag %Rcv. Found True Units SD/RSD								
Hg 105. 5.26 5.00 ppb .000 %								
*** Check Standard: 1 Ck1ccb				Seq: 23	14:49:05 12 Oct 06	HG		
Line Flag Found Range(+/-) Units SD/RSD								
Hg -.021 .059 ppb .000 %								
*** Sample ID: JF3TC				Seq: 24	14:51:05 12 Oct 06	HG		
Hg	12.4	ppb	.000 %	12.4				
*** Sample ID: JF3TH				Seq: 25	14:53:01 12 Oct 06	HG		
Hg	.291	ppb	.000 %	.291				
*** Sample ID: JF3TN				Seq: 26	14:55:20 12 Oct 06	HG		
Hg	.012	ppb	.000 %	.012				
*** Sample ID: JF3TX				Seq: 27	14:57:17 12 Oct 06	HG		
Hg	.040	ppb	.000 %	.040				
*** Sample ID: JF3WM				Seq: 28	14:59:27 12 Oct 06	HG		
Hg	9.07	ppb	.000 %	9.07				
*** Sample ID: JF3WX				Seq: 29	15:01:25 12 Oct 06	HG		
Hg	.260	ppb	.000 %	.260				
*** Sample ID: JF3W9				Seq: 30	15:03:15 12 Oct 06	HG		
Hg	8.24	ppb	.000 %	8.24				
*** Sample ID: JF3XL				Seq: 31	15:05:24 12 Oct 06	HG		
Hg	.588	ppb	.000 %	.588				

Line	Conc.	Units	SD/RSD	1	2	3	4	5
------	-------	-------	--------	---	---	---	---	---

*** Sample ID: JF3X0 Seq: 32 15:07:53 12 Oct 06 HG

Hg 7.98 ppb .000 % 7.98

*** Sample ID: JF3X9 Seq: 33 15:09:41 12 Oct 06 HG

Hg .708 ppb .000 % .708

*** Check Standard: 3 Ck3ccv Seq: 34 15:11:48 12 Oct 06 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		104.	5.20	5.00	ppb	.000 %

*** Check Standard: 1 Ck1ccb Seq: 35 15:14:00 12 Oct 06 HG

Line	Flag	Found	Range(+/-)	Units	SD/RSD
Hg		-.024	.059	ppb	.000 %

*** Sample ID: JF30D Seq: 36 15:15:58 12 Oct 06 HG

Hg -.013 ppb .000 % -.013

*** Sample ID: JF30G Seq: 37 15:17:48 12 Oct 06 HG

Hg -.013 ppb .000 % -.013

*** Sample ID: JF30P Seq: 38 15:19:44 12 Oct 06 HG

Hg -.022 ppb .000 % -.022

*** Sample ID: JF301 Seq: 39 15:21:31 12 Oct 06 HG

Hg -.006 ppb .000 % -.006

*** Check Standard: 3 Ck3ccv Seq: 40 15:23:21 12 Oct 06 HG

Line	Flag	%Rcv.	Found	True	Units	SD/RSD
Hg		105.	5.23	5.00	ppb	.000 %

*** Check Standard: 1 Ck1ccb Seq: 41 15:25:14 12 Oct 06 HG

Line	Flag	Found	Range(+/-)	Units	SD/RSD
Hg		-.042	.059	ppb	.000 %

Line	Conc.	Units	SD/RSD	1	2	3	4	5
<hr/>								
*** Sample ID: JF3R1Z3				Seq: 42	15:58:33 12 Oct 06	HG		
Hg	4.37	ppb	.000 %	4.37				
*** Sample ID: JF3R1SZ3				Seq: 43	16:00:21 12 Oct 06	HG		
Hg	4.40	ppb	.000 %	4.40				
*** Sample ID: JF3R1DZ3				Seq: 44	16:02:12 12 Oct 06	HG		
Hg	4.44	ppb	.000 %	4.44				
*** Sample ID: JF3R1Z3A			PDS 67.8%	Seq: 45	16:04:58 12 Oct 06	HG		
Hg	4.98	ppb	.000 %	4.98				
*** Sample ID: JF3TCZ3				Seq: 46	16:06:47 12 Oct 06	HG		
Hg	4.36	ppb	.000 %	4.36				
*** Sample ID: JF3WMZ3				Seq: 47	16:08:35 12 Oct 06	HG		
Hg	3.16	ppb	.000 %	3.16				
*** Sample ID: JF3W9Z3				Seq: 48	16:10:22 12 Oct 06	HG		
Hg	2.84	ppb	.000 %	2.84				
*** Sample ID: JF3X0Z3				Seq: 49	16:12:09 12 Oct 06	HG		
Hg	2.76	ppb	.000 %	2.76				
*** Check Standard: 3 Ck3ccv				Seq: 50	16:14:17 12 Oct 06	HG		
Line Flag %Rcv. Found True Units SD/RSD								
Hg 104. 5.22 5.00 ppb .000 %								
*** Check Standard: 1 Ck1ccb				Seq: 51	16:16:05 12 Oct 06	HG		
Line Flag Found Range(+/-) Units SD/RSD								
Hg -.048 .059 ppb .000 %								
*** Sample ID: JF3TCZ3A			71.1%	Seq: 52	16:20:43 12 Oct 06	HG		
Hg 5.00 ppb .000 % 5.00			PDS					
*** Sample ID: JF3WMZ3A			78.9%	Seq: 53	16:22:32 12 Oct 06	HG		
Hg 3.87 ppb .000 % 3.87			PDS					
*** Sample ID: JF3W9Z3A			86.7%	Seq: 54	16:24:31 12 Oct 06	HG		
Hg 3.62 ppb .000 % 3.62			PDS					
*** Sample ID: JF3X0Z3A			87.8%	Seq: 55	16:26:37 12 Oct 06	HG		
Hg 3.55 ppb .000 % 3.55			PDS					
*** Sample ID: JF3TNA			✓	Seq: 56	16:40:38 12 Oct 06	HG		
Hg .983 ppb .000 % .983			PDS					
*** Sample ID: JF30DA			✓	Seq: 57	16:42:27 12 Oct 06	HG		
Hg .987 ppb .000 % .987			PDS					

passes, but not "optimally"

Line	Conc.	Units	SD/RSD	1	2	3	4	5
<hr/>								
*** Sample ID: JF3QPZ5				Seq: 58	16:44:16 12 Oct 06	HG		
Hg	1.35	ppb	.000 %	1.35				
*** Sample ID: JF3QPZ5A				98.9% Seq: 59	16:46:05 12 Oct 06	HG		
			PDS					
Hg	2.24	ppb	.000 %	2.24				
*** Check Standard: 3 Ck3ccv				Seq: 60	16:47:52 12 Oct 06	HG		
Line	Flag	%Rcv.	Found	True	Units	SD/RSD		
Hg		103.	5.14	5.00	ppb	.000 %		
*** Check Standard: 1 Ck1ccb				Seq: 61	16:50:08 12 Oct 06	HG		
Line	Flag	Found	Range(+/-)	Units	SD/RSD			
Hg		-.023	.059	ppb	.000 %			
*** Sample ID: JF3R1Z10				Seq: 62	16:51:58 12 Oct 06	HG		
Hg	1.29	ppb	.000 %	1.29				
*** Sample ID: JF3R1Z10A				98.9% Seq: 63	16:53:59 12 Oct 06	HG		
			PDS					
Hg	2.18	ppb	.000 %	2.18				
*** Sample ID: JF3R1SZ10				Seq: 64	16:55:48 12 Oct 06	HG		
Hg	1.27	ppb	.000 %	1.27				
*** Sample ID: JF3R1DZ10				0574x matrix spike Seq: 65	16:57:50 12 Oct 06	HG		
Hg	1.30	ppb	.000 %	1.30				
*** Sample ID: JF3TCZ5				Seq: 66	16:59:42 12 Oct 06	HG		
Hg	2.61	ppb	.000 %	2.61				
*** Sample ID: JF3TCZ5A				80% Seq: 67	17:02:19 12 Oct 06	HG		
			PDS					
Hg	3.33	ppb	.000 %	3.33				
*** Sample ID: JF3WMZ5				Seq: 68	17:10:30 12 Oct 06	HG		
Hg	1.90	ppb	.000 %	1.90				
*** Sample ID: JF3WMZ5A				91.1% Seq: 69	17:12:38 12 Oct 06	HG		
			PDS					
Hg	2.72	ppb	.000 %	2.72				
*** Check Standard: 3 Ck3ccv				Seq: 70	17:14:39 12 Oct 06	HG		
Line	Flag	%Rcv.	Found	True	Units	SD/RSD		
Hg		102.	5.11	5.00	ppb	.000 %		
*** Check Standard: 1 Ck1ccb				Seq: 71	17:16:25 12 Oct 06	HG		
Line	Flag	Found	Range(+/-)	Units	SD/RSD			
Hg		-.050	.059	ppb	.000 %			
*** Sample ID: JF3WXA				Seq: 72	17:18:41 12 Oct 06	HG		
			✓ PDS, KMnO4					
Hg	1.21	ppb	.000 %	1.21				
*** Sample ID: JF3XLA				Seq: 73	17:20:27 12 Oct 06	HG		
			✓ PDS, KMnO4					
Hg	1.49	ppb	.000 %	1.49				

Line	Conc.	Units	SD/RSD	1	2	3	4	5
*** Sample ID: JF3X9A								
			✓	Seq: 74	17:22:18 12 Oct 06 HG			
			PDS, KMnO4					
Hg	1.68	ppb	.000 %	1.68				
*** Check Standard: 3 Ck3ccv								
Line	Flag	%Rcv.	Found	True	Units	SD/RSD	17:24:05 12 Oct 06 HG	
Hg		103.	5.15	5.00	ppb	.000 %		
*** Check Standard: 1 Ck1ccb								
Line	Flag	Found	Range(+/-)	Units	SD/RSD	17:25:57 12 Oct 06 HG		
Hg		-.046	.059	ppb	.000 %			

STL Knoxville **Mercury Analysis Cover Sheet**

Analyst	<i>Dkw</i>	Instrument	Leeman Hydra AA Mercury Analyzer
Run Date	<i>10/25/06</i>	Chart Name	<i>H102506A</i>

Daily Maintenance		As Needed Maintenance	
☒	Check tubing.	☐	Adjust/change Hg lamp.
☒	Check maintenance schedule flags.	☐	Clean or replace optical cell.
		☐	Lubricate pump and autosampler arm.
		☐	Change the drying tube.


```

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:      Instrument Upload                      Run Log - Page 1 :
:      Started Thu Oct 26 08:59:51 2006 by WILBURND           :
:      Data File: UPL$KNX_DATA_ROOT:<LHG>H102506A.PRN;1      :
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```

#	WorkOrder	Dilution	Date	Time	Batch	Lot	Instrument
1	CK2ICV	1.00	25-OCT-2006	10:36:27			HG
2	ICB	1.00	25-OCT-2006	10:38:23			HG
3	CRA	1.00	25-OCT-2006	10:40:12			HG
4	CK3CCV	1.00	25-OCT-2006	10:41:58			HG
5	CK1CCB	1.00	25-OCT-2006	10:43:58			HG
6	JG4WXB	1.00	25-OCT-2006	10:45:54	6297280	H6J240000	HG
7	JG4WXC	1.00	25-OCT-2006	10:47:55	6297280	H6J240000	HG
8	JF5TVB	0.10	25-OCT-2006	10:49:41	6284187	H6J110000	HG
9	JF5TVC	0.10	25-OCT-2006	10:51:27	6284187	H6J110000	HG
10	JF5TVL	0.10	25-OCT-2006	10:53:36	6284187	H6J110000	HG
11	JF5TXB	0.25	25-OCT-2006	10:56:33	6284188	H6J110000	HG
12	JF5TXC	0.25	25-OCT-2006	10:58:40	6284188	H6J110000	HG
13	JG2XE	1.00	25-OCT-2006	11:00:33	6297280	H6J230102	HG
14	JG2XF	1.00	25-OCT-2006	11:02:21	6297280	H6J230102	HG
15	JG2XG	1.00	25-OCT-2006	11:04:08	6297280	H6J230102	HG
16	CK3CCV	1.00	25-OCT-2006	11:05:56			HG
17	CK1CCB	1.00	25-OCT-2006	11:08:24			HG
18	JG2XH	1.00	25-OCT-2006	11:10:50	6297280	H6J230102	HG
19	JG2XM	1.00	25-OCT-2006	11:12:37	6297280	H6J230102	HG
20	JG2XN	1.00	25-OCT-2006	11:14:49	6297280	H6J230102	HG
21	JG2XEA	1.00	25-OCT-2006	11:17:28	6297280	H6J230102	HG
22	JG2XEA	1.00	25-OCT-2006	11:19:15	6297280	H6J230102	HG
23	JF302	0.10	25-OCT-2006	11:21:53	6284187	H6J100152	HG
24	JF303	0.10	25-OCT-2006	11:24:31	6284187	H6J100152	HG
25	JF305	0.10	25-OCT-2006	11:26:58	6284187	H6J100152	HG
26	JF34C	0.10	25-OCT-2006	11:29:19	6284187	H6J100152	HG
27	JF3TW	0.68	25-OCT-2006	11:31:16	6284188	H6J100152	HG
28	CK3CCV	1.00	25-OCT-2006	11:33:24			HG
29	CK1CCB	1.00	25-OCT-2006	11:35:43			HG
30	JF30E	0.73	25-OCT-2006	11:37:29	6284188	H6J100152	HG
31	JF30T	0.30	25-OCT-2006	11:39:46	6284188	H6J100152	HG
32	CK3CCV	1.00	25-OCT-2006	11:41:56			HG
33	CK1CCB	1.00	25-OCT-2006	11:43:57			HG
34	JF3P7Z10K	1.00	25-OCT-2006	11:45:57	6284187	H6J100152	HG
35	JF3RWZ10K	1.00	25-OCT-2006	11:47:46	6284187	H6J100152	HG
36	JF3R8Z10K	1.00	25-OCT-2006	11:49:33	6284187	H6J100152	HG
37	JF3WFZ10K	1.00	25-OCT-2006	11:51:25	6284187	H6J100152	HG
38	JF3W4Z10K	1.00	25-OCT-2006	11:53:47	6284187	H6J100152	HG
39	JF3XXZ10K	1.00	25-OCT-2006	11:55:54	6284187	H6J100152	HG
40	JF3P7Z100	1.00	25-OCT-2006	12:03:20	6284187	H6J100152	HG
41	JF3RWZ100	1.00	25-OCT-2006	12:05:07	6284187	H6J100152	HG
42	JF3R8Z100	1.00	25-OCT-2006	12:07:20	6284187	H6J100152	HG
43	JF3WFZ100	1.00	25-OCT-2006	12:09:21	6284187	H6J100152	HG
44	CK3CCV	1.00	25-OCT-2006	12:11:10			HG

----- (continued) -----


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:      Instrument Upload                      Run Log - Page  2 :
:      Started Thu Oct 26 08:59:51 2006 by WILBURND           :
:      Data File: UPL$KNX_DATA_ROOT:<LHG>H102506A.PRN;1      :
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#	WorkOrder	Dilution	Date	Time	Batch	Lot	Instrument
45	CK1CCB	1.00	25-OCT-2006	12:13:07			HG
46	JF3W4Z10	1.00	25-OCT-2006	12:14:53	6284187	H6J100152	HG
47	JF3XXZ100	1.00	25-OCT-2006	12:16:55	6284187	H6J100152	HG
48	JF3P7	0.10	25-OCT-2006	12:21:02	6284187	H6J100152	HG
49	JF3RW	0.10	25-OCT-2006	12:25:27	6284187	H6J100152	HG
50	JF3R8	0.10	25-OCT-2006	12:27:24	6284187	H6J100152	HG
51	JF3WF	0.10	25-OCT-2006	12:29:11	6284187	H6J100152	HG
52	JF3W4	0.10	25-OCT-2006	12:31:00	6284187	H6J100152	HG
53	JF3XX	0.10	25-OCT-2006	12:32:48	6284187	H6J100152	HG
54	JF3RWA	1.00	25-OCT-2006	12:34:42	6284187	H6J100152	HG
55	CK3CCV	1.00	25-OCT-2006	12:36:29			HG
56	CK1CCB	1.00	25-OCT-2006	12:38:21			HG
57	JF3QTZ100	1.00	25-OCT-2006	12:53:13	6284188	H6J100152	HG
58	JF3R3Z100	1.00	25-OCT-2006	12:55:01	6284188	H6J100152	HG
59	JF3TEZ100	1.00	25-OCT-2006	12:56:58	6284188	H6J100152	HG
60	JF3WTZ100	1.00	25-OCT-2006	12:58:51	6284188	H6J100152	HG
61	JF3XCZ100	1.00	25-OCT-2006	13:00:42	6284188	H6J100152	HG
62	JF3X6Z100	1.00	25-OCT-2006	13:02:35	6284188	H6J100152	HG
63	JF3QTZ10	1.00	25-OCT-2006	13:06:25	6284188	H6J100152	HG
64	JF3R3Z10	1.00	25-OCT-2006	13:08:36	6284188	H6J100152	HG
65	JF3TEZ10	1.00	25-OCT-2006	13:10:25	6284188	H6J100152	HG
66	JF3WTZ10	1.00	25-OCT-2006	13:12:14	6284188	H6J100152	HG
67	CK3CCV	1.00	25-OCT-2006	13:14:21			HG
68	CK1CCB	1.00	25-OCT-2006	13:16:58			HG
69	JF3XCZ10	1.00	25-OCT-2006	13:18:49	6284188	H6J100152	HG
70	JF3X6Z10	1.00	25-OCT-2006	13:20:46	6284188	H6J100152	HG
71	JF3QT	0.93	25-OCT-2006	13:25:53	6284188	H6J100152	HG
72	JF3R3	0.70	25-OCT-2006	13:27:46	6284188	H6J100152	HG
73	JF3R3S	0.70	25-OCT-2006	13:29:34	6284188	H6J100152	HG
74	JF3R3D	0.70	25-OCT-2006	13:31:52	6284188	H6J100152	HG
75	JF3TE	0.75	25-OCT-2006	13:33:40	6284188	H6J100152	HG
76	JF3WT	1.25	25-OCT-2006	13:35:37	6284188	H6J100152	HG
77	JF3XC	0.90	25-OCT-2006	13:37:35	6284188	H6J100152	HG
78	JF3X6	0.73	25-OCT-2006	13:39:53	6284188	H6J100152	HG
79	CK3CCV	1.00	25-OCT-2006	13:41:55			HG
80	CK1CCB	1.00	25-OCT-2006	13:43:42			HG
81	JG2XP	1.00	25-OCT-2006	13:45:49	6297280	H6J230102	HG
82	JG2XR	1.00	25-OCT-2006	13:48:07	6297280	H6J230102	HG
83	JG2XRS	1.00	25-OCT-2006	13:50:15	6297280	H6J230102	HG
84	JG2XRZ20	1.00	25-OCT-2006	14:04:07	6297280	H6J230102	HG
85	JG2XRSZ20	1.00	25-OCT-2006	14:05:58	6297280	H6J230102	HG
86	JG2XRDZ20	1.00	25-OCT-2006	14:08:26	6297280	H6J230102	HG
87	JG2XRPZ100	1.00	25-OCT-2006	14:10:50			HG
88	CK3CCV	1.00	25-OCT-2006	14:12:37			HG

----- (continued) -----

: Instrument Upload Run Log - Page 3 :
: Started Thu Oct 26 08:59:51 2006 by WILBURND :
: Data File: UPL\$KNX_DATA_ROOT:<LHG>H102506A.PRN;1 :

#	WorkOrder	Dilution	Date	Time	Batch	Lot	Instrument
89	CK1CCB	1.00	25-OCT-2006	14:14:45			HG
90	JG2XRZ40	40.0	25-OCT-2006	14:57:14	6297280	H6J230102	HG
91	JG2XRSZ4	40.0	25-OCT-2006	14:59:24	6297280	H6J230102	HG
92	JG2XRDZ40	40.0	25-OCT-2006	15:01:22	6297280	H6J230102	HG
93	JG2XRPZ200	1.00	25-OCT-2006	15:03:11			HG
94	CK3CCV	1.00	25-OCT-2006	15:05:00			HG
95	CK1CCB	1.00	25-OCT-2006	15:06:50			HG

----- End of Report -----

STL Knoxville

Method Information

Method Name: 7pt.std/SW-846 7470A/7471A/0.1 RL

Element: Hg

Chart Number: h102506a.prn

Instrument Calibrated Every ? Hours: 24

Number of Calibration Standards: 6

Correlation Coefficient >=: 0.995

Run ICV Immediately After Calibration?: Yes

CRA Required?: Yes

Number of Samples Between CCVs: 10

Duplicate RPD: 20

Calculate Duplicates by CLP or SW-846?: SW-846 Protocol

CRA Recovery Range: 30.0

CRA Conc. (ug/L): 0.2

ICV Recovery Range: 10.5

ICV Conc. (ug/L): 2.5

CCV Recovery Range: 20.5

CCV Conc. (ug/L): 5

LCS Recovery Range: 10.5

LCS Spike Level (ug/L): 5

MS/MSD Recovery Range: 15.5

MS Spike Level (ug/L): 1

Letter to Signify Blanks: B

Position to Signify Blanks: 6

Letter to Signify LCS's: C

Position to Signify LCS's: 6

Letter to Signify LCSD's: L

Position to Signify LCSD's: 6

Letter to Signify Dilutions: Z

Position to Signify Dilutions: 6

Letter to Signify Duplicates: X

Position to Signify Duplicates: 6

Letter to Signify MS's: S

Position to Signify MS's: 6

Letter to Signify MSD's: D

Position to Signify MSD's: 6

Letters to Signify MSA's: MSA+

Position to Signify MSA's: 6

Number of Additions: 3

Calibration Standard Concentrations (ug/L)

Standard 1 Conc: 0.1

Standard 2 Conc: 0.2

Standard 3 Conc: 0.5

Standard 4 Conc: 1

Standard 5 Conc: 5

Standard 6 Conc: 10

Standard 7 Conc: 0

Standard 8 Conc: 0

ICB/CCB Check Level (ug/L): 0.059

Prep Blank Check Level (ug/L): 0.049

Reporting Limit (ug/L): 0.1

IDL (ug/L): 0.06

Date of IDL: 12/8/2005

STL Knoxville Mercury Data Review Checklist

Method: 7pt.std/SW-846 7470A/7471A/0.1 RL

Analyst:	DKW			Instrument:	Leeman Hydra AA Mercury Analyzer		
Run Date:	Oct-25-06	Calibration Number:	1	Chart Name:	h102506a.prn	Element:	Hg

A. Calibration/Instrument Run QC				N/A	Yes	No	Comments
1.	Instrument calibrated every 24 hours?				X		Calibration was 4 hours and 47 minutes long
2.	Instrument calibrated using a minimum of a blank and 5 standards?				X		
3.	Do standard absorbances increase as standard concentrations increase?				X		
4.	Instrument calibrated with standards at the SOP levels?				X		
5.	Correlation coefficient greater than or equal to 0.995?				X		Correlation coefficient was 0.9999
6.	ICV analyzed directly after calibration?				X		
7.	ICV within specified control limits?				X		
8.	ICB analyzed immediately after ICV?				X		
9.	ICB within acceptable range?				X		
10.	CRA analyzed at the beginning of the run?				X		
11.	CRA results within acceptable range?				X		
12.	All CCV's within specified control limits?				X		
13.	All CCB's within acceptable range?				X		
14.	All CCB's analyzed immediately after CCV's?				X		

B. Client Sample and QC Sample Results

1.	Were all sample results within the linear range of the instrument?				X		See Comments on Next Page
2.	Were there any samples with results more negative than Report Limit?				X		See Comments on Next Page
3.	Were samples analyzed within the holding time?				X		

C. Preparation/Matrix QC

1.	Was one method blank prepared for each batch?				X		
2.	Were all method blanks less than the specified level?				X		
3.	Was an LCS prepared for each batch?				X		
4.	Were all LCS recoveries within QC limits?				X	X	See Comments on Next Page
5.	Were matrix spikes, sample duplicates and/or post-digestion spikes run at required frequency?				X		
6.	Were all matrix spike recoveries within QC limits?					X	See Comments on Next Page
7.	Were post-digestion spike recoveries within QC limits?				X		
8.	Were duplicate RPDs within QC limits?				X		

D. Other

1.	Current IDL data on file?				X		
2.	Current MDL data on file?				X		
3.	Are all nonconformances documented appropriately?	X					
4.	Were all project specific instructions followed?				X		NCM#:

Question

Number: Problem(s) Found:

- B1 Sample JG2XRS at 10/25/2006 1:50:15 PM exceeded linear range and an acceptable dilution was NOT found. } **DILUTED**
- B1 Sample JG2XRSZ20 at 10/25/2006 2:05:58 PM exceeded linear range and an acceptable dilution was NOT found. }
- B1 Sample JG2XRDZ20 at 10/25/2006 2:08:26 PM exceeded linear range and an acceptable dilution was NOT found. }
- B2 Sample JF5TXB at 10/25/2006 10:56:33 AM: Original sample is more negative than report limit. Dilute sample and re-analyze. **N/A**
- C4 Method LCS JF5TVL at 10/25/2006 10:53:36 AM had 116.6% recovery. **OK (80-120%)**

STL Knoxville Mercury Data Review Checklist

C4 Method LCS JF5TXC at 10/25/2006 10:58:40 AM had 84.8% recovery. *OK 80-120%*
C6 Matrix spike sample JG2XRS at 10/25/2006 1:50:15 PM had 300% recovery.
C6 Matrix spike sample JG2XRSZ20 at 10/25/2006 2:05:58 PM had 360% recovery.
C6 Matrix spike sample JG2XRDZ20 at 10/25/2006 2:08:26 PM had 200% recovery.
C6 Matrix spike sample JG2XRSZ40 at 10/25/2006 2:59:24 PM had 196% recovery.
C6 Matrix spike sample JG2XRDZ40 at 10/25/2006 3:01:22 PM had 118% recovery.

*OK
MSB-NC*

Analyst: _____ **Date:** _____

Analyst Comments: _____

WinHg Database 1.215

- [] x

File Utility Help

RN↓

RN↑

Protocol 7ptcurve

Dataset/Proto H102506A/7ptcurve

Protocol | Line info | Cal Curve | Report | Ctrl Chart | Viewer

Reset

Calib Coeffs

A

☒ CalibratedRel. Abs.
1316751

New Cal

B

7.60886e-6

☒ Accepted

Accepted

Update Coeffs

C

-5.04754e-2

Accept

New

Spike Coeffs

rho

.999960

Type Linear

Conc. 10.0

Include S1 Rep 1 ☒ 2 ☐ 3 ☐ 4 ☐ 5 ☐

S	Conc.	Calc.	Dev.	Mean	SD or %RSD	Rep 1	Rep 2	Rep 3	
01	.00000	-.021	-.021	3917	1	3917			
02	.10000	.078	-.022	16889	0%	16889			
03	.20000	.210	.010	34209	0%	34209			
04	.50000	.520	.020	74996	0%	74996			
05	1.0000	.981	-.019	135512	0%	135512			
06	5.0000	5.06	.064	672116	0%	672116			

Ready

CAP NUM

WinHg Database 1.215

- [] x

File Utility Help

RN↓

RN↑

Protocol 7ptcurve

Dataset/Proto H102506A/7ptcurve

Protocol | Line info | Cal Curve | Report | Ctrl Chart | Viewer

Reset

Calib Coeffs

A

☒ CalibratedRel. Abs.
1316751

New Cal

B

7.60886e-6

☒ Accepted

Accepted

Update Coeffs

C

-5.04754e-2

Accept

New

Spike Coeffs

rho

.999960

Type Linear

Conc. 10.0

Include S1 Rep 1 ☒ 2 ☐ 3 ☐ 4 ☐ 5 ☐

S	Conc.	Calc.	Dev.	Mean	SD or %RSD	Rep 1	Rep 2	Rep 3	
02	.10000	.078	-.022	16889	0%	16889			
03	.20000	.210	.010	34209	0%	34209			
04	.50000	.520	.020	74996	0%	74996			
05	1.0000	.981	-.019	135512	0%	135512			
06	5.0000	5.06	.064	672116	0%	672116			
07	10.000	9.97	-.032	1316752	0%	1316751			

Ready

CAP NUM

Line	Conc.	Units	SD/RSD	1	2	3	4	5
*** Standard: 1 Rep: 1				Seq: 0		10:19:03 25 Oct 06		HG
Hg	.000	ppb	3917					
*** Standard: 2 Rep: 1				Seq: 1		10:21:04 25 Oct 06		HG
Hg	.100	ppb	16889					
*** Standard: 3 Rep: 1				Seq: 2		10:23:14 25 Oct 06		HG
Hg	.200	ppb	34209					
*** Standard: 4 Rep: 1				Seq: 3		10:25:03 25 Oct 06		HG
Hg	.500	ppb	74996					
*** Standard: 5 Rep: 1				Seq: 4		10:27:04 25 Oct 06		HG
Hg	1.00	ppb	135512					
*** Standard: 6 Rep: 1				Seq: 5		10:28:53 25 Oct 06		HG
Hg	5.00	ppb	672116					
*** Standard: 7 Rep: 1				Seq: 6		10:30:46 25 Oct 06		HG
Hg	10.0	ppb	1316751					
*** Check Standard: 2 Ck2icv				Seq: 7		10:36:27 25 Oct 06		HG
Line Flag %Rcv. Found True Units SD/RSD								
Hg	94.7	2.37	2.50	ppb		.000 %		
*** Sample ID: ICB				Seq: 8		10:38:23 25 Oct 06		HG
		ICB						
Hg	-.055	ppb	.000 %	-.055				
*** Sample ID: CRA				Seq: 9		10:40:12 25 Oct 06		HG
		CRA						
Hg	.174	ppb	.000 %	.174				
*** Check Standard: 3 Ck3ccv				Seq: 10		10:41:58 25 Oct 06		HG
Line Flag %Rcv. Found True Units SD/RSD								
Hg	98.8	4.94	5.00	ppb		.000 %		
*** Check Standard: 1 Ck1ccb				Seq: 11		10:43:58 25 Oct 06		HG
Line Flag Found Range(+/-) Units SD/RSD								
Hg	L	-.086	.059	ppb		.000 %		
*** Sample ID: JG4WXB				Seq: 12		10:45:54 25 Oct 06		HG
		6297280						
Hg	-.042	ppb	.000 %	-.042				
*** Sample ID: JG4WXC				Seq: 13		10:47:55 25 Oct 06		HG
Hg	4.71	ppb	.000 %	4.71				
*** Sample ID: JF5TVB				Seq: 14		10:49:41 25 Oct 06		HG
		6284187 FH						
Hg	.034	ppb	.000 %	.034				
*** Sample ID: JF5TVC				Seq: 15		10:51:27 25 Oct 06		HG
Hg	5.21	ppb	.000 %	5.21				

Line	Conc.	Units	SD/RSD	1	2	3	4	5
<hr/>								
*** Sample ID: JF5TVL				Seq: 16		10:53:36 25 Oct 06		HG
Hg	5.83	ppb	.000 %	5.83				
*** Sample ID: JF5TXB				Seq: 17		10:56:33 25 Oct 06		HG
			6284188 BH					
Hg	-.186	ppb	.000 %	-.186				
*** Sample ID: JF5TXC				Seq: 18		10:58:40 25 Oct 06		HG
Hg	4.24	ppb	.000 %	4.24				
*** Sample ID: JG2XE				Seq: 19		11:00:33 25 Oct 06		HG
Hg	.066	ppb	.000 %	.066				
*** Sample ID: JG2XF				Seq: 20		11:02:21 25 Oct 06		HG
Hg	.037	ppb	.000 %	.037				
*** Sample ID: JG2XG				Seq: 21		11:04:08 25 Oct 06		HG
Hg	.016	ppb	.000 %	.016				
*** Check Standard: 3 Ck3ccv				Seq: 22		11:05:56 25 Oct 06		HG
Line Flag %Rcv. Found True Units						SD/RSD		
Hg	98.0		4.90	5.00	ppb	.000 %		
*** Check Standard: 1 Ck1ccb				Seq: 23		11:08:24 25 Oct 06		HG
Line Flag Found Range(+/-) Units						SD/RSD		
Hg	-.058		.059		ppb	.000 %		
*** Sample ID: JG2XH				Seq: 24		11:10:50 25 Oct 06		HG
Hg	.011	ppb	.000 %	.011				
*** Sample ID: JG2XM				Seq: 25		11:12:37 25 Oct 06		HG
Hg	.150	ppb	.000 %	.150				
*** Sample ID: JG2XN				Seq: 26		11:14:49 25 Oct 06		HG
Hg	.121	ppb	.000 %	.121				
*** Sample ID: JG2XEA				Seq: 27		11:17:28 25 Oct 06		HG
			PDS					
Hg	1.05	ppb	.000 %	1.05				
*** Sample ID: JG2XEA				Seq: 28		11:19:15 25 Oct 06		HG
			PDSD					
Hg	1.09	ppb	.000 %	1.09				
*** Sample ID: JF302				Seq: 29		11:21:53 25 Oct 06		HG
			FH					
Hg	.005	ppb	.000 %	.005				
*** Sample ID: JF303				Seq: 30		11:24:31 25 Oct 06		HG
			FH					
Hg	.035	ppb	.000 %	.035				
*** Sample ID: JF305				Seq: 31		11:26:58 25 Oct 06		HG
			FH					
Hg	.001	ppb	.000 %	.001				

Line	Conc.	Units	SD/RSD	1	2	3	4	5
<hr/>								
*** Sample ID: JF34C				Seq: 32		11:29:19 25 Oct 06		HG
			FH					
Hg	-.018	ppb	.000 %	-.018				
*** Sample ID: JF3TW				Seq: 33		11:31:16 25 Oct 06		HG
			BH					
Hg	-.023	ppb	.000 %	-.023				
*** Check Standard: 3 Ck3ccv				Seq: 34		11:33:24 25 Oct 06		HG
Line	Flag	%Rcv.	Found	True	Units	SD/RSD		
Hg		98.8	4.94	5.00	ppb	.000 %		
*** Check Standard: 1 Ck1ccb				Seq: 35		11:35:43 25 Oct 06		HG
Line	Flag	Found	Range(+/-)	Units	SD/RSD			
Hg		-.038	.059	ppb	.000 %			
*** Sample ID: JF30E				Seq: 36		11:37:29 25 Oct 06		HG
			BH					
Hg	-.029	ppb	.000 %	-.029				
*** Sample ID: JF30T				Seq: 37		11:39:46 25 Oct 06		HG
			BH					
Hg	-.059	ppb	.000 %	-.059				
*** Check Standard: 3 Ck3ccv				Seq: 38		11:41:56 25 Oct 06		HG
Line	Flag	%Rcv.	Found	True	Units	SD/RSD		
Hg		97.9	4.90	5.00	ppb	.000 %		
*** Check Standard: 1 Ck1ccb				Seq: 39		11:43:57 25 Oct 06		HG
Line	Flag	Found	Range(+/-)	Units	SD/RSD			
Hg	L	-.078	.059	ppb	.000 %			
*** Sample ID: JF3P7Z10K				Seq: 40		11:45:57 25 Oct 06		HG
			Z10000					
Hg	.008	ppb	.000 %	.008				
*** Sample ID: JF3RWZ10K				Seq: 41		11:47:46 25 Oct 06		HG
			Z10000					
Hg	.020	ppb	.000 %	.020				
*** Sample ID: JF3R8Z10K				Seq: 42		11:49:33 25 Oct 06		HG
			Z10000					
Hg	-.040	ppb	.000 %	-.040				
*** Sample ID: JF3WFZ10K				Seq: 43		11:51:25 25 Oct 06		HG
			Z10000					
Hg	-.028	ppb	.000 %	-.028				
*** Sample ID: JF3W4Z10K				Seq: 44		11:53:47 25 Oct 06		HG
			Z10000					
Hg	-.020	ppb	.000 %	-.020				
*** Sample ID: JF3XXZ10K				Seq: 45		11:55:54 25 Oct 06		HG
			Z10000					
Hg	-.010	ppb	.000 %	-.010				
*** Sample ID: JF3P7Z100				Seq: 46		12:03:20 25 Oct 06		HG
Hg	.010	ppb	.000 %	.010				
*** Sample ID: JF3RWZ100				Seq: 47		12:05:07 25 Oct 06		HG
Hg	-.018	ppb	.000 %	-.018				

Line	Conc.	Units	SD/RSD	1	2	3	4	5
<hr/>								
*** Sample ID: JF3R8Z100				Seq: 48		12:07:20 25 Oct 06		HG
Hg	-.048	ppb	.000 %	-.048				
*** Sample ID: JF3WFZ100				Seq: 49		12:09:21 25 Oct 06		HG
Hg	-.068	ppb	.000 %	-.068				
*** Check Standard: 3 Ck3ccv				Seq: 50		12:11:10 25 Oct 06		HG
Line Flag %Rcv. Found True Units					SD/RSD			
Hg	98.6	4.93	5.00	ppb	.000 %			
*** Check Standard: 1 Ck1ccb				Seq: 51		12:13:07 25 Oct 06		HG
Line Flag Found Range(+/-) Units					SD/RSD			
Hg	-.044	.059		ppb	.000 %			
*** Sample ID: JF3W4Z100				Seq: 52		12:14:53 25 Oct 06		HG
Hg	-.018	ppb	.000 %	-.018				
*** Sample ID: JF3XXZ100				Seq: 53		12:16:55 25 Oct 06		HG
Hg	-.027	ppb	.000 %	-.027				
*** Sample ID: JF3P7				Seq: 54		12:21:02 25 Oct 06		HG
Hg	.008	ppb	.000 %	.008				
*** Sample ID: JF3RW				Seq: 55		12:25:27 25 Oct 06		HG
Hg	.074	ppb	.000 %	.074				
*** Sample ID: JF3R8				Seq: 56		12:27:24 25 Oct 06		HG
Hg	.065	ppb	.000 %	.065				
*** Sample ID: JF3WF				Seq: 57		12:29:11 25 Oct 06		HG
Hg	.777	ppb	.000 %	.777				
*** Sample ID: JF3W4				Seq: 58		12:31:00 25 Oct 06		HG
Hg	1.16	ppb	.000 %	1.16				
*** Sample ID: JF3XX				Seq: 59		12:32:48 25 Oct 06		HG
Hg	.936	ppb	.000 %	.936				
*** Sample ID: JF3RWA				Seq: 60		12:34:42 25 Oct 06		HG
		PDS						
Hg	.916	ppb	.000 %	.916				
*** Check Standard: 3 Ck3ccv				Seq: 61		12:36:29 25 Oct 06		HG
Line Flag %Rcv. Found True Units					SD/RSD			
Hg	98.5	4.93	5.00	ppb	.000 %			
*** Check Standard: 1 Ck1ccb				Seq: 62		12:38:21 25 Oct 06		HG
Line Flag Found Range(+/-) Units					SD/RSD			
Hg	-.018	.059		ppb	.000 %			
*** Sample ID: JF3QTZ100				Seq: 63		12:53:13 25 Oct 06		HG
Hg	-.045	ppb	.000 %	-.045				

Line	Conc.	Units	SD/RSD	1	2	3	4	5

*** Sample ID: JF3R3Z100				Seq: 64		12:55:01 25 Oct 06		HG
Hg	-.038	ppb	.000 %	-.038				
*** Sample ID: JF3TEZ100				Seq: 65		12:56:58 25 Oct 06		HG
Hg	-.003	ppb	.000 %	-.003				
*** Sample ID: JF3WTZ100				Seq: 66		12:58:51 25 Oct 06		HG
Hg	.010	ppb	.000 %	.010				
*** Sample ID: JF3XCZ100				Seq: 67		13:00:42 25 Oct 06		HG
Hg	-.088	ppb	.000 %	-.088				
*** Sample ID: JF3X6Z100				Seq: 68		13:02:35 25 Oct 06		HG
Hg	-.033	ppb	.000 %	-.033				
*** Sample ID: JF3QTZ10				Seq: 69		13:06:25 25 Oct 06		HG
Hg	-.025	ppb	.000 %	-.025				
*** Sample ID: JF3R3Z10				Seq: 70		13:08:36 25 Oct 06		HG
Hg	-.045	ppb	.000 %	-.045				
*** Sample ID: JF3TEZ10				Seq: 71		13:10:25 25 Oct 06		HG
Hg	-.034	ppb	.000 %	-.034				
*** Sample ID: JF3WTZ10				Seq: 72		13:12:14 25 Oct 06		HG
Hg	-.034	ppb	.000 %	-.034				
*** Check Standard: 3 Ck3ccv				Seq: 73		13:14:21 25 Oct 06		HG
Line Flag %Rcv. Found True Units					SD/RSD			
Hg	97.2	4.86	5.00	ppb	.000 %			
*** Check Standard: 1 Ck1ccb				Seq: 74		13:16:58 25 Oct 06		HG
Line Flag Found Range(+/-) Units					SD/RSD			
Hg	-.037	.059		ppb	.000 %			
*** Sample ID: JF3XCZ10				Seq: 75		13:18:49 25 Oct 06		HG
Hg	-.035	ppb	.000 %	-.035				
*** Sample ID: JF3X6Z10				Seq: 76		13:20:46 25 Oct 06		HG
Hg	-.052	ppb	.000 %	-.052				
*** Sample ID: JF3QT				Seq: 77		13:25:53 25 Oct 06		HG
Hg	-.090	ppb	.000 %	-.090				
*** Sample ID: JF3R3				Seq: 78		13:27:46 25 Oct 06		HG
Hg	.024	ppb	.000 %	.024				
*** Sample ID: JF3R3S				Seq: 79		13:29:34 25 Oct 06		HG
Hg	.889	ppb	.000 %	.889				

Line	Conc.	Units	SD/RSD	1	2	3	4	5
<hr/>								
*** Sample ID: JF3R3D				Seq: 80		13:31:52 25 Oct 06		HG
Hg	.928	ppb	.000 %	.928				
*** Sample ID: JF3TE				Seq: 81		13:33:40 25 Oct 06		HG
Hg	-.018	ppb	.000 %	-.018				
*** Sample ID: JF3WT				Seq: 82		13:35:37 25 Oct 06		HG
Hg	-.017	ppb	.000 %	-.017				
*** Sample ID: JF3XC				Seq: 83		13:37:35 25 Oct 06		HG
Hg	.004	ppb	.000 %	.004				
*** Sample ID: JF3X6				Seq: 84		13:39:53 25 Oct 06		HG
Hg	.009	ppb	.000 %	.009				
*** Check Standard: 3 Ck3ccv				Seq: 85		13:41:55 25 Oct 06		HG
Line Flag %Rcv. Found True Units SD/RSD								
Hg		98.7	4.94	5.00	ppb	.000 %		
*** Check Standard: 1 Ck1ccb				Seq: 86		13:43:42 25 Oct 06		HG
Line Flag Found Range(+/-) Units SD/RSD								
Hg	L	-.062	.059		ppb	.000 %		
*** Sample ID: JG2XP				Seq: 87		13:45:49 25 Oct 06		HG
Hg	1.17	ppb	.000 %	1.17				
*** Sample ID: JG2XR				Seq: 88		13:48:07 25 Oct 06		HG
Hg	105.	ppb	.000 %	105.				
*** Sample ID: JG2XRS				Seq: 89		13:50:15 25 Oct 06		HG
Hg	108.	ppb	.000 %	108.				
*** Sample ID: JG2XRZ20				Seq: 90		14:04:07 25 Oct 06		HG
Hg	14.4	ppb	.000 %	14.4				
*** Sample ID: JG2XRSZ20				Seq: 91		14:05:58 25 Oct 06		HG
Hg	18.0	ppb	.000 %	18.0				
*** Sample ID: JG2XRDZ20				Seq: 92		14:08:26 25 Oct 06		HG
Hg	16.4	ppb	.000 %	16.4				
<i>SERIAL DILUTION DRW 10/24/06</i>								
*** Sample ID: JG2XRPZ100				Seq: 93		14:10:50 25 Oct 06		HG
Hg	3.10	ppb	.000 %	3.10				
*** Check Standard: 3 Ck3ccv				Seq: 94		14:12:37 25 Oct 06		HG
Line Flag %Rcv. Found True Units SD/RSD								
Hg		97.8	4.89	5.00	ppb	.000 %		
*** Check Standard: 1 Ck1ccb				Seq: 95		14:14:45 25 Oct 06		HG
Line Flag Found Range(+/-) Units SD/RSD								
Hg		-.044	.059		ppb	.000 %		

Line	Conc.	Units	SD/RSD	1	2	3	4	5
*** Sample ID: JG2XRZ40 Seq: 96 14:57:14 25 Oct 06 HG								
Hg	7.26	ppb	.000 %	7.26				
*** Sample ID: JG2XRSZ40 Seq: 97 14:59:24 25 Oct 06 HG								
Hg	9.22	ppb	.000 %	9.22				
*** Sample ID: JG2XRDZ40 Seq: 98 15:01:22 25 Oct 06 HG								
Hg	8.44	ppb	.000 %	8.44				
*** Sample ID: JG2XRPZ200 Seq: 99 15:03:11 25 Oct 06 HG								
Hg	1.51	ppb	.000 %	1.51				
*** Check Standard: 3 Ck3ccv Seq: 100 15:05:00 25 Oct 06 HG								
Line	Flag	%Rcv.	Found	True	Units	SD/RSD		
Hg		97.7	4.89	5.00	ppb	.000 %		
*** Check Standard: 1 Ck1ccb Seq: 101 15:06:50 25 Oct 06 HG								
Line	Flag	Found	Range(+/-)	Units	SD/RSD			
Hg	L	-.060	.059	ppb	.000 %			

SERIAL DIL.

3.99%

Miscellaneous Data

Lot / SDG #:	No QC reported	Batch QC reported	Client QC reported
6254149			
A. Review of QuantIMS / QDS Results			
1. Were PM checklists, Lot Summary and any applicable QAS reviewed?	NA	Yes	No
2. Were all prep sheets, prep spreadsheets and any existing NCMs reviewed?		✓	
3. Were manual calculations of results and RLs performed for each sample, blank, LCS, LCSD, MS, MSD and DUP? (Document 1 calculation per batch.)		✓	
4. Were elements with negative results >RL reported as ND G?	✓		
5. For each sample, blank, LCS, LCSD, MS, MSD and DUP, were flags, units, DFs, prep date, date/time of analysis verified to be correct?	NA	✓	
6. Were spike amounts verified for each LCS/MS? (Document 1 manual calculation.)	6254149	✓	
7. Were method blank results <1/2 RL for water/solid samples or <RL for air train samples?		✓	
8. LCS or LCS/LCSD within QC limits? (90-110%R)		✓	
9. MS/MSD or MS/DUP run at required frequency?		✓	
10. MS %R or MS/MSD %R & RPD within QC limits?		✓	
11. DUP RPD within limits? (0-20 RPD for results ≥5xRL; +RL if result <5xRL)	✓		
12. Were J flags added to the DUP as needed?	✓		
13. Is DUP RPD=0 for two ND results and RPD=200 for one ND and a positive result?	✓		
14. Are all results present for all samples?		✓	
15. Were the samples analyzed within the holding time?		✓	

Date:	06/27/06
Data Reviewer: <i>[Signature]</i>	
Calculation Checks / Comments:	
$RL = 0.1 \mu g / L \times 0.116 = 0.0116 \mu g$	
$B.H. \quad JF3X9: 0.708 \mu g / L \times \frac{50 \text{ mL}}{2.5 \text{ mL}} \times 0.4606 = 0.651 \mu g \quad RL: 0.1 \mu g / L \times 0.056 = 0.0056 \mu g$	
$B.H. \quad 6254149: JF3R35: 0.589 \mu g / L \times 0.1406 \times \frac{50 \text{ mL}}{10 \text{ mL}} = 0.6223 \mu g$	

*Such action must be taken in consultation with client.
 NOTE: Nonconformance memos are required for bold and italicized [autotext] statements: **Bold** = deficiency, *italicized* = anomaly.

Lot / SDG #: H6J100152		Chart #				Chart #				Chart #				Chart #				Why is data reportable?																	
B. Review of QC Summary Forms Note: Y=Yes, N=No, NA=Not Applicable																																			
1. ICV within limits? (7470A/7471A=90-110%R; 245.1/245.5=95-105%R)																		Y Y Y Y Y																	
2. CCV within limits? (7470A/7471A=80-120%R; 245.1/245.5=90-110%R)																		Y Y Y Y Y																	
3. ICB/CCB within limits? (<MDL for water/solid samples; <RL for air train samples)																		Y Y Y Y Y																	
4. CRA within limits? (The CRA standard contains mercury at 0.2 ug/L. The CRA result must fall within 30% of the true value.)																		Y Y Y Y Y																	
5. PDS or PDS/PDSD run at required frequency?																		Y N/A																	
6. PDS/PDSD within limits? (75-125%R) Reminder: Place copy of PDS results in Sample Data Summary and QC Summary sections of report.																		Y N/A																	
7. Are the IDLs on summary forms current?																		Y Y Y Y Y																	
8. Are the QC summary forms correct?																		Y Y Y Y Y																	

Data Reviewer:	Date: Oct 13, 06
Comments:	of Oct 27, 06

*Such action must be taken in consultation with client.

NOTE: Nonconformance memos are required for **bold** and *italicized* [autotext] statements: **Bold** = deficiency *italicized* = anomaly.

Lot / SDG #:	H65100152		
Report Type:	☐ Report (COA)	☒ Level 4 Package	☐ QDS Package
	☐ Forms Only	☐ Other	
C. Review of Final Deliverable			
1. Are all nonconformances documented and discussed in narrative? (Reminder: Place copy of all NCMs in front of deliverable.)	☒	☐	☐
2. For air trains, was the appropriate autotext selected for the narrative? (Reminder: Review the autotext and make all appropriate changes.)	☒	☐	☐
3. For PM10 projects, was the appropriate autotext selected for the narrative?	☒	☐	☐
4. Was a Filter Lot Check report included for PM10 filters?	☒	☐	☐
5. Is the narrative complete and does it contain the appropriate deviations noted on the analyst DRCs, ICP DRC, Hg DRC and ICP-MS DRC?	☒	☐	☐
6. Were all client/project specific requirements met? (As described in PM checklists, Lot Summary or Client Analysis Summary, and any applicable QAS.)	☒	☐	☐
7. Are the original DRCs behind narrative with copy in report?	☒	☐	☐
8. Are results present for all samples?	☒	☐	☐
9. Is the final deliverable in the proper format?	☒	☐	☐
10. Were the ICP and Hg charts and cover pages scanned? (Check .pdf files.)	☒	☐	☐

Data Reviewer:	V. [Signature]
Comments:	
Date:	Oct 27, 06

STL Knoxville

Microwave Prep Performed by: DKW

1st Level Review/Relinquished by: DKW

NTN

Date: 10/26/2006

Date: Oct 26, 06

[illegible]

Comments:

$$\text{QuantIMS Upload Dilution Factor} = \frac{\text{Final Microwave Digestate Volume (L)} \times \text{Final Hg Digestate Volume (ml)} \times \text{Hg Bench Dilution Factor}}{\text{QuantIMS Upload Dilution Factor} \text{ and QuantIMS Multipplier} \times \text{Volume Microwave Digestate Used (ml)}} \times \text{Hg Bench Dilution Factor}$$

STL Knoxville

Analyst: DkwMercury Air Prep Spiking Form
Date: 10/24/06 Batch: 6284/87Bath A Temp: 93°C
Bath B Temp: 94°C
(Acceptance range 90°-95°C)

- ☐ Hg in PM10 filters: KNOX-IP-0003, Rev. 4
☐ MMT train: KNOX-MT-0006, Rev. 9

✓ Ontario Hydro: KNOX-IP-0006, Rev. 2

Standard Type	Standard ID	Intermediate Std.		Volume Used (ml)	Final Volume (ml)	Final Concentration (ug/L)
		Source	Conc.(ug/L)			
Calibration Std 1	N/A		N/A	N/A	50	Blank
Calibration Std 2	I-CAL- <u>3425-3-10</u>	<u>SPEX</u>	100	0.05	50	0.1
Calibration Std 3	I-CAL- <u>3425-3-10</u>		100	0.1	50	0.2
Calibration Std 4	I-CAL-		100	0.25	50	0.5
Calibration Std 5	I-CAL-		100	0.5	50	1.0
Calibration Std 6	I-CAL-		100	2.5	50	5.0
Calibration Std 7	I-CAL-		100	5.0	50	10.0

Standard Type	Standard ID	Intermediate Std.		Amount Used (ml)	Final Volume (ml)	Final Conc. (ug/L)
		Source	Conc.(ug/L)			
ICV	I-VER- <u>3426-3-10</u>	<u>ULTRA</u>	100	1.25	50	2.5
CCV	I-CAL- <u>3425-3-10</u>	<u>SPEX</u>	100	2.5	50	5.0
CRA	I-CAL- <u>L</u>	<u>L</u>	100	0.1	50	0.2

Standard Type	Standard ID	Intermediate Std.		Amount Used @ ICP prep/final volume	ICP Sample Volume used @ Hg prep (ml)	Final Conc. @ Hg prep (ug/L)	Final Amount (ug)
		Source	Conc.(ug/L)				
Air (PM10) LCS	I-CAL-		10,000	0.250 ml/50ml	5.0	5.0	11.25
Air (PM10) MS	I-CAL-		10,000	0.050 ml/50ml	5.0	1.0	2.25

REAGENTS			
Conc. H ₂ SO ₄ Lot #:	<u>C05024</u>	5% KMnO ₄ ID #:	<u>B-3122-11-B</u>
Conc. HNO ₃ Lot #:	<u>C02005</u>	5% K ₂ S ₂ O ₈ ID #:	<u>D-2638-17-B</u>
Conc. HCL Lot #:	<u>C07001</u>	SnCl ₂ Solution ID #:	<u>A-3382-13-E</u>
12% NaClNH ₂ OH·HCL ID #:	<u>C-3267-3-B</u>		

STL Knoxville

Pre-prep Performed by: KND

1st Level Review/Relinquished by: DKW2nd Level Review/Received by: NTM

W.

[illegible]

* = Sample chosen for PDS.

* = Sample chosen for PDS.

Pre-prep KMnO4 Lot #: #056788

$$\text{QuantilMS Upload Dilution Factor and QuantilMS Multiplier} = (\text{Total Sample Volume (L)} + \text{Volume NH}_4\text{OH Added (L)}) \times \text{Final Hg Digestate Volume (ml)} / \text{Volume Sample Used (ml)} \times \text{Hg Bench Dilution Factor}$$

STL Knoxville

Mercury Air Prep Spiking Form

Analyst: DkwDate: 10/24/06Batch: 0284188Bath A Temp: 93°CBath B Temp: 94°C

(Acceptance range 90"-95°C)

☐ Hg in PM10 filters: KNOX-IP-0003, Rev. 4☒ Ontario Hydro: KNOX-IP-0006, Rev. 2☐ MMT train: KNOX-MT-0006, Rev. 9

Standard Type	Standard ID	Intermediate Std.		Volume Used (ml)	Final Volume (ml)	Final Concentration (ug/L)
		Source	Conc.(ug/L)			
Calibration Std 1	N/A		N/A	N/A	50	Blank
Calibration Std 2	I-CAL- 3425-3-10	SPEX	100	0.05	50	0.1
Calibration Std 3	I-CAL- 3425-3-10		100	0.1	50	0.2
Calibration Std 4	I-CAL-		100	0.25	50	0.5
Calibration Std 5	I-CAL-		100	0.5	50	1.0
Calibration Std 6	I-CAL-		100	2.5	50	5.0
Calibration Std 7	I-CAL-		100	5.0	50	10.0

Standard Type	Standard ID	Intermediate Std.		Amount Used (ml)	Final Volume (ml)	Final Conc. (ug/L)
		Source	Conc.(ug/L)			
ICV	I-VER- 3426-3-10	ULTRA	100	1.25	50	2.5
CCV	I-CAL- 3425-3-10	SPEX	100	2.5	50	5.0
CRA	I-CAL- L	L	100	0.1	50	0.2

Standard Type	Standard ID	Intermediate Std.		Amount Used @ ICP prep/final volume	ICP Sample Volume used @ Hg prep (ml)	Final Conc. @ Hg prep (ug/L)	Final Amount (ug)
		Source	Conc.(ug/L)				
Air (PM10) LCS	I-CAL-		10,000	0.250 ml/50ml	5.0	5.0	11.25
Air (PM10) MS	I-CAL-		10,000	0.050 ml/50ml	5.0	1.0	2.25

REAGENTS			
Conc. H ₂ SO ₄ Lot #:	C05024	5% KMnO ₄ ID #:	B-3122-11-B
Conc. HNO ₃ Lot #:	C02005	5% K ₂ S ₂ O ₈ ID #:	D-2638-17-B
Conc. HCL Lot #:	C07001	SnCl ₂ Solution ID #:	A-3382-13-E
12% NaCl/NH ₂ OH·HCL ID #:	C-3267-3-B		

STL Knoxville

ch Number: 6284189

Prep Date: 10/12/2006 0800

Comp Date: 10/12/2006 1300

Pre-prep Performed by: BNC

1st Level Review/Relinquished by: BNC

2nd Level Review/Received by: *NTM*

Date: 10/12/2006

Date: 10/13/2006

Date: Oct 13, 06

[illegible]

Comments: All KCl fractions were received clear. The cloudiness associated w/JF3W1M and JF3W9 was due to particulate matter, not permanganate, as decolorizer had no effect on sample clarity in these two cases.

Pre-prep KMnO4 Lot #:

Halt CS/ CSN Spike: 2.5 ml of

Hg MS/MSD Spike: 0.5 mL of

• Sample chosen for PDS.

* = Sample chosen for PDS/PDSD.

$$\text{QuantMS Undiluted Dilution Factor and QuantMS Undiluted Dilution Factor} = \frac{\text{Total Sample Volume (L)} + \text{Volume NH}_4\text{OH Added (L)}}{\text{Final Hg Digestate Volume (ml)}} \times \frac{\text{Sample Used (ml)}}{\text{Volume Sample Used (ml)}} \times \text{Hg Bench Dilution Factor}$$

h6i100152 OH.x/5

Ontario Hydro Alr Train rev 1.xlt

MT110R1, 1/10/06

STL Knoxville
Mercury Air Prep Spiking Form

Analyst: BNCDate: 10/20/06Batch: 6284189Bath A Temp: 95°CBath B Temp: n/a

(Acceptance range 90°-95°C)

☐ Hg in PM10 filters: KNOX-IP-0003, Rev. 4☒ Ontario Hydro: KNOX-IP-0006, Rev. 2☐ MMT train: KNOX-MT-0006, Rev. 9

Standard Type	Standard ID	Intermediate Std.		Volume Used (ml)	Final Volume (ml)	Final Concentration (ug/L)
		Source	Conc.(ug/L)			
Calibration Std 1	N/A		N/A	N/A	50	Blank
Calibration Std 2	I-CAL- 3425-3-4	SPEX	100	0.05	50	0.1
Calibration Std 3	I-CAL-		100	0.1	50	0.2
Calibration Std 4	I-CAL-		100	0.25	50	0.5
Calibration Std 5	I-CAL-		100	0.5	50	1.0
Calibration Std 6	I-CAL-		100	2.5	50	5.0
Calibration Std 7	I-CAL-		100	5.0	50	10.0

Standard Type	Standard ID	Intermediate Std.		Amount Used (ml)	Final Volume (ml)	Final Conc. (ug/L)
		Source	Conc.(ug/L)			
ICV	I-VER- 3426-3-4	ULTRA	100	1.25	50	2.5
CCV	I-CAL- 3425-3-4	SPEX	100	2.5	50	5.0
CRA	I-CAL- 1	1	100	0.1	50	0.2

Standard Type	Standard ID	Intermediate Std.		Amount Used @ ICP prep/final volume	ICP Sample Volume used @ Hg prep (ml)	Final Conc. @ Hg prep (ug/L)	Final Amount (ug)
		Source	Conc.(ug/L)				
Air (PM10) LCS	I-CAL-		10,000	0.250 ml/50ml	5.0	5.0	11.25
Air (PM10) MS	I-CAL-		10,000	0.050 ml/50ml	5.0	1.0	2.25

REAGENTS			
Conc. H ₂ SO ₄ Lot #:	C05024	5% KMnO ₄ ID #:	B-3122-11-A
Conc. HNO ₃ Lot #:	C02065	5% K ₂ S ₂ O ₈ ID #:	D-2638-17-A
Conc. HCL Lot #:	B32A17	SnCl ₂ Solution ID #:	A-3382-12-E
12% NaCl/NH ₂ OH·HCL ID #:	C-3267-3-A		

Wet Chemistry

Sample Summary

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 1 THIMBLE

General Chemistry

Lot-Sample #...: H6J100152-001

Work Order #...: JF3PX

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Particulates (total)	3160	0.50	mg	CFR60A 5	10/11-10/13/06	6285361
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK RUN 1 ACETONE

General Chemistry

Lot-Sample #...: H6J100152-002

Work Order #...: JF3P5

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Particulates (total)	2.5	0.50	mg	CFR60A 5	10/11-10/13/06	6285361
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 2 THIMBLE

General Chemistry

Lot-Sample #...: H6J100152-007

Work Order #...: JF3Q9

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Particulates (total)	3010	0.50	mg	CFR60A 5	10/11-10/13/06	6285361
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 2 ACETONE

General Chemistry

Lot-Sample #...: H6J100152-008

Work Order #...: JF3RR

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Particulates (total)	2.2	0.50	mg	CFR60A 5	10/11-10/13/06	6285361
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK RUN 3 THIMBLE

General Chemistry

Lot-Sample #...: H6J100152-013 Work Order #...: JF3R5 Matrix.....: AIR
Date Sampled...: 10/07/06 Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Particulates (total)	3000	0.50	mg	CFR60A 5	10/11-10/13/06	6285361
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 STACK RUN 3 ACETONE

General Chemistry

Lot-Sample #...: H6J100152-014

Work Order #...: JF3R7

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Particulates (total)	2.3	0.50	mg	CFR60A 5	10/11-10/13/06	6285361
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET TO ORIG RUN 1 THIMBLE

General Chemistry

Lot-Sample #...: H6J100152-022

Work Order #...: JF3V4

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Particulates (total)	7930	0.50	mg	CFR60A 5	10/11-10/13/06	6285361
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG RUN 1 ACETONE

General Chemistry

Lot-Sample #....: H6J100152-023

Work Order #....: JF3WC

Matrix.....: AIR

Date Sampled....: 10/05/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Particulates (total)	262	0.50	mg	CFR60A 5	10/11-10/13/06	6285361
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG RUN 2 THIMBLE

General Chemistry

Lot-Sample #...: H6J100152-028 Work Order #...: JF3W1 Matrix.....: AIR
Date Sampled...: 10/06/06 Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Particulates (total)	8330	0.50	mg	CFR60A 5	10/11-10/13/06	6285361
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET TO ORIG RUN 2 ACETONE

General Chemistry

Lot-Sample #...: H6J100152-029

Work Order #...: JF3W2

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Particulates (total)	136	0.50	mg	CFR60A 5	10/11-10/13/06	6285361
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET TO ORIG RUN 3 THIMBLE

General Chemistry

Lot-Sample #...: H6J100152-034

Work Order #...: JF3XQ

Matrix.....: AIR

Date Sampled...: 10/07/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Particulates (total)	8820	0.50	mg	CFR60A 5	10/11-10/13/06	6285361
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT N0.2 INLET TO ORIG RUN 3 ACETONE

General Chemistry

Lot-Sample #....: H6J100152-035

Work Order #....: JF3XW

Matrix.....: AIR

Date Sampled....: 10/07/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Particulates (total)	95.3	0.50	mg	CFR60A 5	10/11-10/13/06	6285361
		Dilution Factor: 1		MDL.....: 0.50		

QC Summary

Raw Data

Total Particulates

STL Knoxville Particulate Matter Determination Data Review/Narrative Checklist
Method: SW-846 Method 0050 by SOP KNOX-WC-0006, Rev. 2
Page 1 of 1

Batch Number:	6285361
Lot Number(s):	H6J100152

Review Items	N/A	Y	N	If No, why is data reportable?	2nd ✓
A. Calibration					
1. Was the balance calibration checked with 5, 50 & 100 gram weights prior to use?		✓			✓
2. Was the balance checked with 100 gram weight after every 10 samples?		✓			✓
3. Was the balance tared before each weighing?		✓			✓
4. Was the balance ID documented?		✓			✓
B. Client Sample and QC Sample Results					
1. Were all special project requirements met? (Were PM Checklists, Lot Summary, and any applicable QAS reviewed?)		✓			✓
2. Were sample IDs verified?		✓			✓
3. Were all transcriptions checked?		✓			✓
4. Calculations checked for error?		✓			✓
5. Final report acceptable? (Results correct, units correct, deviations noted in narrative, and analysis dates correct.)		✓			✓
C. Preparation/Matrix QC					
1. Were all sample weighings performed in duplicate (at least)?		✓			✓
2. Was the average of the last two weighings used?		✓			✓
D. Other					
1. Are all nonconformances documented appropriately?	✓			NCM No.:	NR

Analyst: <i>Lauren Walker</i>	Date: <i>10/13/06</i>	2 nd Level Reviewer: <i>Mark L</i>	Date: <i>10/19/06</i>
Comments:		Comments:	
		Client tared filter thimbles but did not share tare weights with STL. Reported value for thimbles is the gross weight. Because LIMS will not report sufficient significant digits, the thimble gross weights will be tabulated in the case narrative to 0.1 mg so that the client can obtain a sufficiently precise net particulate weight.	

Batch Number: 6285361
Prep Date: 10/11/2006 1400
Comp Date: 10/12/2006 1730

LDW

Reviewed by:

Date:

Mukul

[illegible]

Comments:

Sample Data Log
Particulate Matter by KNOX-WC-0006

Batch Number: 6285361													
Sample Number	Work Order Number	Matrix	Filter or Beaker No.	Probe Rinse Volume (mL)	Tare Weight (g)	Replicate No.	Balance ID	Cal Check ¹	Tare ²	Individual Weight (g)	Date	Time	Analyst Initials
1	H6J100152-001	T H M B TE	NA	NA	NA	1	H-47372	100.0000	✓	3.1591	10.12.06	14:53	LDW
						2	↓	↓		3.1586	10.13.06	09:20	↓
						3							
						4							
2	H6J100152-002	T H M B TE	NA	NA	92mL	1	H-47372	100.0000	✓	69.1534	10.12.06	15:06	LDW
						2	↓	↓		69.1537	10.13.06	09:27	↓
						3							
						4							
3	H6J100152-007	T H M B TE	NA	NA	NA	1	H-47372	100.0000	✓	3.0073	10.12.06	14:56	LDW
						2	↓	↓		3.0069	10.13.06	09:21	↓
						3							
						4							
4	H6J100152-008	T H M B TE	NA	NA	NA	1	H-47372	100.0000	✓	67.1847	10.12.06	15:07	LDW
						2	↓	↓		67.1848	10.13.06	09:28	↓
						3							
						4							
5	H6J100152-013	T H M B TE	NA	NA	NA	1	H-47372	100.0000	✓	2.9990	10.12.06	14:57	LDW
						2	↓	↓		2.9985	10.13.06	09:22	↓
						3							
						4							

¹ Record the measured weight of the 100 gram weight. Was the measured weight 100 ± 0.0005 grams? (At start, and after every ten containers)

² Was the balance tared before the current weighing?

SIL KNOXVINE
Sample Data Log
Particulate Matter by KNOX-WC-0006

Batch Number: 6285361													
Sample Number	Work Order Number	Matrix	Filter or Beaker No.	Probe Rinse Volume (mL)	Tare Weight (g)	Replicate No.	Balance ID	Cal Check ¹	Tare ²	Individual Weight (g)	Date	Time	Analyst Initials
1 H6J100152-014	J63W11AA	P P R	014	58 mL	66.7128	1	H-47372	100.0000	✓	66.7151	10.12.06	15:08	LDW
						2	↓	↓	✓	66.7151	10.13.06	09:29	↓
						3							
						4							
2 H6J100152-022	J63W11AA	T H M B R	NA	NA	NA	1	H-47372	100.0000	✓	7.9290	10.12.06	15:00	LDW
						2	↓	↓	✓	7.9289	10.13.06	09:23	↓
						3							
						4							
3 H6J100152-023	J63W11AA	P P R	023	330 mL	65.1225	1	H-47372	100.0000	✓	65.3846	10.12.06	15:09	LDW
						2	↓	↓	✓	65.3849	10.13.06	09:30	↓
						3							
						4							
4 H6J100152-028	J63W11AA	T H M B R	NA	NA	NA	1	H-47372	100.0000	✓	8.3343	10.12.06	15:01	LDW
						2	↓	↓	✓	8.3345	10.13.06	09:24	↓
						3							
						4							
5 H6J100152-029	J63W11AA	P P R	029	98 mL	68.3600	1	H-47372	100.0000	✓	68.4959	10.12.06	15:10	LDW
						2	↓	↓	✓	68.4961	10.13.06	09:31	↓
						3							
						4							

¹ Record the measured weight of the 100 gram weight. Was the measured weight 100 ± 0.0005 grams? (At start, and after every ten containers)

² Was the balance tared before the current weighing?

STL Knoxville
Sample Data Log
Particulate Matter by KNOX-WC-0006

Batch Number: 6285361													
Sample Number	Work Order Number	Matrix	Filter or Beaker No.	Probe Rinse Volume (mL)	Tare Weight (g)	Replicate No.	Balance ID	Cal Check ¹	Tare ²	Individual Weight (g)	Date	Time	Analyst Initials
1	H6J100152-034	THABE	NA	NA	NA	1	H47372	100.0000	✓	8.8165	10.12.06	15:03	LDW
						2	↓	↓	✓	8.8161	10.13.06	09:05	↓
						3							
						4							
2	H6J100152-035	P	035	78mL	✓	1	H47372	100.0000	✓	65.0059	10.13.06	15:11	LDW
						2	↓	↓	✓	65.0060	10.13.06	09:32	↓
						3							
						4							
3						1							
						2							
						3							
						4							
4						1							
						2							
						3							
						4							
5						1							
						2							
						3							
						4							

¹ Record the measured weight of the 100 gram weight. Was the measured weight 100 ± 0.0005 grams? (At start, and after every ten containers)

² Was the balance tared before the current weighing?

STL Knoxville

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Tare Weight Log
Particulate Matter by KNOX-WC-0006

	Filter or Beaker No.	Matrix	Replicate No.	Balance ID	Cal Check ¹	Tare? ²	Individual Weight (g)	Date	Time	Analyst Initials	Tare Weight (g)
1	I-1047	F	1	H-47372	100.0000	✓	31.8994	10-04-06	1501	JMH	31.8994
			2								
			3					JMH			
			4					10-04-06			
2	I-1048	F	1	H-47372	100.0000	✓	33.8818	10-04-06	1502	JMH	33.8818
			2								
			3					JMH			
			4					10-04-06			
3	I-1049	F	1	H-47372	100.0000	✓	29.8226	10-04-06	1503	JMH	29.8226
			2								
			3					JMH			
			4					10-04-06			
4	I-1050	F	1	H-47372	100.0000	✓	37.2341	10-04-06	1504	JMH	37.2341
			2								
			3					JMH			
			4					10-04-06			
5	002	ACE	1	H-47372	100.0000	✓	69.1510	10-11-06	1109	JMH	69.1510
			2								
			3					JMH			
			4					10/11/06			
6	008	ACE	1	H-47372	100.0000	✓	67.1826	10-11-06	1110	JMH	67.1826
			2								
			3					JMH			
			4					10/11/06			
7	014	ACE	1	H-47372	100.0000	✓	66.7128	10-11-06	11:11	JMH	66.7128
			2								
			3					JMH			
			4					10/11/06			
8	023	ACE	1	H-47372	100.0000	✓	65.1225	10-11-06	1113	JMH	65.1225
			2								
			3					JMH			
			4					10/11/06			
9	029	ACE	1	H-47372	100.0000	✓	68.3600	10-11-06	1115	JMH	68.3600
			2								
			3					JMH			
			4					10/11/06			
10	035	ACE	1	H-47372	100.0000	✓	64.9106	10-11-06	1116	JMH	64.9106
			2								
			3					JMH			
			4					10/11/06			

¹ Record the measured weight of the 100 gram weight. Was the measured weight 100 ± 0.0005 grams?

(At start, and after every ten containers)

² Was the balance tared before the current weighing?

Sample Receipt Documentation

ASSOCIATES, INC.

Chain of Custody Record

[illegible]

46510152

Chain of Custody Record

Client	Project No.	Page	of			
APA-ES	06-056	6	16			
Address	Unit No.	Lab				
Public Service of NH	Unit No. 2 Stack	Severn Trent				
City	Project Manager	Lab Contact				
Bow	Bill Mollins	Billy Anderson				
Run No.	Test Method	Lab Phone No.				
Z	Ontario Hydro					
Sample I.D.	Date	Time	Absorbing Solution	No. of Containers	Comments	Analysis
Container No. 1	10/6/06	1820	Thimble	1 -		Pant. Hg
Container No. 2 A	10/6/06	1823	Acetone FW	1 -		Toxic Hg
Container No. 2	10/6/06	1824	HND ₃ FW	1 -		Pant. Hg
Container No. 3	10/6/06	1836	KCl, Imp 1, 2, 3	1 -		
Container No. 4	10/6/06	1809	HND ₃ /H ₂ O ₂ , Imp 4	1 -		X
Container No. 5	10/6/06	1819	KMnO ₄ , Imp 5, 6, 7	1 -		X
Special Instructions:						
Turn Around Time Required:	☒ Normal	☐ Rush	Sample Disposal:	☐ Return to ASAI	☒ Disposal By Lab	☐ Archive For
1. Received By EPA WY	Date 10/6/06	Time 1836	1. Relinquished By Bili WY	Date 10/9/06	Time 1427	Months
2. Received By Z.M.C. Anderson	Date 10/9/06	Time 1427	2. Relinquished By	Date	Time	
3. Received By	Date	Time	3. Relinquished By	Date	Time	
Comments:

1465100152

Chain of Custody Record

Client		Project No.		Page		Analysis	
Address		Unit No.		Lab		Part. Matter	
City		Project Manager		Lab Contact		Part. Hg	
Run No.		Test Method		Lab Phone No.		Toxic Hg	
Sample I.D.		Absorbing Solution		No. of Containers		Elemental Hg	
Date		Time		Comments			
Container No. 1	10/7/06	1235	Thimble	1-			
Container No. 2A	10/13/06	1238	Acetone FW	1-			
Container No. 2	10/13/06	1239	HNO3 FW	1-			
Container No. 3	10/13/06	1309	KCl, Impl, 2, 3	1-			
Container No. 4	10/13/06	1257	HNO3 H2O, Impl 4	1-			
Container No. 5	10/17/06	1255	KNO3, Impl 5, 6, 7	1-			
Special Instructions:							
Turn Around Time Required:		☒ Normal ☐ Rush		Sample Disposal:		Return to ASAI ☐ Disposal By Lab ☒ Archive For ☐ Months	
1. Recovered By		10/7/06		1309		10/9/06	
2. Received By		10/19/06		1427		1427	
3. Received By		10/19/06		1427		1427	
Comments:

Chain of Custody Record

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**AIR
SAMPLING
ASSOCIATES, INC.**

H165100152

Chain of Custody Record

Client	ADA-ES		Project No.	06-056		Page	1	of	16	Analysis	
Address	Public Service of NH		Unit No.	Unit No. 2 Inlet to Orig. ESP		Lab	Seyvern Trent		Part. Matter		
City	State	Zip Code	Project Manager			Lab Contact	Billy Anderson		Part. Hg		
Run No.	1		Test Method	Ontaria Hydro		Lab Phone No.	1		Elemental Hg		
Sample I.D.	Date	Time	Absorbing Solution	No. of Containers	Comments						
Container No. 1	10/5/06	1750	Thimble	1							
Container No. 2 A	10/5/06	1755	Acetone FW	1							
Container No. 2	10/5/06	1800	HNO ₃ FW	1							
Container No. 3	10/5/06	1957	KCl, Imp 1, 3, 3	1							
Container No. 4	10/5/06	1950	HNO ₃ /H ₂ O ₂ Imp 1	1							
Container No. 5	10/5/06	2002	KMnO ₄ Imp 5, 6, 7	1							
Special Instructions:											
Turn Around Time Required:	☒ Normal	☐ Rush	Sample Disposal:	☐ Return to ASAI	☒ Disposal By Lab	☒ Archive For	6	Months			
1. Received By	Billy Mullins		Date	10/5/06		Time	2005		10/7/06 1420		
2. Received By	Billy Mullins		Date	10/7/06		Time	1420		10/9/06 1427		
3. Received By	Zach C. Anderson		Date	10/9/06		Time	1427				
Comments:

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1465100152

Chain of Custody Record

Client ADA-ES	Project No. 06-056	Page 5	of 16	Analysis	
Address Public Service of NH	Unit No. Unit No. 2 Inlet to Engr. ESP	Lab Savern Trent			
City Bow	State NH	Lab Contact Billy Anderson			
Run No. 2	Zip Code	Lab Phone No.			
Sample I.D.	Date	Time	Absorbing Solution	No. of Containers	Comments
Container No. 1	10/6/06	1445	Thimble	1	
Container No. 2	10/6/06	1450	HNO ₃ FW	1	
Container No. 3	10/6/06	1645	KCl, Temp 3, 3	1	
Container No. 4	10/6/06	1710	HNO ₃ H ₂ O, Temp 4	1	
Container No. 5	10/6/06	1720	KNO ₃ Temp 5, 7	1	
Container No. 2A	10/6/06	1448	Acetone FW	1	
Special Instructions:					
Turn Around Time Required: ☒ Normal ☐ Rush					
1. Received By Billy Mullins		Sample Disposal: Date 10/6/06		Time 1720	
2. Received By Bill Anderson		Date 10/7/06		Time 1420	
3. Received By William C. Anderson		Date 10/9/06		Time 1427	
Comments:

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H65100152

Chain of Custody Record

Client		ADA-ES		Project No.		06-056		Page 13 of 16		Analysis	
Address		Public Service of NH		Unit No.		Unit No. 2 Inlet to Orig. ESP		Lab		Severn Trent	
City		Bow		State		NH		Lab Contact		Billy Anderson	
Run No.		3		Test Method		Ontario Hydro		Lab Phone No.			
Sample I.D.		Date		Time		Absorbing Solution		No. of Containers		Comments	
Container No. 1		10/7/06		1131		Thimble		1			
Container No. 2		10/7/06		1133		Acetone FW		1			
Container No. 3		10/7/06		1134		H2O3 FW		1			
Container No. 4		10/7/06		1156		KCl, Imp 1, 2, 3		1			
Container No. 5		10/7/06		1149		H2O3, H2O2, Imp 4		1			
Container No. 6		10/7/06		1149		KMnO4 Imp 5, 6, 7		1			
Special Instructions:											
Turn Around Time Required:		☒ Normal		☐ Rush		Sample Disposal:		☐ Return to ASAI		☒ Disposal By Lab	
1. Recovered By		Paul Wylly		10/7/06		1156		1. Relinquished By		Paul Wylly	
2. Received By		2 Mr. C. Anderson		10/9/06		1427		2. Relinquished By		10/9/06 1427	
3. Received By								3. Relinquished By			
Comments:

Chain of Custody Record

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HV5100152

Chain of Custody Record

Client	Project No.	Page	of	Analysis			
ADA-ES	06-056	16	16				
Address Public Service of NH	Unit No. 2	Lab Sereny Transit					
City Bow	State NH	Project Manager Billy Mullins	Lab Contact Billy Anderson				
Run No. Reagent Blanks	Test Method Ontario Hydro	Lab Phone No.					
Sample I.D.	Date	Time	Absorbing Solution	No. of Containers	Comments		
Container No. 7	10/7/06	1039	0.1N HNO ₃	1	OK (BA) Conf 7 is recovered		
Container No. 8	10/7/06	1042	1N KCl	1			
Container No. 9	10/7/06	1043	5% HNO ₃ - 10% H ₂ O ₂	1			
Container No. 10	10/7/06	1044	H ₂ SO ₄ - KMnO ₄	1			
Container No. 11	10/7/06	1045	10% Hydroxylamine	1			
Container No. 12	10/7/06	1045	Thimble No. 49	3			
A, B, C			4847	3			
			10/7/06				
Special Instructions:							
Turn Around Time Required:	☒ Normal	☐ Rush	Sample Disposal:	☐ Return to ASAI	☒ Disposal By Lab	Archive For	Months
1. Recovered By Billy Mullins	10/7/06	1045	Time	1. Relinquished By Billy Mullins	10/7/06	1045	Time
2. Received By Billy Mullins	10/7/06	1420	Time	2. Relinquished By Billy Mullins	10/7/06	1427	Time
3. Received By Billy Mullins	10/7/06	1427	Time	3. Relinquished By Billy Mullins	10/7/06	1427	Time
Comments:							

STL KNOXVILLE SAMPLE RECEIPT/CONDITION UPON RECEIPT ANOMALY CHECKLIST

Client: AIR SAMPLING ASSOC. Project: 15a

Lot Number: H65100152

Review Items	Yes	No	NA	If No, what was the problem?	Comments/Actions Taken
1. Do sample container labels match COC? (IDs, Dates, Times)	☒			☐ 1a Do not match COC ☐ 1b Incomplete information ☐ 1c Marking smeared ☐ 1d Label torn ☐ 1e No label ☐ 1f COC not received ☐ 1g Other:	15a) Recent blanks received for outland Hydro, No analysis listed on COC
2. Is the cooler temperature within limits? (> freezing temp. of water to 6 °C; NC, 1668, 1613B: 0-4°C; VOST: 10°C; MA: 2-6 °C)			☒	☐ 2a Temp Blank = ☐ 2b Cooler Temp = ☐ 3a Sample preservative =	
3. Were samples received with correct chemical preservative (excluding Encore)?			☒	☒ 4a Not present ☐ 4b Not intact ☐ 4c Other:	
4. Were custody seals present/intact on cooler and/or containers?		☒		☐ 5a Samples received-not on COC ☐ 5b Samples not received-on COC ☐ 6a Leaking ☐ 6b Broken ☐ 7a Headspace (VOA only) ☐ 8a Improper container	
5. Were all of the samples listed on the COC received?	☒			☐ 9a Could not be determined due to matrix interference ☐ 10a Holding time expired ☐ Incomplete information	
6. Were all of the sample containers received intact?	☒			If yes & appears to be >1%, was SOG notified?	
7. Were VOA samples received without headspace?	☒		☒	☐ 13a Leaking ☐ 13b Other:	
8. Were samples received in appropriate containers?	☒			☐ 14a Not relinquished ☒ 15a Incomplete information	
9. Did you check for residual chlorine, if necessary?	☒			☐ 15a Incomplete information ☐ 15a Incomplete information	
10. Were samples received within holding time?	☒			☐ 15a Incomplete information	
11. For rad samples, was sample activity info. provided?	☒				
12. For SOG water samples (1613B, 1668A, 8290, LR PAHs), do samples have visible solids present?	☒				
13. Are the shipping containers intact?	☒				
14. Was COC relinquished? (Signed/Dated/Timed)	☒				
15. Are tests/parameters listed for each sample?	☒				
16. Is the matrix of the samples noted?	☒				
17. Is the date/time of sample collection noted?	☒				
18. Is the client and project name/# identified?	☒				
19. Was the sampler identified on the COC?	☒				
Quote #: <u>72504</u> PM Instructions:					

Sample Receiving Associate: [Signature]

Date: 10/9/06

Appendix F:
Particulate Matter and Halides Analytical Data

Air Sampling Associates, Inc.

Particulate Analysis Summary

Project Number: 06-056

Date Analysis Completed: 10/30/06

Project Name: ADA-ES

Unit Tested: Unit No. 2 Inlet to
Original ESP (Duct A)

Project Location: Bow, NH

EPA 26A Train

Run Number:

1 2 3

Particulate Matter on Filter (mg):

3,776.1 4,922.7 3,065.6

Particulate Matter in Front Wash (mg):

104.0 28.0 42.9

Total Particulate Matter in "Front-Half" – MF (mg):

3880.1 4950.7 3108.5

Particulate Matter in "Back-Half" (mg):

— — —

Total Particulate Matter in Sample – MT (mg):

✓ — —

STL

Analyst

Billy J. Mullins 11/3/06

Data Checked By

Particulate Analysis EPA Method 17

Stack Filters

Project No. 06-056
Project Name ADA-ES

Location Bow, NH
Unit Tested Unit No. 2 Inlet to Original ESP (duct) EPA 26A Train

Desiccator Time In					
Desiccator Time Out					

Run No.		Filter No. <u>36</u>		Sample I.D.	
Filter & Particulate (g)					

Filter & Particulate Average (g) 6.5600
Initial Filter Weight (g) 2.7839
Total Particulate (mg) 3,776.1

Run No.		Filter No. <u>41</u>		Sample I.D.	
Filter & Particulate (g)					

Filter & Particulate Average (g) 7.8100
Initial Filter Weight (g) 2.8873
Total Particulate (mg) 4,922.7

Run No.		Filter No. <u>45</u>		Sample I.D.	
Filter & Particulate (g)					

Filter & Particulate Average (g) 5.8600
Initial Filter Weight (g) 2.794.4
Total Particulate (mg) 3,065.6

Billy J. Mullins, Jr.
Analyst

Air Sampling Associates, Inc.

Particulate Analysis Summary

Project Number: 06-056

Date Analysis Completed: 10/30/06

Project Name: ADA-ES

Unit Tested: Unit No. 2 Stack

Project Location: Bow, NH

EPA 26A Train

Run Number:

1 2 3

Particulate Matter on Filter (mg):

71.0 50.6 70.3

Particulate Matter in Front Wash (mg):

64.7 63.6 120.0

Total Particulate Matter in "Front-Half" – MF (mg):

135.7 114.2 190.3

Particulate Matter in "Back-Half" (mg):

— — —

Total Particulate Matter in Sample – MT (mg):

— — —

STL

Analyst

Billy J. Mullins, Jr.

Date: 11/03/06

Data Checked By

Particulate Analysis EPA Method 5

Stack Filters

Project No. 06-056
Project Name ADAFES

Location Bow, NH
Unit Tested Unit No. 2 Stack
EPA 20A Train

Desiccator Time In					
Desiccator Time Out					

Run No.		Filter No. <u>A089</u>		Sample I.D.	
Filter & Particulate (g)					

Filter & Particulate Average (g) 0.4260
Initial Filter Weight (g) 0.3550
Total Particulate (mg) 71.0

Run No.		Filter No. <u>A091</u>		Sample I.D.	
Filter & Particulate (g)					

Filter & Particulate Average (g) 0.3990
Initial Filter Weight (g) 0.3484
Total Particulate (mg) 50.6

Run No.		Filter No. <u>A090</u>		Sample I.D.	
Filter & Particulate (g)					

Filter & Particulate Average (g) 0.4250
Initial Filter Weight (g) 0.3547
Total Particulate (mg) 70.3

Billy J. Mullins, Jr.
Analyst

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Wet Chemistry	55
Sample Summary	56
QC Summary	85
Raw Data	93
Sample Receipt Documentation	268
Total Number of Pages	276

STL

STL Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Tel: 865 291 3000 Fax: 865 584 4315
www.stl-inc.com

ANALYTICAL REPORT

PROJECT NO. 06-056 M026A

New Hampshire

Lot #: H6J100230

Bill Hefley

Air Sampling Associates, Inc.
407-2B Holford's Prairie Road
Lewisville, TX 75056

SEVERN TRENT LABORATORIES, INC.

A handwritten signature in dark ink, appearing to read "Terry Wasmund".
Terry Wasmund
Project Manager

October 30, 2006

ANALYTICAL METHODS SUMMARY

H6J100230

<u>PARAMETER</u>	<u>ANALYTICAL METHOD</u>
Bromine Emissions	KNOX 0050/26A Mod
Chlorine Emissions	KNOX 0050/26A Mod
Hydrogen Bromide Emissions	KNOX 0050/26A Mod
Hydrogen Chloride Emissions	KNOX 0050/26A Mod
Hydrogen Fluoride Emissions	KNOX 0050/26A Mod
Particulate Emissions	CFR60A 5

References:

CFR60A "Test Methods", 40 CFR, Part 60, Appendix A, July 1, 1993.

KNOX Severn Trent Laboratories Knoxville, Facility Standard
Operating Procedure.

PROJECT NARRATIVE

H6J100230

The results reported herein are applicable to the samples submitted for analysis only.

This report shall not be reproduced except in full, without the written approval of the laboratory.

The original chain of custody documentation is included with this report.

Sample Receipt

Custody seals were not present upon sample receipt at STL Knoxville; however, the samples were hand delivered.

Quality Control and Data Interpretation

Unless otherwise noted, all holding times and QC criteria were met and the test results shown in this report meet all applicable NELAC requirements.

Wet Chemistry

Samples were analyzed for chloride (Cl^-), fluoride (F^-) and bromide (Br^-) by ion chromatography using SOP number KNOX-WC-005 (based on EPA methods 9056, 9057 and 26A). Results for the H_2SO_4 impinger samples were reported as total μg hydrogen chloride (HCl), total μg hydrogen fluoride (HF) and total μg hydrogen bromide (HBr). Results for the NaOH impinger samples were reported as total μg chlorine (Cl_2), total μg hydrogen fluoride (HF) and total μg hydrogen bromine (Br_2).

Please note that the halogen fluorine (F) is not expected to be present in stack gas as diatomic fluorine (F_2). Fluorine reacts with water vapor in a favored reaction that forms HF : $2\text{F}_2 + 2\text{H}_2\text{O} \rightarrow 4\text{HF} + \text{O}_2$. Therefore, the results from the H_2SO_4 impingers and the NaOH impingers are reported as HF , and no F_2 is expected in the samples.

Results were calculated using the following equations:

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PROJECT NARRATIVE

H6J100230

$$\text{HX, ug} = (\text{X}^-, \text{ug / mL}) * (\text{Sample Volume, mL}) * \left(\frac{\text{Molecular Weight HX}}{\text{Molecular Weight X}^-} \right) * (\text{Bench Dilution})$$

$$\text{Cl}_2, \text{Br}_2 \text{ ug} = (\text{X}^-, \text{ug / mL}) * (\text{Sample Volume, mL}) * (\text{Bench Dilution})$$

NaOH impinger samples were treated with sodium thiosulfate ($\text{Na}_2\text{S}_2\text{O}_3$) prior to the final analysis in order to convert residual hypochlorite (OCl^-) to chloride ion. The presence of hypobromite is also assumed to be converted to bromide under these conditions.

Note: A sample volume of 100 mL was used to convert the results to total μg for the method blanks, laboratory control samples, and client reagent blanks.

For demonstration of analytical method performance on these samples, STL Knoxville analyzed matrix spikes (MS) and matrix spike duplicates (MSD). Acceptable recoveries of these spikes demonstrate that quantitation from this particular stack gas matrix is accurate and acceptable. Impinger samples containing 0.1N H_2SO_4 and 0.1N NaOH display matrix interference effects causing poor method performance and possibly giving unreliable data unless the interference is removed. Therefore, the samples were diluted in the lab to remove the interference for a more accurate chloride response. The samples may be analyzed at increasing dilutions along with matrix spikes until matrix spikes recover from the sample within laboratory control limits. The ion chromatograph calibration range used to quantitate the sample results permits a standard ten-fold sample dilution while supporting the reporting limit with the low calibration standard.

The dilution factor reported on the sample result form does not represent the bench dilution factor. It is actually the combination of factors required by the method to convert the anion reporting limit and method detection limit from $\mu\text{g/mL}$ to total μg . It may appear to be elevated because it includes the total sample volume in mL.

The pH for several samples was adjusted prior to analysis. Refer to the STL Knoxville Source Air Analysis Sample Information form in the Raw Data section of the deliverable.

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PROJECT NARRATIVE

H6J100230

Total Particulates:

The measurement of the mass of particulate matter trapped by the particulate filter and probe rinse derived from an M-5 sampling train was performed using SOP number KNOX-WC-0006 (based on EPA Methods 0050 and 5). Microfiber filters, Petri dishes, and 150 mL beakers are carefully inspected and tare weighed to constant weight. After sample collection, the filters are dried, and then carefully weighed to constant weight to determine the mass of particulate matter trapped on the filters. The acetone probe rinse solution is evaporated to dryness, and then weighed to constant weight to determine the total particulate mass collected in the rinse. The total particulate mass collected by an M-5 train is the sum of the particulate filter and the acetone probe rinse residue weights.

Filter thimbles and disks were submitted for analysis that were not prepared by STL Knoxville. The reported weight is the gross weight, which includes the total weight of the filter and the entrained particulate material. Unfortunately, the laboratory information system will not report sufficient digits to obtain a precise net particulate weight when the tare weight is subtracted from the gross weight. The actual raw data is tabulated below for the user's convenience.

Lot-Sample Number	Work Order Number	Client ID	Gross Weight Average (mg)
H6J100230-001	JF4DR1AA	UNIT N0.2 INLET RUN 1 THIMBLE	6563.4
H6J100230-005	JF4FQ1AA	UNIT N0.2 INLET RUN 2 THIMBLE	7812.6
H6J100230-009	JF4F01AA	UNIT N0.2 INLET RUN 3 THIMBLE	5855.7
H6J100230-013	JF4F81AA	UNIT N0.2 STACK RUN 1 FILTER	425.7
H6J100230-017	JF4GP1AA	UNIT N0.2 STACK RUN 2 FILTER	399.1
H6J100230-021	JFFG01AA	UNIT N0.2 STACK RUN 3 FILTER	425.0

Some of the samples were very hygroscopic and it was difficult to achieve constant weight. Extra measurements were taken, with baking and cooling in a dessicator between

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PROJECT NARRATIVE

H6J100230

each measurement. Several samples still did not achieve a stable weight, but there is enough evidence to demonstrate that the reported results are reasonably reproducible. The affected samples are: UNIT N0.2 INLET RUN 2 THIMBLE, UNIT N0.2 STACK RUN 1 FILTER, UNIT N0.2 STACK RUN 2 FILTER, UNIT N0.2 STACK RUN 2 ACETONE, UNIT N0.2 STACK RUN 3 FILTER, and UNIT N0.2 STACK RUN 3 ACETONE.

STL Knoxville maintains the following certifications, approvals and accreditations: Arkansas DEQ Cert. #05-043-0, California DHS ELAP Cert. #2423, Colorado DPHE, Connecticut DPH Cert. #PH-0223, Florida DOH Cert. #E87177, Georgia DNR Cert. #906, Hawaii DOH, Illinois EPA Cert. #000687, Indiana DOH Cert. #C-TN-02, Iowa DNR Cert. #375, Kansas DHE Cert. #E-10349, Kentucky DEP Lab ID #90101, Louisiana DEQ Cert. #03079, Louisiana DOHH Cert. #LA030024, Maryland DHMH Cert. #277, Massachusetts DEP Cert. #M-TN009, Michigan DEQ Lab ID #9933, New Jersey DEP Cert. #TN001, New York DOH Lab #10781, North Carolina DPH Lab ID #21705, North Carolina DEHNR Cert. #64, Ohio EPA VAP Cert. #CL0059, Oklahoma DEQ ID #9415, Pennsylvania DEP Cert. #68-00576, South Carolina DHEC Lab ID #84001001, Tennessee DOH Lab ID #02014, Utah DOH Cert. # QUAN3, Virginia DGS Lab ID #00165, Washington DOE Lab #C120, West Virginia DEP Cert. #345, Wisconsin DNR Lab ID #998044300, Naval Facilities Engineering Service Center and USDA Soil Permit #S-46424. This list of approvals is subject to change and does not imply that laboratory certification is available for all parameters reported in this environmental sample data report.

SAMPLE SUMMARY

H6J100230

WO #	SAMPLE#	CLIENT SAMPLE ID	SAMPLED DATE	SAMP TIME
JF4DR	001	UNIT NO.2 INLET RUN 1 THIMBLE	10/05/06	20:15
JF4E8	002	UNIT NO.2 INLET RUN 1 ACETONE FW	10/05/06	20:17
JF4FL	003	UNIT NO.2 INLET RUN 1 ACIDIC IMP.	10/05/06	20:19
JF4FN	004	UNIT NO.2 INLET RUN 1 ALKALINE IMP.	10/05/06	20:21
JF4FQ	005	UNIT NO.2 INLET RUN 2 THIMBLE	10/06/06	15:25
JF4FR	006	UNIT NO.2 INLET RUN 2 ACETONE FW	10/06/06	15:27
JF4FT	007	UNIT NO.2 INLET RUN 2 ACIDIC IMP.	10/06/06	15:50
JF4FW	008	UNIT NO.2 INLET RUN 2 ALKALINE IMP.	10/06/06	15:55
JF4F0	009	UNIT NO.2 INLET RUN 3 THIMBLE	10/06/06	17:30
JF4F1	010	UNIT NO.2 INLET RUN 3 ACETONE FW	10/06/06	17:35
JF4F4	011	UNIT NO.2 INLET RUN 3 ACIDIC IMP	10/06/06	17:38
JF4F6	012	UNIT NO.2 INLET RUN 3 ALKALINE IMP	10/06/06	17:40
JF4F8	013	UNIT NO.2 STACK RUN 1 FILTER	10/05/06	21:00
JF4GC	014	UNIT NO.2 STACK RUN 1 ACETONE FW	10/05/06	21:06
JF4GH	015	UNIT NO.2 STACK RUN 1 ACIDIC IMP	10/05/06	21:05
JF4GL	016	UNIT NO.2 STACK RUN 1 ALKALINE IMP	10/05/06	21:10
JF4GP	017	UNIT NO.2 STACK RUN 2 FILTER	10/06/06	18:30
JF4GQ	018	UNIT NO.2 STACK RUN 2 ACETONE FW	10/06/06	18:35
JF4GT	019	UNIT NO.2 STACK RUN 2 ACIDIC IMP	10/06/06	18:40
JF4GW	020	UNIT NO.2 STACK RUN 2 ALKALINE IMP	10/06/06	18:45
JF4G0	021	UNIT NO.2 STACK RUN 3 FILTER	10/06/06	18:45
JF4G1	022	UNIT NO.2 STACK RUN 3 ACETONE FW	10/06/06	18:50
JF4G3	023	UNIT NO.2 STACK RUN 3 ACIDIC IMP	10/06/06	18:55
JF4G5	024	UNIT NO.2 STACK RUN 3 ALKALINE IMP	10/06/06	18:58
JF4G7	025	UNIT NO.2 STACK RUN BLANK ACETONE	10/06/06	16:20
JF4HD	026	UNIT NO.2 STACK RUN BLANK H2SO4	10/06/06	16:22
JF4HG	027	UNIT NO.2 STACK RUN BLANK NAOH	10/06/06	16:24
JF4HL	028	UNIT NO.2 STACK RUN BLANK DI WATER	10/06/06	16:26

NOTE(S) :

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

QC DATA ASSOCIATION SUMMARY

H6J100230

Sample Preparation and Analysis Control Numbers

<u>SAMPLE#</u>	<u>MATRIX</u>	<u>ANALYTICAL METHOD</u>	<u>LEACH BATCH #</u>	<u>PREP BATCH #</u>	<u>MS RUN#</u>
001	AIR	CFR60A 5		6289129	
002	AIR	CFR60A 5		6289129	
003	AIR	KNOX 0050/26A Mod		6292450	6292273
	AIR	KNOX 0050/26A Mod		6296221	6296104
	AIR	KNOX 0050/26A Mod		6296079	6296054
004	AIR	KNOX 0050/26A Mod		6299332	6299229
	AIR	KNOX 0050/26A Mod		6296411	6296205
	AIR	KNOX 0050/26A Mod		6296301	6296160
005	AIR	CFR60A 5		6289129	
006	AIR	CFR60A 5		6289129	
007	AIR	KNOX 0050/26A Mod		6292450	6292273
	AIR	KNOX 0050/26A Mod		6296221	6296104
	AIR	KNOX 0050/26A Mod		6296079	6296054
008	AIR	KNOX 0050/26A Mod		6299332	6299229
	AIR	KNOX 0050/26A Mod		6296411	6296205
	AIR	KNOX 0050/26A Mod		6296301	6296160
009	AIR	CFR60A 5		6289129	
010	AIR	CFR60A 5		6289129	
011	AIR	KNOX 0050/26A Mod		6292450	6292273
	AIR	KNOX 0050/26A Mod		6296221	6296104
	AIR	KNOX 0050/26A Mod		6296079	6296054
012	AIR	KNOX 0050/26A Mod		6299332	6299229
	AIR	KNOX 0050/26A Mod		6296411	6296205
	AIR	KNOX 0050/26A Mod		6296301	6296160
013	AIR	CFR60A 5		6289129	
014	AIR	CFR60A 5		6289129	
015	AIR	KNOX 0050/26A Mod		6292450	6292273
	AIR	KNOX 0050/26A Mod		6296221	6296104
	AIR	KNOX 0050/26A Mod		6296079	6296054

(Continued on next page)

QC DATA ASSOCIATION SUMMARY

H6J100230

Sample Preparation and Analysis Control Numbers

<u>SAMPLE#</u>	<u>MATRIX</u>	<u>ANALYTICAL METHOD</u>	<u>LEACH BATCH #</u>	<u>PREP BATCH #</u>	<u>MS RUN#</u>
016	AIR	KNOX 0050/26A Mod		6299332	6299229
	AIR	KNOX 0050/26A Mod		6296411	6296205
	AIR	KNOX 0050/26A Mod		6296301	6296160
017	AIR	CFR60A 5		6289129	
018	AIR	CFR60A 5		6289129	
019	AIR	KNOX 0050/26A Mod		6292450	6292273
	AIR	KNOX 0050/26A Mod		6296221	6296104
	AIR	KNOX 0050/26A Mod		6296079	6296054
020	AIR	KNOX 0050/26A Mod		6299332	6299229
	AIR	KNOX 0050/26A Mod		6298118	
	AIR	KNOX 0050/26A Mod		6296301	6296160
021	AIR	CFR60A 5		6289129	
022	AIR	CFR60A 5		6289129	
023	AIR	KNOX 0050/26A Mod		6292450	6292273
	AIR	KNOX 0050/26A Mod		6296221	6296104
	AIR	KNOX 0050/26A Mod		6296079	6296054
024	AIR	KNOX 0050/26A Mod		6299332	6299229
	AIR	KNOX 0050/26A Mod		6296411	6296205
	AIR	KNOX 0050/26A Mod		6296301	6296160
025	AIR	CFR60A 5		6289129	
026	AIR	KNOX 0050/26A Mod		6292450	6292273
	AIR	KNOX 0050/26A Mod		6296291	
	AIR	KNOX 0050/26A Mod		6296079	6296054
027	AIR	KNOX 0050/26A Mod		6299332	6299229
	AIR	KNOX 0050/26A Mod		6296411	6296205
	AIR	KNOX 0050/26A Mod		6296301	6296160
028	AIR	KNOX 0050/26A Mod		6292450	6292273
	AIR	KNOX 0050/26A Mod		6296221	6296104
	AIR	KNOX 0050/26A Mod		6296079	6296054

Sample Data Summary

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET RUN 1 THIMBLE

General Chemistry

Lot-Sample #....: H6J100230-001

Work Order #....: JF4DR

Matrix.....: AIR

Date Sampled....: 10/05/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Particulates (total)	6560	0.50	mg	CFR60A 5	10/13-10/20/06	6289129
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET RUN 1 ACETONE FW

General Chemistry

Lot-Sample #...: H6J100230-002

Work Order #...: JF4E8

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Particulates (total)	104	0.50	mg	CFR60A 5	10/13-10/20/06	6289129
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET RUN 1 ACIDIC IMP.

General Chemistry

Lot-Sample #...: H6J100230-003
 Date Sampled...: 10/05/06

Work Order #...: JF4FL
 Date Received...: 10/09/06

Matrix.....: AIR

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Hydrogen bromide	503 B	506	ug	KNOX 0050/26A Mod	10/18/06	6292450
		Dilution Factor: 506.31		MDL.....: 60.8		
Hydrogen chloride	45700	5140	ug	KNOX 0050/26A Mod	10/18/06	6296221
		Dilution Factor: 5142.1		MDL.....: 1540		
Hydrogen fluoride	1880	526	ug	KNOX 0050/26A Mod	10/18/06	6296079
		Dilution Factor: 526.5		MDL.....: 526		

NOTE(S):

RL Reporting Limit

B Estimated result. Result is less than RL.

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET RUN 1 ALKALINE IMP.

General Chemistry

Lot-Sample #...: H6J100230-004

Work Order #...: JF4FN

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Bromine	ND	275	ug	KNOX 0050/26A Mod	10/19/06	6299332
		Dilution Factor: 275		MDL.....: 33.0		
Chlorine	349 B	550	ug	KNOX 0050/26A Mod	10/19/06	6296411
		Dilution Factor: 550		MDL.....: 165		
Hydrogen fluoride	ND	290	ug	KNOX 0050/26A Mod	10/19/06	6296301
		Dilution Factor: 289.6		MDL.....: 290		

NOTE(S) :

RL Reporting Limit

B Estimated result. Result is less than RL.

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET RUN 2 THIMBLE

General Chemistry

Lot-Sample #...: H6J100230-005 Work Order #...: JF4FQ Matrix.....: AIR
Date Sampled...: 10/06/06 Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Particulates (total)	7810	0.50	mg	CFR60A 5	10/13-10/20/06	6289129
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET RUN 2 ACETONE FW

General Chemistry

Lot-Sample #...: H6J100230-006 Work Order #...: JF4FR Matrix.....: AIR
Date Sampled...: 10/06/06 Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Particulates (total)	28.0	0.50	mg	CFR60A 5	10/13-10/20/06	6289129
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET RUN 2 ACIDIC IMP.

General Chemistry

Lot-Sample #...: H6J100230-007 Work Order #...: JF4FT Matrix.....: AIR
 Date Sampled...: 10/06/06 Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Hydrogen bromide	759	466	ug	KNOX 0050/26A Mod	10/18/06	6292450
			Dilution Factor: 465.8	MDL.....: 55.9		
Hydrogen chloride	46600	4730	ug	KNOX 0050/26A Mod	10/18/06	6296221
			Dilution Factor: 4730.8	MDL.....: 1420		
Hydrogen fluoride	1930	484	ug	KNOX 0050/26A Mod	10/18/06	6296079
			Dilution Factor: 484.4	MDL.....: 484		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET RUN 2 ALKALINE IMP.

General Chemistry

Lot-Sample #...: H6J100230-008 Work Order #...: JF4FW Matrix.....: AIR
 Date Sampled...: 10/06/06 Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Bromine	ND	270	ug	KNOX 0050/26A Mod	10/19/06	6299332
		Dilution Factor: 270		MDL.....: 32.4		
Chlorine	ND	540	ug	KNOX 0050/26A Mod	10/19/06	6296411
		Dilution Factor: 540		MDL.....: 162		
Hydrogen fluoride	ND	284	ug	KNOX 0050/26A Mod	10/19/06	6296301
		Dilution Factor: 284.3		MDL.....: 284		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET RUN 3 THIMBLE

General Chemistry

Lot-Sample #...: H6J100230-009 Work Order #...: JF4F0 Matrix.....: AIR
Date Sampled...: 10/06/06 Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Particulates (total)	5860	0.50	mg	CFR60A 5	10/13-10/20/06	6289129
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET RUN 3 ACETONE FW

General Chemistry

Lot-Sample #...: H6J100230-010

Work Order #...: JF4F1

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Particulates (total)	42.9	0.50	mg	CFR60A 5	10/13-10/20/06	6289129
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET RUN 3 ACIDIC IMP

General Chemistry

Lot-Sample #...: H6J100230-011 Work Order #...: JF4F4 Matrix.....: AIR
 Date Sampled...: 10/06/06 Date Received..: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Hydrogen bromide	611	430	ug	KNOX 0050/26A Mod 10/18/06	10/18/06	6292450
		Dilution Factor: 430.36		MDL.....: 51.6		
Hydrogen chloride	48700	4370	ug	KNOX 0050/26A Mod 10/18/06	10/18/06	6296221
		Dilution Factor: 4370.8		MDL.....: 1310		
Hydrogen fluoride	1850	448	ug	KNOX 0050/26A Mod 10/18/06	10/18/06	6296079
		Dilution Factor: 447.5		MDL.....: 448		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET RUN 3 ALKALINE IMP

General Chemistry

Lot-Sample #...: H6J100230-012

Work Order #...: JF4F6

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Bromine	ND	280	ug	KNOX 0050/26A Mod	10/19/06	6299332
		Dilution Factor: 280		MDL.....: 33.76		
Chlorine	238 B	560	ug	KNOX 0050/26A Mod	10/19/06	6296411
		Dilution Factor: 560		MDL.....: 168		
Hydrogen fluoride	ND	295	ug	KNOX 0050/26A Mod	10/19/06	6296301
		Dilution Factor: 294.9		MDL.....: 295		

NOTE(S) :

RL Reporting Limit

B Estimated result. Result is less than RL.

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 1 FILTER

General Chemistry

Lot-Sample #...: H6J100230-013

Work Order #...: JF4F8

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Particulates (total)	426	0.50	mg	CFR60A 5	10/13-10/20/06	6289129
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 1 ACETONE FW

General Chemistry

Lot-Sample #...: H6J100230-014

Work Order #...: JF4GC

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Particulates (total)	64.7	0.50	mg	CFR60A 5	10/13-10/20/06	6289129
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 1 ACIDIC IMP

General Chemistry

Lot-Sample #...: H6J100230-015 Work Order #...: JF4GH Matrix.....: AIR
 Date Sampled...: 10/05/06 Date Received..: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Hydrogen bromide	600	334	ug	KNOX 0050/26A Mod	10/18/06	6292450
		Dilution Factor: 334.16		MDL.....: 40.1		
Hydrogen chloride	45200	3390	ug	KNOX 0050/26A Mod	10/18/06	6296221
		Dilution Factor: 3393.8		MDL.....: 1020		
Hydrogen fluoride	4460	348	ug	KNOX 0050/26A Mod	10/18/06	6296079
		Dilution Factor: 347.5		MDL.....: 348		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 1 ALKALINE IMP

General Chemistry

Lot-Sample #...: H6J100230-016

Work Order #...: JF4GL

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Bromine	ND	270	ug	KNOX 0050/26A Mod	10/19/06	6299332
		Dilution Factor: 270		MDL.....: 32.4		
Chlorine	494 B	540	ug	KNOX 0050/26A Mod	10/19/06	6296411
		Dilution Factor: 540		MDL.....: 162		
Hydrogen fluoride	ND	284	ug	KNOX 0050/26A Mod	10/19/06	6296301
		Dilution Factor: 284.3		MDL.....: 284		

NOTE(S) :

RL Reporting Limit

B Estimated result. Result is less than RL.

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 2 FILTER

General Chemistry

Lot-Sample #...: H6J100230-017

Work Order #...: JF4GP

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Particulates (total)	399	0.50	mg	CFR60A 5	10/13-10/20/06	6289129
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 2 ACETONE FW

General Chemistry

Lot-Sample #...: H6J100230-018

Work Order #...: JF4GQ

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Particulates (total)	63.6	0.50	mg	CFR60A 5	10/13-10/20/06	6289129
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 2 ACIDIC IMP

General Chemistry

Lot-Sample #...: H6J100230-019 Work Order #...: JF4GT Matrix.....: AIR
 Date Sampled...: 10/06/06 Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Hydrogen bromide	798	334	ug	KNOX 0050/26A Mod 10/18/06	10/18/06	6292450
		Dilution Factor: 334.16		MDL.....: 40.1		
Hydrogen chloride	53300	3390	ug	KNOX 0050/26A Mod 10/18/06	10/18/06	6296221
		Dilution Factor: 3393.8		MDL.....: 1020		
Hydrogen fluoride	5260	348	ug	KNOX 0050/26A Mod 10/18/06	10/18/06	6296079
		Dilution Factor: 347.5		MDL.....: 348		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 2 ALKALINE IMP

General Chemistry

Lot-Sample #...: H6J100230-020

Work Order #...: JF4GW

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Bromine	ND	270	ug	KNOX 0050/26A Mod	10/19/06	6299332
		Dilution Factor: 270		MDL.....: 32.4		
Chlorine	221 B	540	ug	KNOX 0050/26A Mod	10/24/06	6298118
		Dilution Factor: 540		MDL.....: 162		
Hydrogen fluoride	ND	284	ug	KNOX 0050/26A Mod	10/19/06	6296301
		Dilution Factor: 284.3		MDL.....: 284		

NOTE(S) :

RL Reporting Limit

B Estimated result. Result is less than RL.

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 3 FILTER

General Chemistry

Lot-Sample #...: H6J100230-021

Work Order #...: JF4G0

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Particulates (total)	425	0.50	mg	CFR60A 5	10/13-10/20/06	6289129
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 3 ACETONE FW

General Chemistry

Lot-Sample #...: H6J100230-022

Work Order #...: JF4G1

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Particulates (total)	120	0.50	mg	CFR60A 5	10/13-10/20/06	6289129
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 3 ACIDIC IMP

General Chemistry

Lot-Sample #...: H6J100230-023

Work Order #...: JF4G3

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Hydrogen bromide	662	344	ug	KNOX 0050/26A Mod	10/18/06	6292450
		Dilution Factor: 344.29		MDL.....: 41.3		
Hydrogen chloride	48800	3500	ug	KNOX 0050/26A Mod	10/18/06	6296221
		Dilution Factor: 3496.7		MDL.....: 1050		
Hydrogen fluoride	5010	358	ug	KNOX 0050/26A Mod	10/18/06	6296079
		Dilution Factor: 358		MDL.....: 358		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 3 ALKALINE IMP

General Chemistry

Lot-Sample #...: H6J100230-024

Work Order #...: JF4G5

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received..: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Bromine	ND	265	ug	KNOX 0050/26A Mod	10/19/06	6299332
		Dilution Factor: 265		MDL.....: 31.8		
Chlorine	376 B	530	ug	KNOX 0050/26A Mod	10/19/06	6296411
		Dilution Factor: 530		MDL.....: 159		
Hydrogen fluoride	ND	279	ug	KNOX 0050/26A Mod	10/19/06	6296301
		Dilution Factor: 279.1		MDL.....: 279		

NOTE(S) :

RL: Reporting Limit

B: Estimated result, Result is less than RL.

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN BLANK ACETONE

General Chemistry

Lot-Sample #...: H6J100230-025 Work Order #...: JF4G7 Matrix.....: AIR
Date Sampled...: 10/06/06 Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Particulates (total)	3.7	0.50	mg	CFR60A 5	10/13-10/20/06	6289129
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN BLANK H2SO4

General Chemistry

Lot-Sample #...: H6J100230-026

Work Order #...: JF4HD

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Hydrogen bromide	ND	101	ug	KNOX 0050/26A Mod	10/18/06	6292450
		Dilution Factor: 101.26		MDL.....: 12.2		
Hydrogen chloride	ND	514	ug	KNOX 0050/26A Mod	10/19/06	6296291
		Dilution Factor: 514.2		MDL.....: 154		
Hydrogen fluoride	ND	105	ug	KNOX 0050/26A Mod	10/18/06	6296079
		Dilution Factor: 105.3		MDL.....: 105		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN BLANK NAOH

General Chemistry

Lot-Sample #...: H6J100230-027

Work Order #...: JF4HG

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Bromine	ND	100	ug	KNOX 0050/26A Mod	10/19/06	6299332
		Dilution Factor: 100		MDL.....: 12.0		
Chlorine	37.4 B	100	ug	KNOX 0050/26A Mod	10/19/06	6296411
		Dilution Factor: 100		MDL.....: 30.0		
Hydrogen fluoride	ND	105	ug	KNOX 0050/26A Mod	10/19/06	6296301
		Dilution Factor: 105.3		MDL.....: 105		

NOTE(S) :

RL Reporting Limit

B Estimated result. Result is less than RL.

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN BLANK DI WATER

General Chemistry

Lot-Sample #...: H6J100230-028

Work Order #...: JF4HL

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Hydrogen bromide	ND	101	ug	KNOX 0050/26A Mod	10/18/06	6292450
		Dilution Factor: 101.26		MDL.....: 12.2		
Hydrogen chloride	ND	103	ug	KNOX 0050/26A Mod	10/18/06	6296221
		Dilution Factor: 102.8		MDL.....: 30.8		
Hydrogen fluoride	ND	105	ug	KNOX 0050/26A Mod	10/18/06	6296079
		Dilution Factor: 105.3		MDL.....: 105		

METHOD BLANK REPORT

General Chemistry

Client Lot #...: H6J100230

Matrix.....: AIR

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Bromine	ND	Work Order #: JHAD31AA 10.0 Dilution Factor: 10	ug	MB Lot-Sample #: H6J260000-332 KNOX 0050/26A Mod 10/19/06		6299332
Chlorine	ND	Work Order #: JG3NF1AA 10.0 Dilution Factor: 10	ug	MB Lot-Sample #: H6J230000-411 KNOX 0050/26A Mod 10/19/06		6296411
Chlorine	ND	Work Order #: JG6PG1AA 10.0 Dilution Factor: 10	ug	MB Lot-Sample #: H6J250000-118 KNOX 0050/26A Mod 10/24/06		6298118
Hydrogen bromide	ND	Work Order #: JGR9C1AA 10.1 Dilution Factor: 10.13	ug	MB Lot-Sample #: H6J190000-450 KNOX 0050/26A Mod 10/18/06		6292450
Hydrogen chloride	ND	Work Order #: JG26M1AA 10.3 Dilution Factor: 10.3	ug	MB Lot-Sample #: H6J230000-221 KNOX 0050/26A Mod 10/18/06		6296221
Hydrogen chloride	ND	Work Order #: JG3DW1AA 10.3 Dilution Factor: 10.3	ug	MB Lot-Sample #: H6J230000-291 KNOX 0050/26A Mod 10/19/06		6296291
Hydrogen fluoride	ND	Work Order #: JG2W71AA 10.5 Dilution Factor: 10.5	ug	MB Lot-Sample #: H6J230000-079 KNOX 0050/26A Mod 10/18/06		6296079
Hydrogen fluoride	ND	Work Order #: JG3FG1AA 10.5 Dilution Factor: 10.5	ug	MB Lot-Sample #: H6J230000-301 KNOX 0050/26A Mod 10/19/06		6296301

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

LABORATORY CONTROL SAMPLE EVALUATION REPORT

General Chemistry

Lot-Sample #...: H6J100230

Matrix.....: AIR

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD	RPD LIMITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Bromine		WO#:JHAD31AC-LCS/JHAD31AD-LCSD LCS Lot-Sample#: H6J260000-332					
	98	(90 - 110)			KNOX 0050/26A Mod	10/19/06	6299332
	99	(90 - 110) 1.2	(0-20)		KNOX 0050/26A Mod	10/19/06	6299332
		Dilution Factor: 1					
Chlorine		WO#:JG3NF1AC-LCS/JG3NF1AD-LCSD LCS Lot-Sample#: H6J230000-411					
	102	(90 - 110)			KNOX 0050/26A Mod	10/19/06	6296411
	100	(90 - 110) 2.6	(0-20)		KNOX 0050/26A Mod	10/19/06	6296411
		Dilution Factor: 1					
Chlorine		WO#:JG6PG1AC-LCS/JG6PG1AD-LCSD LCS Lot-Sample#: H6J250000-118					
	101	(90 - 110)			KNOX 0050/26A Mod	10/24/06	6298118
	102	(90 - 110) 1.3	(0-20)		KNOX 0050/26A Mod	10/24/06	6298118
		Dilution Factor: 1					
Hydrogen bromide		WO#:JGR9C1AC-LCS/JGR9C1AD-LCSD LCS Lot-Sample#: H6J190000-450					
	100	(90 - 110)			KNOX 0050/26A Mod	10/18/06	6292450
	98	(90 - 110) 1.2	(0-20)		KNOX 0050/26A Mod	10/18/06	6292450
		Dilution Factor: 1					
Hydrogen chloride		WO#:JG26M1AC-LCS/JG26M1AD-LCSD LCS Lot-Sample#: H6J230000-221					
	101	(90 - 110)			KNOX 0050/26A Mod	10/18/06	6296221
	101	(90 - 110) 0.12	(0-20)		KNOX 0050/26A Mod	10/18/06	6296221
		Dilution Factor: 1					
Hydrogen chloride		WO#:JG3DW1AC-LCS/JG3DW1AD-LCSD LCS Lot-Sample#: H6J230000-291					
	102	(90 - 110)			KNOX 0050/26A Mod	10/19/06	6296291
	100	(90 - 110) 2.7	(0-20)		KNOX 0050/26A Mod	10/19/06	6296291
		Dilution Factor: 1					
Hydrogen fluoride		WO#:JG2W71AC-LCS/JG2W71AD-LCSD LCS Lot-Sample#: H6J230000-079					
	102	(90 - 110)			KNOX 0050/26A Mod	10/18/06	6296079
	103	(90 - 110) 0.24	(0-20)		KNOX 0050/26A Mod	10/18/06	6296079
		Dilution Factor: 1					
Hydrogen fluoride		WO#:JG3FG1AC-LCS/JG3FG1AD-LCSD LCS Lot-Sample#: H6J230000-301					
	102	(90 - 110)			KNOX 0050/26A Mod	10/19/06	6296301
	102	(90 - 110) 0.37	(0-20)		KNOX 0050/26A Mod	10/19/06	6296301
		Dilution Factor: 1					

(Continued on next page)

LABORATORY CONTROL SAMPLE EVALUATION REPORT

General Chemistry

Lot-Sample #...: H6J100230

Matrix.....: AIR

<u>PARAMETER</u>	<u>PERCENT</u> <u>RECOVERY</u>	<u>RECOVERY</u> <u>LIMITS</u>	<u>RPD</u> <u>LIMITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>PREP</u> <u>BATCH #</u>
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NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

LABORATORY CONTROL SAMPLE DATA REPORT

General Chemistry

Lot-Sample #...: H6J100230

Matrix.....: AIR

PARAMETER	SPIKE AMOUNT	MEASURED AMOUNT	UNITS	PERCNT RECVRY	RPD	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
WO#:JHAD31AC-LCS/JHAD31AD-LCSD LCS Lot-Sample#: H6J260000-332								
Bromine	75.0	73.4	ug	98		KNOX 0050/26A Mod	10/19/06	6299332
	75.0	74.3	ug	99	1.2	KNOX 0050/26A Mod	10/19/06	6299332
Dilution Factor: 1								
WO#:JG3NF1AC-LCS/JG3NF1AD-LCSD LCS Lot-Sample#: H6J230000-411								
Chlorine	75.0	76.8	ug	102		KNOX 0050/26A Mod	10/19/06	6296411
	75.0	74.8	ug	100	2.6	KNOX 0050/26A Mod	10/19/06	6296411
Dilution Factor: 1								
WO#:JG6PG1AC-LCS/JG6PG1AD-LCSD LCS Lot-Sample#: H6J250000-118								
Chlorine	75.0	75.5	ug	101		KNOX 0050/26A Mod	10/24/06	6298118
	75.0	76.5	ug	102	1.3	KNOX 0050/26A Mod	10/24/06	6298118
Dilution Factor: 1								
WO#:JGR9C1AC-LCS/JGR9C1AD-LCSD LCS Lot-Sample#: H6J190000-450								
Hydrogen bromide	75.9	75.6	ug	100		KNOX 0050/26A Mod	10/18/06	6292450
	75.9	74.7	ug	98	1.2	KNOX 0050/26A Mod	10/18/06	6292450
Dilution Factor: 1								
WO#:JG26M1AC-LCS/JG26M1AD-LCSD LCS Lot-Sample#: H6J230000-221								
Hydrogen chloride	77.1	77.5	ug	101		KNOX 0050/26A Mod	10/18/06	6296221
	77.1	77.6	ug	101	0.12	KNOX 0050/26A Mod	10/18/06	6296221
Dilution Factor: 1								
WO#:JG3DW1AC-LCS/JG3DW1AD-LCSD LCS Lot-Sample#: H6J230000-291								
Hydrogen chloride	77.1	79.0	ug	102		KNOX 0050/26A Mod	10/19/06	6296291
	77.1	76.9	ug	100	2.7	KNOX 0050/26A Mod	10/19/06	6296291
Dilution Factor: 1								
WO#:JG2W71AC-LCS/JG2W71AD-LCSD LCS Lot-Sample#: H6J230000-079								
Hydrogen fluoride	79.0	80.9	ug	102		KNOX 0050/26A Mod	10/18/06	6296079
	79.0	81.1	ug	103	0.24	KNOX 0050/26A Mod	10/18/06	6296079
Dilution Factor: 1								
WO#:JG3FG1AC-LCS/JG3FG1AD-LCSD LCS Lot-Sample#: H6J230000-301								
Hydrogen fluoride	79.0	80.6	ug	102		KNOX 0050/26A Mod	10/19/06	6296301
	79.0	80.9	ug	102	0.37	KNOX 0050/26A Mod	10/19/06	6296301
Dilution Factor: 1								

(Continued on next page)

LABORATORY CONTROL SAMPLE DATA REPORT

General Chemistry

Lot-Sample #...: H6J100230

Matrix.....: AIR

PARAMETER	SPIKE AMOUNT	MEASURED AMOUNT	UNITS	PERCNT RECVRY	RPD	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
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NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE SAMPLE EVALUATION REPORT

General Chemistry

Client Lot #...: H6J100230

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD	RPD LIMITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Bromine			WO#:		JF4FW1AF-MS/JF4FW1AG-MSD	MS Lot-Sample #:	H6J100230-008
	102	(75 - 125)			KNOX 0050/26A Mod	10/19/06	6299332
	103	(75 - 125)	0.36	(0-20)	KNOX 0050/26A Mod	10/19/06	6299332
			Dilution Factor: 1				
Chlorine			WO#:		JF4FW1AC-MS/JF4FW1AD-MSD	MS Lot-Sample #:	H6J100230-008
	96	(75 - 125)			KNOX 0050/26A Mod	10/19/06	6296411
	92	(75 - 125)	4.2	(0-20)	KNOX 0050/26A Mod	10/19/06	6296411
			Dilution Factor: 1				
Hydrogen bromide			WO#:		JF4FT1AF-MS/JF4FT1AG-MSD	MS Lot-Sample #:	H6J100230-007
	98	(75 - 125)			KNOX 0050/26A Mod	10/18/06	6292450
	105	(75 - 125)	4.1	(0-20)	KNOX 0050/26A Mod	10/18/06	6292450
			Dilution Factor: 1				
Hydrogen chloride			WO#:		JF4FT1AC-MS/JF4FT1AD-MSD	MS Lot-Sample #:	H6J100230-007
	97	(75 - 125)			KNOX 0050/26A Mod	10/18/06	6296221
	107	(75 - 125)	1.6	(0-20)	KNOX 0050/26A Mod	10/18/06	6296221
			Dilution Factor: 1				
Hydrogen fluoride			WO#:		JF4FT1AJ-MS/JF4FT1AK-MSD	MS Lot-Sample #:	H6J100230-007
	109	(75 - 125)			KNOX 0050/26A Mod	10/18/06	6296079
	109	(75 - 125)	0.0	(0-20)	KNOX 0050/26A Mod	10/18/06	6296079
			Dilution Factor: 1				
Hydrogen fluoride			WO#:		JF4FW1AJ-MS/JF4FW1AK-MSD	MS Lot-Sample #:	H6J100230-008
	82	(75 - 125)			KNOX 0050/26A Mod	10/19/06	6296301
	81	(75 - 125)	1.7	(0-20)	KNOX 0050/26A Mod	10/19/06	6296301
			Dilution Factor: 1				

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE SAMPLE DATA REPORT

General Chemistry

Client Lot #...: H6J100230

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	SAMPLE AMOUNT	SPIKE AMT	MEASRD AMOUNT	UNITS	PERCNT RECVRY	RPD	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Bromine									
WO#: JF4FW1AF-MS/JF4FW1AG-MSD MS Lot-Sample #: H6J100230-008									
	ND	540	552	ug	102		KNOX 0050/26A	10/19/06	6299332
	ND	540	554	ug	103	0.36	KNOX 0050/26A	10/19/06	6299332
Dilution Factor: 1									
Chlorine									
WO#: JF4FW1AC-MS/JF4FW1AD-MSD MS Lot-Sample #: H6J100230-008									
	ND	1080	1040	ug	96		KNOX 0050/26A	10/19/06	6296411
	ND	1080	997	ug	92	4.2	KNOX 0050/26A	10/19/06	6296411
Dilution Factor: 1									
Hydrogen bromide									
WO#: JF4FT1AF-MS/JF4FT1AG-MSD MS Lot-Sample #: H6J100230-007									
	759	932	1670	ug	98		KNOX 0050/26A	10/18/06	6292450
	759	932	1740	ug	105	4.1	KNOX 0050/26A	10/18/06	6292450
Dilution Factor: 1									
Hydrogen chloride									
WO#: JF4FT1AC-MS/JF4FT1AD-MSD MS Lot-Sample #: H6J100230-007									
	46600	9460	55800	ug	97		KNOX 0050/26A	10/18/06	6296221
	46600	9460	56700	ug	107	1.6	KNOX 0050/26A	10/18/06	6296221
Dilution Factor: 1									
Hydrogen fluoride									
WO#: JF4FT1AJ-MS/JF4FT1AK-MSD MS Lot-Sample #: H6J100230-007									
	1930	969	2990	ug	109		KNOX 0050/26A	10/18/06	6296079
	1930	969	2990	ug	109	0.0	KNOX 0050/26A	10/18/06	6296079
Dilution Factor: 1									
Hydrogen fluoride									
WO#: JF4FW1AJ-MS/JF4FW1AK-MSD MS Lot-Sample #: H6J100230-008									
	ND	569	468	ug	82		KNOX 0050/26A	10/19/06	6296301
	ND	569	460	ug	81	1.7	KNOX 0050/26A	10/19/06	6296301
Dilution Factor: 1									

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

Sample Receipt Documentation

**AIR
SAMPLING
ASSOCIATES, INC.**

H6J 100230

Chain of Custody Record

Client		Project No.		Page		of		Analysis	
Address		Unit No.		Lab		Lab		Analysis	
City	State	Zip Code	Project Manager	Lab Contact		Lab Phone No.		Analysis	
Run No.	Test Method		Absorbing Solution		No. of Containers	Comments		Analysis	
ADA-ES	06-056		3		16		Part. Matter		Hydrogen fluoride
Public Service of NH	Bow		NH		Severn Trent		Billy Anderson		Hydrogen fluoride
Container No. 1	10/5/06	2015	Thimble		1			X	
Container No. 2	10/5/06	2017	Acetone FW		1			X	
Container No. 3	10/5/06	2019	H2SO4, Temp 1, 2		1			X	
Container No. 4	10/5/06	2021	NaOH, Temp 3, 4		1			X	
					HAND DELIVERED				
					NO CUSTODY SEALS				
					RECEIVED AT AMBIENT				
					BND 10-9-06				
Special Instructions:									
Turn Around Time Required:			☒ Normal ☐ Rush		Sample Disposal:		Return to ASAI ☒ Disposal By Lab ☒ Archive For		6 Months
1. Recovered By			Billy A. Mullins Jr		2025 10/5/06		1. Relinquished By		10/7/06 1420
2. Received By			Bill Wp		10/7/06 1420		2. Relinquished By		10/9/06 1427
3. Received By			William C. Anderson		10/9/06 1427		3. Relinquished By		10/9/06 1427
Comments:

465100230

Chain of Custody Record

[illegible]

**AIR
SAMPLING
ASSOCIATES, INC.**

1-651 00230

Chain of Custody Record

Client ADA-ES		Project No. 06-056		Page 9 of 16	Analysis	
Address Public Service of NH		Unit No. Unit No. 2 Inlet to Orig. ESP	Lab Severn Trent			
City Bow	State NH	Zip Code	Lab Contact Billy Anderson			
Run No. 3	Test Method EPA Method 26A		Lab Phone No.			
Sample I.D.	Date	Time	Absorbing Solution	No. of Containers	Comments	
Container No. 1	10/6/06	1730	Thimble	1		
Container No. 2	10/6/06	1735	Acetone FW	1		
Container No. 3	10/6/06	1738	H ₂ S, Imp 1, 2	1		
Container No. 4	10/6/06	1740	NaOH, Imp 3, 4	1		
Special Instructions:						
Turn Around Time Required: ☒ Normal ☐ Rush		Sample Disposal: ☐ Return to ASAI ☒ Disposal By Lab ☒ Archive For 6 Months				
1. Received By Billy J. Mullins		Date 10/6/06	Time 1740	1. Relinquished By Billy J. Mullins Date 10/7/06 Time 1420		
2. Received By Billy Anderson		Date 10/7/06	Time 1420	2. Relinquished By Billy Anderson Date 10/9/06 Time 1427		
3. Received By Billy Anderson		Date 10/9/06	Time 1427	3. Relinquished By		
Comments:

**AIR
SAMPLING
ASSOCIATES, INC.**

46 J 100 230

Chain of Custody Record

Client	ADA-ES		Project No.	06-056		Page	4	of	16	Analysis	
Address	Public Service of NH		Unit No.	Unit No. 2 Stack		Lab	Severn Trent				
City	State	Zip Code	Project Manager	Bill Mullins		Lab Contact	Billy Anderson				
Run No.	1		Test Method	EPA Method 26A		Lab Phone No.					
Sample I.D.	Date	Time	Absorbing Solution	No. of Containers	Comments						
Container No. 1	10/5/06	2100	Filter	1							
Container No. 2	10/5/06	2106	Acetone FW	1							
Container No. 3	10/5/06	2105	H ₂ SO ₄ Imp 1, 2	1							
Container No. 4	10/5/06	2110	NaOH Imp 3, 4	1							
Special Instructions:											
Turn Around Time Required: ☒ Normal ☐ Rush											
Return to ASAI ☒ Disposal By Lab ☒ Archive For 6 Months											
1. Recovered By		Billy P. Mullins		2115		Sample Disposal:		1. Relinquished By		Billy P. Mullins	
2. Received By		Bill Dyl		10/7/06		Time		2. Relinquished By		10/7/06 1420	
3. Received By		Sam C. Anderson		10/9/06		Time		3. Relinquished By		10/9/06 1427	
Comments:

H65100230

Chain of Custody Record

[illegible]

H65 100230

Chain of Custody Record

Client ADA-ES	Project No. 06-056	Page 10	of 16		
Address Public Service of NH	Unit No. Unit No. 2 Stack	Lab Severn Trent	Analysis Part. Matter Hydrogen Halides Halogens		
City Bow	State NH	Lab Contact Billy Anderson			
Zip Code 3	Project Manager Bill Mullins	Lab Phone No.			
Run No.	Test Method EPA Method 26A				
Sample I.D.	Date	Time	Absorbing Solution	No. of Containers	Comments
Container No. 1	10/6/06	1845	Filter	1	
Container No. 2	10/6/06	1850	Acetone FW	1	
Container No. 3	10/6/06	1855	H ₂ SO ₄ Imp 1,2	1	
Container No. 4	10/6/06	1858	N ₂ O ₄ Imp 3,4	1	
Special Instructions:					
Turn Around Time Required: ☒ Normal ☐ Rush		Sample Disposal: ☐ Return to ASAI ☒ Disposal By Lab ☒ Archive For 6 Months			
1. Recovered By Billy J. Mullins		Date 10/6/06		Time 1900	
2. Received By Bill J. Mullins		Date 10/7/06		Time 1420	
3. Received By W.M. C. Anderson		Date 10/9/06		Time 1427	
Comments:

465700230

Chain of Custody Record

[illegible]

STL KNOXVILLE SAMPLE RECEIPT/CONDITION UPON RECEIPT ANOMALY CHECKLIST

Client: AIR SAMPLING ASSOC. Project: _____Lot Number: 465100230

Review Items	Yes	No	NA	If No, what was the problem?	Comments/Actions Taken
1. Do sample container labels match COC? (IDs, Dates, Times)	☒			☐ 1a Do not match COC ☐ 1b Incomplete information ☐ 1c Marking smeared ☐ 1d Label torn ☐ 1e No label ☐ 1f COC not received ☐ 1g Other: _____	
2. Is the cooler temperature within limits? (> freezing temp. of water to 6°C; NC, 1668, 1613B: 0-4°C; VOST: 10°C; MA: 2-6°C)		☒		☐ 2a Temp Blank = _____ ☐ 2b Cooler Temp = _____	
3. Were samples received with correct chemical preservative (excluding Encore)?		☒		☐ 3a Sample preservative = _____	
4. Were custody seals present/intact on cooler and/or containers?		☒		☒ 4a Not present ☐ 4b Not intact ☐ 4c Other: _____	
5. Were all of the samples listed on the COC received?	☒			☐ 5a Samples received-not on COC ☐ 5b Samples not received-on COC	
6. Were all of the sample containers received intact?	☒			☐ 6a Leaking ☐ 6b Broken	
7. Were VOA samples received without headspace?	☒			☐ 7a Headspace (VOA only)	
8. Were samples received in appropriate containers?	☒			☐ 8a Improper container	
9. Did you check for residual chlorine, if necessary?		☒		☐ 9a Could not be determined due to matrix interference	
10. Were samples received within holding time?	☒			☐ 10a Holding time expired	
11. For rad samples, was sample activity info. provided?				☐ Incomplete information	
12. For SOG water samples (1613B, 1668A, 8290, LR PAHs), do samples have visible solids present?				If yes & appears to be >1%, was SOG notified? _____	
13. Are the shipping containers intact?	☒			☐ 13a Leaking ☐ 13b Other: _____	
14. Was COC relinquished? (Signed/Dated/Timed)	☒			☐ 14a Not relinquished	
15. Are tests/parameters listed for each sample?	☒			☐ 15a Incomplete information	
16. Is the matrix of the samples noted?	☒			☐ 15a Incomplete information	
17. Is the date/time of sample collection noted?	☒			☐ 15a Incomplete information	
18. Is the client and project name/# identified?	☒			☐ 15a Incomplete information	
19. Was the sampler identified on the COC?	☒				
Quote #: <u>72504</u> PM Instructions: _____					

QA026R18.doc, 1/30/06

Wet Chemistry

Sample Summary

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET RUN 1 THIMBLE

General Chemistry

Lot-Sample #...: H6J100230-001

Work Order #...: JF4DR

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Particulates (total)	6560	0.50	mg	CFR60A 5	10/13-10/20/06	6289129
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET RUN 1 ACETONE FW

General Chemistry

Lot-Sample #...: H6J100230-002

Work Order #...: JF4E8

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Particulates (total)	104	0.50	mg	CFR60A 5	10/13-10/20/06	6289129
Dilution Factor: 1				MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET RUN 1 ACIDIC IMP.

General Chemistry

Lot-Sample #...: H6J100230-003

Work Order #...: JF4FL

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Hydrogen bromide	503 B	506	ug	KNOX 0050/26A Mod	10/18/06	6292450
		Dilution Factor: 506.31		MDL.....: 60.8		
Hydrogen chloride	45700	5140	ug	KNOX 0050/26A Mod	10/18/06	6296221
		Dilution Factor: 5142.1		MDL.....: 1540		
Hydrogen fluoride	1880	526	ug	KNOX 0050/26A Mod	10/18/06	6296079
		Dilution Factor: 526.5		MDL.....: 526		

NOTE(S) :

RL Reporting Limit

B Estimated result. Result is less than RL.

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET RUN 1 ALKALINE IMP.

General Chemistry

Lot-Sample #...: H6J100230-004

Work Order #...: JF4FN

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Bromine	ND	275	ug	KNOX 0050/26A Mod	10/19/06	6299332
		Dilution Factor: 275		MDL.....: 33.0		
Chlorine	349 B	550	ug	KNOX 0050/26A Mod	10/19/06	6296411
		Dilution Factor: 550		MDL.....: 165		
Hydrogen fluoride	ND	290	ug	KNOX 0050/26A Mod	10/19/06	6296301
		Dilution Factor: 289.6		MDL.....: 290		

NOTE(S) :

RL Reporting Limit

B Estimated result. Result is less than RL.

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET RUN 2 THIMBLE

General Chemistry

Lot-Sample #...: H6J100230-005

Work Order #...: JF4FQ

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Particulates (total)	7810	0.50	mg	CFR60A 5	10/13-10/20/06	6289129
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET RUN 2 ACETONE FW

General Chemistry

Lot-Sample #...: H6J100230-006

Work Order #...: JF4FR

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Particulates (total)	28.0	0.50	mg	CFR60A 5	10/13-10/20/06	6289129
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET RUN 2 ACIDIC IMP.

General Chemistry

Lot-Sample #...: H6J100230-007 Work Order #...: JF4FT Matrix.....: AIR
 Date Sampled...: 10/06/06 Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Hydrogen bromide	759	466	ug	KNOX 0050/26A Mod	10/18/06	6292450
		Dilution Factor: 465.8		MDL.....: 55.9		
Hydrogen chloride	46600	4730	ug	KNOX 0050/26A Mod	10/18/06	6296221
		Dilution Factor: 4730.8		MDL.....: 1420		
Hydrogen fluoride	1930	484	ug	KNOX 0050/26A Mod	10/18/06	6296079
		Dilution Factor: 484.4		MDL.....: 484		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET RUN 2 ALKALINE IMP.

General Chemistry

Lot-Sample #...: H6J100230-008

Work Order #...: JF4FW

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Bromine	ND	270	ug	KNOX 0050/26A Mod	10/19/06	6299332
		Dilution Factor: 270		MDL.....: 32.4		
Chlorine	ND	540	ug	KNOX 0050/26A Mod	10/19/06	6296411
		Dilution Factor: 540		MDL.....: 162		
Hydrogen fluoride	ND	284	ug	KNOX 0050/26A Mod	10/19/06	6296301
		Dilution Factor: 284.3		MDL.....: 284		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET RUN 3 THIMBLE

General Chemistry

Lot-Sample #...: H6J100230-009 Work Order #...: JF4F0 Matrix.....: AIR
Date Sampled...: 10/06/06 Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Particulates (total)	5860	0.50	mg	CFR60A 5	10/13-10/20/06	6289129
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET RUN 3 ACETONE FW

General Chemistry

Lot-Sample #...: H6J100230-010

Work Order #...: JF4F1

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Particulates (total)	42.9	0.50	mg	CFR60A 5	10/13-10/20/06	6289129
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET RUN 3 ACIDIC IMP

General Chemistry

Lot-Sample #...: H6J100230-011

Work Order #...: JF4F4

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Hydrogen bromide	611	430	ug	KNOX 0050/26A Mod	10/18/06	6292450
		Dilution Factor: 430.36		MDL.....: 51.6		
Hydrogen chloride	48700	4370	ug	KNOX 0050/26A Mod	10/18/06	6296221
		Dilution Factor: 4370.8		MDL.....: 1310		
Hydrogen fluoride	1850	448	ug	KNOX 0050/26A Mod	10/18/06	6296079
		Dilution Factor: 447.5		MDL.....: 448		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET RUN 3 ALKALINE IMP

General Chemistry

Lot-Sample #...: H6J100230-012

Work Order #...: JF4F6

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Bromine	ND	280	ug	KNOX 0050/26A Mod	10/19/06	6299332
		Dilution Factor: 280		MDL.....: 33.6		
Chlorine	238 B	560	ug	KNOX 0050/26A Mod	10/19/06	6296411
		Dilution Factor: 560		MDL.....: 168		
Hydrogen fluoride	ND	295	ug	KNOX 0050/26A Mod	10/19/06	6296301
		Dilution Factor: 294.9		MDL.....: 295		

NOTE(S) :

RL Reporting Limit

B Estimated result. Result is less than RL.

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 INLET RUN 3 ALKALINE IMP

General Chemistry

Lot-Sample #...: H6J100230-012

Work Order #...: JF4F6

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Bromine	ND	280	ug	KNOX 0050/26A Mod	10/19/06	6299332
		Dilution Factor: 280		MDL.....: 33.6		
Chlorine	238 B	560	ug	KNOX 0050/26A Mod	10/19/06	6296411
		Dilution Factor: 560		MDL.....: 168		
Hydrogen fluoride	ND	295	ug	KNOX 0050/26A Mod	10/19/06	6296301
		Dilution Factor: 294.9		MDL.....: 295		

NOTE(S) :

RL Reporting Limit

B Estimated result. Result is less than RL.

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 1 FILTER

General Chemistry

Lot-Sample #...: H6J100230-013

Work Order #...: JF4F8

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Particulates (total)	426	0.50	mg	CFR60A 5	10/13-10/20/06	6289129
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 1 ACETONE FW

General Chemistry

Lot-Sample #...: H6J100230-014

Work Order #...: JF4GC

Matrix.....: AIR

Date Sampled...: 10/05/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Particulates (total)	64.7	0.50	mg	CFR60A 5	10/13-10/20/06	6289129
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 1 ACIDIC IMP

General Chemistry

Lot-Sample #...: H6J100230-015
 Date Sampled...: 10/05/06

Work Order #...: JF4GH
 Date Received...: 10/09/06

Matrix.....: AIR

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Hydrogen bromide	600	334	ug	KNOX 0050/26A Mod 10/18/06 MDL.....: 40.1	10/18/06	6292450
		Dilution Factor: 334.16				
Hydrogen chloride	45200	3390	ug	KNOX 0050/26A Mod 10/18/06 MDL.....: 1020	10/18/06	6296221
		Dilution Factor: 3393.8				
Hydrogen fluoride	4460	348	ug	KNOX 0050/26A Mod 10/18/06 MDL.....: 348	10/18/06	6296079
		Dilution Factor: 347.5				

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 1 ALKALINE IMP

General Chemistry

Lot-Sample #...: H6J100230-016
 Date Sampled...: 10/05/06

Work Order #...: JF4GL
 Date Received...: 10/09/06

Matrix.....: AIR

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Bromine	ND	270	ug	KNOX 0050/26A Mod	10/19/06	6299332
		Dilution Factor: 270		MDL.....: 32.4		
Chlorine	494 B	540	ug	KNOX 0050/26A Mod	10/19/06	6296411
		Dilution Factor: 540		MDL.....: 162		
Hydrogen fluoride	ND	284	ug	KNOX 0050/26A Mod	10/19/06	6296301
		Dilution Factor: 284.3		MDL.....: 284		

NOTE(S) :

RL Reporting Limit

B Estimated result. Result is less than RL.

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 2 FILTER

General Chemistry

Lot-Sample #...: H6J100230-017
Date Sampled...: 10/06/06Work Order #...: JF4GP
Date Received...: 10/09/06

Matrix.....: AIR

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Particulates (total)	399	0.50	mg	CFR60A 5	10/13-10/20/06	6289129
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 2 ACETONE FW

General Chemistry

Lot-Sample #...: H6J100230-018
Date Sampled...: 10/06/06Work Order #...: JF4GQ
Date Received...: 10/09/06

Matrix.....: AIR

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Particulates (total)	63.6	0.50	mg	CFR60A 5	10/13-10/20/06	6289129
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 2 ACIDIC IMP

General Chemistry

Lot-Sample #...: H6J100230-019 Work Order #...: JF4GT Matrix.....: AIR
 Date Sampled...: 10/06/06 Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Hydrogen bromide	798	334	ug	KNOX 0050/26A Mod 10/18/06		6292450
		Dilution Factor: 334.16		MDL.....: 40.1		
Hydrogen chloride	53300	3390	ug	KNOX 0050/26A Mod 10/18/06		6296221
		Dilution Factor: 3393.8		MDL.....: 1020		
Hydrogen fluoride	5260	348	ug	KNOX 0050/26A Mod 10/18/06		6296079
		Dilution Factor: 347.5		MDL.....: 348		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 2 ALKALINE IMP

General Chemistry

Lot-Sample #...: H6J100230-020
Date Sampled...: 10/06/06Work Order #...: JF4GW
Date Received...: 10/09/06

Matrix.....: AIR

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Bromine	ND	270	ug	KNOX 0050/26A Mod	10/19/06	6299332
		Dilution Factor: 270		MDL.....: 32.4		
Chlorine	221 B	540	ug	KNOX 0050/26A Mod	10/24/06	6298118
		Dilution Factor: 540		MDL.....: 162		
Hydrogen fluoride	ND	284	ug	KNOX 0050/26A Mod	10/19/06	6296301
		Dilution Factor: 284.3		MDL.....: 284		

NOTE(S) :

RL Reporting Limit

B Estimated result. Result is less than RL.

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 3 FILTER

General Chemistry

Lot-Sample #...: H6J100230-021
Date Sampled...: 10/06/06Work Order #...: JF4G0
Date Received...: 10/09/06

Matrix.....: AIR

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Particulates (total)	425	0.50	mg	CFR60A 5	10/13-10/20/06	6289129
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 3 ACETONE FW

General Chemistry

Lot-Sample #...: H6J100230-022

Work Order #...: JF4G1

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Particulates (total)	120	0.50	mg	CFR60A 5	10/13-10/20/06	6289129
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 3 ACIDIC IMP

General Chemistry

Lot-Sample #...: H6J100230-023

Work Order #...: JF4G3

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Hydrogen bromide	662	344	ug	KNOX 0050/26A Mod 10/18/06		6292450
		Dilution Factor: 344.29		MDL.....: 41.3		
Hydrogen chloride	48800	3500	ug	KNOX 0050/26A Mod 10/18/06		6296221
		Dilution Factor: 3496.7		MDL.....: 1050		
Hydrogen fluoride	5010	358	ug	KNOX 0050/26A Mod 10/18/06		6296079
		Dilution Factor: 358		MDL.....: 358		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN 3 ALKALINE IMP

General Chemistry

Lot-Sample #...: H6J100230-024

Work Order #...: JF4G5

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Bromine	ND	265	ug	KNOX 0050/26A Mod	10/19/06	6299332
		Dilution Factor: 265		MDL.....: 31.8		
Chlorine	376 B	530	ug	KNOX 0050/26A Mod	10/19/06	6296411
		Dilution Factor: 530		MDL.....: 159		
Hydrogen fluoride	ND	279	ug	KNOX 0050/26A Mod	10/19/06	6296301
		Dilution Factor: 279.1		MDL.....: 279		

NOTE(S) :

RL Reporting Limit

B Estimated result. Result is less than RL.

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN BLANK ACETONE

General Chemistry

Lot-Sample #...: H6J100230-025 Work Order #...: JF4G7 Matrix.....: AIR
Date Sampled...: 10/06/06 Date Received...: 10/09/06

<u>PARAMETER</u>	<u>RESULT</u>	<u>RL</u>	<u>UNITS</u>	<u>METHOD</u>	<u>PREPARATION- ANALYSIS DATE</u>	<u>PREP BATCH #</u>
Particulates (total)	3.7	0.50	mg	CFR60A 5	10/13-10/20/06	6289129
		Dilution Factor: 1		MDL.....: 0.50		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN BLANK H2SO4

General Chemistry

Lot-Sample #...: H6J100230-026

Work Order #...: JF4HD

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Hydrogen bromide	ND	101	ug	KNOX 0050/26A Mod 10/18/06	10/18/06	6292450
		Dilution Factor: 101.26		MDL.....: 12.2		
Hydrogen chloride	ND	514	ug	KNOX 0050/26A Mod 10/19/06	10/19/06	6296291
		Dilution Factor: 514.2		MDL.....: 154		
Hydrogen fluoride	ND	105	ug	KNOX 0050/26A Mod 10/18/06	10/18/06	6296079
		Dilution Factor: 105.3		MDL.....: 105		

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN BLANK NAOH

General Chemistry

Lot-Sample #...: H6J100230-027

Work Order #...: JF4HG

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Bromine	ND	100	ug	KNOX 0050/26A Mod	10/19/06	6299332
		Dilution Factor: 100		MDL.....: 12.0		
Chlorine	37.4 B	100	ug	KNOX 0050/26A Mod	10/19/06	6296411
		Dilution Factor: 100		MDL.....: 30.0		
Hydrogen fluoride	ND	105	ug	KNOX 0050/26A Mod	10/19/06	6296301
		Dilution Factor: 105.3		MDL.....: 105		

NOTE(S) :

RL Reporting Limit

B Estimated result. Result is less than RL.

Air Sampling Associates, Inc.

Client Sample ID: UNIT NO.2 STACK RUN BLANK DI WATER

General Chemistry

Lot-Sample #...: H6J100230-028

Work Order #...: JF4HL

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received..: 10/09/06

PARAMETER	RESULT	RL	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Hydrogen bromide	ND	101	ug	KNOX 0050/26A Mod	10/18/06	6292450
		Dilution Factor: 101.26		MDL.....: 12.2		
Hydrogen chloride	ND	103	ug	KNOX 0050/26A Mod	10/18/06	6296221
		Dilution Factor: 102.8		MDL.....: 30.8		
Hydrogen fluoride	ND	105	ug	KNOX 0050/26A Mod	10/18/06	6296079
		Dilution Factor: 105.3		MDL.....: 105		

QC Summary

METHOD BLANK REPORT

General Chemistry

Client Lot #...: H6J100230

Matrix.....: AIR

PARAMETER	RESULT	REPORTING LIMIT	UNITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Bromine	ND	Work Order #: JHAD31AA 10.0	ug	MB Lot-Sample #: H6J260000-332 KNOX 0050/26A Mod 10/19/06		6299332
		Dilution Factor: 10				
Chlorine	ND	Work Order #: JG3NF1AA 10.0	ug	MB Lot-Sample #: H6J230000-411 KNOX 0050/26A Mod 10/19/06		6296411
		Dilution Factor: 10				
Chlorine	ND	Work Order #: JG6PG1AA 10.0	ug	MB Lot-Sample #: H6J250000-118 KNOX 0050/26A Mod 10/24/06		6298118
		Dilution Factor: 10				
Hydrogen bromide	ND	Work Order #: JGR9C1AA 10.1	ug	MB Lot-Sample #: H6J190000-450 KNOX 0050/26A Mod 10/18/06		6292450
		Dilution Factor: 10.13				
Hydrogen chloride	ND	Work Order #: JG26M1AA 10.3	ug	MB Lot-Sample #: H6J230000-221 KNOX 0050/26A Mod 10/18/06		6296221
		Dilution Factor: 10.3				
Hydrogen chloride	ND	Work Order #: JG3DW1AA 10.3	ug	MB Lot-Sample #: H6J230000-291 KNOX 0050/26A Mod 10/19/06		6296291
		Dilution Factor: 10.3				
Hydrogen fluoride	ND	Work Order #: JG2W71AA 10.5	ug	MB Lot-Sample #: H6J230000-079 KNOX 0050/26A Mod 10/18/06		6296079
		Dilution Factor: 10.5				
Hydrogen fluoride	ND	Work Order #: JG3FG1AA 10.5	ug	MB Lot-Sample #: H6J230000-301 KNOX 0050/26A Mod 10/19/06		6296301
		Dilution Factor: 10.5				

NOTE (S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

LABORATORY CONTROL SAMPLE EVALUATION REPORT

General Chemistry

Lot-Sample #...: H6J100230

Matrix.....: AIR

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD	RPD LIMITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Bromine		WO#:JHAD31AC-LCS/JHAD31AD-LCSD LCS Lot-Sample#: H6J260000-332					
	98	(90 - 110)			KNOX 0050/26A Mod	10/19/06	6299332
	99	(90 - 110)	1.2	(0-20)	KNOX 0050/26A Mod	10/19/06	6299332
		Dilution Factor: 1					
Chlorine		WO#:JG3NF1AC-LCS/JG3NF1AD-LCSD LCS Lot-Sample#: H6J230000-411					
	102	(90 - 110)			KNOX 0050/26A Mod	10/19/06	6296411
	100	(90 - 110)	2.6	(0-20)	KNOX 0050/26A Mod	10/19/06	6296411
		Dilution Factor: 1					
Chlorine		WO#:JG6PG1AC-LCS/JG6PG1AD-LCSD LCS Lot-Sample#: H6J250000-118					
	101	(90 - 110)			KNOX 0050/26A Mod	10/24/06	6298118
	102	(90 - 110)	1.3	(0-20)	KNOX 0050/26A Mod	10/24/06	6298118
		Dilution Factor: 1					
Hydrogen bromide		WO#:JGR9C1AC-LCS/JGR9C1AD-LCSD LCS Lot-Sample#: H6J190000-450					
	100	(90 - 110)			KNOX 0050/26A Mod	10/18/06	6292450
	98	(90 - 110)	1.2	(0-20)	KNOX 0050/26A Mod	10/18/06	6292450
		Dilution Factor: 1					
Hydrogen chloride		WO#:JG26M1AC-LCS/JG26M1AD-LCSD LCS Lot-Sample#: H6J230000-221					
	101	(90 - 110)			KNOX 0050/26A Mod	10/18/06	6296221
	101	(90 - 110)	0.12	(0-20)	KNOX 0050/26A Mod	10/18/06	6296221
		Dilution Factor: 1					
Hydrogen chloride		WO#:JG3DW1AC-LCS/JG3DW1AD-LCSD LCS Lot-Sample#: H6J230000-291					
	102	(90 - 110)			KNOX 0050/26A Mod	10/19/06	6296291
	100	(90 - 110)	2.7	(0-20)	KNOX 0050/26A Mod	10/19/06	6296291
		Dilution Factor: 1					
Hydrogen fluoride		WO#:JG2W71AC-LCS/JG2W71AD-LCSD LCS Lot-Sample#: H6J230000-079					
	102	(90 - 110)			KNOX 0050/26A Mod	10/18/06	6296079
	103	(90 - 110)	0.24	(0-20)	KNOX 0050/26A Mod	10/18/06	6296079
		Dilution Factor: 1					
Hydrogen fluoride		WO#:JG3FG1AC-LCS/JG3FG1AD-LCSD LCS Lot-Sample#: H6J230000-301					
	102	(90 - 110)			KNOX 0050/26A Mod	10/19/06	6296301
	102	(90 - 110)	0.37	(0-20)	KNOX 0050/26A Mod	10/19/06	6296301
		Dilution Factor: 1					

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LABORATORY CONTROL SAMPLE EVALUATION REPORT

General Chemistry

Lot-Sample #...: H6J100230

Matrix.....: AIR

<u>PARAMETER</u>	<u>PERCENT</u> <u>RECOVERY</u>	<u>RECOVERY</u> <u>LIMITS</u>	<u>RPD</u> <u>RPD</u>	<u>LIMITS</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>PREP</u> <u>BATCH #</u>
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NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

LABORATORY CONTROL SAMPLE DATA REPORT

General Chemistry

Lot-Sample #...: H6J100230

Matrix.....: AIR

PARAMETER	SPIKE AMOUNT	MEASURED AMOUNT	UNITS	PERCNT RECVRY	RPD	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Bromine								
						WO#:JHAD31AC-LCS/JHAD31AD-LCSD	LCS Lot-Sample#: H6J260000-332	
	75.0	73.4	ug	98		KNOX 0050/26A Mod	10/19/06	6299332
	75.0	74.3	ug	99	1.2	KNOX 0050/26A Mod	10/19/06	6299332
						Dilution Factor: 1		
Chlorine								
						WO#:JG3NF1AC-LCS/JG3NF1AD-LCSD	LCS Lot-Sample#: H6J230000-411	
	75.0	76.8	ug	102		KNOX 0050/26A Mod	10/19/06	6296411
	75.0	74.8	ug	100	2.6	KNOX 0050/26A Mod	10/19/06	6296411
						Dilution Factor: 1		
Chlorine								
						WO#:JG6PG1AC-LCS/JG6PG1AD-LCSD	LCS Lot-Sample#: H6J250000-118	
	75.0	75.5	ug	101		KNOX 0050/26A Mod	10/24/06	6298118
	75.0	76.5	ug	102	1.3	KNOX 0050/26A Mod	10/24/06	6298118
						Dilution Factor: 1		
Hydrogen bromide								
						WO#:JGR9C1AC-LCS/JGR9C1AD-LCSD	LCS Lot-Sample#: H6J190000-450	
	75.9	75.6	ug	100		KNOX 0050/26A Mod	10/18/06	6292450
	75.9	74.7	ug	98	1.2	KNOX 0050/26A Mod	10/18/06	6292450
						Dilution Factor: 1		
Hydrogen chloride								
						WO#:JG26M1AC-LCS/JG26M1AD-LCSD	LCS Lot-Sample#: H6J230000-221	
	77.1	77.5	ug	101		KNOX 0050/26A Mod	10/18/06	6296221
	77.1	77.6	ug	101	0.12	KNOX 0050/26A Mod	10/18/06	6296221
						Dilution Factor: 1		
Hydrogen chloride								
						WO#:JG3DW1AC-LCS/JG3DW1AD-LCSD	LCS Lot-Sample#: H6J230000-291	
	77.1	79.0	ug	102		KNOX 0050/26A Mod	10/19/06	6296291
	77.1	76.9	ug	100	2.7	KNOX 0050/26A Mod	10/19/06	6296291
						Dilution Factor: 1		
Hydrogen fluoride								
						WO#:JG2W71AC-LCS/JG2W71AD-LCSD	LCS Lot-Sample#: H6J230000-079	
	79.0	80.9	ug	102		KNOX 0050/26A Mod	10/18/06	6296079
	79.0	81.1	ug	103	0.24	KNOX 0050/26A Mod	10/18/06	6296079
						Dilution Factor: 1		
Hydrogen fluoride								
						WO#:JG3FG1AC-LCS/JG3FG1AD-LCSD	LCS Lot-Sample#: H6J230000-301	
	79.0	80.6	ug	102		KNOX 0050/26A Mod	10/19/06	6296301
	79.0	80.9	ug	102	0.37	KNOX 0050/26A Mod	10/19/06	6296301
						Dilution Factor: 1		

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LABORATORY CONTROL SAMPLE DATA REPORT

General Chemistry

Lot-Sample #...: H6J100230

Matrix.....: AIR

<u>PARAMETER</u>	<u>SPIKE</u> <u>AMOUNT</u>	<u>MEASURED</u> <u>AMOUNT</u>	<u>UNITS</u>	<u>PERCNT</u> <u>RECVRY</u>	<u>RPD</u>	<u>METHOD</u>	<u>PREPARATION-</u> <u>ANALYSIS DATE</u>	<u>PREP</u> <u>BATCH #</u>
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NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE SAMPLE EVALUATION REPORT

General Chemistry

Client Lot #...: H6J100230

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	PERCENT RECOVERY	RECOVERY LIMITS	RPD	RPD LIMITS	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Bromine			WO#: JF4FW1AF-MS/JF4FW1AG-MSD MS Lot-Sample #: H6J100230-008				
	102	(75 - 125)			KNOX 0050/26A Mod	10/19/06	6299332
	103	(75 - 125)	0.36	(0-20)	KNOX 0050/26A Mod	10/19/06	6299332
			Dilution Factor: 1				
Chlorine			WO#: JF4FW1AC-MS/JF4FW1AD-MSD MS Lot-Sample #: H6J100230-008				
	96	(75 - 125)			KNOX 0050/26A Mod	10/19/06	6296411
	92	(75 - 125)	4.2	(0-20)	KNOX 0050/26A Mod	10/19/06	6296411
			Dilution Factor: 1				
Hydrogen bromide			WO#: JF4FT1AF-MS/JF4FT1AG-MSD MS Lot-Sample #: H6J100230-007				
	98	(75 - 125)			KNOX 0050/26A Mod	10/18/06	6292450
	105	(75 - 125)	4.1	(0-20)	KNOX 0050/26A Mod	10/18/06	6292450
			Dilution Factor: 1				
Hydrogen chloride			WO#: JF4FT1AC-MS/JF4FT1AD-MSD MS Lot-Sample #: H6J100230-007				
	97	(75 - 125)			KNOX 0050/26A Mod	10/18/06	6296221
	107	(75 - 125)	1.6	(0-20)	KNOX 0050/26A Mod	10/18/06	6296221
			Dilution Factor: 1				
Hydrogen fluoride			WO#: JF4FT1AJ-MS/JF4FT1AK-MSD MS Lot-Sample #: H6J100230-007				
	109	(75 - 125)			KNOX 0050/26A Mod	10/18/06	6296079
	109	(75 - 125)	0.0	(0-20)	KNOX 0050/26A Mod	10/18/06	6296079
			Dilution Factor: 1				
Hydrogen fluoride			WO#: JF4FW1AJ-MS/JF4FW1AK-MSD MS Lot-Sample #: H6J100230-008				
	82	(75 - 125)			KNOX 0050/26A Mod	10/19/06	6296301
	81	(75 - 125)	1.7	(0-20)	KNOX 0050/26A Mod	10/19/06	6296301
			Dilution Factor: 1				

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE SAMPLE DATA REPORT

General Chemistry

Client Lot #...: H6J100230

Matrix.....: AIR

Date Sampled...: 10/06/06

Date Received...: 10/09/06

PARAMETER	SAMPLE AMOUNT	SPIKE AMT	MEASRD AMOUNT	UNITS	PERCNT RECVRY	RPD	METHOD	PREPARATION- ANALYSIS DATE	PREP BATCH #
Bromine									
WO#: JF4FW1AF-MS/JF4FW1AG-MSD MS Lot-Sample #: H6J100230-008									
	ND	540	552	ug	102		KNOX 0050/26A	10/19/06	6299332
	ND	540	554	ug	103	0.36	KNOX 0050/26A	10/19/06	6299332
Dilution Factor: 1									
Chlorine									
WO#: JF4FW1AC-MS/JF4FW1AD-MSD MS Lot-Sample #: H6J100230-008									
	ND	1080	1040	ug	96		KNOX 0050/26A	10/19/06	6296411
	ND	1080	997	ug	92	4.2	KNOX 0050/26A	10/19/06	6296411
Dilution Factor: 1									
Hydrogen bromide									
WO#: JF4FT1AF-MS/JF4FT1AG-MSD MS Lot-Sample #: H6J100230-007									
	759	932	1670	ug	98		KNOX 0050/26A	10/18/06	6292450
	759	932	1740	ug	105	4.1	KNOX 0050/26A	10/18/06	6292450
Dilution Factor: 1									
Hydrogen chloride									
WO#: JF4FT1AC-MS/JF4FT1AD-MSD MS Lot-Sample #: H6J100230-007									
	46600	9460	55800	ug	97		KNOX 0050/26A	10/18/06	6296221
	46600	9460	56700	ug	107	1.6	KNOX 0050/26A	10/18/06	6296221
Dilution Factor: 1									
Hydrogen fluoride									
WO#: JF4FT1AJ-MS/JF4FT1AK-MSD MS Lot-Sample #: H6J100230-007									
	1930	969	2990	ug	109		KNOX 0050/26A	10/18/06	6296079
	1930	969	2990	ug	109	0.0	KNOX 0050/26A	10/18/06	6296079
Dilution Factor: 1									
Hydrogen fluoride									
WO#: JF4FW1AJ-MS/JF4FW1AK-MSD MS Lot-Sample #: H6J100230-008									
	ND	569	468	ug	82		KNOX 0050/26A	10/19/06	6296301
	ND	569	460	ug	81	1.7	KNOX 0050/26A	10/19/06	6296301
Dilution Factor: 1									

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

Raw Data

Anions

1 CAL STD #1 ICWS-8915

Sample Name: CAL STD #1 ICWS-8915
 Vial Number: 1292
 Sample Type: standard
 Control Program: AS14A ANIONS METHOD
 Quantif. Method: AS4A-SC ANION METHOD
 Recording Time: 10/18/2006 9:14
 Run Time (min): 15.00

Injection Volume: 50.0
 Channel: ECD_1
 Wavelength: n.a.
 Bandwidth: n.a.
 Dilution Factor: 1.0000
 Sample Weight: 1.0000
 Sample Amount: 1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S} \cdot \text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	0.20347	0.035	16.69	0.0752	BMB
2	4.61	Chloride	0.21212	0.036	16.87	0.0964	BMB
3	5.37	Nitrite-N	0.30167	0.057	26.98	0.0791	BMB
4	6.67	Bromide	0.05610	0.011	5.39	0.0791	BMB
5	7.47	Nitrate-N	0.28758	0.072	34.07	0.0828	BMB

2 CAL STD #2 ICWS-8916

Sample Name: CAL STD #2 ICWS-8916
Vial Number: 1293
Sample Type: standard
Control Program: AS14A ANIONS METHOD
Quantif. Method: AS4A-SC ANION METHOD
Recording Time: 10/18/2006 9:32
Run Time (min): 15.00

Injection Volume: 50.0
Channel: ECD_1
Wavelength: n.a.
Bandwidth: n.a.
Dilution Factor: 1.0000
Sample Weight: 1.0000
Sample Amount: 1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S} \cdot \text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	0.09910	0.019	6.45	n.a.	BMB
2	3.26	Fluoride	0.26277	0.046	15.73	0.0970	BMB
3	4.61	Chloride	0.23228	0.052	17.83	0.1055	BMB
4	5.37	Nitrite-N	0.38584	0.072	24.74	0.1012	BMB
5	6.68	Bromide	0.06928	0.015	5.09	0.0977	BMB
6	7.47	Nitrate-N	0.35086	0.088	30.16	0.1009	BMB

3 CAL STD #3 ICWS-8917

Sample Name: CAL STD #3 ICWS-8917
 Vial Number: 1293
 Sample Type: standard
 Control Program: AS14A ANIONS METHOD
 Quantif. Method: AS4A-SC ANION METHOD
 Recording Time: 10/18/2006 9:49
 Run Time (min): 15.00

Injection Volume: 50.0
 Channel: ECD_1
 Wavelength: n.a.
 Bandwidth: n.a.
 Dilution Factor: 1.0000
 Sample Weight: 1.0000
 Sample Amount: 1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S} \cdot \text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	0.09667	0.019	2.79	n.a.	BMB
2	3.26	Fluoride	0.66838	0.127	18.21	0.2438	BMB
3	4.60	Chloride	0.56206	0.103	14.73	0.2548	BMB
4	5.37	Nitrite-N	0.95211	0.184	26.44	0.2484	BMB
5	6.66	Bromide	0.17667	0.040	5.79	0.2488	BMB
6	7.46	Nitrate-N	0.87649	0.223	32.04	0.2502	BMB

4 CAL STD #4 ICWS-8918

Sample Name: CAL STD #4 ICWS-8918
Vial Number: 1295
Sample Type: standard
Control Program: AS14A ANIONS METHOD
Quantif. Method: AS4A-SC ANION METHOD
Recording Time: 10/18/2006 10:07
Run Time (min): 15.00

Injection Volume: 50.0
Channel: ECD_1
Wavelength: n.a.
Bandwidth: n.a.
Dilution Factor: 1.0000
Sample Weight: 1.0000
Sample Amount: 1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	0.10012	0.018	1.29	n.a.	BMB
2	3.26	Fluoride	1.39754	0.256	18.63	0.4996	BMB
3	4.61	Chloride	1.09898	0.191	13.89	0.4964	BM
4	5.37	Nitrite-N	1.94194	0.385	27.97	0.5022	M
5	6.67	Bromide	0.35570	0.078	5.68	0.4998	MB
6	7.46	Nitrate-N	1.76858	0.448	32.55	0.4985	BMB

5 CAL STD #5 ICWS-8919

Sample Name: CAL STD #5 ICWS-8919
Vial Number: 1295
Sample Type: standard
Control Program: AS14A ANIONS METHOD
Quantif. Method: AS4A-SC ANION METHOD
Recording Time: 10/18/2006 10:24
Run Time (min): 15.00

Injection Volume: 50.0
Channel: ECD_1
Wavelength: n.a.
Bandwidth: n.a.
Dilution Factor: 1.0000
Sample Weight: 1.0000
Sample Amount: 1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	0.13527	0.026	0.94	n.a.	BMB
2	3.26	Fluoride	2.91620	0.530	19.16	1.0032	BM
3	4.61	Chloride	2.22320	0.373	13.49	0.9966	M
4	5.37	Nitrite-N	3.92501	0.773	27.95	0.9983	MB
5	6.67	Bromide	0.71491	0.156	5.62	1.0005	Ru
6	7.45	Nitrate-N	3.63765	0.908	32.83	0.9998	BMB

6 CAL STD #6 ICWS-8920

Sample Name: CAL STD #6 ICWS-8920
Vial Number: 1295
Sample Type: standard
Control Program: AS14A ANIONS METHOD
Quantif. Method: AS4A-SC ANION METHOD
Recording Time: 10/18/2006 10:41
Run Time (min): 15.00

Injection Volume: 50.0
Channel: ECD_1
Wavelength: n.a.
Bandwidth: n.a.
Dilution Factor: 1.0000
Sample Weight: 1.0000
Sample Amount: 1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	0.15975	0.030	0.53	n.a.	BMB
2	3.25	Fluoride	6.24513	1.086	19.22	1.9994	BM
3	4.60	Chloride	4.53115	0.754	13.35	2.0009	M
4	5.37	Nitrite-N	8.12633	1.598	28.28	2.0003	M
5	6.66	Bromide	1.44051	0.306	5.42	1.9999	Ru
6	7.43	Nitrate-N	7.63891	1.876	33.19	2.0001	MB

~~4 CAL STD #4 ICWS-8918~~Dkn
10/19/06

Sample Name: CAL STD #4 ICWS-8918
 Vial Number: 1295
 Sample Type: standard
 Control Program: AS14A ANIONS METHOD
 Quantif. Method: AS4A-SC ANION METHOD
 Recording Time: #####
 Run Time (min): 15.00

Injection Volume: 50.0
 Channel: ECD_1
 Wavelength: n.a.
 Bandwidth: n.a.
 Dilution Factor: 1.0000
 Sample Weight: 1.0000
 Sample Amount: 1.0000

No.	Ret.Time min	Peak Name	Cal.Type	Points	R-Square	Offset	Slope	Curve
1	2.25	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2	3.26	Fluoride	Quad	6	✓ 1.0000	0.000000	2.68877	0.217432
3	4.61	Chloride	Quad	6	0.9998	0.000000	2.19733	0.033578
4	5.37	Nitrite-N	Quad	6	1.0000	0.000000	3.80119	0.130678
5	6.67	Bromide	Quad	6	1.0000	0.000000	0.70878	0.005755
6	7.46	Nitrate-N	Quad	6	1.0000	0.000000	3.45770	0.180759
Average:					1.0000	0.0000	2.5708	0.1136

4 CAL STD #4 ICWS-8918Dkw
10/19/06

Sample Name: CAL STD #4 ICWS-8918
 Vial Number: 1295
 Sample Type: standard
 Control Program: AS14A ANIONS METHOD
 Quantif. Method: AS4A-SC ANION METHOD
 Recording Time: #####
 Run Time (min): 15.00

Injection Volume: 50.0
 Channel: ECD_1
 Wavelength: n.a.
 Bandwidth: n.a.
 Dilution Factor: 1.0000
 Sample Weight: 1.0000
 Sample Amount: 1.0000

No.	Ret.Time min	Peak Name	Cal.Type	Points	R-Square	Offset	Slope	Curve
1	2.25	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2	3.26	Fluoride	Quad	6	1.0000	0.000000	2.68877	0.217432
3	4.61	Chloride	Quad	6	✓ 0.9998	0.000000	2.19733	0.033578
4	5.37	Nitrite-N	Quad	6	1.0000	0.000000	3.80119	0.130678
5	6.67	Bromide	Quad	6	1.0000	0.000000	0.70878	0.005755
6	7.46	Nitrate-N	Quad	6	1.0000	0.000000	3.45770	0.180759
Average:					1.0000	0.0000	2.5708	0.1136

4 CAL STD #4 ICWS-8918DPW
10/19/06

Sample Name: CAL STD #4 ICWS-8918
 Vial Number: 1295
 Sample Type: standard
 Control Program: AS14A ANIONS METHOD
 Quantif. Method: AS4A-SC ANION METHOD
 Recording Time: #####
 Run Time (min): 15.00

Injection Volume: 50.0
 Channel: ECD_1
 Wavelength: n.a.
 Bandwidth: n.a.
 Dilution Factor: 1.0000
 Sample Weight: 1.0000
 Sample Amount: 1.0000

No.	Ret.Time min	Peak Name	Cal.Type	Points	R-Square	Offset	Slope	Curve
1	2.25	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2	3.26	Fluoride	Quad	6	1.0000	0.000000	2.68877	0.217432
3	4.61	Chloride	Quad	6	0.9998	0.000000	2.19733	0.033578
4	5.37	Nitrite-N	Quad	6	✓ 1.0000	0.000000	3.80119	0.130678
5	6.67	Bromide	Quad	6	1.0000	0.000000	0.70878	0.005755
6	7.46	Nitrate-N	Quad	6	1.0000	0.000000	3.45770	0.180759
Average:					1.0000	0.0000	2.5708	0.1136

~~4~~ CAL STD #4 ICWS-8918DFW
10/19/06

Sample Name: CAL STD #4 ICWS-8918
 Vial Number: 1295
 Sample Type: standard
 Control Program: AS14A ANIONS METHOD
 Quantif. Method: AS4A-SC ANION METHOD
 Recording Time: #####
 Run Time (min): 15.00

Injection Volume: 50.0
 Channel: ECD_1
 Wavelength: n.a.
 Bandwidth: n.a.
 Dilution Factor: 1.0000
 Sample Weight: 1.0000
 Sample Amount: 1.0000

No.	Ret.Time min	Peak Name	Cal.Type	Points	R-Square	Offset	Slope	Curve
1	2.25	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2	3.26	Fluoride	Quad	6	1.0000	0.000000	2.68877	0.217432
3	4.61	Chloride	Quad	6	0.9998	0.000000	2.19733	0.033578
4	5.37	Nitrite-N	Quad	6	1.0000	0.000000	3.80119	0.130678
5	6.67	Bromide	Quad	6	✓ 1.0000	0.000000	0.70878	0.005755
6	7.46	Nitrate-N	Quad	6	1.0000	0.000000	3.45770	0.180759
Average:					1.0000	0.0000	2.5708	0.1136

← 4 CAL STD #4 ICWS-8918		<i>DFW</i> <i>10/19/06</i>	
Sample Name:	CAL STD #4 ICWS-8918	Injection Volume:	50.0
Vial Number:	1295	Channel:	ECD_1
Sample Type:	standard	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	1.0000
Recording Time:	#####	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time min	Peak Name	Cal.Type	Points	R-Square	Offset	Slope	Curve
1	2.25	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2	3.26	Fluoride	Quad	6	1.0000	0.000000	2.68877	0.217432
3	4.61	Chloride	Quad	6	0.9998	0.000000	2.19733	0.033578
4	5.37	Nitrite-N	Quad	6	1.0000	0.000000	3.80119	0.130678
5	6.67	Bromide	Quad	6	1.0000	0.000000	0.70878	0.005755
6	7.46	Nitrate-N	Quad	6	✓ 1.0000	0.000000	3.45770	0.180759
Average:					1.0000	0.0000	2.5708	0.1136

STL KNOXVILLE
PREPARATION OF FINAL WORKING STANDARD SOLUTIONS FROM VENDOR PREPARED STOCKS
WET CHEMISTRY

Date: 9/25/06 Chemist: DKW Expiration Date: 12/25/06

ID Number	Compound Name	Parent Lot Number	Parent Source	Parent Exp. Date	Parent Conc.	Aliquot Volume (ml)	Dilution Volume (ml)	Final Conc.
1. ICWT-8837	F-	17125	ERA	12/31/07	1000 ppm	5.	50	100. mg/L (ppm)
2. (intermed.)	Cl-	36065		6/30/07				
3. (calib.)	NO ₃ N	17075		7/31/07				
4. (source)	BR-	27025		2/28/07				
5.	NO ₃ N-	17026		2/28/08				
6. ICWT-8838	F-	1-385-2	SPEX	8/15/07	1000 ppm	5.	50	100. pp- (mg/L)
7. (intermed)	Cl-	1-5CL-2		3/15/07				
8. (2nd source)	NO ₃ N-	1-13NO ₃ N-2		9/15/07				
9.	BR-	1-1BR-2		4/30/07				
10.	NO ₃ N-	1-2NO ₃ N-2		5/15/07				
11.								
12.								
13.								
14.								

Reviewed By: _____

STL KNOXVILLE
PREPARATION OF FINAL WORKING STANDARD SOLUTIONS FROM VENDOR PREPARED STOCKS
WET CHEMISTRY

Date: 10/18/06 Chemist: WWK Expiration Date: 10/19/06

ID Number	Compound Name	Parent Lot Number	Parent Source	Parent Exp. Date	Parent Conc.	Aliquot Volume (ml)	Dilution Volume (ml)	Final Conc.
1. 10W3-8915	F-	ICWI-	WWK 8838-8837 10/18/06	12/25/06	100 ppm	0.075	100ml	0.075 ppm
2. (Cal Std ①)	Cl ⁻							
3.	NO ₂ -N							
4.	Br ⁻							
5.	NO ₃ -N							
6. 10W3-8916	F-					0.100		0.100 ppm
7. (Cal Std ②)	Cl ⁻							
8.	NO ₂ -N							
9.	Br ⁻							
10.	NO ₃ -N							
11. 10W3-8917	F-					0.250		0.250 ppm
12. (Cal Std ③)	Cl ⁻							
13.	NO ₂ -N							
14.	Br ⁻							
NO ₃ -N								

Reviewed By _____

WC031R3.DOC, 8/28/03

STL KNOXVILLE
PREPARATION OF FINAL WORKING STANDARD SOLUTIONS FROM VENDOR PREPARED STOCKS
WET CHEMISTRY

Date: 10/18/06 Chemist: WV Expiration Date: 10/19/06

ID Number	Compound Name	Parent Lot Number	Parent Source	Parent Exp. Date	Parent Conc.	Aliquot Volume (ml)	Dilution Volume (ml)	Final Conc.
1. 1WVS-8918	F-	ICWI-	8837	12/25/06	100 ppm	0.500	100 ml	0.50 ppm
2. (CAL STD (4))	Cl ⁻							
3.	NO ₃ -N							
4.	Br ⁻							
5.	NO ₃ -N							
6. 1WVS-8919	F-					1.00		1.0 ppm
7. (CAL STD (5))	Cl ⁻							
8.	NO ₃ -N							
9.	Br ⁻							
10.	NO ₃ -N							
11. 1WVS-8920	F-					2.00		2.0 ppm
12. (CAL STD (6))	Cl ⁻							
13.	NO ₃ -N							
14.	Br ⁻							
NO ₃ -N								

Reviewed By: _____

Lot #:	Analysis Date:	File ID:	ICAL File ID:	2nd
100230	09/23/06	518-100230-101306	518-100230-101306	✓
Review Items				
1. Were PM checklists (L40), Lot Summary and any applicable QAS reviewed?				✓
2. ICV within 90-110%R?				✓
3. ICB/CCB < 1/2 RL?				✓
4. CCVs/CCBs run after every 10 samples, and at end of sequence?				✓
5. Is %D ≤ 10% for each CCV?				✓
6. If CCV failed, was it rerun only once?				✓
7. LCS/LCSD analytes within 90-110%R? If no, list LCS ID:				N/A
8. Method blank < 1/2 RL? If no, list blank ID:				✓
9. Matrix spikes run at required frequency?				✓
10. Matrix spikes within 75-125% recovery? If no, list MS ID:				✓
11. Were MS run #'s assigned to all matrix spikes except reagent blanks?				✓
12. Sample analyses done within holding time (HT)? If no, list samples:				✓
13. Were results processed using correct ICAL?				✓
14. Are positive results within the calibration range?				✓
15. Is integration acceptable for all samples, QC samples and standards?				✓
16. For manual integrated standards and QC samples, are before/after chromatograms provided with initials/date/reason?				✓
17. Calculations checked for error? (Document manual calculation checks.)				✓
18. Were spreadsheets checked for transcription errors?				✓
19. Final report/F6 correct? (Verify results, RLs, units, qualifiers, DFs, dates, spikes.)				✓
20. Are all nonconformances documented and discussed in narrative?				✓
21. Appropriate air train autotext selected for narrative?				✓
22. Sample pH adjustment included in narrative?				✓
23. Audit sample results included in narrative?				✓
1st Level Reviewer: <i>WJK</i> Date: 10/23/06				2nd Level Reviewer: <i>AM/legna</i> Date: 10/27/06
$y = 0 + 2.19733(0.98403) + 0.033573(0.98403)^2$ $y = 2.16349771 + 0.032551959$ $y = 2.1960$				

Nonconformance memos are required for bold and italicized [autotext] statements; Bold = deficiency, italicized = anomaly.

WC081R2.DOC, 5/18/06

2nd Level Review by: KMW
Date: 10/27/06
No. of Significant Figures: 3

Rounded Result, ug HF = Fluoride result (ug/mL) x (MW HF/MW F) x Sample Volume (mL)
 Rounded RL, ug HF = Low Calibration Standard (ug/mL) x (MW HF/MW F) x Sample Volume (mL) x Bench Dilution
 Rounded MDL, ug HF = QuantIMS MDL (ug/mL) x Low Calibration Standard (ug/mL) / QuantIMS RL (ug/mL) x (MW HF/MW F) x Sample Volume (mL) x Bench Dilution
 QuantIMS Dilution Factor = Sample Volume (mL) x Bench Dilution x Low Calibration Standard (ug/mL) / QuantIMS RL (ug/mL) x (MW HF/MW F)
 Molecular Weight (MW) HF = 1.0079 + 18.9984 = 20.0063
 Molecular Weight (MW) F = 18.9984

Low Calibration Standard (ug/mL): 0.1 ✓

WC080r2, 4/14/06

STL Knoxville

Dionex IC Runlog Cover Page

Analyst:	CWZ	Date:	10/18/06	Sequence ID:	J18-LDWLEVEL-FCLN02BRN03-101306
Instrument:	☐ DX-600 ☒ ICS-1500 ☐ DX-320	Method:	☐ KNOX-WC-0003, SW-846 0061/7199 ☐ KNOX-WC-0005, ☐ SW-846 9056 ☐ EPA 300.0 ☐ SW-846 9057-Mod ☒ EPA 26A-Mod ☐ KNOX-WC-0014, EPA 314.0		

Preventive Maintenance	Instrument Conditions
Daily: ☒ Check pump and gas pressure ☒ Check all lines for crimping, leaks and discoloration As Needed: ☐ Change column and guard column ☐ Change column and/or guard column bed support ☐ Clean conductivity cell ☐ De-gas pump head when flow is erratic ☐ Check/replace eluant end line filter	Flow Rate = 1.00 mL/min Pressure = 1810 psi Conductance = 24.7 μ S Suppressor Current = 43 mA Eluent Generator = — mM KOH

MS/MSD Spike Information						
WO #	Compound	Spike ID	Parent Conc.	Spike Added (mL)	Final Volume (mL)	Final Conc.
JF4FT	Cl ⁻	ICWI- 8838	100 ppm	0.020 mL	10 mL	0.2 ppm
	F ⁻					
	Br ⁻					
JF4HL	Cl ⁻					
	F ⁻					
	Br ⁻					
JF4HD	Cl ⁻					
	F ⁻					
	Br ⁻					

Comments:

Br⁻ batch: 6292450F⁻ batch 6296079Cl⁻ batch: 6296221☐ Sodium Thiosulfate added to NaOH impinger samples.

Sequence: J18_LOWLEVEL_FCLNO2BRNO3_101806
 Operator: kauker

Page 1 of 81
 Printed: 10/19/2006 8:06:01 AM

Title:
 Datasource: ICS_1500_net
 Location: ICS1500
 Timebase: ICS1500
 #Samples: 38

Created: 10/18/2006 8:57:54 AM by kauker
 Last Update: 10/18/2006 3:17:04 PM by kauker

CWK
 10/19/06

No.	Name	Sample ID	Inj. Vol.	Inj. Date/Time	Dil. Factor	*Multiplier [Liters]
1	CAL STD #1 ICWS-8915		50.0	10/18/2006 9:14:56 AM	1.0000	
2	CAL STD #2 ICWS-8916		50.0	10/18/2006 9:32:20 AM	1.0000	
3	CAL STD #3 ICWS-8917		50.0	10/18/2006 9:49:45 AM	1.0000	
4	CAL STD #4 ICWS-8918		50.0	10/18/2006 10:07:09 AM	1.0000	
5	CAL STD #5 ICWS-8919		50.0	10/18/2006 10:24:33 AM	1.0000	
6	CAL STD #6 ICWS-8920		50.0	10/18/2006 10:41:57 AM	1.0000	
7	ICV/LCS ICWS-8921		50.0	10/18/2006 11:04:22 AM	1.0000	
8	ICV/LCSD ICWS-8922		50.0	10/18/2006 11:21:46 AM	1.0000	
9	ICB/METHOD BLK		50.0	10/18/2006 11:39:11 AM	1.0000	
10	H6J100230 JF4FT 1/10		50.0	10/18/2006 11:56:35 AM	10.0000	
11	H6J100230 JF4FT MS 1/10 0.2 PPM CL		50.0	10/18/2006 12:13:59 PM	10.0000	
12	H6J100230 JF4FT MSD 1/10 0.2 PPM CL		50.0	10/18/2006 12:31:24 PM	10.0000	
13	H6J100230 JF4FT 1/100		50.0	10/18/2006 12:48:48 PM	100.0000	
14	H6J100230 JF4FT MS 1/100 0.2 PPM CL		50.0	10/18/2006 1:06:12 PM	100.0000	
15	H6J100230 JF4FT MSD 1/100 0.2 PPM CL		50.0	10/18/2006 1:23:36 PM	100.0000	
16	H6J100230 JF4HL 1/10		50.0	10/18/2006 1:41:00 PM	10.0000	
17	CCV ICWS-8919		50.0	10/18/2006 1:58:25 PM	1.0000	
18	CCB		50.0	10/18/2006 2:15:49 PM	1.0000	
19	H6J100230 JF4HL MS 1/10 0.2 PPM CL		50.0	10/18/2006 2:33:13 PM	10.0000	
20	H6J100230 JF4FL 1/10		50.0	10/18/2006 2:50:37 PM	10.0000	
21	H6J100230 JF4FL 1/100		50.0	10/18/2006 3:08:02 PM	100.0000	
22	H6J100230 JF4F4 1/10		50.0	10/18/2006 3:25:26 PM	10.0000	
23	H6J100230 JF4F4 1/100		50.0	10/18/2006 3:42:50 PM	100.0000	
24	H6J100230 JF4HD 1/10		50.0	10/18/2006 4:00:14 PM	10.0000	
25	H6J100230 JF4HD MS 1/10 0.2 PPM CL		50.0	10/18/2006 4:17:38 PM	10.0000	
26	H6J100230 JF4GH 1/10		50.0	10/18/2006 4:35:03 PM	10.0000	
27	H6J100230 JF4GT 1/10		50.0	10/18/2006 4:52:27 PM	10.0000	
28	H6J100230 JF4G3 1/10		50.0	10/18/2006 5:09:51 PM	10.0000	
29	CCV ICWS-8919		50.0	10/18/2006 5:27:15 PM	1.0000	
30	CCB		50.0	10/18/2006 5:44:40 PM	1.0000	
31	H6J100230 JF4GH 1/100		50.0	10/18/2006 6:02:04 PM	100.0000	
32	H6J100230 JF4GT 1/100		50.0	10/18/2006 6:19:28 PM	100.0000	
33	H6J100230 JF4G3 1/100		50.0	10/18/2006 6:36:52 PM	100.0000	
34	H6J100230 JF4HD 1/20		50.0	10/18/2006 6:54:17 PM	20.0000	
35	H6J100230 JF4HD MS 1/20 0.2 PPM CL		50.0	10/18/2006 7:11:41 PM	20.0000	
36	CCV ICWS-8919		50.0	10/18/2006 7:29:05 PM	1.0000	
37	CCB		50.0	10/18/2006 7:46:29 PM	1.0000	
38	SHUTDOWN		50.0	10/18/2006 8:03:53 PM	1.0000	

7 ICV/LCS ICWS-8921

Sample Name:	ICV/LCS ICWS-8921	Injection Volume:	50.0
Vial Number:	1296	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	1.0000
Recording Time:	10/18/2006 11:04	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	0.10928	0.018	0.88	n.a.	BMB
2	3.25	Fluoride	2.19521	0.398	19.30	0.7687	BMB
3	4.60	Chloride	1.67510	0.279	13.54	0.7537	BMB
4	5.36	Nitrite-N	2.94321	0.582	28.25	0.7547	BMB
5	6.65	Bromide	0.53229	0.115	5.60	0.7465	BMB
6	7.44	Nitrate-N	2.68948	0.669	32.43	0.7485	BMB

JGR9C1AC HBr

JG2W71AC

JG26M1AC Cl⁻

8 ICV/LCSD ICWS-8922

Sample Name:	ICV/LCSD ICWS-8922	Injection Volume:	50.0
Vial Number:	1297	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	1.0000
Recording Time:	10/18/2006 11:21	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S} \cdot \text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	0.12823	0.024	1.16	n.a.	BMB
2	3.25	Fluoride	2.19877	0.389	18.93	0.7698	BMB
3	4.60	Chloride	1.67812	0.280	13.60	0.7550	BM
4	5.37	Nitrite-N	2.95047	0.582	28.30	0.7565	MB
5	6.66	Bromide	0.52570	0.114	5.56	0.7373	BMB
6	7.45	Nitrate-N	2.69754	0.667	32.45	0.7507	BMB

JGR9C1AD HBr

JG2W71AD

JG26M1AD Cl

9 ICB/METHOD BLK

Sample Name:	ICB/METHOD BLK	Injection Volume:	50.0
Vial Number:	1298	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	1.0000
Recording Time:	10/18/2006 11:39	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
-----	--------------------	-----------	----------------	--------------------------------------	-----------------	------------------	--------------

(ND)

JG2W71AA F-

JG26M1AA Cl-

JGR9C1AA HBr-

10 H6J100230 JF4FT 1/10

Sample Name:	H6J100230 JF4FT 1/10	Injection Volume:	50.0
Vial Number:	1294	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 11:56	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area μS*min	Rel.Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	1.10846	0.184	0.21	3.9936	BMB*
2	4.44	n.a.	0.59689	0.088	0.10	n.a.	BM *
3	4.70	Chloride	30.86555	4.420	5.07	118.8740	MB*
4	6.67	Bromide	0.11571	0.027	0.03	1.6304	BM
5	7.46	Nitrate-N	1.70936	0.418	0.48	4.8221	MB
6	10.56	n.a.	2.55480	0.779	0.89	n.a.	BM
7	11.62	n.a.	#####	81.220	93.21	n.a.	MB

(B) awk 10/18/06

10 H6J100230 JF4FT 1/10

Sample Name:	H6J100230 JF4FT 1/10	Injection Volume:	50.0
Vial Number:	1294	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 11:56	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	1.27747	0.478	0.55	4.5814	BM
2	3.80	n.a.	0.06648	0.010	0.01	n.a.	Rd
3	4.44	n.a.	0.67723	0.114	0.13	n.a.	M
4	4.70	Chloride	30.93472	4.487	5.13	119.1049	MB
5	6.67	Bromide	0.11571	0.027	0.03	1.6304	BM
6	7.46	Nitrate-N	1.70936	0.418	0.48	4.8221	MB
7	10.56	n.a.	2.55480	0.779	0.89	n.a.	BM
8	11.62	n.a.	#####	81.220	92.79	n.a.	MB

original

10 H6J100230 JF4FT 1/10

Sample Name:	H6J100230 JF4FT 1/10	Injection Volume:	50.0
Vial Number:	1294	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 11:56	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area µS*min	Rel.Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	1.27747	0.478	0.55	4.5814	BM
2	3.80	n.a.	0.06648	0.010	0.01	n.a.	Rd
3	4.44	n.a.	0.67723	0.114	0.13	n.a.	M
4	4.70	Chloride	30.93472	4.487	5.13	119.1049	MB
5	6.67	Bromide	0.11571	0.027	0.03	1.6304	BM
6	7.46	Nitrate-N	1.70936	0.418	0.48	4.8221	MB
7	10.56	n.a.	2.55480	0.779	0.89	n.a.	BM
8	11.62	n.a.	#####	81.220	92.79	n.a.	MB

10 H6J100230 JF4FT 1/10

Sample Name:	H6J100230 JF4FT 1/10	Injection Volume:	50.0
Vial Number:	1294	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 11:56	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S} \cdot \text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	1.27747	0.478	0.55	4.5814	BM
2	3.80	n.a.	0.06648	0.010	0.01	n.a.	Rd
3	4.44	n.a.	0.67723	0.114	0.13	n.a.	M
4	4.70	Chloride	30.93472	4.487	5.13	119.1049	MB
5	6.67	Bromide	0.11571	0.027	0.03	1.6304	BM
6	7.46	Nitrate-N	1.70936	0.418	0.48	4.8221	MB
7	10.56	n.a.	2.55480	0.779	0.89	n.a.	BM
8	11.62	n.a.	#####	81.220	92.79	n.a.	MB

11 H6J100230 JF4FT MS 1/10 0.2 PPM CL *10/27/06*

Sample Name:	H6J100230 JF4FT MS 1/10 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1294	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 12:13	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area μS*min	Rel.Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	1.74331	0.291	0.33	6.1753	BMB*
2	4.44	n.a.	0.70251	0.106	0.12	n.a.	BM *
3	4.69	Chloride	31.87580	4.490	5.07	122.2338	M *
4	5.38	Nitrite-N	0.93882	0.198	0.22	2.4492	MB*
5	6.67	Bromide	0.25462	0.052	0.06	3.5819	BMB
6	7.45	Nitrate-N	2.49400	0.613	0.69	6.9597	BMB
7	10.55	n.a.	2.40923	0.733	0.83	n.a.	BM
8	11.61	n.a.	#####	82.078	92.68	n.a.	MB

Ⓟ awc 10/18/06

$6.1753 - 3.9936 = 2.1817 / 2 = 109.1\%$

11 H6J100230 JF4FT MS 1/10 0.2 PPM CL *CL 10/27/06*

Sample Name:	H6J100230 JF4FT MS 1/10 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1294	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 12:13	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S} \cdot \text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	1.89105	0.554	0.62	6.6730	BM
2	3.80	n.a.	0.06247	0.009	0.01	n.a.	Rd
3	4.44	n.a.	0.76578	0.129	0.14	n.a.	M
4	4.69	Chloride	31.92887	4.522	5.09	122.4095	M
5	5.38	Nitrite-N	0.96407	0.211	0.24	2.5145	MB
6	6.67	Bromide	0.25462	0.052	0.06	3.5819	BMB
7	7.45	Nitrate-N	2.49400	0.613	0.69	6.9597	BMB
8	10.55	n.a.	2.40923	0.733	0.82	n.a.	BM
9	11.61	n.a.	#####	82.078	92.33	n.a.	MB

original

11 H6J100230 JF4FT MS 1/10 0.2 PPM CL *CL 14/27/06*

Sample Name:	H6J100230 JF4FT MS 1/10 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1294	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 12:13	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area μS*min	Rel.Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	1.89105	0.554	0.62	6.6730	BM
2	3.80	n.a.	0.06247	0.009	0.01	n.a.	Rd
3	4.44	n.a.	0.76578	0.129	0.14	n.a.	M
4	4.69	Chloride	31.92887	4.522	5.09	122.4095	M
5	5.38	Nitrite-N	0.96407	0.211	0.24	2.5145	MB
6	6.67	Bromide	0.25462	0.052	0.06	3.5819	BMB
7	7.45	Nitrate-N	2.49400	0.613	0.69	6.9597	BMB
8	10.55	n.a.	2.40923	0.733	0.82	n.a.	BM
9	11.61	n.a.	#####	82.078	92.33	n.a.	MB

$$B(-) \quad 3.5819 - 1.6304 = 1.9515 / 2.0 = 97.6\% R$$

12 H6J100230 JF4FT MSD 1/10 0.2 PPM CL *CL 10/18/06*

Sample Name:	H6J100230 JF4FT MSD 1/10 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1316	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 12:31	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area μS*min	Rel. Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	1.74304	0.289	0.33	6.1744	BMB*
2	3.80	n.a.	0.05919	0.003	0.00	n.a.	BMb*
3	4.45	n.a.	0.72209	0.112	0.13	n.a.	bM
4	4.70	Chloride	31.86460	4.494	5.08	122.1966	M
5	5.39	Nitrite-N	0.94964	0.205	0.23	2.4772	MB
6	6.68	Bromide	0.26496	0.059	0.07	3.7270	BM
7	7.46	Nitrate-N	2.48971	0.607	0.69	6.9481	MB
8	10.57	n.a.	2.47131	0.752	0.85	n.a.	BM
9	11.62	n.a.	#####	81.943	92.63	n.a.	MB

(B) CWK 10/18/06

default_letter/Integration

$$F = \frac{6.1744}{6.1744 + 3.9936} = 2.1808$$

$$2.1808 \times 100 = 109.0\% R$$

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 Version 6.50 SP4 Build 1000

12 H6J100230 JF4FT MSD 1/10 0.2 PPM CL *EW 10/17/06*

Sample Name:	H6J100230 JF4FT MSD 1/10 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1316	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 12:31	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	1.85456	0.453	0.51	6.5505	BM
2	3.80	n.a.	0.17487	0.041	0.05	n.a.	MB
3	4.45	n.a.	0.72209	0.112	0.13	n.a.	bM
4	4.70	Chloride	31.86460	4.494	5.07	122.1966	M
5	5.39	Nitrite-N	0.94964	0.205	0.23	2.4772	MB
6	6.68	Bromide	0.26496	0.059	0.07	3.7270	BM
7	7.46	Nitrate-N	2.48971	0.607	0.68	6.9481	MB
8	10.57	n.a.	2.47131	0.752	0.85	n.a.	BM
9	11.62	n.a.	#####	81.943	92.42	n.a.	MB

original

12 H6J100230 JF4FT MSD 1/10 0.2 PPM CL *EW 10/27/06*

Sample Name:	H6J100230 JF4FT MSD 1/10 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1316	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 12:31	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area μS*min	Rel.Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	1.74304	0.289	0.33	6.1744	BMB*
2	3.80	n.a.	0.05919	0.003	0.00	n.a.	BMb*
3	4.45	n.a.	0.72209	0.112	0.13	n.a.	bM
4	4.70	Chloride	31.86460	4.494	5.08	122.1966	M
5	5.39	Nitrite-N	0.94964	0.205	0.23	2.4772	MB
6	6.68	Bromide	0.26496	0.059	0.07	3.7270	BM
7	7.46	Nitrate-N	2.48971	0.607	0.69	6.9481	MB
8	10.57	n.a.	2.47131	0.752	0.85	n.a.	BM
9	11.62	n.a.	#####	81.943	92.63	n.a.	MB

13 H6J100230 JF4FT 1/100

Sample Name:	H6J100230 JF4FT 1/100	Injection Volume:	50.0
Vial Number:	1317	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	100.0000
Recording Time:	10/18/2006 12:48	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area μS*min	Rel. Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	0.10400	0.016	0.23	3.8559	BMB
2	4.61	Chloride	2.19605	0.375	5.42	98.4603	BMB
3	7.47	Nitrate-N	0.17377	0.041	0.60	5.0125	BMB
4	10.57	n.a.	0.20602	0.066	0.96	n.a.	BMB
5	11.79	n.a.	19.76664	6.411	92.79	n.a.	BMB

14 H6J100230 JF4FT MS 1/100 0.2 PPM CL

Sample Name:	H6J100230 JF4FT MS 1/100 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1317	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	100.0000
Recording Time:	10/18/2006 13:06	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area μS*min	Rel. Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	0.68398	0.132	1.77	24.9357	BMB
2	4.61	Chloride	2.63831	0.444	5.96	117.9429	BMB
3	5.37	Nitrite-N	0.80250	0.152	2.04	20.9607	BMB
4	6.67	Bromide	0.15190	0.032	0.43	21.3940	BMB
5	7.46	Nitrate-N	0.89713	0.226	3.03	25.6033	BMB
6	10.57	n.a.	0.17297	0.052	0.69	n.a.	BMB
7	11.79	n.a.	19.75977	6.411	86.07	n.a.	BMB

$$\text{Cl}^- \quad 117.9429 - 98.4603 = 19.4826 / 20 = 97.4\% \text{ R}$$

15 H6J100230 JF4FT MSD 1/100 0.2 PPM CL

Sample Name:	H6J100230 JF4FT MSD 1/100 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1317	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	100.0000
Recording Time:	10/18/2006 13:23	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area μS*min	Rel.Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	0.68748	0.131	1.75	25.0606	BMB
2	4.61	Chloride	2.68300	0.477	6.35	119.9053	BM
3	5.38	Nitrite-N	0.83153	0.165	2.19	21.7133	MB
4	6.67	Bromide	0.16959	0.042	0.56	23.8807	Ru
5	7.46	Nitrate-N	0.90764	0.229	3.05	25.8991	BMB
6	10.57	n.a.	0.16438	0.048	0.64	n.a.	BMB
7	11.78	n.a.	19.79913	6.418	85.46	n.a.	BMB

$$119.9053 - 98.4603 = 21.445 \quad |_{20} = 107.2\% R$$

16 H6J100230 JF4HL 1/10

Sample Name:	H6J100230 JF4HL 1/10	Injection Volume:	50.0
Vial Number:	1317	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 13:41	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.77	n.a.	0.13859	0.114	91.42	n.a.	BMB
2	11.87	n.a.	0.03052	0.011	8.58	n.a.	BMB

ND

17 CCV ICWS-8919

Sample Name:	CCV ICWS-8919	Injection Volume:	50.0
Vial Number:	1317	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	1.0000
Recording Time:	10/18/2006 13:58	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	0.14123	0.030	1.07	n.a.	BMB
2	3.25	Fluoride	2.95159	0.527	19.03	1.0145	BMB
3	4.61	Chloride	2.24632	0.369	13.31	1.0068	BMB
4	5.38	Nitrite-N	3.94189	0.775	27.99	1.0025	BMB
5	6.67	Bromide	0.71292	0.154	5.56	0.9978	Ru
6	7.45	Nitrate-N	3.65033	0.915	33.05	1.0031	BMB

18 CCB

Sample Name:	CCB	Injection Volume:	50.0
Vial Number:	1317	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	1.0000
Recording Time:	10/18/2006 14:15	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S} \cdot \text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
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ND

19 H6J100230 JF4HL MS 1/10 0.2 PPM CL

Sample Name:	H6J100230 JF4HL MS 1/10 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1318	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 14:33	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	2.04	n.a.	0.22782	0.249	31.52	n.a.	BMB
2	3.26	Fluoride	0.56259	0.104	13.24	2.0581	BMB*
3	4.61	Chloride	0.46528	0.074	9.37	2.1106	BMB*
4	5.38	Nitrite-N	0.78981	0.153	19.42	2.0632	BMB
5	6.67	Bromide	0.14391	0.031	3.95	2.0270	BM
6	7.47	Nitrate-N	0.70725	0.177	22.49	2.0240	MB

Ⓟ CWB 10/18/06

19 H6J100230 JF4HL MS 1/10 0.2 PPM CL

Sample Name:	H6J100230 JF4HL MS 1/10 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1318	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 14:33	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	2.04	n.a.	0.22782	0.249	24.44	n.a.	BMB
2	3.26	Fluoride	0.69227	0.333	32.73	2.5232	BMB
3	4.61	Chloride	0.46528	0.074	7.27	2.1106	bMB
4	5.38	Nitrite-N	0.78981	0.153	15.06	2.0632	BMB
5	6.67	Bromide	0.14391	0.031	3.07	2.0270	BM
6	7.47	Nitrate-N	0.70725	0.177	17.44	2.0240	MB

original

20 H6J100230 JF4FL 1/10

Sample Name:	H6J100230 JF4FL 1/10	Injection Volume:	50.0
Vial Number:	1319	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 14:50	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area μS*min	Rel.Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	0.98978	0.190	0.22	3.5776	BMB
2	4.70	Chloride	27.86589	3.917	4.48	108.7456	BMB
3	6.68	Bromide	0.07052	0.014	0.02	0.9942	BMB
4	7.47	Nitrate-N	0.25505	0.062	0.07	0.7348	BMB
5	11.62	n.a.	#####	83.318	95.22	n.a.	BMB

20 H6J100230 JF4FL 1/10

Sample Name:	H6J100230 JF4FL 1/10	Injection Volume:	50.0
Vial Number:	1319	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 14:50	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area μS*min	Rel.Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	0.98978	0.190	0.22	3.5776	BMB
2	4.70	Chloride	27.86589	3.917	4.48	108.7456	BMB
3	6.68	Bromide	0.07052	0.014	0.02	0.9942	BMB
4	7.47	Nitrate-N	0.25505	0.062	0.07	0.7348	BMB
5	11.62	n.a.	#####	83.318	95.22	n.a.	BMB

-5.00 1/100

20 H6J100230 JF4FL 1/10

Sample Name:	H6J100230 JF4FL 1/10	Injection Volume:	50.0
Vial Number:	1319	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 14:50	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	0.98978	0.190	0.22	3.5776	BMB
2	4.70	Chloride	27.86589	3.917	4.48	108.7456	BMB
3	6.68	Bromide	0.07052	0.014	0.02	0.9942	BMB
4	7.47	Nitrate-N	0.25505	0.062	0.07	0.7348	BMB
5	11.62	n.a.	#####	83.318	95.22	n.a.	BMB

21 H6J100230 JF4FL 1/100

Sample Name:	H6J100230 JF4FL 1/100	Injection Volume:	50.0
Vial Number:	1348	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	100.0000
Recording Time:	10/18/2006 15:08	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area μS*min	Rel. Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	0.08889	0.013	0.19	3.2973	BMB
2	4.61	Chloride	1.97925	0.362	5.22	88.8681	BMB
3	11.79	n.a.	20.17509	6.551	94.59	n.a.	BMB

22 H6J100230 JF4F4 1/10

Sample Name:	H6J100230 JF4F4 1/10	Injection Volume:	50.0
Vial Number:	1349	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 15:25	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area μS*min	Rel.Area (%)	Amount (mg/L)	Peak Type
1	3.27	Fluoride	1.14560	0.230	0.23	4.1232	BMB
2	4.71	Chloride	37.33006	5.144	5.13	139.9555	BMB
3	6.68	Bromide	0.10077	0.021	0.02	1.4201	BMB
4	7.48	Nitrate-N	0.17018	0.040	0.04	0.4909	BMB
5	10.56	n.a.	0.79691	0.243	0.24	n.a.	BM
6	11.60	n.a.	#####	94.502	94.33	n.a.	MB

see 1/100

22 H6J100230 JF4F4 1/10

Sample Name:	H6J100230 JF4F4 1/10	Injection Volume:	50.0
Vial Number:	1349	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 15:25	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area μS*min	Rel.Area (%)	Amount (mg/L)	Peak Type
1	3.27	Fluoride	1.14560	0.230	0.23	4.1232	BMB
2	4.71	Chloride	37.33006	5.144	5.13	139.9555	BMB
3	6.68	Bromide	0.10077	0.021	0.02	1.4201	BMB
4	7.48	Nitrate-N	0.17018	0.040	0.04	0.4909	BMB
5	10.56	n.a.	0.79691	0.243	0.24	n.a.	BM
6	11.60	n.a.	#####	94.502	94.33	n.a.	MB

23 H6J100230 JF4F4 1/100

Sample Name:	H6J100230 JF4F4 1/100	Injection Volume:	50.0
Vial Number:	1350	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	100.0000
Recording Time:	10/18/2006 15:42	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	3.25	Fluoride	0.10496	0.016	0.20	3.8913	BMB
2	4.61	Chloride	2.49004	0.450	5.68	111.4236	BMB
3	10.55	n.a.	0.06976	0.021	0.26	n.a.	BMB
4	11.78	n.a.	22.96627	7.434	93.86	n.a.	BMB

24 H6J100230 JF4HD 1/10

Sample Name:	H6J100230 JF4HD 1/10	Injection Volume:	50.0
Vial Number:	1351	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 16:00	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	4.74	Chloride	0.34376	0.191	0.10	1.5607	BMB
2	11.43	n.a.	#####	198.241	99.90	n.a.	BMB

no F- peak

② CWK 10/19/06

24 H6J100230 JF4HD 1/10

Sample Name:	H6J100230 JF4HD 1/10	Injection Volume:	50.0
Vial Number:	1351	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 16:00	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	3.34	Fluoride	0.09579	0.167	0.08	0.3552	BMB
2	4.74	Chloride	0.34376	0.191	0.10	1.5607	BMB
3	11.43	n.a.	#####	198.241	99.82	n.a.	BMB

- See 1/50

original

24 H6J100230 JF4HD 1/10

Sample Name:	H6J100230 JF4HD 1/10	Injection Volume:	50.0
Vial Number:	1351	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 16:00	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	4.74	Chloride	0.34376	0.191	0.10	1.5607	BMB
2	11.43	n.a.	#####	198.241	99.90	n.a.	BMB

Br- (ND)

25 H6J100230 JF4HD MS 1/10 0.2 PPM CL *CL 10/17/06*

Sample Name:	H6J100230 JF4HD MS 1/10 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1352	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 16:17	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	0.56296	0.099	0.05	2.0595	BMB*
2	4.70	Chloride	0.84608	0.222	0.11	3.8281	BM
3	5.39	Nitrite-N	0.92546	0.202	0.10	2.4146	MB
4	6.68	Bromide	0.14374	0.029	0.01	2.0247	BMB
5	7.47	Nitrate-N	0.72884	0.177	0.09	2.0851	BMB
6	11.43	n.a.	#####	199.958	99.64	n.a.	BMB

② CWK 10/19/06

25 H6J100230 JF4HD MS 1/10 0.2 PPM CL *Low 10/27/06*

Sample Name:	H6J100230 JF4HD MS 1/10 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1352	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 16:17	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area μS*min	Rel.Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	0.56296	0.099	0.05	2.0595	BMB*
2	4.70	Chloride	0.84608	0.222	0.11	3.8281	BM
3	5.39	Nitrite-N	0.92546	0.202	0.10	2.4146	MB
4	6.68	Bromide	0.14374	0.029	0.01	2.0247	BMB
5	7.47	Nitrate-N	0.72884	0.177	0.09	2.0851	BMB
6	11.43	n.a.	#####	199.958	99.64	n.a.	BMB

25 H6J100230 JF4HD MS 1/10 0.2 PPM CL *CL 10/21/06*

Sample Name:	H6J100230 JF4HD MS 1/10 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1352	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 16:17	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	0.72076	0.384	0.19	2.6249	BMB
2	4.70	Chloride	0.84608	0.222	0.11	3.8281	BM
3	5.39	Nitrite-N	0.92546	0.202	0.10	2.4146	MB
4	6.68	Bromide	0.14374	0.029	0.01	2.0247	BMB
5	7.47	Nitrate-N	0.72884	0.177	0.09	2.0851	BMB
6	11.43	n.a.	#####	199.958	99.50	n.a.	BMB

original

26 H6J100230 JF4GH 1/10

Sample Name:	H6J100230 JF4GH 1/10	Injection Volume:	50.0
Vial Number:	1353	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 16:35	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	3.80755	0.606	0.46	12.8298	BMB*
2	4.72	Chloride	46.80891	6.356	4.84	169.2510	BM *
3	6.67	Bromide	0.13178	0.029	0.02	1.8564	Mb*
4	7.47	Nitrate-N	0.17020	0.041	0.03	0.4910	bMB
5	10.56	n.a.	0.13550	0.039	0.03	n.a.	BMB
6	11.54	n.a.	#####	124.166	94.61	n.a.	BMB

overrange

② awk 10/19/06

Chloride overrange

26 H6J100230 JF4GH 1/10

Sample Name:	H6J100230 JF4GH 1/10	Injection Volume:	50.0
Vial Number:	1353	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 16:35	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	4.09196	1.063	0.81	13.7007	BM
2	4.72	Chloride	46.95216	6.592	5.00	169.6805	M
3	6.67	Bromide	0.16410	0.048	0.04	2.3109	MB
4	7.47	Nitrate-N	0.17020	0.041	0.03	0.4910	bMB
5	10.56	n.a.	0.13550	0.039	0.03	n.a.	BMB
6	11.54	n.a.	#####	124.166	94.10	n.a.	BMB

original

26 H6J100230 JF4GH 1/10

Sample Name:	H6J100230 JF4GH 1/10	Injection Volume:	50.0
Vial Number:	1353	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 16:35	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area μS*min	Rel.Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	3.80755	0.606	0.46	12.8298	BMB*
2	4.72	Chloride	46.80891	6.360	4.85	169.2510	BMB*
3	6.67	Bromide	0.12742	0.026	0.02	1.7951	Rd*
4	7.47	Nitrate-N	0.17020	0.041	0.03	0.4910	bMB
5	10.56	n.a.	0.13550	0.039	0.03	n.a.	BMB
6	11.54	n.a.	#####	124.166	94.61	n.a.	BMB

Ⓟ CWK 10/19/06

26 H6J100230 JF4GH 1/10

Sample Name:	H6J100230 JF4GH 1/10	Injection Volume:	50.0
Vial Number:	1353	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 16:35	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area μS*min	Rel.Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	3.80755	0.606	0.46	12.8298	BMB*
2	4.72	Chloride	46.80891	6.356	4.84	169.2510	BM *
3	6.67	Bromide	0.13178	0.029	0.02	1.8564	Mb*
4	7.47	Nitrate-N	0.17020	0.041	0.03	0.4910	bMB
5	10.56	n.a.	0.13550	0.039	0.03	n.a.	BMB
6	11.54	n.a.	#####	124.166	94.61	n.a.	BMB

original

27 H6J100230 JF4GT 1/10

Sample Name:	H6J100230 JF4GT 1/10	Injection Volume:	50.0
Vial Number:	1354	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 16:52	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S} \cdot \text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	0.32	n.a.	0.56922	0.171	0.12	n.a.	BMB
2	3.26	Fluoride	4.56861	0.823	0.59	15.1383	BMB
3	4.47	n.a.	1.09206	0.157	0.11	n.a.	BM
4	4.72	Chloride	57.89210	7.882	5.70	201.4501	MB
5	6.67	Bromide	0.16951	0.036	0.03	2.3870	BMB
6	7.46	Nitrate-N	0.82771	0.202	0.15	2.3646	BMB
7	10.54	n.a.	2.29811	0.688	0.50	n.a.	BM
8	11.52	n.a.	#####	128.390	92.80	n.a.	MB

✓
- See 1/100

27 H6J100230 JF4GT 1/10

Sample Name:	H6J100230 JF4GT 1/10	Injection Volume:	50.0
Vial Number:	1354	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 16:52	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	0.32	n.a.	0.56922	0.171	0.12	n.a.	BMB
2	3.26	Fluoride	4.56861	0.823	0.59	15.1383	BMB
3	4.47	n.a.	1.09206	0.157	0.11	n.a.	BM
4	4.72	Chloride	57.89210	7.882	5.70	201.4501	MB
5	6.67	Bromide	0.16951	0.036	0.03	2.3870	BMB
6	7.46	Nitrate-N	0.82771	0.202	0.15	2.3646	BMB
7	10.54	n.a.	2.29811	0.688	0.50	n.a.	BM
8	11.52	n.a.	#####	128.390	92.80	n.a.	MB

27 H6J100230 JF4GT 1/10

Sample Name:	H6J100230 JF4GT 1/10	Injection Volume:	50.0
Vial Number:	1354	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 16:52	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	0.32	n.a.	0.56922	0.171	0.12	n.a.	BMB
2	3.26	Fluoride	4.56861	0.823	0.59	15.1383	BMB
3	4.47	n.a.	1.09206	0.157	0.11	n.a.	BM
4	4.72	Chloride	57.89210	7.882	5.70	201.4501	MB
5	6.67	Bromide	0.16951	0.036	0.03	2.3870	BMB
6	7.46	Nitrate-N	0.82771	0.202	0.15	2.3646	BMB
7	10.54	n.a.	2.29811	0.688	0.50	n.a.	BM
8	11.52	n.a.	#####	128.390	92.80	n.a.	MB

Chloride overrange

28 H6J100230 JF4G3 1/10

Sample Name:	H6J100230 JF4G3 1/10	Injection Volume:	50.0
Vial Number:	1355	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 17:09	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S} \cdot \text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	2.07	n.a.	0.21065	0.157	0.12	n.a.	BMB
2	3.27	Fluoride	4.19051	0.757	0.58	14.0002	Ru*
3	4.73	Chloride	50.42097	7.403	5.66	179.9695	BM *
4	6.68	Bromide	0.17126	0.047	0.04	2.4116	Mb*
5	7.50	Nitrate-N	0.07011	0.016	0.01	0.2026	bMB
6	10.56	n.a.	3.70355	1.123	0.86	n.a.	BM
7	11.56	n.a.	#####	121.243	92.73	n.a.	MB

③ wk 10 11/10/06

28 H6J100230 JF4G3 1/10

Sample Name:	H6J100230 JF4G3 1/10	Injection Volume:	50.0
Vial Number:	1355	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 17:09	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area μS*min	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.07	n.a.	0.21065	0.157	0.12	n.a.	BMB
2	3.27	Fluoride	4.37543	1.101	0.84	14.5589	BM
3	4.73	Chloride	50.42097	7.059	5.40	179.9695	M
4	6.68	Bromide	0.17126	0.047	0.04	2.4116	MB
5	7.50	Nitrate-N	0.07011	0.016	0.01	0.2026	bMB
6	10.56	n.a.	3.70355	1.123	0.86	n.a.	BM
7	11.56	n.a.	#####	121.243	92.73	n.a.	MB

original

28 H6J100230 JF4G3 1/10

Sample Name:	H6J100230 JF4G3 1/10	Injection Volume:	50.0
Vial Number:	1355	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 17:09	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.07	n.a.	0.21065	0.157	0.12	n.a.	BMB
2	3.27	Fluoride	4.19051	0.757	0.58	14.0002	Ru*
3	4.73	Chloride	50.42097	7.423	5.68	179.9695	BMB*
4	6.68	Bromide	0.13644	0.027	0.02	1.9220	Rd*
5	7.50	Nitrate-N	0.07011	0.016	0.01	0.2026	bMB
6	10.56	n.a.	3.70355	1.123	0.86	n.a.	BM
7	11.56	n.a.	#####	121.243	92.73	n.a.	MB

Ⓟ WK 10/19/06

28 H6J100230 JF4G3 1/10

Sample Name:	H6J100230 JF4G3 1/10	Injection Volume:	50.0
Vial Number:	1355	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 17:09	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area μS*min	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.07	n.a.	0.21065	0.157	0.12	n.a.	BMB
2	3.27	Fluoride	4.19051	0.757	0.58	14.0002	Ru*
3	4.73	Chloride	50.42097	7.403	5.66	179.9695	BM *
4	6.68	Bromide	0.17126	0.047	0.04	2.4116	Mb*
5	7.50	Nitrate-N	0.07011	0.016	0.01	0.2026	bMB
6	10.56	n.a.	3.70355	1.123	0.86	n.a.	BM
7	11.56	n.a.	#####	121.243	92.73	n.a.	MB

original

28 H6J100230 JF4G3 1/10

Sample Name:	H6J100230 JF4G3 1/10	Injection Volume:	50.0
Vial Number:	1355	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/18/2006 17:09	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (μS)	Area $\mu\text{S}\cdot\text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	2.07	n.a.	0.21065	0.157	0.12	n.a.	BMB
2	3.27	Fluoride	4.19051	0.757	0.58	14.0002	Ru*
3	4.73	Chloride	50.42097	7.403	5.66	179.9695	BM *
4	6.68	Bromide	0.17126	0.047	0.04	2.4116	Mb*
5	7.50	Nitrate-N	0.07011	0.016	0.01	0.2026	bMB
6	10.56	n.a.	3.70355	1.123	0.86	n.a.	BM
7	11.56	n.a.	#####	121.243	92.73	n.a.	MB

Chloride overrange

29 CCV ICWS-8919

Sample Name:	CCV ICWS-8919	Injection Volume:	50.0
Vial Number:	1356	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	1.0000
Recording Time:	10/18/2006 17:27	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	0.13700	0.025	0.90	n.a.	BMB
2	3.25	Fluoride	2.96619	0.534	19.28	1.0192	BM
3	4.60	Chloride	2.19816	0.372	13.40	0.9855	M
4	5.37	Nitrite-N	3.97477	0.784	28.28	1.0106	MB
5	6.66	Bromide	0.72255	0.157	5.65	1.0111	BMB
6	7.44	Nitrate-N	3.65499	0.901	32.50	1.0043	BMB

30 CCB

Sample Name:	CCB	Injection Volume:	50.0
Vial Number:	1357	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	1.0000
Recording Time:	10/18/2006 17:44	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	12.13	n.a.	0.04440	0.021	100.00	n.a.	BMB

ND

31 H6J100230 JF4GH 1/100

Sample Name:	H6J100230 JF4GH 1/100	Injection Volume:	50.0
Vial Number:	1358	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	100.0000
Recording Time:	10/18/2006 18:02	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	0.36230	0.070	0.66	13.3307	BMB
2	4.62	Chloride	2.98447	0.537	5.12	133.1144	BMB
3	11.78	n.a.	30.58940	9.884	94.22	n.a.	BMB

32 H6J100230 JF4GT 1/100

Sample Name:	H6J100230 JF4GT 1/100	Injection Volume:	50.0
Vial Number:	1359	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	100.0000
Recording Time:	10/18/2006 18:19	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	0.40785	0.075	0.69	14.9869	BMB
2	4.62	Chloride	3.53304	0.615	5.66	157.0201	BMB
3	7.48	Nitrate-N	0.10379	0.024	0.22	2.9970	BMB
4	10.58	n.a.	0.15967	0.046	0.43	n.a.	BMB
5	11.78	n.a.	31.30738	10.096	93.00	n.a.	BMB

33 H6J100230 JF4G3 1/100

Sample Name:	H6J100230 JF4G3 1/100	Injection Volume:	50.0
Vial Number:	1360	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	100.0000
Recording Time:	10/18/2006 18:36	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area μS*min	Rel.Area (%)	Amount (mg/L)	Peak Type
1	3.26	Fluoride	0.37109	0.067	0.65	13.6508	BMB
2	4.62	Chloride	3.13090	0.553	5.36	139.5119	BMB
3	10.56	n.a.	0.19868	0.060	0.58	n.a.	BMB
4	11.77	n.a.	29.79312	9.649	93.41	n.a.	BMB

34 H6J100230 JF4HD 1/20

Sample Name:	H6J100230 JF4HD 1/20	Injection Volume:	50.0
Vial Number:	1361	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	20.0000
Recording Time:	10/18/2006 18:54	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	4.76	Chloride	0.30708	0.150	0.15	2.7891	BMB
2	11.59	n.a.	#####	97.936	99.85	n.a.	BMB

- See 1/50

35 H6J100230 JF4HD MS 1/20 0.2 PPM CL

Sample Name:	H6J100230 JF4HD MS 1/20 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1362	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	20.0000
Recording Time:	10/18/2006 19:11	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area μS*min	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.63	n.a.	0.07087	0.036	0.04	n.a.	BMB*
2	3.26	Fluoride	0.55469	0.102	0.10	4.0593	bMB
3	4.69	Chloride	0.73897	0.158	0.16	6.6919	Ru*
4	5.39	Nitrite-N	0.88691	0.211	0.21	4.6296	BMB*
5	6.67	Bromide	0.14813	0.032	0.03	4.1729	BMB
6	7.46	Nitrate-N	0.72568	0.178	0.18	4.1524	BMB
7	11.58	n.a.	#####	98.456	99.28	n.a.	BMB

$$6.6919 - 2.7891 = 3.9028 \quad | \quad 4 = 97.6\%$$

35 H6J100230 JF4HD MS 1/20 0.2 PPM CL

Sample Name:	H6J100230 JF4HD MS 1/20 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1362	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	20.0000
Recording Time:	10/18/2006 19:11	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.63	n.a.	0.07087	0.036	0.04	n.a.	BMB
2	3.26	Fluoride	0.55469	0.102	0.10	4.0593	bMB
3	4.69	Chloride	0.75702	0.187	0.19	6.8544	BM
4	5.39	Nitrite-N	0.88691	0.182	0.18	4.6296	MB
5	6.67	Bromide	0.14813	0.032	0.03	4.1729	BMB
6	7.46	Nitrate-N	0.72568	0.178	0.18	4.1524	BMB
7	11.58	n.a.	#####	98.456	99.28	n.a.	BMB

original

36 CCV ICWS-8919

Sample Name:	CCV ICWS-8919	Injection Volume:	50.0
Vial Number:	1363	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	1.0000
Recording Time:	10/18/2006 19:29	Sample Weight:	1.0000
Run Time (min):	14.99	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.26	n.a.	0.14228	0.028	1.00	n.a.	BMB
2	3.26	Fluoride	2.95870	0.518	18.69	1.0168	BMB
3	4.61	Chloride	2.18755	0.369	13.31	0.9808	BM
4	5.37	Nitrite-N	3.97912	0.779	28.10	1.0116	MB
5	6.66	Bromide	0.71440	0.154	5.56	0.9998	BMB
6	7.44	Nitrate-N	3.66364	0.905	32.65	1.0066	BMB
7	12.07	n.a.	0.04270	0.019	0.70	n.a.	BMB

37 CCB

Sample Name:	CCB	Injection Volume:	50.0
Vial Number:	1364	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	1.0000
Recording Time:	10/18/2006 19:46	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	12.10	n.a.	0.03726	0.018	100.00	n.a.	BMB

ND

STL Knoxville
Source Air Analysis Sample Information

Analyst	Date	Lot #	Work Order #	FH or BH	Impinger Volume (mL)	Impinger pH as received	Impinger pH after adjustment	Amount added to adjust pH
CWK	10/18/06	H6J100230	JF4FL	FH	500 mL	pH ≤ 2	—	—
			JF4FT	FH	460 mL	pH ≤ 2	—	—
			JF4FH	FH	425 mL	pH ≤ 2	—	—
			JF4GH	FH	330 mL	pH ≤ 2	—	—
			JF4GT	FH	330 mL	pH ≤ 2	—	—
			JF4G3	FH	340 mL	pH ≤ 2	—	—
			JF4HD	FH (BLK)	95 mL	pH ≤ 2	—	—
			JF4HL	FH (DI WATER)	100 mL	pH 5	—	—
CWK	10/19/06	H6J100230	JF4FW	BH	270 mL	pH 2	pH ~ 9	0.120 mL
			JF4FN	BH	275 mL	pH 7	pH ~ 9	0.080 mL
			JF4F6	BH	280 mL	pH 2	pH ~ 9	0.120 mL
			JF4GL	BH	270 mL	pH 7	pH ~ 9	0.080 mL
			JF4GN	BH	270 mL	pH 2	pH ~ 9	0.120 mL
			JF4G5	BH	265 mL	pH 7	pH ~ 9	0.080 mL
			JF4HG	BH (BLK)	100 mL	pH 4	—	—

Comments: Several of the Back Half impingers completely discolored the pH indicator paper.

STL KNOXVILLE
PREPARATION OF FINAL WORKING STANDARD SOLUTIONS FROM VENDOR PREPARED STOCKS
WET CHEMISTRY

Date: 10/18/06 Chemist: WVK Expiration Date: 10/19/06

ID Number	Compound Name	Parent Lot Number	Parent Source	Parent Exp. Date	Parent Conc.	Aliquot Volume (ml)	Dilution Volume (ml)	Final Conc.
1. 10WS-8918	F-	ICWI-	8837	12/25/06	100 ppm	0.500	100 mL	0.50 ppm
2. Cal std (4)	Cl-							
3.	NO ₂ -N							
4.	Br-							
5.	NO ₃ -N							
6. 10WS-8919	F-					1.00		1.0 ppm
7. Cal std (5)	Cl-							
8.	NO ₂ -N							
9.	Br-							
10.	NO ₃ -N							
11. 10WS-8920	F-					2.00		2.0 ppm
12. Cal std 6	Cl-							
13.	NO ₂ -N							
14.	Br-							
	NO ₃ -N							

Reviewed By: _____

WC031R3.DOC, 8/28/03

STL KNOXVILLE
PREPARATION OF FINAL WORKING STANDARD SOLUTIONS FROM VENDOR PREPARED STOCKS
WET CHEMISTRY

Date: 10/18/06 Chemist: WV Expiration Date: 10/19/06

ID Number	Compound Name	Parent Lot Number	Parent Source	Parent Exp. Date	Parent Conc.	Aliquot Volume (ml)	Dilution Volume (ml)	Final Conc.
1. 1005-8921	F ⁻	IOWI -	8838	12/25/06	100 ppm	0.75	100	0.75 ppm
2. (10W/LUS)	Cl ⁻							
3.	NO ₃ ⁻ N							
4.	Br ⁻							
5.	NO ₃ ⁻ N							
6. 1005-8922	F ⁻							
7. (10W/LUS)	Cl ⁻							
8.	NO ₃ ⁻ N							
9.	Br ⁻							
10.	NO ₃ ⁻ N							
11.								
12.								
13.								
14.								

Reviewed By: _____

WC031R3.DOC, 8/28/03

STL Knoxville Anions in Air Data Review / Narrative Checklist for Methods 9056/9057/26A, SOP KNOX-WC-0005, Rev. 7

Page 1 of 1

Lot #:	Analysis Date:	File ID:	ICAL File ID:	2nd
100230	10/19/06	J19-LowLevel-FCI-028ND3-101906	J18-LowLevel-FCI-028ND3-101806	✓
Review Items				2nd
1. Were PM checklists (L40), Lot Summary and any applicable QAS reviewed?	NA	Yes	No	✓
2. ICV within 90-110%R?		✓		✓
3. ICB/CCB < 1/2 RL?		✓		✓
4. CCV/CCBs run after every 10 samples, and at end of sequence?		✓		✓
5. Is %D ≤ 10% for each CCV?		✓		✓
6. If CCV failed, was it rerun only once?		✓		✓
7. LCS/LCSD analytes within 90-110%R? If no, list LCS ID:		✓		✓
8. Method blank < 1/2 RL? If no, list blank ID:		✓		✓
9. Matrix spikes run at required frequency?		✓		✓
10. Matrix spikes within 75-125% recovery? If no, list MS ID:		✓		✓
11. Were MS run #'s assigned to all matrix spikes except reagent blanks?		✓		✓
12. Sample analyses done within holding time (HT)? If no, list samples:		✓		✓
13. Were results processed using correct ICAL?		✓		✓
14. Are positive results within the calibration range?		✓		✓
15. Is integration acceptable for all samples, QC samples and standards?		✓		✓
16. For manual integrated standards and QC samples, are before/after chromatograms provided with initials/date/reason?		✓		✓
17. Calculations checked for error? (Document manual calculation checks.)		✓		✓
18. Were spreadsheets checked for transcription errors?		✓		✓
19. Final report/F6 correct? (Verify results, RLs, units, qualifiers, DFs, dates, spikes.)		✓		✓
20. Are all nonconformances documented and discussed in narrative?		✓		✓
21. Appropriate air train autotext selected for narrative?		✓		✓
22. Sample pH adjustment included in narrative?		✓		✓
23. Audit sample results included in narrative?		✓		✓
1st Level Reviewer: <i>mlk</i>	Date: 10/23/06	2nd Level Reviewer: <i>[Signature]</i>	Date: 10/27/06	
$Y = 0 + 2.19733(0.19184) + 0.033578(0.19184)^2$ $Y = 0.421535787 + 0.001235757$ $Y = 0.42277$				

Nonconformance memos are required for bold and italicized [autotext] statements: Bold = deficiency, italicized = anomaly.

WC081R2.DOC, 5/18/06

Low Calibration Standard (ug/mL):	0.1
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WC080r2, 4/14/06

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2nd Level Review by: *[Signature]*

Date: 10/27/04

No. of Significant Figures: 3

No. of Significant Figures: 3

WC086r2, 4/18/06

2nd Level Review by: [Signature]
Date: 10/27/06
No. of Significant Figures: 3

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STL Knoxville

Dionex IC Runlog Cover Page

Analyst:	CWK	Date:	10/19/06	Sequence ID:	J19-LOWLEVEL-FLLN02BRN03-101906
Instrument:	☐ DX-600	Method:	☐ KNOX-WC-0003, SW-846 0061/7199		
	☒ ICS-1500		☐ KNOX-WC-0005, ☐ SW-846 9056 ☐ EPA 300.0 ☐ SW-846 9057-Mod ☒ EPA 26A-Mod		
	☐ DX-320		☐ KNOX-WC-0014, EPA 314.0		

Preventive Maintenance	Instrument Conditions
Daily:	Flow Rate = 1.00 mL/min
☒ Check pump and gas pressure	^{CWK} _{10/19/06} Pressure = 24.1810 psi
☒ Check all lines for crimping, leaks and discoloration	Conductance = 24.8 μ S
As Needed:	Suppressor Current = 43 mA
☐ Change column and guard column	Eluent Generator = — mM KOH
☐ Change column and/or guard column bed support	
☐ Clean conductivity cell	
☐ De-gas pump head when flow is erratic	
☐ Check/replace eluant end line filter	

MS/MSD Spike Information

WO #	Compound	Spike ID	Parent Conc.	Spike Added (mL)	Final Volume (mL)	Final Conc.
JF4HD	Cl ⁻	ICWI-8838	100 ppm	0.020 mL	10 mL	0.2 ppm
JF4FW	F ⁻	ICWI-8838	100 ppm	0.020 mL	10 mL	0.2 ppm
	Cl ⁻					
	Br ⁻					
JF4HG	F ⁻	ICWI-8838	100 ppm	0.020 mL	10 mL	0.2 ppm
	Cl ⁻					
	Br ⁻					

Comments:

Batch: 6296411 Cl ₂	
(6298118 JF4GW)	
☒ Sodium Thiosulfate added to NaOH impinger samples.	Batch 6299332 Br ₂

Sequence: J19_LOWLEVEL_FCLNO2BRNO3_101906
 Operator: kauker

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 Printed: 10/23/2006 8:38:44 AM

Title:
 Datasource: ICS_1500_net
 Location: ICS1500
 Timebase: ICS1500
 #Samples: 36

Created: 10/19/2006 8:07:59 AM by kauker
 Last Update: 10/19/2006 3:01:02 PM by kauker

CWK
 10/23/06

No.	Name	Sample ID	Inj. Vol.	Inj. Date/Time	Dil. Factor	*Multiplier [Liters]
1	CAL STD #1 ICWS-8915		50.0	10/18/2006 9:14:56 AM	1.0000	
2	CAL STD #2 ICWS-8916		50.0	10/18/2006 9:32:20 AM	1.0000	
3	CAL STD #3 ICWS-8917		50.0	10/18/2006 9:49:45 AM	1.0000	
4	CAL STD #4 ICWS-8918		50.0	10/18/2006 10:07:09 AM	1.0000	
5	CAL STD #5 ICWS-8919		50.0	10/18/2006 10:24:33 AM	1.0000	
6	CAL STD #6 ICWS-8920		50.0	10/18/2006 10:41:57 AM	1.0000	
7	ICV/LCS ICWS-8924		50.0	10/19/2006 9:07:57 AM	1.0000	
8	ICV/LCSD ICWS-8925		50.0	10/19/2006 9:25:22 AM	1.0000	
9	ICB/METHOD BLK		50.0	10/19/2006 9:42:46 AM	1.0000	
10	H6J100230 JF4HD 1/50		50.0	10/19/2006 10:00:10 AM	50.0000	
11	H6J100230 JF4HD MS 1/50 0.2 PPM CL		50.0	10/19/2006 10:17:34 AM	50.0000	
12	H6J100230 JF4FW 1/10		50.0	10/19/2006 10:34:59 AM	10.0000	
13	H6J100230 JF4FW MS 1/10 0.2 PPM CL		50.0	10/19/2006 11:07:23 AM	10.0000	
14	H6J100230 JF4FN 1/10		50.0	10/19/2006 11:39:48 AM	10.0000	
15	H6J100230 JF4HG 1/10		50.0	10/19/2006 12:12:12 PM	10.0000	
16	H6J100230 JF4HG MS 1/10 0.2 PPM CL		50.0	10/19/2006 12:44:36 PM	10.0000	
17	CCV ICWS-8926		50.0	10/19/2006 1:17:00 PM	1.0000	
18	CCB		50.0	10/19/2006 1:34:25 PM	1.0000	
19	H6J100230 JF4FW MSD 1/10 0.2 PPM CL		50.0	10/19/2006 1:51:49 PM	10.0000	
20	H6J100230 JF4FW 1/20		50.0	10/19/2006 2:24:13 PM	20.0000	
21	H6J100230 JF4FW MS 1/20 0.2 PPM CL		50.0	10/19/2006 2:56:37 PM	20.0000	
22	H6J100230 JF4FW MSD 1/20 0.2 PPM CL		50.0	10/19/2006 3:29:02 PM	20.0000	
23	H6J100230 JF4FN 1/20		50.0	10/19/2006 4:01:26 PM	20.0000	
24	H6J100230 JF4F6 1/10		50.0	10/19/2006 4:33:50 PM	10.0000	
25	H6J100230 JF4F6 1/20		50.0	10/19/2006 5:06:15 PM	20.0000	
26	H6J100230 JF4GL 1/10		50.0	10/19/2006 5:38:39 PM	10.0000	
27	H6J100230 JF4GL 1/20		50.0	10/19/2006 6:11:04 PM	20.0000	
28	H6J100230 JF4GW 1/10		50.0	10/19/2006 6:43:28 PM	10.0000	
29	CCV ICWS-8926		50.0	10/19/2006 7:15:53 PM	1.0000	
30	CCB		50.0	10/19/2006 7:33:17 PM	1.0000	
31	H6J100230 JF4GW 1/20		50.0	10/19/2006 7:50:41 PM	20.0000	
32	H6J100230 JF4G5 1/10		50.0	10/19/2006 8:23:06 PM	10.0000	
33	H6J100230 JF4G5 1/20		50.0	10/19/2006 8:55:30 PM	20.0000	
34	CCV ICWS-8926		50.0	10/19/2006 9:27:55 PM	1.0000	
35	CCB		50.0	10/19/2006 9:45:19 PM	1.0000	
36	SHUTDOWN		50.0	10/19/2006 10:02:43 PM	1.0000	

7 ICV/LCS ICWS-8924

Sample Name: ICV/LCS ICWS-8924
Vial Number: 1296
Sample Type: unknown
Control Program: AS14A ANIONS METHOD
Quantif. Method: AS4A-SC ANION METHOD
Recording Time: 10/19/2006 9:07
Run Time (min): 15.00

Injection Volume: 50.0
Channel: ECD_1
Wavelength: n.a.
Bandwidth: n.a.
Dilution Factor: 1.0000
Sample Weight: 1.0000
Sample Amount: 1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S} \cdot \text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	0.11733	0.024	1.14	n.a.	BMB
2	3.26	Fluoride	2.18628	0.400	19.25	0.7657	BMB
3	4.60	Chloride	1.70801	0.279	13.42	0.7683	BMB
4	5.37	Nitrite-N	2.96475	0.586	28.18	0.7601	BMB
5	6.66	Bromide	0.52358	0.112	5.39	0.7343	BMB
6	7.45	Nitrate-N	2.71484	0.678	32.62	0.7553	BMB

JG3NF1AC - Cl₂JHAD31AC - Br₂

JG3DW1AC - HCl

JG3FG1AC - HF

8 ICV/LCSD ICWS-8925

Sample Name: ICV/LCSD ICWS-8925
Vial Number: 1297
Sample Type: unknown
Control Program: AS14A ANIONS METHOD
Quantif. Method: AS4A-SC ANION METHOD
Recording Time: 10/19/2006 9:25
Run Time (min): 15.00

Injection Volume: 50.0
Channel: ECD_1
Wavelength: n.a.
Bandwidth: n.a.
Dilution Factor: 1.0000
Sample Weight: 1.0000
Sample Amount: 1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	0.12247	0.022	1.06	n.a.	BMB
2	3.26	Fluoride	2.19469	0.403	19.37	0.7685	BMB
3	4.61	Chloride	1.66169	0.268	12.91	0.7477	BMB
4	5.37	Nitrite-N	2.96545	0.588	28.27	0.7603	BMB
5	6.66	Bromide	0.52962	0.115	5.55	0.7427	Ru
6	7.45	Nitrate-N	2.71223	0.683	32.85	0.7546	BMB

JG3NF1AD-Cl₂

JHAD31AD-B12

JG3DW1AD-HCl

JG3FG1AD-HF

9 ICB/METHOD BLK

Sample Name:	ICB/METHOD BLK	Injection Volume:	50.0
Vial Number:	1298	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	1.0000
Recording Time:	10/19/2006 9:42	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
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JG3DW1AA-HCl

JG3NF1AA-Cl₂

(ND)

JG3FG1AA-HF

JHAD31AA-Bi2

10 H6J100230 JF4HD 1/50

Sample Name:	H6J100230 JF4HD 1/50	Injection Volume:	50.0
Vial Number:	1294	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	50.0000
Recording Time:	10/19/2006 10:00	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	4.90	n.a.	0.11805	0.052	0.14	n.a.	BMB
2	11.72	n.a.	#####	36.544	99.86	n.a.	BMB

peak not chloride

11 H6J100230 JF4HD MS 1/50 0.2 PPM CL

Sample Name:	H6J100230 JF4HD MS 1/50 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1294	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	50.0000
Recording Time:	10/19/2006 10:17	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S} \cdot \text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	3.27	Fluoride	0.56050	0.109	0.30	10.2530	BMB
2	4.65	Chloride	0.44155	0.114	0.31	10.0167	BM
3	5.39	Nitrite-N	0.84149	0.167	0.45	10.9858	MB
4	6.67	Bromide	0.14044	0.029	0.08	9.8911	BMB
5	7.47	Nitrate-N	0.72447	0.182	0.49	10.3639	BMB
6	11.72	n.a.	#####	36.256	98.37	n.a.	BMB

12 H6J100230 JF4FW 1/10

Sample Name:	H6J100230 JF4FW 1/10	Injection Volume:	50.0
Vial Number:	1316	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_CI2 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 10:34	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	5.47224	1.239	0.26	n.a.	BM
2	3.79	n.a.	15.02684	2.508	0.53	n.a.	M
3	4.38	Chloride	0.83712	0.218	0.05	3.7878	MB
4	7.42	Nitrate-N	3.46230	0.877	0.18	9.5378	BMB
5	10.22	n.a.	#####	194.482	40.87	n.a.	BM
6	11.39	n.a.	#####	197.733	41.56	n.a.	MB
7	21.05	n.a.	77.93005	78.776	16.56	n.a.	BMB

Based on spike recovery Peak identified at RT4.380 is not chloride.

F - ND

12 H6J100230 JF4FW 1/10

Sample Name: H6J100230 JF4FW 1/10
Vial Number: 1316
Sample Type: unknown
Control Program: AS14A ANIONS_CI2 METHOD
Quantif. Method: AS4A-SC ANION METHOD
Recording Time: 10/19/2006 10:34
Run Time (min): 30.00

Injection Volume: 50.0
Channel: ECD_1
Wavelength: n.a.
Bandwidth: n.a.
Dilution Factor: 10.0000
Sample Weight: 1.0000
Sample Amount: 1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	5.47224	1.239	0.26	n.a.	BM
2	3.79	n.a.	15.02684	2.508	0.53	n.a.	M
3	4.38	Chloride	0.83712	0.218	0.05	3.7878	MB
4	7.42	Nitrate-N	3.46230	0.877	0.18	9.5378	BMB
5	10.22	n.a.	#####	194.482	40.87	n.a.	BM
6	11.39	n.a.	#####	197.733	41.56	n.a.	MB
7	21.05	n.a.	77.93005	78.776	16.56	n.a.	BMB

12 H6J100230 JF4FW 1/10

Sample Name:	H6J100230 JF4FW 1/10	Injection Volume:	50.0
Vial Number:	1316	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_C12 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 10:34	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	5.47224	1.239	0.26	n.a.	BM
2	3.79	n.a.	15.02684	2.508	0.53	n.a.	M
3	4.38	n.a.	0.83712	0.217	0.05	n.a.	MB*
4	4.58	Chloride	0.01465	0.001	0.00	0.0667	Rd*^
5	7.42	Nitrate-N	3.46230	0.877	0.18	9.5378	BMB
6	10.22	n.a.	#####	194.482	40.87	n.a.	BM
7	11.39	n.a.	#####	197.733	41.56	n.a.	MB
8	21.05	n.a.	77.93005	78.776	16.56	n.a.	BMB

12 H6J100230 JF4FW 1/10

Sample Name:	H6J100230 JF4FW 1/10	Injection Volume:	50.0
Vial Number:	1316	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_CI2 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 10:34	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area µS*min	Rel. Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	5.47224	1.239	0.26	n.a.	BM
2	3.79	n.a.	15.02684	2.508	0.53	n.a.	M
3	4.38	Chloride	0.83712	0.218	0.05	3.7878	MB
4	7.42	Nitrate-N	3.46230	0.877	0.18	9.5378	BMB
5	10.22	n.a.	#####	194.482	40.87	n.a.	BM
6	11.39	n.a.	#####	197.733	41.56	n.a.	MB
7	21.05	n.a.	77.93005	78.776	16.56	n.a.	BMB

Br- ND

13 H6J100230 JF4FW MS 1/10 0.2 PPM CL

Sample Name:	H6J100230 JF4FW MS 1/10 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1317	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_CI2 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 11:07	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	5.46668	1.254	0.27	n.a.	BM
2	3.23	Fluoride	0.44803	0.085	0.02	1.6444	Rd
3	3.79	n.a.	14.98760	2.508	0.53	n.a.	M
4	4.38	Chloride	0.88293	0.156	0.03	3.9938	M
5	4.57	n.a.	0.72511	0.143	0.03	n.a.	MB
6	5.35	Nitrite-N	0.77525	0.176	0.04	2.0254	BMB
7	6.64	Bromide	0.14512	0.032	0.01	2.0440	BMB
8	7.41	Nitrate-N	4.23340	1.069	0.23	11.5464	BMB
9	10.22	n.a.	#####	187.195	39.76	n.a.	BM
10	11.38	n.a.	#####	199.782	42.44	n.a.	MB
11	21.05	n.a.	77.75641	78.386	16.65	n.a.	BMB

$$F = 1.6444 / 2 = 82.2$$

$$\text{default_letter/Integration } B_1 = 2.0440 / 2 = 102.2$$

13 H6J100230 JF4FW MS 1/10 0.2 PPM CL

Sample Name:	H6J100230 JF4FW MS 1/10 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1317	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_CI2 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 11:07	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S} \cdot \text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	5.46668	1.254	0.27	n.a.	BM
2	3.23	Fluoride	0.44803	0.085	0.02	1.6444	Rd
3	3.79	n.a.	14.98760	2.508	0.53	n.a.	M
4	4.38	n.a.	0.88293	0.260	0.06	n.a.	MB*
5	4.57	Chloride	0.29836	0.039	0.01	1.3550	Rd*
6	5.35	Nitrite-N	0.77525	0.176	0.04	2.0254	BMB
7	6.64	Bromide	0.14512	0.032	0.01	2.0440	BMB
8	7.41	Nitrate-N	4.23340	1.069	0.23	11.5464	BMB
9	10.22	n.a.	#####	187.195	39.76	n.a.	BM
10	11.38	n.a.	#####	199.782	42.44	n.a.	MB
11	21.05	n.a.	77.75641	78.386	16.65	n.a.	BMB

default_letter/Integration

Cl- 1.3550 / 2.0 = 67.8% R

S awk 10/19/06

Chromleon (c) Dionex 1996-2001
Version 6.50 SP4 Build 1000

13 H6J100230 JF4FW MS 1/10 0.2 PPM CL

Sample Name:	H6J100230 JF4FW MS 1/10 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1317	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_CI2 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 11:07	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	5.46668	1.254	0.27	n.a.	BM
2	3.23	Fluoride	0.44803	0.085	0.02	1.6444	Rd
3	3.79	n.a.	14.98760	2.508	0.53	n.a.	M
4	4.38	n.a.	0.88293	0.156	0.03	n.a.	M
5	4.57	Chloride	0.72511	0.143	0.03	3.2835	MB^
6	5.35	Nitrite-N	0.77525	0.176	0.04	2.0254	BMB
7	6.64	Bromide	0.14512	0.032	0.01	2.0440	BMB
8	7.41	Nitrate-N	4.23340	1.069	0.23	11.5464	BMB
9	10.22	n.a.	#####	187.195	39.76	n.a.	BM
10	11.38	n.a.	#####	199.782	42.44	n.a.	MB
11	21.05	n.a.	77.75641	78.386	16.65	n.a.	BMB

13 H6J100230 JF4FW MS 1/10 0.2 PPM CL

Sample Name:	H6J100230 JF4FW MS 1/10 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1317	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_C12 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 11:07	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area μS*min	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	5.46668	1.254	0.27	n.a.	BM
2	3.23	Fluoride	0.44803	0.085	0.02	1.6444	Rd
3	3.79	n.a.	14.98760	2.508	0.53	n.a.	M
4	4.38	Chloride	0.88293	0.156	0.03	3.9938	M
5	4.57	n.a.	0.72511	0.143	0.03	n.a.	MB
6	5.35	Nitrite-N	0.77525	0.176	0.04	2.0254	BMB
7	6.64	Bromide	0.14512	0.032	0.01	2.0440	BMB
8	7.41	Nitrate-N	4.23340	1.069	0.23	11.5464	BMB
9	10.22	n.a.	#####	187.195	39.76	n.a.	BM
10	11.38	n.a.	#####	199.782	42.44	n.a.	MB
11	21.05	n.a.	77.75641	78.386	16.65	n.a.	BMB

13 H6J100230 JF4FW MS 1/10 0.2 PPM CL

Sample Name:	H6J100230 JF4FW MS 1/10 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1317	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_C12 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 11:07	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area μS*min	Rel. Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	5.46668	1.254	0.27	n.a.	BM
2	3.23	Fluoride	0.44803	0.085	0.02	1.6444	Rd
3	3.79	n.a.	14.98760	2.508	0.53	n.a.	M
4	4.38	Chloride	0.88293	0.156	0.03	3.9938	M
5	4.57	n.a.	0.72511	0.143	0.03	n.a.	MB
6	5.35	Nitrite-N	0.77525	0.176	0.04	2.0254	BMB
7	6.64	Bromide	0.14512	0.032	0.01	2.0440	BMB
8	7.41	Nitrate-N	4.23340	1.069	0.23	11.5464	BMB
9	10.22	n.a.	#####	187.195	39.76	n.a.	BM
10	11.38	n.a.	#####	199.782	42.44	n.a.	MB
11	21.05	n.a.	77.75641	78.386	16.65	n.a.	BMB

14 H6J100230 JF4FN 1/10

Sample Name:	H6J100230 JF4FN 1/10	Injection Volume:	50.0
Vial Number:	1317	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_CI2 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 11:39	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S} \cdot \text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	1.65	n.a.	0.66208	0.743	0.15	n.a.	BM
2	2.25	n.a.	8.74504	2.261	0.45	n.a.	MB
3	4.67	Chloride	0.50236	0.202	0.04	2.2783	BMB
4	7.44	Nitrate-N	0.69993	0.180	0.04	2.0033	BMB
5	10.21	n.a.	#####	188.086	37.12	n.a.	BM
6	11.33	n.a.	#####	237.366	46.85	n.a.	MB
7	21.04	n.a.	77.41953	77.818	15.36	n.a.	BMB

F-ND

14 H6J100230 JF4FN 1/10

Sample Name:	H6J100230 JF4FN 1/10	Injection Volume:	50.0
Vial Number:	1317	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_CI2 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 11:39	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area μS*min	Rel.Area (%)	Amount (mg/L)	Peak Type
1	1.65	n.a.	0.66208	0.743	0.15	n.a.	BM
2	2.25	n.a.	8.74504	2.261	0.45	n.a.	MB
3	4.67	Chloride	0.50236	0.202	0.04	2.2783	BMB
4	7.44	Nitrate-N	0.69993	0.180	0.04	2.0033	BMB
5	10.21	n.a.	#####	188.086	37.12	n.a.	BM
6	11.33	n.a.	#####	237.366	46.85	n.a.	MB
7	21.04	n.a.	77.41953	77.818	15.36	n.a.	BMB

Br- ND

15 H6J100230 JF4HG 1/10

Sample Name: H6J100230 JF4HG 1/10
Vial Number: 1317
Sample Type: unknown
Control Program: AS14A ANIONS_CI2 METHOD
Quantif. Method: AS4A-SC ANION METHOD
Recording Time: 10/19/2006 12:12
Run Time (min): 30.00

Injection Volume: 50.0
Channel: ECD_1
Wavelength: n.a.
Bandwidth: n.a.
Dilution Factor: 10.0000
Sample Weight: 1.0000
Sample Amount: 1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S} \cdot \text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	8.75319	7.984	9.85	n.a.	BMB
2	4.56	Chloride	0.16827	0.264	0.33	0.7649	Rd
3	7.75	Nitrate-N	0.44150	1.470	1.81	1.2684	BMB
4	10.85	n.a.	0.05082	0.025	0.03	n.a.	bMB
5	11.76	n.a.	0.52732	0.216	0.27	n.a.	BMB
6	21.12	n.a.	72.66120	71.129	87.72	n.a.	BMB

F - ND

15 H6J100230 JF4HG 1/10

Sample Name:	H6J100230 JF4HG 1/10	Injection Volume:	50.0
Vial Number:	1317	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_C12 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 12:12	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	8.75319	8.236	10.16	n.a.	BMB*
2	4.56	Chloride	0.08213	0.012	0.01	0.3736	Rd*
3	7.75	Nitrate-N	0.44150	1.470	1.81	1.2684	BMb*
4	10.85	n.a.	0.05082	0.025	0.03	n.a.	bMB
5	11.76	n.a.	0.52732	0.216	0.27	n.a.	BMB
6	21.12	n.a.	72.66120	71.129	87.72	n.a.	BMB

⑧ OK 2/23/06

15 H6J100230 JF4HG 1/10

Sample Name:	H6J100230 JF4HG 1/10	Injection Volume:	50.0
Vial Number:	1317	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_C12 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 12:12	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	8.75319	7.984	9.85	n.a.	BMB
2	4.56	Chloride	0.16827	0.264	0.33	0.7649	Rd
3	7.75	Nitrate-N	0.44150	1.470	1.81	1.2684	BMB
4	10.85	n.a.	0.05082	0.025	0.03	n.a.	bMB
5	11.76	n.a.	0.52732	0.216	0.27	n.a.	BMB
6	21.12	n.a.	72.66120	71.129	87.72	n.a.	BMB

original

15 H6J100230 JF4HG 1/10

Sample Name:	H6J100230 JF4HG 1/10	Injection Volume:	50.0
Vial Number:	1317	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_CI2 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 12:12	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	8.75319	7.984	9.85	n.a.	BMB
2	4.56	Chloride	0.16827	0.264	0.33	0.7649	Rd
3	7.75	Nitrate-N	0.44150	1.470	1.81	1.2684	BMB
4	10.85	n.a.	0.05082	0.025	0.03	n.a.	bMB
5	11.76	n.a.	0.52732	0.216	0.27	n.a.	BMB
6	21.12	n.a.	72.66120	71.129	87.72	n.a.	BMB

Br- ND

16 H6J100230 JF4HG MS 1/10 0.2 PPM CL

Sample Name:	H6J100230 JF4HG MS 1/10 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1317	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_CI2 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 12:44	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	7.94241	6.857	8.57	n.a.	BMB
2	3.23	Fluoride	0.46658	0.097	0.12	1.7116	Rd
3	4.58	Chloride	0.52617	0.120	0.15	2.3859	Rd
4	5.29	Nitrite-N	0.78001	0.180	0.22	2.0377	Rd
5	6.67	Bromide	0.72315	0.621	0.78	10.1196	BM
6	7.45	Nitrate-N	1.19252	1.056	1.32	3.3889	MB
7	11.76	n.a.	0.51389	0.202	0.25	n.a.	BMB
8	21.13	n.a.	72.41806	70.912	88.59	n.a.	BMB

cu
10/27/06

16 H6J100230 JF4HG MS 1/10 0.2 PPM CL

Sample Name:	H6J100230 JF4HG MS 1/10 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1317	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_CI2 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 12:44	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	7.94241	6.857	8.73	n.a.	BMB
2	3.23	Fluoride	0.46658	0.097	0.12	1.7116	Rd
3	4.58	Chloride	0.52617	0.120	0.15	2.3859	Rd
4	5.29	Nitrite-N	0.78001	0.180	0.23	2.0377	Rd
5	6.67	Bromide	0.13035	0.026	0.03	1.8363	BMB*
6	7.45	Nitrate-N	0.72510	0.174	0.22	2.0746	BMB*
7	11.76	n.a.	0.51389	0.202	0.26	n.a.	BMB
8	21.13	n.a.	72.41806	70.912	90.25	n.a.	BMB

(B) CWK 10/19/06

16 H6J100230 JF4HG MS 1/10 0.2 PPM CL

Sample Name:	H6J100230 JF4HG MS 1/10 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1317	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_CI2 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 12:44	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	7.94241	6.857	8.57	n.a.	BMB
2	3.23	Fluoride	0.46658	0.097	0.12	1.7116	Rd
3	4.58	Chloride	0.52617	0.120	0.15	2.3859	Rd
4	5.29	Nitrite-N	0.78001	0.180	0.22	2.0377	Rd
5	6.67	Bromide	0.72315	0.621	0.78	10.1196	BM
6	7.45	Nitrate-N	1.19252	1.056	1.32	3.3889	MB
7	11.76	n.a.	0.51389	0.202	0.25	n.a.	BMB
8	21.13	n.a.	72.41806	70.912	88.59	n.a.	BMB

original

17 CCV ICWS-8926

Sample Name:	CCV ICWS-8926	Injection Volume:	50.0
Vial Number:	1317	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	1.0000
Recording Time:	10/19/2006 13:17	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	0.13733	0.024	0.87	n.a.	BMB
2	3.26	Fluoride	2.95171	0.587	20.90	1.0146	BMB ✓
3	4.61	Chloride	2.23283	0.375	13.36	1.0008	bMB ✓
4	5.37	Nitrite-N	4.00347	0.774	27.58	1.0176	BMB ✓
5	6.66	Bromide	0.71783	0.151	5.38	1.0046	BMB ✓
6	7.44	Nitrate-N	3.65949	0.895	31.92	1.0055	BMB

18 CCB

Sample Name:	CCB	Injection Volume:	50.0
Vial Number:	1317	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	1.0000
Recording Time:	10/19/2006 13:34	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	12.07	n.a.	0.04851	0.023	100.00	n.a.	BMB

ND

19 H6J100230 JF4FW MSD 1/10 0.2 PPM CL

Sample Name:	H6J100230 JF4FW MSD 1/10 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1318	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_C12 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 13:51	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area μS*min	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	5.57156	1.280	0.25	n.a.	BM
2	3.23	Fluoride	0.44092	0.084	0.02	1.6187	Rd
3	3.78	n.a.	15.40954	2.581	0.50	n.a.	M
4	4.38	Chloride	0.86571	0.152	0.03	3.9164	M
5	4.56	n.a.	0.73935	0.154	0.03	n.a.	M
6	5.34	Nitrite-N	0.80710	0.205	0.04	2.1080	M
7	6.63	Bromide	0.15535	0.041	0.01	2.1879	M
8	7.41	Nitrate-N	4.34298	1.098	0.21	11.8288	MB
9	10.23	n.a.	#####	162.479	31.77	n.a.	BM
10	11.30	n.a.	#####	265.397	51.89	n.a.	MB
11	21.04	n.a.	77.44404	78.016	15.25	n.a.	BMB

19 H6J100230 JF4FW MSD 1/10 0.2 PPM CL

Sample Name:	H6J100230 JF4FW MSD 1/10 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1318	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_C12 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 13:51	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	5.57156	1.280	0.25	n.a.	BM
2	3.23	Fluoride	0.44092	0.084	0.02	1.6187	Rd
3	3.78	n.a.	15.40954	2.581	0.50	n.a.	M
4	4.38	n.a.	0.86571	0.267	0.05	n.a.	M *
5	4.56	Chloride	0.30543	0.039	0.01	1.3871	Rd^A
6	5.34	Nitrite-N	0.80710	0.205	0.04	2.1080	M
7	6.63	Bromide	0.15535	0.041	0.01	2.1879	M
8	7.41	Nitrate-N	4.34298	1.098	0.21	11.8288	MB
9	10.23	n.a.	#####	162.479	31.77	n.a.	BM
10	11.30	n.a.	#####	265.397	51.89	n.a.	MB
11	21.04	n.a.	77.44404	78.016	15.25	n.a.	BMB

19 H6J100230 JF4FW MSD 1/10 0.2 PPM CL

Sample Name:	H6J100230 JF4FW MSD 1/10 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1318	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_C12 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 13:51	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	5.57156	1.280	0.25	n.a.	BM
2	3.23	Fluoride	0.44092	0.084	0.02	1.6187	Rd
3	3.78	n.a.	15.40954	2.581	0.50	n.a.	M
4	4.38	Chloride	0.86571	0.152	0.03	3.9164	M
5	4.56	n.a.	0.73935	0.154	0.03	n.a.	M
6	5.34	Nitrite-N	0.80710	0.205	0.04	2.1080	M
7	6.63	Bromide	0.15535	0.041	0.01	2.1879	M
8	7.41	Nitrate-N	4.34298	1.098	0.21	11.8288	MB
9	10.23	n.a.	#####	162.479	31.77	n.a.	BM
10	11.30	n.a.	#####	265.397	51.89	n.a.	MB
11	21.04	n.a.	77.44404	78.016	15.25	n.a.	BMB

19 H6J100230 JF4FW MSD 1/10 0.2 PPM CL

Sample Name:	H6J100230 JF4FW MSD 1/10 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1318	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_C12 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 13:51	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	5.57156	1.280	0.25	n.a.	BM
2	3.23	Fluoride	0.44092	0.084	0.02	1.6187	Rd
3	3.78	n.a.	15.40954	2.581	0.50	n.a.	M
4	4.38	n.a.	0.86571	0.267	0.05	n.a.	M*
5	4.56	Chloride	0.30543	0.039	0.01	1.3871	Rd**
6	5.34	Nitrite-N	0.80710	0.205	0.04	2.1080	M
7	6.63	Bromide	0.14577	0.033	0.01	2.0532	Ru*
8	7.41	Nitrate-N	4.34298	1.106	0.22	11.8288	MB*
9	10.23	n.a.	#####	162.479	31.77	n.a.	BM
10	11.30	n.a.	#####	265.397	51.89	n.a.	MB
11	21.04	n.a.	77.44404	78.016	15.25	n.a.	BMB

19 H6J100230 JF4FW MSD 1/10 0.2 PPM CL

Sample Name:	H6J100230 JF4FW MSD 1/10 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1318	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_CI2 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 13:51	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area μS*min	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	5.57156	1.280	0.25	n.a.	BM
2	3.23	Fluoride	0.44092	0.084	0.02	1.6187	Rd
3	3.78	n.a.	15.40954	2.581	0.50	n.a.	M
4	4.38	n.a.	0.86571	0.267	0.05	n.a.	M *
5	4.56	Chloride	0.30543	0.039	0.01	1.3871	Rd**
6	5.34	Nitrite-N	0.80710	0.205	0.04	2.1080	M
7	6.63	Bromide	0.15535	0.041	0.01	2.1879	M
8	7.41	Nitrate-N	4.34298	1.098	0.21	11.8288	MB
9	10.23	n.a.	#####	162.479	31.77	n.a.	BM
10	11.30	n.a.	#####	265.397	51.89	n.a.	MB
11	21.04	n.a.	77.44404	78.016	15.25	n.a.	BMB

20 H6J100230 JF4FW 1/20

Sample Name:	H6J100230 JF4FW 1/20	Injection Volume:	50.0
Vial Number:	1319	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_C12 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	20.0000
Recording Time:	10/19/2006 14:24	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	3.09782	0.666	0.23	n.a.	BM
2	3.79	n.a.	7.28054	1.160	0.41	n.a.	Mb
3	4.38	n.a.	0.33598	0.078	0.03	n.a.	bMB*
4	4.57	Chloride	0.04681	0.006	0.00	0.4259	Rd*^
5	7.43	Nitrate-N	1.71894	0.431	0.15	9.6969	BMB
6	10.36	n.a.	#####	76.138	26.67	n.a.	BM
7	11.48	n.a.	#####	131.816	46.17	n.a.	MB
8	21.07	n.a.	75.54825	75.214	26.34	n.a.	BMB

(S) wk 10/19/06

20 H6J100230 JF4FW 1/20

Sample Name:	H6J100230 JF4FW 1/20	Injection Volume:	50.0
Vial Number:	1319	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_CI2 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	20.0000
Recording Time:	10/19/2006 14:24	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	3.09782	0.666	0.23	n.a.	BM
2	3.79	n.a.	7.28054	1.160	0.41	n.a.	Mb
3	4.38	Chloride	0.33598	0.083	0.03	3.0510	bMB
4	7.43	Nitrate-N	1.71894	0.431	0.15	9.6969	BMB
5	10.36	n.a.	#####	76.138	26.67	n.a.	BM
6	11.48	n.a.	#####	131.816	46.17	n.a.	MB
7	21.07	n.a.	75.54825	75.214	26.34	n.a.	BMB

original

21 H6J100230 JF4FW MS 1/20 0.2 PPM CL

Sample Name:	H6J100230 JF4FW MS 1/20 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1348	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_CI2 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	20.0000
Recording Time:	10/19/2006 14:56	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	1.64	n.a.	0.25964	0.261	0.09	n.a.	Ru
2	2.25	n.a.	4.01087	1.925	0.66	n.a.	BM
3	3.24	Fluoride	0.50148	0.088	0.03	3.6756	Rd
4	3.80	n.a.	7.69956	1.308	0.45	n.a.	M
5	4.38	n.a.	0.46658	0.167	0.06	n.a.	M *
6	4.58	Chloride	0.42277	0.059	0.02	3.8368	Rd*
7	5.36	Nitrite-N	0.82234	0.187	0.06	4.2951	MB
8	6.65	Bromide	0.14528	0.032	0.01	4.0926	BMB
9	7.43	Nitrate-N	2.53723	0.635	0.22	14.1523	BMB
10	10.37	n.a.	#####	78.208	26.66	n.a.	BM
11	11.48	n.a.	#####	135.440	46.17	n.a.	MB

12	21.08	n.a.	75.57814	75.020	25.58	n.a.	BMB
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21 H6J100230 JF4FW MS 1/20 0.2 PPM CL

Sample Name:	H6J100230 JF4FW MS 1/20 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1348	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_CI2 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	20.0000
Recording Time:	10/19/2006 14:56	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	1.64	n.a.	0.25964	0.261	0.09	n.a.	Ru
2	2.25	n.a.	4.01087	1.925	0.66	n.a.	BM
3	3.24	Fluoride	0.50148	0.088	0.03	3.6756	Rd
4	3.80	n.a.	7.69956	1.308	0.45	n.a.	M
5	4.38	n.a.	0.46658	0.083	0.03	n.a.	M
6	4.58	Chloride	0.68280	0.143	0.05	6.1855	M
7	5.36	Nitrite-N	0.82234	0.187	0.06	4.2951	MB
8	6.65	Bromide	0.14528	0.032	0.01	4.0926	BMB
9	7.43	Nitrate-N	2.53723	0.635	0.22	14.1523	BMB
10	10.37	n.a.	#####	78.208	26.66	n.a.	BM
11	11.48	n.a.	#####	135.440	46.17	n.a.	MB

12	21.08	n.a.	75.57814	75.020	25.58	n.a.	BMB
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22 H6J100230 JF4FW MSD 1/20 0.2 PPM CL

Sample Name:	H6J100230 JF4FW MSD 1/20 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1349	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_CI2 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	20.0000
Recording Time:	10/19/2006 15:29	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	5.93334	3.925	1.32	n.a.	BM *
2	3.24	Fluoride	0.51236	0.094	0.03	3.7542	Rd
3	3.80	n.a.	8.82546	1.890	0.63	n.a.	M *
4	4.38	n.a.	1.21410	0.766	0.26	n.a.	M *
5	4.58	Chloride	0.40694	0.057	0.02	3.6935	Rd*
6	5.36	Nitrite-N	1.27246	0.703	0.24	6.6197	M *
7	6.64	Bromide	0.13558	0.029	0.01	3.8197	Rd
8	7.43	Nitrate-N	2.61323	0.702	0.24	14.5612	MB
9	10.37	n.a.	#####	77.266	25.96	n.a.	BM
10	11.48	n.a.	#####	137.253	46.12	n.a.	MB
11	21.09	n.a.	75.42312	74.946	25.18	n.a.	BMB

22 H6J100230 JF4FW MSD 1/20 0.2 PPM CL

Sample Name:	H6J100230 JF4FW MSD 1/20 0.2 PPM CL	Injection Volume:	50.0
Vial Number:	1349	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_C12 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	20.0000
Recording Time:	10/19/2006 15:29	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area µS*min	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	5.93334	3.925	1.32	n.a.	BM
2	3.24	Fluoride	0.51236	0.094	0.03	3.7542	Rd
3	3.80	n.a.	8.82546	1.890	0.63	n.a.	M
4	4.38	n.a.	0.20712	0.024	0.01	n.a.	Ru
5	4.58	Chloride	1.34393	0.799	0.27	12.1201	M
6	5.36	Nitrite-N	1.27246	0.703	0.24	6.6197	M
7	6.64	Bromide	0.13558	0.029	0.01	3.8197	Rd
8	7.43	Nitrate-N	2.61323	0.702	0.24	14.5612	MB
9	10.37	n.a.	#####	77.266	25.96	n.a.	BM
10	11.48	n.a.	#####	137.253	46.12	n.a.	MB
11	21.09	n.a.	75.42312	74.946	25.18	n.a.	BMB

23 H6J100230 JF4FN 1/20

Sample Name:	H6J100230 JF4FN 1/20	Injection Volume:	50.0
Vial Number:	1350	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_CI2 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	20.0000
Recording Time:	10/19/2006 16:01	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	5.46107	1.570	0.39	n.a.	BMb*
2	4.65	Chloride	0.13977	0.021	0.01	1.2709	bM *
3	4.71	n.a.	0.14223	0.053	0.01	n.a.	MB*
4	7.44	Nitrate-N	0.35958	0.087	0.02	2.0687	BMB
5	10.35	n.a.	#####	74.604	18.64	n.a.	BM
6	11.42	n.a.	#####	167.321	41.80	n.a.	MB
7	16.56	n.a.	0.39590	0.129	0.03	n.a.	BMB
8	20.47	n.a.	#####	156.493	39.10	n.a.	BMB

⑤ CWF 10/23/06

23 H6J100230 JF4FN 1/20

Sample Name:	H6J100230 JF4FN 1/20	Injection Volume:	50.0
Vial Number:	1350	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_CI2 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	20.0000
Recording Time:	10/19/2006 16:01	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	5.46107	1.570	0.39	n.a.	BMB
2	4.65	Chloride	0.13977	0.074	0.02	1.2709	bMB
3	7.44	Nitrate-N	0.35958	0.087	0.02	2.0687	BMB
4	10.35	n.a.	#####	74.604	18.64	n.a.	BM
5	11.42	n.a.	#####	167.321	41.80	n.a.	MB
6	16.56	n.a.	0.39590	0.129	0.03	n.a.	BMB
7	20.47	n.a.	#####	156.493	39.10	n.a.	BMB

original

24 H6J100230 JF4F6 1/10

Sample Name:	H6J100230 JF4F6 1/10	Injection Volume:	50.0
Vial Number:	1351	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_C12 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 16:33	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	6.44678	2.663	0.56	n.a.	BM
2	3.79	n.a.	2.38119	1.378	0.29	n.a.	MB
3	4.57	Chloride	0.13403	0.026	0.01	0.6094	Rd
4	7.43	Nitrate-N	0.81393	0.208	0.04	2.3257	BMB
5	10.22	n.a.	#####	181.445	38.23	n.a.	BM
6	11.36	n.a.	#####	210.136	44.28	n.a.	MB
7	21.05	n.a.	78.03705	78.737	16.59	n.a.	BMB

F-ND

24 H6J100230 JF4F6 1/10

Sample Name:	H6J100230 JF4F6 1/10	Injection Volume:	50.0
Vial Number:	1351	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_CI2 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 16:33	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area μS*min	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	6.44678	2.663	0.56	n.a.	BM
2	3.79	n.a.	2.38119	1.378	0.29	n.a.	MB
3	4.57	Chloride	0.13403	0.026	0.01	0.6094	Rd
4	7.43	Nitrate-N	0.81393	0.208	0.04	2.3257	BMB
5	10.22	n.a.	#####	181.445	38.23	n.a.	BM
6	11.36	n.a.	#####	210.136	44.28	n.a.	MB
7	21.05	n.a.	78.03705	78.737	16.59	n.a.	BMB

Br- ND

25 H6J100230 JF4F6 1/20

Sample Name:	H6J100230 JF4F6 1/20	Injection Volume:	50.0
Vial Number:	1352	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_C12 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	20.0000
Recording Time:	10/19/2006 17:06	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	3.31542	0.773	0.29	n.a.	BMB
2	3.79	n.a.	0.85704	0.152	0.06	n.a.	bMB
3	4.58	Chloride	0.09356	0.016	0.01	0.8510	BMB
4	7.44	Nitrate-N	0.40732	0.103	0.04	2.3417	BMB
5	10.36	n.a.	#####	89.761	33.49	n.a.	BM
6	11.53	n.a.	#####	101.709	37.95	n.a.	MB
7	21.07	n.a.	75.80127	75.469	28.16	n.a.	BMB

26 H6J100230 JF4GL 1/10

Sample Name:	H6J100230 JF4GL 1/10	Injection Volume:	50.0
Vial Number:	1353	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_CI2 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 17:38	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S} \cdot \text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	1.70	n.a.	0.58513	0.654	0.13	n.a.	BM
2	2.25	n.a.	8.84807	2.209	0.44	n.a.	MB
3	4.67	Chloride	0.51157	0.222	0.04	2.3199	BMB
4	7.44	Nitrate-N	0.45435	0.119	0.02	1.3051	BMB
5	10.24	n.a.	#####	155.762	31.09	n.a.	BM
6	11.30	n.a.	#####	265.328	52.96	n.a.	MB
7	21.06	n.a.	76.61752	76.743	15.32	n.a.	BMB

F- ND

26 H6J100230 JF4GL 1/10

Sample Name:	H6J100230 JF4GL 1/10	Injection Volume:	50.0
Vial Number:	1353	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_C12 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 17:38	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S} \cdot \text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	1.70	n.a.	0.58513	0.654	0.13	n.a.	BM
2	2.25	n.a.	8.84807	2.209	0.44	n.a.	MB
3	4.67	Chloride	0.51157	0.222	0.04	2.3199	BMB
4	7.44	Nitrate-N	0.45435	0.119	0.02	1.3051	BMB
5	10.24	n.a.	#####	155.762	31.09	n.a.	BM
6	11.30	n.a.	#####	265.328	52.96	n.a.	MB
7	21.06	n.a.	76.61752	76.743	15.32	n.a.	BMB

FND

26 H6J100230 JF4GL 1/10

Sample Name:	H6J100230 JF4GL 1/10	Injection Volume:	50.0
Vial Number:	1353	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_C12 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 17:38	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S} \cdot \text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	1.70	n.a.	0.58513	0.654	0.13	n.a.	BM
2	2.25	n.a.	8.84807	2.209	0.44	n.a.	MB
3	4.67	Chloride	0.51157	0.222	0.04	2.3199	BMB
4	7.44	Nitrate-N	0.45435	0.119	0.02	1.3051	BMB
5	10.24	n.a.	#####	155.762	31.09	n.a.	BM
6	11.30	n.a.	#####	265.328	52.96	n.a.	MB
7	21.06	n.a.	76.61752	76.743	15.32	n.a.	BMB

B1 - ND

27 H6J100230 JF4GL 1/20

Sample Name:	H6J100230 JF4GL 1/20	Injection Volume:	50.0
Vial Number:	1354	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_C12 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	20.0000
Recording Time:	10/19/2006 18:11	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area μS*min	Rel.Area (%)	Amount (mg/L)	Peak Type
1	1.83	n.a.	0.20842	0.196	0.07	n.a.	BM
2	2.25	n.a.	4.73027	1.008	0.35	n.a.	MB
3	4.72	Chloride	0.20141	0.098	0.03	1.8306	BMB
4	7.45	Nitrate-N	0.23283	0.057	0.02	1.3420	BMB
5	10.37	n.a.	#####	73.544	25.82	n.a.	BM
6	11.48	n.a.	#####	137.203	48.18	n.a.	MB
7	21.10	n.a.	73.87738	72.684	25.52	n.a.	BMB

28 H6J100230 JF4GW 1/10

Sample Name:	H6J100230 JF4GW 1/10	Injection Volume:	50.0
Vial Number:	1355	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_CI2 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 18:43	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	5.54080	1.130	0.24	n.a.	BM *
2	3.79	n.a.	17.17547	2.774	0.58	n.a.	MB*
3	4.38	Chloride	1.32235	0.213	0.04	5.9636	BMB*
4	5.35	Nitrite-N	0.10321	0.043	0.01	0.2713	BMB
5	7.40	Nitrate-N	4.80523	1.212	0.25	13.0121	BMB
6	10.23	n.a.	#####	149.100	31.17	n.a.	BM
7	11.30	n.a.	#####	251.064	52.48	n.a.	MB
8	21.07	n.a.	73.98756	72.875	15.23	n.a.	BMB

F-ND

28 H6J100230 JF4GW 1/10

Sample Name:	H6J100230 JF4GW 1/10	Injection Volume:	50.0
Vial Number:	1355	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_C12 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 18:43	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S} \cdot \text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	5.54080	1.130	0.24	n.a.	BM *
2	3.79	n.a.	17.17547	2.774	0.58	n.a.	MB*
3	4.38	Chloride	1.32235	0.213	0.04	5.9636	BMB*
4	5.35	Nitrite-N	0.10321	0.043	0.01	0.2713	BMB
5	7.40	Nitrate-N	4.80523	1.212	0.25	13.0121	BMB
6	10.23	n.a.	#####	149.100	31.17	n.a.	BM
7	11.30	n.a.	#####	251.064	52.48	n.a.	MB
8	21.07	n.a.	73.98756	72.875	15.23	n.a.	BMB

FND

28 H6J100230 JF4GW 1/10

Sample Name:	H6J100230 JF4GW 1/10	Injection Volume:	50.0
Vial Number:	1355	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_C12 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 18:43	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S} \cdot \text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	5.54080	1.130	0.24	n.a.	BM *
2	3.79	n.a.	17.17547	2.774	0.58	n.a.	MB*
3	4.38	Chloride	1.32235	0.213	0.04	5.9636	BMB*
4	5.35	Nitrite-N	0.10321	0.043	0.01	0.2713	BMB
5	7.40	Nitrate-N	4.80523	1.212	0.25	13.0121	BMB
6	10.23	n.a.	#####	149.100	31.17	n.a.	BM
7	11.30	n.a.	#####	251.064	52.48	n.a.	MB
8	21.07	n.a.	73.98756	72.875	15.23	n.a.	BMB

Br- ND

29 CCV ICWS-8926

Sample Name:	CCV ICWS-8926	Injection Volume:	50.0
Vial Number:	1356	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	1.0000
Recording Time:	10/19/2006 19:15	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S} \cdot \text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	0.16710	0.032	1.11	n.a.	BMB
2	3.26	Fluoride	2.94243	0.540	18.94	1.0116	BMB
3	4.60	Chloride	2.20676	0.376	13.18	0.9893	bMB
4	5.37	Nitrite-N	4.03736	0.789	27.65	1.0259	BMB
5	6.65	Bromide	0.72157	0.154	5.41	1.0098	BMB
6	7.43	Nitrate-N	3.68973	0.903	31.64	1.0134	BMB
7	12.04	n.a.	0.11889	0.059	2.07	n.a.	BMB

30 CCB

Sample Name:	CCB	Injection Volume:	50.0
Vial Number:	1357	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	1.0000
Recording Time:	10/19/2006 19:33	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	10.87	n.a.	0.05666	0.025	100.00	n.a.	BMB

ND

31 H6J100230 JF4GW 1/20

Sample Name:	H6J100230 JF4GW 1/20	Injection Volume:	50.0
Vial Number:	1358	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_C12 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	20.0000
Recording Time:	10/19/2006 19:50	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	3.38048	0.740	0.27	n.a.	BM
2	3.79	n.a.	8.38678	1.328	0.48	n.a.	MB
3	4.38	n.a.	0.62485	0.105	0.04	n.a.	BM *
4	4.54	n.a.	0.18990	0.024	0.01	n.a.	MB*
5	4.59	Chloride	0.00854	0.001	0.00	0.0778	Rd**
6	5.31	Nitrite-N	0.05384	0.017	0.01	0.2832	BMB
7	7.42	Nitrate-N	2.39337	0.600	0.22	13.3760	BMB
8	10.36	n.a.	#####	75.351	27.43	n.a.	BM
9	11.49	n.a.	#####	121.502	44.24	n.a.	MB
10	21.06	n.a.	75.54043	74.987	27.30	n.a.	BMB

31 H6J100230 JF4GW 1/20

Sample Name:	H6J100230 JF4GW 1/20	Injection Volume:	50.0
Vial Number:	1358	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_C12 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	20.0000
Recording Time:	10/19/2006 19:50	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	3.38048	0.740	0.27	n.a.	BM
2	3.79	n.a.	8.38678	1.328	0.48	n.a.	MB
3	4.38	Chloride	0.62485	0.129	0.05	5.6629	BMB
4	5.31	Nitrite-N	0.05384	0.017	0.01	0.2832	BMB
5	7.42	Nitrate-N	2.39337	0.600	0.22	13.3760	BMB
6	10.36	n.a.	#####	75.351	27.43	n.a.	BM
7	11.49	n.a.	#####	121.502	44.24	n.a.	MB
8	21.06	n.a.	75.54043	74.987	27.30	n.a.	BMB

default_letter/Integration

original
not chloride based on RT.
Chromatogram similar to
Sample JF4FW.

32 H6J100230 JF4G5 1/10

Sample Name:	H6J100230 JF4G5 1/10	Injection Volume:	50.0
Vial Number:	1359	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_C12 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 20:23	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	0.60	n.a.	0.26453	0.352	0.07	n.a.	BMB
2	2.25	n.a.	7.77943	1.438	0.27	n.a.	bMB
3	4.58	Chloride	0.24000	0.040	0.01	1.0904	BMB
4	7.43	Nitrate-N	0.42926	0.109	0.02	1.2335	BMB
5	10.22	n.a.	#####	152.976	28.50	n.a.	BM
6	11.24	n.a.	#####	305.550	56.93	n.a.	MB
7	21.06	n.a.	76.40939	76.265	14.21	n.a.	BMB

F-ND

32 H6J100230 JF4G5 1/10

Sample Name:	H6J100230 JF4G5 1/10	Injection Volume:	50.0
Vial Number:	1359	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_CI2 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 20:23	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	0.60	n.a.	0.26453	0.352	0.07	n.a.	BMB
2	2.25	n.a.	7.77943	1.438	0.27	n.a.	bMB
3	4.58	Chloride	0.24000	0.040	0.01	1.0904	BMB
4	7.43	Nitrate-N	0.42926	0.109	0.02	1.2335	BMB
5	10.22	n.a.	#####	152.976	28.50	n.a.	BM
6	11.24	n.a.	#####	305.550	56.93	n.a.	MB
7	21.06	n.a.	76.40939	76.265	14.21	n.a.	BMB

32 H6J100230 JF4G5 1/10

Sample Name:	H6J100230 JF4G5 1/10	Injection Volume:	50.0
Vial Number:	1359	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_CI2 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	10.0000
Recording Time:	10/19/2006 20:23	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area µS*min	Rel.Area (%)	Amount (mg/L)	Peak Type
1	0.60	n.a.	0.26453	0.352	0.07	n.a.	BMB
2	2.25	n.a.	7.77943	1.438	0.27	n.a.	bMB
3	4.58	Chloride	0.24000	0.040	0.01	1.0904	BMB
4	7.43	Nitrate-N	0.42926	0.109	0.02	1.2335	BMB
5	10.22	n.a.	#####	152.976	28.50	n.a.	BM
6	11.24	n.a.	#####	305.550	56.93	n.a.	MB
7	21.06	n.a.	76.40939	76.265	14.21	n.a.	BMB

Br- ND

33 H6J100230 JF4G5 1/20

Sample Name:	H6J100230 JF4G5 1/20	Injection Volume:	50.0
Vial Number:	1360	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_C12 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	20.0000
Recording Time:	10/19/2006 20:55	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	1.80	n.a.	0.08364	0.084	0.03	n.a.	BMB
2	2.25	n.a.	3.69516	0.740	0.25	n.a.	bMB
3	4.59	Chloride	0.15620	0.024	0.01	1.4202	BMB
4	7.44	Nitrate-N	0.21266	0.054	0.02	1.2261	BMB
5	10.36	n.a.	#####	73.271	24.33	n.a.	BM
6	11.45	n.a.	#####	153.894	51.10	n.a.	MB
7	21.08	n.a.	74.20946	73.079	24.27	n.a.	BMB

34 CCV ICWS-8926

Sample Name:	CCV ICWS-8926	Injection Volume:	50.0
Vial Number:	1363	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	1.0000
Recording Time:	10/19/2006 21:27	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.26	n.a.	0.09179	0.020	0.69	n.a.	BMB*
2	3.26	Fluoride	3.00310	0.527	18.55	1.0310	BMB*
3	4.61	Chloride	2.19767	0.370	13.04	0.9853	BMB*
4	5.38	Nitrite-N	4.04112	0.778	27.39	1.0269	BMB*
5	6.66	Bromide	0.71625	0.152	5.36	1.0024	BMB
6	7.44	Nitrate-N	3.68893	0.907	31.93	1.0132	BMB
7	10.83	n.a.	0.06266	0.033	1.16	n.a.	BMB
8	12.05	n.a.	0.10690	0.053	1.88	n.a.	BMB

34 CCV ICWS-8926

Sample Name:	CCV ICWS-8926	Injection Volume:	50.0
Vial Number:	1363	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	1.0000
Recording Time:	10/19/2006 21:27	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.26	n.a.	0.32189	0.091	2.03	n.a.	BM
2	3.26	Fluoride	3.59487	1.633	36.40	1.2172	M
3	4.61	Chloride	2.64459	0.658	14.67	1.1822	M
4	5.38	Nitrite-N	4.28958	0.959	21.37	1.0878	MB
5	6.66	Bromide	0.71625	0.152	3.39	1.0024	BMB
6	7.44	Nitrate-N	3.68893	0.907	20.22	1.0132	BMB
7	10.83	n.a.	0.06266	0.033	0.74	n.a.	BMB
8	12.05	n.a.	0.10690	0.053	1.19	n.a.	BMB

original

35 CCB

Sample Name:	CCB	Injection Volume:	50.0
Vial Number:	1364	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	1.0000
Recording Time:	10/19/2006 21:45	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	4.31	n.a.	0.26450	0.116	88.60	n.a.	BMB
2	4.91	n.a.	0.03878	0.015	11.40	n.a.	bMB

ND

STL KNOXVILLE
PREPARATION OF FINAL WORKING STANDARD SOLUTIONS FROM VENDOR PREPARED STOCKS
WET CHEMISTRY

Date: 10/19/06 Chemist: WJK Expiration Date: 10/22/06

ID Number	Compound Name	Parent Lot Number	Parent Source	Parent Exp. Date	Parent Conc.	Aliquot Volume (ml)	Dilution Volume (ml)	Final Conc.
1. 10WS-8924	F-	ICWI-	8838	12/25/06	100 ppm	0.750 ml	100 ml	6.75 ppm
2. (10W/LCS)	Cl-							
3.	NO ₂ -N							
4.	Br-							
5.	NO ₃ -N							
6. 10WS8925	F-							
7. (10W/LCSD)	Cl-							
8.	NO ₂ -N							
9.	Br-							
10.	NO ₃ -N							
11. 10WS8926	F-	ICWI-	8837			1.0 ml		1.0 ppm
12. (CCV)	Cl-							
13.	NO ₂ -N							
14.	Br-							
	NO ₃ -N							

Reviewed By: _____

Lot #:	Analysis Date:	File ID:	ICAL File ID:	2 nd ✓
10113, H6J100230	10/24/06	J24-LOWLEVEL-PU-N02B8N03-102406	J18-LOWLEVEL-F6LND2B8N03-101806	
Review Items				
1. Were PM checklists (L40), Lot Summary and any applicable QAS reviewed?				✓
2. ICV within 90-110%R?				✓
3. ICB/CCB < 1/2 RL?				✓
4. CCVs/CCBs run after every 10 samples, and at end of sequence?				✓
5. Is %ID ≤ 10% for each CCV?				✓
6. If CCV failed, was it rerun only once?				✓
7. LCS/LCSD analytes within 90-110%R? If no, list LCS ID:				✓
8. Method blank < 1/2 RL? If no, list blank ID:				✓
9. Matrix spikes run at required frequency?				✓
10. Matrix spikes within 75-125% recovery? If no, list MS ID:				✓
11. Were MS run #'s assigned to all matrix spikes except reagent blanks?				✓
12. Sample analyses done within holding time (HT)? If no, list samples:				✓
13. Were results processed using correct ICAL?				✓
14. Are positive results within the calibration range?				✓
15. Is integration acceptable for all samples, QC samples and standards?				✓
16. For manual integrated standards and QC samples, are before/after chromatograms provided with initials/date/reason?				✓
17. Calculations checked for error? (Document manual calculation checks.)				✓
18. Were spreadsheets checked for transcription errors?				✓
19. Final report/F6 correct? (Verify results, RLs, units, qualifiers, DFs, dates, spikes.)				✓
20. Are all nonconformances documented and discussed in narrative?				✓
21. Appropriate air train autotext selected for narrative?				✓
22. Sample pH adjustment included in narrative?				✓
23. Audit sample results included in narrative?				✓
1 st Level Reviewer: WLF		2 nd Level Reviewer: FMM		Date: 10/27/06
$Y = 0 + 2.19733(0.22685) + 0.033578(0.22585)^2$ $Y = 0.496266981 + 0.0017127541$ $Y = 0.49797 \checkmark$				

Nonconformance memos are required for bold and *italicized* [autotext] statements: Bold = deficiency, *italicized* = anomaly.

Low Calibration Standard (ug/mL): 0.1

WC086r2, 4/18/06

STL Knoxville

Dionex IC Runlog Cover Page

Analyst:	CWK	Date:	10/24/06	Sequence ID:	J24-LOWLEVEL-FLND2BRND3-102406
Instrument:	☐ DX-600 ☒ ICS-1500 ☐ DX-320	Method:	☐ KNOX-WC-0003, SW-846 0061/7199 ☐ KNOX-WC-0005, ☐ SW-846 9056 ☐ EPA 300.0 ☐ SW-846 9057-Mod ☒ EPA 26A-Mod ☐ KNOX-WC-0014, EPA 314.0		

Preventive Maintenance	Instrument Conditions
Daily: ☒ Check pump and gas pressure ☒ Check all lines for crimping, leaks and discoloration As Needed: ☐ Change column and guard column ☐ Change column and/or guard column bed support ☐ Clean conductivity cell ☐ De-gas pump head when flow is erratic ☐ Check/replace eluant end line filter	Flow Rate = 1.00 mL/min Pressure = 1810 psi Conductance = 24.8 μ S Suppressor Current = 43 mA Eluent Generator = — mM KOH

MS/MSD Spike Information

WO #	Compound	Spike ID	Parent Conc.	Spike Added (mL)	Final Volume (mL)	Final Conc.
JF5QF	Cl ⁻	IcwI-8838	100 ppm	0.020 mL	1 mL	0.2 ppm
1	F ⁻					
JF5QH	Cl ⁻					
1	F ⁻					
JF4GW	Cl ⁻					

Comments:

☒ Sodium Thiosulfate added to NaOH impinger samples.

Sequence: J24_LOWLEVEL_FCLNO2BRNO3_102406
 Operator: kauker

Page 1 of 31
 Printed: 10/24/2006 3:43:05 PM

Title:
 Datasource: ICS_1500_net
 Location: ICS1500
 Timebase: ICS1500
 #Samples: 23

Created: 10/24/2006 8:35:42 AM by kauker
 Last Update: 10/24/2006 3:42:57 PM by kauker

Wk
 10/24/06

No.	Name	Sample ID	Inj. Vol.	Inj. Date/Time	Dil. Factor	*Multiplier [Liters]	Weight
1	CAL STD #1 ICWS-8915		50.0	10/18/2006 9:14:56 AM	1.0000		1.0000
2	CAL STD #2 ICWS-8916		50.0	10/18/2006 9:32:20 AM	1.0000		1.0000
3	CAL STD #3 ICWS-8917		50.0	10/18/2006 9:49:45 AM	1.0000		1.0000
4	CAL STD #4 ICWS-8918		50.0	10/18/2006 10:07:09 AM	1.0000		1.0000
5	CAL STD #5 ICWS-8919		50.0	10/18/2006 10:24:33 AM	1.0000		1.0000
6	CAL STD #6 ICWS-8920		50.0	10/18/2006 10:41:57 AM	1.0000		1.0000
7	ICV/LCS ICWS-8929		50.0	10/24/2006 9:36:57 AM	1.0000		1.0000
8	ICV/LCSD ICWS-8930		50.0	10/24/2006 9:54:22 AM	1.0000		1.0000
9	ICB/METHOD BLK		50.0	10/24/2006 10:11:45 AM	1.0000		1.0000
10	H6J110113 JF5QF 1/10		50.0	10/24/2006 10:29:10 AM	10.0000		1.0000
11	H6J110113 JF5QH 1/10		50.0	10/24/2006 10:46:35 AM	10.0000		1.0000
12	H6J110113 JF5QH MS 1/10 0.2 PPM		50.0	10/24/2006 11:03:58 AM	10.0000		1.0000
13	H6J110113 JF5QF MS 1/10 0.2 PPM CL		50.0	10/24/2006 11:21:23 AM	10.0000		1.0000
14	H6J110113 JF5QF MSD 1/10 0.2 PPM CL		50.0	10/24/2006 11:38:47 AM	10.0000		1.0000
15	H6J100230 JF4GW MS 1/20 0.2 PPM CL		50.0	10/24/2006 12:02:06 PM	20.0000		1.0000
16	H6J100230 JF4GW 1/20		50.0	10/24/2006 12:45:23 PM	20.0000		1.0000
17	CCV ICWS-8931		50.0	10/24/2006 1:17:47 PM	1.0000		1.0000
18	CCB		50.0	10/24/2006 1:35:11 PM	1.0000		1.0000
19	H6J100230 JF4GW 1/20		50.0	10/24/2006 1:52:36 PM	20.0000		1.0000
20	H6J100230 JF4GW MS 1/20 0.2PPM CL		50.0	10/24/2006 2:25:00 PM	20.0000		1.0000
21	CCV ICWS-8931		50.0	10/24/2006 3:06:19 PM	1.0000		1.0000
22	CCB		50.0	10/24/2006 3:23:44 PM	1.0000		1.0000
23	SHUTDOWN		50.0	10/24/2006 3:42:57 PM	1.0000		1.0000

7 ICV/LCS ICWS-8929

Sample Name:	ICV/LCS ICWS-8929	Injection Volume:	50.0
Vial Number:	1296	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	1.0000
Recording Time:	10/24/2006 9:36	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S} \cdot \text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	0.07623	0.013	0.65	n.a.	BMB
2	3.26	Fluoride	2.16327	0.393	18.94	0.7581	BMB
3	4.60	Chloride	1.67816	0.275	13.25	0.7550	BMB
4	5.36	Nitrite-N	2.97158	0.586	28.23	0.7618	BMB
5	6.65	Bromide	0.53113	0.115	5.52	0.7448	BMB
6	7.44	Nitrate-N	2.69925	0.669	32.26	0.7512	BMB
7	12.10	n.a.	0.05386	0.024	1.15	n.a.	BMB

JG6PG1AC Cl_2 JG5CE1AC Cl^- JG5AG1AC F^-

8 ICV/LCSD ICWS-8930

Sample Name:	ICV/LCSD ICWS-8930	Injection Volume:	50.0
Vial Number:	1297	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	1.0000
Recording Time:	10/24/2006 9:54	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	0.07099	0.014	0.67	n.a.	BMB
2	3.25	Fluoride	2.16755	0.394	19.22	0.7595	BM
3	4.60	Chloride	1.69976	0.276	13.47	0.7646	M
4	5.36	Nitrite-N	2.98267	0.585	28.50	0.7646	MB
5	6.65	Bromide	0.52876	0.113	5.49	0.7415	BMB
6	7.43	Nitrate-N	2.70200	0.670	32.66	0.7519	BMB

JG6PG1AD Cl_2 JG5CE1AD Cl^- JG5AB1AD F^-

9 ICB/METHOD BLK

Sample Name:	ICB/METHOD BLK	Injection Volume:	50.0
Vial Number:	1298	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	1.0000
Recording Time:	10/24/2006 10:11	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area µS*min	Rel.Area (%)	Amount (mg/L)	Peak Type
-----	--------------------	-----------	----------------	----------------	-----------------	------------------	--------------

JG5AG1AA F -

JG5CE1AA Cl⁻

ND

JG6PG1AA - Cl₂

17 CCV ICWS-8931

Sample Name:	CCV ICWS-8931	Injection Volume:	50.0
Vial Number:	1317	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	1.0000
Recording Time:	10/24/2006 13:17	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.26	n.a.	0.09641	0.018	0.64	n.a.	BMB
2	3.26	Fluoride	2.90111	0.519	18.75	0.9984	BMB
3	4.60	Chloride	2.24753	0.366	13.20	1.0073	BMB
4	5.37	Nitrite-N	3.98706	0.783	28.27	1.0136	BM
5	6.66	Bromide	0.71632	0.152	5.50	1.0025	MB
6	7.43	Nitrate-N	3.66791	0.908	32.79	1.0077	BMB
7	12.06	n.a.	0.04763	0.024	0.85	n.a.	BMB

18 CCB

Sample Name:	CCB	Injection Volume:	50.0
Vial Number:	1317	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	1.0000
Recording Time:	10/24/2006 13:35	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	8.81	n.a.	0.38947	0.940	100.00	n.a.	BMB

ND

19 H6J100230 JF4GW 1/20

Sample Name:	H6J100230 JF4GW 1/20	Injection Volume:	50.0
Vial Number:	1318	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_CI2 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	20.0000
Recording Time:	10/24/2006 13:52	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	3.02429	0.620	0.22	n.a.	BMB
2	3.79	n.a.	12.26100	1.912	0.69	n.a.	BM
3	4.38	n.a.	0.28106	0.090	0.03	n.a.	MB*
4	4.57	Chloride	0.09015	0.011	0.00	0.8200	Rd**
5	7.42	Nitrate-N	2.30786	0.576	0.21	12.9132	BMB
6	10.37	n.a.	#####	67.689	24.50	n.a.	BM
7	11.48	n.a.	#####	131.229	47.51	n.a.	MB
8	21.06	n.a.	74.88626	74.110	26.83	n.a.	BMB

(5) wk 10/24/06

19 H6J100230 JF4GW 1/20

Sample Name:	H6J100230 JF4GW 1/20	Injection Volume:	50.0
Vial Number:	1318	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_CI2 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	20.0000
Recording Time:	10/24/2006 13:52	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	3.02429	0.620	0.22	n.a.	BMB
2	3.79	n.a.	12.26100	1.912	0.69	n.a.	BM
3	4.38	Chloride	0.28106	0.048	0.02	2.5532	M
4	4.57	n.a.	0.22787	0.053	0.02	n.a.	MB
5	7.42	Nitrate-N	2.30786	0.576	0.21	12.9132	BMB
6	10.37	n.a.	#####	67.689	24.50	n.a.	BM
7	11.48	n.a.	#####	131.229	47.51	n.a.	MB
8	21.06	n.a.	74.88626	74.110	26.83	n.a.	BMB

original

20 H6J100230 JF4GW MS 1/20 0.2PPM CL

Sample Name:	H6J100230 JF4GW MS 1/20 0.2PPM CL	Injection Volume:	50.0
Vial Number:	1319	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_CI2 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	20.0000
Recording Time:	10/24/2006 14:25	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	3.54520	0.912	0.33	n.a.	BMb
2	3.24	Fluoride	0.49598	0.088	0.03	3.6358	bMB
3	3.79	n.a.	12.40378	1.916	0.69	n.a.	BMB
4	4.38	n.a.	0.23732	0.075	0.03	n.a.	BMB*
5	4.58	Chloride	0.48361	0.069	0.02	4.3871	Rd*
6	5.34	Nitrite-N	0.78328	0.189	0.07	4.0924	BMB
7	6.64	Bromide	0.14394	0.033	0.01	4.0550	Rd
8	7.41	Nitrate-N	3.09668	0.780	0.28	17.1436	BMB
9	10.37	n.a.	#####	67.617	24.32	n.a.	BM
10	11.47	n.a.	#####	132.648	47.71	n.a.	MB
11	21.06	n.a.	74.70572	73.678	26.50	n.a.	BMB

20 H6J100230 JF4GW MS 1/20 0.2PPM CL

Sample Name:	H6J100230 JF4GW MS 1/20 0.2PPM CL	Injection Volume:	50.0
Vial Number:	1319	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS_CI2 METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	20.0000
Recording Time:	10/24/2006 14:25	Sample Weight:	1.0000
Run Time (min):	30.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S}\cdot\text{min}$	Rel.Area (%)	Amount (mg/L)	Peak Type
1	2.25	n.a.	3.54520	0.912	0.33	n.a.	BMB
2	3.24	Fluoride	0.49598	0.088	0.03	3.6358	bMB
3	3.79	n.a.	12.40378	1.916	0.69	n.a.	BMB
4	4.38	n.a.	0.23732	0.033	0.01	n.a.	BM
5	4.58	Chloride	0.60786	0.112	0.04	5.5095	MB
6	5.34	Nitrite-N	0.78328	0.189	0.07	4.0924	BMB
7	6.64	Bromide	0.14394	0.033	0.01	4.0550	Rd
8	7.41	Nitrate-N	3.09668	0.780	0.28	17.1436	BMB
9	10.37	n.a.	#####	67.617	24.32	n.a.	BM
10	11.47	n.a.	#####	132.648	47.71	n.a.	MB
11	21.06	n.a.	74.70572	73.678	26.50	n.a.	BMB

21 CCV ICWS-8931

Sample Name:	CCV ICWS-8931	Injection Volume:	50.0
Vial Number:	1356	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	1.0000
Recording Time:	10/24/2006 15:06	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret. Time (min.)	Peak Name	Height (uS)	Area $\mu\text{S} \cdot \text{min}$	Rel. Area (%)	Amount (mg/L)	Peak Type
1	2.26	n.a.	0.09918	0.017	0.63	n.a.	BMB
2	3.26	Fluoride	2.91950	0.534	19.11	1.0043	BM
3	4.61	Chloride	2.23820	0.370	13.24	1.0032	M
4	5.37	Nitrite-N	3.99329	0.799	28.58	1.0151	M
5	6.66	Bromide	0.71751	0.154	5.52	1.0041	Ru
6	7.44	Nitrate-N	3.67764	0.920	32.92	1.0103	MB

22 CCB

Sample Name:	CCB	Injection Volume:	50.0
Vial Number:	1357	Channel:	ECD_1
Sample Type:	unknown	Wavelength:	n.a.
Control Program:	AS14A ANIONS METHOD	Bandwidth:	n.a.
Quantif. Method:	AS4A-SC ANION METHOD	Dilution Factor:	1.0000
Recording Time:	10/24/2006 15:23	Sample Weight:	1.0000
Run Time (min):	15.00	Sample Amount:	1.0000

No.	Ret.Time (min.)	Peak Name	Height (uS)	Area µS*min	Rel.Area (%)	Amount (mg/L)	Peak Type
1	7.95	n.a.	0.30783	0.401	71.70	n.a.	BMB
2	10.71	n.a.	0.13177	0.158	28.30	n.a.	BMB

ND

STL KNOXVILLE
PREPARATION OF FINAL WORKING STANDARD SOLUTIONS FROM VENDOR PREPARED STOCKS
WET CHEMISTRY

Date: 10/24/06 Chemist: CLK Expiration Date: 10/25/06

ID Number	Compound Name	Parent Lot Number	Parent Source	Parent Exp. Date	Parent Conc.	Aliquot Volume (ml)	Dilution Volume (ml)	Final Conc.
1. 1CW5-8929	F ⁻	ICWI-	8838	12/25/06	100 ppm	0.750 mL	100 mL	0.75 ppm
2. (1CW1C5)	Cl ⁻							
3.	NO ₃ -N							
4.	Br ⁻							
5.	NO ₃ -N							
6. 1CW5-8930	F ⁻							
7. (1CW1C507)	Cl ⁻							
8.	NO ₃ -N							
9.	Br ⁻							
10.	NO ₃ -N							
11. 1CW5-8931	F ⁻	ICWI-	8837			1.0 mL		1.0 ppm
12. (CW17)	Cl ⁻							
13.	NO ₃ -N							
14.	Br ⁻							
	NO ₃ -N							

Reviewed By: _____

WC031R3.DOC, 8/28/03

Total Particulates

STL Knoxville Particulate Matter Determination Data Review/Narrative Checklist

Method: SW-846 Method 0050 by SOP KNOX-WC-0006, Rev. 2

Page 1 of 1

Batch Number:	6289129
Lot Number(s):	H6J100230

Review Items	N/A	Y	N	If No, why is data reportable?	2nd √
A. Calibration					
1. Was the balance calibration checked with 5, 50 & 100 gram weights prior to use?		✓			✓
2. Was the balance checked with 100 gram weight after every 10 samples?		✓			✓
3. Was the balance tared before each weighing?		✓			✓
4. Was the balance ID documented?		✓			✓
B. Client Sample and QC Sample Results					
1. Were all special project requirements met? (Were PM Checklists, Lot Summary, and any applicable QAS reviewed?)		✓			✓
2. Were sample IDs verified?		✓			✓
3. Were all transcriptions checked?		✓			✓
4. Calculations checked for error?		✓			✓
5. Final report acceptable? (Results correct, units correct, deviations noted in narrative, and analysis dates correct.)		✓			✓
C. Preparation/Matrix QC					
1. Were all sample weighings performed in duplicate (at least)?		✓			✓
2. Was the average of the last two weighings used?		✓			✓
D. Other					
1. Are all nonconformances documented appropriately?	✓			NCM No.:	N/A

[illegible]

Amel

Analyst: LDW

Reviewed by:

Date: _____

10/28/06

[illegible]

Comments:

STL Knoxville
SOP KNOX-WC-0006
Particulate Data Worksheet

Batch Number: 6289129
Prep Date: 10/13/2006 1200
Comp Date: 10/16/2006 1700

Analyst: LDW

Reviewed by: *[Signature]*

Date: 10/28/06

Lot Number	Lot Sample Number	Suffix	Method Code	Client ID	WO #	1	2	3	Tare Weight Average (g)	1	2	3	Final Weight Average (g)	Particulate Weight (mg)
H6J100230	1		88AG	UNIT NO.2 INLET RUN 1 THIMBLE	JF4DR1AA					6.5686	6.5582		6.56340	6563.4 ✓
H6J100230	2		88AG	UNIT NO.2 INLET RUN 1 ACETONE	JF4E81AA	64.9124			64.91240	65.0158	65.0162		65.01600	103.6
H6J100230	5		88AG	UNIT NO.2 INLET RUN 2 THIMBLE	JF4FQ1AA					7.8130	7.8122		7.81260	7812.6
H6J100230	6		88AG	UNIT NO.2 INLET RUN 2 ACETONE	JF4FR1AA	67.5189			67.51890	67.5467	67.5470		67.54685	28.0
H6J100230	9		88AG	UNIT NO.2 INLET RUN 3 THIMBLE	JF4FO1AA					5.8555	5.8559		5.85570	5855.7
H6J100230	10		88AG	UNIT NO.2 INLET RUN 3 ACETONE	JF4FI1AA	84.3154			84.31540	84.3582	84.3584		84.35830	42.9
H6J100230	13		88AG	UNIT NO.2 INLET RUN 1 FILTER	JF4F81AA					26.2846	26.2822		26.28340	26283.4
H6J100230	14		88AG	UNIT NO.2 STACK RUN 1 ACETONE	JF4GC1AA	67.5079			67.50790	67.5727	67.5725		67.57260	64.7
H6J100230	17		88AG	UNIT NO.2 STACK RUN 2 FILTER	JF4GP1AA					25.5699	25.5648		25.56735	25567.4
H6J100230	18		88AG	UNIT NO.2 STACK RUN 2 ACETONE	JF4GQ1AA	67.0244			67.02440	67.0885	67.0875		67.08800	63.6
H6J100230	21		88AG	UNIT NO.2 STACK RUN 3 FILTER	JF4G01AA					32.2079	32.1975		32.20270	32202.7
H6J100230	22		88AG	UNIT NO.2 STACK RUN 3 ACETONE	JF4G11AA	64.8817			64.88170	65.0031	64.9992		65.00115	119.5
H6J100230	25		88AG	UNIT NO.2 STACK RUN BLANK AC	JF4G71AA	66.6071			66.60710	66.6108	66.6108		66.61080	3.7
H6J100230	013			Petrol Dish Weight	JF4B1AA	25.1507								
H6J100230	017				JF4B1AA	25.1683								
H6J100230	021				60	31.7777								

Comments:

Filter weights for #13, 17 + 21 include dish wt. We also did separate for sub-trace from filter to get filter + pent + sub-trace wt. Done
10/28/06

STL Knoxville
Sample Data Log
Particulate Matter by KNOX-WC-0006

95

Batch Number: 6289129													
Sample Number	Work Order Number	Matrix	Filter or Beaker No.	Probe Rinse Volume (mL)	Tare Weight (g)	Replicate No.	Balance ID	Cal Check ¹	Tare ²	Individual Weight (g)	Date	Time	Analyst Initials
1 H6J100230-001	JF4DR	THMBE	36	NA	NA	1	H-47372	100.0000	✓	6.5559	10/16/06	10:40	LDW
						2	↓	↓	✓	6.5588	↓	14:34	↓
						3	↓	↓	✓	6.5686	10/17/06	15:01	↓
						4	↓	99.9998	✓	6.5582	10/20/06	16:40	↓
2 H6J100230-002	JF4EB	ACE	002	250mL	64.9124	1	H-47372	99.9999	✓	65.0158	10/17/06	12:03	LDW
						2	↓	↓	✓	65.0162	↓	14:53	↓
						3	↓	↓	✓	↓	↓	↓	↓
						4	↓	↓	✓	↓	↓	↓	↓
3 H6J100230-005	JF4FQ	THMBE	45	NA	NA	1	H-47372	100.0000	✓	7.8050	10/16/06	10:42	LDW
						2	↓	↓	✓	7.8078	↓	14:35	↓
						3	↓	↓	✓	7.8130	10/17/06	15:02	↓
						4	↓	↓	✓	7.8122	10/18/06	16:57	↓
4 H6J100230-006	JF4FR	ACE	006	141mL	67.5189	1	H-47372	99.9999	✓	67.5467	10/17/06	12:04	LDW
						2	↓	↓	✓	67.5470	↓	14:54	↓
						3	↓	↓	✓	↓	↓	↓	↓
						4	↓	↓	✓	↓	↓	↓	↓
5 H6J100230-009	JF4FO	THMBE	46	NA	NA	1	H-47372	100.0000	✓	5.8491	10/16/06	10:44	LDW
						2	↓	↓	✓	5.8521	↓	14:36	↓
						3	↓	↓	✓	5.8555	10/17/06	15:03	↓
						4	↓	99.9999	✓	5.8559	10/18/06	16:35	↓

¹ Record the measured weight of the 100 gram weight. Was the measured weight 100 ± 0.0005 grams? (At start, and after every ten containers)

² Was the balance tared before the current weighing?

STL Knoxville
Sample Data Log
Particulate Matter by KNOX-WC-0006

96

Batch Number: 6389129													
Sample Number	Work Order Number	Matrix	Filter or Beaker No.	Probe Rinse Volume (mL)	Tare Weight (g)	Replicate No.	Balance ID	Cal Check ¹	Tare ²	Individual Weight (g)	Date	Time	Analyst Initials
1 H6J100230-010	JF4F1	A C E	010	150mL	84.3154	1	H-47372	99.9999	✓	84.3582	10/17/06	12:05	LDO
						2	↓	↓	✓	84.3584	↓	14:55	↓
						3							
						4							
2 H6J100230-013	JF4F8	F	A089	NA	NA	1	H-47372	100.0000	✓	26.2756	10/16/06	10:45	LDO
						2	↓	100.0002	✓	26.2707	↓	14:37	↓
						3	↓	↓	✓	26.2846	10/17/06	15:05	↓
						4	↓	99.9999	✓	26.2822	10/18/06	16:40	↓
3 H6J100230-014	JF46C	A C E	014	200mL 10/17/06	67.5079	1	H-47372	99.9999	✓	67.5798	10/17/06	12:06	LDO
						2	↓	↓	✓	67.5817	↓	14:56	↓
						3	↓	↓	✓	67.5727	10/18/06	11:11	↓
						4	↓	↓	✓	67.5735	↓	16:30	↓
4 H6J100230-017	JF46P	F	A090	NA	NA	1	H-47372	100.0000	✓	25.5658	10/16/06	10:46	LDO
						2	↓	100.0002	✓	25.5677	↓	14:43	↓
						3	↓	↓	✓	25.5699	10/17/06	15:08	↓
						4	↓	99.9998	✓	25.5648	10/20/06	16:43	↓
5 H6J100230-018	JF46Q	A C E	018	200mL	67.0244	1	H-47372	99.9999	✓	67.0959	10/17/06	12:07	LDO
						2	↓	↓	✓	67.0981	↓	14:57	↓
						3	↓	↓	✓	67.0895	10/18/06	11:12	↓
						4	↓	↓	✓	67.0885	↓	16:31	↓

¹ Record the measured weight of the 100 gram weight. Was the measured weight 100 ± 0.0005 grams? (At start, and after every ten containers)

² Was the balance tared before the current weighing?

↓ 99.9998 ✓ 67.0875 10/20/06 16:48 LDO

STL Knoxville Sample Data Log

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Particulate Matter by KNOX-WC-0006

Batch Number: 6289/29

Sample Number	Work Order Number	Matrix	Filter or Beaker No.	Probe Rinse Volume (mL)	Tare Weight (g)	Replicate No.	Balance ID	Cal Check ¹	Tare ²	Individual Weight (g)	Date	Time	Analyst Initials
1	H6J100230-021	F				1	H-47372	100.0000	✓	33.7992	10/16/06	10:47	LDA
						2		↓		33.2072	↓	↓	
						3		100.0022	✓	33.2041	↓	14:44	
			A091	NA		4		↓	✓	33.2098	10/17/06	15:10	✓
2	H6J100230-022	A C E				1	H-47372	99.9999	✓	65.0107	10/17/06	13:08	LDA
						2		↓	✓	65.0145	↓	14:58	
			022	411 mL	64.8817	3		↓	✓	64.9994	10/18/06	11:14	
						4		↓	✓	65.0031	↓	16:32	✓
3	H6J100230-025	A C E				1	H-47372	99.9999	✓	66.6108	10/17/06	12:09	LDA
			025	213 mL	66.6071	2		↓	✓	66.6108	↓	14:59	✓
						3							
						4							
4						1							
						2							
						3							
						4							
5						1							
						2							
						3							
						4							

¹ Record the measured weight of the 100 gram weight. Was the measured weight 100 ± 0.0005 grams? (At start, and after every ten containers)

² Was the balance tared before the current weighing?

→ BALANCE ID - H-47372, CAL CHECK & TARE WERE DONE ON THESE SAMPLES.

Tare Weight Log
Particulate Matter by KNOX-WC-0006

	Filter or Beaker No.	Matrix	Replicate No.	Balance ID	Cal Check ¹	Tare? ²	Individual Weight (g)	Date	Time	Analyst Initials	Tare Weight (g)
1	002	ACE	1	H-473742	100.0000	✓	64.9124	10-11-06	1117	JMH	64.9124
			2	H-47372							
			3					JMH			
			4					10/11/06			
2	006	ACE	1	H-473742	100.0000	✓	67.5189	10-11-06	1119	JMH	67.5189
			2	H-47372							
			3					JMH			
			4					10/11/06			
3	010	ACE	1	H-473742	100.0000	✓	84.3154	10-11-06	1120	JMH	84.3154
			2	H-47372							
			3					JMH			
			4					10/11/06			
4	014	ACE	1	H-473742	100.0000	✓	67.5079	10-11-06	1122	JMH	67.5079
			2	H-47372							
			3					JMH			
			4					10/11/06			
5	018	ACE	1	H-473742	100.0000	✓	67.0244	10-11-06	1124	JMH	67.0244
			2	H-47372							
			3					JMH			
			4					10/11/06			
6	022	ACE	1	H-473742	100.0000	✓	64.8817	10-11-06	1125	JMH	64.8817
			2	H-47372							
			3					JMH			
			4					10/11/06			
7	025	ACE	1	H-473742	100.0000	✓	66.6071	10-11-06	1126	JMH	66.6071
			2	H-47372							
			3					JMH			
			4					10/11/06			
8			1								
			2								
			3								
			4								
9			1								
			2								
			3								
			4								
10			1								
			2								
			3								
			4								

¹ Record the measured weight of the 100 gram weight. Was the measured weight 100 ± 0.0005 grams?

(At start, and after every ten containers)

² Was the balance tared before the current weighing?

Sample Receipt Documentation

**AIR
SAMPLING
ASSOCIATES, INC.**

H6J 100230

Chain of Custody Record

Client		Project No.		Page		of		Analysis	
Address		Unit No.		Lab		Lab		Analysis	
City	State	Zip Code	Project Manager	Lab Contact		Lab Phone No.		Analysis	
Run No.	Test Method		Absorbing Solution		No. of Containers	Comments		Analysis	
ADA-ES	06-056		3		16		Part. Matter		Hydrogen fluoride
Public Service of NH	Bow NH		Bill Mullins		Severn Trent		Billy Anderson		Hydrogen fluoride
Container No. 1	10/5/06	2015	Thimble	1	HAND DELIVERED		X		X
Container No. 2	10/5/06	2017	Acetone FW	1	NO CUSTODY SEALS		X		X
Container No. 3	10/5/06	2019	H2SO4, Temp 1, 2	1	RECEIVED AT AMBIENT		X		X
Container No. 4	10/5/06	2021	NaOH, Temp 3, 4	1	BND 10-9-06		X		X
Special Instructions:									
Turn Around Time Required:		Normal		Rush		Sample Disposal:		Return to ASAI	
1. Recovered By		2025		10/5/06		1. Relinquished By		Disposal By Lab	
2. Recovered By		10/7/06		1400		2. Relinquished By		Archive For	
3. Received By		10/9/06		1427		3. Relinquished By		6 Months	
Comments:

**AIR
SAMPLING
ASSOCIATES, INC.**

465100230

Chain of Custody Record

Client		Project No.		Page	of	Analysis	
Address		Unit No.	Lab		Part. Matter		Hydrogen Halide
City	State	Project Manager	Lab Contact		Date		Time
Run No.	Zip Code	Test Method	Lab Phone No.		Date		Time
ADA-ES	06-056	06-056	16				
Public Service of NH	Unit No. 2 Inlet to Orig. ESP	Bill Mullins	Severn Trent				
Bow	NH	EPA Method 26A	Billy Anderson				
2							
Sample I.D.	Date	Time	Absorbing Solution	No. of Containers	Comments		
Container No. 1	10/6/06	1525	Thimble	1			
Container No. 2	10/6/06	1527	Acetone FW	1			
Container No. 3	10/6/06	1550	H ₂ SO ₄ , Temp 12	1			
Container No. 4	10/6/06	1555	NaOH, Temp 34	1			
Special Instructions:							
Turn Around Time Required: ☒ Normal ☐ Rush ☐ Sample Disposal: ☐ Return to ASAI ☒ Disposal By Lab ☐ Archive For ☐ Months							
1. Recovered By		10/6/06		1555		10/7/06 1420	
2. Received By		10/7/06		1420		10/9/06 1427	
3. Received By		10/9/06		1427		10/9/06 1427	
Comments:

1465100230

Chain of Custody Record

Client		Project No.		Page		of		Analysis	
Address		Unit No.		Lab		Lab		Analysis	
City		Project Manager		Lab Contact		Lab Phone No.		Analysis	
Run No.		Test Method		No. of Containers		Comments		Analysis	
Container No. 1	10/6/06	1730	Thimble	1					
Container No. 2	10/6/06	1735	Acetone FW	1					
Container No. 3	10/6/06	1738	H ₂ S ₄ Imp 1,2	1					
Container No. 4	10/6/06	1740	NaOH, Imp 3,4	1					

Special Instructions:

Turn Around Time Required: ☒ Normal ☐ Rush ☐ Sample Disposal: ☐ Return to ASAI ☒ Disposal By Lab ☒ Archive For 6 Months

1. Recovered By: Billy L. Mullins, Jr. 10/6/06 1740 Date Time

2. Received By: Bill Dyer 10/7/06 1420 Date Time

3. Received By: Edm. C. Anderson 10/9/06 1427 Date Time

Comments:

**AIR
SAMPLING
ASSOCIATES, INC.**

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Chain of Custody Record

Client	ADA-ES		Project No.	06-056		Page	4	of	16	Analysis	
Address	Public Service of NH		Unit No.	Unit No. 2 Stack		Lab	Severn Trent				
City	State	Zip Code	Project Manager	Bill Mullins		Lab Contact	Billy Anderson				
Run No.	Bow NH		Test Method	EPA Method 26A		Lab Phone No.					
Sample I.D.	Date	Time	Absorbing Solution	No. of Containers	Comments						
Container No. 1	10/5/06	2100	Filter	1		Part. Matter X					
Container No. 2	10/5/06	2106	Acetone FW	1		Hydrogen Halide X					
Container No. 3	10/5/06	2105	H ₂ SO ₄ Imp 1, 2	1		X					
Container No. 4	10/5/06	2110	NaOH Imp 3, 4	1		X					
Special Instructions:											
Turn Around Time Required:			☒ Normal	☐ Rush	Sample Disposal:			☐ Return to ASAI ☒ Disposal By Lab ☒ Archive For 6			
1. Recovered By			Date		Time		Date		Time		
Billy P. Mullins			2115		10/5/06		Billy P. Mullins		10/7/06 1420		
2. Received By			Date		Time		Date		Time		
Bill Dyer			10/7/06		1420		Bill Dyer		10/9/06 1427		
3. Received By			Date		Time		Date		Time		
Sam C. Anderson			10/9/06		1427		Sam C. Anderson		10/9/06 1427		
Comments:

465100230

Chain of Custody Record

Client	Project No.		Page	of	Analysis
Address	Unit No.	Unit No. 2 Stack	Lab	Severn Trent	
City	State	Zip Code	Project Manager	Billy Mullins	
Run No.	Sample I.D.	Date	Time	Absorbing Solution	No. of Containers
1	Container No. 1	10/6/06	1830	Filter	1
2	Container No. 2	10/6/06	1835	Acetone FW	1
3	Container No. 3	10/6/06	1840	H ₂ SO ₄ Temp 12	1
4	Container No. 4	10/6/06	1845	NaOH Temp 34	1
5					
6					
7					
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9					
10					
11					
12					
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Chain of Custody Record

Client ADA-ES		Project No. 06-056		Page 10 of 16	
Address Public Service of NH		Unit No. Unit No. 2 Stack		Lab Severn Trent	
City Bow	State NH	Project Manager Bill Mullins		Lab Contact Billy Anderson	
Run No. 3	Test Method EPA Method 26A		Lab Phone No.		Analysis Part. Matter
Sample I.D.	Date	Time	Absorbing Solution	No. of Containers	Comments
Container No. 1	10/6/06	1845	Filter	1	X
Container No. 2	10/6/06	1850	Acetone FW	1	X
Container No. 3	10/6/06	1855	H ₂ SO ₄ Imp 1,2	1	X
Container No. 4	10/6/06	1858	N ₂ O ₄ Imp 3,4	1	X
Special Instructions:					
Turn Around Time Required:		☒ Normal	☐ Rush	Return to ASAI ☒ Disposal By Lab ☒ Archive For 6 Months	
1. Recovered By Billy J. Mullins	Date 10/6/06	Time 1900	1. Relinquished By Billy J. Mullins Date 10/7/06 Time 1420		
2. Received By Bill J. Mullins	Date 10/7/06	Time 1420	2. Relinquished By Bill J. Mullins Date 10/9/06 Time 1427		
3. Received By W.M. C. Anderson	Date 10/9/06	Time 1427	3. Relinquished By W.M. C. Anderson Date 10/9/06 Time 1427		
Comments:

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Chain of Custody Record

Client	Project No.	Page	of		
ADA-ES	06-056	11	16		
Address Public Service of NH	Unit No. Unit No. 2	Lab Severn Trent	Analysis Hydrogen Halides		
City Bow	State NH	Lab Contact Billy Anderson	Part. Matter		
Run No. BLANKS	Test Method EPA Method 26A	Lab Phone No.	Halogens		
Sample I.D.	Date	Time	Absorbing Solution	No. of Containers	Comments
Container No. 6	10/6/06	1620	Acetone	1	Blank
Container No. 7	10/6/06	1622	D.I.NH ₂ SO ₄	1	Blank
Container No. 8	10/6/06	1624	0.1 N NaOH	1	Blank
Container No. 9	10/6/06	1626	P.T. Water	1	Blank
Special Instructions:					
Turn Around Time Required: ☒ Normal ☐ Rush		Sample Disposal: ☐ Return to ASAI ☒ Disposal By Lab ☒ Archive For		Months	
1. Received By Billy J. Mullins, Jr. 10/6/06 1626		1. Relinquished By Billy J. Mullins, Jr. 10/7/06 1420		Date Time	
2. Received By Hall W.M. 10/7/06 1420		2. Relinquished By Bill Anderson 10/9/06 1427		Date Time	
3. Received By Adam C. Anderson 10/9/06 1427		3. Relinquished By		Date Time	
Comments:					

STL KNOXVILLE SAMPLE RECEIPT/CONDITION UPON RECEIPT ANOMALY CHECKLIST

Client: AIR SAMPLING ASSOC. Project: _____Lot Number: 465100230

Review Items	Yes	No	NA	If No, what was the problem?	Comments/Actions Taken
1. Do sample container labels match COC? (IDs, Dates, Times)	☒			☐ 1a Do not match COC ☐ 1b Incomplete information ☐ 1c Marking smeared ☐ 1d Label torn ☐ 1e No label ☐ 1f COC not received ☐ 1g Other: _____	
2. Is the cooler temperature within limits? (> freezing temp. of water to 6°C; NC, 1668, 1613B: 0-4°C; VOST: 10°C; MA: 2-6°C)		☒		☐ 2a Temp Blank = _____ ☐ 2b Cooler Temp = _____	
3. Were samples received with correct chemical preservative (excluding Encore)?		☒		☐ 3a Sample preservative = _____	
4. Were custody seals present/intact on cooler and/or containers?		☒		☒ 4a Not present ☐ 4b Not intact ☐ 4c Other: _____	
5. Were all of the samples listed on the COC received?	☒			☐ 5a Samples received-not on COC ☐ 5b Samples not received-on COC	
6. Were all of the sample containers received intact?	☒			☐ 6a Leaking ☐ 6b Broken	
7. Were VOA samples received without headspace?	☒			☐ 7a Headspace (VOA only)	
8. Were samples received in appropriate containers?	☒			☐ 8a Improper container	
9. Did you check for residual chlorine, if necessary?		☒		☐ 9a Could not be determined due to matrix interference	
10. Were samples received within holding time?	☒			☐ 10a Holding time expired	
11. For rad samples, was sample activity info. provided?				☐ Incomplete information	
12. For SOG water samples (1613B, 1668A, 8290, LR PAHs), do samples have visible solids present?				If yes & appears to be >1%, was SOG notified? _____	
13. Are the shipping containers intact?	☒			☐ 13a Leaking ☐ 13b Other: _____	
14. Was COC relinquished? (Signed/Dated/Timed)	☒			☐ 14a Not relinquished	
15. Are tests/parameters listed for each sample?	☒			☐ 15a Incomplete information	
16. Is the matrix of the samples noted?	☒			☐ 15a Incomplete information	
17. Is the date/time of sample collection noted?	☒			☐ 15a Incomplete information	
18. Is the client and project name/# identified?	☒			☐ 15a Incomplete information	
19. Was the sampler identified on the COC?	☒				
Quote #: <u>72504</u> PM Instructions: _____					

QA026R18.doc, 1/30/06

Date: 10-9-06Sample Receiving Associate: Ramona J. Janssen

Appendix G:
Chain of Custodies

**AIR
SAMPLING
ASSOCIATES, INC.**

H105100152

Chain of Custody Record

Client	Project No.	Page	of	Analysis	
ADA-ES	06-056	1	16		
Address	Unit No.	Lab			
Public Service of NH	Unit No. 2 Inlet to Orig. ESP	Severn Trent			
City	Project Manager	Lab Contact			
Bow	Bill Mullins	Billy Anderson			
Run No.	Test Method	Lab Phone No.			
1	Ontaria Hydro				
Sample I.D.	Date	Time	Absorbing Solution	No. of Containers	Comments
Container No. 1	10/5/06	1750	Thimble	1	
Container No. 2 A	10/5/06	1755	Acetone FW	1	
Container No. 2	10/5/06	1800	HNO ₃ FW	1	
Container No. 3	10/5/06	1957	KCl, Imp 1, 2, 3	1	
Container No. 4	10/5/06	1950	HNO ₃ H ₂ O ₂ Imp	1	
Container No. 5	10/5/06	2002	KMnO ₄ Imp 5, 6, 7	1	
Special Instructions:					
Turn Around Time Required:	☒ Normal	☐ Rush	Sample Disposal:	☐ Return to ASAI	☒ Disposal By Lab
1. Recovered By	10/5/06	2005	1. Relinquished By	10/7/06	1420
2. Received By	10/7/06	1420	2. Relinquished By	10/9/06	1427
3. Received By	10/9/06	1427	3. Relinquished By		
Comments:

**AIR
SAMPLING
ASSOCIATES, INC.**

1465100152

Chain of Custody Record

Client	Project No.	Page	of	Analysis	
ADA-ES	06-056	2	16		
Address Public Service of NH	Unit No. Unit No. 2 Stack	Lab Severn Trent			
City Bow	Project Manager Bill Mullins	Lab Contact Billy Anderson			
State NH	Test Method Ontario Hydro	Lab Phone No.			
Run No. 1					
Sample I.D.	Date	Time	Absorbing Solution	No. of Containers	Comments
Container No. 1	10/5/06	2025	Thimble	1	
Container No. 2A	10/5/06	2030	Acetone FW	1	
Container No. 2	10/5/06	2032	HNO ₃ FW	1	
Container No. 3	10/5/06	2040	KCl, Temp 12, 3	1	
Container No. 4	10/5/06	2024	HNO ₃ /H ₂ O ₂ , Dup 4	1	
Container No. 5	10/5/06	2035	KNO ₃ , Temp 3, 7	1	
					HAND DELIVERED
					NO CUSTODY SEALS
					REMOVED AT AMBIENT TEMP
					BFO 10-9-06
Special Instructions:					
Turn Around Time Required:	☒ Normal	☐ Rush	Sample Disposal:	☐ Return to ASAI	☒ Disposal By Lab
1. Recovered By Billy Mullins	10/5/06	2040	1. Relinquished By Billy Mullins	10/7/06	1420
2. Received By Add 10/7/06	10/7/06	1420	2. Relinquished By Bill 10/7/06	10/9/06	1427
3. Received By Wm C. Anderson	10/9/06	1427	3. Relinquished By		
Comments:

**AIR
SAMPLING
ASSOCIATES, INC.**

H6J 100 230

Chain of Custody Record

Client		Project No.		Page		of		Analysis	
Address		Unit No.		Lab		Lab Contact		Lab Phone No.	
City		State		Zip Code		Project Manager		Test Method	
Run No.		Sample I.D.		Date		Time		Absorbing Solution	
No. of Containers		Comments		No. of Containers		Comments		No. of Containers	
Container No. 1	10/5/06	2015	Thimble	1					
Container No. 2	10/5/06	2017	Acetone FW	1					
Container No. 3	10/5/06	2019	H2SO4, Imp 1, 2	1					
Container No. 4	10/5/06	2021	NaOH, Imp 3, 4	1					
Special Instructions:									
Turn Around Time Required: ☒ Normal ☐ Rush									
Sample Disposal: ☐ Return to ASAI ☒ Disposal By Lab ☒ Archive For 6 Months									
1. Recovered By		Date		Time		Date		Time	
Billy L. Mullins, Jr.		2025		10/5/06		Billy L. Mullins, Jr.		10/7/06 1420	
2. Received By		Date		Time		Date		Time	
Bill W. W.		10/7/06		1400		Bill W. W.		10/9/06 1427	
3. Received By		Date		Time		Date		Time	
William C. Anderson		10/9/06		1427					
Comments:

1465 100 230

Chain of Custody Record

[illegible]

140510052

Chain of Custody Record

Client	ADA-ES	Project No.	06-056	Page	5	of	16
Address	Public Service of NH	Unit No.	Unit No. 2 Inbt to Enig. ESP	Lab	Savarn Trent		
City	Bow NH	State	NH	Zip Code	Bill Mullins		
Run No.	2	Test Method	Ontario Hydro	No. of Containers	Comments		
Sample I.D.	Date	Time	Absorbing Solution	No. of Containers	Comments	Analysis	
Container No. 1	10/6/06	1445	Thimble	1'		X	Part. Matter
Container No. 2	10/6/06	1450	HNO ₃ FW	1'		X	Panic Hg
Container No. 3	10/6/06	1645	KCl, Imp 1, 2, 3	1'		X	Tonic Hg
Container No. 4	10/6/06	1710	HNO ₃ /H ₂ O, Imp 4	1'			
Container No. 5	10/6/06	1720	KMnO ₄ , Imp 5 & 7	1'			X
Container No. 2A	10/6/06	1448	Acetone FW	1'		X X	
Special Instructions:							
Turn Around Time Required:		☒ Normal		☐ Rush		Return to ASAI ☒ Disposal By Lab ☒ Archive For 6 Months	
1. Recovered By Billy J. Mullins, Jr.	10/6/06	1720	Time	Relinquished By Billy J. Mullins, Jr.	10/7/06	1420	Time
2. Received By Edil Aylmer	10/7/06	1420	Time	Relinquished By Edil Aylmer	10/9/06	1427	Time
3. Received By Wm. C. Anderson	10/9/06	1427	Time	Relinquished By			Time
Comments:

**AIR
SAMPLING
ASSOCIATES, INC.**

HVS 100152

Chain of Custody Record

Client		Project No.		Page		of		Analysis	
Address		Unit No.		Lab		Lab Contact		Pat. Matter	
City		Project Manager		Lab Phone No.		Lab		Pat. Matter	
Run No.		Test Method		No. of Containers		Comments		Pat. Matter	
Sample I.D.		Date		Time		Absorbing Solution		No. of Containers	
Container No. 1		10/6/06		1820		Thimble		1	
Container No. 2 A		10/6/06		1823		Acetone FW		1	
Container No. 2		10/6/06		1824		HND3 FW		1	
Container No. 3		10/6/06		1836		KCl, Imp 12, 3		1	
Container No. 4		10/6/06		1809		HND3 H2O2, Imp 1		1	
Container No. 5		10/6/06		1819		KMnO4, Imp 56.7		1	
Special Instructions:									
Turn Around Time Required:		☒ Normal		☐ Rush		Sample Disposal:		☐ Return to ASAI	
1. Recovered By		Date		Time		1. Relinquished By		Date	
Bill M		10/6/06		1836		Bill M		10/6/06	
2. Received By		Date		Time		2. Relinquished By		Date	
Bill M		10/6/06		1427		Bill M		10/6/06	
3. Received By		Date		Time		3. Relinquished By		Date	
Bill M		10/6/06		1427		Bill M		10/6/06	
Comments:

465100230

Chain of Custody Record

Client	Address		City	State	Zip Code	Run No.	Sample I.D.	Date	Time	Absorbing Solution	No. of Containers	Comments	Project No.	Unit No.	Project Manager	Test Method	Lab	Lab Contact	Lab Phone No.	Page	of	Analysis					
ADA-ES	Public Service of NH		Bow	NH		2							06-056					Severn Trent		7	16						
							Container No. 1	10/6/06	1525	Thimble	1											Hydrogen Halide					
							Container No. 2	10/6/06	1527	Acetone FW	1											Part. Matter					
							Container No. 3	10/6/06	1550	H ₂ SO ₄ , Imp 1, 2	1																
							Container No. 4	10/6/06	1555	NaOH, Imp 3, 4	1																
Special Instructions:																											
Turn Around Time Required:												☒ Normal		☐ Rush		Sample Disposal:				☐ Return to ASAI		☒ Disposal By Lab		☐ Archive For		Months	
1. Recovered By												10/6/06		1555		1. Relinquished By				10/7/06		1420		Time			
2. Received By												10/7/06		1420		2. Relinquished By				10/9/06		1427		Time			
3. Received By												10/9/06		1427		3. Relinquished By				10/9/06		1427		Time			
Comments:

Chain of Custody Record

Client	Project No.		Page	of	Analysis
ADT-ES	06-056		8	16	
Address	Unit No.	Lab			
Public Service of NH	Unit No. 2 Stack	Severn Trent			
City	Project Manager	Lab Contact			
Bow	Bill Mullins	Billy Anderson			
Run No.	Test Method	Lab Phone No.			
2	EPA Method 26 A				
Sample I.D.	Date	Time	Absorbing Solution	No. of Containers	Comments
Container No. 1	10/6/06	1830	Filter	1	X
Container No. 2	10/6/06	1835	Acetone Fw	1	X
Container No. 3	10/6/06	1840	H2SO4, Temp 1, 2	1	X
Container No. 4	10/6/06	1845	NaOH, Temp 3, 4	1	X
Special Instructions:					
Turn Around Time Required: ☒ Normal ☐ Rush ☐ Return to ASAI ☒ Disposal By Lab ☐ Archive For ☐ Months					
1. Received By	Bill Mullins		Sample Disposal:		1. Relinquished By
10/6/06	1845	10/6/06	1845	Billy Mullins	10/7/06 1420
2. Received By	Bill Mullins		Sample Disposal:		2. Relinquished By
10/7/06	1420	10/7/06	1420	Bill Mullins	10/9/06 1427
3. Received By	Jim C. Anderson		Sample Disposal:		3. Relinquished By
10/9/06	1427	10/9/06	1427	Jim C. Anderson	10/9/06 1427
Comments:

1465100230

Chain of Custody Record

Client		Project No.		Page		of		Analysis	
Address		Unit No.		Lab		Lab		Analysis	
City		Project Manager		Lab Contact		Lab Phone No.		Analysis	
Run No.		Test Method		Absorbing Solution		No. of Containers		Comments	
Sample I.D.		Date		Time		No. of Containers		Comments	
Container No. 1	10/6/06	1730	Thimble	1					
Container No. 2	10/6/06	1735	Acetone FW	1					
Container No. 3	10/6/06	1738	H ₂ SO ₄ , Imp 1, 2	1					
Container No. 4	10/6/06	1740	NaOH, Imp 3, 4	1					
Special Instructions:									
Turn Around Time Required:		Normal		Rush		Sample Disposal:		Return to ASAI	
1. Recovered By		10/6/06		1740		1. Relinquished By		Disposal By Lab	
2. Received By		10/7/06		1420		2. Relinquished By		Archive For	
3. Received By		10/9/06		1427		3. Relinquished By		Months	
Comments:									

G-10

465 100230

Chain of Custody Record

[illegible]

**AIR
SAMPLING
ASSOCIATES, INC.**

465700230

Chain of Custody Record

Client		Project No.		Page	of	Analysis	
Address		Unit No.	Unit No.	Lab	Lab Contact	Lab Phone No.	
City	State	Zip Code	Project Manager				
Run No.	Sample I.D.	Date	Time	Absorbing Solution	No. of Containers	Comments	
ADA-ES		06-056		Blank	1		Part. Matter
Public Service of NH		Unit No. 2		Blank	1		Hydrogen Halides
Bow	NH	Bill Mullins		Blank	1		Halogens
BLANKS		EPA Method 26A		Blank	1		
Container No. 6		10/6/06	1620	Acetone	1		
Container No. 7		10/6/06	1622	0.1N H2SO4	1		
Container No. 8		10/6/06	1624	0.1N NaOH	1		
Container No. 9		10/6/06	1626	DI Water	1		
G-12							
Special Instructions:							
Turn Around Time Required:		☒ Normal	☐ Rush	Sample Disposal:		☐ Return to ASAI	☒ Disposal By Lab
1. Recovered By		Date		Time		Archive For	
Billy J. Mullins		10/6/06		1626		6 Months	
2. Received By		Date		Time		Date	
Bill Mullins		10/7/06		1420		10/7/06 1420	
3. Received By		Date		Time		Date	
Bill Mullins		10/9/06		1427		10/9/06 1427	
Comments:

1465100152

Chain of Custody Record

Client	Project No.	Page	of	Analysis	
ADA-ES	06-056	12	16		
Address	Unit No.	Lab			
Public Service of NH	Unit No. 2 Stack	Severn Trent			
City	Project Manager	Lab Contact			
Bow	Bill Mullins	Billy Anderson			
Run No.	Test Method	Lab Phone No.			
3	Ontario Hydro				
Sample I.D.	Date	Time	Absorbing Solution	No. of Containers	Comments
Container No. 1	10/7/06	1235	Thimble	1	
Container No. 2A	10/7/06	1238	Acetone FW	1	
Container No. 2	10/7/06	1239	HNO3 FW	1	
Container No. 3	10/7/06	1309	KCl, Imp 1, 2, 3	1	
Container No. 4	10/7/06	1257	HNO3 H2O, Drip 4	1	
Container No. 5	10/7/06	1255	KMnO4, Imp 5, 6, 7	1	
Special Instructions:					
Turn Around Time Required:	☒ Normal	☐ Rush	Sample Disposal:	☐ Return to ASAI	☒ Disposal By Lab
1. Recovered By	10/7/06	1309	1. Relinquished By	10/9/06	1427
2. Received By	10/9/06	1427	2. Relinquished By		
3. Received By			3. Relinquished By		
Comments:

**AIR
SAMPLING
ASSOCIATES, INC.**

H65100152

Chain of Custody Record

Client		Project No.		Page		of		Analysis	
Address		Unit No.		Lab		Lab Contact		Lab Phone No.	
City		State		Zip Code		Project Manager		Test Method	
Run No.		Sample I.D.		Date		Time		Absorbing Solution	
No. of Containers		Comments		No. of Containers		Absorbing Solution		Time	
Container No. 1	10/7/06	1131	Thimble	1					
Container No. 2A	10/7/06	1133	Acetone FW	1					
Container No. 2	10/7/06	1134	HWD3 FW	1					
Container No. 3	10/7/06	1156	KCl, Imp, 2, 3	1					
Container No. 4	10/7/06	1156	HWD3 Hb2, Imp 4	1					
Container No. 5	10/7/06	1149	KMdy Imp 567	1					
Special Instructions:									
Turn Around Time Required:				☒ Normal		☐ Rush		Sample Disposal:	
1. Recovered By				10/7/06		1156		1. Relinquished By	
2. Received By				10/9/06		1427		2. Relinquished By	
3. Received By				10/9/06		1427		3. Relinquished By	
Comments:									

Project No. 06-056
Unit No. Unit No. 2 Inlet to Orig. ESP
Project Manager Bill Mullins
Test Method Ontario Hydro

Page 13 of 16
Lab Severn Trent
Lab Contact Billy Anderson
Lab Phone No.

Analysis: Part. Matter, Part. Hg, Ionic Hg, Elemental Hg

Turn Around Time Required: ☒ Normal ☐ Rush
1. Recovered By: Bill Wyl
2. Received By: Bill Wyl
3. Received By: Bill Wyl

Sample Disposal: 10/7/06 1156
1. Relinquished By: Bill Wyl
2. Relinquished By: Bill Wyl
3. Relinquished By: Bill Wyl

Comments:

465100152

Chain of Custody Record

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**AIR
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1465100152

Chain of Custody Record

Client		Project No.		Page 15 of 16		Analysis	
Address		Unit No.		Lab		Analysis	
City		Project Manager		Lab Contact		Analysis	
Run No.		Test Method		Lab Phone No.		Analysis	
ADA-ES		06-056		Severn Trent		Part. Matter	
Public Service of NH		Unit No. 2 Inlet to Orig. ESP		Billy Anderson		Part. Matter	
Bow		Bill Mullins		Billy Anderson		Part. Matter	
Blank Train		Ontario Hydro		Billy Anderson		Part. Matter	
Sample I.D.	Date	Time	Absorbing Solution	No. of Containers	Comments	Analysis	
Container No. 1	10/7/06		Thimble	1	(B4)	X	Part. Matter
Container No. 2A	10/7/06		Acetone FW	1		X	Part. Matter
Container No. 2	10/7/06		HNO ₃ FW	1		X	Part. Matter
Container No. 3	10/7/06	1224	KCl Imp, 33	1		X	Part. Matter
Container No. 4	10/7/06	1215	HNO ₃ /H ₂ O ₂ , Imp 4	1		X	Part. Matter
Container No. 5	10/7/06	1213	KMnO ₄ , Imp 5, 6, 7	1		X	Part. Matter
Special Instructions:							
Turn Around Time Required:		Normal ☒ Rush ☐		Sample Disposal:		Return to ASAI ☐ Disposal By Lab ☒ Archive For 6 Months	
1. Recovered By		Date		Time		Date	
L. H. (M)		10/10/06		1224		10/9/06 477	
2. Received By		Date		Time		Date	
L. H. C. Anderson		10/9/06		1427		10/9/06 477	
3. Received By		Date		Time		Date	
Comments:

**AIR
SAMPLING
ASSOCIATES, INC.**

HV5100152

Chain of Custody Record

Client	Project No.	Page	of	Analysis			
ADA-E5	06-056	16	16				
Address Public Service of NH	Unit No. Unit No. 2	Lab Sereny Transit					
City Bow	Project Manager Bill Mullins	Lab Contact Billy Anderson					
State NH	Test Method Ontario Hydro	Lab Phone No.					
Zip Code							
Run No.	Sample I.D.	Date	Time	Absorbing Solution	No. of Containers	Comments	
Container No. 7		10/7/06	1039	ONAHV03	1	OK-BA Cont 7 is recovered	
Container No. 8		10/7/06	1042	IN KCl	1		
Container No. 9		10/7/06	1043	530TH03-10/05/02	1		
Container No. 10		10/7/06	1044	H2SO4-KMnO4	1		
Container No. 11		10/7/06	1045	1030/Hydroxylamine	1		
Container No. 12		10/7/06	1045	Thimble No. 49	X 3		
	A18C			48A7	Bom		
					10/7/06		
Special Instructions:							
Turn Around Time Required:	☒ Normal	☐ Rush	Sample Disposal:	☐ Return to ASAI	☒ Disposal By Lab	☒ Archive For	Months
1. Recovered By Billy Mullins	10/7/06	1045	10/7/06	1045	10/7/06	10/7/06	10/7/06
2. Received By Bill Mullins	10/7/06	1420	10/7/06	1420	10/7/06	10/7/06	10/7/06
3. Received By Billy Mullins	10/7/06	1427	10/7/06	1427	10/7/06	10/7/06	10/7/06
Comments:

Appendix H:
Resumes of Test Personnel

BILLY J. MULLINS, JR.; President

<u>Education</u>	<p>Post Graduate Study Environmental Engineering at Southern Methodist University; Dallas, Texas 1970.</p> <p>M.S. 1969, New York University; New York, New York, in Civil Engineering (Air Resources).</p> <p>B.S. 1968, Texas Tech University; Lubbock, Texas, in Civil Engineering (Water Resources). Studies in Engineering at the U.S. Naval Academy; Annapolis, Maryland, 1963-1964</p>
<u>Professional Training Courses</u>	<p>Attended Short Course on Air Pollution Engineering at the University of Texas at Austin, February 1970.</p> <p>Attended four-week management course presented by the American Management Association, 1976.</p>
<u>Certification</u>	<p>Registered Professional Engineer Certified Visible Emissions Evaluator Licensed Private Pilot (Multi-Engine-Land, Instrument) Diplomat in the American Academy of Environmental Engineers Inductee into the Stack Sampling Hall of Fame Certified as Qualified Environmental Professional (QEP)</p>
<u>Professional Memberships</u>	<p>Air & Waste Management Association – Past Chairman, Past Vice Chairman, and Past Board of Directors of North Texas Chapter and Southwest Section; Past Chairman, Consultants Committee; Past Chairman, Source Measurement Committee</p> <p>Source Evaluations Society – Past President, Past Board of Directors</p> <p>American Management Association</p>

MULLINS (p. 2)

Publications

Authored "Real World Experience with USEPA's New Sampling and Analytical Methods for Conducting Risk Burn," May 1998.

Co-authored "Sulfur Compound Emissions of the Petroleum Production Industry," December 1974.

Co-authored "Field Procedure for Stabilizing Hydrogen Sulfide Samples to be Analyzed Using Modified Methylene Blue Technique," presented at the Conference on Ambient Air Quality Measurements, Austin, Texas, March 1975.

Co-authored "Atmospheric Emissions Survey of the Sour Gas Industry," October 1975.

Co-authored "Technique for Insuring the Validity of Samples for High Concentrations of Sulfur Dioxide Using the EPA Method 5 Sampling Train," presented at the Third National Conference on Energy and the Environment, College Corner, Ohio, September 1975.

Teaching
Experience

Conducted training seminars on sampling methods periodically since 1974 to present.

Conducted a one-day seminar on Part 75 Testing over ten times in 1993 and 1994.

Served as a lecturer in the Environmental Protection Agency's (EPA) training course number 450, "Source Sampling for Particulate Pollutants," for two years from January 1974 to October 1975 and March, 1992.

Conducted a two-day training course entitled "technical Assistance in Source Sampling" at Iowa State University, Ames, Iowa, for the Environmental Protection Agency (EPA), October 1974.

Conducted Environmental Protection Agency's (EPA) training course number 450, "Source Sampling for Particulate Pollutants," at Research Triangle Park, North Carolina, September 1975.

MULLINS (p. 3)

Teaching
Experience
(Cont'd)

Conducted a two-day short course entitled "Performing and Observing Source Sampling," Dallas, Texas, July 1976, May 1977, October 1977, November 1987 and November 1988; Lake Charles, Louisiana, May 1977; Casper Wyoming, May 1977; Point Comfort, Texas, November 1992.

Served as a lecturer in the Environmental Protection Agency's two-day seminar entitled "Asphalt Industry Environmental Solutions," presented in Dallas, Texas, March 21-22, 1979.

Conducted a two-day short course entitled "Performing and Observing Source Sampling," Phoenix, Arizona, August, 1990, for the State of Arizona, Department of Environmental Quality; Lincoln, Nebraska, March 1980, for the State of Nebraska, Air Quality Control Division.

Technical
Experience

Directed and performed stack sampling on over 2000 sources of which over 500 were sampled simultaneously using more than one sampling train at several points in the flue gas stream; 1972-present.

Directed and performed over 200 short-term ambient air studies using mobile sampling vans and various ambient air sampling equipment; 1972-present.

Designed, directed and operated over 20 permanent ambient air networks of various size and duration for a variety of parameters; 1972-present.

Designed surface and underground drainage systems for residential subdivisions, public works projects, and shopping centers; 1969-1972.

Designed several residential subdivisions including lot layout, street design, drainage design, and utility design; 1969-1972.

MULLINS (p. 4)

Research
Projects

Supervised and conducted a study made by the Hawaiian Sugar Planters' Association to characterize the emissions for several bagasse-fired boilers, April-May 1976.

Supervised and conducted a study made by the Rio Grande Valley Sugar Growers, Inc. to determine the area affected by the burning of sugarcane fields prior to harvesting, November 1974-April 1975.

Supervised and conducted a study by a lightweight aggregate manufacturer to develop a material balance around the process through sampling and analysis of several parameters, November 1973.

Conducted a study in New York City to attempt to develop a correlation in the ambient air between carbon dioxide and sulfur dioxide to provide a tool for predicting air pollution predicting air pollution episodes, January-May 1969.

Related
Projects

Served as Chairman of the Engineering Foundation Conference on Stack Sampling and Source Evaluation in Destin, Florida, 2002, and Santa Barbara, California, 1985.

Served as Co-Chairman of the Engineering Foundation Conference on Stack Sampling and Source Evaluation in Destin, Florida, 2001.

Served as Session Chairman at the Engineering Foundation Conference on Stack Sampling and Source Evaluation in Hershey, Pennsylvania, 1984; San Diego, California, 1993; and in Palm Coast, Florida, 1994.

BILLY L. HEFLEY; Associate

Education B.S. 1992, East Central University; Ada, Oklahoma, in Environmental Science with a concentration in Environmental Management.

Professional Training Attended 40-hour Occupational and Environmental Training Program on Hazardous Materials (CFR 1910.120) Dallas, Texas, April 1993.

Also attended an 8-hour refresher course January 1994, February 1995, January 1996, and May 2004.

Attended 8-hour Safe Hazardous Materials Transportation Training Program (HM-126F and HM-181) Dallas, Texas, October 1994.

Attended Bill Mullins' Performing and Observing Source Sampling Short Course; Dallas, Texas, January 1995.

Certification Certified Visible Emissions Evaluator

Professional Memberships **Air & Waste Management Association**
Source Evaluations Society

Technical Experience Participated in the sampling of over 750 sources, including several of which were sampled simultaneously using more than one sampling train. Thoroughly trained in all EPA testing procedures, 1992-present.

Participated in an auditing program for a permanent eight-station sulfur dioxide ambient air network in East Texas, 1992-1993.

Participated in a semi-monthly ambient air monitoring survey for organic compounds at a petrochemical facility located in South Texas, 1992-1993.

Participated in EPA's Information Collection Request for Mercury conducting more than 46 simultaneous tests for Speciated Mercury using the "Standard Test Method for Elemental, Oxidized, Particle-Bound, and Total Mercury in Flue Gas Generated from Coal-Fired Stationary Sources (Ontario Hydro Method)." September 1999-May 2000.

HEFLEY (p. 2)

Experienced in the analysis of commercial calibration gas cylinders for NO_x, SO₂, CO₂, and O₂.

Experience with calibration techniques for all field testing equipment.

Thoroughly trained in the operation and routine maintenance of the following:

- Anarad Model AR50-C Carbon Dioxide Analyzer
- Anarad Model AR880 Oxides of Nitrogen Analyzer
- Anarad Model AR23 Oxygen Analyzer
- Anarad Model AR30C2 Sulfur Dioxide Analyzer
- California Analytical Model 300-HFID Total Hydrocarbon Analyzer
- Servomex Model 1440 Carbon Dioxide Analyzer
- Servomex Model 1440 Oxygen Analyzer
- Teledyne Model 326 Oxygen Analyzer
- Thermo Environmental Model 10AR & 10S Oxides of Nitrogen Analyzer
- Thermo Electron Model 46C Oxides of Nitrogen Analyzer
- Thermo Electron Model 48C Oxides of Nitrogen Analyzer
- Western Research Model 721A Sulfur Dioxide Analyzer

GARY B. GOLDMAN; Associate

<u>Education</u>	B.S. 1993, University of Texas at Arlington; Arlington, Texas, in Geology.
<u>Certification</u>	Certified Visible Emissions Evaluator
<u>Professional Memberships</u>	Source Evaluation Society
<u>Technical Experience</u>	<p>Senior Emissions Evaluator with the Texas Commission on Environmental Quality, responsible for oversight of all source testing activities within the State of Texas, Region 4, which encompasses 19 counties in the North Texas region, 1999-2005.</p> <p>Participated in the sampling of over 750 sources, including several of which were sampled simultaneously utilizing more than one sampling train, 1994-1999.</p> <p>Thoroughly trained in all EPA testing procedures specified in Title 40 of the Code of Federal Regulations, Part 60.</p> <p>Thoroughly trained in Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 0010 Through 0100 Series.</p> <p>Participated in EPA's 3-D probe study. May – August 1997.</p> <p>Experienced in the analysis of commercial calibration gas cylinders for NO_x, SO₂, CO₂, and O₂.</p> <p>Experienced with calibration techniques for all field testing equipment.</p> <p>Thoroughly trained in the operation and routine maintenance of the following:</p> <p>Anarad Model AR50-C Carbon Dioxide Analyzer Anarad Model AR880 Oxides of Nitrogen Analyzer Anarad Model AR23 Oxygen Analyzer Anarad Model AR30C2 Sulfur Dioxide Analyzer</p>

GOLDMAN (p. 2)

California Analytical Model 300-HFID Total Hydrocarbon Analyzer
Servomex Model 1440 Carbon Dioxide Analyzer
Servomex Model 1440 Oxygen Analyzer
Teledyne Model 326 Oxygen Analyzer
Thermo Environmental Model 10AR/S Oxides of Nitrogen Analyzer
Thermo Electron Model 46C Oxides of Nitrogen Analyzer
Thermo Electron Model 48C Oxides of Nitrogen Analyzer
Western Research Model 721A Sulfur Dioxide Analyzer

Professional
Training

Attended 40-hour Occupational and Environmental Training Program on Hazardous Materials (CFR 1910.120) Dallas, Texas, April 1993.

Attended HAZWOPER 8-hour refresher course, 1994-2005.

Attended the following Environmental Protection Agency (EPA) Courses:

Course 345, Emission Capture and Gas Handling System Inspection
Course 380, Fugitive Source Inspection
Course 400, Introduction to Hazardous Air Pollutants
Course 413, Control of Particulate Emissions
Course 415, Control of Gaseous Emissions
Course 418, Control of Nitrogen Oxide Emissions
Course 427, Combustion Evaluation
Course 444, Air Pollution Field Enforcement
Course 445, Inspection of Particle Control Devices
Course 446, Inspection Safety Procedures
Course 450, Source Sampling for Particulate Pollutants
Course 452, Principles and Practice of Air Pollution Control
Course 455, Inspection of Gas Control Devices and Selected Industries
Course 474, Continuous Emission Monitoring
Course 482, Sources and Control of Volatile Organic Air Pollutants

Attended the following California Air Resources Board (CARB) Courses

Course 221, Continuous Emission Monitoring
Course 233, Solvent Cleaning: Degreasing Operations
Course 242, Hot Mix Asphalt Facilities
Course 245, Cement Plants
Course 270, Incinerators

PATRICK SELAKOVICH; Associate

<u>Education</u>	B.S.B.A. 1992, University of Arkansas; Fayetteville, Arkansas, in General Business.
<u>Professional Training</u>	<p>Attended 24-hour Occupational and Environmental Training Program on Hazardous Materials (CFR 1910.120) Dallas, Texas, April 1997.</p> <p>Attended 40-hour Occupational and Environmental Training Program on Hazardous Materials (CFR 1910.120) & 'Train the Trainer', Gettysburg, Pennsylvania, July 1998.</p> <p>Also attended an 8-hour refresher course January 2000, January 2001, and May 2004.</p> <p>Attended OSHA General Industry Safety and Health Training, May 1999.</p>
<u>Professional Memberships</u>	Society For Human Resource Management
<u>Technical Experience</u>	<p>Participated in the sampling of over 150 sources, including several of which were sampled simultaneously using more than one sampling train. Thoroughly trained in all EPA testing procedures, 1996-present.</p> <p>Participated in EPA's 3-D probe study. May – August 1997.</p> <p>Experience with calibration techniques for all field testing equipment.</p> <p>Thoroughly trained in the operation and routine maintenance of the following:</p> <p>California Analytical Model 300-HFID Total Hydrocarbon Analyzer Servomex Model 1440 Carbon Dioxide Analyzer Servomex Model 1440 Oxygen Analyzer Thermo Electron Model 46C Oxides of Nitrogen Analyzer Thermo Electron Model 48C Oxides of Nitrogen Analyzer Western Research Model 721A Sulfur Dioxide Analyzer</p>

SCOT JACKSON; Associate

Education B.S.B.A. May 1978, Mountain View Jr. College, in General Business.

Professional Training Purchasing Supervisor for METCO Environmental, Inc. in charge of inventory and supplies. January 1995 – April 2005.

Attended 40-hour Occupational and Environmental Training Program on Hazardous Materials (CFR 1910.120), Dallas, Texas, May 2000.

Attended Fed-Ex Hazardous Goods Shipping Training, June 2004.

Certification Certified Visible Emissions Evaluator

Technical Experience Participated in the sampling of over 100 sources, including several of which were sampled simultaneously using more than one sampling train. Thoroughly trained in all EPA testing procedures, 1995-present.

Experience with calibration techniques for all field testing equipment.

Thoroughly trained in the operation and routine maintenance of the following:

California Analytical Model 300-HFID Total Hydrocarbon Analyzer
Servomex Model 1440 Carbon Dioxide Analyzer
Servomex Model 1440 Oxygen Analyzer
Thermo Electron Model 42C Oxides of Nitrogen Analyzer
Thermo Electron Model 48C Oxides of Nitrogen Analyzer
Western Research Model 721A Sulfur Dioxide Analyzer

SCOT JACKSON; Associate

Education B.S.B.A. May 1978, Mountain View Jr. College, in General Business.

Professional Training Purchasing Supervisor for METCO Environmental, Inc. in charge of inventory and supplies. January 1995 – April 2005.

Attended 40-hour Occupational and Environmental Training Program on Hazardous Materials (CFR 1910.120), Dallas, Texas, May 2000.

Attended Fed-Ex Hazardous Goods Shipping Training, June 2004.

Certification Certified Visible Emissions Evaluator

Technical Experience Participated in the sampling of over 100 sources, including several of which were sampled simultaneously using more than one sampling train. Thoroughly trained in all EPA testing procedures, 1995-present.

Experience with calibration techniques for all field testing equipment.

Thoroughly trained in the operation and routine maintenance of the following:

California Analytical Model 300-HFID Total Hydrocarbon Analyzer
Servomex Model 1440 Carbon Dioxide Analyzer
Servomex Model 1440 Oxygen Analyzer
Thermo Electron Model 42C Oxides of Nitrogen Analyzer
Thermo Electron Model 48C Oxides of Nitrogen Analyzer
Western Research Model 721A Sulfur Dioxide Analyzer

Environmental Services	B.-Unit:	PAU
		Name:	Dr. Mayer/Fe
		Date:	12/20/2006
		Page:	1 of 17
ADA-ES, Merrimack Station, Unit #2		Phone:	+49-2096016284
		Fax:	+49-2096016403
		Report-No:	06-16-640285

SO₃ Test Report

- D R A F T -

Test period: 10/02 - 10/03/2006 and 10/31 - 11/01/2006

ordered by ADA-ES, Inc.

Name of Plant Owner: Public Service of New Hampshire (PSNH)
Plant Identification: Merrimack Station, Unit 2
Location of Plant: 97 River Road, Bow, NH 03304

address: E.ON Engineering GmbH, P.O.Box 20 02 55, 45837 Gelsenkirchen

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Environmental Services	B.-Unit:	PAU
		Name:	Dr. Mayer/Fe
		Date:	12/20/2006
		Page:	2 of 17
ADA-ES, Merrimack Station, Unit #2 SO₃ Test Report - <i>D R A F T</i> -		Phone:	+49-2096016284
		Fax:	+49-2096016403
		Report-No:	06-16-640285

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4	Test Conditions and Results.....	8
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Environmental Services	B.-Unit:	PAU
		Name:	Dr. Mayer/Fe
		Date:	12/20/2006
		Page:	3 of 17
ADA-ES, Merrimack Station, Unit #2 SO₃ Test Report - D R A F T -		Phone:	+49-2096016284
		Fax:	+49-2096016403
		Report-No:	06-16-640285

1 Task description

Public Service of New Hampshire (PSNH) operates two coal fired boilers with cyclone burners (Unit 1: 120 MW and Unit: 2: 330 MW) at Merrimack Station which is located in Bow, New Hampshire. ADA-ES, Inc. carries out a comprehensive research program for mercury mitigation at Merrimack Station and, in this context, was interested in the behaviour of sulphur trioxide (SO₃) along the flue gas path from the air heater outlet to the stack. For this reason E.ON Engineering GmbH was commissioned to carry out SO₃ baseline testing and SO₃ testing during sorbent injection at Merrimack Station, Unit 2.

2 Test schedule, SO₃ measurement locations

All the tests were performed at full load (332 MW_{gross}) when firing fuel blends of various low and mid sulfur coals. Unit 2 is equipped with a tubular heat exchanger (air heater) and soot blowers are not installed. The following test locations and measuring points for SO₃ testing were agreed:

For baseline testing (October 02-03, 2006):

- Air heater outlet, North and South): Two ducts, three ports, 1 point deep (ca. 1.8 m, 5.9 ft)
- Inter ESP: One duct, one port, 1 point deep (ca. 2.5 m, 8.2 ft)
- Downstream ESP II, upstream stack: One duct, one port, 1 point deep (ca. 2.5 m, 8.2 ft)

For testing during sorbent injection (October 31 and November 01, 2006):

- Inter ESP: One duct, one port, 1 point deep (ca. 2.5 m, 8.2 ft)

At the sampling location "air heater outlet" flue gas temperatures at the different sampling ports were provided by the client. It was agreed upon that SO₃ sampling was performed on three ports with highest, lowest and medium average temperatures along the measured points. The temperature profile of the ducts at air heater outlet is given in Annex 1.

A graphical representation of all test locations is given in Figures 1 and 2.

Environmental Services	B.-Unit:	PAU
		Name:	Dr. Mayer/Fe
		Date:	12/20/2006
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ADA-ES, Merrimack Station, Unit #2 SO₃ Test Report - D R A F T -		Phone:	+49-2096016284
		Fax:	+49-2096016403
		Report-No:	06-16-640285

Figure 1: Scheme of Merrimack Station, Unit 2, and location of sampling ports used for SO₃ sampling

Figure 2: Sampling ports at air heater outlet (used ports in black) and average flue gas temperatures

Environmental Services	B.-Unit:	PAU
		Name:	Dr. Mayer/Fe
		Date:	12/20/2006
		Page:	5 of 17
ADA-ES, Merrimack Station, Unit #2 SO₃ Test Report - D R A F T -		Phone:	+49-2096016284
		Fax:	+49-2096016403
		Report-No:	06-16-640285

3 Measuring and Analytical Methods

3.1 Measuring Parameter: Sulphur Trioxide (SO₃)

Measuring Method: (Modified) Controlled Condensation Method

The Controlled Condensation Method (VGB Method 4.5.2) was designed to measure the vapour phase of SO₃ by condensation as H₂SO₄ under controlled gas conditions, eliminating the potential for interference with sulphur dioxide. This method was applied during baseline testing.

The Controlled Condensation Method has been modified by E.ON Engineering for determining sulphuric acid emissions downstream of wet scrubbers or at wet stacks of coal fired power stations or where any alkaline ashes or sorbents are present in the flue gas which may react with the SO₃ on the filter. Instead of the typically used quartz filter, the E.ON method utilizes a tubular electrostatic precipitator (ESP) to remove the ash particles to the side walls away from the gas stream. The sulphuric acid aerosols, if present, are evaporated in the ESP without intensive contact to fly ash particles. The high residence time of the gas stream within the heated ESP and the operation of the ESP at a temperature level significantly higher than the acid dew point ensure that only gaseous SO₃ is entering the condenser. This Method was applied for testing during sorbent injection.

Sampling Equipment:

The following items were used for sample collection:

Sampling Train:

A schematic of the sampling train used is shown below in Figure 3. The schematic is similar to the Method 8A¹ train (as used in the US) except that the impingers for SO₂ determination are omitted and that - in case of the modified method - an electrostatic precipitator is used instead of the quartz filter. The dry gas meter was replaced by a wet gas meter eliminating the need for a silica gel drying tube.

Quartz wool filter:

Quartz tube with lateral inlet in direction of the flue gas flow and packed with quartz wool. The filter is heated by the flue gas (isothermal filter conditions).

Probe liner:

Quartz, straight tube approximately 10-mm inside diameter, with a heating element and a stainless steel jacket. The temperature of the probe is controlled by a thermocouple taped on the quartz tube insulated with glass wool. Probe temperature was set to 260 °C (500 °F).

¹ A Method from the National Council of the Paper Industry for Air and Stream Improvement

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Figure 3: Sulphuric Acid Sampling Train

Electrostatic Precipitator (ESP):

Tubular ESP heated up to 200 °C (392 °F).

High voltage: 2 to 24 kV. Maximum flow rate: 70 l/min.

View and schematic of the ESP is given in Figure 4.

The filter consists of an exchangeable tube with a removable precipitation foil and a spray electrode in the center. The filter is placed in a caloric isolated container. The heating is adjusted to 200 °C (392 °F). At a high voltage of 24 kV and a filter current of 0.5 mA the separation efficiency of the filter is > 99.5 % for a particle size of 0.1 to 10 µm.

Figure 4: View and Schematic of the ESP

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H₂SO₄ Condenser:

The condenser coil is made from borosilicate glass with 500 cm of 6 mm ID tubing. The condenser coil is placed in a water bath which is maintained at a temperature of 80-90 °C (175-195 °F).

Metering System:

This system consists of a vacuum gauge, leak-free pump, temperature sensors capable of measuring temperature to within 1 °C, wet gas meter (WGM) capable of measuring volume to within 2 percent, and related equipment, as shown in Figure 3.

Sample Recovery

After each sampling run, the condensation coil is removed from the water bath and cooled down to ambient air temperature. The condensation coil is then rinsed with deionised water in a volumetric flask. Multiple rinses are used for good washing. The volumetric flask is filled up with deionised water to exactly 200 ml.

Sample Analysis

With a graduated pipette a volume of 20 ml is taken from the volumetric flask (section 4.2.2.3) and transferred to a 250 ml Erlenmeyer flask. After adding 80 ml of 2-propanol (IPA) and 4 drops of Thorine as indicator the solution is titrated with barium-perchlorate. Based on the sampled gas volume and the titration test result, the sulphuric acid aerosol concentration present in the flue gas is calculated.

Limit of Determination: 1 mg/m³ at a sample volume of 0.1 m³

3.2 Measuring Parameter: Oxygen (O₂)

Oxygen was measured at the gas meter outlet of each SO₃ sampling train.

Analyzer: Manufacturer: M & C Company, Type: PMA 10

Measuring Range: 0 - 30 Vol.-%

Analyzer Calibration: Calibration Gas: Air (20.9 Vol.-%)

Limit of Determination: 0.1 Vol.-%

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4 Test Conditions and Results

4.1 Operating Conditions of the Plant during Testing

Normally all SO₃ tests were carried out during full load of the plant (321 MW_{gross}). On October 3rd 2006 initially baseline testing at full load with reduced air heater outlet temperature was intended. However, due to transformer troubles, boiler load had to be reduced to 232 MW_{gross} and therefore SO₃ testing was performed at reduced load. Detailed plant data of the testing period 10/02/2006 - 10/03/2006 are summarized in Annex 2.

4.2 Testing Results

Baseline Testing:

The results of the baseline testing during full load operation without injection of SO₃ sorbents at the three different sampling locations are summarized in Table 1. Detailed sampling and analysis data of each individual testing are documented in Annex 3.

Table 1: Summarized Results of SO₃ Baseline Testing*

Date	Location	Average Flue Gas Temperature [°F]	Number of Tests	Average SO ₃ Concentration [ppm at 3 % O ₂]	Comment
10/02/2006	Air heater outlet	344	12	12.9	three ports (7, 10, 16)
10/02/2006	Inter ESP	331	7	15.2	one port
10/02/2006	ESP II outlet	327	7	13.9	one port

* Tests on October 03, 2006 at reduced load are not considered in this table

Testing during Sorbent Injection:

Summarized results of testing with sorbent injection on October 31st and November 1st, 2006 are presented in Table 2. Detailed sampling and analysis data of each individual testing are documented in Annex 4.

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Table 2: Summarized Results of SO₃ Testing at Sampling Location "Inter ESP" during Sorbent Injection

Date	Time	Number of Tests	Average SO ₃ Concentration [ppm at 3 % O ₂]	Comment
10/31/2006	10:30-12:00	3	14.8	No injection
10/31/2006	16:30-18:00	3	10.2	With injection*
11/01/2006	10:10-10:40	2	8.8	Injection: 500 lb/h, drop temp. before pre-heater
11/01/2006	11:15-14:10	6	8.5	Injection: 625 lb/h, drop temp. before pre-heater
11/01/2006	14:55-16:15	4	7.3	Injection: 625 lb/h, normal temp. before pre-heater
11/01/2006	17:15-17:55	2	20.2	No injection, drop temp. before pre-heater

* One test without injection within this time period is not considered in these values.

PAU/May-Fe

12/20/2006

 Hans-Joachim Dieckmann

 Dr. Johannes Mayer

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5 Annex

Annex 1	Temperature Profile at Air Heater Outlet
Annex 2	Plant Data of October 02-03, 2006
Annex 3	Individual Results of SO ₃ Baseline Testing
Annex 4	Individual Results of SO ₃ Testing during Sorbent Injection

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Annex 1: Flue gas temperatures [°F] at air heater outlet, provided by the client

		Port no.															
		Duct North								Duct South							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Depth [inches]	6 5/16	349		368		340		317			-		-		-		366
	19	347		362		337		307		306			-		-		361
	31 11/16	342		360		334		308		303			331		360		363
	44 5/16	354		351		334		330		305			335		365		370
	51	359		357		347		345		308			354		368		368
	69	364		353		344		342		319			351		360		360
Average		352.5		358.5		339.3		324.8		308.2			342.8		363.3		364.7

Date of measurement: 09/29/2006

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Annex 2.1: Plant Data of October 02-03, 2006

Gross MW	Coal Burned	Cond Press LP inHg	Cond Press HP inHg	Primary SH Diff inH2O	Secondary SH Diff inH2O	Econo diff inH2O	AH diff inH2O	Gas Outlet inH2O	Furnace pres inH2O	Windbox pres inH2O	FD Discharge 2A Press inH2O	FD Discharge 2B Press inH2O
AW2701020001 0001 INT	AW2701020001 0001 INT	AW2701020001 0001 INT	AW2701020001 0001 INT	AW2701020001 0001 INT	AW2701020001 0001 INT	AW2701020001 0001 INT	AW2701020001 0001 INT	AW2701020001 0001 INT	AW2701020001 0001 INT	AW2701020001 0001 INT	AW2701020001 0001 INT	AW2701020001 0001 INT
314.1	235.9	1.61	1.95	4.99	1.83	1.67	7.21	5.93	27.37	59.38	65.41	66.88
314.3	236.4	1.61	1.95	4.96	1.82	1.66	7.15	5.93	27.21	59.33	65.26	66.79
314.2	236.9	1.61	1.95	5.02	1.81	1.69	7.26	5.96	27.51	59.60	65.62	67.15
314.8	236.9	1.61	1.95	5.04	1.83	1.70	7.24	5.94	27.57	59.65	65.71	67.18
313.7	236.0	1.66	1.95	4.96	1.82	1.67	7.02	5.94	26.97	59.01	65.80	66.48
314.0	235.0	1.61	1.95	4.96	1.82	1.68	7.12	5.94	27.07	59.17	65.14	66.64
324.7	245.4	1.61	1.95	5.16	1.95	1.76	7.46	6.10	28.63	60.57	67.00	68.34
325.3	244.2	1.61	1.95	5.21	1.91	1.77	7.48	6.14	28.62	60.63	66.96	68.46
325.2	244.7	1.61	1.95	5.09	1.89	1.70	7.11	6.03	27.64	59.25	67.45	68.92
324.9	244.4	1.61	1.95	5.23	1.80	1.63	7.41	6.04	28.29	60.37	66.66	68.08
324.8	244.9	1.61	1.95	5.26	1.81	1.63	7.40	6.04	28.49	60.50	66.80	68.27
325.2	245.4	1.61	1.95	5.24	1.82	1.64	7.40	6.04	28.49	60.53	66.86	68.27
325.2	244.9	1.61	1.95	5.27	1.78	1.63	7.40	6.04	28.38	60.40	66.73	68.21
324.8	244.8	1.61	2.04	5.26	1.83	1.64	7.40	6.04	28.49	60.50	66.88	68.29
325.2	244.8	1.66	2.05	5.27	1.83	1.64	7.43	6.04	28.57	60.65	67.01	68.43
325.1	244.8	1.72	2.05	5.24	1.77	1.64	7.40	6.04	28.46	60.47	66.76	68.17
324.9	244.6	1.72	2.05	5.27	1.79	1.64	7.39	6.04	28.39	60.48	66.79	68.21
325.1	243.9	1.72	2.05	5.24	1.82	1.63	7.38	6.04	28.25	60.31	66.56	68.02
324.9	244.4	1.72	2.05	5.21	1.84	1.64	7.40	6.04	28.37	60.38	66.73	68.08
326.7	246.3	1.72	2.05	5.32	1.85	1.66	7.56	6.04	28.85	60.87	67.29	68.71
327.2	246.3	1.72	2.05	5.30	1.86	1.66	7.53	6.04	28.97	61.04	67.49	68.88
325.8	245.5	1.72	2.05	5.27	1.86	1.65	7.55	6.04	28.81	60.83	67.22	68.67
325.0	244.7	1.81	2.05	5.21	1.87	1.63	7.51	6.04	28.61	60.61	66.97	68.36
324.6	245.4	1.88	2.05	5.22	1.86	1.62	7.47	6.04	28.50	60.57	66.86	68.35
324.7	246.0	2.08	2.17	5.25	1.86	1.64	7.49	6.04	28.73	60.74	67.09	68.53
325.0	246.4	2.25	2.25	5.24	1.90	1.65	7.48	6.04	28.64	60.89	67.30	68.79
318.0	239.8	2.00	2.14	5.06	1.85	1.77	7.20	5.87	27.59	59.72	65.85	67.31
305.0	228.4	1.79	1.97	4.77	1.86	1.66	6.76	5.48	25.69	57.80	63.42	64.91
304.9	229.2	1.76	1.94	4.80	1.77	1.69	6.81	5.48	26.08	58.14	63.82	65.36
305.1	229.4	1.76	1.94	4.80	1.79	1.69	6.77	5.43	25.95	58.01	63.64	65.15
319.2	240.0	1.76	1.99	5.10	1.90	1.80	7.23	5.61	27.90	59.91	66.01	67.53
324.7	243.3	1.76	2.04	5.20	1.94	1.83	7.42	6.01	28.60	60.65	66.94	68.48
325.2	243.6	1.76	2.04	5.21	1.92	1.83	7.43	6.01	28.65	60.78	67.12	68.47
325.0	243.6	1.71	2.04	5.19	1.93	1.82	7.47	6.01	28.57	60.67	67.03	68.51
324.8	243.3	1.66	2.04	5.21	1.93	1.82	7.42	6.01	28.51	60.63	66.91	68.37
325.2	243.3	1.66	2.04	5.19	1.99	1.82	7.42	6.01	28.52	60.65	66.99	68.44
325.1	243.8	1.66	2.04	5.18	1.97	1.82	7.47	6.01	28.52	60.64	66.96	68.44
325.0	244.0	1.66	2.04	5.26	1.96	1.83	7.51	6.01	28.79	60.86	67.24	68.93
325.2	243.9	1.71	2.04	5.21	1.93	1.83	7.48	6.01	28.68	60.83	67.24	68.92
325.7	243.3	1.69	2.04	5.20	1.96	1.82	7.39	6.01	28.59	60.69	67.04	68.71
325.6	242.8	1.66	2.04	5.22	1.93	1.83	7.52	6.01	28.75	60.83	67.20	68.89
325.0	241.0	1.69	2.04	5.19	1.90	1.61	7.40	6.01	28.46	60.55	66.84	68.53
324.9	240.7	1.76	2.04	5.16	1.89	1.61	7.42	6.01	28.50	60.57	66.89	68.52
324.5	240.5	1.76	2.04	5.16	1.90	1.62	7.41	6.01	28.49	60.56	66.85	68.58
325.3	241.0	1.76	2.04	5.17	1.99	1.82	7.42	6.01	28.58	60.71	67.08	68.78
262.9	192.9	1.76	1.88	3.96	1.50	1.40	5.61	4.18	21.05	53.36	57.91	59.46
231.4	175.2	1.77	1.83	3.75	1.40	1.33	5.30	3.78	19.76	51.88	56.13	57.74
233.0	177.9	1.80	1.83	3.79	1.44	1.34	5.37	3.78	20.04	52.13	56.43	57.94
232.9	176.5	1.86	1.85	3.81	1.45	1.35	5.30	3.89	20.16	52.26	56.58	58.14
233.0	179.2	1.96	1.96	3.84	1.45	1.36	5.34	4.04	20.32	52.35	56.70	58.29
233.0	179.1	2.01	1.97	3.89	1.46	1.37	5.36	4.20	20.41	52.54	56.96	58.47
233.1	176.4	1.82	1.83	3.84	1.46	1.36	5.36	4.15	20.32	52.46	56.82	58.37

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Annex 2.2: Plant Data of October 02-03, 2006 (continued)

Wind turn diff inH ₂ O	U2 GFF 2A atm/s	U2 GFF 2B atm/s	AH gas out temp N	AH gas out temp N1	AH gas out temp S1	AH gas out temp S	AH cold end ave N temp	AH cold end ave S temp	AH ave cold end temp	AH air inlet 2B temp	AH air inlet 2A temp	Opacity
32.02	-0.17	84.72	342.9	305.2	305.4	343.1	251.1	255.3	253.0	183.1	177.8	6.95
32.12	-0.17	84.85	342.2	304.8	304.9	342.8	250.6	254.9	252.8	183.1	177.8	6.80
32.09	-0.17	84.71	341.8	304.4	304.5	342.7	250.6	254.6	252.5	182.7	178.1	6.76
32.08	-0.17	84.71	341.5	303.9	303.9	342.2	250.6	254.3	252.2	182.4	178.4	6.66
32.04	-0.17	84.89	340.5	303.7	303.9	342.2	250.8	254.3	252.3	183.6	178.4	6.78
32.10	-0.17	84.84	339.8	303.7	303.9	342.3	250.1	254.3	252.1	183.2	178.0	6.64
31.94	-0.17	84.55	340.8	303.4	304.0	342.2	250.0	254.1	252.2	182.5	178.4	6.66
32.01	-0.17	84.82	341.2	303.9	304.9	342.6	250.4	254.2	252.4	182.6	178.2	6.71
31.60	-0.17	84.90	340.5	303.7	304.7	342.7	250.1	254.2	252.4	183.0	178.4	6.76
32.08	-0.17	85.02	339.7	303.3	304.1	342.6	250.0	254.2	252.4	183.1	178.4	6.71
32.01	-0.17	84.76	339.2	302.4	302.9	342.1	250.0	253.5	251.6	183.0	178.9	6.77
32.04	-0.17	84.67	338.9	302.2	302.1	341.3	249.9	253.2	251.4	182.8	179.0	6.79
32.01	-0.17	84.97	338.5	301.9	301.9	341.1	249.5	252.7	251.3	183.1	179.0	6.72
32.01	-0.17	84.83	338.2	301.7	301.6	343.6	249.5	252.7	251.1	182.8	179.0	6.80
32.08	-0.17	84.69	338.3	301.8	301.8	344.1	249.5	252.8	251.3	182.8	179.2	7.34
32.01	-0.17	84.88	339.7	303.1	303.6	342.6	250.0	254.0	252.1	183.1	178.7	6.91
32.09	-0.17	84.95	340.2	303.4	303.9	342.2	250.0	254.3	252.2	183.1	178.4	6.56
32.07	-0.17	84.93	340.4	303.6	303.9	342.9	250.0	254.3	252.2	182.9	178.4	6.46
32.01	-0.17	84.93	340.3	303.6	304.4	342.7	250.0	254.3	252.4	183.1	178.4	6.48
32.01	-0.17	84.86	340.7	303.9	304.5	342.7	250.3	254.8	252.5	183.1	178.4	6.40
32.07	-0.17	84.96	340.8	304.0	304.5	342.7	250.5	254.8	252.5	183.1	178.4	6.78
32.02	-0.17	84.72	340.8	304.1	304.1	342.5	250.5	254.6	252.3	182.9	178.4	6.62
32.01	-0.17	84.98	340.8	304.0	304.0	342.0	250.5	254.3	252.2	182.7	178.4	6.60
32.06	-0.17	85.03	340.8	303.8	304.0	342.7	250.4	254.3	252.2	183.1	178.4	6.68
32.01	-0.17	84.87	341.2	303.7	303.5	342.6	250.5	253.9	252.1	182.5	178.4	6.69
32.05	-0.17	84.56	341.3	303.5	303.4	342.2	250.5	253.8	252.1	182.6	178.4	6.84
32.13	-0.17	85.13	341.2	303.4	303.3	342.0	250.4	253.8	252.0	182.7	178.4	6.71
32.10	-0.17	85.12	339.9	303.0	302.2	345.0	249.9	253.6	251.7	183.1	178.6	6.65
32.08	-0.17	84.53	338.8	302.1	300.6	343.6	249.9	252.6	251.0	183.0	178.9	6.71
32.06	-0.17	84.62	338.4	301.7	299.8	342.7	249.4	251.8	250.7	182.6	178.9	6.56
32.01	-0.17	84.52	339.1	302.0	300.0	342.8	249.9	251.8	250.9	181.9	178.4	6.79
32.06	-0.17	85.04	341.1	303.1	301.4	344.4	250.5	252.2	251.5	181.5	179.1	6.69
32.13	-0.17	85.05	342.2	304.0	302.6	345.0	250.5	253.0	251.9	181.8	178.5	6.71
32.10	-0.17	84.77	342.9	304.5	303.3	342.7	251.0	253.3	252.2	182.0	178.3	6.75
32.11	-0.17	84.99	343.3	304.8	303.6	342.2	251.0	253.6	252.4	182.0	178.1	6.74
32.13	-0.17	84.94	343.3	304.9	303.8	342.2	251.0	253.8	252.4	181.5	178.0	6.76
32.12	-0.17	84.77	343.3	304.9	303.7	342.2	251.0	253.8	252.3	181.7	178.1	6.87
32.07	-0.17	84.57	343.6	305.2	304.3	342.4	251.1	253.8	252.4	181.5	177.9	6.90
32.17	-0.17	84.79	344.2	305.4	304.6	345.1	251.4	253.9	252.7	181.7	177.8	7.00
32.11	-0.17	85.03	343.7	305.1	304.8	342.2	251.0	254.3	252.6	182.0	177.8	6.90
32.07	-0.17	84.76	343.2	304.9	304.6	342.6	251.0	253.9	252.5	181.6	177.6	6.81
32.09	-0.17	84.84	343.8	305.1	304.7	345.0	251.0	254.3	252.6	182.0	177.6	6.90
32.07	-0.17	84.56	343.8	305.2	305.1	345.2	251.0	254.3	252.7	182.1	177.8	6.99
32.07	-0.17	85.14	344.1	305.3	305.1	345.2	251.0	254.3	252.8	182.1	177.8	7.01
32.13	-0.17	85.09	341.2	304.6	303.7	342.7	250.3	254.3	252.2	182.9	177.5	6.70
32.30	-0.17	84.89	333.5	298.6	296.9	340.8	245.8	246.8	243.9	180.6	175.5	7.55
32.12	-0.17	84.94	326.7	292.5	290.5	333.0	242.4	245.8	242.1	179.7	175.1	7.13
32.09	-0.17	84.54	326.7	288.9	287.5	329.2	240.6	244.0	242.1	179.6	175.1	6.74
32.10	-0.17	84.97	323.4	288.9	287.5	329.2	240.6	243.5	241.6	179.7	175.1	6.69
32.03	-0.17	84.69	321.8	287.5	286.2	327.9	239.5	243.5	241.3	179.9	175.1	6.54
32.13	-0.17	84.83	321.0	287.2	285.8	327.6	239.5	243.3	241.3	179.9	175.1	6.54
32.14	-0.17	84.82	320.3	286.8	285.4	326.4	239.5	243.0	241.3	179.9	175.2	6.27

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Annex 2.3: Plant Data of October 02-03, 2006 (continued)

Coal Flow 2A klb/hr AVE TO SEDAR 2003 INT	Coal Flow 2B klb/hr AVE TO SEDAR 2003 INT	Coal Flow 2C klb/hr AVE TO SEDAR 2003 INT	Coal Flow 2D klb/hr AVE TO SEDAR 2003 INT	Coal Flow 2E klb/hr AVE TO SEDAR 2003 INT	Coal Flow 2G klb/hr AVE TO SEDAR 2003 INT	Main steam klb/hr AVE TO SEDAR 2003 INT	Turbine inlet steam temp AVE TO SEDAR 2003 INT	Turbine inlet steam Pias AVE TO SEDAR 2003 INT	feedwater flow AVE TO SEDAR 2003 INT	O2 East Average AVE TO SEDAR 2003 INT	O2 West Average AVE TO SEDAR 2003 INT
35.41	35.38	35.34	35.35	35.35	35.33	23.33	2124	2375	2102	2.41	2.20
35.41	35.38	35.39	35.35	35.35	35.69	23.47	2126	2375	2106	2.37	2.24
35.41	35.38	35.45	35.39	35.72	35.75	23.65	2127	2375	2110	2.34	2.21
35.34	35.31	35.30	35.30	35.44	35.24	23.54	2131	2375	2107	2.43	2.23
35.17	35.29	35.28	35.27	35.40	35.17	23.64	2127	2375	2096	2.37	2.20
35.56	35.59	35.36	35.35	35.20	35.24	23.26	2130	2375	2101	2.26	2.53
35.57	35.33	35.36	35.35	35.43	35.44	24.56	2163	2373	2171	2.21	2.39
35.37	35.35	35.31	35.32	35.32	35.33	23.33	2190	2376	2167	2.43	2.23
34.94	34.88	34.82	34.84	34.71	34.77	34.94	2188	2375	2162	2.29	2.33
34.94	34.88	34.82	34.84	34.71	34.77	34.94	2188	2375	2162	2.31	2.26
34.94	34.88	34.82	34.84	34.71	34.77	34.94	2188	2375	2162	2.32	2.33
34.98	34.97	34.97	34.94	35.03	35.13	35.06	2186	2375	2160	2.28	2.31
34.95	34.88	34.81	34.84	35.04	35.21	35.02	2187	2375	2160	2.32	2.29
34.92	34.88	34.80	34.89	34.90	34.98	35.00	2185	2375	2160	2.22	2.35
34.94	34.88	34.95	34.84	35.10	35.12	35.01	2190	2376	2165	2.35	2.29
34.90	34.88	34.91	34.84	35.04	34.99	35.07	2193	2375	2167	2.33	2.26
34.90	34.88	34.93	34.84	34.93	34.87	35.07	2192	2376	2167	2.32	2.27
34.90	34.88	34.78	34.84	34.82	34.72	34.83	2194	2375	2169	2.40	2.21
34.88	34.84	34.84	34.84	34.92	34.86	34.91	2191	2375	2167	2.37	2.21
35.17	35.15	35.16	35.12	35.20	35.21	35.20	2201	2375	2176	2.26	2.35
35.22	35.27	35.24	35.21	35.21	35.19	35.14	2196	2375	2181	2.31	2.30
34.95	34.96	35.11	35.15	35.10	35.19	35.14	2196	2378	2171	2.34	2.25
34.91	34.89	34.80	34.85	34.85	34.93	35.03	2187	2376	2161	2.36	2.26
35.00	34.85	35.16	35.15	35.16	35.06	35.06	2188	2375	2162	2.34	2.25
35.02	35.29	35.29	35.27	35.27	35.16	35.12	2192	2375	2164	2.31	2.25
35.39	35.38	35.29	35.36	35.27	35.16	35.12	2201	2375	2176	2.36	2.27
34.23	34.41	34.36	34.40	34.36	34.35	34.29	2149	2378	2118	2.26	2.30
32.50	32.59	32.66	32.65	32.67	32.69	32.64	2072	2374	2032	2.38	2.18
32.72	32.82	32.77	32.78	32.72	32.62	32.74	2076	2375	2045	2.40	2.20
32.68	32.77	32.63	32.69	32.61	32.74	32.73	2078	2375	2045	2.45	2.18
34.20	34.14	34.17	34.16	34.10	34.10	34.19	2162	2373	2137	2.41	2.19
34.83	34.83	34.82	34.85	34.75	34.78	34.80	2193	2376	2171	2.45	2.16
34.91	34.83	34.82	34.85	34.75	34.69	34.84	2196	2375	2173	2.36	2.24
34.86	34.83	34.82	34.85	34.75	34.69	34.80	2191	2376	2168	2.36	2.21
34.84	34.83	34.82	34.85	34.75	34.70	34.82	2190	2375	2165	2.39	2.22
34.82	34.83	34.82	34.85	34.78	34.74	34.80	2193	2375	2169	2.34	2.26
34.88	34.83	34.82	34.85	34.75	34.74	34.83	2191	2375	2168	2.44	2.15
34.86	34.83	34.82	34.85	34.80	34.77	34.82	2189	2375	2166	2.38	2.20
34.79	34.79	34.86	34.80	34.82	34.88	34.82	2190	2375	2167	2.45	2.20
34.85	34.84	34.79	34.85	34.74	34.69	34.84	2183	2376	2170	2.40	2.16
34.69	34.60	34.75	34.72	34.74	34.69	34.64	2182	2376	2169	2.43	2.17
34.21	34.39	34.42	34.35	34.36	34.44	34.45	2191	2375	2166	2.37	2.19
34.25	34.33	34.39	34.35	34.30	34.29	34.45	2194	2375	2170	2.43	2.16
34.27	34.30	34.33	34.30	34.31	34.35	34.37	2193	2375	2169	2.45	2.15
34.34	34.33	34.35	34.33	34.27	34.48	34.41	2192	2377	2169	2.39	2.22
27.65	27.75	27.72	27.76	27.69	27.88	27.63	1806	2371	1759	3.10	2.91
25.08	25.08	25.09	24.95	24.99	24.96	25.00	1808	2375	1573	4.15	4.15
25.36	25.44	25.52	25.43	25.40	25.37	25.36	1821	2375	1583	4.11	4.08
25.39	25.55	25.56	25.50	25.43	25.47	25.53	1822	2375	1583	4.13	4.05
25.60	25.55	25.56	25.50	25.50	25.74	25.63	1824	2375	1584	4.19	4.03
25.42	25.55	25.56	25.50	25.66	25.44	25.68	1823	2375	1584	4.02	4.11
25.47	25.55	25.56	25.60	25.51	25.46	25.49	1818	2376	1581	4.11	4.09

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Annex 3.1: Individual Results of SO₃ Baseline Testing

Table A3-1: SO₃ test results at air heater outlet (ESP Inlet), 10/02/2006

test period	gas counter					titration	SO ₃ concentration (STP, dry)		comment
	V	p	t	O ₂	V ₀		actual O ₂	3 % O ₂	
[start - end]	[L]	[mbar]	[°C]	[Vol.-%]	[NL]	[mL]	[ppm]	[ppm]	
09:20-09:29	150	1022	23	5.1	136	1.15	9.5	10.8	port 7, 325 °F
09:55-10:03	150	1024	22	5.5	137	1.25	10.2	11.9	port 7, 325 °F
10:10-10:20	150	1024	22	5.2	137	1.25	10.2	11.6	port 7, 325 °F
						average:	10.0	11.4	port 7, 325 °F
10:44-10:54	150	1024	24	8.8	136	0.85	7.0	10.4	port 10, 308 °F
11:00-11:09	150	1023	24	8.6	135	0.90	7.5	10.8	port 10, 308 °F
11:44-11:54	150	1023	23	8.5	136	0.90	7.4	10.7	port 10, 308 °F
						average:	7.3	10.6	port 10, 308 °F
12:31-12:41	150	1023	21	3.0	137	1.90	15.5	15.5	port 16, 365 °F
14:20-14:30	150	1023	22	3.0	137	1.70	14.0	14.0	port 16, 365 °F
14:40-14:50	155	1023	21	3.0	142	1.80	14.2	14.2	port 16, 365 °F
						average:	14.6	14.6	port 16, 365 °F
15:32-15:42	150	1025	23	4.5	137	1.60	13.1	14.3	port 7, 325 °F, with ESP
16:27-16:38	205	1028	21	4.2	189	2.35	13.9	14.9	port 7, 325 °F
17:20-17:30	150	1020	19	4.5	138	1.70	13.8	15.1	port 7, 325 °F
						average:	13.6	14.8	port 7, 325 °F
						total average:	11.4	12.9	ports 7, 10, 16

Table A3-2: SO₃ test results inter ESP, 10/02/2006 (all testing without ESP)

test period	gas counter					titration	(STP, dry)		comment
	V	p	t	O ₂	V ₀		actual O ₂	3 % O ₂	
[start - end]	[L]	[mbar]	[°C]	[Vol.-%]	[NL]	[mL]	[ppm]	[ppm]	
09:40-09:48	160	1019	23	4.6	145	1.60	12.4	13.6	331 °F
10:45-10:53	165	1017	24	4.7	148	1.75	13.2	14.6	331 °F
12:34-12:42	160	1017	24	4.7	143	1.85	14.5	16.0	331 °F
15:12-15:20	160	1018	23	4.7	144	1.70	13.2	14.6	331 °F
15:49-15:57	160	1018	24	4.7	143	1.65	12.9	14.2	331 °F
16:25-16:33	160	1018	23	4.8	144	1.95	15.2	16.9	331 °F
17:24-17:32	160	1017	23	4.6	144	1.95	15.2	16.7	331 °F
						average:	13.8	15.2

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		Fax:	+49-2096016403
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Annex 3.2: Individual Results of SO₃ Baseline Testing (continued)

Table A3-3: SO₃ test results ESP II Outlet, 10/02/2006 (all testing without ESP)

test period	gas counter					titration Ba(ClO ₄) ₂ [mL]	(STP, dry)		comment
	V	p	t	O ₂	V ₀		actual O ₂	3 % O ₂	
	[L]	[mbar]	[°C]	[Vol.-%]	[NL]		[ppm]	[ppm]	
10:20-10:28	160	1017	24	5.5	143	1.35	10.6	12.3	327 °F
11:04-11:12	160	1017	24	5.6	143	1.45	11.3	13.3	327 °F
12:10-12:18	160	1017	24	5.6	143	1.60	12.5	14.6	327 °F
15:30-15:38	161	1018	24	5.6	145	1.40	10.8	12.7	327 °F
16:09-16:17	160	1018	24	5.6	144	1.55	12.1	14.1	327 °F
16:45-16:53	160	1018	23	5.6	144	1.60	12.5	14.6	327 °F
17:06-17:14	160	1018	24	5.5	144	1.75	13.6	15.9	327 °F
						average:	11.9	13.9	

Table A3-4: SO₃ test results ESP II Outlet, 10/03/2006 (all testing without ESP)

test period	gas counter					titration Ba(ClO ₄) ₂ [mL]	(STP, dry)		comment
	V	p	t	O ₂	V ₀		actual O ₂	3 % O ₂	
	[L]	[mbar]	[°C]	[Vol.-%]	[NL]		[ppm]	[ppm]	
08:35-08:45	150	1020	21	7.5	137	0.60	4.9	6.6	reduced load
08:55-09:04	150	1020	21	7.5	137	0.65	5.3	7.1	reduced load
09:55-10:10	200	1022	22	7.5	182	1.05	6.5	8.6	reduced load
10:20-10:33	200	1022	22	7.5	182	1.00	6.2	8.2	reduced load
						average:	5.7	7.6

Platt Environmental Services, Inc.

371 Balm Court
Wood Dale, IL 60191
630-521-9400
630-521-9494 fax

**SULFURIC ACID MIST AND
TOTAL MERCURY EMISSION STUDY**

Performed for
ADA-ES, Inc.

At the
**Public Service of New Hampshire
Merrimack Power Plant
Unit 2 Stack
Bow, New Hampshire**

Test Dates
April 13 and 14, 2006

**Platt Environmental Services, Inc.
Report PE2006067**

Report Submittal Date
May 22, 2006

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CERTIFICATION SHEET

Having reviewed the test program described in this report, I hereby certify the data, information, and results in this report to be accurate and true according to the methods and procedures used.

Data collected under the supervision of others is included in this report and is presumed to have been gathered in accordance with recognized standards.

PLATT ENVIRONMENTAL SERVICES, INC.

A handwritten signature in black ink, appearing to read "E. L. Ehlers", written over a horizontal line.

Eric L. Ehlers
Senior Project Manager

1.0 INTRODUCTION

Platt Environmental Services, Inc., ("Platt Environmental") performed a total mercury and sulfuric acid mist emission test program on the Unit 2 Stack at the Merrimack Power Plant of the Public Service of New Hampshire in Bow, New Hampshire on April 13 and 14, 2006. The tests were authorized by the Public Service of New Hampshire and performed for ADA-ES, Inc.

The purpose of the test program was to determine the effects of operating at a high temperature and low temperature condition.

1.1 Project Contact Information

Location	Address	Contact
Test Coordinator	ADA-ES, Inc. 8100 South Park Way Unit B Littleton, Colorado, 80120	Mr. Tom Campbell Manager, DOE Demonstrations 303-734-1727 (phone) 303-734-0330 (fax) tomc@adaes.com
Testing Company Representative	Platt Environmental Services, Inc. 371 Balm Court Wood Dale, Illinois 60191	Eric Ehlers Senior Project Manager 630-521-9400 (phone) 630-521-9494 (fax) ericehlers@dataflo.net

The tests were conducted by Messrs. R. Owens and E. Ehlers of Platt Environmental.

2.0 SUMMARY OF RESULTS

The following table summarizes the test results for each of the test conditions:

Parameter	Reference Method	High Temp	Low Temp
Sulfuric Acid Mist (ppm SO ₃ as H ₂ SO ₄)	NCASI Method 8A	2.19	0.57
Total Mercury (ppb)	Appendix K to 40CFR75	1.04	1.17

Complete test results are appended in Section 6.0.

3.0 DISCUSSION OF RESULTS

Source operation appeared normal during the entire test program. No problems were encountered with the testing equipment during the test program.

4.0 TEST PROCEDURES

All testing, sampling, analytical, and calibration procedures used for this test program were performed as described in the Title 40, Code of Federal Regulations, Part 75 (40CFR75), Appendix K, and NCASI Method 8A.

4.1 Sulfur Trioxide (SO₃) Determination

The National Council of the Paper Industry for Air and Stream Improvement Inc. (NCASI) Method 8A, Determination of Sulfuric Acid Vapor or Mist and Sulfur Dioxide Emissions from Kraft Recovery Furnaces test procedure was used to determine the sulfur trioxide (SO₃) concentrations as sulfuric acid (H₂SO₄) mist at the Unit 2 Outlet stack test location.

By using a modified Graham condenser, the gas was collected to the acid dew point at which the SO₃ (H₂SO₄ vapor) condenses. The temperature of the gas was kept above the water dew point to prevent interference from SO₂ while a heated quartz filter system removed particulate matter.

After each run, the probe, connecting lines, controlled condensation coil, and filter holder, were cleaned. The probe and connecting lines were rinsed with demineralized water. The filter holder was inspected and cleaned before the next run and the filter pad was replaced.

Prior to use, the controlled condensation coil (CCC) was cleaned and dried. The CCC was transported to the site with a stopper in each end. The CCC was connected to a water bath and the circulation of the (167°F - 185°F) water was started. This evaporates any premature condensation.

With the probe still out of the stack, the train was assembled. All ball joints were checked to ensure they were completely clean and free of dust. Because of the possibility that the grease will seize at the temperatures employed, grease was not used.

A leak check was performed on the complete system. If the leak rate is less than 0.003 cfm, the system was ready for use. If a leak rate greater than 0.003 cfm was found, the system was checked for loose joints and connections. Any leak

was corrected prior to the start of the test. A post test leak check followed each test.

The probe and the filter holder were heated to greater than 350°F and 500°F, respectively. The heating bath is set at between (167°F - 185°F). Once the temperatures reached these values, the run commenced.

After leak checking, the pump was again turned on and the flowrate adjusted to 8 lpm (0.3 cfm) using the dry test meter and a stopwatch. The pump was turned off without readjusting the valve settings.

At the end of the sampling period, the probe was removed from the duct, a leak check performed and the pump slowly shut off. After the pressure dropped, the CCC was removed from the system without removing the water bath hoses. The CCC was carefully connected to the Erlenmeyer flask without spilling any condensate in the tube. In 10 ml increments (up to 30 mls), demineralized water was used to rinse out the CCC. The rinse solution in the stoppered Erlenmeyer was transferred to the laboratory and was diluted to with 100% IPA to reach a 80% IPA matrix prior to analysis.

The probe was rinsed with 30 mls of demineralized water. This solution was transferred to the laboratory and filtered through a Whatman No. 1 filter into a 50 ml volumetric flask.

The filter and any debris from the filter holder was removed and placed into the probe wash bottle.

The method of analysis was titration. All samples were carefully handled, stored in clean glassware and the coil rinse was analyzed as soon as possible. All results were recorded on the appended laboratory data sheet.

4.2 Total Mercury Determination

Paired trains were utilized using one (1) test point at the Unit 2 Stack test location to sample for total mercury.

Per Appendix K sampling, each sample was drawn through a heated quartz lined probe into the carbon sorbent trap. A tube of silica was used to capture remaining moisture prior to the sample reaching the gas metering system.

The sample train used for this test program was designed by Frontier Geosciences, Inc. (FGS) and meet all requirements for Appendix K sampling. Samples were sent to FGS after sampling for total mercury analysis.

Copies of all sample analysis sheets are appended to this report.

Calculations were performed on a computer and by hand. An explanation of the nomenclature and calculations along with the complete test results are appended. Also appended are the calibration data and copies of the raw field data sheets.

Raw data are kept on file at the Platt Environmental office in Wood Dale, Illinois. All samples from this test program (not already used in analysis) will be retained for 60 days after the submittal of the report, after which they will be discarded unless Platt Environmental is advised otherwise.

5.0 QUALITY ASSURANCE PROCEDURES

Platt Environmental recognizes the previously described reference methods to be very technique oriented and attempts to minimize all factors which can increase error by implementing its Quality Assurance Program into every segment of its testing activities.

Shelf life of chemical reagents prepared at the Platt Environmental laboratory or at the jobsite did not exceed those specified in the above mentioned methods; and, those reagents having a shelf life of one week were prepared daily at the jobsite. When on-site analyses were required, all reagent standardizations were performed daily by the same person performing the analysis.

Dry and wet test meters were calibrated according to methods described in the Quality Assurance Handbook, Sections 3.3.2, 3.4.2 and 3.5.2. Percent error for the wet test meter according to the methods was less than the allowable error of 1.0 percent. The dry test meters measured the test sample volumes to within 2 percent at the flowrate and conditions encountered during sampling.

6.0 TEST RESULTS SUMMARY

Mercury Test Results Summary
Public Service Of New Hampshire
Merrimack Generating Station
Unit 2 Stack
April 13 and 14, 2006

Test No.	Date	Time	V _m (L)	ug detected	ppb	ug/dncm
High Temperature						
1A	4/13/2006	9:25-10:25	13.23	0.1150	1.04	8.70
1B	4/13/2006	9:25-10:25	13.01	0.1207	1.11	9.69
2A	4/13/2006	11:00-12:00	14.14	0.1166	0.99	8.26
2B	4/13/2006	11:00-12:00	14.09	0.1364	1.16	9.75
3A	4/13/2006	12:35-13:35	15.22	0.1196	0.94	7.87
3B	4/13/2006	12:35-13:35	15.08	0.1272	1.01	8.44
Average					1.04	8.78
Low Temperature						
1A	4/14/2006	8:30-9:30	14.28	0.1310	1.10	9.18
1B	4/14/2006	8:30-9:30	14.23	0.1357	1.14	9.55
2A	4/14/2006	10:15-11:15	13.99	0.1362	1.17	9.75
2B	4/14/2006	10:15-11:15	13.99	0.1445	1.24	10.34
3A	4/14/2006	11:50-12:50	14.83	0.1439	1.16	9.71
3B	4/14/2006	11:50-12:50	14.78	0.1476	1.20	10.00
Average				0.1398	1.17	9.75

Sulfuric Acid Mist Test Results Summary
Public Service Of New Hampshire
Merrimack Generating Station
Unit 2 Stack
April 13 and 14, 2006

Test No.	Date	Time	V _m (L)	mg detected	ppm as H ₂ SO ₄
High Temperature					
1	4/13/2006	9:20-10:20	513.96	3.7	1.77
2	4/13/2006	11:00-12:00	510.15	5.0	2.40
3	4/13/2006	12:35-13:35	447.48	4.4	2.41
Average					2.19
Low Temperature					
1	4/14/2006	8:30-9:30	522.69	0.4	0.19
2	4/14/2006	10:15-11:15	507.98	1.2	0.58
3	4/14/2006	11:50-12:50	499.46	1.9	0.93
Average					0.57

APPENDIX

GASEOUS TRAVERSE FOR ROUND DUCTS

Job: Public Service of New Hampshire – Merrimack Station

Date: April 13 and 14, 2006

Unit No: 2

Test Location: Stack

METHOD 8A - DETERMINATION OF SULFURIC ACID VAPOR OR MIST AND SULFUR DIOXIDE EMISSIONS FROM KRAFT RECOVERY FURNACES

Sampling Console

Platt Environmental Services, Inc

CHAIN-OF-CUSTODY RECORD						
Project Number: PE2006067				Date Results Required:		
Client: ADA ES				TAT Required:		
Plant/Location: Public Service of New Hampshire – Merrimack Station/Unit 2 Stack					PO Number:	
Project Supervisor: ELE						
Sample Number	Date Sampled	Sample Point Identification	# of Conts	Grab/Comp	Analysis Requested	Sub Lab
001	4/13/06	Unit 2 Stack Coil Rinse #1	1		M8A	
002	4/13/06	Unit 2 Stack Coil Rinse #2	1		M8A	
003	4/13/06	Unit 2 Stack Coil Rinse #3	1		M8A	
004	4/14/06	Unit 2 Stack Coil Rinse #1	1		M8A	
005	4/14/06	Unit 2 Stack Coil Rinse #2	1		M8A	
006	4/14/06	Unit 2 Stack Coil Rinse #3	1		M8A	
007						
008						
009						
010						
011						
012						
013						
014						
015						
016						
Delivered by:		Date/Time	Processed by:		Date/Time 4-18-06 1037	Received by Laboratory: <i>g. O'Neill</i>

Special Instructions:

LABORATORY REPORT

TEI Analytical, Inc.
7177 N. Austin
Niles, IL 60714-4617
847-647-1345

PREPARED FOR:

PAGE 1 of 1

Jim Platt
Platt Environmental Services Inc.
371 Balm Court
Wood Dale, IL 60191

Report #: 71751
Report Date: 4/24/2006
Sample Received:
4/18/06 10:37

PE2006067

TEI Number	Sample	Sulfuric Acid (Method 8)	Date Performed
		mg	
71751	001 #1 High Temp	3.7	4/21/2006
71752	002 #2 High Temp	5.0	4/21/2006
71753	003 #3 High Temp	4.4	4/21/2006
71754	004 #1 Low Temp	<0.4	4/21/2006
71755	005 #2 Low Temp	1.2	4/21/2006
71756	006 #3 Low Temp	1.9	4/21/2006

Gayle E. O'Neill, Ph.D.

Results of M324 Sorbent Total Mercury in Coal Fluegas
For Platt Environmental - Samples received 04/18/06
 Frontier Geosciences Inc., Lucas Hawkins (lucash@frontiergeosciences.com)
 Report Date: May 16, 2006

Samples Analyzed: May 15, 2006 (THg08-060515-1)

Gas Volume Calculations									
Trap ID	Location	Ave Gas Meter Temp (°F)	Ave Data Sheet Pres (Inch Hg)	Logger Final Volume (L)	Totalizer Final Volume (L)	Logger Vol T/P Corr. (std. L)	Totalizer Vol T/P Corr. (std. L)	Vol Difference (Tot-Log)/Tot (%)	Comment
S2936	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service
S2938	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service
S2935	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service
S2940	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service
S2939	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service
S2942	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service
S2937	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service
S2930	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service
S2931	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service
S2933	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service
S2929	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service
S2934	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service
S2932	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service
S2941	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service

Sample Concentration Calculations										
Trap ID	FGS Sample ID	Start Date/Time	End Date/Time	Trap Sect. A Blank Corr. Total Hq (ng/trap)	Trap Sect. B Blank Corr. Total Hq (ng/trap)	Trap Sect. C Blank Corr. Total Hq (ng/trap)	Total Hg Blank Corrected (ng/trap)	Total Hg in Fluegas (STP, dry) (ug/dsm ³)	Total Hg in Fluegas (STP, dry) (lbs/ft ³)	Comment
S2936	0604055-01	N/P	N/P	-	-	-	-	N/C	N/C	Analysis not requested
S2938	0604055-02	N/P	N/P	-	-	-	-	N/C	N/C	Analysis not requested
S2935	0604055-03	N/P	N/P	127.1	0.08	-	127.2	N/C	N/C	
S2940	0604055-04	N/P	N/P	135.7	-	-	135.7	N/C	N/C	
S2939	0604055-05	N/P	N/P	131.0	-	-	131.0	N/C	N/C	
S2942	0604055-06	N/P	N/P	144.4	0.07	815.00	144.5	N/C	N/C	Spike Recovery = 90.6%
S2937	0604055-07	N/P	N/P	136.2	-	-	136.2	N/C	N/C	
S2930	0604055-08	N/P	N/P	115.0	-	-	115.0	N/C	N/C	Moisture noted on B trap
S2931	0604055-09	N/P	N/P	116.6	-	-	116.6	N/C	N/C	
S2933	0604055-10	N/P	N/P	147.6	0.04	-	147.6	N/C	N/C	
S2929	0604055-11	N/P	N/P	120.7	-	-	120.7	N/C	N/C	
S2934	0604055-12	N/P	N/P	119.6	-	-	119.6	N/C	N/C	
S2932	0604055-13	N/P	N/P	143.9	-	-	143.9	N/C	N/C	
S2941	0604055-14	N/P	N/P	136.2	0.17	779.38	136.4	N/C	N/C	Spike Recovery = 86.6%

N/C - Not calculated due to missing data

N/P - Data not provided

Results of M324 Sorbent Total Mercury in Coal Fluegas
For Platt Environmental - Samples received 04/18/06
 Frontier Geosciences Inc., Lucas Hawkins (lucash@frontiergeosciences.com)
 Report Date: May 16, 2006

Samples Analyzed: May 15, 2006 (THg08-060515-1)

Digestion Blanks	THg (ng/trap)
PB-1	0.06
PB-2	0.05
PB-3	0.08
Average	0.07
St Dev	0.01
Estimated MDL (3 X St Dev)	0.04

CRM's and Spikes (Accuracy)	THg (% Rec.)
NIST 1641d (15.9 ng/L)	95.6%
Sample ID	S2935 A
Spiking Level (ng/digest)	560.0
Sample AS	105.5%
Sample ASD	102.9%

Sample Duplicates (Precision)	THg (ng/trap)
Sample ID	S2935 A
Sample Result	127.11
Sample Result AD	127.8
RPD	0.6%
Sample ID	S2935 A
Sample Result AS	718.1
Sample Result ASD	703.9
RPD	2.0%

MERCURY SAMPLE CALCULATION

Concentration

$$\frac{\mu\text{g}}{\text{m}^3} = \frac{\mu\text{g of sample}}{\text{dscf volume sampled} \times 0.02832 \frac{\text{m}^3}{\text{ft}^3}}$$

Emission Rate

$$\frac{\mu\text{g of sample} \times \frac{1 \times 10^{-6} \text{ grams}}{\mu\text{g}}}{453.6 \text{ gr/lb}} = \text{lbs of sample}$$

$$\frac{\text{lbs/sample}}{\text{Vm (std) sample}} \times \text{dscfm} \times 60 \frac{\text{min}}{\text{hr}} = \text{lbs/hr}$$

CALCULATIONS FOR SULFURIC ACID MIST INCLUDING SULFUR TRIOXIDE

$$V_{m(\text{std})} = 17.64 V_m Y \frac{P_{\text{bar}} + \frac{\Delta H}{13.6}}{T_m}$$

$$C_{\text{H}_2\text{SO}_4} = 1.0811 \times 10^{-4} \frac{(V_t - V_{\text{tb}}) N \left(\frac{V_{\text{soln}}}{V_a} \right)}{V_{m(\text{std})}}$$

$$\text{ppm H}_2\text{SO}_4 = 3.9289 \times 10^6 C_{\text{H}_2\text{SO}_4} \quad (\text{expressed as H}_2\text{SO}_4)$$

Where:

$C_{\text{H}_2\text{SO}_4}$ = Concentration of sulfuric acid (including sulfur trioxide), dry basis, corrected to standard conditions, lb/dscf

N = Normality of barium perchlorate titrant, meq/ml

P_{bar} = Barometric pressure at the exit orifice of the dry gas meter, in. Hg

P_{std} = Standard absolute pressure, 29.92 in. Hg

T_m = Dry gas meter average absolute temperature, °R

T_{std} = Standard absolute temperature, 528 °R

V_a = Volume of sample aliquot titrated, ml

V_m = Dry gas volume measured by dry gas meter, dcf

$V_{m(\text{std})}$ = Dry gas volume measured by dry gas meter, corrected to standard conditions, dscf

V_{soln} = Total volume of solution in which the sulfuric acid sample is contained, ml

V_t = Volume of barium perchlorate titrant used for the sample (average of replicate titrations), ml

V_{tb} = Volume of barium perchlorate titrant used for the blank, ml

Y = Dry gas meter calibration factor

ΔH = Average pressure differential across the orifice meter, in. H₂O

13.6 = Specific gravity of mercury (Hg)

17.64 = $T_{\text{std}}/P_{\text{std}}$

1.0811×10^{-4} = Equivalent weight of sulfuric acid, lb/g-meq

3.9289×10^6 = $\frac{\text{dscf}}{\text{lb}}$

EMISSION RATE CALCULATIONS

A pollutant emission rate (E), expressed as pounds of pollutant per million Btu heat input from the fuel combusted can be calculated by several methods as follows:

1. $C = C_s/7000$ where, C = pollutant concentration, lb/dscf
 c_s = pollutant concentration, grains/dscf
2. If fuel flow is monitored and the fuel combusted during the test is sampled and analyzed for gross calorific value, then:

$$E = \frac{Q_{sd} C}{\text{fuel flow rate (lb / hr) GCV}} \times 10^6$$

where, E = lbs per million Btu

GCV = gross calorific value, Btu / lb

Q_{sd} = dry volumetric gas flow at standard conditions, dscf / hr

3. If an integrated gas sample is taken during the test and analyzed for %CO₂ or %O₂, dry basis by volume, with an Orsat gas analyzer, then

$$E = C F_c \frac{100}{(\%CO_2)} \text{ or, } E = C F \frac{20.9}{(20.9 - \%O_2)} \text{ where,}$$

%CO₂ and %O₂ are expressed as percent; and, for example, for subbituminous and bituminous coals:

F_c = a factor representing a ratio of the volume of carbon dioxide generated to the calorific value of the fuel combusted, 1800 scf CO₂/million Btu.

F = a factor representing a ratio of the volume of dry flue gases generated to the calorific value of the fuel combusted, 9780 dscf/million Btu.

4. If fuel sample increments are taken and composited during the test and an ultimate analysis is performed and the GCV is determined, then

$$F_c = \frac{321 \times 10^3 (\%C)}{GCV} \text{ where, \%C = carbon content by weight expressed as percent}$$

$$F = \frac{[3.64 (\%H) + 1.53 (\%C) + 0.57 (\%S) + 0.14 (\%N) - 0.46 (\%O_2)]}{GVC} \times 10^6$$

where, H, C, S, N, and O are content by weight of hydrogen, carbon, sulfur, nitrogen, and oxygen (expressed as percent) respectively.

5. If fuels other than subbituminous and bituminous coals are fired, other F-factors than those above will apply; and, if combinations of different fuels are fired, the F-factors must be prorated according to the fraction of the total heat input derived from each type of fuel.

APPENDIX K TEST RESULTS

Date:	4/13/2006	Condition:	High Temp
Project:	P.S. of New Hampshire-Merrimack Station	Data Taken By:	ELE
Location:	Stack	Fuel Factor:	9780
Source:	Unit 2		

Test Number:	1A	Time:	9:25-10:25
Pressure, Barometric(Hg"):	28.870	Hg (ug)	0.1150
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.000
Pressure, Stack(Hg"):	28.870	Hg (ppb)	1.04
Initial Volume (liters)	0	Hg (ug/dncm)	8.70
Final Volume (liters)	14.22		
Meter Temperature (°F)	50.42		
Meter Volume (Normal liters)	13.23		
Meter Calibration (Y)	1.000		
Average Delta H (ΔH)	0.010		

Test Number:	2A	Time:	11:00-12:00
Pressure, Barometric(Hg"):	28.870	Hg (ug)	0.1166
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.000
Pressure, Stack(Hg"):	28.870	Hg (ppb)	0.99
Initial Volume (liters)	0	Hg (ug/dncm)	8.26
Final Volume (liters)	15.29		
Meter Temperature (°F)	53.50		
Meter Volume (Normal liters)	14.14		
Meter Calibration (Y)	1.000		
Average Delta H (ΔH)	0.010		

Test Number:	3A	Time:	12:35-13:35
Pressure, Barometric(Hg"):	28.870	Hg (ug)	0.1196
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.000
Pressure, Stack(Hg"):	28.870	Hg (ppb)	0.94
Initial Volume (liters)	0	Hg (ug/dncm)	7.87
Final Volume (liters)	15.59		
Meter Temperature (°F)	61.92		
Meter Volume (Normal liters)	15.22		
Meter Calibration (Y)	1.000		
Average Delta H (ΔH)	0.010		

APPENDIX K TEST RESULTS

Date: 4/13/2006
 Project: P.S. of New Hampshire-Merrimack Station
 Location: Stack
 Source: Unit 2

Condition: High Temp
 Data Taken By: ELE
 Fuel Factor: 9780

Test Number:	1B	Time:	9:25-10:25
Pressure, Barometric(Hg"):	28.870	Hg (ug)	0.1207
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.000
Pressure, Stack(Hg"):	28.870	Hg (ppb)	1.11
Initial Volume (liters)	0	Hg (ug/dncm)	9.29
Final Volume (liters)	13.99		
Meter Temperature (°F)	50.42		
Meter Volume (Normal liters)	13.01		
Meter Calibration (Y)	1.000		
Average Delta H (ΔH)	0.010		

Test Number:	2B	Time:	11:00-12:00
Pressure, Barometric(Hg"):	28.870	Hg (ug)	0.1364
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.000
Pressure, Stack(Hg"):	28.870	Hg (ppb)	1.16
Initial Volume (liters)	0	Hg (ug/dncm)	9.69
Final Volume (liters)	15.24		
Meter Temperature (°F)	53.50		
Meter Volume (Normal liters)	14.09		
Meter Calibration (Y)	1.000		
Average Delta H (ΔH)	0.010		

Test Number:	3B	Time:	12:35-13:35
Pressure, Barometric(Hg"):	28.870	Hg (ug)	0.1272
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.000
Pressure, Stack(Hg"):	28.870	Hg (ppb)	1.01
Initial Volume (liters)	0	Hg (ug/dncm)	8.44
Final Volume (liters)	15.45		
Meter Temperature (°F)	61.92		
Meter Volume (Normal liters)	15.08		
Meter Calibration (Y)	1.000		
Average Delta H (ΔH)	0.010		

METHOD 8A TEST RESULTS

Date: 4/13/2006	Condition: High Temp
Project: P.S. of New Hampshire-Merrimack Station	Data Taken By: RGO
Location: Stack	Fuel Factor: 9780
Source: Unit 2	

Test Number:	1	Time:	9:20-10:20
Pressure, Barometric(Hg"):	28.870	SO ₃ (mg):	3.7000
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.094
Pressure, Stack(Hg"):	28.870	SO ₃ (ppm):	1.77
Initial Volume (cu.ft.):	27.188		
Final Volume (cu.ft.):	45.25		
Meter Temperature (°F):	50.42		
Meter Volume (dscf):	18.15		
Meter Calibration (Y):	1.006		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	240.0		
Average Delta H (ΔH):	0.300		

Test Number:	2	Time:	11:00-12:00
Pressure, Barometric(Hg"):	28.870	SO ₃ (mg):	5.0000
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.090
Pressure, Stack(Hg"):	28.870	SO ₃ (ppm):	2.40
Initial Volume (cu.ft.):	52.444		
Final Volume (cu.ft.):	70.48		
Meter Temperature (°F):	53.50		
Meter Volume (dscf):	18.02		
Meter Calibration (Y):	1.006		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	238.0		
Average Delta H (ΔH):	0.300		

Test Number:	3	Time:	12:35-13:35
Pressure, Barometric(Hg"):	28.870	SO ₃ (mg):	4.4000
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.097
Pressure, Stack(Hg"):	28.870	SO ₃ (ppm):	2.41
Initial Volume (cu.ft.):	72.63		
Final Volume (cu.ft.):	88.71		
Meter Temperature (°F):	61.92		
Meter Volume (dscf):	15.80		
Meter Calibration (Y):	1.006		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	236.0		
Average Delta H (ΔH):	0.300		

APPENDIX K TEST RESULTS

Date:	4/14/2006	Condition:	Low Temp
Project:	P.S. of New Hampshire-Merrimack Station	Data Taken By:	ELE
Location:	Stack	Fuel Factor:	9780
Source:	Unit 2		

Test Number:	1A	Time:	8:30-9:30
Pressure, Barometric(Hg"):	29.010	Hg (ug):	0.1310
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.000
Pressure, Stack(Hg"):	29.010	Hg (ppb):	1.10
Initial Volume (liters):	0	Hg (ug/dncm):	9.18
Final Volume (liters):	15.14		
Meter Temperature (°F):	45.67		
Meter Volume (Normal liters):	14.28		
Meter Calibration (Y):	1.000		
Average Delta H (ΔH):	0.010		

Test Number:	2A	Time:	10:15-11:15
Pressure, Barometric(Hg"):	29.010	Hg (ug):	0.1362
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.000
Pressure, Stack(Hg"):	29.010	Hg (ppb):	1.17
Initial Volume (liters):	0	Hg (ug/dncm):	9.75
Final Volume (liters):	15.23		
Meter Temperature (°F):	59.42		
Meter Volume (Normal liters):	13.99		
Meter Calibration (Y):	1.000		
Average Delta H (ΔH):	0.010		

Test Number:	3A	Time:	11:50-12:50
Pressure, Barometric(Hg"):	29.010	Hg (ug):	0.1439
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.000
Pressure, Stack(Hg"):	29.010	Hg (ppb):	1.16
Initial Volume (liters):	0	Hg (ug/dncm):	9.71
Final Volume (liters):	15.25		
Meter Temperature (°F):	66.50		
Meter Volume (Normal liters):	14.83		
Meter Calibration (Y):	1.000		
Average Delta H (ΔH):	0.010		

APPENDIX K TEST RESULTS

Date: 4/14/2006
 Project: P.S. of New Hampshire-Merrimack Station
 Location: Stack
 Source: Unit 2

Condition: Low Temp
 Data Taken By: ELE
 Fuel Factor: 9780

Test Number:	1B	Time:	8:30-9:30
Pressure, Barometric(Hg"):	29.010	Hg (ug)	0.1357
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.000
Pressure, Stack(Hg"):	29.010	Hg (ppb)	1.14
Initial Volume (liters)	0	Hg (ug/dncm)	9.55
Final Volume (liters)	15.08		
Meter Temperature (°F)	45.67		
Meter Volume (Normal liters)	14.23		
Meter Calibration (Y)	1.000		
Average Delta H (ΔH)	0.010		

Test Number:	2B	Time:	10:15-11:15
Pressure, Barometric(Hg"):	29.010	Hg (ug)	0.1445
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.000
Pressure, Stack(Hg"):	29.010	Hg (ppb)	1.24
Initial Volume (liters)	0	Hg (ug/dncm)	10.34
Final Volume (liters)	15.23		
Meter Temperature (°F)	59.42		
Meter Volume (Normal liters)	13.99		
Meter Calibration (Y)	1.000		
Average Delta H (ΔH)	0.010		

Test Number:	3B	Time:	11:50-12:50
Pressure, Barometric(Hg"):	29.010	Hg (ug)	0.1476
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.000
Pressure, Stack(Hg"):	29.010	Hg (ppb)	1.20
Initial Volume (liters)	0	Hg (ug/dncm)	10.00
Final Volume (liters)	15.2		
Meter Temperature (°F)	66.50		
Meter Volume (Normal liters)	14.78		
Meter Calibration (Y)	1.000		
Average Delta H (ΔH)	0.010		

METHOD 8A TEST RESULTS

Date: 4/14/2006
 Project: AEP Conesville (ADA)
 Location: Stack
 Source: Unit 2

Condition: Low Temp
 Data Taken By: RGO
 Fuel Factor: 9780

Test Number:	<u>1</u>	Time:	<u>8:30-9:30</u>
Pressure, Barometric(Hg"):	29.010	SO ₃ (mg):	0.4000
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.084
Pressure, Stack(Hg"):	29.010	SO ₃ (ppm):	0.19
Initial Volume (cu.ft.):	6.551		
Final Volume (cu.ft.):	24.661		
Meter Temperature (°F):	45.67		
Meter Volume (dscf):	18.46		
Meter Calibration (Y):	1.006		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	236.0		
Average Delta H (ΔH):	0.300		

Test Number:	<u>2</u>	Time:	<u>10:15-11:15</u>
Pressure, Barometric(Hg"):	29.010	SO ₃ (mg):	1.2000
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.093
Pressure, Stack(Hg"):	29.010	SO ₃ (ppm):	0.58
Initial Volume (cu.ft.):	25.101		
Final Volume (cu.ft.):	43.18		
Meter Temperature (°F):	59.42		
Meter Volume (dscf):	17.94		
Meter Calibration (Y):	1.006		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	239.0		
Average Delta H (ΔH):	0.300		

Test Number:	<u>3</u>	Time:	<u>11:50-12:50</u>
Pressure, Barometric(Hg"):	29.010	SO ₃ (mg):	1.9000
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.099
Pressure, Stack(Hg"):	29.010	SO ₃ (ppm):	0.93
Initial Volume (cu.ft.):	43.383		
Final Volume (cu.ft.):	61.401		
Meter Temperature (°F):	66.50		
Meter Volume (dscf):	17.64		
Meter Calibration (Y):	1.006		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	241.0		
Average Delta H (ΔH):	0.300		

*Air flows taken from ESP Inlet data

CALIBRATION PROCEDURES

TEMPERATURE SENSING DEVICES

The potentiometer and thermocouples are calibrated against a mercury thermometer in a calibration well. Alternatively, readings are checked utilizing a NBS traceable millivolt source.

DRY GAS METERS

The test meters are calibrated according to Method 5, Section 5.3 and "Procedures for Calibrating and Using Dry Gas Volume Meters as Calibration Standards" by P.R. Westlin and R.T. Shigehara, March 10, 1978.

METER BOX CALIBRATION

Dry Gas Meter No.
Standard Meter No.
Standard Meter (Yr)

CM5
90605804
0.9914

Date:

March 13, 2006

Calibrated By:

J. Robertson

Barometric Pressure :

28.84

Run Number	Orifice Setting in H ₂ O Chg (H)	Standard Meter Gas Volume V _r	Dry Meter Gas Volume V _d	Standard Meter Temp. F t _r	Dry Gas Meter Inlet Temp. F t _{di}	Dry Gas Meter Outlet Temp. F t _{do}	Dry Gas Meter Avg. Temp. F t _d	Time Min.	Time Sec.	Chg (H@)
Final		591.019	958.463	59	63	62				
Initial		585.789	953.271	59	63	63				
Difference	1	0.20	5.230	5.192	59	63	63	18	6	1.014
Final		596.533	963.924	58	64	62				1.356
Initial		591.172	958.614	59	62	62				
Difference	2	0.50	5.361	5.310	59	63	62	12	1	1.016
Final		601.846	969.193	58	65	62				
Initial		596.712	964.091	59	63	62				
Difference	3	0.70	5.134	5.102	59	64	62	9	51	1.013
Final		607.073	974.462	58	66	62				
Initial		602.032	969.399	58	64	62				
Difference	4	0.90	5.041	5.063	58	65	62	8	37	1.004
Final		612.349	979.793	58	67	63				1.481
Initial		607.293	974.692	58	65	62				
Difference	5	1.20	5.056	5.101	58	66	63	7	32	1.000
Final		617.787	985.326	58	68	63				1.498
Initial		612.583	980.032	59	66	63				
Difference	6	2.00	5.204	5.294	59	67	63	6	13	0.990
Average										1.006
										1.469

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM **(FOR K-TYPE THERMOCOUPLES)**

EPA Control Module Number: CM5

Name: J. Robertson

Ambient Temperature: 64.3 °F

Date: March 13, 2006

Omega Engineering Calibrator Model No. CL23A Serial #

T-249465

Date Of Calibration Verification:

June 16, 2005

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference ^a Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	-2	0.4
250	248	0.3
600	599	0.1
1200	1206	0.4

$$\frac{(\text{Ref. Temp., } ^\circ\text{F} + 460) - (\text{Test Therm. Temp., } ^\circ\text{F} + 460)}{\text{Ref. Temp., } ^\circ\text{F} + 460} * 100 \leq 1.5 \%$$

Client Name:	Platt Environmental Inc.	
Test ID:	#1 White Line - High Temp	Test Location: Unit 2 Stack
Test Start (Date/Time):	6/13/06 9:20	Carbon Trap ID: S2930
Sampled by:	C. Chiles	Test End (Date/Time):
		Sampling Box ID: SW 75679
		Fluegas Testing

Date	Time	Stack Temperature (Indicate °F or °C)	Meter Temperature (Indicate °F or °C)	Heated Probe Temperature (Indicate °F or °C)	Sampling Flow Rate (cc/min)	Stack Gas Flow Rate (m³/min)	Gas Volume Totalizer (m³ elapsed)	Ambient Pressure (psi)	Comments
4/13/06	0925			235	0.25		0	28.87	Asst - 0.025
	0930			223			1.06		
	0935			216			2.38		Pr 66 - 0.022
	0940			222			3.61		
	0945			218			4.89		
	0950			219			6.22		
	0955			219			7.34		
	1000			219			8.60		
	1005			219			9.67		
	1010			219			10.77		
	1015			219			12.01		
	1020			220			12.78		
	1025			220			14.22		
									66 0.022
Total/Average									

Relinquished by: _____	Date _____
Received by: _____	Date _____
Relinquished by: _____	Date _____
Received for Laboratory by: _____	Date _____

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 206-622-6960
Please return Data Sheet along with sample to:

Frontier Geosciences, 414 Pontius Ave. N, Seattle, WA 98109

White

Appendix K (FSTM™ Trap) Field Data Sheet

Client Name: Platt Environmental Inc. Test Location: Fluegas Testing

Test ID: #2 White Line High Temp Carbon Trap ID: S2931

Test Start (Date/Time:): 4/13/06 Test End (Date/Time:): _____

Sampled by: E. White Sampling Box ID: _____

Date	Time	Stack Temperature (Indicate °F or °C)	Meter Temperature (Indicate °F or °C)	Heated Probe Temperature (Indicate °F or °C)	Sampling Flow Rate (cc/min)	Stack Gas Flow Rate (m³/min)	Gas Volume Totalizer (m³ elapsed)	Ambient Pressure (psi)	Comments
4/13/06	1100			220	0.20		0.000		
	1103			220			1.18		
	1105			220			2.76		
	1107			220			3.95		
	1120			220			5.05		
	1125			220			6.41		
	1130			220			7.28		
	1135			220			9.05		
	1140			220			10.32		
	1145			221			11.87		
	1152			220			12.91		
	1157			220			14.20		
	1200			220			15.29		
									LC 0.00
Total/Average									

Sample Chain of Custody

Relinquished by: _____ Date: _____

Received by: _____ Date: _____

Relinquished by: _____ Date: _____

Received for Laboratory by: _____ Date: _____

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 206-622-6960
Please return Data Sheet along with sample to:

Frontier Geosciences, 414 Pontius Ave. N, Seattle, WA 98109

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Fluegas Testing

Carbon Trap ID:

Test End (Date/Time:)

Sampling Box ID: SW 75723

Sample Chain of Custody

Date _____

Date _____

Date _____

Date _____

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 206-622-6960
Please return Data Sheet along with sample to:

Frontier Geosciences, 414 Pontius Ave. N, Seattle, WA 98109

Appendix K (FSTM™ Trap) Field Data Sheet

Client Name: Platt Environmental Inc. BSNH (30A) Test Location: Unit 2 Street Fluegas Testing
 Test ID: #1 Drayage Line - High Temp Carbon Trap ID: S2929
 Test Start (Date/Time): 4/13/06 Test End (Date/Time):
 Sampled by: G. Chabon Sampling Box ID: SN 11622

Date	Time	Stack Temperature (Indicate °F or °C)	Meter Temperature (Indicate °F or °C)	Heated Probe Temperature (Indicate °F or °C)	Sampling Flow Rate (cc/min)	Stack Gas Flow Rate (m³/min)	Gas Volume Totalizer (m³ elapsed)	Ambient Pressure (psi)	Comments
4/13/06	7:25			225	0.25		0	29.87	0.0461 v. 0.036
	9:30			223			1.16		P2 back check v. 0.033
	9:35			216			2.33		
	9:40			222			3.48		
	9:45			218			4.76		
	9:50			219			6.03		
	9:55			219			7.11		
	10:00			219			8.34		
	10:05			219			9.42		
	10:10			219			10.50		
	10:15			219			11.73		
	10:20			219			13.03		
	10:25			220			13.99		
									0.0461 v. 0.036
Total/Average									

Sample Chain of Custody

Relinquished by: _____ Date: _____
 Received by: _____ Date: _____
 Relinquished by: _____ Date: _____
 Received for Laboratory by: _____ Date: _____

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 206-622-6960
 Please return Data Sheet along with sample to:

Frontier Geosciences, 414 Pontius Ave. N, Seattle, WA 98109

Appendix K (FSTM™ Trap) Field Data Sheet

Client Name: Platt Environmental Inc. Q5-H-AOA Test Location: Unit 2 Stock Fluegas Testing
 Test ID: Tes1 #2 Orange Lake - High Temp Carbon Trap ID: S2941
 Test Start (Date/Time): 4/13/06 1100 Test End (Date/Time):
 Sampled by: K. G. G. Sampling Box ID: SN 11622

Date	Time	Stack Temperature (Indicate °F or °C)	Meter Temperature (Indicate °F or °C)	Heated Probe Temperature (Indicate °F or °C)	Sampling Flow Rate (cf/min)	Stack Gas Flow Rate (m³/min)	Gas Volume Totalizer (m³ elapsed)	Ambient Pressure (psi)	Comments
4/13/06	1120			220	0.25		0.00	28.87	LC 0.00
	1125			220			1.14		
	1130			220			2.78		
	1135			220			3.64		
	1140			220			5.00		
	1145			220			6.34		
	1150			220			7.72		
	1155			220			8.91		
	1200			220			10.24		
	1205			221			11.78		
	1210			220			12.85		
	1215			220			14.13		
	1220			220			15.24		LC 0.00
Total/Average									

Sample Chain of Custody

Relinquished by: _____ Date: _____
 Received by: _____ Date: _____
 Relinquished by: _____ Date: _____
 Received for Laboratory by: _____ Date: _____

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 206-622-6960
 Please return Data Sheet along with sample to:

Frontier Geosciences, 414 Pontius Ave. N, Seattle, WA 98109

Client Name:	Platt Environmental Inc.	Test Location:	Unit 2 Stalk	Fluegas Testing
Test ID:	#3- High Temp Orange Line	Carbon Trap ID:		S2935
Test Start (Date/Time):	4/13/06 1235	Test End (Date/Time):		
Sampled by:	E. Ehlers	Sampling Box ID:	S21622	

[illegible]

Relinquished by: _____ Date: _____

Received by: _____ Date: _____

Relinquished by: _____ Date: _____

Received for Laboratory by: _____ Date: _____

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 206-622-6960
Please return Data Sheet along with sample to:

Frontier Geosciences, 414 Pontius Ave. N, Seattle, WA 98109

Appendix K (FSTM™ Trap) Field Data Sheet

Client Name: Platt Environmental Inc. 85 NW - ADA Test Location: Fluegas Testing
 Test ID: 4/14/06 Carbon Trap ID: S2939
 Test Start (Date/Time): 4/14/06 8:30 Test End (Date/Time): 4/14/06 9:30
 Sampled by: C. Hawkins Sampling Box ID: SW 75659

Date	Time	Stack Temperature (Indicate °F or °C)	Meter Temperature (Indicate °F or °C)	Heated Probe Temperature (Indicate °F or °C)	Sampling Flow Rate (cc/min)	Stack Gas Flow Rate (m³/min)	Gas Volume Totalizer (m³ elapsed)	Ambient Pressure (psi)	Comments
4/14/06	8:30			220	0.25		0.0		0.0001 - 0.031
	8:35			220			1.28		6.0000
	8:40			220			2.53		
	8:45			220			3.80		
	8:50			220			5.04		
	8:55			220			6.32		
	9:00			220			7.57		
	9:05			220			8.82		
	9:10			220			10.07		
	9:15			220			11.37		
	9:20			220			12.62		
	9:25			220			13.88		
	9:30			220			15.14		6.0000
Total/Average									

Sample Chain of Custody

Relinquished by: _____ Date: _____
 Received by: _____ Date: _____
 Relinquished by: _____ Date: _____
 Received for Laboratory by: _____ Date: _____

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 206-622-6960
 Please return Data Sheet along with sample to:

Frontier Geosciences, 414 Pontius Ave. N, Seattle, WA 98109

Appendix K (FSTM™ Trap) Field Data Sheet

Client Name: Platt Environmental Inc. Test Location: Fluegas Testing

Test ID: #2 White - Low Temp Carbon Trap ID: S2937

Test Start (Date/Time): 4/14/06 10:15 Test End (Date/Time): 4/14/06 11:15

Sampled by: C. Ehlers Sampling Box ID: SN 75679

Date	Time	Stack Temperature (Indicate °F or °C)	Meter Temperature (Indicate °F or °C)	Heated Probe Temperature (Indicate °F or °C)	Sampling Flow Rate (cc/min)	Stack Gas Flow Rate (m³/min)	Gas Volume Totalizer (m³ elapsed)	Ambient Pressure (psi)	Comments
4/14/06	10:15			220	0.25		0.0		LC 0.00
	10:20			220			1.24		
	10:25			220			2.30		
	10:30			220			3.77		
	10:35			220			5.04		
	10:40			220			6.35		
	10:45			220			7.65		
	10:50			220			8.91		
	10:55			220			10.20		
	11:00			220			11.42		
	11:05			220			12.68		
	11:10			220			13.94		
	11:15			220			15.23		LC 0.00
Total/Average									

Sample Chain of Custody

Relinquished by: _____ Date: _____

Received by: _____ Date: _____

Relinquished by: _____ Date: _____

Received for Laboratory by: _____ Date: _____

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 206-622-6960
Please return Data Sheet along with sample to:

Frontier Geosciences, 414 Pontius Ave. N, Seattle, WA 98109

Appendix K (FSTM™ Trap) Field Data Sheet

Client Name: Platt Environmental Inc. D3011-100A Test Location: Unit 3 Stack Fluegas Testing
 Test ID: #3 White Low Temp Carbon Trap ID: S2932
 Test Start (Date/Time): 4/14/06 1150 Test End (Date/Time): 4/14/06 1250
 Sampled by: C. C. L. L. Sampling Box ID: SN 75679

Date	Time	Stack Temperature (Indicate °F or °C)	Meter Temperature (Indicate °F or °C)	Heated Probe Temperature (Indicate °F or °C)	Sampling Flow Rate (cf/min)	Stack Gas Flow Rate (m³/min)	Gas Volume Totalizer (m³ elapsed)	Ambient Pressure (psi)	Comments
4/14/06	1150			220	2.5		0.0		
	1155			220			1.23		
	1200			220			2.5		
	1205			220			3.78		
	1210			220			5.06		
	1215			220			6.32		
	1220			220			7.60		
	1225			220			8.87		
	1230			220			10.14		
	1235			220			11.40		
	1240			220			12.66		
	1245			220			13.92		
	1250			220			15.18		
									LC 0.000
Total/Average									

Sample Chain of Custody

Relinquished by: _____ Date: _____
 Received by: _____ Date: _____
 Relinquished by: _____ Date: _____
 Received for Laboratory by: _____ Date: _____

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 206-622-6960
 Please return Data Sheet along with sample to:

Frontier Geosciences, 414 Pontius Ave. N, Seattle, WA 98109

Client Name:	Platt Environmental Inc.	PS-4-ADA	Test Location: Gas Stack	Fluegas Testing
Test ID:	#10, Long - Low Temp		Carbon Trap ID:	S2940
Test Start (Date/Time):	4/14/06		Test End (Date/Time):	
Sampled by:			Sampling Box ID:	

[illegible]

Relinquished by: _____ Date _____

Received by: _____ Date _____

Relinquished by: _____ Date _____

Received for Laboratory by: _____ Date _____

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 206-622-6960
Please return Data Sheet along with sample to:

Frontier Geosciences, 414 Pontius Ave. N, Seattle, WA 98109

Appendix K (FSTM™ Trap) Field Data Sheet

Client Name: Platt Environmental Inc. Test Location: Fluegas Testing

Test ID: A2 Orange - Low Temp Carbon Trap ID: S2942

Test Start (Date/Time): 4/14/06 10:57 Test End (Date/Time): 4/14/06 11:15

Sampled by: C. Chel Sampling Box ID: SN 11622

Date	Time	Stack Temperature (Indicate °F or °C)	Meter Temperature (Indicate °F or °C)	Heated Probe Temperature (Indicate °F or °C)	Sampling Flow Rate (cc/min)	Stack Gas Flow Rate (m³/min)	Gas Volume Totalizer (m³ elapsed)	Ambient Pressure (psi)	Comments
4/14/06	10:15			220	0.25		0.0		LC 0.000
	10:20			220			1.21		
	10:25			220			2.52		
	10:30			220			3.76		
	10:35			220			5.03		
	10:40			220			6.33		
	10:45			220			7.63		
	10:50			220			8.90		
	10:55			220			10.17		
	11:00			220			11.39		
	11:05			220			12.70		
	11:10			220			13.91		
	11:15			220			15.23		LC 0.000
Total/Average									

Sample Chain of Custody

Relinquished by: _____ Date: _____

Received by: _____ Date: _____

Relinquished by: _____ Date: _____

Received for Laboratory by: _____ Date: _____

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 206-622-6960
Please return Data Sheet along with sample to:

Frontier Geosciences, 414 Pontius Ave. N, Seattle, WA 98109

Appendix K (FSTM™ Trap) Field Data Sheet

Client Name: Platt Environmental Inc. PSNH-ADA Test Location: Unit 2 Stack Fluegas Testing
 Test ID: #3 Orange - Low Temp Carbon Trap ID: S2933
 Test Start (Date/Time): 4/14/06 11:50 Test End (Date/Time): 4/14/06 12:50
 Sampled by: G. Chaw Sampling Box ID: S-11622

Date	Time	Stack Temperature (Indicate °F or °C)	Meter Temperature (Indicate °F or °C)	Heated Probe Temperature (Indicate °F or °C)	Sampling Flow Rate (cc/min)	Stack Gas Flow Rate (m³/min)	Gas Volume Totalizer (m³ elapsed)	Ambient Pressure (psi)	Comments
4/14/06	11:50			221	0.25		0.00		LC 0.020
	11:51			220			1.21		
	12:00			220			3.47		
	12:05			220			3.74		
	12:10			220			5.01		
	12:15			220			6.27		
	12:20			220			7.55		
	12:25			220			8.82		
	12:30			220			10.08		
	12:35			220			11.37		
	12:40			220			12.62		
	12:45			220			13.93		
	12:50			220			15.20		LC 0.020
Total/Average									

Sample Chain of Custody

Relinquished by: _____ Date: _____
 Received by: _____ Date: _____
 Relinquished by: _____ Date: _____
 Received for Laboratory by: _____ Date: _____

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 206-622-6960
 Please return Data Sheet along with sample to:

Frontier Geosciences, 414 Pontius Ave. N, Seattle, WA 98109

0601019 5701000

Appendix K (FSTM™ Trap) Field Data Sheet

Client Name:	Platt Environmental Inc.	Fluegas Testing
Test ID:		S2938
Test Start (Date/Time:)		
Test End (Date/Time:)		
Sampled by:		
Test Location:		
Carbon Trap ID:		
Sampling Box ID:		

[illegible]

Sample Chain of Custody

Relinquished by:

Received by:

Reimagined by:

Requisitioned by: _____

Requisitioned for: _____

Date _____

Data

Date:

Date:

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 206-622-6960
Please return Data Sheet along with sample to:

Frontier Geosciences 414 Pontiac Ave N Seattle WA 98109

660-099
4/11/06

Appendix K (FSTM™ Trap) Field Data Sheet

~~* Postcard Project * 1/2/00~~

Fluegas Testing

Carbon Tran ID:

52936

Test End (Date/Time:)

Sampling Box ID:

[illegible]

Station	Altitude	Notes
1	1000	1 red cup broken off end of trap.

Sample Chain of Custody

Relinquished by:
Received by: A. Prath, FGS

Date _____

Received by: Asst. A. Prath, FGS

Date _____

Bellevue and her

Date _____

—

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 208-622-6960
Please return Data Sheet along with sample to:

equipment returned with traps

- Digi Sense thermometer
- 15 glass tubes (clear).

Frontier Geosciences, 414 Pontius Ave. N. Seattle, WA 98109

Mercury Test Results Summary
Public Service Of New Hampshire
Merrimack Generating Station
Unit 2 Stack
April 13 and 14, 2006

Test No.	Date	Time	V _m (L)	ug detected	ppb	ug/dncm
High Temperature						
1A	4/13/2006	9:25-10:25	13.23	0.1150	1.04	8.70
1B	4/13/2006	9:25-10:25	13.01	0.1207	1.11	9.69
2A	4/13/2006	11:00-12:00	14.14	0.1166	0.99	8.26
2B	4/13/2006	11:00-12:00	14.09	0.1364	1.16	9.75
3A	4/13/2006	12:35-13:35	15.22	0.1196	0.94	7.87
3B	4/13/2006	12:35-13:35	15.08	0.1272	1.01	8.44
Average				0.1241	1.04	8.80
Low Temperature						
1A	4/14/2006	8:30-9:30	14.28	0.1310	1.10	9.18
1B	4/14/2006	8:30-9:30	14.23	0.1357	1.14	9.55
2A	4/14/2006	10:15-11:15	13.99	0.1362	1.17	9.75
2B	4/14/2006	10:15-11:15	13.99	0.1445	1.24	10.34
3A	4/14/2006	11:50-12:50	14.83	0.1439	1.16	9.71
3B	4/14/2006	11:50-12:50	14.78	0.1476	1.20	10.00
Average				0.1398	1.17	9.75

Sulfuric Acid Mist Test Results Summary

Public Service Of New Hampshire

Merrimack Generating Station

Unit 2 Stack

April 13 and 14, 2006

Test No.	Date	Time	V _m (L)	mg detected	ppm
High Temperature					
1	4/13/2006	9:20-10:20	513.96	3.7	1.77
2	4/13/2006	11:00-12:00	510.15	5.0	2.40
3	4/13/2006	12:35-13:35	447.48	4.4	2.41
Average				4.4	2.19
Low Temperature					
1	4/14/2006	8:30-9:30	522.69	0.4	0.19
2	4/14/2006	10:15-11:15	507.98	1.2	0.58
3	4/14/2006	11:50-12:50	499.46	1.9	0.93
Average				3.0	0.57

METHOD 8A TEST RESULTS

Date: 4/13/2006
 Project: P.S. of New Hampshire-Merrimack Station
 Location: Stack
 Source: Unit 2

Condition: High Temp
 Data Taken By: RGO
 Fuel Factor: 9780

Test Number:	1	Time:	9:20-10:20
Pressure, Barometric(Hg"):	28.870	SO ₃ (mg):	3.7000
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.094
Pressure, Stack(Hg"):	28.870	SO ₃ (ppm):	1.77
Initial Volume (cu.ft.):	27.188		
Final Volume (cu.ft.):	45.25		
Meter Temperature (°F):	50.42		
Meter Volume (dscf):	18.15		
Meter Calibration (Y):	1.006		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	240.0		
Average Delta H (ΔH):	0.300		

Test Number:	2	Time:	11:00-12:00
Pressure, Barometric(Hg"):	28.870	SO ₃ (mg):	5.0000
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.090
Pressure, Stack(Hg"):	28.870	SO ₃ (ppm):	2.40
Initial Volume (cu.ft.):	52.444		
Final Volume (cu.ft.):	70.48		
Meter Temperature (°F):	53.50		
Meter Volume (dscf):	18.02		
Meter Calibration (Y):	1.006		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	238.0		
Average Delta H (ΔH):	0.300		

Test Number:	3	Time:	12:35-13:35
Pressure, Barometric(Hg"):	28.870	SO ₃ (mg):	4.4000
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.097
Pressure, Stack(Hg"):	28.870	SO ₃ (ppm):	2.41
Initial Volume (cu.ft.):	72.63		
Final Volume (cu.ft.):	88.71		
Meter Temperature (°F):	61.92		
Meter Volume (dscf):	15.80		
Meter Calibration (Y):	1.006		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	236.0		
Average Delta H (ΔH):	0.300		

METHOD 8A TEST RESULTS

Date: 4/14/2006
 Project: AEP Conesville (ADA)
 Location: Stack
 Source: Unit 2

Condition: Low Temp
 Data Taken By: RGO
 Fuel Factor: 9780

Test Number:	1	Time:	8:30-9:30
Pressure, Barometric(Hg"):	29.010	SO ₃ (mg):	0.4000
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.084
Pressure, Stack(Hg"):	29.010	SO ₃ (ppm):	0.19
Initial Volume (cu.ft.):	6.551		
Final Volume (cu.ft.):	24.661		
Meter Temperature (°F):	45.67		
Meter Volume (dscf):	18.46		
Meter Calibration (Y):	1.006		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	236.0		
Average Delta H (ΔH):	0.300		

Test Number:	2	Time:	10:15-11:15
Pressure, Barometric(Hg"):	29.010	SO ₃ (mg):	1.2000
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.093
Pressure, Stack(Hg"):	29.010	SO ₃ (ppm):	0.58
Initial Volume (cu.ft.):	25.101		
Final Volume (cu.ft.):	43.18		
Meter Temperature (°F):	59.42		
Meter Volume (dscf):	17.94		
Meter Calibration (Y):	1.006		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	239.0		
Average Delta H (ΔH):	0.300		

Test Number:	3	Time:	11:50-12:50
Pressure, Barometric(Hg"):	29.010	SO ₃ (mg):	1.9000
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.099
Pressure, Stack(Hg"):	29.010	SO ₃ (ppm):	0.93
Initial Volume (cu.ft.):	43.383		
Final Volume (cu.ft.):	61.401		
Meter Temperature (°F):	66.50		
Meter Volume (dscf):	17.64		
Meter Calibration (Y):	1.006		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	241.0		
Average Delta H (ΔH):	0.300		

*Air flows taken from ESP Inlet data

H₂SO₄ VAPOR FIELD DATA SHEET (Method 8A)

Project: Public Service of New Hampshire (ADF) Date: 4/13/06

Sampling Location: Unit 2 Stacks Test #1

Source Condition: Normal - High Temp

Dry Gas Meter No. C145 Y = 1.006

Barometric Pressure 28.87 in. Hg

Leak Check: Pre-sampling 0.000 cfm @ 6 in. Hg vacuum

Post-sampling 0.000 cfm @ 6 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Stack (°F)	Probe (°F)	Filter	Condenser Water (≈140°F)	Coil Exit (°F)	Dry Gas Meter	
					Outlet (°F)			Inlet (°F)	Outlet (°F)
9 ²⁰	27.18	.3		440	501		167	50	50
9 ³⁰	30.17	.3		489	500		167	50	50
9 ⁴⁰	33.21	.3		497	500		167	50	50
9 ⁵⁰	36.20	.3		499	500		167	50	50
10 ⁰⁰	39.30	.3		499	500		167	51	51
10 ¹⁰	42.21	.3		499	500		166	52	51
10 ²⁰	45.25								
	18.062								
Avg.									

Comments: _____

Operator: RGO/EE

H₂SO₄ VAPOR FIELD DATA SHEET (Method 8A)

Project: Public Service of New Hampshire (PSNH) Date: 4/13/00

Sampling Location: Unit 2 Stack - Test #3

Source Condition: Normal - High Temp

Dry Gas Meter No. CM5 Y = 1.006

Barometric Pressure 28.87 in. Hg

Leak Check: Pre-sampling 0.000 cfm @ 6 in. Hg vacuum

Post-sampling 0.000 cfm @ 6 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Stack (°F)	Probe (°F)	Filter	Condenser Water (≈140°F)	Coil Exit (°F)	Dry Gas Meter	
					Outlet (°F)			Inlet (°F)	Outlet (°F)
11 ⁰⁰	52.44	.3		466	503		167	52	53
11 ¹⁰	55.47	.3		500	500		167	53	53
11 ²⁰	58.51	.3		499	500		167	53	52
11 ³⁰	61.45	.3		501	500		168	54	53
11 ⁴⁰	64.51	.3		499	500		167	54	53
11 ⁵⁰	67.42	.3		498	499		167	56	56
12 ⁰⁰	70.48								
Avg.									

Comments: _____

Operator: RG01 EE

H₂SO₄ VAPOR FIELD DATA SHEET (Method 8A)

Project: Public Services & New Hampshire (RDA) Date: 4/12/04

Sampling Location: Unit 2 stack - Test #3

Source Condition: Normal - High Temp

Dry Gas Meter No. CM5 Y = 1.006

Barometric Pressure 28.87 in. Hg

Leak Check: Pre-sampling 0.000 cfm @ 6 in. Hg vacuum

Post-sampling 0.000 cfm @ 6 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Stack (°F)	Probe (°F)	Filter	Condenser Water (≈140°F)	Coil Exit (°F)	Dry Gas Meter	
					Outlet (°F)			Inlet (°F)	Outlet (°F)
12 ³⁵	72.63	.3		470	502		167	61	61
12 ⁴⁵	75.60	.3		488	499		166	62	61
12 ⁵⁵	78.55	.3		498	501		167	62	62
13 ⁰⁵	81.58	.3		499	501		167	62	62
13 ¹⁵	84.62	.3		501	504		166	62	63
13 ²⁵	84.66	.3		502	508		166	62	63
13 ³⁵	88.71								
Avg.									

Comments: _____

Operator: RG0/EE

H₂SO₄ VAPOR FIELD DATA SHEET (Method 8A)

Project: Pub. Ser. of N.H. / ADA Date: 4/14/06

Sampling Location: Unit 2 Stack

Source Condition: Normal Load Low Temp Test ①

Dry Gas Meter No. CM5 Y = 1.006

Barometric Pressure 29.01 in. Hg

Leak Check: Pre-sampling 0.000 cfm @ 6 in. Hg vacuum

Post-sampling 0.000 cfm @ 6 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Stack (°F)	Probe (°F)	Filter	Condenser Water (≈140°F)	Coil Exit (°F)	Dry Gas Meter	
					Outlet (°F)			Inlet (°F)	Outlet (°F)
8 ³⁰	6.551	.3		467	496		171	43	42
8 ⁴⁰	9.61	.3		492	503		173	45	43
8 ⁵⁰	12.60	.3		500	501		170	47	44
9 ⁰⁰	15.54	.3		500	506		170	48	44
9 ¹⁰	18.61	.3		499	505		173	49	46
9 ²⁰	21.63	.3		499	496		172	50	47
9 ³⁰	24.66								
Avg.									

Comments: _____

Operator: RG01EE

H₂SO₄ VAPOR FIELD DATA SHEET (Method 8A)

Project: Pub Ser of NH / ADA Date: 4/14/06

Sampling Location: Unit 2 Stock

Source Condition: Normal Load / Low Temp Test (2)

Dry Gas Meter No. CM5 Y = 1.006

Barometric Pressure 29.01 in. Hg

Leak Check: Pre-sampling 0.000 cfm @ 6 in. Hg vacuum

Post-sampling 0.000 cfm @ 6 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Stack (°F)	Probe (°F)	Filter	Condenser Water (≈140°F)	Coil Exit (°F)	Dry Gas Meter	
					Outlet (°F)			Inlet (°F)	Outlet (°F)
10 ¹⁵	25.101	.3		484	507		167	58	54
10 ²⁵	28.17	.3		488	501		168	58	55
10 ³⁵	31.21	.3		498	505		169	62	58
10 ⁴⁵	34.22	.3		500	497		171	61	59
10 ⁵⁵	37.16	.3		498	501		171	63	60
11 ⁰⁵	40.15	.3		500	498		174	64	61
11 ¹⁵	43.18								
Avg.									

Comments: _____

Operator: RGO / EE

H₂SO₄ VAPOR FIELD DATA SHEET (Method 8A)

Project: Pub. Ser. of NH / ADA Date: 4/14/06

Sampling Location: Unit 2 Stack

Source Condition: Normal Load / Low Temp Test (3)

Dry Gas Meter No. CMS Y = 1.006

Barometric Pressure 29.01 in. Hg

Leak Check: Pre-sampling 0.000 cfm @ 6 in. Hg vacuum

Post-sampling 0.000 cfm @ 6 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Stack (°F)	Probe (°F)	Filter	Condenser Water (≈140°F)	Coil Exit (°F)	Dry Gas Meter	
					Outlet (°F)			Inlet (°F)	Outlet (°F)
11 ⁵⁰	43.383	.3		476	491		173	66	66
12 ⁰⁰	46.42	.3		481	506		173	68	66
12 ¹⁰	49.46	.3		490	506		174	67	66
12 ²⁰	52.50	.3		497	497		174	66	66
12 ³⁰	55.41	.3		498	496		176	67	66
12 ⁴⁰	58.43	.3		499	503		178	68	66
12 ⁵⁰	61.401								
Avg.									

Comments: _____

Operator: RGO / EE

Environmental Services	B.-Unit:	PAU
		Name:	Dr. Mayer/Fe
		Date:	12/20/2006
		Page:	17 of 17
ADA-ES, Merrimack Station, Unit #2 SO₃ Test Report - D R A F T -		Phone:	+49-2096016284
		Fax:	+49-2096016403
		Report-No:	06-16-640285

Annex 4.1: Individual Results of SO₃ Testing during Sorbent Injection

Table A4-1: SO₃ test results inter ESP, 10/31/2006 (all testing with ESP)

test period [start - end]	gas counter					titration Ba(ClO ₄) ₂ [mL]	(STP, dry)		comment
	V [L]	p [mbar]	T [°C]	O ₂ [Vol.-%]	V ₀ [NL]		actual O ₂ [ppm]	3 % O ₂ [ppm]	
16:30-16:55	150	1017	22	5.7	136	1.10	9.1	10.7	with Injection
17:20-17:40	150	1014	22	5.6	135	1.00	8.3	9.7	with Injection
17:40 18:00	150	1013	22	5.6	135	1.05	8.7	10.2	with Injection
average:							8.7	10.2	with injection

Table A4-2: SO₃ test results inter ESP, 11/01/2006 (all testing with ESP)

test period [start - end]	gas counter					titration Ba(ClO ₄) ₂ [mL]	(STP, dry)		comment
	V [L]	p [mbar]	T [°C]	O ₂ [Vol.-%]	V ₀ [NL]		actual O ₂ [ppm]	3 % O ₂ [ppm]	
10:10 - 10:30	150	1019	22	5.7	136	0.90	7.4	8.7	drop temp. before pre-heater Injection = 500 lb/h
10:30 - 10:40	100	1017	22	5.8	90	0.60	7.4	8.8	
average:							7.4	8.8	drop temp. / 500 lb/h
11:15 - 11:35	150	1014	22	5.7	135	0.85	7.0	8.3	drop temp. before pre-heater Injection = 625 lb/h
11:35 - 11:55	150	1016	22	5.8	136	0.85	7.0	8.3	
11:55 - 12:15	170	1016	22	5.6	154	0.95	6.9	8.1	
12:15 - 12:35	150	1017	22	5.8	136	0.95	7.8	9.3	
13:30 - 13:50	160	1019	22	5.6	145	0.95	7.3	8.6	
13:50 - 14:10	150	1018	22	5.8	136	0.85	7.0	8.3	
average:							7.2	8.5	drop temp. / 625 lb/h
14:55 - 15:15	160	1018	23	5.7	144	0.85	6.6	7.8	normal temp. before pre-heater Injection = 625 lb/h
15:15 - 15:35	150	1017	23	5.8	135	0.80	6.6	7.9	
15:35 - 15:55	150	1017	23	5.5	135	0.70	5.8	6.8	
15:55 - 16:15	150	1019	23	5.7	135	0.70	5.8	6.8	
average:							6.2	7.3	normal temp. / 625 lb/h
17:15 - 17:35	150	1018	23	5.7	135	2.05	17.0	20.0	normal temp. before pre-heater No injection
17:35 - 17:55	150	1018	23	5.6	135	2.10	17.4	20.4	
average:							17.2	20.2	normal. / 0 lb/h

Sulfuric Acid Mist Emissions Test Report

Performed for
ADA-ES

at the

Public Service of New Hampshire
Merrimack Generating Station
Unit 2

SCR Inlet, SCR Outlet, Air Preheater Outlet,
Primary ESP Outlet, and Secondary ESP Outlet
Bow, New Hampshire
March 26 through 28, 2008

Platt Environmental Services, Inc.

Platt Environmental Services, Inc.

371 Balm Court
Wood Dale, IL 60191
630-521-9400
630-521-9494 fax

Sulfuric Acid Mist Emissions Test Report

Performed for
ADA-ES

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Public Service of New Hampshire
Merrimack Generating Station
Unit 2

SCR Inlet, SCR Outlet, Air Preheater Outlet,
Primary ESP Outlet, and Secondary ESP Outlet
Bow, New Hampshire
March 26 through 28, 2008

Prepared By

Platt Environmental Services, Inc.

Report No. M081310

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1.0 Introduction

PLATT ENVIRONMENTAL SERVICES, INC. (PES) conducted a sulfuric acid mist emissions test program at the Public Service of New Hampshire (PSNH) Merrimack Generating Station on Unit 2 in Bow, New Hampshire on March 26 and 28, 2008. This report summarizes the results of the test program and test methods used.

The test locations, test parameters, test dates are summarized below.

Test Overview

Test Locations	Test Parameter	Test Dates
Unit 2: SCR Inlet, SCR Outlet, Air Preheater Outlet, Primary ESP Outlet, Secondary ESP Outlet	Sulfuric acid mist (SO ₃ as H ₂ SO ₄)	March 26 through 28, 2008

The identification of individuals associated with the test program is summarized below.

Location	Address	Contact
Test Coordinator	ADA-ES, Inc. 8100 South Park Way Unit B Littleton, Colorado, 80120	Mr. Tom Campbell Manager, DOE Demonstrations 303-734-1727 (phone) 303-734-0330 (fax) tomc@adaes.com
Testing Company Representative	Platt Environmental Services, Inc. 371 Balm Court Wood Dale, Illinois 60191	Mr. Eric L. Ehlers (630) 521-9400 (phone) eehlers@plattenv.com

The test crew consisted of Messrs. L. Sorce and E. Ehlers of PES.

2.0 Executive Summary

Selected results of the test program are summarized below, in Table 1. A complete summary of emission test results follows the narrative portion of this report.

Three test runs were performed at each of the below test locations with trona injection of 500 lbs/hr, and the supplementary ESP outlet was rerun with a trona injection rate of 1000 lbs/hr.

Table 1
Test Results

Parameter	Test Location	Condition	Particulate Phase	Gaseous Phase
Sulfuric Acid Mist (ppm SO ₃ as H ₂ SO ₄)	Unit 2 SCR Inlet	500 lbs/hr trona injection rate	4.23	12.13
	Unit 2 SCR Outlet		5.71	8.52
	Unit 2 Air Preheater Outlet		3.96	6.68
	Unit 2 Primary ESP Outlet		2.89	6.40
	Unit 2 Supplementary ESP Outlet*		2.93	7.56
	Unit 2 Supplementary ESP Outlet	1000 lbs/hr trona injection rate	1.69	3.37

* Test 3 not included in the average as the particulate quartz plug was pulled into the coil and results of particulate and gaseous phase SO₃ are presented as one number.

3.0 Test Methodology

Emissions testing was conducted following the methods specified in 40 CFR, Part 60, Appendix A. A schematic of the sampling train used and copies of field data sheets for each test run are included in the Appendix.

The following methodology was used during the test program:

Consol Controlled Condensate Sulfuric Acid Mist (SO₃) Determination

Stack gas sulfuric acid mist (SO₃) concentrations were determined in accordance with the Consol Controlled Condensate Method. An Environmental Supply Company, Inc. sampling train was used to sample stack gas, in the manner specified in the Method.

The flue gas was extracted through a quartz-lined probe fitted with a quartz wool plug to remove particulate matter. SO₃ was then collected as the sample gas passed through a hot water cooled condenser that was also loosely packed with quartz wool. The condenser assembly was maintained at a temperature of 140°F. The sample was then passed through impingers loaded with 3% H₂O₂ to capture the sulfur dioxide (SO₂) passing through the system. The impingers were placed in an ice bath to maintain the exit gas from the last impinger containing silica gel below 68°F. Maintaining the temperature increases the efficiency of the silica gel in drying the metered gas. A leak check of the entire sample train was performed at a vacuum greater than the sampling vacuum after each sampling run in order to determine if any leakage had occurred during the test run. A leakage rate not in excess of 2% of the average sampling rate is considered acceptable.

Samples were recovered as follows: the quartz wool particulate plug was removed and the probe was rinsed with an 80% IPA solution and placed in one bottle, the quartz wool plug in the condenser coil was removed and the coil was rinsed with 80% IPA, and the impingers were measured for moisture determination and the H₂O₂ solution was kept for potential analysis for SO₂ concentration.

Samples were then taken to the plant laboratory and analyzed Mr. E. Ehlers of PES utilizing a barium thorin titration. Both particulate phase and gaseous phase SO₃ samples were brought up to a known volume and titrated as required by USEPA Method 6.

4.0 Test Result Summaries

Consol Controlled Condensate Titration Results Summary
Public Service of New Hampshire - Merrimack Station
Unit 2 SCR Inlet Duct
500 lbs/hr Trona Injection Rate
3/28/08

Particulate Phase SO ₃ , 80% IPA probe rinse								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	8:35-9:20	1.05	0.01023	50	10	4.13	1.15E-06	5.52
2	9:45-10:30	0.20	0.01023	50	10	4.08	2.21E-07	1.06
3	10:55-11:40	1.10	0.01023	50	10	3.92	1.27E-06	6.10
							Average	4.23

Gaseous Phase SO ₃ , 80% IPA Condenser Coil								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	8:35-9:20	2.10	0.01023	100	20	4.13	2.30E-06	11.05
2	9:45-10:30	2.60	0.01023	100	20	4.08	2.88E-06	13.84
3	10:55-11:40	2.075	0.01023	100	20	3.92	2.39E-06	11.50
							Average	12.13

Consol Controlled Condensate Titration Results Summary
Public Service of New Hampshire - Merrimack Station
Unit 2 SCR Outlet Duct
500 lbs/hr Trona Injection Rate
3/27/08

Particulate Phase SO ₃ , 80% IPA probe rinse								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	13:57-14:42	0.45	0.01023	200	20	4.31	9.43E-07	4.54
2	15:00-15:45	0.80	0.01023	200	20	4.81	1.50E-06	7.23
3	16:02-16:47	0.50	0.01023	200	20	4.06	1.11E-06	5.35
							Average	5.71

Gaseous Phase SO ₃ , 80% IPA Condenser Coil								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	13:57-14:42	0.85	0.01023	220	20	4.31	1.96E-06	9.43
2	15:00-15:45	1.20	0.01023	100	20	4.81	1.13E-06	5.42
3	16:02-16:47	1.00	0.01023	200	20	4.06	2.22E-06	10.70
							Average	8.52

**Consol Controlled Condensate Titration Results Summary
Public Service of New Hampshire - Merrimack Station
Unit 2 Air Preheater Outlet Duct
500 lbs/hr Trona Injection Rate
3/27/08**

Particulate Phase SO₃, 80% IPA probe rinse								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	9:05-9:50	0.70	0.01023	200	20	4.17	1.52E-06	7.29
2	10:15-11:00	0.50	0.01023	100	20	4.28	5.27E-07	2.54
3	11:20-12:05	0.40	0.01023	100	20	4.23	4.27E-07	2.05
Average								3.96

Gaseous Phase SO₃, 80% IPA Condenser Coil								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	9:05-9:50	0.70	0.01023	200	20	4.17	1.52E-06	7.29
2	10:15-11:00	1.40	0.01023	100	20	4.28	1.48E-06	7.11
3	11:20-12:05	1.10	0.01023	100	20	4.23	1.17E-06	5.65
Average								6.68

**Consol Controlled Condensate Titration Results Summary
Public Service of New Hampshire - Merrimack Station
Unit 2 Primary ESP Outlet Duct
500 lbs/hr Trona Injection Rate
3/26/08**

Particulate Phase SO₃, 80% IPA probe rinse								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	15:15-16:00	0.55	0.01023	100	20	4.06	6.11E-07	2.94
2	16:15-17:00	0.40	0.01023	100	20	4.12	4.38E-07	2.11
3	17:20-18:05	0.70	0.01023	100	20	4.21	7.51E-07	3.61
Average								2.89

Gaseous Phase SO₃, 80% IPA Condenser Coil								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	15:15-16:00	0.65	0.01023	100	10	4.06	1.45E-06	6.96
2	16:15-17:00	1.15	0.01023	100	20	4.12	1.26E-06	6.06
3	17:20-18:05	1.20	0.01023	100	20	4.21	1.29E-06	6.19
Average								6.40

**Consol Controlled Condensate Titration Results Summary
Public Service of New Hampshire - Merrimack Station
Unit 2 Supplementary ESP Outlet Duct
500 lbs/hr Trona Injection Rate
3/26/08**

Particulate Phase SO₃, 80% IPA probe rinse								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	11:45-12:30	0.45	0.01023	100	10	6.84	5.94E-07	2.86
2	13:00-13:45	0.40	0.01023	100	10	5.82	6.20E-07	2.99
3*	14:05-14:50	0.00	0.01023	100	10	4.00	0.00E+00	0.00
Average								2.93

Gaseous Phase SO₃, 80% IPA Condenser Coil								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	11:45-12:30	0.95	0.01023	100	10	6.84	1.25E-06	6.03
2	13:00-13:45	0.95	0.01023	100	10	5.82	1.47E-06	7.09
3*	14:05-14:50	1.00	0.01023	100	10	4.00	2.26E-06	10.86
Average								6.56

* Test 3 not included in the average as the particulate quartz plug was pulled into the coil and results of particulate and gaseous phase SO₃ are presented as one number.

**Consol Controlled Condensate Titration Results Summary
Public Service of New Hampshire - Merrimack Station
Unit 2 Supplementary ESP Outlet Duct
1000 lbs/hr Trona Injection Rate
3/28/08**

Particulate Phase SO₃, 80% IPA probe rinse								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	15:05-15:50	0.55	0.01023	50	10	4.24	5.86E-07	2.82
2	16:05-16:50	0.20	0.01023	50	10	4.28	2.11E-07	1.02
3	17:00-17:45	0.25	0.01023	50	10	4.41	2.56E-07	1.23
Average								1.69

Gaseous Phase SO₃, 80% IPA Condenser Coil								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	15:05-15:50	0.75	0.01023	100	20	4.24	7.98E-07	3.84
2	16:05-16:50	0.65	0.01023	100	20	4.28	6.86E-07	3.30
3	17:00-17:45	0.60	0.01023	100	20	4.41	6.14E-07	2.96
Average								3.37

5.0 Conclusion and Certification

PLATT ENVIRONMENTAL SERVICES, INC. is pleased to have been of service to ADA-ES. If you have any questions regarding this test report, please do not hesitate to contact us at 630-521-9400.

CERTIFICATION

As project manager, I hereby certify that this test report represents a true and accurate summary of emissions test results and the methodologies employed to obtain those results, and the test program was performed in accordance with the methods specified in this test report.

PLATT ENVIRONMENTAL SERVICES, INC.

Eric L. Ehlers

Program Manager

Scott W. Banach

Quality Assurance

Appendix

Consol Controlled Condensate – Sulfuric Acid Mist Sample Train Diagram

MOISTURE CALCULATIONS

$$V_{wc(std)} = \frac{(V_f - V_i) \rho_w R T_{std}}{P_{std} M_w} = 0.04707(V_f - V_i)$$

$$V_{wsg(std)} = \frac{(W_f - W_i) R T_{std}}{P_{std} M_w} = 0.04715(W_f - W_i)$$

$$V_{m(std)} = 17.64 V_m Y \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}$$

$$B_{ws} = \frac{V_{wc(std)} + V_{wsg(std)}}{V_{wc(std)} + V_{wsg(std)} + V_{m(std)}}$$

Where:

B_{ws} = Water vapor in gas stream, proportion by volume

M_w = Molecular weight of water, 18.015 lb/lb-mole

P_{bar} = Barometric pressure at the testing site, in. Hg

P_{std} = Standard absolute pressure, 29.92 in. Hg

R = Ideal gas constant, $0.048137 \text{ (in. Hg)(ft}^3\text{)/(g-mole)(}^\circ\text{R)} =$
 $[21.8348 \text{ (in. Hg)(ft}^3\text{)/(lb-mole)(}^\circ\text{R)}]/453.592 \text{ g-mole/lb-mole}$

T_m = Absolute average dry gas meter temperature, $^\circ\text{R}$

T_{std} = Standard absolute temperature, 528 $^\circ\text{R}$

V_f = Final volume of condenser water, ml

V_i = Initial volume of condenser water, ml

V_m = Dry gas volume measured by dry gas meter, dcf

$V_{m(std)}$ = Dry gas volume measured by dry gas meter, corrected to standard conditions, scf

$V_{wc(std)}$ = Volume of condensed water vapor, corrected to standard conditions, scf

$V_{wsg(std)}$ = Volume of water vapor collected in silica gel, corrected to standard conditions, scf

W_f = Final weight of silica gel, g

W_i = Initial weight of silica gel, g

Y = Dry gas meter calibration factor

ΔH = Average pressure exerted on dry gas meter outlet by gas sample bag, in. H_2O

ρ_w = Density of water, 0.9982 g/ml

13.6 = Specific gravity of mercury (Hg)

17.64 = T_{std}/P_{std}

0.04707 = ft^3/ml 0.04715 = ft^3/g

PLATT ENVIRONMENTAL SERVICES, INC.

Calculations For Sulfuric Acid Mist

$$V_{m(std)} = 17.647 V_m Y \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}$$

$$C_{H_2SO_4} = 1.0811 \times 10^{-4} \frac{(V_t - V_{tb}) N \left(\frac{V_{soln}}{V_a} \right)}{V_{m(std)}}$$

$$\text{ppm } H_2SO_4 = 3.9289 \times 10^6 C_{H_2SO_4} \quad (\text{expressed as } H_2SO_4)$$

Where:

$C_{H_2SO_4}$ = Concentration of sulfuric acid (including sulfur trioxide), dry basis, corrected to standard conditions, lb/dscf

N = Normality of barium chloride titrant, meq/ml

P_{bar} = Barometric pressure at the exit of the dry gas meter, inches of mercury

P_{std} = Standard pressure, 29.92 inches of mercury

T_{std} = Standard temperature, 528 °R

$17.647 = T_{std}/P_{std}$

V_a = Volume of sample aliquot titrated, ml

T_m = Dry gas meter average temperature, °R

V_m = Dry gas volume measured by dry gas meter, dcf

$V_{m(std)}$ = Dry gas volume measured by dry gas meter, corrected to standard conditions, dscf

V_{soln} = Total volume of solution in which the sulfuric acid sample is contained, ml

V_t = Volume of barium perchlorate titrant used for the sample, ml

V_{tb} = Volume of barium perchlorate titrant used for the blank, ml

Y = Dry gas meter calibration factor

ΔH = Average pressure differential across the orifice meter, inches of water

13.6 = Specific gravity of mercury

1.0811×10^{-4} = Equivalent weight of sulfuric acid, lb/g-meq

$3.9289 \times 10^6 = \frac{\text{dscf}}{\text{lb}}$ of sulfuric acid

PLATT ENVIRONMENTAL SERVICES, INC.

Coal Emission Rate Calculations

A pollutant emission rate (E), expressed as pounds of pollutant per million Btu heat input from the fuel combusted can be calculated by several methods as follows:

- A. $C = C_s/7000$ where, C = pollutant concentration, lb/dscf
 c_s = pollutant concentration, grains/dscf
- B. If fuel flow is monitored and the fuel combusted during the test is sampled and analyzed for gross calorific value, then:

$$E = \frac{Q_{sd} C}{\text{fuel flow rate (lb/hr) GCV}} \times 10^6$$

where, E = lbs per million Btu

GCV = gross calorific value, Btu / lb

Q_{sd} = dry volumetric gas flow at standard conditions, dscf / hr

- C. If an integrated gas sample is taken during the test and analyzed for %CO₂ or %O₂, dry basis by volume, with an approved USEPA Method 3 or 3A gas analyzer, then

$$E = C F_c \frac{100}{(\%CO_2)} \text{ or, } E = C F \frac{20.9}{(20.9 - \%O_2)} \text{ where,}$$

%CO₂ and %O₂ are expressed as percent values:

F_c = a factor representing a ratio of the volume of carbon dioxide generated to the calorific value of the fuel combusted, 1800 scf CO₂/million Btu.

F = a factor representing a ratio of the volume of dry flue gases generated to the calorific value of the fuel combusted, 9780 dscf/million Btu.

- D. If fuel sample increments are taken and composited during the test and an ultimate analysis is performed and the GCV is determined, then

$$F_c = \frac{321 \times 10^3 (\%C)}{GCV} \text{ where, \%C = carbon content by weight expressed as percent}$$

$$F = \frac{[3.64 (\%H) + 1.53 (\%C) + 0.57 (\%S) + 0.14 (\%N) - 0.46 (\%O_2)]}{GCV} \times 10^6$$

1. H = Hydrogen, percent
2. C = Carbon, percent
3. S = Sulfur, percent
4. N = Nitrogen, percent
5. O = Oxygen, percent

PLATT ENVIRONMENTAL SERVICES, INC.

Derivation of Factors Used in Sulfuric Acid Mist Calculations

Factors for calculating from lb/dscf to parts per million:

Using 22.414 liters of gas per gram-mole at 0°C and 1 atmosphere pressure,

One pound-mole of gas is contained in 359.04765 ft³ at 32°F and 29.92 in. Hg, or 385.31943 ft³ at 68°F and 29.92 in. Hg

$$\text{ppm} = \frac{M \text{ lb/lb-mole}}{385.31943 \text{ dscf/lb-mole} \times 10^6} = 2.5952494 \times 10^{-9} M \text{ lb/dscf}$$

Where M = pollutant molecular weight; H₂SO₄ = 98.076 lb/lb-mole

$$\text{Factor for ppm H}_2\text{SO}_4 = \frac{1}{98.076 \times 2.5952 \times 10^{-9}} = 3.9289 \times 10^6 \text{ dscf/lb}$$

Use 3.9289 × 10⁶

Factor for converting ppm to lbs/hr

$$\text{ppm H}_2\text{SO}_4 \times 2.545 \times 10^{-7} = \frac{\text{lbs H}_2\text{SO}_4}{\text{dscf}}$$

$$\frac{\text{lbs H}_2\text{SO}_4}{\text{dscf}} \times \frac{\text{dscf}}{\text{min}} \times \frac{60 \text{ min}}{\text{hr}} = \frac{\text{lbs H}_2\text{SO}_4}{\text{hr}}$$

Barium-Thorin Titrations

Project/Project Number: ADA - Public Service of New Hampshire Analyst: ELC Date: 3/26/08

Barium Titrant Standardization	Run No. 1	Run No. 2	Run No. 3
Volume 0.02 N H ₂ SO ₄ titrated (ml)	25	25	25
Volume BaCl ₂ added (ml)	24.1	24.3	24.6
Calculated BaCl ₂ normality	0.01025	0.01029	0.01016

Average BaCl₂ normality = 0.01023 N
Standardization Blank (25 ml Water + 100 ml isopropanol) = ml ; Must be <0.5 ml.

Sample Number	Sample Date	Sample Description	Total Volume	Sample Aliquot	Titration Volume for Sample		Titration Volume Corrected for Blank (V _t - V _{tb}) ml
Ammonium Sulfate-Controls	3/26/08	80% EPA Blank	20	20	0.9 - 0.8 1.0 - 0.9 Average = 0.1	= 0.1 = 0.1 Average = 0.1	
		#1 Supplementary ESP out Unit 2 Coal River	100	10	2.3 - 1.2 3.3 - 2.2 Average = 1.05	= 1.0 = 1.1 Average = 1.05	0.95
		#1 Supplementary ESP out Unit 2 Probe Wash & Thimble	100	10	3.8 - 3.3 4.5 - 3.9 Average = 2.55	= 0.5 = 0.6 Average = 2.55	0.45
		#2 Supplementary ESP out U. 2 Coal River	100	10	5.4 - 4.5 6.4 - 5.4 Average = 0.9	= 0.9 = 1.0 Average = 0.9	0.95
		#2 Sup. ESP out U. 2 Thimble	100	10	2.1 - 1.9 2.9 - 2.4 Average = 0.5	= 0.1 = 0.5 Average = 0.5	0.4
		#3 Sup. ESP out U. 2 Coal River & Thimble			4.0 - 2.9 5.1 - 4.0 Average = 1.1	= 1.0 = 1.1 Average = 1.1	1.00
		H ₂ O ₂ Reagent Blank			- - Average =	= = Average =	V _{tb}

2.5
4.8
20.2
15.1
35.3

* All titrations must be performed in replicate with agreement of 0.1% or 0.2 ml, whichever is larger.

Barium-Thorin Titrations

Project/Project Number: _____

Analyst: _____

Page ____ of ____

Sample Number	Sample Date	Sample Description	Total Volume	Sample Aliquot	Titration Volume for Sample		Titration Volume Corrected for Blank ($V_t - V_{tb}$) ml
	3/26/04	#1 Primary ESP Dist U.2 Coil Rinse	100	10	0.8 - 0.0 1.5 - 0.2 Average = 0.75"		0.65"
		#1 Primary ESP Dist U.2 Quartz Wash Plug	100	20	2.1 - 1.5 2.8 - 2.1 Average = 0.65"		0.55"
		#2 Primary ESP Dist U.2 Coil Rinse	100	20	1.2 - 0.0 2.3 - 1.2 Average = 1.25"		1.15"
		#2 Primary ESP Dist U.2 Quartz Wash Plug	100	20	5.8 - 4.9 5.9 - 5.4 Average = 0.5"		0.40"
		#3 Prim. ESP Dist U.2 Coil Rinse	100	20	1.20 - 0.0 2.60 - 1.20 Average = 1.20"		1.20"
		#3 Prim ESP In U.2 Quartz Wash Plug	100	20	3.4 - 2.6 4.2 - 3.4 Average = 0.8"		0.70"
		#3 Suppl. ESP U.2 only 32 Imp ✓	210	20	3.8 - 2.0 - Average = 35.41"		35.3"
		#1 Primary ESP Dist U.2 502 Imp ✓	210	20	68.8 - 0.0 - Average = 68.8"		68.7"
					- - Average =		

* All titrations must be performed in replicate with agreement of 0.1% or 0.2 ml, whichever is larger.

Barium-Thorin Titrations

Project/Project Number: _____ Analyst: _____ Date: _____

Barium Titrant Standardization	Run No. 1	Run No. 2	Run No. 3
Volume 0.02 N H ₂ SO ₄ titrated (ml)			
Volume BaCl ₂ added (ml)			
Calculated BaCl ₂ normality			

Average BaCl₂ normality = _____ N
 Standardization Blank (25 ml Water + 100 ml isopropanol) = _____ ml ; Must be <0.5 ml.

Sample Number	Sample Date	Sample Description	Total Volume	Sample Aliquot	Titration Volume for Sample		Titration Volume Corrected for Blank (V _t - V _{tb}) ml
Ammonium Sulfate Controls	3/27/08	#1 U.2 Air Preheader Outlet Coil Rinse	200	20	5.3 - 4.5 6.8 - 5.3 Average = 0.8		0.70
		#1 U.2 Air Preheader Outlet Quartz w/val Probe	200	20	6.8 - 6.1 7.7 - 6.8 Average = 0.8		0.70
		#2 U.2 Air Preheader Outlet Coil Rinse	100	20	9.0 - 7.9 10.4 - 9.0 12.0 - 10.8 Average = 1.5		1.4
		#2 U.2 Air Preheader Outlet Quartz w/val Plug	100	20	12.6 - 12.0 13.2 - 12.6 Average = 0.6		0.5
		#3 U.2 Air Preheader Outlet Coil Rinse	100	20	1.2 - 0.0 2.4 - 1.3 4.1 - 2.9 Average = 1.2		1.1
		#3 U.2 Air Preheader Outlet Quartz w/val Plug	100	20	4.7 - 4.1 5.1 - 4.7 Average = 0.5		0.4
		H ₂ O ₂ Reagent Blank			- - Average =		V _{tb}

* All titrations must be performed in replicate with agreement of 0.1% or 0.2 ml, whichever is larger.

Barium-Thorin Titrations

Project/Project Number: _____ Analyst: _____ Page ____ of ____

Sample Number	Sample Date	Sample Description	Total Volume	Sample Aliquot	Titration Volume for Sample		Titration Volume Corrected for Blank ($V_t - V_{tb}$) ml
		#1 SCA out U.I. Coil Rinse	220	20	8.9 - 8.9 9.8 - 8.9 Average = 0.95	= 1.0 = 0.9 Average = 0.95	0.85
		#1 SCA out U.I. chloride wash Plug	200	20	7.7 - 7.7 7.9 - 7.7 Average = 0.25	= 0.3 = 0.2 Average = 0.25	0.15
		#2 SCA out U.I. Coil Rinse	100	20	1.3 - 0.0 2.6 - 1.3 Average = 1.3	= 1.3 = 1.3 Average = 1.3	1.20
		#2 SCA out ammonia wash Plug	200	10	3.1 - 2.6 3.7 - 3.1 Average = 0.55	= 0.5 = 0.6 Average = 0.55	0.45
		#3 SCA out Coil Rinse	200	20	1.1 - 0.0 2.8 - 1.1 Average = 1.1	= 1.1 = 1.1 Average = 1.1	1.0
		#3 SCA out ammonia wash Plug	200	20	0.4 - 0.0 1.0 - 0.4 Average = 0.5	= 0.4 = 0.6 Average = 0.5	0.4
		#1 SCA out filtered wash Plug	200	20	3.6 - 3.0 4.1 - 3.6 Average = 0.55	= 0.6 = 0.5 Average = 0.55	0.45
		#2 SCA out filtered wash Plug	200	20	5.2 - 4.2 6.0 - 5.2 Average = 0.9	= 1.0 = 0.8 Average = 0.9	0.80
		#3 SCA out filtered wash Plug	200	20	6.7 - 6.0 7.2 - 6.7 Average = 0.6	= 0.7 = 0.5 Average = 0.6	0.5

* All titrations must be performed in replicate with agreement of 0.1% or 0.2 ml, whichever is larger.

#3 SCA out S₂ 210 43.6 43.5
#2 APH out S₂ 210 45.6 45.5

Barium-Thorin Titrations

Project/Project Number: _____

Analyst: _____

Page ____ of ____

Sample Number	Sample Date	Sample Description	Total Volume	Sample Aliquot	Titrant Volume for Sample		Titrant Volume Corrected for Blank ($V_t - V_{tb}$) ml
		#1 SCR In U2 Filled Coil Rinse	100	20	2.1 - 0.0 4.4 - 2.1 Average = 3.2		2.1
		#1 SCR In U2 Filled Sample Serial Filter	50	10	5.5 - 4.4 6.7 - 5.5 Average = 1.1		1.05
		#2 SCR In U2 Filled Coil Rinse	100	20	3.0 - 0.4 5.8 - 3.0 Average = 2.7		2.60
		#2 SCR In U2 Filled Plug	50	10	6.0 - 5.8 6.4 - 6.0 Average = 2.3		0.2
		#3 SCR In Filled Coil Rinse	100	20	2.25 - 0.0 4.35 - 2.25 Average = 2.475		2.075
		#3 SCR In Filled Plug	50	10	5.6 - 4.4 6.8 - 5.6 Average = 1.2		1.1
		#1 Super ESP Out Coil Rinse	100	20	1.4 - 0.2 2.5 - 1.4 Average = 1.3		1.2
		#1 Super ESP Out Plug	50	10	3.2 - 2.8 3.6 - 3.2 Average = 0.4		0.3
		#2 Super ESP Out Coil	100	20	4.5 - 3.6 5.3 - 4.5 Average = 0.85		0.75

* All titrations must be performed in replicate with agreement of 0.1% or 0.2 ml, whichever is larger.

#2 Super ESP Out 50 10 6.0 - 5.3 0.7
#2.1 Plug 50 10 6.6 - 6.0 0.6
0.65 0.55

Barium-Thorin Titrations

Project/Project Number: _____ Analyst: _____ Page ____ of ____

Sample Number	Sample Date	Sample Description	Total Volume	Sample Aliquot	Titration Volume for Sample		Titration Volume Corrected for Blank ($V_t - V_{t0}$) ml
		#3 Sup. GSP out Coil	100	20	0.9 - 0.1 1.6 - 0.9 Average = 0.75	0.8 0.7 Average = 0.75	0.61
		#3 Sup. GSP out Wood Plug	50	10	1.8 - 1.6 2.2 - 1.8 Average = 0.3	0.2 0.4 Average = 0.3	0.2
		#4 Sup. GSP out Coil	100	20	2.9 - 2.2 3.6 - 2.9 Average = 0.7	0.7 0.7 Average = 0.7	0.6
		#4 Sup. GSP out Wood Plug	50	10	3.9 - 3.6 4.3 - 3.9 Average = 0.31	0.3 0.4 Average = 0.31	0.25
					-	=	
					-	=	
					Average =		
					-	=	
					-	=	
					Average =		
					-	=	
					-	=	
					Average =		
					-	=	
					-	=	
					Average =		
					-	=	
					-	=	
					Average =		

* All titrations must be performed in replicate with agreement of 0.1% or 0.2 ml, whichever is larger.

CONSOL CONTROLLED CONDENSATE TEST RESULTS

Date:	3/26/2008	Condition:	500 lbs trona injection
Project:	P.S. of New Hampshire-Merrimack Station	Data Taken By:	ALS
Location:	Supplementary ESP Outlet Duct	Fuel Factor:	9780
Source:	Unit 2		

Test Number:	<u>1</u>	Time:	<u>11:45-12:30</u>
Pressure, Barometric(Hg"):	29.900		
Pressure, Static(H ₂ O"):	2.00	Water Vapor in Flue Gas (Bws):	0.094
Pressure, Stack(Hg"):	30.047		
Initial Volume (cu.ft.):	2.927		
Final Volume (cu.ft.):	9.75		
Meter Temperature (°F):	74.00		
Meter Volume (dscf):	6.84		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	215.0		
Average Delta H (ΔH):	0.040		

Test Number:	<u>2</u>	Time:	<u>13:00-13:45</u>
Pressure, Barometric(Hg"):	29.900		
Pressure, Static(H ₂ O"):	2.00	Water Vapor in Flue Gas (Bws):	0.089
Pressure, Stack(Hg"):	30.047		
Initial Volume (cu.ft.):	9.801		
Final Volume (cu.ft.):	15.643		
Meter Temperature (°F):	78.00		
Meter Volume (dscf):	5.82		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	212.0		
Average Delta H (ΔH):	0.020		

Test Number:	<u>3</u>	Time:	<u>14:05-14:50</u>
Pressure, Barometric(Hg"):	29.900		
Pressure, Static(H ₂ O"):	2.00	Water Vapor in Flue Gas (Bws):	0.086
Pressure, Stack(Hg"):	30.047		
Initial Volume (cu.ft.):	6.716		
Final Volume (cu.ft.):	10.76		
Meter Temperature (°F):	81.00		
Meter Volume (dscf):	4.00		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	208.0		
Average Delta H (ΔH):	0.020		

CONSOL CONTROLLED CONDENSATE TEST RESULTS

Date:	3/26/2008	Condition:	500 lbs trona injection
Project:	P.S. of New Hampshire-Merrimack Station	Data Taken By:	ALS
Location:	Primary ESP Outlet	Fuel Factor:	9780
Source:	Unit 2		

Test Number:	1	Time:	15:15-16:00
Pressure, Barometric(Hg"):	29.900		
Pressure, Static(H ₂ O"):	3.00	Water Vapor in Flue Gas (Bws):	0.104
Pressure, Stack(Hg"):	30.121		
Initial Volume (cu.ft.):	10.784		
Final Volume (cu.ft.):	14.86		
Meter Temperature (°F):	78.00		
Meter Volume (dscf):	4.06		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.020		

Test Number:	2	Time:	16:15-17:00
Pressure, Barometric(Hg"):	29.900		
Pressure, Static(H ₂ O"):	3.00	Water Vapor in Flue Gas (Bws):	0.103
Pressure, Stack(Hg"):	30.121		
Initial Volume (cu.ft.):	4.933		
Final Volume (cu.ft.):	8.993		
Meter Temperature (°F):	68.00		
Meter Volume (dscf):	4.12		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.020		

Test Number:	3	Time:	17:20-18:05
Pressure, Barometric(Hg"):	29.900		
Pressure, Static(H ₂ O"):	3.00	Water Vapor in Flue Gas (Bws):	0.101
Pressure, Stack(Hg"):	30.121		
Initial Volume (cu.ft.):	8.924		
Final Volume (cu.ft.):	13.015		
Meter Temperature (°F):	60.00		
Meter Volume (dscf):	4.21		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.020		

CONSOL CONTROLLED CONDENSATE TEST RESULTS

Date: 3/27/2008
 Project: P.S. of New Hampshire-Merrimack Station
 Location: Air Preheater Outlet
 Source: Unit 2

Condition: 500 lbs trona injection
 Data Taken By: ALS
 Fuel Factor: 9780

Test Number:	1	Time:	9:05-9:50
Pressure, Barometric(Hg"):	29.890		
Pressure, Static(H ₂ O"):	6.00	Water Vapor in Flue Gas (Bws):	0.101
Pressure, Stack(Hg"):	30.332		
Initial Volume (cu.ft.):	4.815		
Final Volume (cu.ft.):	8.975		
Meter Temperature (°F):	62.00		
Meter Volume (dscf):	4.17		
Meter Calibration (Y):	0.993		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.030		

Test Number:	2	Time:	10:15-11:00
Pressure, Barometric(Hg"):	29.890		
Pressure, Static(H ₂ O"):	6.00	Water Vapor in Flue Gas (Bws):	0.099
Pressure, Stack(Hg"):	30.332		
Initial Volume (cu.ft.):	9.087		
Final Volume (cu.ft.):	13.393		
Meter Temperature (°F):	67.00		
Meter Volume (dscf):	4.28		
Meter Calibration (Y):	0.993		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.030		

Test Number:	3	Time:	11:20-12:05
Pressure, Barometric(Hg"):	29.890		
Pressure, Static(H ₂ O"):	6.00	Water Vapor in Flue Gas (Bws):	0.100
Pressure, Stack(Hg"):	30.332		
Initial Volume (cu.ft.):	13.51		
Final Volume (cu.ft.):	17.76		
Meter Temperature (°F):	66.00		
Meter Volume (dscf):	4.23		
Meter Calibration (Y):	0.993		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.030		

*Air flows taken from ESP Inlet data

CONSOL CONTROLLED CONDENSATE TEST RESULTS

Date: 3/27/2008
 Project: P.S. of New Hampshire-Merrimack Station
 Location: SCR Outlet
 Source: Unit 2

Condition: 500 lbs trona injection
 Data Taken By: ALS
 Fuel Factor: 9780

Test Number:	<u>1</u>	Time:	<u>13:57-14:42</u>
Pressure, Barometric(Hg"):	29.890		
Pressure, Static(H ₂ O"):	13.00	Water Vapor in Flue Gas (Bws):	0.099
Pressure, Stack(Hg"):	30.847		
Initial Volume (cu.ft.):	3.132		
Final Volume (cu.ft.):	7.28		
Meter Temperature (°F):	55.00		
Meter Volume (dscf):	4.31		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.030		

Test Number:	<u>2</u>	Time:	<u>15:00-15:45</u>
Pressure, Barometric(Hg"):	29.890		
Pressure, Static(H ₂ O"):	13.00	Water Vapor in Flue Gas (Bws):	0.089
Pressure, Stack(Hg"):	30.847		
Initial Volume (cu.ft.):	7.373		
Final Volume (cu.ft.):	12.009		
Meter Temperature (°F):	56.00		
Meter Volume (dscf):	4.81		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.030		

Test Number:	<u>3</u>	Time:	<u>16:02-16:47</u>
Pressure, Barometric(Hg"):	29.890		
Pressure, Static(H ₂ O"):	13.00	Water Vapor in Flue Gas (Bws):	0.104
Pressure, Stack(Hg"):	30.847		
Initial Volume (cu.ft.):	2.19		
Final Volume (cu.ft.):	6.1		
Meter Temperature (°F):	56.00		
Meter Volume (dscf):	4.06		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.030		

*Air flows taken from ESP Inlet data

CONSOL CONTROLLED CONDENSATE TEST RESULTS

Date: 3/28/2008
 Project: P.S. of New Hampshire-Merrimack Station
 Location: SCR Inlet
 Source: Unit 2

Condition: 500 lbs trona injection
 Data Taken By: ALS
 Fuel Factor: 9780

Test Number:	1	Time:	8:35-9:20
Pressure, Barometric(Hg"):	29.460		
Pressure, Static(H ₂ O"):	18.00	Water Vapor in Flue Gas (Bws):	0.112
Pressure, Stack(Hg"):	30.785		
Initial Volume (cu.ft.):	6.055		
Final Volume (cu.ft.):	9.99		
Meter Temperature (°F):	43.00		
Meter Volume (dscf):	4.13		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	211.0		
Average Delta H (ΔH):	0.020		

Test Number:	2	Time:	9:45-10:30
Pressure, Barometric(Hg"):	29.460		
Pressure, Static(H ₂ O"):	18.00	Water Vapor in Flue Gas (Bws):	0.104
Pressure, Stack(Hg"):	30.785		
Initial Volume (cu.ft.):	0.011		
Final Volume (cu.ft.):	3.927		
Meter Temperature (°F):	47.00		
Meter Volume (dscf):	4.08		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.030		

Test Number:	3	Time:	10:55-11:40
Pressure, Barometric(Hg"):	29.460		
Pressure, Static(H ₂ O"):	18.00	Water Vapor in Flue Gas (Bws):	0.107
Pressure, Stack(Hg"):	30.785		
Initial Volume (cu.ft.):	4.027		
Final Volume (cu.ft.):	7.818		
Meter Temperature (°F):	50.00		
Meter Volume (dscf):	3.92		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.040		

*Air flows taken from ESP Inlet data

CONSOL CONTROLLED CONDENSATE TEST RESULTS

Date:	3/28/2008	Condition:	1000 lbs trona injection
Project:	P.S. of New Hampshire-Merrimack Station	Data Taken By:	ALS
Location:	Supplementary ESP Outlet Duct	Fuel Factor:	9780
Source:	Unit 2		

Test Number:	1	Time:	15:05-15:50
Pressure, Barometric(Hg"):	29.460		
Pressure, Static(H ₂ O"):	2.00	Water Vapor in Flue Gas (Bws):	0.109
Pressure, Stack(Hg"):	29.607		
Initial Volume (cu.ft.):	1.059		
Final Volume (cu.ft.):	5.432		
Meter Temperature (°F):	73.00		
Meter Volume (dscf):	4.24		
Meter Calibration (Y):	0.993		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	211.0		
Average Delta H (ΔH):	0.020		

Test Number:	2	Time:	16:05-16:50
Pressure, Barometric(Hg"):	29.460		
Pressure, Static(H ₂ O"):	2.00	Water Vapor in Flue Gas (Bws):	0.117
Pressure, Stack(Hg"):	29.607		
Initial Volume (cu.ft.):	5.505		
Final Volume (cu.ft.):	9.935		
Meter Temperature (°F):	74.00		
Meter Volume (dscf):	4.28		
Meter Calibration (Y):	0.993		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	212.0		
Average Delta H (ΔH):	0.020		

Test Number:	3	Time:	17:00-17:45
Pressure, Barometric(Hg"):	29.460		
Pressure, Static(H ₂ O"):	2.00	Water Vapor in Flue Gas (Bws):	0.105
Pressure, Stack(Hg"):	29.607		
Initial Volume (cu.ft.):	10.003		
Final Volume (cu.ft.):	14.56		
Meter Temperature (°F):	73.00		
Meter Volume (dscf):	4.41		
Meter Calibration (Y):	0.993		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	211.0		
Average Delta H (ΔH):	0.020		

PLATT ENVIRONMENTAL SERVICES, INC.

Procedures for Calibration

Dry Gas Meters

The test meters are calibrated according to Method 5, Section 5.3 and "Procedures for Calibrating and Using Dry Gas Volume Meters as Calibration Standards" by P.R. Westlin and R.T. Shigehara, March 10, 1978.

Analytical Balance

The accuracy of the analytical balance is checked with Class S, Stainless Steel Type 303 weights manufactured by F. Hopken and Son, Jersey City, New Jersey.

Temperature Sensing Devices

The potentiometer and thermocouples are calibrated utilizing a NBS traceable millivolt source.

Meter Box Calibration

Dry Gas Meter No.
Standard Meter No.
Standard Meter (Y)

CM 13
9605804
0.9993

Date:
Calibrated By:
Barometric Pressure:

March 3, 2008
S. Dyrá
29.07

Run Number	Orifice Setting in H ₂ O Chg (H)	Standard Meter Gas Volume vr	Dry Gas Meter Gas Volume vd	Standard Meter Temp. F° tr	Dry Gas Meter Inlet Temp. F° tdi	Dry Gas Meter Outlet Temp. F° tdo	Dry Gas Meter Avg. Temp. F° td	Time Min	Time Sec	Y	Chg (H)
Final		23.667	99.646	71	75	74					
Initial		18.082	93.978	71	76	73					
Difference	1	5.585	5.668	71	76	74	75	20	3	0.991	1.482
Final		33.811	109.899	71	77	72					
Initial		23.667	99.646	71	73	73					
Difference	2	10.144	10.253	71	75	73	74	23	37	0.993	1.560
Final		42.245	118.449	71	79	73					
Initial		33.811	109.899	71	76	73					
Difference	3	8.434	8.550	71	78	73	75	16	51	0.993	1.604
Final		47.360	23.619	71	80	73					
Initial		42.245	18.449	71	78	73					
Difference	4	5.115	5.170	71	79	73	76	9	8	0.996	1.645
Final		53.132	29.480	71	81	73					
Initial		47.360	23.619	71	78	73					
Difference	5	5.772	5.861	71	80	73	76	8	43	0.992	1.568
Final		17.933	93.841	71	80	72					
Initial		3.909	79.725	71	73	73					
Difference	6	14.024	14.116	71	77	73	75	16	33	0.995	1.601

Average 0.993 1.577

Stack Temperature Sensor Calibration

Meter Box # : CM 13

Name : S. Dyra

Ambient Temperature : 67.9 °F

Date : March 3, 2008

Calibrator Model # : CL23A

Serial # : T-249465

Date Of Certification : September 22, 2006

Primary Standards Directly Traceable National Institute of Standards and Technology (NIST)

Reference Source Temperature (°F)	Test Thermometer Temperature (°F)	Temperature Difference %
0	5	1.1
250	255	0.7
600	604	0.4
1200	1205	0.3

$$\frac{(\text{Ref. Temp., } ^\circ\text{F} + 460) - (\text{Test Therm. Temp., } ^\circ\text{F} + 460)}{\text{Ref. Temp., } ^\circ\text{F} + 460} * 100 \leq 1.5 \%$$

Ref. Temp., °F + 460

Meter Box Calibration

Dry Gas Meter No.
Standard Meter No.
Standard Meter (Y)

CM 16
9605804
0.9993

Date:
Calibrated By:
Barometric Pressure:

February 29, 2008
S. Dyrá
29.14

Run Number	Orifice Setting in H ₂ O Chg (H)	Standard Meter Gas Volume vr	Dry Gas Meter Gas Volume vd	Standard Meter Temp. F° tr	Dry Gas Meter Inlet Temp. F° tdi	Dry Gas Meter Outlet Temp. F° tdo	Dry Gas Meter Avg. Temp. F° td	Time Min	Time Sec	Y	Chg (H)
Final		21.748	49.230	68	73	72					
Initial		16.110	43.608	68	73	71					
Difference	1	5.638	5.622	68	73	72	72	20	9	1.010	1.455
Final		30.592	58.014	68	75	72					
Initial		21.748	49.230	68	72	72					
Difference	2	8.844	8.784	68	74	72	73	20	50	1.015	1.578
Final		43.225	70.573	68	77	73					
Initial		30.592	58.014	68	75	72					
Difference	3	12.633	12.559	68	76	73	74	24	56	1.016	1.547
Final		51.865	79.162	68	78	73					
Initial		43.225	70.573	69	76	73					
Difference	4	8.640	8.589	69	77	73	75	15	10	1.016	1.574
Final		64.596	91.838	68	76	73					
Initial		51.865	79.162	69	76	73					
Difference	5	12.731	12.676	69	76	73	75	19	33	1.013	1.608
Final		15.952	43.442	67	79	71					
Initial		7.851	35.407	66	75	71					
Difference	6	8.101	8.035	67	77	71	74	9	46	1.017	1.641
Average										1.015	1.567

Stack Temperature Sensor Calibration

Meter Box # : CM 16 Name : S. Dyra

Ambient Temperature : 67.1 °F Date : February 29, 2008

Calibrator Model # : CL23A

Serial # : T-249465

Date Of Certification : September 22, 2006

Primary Standards Directly Traceable National Institute of Standards and Technology (NIST)

Reference Source Temperature (°F)	Test Thermometer Temperature (°F)	Temperature Difference %
0	1	0.2
250	252	0.3
600	601	0.1
1200	1203	0.2

$$\frac{(\text{Ref. Temp., } ^\circ\text{F} + 460) - (\text{Test Therm. Temp., } ^\circ\text{F} + 460)}{\text{Ref. Temp., } ^\circ\text{F} + 460} * 100 \leq 1.5 \%$$

Ref. Temp., °F + 460

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: _____ Date: 3/26/08

Sampling Location: U2 Supplementary ESP Outlet

Source Condition: Normal

Dry Gas Meter No. CM-16 Y = 1.015

Barometric Pressure: 29.92 in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 5.0 in. Hg vacuum

Post-sampling 0. cfm @ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Stack ESP Vac 11 Hg	> 500° Probe (°F)	> 500° Filter Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
1145	2.927	.08	1.0	500	500	146	140	75	74
1150	4.12	.05	1.0	500	500	146	140	74	74
1155	5.05	.03	1.0	500	500	148	139	72	72
1200	5.74	.03	1.0	500	500	152	139	72	72
1205	6.56	.03	1.0	500	500	158	139	72	72
1210	7.28	.03	1.0	500	500	162	140	72	72
1215	7.79	.03	1.0	500	500	155	140	73	72
1220	8.52	.03	1.0	500	500	152	141	73	72
1225	9.15	.02	1.0	500	500	148	141	75	72
1230	9.75	.02	1.0	500	500	147	140	75	72
Avg.									

Operator: A-L. SORCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

PSNH MERRIMACK

Project/Project Number: M0813 Date: 3-26-08

Sampling Location: U2 Supplementary ESP OUTLET

Source Condition: Normal

Dry Gas Meter No. Cm-16 Y = 1.015

Barometric Pressure: 29.90 in. Hg

Leak Check: Pre-sampling 0 cfm @ 4.0 in. Hg vacuum

Post-sampling 0 cfm @ 4.0 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Vac 11 Hg Stack (FF)	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
1300	9.801	.02	1.0	500	500	146	140	81	78
1305	10.44	.02	1.0	500	500	148	141	83	79
1310	11.17	.02	1.0	500	500	147	140	84	81
1315	11.98	.02	1.0	500	500	145	140	80	80
1320	12.55	.02	1.0	500	500	146	139	80	80
1325	13.10	.02	1.0	500	500	146	139	74	76
1330	13.88	.02	1.0	500	500	147	141	76	74
1335	14.41	.02	1.0	500	500	147	140	76	75
1340	15.06	.02	1.0	500	500	147	139	76	76
1345	15.643								
Avg.									

Operator: A.L. SORCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH Merrimack Date: 3-26-08

Sampling Location: U2 Suppl. ESP-Outlet

Source Condition: Normal

Dry Gas Meter No. CM-16 Y = 1.015

Barometric Pressure: 29.90 in. Hg

Leak Check: Pre-sampling 0 0 cfm @ 4.0 in. Hg vacuum

Post-sampling 0 cfm @ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			<u>Val</u> <u>1 1/2"</u> <u>Stack</u> <u>(25)</u>	<u>> 500°</u> Probe (°F)	<u>> 500°</u> Outlet (°F)	Condenser Water (°F)	<u>140°</u> Coil Exit (°F)	Dry Gas Meter Inlet (°F)	Outlet (°F)
1405	6.716	.02	2.0	500	500	146	140	85	82
10	7.27	.02	2.0	500	500	147	140	83	84
15	7.80	.02	2.0	500	500	145	140	84	83
20	8.32	.02	2.0	500	500	145	140	84	83
25	8.76	.02	2.0	500	500	144	140	84	83
1430	9.15	.02	2.0	500	500	144	140	84	83
35	9.59	.02	2.0	500	500	144	140	82	83
40	9.92	.02	2.0	500	500	145	139	74	78
45	10.37	.02	2.0	500	500	146	139	72	75
1450	10.76								
Avg.									

Operator: A. L. SORCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH MERRIMACK Date: 3-26-08

Sampling Location: U2 Primary ESP- Outlet

Source Condition: NORMAL

Dry Gas Meter No. Cm-16 Y = 1.015

Barometric Pressure: 29.90 in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 5.0 in. Hg vacuum

Post-sampling 0. cfm @ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			V/L 11 Hg Stack (°F)	> 500° Probe (°F)	> 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter Inlet (°F)	Outlet (°F)
1515	10.784	.02	2.0	500	500	147	139	71	71
20	11.19	.02	2.0	500	500	148	141	73	72
25	11.57	.02	2.0	500	500	148	141	74	73
30	12.00	.02	3.0	500	500	147	140	75	73
35	12.39	.02	3.0	500	500	148	140	76	74
40	12.80	.02	3.0	500	500	147	140	79	75
45	13.34	.02	3.0	500	500	146	140	79	76
50	13.86	.02	3.0	500	500	146	139	78	77
55	14.37	.02	4.0	500	500	147	139	80	76
1600	14.860								
Avg.									

Operator: A. L. SORCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH MERRIMACK Date: 3-26-08

Sampling Location: U2 PRIMARY ESP OUTLET

Source Condition: NORMAL

Dry Gas Meter No. CM-16 Y = 1.015

Barometric Pressure: 29.90 in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 6.0 in. Hg vacuum

Post-sampling 0. cfm @ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Vac 11 Hg Stack (25)	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
1615	4.933	.02	2.0	500	500	150	141	78	77
20	5.32	.02	2.0	500	500	149	140	79	77
25	5.73	.02	2.0	500	500	147	140	77	77
30	6.15	.02	2.0	500	500	146	140	74	75
35	6.61	.02	2.0	500	500	146	140	70	73
40	7.03	.02	2.0	500	500	146	140	70	66
45	7.50	.02	3.0	500	500	146	140	65	69
50	7.96	.02	3.0	500	500	145	140	63	66
55	8.41	.02	3.0	500	500	146	139	60	64
1700	8.993								
Avg.									

Operator: A. L. SORCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH Merrimack Date: 3-26-08

Sampling Location: U2 Primary ESP Outlet

Source Condition: Normal

Dry Gas Meter No. CM-16 Y = 1.015

Barometric Pressure: 29.9 in. Hg

Leak Check: Pre-sampling 0 cfm @ 6.0 in. Hg vacuum

Post-sampling 0 cfm @ _____ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Vac "H ₂ O Stack (°F)	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
1720	8.924	.02	2.0	500	500	147	139	56	57
25	9.37	.02	2.0	500	500	149	140	58	58
30	9.77	.02	2.0	500	500	148	140	59	58
35	10.22	.02	2.0	500	500	149	140	60	59
40	10.64	.02	3.0	500	500	148	140	61	59
45	11.11	.02	3.0	500	500	147	140	61	60
50	11.54	.02	3.0	500	500	148	141	62	60
55	12.02	.02	3.0	500	500	147	140	62	60
1800	12.50	.02	3.0	500	500	147	140	63	61
1805	13.015								
Avg.									

Operator: A.L. SORCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH MERRIMACK Date: 3/27/08

Sampling Location: U2 PRE-HEATER- OUTLET

Source Condition: Normal

Dry Gas Meter No. CM-13 Y = 0.993

Barometric Pressure: 29.89 in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 6.0 in. Hg vacuum

Post-sampling 0.0 cfm @ 9.0 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Vac " Hg Stack (°F)	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
0905	4.815	.02	3.0	500	500	150	140	54	51
10	5.32	.03	4.0	500	500	151	140	56	52
15	5.73	.04	5.0	500	500	151	141	58	54
20	6.16	.04	5.0	500	500	149	140	60	55
25	6.57	.04	5.0	500	500	145	140	62	57
30	7.02	.05	5.0	500	500	145	139	64	58
35	7.46	.04	6.0	500	500	143	140	65	60
40	7.96	.04	6.0	500	500	145	140	66	61
45	8.42	.04	6.0	500	500	146	140	67	62
0950	8.975								
Avg.									

Operator: A. L. SORCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH MERRIMACK Date: 3-27-08

Sampling Location: U2 PREHEATER OUTLET

Source Condition: NORMAL

Dry Gas Meter No. CM-13 Y = 0.993

Barometric Pressure: 29.90 in. Hg

Leak Check: Pre-sampling 0 cfm @ 10.0 in. Hg vacuum

Post-sampling 0 cfm @ 10.0 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Vac " Hg Static Probe	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
1015	9.087	.03	3.0	500	500	147	139	66	65
20	9.57	.03	3.0	500	500	148	140	67	65
25	10.08	.03	3.0	500	500	148	140	68	66
30	10.59	.03	3.0	500	500	149	141	68	66
35	11.08	.03	4.0	500	500	149	140	68	66
40	11.57	.03	4.0	500	500	148	140	68	66
45	12.03	.03	4.0	500	500	148	140	68	66
50	12.47	.03	4.0	500	500	148	140	68	67
55	12.90	.03	4.0	500	500	148	140	68	67
1100	13.393								
Avg.									

Operator: A.L. Soule

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH Merrimack Date: 3-27-08

Sampling Location: U2 PREHEATER OUTLET

Source Condition: NORMAL

Dry Gas Meter No. CM-13 Y = 0.993

Barometric Pressure: 29.90 in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 10.0 in. Hg vacuum

Post-sampling 0. cfm @ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			VAC. " H ₂ Stack (°F)	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
1120	13.510	.03	4.0	500	500	148	140	67	68
1125	14.02	.03	5.0	500	500	148	140	67	68
1130	14.55	.03	5.0	500	500	149	140	66	68
1135	15.05	.03	5.0	500	500	150	140	66	68
1140	15.52	.03	5.0	500	500	150	141	66	68
1145	15.98	.03	5.0	500	500	150	140	66	68
1150	16.44	.03	5.0	500	500	150	140	66	68
1155	16.87	.03	5.0	500	500	149	139	66	68
1200	17.31	.03	5.0	500	500	149	140	66	67
1205	17.76								
Avg.									

Operator: A.L. SOURCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH Merrimack Date: 3-27-08

Sampling Location: U2 SCR Outlet

Source Condition: NORMAL

Dry Gas Meter No. CM-16 Y = 1.015

Barometric Pressure: 29.90 in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 10.0 in. Hg vacuum

Post-sampling 0.0 cfm @ 10.0 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Vac " Hg Stack (°F)	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
1357	3.132	.03	3.0	500	500	148	141	54	53
1402	3.57	.03	3.0	500	500	147	140	54	54
07	4.02	.03	3.0	500	500	148	140	54	53
12	4.46	.03	3.0	500	500	148	140	55	54
17	4.99	.03	4.0	500	500	148	140	55	54
22	5.33	.03	4.0	500	500	147	139	55	54
27	5.82	.03	4.0	500	500	148	140	55	55
32	6.31	.03	4.0	500	500	149	140	55	55
37	6.75	.03	5.0	500	500	149	140	56	55
1442	7.280								
Avg.									

Operator: A.L. SORRE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH MERRIMACK Date: 3-27-08

Sampling Location: U2 SCR Outlet

Source Condition: NORMAL

Dry Gas Meter No. CM-16 Y = 1.015

Barometric Pressure: 29.90 in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 12.0 in. Hg vacuum

Post-sampling 0.0 cfm @ 12.0 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Vac 11 Hg Static	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
1602	2.190	.03	6.0	500	500	148	140	56	56
07	2.51	.03	7.0	500	500	148	140	56	56
12	2.93	.03	8.0	500	500	148	140	56	56
17	3.37	.02	8.0	500	500	148	140	56	56
22	3.78	.02	8.0	500	500	148	140	56	56
27	4.14	.03	8.0	500	500	148	140	56	56
32	4.65	.03	9.0	500	500	148	140	56	56
37	5.09	.03	10.0	500	500	148	140	56	57
42	5.53	.03	10.0	500	500	148	140	56	57
1647	6.10								
Avg.									

Operator: A. L. Sorce

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET

For Controlled Condensate (CCS)

(NCASI Method 8A)

Project/Project Number: PSNH Merrimack Date: 3-27-08

Sampling Location: U2 SCRE Outlet

Source Condition: NORMAL

Dry Gas Meter No. CM-16 Y = 1.015

Barometric Pressure: 29.90 in. Hg

Leak Check: Pre-sampling 0 0 cfm @ 10.0 in. Hg vacuum

Post-sampling 0 cfm @ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Vac		Filter			Dry Gas Meter	
			"Hg Stack (°F)	> 500° Probe (°F)	> 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Inlet (°F)	Outlet (°F)
1500	7.313	.03	4.0	500	500	147	140	55	55
05	7.78	.03	7.0	500	500	148	140	55	55
10	8.35	.03	8.0	500	500	148	140	55	55
15	8.99	.03	8.0	500	500	148	140	55	55
20	9.46	.03	8.0	500	500	148	140	56	55
25	10.02	.03	8.0	500	500	148	140	56	56
30	10.52	.03	9.0	500	500	148	140	56	56
35	11.03	.03	9.0	500	500	148	140	57	56
40	11.52	.03	9.0	500	500	148	140	56	56
1545	12.009								
Avg.									

Operator: A.L. Sorrell

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH MERRIMACK Date: 3-28-08

Sampling Location: U2 SCR INLET

Source Condition: NORMAL

Dry Gas Meter No. CM Y = 1.015

Barometric Pressure: 29.46 in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 10.0 in. Hg vacuum

Post-sampling 0.0 cfm @ 10.0 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			<u>Vac</u> <u>11/16</u> <u>Stack</u> <u>(45)</u>	> 500° Probe (°F)	> 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
0835	6.055	.02	2.0	500	500	150	139	40	40
40	6.46	.02	2.0	500	500	155	139	42	40
45	6.74	.02	2.0	500	500	155	140	42	40
50	7.27	.02	2.0	500	500	160	140	42	40
55	7.78	.02	2.0	500	500	160	140	42	40
0900	8.15	.02	2.0	500	500	160	141	43	40
05	8.69	.02	2.0	500	500	160	140	44	41
10	9.02	.02	2.0	500	500	160	140	44	41
15	9.50	.02	2.0	500	500	160	140	44	42
0920	9.99								
Avg.									

Operator: A. L. Sorce

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH MERRIMACK Date: 3-28-08
 Sampling Location: U2 SCR INLET
 Source Condition: NORMAL
 Dry Gas Meter No. CM-16 Y = 1.015
 Barometric Pressure: 29.46 in. Hg
 Leak Check: Pre-sampling 0.0 cfm @ 10.0 in. Hg vacuum
 Post-sampling 0.0 cfm @ 10.0 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			VAC 11 1/4 Stack (in)	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
0945	0.011	.02	2.0	500	500	160	140	45	44
50	0.42	.03	2.0	500	500	157	140	46	44
55	0.74	.03	2.0	500	500	157	140	47	44
1000	1.22	.03	2.0	500	500	157	140	47	45
05	1.67	.03	3.0	500	500	158	141	48	45
10	2.09	.03	3.0	500	500	156	140	48	46
15	2.43	.03	3.0	500	500	155	140	48	46
20	2.77	.03	4.0	500	500	155	140	48	46
25	3.74	.03	4.0	500	500	155	140	48	46
1030	3.927								
Avg.									

Operator: A.L. Sacco

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH Merrimack Date: 3-28-08

Sampling Location: U2 SCR Inlet

Source Condition: Normal

Dry Gas Meter No. 0M-16 Y = 1.015

Barometric Pressure: _____ in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 10.0 in. Hg vacuum

Post-sampling 0.0 cfm @ _____ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						Dry Gas Meter	
			Vac 11 H ₂ O Stack (°F)	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)			
1055	4.027	.04	3.0	500	500	153	140	49	47	
1100	4.48	.04	4.0	500	500	153	141	49	47	
05	4.76	.04	4.0	500	500	152	140	50	48	
10	5.18	.05	5.0	500	500	152	139	51	49	
15	5.55	.05	5.0	500	500	153	140	51	49	
20	5.98	.05	6.0	500	500	153	140	51	49	
25	6.43	.05	6.0	500	500	153	140	51	49	
30	6.85	.04	7.0	500	500	153	140	51	49	
35	7.24	.04	7.0	500	500	152	140	51	49	
1140	7.818									
Avg.										

Operator: A.L. Sorock

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSN14 MERRIMACK Date: 3-28-08

Sampling Location: P 112 Suppl. ESP Outlet

Source Condition: CONDITION 2

Dry Gas Meter No. CM-13 Y = 0.993

Barometric Pressure: _____ in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 10.0 in. Hg vacuum

Post-sampling 0.0 cfm @ _____ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature					Dry Gas Meter	
			VAC 11 Hg Static	> 500° Probe (°F)	> 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Inlet (°F)	Outlet (°F)
1505	1.059	.02	3.0	500	500	146	140	73	71
10	1.50	.02	3.0	500	500	146	140	73	72
15	1.99	.02	3.0	500	500	146	140	73	72
20	2.47	.02	3.0	500	500	147	140	73	72
25	2.95	.02	3.0	500	500	148	141	74	72
30	3.39	.02	3.0	500	500	146	140	74	72
35	3.89	.02	3.0	500	500	146	140	74	73
40	4.42	.02	3.0	500	500	146	140	74	73
45	4.93	.02	3.0	500	500	146	140	74	73
1550	5.432								
Avg.									

Operator: A. L. SORCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH MERRIMACK Date: 3-28-08

Sampling Location: U2 Suppl. ESP Outlet

Source Condition: CONDITION 2

Dry Gas Meter No. CM-13 Y = 0.993

Barometric Pressure: _____ in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 9.0 in. Hg vacuum

Post-sampling 0. cfm @ _____ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Vac 11 Hg Stack (PSI)	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
1605	5.505	.02	3.0	500	500	146	140	74	73
10	6.06	.02	3.0	500	500	146	140	74	73
15	6.58	.02	3.0	500	500	146	140	74	73
20	7.08	.02	3.0	500	500	146	140	74	73
25	7.57	.02	3.0	500	500	145	140	74	73
30	8.06	.02	3.0	500	500	146	140	74	73
35	8.52	.02	3.0	500	500	146	140	74	73
40	8.99	.02	3.0	500	500	146	140	74	73
45	9.48	.02	3.0	500	500	146	140	74	73
1650	9.935								
Avg.									

Operator: A. L. SORCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH MERRIMACK Date: 3-28-08

Sampling Location: U2 Suppl. ESP Outlet

Source Condition: CONDITION 2

Dry Gas Meter No. CM-13 Y = 0.993

Barometric Pressure: _____ in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 10.0 in. Hg vacuum

Post-sampling 0. cfm @ _____ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			<u>Vac</u> <u>11 Hg</u> <u>5.0</u>	> 500° Probe (°F)	> 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
1700	10.003	.02	5.0	500	500	145	140	74	72
05	10.57	.02	5.0	500	500	146	141	73	72
10	11.19	.02	5.0	500	500	145	140	73	72
15	11.69	.02	5.0	500	500	144	140	74	72
20	12.16	.02	5.0	500	500	143	140	75	73
25	12.63	.02	5.0	500	500	144	140	74	73
30	13.09	.02	5.0	500	500	144	139	74	73
35	13.56	.02	5.0	500	500	146	140	73	73
40	14.03	.02	5.0	500	500	146	140	73	72
1745	14.56								
Avg.									

Operator: A. L. Sorce

APPENDIX D: CEMS and STM Description

Thermo Electron Mercury Freedom System™ CEM System Description

The Mercury Freedom™ CEM has four key components: the sample extraction probe (Figure 1), sample pretreatment and conversion, the mercury analyzer, and the calibration module. These are described briefly below and presented in Figure 2, a schematic of the entire system showing the key components and other supporting instrumentation. Two other modules that are shown in the sketch are the probe controller, which incorporates pressure regulators and temperature controllers for the probe and hot-line, and a zero gas generator for the dilution air that scrubs mercury from clean, dry compressed air.

Figure 1: Mercury CEM Extraction Probe

- **Sample Extraction Probe.** An inertial filter is used to separate a particulate-free vapor-phase sample while minimizing the interactions with fly ash, which can cause sampling artifacts. A sample is drawn from the sample port on the inertial sampling filter using a dilution eductor. Compressed, clean, dry, mercury-free dilution air is delivered to the dilution eductor and a critical orifice is connected between the vacuum port on the eductor and the sample port on the inertial filter to maintain a fixed sample flow rate. The sample is immediately diluted with pre-heated dilution air to minimize mercury reactions with other flue gas species. The dilution ratio is typically between 25:1 and 100:1, depending on the size of the critical orifice and reactivity of the flue gas. The probe is heated and all of the internal surfaces that are exposed to sample gas have a glass coating to prevent unwanted chemical reactions with the mercury.
- **Sample Pretreatment and Conversion.** A dry, thermal converter, located within the housing for the probe, converts oxidized mercury to elemental mercury for a total vapor phase mercury measurement. The proprietary design combines high temperature (>750 °F) and a chemical reaction to achieve the conversion. Oxidized mercury can be scrubbed from a second sample stream to

deliver only elemental mercury to the analyzer through the second sampling line when a speciated measurement is desired.

- **Mercury Analyzer.** The analyzer is capable of measuring both total vapor-phase mercury and elemental vapor-phase mercury. The analyzer determines total vapor-phase mercury concentrations by reducing all of the oxidized mercury to the elemental form near the extraction location. To measure elemental mercury, the oxidized mercury is removed while allowing elemental mercury to pass through without being altered. Mercury is measured directly in the analyzer using Cold Vapor Atomic Fluorescence Spectroscopy (CVAFS). There is no cross interference from SO₂ with CVAFS. Because the sample is diluted, it has low moisture, is relatively non-reactive and therefore has minimal interference from other gases. Because no moisture is removed from the sample, it is reported on a wet-basis. The analyzer detection limit is currently 1 ng/m³ (~0.1 ppt)
- **Calibration Module.** The calibrator incorporates a mercury source in a temperature-controlled chamber that can be heated or cooled to maintain the source at a precise temperature via Peltier Cooler/vapor pressure control and mass flow controllers. It can deliver mercury in concentrations from 1 to 50 µg/m³. The operator can program the calibrator to deliver zero or span gas to the analyzer, to the sample port between the inertial filter and the critical orifice, or upstream of the inertial filter. This allows the user to monitor the operation of the analyzer through direct calibrations, buildup on the critical orifice that could result in changes in the dilution ratio, or particulate deposits on the filter that may scrub mercury. The frequency of the cleaning blowback air is also controlled through the calibrator module. Blowback air can be delivered between the critical orifice and the filter to clean the filter or upstream of the filter to clear any excess particulate that has deposited in the probe extension.

Figure 2: Thermo Electron Mercury Freedom™ CEM.

Vapor-Phase Mercury Emissions Using Sorbent Trap Method (STM)

This non-isokinetic test method samples flue gas while minimizing particulate capture, and provides total vapor-phase mercury emissions. The dry sorbent trap method was proposed in the Utility Mercury Reduction Rule (FR January 30, 2004) as a draft EPA test method, *Method 324 Determination of Vapor Phase Flue Gas Mercury Emissions from Stationary Sources Using Dry Sorbent Trap Sampling*. The method was proposed in the Utility Mercury Reduction Rule either for application as a reference method test, or for continuous compliance measurement for mercury. ADA-ES has used the method in the field since the early 1990's, and conducted the validation testing for Method 324, in which it compared favorably with the Ontario Hydro Method. The procedures used during the MK2 tests were consistent with the procedures used during validation testing of the new Method.

In the recently redacted Clean Air Mercury Rule (CAMR), the proposed Method 324 was revised and renamed as 40 CFR Part 75 Appendix K. The revised and renamed method will be an option for some sources for continuous compliance measurements for mercury. The method described in Appendix K has many rigorous quality control requirements that are in excess of what is necessary for the Big Brown tests. However, the principles of the method described in 40 CFR Part 75 Appendix K will be applied in this test program and will be referred to as the sorbent trap method (STM). The detailed procedures to be followed are summarized here.

This mercury measurement method extracts a known volume of flue gas from a duct through a dry sorbent trap (containing a specially treated form of activated carbon) as a single-point sample, with a nominal flow rate of about 400 cc/min at the gas meter. The dry sorbent trap, which is in the flue gas stream during testing, represents the entire mercury sample. Each trap is recovered in the field and shipped to a specialized lab such as Frontier GeoSciences, Inc. for analysis. Each trap is acid leached and the resulting leachate is analyzed for mercury using cold vapor atomic fluorescence spectrometry. Samples can be collected over time periods ranging from less than an hour to weeks in duration. The test result provides a time averaged total vapor-phase mercury measurement of the flue gas stream.

STM sampling collects paired samples as a quality control measure. The analysis results of the paired sample trains are compared and are typically in agreement within 5-20% relative percent difference (RPD) or about 1 lb/TBtu. Another built-in quality assurance measure is

achieved through the analysis of two trap sections in series. Each trap has two separate mercury sorbent sections, as shown in the figure below, and the “B” section is analyzed to evaluate whether any mercury breakthrough occurred. Low B section mercury, in conjunction with a field blank trap, is used to confirm overall sample handling quality.

The sample train is fairly simple, as shown below. Major components are a dry sorbent trap mounted directly on the end of a probe (usually heated), a moisture knockout outside the duct, and a sampling console that controls the sampling rate and meters the flue gas, as well as recording data in a data logger. Key temperatures, sampling volume, and barometric pressure are recorded on field sampling data sheets and/or by a data logger for each sample run.

The STM directly measures mercury concentration in units of $\mu\text{g}/\text{dNm}^3$. Using stack gas flow rate and gaseous data from the plant’s CEMS and coal Ultimate Analysis (or EPA Method 19 F-Factors if Ultimate Analysis is unavailable), results can be calculated and reported in lb/TBtu.

APPENDIX E: CEMS Data Quality Assurance and Quality Control

THERMO MERCURY SYSTEM 82 — MERRIMACK INLET

JANUARY 15 TO JANUARY 21, 2007

MERCURY DETECTION

THERMO MERCURY SYSTEM 82 — MERRIMACK INLET

JANUARY 15 TO JANUARY 21, 2007

PROBE TEMPERATURES AND PRESSURES

PROBE TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
prbt	216.70	210.28 / 225.24	2.33

probe temperature stable between 190-220°C

probe temperature OK

note: revised interface boards not installed

EDUCTOR PRESSURE

DATA	AVERAGE	RANGE	STDEV
edup	16.75	1.17 / 19.55	1.36

eductor pressure stable between 15-19 psi.

eductor pressure off during calibrations

eductor pressure OK

variations due to error in air supply - corrected

CONVERTER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
cnvt	759.48	749.48 / 769.70	2.82

converter temperature stable between 750-800°C

converter temperature OK

note: revised interface boards not installed

ORIFICE PRESSURE

DATA	AVERAGE	RANGE	STDEV
orfp	0.93	0.76 / 6.37	0.09

orifice pressure stable between 0-2 psi.

orifice pressure OK

UMBILICAL TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
umbt	176.42	142.28 / 198.72	12.32

umbilical temperature stable between 170-190°C

converter temperature minor fluctuations

note: revised interface boards not installed

VENTURI PRESSURE

DATA	AVERAGE	RANGE	STDEV
vntp	3.26	2.67 / 3.61	0.20

venturi pressure stable between 2-6 psi.

venturi pressure sample < fspan <= fzero

venturi pressure OK

THERMO MERCURY SYSTEM 82 — MERRIMACK INLET

JANUARY 15 TO JANUARY 21, 2007

GAS SAMPLE FLOW

DATA	AVERAGE	RANGE	STDEV
smplf	0.46	0.45 / 0.48	0.00
sample flow stable and consistent			
sample flow OK flow on both channels equal			

PROBE VACCUUM

DATA	AVERAGE	RANGE	STDEV
vac	21.91	0.51 / 22.79	2.82
probe vacuum 20-22 psi, decrease during blowback			
probe vacuum OK variations due to error in air supply - corrected			

DILUTION AIR PRESSURE

DATA	AVERAGE	RANGE	STDEV
dilp	49.67	1.37 / 52.28	7.41
dilution pressure 45-55 and extremely stable for all modes			
dilution pressure OK variations due to error in air supply - corrected			

BLOWBACK PRESSURE

DATA	AVERAGE	RANGE	STDEV
bbkp	49.77	1.61 / 53.57	7.28
blowback pressure stable with regular blowbacks			
blowbacks at regular intervals variations due to error in air supply - corrected			

DILUTION AIR FLOW

DATA	AVERAGE	RANGE	STDEV
ain1	4.85	0.04 / 11.25	0.72
dilution air flow extremely stable for all modes			
dilution air flow OK variations due to error in air supply - corrected			

DATA	AVERAGE	RANGE	STDEV

THERMO MERCURY SYSTEM 82 — MERRIMACK INLET

JANUARY 22 TO JANUARY 28, 2007

MERCURY DETECTION

THERMO MERCURY SYSTEM 82 — MERRIMACK INLET

JANUARY 22 TO JANUARY 28, 2007

PROBE TEMPERATURES AND PRESSURES

PROBE TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
prbt	216.76	209.49 / 225.76	2.35

probe temperature stable between 190-220°C
probe temperature OK

EDUCTOR PRESSURE

DATA	AVERAGE	RANGE	STDEV
edup	16.73	10.32 / 16.84	0.12

eductor pressure stable between 15-19 psi.
eductor pressure off during calibrations
eductor pressure OK
minor fluctuations on 1/27

CONVERTER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
cnvt	759.66	750.01 / 770.48	2.80

converter temperature stable between 750-800°C
converter temperature OK

ORIFICE PRESSURE

DATA	AVERAGE	RANGE	STDEV
orfp	0.86	0.73 / 1.68	0.07

orifice pressure stable between 0-2 psi.
orifice pressure OK

UMBILICAL TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
umbt	176.60	142.02 / 198.46	12.54

umbilical temperature stable between 170-190°C
umbilical temperature OK

VENTURI PRESSURE

DATA	AVERAGE	RANGE	STDEV
vntp	3.43	2.86 / 3.78	0.13

venturi pressure stable between 2-6 psi.
venturi pressure sample < fspan <= fzero
venturi pressure OK
typical response during calibration routine

THERMO MERCURY SYSTEM 82 — MERRIMACK INLET

JANUARY 22 TO JANUARY 28, 2007

GAS SAMPLE FLOW

DATA	AVERAGE	RANGE	STDEV
smpif	0.46	0.45 / 0.47	0.00
sample flow stable and consistent			
gas sample flow OK			

PROBE VACCUUM

DATA	AVERAGE	RANGE	STDEV
vac	22.49	8.37 / 22.74	0.79
probe vacuum 20-22 psi, decrease during blowback			
probe vacuum OK air supply interference due to extremely cold weather (influenced by dilution air pressures)			

DILUTION AIR PRESSURE

DATA	AVERAGE	RANGE	STDEV
dilp	50.89	12.46 / 52.79	3.40
dilution pressure 45-55 and extremely stable for all modes			
dilution air pressure generally stable air supply interference due to extremely cold weather			

BLOWBACK PRESSURE

DATA	AVERAGE	RANGE	STDEV
bbkp	50.88	12.66 / 53.94	3.31
blowback pressure stable with regular blowbacks			
blowback pressure OK regular blowback schedule air supply interference due to extremely cold weather			

DILUTION AIR FLOW

DATA	AVERAGE	RANGE	STDEV
ain1	4.93	0.48 / 5.78	0.38
dilution air flow extremely stable for all modes			
dilution air flow OK air supply interference due to extremely cold weather			

THERMO MERCURY SYSTEM 82 — MERRIMACK INLET

JANUARY 29 TO FEBRUARY 4, 2007

MERCURY DETECTION

THERMO MERCURY SYSTEM 82 — MERRIMACK INLET

JANUARY 29 TO FEBRUARY 4, 2007

PROBE TEMPERATURES AND PRESSURES

PROBE TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
prbt	216.57	210.28 / 224.45	2.06

probe temperature stable between 190-220°C
probe temperature OK

EDUCTOR PRESSURE

DATA	AVERAGE	RANGE	STDEV
edup	16.67	3.61 / 17.01	0.50

eductor pressure stable between 15-19 psi.
eductor pressure off during calibrations
eductor pressure OK, cal response OK
fluctuations on 1/30 and 2/4 due to air supply interruptions

CONVERTER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
cnvt	759.48	698.03 / 767.60	2.71

converter temperature stable between 750-800°C
converter temperature OK
decrease on 1/29 (power service)

ORIFICE PRESSURE

DATA	AVERAGE	RANGE	STDEV
orfp	0.83	0.66 / 6.37	0.13

orifice pressure stable between 0-2 psi.
orifice pressure OK

UMBILICAL TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
umbt	176.18	140.71 / 196.62	11.94

umbilical temperature stable between 170-190°C
umbilical temperature OK

VENTURI PRESSURE

DATA	AVERAGE	RANGE	STDEV
vntp	3.12	2.44 / 3.36	0.09

venturi pressure stable between 2-6 psi.
venturi pressure sample < fspan <= fzero
venturi pressure OK
venturi response during calibrations OK

THERMO MERCURY SYSTEM 82 — MERRIMACK INLET

JANUARY 29 TO FEBRUARY 4, 2007

GAS SAMPLE FLOW

• smp1f mer in (all)

DATA	AVERAGE	RANGE	STDEV
smp1f	0.45	0.00 / 0.46	0.01

sample flow stable and consistent
gas sample flow OK

PROBE VACCUUM

— vac mer in (all)

DATA	AVERAGE	RANGE	STDEV
vac	22.39	2.78 / 22.78	1.54

probe vacuum 20-22 psi, decrease during blowback
probe vacuum OK
fluctuations due to air supply interruptions

DILUTION AIR PRESSURE

— dilp mer in (sample) • dilp mer in (fzero end) • dilp mer in (fspan end)

DATA	AVERAGE	RANGE	STDEV
dilp	50.78	4.32 / 52.25	4.65

dilution pressure 45-55 and extremely stable for all modes
dilution air pressure OK
fluctuations due to air supply interruptions

BLOWBACK PRESSURE

— bbkp mer in (sample) • bbkp mer in (bbfilter)

DATA	AVERAGE	RANGE	STDEV
bbkp	50.94	4.73 / 54.31	4.64

blowback pressure stable with regular blowbacks
blowbacks regular schedule
fluctuations due to air supply interruptions

DILUTION AIR FLOW

— ain1 mer in (sample) • ain1 mer in (fzero end) • ain1 mer in (fspan end)

DATA	AVERAGE	RANGE	STDEV
ain1	4.91	0.04 / 5.60	0.46

dilution air flow extremely stable for all modes
dilution air flow OK
fluctuations due to air supply interruptions

THERMO MERCURY SYSTEM 82 — MERRIMACK INLET

FEBRUARY 5 TO FEBRUARY 11, 2007

MERCURY DETECTION

THERMO MERCURY SYSTEM 82 — MERRIMACK INLET

FEBRUARY 5 TO FEBRUARY 11, 2007

PROBE TEMPERATURES AND PRESSURES

PROBE TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
prbt	216.50	210.01 / 225.24	2.05
probe temperature stable between 190-220°C			
probe temperature OK			

EDUCTOR PRESSURE

DATA	AVERAGE	RANGE	STDEV
edup	16.62	1.03 / 29.22	1.28
eductor pressure stable between 15-19 psi.			
eductor pressure off during calibrations			
eductor pressure OK, cal response OK			
decreases on 2/6, 2/8, and 2/9 due to air supply failures			

CONVERTER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
cnvt	759.56	749.74 / 767.60	2.59
converter temperature stable between 750-800°C			
converter temperature OK			

ORIFICE PRESSURE

DATA	AVERAGE	RANGE	STDEV
orfp	0.83	0.62 / 6.36	0.14
orifice pressure stable between 0-2 psi.			
orifice pressure OK			
stabilizes on 2/10 due to unit boiler outage (tube leak)			

UMBILICAL TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
umbt	175.30	135.46 / 196.89	12.79
umbilical temperature stable between 170-190°C			
umbilical temperature OK			

VENTURI PRESSURE

DATA	AVERAGE	RANGE	STDEV
vntp	3.02	2.25 / 3.77	0.11
venturi pressure stable between 2-6 psi.			
venturi pressure sample < fspan <= fzero			
venturi pressure OK, cal response OK			
fluctuations due to air supply failures			

THERMO MERCURY SYSTEM 82 — MERRIMACK INLET

FEBRUARY 5 TO FEBRUARY 11, 2007

GAS SAMPLE FLOW

DATA	AVERAGE	RANGE	STDEV
smp1f	0.44	0.00 / 0.57	0.01

sample flow stable and consistent
gas sample flow OK
change in sample flow due to service (sample pump)

PROBE VACCUUM

DATA	AVERAGE	RANGE	STDEV
vac	21.78	1.11 / 22.77	2.97

probe vacuum 20-22 psi, decrease during blowback
probe vacuum OK
decreases on 2/6, 2/8, and 2/9 due to air supply failures

DILUTION AIR PRESSURE

DATA	AVERAGE	RANGE	STDEV
dilp	48.89	1.23 / 52.38	8.33

dilution pressure 45-55 and extremely stable for all modes
dilution pressure OK
decreases on 2/6, 2/8, and 2/9 due to air supply failures

BLOWBACK PRESSURE

DATA	AVERAGE	RANGE	STDEV
bbkp	49.31	1.47 / 54.25	8.42

blowback pressure stable with regular blowbacks
blowback pressure OK
blowback regular schedule
decreases on 2/6, 2/8, and 2/9 due to air supply failures

DILUTION AIR FLOW

DATA	AVERAGE	RANGE	STDEV
ain1	4.74	0.04 / 8.15	0.83

dilution air flow extremely stable for all modes
dilution air flow acceptable when stable
decreases on 2/6, 2/8, and 2/9 due to air supply failures

THERMO MERCURY SYSTEM 82 — MERRIMACK INLET

FEBRUARY 12 TO FEBRUARY 25, 2007

MERCURY DETECTION

THERMO MERCURY SYSTEM 82 — MERRIMACK INLET

FEBRUARY 12 TO FEBRUARY 25, 2007

PROBE TEMPERATURES AND PRESSURES

PROBE TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
prbt	216.70	209.23 / 224.45	2.08
probe temperature stable between 190-220°C			
probe temperature OK			

EDUCTOR PRESSURE

DATA	AVERAGE	RANGE	STDEV
edup	16.74	16.63 / 17.07	0.07
eductor pressure stable between 15-19 psi.			
eductor pressure off during calibrations			
eductor pressure OK			
response during calibrations OK			

CONVERTER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
cnvt	759.50	749.74 / 767.86	2.84
converter temperature stable between 750-800°C			
converter temperature OK			

ORIFICE PRESSURE

DATA	AVERAGE	RANGE	STDEV
orfp	0.82	0.62 / 2.26	0.09
orifice pressure stable between 0-2 psi.			
orifice pressure OK			
fluctuations during blowback OK			

UMBILICAL TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
umbt	176.36	135.46 / 196.89	11.79
umbilical temperature stable between 170-190°C			
umbilical temperature OK			

VENTURI PRESSURE

DATA	AVERAGE	RANGE	STDEV
vntp	2.81	2.31 / 3.17	0.18
venturi pressure stable between 2-6 psi.			
venturi pressure sample < fspan <= fzero			
venturi pressure OK			
response during calibrations OK			

THERMO MERCURY SYSTEM 82 — MERRIMACK INLET

FEBRUARY 12 TO FEBRUARY 25, 2007

GAS SAMPLE FLOW

• smp1f merrimack in (all)

DATA	AVERAGE	RANGE	STDEV
smp1f	0.43	0.09 / 1.87	0.01
sample flow stable and consistent			
gas sample flow OK			

PROBE VACCUUM

— vac merrimack in (all)

DATA	AVERAGE	RANGE	STDEV
vac	22.65	22.22 / 22.91	0.07
probe vacuum 20-22 psi, decrease during blowback			
probe vacuum OK typical decrease in vacuum during blowback			

DILUTION AIR PRESSURE

— dilp merrimack in (sample) • dilp merrimack in (fzero end) • dilp merrimack in (fspan end)

DATA	AVERAGE	RANGE	STDEV
dilp	51.59	50.96 / 52.38	0.21
dilution pressure 45-55 and extremely stable for all modes			
dilution air pressure OK -- only minor fluctuations			

BLOWBACK PRESSURE

— bbkp merrimack in (sample) • bbkp merrimack in (bbfilter)

DATA	AVERAGE	RANGE	STDEV
bbkp	52.48	51.19 / 54.72	0.56
blowback pressure stable with regular blowbacks			
blowback pressure OK 3-hour blowback schedule			

DILUTION AIR FLOW

— ain1 merrimack in (sample) • ain1 merrimack in (fzero end) • ain1 merrimack in (fspan end)

DATA	AVERAGE	RANGE	STDEV
ain1	4.95	4.53 / 5.29	0.07
dilution air flow extremely stable for all modes			
dilution air flow OK			

DATA	AVERAGE	RANGE	STDEV

THERMO MERCURY SYSTEM 82 — MERRIMACK INLET

FEBRUARY 26 TO MARCH 11, 2007

MERCURY DETECTION

THERMO MERCURY SYSTEM 82 — MERRIMACK INLET

FEBRUARY 26 TO MARCH 11, 2007

PROBE TEMPERATURES AND PRESSURES

PROBE TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
prbt	217.00	210.01 / 224.98	1.96
probe temperature stable between 190-220°C			
probe temperature OK			

EDUCTOR PRESSURE

DATA	AVERAGE	RANGE	STDEV
edup	16.87	16.77 / 17.01	0.04
eductor pressure stable between 15-19 psi.			
eductor pressure off during calibrations			
eductor pressure OK			
response during calibrations OK			

CONVERTER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
cnvt	759.75	750.27 / 769.17	2.65
converter temperature stable between 750-800°C			
converter temperature OK			

ORIFICE PRESSURE

DATA	AVERAGE	RANGE	STDEV
orfp	0.74	0.66 / 1.70	0.04
orifice pressure stable between 0-2 psi.			
orifice pressure OK			
fluctuations during blowback OK			

UMBILICAL TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
umbt	176.27	140.45 / 200.04	11.80
umbilical temperature stable between 170-190°C			
umbilical temperature OK			

VENTURI PRESSURE

DATA	AVERAGE	RANGE	STDEV
vn timer	2.63	2.37 / 2.92	0.12
venturi pressure stable between 2-6 psi.			
venturi pressure sample < fspan <= fzero			
venturi pressure OK			
response during calibrations OK			

THERMO MERCURY SYSTEM 82 — MERRIMACK INLET

FEBRUARY 26 TO MARCH 11, 2007

GAS SAMPLE FLOW

• smplf merrimack in (all)

DATA	AVERAGE	RANGE	STDEV
smplf	0.42	0.33 / 0.45	0.00

sample flow stable and consistent
gas sample flow OK

PROBE VACCUUM

— vac merrimack in (all)

DATA	AVERAGE	RANGE	STDEV
vac	22.58	22.14 / 22.73	0.07

probe vacuum 20-22 psi, decrease during blowback
probe vacuum OK
typical decrease in vacuum during blowback

DILUTION AIR PRESSURE

— dilp merrimack in (sample) • dilp merrimack in (fzero end) • dilp merrimack in (fspan end)

DATA	AVERAGE	RANGE	STDEV
dilp	51.49	51.13 / 52.04	0.20

dilution pressure 45-55 and extremely stable for all modes
dilution air pressure OK -- only minor fluctuations

BLOWBACK PRESSURE

— bbkp merrimack in (sample) • bbkp merrimack in (bbfilter)

DATA	AVERAGE	RANGE	STDEV
bbkp	52.51	51.23 / 55.20	0.58

blowback pressure stable with regular blowbacks
blowback pressure OK
3-hour blowback schedule

DILUTION AIR FLOW

— ain1 merrimack in (sample) • ain1 merrimack in (fzero end) • ain1 merrimack in (fspan end)

DATA	AVERAGE	RANGE	STDEV
ain1	4.94	4.48 / 5.32	0.06

dilution air flow extremely stable for all modes
dilution air flow OK

PSNH MERRIMACK UNIT 2 INLET
THERMO MERCURY SYSTEM 82
APRIL 2 – APRIL 8, 2007
WEEK 33: DARCO HG-LH + MgO TESTING

PSNH MERRIMACK UNIT 2 INLET
APRIL 2 – APRIL 8, 2007

TOTAL MERCURY CALIBRATION RESPONSES

calibrations on 4/7 and 4/8 failed low

ELEMENTAL MERCURY CALIBRATION RESPONSES

calibrations on 4/7 and 4/8 failed low

BACKGROUNDS

DATA	AVERAGE	RANGE	STDEV
obkg	13.64	13.09 / 13.93	0.40
tbg	13.52	12.77 / 13.92	0.55

calibration factor backgrounds OK

COEFFICIENTS

DATA	AVERAGE	RANGE	STDEV
ocoeff	1.03	1.00 / 1.04	0.02
tcoef	0.99	0.98 / 1.00	0.01

calibration factor coefficients OK

PSNH MERRIMACK UNIT 2 INLET
APRIL 2 – APRIL 8, 2007

PROBE TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
prbt	217.24	208.96 / 228.13	2.28
prbt *	217.18	211.59 / 222.88	2.14

probe temperature OK

AMBIENT TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
intt	34.66	33.81 / 36.26	0.40
intt *	34.60	33.81 / 35.52	0.32

analyzer internal temperature OK

CONVERTER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
cnvt	759.82	748.43 / 769.43	2.68
cnvt *	759.82	752.11 / 767.60	2.66

converter temperature OK

CHAMBER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
rctt	45.16	44.61 / 45.78	0.19
rctt *	45.16	44.61 / 45.71	0.19

detection chamber temperature stable

UMBILICAL TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
umbt	176.41	143.33 / 196.36	11.85
umbt *	177.06	150.68 / 196.36	11.20

umbilical temperature fluctuates but OK

probe controller interface board not current version

LAMP TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
lampt	-	-	-
lampt *			

mercury lamp temperature not recorded (old software)

PSNH MERRIMACK UNIT 2 INLET
APRIL 2 – APRIL 8, 2007

DILUTION AIR / VACCUUM

DATA	AVERAGE	RANGE	STDEV
dilp	51.18	50.92 / 51.67	0.10
dilp *	51.18	50.92 / 51.50	0.10
dilp span	51.18	50.96 / 51.33	0.11
vac	22.58	22.43 / 22.69	0.08

dilution pressure stable in sample and calibration mode
probe vacuum stable

VENTURI PRESSURE

DATA	AVERAGE	RANGE	STDEV
vn timer	2.29	2.15 / 2.42	0.04
vn timer *	2.29	2.19 / 2.41	0.04
vn timer zero	4.98	4.74 / 5.16	0.14
vn timer span	4.12	4.04 / 4.18	0.06

venturi pressure stable
typical pressure increases during calibrations

EDUCTOR PRESSURE

DATA	AVERAGE	RANGE	STDEV
edup	16.88	16.77 / 17.01	0.03
edup *	16.88	16.84 / 16.94	0.03
edup cal	1.26	1.23 / 1.30	0.03

eductor pressure is stable
eductor setpoint may be higher than required
eductor is turned off during system calibrations

BLOWBACK PRESSURE

DATA	AVERAGE	RANGE	STDEV
bbkp	52.27	50.85 / 54.65	0.70
bbkp *	52.20	50.85 / 53.87	0.62

blowback pressure is stable and at acceptable levels
blowbacks on 2-hour cycle
pressure elevation on 4/3 due by maintenance

ORIFICE PRESSURE

DATA	AVERAGE	RANGE	STDEV
orfp	0.72	0.65 / 0.77	0.01
orfp *	0.72	0.69 / 0.75	0.01

orifice pressure OK
minor fluctuations in orifice pressure OK

CHAMBER PRESSURE

DATA	AVERAGE	RANGE	STDEV
pres	63.31	61.37 / 66.16	0.95
pres *	63.31	61.37 / 66.16	0.95

mercury chamber pressure at elevated levels
pressure starting to fluctuate and become unstable
typically indicates a need to rebuild or replace pump

PSNH MERRIMACK UNIT 2 INLET
APRIL 2 – APRIL 8, 2007

SAMPLE GAS FLOW

DATA	AVERAGE	RANGE	STDEV
smpif	0.40	0.38 / 0.43	0.01
smpif *	0.40	0.38 / 0.43	0.01

sample gas flow OK
flow changes caused by changing pump performance

ANALOG INPUT 1

DATA	AVERAGE	RANGE	STDEV
ain1	4.87	4.47 / 5.16	0.06
ain1 *	4.87	4.73 / 5.01	0.05

analog input 1 measures dilution air flow rate in LPM
measurement fluctuations typical

PMT VOLTAGE

DATA	AVERAGE	RANGE	STDEV
pmtv	785.63	776.26 / 790.69	6.37
pmtv *	785.63	776.26 / 790.69	6.37

PMT voltage increased as maintenance
change to force instrument calibration coefficient to 1.00

ANALOG INPUT 2

DATA	AVERAGE	RANGE	STDEV
ain2	-	-	-
ain2 *	-	-	-

analog input 2 is currently not in service

LAMP INTENSITY

DATA	AVERAGE	RANGE	STDEV
rfint	60350.89	55976 / 62756	2400.03
rfint *	60350.89	55976 / 62756	2400.03

changes in mercury lamp intensity are typical

ANALOG INPUT 3

DATA	AVERAGE	RANGE	STDEV
ain3	-	-	-
ain3 *	-	-	-

analog input 3 is currently not in service

PSNH MERRIMACK UNIT 2 INLET
THERMO MERCURY SYSTEM 82
APRIL 9 – APRIL 15, 2007
WEEK 34: DARCO HG-LH + TRONA TESTING

PSNH MERRIMACK UNIT 2 INLET
APRIL 9 – APRIL 15, 2007

TOTAL MERCURY CALIBRATION RESPONSES

calibrations on 4/9 failed low and corrected
system span concentration changed from 6.0 to 9.0 on 4/12 after software upgrade.

ELEMENTAL MERCURY CALIBRATION RESPONSES

calibrations on 4/9 failed low and corrected
system span concentration changed from 6.0 to 9.0 on 4/12 after software upgrade.

BACKGROUNDS

DATA	AVERAGE	RANGE	STDEV
obkg	15.17	0.00 / 17.48	1.45
tblg	13.17	0.00 / 15.04	1.32

calibration factor backgrounds OK
step-change due to reset for software upgrade

COEFFICIENTS

DATA	AVERAGE	RANGE	STDEV
ocoef	1.03	0.83 / 1.46	0.27
tcoef	0.87	0.84 / 1.00	0.06

calibration factor coefficients OK
coefficient was high from 4/9 to 4/11

PSNH MERRIMACK UNIT 2 INLET
APRIL 9 – APRIL 15, 2007

PROBE TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
prbt	217.11	187.44 / 227.08	2.50
prbt *	217.13	211.59 / 222.88	2.09

probe temperature OK

AMBIENT TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
intt	35.10	33.98 / 37.29	0.73
intt *	34.97	33.98 / 36.54	0.54

analyzer internal temperature OK

CONVERTER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
cnvt	757.94	739.94 / 769.17	27.48
cnvt *	759.77	752.11 / 767.60	2.67

converter temperature OK

CHAMBER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
rctt	45.15	44.61 / 45.81	0.19
rctt *	45.15	44.61 / 45.71	0.19

detection chamber temperature stable

UMBILICAL TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
umbt	176.23	89.52 / 196.62	12.62
umbt *	176.81	149.37 / 196.62	11.64

umbilical temperature fluctuates but OK
probe controller interface board not current version

LAMP TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
lampt			
lampt *			

mercury lamp temperature after software upgrade
does not work correctly in this system

PSNH MERRIMACK UNIT 2 INLET
APRIL 9 – APRIL 15, 2007

DILUTION AIR / VACCUUM

DATA	AVERAGE	RANGE	STDEV
dilp	50.95	1.30 / 51.84	3.42
dilp *	51.18	50.85 / 51.50	0.12
dilp span	51.21	51.06 / 51.47	0.14
vac	22.48	22.27 / 22.61	0.09

dilution pressure stable in sample and calibration mode
probe vacuum stable; power loss on 4/9

VENTURI PRESSURE

DATA	AVERAGE	RANGE	STDEV
vn timer	2.07	1.66 / 2.39	0.19
vn timer *	2.07	1.66 / 2.39	0.19
vn timer zero	17.69	4.95 / 35.28	8.38
vn timer span	10.71	10.54 / 10.97	0.18

venturi pressure stable

typical pressure response changes, software issue?

EDUCTOR PRESSURE

DATA	AVERAGE	RANGE	STDEV
edup	16.87	1.13 / 17.18	1.08
edup *	16.94	16.73 / 17.18	0.08
edup cal	1.32	1.27 / 1.40	0.04

eductor pressure is stable

eductor setpoint may be higher than required
eductor is turned off during system calibrations

BLOWBACK PRESSURE

DATA	AVERAGE	RANGE	STDEV
bbkp	51.83	1.54 / 54.96	3.51
bbkp *	52.01	50.85 / 53.40	0.53

blowback pressure is stable and at acceptable levels
blowbacks on 3-hour cycle
power loss on 4/9

ORIFICE PRESSURE

DATA	AVERAGE	RANGE	STDEV
orfp	0.71	0.67 / 0.92	0.02
orfp *	0.71	0.67 / 0.75	0.02

orifice pressure OK
increase due to power loss on 4/9

CHAMBER PRESSURE

DATA	AVERAGE	RANGE	STDEV
pres	71.01	63.46 / 751.10	45.15
pres *	67.95	63.46 / 74.24	2.17

mercury chamber pressure at elevated levels
pressure starting to fluctuate and become unstable
typically indicates a need to rebuild or replace pump

PSNH MERRIMACK UNIT 2 INLET
APRIL 9 – APRIL 15, 2007

SAMPLE GAS FLOW

DATA	AVERAGE	RANGE	STDEV
smp1f	0.41	0.00 / 0.67	0.03
smp1f *	0.42	0.36 / 0.47	0.02

sample gas flow OK
step-change increase due to software upgrade?

ANALOG INPUT 1

DATA	AVERAGE	RANGE	STDEV
ain1	4.84	0.04 / 5.39	0.34
ain1 *	4.87	4.72 / 5.01	0.05

analog input 1 measures dilution air flow rate in LPM
measurement fluctuations typical

PMT VOLTAGE

DATA	AVERAGE	RANGE	STDEV
pmtv	790.29	789.58 / 790.69	0.17
pmtv *	790.32	-	-

PMT voltage stable and OK

ANALOG INPUT 2

DATA	AVERAGE	RANGE	STDEV
ain2			
ain2 *			

analog input 2 is currently not in service

LAMP INTENSITY

DATA	AVERAGE	RANGE	STDEV
rfint	58104.73	5297.00 / 61984.4	2456.30
rfint *	58104.73	5297.00 / 61984.4	2456.30

changes in mercury lamp intensity are typical
lamp intensity increase over time unusual

ANALOG INPUT 3

DATA	AVERAGE	RANGE	STDEV
ain3			
ain3 *			

analog input 3 is currently not in service

PSNH MERRIMACK UNIT 2 INLET
THERMO MERCURY SYSTEM 82
APRIL 16 – APRIL 22, 2007
WEEK 35: BASELINE / OUTAGE

PSNH MERRIMACK UNIT 2 INLET
APRIL 16 – APRIL 22, 2007

TOTAL MERCURY CALIBRATION RESPONSES

poor response to span gas concentrations on 4/17 and 4/18 due to interruption of source air supply

ELEMENTAL MERCURY CALIBRATION RESPONSES

poor response to span gas concentrations on 4/17 and 4/18 due to interruption of source air supply

BACKGROUNDS

DATA	AVERAGE	RANGE	STDEV
obkg	15.21	13.52 / 37.54	5.91
tbg	15.27	12.51 / 37.10	5.78

calibration factor backgrounds OK
backgrounds set incorrectly on 4/16 and corrected

COEFFICIENTS

DATA	AVERAGE	RANGE	STDEV
ocoef	0.81	0.71 / 1.99	0.32
tcoef	1.01	0.84 / 1.03	0.06

calibration factor coefficients OK
coefficients set incorrectly on 4/16 and corrected

PSNH MERRIMACK UNIT 2 INLET
APRIL 16 – APRIL 22, 2007

PROBE TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
prbt	217.21	210.80 / 226.55	2.10
prbt *	217.20	211.59 / 222.88	2.05

probe temperature OK

AMBIENT TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
intt	35.55	34.00 / 37.29	0.79
intt *	35.55	34.00 / 37.29	0.79

analyzer internal temperature OK

CONVERTER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
cnvt	760.02	749.74 / 768.65	2.79
cnvt *	760.02	751.84 / 768.38	2.77

converter temperature OK

CHAMBER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
rctt	45.16	44.64 / 45.84	0.19
rctt *	45.15	44.64 / 45.71	0.18

detection chamber temperature stable

UMBILICAL TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
umbt	175.22	120.76 / 197.41	15.36
umbt *	177.97	146.22 / 197.41	12.09

umbilical temperature fluctuates but OK
probe controller interface board not current version

LAMP TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
lampt	40.31	-	-
lampt *	40.31	-	-

does not work correctly in this system

PSNH MERRIMACK UNIT 2 INLET
APRIL 16 – APRIL 22, 2007

DILUTION AIR / VACCUUM

DATA	AVERAGE	RANGE	STDEV
dilp	41.69	1.27 / 51.80	19.58
dilp *	51.21	50.48 / 51.74	0.17
dilp span	40.49	1.34 / 51.80	20.81
vac	22.45	22.05 / 22.73	0.14

dilution pressure stable in sample and calibration mode
probe vacuum stable; **source air interrupted on 4/18**

VENTURI PRESSURE

DATA	AVERAGE	RANGE	STDEV
vn timer	1.76	1.27 / 2.10	0.22
vn timer *	1.76	1.27 / 2.10	0.22
vn timer zero	16.00	1.31 / 20.97	7.65
vn timer span	10.56	9.98 / 11.14	0.34

venturi pressure stable
source air interrupted on 4/18

EDUCTOR PRESSURE

DATA	AVERAGE	RANGE	STDEV
edup	14.02	1.13 / 17.24	6.20
edup *	17.04	16.84 / 17.21	0.05
edup cal	1.28	1.13 / 1.37	0.06

eductor pressure is stable
eductor setpoint may be higher than required
eductor is turned off during system calibrations

BLOWBACK PRESSURE

DATA	AVERAGE	RANGE	STDEV
bbkp	43.35	1.54 / 54.82	20.33
bbkp *	53.23	48.62 / 54.82	1.02

blowback pressure is stable and at acceptable levels
blowbacks on 3-hour cycle
source air interrupted on 4/18

ORIFICE PRESSURE

DATA	AVERAGE	RANGE	STDEV
orfp	0.65	0.48 / 0.83	0.10
orfp *	0.65	0.48 / 0.83	0.10

orifice pressure OK
source air interrupted on 4/18
orifice pressure changes as unit is offline

CHAMBER PRESSURE

DATA	AVERAGE	RANGE	STDEV
pres	71.94	69.15 / 217.64	2.06
pres *	71.92	69.15 / 75.44	1.32

mercury chamber pressure at high levels
pressure starting to fluctuate and become unstable
typically indicates a need to rebuild or replace pump

PSNH MERRIMACK UNIT 2 INLET
APRIL 16 – APRIL 22, 2007

SAMPLE GAS FLOW

DATA	AVERAGE	RANGE	STDEV
smpflf	0.41	0.00 / 0.44	0.01
smpflf *	0.41	0.39 / 0.44	0.01

sample gas flow OK

ANALOG INPUT 1

DATA	AVERAGE	RANGE	STDEV
ain1	3.94	0.05 / 5.38	1.88
ain1 *	4.85	4.55 / 5.09	0.06

analog input 1 measures dilution air flow rate in LPM
source air interrupted on 4/18

PMT VOLTAGE

DATA	AVERAGE	RANGE	STDEV
pmtv	790.33	789.58 / 790.69	0.13
pmtv *	790.32	-	-

PMT voltage stable and OK

ANALOG INPUT 2

DATA	AVERAGE	RANGE	STDEV
ain2	0.04	0.03 / 0.05	0.00
ain2 *	0.04	0.03 / 0.05	0.00

analog input 2 is currently not in service

LAMP INTENSITY

DATA	AVERAGE	RANGE	STDEV
rfint	62219.49	60597 / 63577	1048.17
rfint *	62219.49	60597 / 63577	1048.17

changes in mercury lamp intensity are typical

ANALOG INPUT 3

DATA	AVERAGE	RANGE	STDEV
ain3	0.04	0.03 / 0.05	0.00
ain3 *	0.04	0.03 / 0.04	0.00

analog input 3 is currently not in service

PSNH MERRIMACK UNIT 2 INLET

THERMO MERCURY SYSTEM 82

MAY 28 – JULY 1, 2007

WEEK 41 – 45: CEMS SERVICE / MAINTENANCE

PSNH MERRIMACK UNIT 2 INLET
MAY 28 – JULY 1, 2007

TOTAL MERCURY CALIBRATION RESPONSES

calibrations were only performed as troubleshooting during maintenance and non-operation
they are not to be considered valid for quality control and system integrity

ELEMENTAL MERCURY CALIBRATION RESPONSES

calibrations were only performed as troubleshooting during maintenance and non-operation
they are not to be considered valid for quality control and system integrity

BACKGROUNDS

DATA	AVERAGE	RANGE	STDEV
obkg	49.8	11.9 / 131	31.4
tbg	42.8	12.1 / 94.7	20.6

backgrounds calculated on 5/30 are OK
backgrounds calculated on 6/28 are high

COEFFICIENTS

DATA	AVERAGE	RANGE	STDEV
occoef	0.983	0.743 / 1.68	0.256
tcoef	0.915	0.549 / 1.04	0.138

coefficients calculated on 6/28 are OK

PSNH MERRIMACK UNIT 2 INLET
MAY 28 – JULY 1, 2007

PROBE TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
prbt	205	0 / 235	43
prbt *	222	214 / 228	2.05

probe temperature stable at setpoint
fluctuations due to maintenance

AMBIENT TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
intt	32.5	22 / 40	1.27
intt *	32.3	29.8 / 34.8	0.837

analyzer internal temperature OK

CONVERTER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
cnvt	743	0 / 939	100
cnvt *	760	752 / 768	2.73

converter temperature stable at setpoint
fluctuations due to maintenance

CHAMBER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
rctt	45.1	24.2 / 45.8	0.346
rctt *	45.1	44.6 / 45.7	0.202

detection chamber temperature OK

UMBILICAL TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
umbt	145	19.2 / 200	15
umbt *	147	111 / 186	10.4

converter temperature stable at setpoint
fluctuations due to maintenance
greater signal noise due to old probe controller boards

LAMP TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
lampt	40.3	-	-
lampt *	40.3	-	-

mercury lamp heater not installed on this system

PSNH MERRIMACK UNIT 2 INLET
MAY 28 – JULY 1, 2007

DILUTION AIR / VACCUUM

DATA	AVERAGE	RANGE	STDEV
dilp	49.5	18.3 / 55.5	0.828
dilp *	49.4	49.1 / 49.9	0.147
dilp span	49.7	48.4 / 55.4	2.03
vac	22.6	0.943 / 23.1	0.548

dilution pressure and vacuum OK in sample mode
system not in sample mode from 6/1 to 6/28

VENTURI PRESSURE

DATA	AVERAGE	RANGE	STDEV
vntp	23.9	1.53 / 29.6	7.73
vntp *	23.9	1.53 / 29.6	7.73
vntp zero	30.6	20.6 / 35.3	4.92
vntp span	25.7	13 / 35.3	6.87

venturi pressure too high when in sample mode
increase in venturi pressure OK when in system cal mode

EDUCTOR PRESSURE

DATA	AVERAGE	RANGE	STDEV
edup	12.5	1.23 / 19.5	1.4
edup *	12.3	12 / 12.6	0.119
edup cal	1.33	1.17 / 1.68	0.148

eductor pressure OK when in sample mode
eductor is turned off during system calibrations

BLOWBACK PRESSURE

DATA	AVERAGE	RANGE	STDEV
bbkp	58.4	12.1 / 63.5	1.44
bbkp *	58.5	57.8 / 59.5	0.337

blowback pressure OK in sample mode
system not in sample mode from 6/1 to 6/28

ORIFICE PRESSURE

DATA	AVERAGE	RANGE	STDEV
orfp	0.566	0.384 / 1.35	0.105
orfp *	0.565	0.384 / 0.86	0.101

orifice pressure OK when in sample mode
system not in sample mode from 6/1 to 6/28

CHAMBER PRESSURE

DATA	AVERAGE	RANGE	STDEV
pres	73.2	8.08 / 762	114
pres *	51.7	50.3 / 53.6	0.478

chamber pressure elevated when in system zero mode
fluctuations due to maintenance

PSNH MERRIMACK UNIT 2 INLET
MAY 28 – JULY 1, 2007

SAMPLE GAS FLOW

DATA	AVERAGE	RANGE	STDEV
smpflf	0.473	0 / 1.87	0.148
smpflf *	0.489	0.0482 / 0.721	0.0942

sample gas flow not analyzed in system zero mode

ANALOG INPUT 1

DATA	AVERAGE	RANGE	STDEV
ain1	4.57	-0.0744 / 11.3	1.01
ain1 *	4.68	4.51 / 4.85	0.0474

analog input 1 measures dilution air flow in LPM
fluctuations due to maintenance
air flow rate stable in system zero mode

PMT VOLTAGE

DATA	AVERAGE	RANGE	STDEV
pmtv	797	578 / 944	25.7
pmtv *	791	790 / 791	0.216

pmt voltage stable in system zero mode
fluctuations during maintenance

ANALOG INPUT 2

DATA	AVERAGE	RANGE	STDEV
ain2	0.0192	0.00797 / 0.0478	0.00457
ain2 *	0.0198	0.0159 / 0.0239	0.00188

analog input 2 is not in service

LAMP INTENSITY

DATA	AVERAGE	RANGE	STDEV
rfint	60000	47700 / 98400	2740
rfint *	59900	55300 / 67800	2560

lamp intensity OK and degradation typical
fluctuations due to power source interruptions

ANALOG INPUT 3

DATA	AVERAGE	RANGE	STDEV
ain3	0.0238	0.0132 / 0.0503	0.00449
ain3 *	0.0235	0.0132 / 0.0344	0.004

analog input 3 is not in service

THERMO MERCURY SYSTEM 92 — MERRIMACK OUTLET

JANUARY 15 TO JANUARY 21, 2007

MERCURY DETECTION

THERMO MERCURY SYSTEM 92 — MERRIMACK OUTLET

JANUARY 15 TO JANUARY 21, 2007

PROBE TEMPERATURES AND PRESSURES

PROBE TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
prbt	220.07	181.66 / 230.49	10.62

probe temperature stable between 190-220°C
 probe temperature OK
 step-change based on settings change (user input)

EDUCTOR PRESSURE

DATA	AVERAGE	RANGE	STDEV
edup	16.13	0.93 / 19.01	1.67

eductor pressure stable between 15-19 psi.
 eductor pressure off during calibrations
 eductor pressure OK
 variations due to error in air supply - corrected

CONVERTER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
cnvt	786.91	745.02 / 800.93	15.91

converter temperature stable between 750-800°C
 converter temperature OK
 step-change based on settings change (user input)

ORIFICE PRESSURE

DATA	AVERAGE	RANGE	STDEV
orfp	0.65	0.47 / 0.86	0.06

orifice pressure stable between 0-2 psi.
 orifice pressure OK

UMBILICAL TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
umbt	131.80	55.65 / 190.06	32.60

umbilical temperature stable between 170-190°C
 umbilical temperature large fluctuations and noise
 note: update to interface board not installed

VENTURI PRESSURE

DATA	AVERAGE	RANGE	STDEV
vntp	4.33	3.61 / 8.16	0.89

venturi pressure stable between 2-6 psi.
 venturi pressure sample < fspan <= fzero
 venturi pressure OK
 fluctuations caused by on-site service (Thermo Hg2+ source)

THERMO MERCURY SYSTEM 92 — MERRIMACK OUTLET

JANUARY 15 TO JANUARY 21, 2007

GAS SAMPLE FLOW

DATA	AVERAGE	RANGE	STDEV
smp1f	0.19	0.00 / 0.41	0.12

sample flow stable and consistent

sample gas flow NOT OK - ON-SITE REPAIR REQUIRED
possible leaks between channels after service
(Thermo Hg2+ source)

PROBE VACCUUM

DATA	AVERAGE	RANGE	STDEV
vac	20.75	0.61 / 22.04	3.30

probe vacuum 20-22 psi, decrease during blowback

probe vacuum OK
variations due to error in air supply - corrected

DILUTION AIR PRESSURE

DATA	AVERAGE	RANGE	STDEV
dilp	50.86	1.47 / 54.65	8.86

dilution pressure 45-55 and extremely stable for all modes

dilution pressure OK
variations due to error in air supply - corrected

BLOWBACK PRESSURE

DATA	AVERAGE	RANGE	STDEV
bbkp	47.97	1.40 / 51.19	8.12

blowback pressure stable with regular blowbacks

blowbacks at regular intervals
variations due to error in air supply - corrected

DILUTION AIR FLOW

DATA	AVERAGE	RANGE	STDEV
ain1	4.54	0.03 / 7.99	0.88

dilution air flow extremely stable for all modes

dilution air flow OK
variations due to error in air supply - corrected

THERMO MERCURY SYSTEM 92 — MERRIMACK OUTLET

JANUARY 22 TO JANUARY 28, 2007

MERCURY DETECTION

THERMO MERCURY SYSTEM 92 — MERRIMACK OUTLET

JANUARY 22 TO JANUARY 28, 2007

PROBE TEMPERATURES AND PRESSURES

PROBE TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
prbt	225.83	44.10 / 232.85	4.32
probe temperature stable between 190-220°C			
probe temperature OK			

EDUCTOR PRESSURE

DATA	AVERAGE	RANGE	STDEV
edup	15.99	0.49 / 18.06	2.17
eductor pressure stable between 15-19 psi.			
eductor pressure off during calibrations			
eductor pressure OK			
response typical during calibration routine			

CONVERTER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
cnvt	769.47	0.00 / 829.29	100.13
converter temperature stable between 750-800°C			
converter temperature OK			

ORIFICE PRESSURE

DATA	AVERAGE	RANGE	STDEV
orfp	0.59	0.11 / 0.86	0.06
orifice pressure stable between 0-2 psi.			
orifice pressure OK			

UMBILICAL TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
umbt	131.09	15.49 / 188.22	33.10
umbilical temperature stable between 170-190°C			
umbilical temperature OK			

VENTURI PRESSURE

DATA	AVERAGE	RANGE	STDEV
vntp	4.07	3.16 / 4.39	0.18
venturi pressure stable between 2-6 psi.			
venturi pressure sample < fspan <= fzero			
venturi pressure OK			
response typical during calibration routine			

THERMO MERCURY SYSTEM 92 — MERRIMACK OUTLET

JANUARY 22 TO JANUARY 28, 2007

GAS SAMPLE FLOW

DATA	AVERAGE	RANGE	STDEV
smp1f	0.14	0.00 / 0.53	0.08

sample flow stable and consistent

gas sample flow OK

Thermo installed metal sample orifices to replace glass orifice causes changes in sample flow, informed was OK by Thermo

PROBE VACCUUM

DATA	AVERAGE	RANGE	STDEV
vac	20.62	1.02 / 22.00	3.55

probe vacuum 20-22 psi, decrease during blowback

probe vacuum OK

affected by air supply and power interruptions

DILUTION AIR PRESSURE

DATA	AVERAGE	RANGE	STDEV
dilp	51.53	1.30 / 54.25	7.80

dilution pressure 45-55 and extremely stable for all modes

dilution air pressure OK

affected by air supply and power interruptions

BLOWBACK PRESSURE

DATA	AVERAGE	RANGE	STDEV
bbkp	48.72	1.34 / 50.96	7.06

blowback pressure stable with regular blowbacks

blowback pressure OK

regular blowback schedule

affected by air supply and power interruptions

DILUTION AIR FLOW

DATA	AVERAGE	RANGE	STDEV
ain1	4.52	0.00 / 6.37	0.77

dilution air flow extremely stable for all modes

dilution air flow OK

affected by air supply and power interruptions

THERMO MERCURY SYSTEM 92 — MERRIMACK OUTLET

JANUARY 29 TO FEBRUARY 4, 2007

SYSTEM IN SERVICE SINCE JANUARY 24, 2007

THERMO MERCURY SYSTEM 92 — MERRIMACK OUTLET

JANUARY 29 TO FEBRUARY 4, 2007

SYSTEM IN SERVICE SINCE JANUARY 24, 2007

PROBE TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
prbt	177.78	0.00 / 234.16	74.66

probe temperature stable between 190-220°C

EDUCTOR PRESSURE

DATA	AVERAGE	RANGE	STDEV
edup	11.15	0.49 / 20.74	5.74

eductor pressure stable between 15-19 psi.

eductor pressure off during calibrations

CONVERTER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
cnvt	665.87	27.56 / 848.45	231.24

converter temperature stable between 750-800°C

ORIFICE PRESSURE

DATA	AVERAGE	RANGE	STDEV
orfp	0.73	0.11 / 6.37	0.68

orifice pressure stable between 0-2 psi.

UMBILICAL TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
umbt	118.93	6.83 / 188.49	47.37

umbilical temperature stable between 170-190°C

VENTURI PRESSURE

DATA	AVERAGE	RANGE	STDEV
vntp	3.86	1.43 / 4.42	0.33

venturi pressure stable between 2-6 psi.

venturi pressure sample < fspan <= fzero

THERMO MERCURY SYSTEM 92 — MERRIMACK OUTLET

JANUARY 29 TO FEBRUARY 4, 2007

SYSTEM IN SERVICE SINCE JANUARY 24, 2007

GAS SAMPLE FLOW

• smp1f mer out (all)

DATA	AVERAGE	RANGE	STDEV
smp1f	0.16	0.00 / 1.87	0.20

sample flow stable and consistent

PROBE VACCUUM

— vac mer out (all)

DATA	AVERAGE	RANGE	STDEV
vac	15.80	-1.26 / 22.81	8.85

probe vacuum 20-22 psi, decrease during blowback

DILUTION AIR PRESSURE

— dilp mer out (sample) • dilp mer out (fzero end) • dilp mer out (fspan end)

DATA	AVERAGE	RANGE	STDEV
dilp	39.69	4.29 / 54.62	19.23

dilution pressure 45-55 and extremely stable for all modes

BLOWBACK PRESSURE

— bbkp mer out (sample) • bbkp mer out (bbfilter)

DATA	AVERAGE	RANGE	STDEV
bbkp	49.34	4.19 / 51.13	5.55

blowback pressure stable with regular blowbacks

DILUTION AIR FLOW

— ain1 mer out (sample) • ain1 mer out (fzero end) • ain1 mer out (fspan end)

DATA	AVERAGE	RANGE	STDEV
ain1	3.80	0.02 / 11.45	1.57

dilution air flow extremely stable for all modes

THERMO MERCURY SYSTEM 92 — MERRIMACK OUTLET

FEBRUARY 5 TO FEBRUARY 11, 2007

MERCURY DETECTION

THERMO MERCURY SYSTEM 92 — MERRIMACK OUTLET

FEBRUARY 5 TO FEBRUARY 11, 2007

PROBE TEMPERATURES AND PRESSURES

PROBE TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
prbt	198.92	83.74 / 213.69	13.87
probe temperature stable between 190-220°C			
probe temperature now OK			
decrease in temperature due to probe service			

EDUCTOR PRESSURE

DATA	AVERAGE	RANGE	STDEV
edup	14.83	0.73 / 20.87	2.86
eductor pressure stable between 15-19 psi.			
eductor pressure off during calibrations			
eductor pressure OK, cal response OK			
fluctuations due to probe service			

CONVERTER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
cnvt	745.30	23.63 / 784.66	92.20
converter temperature stable between 750-800°C			
converter temperature now OK			
decrease in temperature due to probe service			

ORIFICE PRESSURE

DATA	AVERAGE	RANGE	STDEV
orfp	0.65	0.42 / 6.37	0.46
orifice pressure stable between 0-2 psi.			
orifice pressure OK			
spikes due to transition of gas sample modes			

UMBILICAL TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
umbt	138.34	77.44 / 187.96	26.45
umbilical temperature stable between 170-190°C			
umbilical temperature OK			

VENTURI PRESSURE

DATA	AVERAGE	RANGE	STDEV
vntp	2.99	1.30 / 4.14	0.91
venturi pressure stable between 2-6 psi.			
venturi pressure sample < fspan <= fzero			
venturi pressure OK, cal response OK after 2/8			

THERMO MERCURY SYSTEM 92 — MERRIMACK OUTLET

FEBRUARY 5 TO FEBRUARY 11, 2007

GAS SAMPLE FLOW

DATA	AVERAGE	RANGE	STDEV
smp1f	0.27	0.00 / 1.87	0.18
sample flow stable and consistent			
gas sample flow OK			
change in sample flow due to service (sample pump)			

PROBE VACCUUM

DATA	AVERAGE	RANGE	STDEV
vac	20.42	1.28 / 21.56	2.93
probe vacuum 20-22 psi, decrease during blowback			
probe vacuum OK			
decreases on 2/6, 2/8, and 2/9 due to air supply failures			

DILUTION AIR PRESSURE

DATA	AVERAGE	RANGE	STDEV
dilp	46.39	1.40 / 49.94	7.96
dilution pressure 45-55 and extremely stable for all modes			
dilution pressure OK			
decreases on 2/6, 2/8, and 2/9 due to air supply failures			

BLOWBACK PRESSURE

DATA	AVERAGE	RANGE	STDEV
bbkp	47.01	1.34 / 51.13	8.48
blowback pressure stable with regular blowbacks			
blowback pressure OK			
blowback regular schedule			
decreases on 2/6, 2/8, and 2/9 due to air supply failures			

DILUTION AIR FLOW

DATA	AVERAGE	RANGE	STDEV
ain1	2.58	0.02 / 11.37	2.13
dilution air flow extremely stable for all modes			
dilution air flow acceptable when stable			
decreases on 2/6, 2/8, and 2/9 due to air supply failures			

THERMO MERCURY SYSTEM 92 — MERRIMACK OUTLET

FEBRUARY 12 TO FEBRUARY 25, 2007

MERCURY DETECTION

THERMO MERCURY SYSTEM 92 — MERRIMACK OUTLET

FEBRUARY 12 TO FEBRUARY 25, 2007

PROBE TEMPERATURES AND PRESSURES

PROBE TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
prbt	201.53	149.63 / 213.43	2.80
probe temperature stable between 190-220°C			
probe temperature OK			

EDUCTOR PRESSURE

DATA	AVERAGE	RANGE	STDEV
edup	16.06	0.83 / 17.68	0.79
eductor pressure stable between 15-19 psi.			
eductor pressure off during calibrations			
eductor pressure OK, cal response OK			
temporary spike on 2/12 caused by unit return to service			

CONVERTER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
cnvt	758.89	747.91 / 767.86	2.49
converter temperature stable between 750-800°C			
converter temperature OK			

ORIFICE PRESSURE

DATA	AVERAGE	RANGE	STDEV
orfp	0.59	0.53 / 5.33	0.12
orifice pressure stable between 0-2 psi.			
orifice pressure OK			
temporary spike on 2/12 caused by unit return to service			

UMBILICAL TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
umbt	135.73	31.50 / 189.01	28.54
umbilical temperature stable between 170-190°C			
umbilical temperature OK			

VENTURI PRESSURE

DATA	AVERAGE	RANGE	STDEV
vn timer	4.09	1.35 / 5.84	1.03
venturi pressure stable between 2-6 psi.			
venturi pressure sample < fspan <= fzero			
venturi pressure abnormal response during calibrations			
reason for abnormalities currently unknown			

THERMO MERCURY SYSTEM 92 — MERRIMACK OUTLET

FEBRUARY 12 TO FEBRUARY 25, 2007

GAS SAMPLE FLOW

DATA	AVERAGE	RANGE	STDEV
smplf	0.34	0.27 / 0.76	0.04

sample flow stable and consistent

gas sample flow OK
temporary spikes in flow OK

PROBE VACCUUM

DATA	AVERAGE	RANGE	STDEV
vac	21.40	20.82 / 21.70	0.10

probe vacuum 20-22 psi, decrease during blowback

probe vacuum OK

DILUTION AIR PRESSURE

DATA	AVERAGE	RANGE	STDEV
dilp	48.79	48.24 / 49.29	0.15

dilution pressure 45-55 and extremely stable for all modes

dilution air pressure OK
minor fluctuations OK

BLOWBACK PRESSURE

DATA	AVERAGE	RANGE	STDEV
bbkp	50.61	49.94 / 51.16	0.16

blowback pressure stable with regular blowbacks

blowback pressure OK
3-hour blowback schedule

DILUTION AIR FLOW

DATA	AVERAGE	RANGE	STDEV
ain1	0.04	0.02 / 0.11	0.01

dilution air flow extremely stable for all modes

dilution air flow OK
minor fluctuations OK

THERMO MERCURY SYSTEM 92 — MERRIMACK OUTLET

FEBRUARY 26 TO MARCH 11, 2007

MERCURY DETECTION

THERMO MERCURY SYSTEM 92 — MERRIMACK OUTLET

FEBRUARY 26 TO MARCH 11, 2007

PROBE TEMPERATURES AND PRESSURES

PROBE TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
prbt	201.95	196.36 / 207.65	1.91
probe temperature stable between 190-220°C			
probe temperature OK			

EDUCTOR PRESSURE

DATA	AVERAGE	RANGE	STDEV
edup	16.20	15.75 / 16.67	0.12
eductor pressure stable between 15-19 psi.			
eductor pressure off during calibrations			
eductor pressure OK			
eductor response during calibrations OK			

CONVERTER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
cnvt	758.69	752.37 / 764.71	2.60
converter temperature stable between 750-800°C			
converter temperature OK			

ORIFICE PRESSURE

DATA	AVERAGE	RANGE	STDEV
orfp	0.58	0.57 / 0.81	0.01
orifice pressure stable between 0-2 psi.			
orifice pressure OK			
temporary spike on 2/12 caused by unit return to service			

UMBILICAL TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
umbt	133.70	43.58 / 188.22	30.91
umbilical temperature stable between 170-190°C			
umbilical temperature OK			

VENTURI PRESSURE

DATA	AVERAGE	RANGE	STDEV
vntp	4.95	3.21 / 5.61	0.40
venturi pressure stable between 2-6 psi.			
venturi pressure sample < fspan <= fzero			
venturi pressure OK			
venturi response during calibrations OK			

THERMO MERCURY SYSTEM 92 — MERRIMACK OUTLET

FEBRUARY 26 TO MARCH 11, 2007

GAS SAMPLE FLOW

• smplf merrimack out (all)

DATA	AVERAGE	RANGE	STDEV
smplf	0.30	0.24 / 0.66	0.02

sample flow stable and consistent

gas sample flow OK
temporary spikes in flow OK

PROBE VACCUUM

— vac merrimack out (all)

DATA	AVERAGE	RANGE	STDEV
vac	21.35	21.02 / 21.67	0.10

probe vacuum 20-22 psi, decrease during blowback

probe vacuum OK

DILUTION AIR PRESSURE

— dilp merrimack out (sample) • dilp merrimack out (fzero end) • dilp merrimack out (fspan end)

DATA	AVERAGE	RANGE	STDEV
dilp	48.85	48.62 / 49.33	0.11

dilution pressure 45-55 and extremely stable for all modes

dilution air pressure OK
minor fluctuations OK

BLOWBACK PRESSURE

— bbkp merrimack out (sample) • bbkp merrimack out (bbfilter)

DATA	AVERAGE	RANGE	STDEV
bbkp	50.58	50.38 / 50.85	0.09

blowback pressure stable with regular blowbacks

blowback pressure OK
3-hour blowback schedule

DILUTION AIR FLOW

— ain1 merrimack out (sample) • ain1 merrimack out (fzero end) • ain1 merrimack out (fspan end)

DATA	AVERAGE	RANGE	STDEV
ain1	0.05	0.03 / 0.06	0.01

dilution air flow extremely stable for all modes

dilution air flow OK
minor fluctuations OK

PSNH MERRIMACK UNIT 2 OUTLET
THERMO MERCURY SYSTEM 92
APRIL 2 – APRIL 8, 2007
WEEK 33: DARCO HG-LH + MgO TESTING

PSNH MERRIMACK UNIT 2 OUTLET
APRIL 2 – APRIL 8, 2007

TOTAL MERCURY CALIBRATION RESPONSES

calibration responses are unstable
failures appear to be a result of zero drift and instability

ELEMENTAL MERCURY CALIBRATION RESPONSES

calibration responses are unstable
failures appear to be a result of zero drift and instability

BACKGROUNDS

DATA	AVERAGE	RANGE	STDEV
obkg	18.97	18.31 / 22.30	1.16
tblg	18.40	13.45 / 21.35	2.93

calibration factor backgrounds OK

COEFFICIENTS

DATA	AVERAGE	RANGE	STDEV
ocoeff	1.85	1.78 / 1.92	0.05
tcoeff	0.98	0.60 / 1.17	0.19

elemental calibration coefficient high
total calibration coefficient OK

PSNH MERRIMACK UNIT 2 OUTLET
APRIL 2 – APRIL 8, 2007

PROBE TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
prbt	201.88	196.89 / 207.65	1.92
prbt *	201.88	196.89 / 207.65	1.92

probe temperature OK

AMBIENT TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
intt	34.15	33.21 / 35.87	0.43
intt *	34.09	33.21 / 35.11	0.35

analyzer internal temperature OK

CONVERTER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
cnvt	758.67	752.37 / 765.23	2.71
cnvt *	758.67	752.37 / 765.23	2.71

converter temperature OK

CHAMBER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
rctt	45.10	44.58 / 45.68	0.13
rctt *	45.09	44.73 / 45.45	0.13

detection chamber temperature stable

UMBILICAL TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
umbt	132.36	45.15 / 190.32	32.86
umbt *	132.36	45.15 / 190.32	32.86

umbilical temperature fluctuates but OK

probe controller interface board not current version

LAMP TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
lampt	-	-	-
lampt *	-	-	-

mercury lamp temperature not recorded (old software)

PSNH MERRIMACK UNIT 2 OUTLET
APRIL 2 – APRIL 8, 2007

DILUTION AIR / VACCUUM

DATA	AVERAGE	RANGE	STDEV
dilp	48.70	48.38 / 48.99	0.07
dilp *	48.70	48.51 / 48.89	0.06
dilp span	48.70	48.62 / 48.79	0.06
vac	21.41	21.11 / 21.65	0.10

dilution pressure stable in sample and calibration mode
probe vacuum stable

VENTURI PRESSURE

DATA	AVERAGE	RANGE	STDEV
vn timer	4.62	4.18 / 5.22	0.20
vn timer *	4.62	4.18 / 5.22	0.20
vn timer zero	27.65	24.97 / 28.85	1.29
vn timer span	17.45	17.01 / 18.28	0.41

venturi pressure stable
typical pressure increases during calibrations

EDUCTOR PRESSURE

DATA	AVERAGE	RANGE	STDEV
edup	16.18	15.92 / 16.67	0.08
edup *	16.18	15.99 / 16.36	0.08
edup cal	0.94	0.90 / 1.00	0.04

eductor pressure is stable
eductor setpoint may be higher than required
eductor is turned off during system calibrations

BLOWBACK PRESSURE

DATA	AVERAGE	RANGE	STDEV
bbkp	50.48	49.91 / 50.75	0.07
bbkp *	50.48	50.35 / 50.58	0.06

blowback pressure is stable and at acceptable levels
blowbacks on 3-hour cycle

ORIFICE PRESSURE

DATA	AVERAGE	RANGE	STDEV
orfp	0.58	0.56 / 0.59	0.00
orfp *	0.58	0.56 / 0.59	0.00

orifice pressure OK

CHAMBER PRESSURE

DATA	AVERAGE	RANGE	STDEV
pres	64.53	53.73 / 75.40	4.36
pres *	64.53	53.73 / 75.40	4.36

mercury chamber pressure at elevated levels
pressure starting to fluctuate and become unstable
typically indicates a need to rebuild or replace pump

PSNH MERRIMACK UNIT 2 OUTLET
APRIL 2 – APRIL 8, 2007

SAMPLE GAS FLOW

DATA	AVERAGE	RANGE	STDEV
smpflf	0.21	0.18 / 0.25	0.01
smpflf *	0.21	0.18 / 0.25	0.01

sample gas flow OK

ANALOG INPUT 1

DATA	AVERAGE	RANGE	STDEV
ain1	0.06	0.05 / 0.07	0.00
ain1 *	0.06	0.05 / 0.06	0.00

analog input 1 measures dilution air flow rate in LPM
mass flow meter is not connected correctly

PMT VOLTAGE

DATA	AVERAGE	RANGE	STDEV
pmtv	686.95	680.06 / 690.79	4.77
pmtv *	686.95	680.06 / 690.79	4.77

PMT voltage increased as maintenance change to force instrument calibration coefficient to 1.00

ANALOG INPUT 2

DATA	AVERAGE	RANGE	STDEV
ain2	-	-	-
ain2 *	-	-	-

analog input 2 is currently not in service

LAMP INTENSITY

DATA	AVERAGE	RANGE	STDEV
rfint	144499.82	140577 / 147936	2238.17
rfint *	144499.82	140577 / 147936	2238.17

changes in mercury lamp intensity are typical

ANALOG INPUT 3

DATA	AVERAGE	RANGE	STDEV
ain3	-	-	-
ain3 *	-	-	-

analog input 3 is currently not in service

PSNH MERRIMACK UNIT 2 OUTLET
THERMO MERCURY SYSTEM 92
APRIL 9 – APRIL 15, 2007
WEEK 34: DARCO HG-LH + TRONA TESTING

PSNH MERRIMACK UNIT 2 OUTLET
APRIL 9 – APRIL 15, 2007

TOTAL MERCURY CALIBRATION RESPONSES

system span concentration changed from 6.0 to 9.0 on 4/12 after software upgrade
calibration response was incorrectly set to 25.0 instead of 9.0 after 4/12 due to default settings (correctable)

ELEMENTAL MERCURY CALIBRATION RESPONSES

system span concentration changed from 6.0 to 9.0 on 4/12 after software upgrade
calibration response was incorrectly set to 25.0 instead of 9.0 after 4/12 due to default settings (correctable)

BACKGROUNDS

DATA	AVERAGE	RANGE	STDEV
obkg	20.60	0.00 / 22.00	1.93
tbg	29.87	0.00 / 35.18	7.00

calibration factor backgrounds at elevated levels
step-change due to reset for software upgrade

COEFFICIENTS

DATA	AVERAGE	RANGE	STDEV
ocoef	1.82	1.00 / 1.87	0.05
tcoef	1.43	1.00 / 1.60	0.22

elemental calibration coefficient high
total calibration coefficient high, error in software?

PSNH MERRIMACK UNIT 2 OUTLET
APRIL 9 – APRIL 15, 2007

PROBE TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
prbt	201.90	176.67 / 212.38	2.11
prbt *	201.92	196.10 / 207.65	1.94

probe temperature OK

AMBIENT TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
intt	34.50	33.16 / 36.62	0.76
intt *	34.43	33.16 / 36.18	0.68

analyzer internal temperature OK

CONVERTER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
cnvt	756.80	204.24 / 765.23	28.61
cnvt *	758.64	749.48 / 765.23	2.77

converter temperature OK

CHAMBER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
rcrt	45.10	44.58 / 45.65	0.13
rcrt *	45.09	44.73 / 45.45	0.13

detection chamber temperature stable

UMBILICAL TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
umbt	131.01	44.89 / 187.17	34.12
umbt *	131.01	44.89 / 187.17	34.12

umbilical temperature fluctuates but OK
probe controller interface board not current version

LAMP TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
lampt			
lampt *			

mercury lamp temperature after software upgrade
does not work correctly in this system

PSNH MERRIMACK UNIT 2 OUTLET
APRIL 9 – APRIL 15, 2007

DILUTION AIR / VACCUUM

DATA	AVERAGE	RANGE	STDEV
dilp	48.50	1.30 / 49.23	3.07
dilp *	48.71	48.38 / 49.09	0.13
dilp span	48.70	48.55 / 48.96	0.12
vac	21.37	21.17 / 21.59	0.07

dilution pressure stable in sample and calibration mode
probe vacuum stable; power loss on 4/9

VENTURI PRESSURE

DATA	AVERAGE	RANGE	STDEV
vn timer	4.61	3.68 / 5.28	0.24
vn timer *	4.62	4.20 / 5.28	0.24
vn timer zero	24.86	18.53 / 35.28	5.86
vn timer span	15.42	12.63 / 19.81	3.16

venturi pressure stable
typical pressure response changes, software issue?

EDUCTOR PRESSURE

DATA	AVERAGE	RANGE	STDEV
edup	16.12	0.83 / 18.46	1.03
edup *	16.18	15.89 / 16.50	0.12
edup cal	0.94	0.90 / 1.00	0.03

eductor pressure is stable
eductor setpoint may be higher than required
eductor is turned off during system calibrations

BLOWBACK PRESSURE

DATA	AVERAGE	RANGE	STDEV
bbkp	50.19	1.44 / 50.65	3.18
bbkp *	50.40	50.18 / 50.65	0.10

blowback pressure is stable and at acceptable levels
blowbacks on 3-hour cycle
power loss on 4/9

ORIFICE PRESSURE

DATA	AVERAGE	RANGE	STDEV
orfp	0.58	0.56 / 0.62	0.01
orfp *	0.58	0.56 / 0.60	0.01

orifice pressure OK
increase due to power loss on 4/9

CHAMBER PRESSURE

DATA	AVERAGE	RANGE	STDEV
pres	71.95	61.15 / 751.94	40.64
pres *	69.40	61.15 / 78.96	3.58

mercury chamber pressure at high levels
pressure starting to fluctuate and become unstable
typically indicates a need to rebuild or replace pump

PSNH MERRIMACK UNIT 2 OUTLET
APRIL 9 – APRIL 15, 2007

SAMPLE GAS FLOW

DATA	AVERAGE	RANGE	STDEV
smplf	0.21	0.00 / 1.30	0.02
smplf *	0.21	0.19 / 0.24	0.01

sample gas flow OK

ANALOG INPUT 1

DATA	AVERAGE	RANGE	STDEV
ain1	0.06	0.05 / 0.08	0.01
ain1 *	0.06	0.05 / 0.07	0.01

analog input 1 measures dilution air flow rate in LPM
mass flow meter is not connected correctly

PMT VOLTAGE

DATA	AVERAGE	RANGE	STDEV
pmtv	690.42	690.05 / 690.79	0.08
pmtv *	690.42	-	-

PMT voltage stable and OK

ANALOG INPUT 2

DATA	AVERAGE	RANGE	STDEV
ain2			
ain2 *			

analog input 2 is currently not in service

LAMP INTENSITY

DATA	AVERAGE	RANGE	STDEV
rfint	144614.50	139790 / 148682	3114.23
rfint *	144614.50	139790 / 148682	3114.23

changes in mercury lamp intensity are typical
lamp intensity increase over time unusual

ANALOG INPUT 3

DATA	AVERAGE	RANGE	STDEV
ain3			
ain3 *			

analog input 3 is currently not in service

PSNH MERRIMACK UNIT 2 OUTLET
THERMO MERCURY SYSTEM 92
APRIL 16 – APRIL 22, 2007
WEEK 35: BASELINE / OUTAGE

PSNH MERRIMACK UNIT 2 OUTLET
APRIL 16 – APRIL 22, 2007

TOTAL MERCURY CALIBRATION RESPONSES

system span response fluctuates greatly between calibrations
problems will be investigated during outage

ELEMENTAL MERCURY CALIBRATION RESPONSES

system span response fluctuates greatly between calibrations
problems will be investigated during outage

BACKGROUNDS

DATA	AVERAGE	RANGE	STDEV
obkg	27.16	22.00 / 28.04	2.01
tblg	24.67	22.37 / 38.63	5.24

calibration factor backgrounds OK

COEFFICIENTS

DATA	AVERAGE	RANGE	STDEV
occoef	1.97	1.79 / 2.00	0.08
tcoef	0.92	0.79 / 1.60	0.30

elemental calibration coefficient high
total calibration coefficient OK

PSNH MERRIMACK UNIT 2 OUTLET
APRIL 16 – APRIL 22, 2007

PROBE TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
prbt	202.09	196.89 / 208.70	2.10
prbt *	202.09	196.89 / 208.70	2.10

probe temperature OK

AMBIENT TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
intt	34.88	33.19 / 36.57	0.84
intt *	34.88	33.19 / 36.57	0.84

analyzer internal temperature OK

CONVERTER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
cnvt	758.96	751.58 / 765.50	2.94
cnvt *	758.96	751.58 / 765.50	2.94

converter temperature OK

CHAMBER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
rctt	45.10	44.61 / 45.75	0.14
rctt *	45.10	44.73 / 45.45	0.13

detection chamber temperature stable

UMBILICAL TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
umbt	140.91	54.87 / 188.75	31.85
umbt *	140.91	54.87 / 188.75	31.85

umbilical temperature fluctuates but OK
probe controller interface board not current version

LAMP TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
lampt	40.31	-	-
lampt *	40.31	-	-

does not work correctly in this system

PSNH MERRIMACK UNIT 2 OUTLET
APRIL 16 – APRIL 22, 2007

DILUTION AIR / VACUUM

DATA	AVERAGE	RANGE	STDEV
dilp	39.75	1.30 / 49.19	18.46
dilp *	48.67	48.14 / 49.19	0.14
dilp span	37.76	1.47 / 48.96	20.13
vac	21.40	21.05 / 21.73	0.15

dilution pressure stable in sample and calibration mode
probe vacuum stable; **source air interrupted on 4/18**

VENTURI PRESSURE

DATA	AVERAGE	RANGE	STDEV
vn timer	4.07	3.65 / 4.70	0.24
vn timer *	4.07	3.65 / 4.70	0.24
vn timer zero	17.23	3.69 / 22.18	7.48
vn timer span	12.14	11.65 / 12.72	0.26

venturi pressure stable
source air interrupted on 4/18

EDUCTOR PRESSURE

DATA	AVERAGE	RANGE	STDEV
edup	13.22	0.90 / 17.07	5.92
edup *	16.11	14.67 / 17.07	0.26
edup cal	0.99	0.86 / 1.06	0.05

eductor pressure is stable
eductor setpoint may be higher than required
eductor is turned off during system calibrations

BLOWBACK PRESSURE

DATA	AVERAGE	RANGE	STDEV
bbkp	41.11	1.44 / 50.65	19.12
bbkp *	50.35	49.87 / 50.65	0.11

blowback pressure is stable and at acceptable levels
blowbacks on 3-hour cycle
source air interrupted on 4/18

ORIFICE PRESSURE

DATA	AVERAGE	RANGE	STDEV
orfp	0.59	0.56 / 0.63	0.02
orfp *	0.58	0.57 / 0.60	0.01

orifice pressure OK
source air interrupted on 4/18
orifice pressure changes as unit is offline

CHAMBER PRESSURE

DATA	AVERAGE	RANGE	STDEV
pres	65.94	54.33 / 124.09	7.55
pres *	65.94	54.33 / 80.15	7.52

mercury chamber pressure at high levels
pressure starting to fluctuate and become unstable
typically indicates a need to rebuild or replace pump
decreasing chamber pressure is unusual

PSNH MERRIMACK UNIT 2 OUTLET
APRIL 16 – APRIL 22, 2007

SAMPLE GAS FLOW

DATA	AVERAGE	RANGE	STDEV
smpflf	0.23	0.00 / 0.27	0.02
smpflf *	0.23	0.17 / 0.27	0.02

sample gas flow OK

ANALOG INPUT 1

DATA	AVERAGE	RANGE	STDEV
ain1	0.07	0.05 / 0.08	0.01
ain1 *	0.07	0.05 / 0.08	0.01

analog input 1 measures dilution air flow rate in LPM
mass flow meter is not connected correctly

PMT VOLTAGE

DATA	AVERAGE	RANGE	STDEV
pmtv	690.45	690.05 / 690.79	0.11
pmtv *	690.42	-	-

PMT voltage stable and OK

ANALOG INPUT 2

DATA	AVERAGE	RANGE	STDEV
ain2	0.03	0.02 / 0.04	0.00
ain2 *	0.03	0.02 / 0.04	0.00

analog input 2 is currently not in service

LAMP INTENSITY

DATA	AVERAGE	RANGE	STDEV
rfint	145802.21	142538 / 149407	2373.13
rfint *	145802.21	142538 / 149407	2373.13

changes in mercury lamp intensity are typical

ANALOG INPUT 3

DATA	AVERAGE	RANGE	STDEV
ain3	0.03	0.02 / 0.04	0.00
ain3 *	0.03	0.02 / 0.04	0.00

analog input 3 is currently not in service

PSNH MERRIMACK UNIT 2 OUTLET

THERMO MERCURY SYSTEM 92

MAY 28 – JULY 1, 2007

WEEK 41 – 45: CEMS SERVICE / MAINTENANCE

PSNH MERRIMACK UNIT 2 OUTLET
MAY 28 – JULY 1, 2007

TOTAL MERCURY CALIBRATION RESPONSES

total mercury calibration responses were affected by unit outage and required maintenance

ELEMENTAL MERCURY CALIBRATION RESPONSES

elemental mercury calibration responses were affected by unit outage and required maintenance

BACKGROUNDS

DATA	AVERAGE	RANGE	STDEV
obkg	14.8	5.74 / 24.9	4.93
tblg	17.7	7.33 / 47.9	6.32

calibration factor backgrounds high fluctuations
integrity of calibration response in question

COEFFICIENTS

DATA	AVERAGE	RANGE	STDEV
occoef	1.16	0.631 / 1.98	0.384
tcoef	1.15	0.751 / 1.98	0.221

calibration factor backgrounds high fluctuations
integrity of calibration response in question

PSNH MERRIMACK UNIT 2 OUTLET
MAY 28 – JULY 1, 2007

PROBE TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
prbt	187	0 / 230	33.9
prbt *	201	195 / 206	1.33

probe temperature stable at setpoint
fluctuations due to maintenance

AMBIENT TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
intt	33.3	22.1 / 40.6	1.15
intt *	33.1	31.3 / 35	0.625

analyzer internal temperature OK
fluctuations caused by maintenance and power source

CONVERTER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
cnvt	749	0 / 785	50.9
cnvt *	758	741 / 772	4.52

converter temperature stable at setpoint
fluctuations due to maintenance
more fluctuations recorded during system zero

CHAMBER TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
rctt	45.1	22 / 45.6	0.288
rctt *	45.1	44.6 / 45.5	0.13

detection chamber temperature OK
fluctuations caused by maintenance and power source

UMBILICAL TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
umbt	123	15.2 / 177	38.7
umbt *	123	15.2 / 177	38.7

converter temperature stable at setpoint
fluctuations due to maintenance
change in signal noise on 6/5 when set to system zero

LAMP TEMPERATURE

DATA	AVERAGE	RANGE	STDEV
lampt	40.3	-	-
lampt *	40.3	-	-

mercury lamp heater not installed on this system

PSNH MERRIMACK UNIT 2 OUTLET
MAY 28 – JULY 1, 2007

DILUTION AIR / VACCUUM

DATA	AVERAGE	RANGE	STDEV
dilp	54.9	48.6 / 55.6	0.197
dilp *	54.9	54.7 / 55.2	0.0922
dilp span	54.8	54.3 / 55.1	0.158
vac	21.7	21.2 / 22	0.112

dilution pressure and vacuum OK in sample mode
system not in sample mode from 6/5 to 6/26

VENTURI PRESSURE

DATA	AVERAGE	RANGE	STDEV
vnlp	4.72	4.08 / 6.39	0.358
vnlp *	4.71	4.08 / 5.74	0.341
vnlp zero	25.9	3.96 / 35.3	10.3
vnlp span	13.7	3.92 / 23	5.49

venturi pressure OK in sample mode
increase in venturi pressure OK when in system cal mode

EDUCTOR PRESSURE

DATA	AVERAGE	RANGE	STDEV
edup	12.4	8.05 / 17.5	3.3
edup *	12.4	8.05 / 17.5	3.3
edup cal	0.998	0.861 / 1.23	0.1

eductor pressure OK when in sample mode
decrease in setpoint on 6/30 (troubleshooting)
eductor is turned off during system calibrations

BLOWBACK PRESSURE

DATA	AVERAGE	RANGE	STDEV
bbkp	58.9	58.5 / 59.3	0.103
bbkp *	58.9	58.6 / 59.1	0.101

blowback pressure OK in sample mode
system not in sample mode from 6/5 to 6/26

ORIFICE PRESSURE

DATA	AVERAGE	RANGE	STDEV
orfp	0.554	0.472 / 0.586	0.014
orfp *	0.554	0.509 / 0.586	0.014

orifice pressure OK when in sample mode
system not in sample mode from 6/1 to 6/28

CHAMBER PRESSURE

DATA	AVERAGE	RANGE	STDEV
pres	69.9	21.4 / 763	39.3
pres *	68	21.4 / 120	23.2

chamber pressure elevated when in system zero mode
fluctuations due to maintenance

PSNH MERRIMACK UNIT 2 OUTLET
MAY 28 – JULY 1, 2007

SAMPLE GAS FLOW

DATA	AVERAGE	RANGE	STDEV
smpfl	0.368	0 / 1.87	0.162
smpfl *	0.366	0 / 0.854	0.154

sample gas flow not analyzed in system zero mode

ANALOG INPUT 1

DATA	AVERAGE	RANGE	STDEV
ain1	0.373	-0.0159 / 4.7	1.17
ain1 *	0.0405	0.0265 / 0.0636	0.00843

analog input 1 measures dilution air flow in LPM
only recording proper data from 6/28 to 6/30

PMT VOLTAGE

DATA	AVERAGE	RANGE	STDEV
pmtv	694	690 / 846	8.07
pmtv *	691	-	-

pmt voltage stable in system zero mode
setpoint change on 6/29

ANALOG INPUT 2

DATA	AVERAGE	RANGE	STDEV
ain2	0.0194	0.00795 / 0.0504	0.00713
ain2 *	0.0176	0.0106 / 0.0292	0.00381

analog input 2 is not in service

LAMP INTENSITY

DATA	AVERAGE	RANGE	STDEV
rfint	132000	9270 / 165000	3070
rfint *	132000	124000 / 141000	2710

lamp intensity OK and degradation typical
fluctuations due to power source interruptions

ANALOG INPUT 3

DATA	AVERAGE	RANGE	STDEV
ain3	0.0225	0.0133 / 0.053	0.00627
ain3 *	0.0208	0.0133 / 0.0292	0.00272

analog input 3 is not in service

ADA-ES MERCURY CEMS WEEKLY SUMMARY

SYS ID # 82

LOCATION: PSNH MERRIMACK INLET

DATE: 02/25/2008

DOCUMENT REVISION: 0802

GAS MODE BREAKDOWN								
SERV	AUTO	SMPL	A CAL	O CAL	S CAL	OXY	BBK	REC *
OFF	ON	85%	0%	0%	3%	0%	2%	10%

COMPONENT POWER				
PRB	CNV	UMB	STNG	EDU
ON	ON	ON	ON	ON

CONFIGURED ALARMS					
HGT	HGO	HG2	PRES	FLOW	LAMP
1%	1%	2%	NO	ALL	NO

COMPENSATIONS		
LAMP	TEMP	PRES
ON	OFF	OFF

OTHER DATA			
PMT	L INT	FLOW	FSAFE
745	26484	0.20	177

COMMENTS	SIGN AND DATE
Calibration span response on the elemental channel very unstable. Orifice transducer in probe is broken. Average vacuum is high. Dilution and blowback pressure slightly unstable. Flow rate alarms are not set correctly. Lamp intensity slightly low. Total coefficient is low while elemental coefficient is high.	

ADA-ES MERCURY CEMS WEEKLY SUMMARY

SYS ID # 82

LOCATION: PSNH MERRIMACK INLET

DATE: 02/25 TO 03/03/2008

DOCUMENT REVISION: 0802

LAST RECORD OF WEEKLY SYSTEM INTEGRITY TEST – OXIDIZED MERCURY SOURCE									
— ELEM ONLY			— OXIDIZED ADD	— RECOVERY	CONC	HGT	HGO	HG2	OX %
					BASE	--	--	--	--
					OX	--	--	--	--
					REC	--	--	--	--
					SYS INTEGRITY CALCULATIONS				
					CALC	BASE	OX	EFF	% SPN
					HGT	--	--	--	--
					SPAN	--	--	--	--

GAS MODE BREAKDOWN								
SERV	AUTO	SMPL	A CAL	O CAL	S CAL	OXY	BBK	REC *
OFF	ON	85%	0%	0%	3%	0%	2%	10%

COMPONENT POWER				
PRB	CNV	UMB	STNG	EDU
ON	ON	ON	ON	ON

CONFIGURED ALARMS					
HGT	HGO	HG2	PRES	FLOW	LAMP
0%	0%	8%	NO	ALL	NO

COMPENSATIONS		
LAMP	TEMP	PRES
ON	OFF	OFF

OTHER DATA			
PMT	L INT	FLOW	FSAFE
744	25810	0.20	177

COMMENTS	SIGN AND DATE
Unit offline on 3/2. Elemental span responses are much worse than total span responses. Umbilical temperature massive spikes during the last hour, monitor for problems over next week. Dilution pressure and blowback pressure mildly unstable. Orifice pressure transducer is broken, spare should be on site.	

ADA-ES MERCURY CEMS WEEKLY SUMMARY

SYS ID # 82

LOCATION: PSNH MERRIMACK INLET

DATE: 03/03 TO 03/06/2008

DOCUMENT REVISION: 0802

GAS MODE BREAKDOWN								
SERV	AUTO	SMPL	A CAL	O CAL	S CAL	OXY	BBK	REC *
1%	ON	83%	0%	0%	3%	0%	2%	12%

COMPONENT POWER				
PRB	CNV	UMB	STNG	EDU
ON	ON	ON	ON	ON

CONFIGURED ALARMS					
HGT	HGO	HG2	PRES	FLOW	LAMP
5%	3%	67%	NO	ALL	NO

COMPENSATIONS		
LAMP	TEMP	PRES
ON	OFF	OFF

OTHER DATA			
PMT	L INT	FLOW	FSAFE
745	27508	0.20	177

COMMENTS	SIGN AND DATE
No mercury concentrations being measured on the probe. Elemental span response is unstable each day. Umbilical temperature spiked on 3/3. Dilution pressure is slightly unstable. Orifice transducer is broken, spare should be on site. On-site activities began on 3/6.	

ADA-ES MERCURY CEMS WEEKLY SUMMARY

SYS ID # 82

LOCATION: PSNH MERRIMACK INLET

DATE: 03/08 TO 03/17/2008

DOCUMENT REVISION: 0802

GAS MODE BREAKDOWN								
SERV	AUTO	SMPL	A CAL	O CAL	S CAL	OXY	BBK	REC *
OFF	98%	58% L	2%	1%	25%	0%	4%	9%

COMPONENT POWER				
PRB	CNV	UMB	STNG	EDU
99% F	99% F	ON	99% F	99% F

CONFIGURED ALARMS					
HGT	HGO	HG2	PRES	FLOW	LAMP
52%	50%	9%	4%	82%	NO

COMPENSATIONS		
LAMP	TEMP	PRES
99% F	OFF	OFF

OTHER DATA			
PMT	L INT	FLOW	FSAFE
747	27987	0.18	177

COMMENTS	SIGN AND DATE
Elemental span response is still very low and prohibits calibration, possible cause is contaminated venturi or inertial filter. No mercury concentrations measured in sample mode, possible cause is plugged stinger or stuck actuator. Pressures and temperatures are OK, or considered smaller issues. Lamp upgrade not installed.	

ADA-ES MERCURY CEMS WEEKLY SUMMARY

SYS ID # 82

LOCATION: PSNH MERRIMACK INLET

DATE: 03/13 TO 03/24/2008

DOCUMENT REVISION: 0802

GAS MODE BREAKDOWN								
SERV	AUTO	SMPL	A CAL	O CAL	S CAL	OXY	BBK	REC *
OFF	97%	78% L	0%	2%	7%	3%	2%	13%

COMPONENT POWER				
PRB	CNV	UMB	STNG	EDU
97% F	97% F	97% F	97% F	94% F

CONFIGURED ALARMS					
HGT	HGO	HG2	PRES	FLOW	LAMP
59%	60%	6%	0%	62%	NO

COMPENSATIONS		
LAMP	TEMP	PRES
97% F	OFF	OFF

OTHER DATA			
PMT	L INT	FLOW	FSAFE
747	26275	0.19	177

COMMENTS	SIGN AND DATE
Maintenance has been performed on the inlet system. The eductor was previously installed backwards and was causing no concentrations to be measured in sample mode. Eductor/venturi/filter also replaced to correct oxidation in fast loop. Lamp upgrade not installed. Dilution and blowback pres unstable.	

ADA-ES MERCURY CEMS WEEKLY SUMMARY

SYS ID # 82

LOCATION: PSNH MERRIMACK INLET

DATE: 03/24 TO 03/31/2008

DOCUMENT REVISION: 0802

GAS MODE BREAKDOWN								
SERV	AUTO	SMPL	A CAL	O CAL	S CAL	OXY	BBK	REC *
OFF	ON	85%	0%	0%	2%	0%	2%	12%

COMPONENT POWER				
PRB	CNV	UMB	STNG	EDU
ON	ON	ON	ON	ON

CONFIGURED ALARMS					
HGT	HGO	HG2	PRES	FLOW	LAMP
0%	0%	1%	NO	41%	NO

COMPENSATIONS		
LAMP	TEMP	PRES
ON	OFF	OFF

OTHER DATA			
PMT	L INT	FLOW	FSAFE
747	27368	0.19	177

COMMENTS	SIGN AND DATE
Dilution pressure is unstable, possible that it is on a 1-hour cycle with peaks. Umbilical temperature setpoint is high. Daily calibration checks are stable and accurate. Venturi pressure slightly fluctuates, increased after calibrations. System scheduled for demobilization soon.	

ADA-ES MERCURY CEMS WEEKLY SUMMARY

SYS ID # 92

LOCATION: PSNH MERRIMACK OUTLET

DATE: 02/25/2008

DOCUMENT REVISION: 0802

GAS MODE BREAKDOWN								
SERV	AUTO	SMPL	A CAL	O CAL	S CAL	OXY	BBK	REC *
OFF	ON	85%	0%	0%	3%	0%	2%	11%

COMPONENT POWER				
PRB	CNV	UMB	STNG	EDU
ON	ON	ON	ON	ON

CONFIGURED ALARMS					
HGT	HGO	HG2	PRES	FLOW	LAMP
0%	1%	1%	NO	NO	NO

COMPENSATIONS		
LAMP	TEMP	PRES
ON	OFF	OFF

OTHER DATA			
PMT	L INT	FLOW	FSAFE
635	33546	0.23	177

COMMENTS	SIGN AND DATE
Old interface board in probe controller causes umbilical temperature signal noise. Calibration span responses are very inconsistent on both total and elemental channels.	

ADA-ES MERCURY CEMS WEEKLY SUMMARY

SYS ID # 92

LOCATION: PSNH MERRIMACK OUTLET

DATE: 02/25 TO 03/03/2008

DOCUMENT REVISION: 0802

GAS MODE BREAKDOWN								
SERV	AUTO	SMPL	A CAL	O CAL	S CAL	OXY	BBK	REC *
OFF	ON	85%	0%	0%	3%	0%	2%	10%

COMPONENT POWER				
PRB	CNV	UMB	STNG	EDU
ON	ON	ON	ON	ON

CONFIGURED ALARMS					
HGT	HGO	HG2	PRES	FLOW	LAMP
10%	10%	10%	NO	NO	NO

COMPENSATIONS		
LAMP	TEMP	PRES
ON	OFF	OFF

OTHER DATA			
PMT	L INT	FLOW	FSAFE
635	32721	0.23	177

COMMENTS	SIGN AND DATE
Unit offline on 3/2. Elemental span responses are much worse than total span responses. Last calibration check on 3/3 did not function, recommend repeat calibration check. Dilution pressure briefly interrupted on 2/28.	

ADA-ES MERCURY CEMS WEEKLY SUMMARY

SYS ID # 92

LOCATION: PSNH MERRIMACK OUTLET

DATE: 03/03 TO 03/06/2008

DOCUMENT REVISION: 0802

GAS MODE BREAKDOWN								
SERV	AUTO	SMPL	A CAL	O CAL	S CAL	OXY	BBK	REC *
1%	ON	83%	0%	0%	3%	0%	2%	12%

COMPONENT POWER				
PRB	CNV	UMB	STNG	EDU
ON	ON	ON	ON	ON

CONFIGURED ALARMS					
HGT	HGO	HG2	PRES	FLOW	LAMP
93%	90%	94%	NO	NO	NO

COMPENSATIONS		
LAMP	TEMP	PRES
ON	OFF	OFF

OTHER DATA			
PMT	L INT	FLOW	FSAFE
636	33963	0.23	177

COMMENTS	SIGN AND DATE
<p>No mercury concentrations being measured on the probe. Umbilical temperature is unstable with old probe controller board. Chamber pressure steady increase. Venturi pressure is very high. On-site activities began on 3/6.</p>	

ADA-ES MERCURY CEMS WEEKLY SUMMARY

SYS ID # 92

LOCATION: PSNH MERRIMACK OUTLET

DATE: 03/03 TO 03/06/2008

DOCUMENT REVISION: 0802

GAS MODE BREAKDOWN								
SERV	AUTO	SMPL	A CAL	O CAL	S CAL	OXY	BBK	REC *
1%	ON	83%	0%	0%	3%	0%	2%	12%

COMPONENT POWER				
PRB	CNV	UMB	STNG	EDU
ON	ON	ON	ON	ON

CONFIGURED ALARMS					
HGT	HGO	HG2	PRES	FLOW	LAMP
93%	90%	94%	NO	NO	NO

COMPENSATIONS		
LAMP	TEMP	PRES
ON	OFF	OFF

OTHER DATA			
PMT	L INT	FLOW	FSAFE
636	33963	0.23	177

COMMENTS	SIGN AND DATE
No mercury concentrations being measured on the probe. Umbilical temperature is unstable with old probe controller board. Chamber pressure steady increase. Venturi pressure is very high. On-site activities began on 3/6.	

ADA-ES MERCURY CEMS WEEKLY SUMMARY

SYS ID # 92

LOCATION: PSNH MERRIMACK OUTLET

DATE: 03/10 TO 03/17/2008

DOCUMENT REVISION: 0802

GAS MODE BREAKDOWN								
SERV	AUTO	SMPL	A CAL	O CAL	S CAL	OXY	BBK	REC *
9%	ON	62% L	5%	0%	5%	0%	18%	9%

COMPONENT POWER				
PRB	CNV	UMB	STNG	EDU
99% F	99% F	ON	99% F	99% F

CONFIGURED ALARMS					
HGT	HGO	HG2	PRES	FLOW	LAMP
13%	24%	21%	3%	7%	NO

COMPENSATIONS		
LAMP	TEMP	PRES
87% F	OFF	OFF

OTHER DATA			
PMT	L INT	FLOW	FSAFE
634	33494	0.23	177

COMMENTS	SIGN AND DATE
<p>Mercury concentrations are lower than expected, this is related to the low calibration response. When the system can be recalibrated (currently have connection errors), the measured concentration should increase 2.5 times its current value (~ 4.7 hgt, 3.9 hg0).</p> <p>Dilution pres is unstable, check air supply.</p>	

ADA-ES MERCURY CEMS WEEKLY SUMMARY

SYS ID # 92

LOCATION: PSNH MERRIMACK OUTLET

DATE: 03/17 TO 03/24/2008

DOCUMENT REVISION: 0802

GAS MODE BREAKDOWN								
SERV	AUTO	SMPL	A CAL	O CAL	S CAL	OXY	BBK	REC *
OFF	ON	84%	0%	0%	3%	0%	2%	12%

COMPONENT POWER				
PRB	CNV	UMB	STNG	EDU
ON	ON	ON	ON	ON

CONFIGURED ALARMS					
HGT	HGO	HG2	PRES	FLOW	LAMP
1%	29%	2%	NO	NO	NO

COMPENSATIONS		
LAMP	TEMP	PRES
ON	OFF	OFF

OTHER DATA			
PMT	L INT	FLOW	FSAFE
634	31191	0.23	177

COMMENTS	SIGN AND DATE
Calibration factors very large change. Modifications made to the diluted sample line. Probe temperature became slightly more unstable after 3/21. Dilution pressure is unstable. Vacuum and venturi pressures are high. Elemental span response is fluctuating, recommend recalibration.	

ADA-ES MERCURY CEMS WEEKLY SUMMARY

SYS ID # 92

LOCATION: PSNH MERRIMACK OUTLET

DATE: 03/24 TO 03/31/2008

DOCUMENT REVISION: 0802

GAS MODE BREAKDOWN								
SERV	AUTO	SMPL	A CAL	O CAL	S CAL	OXY	BBK	REC *
OFF	ON	85%	0%	0%	2%	0%	2%	12%

COMPONENT POWER				
PRB	CNV	UMB	STNG	EDU
ON	ON	ON	ON	ON

CONFIGURED ALARMS					
HGT	HGO	HG2	PRES	FLOW	LAMP
1%	1%	2%	NO	NO	NO

COMPENSATIONS		
LAMP	TEMP	PRES
ON	OFF	OFF

OTHER DATA			
PMT	L INT	FLOW	FSAFE
634	31643	0.23	177

COMMENTS	SIGN AND DATE
Concentrations changed on 3/28. Elemental coefficient is high and total coefficient is low (split). Elemental span responses slightly noisy through the week. Dilution pressure is very unstable. Umbilical temperature setpoint is high. Venturi pressure is high. System scheduled for demobilization soon.	

APPENDIX F: Breen AbSensor Equipment Description

Breen AbSensor – SO₃ Sulfuric Acid Dewpoint Measurement Device

Breen Energy Solutions AbSensor – an SO₃ dewpoint measurement system which operates on the principle of controlling a boundary level temperature between the flue gas and the tip of the probe sensor. The probe module operates on the principle of a Breen patented technology which closely controls the cooling of condensate on the probe tip. Detection is accomplished by cooling an initially hot detector surface with a tightly controlled amount of cooling air. Since the amount of cooling air is closely controlled and monitored, it is possible to allow continual feedback and monitoring of the formation of liquids at the probe tip. Furthermore, the presence of a condensed liquid is determined by changes in the resistance between the probe electrodes. When current is sensed through the probe tip, the formation (or kinetic dew-point) has been achieved.

Once condensate has been detected, the cooling air is removed and the probe returns to the temperature of the surrounding flue gas. As the probe begins to heat again, the amount of current is reported back to the control unit. When the evaporation temperature of the liquid on the probe tip is reached, which is achieved when there is a rapid increase in the current on the probe surface, a cycle of the process is completed.

This relationship is used to determine the vapor dewpoint. This information is combined and compared to information with gas moisture levels using mathematical analysis to provide real time feedback. The detection process consists programmable logic control module which controls all functions of the induct probe as well as perform the required mathematical computations.¹

¹ Commentary courtesy of: <http://www.breenes.com/so3.htm>

104 Broadway Street | Carnegie | PA | 15106
Tel: 412-431-4499 | Fax: 412-431-4104
Email: Support@BreenES.com

EMISSIONS CONTROL PROCESS ENHANCEMENT
NOX | MERCURY | ASH QUALITY

AbSensor — SO₃

Sulfuric Acid/SO₃ Detection & Measurement

SO₃ FORMATION IN FLUE GAS STREAMS

There are many boiler operational parameters that influence the degree of total SO₃ formation. Among these are:

- Fuel sulfur content,
- Ash content and composition,
- Convective pass surface area,
- Gas and tube surface temperature distributions,
- Excess air level, and
- Coal fineness.

As a result the same coal burned in two different boilers, or in the same boiler at different operating conditions, can produce substantially different levels of SO₃. Assumption of the level of total SO₃ based on any one variable is clearly inadequate.

Direct Measurement of Sulfuric Acid Vapor

The *AbSensor* – *SO₃* condensables probe from Breen Energy Solutions is an industry proven instrument for measuring the concentration of sulfuric acid vapor in utility flue gas streams. It is effective in measuring acid vapor levels from the SCR outlet to the scrubber inlet and, by combination with gas moisture level, the corresponding levels of *SO₃*.

The system works by controlling the boundary layer temperature between the flue gas and the sensor tip of the instrument. Precisely controlled cycling between preset high and low temperatures results in accurate determination of the vapor dewpoint. Combining this information with gas moisture levels using proven mathematical analysis provides real time information on *SO₃* concentration.

THE CHALLENGE – CONTROL OF SULFURIC ACID

High sulfuric acid levels produce multiple detrimental effects including:

- Corrosion and fouling of heat exchangers and ductwork,
- Increased carbon emissions through elevated air heater outlet temperature and,
- Formation of acid mist in the stack plume.

Conversely, sulfuric acid has the beneficial effect of promoting fly ash collection in cold-side electrostatic precipitators. Successful control of sulfuric acid levels can have a significant impact on the overall performance of any electric generating unit.

Acid Vapor / SO₃ Relationship

The graph above is a well accepted representation of the relationship between SO₃ concentration, Sulfuric acid vapor dewpoint and flue gas moisture.

For applications related to acid condensation (Blue Plume and back end corrosion) it is actually more important to know the dewpoint than the SO₃ concentration. This is because the dewpoint provides the real-time summation of gas moisture, gas pressure and SO₃ level. Where the SO₃ concentration must be expressed in parts per million, addition of a moisture level variable is required.

Optimize SO₃ Processes with AbSensor-SO₃

There are a great many processes within the power plant environment that can be optimized by controlling sulfuric acid vapor concentration. These include:

- Heat rate improvement through control of the air heater cold end temperature,
- ESP back-end and duct corrosion avoidance through control of ESP outlet temperature,
- ESP performance improvement through control of acid dewpoint/ESP inlet temperature relationship,
- Blue Plume (acid mist) mitigation.

AbSensor – SO₃ Technology

The *AbSensor – SO₃* condensables probe measures conduction across a uniquely constructed probe surface resulting from condensed sulfuric acid below its dew point. The condensables measurement technique and probe designs are described in United States Patent No. 6,677,765

The detection process consists of cooling the initially hot detector surface by controlled application of cooling air. The descent rate is tightly controlled to allow continuous monitoring of condensate conditions on the probe tip. The presence of a condensed liquid phase is determined by the resistance between two electrodes. When current is detected, the kinetic dew-point (or formation) temperature has been reached.

Following detection of condensate, the cooling gas is removed and the probe is allowed to return to localized gas temperature. As the probe heats, the instantaneous current is measured and reported back to the controller. When the liquid evaporation temperature is reached (detected by a rapid decrease in probe surface current) the process has completed and a new measurement cycle is initiated.

Breen Energy Solutions offers full turn-key, closed-loop control solutions for each of these applications. Closed loop solutions may include:

- Process optimization using our multi-variable predictive controller, QuickStudy,
- DCS logic changes to accommodate the optimization strategy,
- DCS graphic interface modifications to allow user monitoring and control of the process,
- Application specific PLC code biasing
- Site specific process consulting to coordinate Breen optimization with existing plant processes (i.e., combustion, sootblowing)

The instrument reports two of the following variables back to the plant control room via 4-20 mA loop or OPC link:

- Formation Temperature
- Evaporation Temperature
- Dewpoint
- SO₃ Concentration

APPENDIX G: Sorbent Screening Device

Sorbent Screening Device

The sorbent screening device (SSD) is an extractive system designed to predict mercury removal performance in a full-scale ESP. A picture showing major components and CEM requirements is shown in Figure 1, and Figure 2 shows the internal components of probe box. The test apparatus consists mainly of the Thermo CEM probe box and a modified sampling train that includes an in-line test bed. The modified sample train contains a test bed, an inertial filter, dilution module and an orifice. The modified sample train is then returned to the normal Thermo CEM sample train for continuous on-line analysis and data capture.

The test beds consist of sand mixed with sorbent and ash in amounts representative of the ESP inlet particulate loading at the host site. The inertial separation probe separates the native fly ash from the sampled flue gas stream prior to the test beds. The on-line nature of the Thermo CEM located downstream of the test bed is used to monitor mercury levels not trapped by the test beds. Once the test trains are installed and leak checked, the assembly is heated (*the inertial filter is maintained at 400°F and the test beds are maintained at the flue gas temperature at the test location*) and flue gas is drawn through the assembly for a test period that typically lasts two hours for ESP studies or until break through of the test bed. Upon subsequent analyses, the mercury collected in the test beds can be used to determine the mercury removal efficiency of the sorbent and a mass balance determined to ensure test accuracy.

A further modification to analyze for temperature effects can be approximated by dropping the test bed temperature to simulate a lower flue gas temperature and its effects on sorbent performance.

Figure 1: SSD Components Requirements

Figure 2: Sketch of Modified Thermo CEM Probe with Test Bed Train

Sorbent Screening Tests

Sorbent screening tests were conducted on five sorbents at baseline conditions and during co-benefit tests to determine if lowering SO_3 levels through SO_3 sorbent injection and lowering flue gas temperatures enhances activated carbon performance. This extractive sorbent screening tool was developed by ADA-ES to quickly evaluate whether a sorbent will effectively remove mercury in the flue gas conditions at the plant. Four of the five sorbents were selected based on previous testing at another DOE test site with a high SO_3 flue gas stream. The fifth sorbent was NORIT DARCO[®] Hg, a non-brominated sorbent widely used as a benchmark sorbent.

The preliminary analysis showed that all sorbents were better at removing mercury when either MgO or Trona was injected for SO_3 control.

PSNH Round 1 SSD Testing: Test Matrix

Sorbent	Coil ?	Inlet Temperature	Bed Temperature
Darco Hg	NO	325	325
Darco Hg-LH	NO	325	325
Darco Hg-LH	NO	325	325
Darco E25c	NO	325	325
Darco E12	NO	325	325
FGS-1	NO	325	325
Darco Hg-LH	Yes	270	325
Darco Hg-LH	Yes	270	275

All sorbents loaded at 0.5 mg/ 5 g sand

Sorbent Screening

In this comparison with lowered CEA temperature, DARCO Hg- and DARCO Hg-LH appeared to perform similarly. FGS-1 did not appear to work as well.

APPENDIX H: CFD Modeling Report

CFD Modeling of Activated Carbon Injection at Merrimack Unit 2

Draft Topical Report

May 11, 2007

Prepared for

**ADA ES, Inc.
8100 Southpark Way, Suite B-2
Littleton, CO 80120**

Prepared by

**Reaction Engineering International
77 West 200 South, Suite 210
Salt Lake City, UT 84101**

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List of Acronyms

ACI	Activated carbon injection
AR	As received
Btu	British thermal unit
CAIR	Clean Air Interstate Rule
CAMR	Clean Air Mercury Rule
CFD	Computational fluid dynamics
DOE	Department of Energy
ESP	Electrostatic precipitator
FGC	Flue-gas conditioning
FGD	Flue gas desulphurisation
Hg	Mercury
HHV	Higher heating value
LSB	Low-sulfur bituminous
LOI	Loss on ignition
MMacf	Millions of actual cubic feet
MMBtu	Millions of Btu
MW	Megawatts
SCA	Specific collection area
SCR	Selective catalytic reduction
SO ₂	Sulfur dioxide

1.0 Introduction

1.1 Background

U.S. EPA has recently put in place limits on mercury emissions from U.S. coal-fired utilities, the largest remaining point-source category of emissions not currently regulated, with the Clean Air Mercury Rule of CAMR. The recent Clean Air Interstate Rule or CAIR specifies reductions in NO_x and SO₂ emissions, which are projected to result in a 40% reduction in mercury emissions in the utility sector by 2010, the start of Phase I of the CAMR. This mercury reduction is assumed to result from existing technologies, primarily as a co-benefit of reducing other pollutants such as NO_x, and SO₂, in 28 eastern states and the District of Columbia. Mercury-specific technology will be required in the U.S. to achieve 70% reductions in mercury emissions mandated by 2018 under the Clean Air Mercury Rule.

States are allowed flexibility in achieving the mercury reductions required under CAMR, including optional participation in the national mercury allowance-trading program. Any state that does not participate in the national program must establish regulations that set emission limitations and compliance schedules to meet their mercury budget. A bill has been enacted by the New Hampshire legislature that will require an 80% reduction in mercury emissions from the coal-fired power plants in New Hampshire by 2013.

In the last several years, demonstrations of a number of different mercury control technologies have been carried out in the US on commercial coal-fired power plants in anticipation of the control of mercury emissions from electricity generating plants, as promulgated by CAMR. Activated carbon injection is one technology that is considered close to commercial application. Other mercury control technologies are in various stages of development, from pilot-scale to long-term, full-scale demonstration.

ADA-ES, Inc., (ADA-ES) and Public Service of New Hampshire (PSNH) are working together under on a Cooperative Agreement (Number DE-FC26-06NT42780) with the Department of Energy to fully evaluate sorbent injection for mercury control at Merrimack Station Unit 2 (MK2). A goal of this project is to use sorbent injection to economically and effectively achieve mercury control of at least 70–90% beyond baseline capture for a period of six months. To achieve project objectives, a series of screening, baseline, and parametric tests were conducted to assess the potential for reducing mercury emissions. Based on the parametric testing of activated carbon injection, the project team will identify the mercury control scheme that satisfies the project objectives. If DOE/NETL approves this approach, a six-month long-term test is planned to establish steady state operation and assess any maintenance and operational problems that may develop.

1.2 Objectives

The objective of this study by Reaction Engineering International (REI) is to provide ADA ES with support for the DOE-funded sorbent injection program. In this report, the results and conclusions from the modeling study of the parametric testing are presented, together with recommendations for the six-month testing.

2.0 Methodology

2.1 CFD Model

The CFD model, *ADAPT*, developed by REI, employs a combination of Eulerian and Lagrangian reference frames. The flow field is assumed to be a steady-state, turbulent, reacting continuum field that can be described locally by general conservation equations. The governing equations for gas-phase fluid mechanics, heat transfer, thermal radiation and scalar transport are solved in an Eulerian framework. The governing equations for particle-phase mechanics are solved in a Lagrangian reference frame. The overall solution scheme is based on a particle-in-cell approach.

The flow solver in *ADAPT* is an adaptive grid algorithm that uses an orthogonal grid with local-mesh refinement. A structured-base grid is input, and grid refinements are performed within *ADAPT*. Cells that are tagged for refinement are divided into eight smaller cells. Cells are tagged for refinement either manually via user input, when needed to resolve geometry, or automatically within the code, based on gradients in field variables in the solution.

The flow model of the *ADAPT* code uses a SIMPLEM algorithm.¹ This algorithm is similar to SIMPLER,² except that the mass-satisfying flow field defined on the cell faces is calculated from the pressure equation directly in lieu of a pressure-correction equation. The momentum equations are solved in a collocated manner so that the velocity field is stored at the cell centers. Velocities from the discretized equations, without the pressure gradient source term, are interpolated to the cell faces via a momentum interpolation. The pressure field, which is also stored at cell centers, is solved from the continuity equation discretized over the cells. The resulting pressure gradient sources are then added to the interpolated face velocities, resulting in a flow field at the faces that satisfies mass conservation. The discretized partial differential equations are solved using an algebraic multi-grid strategy.

Gas properties are determined through local mixing calculations and are assumed to fluctuate randomly to characterize the effects of turbulence. Turbulence is modeled with a two-equation k - ϵ model.

Sorbent particle mechanics are computed by following the mean path for a discretized group of particles, or particle cloud, in a Lagrangian reference frame. The dispersion of the particle cloud is based on statistics gathered from the turbulent flow field. Heat, mass and momentum transfer effects are included for each particle cloud. The properties of the particle cloud are computed from a statistical average over the particles within the cloud. The properties of the local gas field are computed with an analogous ensemble averaging procedure. Particle mass and momentum sources are converted from a Lagrangian to an Eulerian reference frame by considering the residence time of each particle cloud within the computational cells.

2.2 Mercury Adsorption Model

The gas concentration of Hg^0 and HgCl_2 is modeled by solving Eulerian conservation equations with sink terms calculated from the Lagrangian sorbent particle model.

Sorbent particles are assumed to be spherical particles. Mass transfer is expressed by the Sherwood number:

$$Sh = k_g d / D$$

where k_g is the gas-phase mass transfer rate, d is the particle diameter and D is the gas-phase diffusivity of mercury. The Sherwood number is related to the Reynolds and Schmidt numbers by:

$$Sh = 2 + 0.6 Re^{1/2} Sc^{1/3}.$$

Both Hg^0 and $HgCl_2$ are assumed to be present in the flue gas. Each species is treated separately in terms of gas-phase diffusivity and adsorption on the activated carbon.

As yet there are no data on the intrinsic adsorption of mercury species on the surface of activated carbon. The porous nature of activated carbon complicates matters. Adsorption isotherms have been measured in fixed-bed situations, but in such situations intrinsic reaction of mercury species with the surface is lumped with pore diffusion. In this work, a “lumped” adsorption model is used because it can be validated against available data.

The Freundlich isotherm was chosen to model mercury adsorption because it allows for heat of adsorption decreasing exponentially with surface coverage, unlike the Langmuir isotherm, which assumes a constant heat of adsorption constant. The Freundlich isotherm was also used by Meserole et al.³ in the creation of a simplified entrained-flow mercury adsorption model.

The Freundlich isotherm specifies the relationship between the concentration of Hg that is in sorbent (W^*) in equilibrium with surface gas-phase Hg concentration (C^*) as follows:

$$W^* = [1/K][C^*]^{1/n}$$

where K and n are parameters that are derived from fixed-bed adsorption isotherms as described below.

The activated carbon particles are tracked in the CFD code and treated as a sink for gaseous mercury. The flux to an individual activated carbon particle is computed by solving equations for mass transfer and material balance, which depend on the particle diameter, the local mercury species concentration (Hg^0 or $HgCl_2$) in the gas and the adsorption isotherm parameters. At each node of the CFD calculation, the concentrations of mercury species in the gas and the mercury content of the sorbent particles are calculated. The molecular diffusivity of mercury in the gas at 150°C was assumed to be $2.55 \times 10^{-5} \text{ m}^2/\text{s}$ and $1.63 \times 10^{-5} \text{ m}^2/\text{s}$ for Hg and $HgCl_2$, respectively. Diffusivity was assumed to be proportional to $T^{3/2}$, where T is gas temperature.

3.0 Model Set-up and Inputs

3.1 Merrimack Unit 2 Description

Table 1 provides a general description of the configuration and operating conditions at MK2. MK2 fires a low-sulfur blend of medium-sulfur eastern bituminous and Venezuelan coals for SO₂ control, which typically has 1.2% sulfur (see Table 2 for coal information used in the simulation). As shown in Figure 1, the unit has an SCR for NO_x control and two cold-side ESPs in series for particulate control. The first ESP is referred to as the “Old” ESP and the second as the “Supplemental” ESP. Because of the SCR catalyst, the SO₃ concentration in the flue gas downstream of the tubular air preheater is 15-20 ppm (as measured in the DOE program). The gas temperature downstream of the air preheater is about 330°F.

Table 1. Merrimack Unit 2 Description.

Size (MW)	335
Coal	Blend of eastern bituminous and Venezuelan (1.2% sulfur mix)
Particulate Control	Two (2) ESPs in series
SCA (ft²/kacfm)	SCA = 350 (120 followed by 230)
NO_x Control	SCR
Sulfur Control	Coal blend
Ash Reuse	Furnace Reinjection or off-site beneficial reuse
Typical Inlet Mercury (µg/dNm³)	7–10
Typical Native Mercury Removal (%)	0–10

Table 2. Coal properties used in simulation.

	Mid-Sulfur Coal	Low-Sulfur Coal	50-50 Blend
Carbon, wt% dry	78.0	80.5	79.3
Hydrogen, wt% dry	5.0	5.0	5.0
Oxygen, wt% dry	5.8	5.8	5.8
Nitrogen, wt% dry	1.6	1.3	1.4
Sulfur, wt% dry	2.0	0.7	1.4
Moisture, wt% AR	6.3	6.9	6.6
Ash, wt% AR	7.1	6.2	6.6
HHV, Btu/lb AR	13,048	13,307	13,178
Hg, ug/g dry	0.15	0.05	0.094

Figure 1. MK2 schematic, showing sorbent injection and mercury measurement locations.

Table 3 details the flue gas properties used in the model. Flue gas compositions and flow rate were computed from the coal analysis and the reported excess O₂ at the air preheater outlet. Mercury was assumed to be 85% HgCl₂ and 15% Hg⁰, based on observations made during the DOE program.

Table 3. Combustion and flue gas properties.

Boiler Heat Input, MMBtu/hr	3,228
Coal Flow, klb/hr	245
Combustion Air Flow, klb/hr	3,182
Overall Furnace Stoichiometric Ratio	1.30
Excess O ₂ in Flue Gas (vol.% dry)	4.9
Total Flue Gas Flow, klb/hr	3,411
Flue Gas Composition (vol.% wet):	
O ₂	4.55%
N ₂	75.00%
CO ₂	13.14%
H ₂ O	7.23%
SO ₂ (ppmv)	1,040
HCl (ppmv)	55
Hg ⁰ (mass fraction)	9.457x10 ⁻¹⁰
HgCl ₂ (mass fraction)	7.254x10 ⁻⁹

3.2 Mercury Adsorption Capacity

Measured fixed-bed equilibrium capacity data were fit to an equation of this form:

$$\text{Capacity} = SA \cdot k_1 \cdot [\text{HCl}] e^{(A/T)} / \{1 + k_2 \cdot [\text{SO}_3] e^{(B/T)}\}$$

Where capacity is in $\mu\text{g/g}$ (assumed at $\text{Hg} = 50 \mu\text{g/dscm}$), SA is the surface area of the carbon in m^2/g , [HCl] and $[\text{SO}_3]$ are the concentrations of HCl and SO_3 , respectively, in ppm, T is temperature in degrees Kelvin. The fixed-bed data for Darco Hg sorbent in Table 1 were used to develop the coefficients described below.

Table 4. Fixed-bed capacity data.

	T, °F	HCl, ppmv	SO_3 , ppmv	SO_2 , ppmv	Capacity, $\mu\text{g/g}$
Pleasant Prairie, with SO_3 FGC	250	0.7	15	425	883
Pleasant Prairie, with SO_3 FGC	300	0.7	15	425	425
Pleasant Prairie, no SO_3 FGC	250	0.7	0.1	425	8823
Pleasant Prairie, no SO_3 FGC	300	0.7	0.1	425	3355
Conesville	325	18	30	2400	219
Conesville, low SO_3	325	18	5	2400	625
Abbott	325	151	28	2800	480
Abbott	375	151	28	2800	146
Brayton Point, with SO_3 FGC	275	105	20	450	1380
Brayton Point, no SO_3 FGC	275	105	5	450	4314

The coefficients of the fit were

$$k_1 = 6.714 \times 10^{-6}$$

$$A = 5886.338$$

$$k_2 = 9.031 \times 10^{-3}$$

$$B = 1682.042$$

The surface area was assumed to be $660 \text{ m}^2/\text{g}$. Figure 1 shows the observed and predicted capacities, with $r^2 = 0.93$. This equation was used to estimate capacities for Merrimack (Table 5). Note that Darco Hg and Darco Hg-LH sorbents performed similarly at Merrimack, so the Darco Hg equation was used to calculate all capacities.

Figure 2. Observed and predicted equilibrium capacity.

Table 5. Predicted capacities for Merrimack model.

T, °F	HCl, ppmv	SO ₃ , ppmv	SO ₂ , ppmv	Capacity, µg/g
330	55	20	1040	430
330	55	8	1040	722
300	55	8	1040	1249

These equilibrium capacities are related to the Freundlich parameters, giving values for the parameter K. In this simulation, Hg^0 and HgCl_2 were assumed to have the same capacity. The parameter n was set to 1 for most of the simulations, with the exception of one case, as described below.

3.3 Activated Carbon Injection System

In the CFD simulations, several different configurations of injection lances were evaluated. Activated carbon was injected between the Old ESP and the Supplemental ESP using four existing ports in the top of the outlet plenum of the Old ESP. In each port, there were two pipes that extended down, with three holes in each pipe. The sizes and locations of the holes varied from case to case (as discussed below). Figure 3 illustrates how the injectors were deployed with respect to the flue gas flow.

Each port had two multi-port lances made of 1 1/4 " Schedule 40 pipe, one injecting in the upper portion in the duct and one in the lower portion. The lances had nine injection nozzles every 15 inches, with the lowest nozzle being 32.5 inches above the bottom of the duct. Thus, there were 18 nozzles located at each port location. The diameter of individual nozzles was 0.3".

Figure 3. Location of injectors and individual nozzles.

Table 6. Carbon injection rates for modeling cases.

Case	Temperature, °F	Sorbent Capacity, $\mu\text{g/g}$ at 50 $\mu\text{g/m}^3$	Carbon Loading, lb/MMacf	Total Carrier Air, lb/hr	Total Carbon Flow, lb/hr	Comments
Case 1A	330	430	3	300	199	
Case 1B	330	430	5	300	332	
Case 2A	330	722	3	300	199	
Case 2B	330	722	5	300	332	
Case 3A	300	1249	3	300	193	
Case 3B	300	1249	5	300	332	
Case 4	300	1249	5	300	321	n=0.5
Case 5A	300	1249	3	300	193	Higher flow rates to 32,33
Case 5B	300	1249	5	300	332	Higher flow rates to 32,33

The total carbon and carrier air flow rates in Table 6 were not divided equally among all the ports. For Cases 1 through 4, the carbon and air distribution was as follows:

- Port 24 – 10%
- Port 33 – 20%
- Port 32 – 20%
- Port 31 – 25%
- Port 30 – 25%

For Case 5, the higher carbon flow rates were assigned to Ports 33 and 32 as follows:

- Port 24 – 10%
- Port 33 – 25%
- Port 32 – 25%
- Port 31 – 20%
- Port 30 – 20%

The size distribution of the activated carbon is given in Table 7. The sorbent has been partitioned into a series of bins. The mean diameter and mass fraction in each bin are shown in the table.

Table 7. Sorbent size distribution.

Size Bin	Diameter, micron	Mass Fraction
1	2.0	0.050
2	2.9	0.050
3	5.0	0.088
4	10.0	0.138
5	18.6	0.177
6	44.0	0.374
7	55.5	0.079
8	60.9	0.020
9	74.0	0.023

3.4 Computational Grid

Figure 4 shows the computational grid used for the CFD modeling, which begins at the outlet of the Old ESP and extends to the inlet (perforated plate) of the Supplemental ESP. The transitional duct between the two ESPs has a series of turning vanes, as shown in the figure. There are also vanes in the inlet and outlet plenums shown.

Figure 4. Computational grid for CFD model.

4.0 Results and Discussion

Examination of the CEM data from the parametric testing suggested that not all the mercury capture from activated carbon injection occurred in-flight. During parametric testing, activated carbon was turned on for one or more hours, while mercury CEMs were used to continuously monitor the inlet and the outlet mercury concentrations. Figure 5 gives an example of CEM data during parametric testing. The straight blue lines indicate the sorbent injection rates. The dark blue line shows the mercury concentration at the inlet of the Supplemental ESP, while the light blue line shows the mercury concentration at the outlet. The green line indicates the calculated mercury removal.

When the activated carbon injection is turned off, the outlet mercury concentration increases immediately, but does not come back up to the inlet concentration for some time. Some of the mercury capture, therefore, was not happening because of the in-flight removal. This phenomenon has been noted before, during the parametric carbon injection tests at Pleasant Prairie, Unit 2.⁴ The non-in-flight removal may be caused by deposition of carbon on surfaces in the duct work.

Figure 5. Mercury concentrations (blue) and removal (green) as a function of time during parametric testing.

From CEM data, like that shown in Figure 5, the amount of non-in-flight removal can be quantified. Figure 6 shows the non-in-flight removal as a function of sorbent injection rate, with and without trona injection. At lower SO_3 concentrations, the sorbent appears capture mercury more effectively, whether in-flight or not.

Figure 6. Non-in-flight capture of mercury as a function of sorbent injection rate.

Five CFD cases were completed, as summarized in Table 8. Selected results will be discussed here; detailed modeling results can be found in the appendix.

Table 8. Predicted mercury removal.

	%Removal (In-Flight)			Max. Removal*	Fraction of Max. Removal	Est. Non-In-flight	Total Removal
	Hg ⁰	HgCl ₂	Total Hg				
Case 1A	18.3%	15.9%	16.3%	29.3%	0.56	3.2%	19.5%
Case 1B	27.3%	23.8%	24.3%	40.8%	0.59	5.2%	29.5%
Case 2A	24.3%	20.9%	21.5%	41.0%	0.52	6.5%	28.0%
Case 2B	35.4%	30.4%	31.2%	53.6%	0.58	10.9%	42.1%
Case 3A	31.7%	27.0%	27.7%	54.6%	0.51	6.5%	34.2%
Case 3B	44.7%	37.9%	38.9%	66.7%	0.58	10.9%	49.8%
Case 4	3.1%	13.7%	12.7%	17.1%	0.71	6.5%	19.2%
Case 5A	31.3%	28.0%	28.5%	54.6%	0.52	6.5%	35.0%
Case 5B	43.8%	39.8%	40.4%	66.7%	0.61	10.9%	51.3%

*Based on carbon capacity, loading, and initial Hg concentration, assuming no mass-transfer limitations

Figure 7 gives the distribution of gas velocity in the ductwork with injection of activated carbon. The gas velocity at the outside of the first turn after the Old ESP (in the vicinity of Port 30) is higher than at the inside of the first turn. This inequality in velocity continues through the transitional duct.

Figure 7. Velocity distribution.

The “maximum” mercury removal, can be estimated based on the assumed capacity of the activated carbon, the carbon loading, and the actual mercury concentration in the flue gas, assuming that there are no limitations on mixing or mass transfer. The maximum removal is predicted to be 67% at 5 lb/MMacf and a sorbent capacity of 1249 ug/g. This capacity was chosen to correspond to Darco Hg sorbent at 300°F with low SO₃ in the flue gas. The capacity of the sorbent imposes an upper bound on mercury removal at MK2. Sorbent capacity could be increased by lowering the temperature, by further lowering the SO₃ in the duct, or by using a different sorbent.

The maximum removal is on the order of 67%, but the best CFD modeling case predicts only 40% removal, or 61% of the maximum removal. Limitations on mass transfer, on residence time, and on distribution of sorbent along the flue gas path could contribute to the difference between maximum and predicted removal.

The turning vanes in the transitional duct between the Old ESP outlet plenum and the Supplemental ESP inlet plenum limit the mixing of the sorbent across the width of the duct. The gap between the lowest injection nozzle and the floor of the duct results in little sorbent in the region that is 2 to 3 feet from the bottom of the duct.

Figure 8 compares the mean particle trajectories at 5 lb/MMacf for Case 1 (higher carbon flow to Ports 30 and 31) and Case 5 (higher carbon flow to Ports 33 and 32). Particle residence times are 3 to 4 seconds. Sorbent is more concentrated and particle residence time is longer on one side of inlet to Supplemental ESP. Biasing sorbent flow to Ports 33, 32 appears to improve uniformity somewhat.

Figure 8. Mean particle trajectories at 5 lb/MMacf.

Figure 9 compares the HgCl_2 concentrations at 5 lb/MMacf and the higher sorbent capacity (1249 $\mu\text{g/g}$). As with Figure 7, Case 1 has higher carbon flow to Ports 30,31, while Case 5 has higher carbon flow to Ports 33,32. The mercury concentrations are higher on the bottom of the duct, because of the gap between the lowest nozzles and the bottom of the duct. The predicted Hg concentration is lower on one side of the inlet to Supplemental ESP due to high sorbent concentration and longer residence time on that side. Biasing flow to injectors 33,32 (Case 5) improves uniformity

For all cases, the predicted removal of Hg^0 was higher than HgCl_2 , which suggests that mass transfer to the sorbent particle surface was a factor in the difference, since the molecular diffusivity of Hg^0 was about 35% higher than that of HgCl_2 . Mass transfer limitations on sorption are more significant for larger particles. Thus, reducing the mass mean diameter of the sorbent could produce improvement in mercury sorption.

Figure 9. Mass fraction of HgCl_2 at 5 lb/MMacf and a sorbent capacity of 1249 $\mu\text{g/g}$.

The CFD model predicts the mercury removal that occurs in flight. However, as discussed above, there is evidence that additional mercury removal occurs, which does not take place in flight. In Figures 10 through 12, the predicted mercury removals are shown as a function of carbon injection rate. The lines show the maximum removal (no mass-transfer limitations), the in-flight removal from the CFD model, and the total removal, which is the in-flight plus non-in-flight removal (see Figure 6). The sorbent capacities and temperatures used in the model were chosen to correspond to conditions with and without trona injection. Mercury removal derived from parametric sorbent injection are shown in the figures as symbols. When the modeling results are adjusted to include non-in-flight removal, the modeling results correspond well to the observed parametric results.

Figure 10. Mercury removal as a function of ACI rate, at 330°F with no trona injection.

Figure 11. Mercury removal as a function of ACI rate, at 330°F with trona injection.

Figure 12. Mercury removal as a function of ACI rate, at 300°F with trona injection.

The modeling results in the figures above are based on an adsorption isotherm using an exponent of 1. The exponent in the Freundlich isotherm is an indicator of the reactivity of the sorbent, which might be important for in-flight capture (though not so important for fixed-bed capture).

In modeling the sorbent injection demonstration at Conesville Unit 5, as part of a different DOE-funded demonstration program, an exponent of 0.5 provided a good fit to the observed mercury removal, when combined with a fixed-bed breakthrough capacity based on flue-gas measurements. However, at MK2, an exponent of 1 provided a better fit to the experimental data, again, when the breakthrough capacity was estimated for the specific conditions in the flue gas. At Conesville, the HCl concentration in the flue gas was estimated to be low (~ 15 ppmv), whereas at MK2 the HCl concentration was estimated to be considerably higher (~55 ppmv). The HCl concentration in the flue gas may be a factor in “conditioning” the carbon surface. If an adsorption isotherm is used to model Hg adsorption, then low HCl concentrations might be better modeled using a lower value of the exponent (as at Conesville).

Future development of the single-particle adsorption model should include incorporation of more detailed surface chemistry, which would represent a different approach to the isotherm approach.

5.0 Conclusions

Five design cases have been modeled. When the modeling results are adjusted to include non-in-flight removal, the modeling results correspond well to the observed parametric results in terms of mercury removal.

The capacity of the sorbent imposes an upper bound on the predicted mercury removal at MK2. Sorbent capacity could be increased by lowering the temperature, by further lowering the SO_3 in the duct, or by using a different sorbent.

In-flight capture of mercury is predicted to be as much as 61% of the maximum achievable removal based on the assumed sorbent capacity, but without mass transfer limitations. Mass transfer to the sorbent particle surface appeared to be a factor in the limitations on mercury sorption. Reducing the mass mean diameter of the sorbent could produce improvement in mercury sorption.

6.0 References

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Appendix

Detailed CFD Modeling Results

Gas Velocity (Case 1A) – 3 lb/MMacf

Gas Velocity (Case 1B) – 5 lb/MMacf

Particle Trajectory (Case 1A) – 3 lb/MMacf

Particle Trajectory (Case 1B) – 5 lb/MMacf

Particle Trajectory (Case 5A) – 3 lb/MMacf

Different sorbent distribution – higher AC to Ports 33, 32

Particle Trajectory (Case 5B) – 5 lb/MMacf

Different sorbent distribution – higher AC to Ports 33, 32

Sorbent Mass Density (Case 1A) – 3 lb/MMacf

3 lb/MMacf, 330°F, low capacity

Sorbent Mass Density (Case 1B) – 5 lb/MMacf

5 lb/MMacf, 330°F, low capacity

Sorbent Mass Density (Case 5A) – 3 lb/MMacf

Different sorbent distribution – higher AC to Ports 33, 32

Sorbent Mass Density (Case 5B) – 5 lb/MMacf

Different sorbent distribution – higher AC to Ports 33, 32

Hg° Mass Fraction (Case 1A)

3 lb/MMacf, 330°F, low capacity

Hg° Mass Fraction (Case 1B)

5 lb/MMacf, 330°F, low capacity

Hg° Mass Fraction (Case 2A)

3 lb/MMacf, 330°F, high capacity

Hg° Mass Fraction (Case 2B)

5 lb/MMacf, 330°F, high capacity

Hg° Mass Fraction (Case 3A)

3 lb/MMacf, 300°F, high capacity

Hg° Mass Fraction (Case 3B)

5 lb/MMacf, 300°F, high capacity

Hg° Mass Fraction (Case 4)

5 lb/MMacf, 300°F, high capacity, $n=0.5$ (low reactivity)

Hg° Mass Fraction (Case 5A)

3 lb/MMacf, 300°F, high capacity, different sorbent distribution

Hg° Mass Fraction (Case 5B)

5 lb/MMacf, 300°F, high capacity, different sorbent distribution

HgCl₂ Mass Fraction (Case 1A)

3 lb/MMacf, 330°F, low capacity

HgCl₂ Mass Fraction (Case 1B)

5 lb/MMacf, 330°F, low capacity

HgCl₂ Mass Fraction (Case 2A)

3 lb/MMacf, 330°F, high capacity

HgCl₂ Mass Fraction (Case 2B)

5 lb/MMacf, 330°F, high capacity

HgCl₂ Mass Fraction (Case 3A)

3 lb/MMacf, 300°F, high capacity

HgCl₂ Mass Fraction (Case 3B)

5 lb/MMacf, 300°F, high capacity

HgCl₂ Mass Fraction (Case 4)

5 lb/MMacf, 300°F, high capacity, $n=0.5$ (low reactivity)

HgCl₂ Mass Fraction (Case 5A)

3 lb/MMacf, 300°F, high capacity, different sorbent distribution

HgCl₂ Mass Fraction (Case 5B)

5 lb/MMacf, 300°F, high capacity, different sorbent distribution

APPENDIX I: Sample and Data Management Plan

DEPARTMENT OF ENERGY EVALUATION OF CONTROL STRATEGIES TO EFFECTIVELY MEET 70-90% MERCURY REDUCTION ON AN EASTERN BITUMINOUS COAL, CYCLONE BOILER WITH SCR FIELD EVALUATION

DOE Test DE-FC26-06NT42780

Sample Collection and Management Plan

Prepared by:

ADA Environmental Solutions, Inc.
8100 SouthPark Way, Unit B
Littleton, CO 80120

July 10, 2006

ADA-ES, Inc. is conducting an DOE supported R&D test utilizing a variety of methods including sorbent injection for mercury control at PSNH's Merrimack Station. The overall objective of this project is to determine the cost and effects of sorbent injection for control of mercury in stack emissions and evaluating the utilization of alternative means to minimize or enhance sorbent injection.

During the evaluation, fuel samples and certain process byproducts will be collected for determination of mercury content, stability, and other analytes. Process byproduct of primary interest is fly ash; however, other process byproducts may also be collected.

Sample and data management are needed for tracking approximately 1000 samples from various solid process streams at Merrimack Station. ADA-ES has developed a Sample and Data Management System (SDMS) that will store test data from the evaluation. These data can be used to generate reports, track sample history, and input results from laboratory analyses.

ADA-ES will also store plant operational data and other test data during the evaluation. Pertinent plant operating parameters will be logged electronically. For data control and security, full access will be limited to the project, site, and sample manager at ADA-ES as well as the PSNH designated representative. Operators collecting samples will be able to upload information to the database and print sample labels and Chain-of-Custody forms. ADA-ES will include results with regularly issued reports to the test team.

Sampling Locations

Samples of various gaseous and solid process streams will be collected during the evaluation. Specific flue gas samples are not included in this document. Sampling locations for Merrimack Station Unit 2 are shown in Figure 1.

Figure 1. Merrimack Station Unit 2 Configuration and Sampling Locations.

Sample Collection

Coal and combustion byproducts will be collected during the mercury control evaluation. Samples will be segregated by the test condition (baseline, each parametric test and long term). Collecting a representative sample is the primary objective of the sampling strategy. Representative samples will be collected only under stable and normal operating conditions unless otherwise directed by ADA-ES personnel.

Sample Streams

Coal Samples – Daily coal sampler samples will be collected by the plant from the coal conveyor that feeds the Unit 2 coal silos. Merrimack plant personnel will collect the sample between 2:00 am and 7:00 am, thus representing the coal fired between 10:00am and 4:00pm. ADA-ES will provide the sample schedule and sample bottles.

ESP Fly Ash – Grab samples of ash will be collected from each row of ESP hoppers each day of testing. Samples will be segregated by the test condition (Baseline, each Parametric test, Long Term). The samples will be stored in 1-quart sample containers for shipping to the analytical laboratories.

The schedule indicates sampling from multiple rows and multiple hoppers of the same row of the ESPs. These samples will be used to determine if stratification exists throughout the system and to compare ash properties across the flow of the flue gas stream. A sketch showing the collection fields from the ESP is shown in Figure 2. The shaded hoppers indicate the collection fields from which fly ash samples will be collected.

During testing, ADA-ES will coordinate ash sampling and hopper emptying activities with plant operations.

During Baseline testing, two sample sets will include ash collection from all ESP hoppers. This will provide a Baseline standard, and ensure that deviations in ash mercury content are acceptable on a day to day basis.

Per DOE request, a 55-gal drum of ESP ash will be collected from the inlet row of the ESP downstream of where sorbent will be injected. One drum will be collected during Baseline testing, and a second drum will be collected during Long Term testing while injecting. Preferably, both drum collections will be an even weighting of the inlet row and occur with the unit at full load.

Figure 2. ESP Hopper Layout and Sampling Locations.

If possible, plant personnel may collect a fly ash sample inside the ESP at the end of the testing period. This sample should be collected from any surface structures (e.g., ledges, corners) that are capable of holding fly ash material in place for a long period of time. This sample should be exposed to coal-derived flue gas for long periods of time. This sample will be analyzed for metals content (e.g., Hg, As, Se) to help determine if these toxics accumulate over time and surpass any recommended exposure limits.

Other Hopper Samples – PSNH Merrimack will provide samples from all hopper collection devices on Unit 2. These include the:

- SCR Inlet and Outlet hoppers (SCR hoppers refer to both inlet and outlet)
- Economizer hoppers
- Bottom Ash from the Sluice Line Outfall
- Air Heater hoppers

In addition, the plant will provide approximate re-injection rates for re-injected materials. The ash collected from these hoppers will be evaluated throughout the test program to assess whether the information gained through the analysis of these samples is pertinent to the testing.

Table 1. Tentative Sampling Schedule.

Test Condition	Type	Frequency	Comments
Process Optimization and SO₃ Co-Benefits Analysis	Coal	Daily during morning bunkering	1 liter
	ESP Ash	Daily: Hoppers Each Row (e.g.ESP1: 1, 2, 3, 4, 6, 10; ESP2: 1, 2, 3, 4, 5, 6, 8, 11) 2 samples per week: All inlet hoppers, same back row hoppers as above Weekly: One Inlet Hopper	1 liter 1 liter5 gallon - Samples
	SCR, Econ, AH Hoppers	Daily	1 liter
	Slag sluice	2 samples per week	1 liter
Baseline	Coal	Daily during morning bunkering	1 liter
	ESP Ash	Daily: Hoppers Each Row (e.g.ESP1: 1, 2, 3, 4, 6, 10; ESP2: 1, 2, 3, 4, 5, 6, 8, 11) 2 samples per week: All inlet hoppers, same back row hoppers as above Weekly: One Inlet Hopper All Hoppers Front Row of ESP2 (each)	1 liter 1 liter 5 gallon 1 liter 55-gal drum
	SCR, Econ, AH Hoppers	Daily	1 liter
	Slag sluice	2 samples per week	1 liter
Parametric	Coal	Daily	1 liter
	ESP Ash	Daily: Hoppers Each Row (e.g.ESP1: 1, 2, 3, 4, 6, 10; ESP2: 1, 2, 3, 4, 5, 6, 8, 11)	1 liter
	Other Hoppers**	Daily	1 liter

Long-Term***	Coal	Daily during morning bunkering	1 liter
	ESP Ash	Daily: One Hopper Each Field, Middle Row	1 liter
		2 samples per week: All Inlet Hoppers	1 liter
		Weekly: One Inlet Hopper	5 gallon – Samples
		Front Row of ESP2	55-gal drum
	Bottom Ash*	2 samples per week	1 liter
	Other Hoppers	Daily	1 liter

- Bottom Ash – Sample frequency to be evaluated per relevancy to test results
- **Other Hoppers include SCR inlet and outlet hoppers, economizer hopper, and air heater hopper.
- ***Long Term Sampling will change frequency based on Variability of sample results: less variability will mean less sampling frequency.

Sample Management Strategy

During the mercury control evaluation, Merrimack plant personnel, as directed by ADA-ES, will collect the coal samples. ADA-ES personnel will collect the in-situ fly ash samples. The ADA-ES site manager will deliver a sampling schedule, which shows the sampling times, volume, and specific samples to collect during each testing day. A sample management flow chart is shown in Figure 3.

Figure 3. Sample Management Flowchart.

Once the samples have been collected, they will be delivered to ADA-ES personnel to be sealed and labeled. The samples will be logged into a database and given a sample identification number. Authorized project team members will have access to the database to see which samples have been collected and are available for testing.

Once the samples have been sealed and labeled, ADA-ES personnel will generate a Chain-of-Custody (COC) form to be delivered with each shipment of samples. The COC will be used

for sample tracking and identification. Although ADA-ES will not enforce the strict COC procedures (e.g., signatures to release sample custody, controlled access), all pertinent information will be recorded.

The samples, along with a COC, will be shipped to the ADA-ES laboratory for storage. Once received, ADA-ES will identify samples for mercury and other analyses. Other analyses will include ultimate and proximate analyses for coal and elemental analyses for coal and ash samples (including chlorine and fluorine contents).

Sample Analysis

Although previous tests from other programs have shown that the byproducts are extremely stable, it is important to continue evaluating these byproducts for each condition using well-established and documented techniques, and new techniques designed to perform even more robust analyses of the byproducts. Additional ash samples will be collected and archived for other tests, including tests requested by EPA, DOE, and independent companies approved by DOE. No samples will be shipped to outside firms without prior approval of PSNH and DOE.

Standard leaching test methods conducted on the fly ash samples will include the Toxicity Characteristic Leaching Procedure (TCLP, SW846-1311) and the synthetic groundwater leaching procedure (SGLP). Solid samples will be collected and analyzed according to the methods as prescribed in Table 2.

The final series of tests are optional, based on whether a determination is made that additional analyses are needed for purposes of troubleshooting or for gaining additional insight into control options. For example, it may be desirable to determine the size and composition of the ash for certain applications. These analyses will provide information on the impacts of mercury control on ash properties. The properties have a significant impact on the performance of combustion and environmental control systems. PSNH MK2 has requested that ash sample techniques to include Total Metals (ppm) and Vanadium (ppm).

Table 2. Summary of Byproduct and Waste Characterization Testing

Series	Test Purpose	Test Method	Comments
1	Ash Disposal	TCLP (SW846-1311)	Measures leachable Hg, As, Ba, Cd, Cr, Pb, Se, Ag
2	Environmental Stability – Leaching	EERC SGLP	Measures leachable Hg at 18 hours, 2 weeks, and 4 weeks
3	Special Testing	Various	As needed for troubleshooting or site-specific information needs

Once the laboratory testing is complete, results will be logged into the SDMS. Authorized project team members will have access to the database to view the results. A report will be generated summarizing results from the sample analyses.

Flue Gas Samples

Flue gas measurements will be made at the locations indicated on Figure 1. Flue gas analyses will include the Ontario Hydro, Controlled Condensate SO₃ concentrations, EPA Method 26A and NH₄ measurements. Hg CEM analyzers and sorbent trap method tests (STM) will also be used at selected locations measuring real-time vapor-phase mercury concentrations in the flue gas.

Table 3. Sampling and Analytical Matrix.

Sampling Location	Sample/Type	Sampling Method	Analytical Method
AH Outlet or ESP1 Outlet	Total Hg – Vapor Phase	STM	EPA Method 1631
	Total/Elemental Mercury – Vapor Phase	Continuous	AF or AA -Analysis
	Particulate Hg	Modified PM _{2.5}	Modified Ohio Lumix ASTM 6722D-01
	Mercury – Vapor Phase and Particulate	OH	ASTM 6784-02
Stack and/or Stack Inlet	HBr, HCl, HF, BR ₂ , CL ₂	M26A	Ion chromatography per the promulgated EPA Method 26a
	Hg	STM	EPA Method 1631
	Total/Elemental Mercury	Continuous	AF or AA-Analysis
	Mercury – Vapor Phase and Particulate	OH	ASTM 6784-02
	Controlled Condensate, Ammonia	Controlled Condensate, CTM027	EPA Method 8A, EPA CTM027
	Hg	Grab Sample	ASTM D6414-99 or 01
Coal Fuel to Boiler	Cl	Grab Sample	Modified ASTM D5808 (Oxidative Hydrolysis Microcoulometry)
	F	Grab Sample	TBD
	Ultimate Analysis	Grab Sample	
	Proximate Analysis	Grab Sample	
	Trace Metals	Grab Sample	
	Hg	Grab Sample	ASTM D6414-99 or 01
Bottom Ash, Fly Ash	Cl	Grab Sample	Modified ASTM D5808 (Oxidative Hydrolysis Microcoulometry)
	LOI / Carbon Content	Grab Sample	ASTM C311-04
	Leaching	Grab Sample	TCLP, SW846-1311, SGLP
	Trace Metals	Grab Sample	

APPENDIX J: Ash–Coal Sample Report

STM

ADA ID	Field ID	Project	Unit	Date	Type	Location	Comments	A ng/g	B ng/g
6545	PSNH12	7009-71		9/29/06 14:39	STM	ESP 1 Outlet Port 22	S3397 - 20' Depth (2/2)	120	
6546	PSNH14	7009-71		9/29/06 16:08	STM	ESP 1 Outlet Port 20	S3399 - 20' Depth (2/2)	133	
6547	PSNH15	7009-71		9/30/06 10:43	STM	ESP 1 Inlet Port 10	S3402 - 4' Depth (1/2)	54.1	
6548	PSNH16	7009-71		9/30/06 10:43	STM	ESP 1 Inlet Port 10	S3401 - 4' Depth (2/2)	61.9	0.1
6549	PSNH17	7009-71		9/30/06 11:35	STM	ESP 1 Inlet Port 14	S3400 - 4' Depth (1/2)	59.1	
6550	PSNH18	7009-71		9/30/06 11:35	STM	ESP 1 Inlet Port 14	S3403 - 4' Depth (2/2)	68	
6551	PSNH34	7009-71		10/5/06 14:14	STM	ESP 2 Inlet Port 28	S3404 - 10' Depth (1/2)	165	
6552	PSNH35	7009-71		10/5/06 14:14	STM	ESP 2 Inlet Port 28	S3405 - 10' Depth (1/2)	168	0.21
6553	PSNH36	7009-71		9/28/06 12:10	STM	Stack Inlet Port 38	S3406 - 5' Depth (1/2)	163	18
6555	PSNH37	7009-71		9/28/06 12:10	STM	Stack Inlet Port 38	S3407 - 5' Depth (2/2)	140	
6557	PSNH62	7009-71		10/6/06 9:41	STM	ESP 2 Inlet Port 28	S3408 - 10' Depth (1/2)	168	
6558	PSNH63	7009-71		10/6/06 9:41	STM	ESP 2 Inlet Port 28	S3409 - 10' Depth (1/2)	172	
6559	PSNH64	7009-71		10/6/06 10:56	STM	Stack Inlet Port 38	S3410 - 5' Depth (1/2)	162	0.17
6561	PSNH65	7009-71		10/6/06 10:56	STM	Stack Inlet Port 38	S3411 - 5' Depth (2/2)	159	
6563	PSNH66	7009-71		10/6/06 14:30	STM	Blank	S3376 - Blank	0.11	0.1
6843	PSNH85	7009-71	2	10/7/06 8:45	STM	ESP Outlet Port 38	S3412 - 5' Depth (1/2)	174	0.19
6844	PSNH86	7009-71	2	10/7/06 8:45	STM	ESP 2 Inlet Port 38	S3373 - 5' Depth (2/2)	166	0.17
6845	PSNH87	7009-71	2	10/7/06 10:05	STM	Stack Inlet Port 28	S3374 - 10' Depth (1/2)	150	0.16
6846	PSNH88	7009-71	2	10/7/06 10:05	STM	Stack Inlet Port 28	S3375 - 10' Depth (1/2)	173	0.03
6847	PSNH238	7009-71	2	10/16/06 20:45	STM	ESP 2 Inlet Port 38	S3377	237	
6848	PSNH239	7009-71	2	10/16/06 21:11	STM	ESP 2 Inlet Port 38	S3378	212	
6849	PSNH240	7009-71	2	10/17/06 15:50	STM	Stack Inlet Port 28	S3380	244	
6850	PSNH241	7009-71	2	10/17/06 15:50	STM	Stack Inlet Port 28	S3379	219	
6930	PSNH287	7009-71		11/14/06 17:50	STM	Stack Inlet Port 38	S3222	160	0.09
6932	PSNH288	7009-71		11/14/06 17:50	STM	Stack Inlet Port 38	S3224	182	
7072	PSNH289	7009-71		11/30/06 14:20	STM	Stack Inlet Port 38	S3215	61.9	0.08
7073	PSNH290	7009-71		11/30/06 14:20	STM	Stack Inlet Port 38	S3216	66.6	
7076	PSNH291	7009-71		12/1/06 13:08	STM	Stack Inlet Port 38	S3217	146	
7077	PSNH292	7009-71		12/1/06 13:08	STM	Stack Inlet Port 38	S3218	0.19	119
7363	PSNH314	7009-71		1/11/07 12:49	STM	Stack Inlet Port 37	S3220	62.29	
7364	PSNH315	7009-71		1/11/07 12:49	STM	Stack Inlet Port 37	S3221	59.73	0.09
7365	PSNH316	7009-71		1/12/07 12:35	STM	Stack Inlet Port 37	S3219	63.75	
7366	PSNH317	7009-71		1/12/07 12:35	STM	Stack Inlet Port 37	S3223	60.28	
7367	PSNH318	7009-71		1/13/07 10:10	STM	Stack Inlet Port 37	S3097	118.1	3.2
7368	PSNH319	7009-71		1/13/07 10:10	STM	Stack Inlet Port 37	S3098	108.6	
7445	PSNH357	7009-71		1/15/07 12:49	STM	Stack Inlet Port 37	S3210	126.9	
7446	PSNH358	7009-71		1/15/07 12:49	STM	Stack Inlet Port 37	S3211	116.2	

STM

ADA ID	Field ID	Project	Unit	Date	Type	Location	Comments	A ng/g	B ng/g
7565	PSNH37 4	7009-71	1	1/30/07 10:21	STM	Stack	S3209 - project 06-8042	466.8	<0.32
7566	PSNH37 5	7009-71	1	1/30/07 10:21	STM	Stack	S3212 - project 06-8042	459.4	<0.32
7567	PSNH37 6	7009-71	1	1/30/07 14:00	STM	Stack	S3208 - project 06-8042	474.1	<0.32
7568	PSNH37 7	7009-71	1	1/30/07 14:00	STM	Stack	S3213 - project 06-8042	437.4	<0.32
7569	PSNH37 8	7009-71	1	1/30/07 16:00	STM	Stack	S3099 - project 06-8042	459.4	2.14
7570	PSNH37 9	7009-71	1	1/30/07 16:00	STM	Stack	S3214 - project 06-8042	452.1	<0.32
7571	PSNH38 0	7009-71		1/31/07 10:48	STM	Stack Inlet Port 37	S3555 - project 06-8042	561.9	0.32
7572	PSNH38 1	7009-71		1/31/07 10:48	STM	Stack Inlet Port 37	S3556 - project 06-8042	474.1	<0.32
7573	PSNH38 2	7009-71		1/31/07 13:38	STM	Stack Inlet Port 37	S3561 - project 06-8042	576.6	<0.32
7574	PSNH38 3	7009-71		1/31/07 13:38	STM	Stack Inlet Port 37	S3562 - project 06-8042	510.7	<0.32
7575	PSNH38 4	7009-71		1/31/07 4:45	STM	Stack Inlet Port 37	S3563 - project 06-8042	517.8	<0.32
7576	PSNH38 5	7009-71		1/31/07 4:45	STM	Stack Inlet Port 37	S3564 - project 06-8042	531.2	<0.32
7577	PSNH38 6	7009-71		1/31/07 13:00	STM	Blank	S3554 - project 06-8042	<0.32	<0.32
7578	PSNH38 7	7009-71	1	2/6/07 11:12	STM	Stack	S3382 - project 06-8042	330.7	<0.32
7579	PSNH38 8	7009-71	1	2/6/07 11:12	STM	Stack	S3565 - project 06-8042	268.3	<0.32
7580	PSNH38 9	7009-71	1	2/6/07 16:10	STM	Stack	S3572 - project 06-8042	330.7	<0.32
7581	PSNH39 0	7009-71	1	2/7/07 16:10	STM	Stack	S3573 - project 06-8042	317.4	<0.32
7582	PSNH39 1	7009-71	1	2/6/07 18:30	STM	Stack	S3570 - project 06-8042	188.4	<0.32
7583	PSNH39 2	7009-71	1	2/6/07 11:12	STM	Stack	S3571 - project 06-8042	117.9	<0.32
7584	PSNH39 3	7009-71		2/7/07 10:35	STM	Stack Inlet Port 37	S3381 - project 06-8042	357.5	<0.32
7585	PSNH39 4	7009-71		2/7/07 10:35	STM	Stack Inlet Port 37	S3569 - project 06-8042	350.8	<0.32
7603	PSNH45 5	7009-71	2	2/21/07 9:55	STM	Stack Inlet Port 38	s3641	372.6	<0.32
7606	PSNH45 6	7009-71	2	2/21/07 9:55	STM	Stack Inlet Port 38	s3646	355	<0.32
7608	PSNH45 7	7009-71	2	2/21/07 13:09	STM	Stack Inlet Port 38	s3635	32.03	<0.32
7609	PSNH45 8	7009-71	2	2/21/07 13:09	STM	Stack Inlet Port 38	s3636	248	<0.32
7611	PSNH45 9	7009-71	2	2/21/07 15:11	STM	Sup ESP Outlet	s3638	290.7	<0.32
7612	PSNH46 0	7009-71	2	2/21/07 15:11	STM	Sup ESP Outlet	s3665	302.4	<0.32
7613	PSNH46 1	7009-71	1	2/22/07 10:08	STM	Stack	s3659	373.3	<0.32
7614	PSNH46 2	7009-71	1	2/22/07 10:08	STM	Stack	s3661	326.6	<0.32
7615	PSNH46 3	7009-71	1	2/22/07 13:20	STM	Stack	s3658	355.8	<0.32
7616	PSNH46 4	7009-71	1	2/22/07 13:20	STM	Stack	s3662	294.4	<0.32
7617	PSNH46 5	7009-71	1	2/22/07 16:17	STM	Stack	s3663	265.2	<0.32
7618	PSNH46 6	7009-71	1	2/22/07 15:17	STM	Stack	s3664	288.6	<0.32
7619	PSNH44 4	7009-71		2/13/07 16:17	STM	Stack Inlet Port 37	S3567	124.5	<0.32
7620	PSNH44 5	7009-71		2/13/07 16:17	STM	Stack Inlet Port 37	S3566	145.1	<0.32
7621	PSNH44 6	7009-71		2/14/07 13:35	STM	Stack Inlet Port 37	S3639	148.8	<0.32
7622	PSNH44 7	7009-71		2/14/07 13:35	STM	Stack Inlet Port 37	S3640	130	<0.32

STM

ADA ID	Field ID	Project	Unit	Date	Type	Location	Comments	A ng/g	B ng/g
7623	PSNH448	7009-71		2/15/07 12:00	STM	Stack Inlet Port 37	S3634	165.8	<0.32
7624	PSNH449	7009-71		2/15/07 12:00	STM	Stack Inlet Port 37	S3633	148.8	<0.32
7625	PSNH450	7009-71		2/16/07 12:50	STM	Stack Inlet Port 37	S3568	154.5	<0.32
7626	PSNH451	7009-71		2/16/07 12:50	STM	Stack Inlet Port 37	S3642	160.2	<0.32
7627	PSNH452	7009-71		2/17/07 12:43	STM	Stack Inlet Port 37	S3644	101.7	<0.32
7628	PSNH453	7009-71		2/17/07 12:43	STM	Stack Inlet Port 37	S3645	96.01	<0.32
7629	PSNH454	7009-71		2/17/07 12:43	STM	Stack Inlet Port 37	S3643	<0.32	<0.32
8095	PSNH544	7009-71	2	4/1/07 14:30	STM	Sup ESP Outlet	S3660	183	<10
8096	PSNH545	7009-71	2	4/1/07 14:30	STM	Sup ESP Outlet	S3657	206	<10
8097	PSNH548	7009-71	2	4/7/07 10:39	STM	Sup ESP Outlet	LT MgO/Hg - S3656	90	<10
8098	PSNH549	7009-71	2	4/7/07 10:39	STM	Sup ESP Outlet	LT MgO/Hg - S3655	97	<10
8127	PSNH578	7009-71	2	4/10/07 9:28	STM	Sup ESP Outlet	S3653	507.1	<0.32
8128	PSNH579	7009-71	2	4/10/07 9:28	STM	Sup ESP Outlet	S3654	469.2	<0.32
8129	PSNH580	7009-71	2	4/10/07 12:35	STM	Sup ESP Outlet	S3666	472.9	<0.32
8130	PSNH581	7009-71	2	4/10/07 12:35	STM	Sup ESP Outlet	S3652	484.2	<0.32
8131	PSNH582	7009-71	2	4/10/07 15:32	STM	Sup ESP Outlet	S3648	495.5	<0.32
8132	PSNH583	7009-71	2	4/10/07 15:32	STM	Sup ESP Outlet	S3651	484.2	<0.32
8133	PSNH584	7009-71	1	4/11/07 13:18	STM	Stack	S3868	217.3	<0.32
8134	PSNH585	7009-71	1	4/11/07 13:18	STM	Stack	S3867	221.1	<0.32
8135	PSNH586	7009-71	1	4/11/07 15:00	STM	Stack	S3647 Blank	<0.32	<0.32
8136	PSNH587	7009-71	1	4/11/07 9:32	STM	Stack	S3649	187.2	<0.32
8137	PSNH588	7009-71	1	4/11/07 9:32	STM	Stack	S3650	172.3	<0.32
8138	PSNH589	7009-71	1	4/11/07 16:09	STM	Stack	S3880	187.6	<0.32
8139	PSNH590	7009-71	1	4/11/07 16:09	STM	Stack	s3869	198.4	<0.32
8140	PSNH591	7009-71	2	4/13/07 11:38	STM	Sup ESP Outlet	S3872	27	<10
8141	PSNH592	7009-71	2	4/13/07 11:38	STM	Sup ESP Outlet	S3873	30	<10
8142	PSNH593	7009-71	2	4/13/07 13:55	STM	Sup ESP Inlet	S3871	247	<10
8143	PSNH594	7009-71	2	4/13/07 13:55	STM	Sup ESP Inlet	S3870	295	<10
8521	PSNH640	7009-71	1	5/31/07 9:24	STM	Unit 1 Stack W	s3879 - HB1673	139	<0.37
8522	PSNH641	7009-71	1	5/31/07 9:24	STM	Unit 1 Stack W	s3877 - HB1673	134.5	<0.37
8523	PSNH642	7009-71	1	5/31/07 13:17	STM	Unit 1 Stack W	s3875 - HB1673	150.2	<0.37
8524	PSNH643	7009-71	1	5/31/07 13:17	STM	Unit 1 Stack W	s3874 - HB1673	139	<0.37
8525	PSNH644	7009-71	1	5/31/07 15:12	STM	Unit 1 Stack W	s3928 - HB1673	142.3	<0.37
8526	PSNH645	7009-71	1	5/31/07 15:12	STM	Unit 1 Stack W	s3876 - HB1673	137.9	<0.37
8527	PSNH646	7009-71	2	6/4/07 10:21	STM	Unit 2 Stack Inlet	s3929 - HB1673	308.2	<0.37
8528	PSNH647	7009-71	2	6/4/07 10:21	STM	Unit 2 Stack Inlet	s3930 - HB1673	285.8	<0.37
8529	PSNH648	7009-71	2	6/4/07 13:46	STM	Unit 2 Stack Inlet	s3933 - HB1673	220.8	<0.37

STM

ADA ID	Field ID	Project	Unit	Date	Type	Location	Comments	A ng/g	B ng/g
8530	PSNH64 9	7009-71	2	6/4/07 13:46	STM	Unit 2 Stack Inlet	s3932 - HB1673	196.1	<0.37
8531	PSNH65 0	7009-71	2	6/4/07 16:11	STM	Unit 2 Stack Inlet	s3934 - HB1673	207.6	<0.37
8532	PSNH65 1	7009-71	2	6/4/07 16:11	STM	Unit 2 Stack Inlet	s3935 - HB1673	214.6	<0.37
8533	PSNH65 2	7009-71	2	6/4/07 17:45	STM	Blank	s3878 - HB1673	<0.37	<0.37
8535	PSNH65 3	7009-71	2	6/5/07 9:39	STM	Unit 2 Stack Inlet	s3936 - HB1673	254.5	<0.37
8536	PSNH65 4	7009-71	2	6/5/07 9:39	STM	Unit 2 Stack Inlet	s3937 - HB1673	238.1	<0.37
8537	PSNH65 5	7009-71	2	6/5/07 12:14	STM	Unit 2 Stack Inlet	s3940 - HB1673	238.1	<0.37
8538	PSNH65 6	7009-71	2	6/5/07 12:14	STM	Unit 2 Stack Inlet	s3941 - HB1673	210	<0.37
8539	PSNH65 7	7009-71	2	6/6/07 9:04	STM	Unit 2 Stack Inlet	s3939 - HB1673	301.5	<0.37
8540	PSNH65 8	7009-71	2	6/6/07 9:04	STM	Unit 2 Stack Inlet	s3938 - HB1673	289.7	<0.37
8541	PSNH65 9	7009-71	2	6/6/07 10:45	STM	Blank	s3931 - HB1673	<0.37	<0.37
11279		7009-71	2	12/4/07 10:30	STM	Sup ESP Outlet	s1557	150.1	<0.19
11280		7009-71	2	12/4/07 10:30	STM	Sup ESP Outlet	s1556	195.4	
11281		7009-71	2	12/4/07 14:31	STM	Sup ESP Inlet	s3967	165.2	
11282		7009-71	2	12/4/07 14:31	STM	Sup ESP Inlet	s1555	79.79	<0.19
11283		7009-71	2	12/4/07 16:33	STM	Sup ESP Inlet	s1558	169	
11284		7009-71	2	12/4/07 16:33	STM	Sup ESP Inlet	s3955	185.9	
12239		7009-71	2	3/28/08 16:23	STM	Sup ESP Inlet	s1617	202.3	0.39
12240		7009-71	2	3/28/08 16:23	STM	Original ESP Outlet	s3903	146.7	0.62
12241		7009-71	2	3/27/08 0:00	STM	Sup ESP Outlet	s3953	141.5	
12242		7009-71	2	3/27/08 0:00	STM	Sup ESP Outlet	s3954	140.2	

ADA ID	Field ID	Project	Unit	Date	Type	Location	Comments	% H2O	% LOI	Hg (ng/g)
5512	M 5	7009-71	2	4/13/06 12:30	l sh	Eco o i er		0.16	8.23	<10
5513	M 6	7009-71	2	4/13/06 12:45	l sh	S inlet		0.14	20.72	<10
5514	M 7	7009-71	2	4/13/06 13:30	l sh	S Outlet		1.62	9.16	37
5515	M 8	7009-71	2	4/13/06 13:00	Botto sh	Slag Hopper		0	0.01	<10
5516	M 9	7009-71	2	4/13/06 11:10	l sh	o posite o 1-6		0	8.63	<10
5517	M 10	7009-71	2	4/13/06 11:10	l sh	o posite o 7-12		0.2	7.64	11
5518	M 11	7009-71	2	4/13/06 11:10	l sh	o -OI Precin		0	15.46	25
5519	M 12	7009-71	2	4/13/06 11:10	l sh	B o -OI Precin		0.01	0.01	38
5520	M 13	7009-71	2	4/13/06 11:10	l sh	o -OI Precin		0	9.33	22
5521	M 14	7009-71	2	4/14/06 11:05	l sh	Eco o i er		0.02	14.1	12
5522	M 15	7009-71	2	4/14/06 10:50	l sh	S inlet		0.02	25.49	15
5523	M 16	7009-71	2	4/14/06 10:25	l sh	S Outlet		0	7.82	<10
5524	M 17	7009-71	2	4/14/06 10:00	Botto sh	Slag Hopper		0.01	0.05	<10
5525	M 18	7009-71	2	4/14/06 10:15	l sh	ir Preheater Shot Hopper		0.03	18.45	<10
5526	M 19	7009-71	2	4/14/06 10:20	l sh	o posite o 1-6		0.01	9.98	17
5527	M 20	7009-71	2	4/14/06 10:20	l sh	o posite o 7-12		0.21	7.91	<10
5528	M 21	7009-71	2	4/14/06 10:10	l sh	o -OI Precin		0.08	12.41	25
5529	M 22	7009-71	2	4/14/06 10:10	l sh	B o -OI Precin		0.04	7.68	19
5530	M 23	7009-71	2	4/14/06 10:10	l sh	o -OI Precin		0.13	9.31	24
5877		7009-71	2	8/3/06 8:30	l sh	Hopper o		0.02	35.19	57
5878		7009-71	2	8/3/06 8:30	l sh	Hopper B o		0	17.89	93
5879		7009-71	2	8/3/06 8:30	l sh	Hopper o		0.01	13.54	96
5880		7009-71	2	8/3/06 8:30	l sh	Hoppers 1-6		0.01	15.75	91
5881		7009-71	2	8/3/06 8:30	l sh	Hoppers 7-12		0.05	13.39	101
6488	PSNH19	7009-71		9/2/06 8:30	l sh	ESP 1 o 1-4	Baseline	0.05	20.7	54
6489	PSNH20	7009-71		9/2/06 8:30	l sh	ESP 1 o 5-8	Baseline	0.1	24.15	81
6490	PSNH21	7009-71		9/2/06 8:30	l sh	ESP 1 o 9-12	Baseline	0.24	19.25	117
6491	PSNH22	7009-71		9/2/06 8:30	l sh	ESP 2 o 1-6	Baseline	0.24	29.77	154
6492	PSNH23	7009-71		9/2/06 8:30	l sh	ESP 2 o 7-12	Baseline	1.49	22.05	195
6498	PSNH29	7009-71		9/5/06 8:30	l sh	ESP 1 o	Baseline	0.68	27.74	93
6499	PSNH30	7009-71		9/3/06 7:45	l sh	ESP 1 o B	Baseline	0.15	18.95	75
6500	PSNH31	7009-71		9/3/06 10:00	l sh	ESP 1 o	Baseline	0.17	21.97	115
6501	PSNH32	7009-71		9/3/06 7:50	l sh	ESP 2 o 1-6	Baseline	0.09	20.75	40
6502	PSNH33	7009-71		9/3/06 8:40	l sh	ESP 2 o 7-12	Baseline	1.04	22.86	72
6503	PSNH38	7009-71			l sh	ESP 2 Hopper 10	Baseline	0.15	19.36	43
6504	PSNH39	7009-71		10/6/06 8:30	l sh	ESP 2 Hopper 9	Baseline	0	16.8	63
6505	PSNH40	7009-71		10/6/06 8:30	l sh	ESP 2 Hopper 5	Baseline	0	26.71	75
6506	PSNH41	7009-71		10/6/06 8:30	l sh	ESP 2 Hopper 6	Baseline	0	28.03	85
6507	PSNH42	7009-71		10/6/06 8:30	l sh	ESP 2 Hopper 8	Baseline	0.04	17.17	59
6508	PSNH43	7009-71		10/6/06 8:30	l sh	ESP 2 Hopper 7	Baseline	0.12	16.62	46
6509	PSNH44	7009-71		10/6/06 8:30	l sh	ESP 2 Hopper 11	Baseline	0.26	23.69	57

ADA ID	Field ID	Project	Unit	Date	Type	Location	Comments	% H2O	% LOI	Hg (ng/g)
6510	PSNH45	7009-71		10/6/06 8:30	I sh	ESP 2 Hopper 12	Baseline	0.19	24.51	76
6511	PSNH46	7009-71		10/6/06 8:30	I sh	ESP 2 Hopper 3	Baseline	0.08	21.82	65
6512	PSNH47	7009-71		10/6/06 8:30	I sh	ESP 2 Hopper 4	Baseline	0	21.83	55
6513	PSNH48	7009-71		10/6/06 8:30	I sh	ESP 2 Hopper 2	Baseline	0	19.8	46
6514	PSNH49	7009-71		10/6/06 8:30	I sh	ESP 2 Hopper 1	Baseline	0	22.75	80
6515	PSNH50	7009-71		10/6/06 8:30	I sh	ESP 1 Hopper 12	Baseline	0	15.91	47
6516	PSNH51	7009-71		10/6/06 8:30	I sh	ESP 1 Hopper 11	Baseline	0	14.63	50
6517	PSNH52	7009-71		10/6/06 8:30	I sh	ESP 1 Hopper 10	Baseline	0	14.72	61
6518	PSNH53	7009-71		10/6/06 8:30	I sh	ESP 1 Hopper 9	Baseline	0	16.36	52
6519	PSNH54	7009-71		10/6/06 8:30	I sh	ESP 1 Hopper 8	Baseline	0	12.32	28
6520	PSNH55	7009-71		10/6/06 8:30	I sh	ESP 1 Hopper 7	Baseline	0	12.82	49
6521	PSNH56	7009-71		10/6/06 8:30	I sh	ESP 1 Hopper 6	Baseline	0	13.22	35
6522	PSNH57	7009-71		10/6/06 8:30	I sh	ESP 1 Hopper 5	Baseline	0	14.5	32
6523	PSNH58	7009-71		10/6/06 8:30	I sh	ESP 1 Hopper 4	Baseline	0	14.4	28
6524	PSNH59	7009-71		10/6/06 8:30	I sh	ESP 1 Hopper 3	Baseline	0	17.95	30
6525	PSNH60	7009-71		10/6/06 8:30	I sh	ESP 1 Hopper 2	Baseline	0	21.17	29
6526	PSNH61	7009-71		10/6/06 8:30	I sh	ESP 1 Hopper 1	Baseline	0	24.93	26
6726	PSNH99	7009-71		10/11/06 0:00	I sh	ESP 1 o	Baseline	0	16.56	18
6727	PSNH100	7009-71		10/11/06 0:00	I sh	ESP 1 o B	Baseline	0	10.5	29
6728	PSNH101	7009-71		10/11/06 0:00	I sh	ESP 1 o	Baseline	0	13.74	46
6729	PSNH102	7009-71		10/11/06 0:00	I sh	ESP 2 o 1-6	Baseline	0	12.09	41
6730	PSNH103	7009-71		10/11/06 0:00	I sh	ESP 2 o 7-12	Baseline	0	10.79	31
6736	PSNH109	7009-71		10/12/06 17:00	I sh	ESP 1 1	MgO Inj	0.01	24.58	38
6737	PSNH110	7009-71		10/12/06 17:00	I sh	ESP 1 2	MgO Inj	0	11.7	46
6738	PSNH111	7009-71		10/12/06 17:00	I sh	ESP 1 3	MgO Inj	0.08	12.33	60
6739	PSNH112	7009-71		10/12/06 17:00	I sh	ESP 1 4	MgO Inj	0.01	9.91	49
6740	PSNH113	7009-71		10/13/06 7:00	I sh	ESP 1 1	MgO Inj	0	13.45	54
6741	PSNH114	7009-71		10/13/06 7:00	I sh	ESP 1 2	MgO Inj	0	23.88	31
6742	PSNH115	7009-71		10/13/06 7:00	I sh	ESP 1 3	MgO Inj	0	12.85	54
6743	PSNH116	7009-71		10/13/06 7:00	I sh	ESP 1 4	MgO Inj	0	9.64	60
6744	PSNH117	7009-71		10/13/06 7:00	I sh	ESP 1 o B	MgO Inj	0	13.83	75
6745	PSNH118	7009-71		10/13/06 7:00	I sh	ESP 1 o	MgO Inj	0	13.4	61
6746	PSNH119	7009-71		10/13/06 7:00	I sh	ESP 2 o 1-6	MgO Inj	0	14.11	59
6747	PSNH120	7009-71		10/13/06 7:00	I sh	ESP 2 o 7-12	MgO Inj	0.1	12.4	55
6760	PSNH133	7009-71		10/15/06 13:45	I sh	ESP 1 1	MgO Inj	0	6.04	14
6761	PSNH134	7009-71		10/15/06 13:45	I sh	ESP 1 2	MgO Inj	0.05	4.57	22
6762	PSNH135	7009-71		10/15/06 13:45	I sh	ESP 1 3	MgO Inj	0	5.04	25
6763	PSNH136	7009-71		10/15/06 13:45	I sh	ESP 1 4	MgO Inj	0.01	4.91	24
6764	PSNH137	7009-71		10/15/06 13:45	I sh	ESP 1 o B	MgO Inj - o posite	0	3.83	19
6765	PSNH138	7009-71		10/15/06 13:45	I sh	ESP 1 o	MgO Inj - o posite	0.02	3.35	29
6766	PSNH139	7009-71		10/15/06 13:30	I sh	ESP 2 o 1-6	MgO Inj	0.03	7.6	24

ADA ID	Field ID	Project	Unit	Date	Type	Location	Comments	% H2O	% LOI	Hg (ng/g)
6767	PSNH14 0	7009-71		10/15/06 13:30	I sh	ESP 2 o 7-12	MgO Inj	0.45	11.1	36
6790	PSNH16 3	7009-71		10/18/06 10:00	I sh	ESP 1 1	MgO Inj	0	6.41	19
6791	PSNH16 4	7009-71		10/18/06 10:00	I sh	ESP 1 2	MgO Inj	0.03	29.2	72
6792	PSNH16 5	7009-71		10/18/06 10:00	I sh	ESP 1 3	MgO Inj	0.02	7.14	40
6793	PSNH16 6	7009-71		10/18/06 10:00	I sh	ESP 1 4	MgO Inj	0.01	4.85	18
6794	PSNH16 7	7009-71		10/18/06 10:00	I sh	ESP 1 o B	MgO Inj - o posite	0	4.6	42
6795	PSNH16 8	7009-71		10/18/06 10:00	I sh	ESP 1 o	MgO Inj - o posite	0	3.9	31
6796	PSNH16 9	7009-71		10/18/06 10:12	I sh	ESP 2 o 1-6	MgO Inj	0	5.14	20
6797	PSNH17 0	7009-71		10/18/06 10:12	I sh	ESP 2 o 7-12	MgO Inj	0.15	4.5	20
6798	PSNH17 1	7009-71		10/19/06 10:00	I sh	ESP 1 1	MgO Inj	0	5.55	33
6799	PSNH17 2	7009-71		10/19/06 10:00	I sh	ESP 1 2	MgO Inj	0.04	31.85	49
6800	PSNH17 3	7009-71		10/19/06 10:00	I sh	ESP 1 3	MgO Inj	0.02	3.72	35
6801	PSNH17 4	7009-71		10/19/06 10:00	I sh	ESP 1 4	MgO Inj	0	4.15	31
6802	PSNH17 5	7009-71		10/19/06 10:00	I sh	ESP 1 o B	MgO Inj - o posite	0	3.12	38
6803	PSNH17 6	7009-71		10/19/06 10:00	I sh	ESP 1 o	MgO Inj - o posite	0	3.58	15
6804	PSNH17 7	7009-71		10/19/06 10:24	I sh	ESP 2 o 1-6	MgO Inj	0.03	4.87	23
6805	PSNH17 8	7009-71		10/19/06 10:24	I sh	ESP 2 o 7-12	MgO Inj	0.14	3.4	15
6816	PSNH18 9	7009-71		10/23/06 8:00	I sh	ESP 1 o	MgO Inj - o posite	0.05	13.31	23
6817	PSNH19 0	7009-71		10/23/06 8:00	I sh	ESP 1 o B	MgO Inj - o posite	0.05	11.85	21
6818	PSNH19 1	7009-71		10/23/06 8:00	I sh	ESP 1 o	MgO Inj - o posite	0.09	8.28	26
6819	PSNH19 2	7009-71		10/23/06 8:00	I sh	ESP 2 o 1-6	Baseline	0.16	7.78	19
6820	PSNH19 3	7009-71		10/23/06 8:00	I sh	ESP 2 o 7-12	Baseline	0.3	7.16	<10
6892	PSNH20 7	7009-71		10/30/06 0:00	I sh	ESP 2 o 7-12	Baseline	0.31	6.73	25
6893	PSNH20 8	7009-71		10/30/06 0:00	I sh	ESP 2 o 1-6	Baseline	0.12	8.19	24
6894	PSNH20 9	7009-71		10/30/06 0:00	I sh	ESP 1 o	Baseline - o posite	0.05	10.61	20
6895	PSNH21 0	7009-71		10/30/06 0:00	I sh	ESP 1 o B	Baseline - o posite	0.06	10.54	19
6896	PSNH21 1	7009-71		10/30/06 0:00	I sh	ESP 1 o	Baseline - o posite	0.05	8.78	25
6897	PSNH21 2	7009-71		10/31/06 0:00	I sh	ESP 2 o 7-12	Baseline	0.15	10.05	26
6898	PSNH21 3	7009-71		10/31/06 0:00	I sh	ESP 2 o 1-6	Baseline	0.09	12.72	42
6899	PSNH21 4	7009-71		10/31/06 0:00	I sh	ESP 1 o	Baseline - o posite	0.03	28.43	33
6900	PSNH21 5	7009-71		10/31/06 0:00	I sh	ESP 1 o B	Baseline - o posite	0.07	16.16	29
6901	PSNH21 6	7009-71		10/31/06 0:00	I sh	ESP 1 o	Baseline - o posite	0.05	14.67	33
6902	PSNH21 8	7009-71		11/1/06 0:00	I sh	ESP 2 o 1-6	Baseline	0.15	33.57	474
6903	PSNH21 9	7009-71		11/1/06 0:00	I sh	ESP 2 o 7-12	Baseline	0.26	48.57	350
6904	PSNH22 0	7009-71		11/1/06 0:00	I sh	ESP 1 1	Baseline	0.19	33.82	84
6905	PSNH22 1	7009-71		11/1/06 0:00	I sh	ESP 1 2	Baseline	0.09	49.43	116
6906	PSNH22 2	7009-71		11/1/06 0:00	I sh	ESP 1 3	Baseline	0.17	46.52	96
6907	PSNH22 3	7009-71		11/1/06 0:00	I sh	ESP 1 4	Baseline	0.2	17.41	99
6908	PSNH22 4	7009-71		11/1/06 0:00	I sh	ESP 1 o B	Baseline - o posite	0.14	17.02	161
6909	PSNH22 5	7009-71		11/1/06 0:00	I sh	ESP 1 o	Baseline - o posite	0.09	22.17	193
6954	PSNH26 3	7009-71		11/13/06 18:00	I sh	ESP 1 1		0	17.1	14

ADA ID	Field ID	Project	Unit	Date	Type	Location	Comments	% H2O	% LOI	Hg (ng/g)
6955	PSNH264	7009-71		11/13/06 18:00	I sh	ESP 1 2		0	30.79	26
6956	PSNH265	7009-71		11/13/06 18:00	I sh	ESP 1 3		0	28.96	<10
6957	PSNH266	7009-71		11/13/06 18:00	I sh	ESP 1 4		0	9.33	<10
6958	PSNH267	7009-71		11/13/06 18:00	I sh	ESP 1 o B	o posite	0	8.45	17
6959	PSNH268	7009-71		11/13/06 18:00	I sh	ESP 1 o	o posite	0	9.18	16
6960	PSNH269	7009-71		11/13/06 18:00	I sh	ESP 2 o 1-6		0	11.14	21
6961	PSNH270	7009-71		11/13/06 18:00	I sh	ESP 2 o 7-12		0.04	9.45	12
7078	PSNH293	7009-71	2	12/1/06 13:30	I sh	ESP 2 Hopper 1	H -LH	0.02	11.49	194
7079	PSNH294	7009-71	2	11/30/06 13:30	I sh	ESP 2 Hopper 2	H -LH	0	15.87	340
7080	PSNH295	7009-71	2	11/30/06 14:00	I sh	ESP 2 Hopper 3	H -LH	0	15.93	269
7081	PSNH296	7009-71	2	11/30/06 13:30	I sh	ESP 2 Hopper 4	H -LH	0	16.22	313
7082	PSNH297	7009-71	2	11/30/06 13:50	I sh	ESP 2 Hopper 5	H -LH	0	13.25	76
7083	PSNH298	7009-71	2	11/30/06 13:30	I sh	ESP 2 Hopper 6	H -LH	0	11	121
7084	PSNH299	7009-71	2	11/30/06 13:00	I sh	ESP 1 o	o posite - H -LH	0	11.62	21
7085	PSNH300	7009-71	2	11/30/06 13:00	I sh	ESP 1 o B	o posite - H -LH	0.08	12.07	24
7086	PSNH301	7009-71	2	11/30/06 13:00	I sh	ESP 1 o	o posite - H -LH	0.01	9.12	23
7087	PSNH302	7009-71	2	11/30/06 13:45	I sh	ESP 2 o posite	H -LH	0.01	8.72	66
7088	PSNH304	7009-71	2	12/1/06 14:30	I sh	ESP 2 Hopper 1	E26	0.01	11.35	252
7089	PSNH305	7009-71	2	12/1/06 14:30	I sh	ESP 2 Hopper 2	E26	0.02	16.09	455
7090	PSNH306	7009-71	2	12/1/06 14:30	I sh	ESP 2 Hopper 3	E26	0.03	18.02	566
7091	PSNH307	7009-71	2	12/1/06 14:30	I sh	ESP 2 Hopper 4	E26	0.04	20.6	727
7092	PSNH308	7009-71	2	12/1/06 14:30	I sh	ESP 2 Hopper 5	E26	0	23.58	844
7093	PSNH309	7009-71	2	12/1/06 14:30	I sh	ESP 2 Hopper 6	E26	0	23.68	711
7094	PSNH310	7009-71	2	12/1/06 14:00	I sh	ESP 1 o	o posite - H -LH	0	17.49	16
7095	PSNH311	7009-71	2	12/1/06 14:00	I sh	ESP 1 o B	o posite - H -LH	0.02	11.19	22
7096	PSNH312	7009-71	2	12/1/06 14:00	I sh	ESP 1 o	o posite - H -LH	0.02	9.58	18
7097	PSNH313	7009-71	2	12/1/06 14:30	I sh	ESP 2 o posite	E26	0.13	17.09	920
7408	PSNH320	7009-71		1/9/07 10:40	I sh	ESP1 (co posite)	BL	0.02	14.09	26
7409	PSNH321	7009-71		1/9/07 10:40	I sh	ESP1 B (co posite)	BL	0.01	12.52	34
7410	PSNH322	7009-71		1/9/07 10:40	I sh	ESP1 (co posite)	BL	0.02	9.97	35
7411	PSNH323	7009-71		1/9/07 10:40	I sh	SUP ESP 1-6	BL	0.02	11.24	39
7412	PSNH324	7009-71		1/9/07 10:40	I sh	SUP ESP7-12	BL	0	10.85	15
7413	PSNH325	7009-71		1/10/07 13:00	I sh	ESP1 (co posite)	H	0.03	12.59	83
7414	PSNH326	7009-71		1/10/07 13:00	I sh	ESP1 B (co posite)	H	0.02	17.43	263
7415	PSNH327	7009-71		1/10/07 13:00	I sh	ESP1 (co posite)	H	0.02	16.87	147
7416	PSNH328	7009-71		1/10/07 13:00	I sh	SUP ESP 1-6	H	0	21.2	2015
7417	PSNH329	7009-71		1/10/07 13:00	I sh	SUP ESP7-12	H	0	20.87	410
7418	PSNH330	7009-71		1/11/07 13:00	I sh	ESP1 (co posite)	H -LH	0.02	14.67	137
7419	PSNH331	7009-71		1/11/07 13:00	I sh	ESP1 B (co posite)	H -LH	0.02	14.15	133
7420	PSNH332	7009-71		1/11/07 13:00	I sh	ESP1 (co posite)	H -LH	0.03	14.26	230
7421	PSNH333	7009-71		1/11/07 13:00	I sh	SUP ESP o 1	H -LH	0.08	20.49	1810

ADA ID	Field ID	Project	Unit	Date	Type	Location	Comments	% H2O	% LOI	Hg (ng/g)
7422	PSNH334	7009-71		1/11/07 13:00	I sh	SUP ESP o 2	H -LH	0.06	25.49	2160
7423	PSNH335	7009-71		1/11/07 13:00	I sh	SUP ESP o 3	H -LH	0	25.33	2300
7424	PSNH336	7009-71		1/11/07 13:00	I sh	SUP ESP o 4	H -LH	0	28.05	2820
7425	PSNH337	7009-71		1/11/07 13:00	I sh	SUP ESP o 5	H -LH	0	31.06	3510
7426	PSNH338	7009-71		1/11/07 13:00	I sh	SUP ESP o 6	H -LH	0.1	35.95	3210
7427	PSNH339	7009-71		1/11/07 13:00	I sh	SUP ESP7-12	H -LH	0.02	32.16	3420
7428	PSNH340	7009-71		1/12/07 13:00	I sh	ESP1 (co- nosite)	BL	0.03	21.96	80
7429	PSNH341	7009-71		1/12/07 13:00	I sh	ESP1 B (co- nosite)	BL	0.02	12.71	160
7430	PSNH342	7009-71		1/12/07 13:00	I sh	ESP1 (co- nosite)	BL	0.03	11.73	234
7431	PSNH343	7009-71		1/12/07 13:00	I sh	SUP ESP 1-6	BL	0	30.16	3030
7432	PSNH344	7009-71		1/12/07 13:00	I sh	SUP ESP7-12	BL	0.07	15.32	2610
7433	PSNH345	7009-71		1/13/07 11:00	I sh	ESP1 o 1	E-26	0.07	13.49	33
7434	PSNH346	7009-71		1/13/07 11:00	I sh	ESP1 o 1B	E-26	0.07	10.25	33
7435	PSNH347	7009-71		1/13/07 11:00	I sh	ESP1 o 1	E-26	0	8.69	31
7436	PSNH348	7009-71		1/13/07 11:00	I sh	SUP ESP o 1	E-26	0	12.02	1100
7437	PSNH349	7009-71		1/13/07 11:00	I sh	SUP ESP o 2	E-26	0.18	16.23	1900
7438	PSNH350	7009-71		1/13/07 11:00	I sh	SUP ESP o 3	E-26	0.44	17.85	1280
7439	PSNH351	7009-71		1/13/07 11:00	I sh	SUP ESP o 4	E-26	0.19	19.95	1960
7440	PSNH352	7009-71		1/13/07 11:00	I sh	SUP ESP o 5	E-26	0	22.41	2020
7441	PSNH353	7009-71		1/13/07 11:00	I sh	SUP ESP o 6	E-26	0	22.91	1810
7442	PSNH354	7009-71		1/13/07 11:00	I sh	SUP ESP7-12 (co- n)	E-26	0.15	17.85	1620
7447	PSNH359	7009-71		1/15/07 13:30	I sh	SUP ESP o 1	Hg-LH			184
7448	PSNH360	7009-71		1/15/07 13:30	I sh	SUP ESP o 2	Hg-LH			149
7449	PSNH361	7009-71		1/15/07 13:30	I sh	SUP ESP o 3	Hg-LH			231
7450	PSNH362	7009-71		1/15/07 13:30	I sh	SUP ESP o 4	Hg-LH			205
7451	PSNH363	7009-71		1/15/07 13:30	I sh	SUP ESP o 5	Hg-LH			285
7452	PSNH364	7009-71		1/15/07 13:30	I sh	SUP ESP o 6	Hg-LH			223
7453	PSNH365	7009-71		1/15/07 13:30	I sh	SUP ESP7-12	Hg-LH			190
7454	PSNH366	7009-71		1/15/07 13:30	I sh	ESP1 o 1- 1	Hg-LH			124
7455	PSNH367	7009-71		1/15/07 13:30	I sh	ESP1 o 1- 2	Hg-LH			142
7456	PSNH368	7009-71		1/15/07 13:30	I sh	ESP1 o 1- 3	Hg-LH			254
7457	PSNH369	7009-71		1/15/07 13:30	I sh	ESP1 o 1- 4	Hg-LH			182
7458	PSNH370	7009-71		1/15/07 13:30	I sh	ESP1 o 3 (co- n)	Hg-LH			192
7586	PSNH395	7009-71		1/30/07 13:45	I sh	Unit 1 Precip hop 1-4	BL - project 06-8042	0.01	29.49	103
7587	PSNH396	7009-71		1/30/07 13:45	I sh	Unit 1 Precip hop 5-8	BL - project 06-8042	0.02	8.72	76
7588	PSNH397	7009-71		1/30/07 13:00	I sh	Unit 1 Sup Precip hop -D	BL - project 06-8042	0.03	7.6	28
7589	PSNH398	7009-71		1/31/07 13:00	I sh	ESP1 (co- nosite)	BL - project 06-8042	0.03	7.06	10
7590	PSNH399	7009-71		1/31/07 13:00	I sh	ESP1 B (co- nosite)	BL - project 06-8042	0.01	5.52	10
7591	PSNH400	7009-71		1/31/07 13:00	I sh	ESP1 (co- nosite)	BL - project 06-8042	0.01	3.41	<10
7592	PSNH401	7009-71		1/31/07 13:30	I sh	SUP ESP 1-6 (co- n)	BL - project 06-8042	0.01	4.45	<10
7593	PSNH402	7009-71		1/31/07 13:30	I sh	SUP ESP7-12 (co- n)	BL - project 06-8042	0.05	5.37	11

ADA ID	Field ID	Project	Unit	Date	Type	Location	Comments	% H2O	% LOI	Hg (ng/g)
7633	PSNH414	7009-71		2/13/07 13:30	I sh	ESP1 o 1-	Hg-LH/30 MgO	0.08	6.46	20
7634	PSNH415	7009-71		2/13/07 13:30	I sh	ESP1 o 1-B	Hg-LH/30 MgO	0.1	10.19	37
7635	PSNH416	7009-71		2/13/07 13:30	I sh	ESP1 o 1-	Hg-LH/30 MgO	0.1	4.92	18
7636	PSNH417	7009-71		2/13/07 13:30	I sh	ESP1 o 1-D	Hg-LH/30 MgO	0.09	5.59	20
7637	PSNH418	7009-71		2/13/07 13:30	I sh	SUP ESP 1-6 (co n)	Hg-LH/30 MgO	0.3	6.91	61
7638	PSNH419	7009-71		2/13/07 13:30	I sh	SUP ESP7-12 (co n)	Hg-LH/30 MgO	0.27	12.94	1390
7645	PSNH426	7009-71		2/15/07 13:30	I sh	ESP1 o 1-	Hg-LH/90 MgO			37
7646	PSNH427	7009-71		2/15/07 13:30	I sh	ESP1 o 1-B	Hg-LH/90 MgO			30
7647	PSNH428	7009-71		2/15/07 13:30	I sh	ESP1 o 1-	Hg-LH/90 MgO			29
7648	PSNH429	7009-71		2/15/07 13:30	I sh	ESP1 o 1-D	Hg-LH/90 MgO			28
7649	PSNH430	7009-71		2/15/07 13:30	I sh	SUP ESP 1-6 (co n)	Hg-LH/90 MgO			1160
7650	PSNH431	7009-71		2/15/07 13:30	I sh	SUP ESP7-12 (co n)	Hg-LH/90 MgO			577
7651	PSNH432	7009-71		2/16/07 13:30	I sh	ESP1 o 1-	L/30MgO			28
7652	PSNH433	7009-71		2/16/07 13:30	I sh	ESP1 o 1-B	L/30MgO			31
7653	PSNH434	7009-71		2/16/07 13:30	I sh	ESP1 o 1-	L/30MgO			31
7654	PSNH435	7009-71		2/16/07 13:30	I sh	ESP1 o 1-D	L/30MgO			23
7655	PSNH436	7009-71		2/16/07 13:30	I sh	SUP ESP 1-6 (co n)	L/30MgO			514
7656	PSNH437	7009-71		2/16/07 13:30	I sh	SUP ESP7-12 (co n)	L/30MgO			657
7657	PSNH438	7009-71		2/17/07 14:00	I sh	ESP1 o 1-	L/90MgO			32
7658	PSNH439	7009-71		2/17/07 14:00	I sh	ESP1 o 1-B	L/90MgO			34
7659	PSNH440	7009-71		2/17/07 14:00	I sh	ESP1 o 1-	L/90MgO			36
7660	PSNH441	7009-71		2/17/07 14:00	I sh	ESP1 o 1-D	L/90MgO			34
7661	PSNH442	7009-71		2/17/07 14:00	I sh	SUP ESP 1-6 (co n)	L/90MgO			486
7662	PSNH443	7009-71		2/17/07 14:00	I sh	SUP ESP7-12 (co n)	L/90MgO			421
7856	PSNH467	7009-71	2	2/21/07 13:00	I sh	ESP 1 Hopper 1	M29			16
7857	PSNH468	7009-71	2	2/21/07 13:00	I sh	ESP 1 Hopper 2	M29			19
7858	PSNH469	7009-71	2	2/21/07 13:00	I sh	ESP 1 Hopper 3	M29			13
7859	PSNH470	7009-71	2	2/21/07 13:30	I sh	ESP 1 Hopper 4	M29			14
7860	PSNH471	7009-71	2	2/21/07 14:00	I sh	ESP 2 o 1-6	M29			47
7862	PSNH473	7009-71	2	2/21/07 14:00	I sh	ESP 2 o 7-12	M29			83
7863	PSNH474	7009-71	2	2/22/07 13:00	I sh	ESP 1 Hopper 1	M29			20
7864	PSNH475	7009-71	2	2/22/07 13:00	I sh	ESP 1 Hopper 2	M29			30
7865	PSNH476	7009-71	2	2/22/07 13:00	I sh	ESP 1 Hopper 3	M29			27
7866	PSNH477	7009-71	2	2/22/07 13:00	I sh	ESP 1 Hopper 3	M29			20
7867	PSNH478	7009-71	2	2/22/07 13:30	I sh	ESP 2 o 1-6	M29			49
7868	PSNH479	7009-71	2	2/22/07 13:30	I sh	ESP 2 o 7-12	M29			56
7869	PSNH480	7009-71	1	2/22/07 13:30	I sh	U1 Ne Sup	M29			13
7870	PSNH481	7009-71	1	2/22/07 13:30	I sh	OI 1-4	M29			42
7871	PSNH482	7009-71	1	2/22/07 13:30	I sh	OI 5-8	M29			26
7873	PSNH484	7009-71	2	2/21/07 13:00	I sh	ESP1 o 1-B	M29			11
7874	PSNH485	7009-71	2	2/21/07 13:00	I sh	ESP1 o 1-	M29			12

ADA ID	Field ID	Project	Unit	Date	Type	Location	Comments	% H2O	% LOI	Hg (ng/g)
7875	PSNH486	7009-71	2	2/21/07 13:00	l sh	ESP1 o 1-	M29			19
7876	PSNH487	7009-71	2	2/28/07 14:45	l sh	ESP1 o 1-	M29			44
7877	PSNH488	7009-71	2	2/28/07 14:45	l sh	ESP1 o 1-B	M29			53
7878	PSNH489	7009-71	2	2/28/07 14:45	l sh	ESP1 o 1-	M29			45
7879	PSNH490	7009-71	2	2/28/07 15:00	l sh	ESP 2 Hopper 1	M29			128
7880	PSNH491	7009-71	2	2/28/07 15:00	l sh	ESP 2 Hopper 2	M29			198
7881	PSNH492	7009-71	2	2/28/07 15:00	l sh	ESP 2 Hopper 3	M29			323
7882	PSNH493	7009-71	2	2/28/07 15:00	l sh	ESP 2 Hopper 4	M29			104
7883	PSNH494	7009-71	2	2/28/07 15:00	l sh	ESP 2 Hopper 5	M29			477
7884	PSNH495	7009-71	2	2/28/07 15:00	l sh	ESP 2 Hopper 6	M29			687
7885	PSNH496	7009-71	2	2/28/07 15:00	l sh	ESP 2 o 7-12	M29			36
7886	PSNH497	7009-71	1	2/6/07 13:00	l sh	U1 o 1 -B	M29			23
7887	PSNH498	7009-71	1	2/6/07 13:00	l sh	U1 o 1 1-4	M29			45
7888	PSNH499	7009-71	1	2/6/07 13:00	l sh	U1 o 2 5-8	M29			29
7902	PSNH507	7009-71	2	2/27/07 14:00	l sh	ESP1 o 1-	M29	0.01	14.04	26
7903	PSNH508	7009-71	2	2/27/07 14:00	l sh	ESP1 o 1-B	M29	0.01	8.05	18
7904	PSNH509	7009-71	2	2/27/07 14:00	l sh	ESP1 o 1-	M29	0.03	6.98	40
7905	PSNH510	7009-71	2	2/27/07 14:00	l sh	ESP 2 o 1-6	M29	0.04	8.55	34
7906	PSNH511	7009-71	2	2/27/07 14:00	l sh	ESP 2 o 7-12	M29	0.12	8.77	31
8071	PSNH512	7009-71	2	3/29/07 13:00	l sh	ESP 1 1	LT MgO/Hg			93
8072	PSNH513	7009-71	2	3/29/07 13:00	l sh	ESP 1 2	LT MgO/Hg			76
8073	PSNH514	7009-71	2	3/29/07 13:00	l sh	ESP 1 3	LT MgO/Hg			56
8074	PSNH515	7009-71	2	3/29/07 13:00	l sh	ESP 1 4	LT MgO/Hg			60
8075	PSNH516	7009-71	2	3/29/07 13:00	l sh	ESP1 B (co-posite)	LT MgO/Hg			63
8076	PSNH517	7009-71	2	3/29/07 13:00	l sh	ESP1 (co-posite)	LT MgO/Hg			104
8077	PSNH518	7009-71	2	3/29/07 13:30	l sh	ESP 2 o 1-6	LT MgO/Hg			342
8078	PSNH519	7009-71	2	3/29/07 13:30	l sh	ESP 2 o 7-12	LT MgO/Hg			555
8079	PSNH520	7009-71	2	3/30/07 13:00	l sh	ESP 1 1	LT MgO/Hg			87
8080	PSNH521	7009-71	2	3/30/07 13:00	l sh	ESP 1 2	LT MgO/Hg			73
8081	PSNH522	7009-71	2	3/30/07 13:00	l sh	ESP 1 3	LT MgO/Hg			63
8082	PSNH523	7009-71	2	3/30/07 13:00	l sh	ESP 1 4	LT MgO/Hg			67
8083	PSNH524	7009-71	2	3/30/07 13:00	l sh	ESP1 B (co-posite)	LT MgO/Hg			94
8084	PSNH525	7009-71	2	3/30/07 13:00	l sh	ESP1 (co-posite)	LT MgO/Hg			88
8085	PSNH526	7009-71	2	3/30/07 13:30	l sh	ESP 2 o 1-6	LT MgO/Hg			3570
8086	PSNH527	7009-71	2	3/30/07 13:30	l sh	ESP 2 o 7-12	LT MgO/Hg			2330
8087	PSNH528	7009-71	2	3/31/07 13:00	l sh	ESP 1 1	LT MgO/Hg			64
8088	PSNH529	7009-71	2	3/31/07 13:00	l sh	ESP 1 2	LT MgO/Hg			64
8089	PSNH530	7009-71	2	3/31/07 13:00	l sh	ESP 1 3	LT MgO/Hg			58
8090	PSNH531	7009-71	2	3/31/07 13:00	l sh	ESP 1 4	LT MgO/Hg			57
8091	PSNH532	7009-71	2	3/31/07 13:00	l sh	ESP1 B (co-posite)	LT MgO/Hg			84
8092	PSNH533	7009-71	2	3/31/07 13:00	l sh	ESP1 (co-posite)	LT MgO/Hg			48

ADA ID	Field ID	Project	Unit	Date	Type	Location	Comments	% H2O	% LOI	Hg (ng/g)
8093	PSNH53 ₄	7009-71	2	3/31/07 13:30	I sh	ESP 2 o 1-6	LT MgO/Hg			3870
8094	PSNH53 ₅	7009-71	2	3/31/07 13:30	I sh	ESP 2 o 7-12	LT MgO/Hg			4140
8099	PSNH55 ₀	7009-71	2	4/2/07 13:00	I sh	ESP 1 1	LT MgO/Hg			64
8100	PSNH55 ₁	7009-71	2	4/2/07 13:00	I sh	ESP 1 2	LT MgO/Hg			67
8101	PSNH55 ₂	7009-71	2	4/2/07 13:00	I sh	ESP 1 3	LT MgO/Hg			52
8102	PSNH55 ₃	7009-71	2	4/2/07 13:00	I sh	ESP 1 4	LT MgO/Hg			54
8103	PSNH55 ₄	7009-71	2	4/2/07 13:00	I sh	ESP1 B (co. nosite)	LT MgO/Hg			89
8104	PSNH55 ₅	7009-71	2	4/2/07 13:00	I sh	ESP1 (co. nosite)	LT MgO/Hg			102
8105	PSNH55 ₆	7009-71	2	4/2/07 13:00	I sh	ESP 2 o 1-6	LT MgO/Hg			4100
8106	PSNH55 ₇	7009-71	2	4/2/07 13:00	I sh	ESP 2 o 7-12	LT MgO/Hg			5260
8107	PSNH55 ₈	7009-71	2	4/3/07 13:00	I sh	ESP1 (co. nosite)	LT MgO/Hg			52
8108	PSNH55 ₉	7009-71	2	4/3/07 13:00	I sh	ESP1 B (co. nosite)	LT MgO/Hg			72
8150	PSNH60 ₁	7009-71	2	4/10/07 0:00	I sh	Original ESP	Hopper 1	0.03	3.47	<10
8151	PSNH60 ₂	7009-71	2	4/10/07 0:00	I sh	Original ESP	Hopper 2	0.01	3.49	<10
8152	PSNH60 ₃	7009-71	2	4/10/07 0:00	I sh	Original ESP	Hopper 3	0	3.44	<10
8153	PSNH60 ₄	7009-71	2	4/10/07 0:00	I sh	Original ESP	Hopper 4	0.01	3.37	20
8154	PSNH60 ₅	7009-71	2	4/10/07 0:00	I sh	Original ESP	Hopper 5	0	3.78	16
8155	PSNH60 ₆	7009-71	2	4/10/07 0:00	I sh	Original ESP	Hopper 6	0	3.3	10
8156	PSNH60 ₇	7009-71	2	4/10/07 0:00	I sh	Original ESP	Hopper 7	0	3.09	20
8157	PSNH60 ₈	7009-71	2	4/10/07 0:00	I sh	Original ESP	Hopper 8	0	3.21	15
8158	PSNH60 ₉	7009-71	2	4/10/07 0:00	I sh	Original ESP	Hopper 9	0.02	3.31	43
8159	PSNH61 ₀	7009-71	2	4/10/07 0:00	I sh	Original ESP	Hopper 10	0.1	4.77	49
8160	PSNH61 ₁	7009-71	2	4/10/07 0:00	I sh	Original ESP	Hopper 11	0.06	4.31	11
8161	PSNH61 ₂	7009-71	2	4/10/07 0:00	I sh	Original ESP	Hopper 12	0	2.93	14
8162	PSNH61 ₃	7009-71	2	4/10/07 0:00	I sh	Sup ESP	Hopper 1	0.1	5.67	361
8163	PSNH61 ₄	7009-71	2	4/10/07 0:00	I sh	Sup ESP	Hopper 2	0	5.3	109
8164	PSNH61 ₅	7009-71	2	4/10/07 0:00	I sh	Sup ESP	Hopper 3	0	6.24	113
8165	PSNH61 ₆	7009-71	2	4/10/07 0:00	I sh	Sup ESP	Hopper 4	0	6.12	94
8166	PSNH61 ₇	7009-71	2	4/10/07 0:00	I sh	Sup ESP	Hopper 5	0	7.02	164
8167	PSNH61 ₈	7009-71	2	4/10/07 0:00	I sh	Sup ESP	Hopper 6	0	7.78	95
8168	PSNH61 ₉	7009-71	2	4/10/07 0:00	I sh	Sup ESP	Hopper 7	0	8.54	287
8169	PSNH62 ₀	7009-71	2	4/10/07 0:00	I sh	Sup ESP	Hopper 8	0	9.79	372
8170	PSNH62 ₁	7009-71	2	4/10/07 0:00	I sh	Sup ESP	Hopper 9	0.02	11.32	839
8171	PSNH62 ₂	7009-71	2	4/10/07 0:00	I sh	Sup ESP	Hopper 10	0	10.77	211
8172	PSNH62 ₃	7009-71	2	4/10/07 0:00	I sh	Sup ESP	Hopper 11	0	9.96	370
8173	PSNH62 ₄	7009-71	2	4/10/07 0:00	I sh	Sup ESP	Hopper 12	0	5.18	<10
9461	PSNH63 ₅	7009-71	2	4/10/07 14:00	I sh	Unit 2 OI	HB1673	0.06	3.32	16
9462	PSNH63 ₆	7009-71	2	4/10/07 14:00	I sh	Unit 2 OI B	HB1673	0.11	3.15	17
9463	PSNH63 ₇	7009-71	2	4/10/07 14:00	I sh	Unit 2 OI	HB1673	0.1	3.17	14
9464	PSNH63 ₈	7009-71	2	4/10/07 14:00	I sh	Unit 2 Ne 1	HB1673	0	6.03	112
9465	PSNH63 ₉	7009-71	2	4/10/07 14:00	I sh	Unit 2 Ne 2	HB1673	0	8.96	254

ADA ID	Field ID	Project	Unit	Date	Type	Location	Comments	% H2O	% LOI	Hg (ng/g)
9467	PSNH661	7009-71	2	6/5/07 13:00	I sh	Unit 2 Ol	HB1673	0.01	5.21	17
9468	PSNH662	7009-71	2	6/5/07 13:00	I sh	Unit 2 Ol B	HB1673	0	2.05	10
9469	PSNH663	7009-71	2	6/5/07 13:00	I sh	Unit 2 Ol	HB1673	0	7.66	21
9470	PSNH664	7009-71	2	6/5/07 13:00	I sh	Unit 2 Ne 1	HB1673	0	6.38	42
9471	PSNH665	7009-71	2	6/5/07 13:00	I sh	Unit 2 Ne 2	HB1673	0.68	11.2	156
11943	PSNH735	7009-71	2	12/5/07 8:00	I sh	ESP 2 o 1-6		0.53	32.63	
11944	PSNH736	7009-71	2	12/5/07 0:00	I sh	ESP1 (co. nosite)		0.09	11.84	
11945	PSNH737	7009-71	2	12/5/07 0:00	I sh	ESP1 B (co. nosite)		0.15	12.27	
11946	PSNH738	7009-71	2	12/5/07 0:00	I sh	ESP1 (co. nosite)		0.19	16.38	
11947	PSNH739	7009-71	2	12/5/07 8:00	I sh	ESP 2 o 7-12		0.64	25.95	
11963	PSNH755	7009-71	2	12/4/07 8:00	I sh	ESP 2 Hoppers 7-12		0.68	22.25	
11964	PSNH756	7009-71	2	12/3/07 8:00	I sh	ESP 2 Hoppers1-6		0.44	36.26	
11965	PSNH757	7009-71	2	12/4/07 8:00	I sh	ESP 2 Hoppers1-6		0.82	37.45	
11968	PSNH760	7009-71	2	12/4/07 9:15	I sh	ESP1 (co. nosite)		0.24	12.13	
11969	PSNH761	7009-71	2	12/3/07 0:00	I sh	ESP1 (co. nosite)		0.28	11.75	
11970	PSNH762	7009-71	2	12/3/07 0:00	I sh	ESP1 B (co. nosite)		0.31	14.24	
11972	PSNH764	7009-71	2	12/4/07 9:00	I sh	ESP1 B (co. nosite)		0.23	13.72	
11973	PSNH765	7009-71	2	12/3/07 0:00	I sh	ESP1 (co. nosite)		0.35	21.45	
11974	PSNH766	7009-71	2	12/3/07 8:00	I sh	ESP 2 Hoppers 7-12		0.6	26.77	
11975	PSNH767	7009-71	2	12/4/07 9:30	I sh	ESP1 (co. nosite)		0.25	16.5	
11983	PSNH775	7009-71	2	12/6/07 8:40	I sh	ESP1 B (co. nosite)		0.32	12.69	
11987	PSNH779	7009-71	2	12/6/07 8:40	I sh	ESP1 (co. nosite)		0.12	16.68	
11988	PSNH780	7009-71	2	12/6/07 8:40	I sh	ESP1 (co. nosite)		0.17	21.06	
12003	PSNH795	7009-71	2	12/7/07 8:45	I sh	ESP1 Hopper - 2		0.15	12.78	
12007	PSNH799	7009-71	2	3/13/08 13:20	I sh	ESP1 (co. nosite)		0.12	22.6	88
12008	PSNH800	7009-71	2	12/11/07 8:30	I sh	ESP1 Hopper - 4		0.13	9.18	
12011	PSNH803	7009-71	2	12/6/07 8:17	I sh	ESP 2 Hoppers1-6		0.52	34.23	
12012	PSNH804	7009-71	2	3/13/08 13:20	I sh	ESP1 (co. nosite)		0.09	25.21	203
12013	PSNH805	7009-71	2	3/13/08 13:20	I sh	ESP1 B (co. nosite)		0.09	21.59	134
12014	PSNH806	7009-71	2	12/6/07 8:17	I sh	ESP 2 Hoppers 7-12		0.96	34.52	
12015	PSNH807	7009-71	2	12/7/07 9:45	I sh	ESP1 (co. nosite)		0.18	18.84	
12016	PSNH808	7009-71	2	12/7/07 9:30	I sh	ESP1 (co. nosite)		0.21	10.98	
12017	PSNH809	7009-71	2	3/13/08 13:55	I sh	ESP 2 Hoppers 7-12		0.4	36.72	586
12018	PSNH810	7009-71	2	12/7/07 9:30	I sh	ESP1 B (co. nosite)		0.24	12.98	
12019	PSNH811	7009-71	2	12/7/07 9:30	I sh	ESP1 Hopper - 4		0.17	10.82	
12022	PSNH814	7009-71	2	3/13/08 13:55	I sh	ESP 2 Hoppers1-6		0.2	53.14	513
12023	PSNH815	7009-71	2	12/11/07 8:30	I sh	ESP1 (co. nosite)		0.12	17.55	
12033	PSNH825	7009-71	2	12/7/07 8:00	I sh	ESP 2 Hoppers 7-12		1.09	36.62	
12034	PSNH826	7009-71	2	12/10/07 8:30	I sh	ESP1 (co. nosite)		0.14	27.13	
12035	PSNH827	7009-71	2	12/7/07 9:30	I sh	ESP1 Hopper - 3		0.1	12.51	
12036	PSNH828	7009-71	2	12/11/07 8:30	I sh	ESP1 Hopper - 2		0.12	10.57	

ADA ID	Field ID	Project	Unit	Date	Type	Location	Comments	% H2O	% LOI	Hg (ng/g)
12037	PSNH829	7009-71	2	12/10/07 9:45	I sh	ESP 2 Hoppers1-6		0.34	43.96	
12041	PSNH833	7009-71	2	12/7/07 9:30	I sh	ESP1 Hopper -1		0.17	14.39	
12043	PSNH835	7009-71	2	12/11/07 8:30	I sh	ESP1 Hopper -1		0.09	14.73	
12044	PSNH836	7009-71	2	12/11/07 8:30	I sh	ESP1 B (co. nosite)		0.1	10.34	
12047	PSNH839	7009-71	2	12/10/07 8:30	I sh	ESP1 (co. nosite)		0.05	15.35	
12049	PSNH841	7009-71	2	12/10/07 9:45	I sh	ESP 2 Hoppers7-12		1.11	47.32	
12050	PSNH842	7009-71	2	12/11/07 8:30	I sh	ESP1 (co. nosite)		0.02	10.09	
12052	PSNH844	7009-71	2	12/7/07 8:00	I sh	ESP 2 Hoppers1-6		0.56	40.3	
12060	PSNH852	7009-71	2	12/11/07 8:45	I sh	ESP 2 Hoppers7-12		1.06	44.64	
12061	PSNH853	7009-71	2	12/11/07 8:30	I sh	ESP1 Hopper -3		0.09	13.23	
12063	PSNH855	7009-71	2	12/11/07 8:45	I sh	ESP 2 Hoppers1-6		0.26	41.1	
12065	PSNH857	7009-71	2	12/12/07 8:30	I sh	ESP1 (co. nosite)		0.34	11.59	
12066	PSNH858	7009-71	2	12/12/07 8:30	I sh	ESP1 (co. nosite)		0.28	15.82	
12068	PSNH860	7009-71	2	12/12/07 10:00	I sh	ESP 2 Hoppers1-6		0.58	40.94	
12070	PSNH862	7009-71	2	12/12/07 8:30	I sh	ESP1 B (co. nosite)		0.19	13.43	
12074	PSNH866	7009-71	2	12/12/07 10:00	I sh	ESP 2 Hoppers7-12		1.34	44.81	
12208	PSNH940	7009-71	2	3/14/08 14:30	I sh	ESP1 (co. nosite)		0.17	25.14	228
12209	PSNH941	7009-71	2	3/14/08 14:30	I sh	ESP1 (co. nosite)		0.13	23.71	99
12210	PSNH942	7009-71	2	3/14/08 14:30	I sh	ESP1 B (co. nosite)		0.14	22.58	183
12211	PSNH943	7009-71	2	3/14/08 14:30	I sh	ESP 2 Hoppers7-12		0.31	56.22	2400
12212	PSNH944	7009-71	2	3/14/08 14:30	I sh	ESP 2		0.24	55.78	1850
12213	PSNH945	7009-71	2	3/26/08 0:00	I sh	ESP1 (co. nosite)		0.09	15.44	68
12214	PSNH946	7009-71	2	3/26/08 0:00	I sh	ESP1 B (co. nosite)		0.11	14.36	132
12215	PSNH947	7009-71	2	3/26/08 0:00	I sh	ESP 2		0.1	40.98	5490
12216	PSNH948	7009-71	2	3/26/08 0:00	I sh	ESP1 (co. nosite)		0.09	22.6	193
12217	PSNH949	7009-71	2	3/26/08 0:00	I sh	ESP 2 B		0.72	44.7	9230
12218	PSNH950	7009-71	2	3/27/08 10:30	I sh	ESP2 (co. nosite)		0.03	45.22	6040
12219	PSNH951	7009-71	2	3/28/08 0:00	I sh	ESP1 (co. nosite)		0.05	23.2	274
12220	PSNH952	7009-71	2	3/28/08 0:00	I sh	ESP1 (co. nosite)		0.04	18.67	83
12221	PSNH953	7009-71	2	3/27/08 10:00	I sh	ESP2 B (co. nosite)		0.06	18.54	153
12222	PSNH954	7009-71	2	3/27/08 10:00	I sh	ESP1 (co. nosite)		0.02	24.48	280
12223	PSNH955	7009-71	2	3/27/08 10:00	I sh	ESP1 (co. nosite)		0.02	16.62	81
12224	PSNH956	7009-71	2	3/27/08 10:30	I sh	ESP 2 Hoppers7-12		1.22	50.17	10800
12230	PSNH962	7009-71	2	3/28/08 0:00	I sh	ESP1 B (co. nosite)		0.13	17.57	175
12231	PSNH963	7009-71	2	3/28/08 8:15	I sh	ESP2 B (co. nosite)		0.81	47.47	10200
12232	PSNH964	7009-71	2	3/28/08 8:15	I sh	ESP2 (co. nosite)		0.23	45.7	7850

ADA ID	Field ID	Project	Unit	Date	Type	Location	Comments	% Ash (as rec)	% Ash (dry)	% C (as rec)	% C (dry)	% H (as rec)	% H (dry)	% H2O (as rec)	% N (as rec)	% N (dry)	% O (as rec)	% O (dry)	% S (as rec)	% S (dry)
5531	M 24	7009-71	2	4/13/06 0:00	oal	oal poste o poste	o poste o M M site 2	6.72	7.35	71.37	77.95	4.68	5.11	8.44	1.32	1.45	6.19	6.74	1.28	1.40
6544	PSNH84	7009-71		10/5/06 0:00	oal	oal Bunker	Baseline - PM Bunker1-2	6.82	7.30	74.73	80.05	4.60	4.93	6.64	1.22	1.31	4.26	4.56	1.73	1.85
6786	PSNH15	7009-71		10/14/06 0:00	oal	oal Bunker	MgO Inj o poste Sa o site	6.06	6.50	75.11	80.55	4.68	5.02	6.76	1.26	1.35	5.14	5.51	0.99	1.07
6814	PSNH18	7009-71			oal	oal Bunker	M an PM unker ca o site	5.41	5.91	74.18	80.96	4.54	4.96	8.37	1.17	1.28	5.45	5.93	0.88	0.96
6945	PSNH25	7009-71		10/31/06 9:00	oal	oal Bunker	S site 2	7.94	8.41	73.04	77.36	4.58	4.85	5.58	1.36	1.44	6.31	6.68	1.19	1.26
7444	PSNH35	7009-71		1/11/07 21:00	oal	oal Bunker	S site 2	7.48	7.85	73.85	77.47	4.75	4.99	4.67	0.96	1.01	6.92	7.24	1.37	1.44
7594	PSNH40	7009-71		1/30/07 0:00	oal	Unit 1 M	BL - project 06-8042	6.81	7.17	77.35	78.54	4.84	4.92	1.52	1.39	1.41	6.83	6.94	1.26	1.32
7595	PSNH40	7009-71		1/30/07 0:00	oal	Unit 1 PM	BL - project 06-8042	7.37	7.76	75.98	77.25	4.86	4.94	1.64	1.17	1.19	7.04	7.16	1.94	2.04
7596	PSNH40	7009-71		1/30/07 0:00	oal	Unit 2 M	BL - project 06-8042	7.67	8.13	75.40	76.71	4.92	5.01	1.71	1.16	1.19	7.16	7.28	1.98	2.10
7597	PSNH40	7009-71		1/30/07 0:00	oal	Unit 2 PM	BL - project 06-8042	7.39	7.77	75.20	76.55	4.96	5.05	1.76	1.19	1.21	7.32	7.45	2.18	2.29
7598	PSNH40	7009-71		1/31/07 0:00	oal	Unit 1 M	BL - project 06-8042	7.40	7.75	76.44	77.67	4.84	4.91	1.58	1.16	1.17	6.57	6.68	2.01	2.11
7599	PSNH40	7009-71		1/31/07 0:00	oal	Unit 1 PM	BL - project 06-8042	6.94	7.27	77.92	79.11	4.78	4.85	1.50	1.09	1.11	6.48	6.58	1.29	1.35
7600	PSNH40	7009-71		1/31/07 0:00	oal	Unit 2 M	BL - project 06-8042	6.49	6.81	78.11	79.33	4.93	5.01	1.54	1.13	1.15	6.37	6.47	1.43	1.50
7601	PSNH41	7009-71		1/31/07 0:00	oal	Unit 2 PM	BL - project 06-8042	7.69	7.98	75.38	76.63	4.84	4.92	1.63	1.18	1.20	7.20	7.32	2.08	2.16
7631	PSNH47	7009-71	2	2/15/07 0:00	oal	Bunker	LH90MgO	7.67	8.36	70.64	76.97	4.67	5.09	8.22	0.94	1.03	6.37	6.93	1.49	1.62
7861	PSNH47	7009-71	1	2/21/07 14:00	oal	Unit 1	M29	7.65	8.20	75.57	76.86	4.85	4.93	1.67	1.16	1.18	7.59	7.72	1.51	1.62
7872	PSNH48	7009-71	1	2/22/07 13:30	oal	Unit 1	M29	7.85	8.29	75.03	76.33	4.93	5.02	1.70	1.18	1.20	7.07	7.19	2.24	2.37
7889	PSNH50	7009-71	1	2/6/07 3:00	oal	U1 MK1 M	M29	7.23	7.54	75.89	77.10	4.97	5.05	1.57	1.20	1.22	6.91	7.02	2.23	2.33
7890	PSNH50	7009-71	2	1/28/07 0:00	oal	U2 S s2 M	M29	8.82	9.36	74.67	76.04	4.72	4.80	1.80	1.13	1.15	7.45	7.59	1.41	1.50
7891	PSNH50	7009-71	2	1/28/07 12:00	oal	U2 S s2 PM	M29	6.69	6.96	76.42	77.74	4.94	5.02	1.70	1.13	1.15	7.79	7.92	1.33	1.38
7892	PSNH50	7009-71	2	1/29/07 0:00	oal	U2 S s2 M	M29	7.56	7.95	75.75	77.09	4.94	5.03	1.74	1.17	1.19	7.09	7.22	1.75	1.84
7893	PSNH50	7009-71	2	1/29/07 12:00	oal	U2 S s2 PM	M29	7.68	8.12	75.24	76.88	4.88	4.98	2.13	1.16	1.18	7.20	7.36	1.71	1.80
7900	PSNH50	7009-71	1	1/29/07 0:00	oal	U1 S s2 M	M29	7.77	8.29	74.19	75.67	4.92	5.02	1.95	1.19	1.22	7.68	7.83	2.30	2.45
7901	PSNH50	7009-71	1	1/29/07 12:00	oal	U1 S s1 M	M29	7.18	7.61	75.81	77.18	5.02	5.11	1.78	1.18	1.20	7.26	7.39	1.77	1.88
8123	PSNH57	7009-71	2	3/29/07 13:00	oal	oal Bunker	LT MgO/Hg	7.19	7.76	71.80	77.54	4.71	5.08	7.40	1.28	1.38	6.31	6.82	1.31	1.42
8144	PSNH59	7009-71	1	4/10/07 0:00	oal	oal Bunker	unit 1 M	7.54	7.97	75.66	76.88	4.94	5.02	1.59	1.19	1.21	7.09	7.20	1.99	2.11
8145	PSNH59	7009-71	1	4/10/07 0:00	oal	oal Bunker	unit 1 PM	6.72	7.11	76.68	77.91	5.03	5.11	1.58	1.17	1.19	7.16	7.27	1.66	1.75
8146	PSNH59	7009-71	2	4/10/07 0:00	oal	oal Bunker	unit 2 M	7.31	7.81	75.92	77.22	5.03	5.12	1.68	1.22	1.24	7.09	7.20	1.75	1.87
8147	PSNH59	7009-71	2	4/10/07 0:00	oal	oal Bunker	unit 2 PM	7.09	7.56	76.20	77.47	5.04	5.13	1.64	1.18	1.20	7.39	7.51	1.46	1.56
8148	PSNH59	7009-71	2	4/12/07 0:00	oal	oal Bunker	ail	6.98	7.29	76.24	77.65	5.04	5.13	1.81	1.18	1.20	7.42	7.56	1.33	1.39
8149	PSNH60	7009-71	2	4/13/07 0:00	oal	oal Bunker	ail	6.75	7.26	76.72	78.04	5.13	5.22	1.69	1.19	1.21	7.10	7.22	1.42	1.52
9452	PSNH62	7009-71	2	4/10/07 2:00	oal	Unit 2 M	HB1673	7.30	7.70	72.79	76.76	4.73	4.99	5.18	1.28	1.35	7.59	8.01	1.13	1.19
9453	PSNH62	7009-71	1	4/11/07 2:00	oal	Unit 1 M	HB1673	6.94	7.29	74.64	78.41	4.73	4.97	4.81	1.28	1.34	6.36	6.69	1.24	1.30
9454	PSNH62	7009-71	1	5/2/07 14:00	oal	Unit 1 PM	HB1673	7.21	7.60	73.21	77.12	4.89	5.16	5.06	1.32	1.39	6.44	6.76	1.87	1.97
9455	PSNH62	7009-71	1	5/30/07 2:00	oal	Unit 1 M	HB1673	7.40	7.73	73.45	76.80	4.95	5.18	4.37	1.34	1.40	6.55	6.86	1.94	2.03
9456	PSNH63	7009-71	1	5/30/07 14:00	oal	Unit 1 PM	HB1673	7.29	7.51	74.93	77.17	4.99	5.14	2.91	1.36	1.40	6.72	6.92	1.80	1.86
9457	PSNH63	7009-71	1	5/31/07 2:00	oal	Unit 1 M	HB1673	7.87	8.18	73.51	76.47	4.96	5.16	3.87	1.34	1.39	6.18	6.44	2.27	2.36
9458	PSNH63	7009-71	2	6/4/07 2:00	oal	Unit 2 M	HB1673	7.11	7.62	71.87	76.96	4.72	5.06	6.62	1.34	1.43	6.63	7.10	1.71	1.83
9459	PSNH63	7009-71	2	6/5/07 2:00	oal	Unit 2 M	HB1673	7.04	7.63	70.06	75.91	4.97	5.38	7.71	1.30	1.41	7.08	7.68	1.84	1.99
9460	PSNH63	7009-71	2	6/4/07 14:00	oal	Unit 2 PM	HB1673	7.19	7.70	71.02	76.07	5.12	5.48	6.64	1.33	1.42	6.89	7.39	1.81	1.94
9466	PSNH66	7009-71	2	6/5/07 2:00	oal	Unit 2 M	HB1673	7.03	7.62	70.97	77.00	4.83	5.24	7.83	1.35	1.47	6.21	6.74	1.78	1.93
12195	PSNH92	7009-71	2	3/12/08 0:00	oal	PM Bunker		6.59	7.21	71.04	77.76	4.48	4.91	8.64	1.34	1.46	6.74	7.38	1.17	1.28
12199	PSNH93	7009-71	2	3/13/08 0:00	oal	Bunker		7.20	7.79	71.59	77.43	5.34	4.71	7.54	1.38	1.49	6.71	7.25	1.23	1.33

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ADA ID	Field ID	Project	Unit	Date	Type	Location	Comments	% Ash (as rec)	% Ash (dry)	% C (as rec)	% C (dry)	% H (as rec)	% H (dry)	% H2O (as rec)	% N (as rec)	% N (dry)	% O (as rec)	% O (dry)	% S (as rec)	% S (dry)
12207	PSN193 9	7009-71	2	3/27/08 0:00	oal	Bunker		6.41	6.88	72.89	78.25	4.55	4.88	6.85	1.36	1.46	6.62	7.12	1.32	1.41
12331		7009-71	2	3/28/08 0:00	oal	oal Bunker		6.87	7.31	73.17	77.87	4.63	4.93	6.03	1.36	1.45	6.67	7.09	1.27	1.35

ADA ID	Field ID	Project	Unit	Date	Type	Location	Comments	% Ash (as rec)	% Ash (dry)	% FC (as rec)	% FC (dry)	% H2O (as rec)	% S (as rec)	% S (dry)	% Vol (as rec)	% Vol (dry)	BTU/lb (as rec)	BTU/lb (dry)	MAF (BTU/lb)
5531	M 24	7009-71	2	4/13/06 0:00	oal	oal	oal	6.72	7.35	53.29	58.19	8.44	1.28	1.40	31.55	34.46	12780	13959	15066
6544	PSNH84	7009-71		10/5/06 0:00	oal	oal Bunker	Baseline - PM Bunker1-2	6.82	7.30	56.58	60.61	6.64	1.73	1.85	29.96	32.09	13232	14173	15290
6786	PSNH15	7009-71		10/14/06 0:00	oal	oal Bunker	MgO Inj o posile Sa ple	6.06	6.50	56.11	60.17	6.76	0.99	1.07	31.07	33.33	13311	14276	15268
6814	PSNH18	7009-71		10/19/06 12:00	oal	oal Bunker	Man PM bunker	5.41	5.91	56.39	61.54	8.37	0.88	0.96	29.83	32.55	13029	14220	15113
6945	PSNH25	7009-71		10/31/06 9:00	oal	oal Bunker	S site 2	7.94	8.41	52.44	55.54	5.88	1.19	1.26	34.04	36.05	13032	13803	15070
7443	PSNH35	7009-71		1/10/07 12:00	oal	oal Bunker	S site 2	6.35	6.71	53.96	57.03	5.39	1.16	1.23	34.30	36.26	13058	13802	14795
7630	PSNH41	7009-71	2	2/14/07 0:00	oal	Bunker	LH/60MgO	6.75	7.15	52.92	56.05	5.59	1.34	1.42	34.74	36.80	13211	13993	15071
8120	PSNH57	7009-71	2	2/28/07 13:00	oal	oal Bunker		6.74	7.16	53.02	56.37	5.94	1.30	1.38	34.30	36.47	13066	13891	14962
8126	PSNH57	7009-71	2	4/1/07 13:00	oal	oal Bunker	LT MgOHg	6.94	7.40	53.47	57.02	6.23	1.41	1.51	33.36	35.58	13040	13907	15020
12195	PSNH92	7009-71	2	3/12/08 0:00	oal	PM Bunker		6.59	7.21	52.28	57.23	8.64	1.17	1.28	32.49	35.56	12618	13812	14886
12199	PSNH93	7009-71	2	3/13/08 0:00	oal	Bunker		7.20	7.79	52.32	56.59	7.54	1.23	1.33	32.94	35.62	12786	13828	14996
12207	PSNH93	7009-71	2	3/27/08 0:00	oal	Bunker		6.41	6.88	53.11	57.02	6.85	1.32	1.41	33.63	36.10	13016	13974	15006
12331		7009-71	2	3/28/08 0:00	oal	oal Bunker		6.87	7.31	53.25	56.67	6.03	1.27	1.35	33.85	36.02	13057	13895	14991

Mercur

ADA ID	Field ID	Project	Unit	Date	Type	Location	Comments	% H2O	Hg (ng/g as rec)	Hg (ng/g dry)
5531	M 24	7009-71	2	4/13/06 0:00	oal	o posite	o posite o M 2 M 3 M 4			74.3
6544	PSNH84	7009-71		10/5/06 0:00	oal	oal Bunker	Baseline - PM Bunker1-2	0.4	86.2	86.5
6786	PSNH15 9	7009-71		10/14/06 0:00	oal	oal Bunker	MgO Inj o posite Sa ple	0.7	91.1	91.7
6788	PSNH16 1	7009-71		10/16/06 0:00	oal	oal Bunker	MgO Inj o posite Sa ple	0		72.3
6814	PSNH18 7	7009-71		10/19/06 12:00	oal	oal Bunker	M an PM unker co - posite	0.3	62	62.2
6945	PSNH25 4	7009-71		10/31/06 9:00	oal	oal Bunker	S ste 2	0		103
7443	PSNH35 5	7009-71		1/10/07 12:00	oal	oal Bunker	S ste 2			61.4
7444	PSNH35 6	7009-71		1/11/07 21:00	oal	oal Bunker	S ste 2			87.8
7459	PSNH37 1	7009-71		1/12/07 12:00	oal	oal Bunker	S ste 2	0		73.2
7594	PSNH40 3	7009-71		1/30/07 0:00	oal	Unit 1 M	BL - project 06-8042			130
7595	PSNH40 4	7009-71		1/30/07 0:00	oal	Unit 1 PM	BL - project 06-8042			143
7596	PSNH40 5	7009-71		1/30/07 0:00	oal	Unit 2 M	BL - project 06-8042			118
7597	PSNH40 6	7009-71		1/30/07 0:00	oal	Unit 2 PM	BL - project 06-8042			168
7598	PSNH40 7	7009-71		1/31/07 0:00	oal	Unit 1 M	BL - project 06-8042			120
7599	PSNH40 8	7009-71		1/31/07 0:00	oal	Unit 1 PM	BL - project 06-8042			133
7600	PSNH40 9	7009-71		1/31/07 0:00	oal	Unit 2 M	BL - project 06-8042			174
7601	PSNH41 0	7009-71		1/31/07 0:00	oal	Unit 2 PM	BL - project 06-8042			130
7631	PSNH41 2	7009-71	2	2/15/07 0:00	oal	Bunker	LH/90MgO			78.9
7632	PSNH41 3	7009-71	2	2/16/07 0:00	oal	Bunker	L/30MgO - M collection			86
7861	PSNH47 2	7009-71	1	2/21/07 14:00	oal	Unit 1	M29			76.2
7872	PSNH48 3	7009-71	1	2/22/07 13:30	oal	Unit 1	M29			134
7889	PSNH50 0	7009-71	1	2/6/07 3:00	oal	U1 Mk1 M	M29			96.5
7890	PSNH50 1	7009-71	2	1/28/07 0:00	oal	U2 S s2 M	M29			70.5
7891	PSNH50 2	7009-71	2	1/28/07 12:00	oal	U2 S s2 PM	M29			63.1
7892	PSNH50 3	7009-71	2	1/29/07 0:00	oal	U2 S s2 M	M29			91.3
7893	PSNH50 4	7009-71	2	1/29/07 12:00	oal	U2 S s2 PM	M29			88
7900	PSNH50 5	7009-71	1	1/29/07 0:00	oal	U1 S s2 M	M29			207
7901	PSNH50 6	7009-71	1	1/29/07 12:00	oal	U1 S s1 M	M29			123
8120	PSNH57 1	7009-71	2	2/28/07 13:00	oal	oal Bunker		0		93.9
8123	PSNH57 4	7009-71	2	3/29/07 13:00	oal	oal Bunker	LT MgO/Hg	0		87.7
8126	PSNH57 7	7009-71	2	4/1/07 13:00	oal	oal Bunker	LT MgO/Hg	0		88.8
8144	PSNH59 5	7009-71	1	4/10/07 0:00	oal	oal Bunker	unit 1 M	0		103
8145	PSNH59 6	7009-71	1	4/10/07 0:00	oal	oal Bunker	unit 1 PM	0		71.7
8146	PSNH59 7	7009-71	2	4/10/07 0:00	oal	oal Bunker	unit 2 M	0		103
8147	PSNH59 8	7009-71	2	4/10/07 0:00	oal	oal Bunker	unit 2 PM	0		77.1
8148	PSNH59 9	7009-71	2	4/12/07 0:00	oal	oal Bunker	ail	0		63.7
8149	PSNH60 0	7009-71	2	4/13/07 0:00	oal	oal Bunker	ail	0		66.6
9452	PSNH62 6	7009-71	2	4/10/07 2:00	oal	Unit 2 M	HB1673	0.9		79
9453	PSNH62 7	7009-71	1	4/11/07 2:00	oal	Unit 1 M	HB1673	0.8		93.9
9454	PSNH62 8	7009-71	1	5/2/07 14:00	oal	Unit 1 PM	HB1673	0.6		67.4
9455	PSNH62 9	7009-71	1	5/30/07 2:00	oal	Unit 1 M	HB1673	0.7		74.2

ADA ID	Field ID	Project	Unit	Date	Type	Location	Comments	% H2O	Hg (ng/g as rec)	Hg (ng/g dry)
9456	PSNH63 0	7009-71	1	5/30/07 14:00	oal	Unit 1 PM	HB1673	0.8		71.4
9457	PSNH63 1	7009-71	1	5/31/07 2:00	oal	Unit 1 M	HB1673	0.8		78
9458	PSNH63 2	7009-71	2	6/4/07 2:00	oal	Unit 2 M	HB1673	0.7		104
9459	PSNH63 3	7009-71	2	6/5/07 2:00	oal	Unit 2 M	HB1673	0.9		117
9460	PSNH63 4	7009-71	2	6/4/07 14:00	oal	Unit 2 PM	HB1673	0.7		117
9466	PSNH66 0	7009-71	2	6/5/07 2:00	oal	Unit 2 M	HB1673	0.8		119
12195	PSNH92 7	7009-71	2	3/12/08 0:00	oal	PM Bunker				61.2
12199	PSNH93 1	7009-71	2	3/13/08 0:00	oal	Bunker				67.3
12207	PSNH93 9	7009-71	2	3/27/08 0:00	oal	Bunker				89.2
12331		7009-71	2	3/28/08 0:00	oal	oal Bunker				68.2

Halogens

ADA ID	Field ID	Project	Unit	Date	Type	Location	Comments	Cl Dry (ug/g)	Cl AD
5531	M 24	7009-71	2	4/13/06 0:00	oal	o posite	o posite o M 2 M 3 M 4	752.95	741.5
6544	PSNH84	7009-71		10/5/06 0:00	oal	oal Bunker	Baseline - PM Bunker1-2	758	750.8
7443	PSNH35 5	7009-71		1/10/07 12:00	oal	oal Bunker	S ste 2	675	665
12195	PSNH92 7	7009-71	2	3/12/08 0:00	oal	PM Bunker		766	758
12199	PSNH93 1	7009-71	2	3/13/08 0:00	oal	Bunker		827	816
12207	PSNH93 9	7009-71	2	3/27/08 0:00	oal	Bunker		839	829
12331		7009-71	2	3/28/08 0:00	oal	oal Bunker		803	793

ADA ID	Field ID	Project	Unit	Date	Type	Location	Comments	Ag (ug/g)	As (ug/g)	Ba (ug/g)	Be (ug/g)	Cd (ug/g)	Co (ug/g)	Cr (ug/g)	Cu (ug/g)	Mn (ug/g)	Ni (ug/g)	Pb (ug/g)	Sb (ug/g)	Se (ug/g)	Tl (ug/g)	V (ug/g)
5531	M - 24	7009-71	2	4/13/06 0:00	oil	o postle	o postle o M - 2 M - 3 M - 4	<0.02	5.00	71.00	0.70	<0.02	3.00	13.00	6.00	24.00	9.00	4.00	<1	1.00	<1	
6544	PSNH484	7009-71		10/5/06 0:00	oil	oil Bunker	Baseline - PM Bunker 1-2	<0.2	4.00	83.00	0.60	<0.2	3.00	9.00	8.00	18.00	7.00	3.00	<1	<1	<1	
6945	PSNH25	7009-71		10/31/06 9:00	oil	oil Bunker	S site - 2	<0.2	6.00	55.00	0.80	<0.2	3.00	14.00	6.00	23.00	10.00	3.00	<1	2.00	<1	
7443	PSNH35	7009-71		11/00/7 12:00	oil	oil Bunker	S site - 2	<0.2	3.00	51.00	0.60	<0.2	2.00	11.00	5.00	26.00	8.00	3.00	<1	3.00	<1	
9517		7009-71	2	7/13/07 0:00	l sh	o postle	Trona- sh Original ESP	<1		660.00	11.10	2.70	42.00	200.00	120.00	279.00	153.00	105.00	6.00		10.00	275.00
9518		7009-71	2	7/13/07 0:00	l sh	o postle	Hg, LH - sh Supple ental ESP	2.00		1040.00	15.40	21.60	49.00	459.00	286.00	364.00	214.00	511.00	40.00		37.00	522.00
12195	PSNH92	7009-71	2	3/12/08 0:00	oil	PM Bunker		<0.2		54.00	0.60	<0.2	3.00	12.00	6.00	28.00	9.00	3.00	<1			
12199	PSNH483	7009-71	2	3/13/08 0:00	oil	Bunker		<0.2		57.00	0.70	0.20	3.00	12.00	6.00	27.00	8.00	7.00	<1			
12207	PSNH93	7009-71	2	3/27/08 0:00	oil	Bunker		<0.2		50.00	0.70	0.30	3.00	12.00	5.00	23.00	9.00	7.00	<1			
12261		7009-71		3/29/08 0:00	l sh	o postle	o postle o oil ples 12233,12234	<1		574.00	11.10	2.40	33.00	190.00	100.00	240.00	137.00	69.00	5.00			309.00
12331		7009-71	2	3/28/08 0:00	oil	oil Bunker		<0.2		53.00	0.70	<0.2	3.00	12.00	6.00	26.00	9.00	3.00	<1			

9750099

Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378	2379	2380	2381	2382	2383	2384	2385	2386	2387	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397	2398	2399	2400	2401	2402	2403	2404	2405	2406	2407	2408	2409	2410	2411	2412	2413	2414	2415	2416	2417	2418	2419	2420	2421	2422	2423	2424	2425	2426	2427	2428	2429	2430	2431	2432	2433	2434	2435	2436	2437	2438	2439	2440	2441	2442	2443	2444	2445	2446	2447	2448	2449	2450	2451	2452	2453	2454	2455	2456	2457	2458	2459	2460	2461	2462	2463	2464	2465	2466	2467	2468	2469	2470	2471	2472	2473	2474	2475	2476	2477	2478	2479	2480	2481	2482	2483	2484	2485	2486	2487	2488	2489	2490	2491	2492	2493	2494	2495	2496	2497	2498	2499	2500	2501	2502	2503	2504	2505	2506	2507	2508	2509	2510	2511	2512	2513	2514	2515	2516	2517	2518	2519	2520	2521	2522	2523	2524	2525	2526	2527	2528	2529	2530	2531	2532	2533	2534	2535	2536	2537	2538	2539	2540	2541	2542	2543	2544	2545	2546	2547	2548	2549	2550	2551	2552	2553	2554	2555	2556	2557	2558	2559	2560	2561	2562	2563	2564	2565	2566	2567	2568	2569	2570	2571	2572	2573	2574	2575	2576	2577	2578	2579	2580	2581	2582	2583	2584	2585	2586	2587	2588	2589	2590	2591	2592	2593	2594	2595	2596	2597	2598	2599	2600	2601	2602	2603	2604	2605	2606	2607	2608	2609	2610	2611	2612	2613	2614	2615	2616	2617	2618	2619	2620	2621	2622	2623	2624	2625	2626	2627	2628	2629	2630	2631	2632	2633	2634	2635	2636	2637	2638	2639	2640	2641	2642	2643	2644	2645	2646	2647	2648	2649	2650	2651	2652	2653	2654	2655	2656	2657	2658	2659	2660	2661	2662	2663	2664	2665	2666	2667	2668	2669	2670	2671	2672	2673	2674	2675	2676	2677	2678	2679	2680	2681	2682	2683	2684	2685	2686	2687	2688	2689	2690	2691	2692	2693	2694	2695	2696	2697	2698	2699	2700	2701	2702	2703	2704	2705	2706	2707	2708	2709	2710	2711	2712	2713	2714	2715	2716	2717	2718	2719	2720	2721	2722	2723	2724	2725	2726	2727	2728	2729	2730	2731	2732	2733	2734	2735	2736	2737	2738	2739	2740	2741	2742	2743	2744	2745	2746	2747	2748	2749	2750	2751	2752	2753	2754	2755	2756	2757	2758	2759	2760	2761	2762	2763	2764	2765	2766	2767	2768	2769	2770	2771	2772	2773	2774	2775	2776	2777	2778	2779	2780	2781	2782	2783	2784	2785	2786	2787	2788	2789	2790	2791	2792	2793	2794	2795	2796	2797	2798	2799	2800	2801	2802	2803	2804	2805	2806	2807	2808	2809	2810	2811	2812	2813	2814	2815	2816	2817	2818	2819	2820	2821	2822	2823	2824	2825	2826	2827	2828	2829	2830	2831	2832	2833	2834	2835	2836	2837	2838	2839	2840	2841	2842	2843	2844	2845	2846	2847	2848	2849	2850	2851	2852	2853	2854	2855	2856	2857	2858	2859	2860	2861	2862	2863	2864	2865	2866	2867	2868	2869	2870	2871	2872	2873	2874	2875	2876	2877	2878	2879	2880	2881	2882	2883	2884	2885	2886	2887	2888	2889	2890	2891	2892	2893	2894	2895	2896	2897	2898	2899	2900	2901	2902	2903	2904	2905	2906	2907	2908	2909	2910	2911	2912	2913	2914	2915	2916	2917	2918	2919	2920	2921	2922	2923	2924	2925	2926	2927	2928	2929	2930	2931	2932	2933	2934	2935	2936	2937	2938	2939	2940	2941	2942	2943	2944	2945	2946	2947	2948	2949	2950	2951	2952	2953	2954	2955	2956	2957	2958	2959	2960	2961	2962	2963	2964	2965	2966	2967	2968	2969	2970	2971	2972	2973	2974	2975	2976	2977	2978	2979	2980	2981	2982	2983	2984	2985	2986	2987	2988	2989	2990	2991	2992	2993	2994	2995	2996	2997	2998	2999	3000	3001	3002	3003	3004	3005	3006	3007	3008	3009	3010	3011	3012	3013	3014	3015	3016	3017	3018	3019	3020	3021	3022	3023	3024	3025	3026	3027	3028	3029	3030	3031	3032	3033	3034	3035	3036	3037	3038	3039	3040	3041	3042	3043	3044	3045	3046	3047	3048	3049	3050	3051	3052	3053	3054	3055	3056	3057	3058	3059	3060	3061	3062	3063	3064	3065	3066	3067	3068	3069	3070	3071	3072	3073	3074	3075	3076	3077	3078	3079	3080	3081	3082	3083	3084	3085	3086	3087	3088	3089	3090	3091	3092	3093	3094	3095	3096	3097	3098	3099	3100	3101	3102	3103	3104	3105	3106	3107	3108	3109	3110	3111	3112	3113	3114	3115	3116	3117	3118	3119	3120	3121	3122	3123	3124	3125	3126	3127	3128	3129	3130	3131	3132	3133	3134	3135	3136	3137	3138	3139	3140	3141	3142	3143	3144	3145	3146	3147	3148	3149	3150	3151	3152	3153	3154	3155	3156	3157	3158	3159	3160	3161	3162	3163	3164	3165	3166	3167	3168	3169	3170	3171	3172	3173	3174	3175	3176	3177	3178	3179	3180	3181	3182	3183	3184	3185	3186	3187	3188	3189	3190	3191	3192	3193	3194	3195	3196	3197	3198	3199	3200	3201	3202	3203	3204	3205	3206	3207	3208	3209	3210	3211	3212	3213	3214	3215	3216	3217	3218	3219	3220	3221	3222	3223	3224	3225	3226	3227	3228	3229	3230	3231	3232	3233	3234	3235	3236	3237	3238	3239	3240	3241	3242	3243	3244	3245	3246	3247	3248	3249	3250	3251	3252	3253	3254	3255	3256	3257	3258	3259	3260	3261	3262	3263	3264	3265	3266	3267	3268	3269	3270	3271	3272	3273	3274	3275	3276	3277	3278	3279	3280	3281	3282	3283	3284	3285	3286	3287	3288	3289	3290	3291	3292	3293	3294	3295	3296	3297	3298	3299	3300	3301	3302	3303	3304	3305	3306	3307	3308	3309	3310	3311	3312	3313	3314	3315	3316	3317	3318	3319	3320	3321	3322	3323	3324	3325	3326	3327	3328	3329	3330	3331	3332	3333	3334	3335	3336	3337	3338	3339	3340	3341	3342	3343	3344	3345	3346	3347	3348	3349	3350	3351	3352	3353	3354	3355	3356	3357	3358	3359	3360	3361	3362	3363	3364	3365	3366	3367	3368	3369	3370	3371	3372	3373	3374	3375	3376	3377	3378	3379	3380	3381	3382	3383	3384
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APPENDIX K: Co-Benefit Report

Analysis of Co-Benefits during Sorbent Injection Testing at Merrimack, Unit 2

Topical Report

October 14, 2008

Prepared for

**ADA ES, Inc.
8100 Southpark Way, Suite B-2
Littleton, CO 80120**

Prepared by

**Reaction Engineering International
77 West 200 South, Suite 210
Salt Lake City, UT 84101**

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List of Acronyms

AC	Activated carbon
DP	Dewpoint
ESP	Electrostatic precipitator
MMacf	Millions of actual cubic feet
MW	Megawatts
SBS	Sodium bisulfate
SCA	Specific collection area
SCR	Selective catalytic reduction
SO ₂	Sulfur dioxide
SO ₃	Sulfur trioxide

Introduction

As part of the mercury control technology demonstration program at Merrimack Unit 2, sorbents to reduce SO_3 in the flue gas have been injected during injection of activated carbon. Previous work with activated carbon injection at coal-fired power plants has shown that the ability of activated carbon to adsorb mercury depends on both the temperature of the flue gas and on the SO_3 concentration in the flue gas. Increasing the concentration of SO_3 in the flue gas can decrease the effectiveness of activated carbon sorbents for mercury removal.

Alkaline sorbents have been used at coal-fired power plants to reduce concentrations of SO_3 in the flue gas, particularly for plants burning high- or medium-sulfur bituminous coals or plants with SCRs. Trona (sodium sesquicarbonate), magnesium oxide, magnesium hydroxide, hydrated lime, and sodium bisulfate (SBS) have all been injected at various locations in boilers with the objective of reducing SO_3 emissions.

Even though Merrimack does not burn a high-sulfur coal, the SO_3 downstream of the air preheater can be high because of the SCR. Two alkaline sorbents (trona and MgO) were injected with the intent of reducing SO_3 and improving the performance of activated carbon for Hg removal. The primary objective of the alkaline sorbent injection was to improve Hg capture by activated carbon. However, reduction of SO_3 could provide a co-benefit to the plant, by allowing the air preheater to operate with a lower cold-end average (CEA) temperature, which would result in an increase in overall efficiency and which could reduce sulfuric acid corrosion at cold spots. Injection of the sorbents might affect the collection efficiency and operation of the ESPs, however.

A program was undertaken to quantify the effects of alkaline sorbents on SO_3 concentrations in the flue gas as well as on the operation of the ESPs. These results are summarized here. The impact of alkaline sorbents on the effectiveness of activated carbon for mercury removal at Merrimack Unit 2 has been discussed elsewhere in the final report and will not be discussed here.

Effect of Alkaline Sorbents on SO₃ in Flue Gas

Figure 1 illustrates the points in the boiler at which sorbent for controlling SO₃, either MgO or trona, or activated carbon (AC) was injected.

In 2006, E.ON Engineering used a manual sampling method to measure vapor-phase SO₃ at Unit 2. E.ON Engineering used a modified Controlled Condensation Method, similar to EPA Method 8A, except that the impingers for measuring SO₂ were not used, the dry gas meter was replaced by a wet gas meter, and an ESP was used instead of a quartz filter. The modifications were made to allow measurement in wet stacks or where reactive (alkaline) ashes might be present in the flue gas. E.ON Engineering used a heated, tubular ESP and claimed that any sulfuric-acid aerosols in the flue gas would evaporate in the ESP and enter the impingers as gaseous SO₃. The impinger was analyzed for SO₃, which was reported on a dry basis at 3% O₂. Appendix A contains details of the measurement system.

Figure 1. Sorbent injection and SO₃ measurement locations.

In 2008, Platt Environmental Services made measurements of SO₃ in the flue gas on Unit 2 during trona injection. Measurement locations included SCR inlet, SCR outlet, air preheater outlet, ESP 1 outlet and ESP 2 outlet.

Platt Environmental Services used the Consol Controlled Condensate Method to measure SO₃ and SO₂. The flue gas passed through a hot, water-cooled condenser (140°F) loosely packed with quartz wool, and then through impingers in series that removed SO₂ and subsequently SO₃. The quartz wool in the condenser was rinsed and analyzed for SO₃ (particulate SO₃). Gaseous SO₃ was obtained from analyzing the impinger. The flue gas O₂ concentration was not recorded, nor was the flue gas temperature. The measured SO₃ was reported on a dry basis at actual O₂ concentration. Appendix B contains details of the measurement system.

In 2006 and 2007, Breen Energy Systems installed a modified dewpoint meter (*AbSensor SO₃*), which records both the initial condensation temperature and the evaporation temperature of condensable vapors in the in the flue gas; these temperatures can be related to the SO₃ concentration in the flue gas.

Table 1 reproduces the averaged SO₃ concentrations as reported by E.ON during baseline testing (October 2, 2006) and injection of trona (October 31, 2006 and November 1, 2006). The baseline SO₃ concentration between the two ESPs (ESP 1 outlet) was in the range of 15 to 20 ppmv SO₃ (dry, at 3% O₂). Injection of 500 lb/hr of trona reduced the SO₃ concentration between the two ESPs to 7-10 ppmv SO₃ (dry, at 3% O₂). The CEA was able to be reduced with trona injection, which resulted in a 20°F lower stack temperature. However, the lower flue gas temperature did not result in a significant decrease in SO₃ downstream of the air preheater.

Table 1. Average SO₃ concentrations measured by modified Controlled Condensation Method in 2006.

Date	Location	Average Temp. °F	No. of Tests	Avg. SO ₃ , dry, ppmv at 3% O ₂	Comments
10/2/06	APH outlet	344	12	12.9	Baseline
10/2/06	ESP 1 outlet	331	7	15.2	Baseline
10/2/06	ESP 2 outlet	327	7	13.9	Baseline
10/31/06	ESP 1 outlet	--	3	14.8	Baseline
10/31/06	ESP 1 outlet	334*	3	10.2	500 lb/hr trona, normal CEA temperature
11/1/06	ESP 1 outlet	326*	4	7.3	500 lb/hr trona, normal temperature
11/1/06	ESP 1 outlet	313*	2	8.8	500 lb/hr trona, lower CEA temperature
11/1/06	ESP 1 outlet	315*	6	8.5	625 lb/hr trona, lower CEA temperature
11/1/06	ESP 1 outlet	333*	2	20.2	Baseline

*Stack temperature

Table 2 shows the averaged SO₃ concentrations as reported by Platt Environmental Services during trona injection on March 26, 27 and 28, 2008). Activated carbon was also being injected between ESP 1 and ESP 2 during this time at a rate of 5 lb/MMacf. The load on Unit 2 was kept steady at 335 MW during this time. The average temperature at the air preheater exit was 334°F, which is similar to the “normal” CEA stack temperature for the 2006 SO₃ measurements shown in Table 1.

The sum of the particulate and gaseous SO₃ is reported in the table, averaged for each run. These results cannot be compared quantitatively to those in Table 2 because the concentrations in Table 2 have not been corrected for the O₂ content of the flue gas and because there are no reported data on coal sulfur content for 2006 or 2008.

Qualitatively, however the impact of trona injection on SO₃ is similar in both sets of measurements. During the 2008 manual SO₃ sampling measurements, trona injection at

500 lb/hr resulted in SO₃ concentrations downstream of the air preheater of 9-10 ppmv (dry, at actual O₂), while 1000 lb/hr of trona injection reduced the SO₃ concentration to 5 ppm SO₃ (dry, actual O₂).

Table 2. Average SO₃ concentrations measured by Controlled Condensation Method in 2008.

Date	Location	No. of Tests	Avg. SO ₃ , dry, ppmv at actual O ₂	Comments
3/28/2008	SCR inlet	3	16.4	500 lb/hr trona injection
3/27/2008	SCR outlet	3	14.2	500 lb/hr trona injection
3/27/2008	APH outlet	3	10.6	500 lb/hr trona injection
3/26/2008	ESP 1 outlet	3	9.3	500 lb/hr trona injection
3/26/2008	ESP 2 outlet	2	9.5	500 lb/hr trona injection
3/28/2008	ESP 2 outlet	3	5.1	1,000 lb/hr trona injection

Figure 2 is a comparison between the E.ON manual method and the Breen dewpoint measurement, where measurements were taken simultaneously in 2006. The SO₃ concentration has been calculated from an assumed water content in the flue gas of 7.6 vol% using the standard formula. Breen recommended using the average of the initial condensation (dewpoint or DP) temperature and the top temperature (or evaporation temperature). This is shown in Figure 2, along with the SO₃ concentration calculated only from the initial condensation temperature (at actual flue gas O₂). The SO₃ concentrations from the manual method fall in between the two concentrations calculated from the dewpoint data. There appears to be a correlation between the methods with R² values of 0.85 and 0.83 for the initial dewpoint and the average dewpoint, respectively.

Figure 2. Comparison of manual and dewpoint SO₃ concentration (at actual O₂) measured at exit of new ESP.

Figure 3 and Figure 4 show the time sequence of the SO₃ concentration for baseline and trona injection, respectively. The Breen instrument appeared responsive to trona injection (Figure 4).

SO₃ Concentrations (Manual and Automatic)

Figure 3. SO₃ concentration (actual O₂) during October, 2006 baseline test.

Figure 4. SO₃ concentration (actual O₂) during October/November, 2006 trona injection.

Figure 5 shows the SO₃ concentrations measured by the manual method in between the ESPs correlated with the trona injection rate in 2006. Trona injection was carried out at both normal cold-end average temperature and reduced temperatures, corresponding to stack temperatures of about 333°F and 315°F, respectively. Trona injection reduced the SO₃ concentration by 50% at 500 lb/hr injection rate and by 64% at 625 lb/hr injection rate.

Figure 5. SO₃ measured between ESPs (at 3% O₂) as a function of trona injection rate.

The Breen dewpoint SO₃ measurement appeared well correlated with the manual method initially and responded to trona injection in the November 1, 2006 testing. Subsequently, the instrument did not appear to respond to sorbent injection (November, 2006 and January, 2007, Figure 6 and Figure 7, respectively), nor did the calculated SO₃ concentration appear to be reasonable. The dewpoint monitor may have become fouled with some of the alkaline sorbent.

SO₃ Concentration and Trona Injection

Figure 6. SO₃ concentration (actual O₂) calculated from dewpoint for November, 2006.

SO₃ Concentration and Trona Injection

Figure 7. SO₃ concentration (actual O₂) calculated from dewpoint for January, 2007.

Injection of MgO was carried out in October, 2006 and February, 2007. Manual SO₃ measurements were not made during MgO injection. During October, the Breen instrument showed a response to MgO injection (Figure 8), although the levels of SO₃, both with and without sorbent injection, appeared to be unrealistically high. During the February, 2007 testing of MgO injection (Figure 9), the Breen SO₃ measurements did not appear to be accurate. Injection of MgO lowered SO₃ concentrations, although the data are not quantitative.

Figure 8. SO₃ concentration (actual O₂) during October, 2006 MgO injection.

Figure 9. SO₃ concentration (actual O₂) during February, 2007 MgO injection.

Effect of Sorbents on ESP Performance and Opacity

Addition of particles to the flue gas upstream of the ESPs can affect the performance of the ESPs and the resulting particulate emissions. During the injection of both SO₃ remediation sorbents (trona, MgO) and activated carbon, the power levels of the ESPs and the stack opacity were measured.

During MgO injection, stack opacity increased (Figure 10), although not consistently. In the October, 2006 testing (up to 180 lb/hr) opacity increased from about 11% to about 17% at normal cold-end average temperature (~333°F stack temperature), although there was considerable scatter in the opacity data. Lowering the temperature (~315°F stack temperature) decreased the opacity at 180 lb/hr injection from about 17% to about 13%. In the February, 2007 testing, however, there was not a clear effect of MgO injection on opacity, and the opacity was lower overall than in the October, 2006 testing.

Figure 10. Stack opacity as a function of MgO injection rate.

Injection of trona, in contrast to MgO, had much less effect on stack opacity, as shown in Figure 11. Opacity increased from about 11% to about 13% at a trona injection rate of 625 lb/hr. At 500 lb/hr there did not appear to be a significant impact on opacity. There was little effect of temperature on the opacity during trona injection.

Figure 11. Stack opacity as a function of trona injection rate.

On October 11, 2006 half of an inlet ESP section in ESP 1 was taken out of service due to a high ash hopper level, which depowered one quarter of the inlet row. The section was repowered on December 18, 2006. All sections were in service during the February MgO injection. The plant noted that the inlet row of ESP 1 had a more significant impact on opacity than any other rows. That was most likely the reason for the higher impact to opacity from MgO injection in October and trona injection in November, 2006, as compared to January and February, 2007.

Activated carbon injection could also have an effect on opacity, since carbon particles can be difficult to collect. Figure 12 shows that at normal stack temperatures, both Darco Hg-LH and Darco E-26 injection resulted in increases in opacity. Injection of Darco E-26 at lower temperature, however, had little impact on opacity. Injection of Darco Hg-LH upstream of the air preheater did not result in a significant increase in opacity, presumably because most of the carbon was caught in ESP 1, thus reducing the added burden on ESP 2.

Figure 12. Stack opacity as a function of activated carbon injection rate.

Summary

- Initially, the Breen dewpoint monitor gave real-time SO₃ readings that corresponded well with the manual measurement of SO₃ made by E.ON Engineering (with and without trona injection). However, over time the instrument did not produce SO₃ measurements that appeared to respond to SO₃ sorbent injection. Contamination from the injected alkaline sorbents.
- Uncontrolled SO₃ levels in between the two ESPs were in the range of 15 to 20 ppmv (dry, 3% O₂). Injection of 500 lb/hr of trona reduced the SO₃ concentration by 50% to 7 to 10 ppmv. Injection of trona at a rate of 1000 lb/hr decreased the SO₃ concentration downstream of the air preheater further to about 5 ppmv.
- Injection of MgO appeared (qualitatively) to reduce SO₃ concentrations downstream of the air preheater.
- Injection of MgO at 180 lb/hr increased opacity from about 11% to about 17% at normal temperatures. When the cold-end average temperature was reduced, giving a stack temperature of 315°F, the opacity decreased to about 13% at 180 lb/hr.
- Injection of trona at 500 lb/hr did not have a noticeable impact on opacity; at 625 lb/hr, there was a slight increase.
- Injection of activated carbon between the two ESPs at normal temperatures increased the stack opacity. Reduced flue gas temperature or injection of activated carbon upstream of the air preheater did not produce a noticeable impact on opacity.

Appendix A

E.ON Engineering Test Report

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SO₃ Test Report

- D R A F T -

Test period: 10/02 - 10/03/2006 and 10/31 - 11/01/2006

ordered by ADA-ES, Inc.

Name of Plant Owner: Public Service of New Hampshire (PSNH)
Plant Identification: Merrimack Station, Unit 2
Location of Plant: 97 River Road, Bow, NH 03304

address: E.ON Engineering GmbH, P.O.Box 20 02 55, 45837 Gelsenkirchen

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1 Task description

Public Service of New Hampshire (PSNH) operates two coal fired boilers with cyclone burners (Unit 1: 120 MW and Unit: 2: 330 MW) at Merrimack Station which is located in Bow, New Hampshire. ADA-ES, Inc. carries out a comprehensive research program for mercury mitigation at Merrimack Station and, in this context, was interested in the behaviour of sulphur trioxide (SO₃) along the flue gas path from the air heater outlet to the stack. For this reason E.ON Engineering GmbH was commissioned to carry out SO₃ baseline testing and SO₃ testing during sorbent injection at Merrimack Station, Unit 2.

2 Test schedule, SO₃ measurement locations

All the tests were performed at full load (332 MW_{gross}) when firing fuel blends of various low and mid sulfur coals. Unit 2 is equipped with a tubular heat exchanger (air heater) and soot blowers are not installed. The following test locations and measuring points for SO₃ testing were agreed:

For baseline testing (October 02-03, 2006):

- Air heater outlet, North and South): Two ducts, three ports, 1 point deep (ca. 1.8 m, 5.9 ft)
- Inter ESP: One duct, one port, 1 point deep (ca. 2.5 m, 8.2 ft)
- Downstream ESP II, upstream stack: One duct, one port, 1 point deep (ca. 2.5 m, 8.2 ft)

For testing during sorbent injection (October 31 and November 01, 2006):

- Inter ESP: One duct, one port, 1 point deep (ca. 2.5 m, 8.2 ft)

At the sampling location "air heater outlet" flue gas temperatures at the different sampling ports were provided by the client. It was agreed upon that SO₃ sampling was performed on three ports with highest, lowest and medium average temperatures along the measured points. The temperature profile of the ducts at air heater outlet is given in Annex 1.

A graphical representation of all test locations is given in Figures 1 and 2.

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Figure 1: Scheme of Merrimack Station, Unit 2, and location of sampling ports used for SO₃ sampling

Figure 2: Sampling ports at air heater outlet (used ports in black) and average flue gas temperatures

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3 Measuring and Analytical Methods

3.1 Measuring Parameter: Sulphur Trioxide (SO₃)

Measuring Method: (Modified) Controlled Condensation Method

The Controlled Condensation Method (VGB Method 4.5.2) was designed to measure the vapour phase of SO₃ by condensation as H₂SO₄ under controlled gas conditions, eliminating the potential for interference with sulphur dioxide. This method was applied during baseline testing.

The Controlled Condensation Method has been modified by E.ON Engineering for determining sulphuric acid emissions downstream of wet scrubbers or at wet stacks of coal fired power stations or where any alkaline ashes or sorbents are present in the flue gas which may react with the SO₃ on the filter. Instead of the typically used quartz filter, the E.ON method utilizes a tubular electrostatic precipitator (ESP) to remove the ash particles to the side walls away from the gas stream. The sulphuric acid aerosols, if present, are evaporated in the ESP without intensive contact to fly ash particles. The high residence time of the gas stream within the heated ESP and the operation of the ESP at a temperature level significantly higher than the acid dew point ensure that only gaseous SO₃ is entering the condenser. This Method was applied for testing during sorbent injection.

Sampling Equipment:

The following items were used for sample collection:

Sampling Train:

A schematic of the sampling train used is shown below in Figure 3. The schematic is similar to the Method 8A¹ train (as used in the US) except that the impingers for SO₂ determination are omitted and that - in case of the modified method - an electrostatic precipitator is used instead of the quartz filter. The dry gas meter was replaced by a wet gas meter eliminating the need for a silica gel drying tube.

Quartz wool filter:

Quartz tube with lateral inlet in direction of the flue gas flow and packed with quartz wool. The filter is heated by the flue gas (isothermal filter conditions).

Probe liner:

Quartz, straight tube approximately 10-mm inside diameter, with a heating element and a stainless steel jacket. The temperature of the probe is controlled by a thermocouple taped on the quartz tube insulated with glass wool. Probe temperature was set to 260 °C (500 °F).

¹ A Method from the National Council of the Paper Industry for Air and Stream Improvement

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Figure 3: Sulphuric Acid Sampling Train

Electrostatic Precipitator (ESP):

Tubular ESP heated up to 200 °C (392 °F).

High voltage: 2 to 24 kV. Maximum flow rate: 70 l/min.

View and schematic of the ESP is given in Figure 4.

The filter consists of an exchangeable tube with a removable precipitation foil and a spray electrode in the center. The filter is placed in a caloric isolated container. The heating is adjusted to 200 °C (392 °F). At a high voltage of 24 kV and a filter current of 0.5 mA the separation efficiency of the filter is > 99.5 % for a particle size of 0.1 to 10 µm.

Figure 4: View and Schematic of the ESP

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H₂SO₄ Condenser:

The condenser coil is made from borosilicate glass with 500 cm of 6 mm ID tubing. The condenser coil is placed in a water bath which is maintained at a temperature of 80-90 °C (175-195 °F).

Metering System:

This system consists of a vacuum gauge, leak-free pump, temperature sensors capable of measuring temperature to within 1 °C, wet gas meter (WGM) capable of measuring volume to within 2 percent, and related equipment, as shown in Figure 3.

Sample Recovery

After each sampling run, the condensation coil is removed from the water bath and cooled down to ambient air temperature. The condensation coil is then rinsed with deionised water in a volumetric flask. Multiple rinses are used for good washing. The volumetric flask is filled up with deionised water to exactly 200 ml.

Sample Analysis

With a graduated pipette a volume of 20 ml is taken from the volumetric flask (section 4.2.2.3) and transferred to a 250 ml Erlenmeyer flask. After adding 80 ml of 2-propanol (IPA) and 4 drops of Thorine as indicator the solution is titrated with barium-perchlorate. Based on the sampled gas volume and the titration test result, the sulphuric acid aerosol concentration present in the flue gas is calculated.

Limit of Determination: 1 mg/m³ at a sample volume of 0.1 m³

3.2 Measuring Parameter: Oxygen (O₂)

Oxygen was measured at the gas meter outlet of each SO₃ sampling train.

Analyzer: Manufacturer: M & C Company, Type: PMA 10

Measuring Range: 0 - 30 Vol.-%

Analyzer Calibration: Calibration Gas: Air (20.9 Vol.-%)

Limit of Determination: 0.1 Vol.-%

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4 Test Conditions and Results

4.1 Operating Conditions of the Plant during Testing

Normally all SO₃ tests were carried out during full load of the plant (321 MW_{gross}). On October 3rd 2006 initially baseline testing at full load with reduced air heater outlet temperature was intended. However, due to transformer troubles, boiler load had to be reduced to 232 MW_{gross} and therefore SO₃ testing was performed at reduced load. Detailed plant data of the testing period 10/02/2006 - 10/03/2006 are summarized in Annex 2.

4.2 Testing Results

Baseline Testing:

The results of the baseline testing during full load operation without injection of SO₃ sorbents at the three different sampling locations are summarized in Table 1. Detailed sampling and analysis data of each individual testing are documented in Annex 3.

Table 1: Summarized Results of SO₃ Baseline Testing*

Date	Location	Average Flue Gas Temperature [°F]	Number of Tests	Average SO ₃ Concentration [ppm at 3 % O ₂]	Comment
10/02/2006	Air heater outlet	344	12	12.9	three ports (7, 10, 16)
10/02/2006	Inter ESP	331	7	15.2	one port
10/02/2006	ESP II outlet	327	7	13.9	one port

* Tests on October 03, 2006 at reduced load are not considered in this table

Testing during Sorbent Injection:

Summarized results of testing with sorbent injection on October 31st and November 1st, 2006 are presented in Table 2. Detailed sampling and analysis data of each individual testing are documented in Annex 4.

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Table 2: Summarized Results of SO₃ Testing at Sampling Location "Inter ESP" during Sorbent Injection

Date	Time	Number of Tests	Average SO ₃ Concentration [ppm at 3 % O ₂]	Comment
10/31/2006	10:30-12:00	3	14.8	No injection
10/31/2006	16:30-18:00	3	10.2	With injection*
11/01/2006	10:10-10:40	2	8.8	Injection: 500 lb/h, drop temp. before pre-heater
11/01/2006	11:15-14:10	6	8.5	Injection: 625 lb/h, drop temp. before pre-heater
11/01/2006	14:55-16:15	4	7.3	Injection: 625 lb/h, normal temp. before pre-heater
11/01/2006	17:15-17:55	2	20.2	No injection, drop temp. before pre-heater

* One test without injection within this time period is not considered in these values.

PAU/May-Fe

12/20/2006

 Hans-Joachim Dieckmann

 Dr. Johannes Mayer

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5 Annex

Annex 1	Temperature Profile at Air Heater Outlet
Annex 2	Plant Data of October 02-03, 2006
Annex 3	Individual Results of SO ₃ Baseline Testing
Annex 4	Individual Results of SO ₃ Testing during Sorbent Injection

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Annex 1: Flue gas temperatures [°F] at air heater outlet, provided by the client

		Port no.															
		Duct North								Duct South							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Depth [inches]	6 5/16	349		368		340		317			-		-		-		366
	19	347		362		337		307		306			-		-		361
	31 11/16	342		360		334		308		303			331		360		363
	44 5/16	354		351		334		330		305			335		365		370
	51	359		357		347		345		308			354		368		368
	69	364		353		344		342		319			351		360		360
Average		352.5		358.5		339.3		324.8		308.2			342.8		363.3		364.7

Date of measurement: 09/29/2006

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Annex 2.1: Plant Data of October 02-03, 2006

Gross MW	Coal Burned	Cond Press LP	Cond Press HP	Primary	Secondary	Econo diff inH2O	AH diff	Gas Outlet	Furnace pres	Windbox	FD Discharge	FD Discharge
	inH _g	inH _g	inH _g	SH diff inH _{2O}	SH Diff inH _{2O}	inH _{2O}	inH _{2O}	inH _{2O}	inH _{2O}	pres inH _{2O}	2A Press inH _{2O}	2B Press inH _{2O}
AW2701000001	AW2701000001	AW2701000001	AW2701000001	AW2701000001	AW2701000001	AW2701000001	AW2701000001	AW2701000001	AW2701000001	AW2701000001	AW2701000001	AW2701000001
314.1	235.9	1.61	1.95	4.99	1.83	1.67	7.21	5.93	27.37	59.38	65.41	66.88
314.2	236.4	1.61	1.95	4.96	1.82	1.66	7.15	5.93	27.21	59.33	65.26	66.79
314.3	236.9	1.61	1.95	5.02	1.81	1.69	7.26	5.96	27.51	59.60	65.62	67.15
314.8	236.9	1.61	1.95	5.04	1.83	1.70	7.24	5.94	27.57	59.65	65.71	67.18
313.7	236.0	1.66	1.95	4.96	1.82	1.67	7.02	5.94	26.97	59.01	65.80	66.48
314.0	235.0	1.61	1.95	4.96	1.82	1.68	7.12	5.94	27.07	59.17	65.14	66.64
324.7	245.4	1.61	1.95	5.16	1.95	1.76	7.46	6.10	28.63	60.57	67.00	68.34
325.3	244.2	1.61	1.95	5.21	1.91	1.77	7.48	6.14	28.62	60.63	66.96	68.46
325.2	244.7	1.61	1.95	5.09	1.89	1.70	7.11	6.03	27.64	59.25	67.45	68.92
324.9	244.4	1.61	1.95	5.23	1.80	1.63	7.41	6.04	28.29	60.37	66.66	68.08
324.8	244.9	1.61	1.95	5.26	1.81	1.63	7.40	6.04	28.49	60.50	66.80	68.27
325.2	245.4	1.61	1.95	5.24	1.82	1.64	7.40	6.04	28.49	60.53	66.86	68.27
325.2	244.9	1.61	1.95	5.27	1.78	1.63	7.40	6.04	28.38	60.40	66.73	68.21
324.8	244.8	1.61	2.04	5.26	1.83	1.64	7.40	6.04	28.49	60.50	66.88	68.29
325.2	244.8	1.66	2.05	5.27	1.83	1.64	7.43	6.04	28.57	60.65	67.01	68.43
325.1	245.1	1.72	2.05	5.24	1.77	1.64	7.40	6.04	28.46	60.47	66.76	68.17
324.9	244.6	1.72	2.05	5.27	1.79	1.64	7.39	6.04	28.39	60.48	66.79	68.21
325.1	243.9	1.72	2.05	5.24	1.82	1.63	7.38	6.04	28.25	60.31	66.56	68.02
324.9	244.4	1.72	2.05	5.21	1.84	1.64	7.40	6.04	28.37	60.38	66.73	68.08
326.7	246.3	1.72	2.05	5.32	1.85	1.66	7.56	6.04	28.85	60.87	67.29	68.71
327.2	246.3	1.72	2.05	5.30	1.86	1.66	7.53	6.04	28.97	61.04	67.49	68.88
325.8	245.5	1.72	2.05	5.27	1.86	1.65	7.55	6.04	28.81	60.83	67.22	68.67
325.0	244.7	1.81	2.05	5.21	1.87	1.63	7.51	6.04	28.61	60.61	66.97	68.36
324.6	245.4	1.88	2.05	5.22	1.86	1.62	7.47	6.04	28.50	60.57	66.86	68.35
324.7	246.0	2.08	2.17	5.25	1.86	1.64	7.49	6.04	28.73	60.74	67.09	68.53
325.0	246.4	2.25	2.25	5.24	1.90	1.65	7.48	6.04	28.64	60.89	67.30	68.79
318.0	239.8	2.00	2.14	5.06	1.85	1.77	7.20	5.87	27.59	59.72	65.85	67.31
305.0	228.4	1.79	1.97	4.77	1.86	1.66	6.76	5.48	25.69	57.80	63.42	64.91
304.9	229.2	1.76	1.94	4.80	1.77	1.69	6.81	5.48	26.08	58.14	63.82	65.36
305.1	229.4	1.76	1.94	4.80	1.79	1.69	6.77	5.43	25.95	58.01	63.64	65.15
319.2	240.0	1.76	1.99	5.10	1.90	1.80	7.23	5.61	27.90	59.91	66.01	67.53
324.7	243.3	1.76	2.04	5.20	1.94	1.83	7.42	6.01	28.60	60.65	66.94	68.48
325.2	243.6	1.76	2.04	5.21	1.92	1.83	7.43	6.01	28.65	60.78	67.12	68.47
325.0	243.6	1.71	2.04	5.19	1.93	1.82	7.47	6.01	28.57	60.67	67.03	68.51
324.8	243.3	1.66	2.04	5.21	1.93	1.82	7.42	6.01	28.51	60.63	66.91	68.37
325.2	243.3	1.66	2.04	5.19	1.99	1.82	7.42	6.01	28.52	60.65	66.99	68.44
325.1	243.8	1.66	2.04	5.18	1.97	1.82	7.47	6.01	28.52	60.64	66.96	68.44
325.0	244.0	1.66	2.04	5.26	1.96	1.83	7.51	6.01	28.79	60.86	67.24	68.93
325.2	243.9	1.71	2.04	5.21	1.93	1.83	7.48	6.01	28.68	60.83	67.24	68.92
325.7	243.3	1.69	2.04	5.20	1.96	1.82	7.39	6.01	28.59	60.69	67.04	68.71
325.6	242.8	1.68	2.04	5.22	1.93	1.83	7.52	6.01	28.75	60.83	67.20	68.89
325.0	241.0	1.69	2.04	5.19	1.90	1.61	7.40	6.01	28.46	60.55	66.84	68.53
324.9	240.7	1.76	2.04	5.16	1.89	1.61	7.42	6.01	28.50	60.57	66.89	68.52
324.5	240.5	1.76	2.04	5.16	1.90	1.62	7.41	6.01	28.49	60.56	66.85	68.58
325.3	241.0	1.76	2.04	5.17	1.99	1.82	7.42	6.01	28.58	60.71	67.08	68.78
262.9	192.9	1.76	1.88	3.96	1.50	1.40	5.61	4.18	21.05	53.36	57.91	59.46
231.4	175.2	1.77	1.83	3.75	1.40	1.33	5.30	3.78	19.76	51.88	56.13	57.74
233.0	177.9	1.80	1.83	3.79	1.44	1.34	5.37	3.78	20.04	52.13	56.43	57.94
232.9	176.5	1.86	1.85	3.81	1.45	1.35	5.30	3.89	20.16	52.26	56.58	58.14
233.0	179.2	1.96	1.96	3.84	1.45	1.36	5.34	4.04	20.32	52.35	56.70	58.29
233.0	179.1	2.01	1.97	3.89	1.46	1.37	5.36	4.20	20.41	52.54	56.96	58.47
233.1	176.4	1.82	1.83	3.84	1.46	1.36	5.36	4.15	20.32	52.46	56.82	58.37

Engineering	Environmental Services	B.-Unit:	PAU
			Name:	Dr. Mayer/Fe
			Date:	12/20/2006
			Page:	13 of 17
ADA-ES, Merrimack Station, Unit #2 SO ₃ Test Report - <i>D R A F T</i> -			Phone:	+49-2096016284
			Fax:	+49-2096016403
			Report-No:	06-16-640285

Annex 2.2: Plant Data of October 02-03, 2006 (continued)

Wind turn diff inH ₂ O	U2 GFF 2A airps AVE TO MEDIAN 25% INT	U2 GFF 2B airps AVE TO MEDIAN 25% INT	AH gas out temp N AVE TO MEDIAN 25% INT	AH gas out temp N1 AVE TO MEDIAN 25% INT	AH gas out temp S1 AVE TO MEDIAN 25% INT	AH gas out temp S AVE TO MEDIAN 25% INT	AH cold end ave N temp AVE TO MEDIAN 25% INT	AH cold end ave S temp AVE TO MEDIAN 25% INT	AH ave cold end temp AVE TO MEDIAN 25% INT	AH air inlet 2B temp AVE TO MEDIAN 25% INT	AH air inlet 2A temp AVE TO MEDIAN 25% INT	Opacity AVE TO MEDIAN 25% INT
32.02	-0.17	84.72	342.9	305.2	305.4	345.1	251.1	255.3	253.0	183.1	177.8	6.95
32.12	-0.17	84.85	342.2	304.8	304.9	345.2	250.6	254.9	252.8	183.1	177.8	6.80
32.09	-0.17	84.71	341.8	304.4	304.5	347.7	250.6	254.6	252.5	182.7	178.1	6.76
32.08	-0.17	84.71	341.5	303.9	303.9	347.2	250.6	254.3	252.2	183.4	178.4	6.66
32.04	-0.17	84.89	340.5	303.7	303.9	347.2	250.8	254.3	252.3	183.4	178.4	6.78
32.10	-0.17	84.84	339.8	303.7	303.9	347.3	250.1	254.3	252.1	183.2	178.0	6.64
31.94	-0.17	84.55	340.8	303.4	304.0	347.2	250.0	254.1	252.2	182.5	178.4	6.66
32.01	-0.17	84.82	341.2	303.9	304.9	347.6	250.4	254.2	252.4	182.6	178.2	6.71
31.60	-0.17	84.90	340.5	303.7	304.7	347.7	250.1	254.2	252.4	183.0	178.4	6.76
32.08	-0.17	85.02	339.7	303.3	304.1	346.6	250.0	254.2	252.4	183.1	178.4	6.71
32.01	-0.17	84.76	339.2	302.4	302.9	344.1	250.0	253.5	251.6	183.0	178.9	6.77
32.04	-0.17	84.67	338.9	302.2	302.1	344.3	249.9	253.2	251.4	182.8	179.0	6.79
32.01	-0.17	84.97	338.5	301.9	301.9	344.1	249.5	252.7	251.3	183.1	179.0	6.72
32.01	-0.17	84.83	338.2	301.7	301.6	343.6	249.5	252.7	251.1	182.8	179.0	6.80
32.08	-0.17	84.69	338.3	301.8	301.8	344.1	249.5	252.8	251.3	182.8	179.2	7.34
32.01	-0.17	84.88	339.7	303.1	303.6	345.6	250.0	254.0	252.1	183.1	178.7	6.91
32.09	-0.17	84.95	340.2	303.4	303.9	347.2	250.0	254.3	252.2	183.1	178.4	6.56
32.07	-0.17	84.93	340.4	303.6	303.9	345.9	250.0	254.3	252.2	182.9	178.4	6.46
32.01	-0.17	84.93	340.3	303.6	304.4	347.7	250.0	254.3	252.4	183.1	178.4	6.48
32.01	-0.17	84.86	340.7	303.9	304.5	347.7	250.3	254.8	252.5	183.1	178.4	6.40
32.07	-0.17	84.96	340.8	304.0	304.5	347.7	250.5	254.8	252.5	183.1	178.4	6.78
32.02	-0.17	84.72	340.8	304.1	304.1	347.5	250.5	254.6	252.3	182.9	178.4	6.62
32.01	-0.17	84.98	340.8	304.0	304.0	347.0	250.5	254.3	252.2	182.7	178.4	6.60
32.06	-0.17	85.03	340.8	303.8	304.0	345.7	250.4	254.3	252.2	183.1	178.4	6.68
32.01	-0.17	84.87	341.2	303.7	303.5	346.4	250.5	253.9	252.1	182.5	178.4	6.69
32.05	-0.17	84.56	341.3	303.5	303.4	346.2	250.5	253.8	252.1	182.6	178.4	6.84
32.13	-0.17	85.13	341.2	303.4	303.3	346.0	250.4	253.8	252.0	182.7	178.4	6.71
32.10	-0.17	85.12	339.9	303.0	302.2	345.0	249.9	253.6	251.7	183.1	178.6	6.65
32.08	-0.17	84.53	338.8	302.1	300.6	343.6	249.9	252.6	251.0	183.0	178.9	6.71
32.06	-0.17	84.62	338.4	301.7	299.8	342.7	249.4	251.8	250.7	182.6	178.9	6.56
32.01	-0.17	84.52	339.1	302.0	300.0	342.8	249.9	251.8	250.9	181.9	178.4	6.79
32.06	-0.17	85.04	341.1	303.1	301.4	344.4	250.5	252.2	251.5	181.5	179.1	6.69
32.13	-0.17	85.05	342.2	304.0	302.6	345.0	250.5	253.0	251.9	181.8	178.5	6.71
32.10	-0.17	84.77	342.9	304.5	303.3	347.7	251.0	253.3	252.2	182.0	178.3	6.75
32.11	-0.17	84.99	343.3	304.8	303.6	347.2	251.0	253.6	252.4	182.0	178.1	6.74
32.13	-0.17	84.94	343.3	304.9	303.8	347.2	251.0	253.8	252.4	181.5	178.0	6.76
32.12	-0.17	84.77	343.3	304.9	303.7	347.2	251.0	253.8	252.3	181.7	178.1	6.87
32.07	-0.17	84.57	343.6	305.2	304.3	347.4	251.1	253.8	252.4	181.5	177.9	6.90
32.17	-0.17	84.79	344.2	305.4	304.6	348.1	251.4	253.9	252.7	181.7	177.8	7.00
32.11	-0.17	85.03	343.7	305.1	304.8	347.6	251.0	254.3	252.6	182.0	177.8	6.90
32.07	-0.17	84.76	343.2	304.9	304.6	347.8	251.0	253.9	252.5	181.6	177.6	6.81
32.09	-0.17	84.84	343.7	304.6	304.6	346.0	251.0	254.1	252.6	182.0	177.6	6.90
32.07	-0.17	84.84	343.8	305.1	304.7	346.5	251.0	254.3	252.7	182.1	177.8	6.99
32.07	-0.17	84.56	343.8	305.2	305.1	346.2	251.0	254.3	252.8	182.1	177.8	6.99
32.13	-0.17	85.14	344.1	305.3	305.1	346.2	251.0	254.3	252.8	181.8	177.8	7.01
32.30	-0.17	85.89	341.2	304.6	303.7	347.7	250.3	254.3	252.2	182.9	177.5	6.70
32.12	-0.17	84.96	333.5	298.6	296.9	340.8	245.8	246.8	245.9	180.6	175.5	7.55
32.09	-0.17	84.54	326.7	282.5	290.5	333.0	242.4	245.8	243.9	179.7	175.1	7.13
32.10	-0.17	84.97	326.9	287.5	287.5	329.2	240.6	244.0	242.1	179.6	175.1	6.74
32.03	-0.17	84.69	321.8	287.5	286.2	327.9	240.0	243.5	241.6	179.7	175.1	6.69
32.13	-0.17	84.83	321.0	287.2	285.8	327.6	239.5	243.3	241.3	179.9	175.1	6.54
32.14	-0.17	84.82	320.3	286.8	285.4	326.4	239.5	243.0	241.3	179.9	175.2	6.27

ADA-ES, Merrimack Station, Unit #2
SO₃ Test Report - *D R A F T* -

Annex 2.3: Plant Data of October 02-03, 2006 (continued)

	Coal Flow		Coal Flow		Coal Flow		Coal Flow		Coal Flow		Main steam		Turbine		Turbine		feedwater		O2 East		O2 West	
	2A kWhr	Avg (MW)	2B kWhr	Avg (MW)	2C kWhr	Avg (MW)	2E kWhr	Avg (MW)	2F kWhr	Avg (MW)	2G kWhr	Avg (MW)	inlet steam temp	inlet steam Pres	inlet steam flow	Avg (MW)	inlet steam temp	inlet steam Pres	inlet steam flow	Avg (MW)	Average	Avg (MW)
10/2/2006 9:00	35.41	35.38	35.34	35.35	35.33	35.34	35.33	35.44	35.66	35.47	23.33	21.34	1001	23.75	2102	2.41	2.20	2.41	2.20	2.41	2.20	
10/2/2006 9:30	35.41	35.36	35.34	35.35	35.64	35.36	35.64	35.66	35.66	21.26	23.47	21.26	1001	23.75	2106	2.37	2.24	2.37	2.24	2.37	2.24	
10/2/2006 10:00	35.41	35.36	35.45	35.39	35.72	35.42	35.72	35.75	35.75	21.27	23.65	21.27	1001	23.75	2110	2.34	2.21	2.34	2.21	2.34	2.21	
10/2/2006 10:30	35.41	35.31	35.34	35.30	35.44	35.34	35.44	35.42	35.42	21.31	23.65	21.31	1001	23.76	2110	2.43	2.23	2.43	2.23	2.43	2.23	
10/2/2006 11:00	35.17	35.29	35.28	35.27	35.20	35.17	35.20	35.17	35.17	21.27	23.64	21.27	1002	23.75	2096	2.37	2.20	2.37	2.20	2.37	2.20	
10/2/2006 11:30	35.36	35.39	35.36	35.35	35.20	35.35	35.20	35.26	35.26	21.30	23.26	21.30	1002	23.75	2101	2.26	2.23	2.26	2.23	2.26	2.23	
10/2/2006 12:00	36.37	36.33	36.36	36.38	36.43	36.44	36.43	36.44	36.44	21.93	24.56	21.93	1001	23.73	2171	2.21	2.23	2.21	2.23	2.21	2.23	
10/2/2006 12:30	35.37	35.35	35.31	35.32	35.33	35.33	35.33	35.33	35.33	21.90	35.23	21.90	1001	23.76	2167	2.43	2.23	2.43	2.23	2.43	2.23	
10/2/2006 13:00	34.84	34.88	34.82	34.84	34.85	35.09	34.84	34.85	35.09	21.88	34.94	21.88	1001	23.75	2162	2.29	2.23	2.29	2.23	2.29	2.23	
10/2/2006 13:30	34.84	34.88	34.82	34.84	34.71	34.77	34.77	34.77	34.77	21.66	34.94	21.66	1001	23.76	2159	2.31	2.26	2.31	2.26	2.31	2.26	
10/2/2006 14:00	34.94	34.92	34.89	34.94	34.96	34.94	34.96	34.94	34.94	21.65	34.99	21.65	1001	23.75	2169	2.32	2.33	2.32	2.33	2.32	2.33	
10/2/2006 14:30	34.98	34.97	34.97	34.94	35.03	35.13	35.06	35.13	35.06	21.68	35.06	21.68	1001	23.75	2160	2.28	2.31	2.28	2.31	2.28	2.31	
10/2/2006 15:00	34.95	34.88	34.81	34.84	35.04	35.21	35.02	35.21	35.02	21.67	35.02	21.67	1002	23.75	2160	2.32	2.29	2.32	2.29	2.32	2.29	
10/2/2006 15:30	34.92	34.92	34.90	34.89	34.90	34.96	34.90	34.96	34.96	21.65	35.00	21.65	1002	23.75	2160	2.22	2.35	2.22	2.35	2.22	2.35	
10/2/2006 16:00	34.84	34.88	34.95	34.84	35.10	35.12	35.01	35.12	35.01	21.90	35.01	21.90	1002	23.76	2165	2.35	2.29	2.35	2.29	2.35	2.29	
10/2/2006 16:30	34.90	34.88	34.91	34.84	35.04	34.99	35.07	35.07	35.07	21.93	35.07	21.93	1002	23.75	2167	2.33	2.29	2.33	2.29	2.33	2.29	
10/2/2006 17:00	34.90	34.88	34.93	34.84	34.83	34.83	34.83	34.82	34.82	21.92	35.07	21.92	1002	23.76	2167	2.32	2.27	2.32	2.27	2.32	2.27	
10/2/2006 17:30	34.90	34.88	34.78	34.84	34.82	34.72	34.83	34.72	34.72	21.94	34.83	21.94	1002	23.75	2169	2.40	2.21	2.40	2.21	2.40	2.21	
10/2/2006 18:00	34.90	34.88	34.84	34.84	34.92	34.86	34.91	34.86	34.86	21.91	34.91	21.91	1001	23.76	2167	2.37	2.21	2.37	2.21	2.37	2.21	
10/2/2006 18:30	35.17	35.15	35.16	35.12	35.20	35.21	35.20	35.21	35.20	22.01	35.20	22.01	1001	23.75	2176	2.26	2.35	2.26	2.35	2.26	2.35	
10/2/2006 19:00	35.22	35.27	35.24	35.21	35.21	35.17	35.21	35.17	35.17	22.08	35.19	22.08	1002	23.75	2161	2.31	2.30	2.31	2.30	2.31	2.30	
10/2/2006 19:30	34.95	35.11	35.15	35.10	35.10	35.13	35.10	35.13	35.13	21.96	35.03	21.96	1001	23.76	2171	2.34	2.25	2.34	2.25	2.34	2.25	
10/2/2006 20:00	34.91	34.89	34.80	34.85	34.85	34.93	34.85	34.93	34.93	21.67	35.03	21.67	1001	23.76	2171	2.36	2.26	2.36	2.26	2.36	2.26	
10/2/2006 20:30	35.00	34.95	35.16	35.15	35.16	35.16	35.16	35.16	35.16	21.68	35.08	21.68	1001	23.75	2162	2.34	2.25	2.34	2.25	2.34	2.25	
10/2/2006 21:00	35.24	35.02	35.29	35.12	35.27	35.16	35.12	35.12	35.12	21.92	35.12	21.92	1001	23.75	2164	2.31	2.25	2.31	2.25	2.31	2.25	
10/2/2006 21:30	35.39	35.38	35.29	35.36	35.27	35.16	35.12	35.12	35.12	22.01	35.12	22.01	1002	23.75	2176	2.36	2.27	2.36	2.27	2.36	2.27	
10/2/2006 22:00	34.23	34.41	34.36	34.40	34.36	34.34	34.36	34.34	34.36	21.49	34.29	21.49	1001	23.78	2118	2.28	2.30	2.28	2.30	2.28	2.30	
10/2/2006 22:30	32.50	32.69	32.66	32.65	32.67	32.69	32.67	32.69	32.64	20.72	32.64	20.72	1003	23.74	2045	2.38	2.18	2.38	2.18	2.38	2.18	
10/2/2006 23:00	32.72	32.78	32.77	32.78	32.78	32.82	32.78	32.82	32.74	20.76	32.74	20.76	1001	23.75	2045	2.40	2.20	2.40	2.20	2.40	2.20	
10/2/2006 23:30	32.88	32.77	32.83	32.89	32.81	32.74	32.81	32.74	32.74	20.76	32.76	20.76	1001	23.76	2046	2.45	2.18	2.45	2.18	2.45	2.18	
10/3/2006 0:00	34.20	34.14	34.17	34.16	34.10	34.10	34.10	34.10	34.10	21.62	34.19	21.62	1002	23.73	2137	2.41	2.19	2.41	2.19	2.41	2.19	
10/3/2006 0:30	34.83	34.83	34.82	34.85	34.75	34.78	34.78	34.78	34.78	21.93	34.80	21.93	1002	23.76	2171	2.45	2.16	2.45	2.16	2.45	2.16	
10/3/2006 1:00	34.91	34.83	34.82	34.85	34.75	34.69	34.69	34.69	34.69	21.96	34.84	21.96	1001	23.75	2173	2.36	2.24	2.36	2.24	2.36	2.24	
10/3/2006 1:30	34.86	34.83	34.82	34.85	34.85	34.69	34.69	34.69	34.69	21.91	34.80	21.91	1001	23.76	2168	2.36	2.21	2.36	2.21	2.36	2.21	
10/3/2006 2:00	34.84	34.83	34.82	34.85	34.75	34.70	34.82	34.75	34.70	21.90	34.82	21.90	1002	23.75	2165	2.39	2.22	2.39	2.22	2.39	2.22	
10/3/2006 2:30	34.82	34.83	34.82	34.85	34.78	34.74	34.80	34.78	34.74	21.93	34.80	21.93	1002	23.75	2169	2.34	2.26	2.34	2.26	2.34	2.26	
10/3/2006 3:00	34.88	34.83	34.82	34.85	34.75	34.74	34.83	34.75	34.74	21.91	34.83	21.91	1001	23.76	2168	2.44	2.15	2.44	2.15	2.44	2.15	
10/3/2006 3:30	34.86	34.83	34.82	34.85	34.80	34.77	34.82	34.80	34.77	21.89	34.82	21.89	1001	23.75	2166	2.36	2.20	2.36	2.20	2.36	2.20	
10/3/2006 4:00	34.79	34.79	34.86	34.80	34.82	34.88	34.82	34.88	34.88	21.90	34.82	21.90	1001	23.76	2167	2.45	2.20	2.45	2.20	2.45	2.20	
10/3/2006 4:30	34.85	34.84	34.85	34.85	34.74	34.69	34.82	34.74	34.69	21.83	34.84	21.83	1002	23.75	2170	2.40	2.19	2.40	2.19	2.40	2.19	
10/3/2006 5:00	34.69	34.60	34.79	34.72	34.74	34.69	34.74	34.69	34.69	21.82	34.69	21.82	1002	23.76	2165	2.43	2.17	2.43	2.17	2.43	2.17	
10/3/2006 5:30	34.21	34.39	34.42	34.35	34.36	34.44	34.36	34.44	34.44	21.91	34.45	21.91	1002	23.75	2166	2.37	2.19	2.37	2.19	2.37	2.19	
10/3/2006 6:00	34.25	34.33	34.39	34.30	34.30	34.29	34.30	34.29	34.29	21.94	34.45	21.94	1002	23.75	2170	2.43	2.16	2.43	2.16	2.43	2.16	
10/3/2006 6:30	34.27	34.30	34.33	34.30	34.31	34.36	34.31	34.36	34.36	21.93	34.37	21.93	1002	23.75	2169	2.45	2.15	2.45	2.15	2.45	2.15	
10/3/2006 7:00	34.34	34.33	34.35	34.33	34.27	34.48	34.41	34.48	34.41	21.92	34.41	21.92	1001	23.77	2169	2.39	2.22	2.39	2.22	2.39	2.22	
10/3/2006 7:30	27.65	27.75	27.72	27.76	27.69	27.68	27.69	27.68	27.68	18.06	27.63	18.06	1003	23.71	1769	3.10	2.91	3.10	2.91	3.10	2.91	
10/3/2006 8:00	24.96	25.08	25.09	24.95	24.98	24.96	24.98	24.96	24.96	16.08	25.00	16.08	1000	23.75	1573	4.15	4.15	4.15	4.15	4.15	4.15	
10/3/2006 8:30	25.36	25.44	25.52	25.43	25.40	25.37	25.40	25.37	25.37	16.21	25.39	16.21	1001	23.75	1563	4.11	4.08	4.11	4.08	4.11	4.08	
10/3/2006 9:00	25.39	25.55	25.56	25.50	25.43	25.47	25.43	25.47	25.47	16.22	25.47	16.22	1001	23.75	1563	4.13	4.05	4.13	4.05	4.13	4.05	
10/3/2006 9:30	25.60	25.55	25.56	25.60	25.50	25.74	25.50	25.74	25.74	16.24	25.58	16.24	1001	23.75	1564	4.19	4.04	4.19	4.04	4.19	4.04	
10/3/2006 10:00	25.42	25.55	25.56	25.50	25.66	25.44	25.66	25.44	25.44	16.13	25.68	16.13	1001	23.75	1564	4.02	4.11	4.02	4.11	4.02	4.11	
10/3/2006 10:30	25.47	25.55	25.56	25.60	25.51	25.46	25.51	25.46	25.46	16.18	25.49	16.18	1002	23.76	1561	4.11	4.09	4.11	4.09	4.11	4.09

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Annex 3.1: Individual Results of SO₃ Baseline Testing

Table A3-1: SO₃ test results at air heater outlet (ESP Inlet), 10/02/2006

test period	gas counter					titration	SO ₃ concentration (STP, dry)		comment
	V	p	t	O ₂	V ₀		actual O ₂	3 % O ₂	
[start - end]	[L]	[mbar]	[°C]	[Vol.-%]	[NL]	[mL]	[ppm]	[ppm]	
09:20-09:29	150	1022	23	5.1	136	1.15	9.5	10.8	port 7, 325 °F
09:55-10:03	150	1024	22	5.5	137	1.25	10.2	11.9	port 7, 325 °F
10:10-10:20	150	1024	22	5.2	137	1.25	10.2	11.6	port 7, 325 °F
						average:	10.0	11.4	port 7, 325 °F
10:44-10:54	150	1024	24	8.8	136	0.85	7.0	10.4	port 10, 308 °F
11:00-11:09	150	1023	24	8.6	135	0.90	7.5	10.8	port 10, 308 °F
11:44-11:54	150	1023	23	8.5	136	0.90	7.4	10.7	port 10, 308 °F
						average:	7.3	10.6	port 10, 308 °F
12:31-12:41	150	1023	21	3.0	137	1.90	15.5	15.5	port 16, 365 °F
14:20-14:30	150	1023	22	3.0	137	1.70	14.0	14.0	port 16, 365 °F
14:40-14:50	155	1023	21	3.0	142	1.80	14.2	14.2	port 16, 365 °F
						average:	14.6	14.6	port 16, 365 °F
15:32-15:42	150	1025	23	4.5	137	1.60	13.1	14.3	port 7, 325 °F, with ESP
16:27-16:38	205	1028	21	4.2	189	2.35	13.9	14.9	port 7, 325 °F
17:20-17:30	150	1020	19	4.5	138	1.70	13.8	15.1	port 7, 325 °F
						average:	13.6	14.8	port 7, 325 °F
						total average:	11.4	12.9	ports 7, 10, 16

Table A3-2: SO₃ test results inter ESP, 10/02/2006 (all testing without ESP)

test period	gas counter					titration	(STP, dry)		comment
	V	p	t	O ₂	V ₀		actual O ₂	3 % O ₂	
[start - end]	[L]	[mbar]	[°C]	[Vol.-%]	[NL]	[mL]	[ppm]	[ppm]	
09:40-09:48	160	1019	23	4.6	145	1.60	12.4	13.6	331 °F
10:45-10:53	165	1017	24	4.7	148	1.75	13.2	14.6	331 °F
12:34-12:42	160	1017	24	4.7	143	1.85	14.5	16.0	331 °F
15:12-15:20	160	1018	23	4.7	144	1.70	13.2	14.6	331 °F
15:49-15:57	160	1018	24	4.7	143	1.65	12.9	14.2	331 °F
16:25-16:33	160	1018	23	4.8	144	1.95	15.2	16.9	331 °F
17:24-17:32	160	1017	23	4.6	144	1.95	15.2	16.7	331 °F
						average:	13.8	15.2

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Annex 3.2: Individual Results of SO₃ Baseline Testing (continued)

Table A3-3: SO₃ test results ESP II Outlet, 10/02/2006 (all testing without ESP)

test period	gas counter					titration Ba(ClO ₄) ₂ [mL]	(STP, dry)		comment
	V	p	t	O ₂	V ₀		actual O ₂	3 % O ₂	
	[L]	[mbar]	[°C]	[Vol.-%]	[NL]		[ppm]	[ppm]	
10:20-10:28	160	1017	24	5.5	143	1.35	10.6	12.3	327 °F
11:04-11:12	160	1017	24	5.6	143	1.45	11.3	13.3	327 °F
12:10-12:18	160	1017	24	5.6	143	1.60	12.5	14.6	327 °F
15:30-15:38	161	1018	24	5.6	145	1.40	10.8	12.7	327 °F
16:09-16:17	160	1018	24	5.6	144	1.55	12.1	14.1	327 °F
16:45-16:53	160	1018	23	5.6	144	1.60	12.5	14.6	327 °F
17:06-17:14	160	1018	24	5.5	144	1.75	13.6	15.9	327 °F
						average:	11.9	13.9	

Table A3-4: SO₃ test results ESP II Outlet, 10/03/2006 (all testing without ESP)

test period	gas counter					titration Ba(ClO ₄) ₂ [mL]	(STP, dry)		comment
	V	p	t	O ₂	V ₀		actual O ₂	3 % O ₂	
	[L]	[mbar]	[°C]	[Vol.-%]	[NL]		[ppm]	[ppm]	
08:35-08:45	150	1020	21	7.5	137	0.60	4.9	6.6	reduced load
08:55-09:04	150	1020	21	7.5	137	0.65	5.3	7.1	reduced load
09:55-10:10	200	1022	22	7.5	182	1.05	6.5	8.6	reduced load
10:20-10:33	200	1022	22	7.5	182	1.00	6.2	8.2	reduced load
						average:	5.7	7.6

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Annex 4.1: Individual Results of SO₃ Testing during Sorbent Injection

Table A4-1: SO₃ test results inter ESP, 10/31/2006 (all testing with ESP)

test period [start - end]	gas counter					titration Ba(ClO ₄) ₂ [mL]	(STP, dry)		comment
	V [L]	p [mbar]	T [°C]	O ₂ [Vol.-%]	V ₀ [NL]		actual O ₂ [ppm]	3 % O ₂ [ppm]	
16:30-16:55	150	1017	22	5.7	136	1.10	9.1	10.7	with Injection
17:20-17:40	150	1014	22	5.6	135	1.00	8.3	9.7	with Injection
17:40 18:00	150	1013	22	5.6	135	1.05	8.7	10.2	with Injection
average:							8.7	10.2	with injection

Table A4-2: SO₃ test results inter ESP, 11/01/2006 (all testing with ESP)

test period [start - end]	gas counter					titration Ba(ClO ₄) ₂ [mL]	(STP, dry)		comment
	V [L]	p [mbar]	T [°C]	O ₂ [Vol.-%]	V ₀ [NL]		actual O ₂ [ppm]	3 % O ₂ [ppm]	
10:10 - 10:30	150	1019	22	5.7	136	0.90	7.4	8.7	drop temp. before pre-heater Injection = 500 lb/h
10:30 - 10:40	100	1017	22	5.8	90	0.60	7.4	8.8	
average:							7.4	8.8	drop temp. / 500 lb/h
11:15 - 11:35	150	1014	22	5.7	135	0.85	7.0	8.3	drop temp. before pre-heater Injection = 625 lb/h
11:35 - 11:55	150	1016	22	5.8	136	0.85	7.0	8.3	
11:55 - 12:15	170	1016	22	5.6	154	0.95	6.9	8.1	
12:15 - 12:35	150	1017	22	5.8	136	0.95	7.8	9.3	
13:30 - 13:50	160	1019	22	5.6	145	0.95	7.3	8.6	
13:50 - 14:10	150	1018	22	5.8	136	0.85	7.0	8.3	
average:							7.2	8.5	drop temp. / 625 lb/h
14:55 - 15:15	160	1018	23	5.7	144	0.85	6.6	7.8	normal temp. before pre-heater Injection = 625 lb/h
15:15 - 15:35	150	1017	23	5.8	135	0.80	6.6	7.9	
15:35 - 15:55	150	1017	23	5.5	135	0.70	5.8	6.8	
15:55 - 16:15	150	1019	23	5.7	135	0.70	5.8	6.8	
average:							6.2	7.3	normal temp. / 625 lb/h
17:15 - 17:35	150	1018	23	5.7	135	2.05	17.0	20.0	normal temp. before pre-heater No injection
17:35 - 17:55	150	1018	23	5.6	135	2.10	17.4	20.4	
average:							17.2	20.2	normal. / 0 lb/h

Appendix B

Platt Environmental Services Test Report

Sulfuric Acid Mist Emissions Test Report

Performed for
ADA-ES

at the

Public Service of New Hampshire
Merrimack Generating Station
Unit 2

SCR Inlet, SCR Outlet, Air Preheater Outlet,
Primary ESP Outlet, and Secondary ESP Outlet
Bow, New Hampshire
March 26 through 28, 2008

Platt Environmental Services, Inc.

Platt Environmental Services, Inc.

371 Balm Court
Wood Dale, IL 60191
630-521-9400
630-521-9494 fax

Sulfuric Acid Mist Emissions Test Report

Performed for
ADA-ES

at the

Public Service of New Hampshire
Merrimack Generating Station
Unit 2

SCR Inlet, SCR Outlet, Air Preheater Outlet,
Primary ESP Outlet, and Secondary ESP Outlet
Bow, New Hampshire
March 26 through 28, 2008

Prepared By

Platt Environmental Services, Inc.

Report No. M081310

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1.0 Introduction

PLATT ENVIRONMENTAL SERVICES, INC. (PES) conducted a sulfuric acid mist emissions test program at the Public Service of New Hampshire (PSNH) Merrimack Generating Station on Unit 2 in Bow, New Hampshire on March 26 and 28, 2008. This report summarizes the results of the test program and test methods used.

The test locations, test parameters, test dates are summarized below.

Test Overview

Test Locations	Test Parameter	Test Dates
Unit 2: SCR Inlet, SCR Outlet, Air Preheater Outlet, Primary ESP Outlet, Secondary ESP Outlet	Sulfuric acid mist (SO ₃ as H ₂ SO ₄)	March 26 through 28, 2008

The identification of individuals associated with the test program is summarized below.

Location	Address	Contact
Test Coordinator	ADA-ES, Inc. 8100 South Park Way Unit B Littleton, Colorado, 80120	Mr. Tom Campbell Manager, DOE Demonstrations 303-734-1727 (phone) 303-734-0330 (fax) tomc@adaes.com
Testing Company Representative	Platt Environmental Services, Inc. 371 Balm Court Wood Dale, Illinois 60191	Mr. Eric L. Ehlers (630) 521-9400 (phone) eehlers@plattenv.com

The test crew consisted of Messrs. L. Sorce and E. Ehlers of PES.

2.0 Executive Summary

Selected results of the test program are summarized below, in Table 1. A complete summary of emission test results follows the narrative portion of this report.

Three test runs were performed at each of the below test locations with trona injection of 500 lbs/hr, and the supplementary ESP outlet was rerun with a trona injection rate of 1000 lbs/hr.

Table 1
Test Results

Parameter	Test Location	Condition	Particulate Phase	Gaseous Phase
Sulfuric Acid Mist (ppm SO ₃ as H ₂ SO ₄)	Unit 2 SCR Inlet	500 lbs/hr trona injection rate	4.23	12.13
	Unit 2 SCR Outlet		5.71	8.52
	Unit 2 Air Preheater Outlet		3.96	6.68
	Unit 2 Primary ESP Outlet		2.89	6.40
	Unit 2 Supplementary ESP Outlet*		2.93	7.56
	Unit 2 Supplementary ESP Outlet	1000 lbs/hr trona injection rate	1.69	3.37

* Test 3 not included in the average as the particulate quartz plug was pulled into the coil and results of particulate and gaseous phase SO₃ are presented as one number.

3.0 Test Methodology

Emissions testing was conducted following the methods specified in 40 CFR, Part 60, Appendix A. A schematic of the sampling train used and copies of field data sheets for each test run are included in the Appendix.

The following methodology was used during the test program:

Consol Controlled Condensate Sulfuric Acid Mist (SO₃) Determination

Stack gas sulfuric acid mist (SO₃) concentrations were determined in accordance with the Consol Controlled Condensate Method. An Environmental Supply Company, Inc. sampling train was used to sample stack gas, in the manner specified in the Method.

The flue gas was extracted through a quartz-lined probe fitted with a quartz wool plug to remove particulate matter. SO₃ was then collected as the sample gas passed through a hot water cooled condenser that was also loosely packed with quartz wool. The condenser assembly was maintained at a temperature of 140°F. The sample was then passed through impingers loaded with 3% H₂O₂ to capture the sulfur dioxide (SO₂) passing through the system. The impingers were placed in an ice bath to maintain the exit gas from the last impinger containing silica gel below 68°F. Maintaining the temperature increases the efficiency of the silica gel in drying the metered gas. A leak check of the entire sample train was performed at a vacuum greater than the sampling vacuum after each sampling run in order to determine if any leakage had occurred during the test run. A leakage rate not in excess of 2% of the average sampling rate is considered acceptable.

Samples were recovered as follows: the quartz wool particulate plug was removed and the probe was rinsed with an 80% IPA solution and placed in one bottle, the quartz wool plug in the condenser coil was removed and the coil was rinsed with 80% IPA, and the impingers were measured for moisture determination and the H₂O₂ solution was kept for potential analysis for SO₂ concentration.

Samples were then taken to the plant laboratory and analyzed Mr. E. Ehlers of PES utilizing a barium thorin titration. Both particulate phase and gaseous phase SO₃ samples were brought up to a known volume and titrated as required by USEPA Method 6.

4.0 Test Result Summaries

Consol Controlled Condensate Titration Results Summary
Public Service of New Hampshire - Merrimack Station
Unit 2 SCR Inlet Duct
500 lbs/hr Trona Injection Rate
3/28/08

Particulate Phase SO ₃ , 80% IPA probe rinse								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	8:35-9:20	1.05	0.01023	50	10	4.13	1.15E-06	5.52
2	9:45-10:30	0.20	0.01023	50	10	4.08	2.21E-07	1.06
3	10:55-11:40	1.10	0.01023	50	10	3.92	1.27E-06	6.10
							Average	4.23

Gaseous Phase SO ₃ , 80% IPA Condenser Coil								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	8:35-9:20	2.10	0.01023	100	20	4.13	2.30E-06	11.05
2	9:45-10:30	2.60	0.01023	100	20	4.08	2.88E-06	13.84
3	10:55-11:40	2.075	0.01023	100	20	3.92	2.39E-06	11.50
							Average	12.13

Consol Controlled Condensate Titration Results Summary
Public Service of New Hampshire - Merrimack Station
Unit 2 SCR Outlet Duct
500 lbs/hr Trona Injection Rate
3/27/08

Particulate Phase SO ₃ , 80% IPA probe rinse								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	13:57-14:42	0.45	0.01023	200	20	4.31	9.43E-07	4.54
2	15:00-15:45	0.80	0.01023	200	20	4.81	1.50E-06	7.23
3	16:02-16:47	0.50	0.01023	200	20	4.06	1.11E-06	5.35
							Average	5.71

Gaseous Phase SO ₃ , 80% IPA Condenser Coil								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	13:57-14:42	0.85	0.01023	220	20	4.31	1.96E-06	9.43
2	15:00-15:45	1.20	0.01023	100	20	4.81	1.13E-06	5.42
3	16:02-16:47	1.00	0.01023	200	20	4.06	2.22E-06	10.70
							Average	8.52

**Consol Controlled Condensate Titration Results Summary
Public Service of New Hampshire - Merrimack Station
Unit 2 Air Preheater Outlet Duct
500 lbs/hr Trona Injection Rate
3/27/08**

Particulate Phase SO₃, 80% IPA probe rinse								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	9:05-9:50	0.70	0.01023	200	20	4.17	1.52E-06	7.29
2	10:15-11:00	0.50	0.01023	100	20	4.28	5.27E-07	2.54
3	11:20-12:05	0.40	0.01023	100	20	4.23	4.27E-07	2.05
Average								3.96

Gaseous Phase SO₃, 80% IPA Condenser Coil								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	9:05-9:50	0.70	0.01023	200	20	4.17	1.52E-06	7.29
2	10:15-11:00	1.40	0.01023	100	20	4.28	1.48E-06	7.11
3	11:20-12:05	1.10	0.01023	100	20	4.23	1.17E-06	5.65
Average								6.68

**Consol Controlled Condensate Titration Results Summary
Public Service of New Hampshire - Merrimack Station
Unit 2 Primary ESP Outlet Duct
500 lbs/hr Trona Injection Rate
3/26/08**

Particulate Phase SO₃, 80% IPA probe rinse								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	15:15-16:00	0.55	0.01023	100	20	4.06	6.11E-07	2.94
2	16:15-17:00	0.40	0.01023	100	20	4.12	4.38E-07	2.11
3	17:20-18:05	0.70	0.01023	100	20	4.21	7.51E-07	3.61
Average								2.89

Gaseous Phase SO₃, 80% IPA Condenser Coil								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	15:15-16:00	0.65	0.01023	100	10	4.06	1.45E-06	6.96
2	16:15-17:00	1.15	0.01023	100	20	4.12	1.26E-06	6.06
3	17:20-18:05	1.20	0.01023	100	20	4.21	1.29E-06	6.19
Average								6.40

**Consol Controlled Condensate Titration Results Summary
Public Service of New Hampshire - Merrimack Station
Unit 2 Supplementary ESP Outlet Duct
500 lbs/hr Trona Injection Rate
3/26/08**

Particulate Phase SO₃, 80% IPA probe rinse								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	11:45-12:30	0.45	0.01023	100	10	6.84	5.94E-07	2.86
2	13:00-13:45	0.40	0.01023	100	10	5.82	6.20E-07	2.99
3*	14:05-14:50	0.00	0.01023	100	10	4.00	0.00E+00	0.00
Average								2.93

Gaseous Phase SO₃, 80% IPA Condenser Coil								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	11:45-12:30	0.95	0.01023	100	10	6.84	1.25E-06	6.03
2	13:00-13:45	0.95	0.01023	100	10	5.82	1.47E-06	7.09
3*	14:05-14:50	1.00	0.01023	100	10	4.00	2.26E-06	10.86
Average								6.56

* Test 3 not included in the average as the particulate quartz plug was pulled into the coil and results of particulate and gaseous phase SO₃ are presented as one number.

**Consol Controlled Condensate Titration Results Summary
Public Service of New Hampshire - Merrimack Station
Unit 2 Supplementary ESP Outlet Duct
1000 lbs/hr Trona Injection Rate
3/28/08**

Particulate Phase SO₃, 80% IPA probe rinse								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	15:05-15:50	0.55	0.01023	50	10	4.24	5.86E-07	2.82
2	16:05-16:50	0.20	0.01023	50	10	4.28	2.11E-07	1.02
3	17:00-17:45	0.25	0.01023	50	10	4.41	2.56E-07	1.23
Average								1.69

Gaseous Phase SO₃, 80% IPA Condenser Coil								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	15:05-15:50	0.75	0.01023	100	20	4.24	7.98E-07	3.84
2	16:05-16:50	0.65	0.01023	100	20	4.28	6.86E-07	3.30
3	17:00-17:45	0.60	0.01023	100	20	4.41	6.14E-07	2.96
Average								3.37

5.0 Conclusion and Certification

PLATT ENVIRONMENTAL SERVICES, INC. is pleased to have been of service to ADA-ES. If you have any questions regarding this test report, please do not hesitate to contact us at 630-521-9400.

CERTIFICATION

As project manager, I hereby certify that this test report represents a true and accurate summary of emissions test results and the methodologies employed to obtain those results, and the test program was performed in accordance with the methods specified in this test report.

PLATT ENVIRONMENTAL SERVICES, INC.

Eric L. Ehlers

Program Manager

Scott W. Banach

Quality Assurance

Appendix

Consol Controlled Condensate – Sulfuric Acid Mist Sample Train Diagram

MOISTURE CALCULATIONS

$$V_{wc(std)} = \frac{(V_f - V_i) \rho_w R T_{std}}{P_{std} M_w} = 0.04707(V_f - V_i)$$

$$V_{wsg(std)} = \frac{(W_f - W_i) R T_{std}}{P_{std} M_w} = 0.04715(W_f - W_i)$$

$$V_{m(std)} = 17.64 V_m Y \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}$$

$$B_{ws} = \frac{V_{wc(std)} + V_{wsg(std)}}{V_{wc(std)} + V_{wsg(std)} + V_{m(std)}}$$

Where:

B_{ws} = Water vapor in gas stream, proportion by volume

M_w = Molecular weight of water, 18.015 lb/lb-mole

P_{bar} = Barometric pressure at the testing site, in. Hg

P_{std} = Standard absolute pressure, 29.92 in. Hg

R = Ideal gas constant, $0.048137 \text{ (in. Hg)(ft}^3\text{)/(g-mole)(}^\circ\text{R)} =$
 $[21.8348 \text{ (in. Hg)(ft}^3\text{)/(lb-mole)(}^\circ\text{R)}]/453.592 \text{ g-mole/lb-mole}$

T_m = Absolute average dry gas meter temperature, $^\circ\text{R}$

T_{std} = Standard absolute temperature, 528 $^\circ\text{R}$

V_f = Final volume of condenser water, ml

V_i = Initial volume of condenser water, ml

V_m = Dry gas volume measured by dry gas meter, dcf

$V_{m(std)}$ = Dry gas volume measured by dry gas meter, corrected to standard conditions, scf

$V_{wc(std)}$ = Volume of condensed water vapor, corrected to standard conditions, scf

$V_{wsg(std)}$ = Volume of water vapor collected in silica gel, corrected to standard conditions, scf

W_f = Final weight of silica gel, g

W_i = Initial weight of silica gel, g

Y = Dry gas meter calibration factor

ΔH = Average pressure exerted on dry gas meter outlet by gas sample bag, in. H_2O

ρ_w = Density of water, 0.9982 g/ml

13.6 = Specific gravity of mercury (Hg)

17.64 = T_{std}/P_{std}

0.04707 = ft^3/ml 0.04715 = ft^3/g

PLATT ENVIRONMENTAL SERVICES, INC.

Calculations For Sulfuric Acid Mist

$$V_{m(std)} = 17.647 V_m Y \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}$$

$$C_{H_2SO_4} = 1.0811 \times 10^{-4} \frac{(V_t - V_{tb}) N \left(\frac{V_{soln}}{V_a} \right)}{V_{m(std)}}$$

$$\text{ppm } H_2SO_4 = 3.9289 \times 10^6 C_{H_2SO_4} \quad (\text{expressed as } H_2SO_4)$$

Where:

$C_{H_2SO_4}$ = Concentration of sulfuric acid (including sulfur trioxide), dry basis, corrected to standard conditions, lb/dscf

N = Normality of barium chloride titrant, meq/ml

P_{bar} = Barometric pressure at the exit of the dry gas meter, inches of mercury

P_{std} = Standard pressure, 29.92 inches of mercury

T_{std} = Standard temperature, 528 °R

$17.647 = T_{std}/P_{std}$

V_a = Volume of sample aliquot titrated, ml

T_m = Dry gas meter average temperature, °R

V_m = Dry gas volume measured by dry gas meter, dcf

$V_{m(std)}$ = Dry gas volume measured by dry gas meter, corrected to standard conditions, dscf

V_{soln} = Total volume of solution in which the sulfuric acid sample is contained, ml

V_t = Volume of barium perchlorate titrant used for the sample, ml

V_{tb} = Volume of barium perchlorate titrant used for the blank, ml

Y = Dry gas meter calibration factor

ΔH = Average pressure differential across the orifice meter, inches of water

13.6 = Specific gravity of mercury

1.0811×10^{-4} = Equivalent weight of sulfuric acid, lb/g-meq

$3.9289 \times 10^6 = \frac{\text{dscf}}{\text{lb}}$ of sulfuric acid

PLATT ENVIRONMENTAL SERVICES, INC.

Coal Emission Rate Calculations

A pollutant emission rate (E), expressed as pounds of pollutant per million Btu heat input from the fuel combusted can be calculated by several methods as follows:

- A. $C = C_s/7000$ where, C = pollutant concentration, lb/dscf
 c_s = pollutant concentration, grains/dscf
- B. If fuel flow is monitored and the fuel combusted during the test is sampled and analyzed for gross calorific value, then:

$$E = \frac{Q_{sd} C}{\text{fuel flow rate (lb/hr) GCV}} \times 10^6$$

where, E = lbs per million Btu

GCV = gross calorific value, Btu / lb

Q_{sd} = dry volumetric gas flow at standard conditions, dscf / hr

- C. If an integrated gas sample is taken during the test and analyzed for %CO₂ or %O₂, dry basis by volume, with an approved USEPA Method 3 or 3A gas analyzer, then

$$E = C F_c \frac{100}{(\%CO_2)} \text{ or, } E = C F \frac{20.9}{(20.9 - \%O_2)} \text{ where,}$$

%CO₂ and %O₂ are expressed as percent values:

F_c = a factor representing a ratio of the volume of carbon dioxide generated to the calorific value of the fuel combusted, 1800 scf CO₂/million Btu.

F = a factor representing a ratio of the volume of dry flue gases generated to the calorific value of the fuel combusted, 9780 dscf/million Btu.

- D. If fuel sample increments are taken and composited during the test and an ultimate analysis is performed and the GCV is determined, then

$$F_c = \frac{321 \times 10^3 (\%C)}{GCV} \text{ where, \%C = carbon content by weight expressed as percent}$$

$$F = \frac{[3.64 (\%H) + 1.53 (\%C) + 0.57 (\%S) + 0.14 (\%N) - 0.46 (\%O_2)]}{GCV} \times 10^6$$

1. H = Hydrogen, percent
2. C = Carbon, percent
3. S = Sulfur, percent
4. N = Nitrogen, percent
5. O = Oxygen, percent

PLATT ENVIRONMENTAL SERVICES, INC.

Derivation of Factors Used in Sulfuric Acid Mist Calculations

Factors for calculating from lb/dscf to parts per million:

Using 22.414 liters of gas per gram-mole at 0°C and 1 atmosphere pressure,

One pound-mole of gas is contained in 359.04765 ft³ at 32°F and 29.92 in. Hg, or 385.31943 ft³ at 68°F and 29.92 in. Hg

$$\text{ppm} = \frac{M \text{ lb/lb-mole}}{385.31943 \text{ dscf/lb-mole} \times 10^6} = 2.5952494 \times 10^{-9} M \text{ lb/dscf}$$

Where M = pollutant molecular weight; H₂SO₄ = 98.076 lb/lb-mole

$$\text{Factor for ppm H}_2\text{SO}_4 = \frac{1}{98.076 \times 2.5952 \times 10^{-9}} = 3.9289 \times 10^6 \text{ dscf/lb}$$

Use 3.9289 × 10⁶

Factor for converting ppm to lbs/hr

$$\text{ppm H}_2\text{SO}_4 \times 2.545 \times 10^{-7} = \frac{\text{lbs H}_2\text{SO}_4}{\text{dscf}}$$

$$\frac{\text{lbs H}_2\text{SO}_4}{\text{dscf}} \times \frac{\text{dscf}}{\text{min}} \times \frac{60 \text{ min}}{\text{hr}} = \frac{\text{lbs H}_2\text{SO}_4}{\text{hr}}$$

Barium-Thorin Titrations

Project/Project Number: ADA - Public Service of New Hampshire Analyst: ELC Date: 3/26/08

Barium Titrant Standardization	Run No. 1	Run No. 2	Run No. 3
Volume 0.02 N H ₂ SO ₄ titrated (ml)	25	25	25
Volume BaCl ₂ added (ml)	24.1	24.3	24.6
Calculated BaCl ₂ normality	0.01025	0.01029	0.01016

Average BaCl₂ normality = 0.01023 N
Standardization Blank (25 ml Water + 100 ml isopropanol) = _____ ml ; Must be <0.5 ml.

Sample Number	Sample Date	Sample Description	Total Volume	Sample Aliquot	Titration Volume for Sample		Titration Volume Corrected for Blank (V _t - V _{tb}) ml
Ammonium Sulfate-Controls	3/26/08	80% EPA Blank	20	20	0.9 - 0.8 1.0 - 0.9 Average = 0.1	= 0.1 = 0.1 Average = 0.1	
		#1 Supplementary ESP out Unit 2 Coal River	100	10	2.3 - 1.2 3.3 - 2.2 Average = 1.05	= 1.0 = 1.1 Average = 1.05	0.95
		#1 Supplementary ESP out Unit 2 Probe Wash & Thimble	100	10	3.8 - 3.3 4.5 - 3.9 Average = 2.55	= 0.5 = 0.6 Average = 2.55	0.45
		#2 Supplementary ESP out U. 2 Coal River	100	10	5.4 - 4.5 6.4 - 5.4 Average = 0.9	= 0.9 = 1.0 Average = 0.9	0.95
		#2 Sup. ESP out U. 2 Thimble	100	10	2.1 - 1.9 2.9 - 2.4 Average = 0.5	= 0.1 = 0.5 Average = 0.5	0.4
		#3 Sup. ESP out U. 2 Coal River & Thimble			4.0 - 2.9 5.1 - 4.0 Average = 1.1	= 1.0 = 1.1 Average = 1.1	1.00
		H ₂ O ₂ Reagent Blank			- - Average =	= = Average =	V _{tb}

2.5
4.8
20.2
15.1
35.3

* All titrations must be performed in replicate with agreement of 0.1% or 0.2 ml, whichever is larger.

Barium-Thorin Titrations

Project/Project Number: _____

Analyst: _____

Page ____ of ____

Sample Number	Sample Date	Sample Description	Total Volume	Sample Aliquot	Titration Volume for Sample		Titration Volume Corrected for Blank ($V_t - V_{tb}$) ml
	3/26/04	#1 Primary ESP Dist U.2 Coil Rinse	100	10	0.8 - 0.0 1.5 - 0.2 Average = 0.75"		0.65"
		#1 Primary ESP Dist U.2 Quartz Wash Plug	100	20	2.1 - 1.5 2.8 - 2.1 Average = 0.65"		0.55"
		#2 Primary ESP Dist U.2 Coil Rinse	100	20	1.2 - 0.0 2.3 - 1.2 Average = 1.25"		1.15"
		#2 Primary ESP Dist U.2 Quartz Wash Plug	100	20	5.8 - 4.9 5.9 - 5.4 Average = 0.5"		0.40"
		#3 Prim. ESP Dist U.2 Coil Rinse	100	20	1.20 - 0.0 2.60 - 1.20 Average = 1.20"		1.20"
		#3 Prim ESP In U.2 Quartz Wash Plug	100	20	3.4 - 2.6 4.2 - 3.4 Average = 0.8"		0.70"
		#3 Suppl. ESP U.2 only 32 Imp ✓	210	20	3.8 - 2.0 - Average = 35.41"		35.3"
		#1 Primary ESP Dist U.2 502 Imp ✓	210	20	68.8 - 0.0 - Average = 68.8"		68.7"
					- - Average =		

* All titrations must be performed in replicate with agreement of 0.1% or 0.2 ml, whichever is larger.

Barium-Thorin Titrations

Project/Project Number: _____ Analyst: _____ Date: _____

Barium Titrant Standardization	Run No. 1	Run No. 2	Run No. 3
Volume 0.02 N H ₂ SO ₄ titrated (ml)			
Volume BaCl ₂ added (ml)			
Calculated BaCl ₂ normality			

Average BaCl₂ normality = _____ N
 Standardization Blank (25 ml Water + 100 ml isopropanol) = _____ ml ; Must be <0.5 ml.

Sample Number	Sample Date	Sample Description	Total Volume	Sample Aliquot	Titration Volume for Sample		Titration Volume Corrected for Blank (V _t - V _{tb}) ml
Ammonium Sulfate Controls	3/27/08	#1 U.2 Air Preheader Outlet Coil Rinse	200	20	5.3 - 4.5 6.8 - 5.3 Average = 0.8		0.70
		#1 U.2 Air Preheader Outlet Quartz w/val Probe	200	20	6.8 - 6.1 7.7 - 6.8 Average = 0.8		0.70
		#2 U.2 Air Preheader Outlet Coil Rinse	100	20	9.0 - 7.1 10.4 - 9.0 12.0 - 10.4 Average = 1.5		1.4
		#2 U.2 Air Preheader Outlet Quartz w/val Plug	100	20	12.6 - 12.0 13.2 - 12.6 Average = 0.6		0.5
		#3 U.2 Air Preheader Outlet Coil Rinse	100	20	1.2 - 0.0 2.4 - 1.3 4.1 - 2.9 Average = 1.2		1.1
		#3 U.2 Air Preheader Outlet Quartz w/val Plug	100	20	4.7 - 4.1 5.1 - 4.7 Average = 0.5		0.4
		H ₂ O ₂ Reagent Blank			- - Average =		V _{tb}

* All titrations must be performed in replicate with agreement of 0.1% or 0.2 ml, whichever is larger.

Barium-Thorin Titrations

Project/Project Number: _____ Analyst: _____ Page ____ of ____

Sample Number	Sample Date	Sample Description	Total Volume	Sample Aliquot	Titration Volume for Sample		Titration Volume Corrected for Blank ($V_t - V_{tb}$) ml
		#1 SCA out U.I. Coil Rinse	220	20	8.9 - 8.9 9.8 - 8.9 Average = 0.95	= 1.0 = 0.9 Average = 0.95	0.85
		#1 SCA out U.I. chloride wash Plug	200	20	7.7 - 7.7 7.9 - 7.7 Average = 0.25	= 0.3 = 0.2 Average = 0.25	0.15
		#2 SCA out U.I. Coil Rinse	100	20	1.3 - 0.0 2.6 - 1.3 Average = 1.3	= 1.3 = 1.3 Average = 1.3	1.20
		#2 SCA out ammonia wash Plug	200	10	3.1 - 2.6 3.7 - 3.1 Average = 0.55	= 0.5 = 0.6 Average = 0.55	0.45
		#3 SCA out Coil Rinse	200	20	1.1 - 0.0 2.8 - 1.1 Average = 1.1	= 1.1 = 1.1 Average = 1.1	1.0
		#3 SCA out ammonia wash Plug	200	20	0.4 - 0.0 1.0 - 0.4 Average = 0.5	= 0.4 = 0.6 Average = 0.5	0.4
		#1 SCA out Filled wash Plug	200	20	3.6 - 3.0 4.1 - 3.6 Average = 0.55	= 0.6 = 0.5 Average = 0.55	0.45
		#2 SCA out Filled wash Plug	200	20	5.2 - 4.2 6.0 - 5.2 Average = 0.9	= 1.0 = 0.8 Average = 0.9	0.80
		#3 SCA out Filled wash Plug	200	20	6.7 - 6.0 7.2 - 6.7 Average = 0.6	= 0.7 = 0.5 Average = 0.6	0.5

* All titrations must be performed in replicate with agreement of 0.1% or 0.2 ml, whichever is larger.

#3 SCA out S₂ 210 43.6 43.5
#2 APH out S₂ 210 45.6 45.5

Barium-Thorin Titrations

Project/Project Number: _____

Analyst: _____

Page ____ of ____

Sample Number	Sample Date	Sample Description	Total Volume	Sample Aliquot	Titrant Volume for Sample		Titrant Volume Corrected for Blank ($V_t - V_{tb}$) ml
		#1 SCR In U2 Filled Coil Rinse	100	20	2.1 - 0.0 4.4 - 2.1 Average = 3.2		2.1
		#1 SCR In U2 Filled Sample Serial Filter	50	10	5.5 - 4.4 6.7 - 5.5 Average = 1.1		1.05
		#2 SCR In U2 Filled Coil Rinse	100	20	3.0 - 0.4 5.8 - 3.0 Average = 2.7		2.60
		#2 SCR In U2 Filled Coil Rinse	50	10	6.0 - 5.8 6.4 - 6.0 Average = 0.3		0.2
		#3 SCR In Filled Coil Rinse	100	20	2.25 - 0.0 4.35 - 2.25 Average = 2.475		2.075
		#3 SCR In Filled Plug	50	10	5.6 - 4.4 6.8 - 5.6 Average = 1.2		1.1
		#1 Super ESP Out Coil Rinse	100	20	1.4 - 0.2 2.5 - 1.4 Average = 1.3		1.2
		#1 Super ESP Out Plug	50	10	3.2 - 2.8 3.6 - 3.2 Average = 0.4		0.3
		#2 Super ESP Out Coil	100	20	4.5 - 3.6 5.3 - 4.5 Average = 0.85		0.75

* All titrations must be performed in replicate with agreement of 0.1% or 0.2 ml, whichever is larger.

#2 Super ESP Out 50 10 6.0 - 5.3 0.7
#2.1 Plug 50 10 6.6 - 6.0 0.6
0.65 0.55

Barium-Thorin Titrations

Project/Project Number: _____ Analyst: _____ Page ____ of ____

Sample Number	Sample Date	Sample Description	Total Volume	Sample Aliquot	Titration Volume for Sample		Titration Volume Corrected for Blank ($V_t - V_{t0}$) ml
		#3 Sup. GSP out Coil	100	20	0.9 - 0.1 1.6 - 0.9 Average = 0.75	= 0.8 = 0.7 Average = 0.75	0.65
		#3 Sup. GSP out Unad. Plug	50	10	1.8 - 1.6 2.2 - 1.8 Average = 0.3	= 0.2 = 0.4 Average = 0.3	0.2
		#4 Sup. GSP out Coil	100	20	2.9 - 2.2 3.6 - 2.9 Average = 0.7	= 0.7 = 0.7 Average = 0.7	0.6
		#4 Sup. GSP out Unad. Plug	50	10	3.9 - 3.6 4.3 - 3.9 Average = 0.35	= 0.3 = 0.4 Average = 0.35	0.25
					-	=	
					-	=	
					Average =		
					-	=	
					-	=	
					Average =		
					-	=	
					-	=	
					Average =		
					-	=	
					-	=	
					Average =		
					-	=	
					-	=	
					Average =		

* All titrations must be performed in replicate with agreement of 0.1% or 0.2 ml, whichever is larger.

CONSOL CONTROLLED CONDENSATE TEST RESULTS

Date:	3/26/2008	Condition:	500 lbs trona injection
Project:	P.S. of New Hampshire-Merrimack Station	Data Taken By:	ALS
Location:	Supplementary ESP Outlet Duct	Fuel Factor:	9780
Source:	Unit 2		

Test Number:	<u>1</u>	Time:	<u>11:45-12:30</u>
Pressure, Barometric(Hg"):	29.900		
Pressure, Static(H ₂ O"):	2.00	Water Vapor in Flue Gas (Bws):	0.094
Pressure, Stack(Hg"):	30.047		
Initial Volume (cu.ft.):	2.927		
Final Volume (cu.ft.):	9.75		
Meter Temperature (°F):	74.00		
Meter Volume (dscf):	6.84		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	215.0		
Average Delta H (ΔH):	0.040		

Test Number:	<u>2</u>	Time:	<u>13:00-13:45</u>
Pressure, Barometric(Hg"):	29.900		
Pressure, Static(H ₂ O"):	2.00	Water Vapor in Flue Gas (Bws):	0.089
Pressure, Stack(Hg"):	30.047		
Initial Volume (cu.ft.):	9.801		
Final Volume (cu.ft.):	15.643		
Meter Temperature (°F):	78.00		
Meter Volume (dscf):	5.82		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	212.0		
Average Delta H (ΔH):	0.020		

Test Number:	<u>3</u>	Time:	<u>14:05-14:50</u>
Pressure, Barometric(Hg"):	29.900		
Pressure, Static(H ₂ O"):	2.00	Water Vapor in Flue Gas (Bws):	0.086
Pressure, Stack(Hg"):	30.047		
Initial Volume (cu.ft.):	6.716		
Final Volume (cu.ft.):	10.76		
Meter Temperature (°F):	81.00		
Meter Volume (dscf):	4.00		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	208.0		
Average Delta H (ΔH):	0.020		

CONSOL CONTROLLED CONDENSATE TEST RESULTS

Date:	3/26/2008	Condition:	500 lbs trona injection
Project:	P.S. of New Hampshire-Merrimack Station	Data Taken By:	ALS
Location:	Primary ESP Outlet	Fuel Factor:	9780
Source:	Unit 2		

Test Number:	<u>1</u>	Time:	<u>15:15-16:00</u>
Pressure, Barometric(Hg"):	29.900		
Pressure, Static(H ₂ O"):	3.00	Water Vapor in Flue Gas (Bws):	0.104
Pressure, Stack(Hg"):	30.121		
Initial Volume (cu.ft.):	10.784		
Final Volume (cu.ft.):	14.86		
Meter Temperature (°F):	78.00		
Meter Volume (dscf):	4.06		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.020		

Test Number:	<u>2</u>	Time:	<u>16:15-17:00</u>
Pressure, Barometric(Hg"):	29.900		
Pressure, Static(H ₂ O"):	3.00	Water Vapor in Flue Gas (Bws):	0.103
Pressure, Stack(Hg"):	30.121		
Initial Volume (cu.ft.):	4.933		
Final Volume (cu.ft.):	8.993		
Meter Temperature (°F):	68.00		
Meter Volume (dscf):	4.12		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.020		

Test Number:	<u>3</u>	Time:	<u>17:20-18:05</u>
Pressure, Barometric(Hg"):	29.900		
Pressure, Static(H ₂ O"):	3.00	Water Vapor in Flue Gas (Bws):	0.101
Pressure, Stack(Hg"):	30.121		
Initial Volume (cu.ft.):	8.924		
Final Volume (cu.ft.):	13.015		
Meter Temperature (°F):	60.00		
Meter Volume (dscf):	4.21		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.020		

CONSOL CONTROLLED CONDENSATE TEST RESULTS

Date: 3/27/2008
Project: P.S. of New Hampshire-Merrimack Station
Location: Air Preheater Outlet
Source: Unit 2

Condition: 500 lbs trona injection
Data Taken By: ALS
Fuel Factor: 9780

Test Number:	1	Time:	9:05-9:50
Pressure, Barometric(Hg"):	29.890		
Pressure, Static(H ₂ O"):	6.00	Water Vapor in Flue Gas (Bws):	0.101
Pressure, Stack(Hg"):	30.332		
Initial Volume (cu.ft.):	4.815		
Final Volume (cu.ft.):	8.975		
Meter Temperature (°F):	62.00		
Meter Volume (dscf):	4.17		
Meter Calibration (Y):	0.993		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.030		

Test Number:	2	Time:	10:15-11:00
Pressure, Barometric(Hg"):	29.890		
Pressure, Static(H ₂ O"):	6.00	Water Vapor in Flue Gas (Bws):	0.099
Pressure, Stack(Hg"):	30.332		
Initial Volume (cu.ft.):	9.087		
Final Volume (cu.ft.):	13.393		
Meter Temperature (°F):	67.00		
Meter Volume (dscf):	4.28		
Meter Calibration (Y):	0.993		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.030		

Test Number:	3	Time:	11:20-12:05
Pressure, Barometric(Hg"):	29.890		
Pressure, Static(H ₂ O"):	6.00	Water Vapor in Flue Gas (Bws):	0.100
Pressure, Stack(Hg"):	30.332		
Initial Volume (cu.ft.):	13.51		
Final Volume (cu.ft.):	17.76		
Meter Temperature (°F):	66.00		
Meter Volume (dscf):	4.23		
Meter Calibration (Y):	0.993		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.030		

*Air flows taken from ESP Inlet data

CONSOL CONTROLLED CONDENSATE TEST RESULTS

Date: 3/27/2008
 Project: P.S. of New Hampshire-Merrimack Station
 Location: SCR Outlet
 Source: Unit 2

Condition: 500 lbs trona injection
 Data Taken By: ALS
 Fuel Factor: 9780

Test Number:	1	Time:	13:57-14:42
Pressure, Barometric(Hg"):	29.890		
Pressure, Static(H ₂ O"):	13.00	Water Vapor in Flue Gas (Bws):	0.099
Pressure, Stack(Hg"):	30.847		
Initial Volume (cu.ft.):	3.132		
Final Volume (cu.ft.):	7.28		
Meter Temperature (°F):	55.00		
Meter Volume (dscf):	4.31		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.030		

Test Number:	2	Time:	15:00-15:45
Pressure, Barometric(Hg"):	29.890		
Pressure, Static(H ₂ O"):	13.00	Water Vapor in Flue Gas (Bws):	0.089
Pressure, Stack(Hg"):	30.847		
Initial Volume (cu.ft.):	7.373		
Final Volume (cu.ft.):	12.009		
Meter Temperature (°F):	56.00		
Meter Volume (dscf):	4.81		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.030		

Test Number:	3	Time:	16:02-16:47
Pressure, Barometric(Hg"):	29.890		
Pressure, Static(H ₂ O"):	13.00	Water Vapor in Flue Gas (Bws):	0.104
Pressure, Stack(Hg"):	30.847		
Initial Volume (cu.ft.):	2.19		
Final Volume (cu.ft.):	6.1		
Meter Temperature (°F):	56.00		
Meter Volume (dscf):	4.06		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.030		

*Air flows taken from ESP Inlet data

CONSOL CONTROLLED CONDENSATE TEST RESULTS

Date: 3/28/2008
 Project: P.S. of New Hampshire-Merrimack Station
 Location: SCR Inlet
 Source: Unit 2

Condition: 500 lbs trona injection
 Data Taken By: ALS
 Fuel Factor: 9780

Test Number:	1	Time:	8:35-9:20
Pressure, Barometric(Hg"):	29.460		
Pressure, Static(H ₂ O"):	18.00	Water Vapor in Flue Gas (Bws):	0.112
Pressure, Stack(Hg"):	30.785		
Initial Volume (cu.ft.):	6.055		
Final Volume (cu.ft.):	9.99		
Meter Temperature (°F):	43.00		
Meter Volume (dscf):	4.13		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	211.0		
Average Delta H (ΔH):	0.020		

Test Number:	2	Time:	9:45-10:30
Pressure, Barometric(Hg"):	29.460		
Pressure, Static(H ₂ O"):	18.00	Water Vapor in Flue Gas (Bws):	0.104
Pressure, Stack(Hg"):	30.785		
Initial Volume (cu.ft.):	0.011		
Final Volume (cu.ft.):	3.927		
Meter Temperature (°F):	47.00		
Meter Volume (dscf):	4.08		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.030		

Test Number:	3	Time:	10:55-11:40
Pressure, Barometric(Hg"):	29.460		
Pressure, Static(H ₂ O"):	18.00	Water Vapor in Flue Gas (Bws):	0.107
Pressure, Stack(Hg"):	30.785		
Initial Volume (cu.ft.):	4.027		
Final Volume (cu.ft.):	7.818		
Meter Temperature (°F):	50.00		
Meter Volume (dscf):	3.92		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.040		

*Air flows taken from ESP Inlet data

CONSOL CONTROLLED CONDENSATE TEST RESULTS

Date:	3/28/2008	Condition:	1000 lbs trona injection
Project:	P.S. of New Hampshire-Merrimack Station	Data Taken By:	ALS
Location:	Supplementary ESP Outlet Duct	Fuel Factor:	9780
Source:	Unit 2		

Test Number:	1	Time:	15:05-15:50
Pressure, Barometric(Hg"):	29.460		
Pressure, Static(H ₂ O"):	2.00	Water Vapor in Flue Gas (Bws):	0.109
Pressure, Stack(Hg"):	29.607		
Initial Volume (cu.ft.):	1.059		
Final Volume (cu.ft.):	5.432		
Meter Temperature (°F):	73.00		
Meter Volume (dscf):	4.24		
Meter Calibration (Y):	0.993		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	211.0		
Average Delta H (ΔH):	0.020		

Test Number:	2	Time:	16:05-16:50
Pressure, Barometric(Hg"):	29.460		
Pressure, Static(H ₂ O"):	2.00	Water Vapor in Flue Gas (Bws):	0.117
Pressure, Stack(Hg"):	29.607		
Initial Volume (cu.ft.):	5.505		
Final Volume (cu.ft.):	9.935		
Meter Temperature (°F):	74.00		
Meter Volume (dscf):	4.28		
Meter Calibration (Y):	0.993		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	212.0		
Average Delta H (ΔH):	0.020		

Test Number:	3	Time:	17:00-17:45
Pressure, Barometric(Hg"):	29.460		
Pressure, Static(H ₂ O"):	2.00	Water Vapor in Flue Gas (Bws):	0.105
Pressure, Stack(Hg"):	29.607		
Initial Volume (cu.ft.):	10.003		
Final Volume (cu.ft.):	14.56		
Meter Temperature (°F):	73.00		
Meter Volume (dscf):	4.41		
Meter Calibration (Y):	0.993		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	211.0		
Average Delta H (ΔH):	0.020		

PLATT ENVIRONMENTAL SERVICES, INC.

Procedures for Calibration

Dry Gas Meters

The test meters are calibrated according to Method 5, Section 5.3 and "Procedures for Calibrating and Using Dry Gas Volume Meters as Calibration Standards" by P.R. Westlin and R.T. Shigehara, March 10, 1978.

Analytical Balance

The accuracy of the analytical balance is checked with Class S, Stainless Steel Type 303 weights manufactured by F. Hopken and Son, Jersey City, New Jersey.

Temperature Sensing Devices

The potentiometer and thermocouples are calibrated utilizing a NBS traceable millivolt source.

Meter Box Calibration

Dry Gas Meter No.
Standard Meter No.
Standard Meter (Y)

CM 13
9605804
0.9993

Date:
Calibrated By:
Barometric Pressure:

March 3, 2008
S. Dyrá
29.07

Run Number	Orifice Setting in H ₂ O Chg (H)	Standard Meter Gas Volume vr	Dry Gas Meter Gas Volume vd	Standard Meter Temp. F° tr	Dry Gas Meter Inlet Temp. F° tdi	Dry Gas Meter Outlet Temp. F° tdo	Dry Gas Meter Avg. Temp. F° td	Time Min	Time Sec	Y	Chg (H)
Final		23.667	99.646	71	75	74					
Initial		18.082	93.978	71	76	73					
Difference	1	5.585	5.668	71	76	74	75	20	3	0.991	1.482
Final		33.811	109.899	71	77	72					
Initial		23.667	99.646	71	73	73					
Difference	2	10.144	10.253	71	75	73	74	23	37	0.993	1.560
Final		42.245	118.449	71	79	73					
Initial		33.811	109.899	71	76	73					
Difference	3	8.434	8.550	71	78	73	75	16	51	0.993	1.604
Final		47.360	23.619	71	80	73					
Initial		42.245	18.449	71	78	73					
Difference	4	5.115	5.170	71	79	73	76	9	8	0.996	1.645
Final		53.132	29.480	71	81	73					
Initial		47.360	23.619	71	78	73					
Difference	5	5.772	5.861	71	80	73	76	8	43	0.992	1.568
Final		17.933	93.841	71	80	72					
Initial		3.909	79.725	71	73	73					
Difference	6	14.024	14.116	71	77	73	75	16	33	0.995	1.601

Average 0.993 1.577

Stack Temperature Sensor Calibration

Meter Box # : CM 13

Name : S. Dyra

Ambient Temperature : 67.9 °F

Date : March 3, 2008

Calibrator Model # : CL23A

Serial # : T-249465

Date Of Certification : September 22, 2006

Primary Standards Directly Traceable National Institute of Standards and Technology (NIST)

Reference Source Temperature (°F)	Test Thermometer Temperature (°F)	Temperature Difference %
0	5	1.1
250	255	0.7
600	604	0.4
1200	1205	0.3

$$\frac{(\text{Ref. Temp., } ^\circ\text{F} + 460) - (\text{Test Therm. Temp., } ^\circ\text{F} + 460)}{\text{Ref. Temp., } ^\circ\text{F} + 460} * 100 \leq 1.5 \%$$

Ref. Temp., °F + 460

Meter Box Calibration

Dry Gas Meter No.
Standard Meter No.
Standard Meter (Y)

CM 16
9605804
0.9993

Date:
Calibrated By:
Barometric Pressure:

February 29, 2008
S. Dyrá
29.14

Run Number	Orifice Setting in H ₂ O Chg (H)	Standard Meter Gas Volume vr	Dry Gas Meter Gas Volume vd	Standard Meter Temp. F° tr	Dry Gas Meter Inlet Temp. F° tdi	Dry Gas Meter Outlet Temp. F° tdo	Dry Gas Meter Avg. Temp. F° td	Time Min	Time Sec	Y	Chg (H)
Final		21.748	49.230	68	73	72					
Initial		16.110	43.608	68	73	71					
Difference	1	5.638	5.622	68	73	72	72	20	9	1.010	1.455
Final		30.592	58.014	68	75	72					
Initial		21.748	49.230	68	72	72					
Difference	2	8.844	8.784	68	74	72	73	20	50	1.015	1.578
Final		43.225	70.573	68	77	73					
Initial		30.592	58.014	68	75	72					
Difference	3	12.633	12.559	68	76	73	74	24	56	1.016	1.547
Final		51.865	79.162	68	78	73					
Initial		43.225	70.573	69	76	73					
Difference	4	8.640	8.589	69	77	73	75	15	10	1.016	1.574
Final		64.596	91.838	68	76	73					
Initial		51.865	79.162	69	76	73					
Difference	5	12.731	12.676	69	76	73	75	19	33	1.013	1.608
Final		15.952	43.442	67	79	71					
Initial		7.851	35.407	66	75	71					
Difference	6	8.101	8.035	67	77	71	74	9	46	1.017	1.641
Average										1.015	1.567

Stack Temperature Sensor Calibration

Meter Box # : CM 16 Name : S. Dyra

Ambient Temperature : 67.1 °F Date : February 29, 2008

Calibrator Model # : CL23A

Serial # : T-249465

Date Of Certification : September 22, 2006

Primary Standards Directly Traceable National Institute of Standards and Technology (NIST)

Reference Source Temperature (°F)	Test Thermometer Temperature (°F)	Temperature Difference %
0	1	0.2
250	252	0.3
600	601	0.1
1200	1203	0.2

$$\frac{(\text{Ref. Temp., } ^\circ\text{F} + 460) - (\text{Test Therm. Temp., } ^\circ\text{F} + 460)}{\text{Ref. Temp., } ^\circ\text{F} + 460} * 100 \leq 1.5 \%$$

Ref. Temp., °F + 460

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: _____ Date: 3/26/08

Sampling Location: U2 Supplementary ESP Outlet

Source Condition: Normal

Dry Gas Meter No. CM-16 Y = 1.015

Barometric Pressure: 29.92 in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 5.0 in. Hg vacuum

Post-sampling 0. cfm @ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Stack Orifice Vac 11 Hg	> 500° Probe (°F)	> 500° Filter Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
1145	2.927	.08	1.0	500	500	146	140	75	74
1150	4.12	.05	1.0	500	500	146	140	74	74
1155	5.05	.03	1.0	500	500	148	139	72	72
1200	5.74	.03	1.0	500	500	152	139	72	72
1205	6.56	.03	1.0	500	500	158	139	72	72
1210	7.28	.03	1.0	500	500	162	140	72	72
1215	7.79	.03	1.0	500	500	155	140	73	72
1220	8.52	.03	1.0	500	500	152	141	73	72
1225	9.15	.02	1.0	500	500	148	141	75	72
1230	9.75	.02	1.0	500	500	147	140	75	72
Avg.									

Operator: A-L. SORCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

PSNH MERRIMACK

Project/Project Number: M0813 Date: 3-26-08

Sampling Location: U2 Supplementary ESP OUTLET

Source Condition: Normal

Dry Gas Meter No. Cm-16 Y = 1.015

Barometric Pressure: 29.90 in. Hg

Leak Check: Pre-sampling 0 cfm @ 4.0 in. Hg vacuum

Post-sampling 0 cfm @ 4.0 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Vac 11 Hg Stack (FF)	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
1300	9.801	.02	1.0	500	500	146	140	81	78
1305	10.44	.02	1.0	500	500	148	141	83	79
1310	11.17	.02	1.0	500	500	147	140	84	81
1315	11.98	.02	1.0	500	500	145	140	80	80
1320	12.55	.02	1.0	500	500	146	139	80	80
1325	13.10	.02	1.0	500	500	146	139	74	76
1330	13.88	.02	1.0	500	500	147	141	76	74
1335	14.41	.02	1.0	500	500	147	140	76	75
1340	15.06	.02	1.0	500	500	147	139	76	76
1345	15.643								
Avg.									

Operator: A.L. SORCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH Merrimack Date: 3-26-08

Sampling Location: U2 Suppl. ESP-Outlet

Source Condition: Normal

Dry Gas Meter No. CM-16 Y = 1.015

Barometric Pressure: 29.90 in. Hg

Leak Check: Pre-sampling 0 0 cfm @ 4.0 in. Hg vacuum

Post-sampling 0 cfm @ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			<u>Val</u> <u>1 1/2"</u> <u>Stack</u> <u>(25)</u>	> 500° Probe (°F)	> 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
1405	6.716	.02	2.0	500	500	146	140	85	82
10	7.27	.02	2.0	500	500	147	140	83	84
15	7.80	.02	2.0	500	500	145	140	84	83
20	8.32	.02	2.0	500	500	145	140	84	83
25	8.76	.02	2.0	500	500	144	140	84	83
1430	9.15	.02	2.0	500	500	144	140	84	83
35	9.59	.02	2.0	500	500	144	140	82	83
40	9.92	.02	2.0	500	500	145	139	74	78
45	10.37	.02	2.0	500	500	146	139	72	75
1450	10.76								
Avg.									

Operator: A. L. SORCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH MERRIMACK Date: 3-26-08

Sampling Location: U2 Primary ESP- Outlet

Source Condition: NORMAL

Dry Gas Meter No. Cm-16 Y = 1.015

Barometric Pressure: 29.90 in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 5.0 in. Hg vacuum

Post-sampling 0.0 cfm @ 5.0 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			V/L 11 Hg Stack (°F)	> 500° Probe (°F)	> 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter Inlet (°F)	Outlet (°F)
1515	10.784	.02	2.0	500	500	147	139	71	71
20	11.19	.02	2.0	500	500	148	141	73	72
25	11.57	.02	2.0	500	500	148	141	74	73
30	12.00	.02	3.0	500	500	147	140	75	73
35	12.39	.02	3.0	500	500	148	140	76	74
40	12.80	.02	3.0	500	500	147	140	79	75
45	13.34	.02	3.0	500	500	146	140	79	76
50	13.86	.02	3.0	500	500	146	139	78	77
55	14.37	.02	4.0	500	500	147	139	80	76
1600	14.860								
Avg.									

Operator: A. L. SORCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH MERRIMACK Date: 3-26-08

Sampling Location: U2 PRIMARY ESP OUTLET

Source Condition: NORMAL

Dry Gas Meter No. CM-16 Y = 1.015

Barometric Pressure: 29.90 in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 6.0 in. Hg vacuum

Post-sampling 0. cfm @ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Vac 11 Hg Stack (25)	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
								Inlet (°F)	Outlet (°F)
1615	4.933	.02	2.0	500	500	150	141	78	77
20	5.32	.02	2.0	500	500	149	140	79	77
25	5.73	.02	2.0	500	500	147	140	77	77
30	6.15	.02	2.0	500	500	146	140	74	75
35	6.61	.02	2.0	500	500	146	140	70	73
40	7.03	.02	2.0	500	500	146	140	70	66
45	7.50	.02	3.0	500	500	146	140	65	69
50	7.96	.02	3.0	500	500	145	140	63	66
55	8.41	.02	3.0	500	500	146	139	60	64
1700	8.993								
Avg.									

Operator: A. L. SORCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH Merrimack Date: 3-26-08

Sampling Location: U2 Primary ESP Outlet

Source Condition: Normal

Dry Gas Meter No. CM-16 Y = 1.015

Barometric Pressure: 29.9 in. Hg

Leak Check: Pre-sampling 0 cfm @ 6.0 in. Hg vacuum

Post-sampling 0 cfm @ _____ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Vac "H ₂ O Stack (°F)	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
1720	8.924	.02	2.0	500	500	147	139	56	57
25	9.37	.02	2.0	500	500	149	140	58	58
30	9.77	.02	2.0	500	500	148	140	59	58
35	10.22	.02	2.0	500	500	149	140	60	59
40	10.64	.02	3.0	500	500	148	140	61	59
45	11.11	.02	3.0	500	500	147	140	61	60
50	11.54	.02	3.0	500	500	148	141	62	60
55	12.02	.02	3.0	500	500	147	140	62	60
1800	12.50	.02	3.0	500	500	147	140	63	61
1805	13.015								
Avg.									

Operator: A. L. Sorce

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH MERRIMACK Date: 3/27/08

Sampling Location: U2 PRE-HEATER- Outlet

Source Condition: Normal

Dry Gas Meter No. CM-13 Y = 0.993

Barometric Pressure: 29.89 in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 6.0 in. Hg vacuum

Post-sampling 0.0 cfm @ 9.0 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Vac " Hg Stack (°F)	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
0905	4.815	.02	3.0	500	500	150	140	54	51
10	5.32	.03	4.0	500	500	151	140	56	52
15	5.73	.04	5.0	500	500	151	141	58	54
20	6.16	.04	5.0	500	500	149	140	60	55
25	6.57	.04	5.0	500	500	145	140	62	57
30	7.02	.05	5.0	500	500	145	139	64	58
35	7.46	.04	6.0	500	500	143	140	65	60
40	7.96	.04	6.0	500	500	145	140	66	61
45	8.42	.04	6.0	500	500	146	140	67	62
0950	8.975								
Avg.									

Operator: A. L. Sorce

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH MERRIMACK Date: 3-27-08

Sampling Location: U2 PREHEATER OUTLET

Source Condition: NORMAL

Dry Gas Meter No. CM-13 Y = 0.993

Barometric Pressure: 29.90 in. Hg

Leak Check: Pre-sampling 0 cfm @ 10.0 in. Hg vacuum

Post-sampling 0 cfm @ 10.0 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Vac " Hg Static Probe	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
1015	9.087	.03	3.0	500	500	147	139	66	65
20	9.57	.03	3.0	500	500	148	140	67	65
25	10.08	.03	3.0	500	500	148	140	68	66
30	10.59	.03	3.0	500	500	149	141	68	66
35	11.08	.03	4.0	500	500	149	140	68	66
40	11.57	.03	4.0	500	500	148	140	68	66
45	12.03	.03	4.0	500	500	148	140	68	66
50	12.47	.03	4.0	500	500	148	140	68	67
55	12.90	.03	4.0	500	500	148	140	68	67
1100	13.393								
Avg.									

Operator: A.L. Soucek

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH Merrimack Date: 3-27-08

Sampling Location: U2 PREHEATER OUTLET

Source Condition: NORMAL

Dry Gas Meter No. CM-13 Y = 0.993

Barometric Pressure: 29.90 in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 10.0 in. Hg vacuum

Post-sampling 0. cfm @ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			VAC. " H ₂ Stack (°F)	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
1120	13.510	.03	4.0	500	500	148	140	67	68
1125	14.02	.03	5.0	500	500	148	140	67	68
1130	14.55	.03	5.0	500	500	149	140	66	68
1135	15.05	.03	5.0	500	500	150	140	66	68
1140	15.52	.03	5.0	500	500	150	141	66	68
1145	15.98	.03	5.0	500	500	150	140	66	68
1150	16.44	.03	5.0	500	500	150	140	66	68
1155	16.87	.03	5.0	500	500	149	139	66	68
1200	17.31	.03	5.0	500	500	149	140	66	67
1205	17.76								
Avg.									

Operator: A.L. SOURCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH Merrimack Date: 3-27-08

Sampling Location: U2 SCR Outlet

Source Condition: Normal

Dry Gas Meter No. CM-16 Y = 1.015

Barometric Pressure: 29.90 in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 10.0 in. Hg vacuum

Post-sampling 0.0 cfm @ 10.0 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Vac " Hg Stack (°F)	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
								Inlet (°F)	Outlet (°F)
1357	3.132	.03	3.0	500	500	148	141	54	53
1402	3.57	.03	3.0	500	500	147	140	54	54
07	4.02	.03	3.0	500	500	148	140	54	53
12	4.46	.03	3.0	500	500	148	140	55	54
17	4.99	.03	4.0	500	500	148	140	55	54
22	5.33	.03	4.0	500	500	147	139	55	54
27	5.82	.03	4.0	500	500	148	140	55	55
32	6.31	.03	4.0	500	500	149	140	55	55
37	6.75	.03	5.0	500	500	149	140	56	55
1442	7.280								
Avg.									

Operator: A.L. SORRE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH MERRIMACK Date: 3-27-08

Sampling Location: U2 SCR Outlet

Source Condition: NORMAL

Dry Gas Meter No. CM-16 Y = 1.015

Barometric Pressure: 29.90 in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 12.0 in. Hg vacuum

Post-sampling 0.0 cfm @ 12.0 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Vac 11 Hg Static	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
1602	2.190	.03	6.0	500	500	148	140	56	56
07	2.51	.03	7.0	500	500	148	140	56	56
12	2.93	.03	8.0	500	500	148	140	56	56
17	3.37	.02	8.0	500	500	148	140	56	56
22	3.78	.02	8.0	500	500	148	140	56	56
27	4.14	.03	8.0	500	500	148	140	56	56
32	4.65	.03	9.0	500	500	148	140	56	56
37	5.09	.03	10.0	500	500	148	140	56	57
42	5.53	.03	10.0	500	500	148	140	56	57
1647	6.10								
Avg.									

Operator: A. L. Sorce

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET

For Controlled Condensate (CCS)

(NCASI Method 8A)

Project/Project Number: PSNH Merrimack Date: 3-27-08

Sampling Location: U2 SCRE Outlet

Source Condition: NORMAL

Dry Gas Meter No. CM-16 Y = 1.015

Barometric Pressure: 29.90 in. Hg

Leak Check: Pre-sampling 0 0 cfm @ 10.0 in. Hg vacuum

Post-sampling 0 cfm @ _____ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Vac		Filter			Dry Gas Meter	
			"Hg Stack (°F)	> 500° Probe (°F)	> 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Inlet (°F)	Outlet (°F)
1500	7.373	.03	4.0	500	500	147	140	55	55
05	7.78	.03	7.0	500	500	148	140	55	55
10	8.35	.03	8.0	500	500	148	140	55	55
15	8.99	.03	8.0	500	500	148	140	55	55
20	9.46	.03	8.0	500	500	148	140	56	55
25	10.02	.03	8.0	500	500	148	140	56	56
30	10.52	.03	9.0	500	500	148	140	56	56
35	11.03	.03	9.0	500	500	148	140	57	56
40	11.52	.03	9.0	500	500	148	140	56	56
1545	12.009								
Avg.									

Operator: A.L. Sorrell

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH MERRIMACK Date: 3-28-08

Sampling Location: U2 SCR INLET

Source Condition: NORMAL

Dry Gas Meter No. CM Y = 1.015

Barometric Pressure: 29.46 in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 10.0 in. Hg vacuum

Post-sampling 0.0 cfm @ 10.0 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			<u>Vac</u> <u>11/16</u> <u>Stack</u> <u>(45)</u>	> 500° Probe (°F)	> 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
0835	6.055	.02	2.0	500	500	150	139	40	40
40	6.46	.02	2.0	500	500	155	139	42	40
45	6.74	.02	2.0	500	500	155	140	42	40
50	7.27	.02	2.0	500	500	160	140	42	40
55	7.78	.02	2.0	500	500	160	140	42	40
0900	8.15	.02	2.0	500	500	160	141	43	40
05	8.69	.02	2.0	500	500	160	140	44	41
10	9.02	.02	2.0	500	500	160	140	44	41
15	9.50	.02	2.0	500	500	160	140	44	42
0920	9.99								
Avg.									

Operator: A. L. Sorce

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH MERRIMACK Date: 3-28-08
 Sampling Location: U2 SCR INLET
 Source Condition: NORMAL
 Dry Gas Meter No. CM-16 Y = 1.015
 Barometric Pressure: 29.46 in. Hg
 Leak Check: Pre-sampling 0.0 cfm @ 10.0 in. Hg vacuum
 Post-sampling 0.0 cfm @ 10.0 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			VAC 11 1/4 Stack (in)	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
0945	0.011	.02	2.0	500	500	160	140	45	44
50	0.42	.03	2.0	500	500	157	140	46	44
55	0.74	.03	2.0	500	500	157	140	47	44
1000	1.22	.03	2.0	500	500	157	140	47	45
05	1.67	.03	3.0	500	500	158	141	48	45
10	2.09	.03	3.0	500	500	156	140	48	46
15	2.43	.03	3.0	500	500	155	140	48	46
20	2.77	.03	4.0	500	500	155	140	48	46
25	3.74	.03	4.0	500	500	155	140	48	46
1030	3.927								
Avg.									

Operator: A.L. Sacco

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH Merrimack Date: 3-28-08

Sampling Location: U2 SCR Inlet

Source Condition: Normal

Dry Gas Meter No. 0M-16 Y = 1.015

Barometric Pressure: _____ in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 10.0 in. Hg vacuum

Post-sampling 0.0 cfm @ _____ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						Dry Gas Meter	
			Vac 11 H ₂ O Stack (°F)	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)			
1055	4.027	.04	3.0	500	500	153	140	49	47	
1100	4.48	.04	4.0	500	500	153	141	49	47	
05	4.76	.04	4.0	500	500	152	140	50	48	
10	5.18	.05	5.0	500	500	152	139	51	49	
15	5.55	.05	5.0	500	500	153	140	51	49	
20	5.98	.05	6.0	500	500	153	140	51	49	
25	6.43	.05	6.0	500	500	153	140	51	49	
30	6.85	.04	7.0	500	500	153	140	51	49	
35	7.24	.04	7.0	500	500	152	140	51	49	
1140	7.818									
Avg.										

Operator: A.L. Sorock

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSN14 MERRIMACK Date: 3-28-08

Sampling Location: P 112 Suppl. ESP Outlet

Source Condition: CONDITION 2

Dry Gas Meter No. CM-13 Y = 0.993

Barometric Pressure: _____ in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 10.0 in. Hg vacuum

Post-sampling 0. cfm @ _____ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature					Dry Gas Meter	
			VAC 11 Hg Static	> 500° Probe (°F)	> 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Inlet (°F)	Outlet (°F)
1505	1.059	.02	3.0	500	500	146	140	73	71
10	1.50	.02	3.0	500	500	146	140	73	72
15	1.99	.02	3.0	500	500	146	140	73	72
20	2.47	.02	3.0	500	500	147	140	73	72
25	2.95	.02	3.0	500	500	148	141	74	72
30	3.39	.02	3.0	500	500	146	140	74	72
35	3.89	.02	3.0	500	500	146	140	74	73
40	4.42	.02	3.0	500	500	146	140	74	73
45	4.93	.02	3.0	500	500	146	140	74	73
1550	5.432								
Avg.									

Operator: A. L. SORCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH MERRIMACK Date: 3-28-08

Sampling Location: U2 Suppl. ESP Outlet

Source Condition: CONDITION 2

Dry Gas Meter No. CM-13 Y = 0.993

Barometric Pressure: _____ in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 9.0 in. Hg vacuum

Post-sampling 0. cfm @ _____ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Vac 11 Hg Stack (PSI)	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
1605	5.505	.02	3.0	500	500	146	140	74	73
10	6.06	.02	3.0	500	500	146	140	74	73
15	6.58	.02	3.0	500	500	146	140	74	73
20	7.08	.02	3.0	500	500	146	140	74	73
25	7.57	.02	3.0	500	500	145	140	74	73
30	8.06	.02	3.0	500	500	146	140	74	73
35	8.52	.02	3.0	500	500	146	140	74	73
40	8.99	.02	3.0	500	500	146	140	74	73
45	9.48	.02	3.0	500	500	146	140	74	73
1650	9.935								
Avg.									

Operator: A. L. SORCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH MERRIMACK Date: 3-28-08

Sampling Location: U2 Suppl. ESP Outlet

Source Condition: CONDITION 2

Dry Gas Meter No. CM-13 Y = 0.993

Barometric Pressure: _____ in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 10.0 in. Hg vacuum

Post-sampling 0. cfm @ _____ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			<u>Vac</u> <u>11 Hg</u> <u>5.0</u>	> 500° Probe (°F)	> 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
1700	10.003	.02	5.0	500	500	145	140	74	72
05	10.57	.02	5.0	500	500	146	141	73	72
10	11.19	.02	5.0	500	500	145	140	73	72
15	11.69	.02	5.0	500	500	144	140	74	72
20	12.16	.02	5.0	500	500	143	140	75	73
25	12.63	.02	5.0	500	500	144	140	74	73
30	13.09	.02	5.0	500	500	144	139	74	73
35	13.56	.02	5.0	500	500	146	140	73	73
40	14.03	.02	5.0	500	500	146	140	73	72
1745	14.56								
Avg.									

Operator: A. L. Sorce

APPENDIX L: Platt April 2006 Report

Platt Environmental Services, Inc.

371 Balm Court
Wood Dale, IL 60191
630-521-9400
630-521-9494 fax

**SULFURIC ACID MIST AND
TOTAL MERCURY EMISSION STUDY**

Performed for
ADA-ES, Inc.

At the
**Public Service of New Hampshire
Merrimack Power Plant
Unit 2 Stack
Bow, New Hampshire**

Test Dates
April 13 and 14, 2006

**Platt Environmental Services, Inc.
Report PE2006067**

Report Submittal Date
May 22, 2006

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CERTIFICATION SHEET

Having reviewed the test program described in this report, I hereby certify the data, information, and results in this report to be accurate and true according to the methods and procedures used.

Data collected under the supervision of others is included in this report and is presumed to have been gathered in accordance with recognized standards.

PLATT ENVIRONMENTAL SERVICES, INC.

A handwritten signature in black ink, appearing to read 'E. L. Ehlers', written over a horizontal line.

Eric L. Ehlers
Senior Project Manager

1.0 INTRODUCTION

Platt Environmental Services, Inc., ("Platt Environmental") performed a total mercury and sulfuric acid mist emission test program on the Unit 2 Stack at the Merrimack Power Plant of the Public Service of New Hampshire in Bow, New Hampshire on April 13 and 14, 2006. The tests were authorized by the Public Service of New Hampshire and performed for ADA-ES, Inc.

The purpose of the test program was to determine the effects of operating at a high temperature and low temperature condition.

1.1 Project Contact Information

Location	Address	Contact
Test Coordinator	ADA-ES, Inc. 8100 South Park Way Unit B Littleton, Colorado, 80120	Mr. Tom Campbell Manager, DOE Demonstrations 303-734-1727 (phone) 303-734-0330 (fax) tomc@adaes.com
Testing Company Representative	Platt Environmental Services, Inc. 371 Balm Court Wood Dale, Illinois 60191	Eric Ehlers Senior Project Manager 630-521-9400 (phone) 630-521-9494 (fax) ericehlers@dataflo.net

The tests were conducted by Messrs. R. Owens and E. Ehlers of Platt Environmental.

2.0 SUMMARY OF RESULTS

The following table summarizes the test results for each of the test conditions:

Parameter	Reference Method	High Temp	Low Temp
Sulfuric Acid Mist (ppm SO ₃ as H ₂ SO ₄)	NCASI Method 8A	2.19	0.57
Total Mercury (ppb)	Appendix K to 40CFR75	1.04	1.17

Complete test results are appended in Section 6.0.

3.0 DISCUSSION OF RESULTS

Source operation appeared normal during the entire test program. No problems were encountered with the testing equipment during the test program.

4.0 TEST PROCEDURES

All testing, sampling, analytical, and calibration procedures used for this test program were performed as described in the Title 40, Code of Federal Regulations, Part 75 (40CFR75), Appendix K, and NCASI Method 8A.

4.1 Sulfur Trioxide (SO₃) Determination

The National Council of the Paper Industry for Air and Stream Improvement Inc. (NCASI) Method 8A, Determination of Sulfuric Acid Vapor or Mist and Sulfur Dioxide Emissions from Kraft Recovery Furnaces test procedure was used to determine the sulfur trioxide (SO₃) concentrations as sulfuric acid (H₂SO₄) mist at the Unit 2 Outlet stack test location.

By using a modified Graham condenser, the gas was collected to the acid dew point at which the SO₃ (H₂SO₄ vapor) condenses. The temperature of the gas was kept above the water dew point to prevent interference from SO₂ while a heated quartz filter system removed particulate matter.

After each run, the probe, connecting lines, controlled condensation coil, and filter holder, were cleaned. The probe and connecting lines were rinsed with demineralized water. The filter holder was inspected and cleaned before the next run and the filter pad was replaced.

Prior to use, the controlled condensation coil (CCC) was cleaned and dried. The CCC was transported to the site with a stopper in each end. The CCC was connected to a water bath and the circulation of the (167°F - 185°F) water was started. This evaporates any premature condensation.

With the probe still out of the stack, the train was assembled. All ball joints were checked to ensure they were completely clean and free of dust. Because of the possibility that the grease will seize at the temperatures employed, grease was not used.

A leak check was performed on the complete system. If the leak rate is less than 0.003 cfm, the system was ready for use. If a leak rate greater than 0.003 cfm was found, the system was checked for loose joints and connections. Any leak

was corrected prior to the start of the test. A post test leak check followed each test.

The probe and the filter holder were heated to greater than 350°F and 500°F, respectively. The heating bath is set at between (167°F - 185°F). Once the temperatures reached these values, the run commenced.

After leak checking, the pump was again turned on and the flowrate adjusted to 8 lpm (0.3 cfm) using the dry test meter and a stopwatch. The pump was turned off without readjusting the valve settings.

At the end of the sampling period, the probe was removed from the duct, a leak check performed and the pump slowly shut off. After the pressure dropped, the CCC was removed from the system without removing the water bath hoses. The CCC was carefully connected to the Erlenmeyer flask without spilling any condensate in the tube. In 10 ml increments (up to 30 mls), demineralized water was used to rinse out the CCC. The rinse solution in the stoppered Erlenmeyer was transferred to the laboratory and was diluted to with 100% IPA to reach a 80% IPA matrix prior to analysis.

The probe was rinsed with 30 mls of demineralized water. This solution was transferred to the laboratory and filtered through a Whatman No. 1 filter into a 50 ml volumetric flask.

The filter and any debris from the filter holder was removed and placed into the probe wash bottle.

The method of analysis was titration. All samples were carefully handled, stored in clean glassware and the coil rinse was analyzed as soon as possible. All results were recorded on the appended laboratory data sheet.

4.2 Total Mercury Determination

Paired trains were utilized using one (1) test point at the Unit 2 Stack test location to sample for total mercury.

Per Appendix K sampling, each sample was drawn through a heated quartz lined probe into the carbon sorbent trap. A tube of silica was used to capture remaining moisture prior to the sample reaching the gas metering system.

The sample train used for this test program was designed by Frontier Geosciences, Inc. (FGS) and meet all requirements for Appendix K sampling. Samples were sent to FGS after sampling for total mercury analysis.

Copies of all sample analysis sheets are appended to this report.

Calculations were performed on a computer and by hand. An explanation of the nomenclature and calculations along with the complete test results are appended. Also appended are the calibration data and copies of the raw field data sheets.

Raw data are kept on file at the Platt Environmental office in Wood Dale, Illinois. All samples from this test program (not already used in analysis) will be retained for 60 days after the submittal of the report, after which they will be discarded unless Platt Environmental is advised otherwise.

5.0 QUALITY ASSURANCE PROCEDURES

Platt Environmental recognizes the previously described reference methods to be very technique oriented and attempts to minimize all factors which can increase error by implementing its Quality Assurance Program into every segment of its testing activities.

Shelf life of chemical reagents prepared at the Platt Environmental laboratory or at the jobsite did not exceed those specified in the above mentioned methods; and, those reagents having a shelf life of one week were prepared daily at the jobsite. When on-site analyses were required, all reagent standardizations were performed daily by the same person performing the analysis.

Dry and wet test meters were calibrated according to methods described in the Quality Assurance Handbook, Sections 3.3.2, 3.4.2 and 3.5.2. Percent error for the wet test meter according to the methods was less than the allowable error of 1.0 percent. The dry test meters measured the test sample volumes to within 2 percent at the flowrate and conditions encountered during sampling.

6.0 TEST RESULTS SUMMARY

Mercury Test Results Summary
Public Service Of New Hampshire
Merrimack Generating Station
Unit 2 Stack
April 13 and 14, 2006

Test No.	Date	Time	V _m (L)	ug detected	ppb	ug/dncm
High Temperature						
1A	4/13/2006	9:25-10:25	13.23	0.1150	1.04	8.70
1B	4/13/2006	9:25-10:25	13.01	0.1207	1.11	9.69
2A	4/13/2006	11:00-12:00	14.14	0.1166	0.99	8.26
2B	4/13/2006	11:00-12:00	14.09	0.1364	1.16	9.75
3A	4/13/2006	12:35-13:35	15.22	0.1196	0.94	7.87
3B	4/13/2006	12:35-13:35	15.08	0.1272	1.01	8.44
Average					1.04	8.78
Low Temperature						
1A	4/14/2006	8:30-9:30	14.28	0.1310	1.10	9.18
1B	4/14/2006	8:30-9:30	14.23	0.1357	1.14	9.55
2A	4/14/2006	10:15-11:15	13.99	0.1362	1.17	9.75
2B	4/14/2006	10:15-11:15	13.99	0.1445	1.24	10.34
3A	4/14/2006	11:50-12:50	14.83	0.1439	1.16	9.71
3B	4/14/2006	11:50-12:50	14.78	0.1476	1.20	10.00
Average				0.1398	1.17	9.75

Sulfuric Acid Mist Test Results Summary
Public Service Of New Hampshire
Merrimack Generating Station
Unit 2 Stack
April 13 and 14, 2006

Test No.	Date	Time	V _m (L)	mg detected	ppm as H ₂ SO ₄
High Temperature					
1	4/13/2006	9:20-10:20	513.96	3.7	1.77
2	4/13/2006	11:00-12:00	510.15	5.0	2.40
3	4/13/2006	12:35-13:35	447.48	4.4	2.41
Average					2.19
Low Temperature					
1	4/14/2006	8:30-9:30	522.69	0.4	0.19
2	4/14/2006	10:15-11:15	507.98	1.2	0.58
3	4/14/2006	11:50-12:50	499.46	1.9	0.93
Average					0.57

APPENDIX

GASEOUS TRAVERSE FOR ROUND DUCTS

Job: Public Service of New Hampshire – Merrimack Station

Date: April 13 and 14, 2006

Unit No: 2

Test Location: Stack

METHOD 8A - DETERMINATION OF SULFURIC ACID VAPOR OR MIST AND SULFUR DIOXIDE EMISSIONS FROM KRAFT RECOVERY FURNACES

Sampling Console

Platt Environmental Services, Inc

CHAIN-OF-CUSTODY RECORD						
Project Number: PE2006067				Date Results Required:		
Client: ADA ES				TAT Required:		
Plant/Location: Public Service of New Hampshire – Merrimack Station/Unit 2 Stack					PO Number:	
Project Supervisor: ELE						
Sample Number	Date Sampled	Sample Point Identification	# of Conts	Grab/Comp	Analysis Requested	Sub Lab
001	4/13/06	Unit 2 Stack Coil Rinse #1	1		M8A	
002	4/13/06	Unit 2 Stack Coil Rinse #2	1		M8A	
003	4/13/06	Unit 2 Stack Coil Rinse #3	1		M8A	
004	4/14/06	Unit 2 Stack Coil Rinse #1	1		M8A	
005	4/14/06	Unit 2 Stack Coil Rinse #2	1		M8A	
006	4/14/06	Unit 2 Stack Coil Rinse #3	1		M8A	
007						
008						
009						
010						
011						
012						
013						
014						
015						
016						
Delivered by:		Date/Time	Processed by:		Date/Time 4-18-06 1037	Received by Laboratory: g. O'Neill

Special Instructions:

LABORATORY REPORT

TEI Analytical, Inc.
7177 N. Austin
Niles, IL 60714-4617
847-647-1345

PREPARED FOR:

PAGE 1 of 1

Jim Platt
Platt Environmental Services Inc.
371 Balm Court
Wood Dale, IL 60191

Report #: 71751
Report Date: 4/24/2006
Sample Received:
4/18/06 10:37

PE2006067

TEI Number	Sample	Sulfuric Acid (Method 8)	Date Performed
		mg	
71751	001 #1 High Temp	3.7	4/21/2006
71752	002 #2 High Temp	5.0	4/21/2006
71753	003 #3 High Temp	4.4	4/21/2006
71754	004 #1 Low Temp	<0.4	4/21/2006
71755	005 #2 Low Temp	1.2	4/21/2006
71756	006 #3 Low Temp	1.9	4/21/2006

Gayle E. O'Neill, Ph.D.

Results of M324 Sorbent Total Mercury in Coal Fluegas
For Platt Environmental - Samples received 04/18/06
 Frontier Geosciences Inc., Lucas Hawkins (lucash@frontiergeosciences.com)
 Report Date: May 16, 2006

Samples Analyzed: May 15, 2006 (THg08-060515-1)

Gas Volume Calculations									
Trap ID	Location	Ave Gas Meter Temp (°F)	Ave Data Sheet Pres (Inch Hg)	Logger Final Volume (L)	Totalizer Final Volume (L)	Logger Vol T/P Corr. (std. L)	Totalizer Vol T/P Corr. (std. L)	Vol Difference (Tot-Log)/Tot (%)	Comment
S2936	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service
S2938	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service
S2935	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service
S2940	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service
S2939	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service
S2942	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service
S2937	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service
S2930	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service
S2931	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service
S2933	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service
S2929	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service
S2934	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service
S2932	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service
S2941	Merrimack	-	-	-	-	-	-	-	Not included w/ requested service

Sample Concentration Calculations										
Trap ID	FGS Sample ID	Start Date/Time	End Date/Time	Trap Sect. A Blank Corr. Total Hg (ng/trap)	Trap Sect. B Blank Corr. Total Hg (ng/trap)	Trap Sect. C Blank Corr. Total Hg (ng/trap)	Total Hg Blank Corrected (ng/trap)	Total Hg in Fluegas (STP, dry) (ug/dsm ³)	Total Hg in Fluegas (STP, dry) (lbs/ft ³)	Comment
S2936	0604055-01	N/P	N/P	-	-	-	-	N/C	N/C	Analysis not requested
S2938	0604055-02	N/P	N/P	-	-	-	-	N/C	N/C	Analysis not requested
S2935	0604055-03	N/P	N/P	127.1	0.08	-	127.2	N/C	N/C	
S2940	0604055-04	N/P	N/P	135.7	-	-	135.7	N/C	N/C	
S2939	0604055-05	N/P	N/P	131.0	-	-	131.0	N/C	N/C	
S2942	0604055-06	N/P	N/P	144.4	0.07	815.00	144.5	N/C	N/C	Spike Recovery = 90.6%
S2937	0604055-07	N/P	N/P	136.2	-	-	136.2	N/C	N/C	
S2930	0604055-08	N/P	N/P	115.0	-	-	115.0	N/C	N/C	Moisture noted on B trap
S2931	0604055-09	N/P	N/P	116.6	-	-	116.6	N/C	N/C	
S2933	0604055-10	N/P	N/P	147.6	0.04	-	147.6	N/C	N/C	
S2929	0604055-11	N/P	N/P	120.7	-	-	120.7	N/C	N/C	
S2934	0604055-12	N/P	N/P	119.6	-	-	119.6	N/C	N/C	
S2932	0604055-13	N/P	N/P	143.9	-	-	143.9	N/C	N/C	
S2941	0604055-14	N/P	N/P	136.2	0.17	779.38	136.4	N/C	N/C	Spike Recovery = 86.6%

N/C - Not calculated due to missing data

N/P - Data not provided

Results of M324 Sorbent Total Mercury in Coal Fluegas
For Platt Environmental - Samples received 04/18/06
 Frontier Geosciences Inc., Lucas Hawkins (lucash@frontiergeosciences.com)
 Report Date: May 16, 2006

Samples Analyzed: May 15, 2006 (THg08-060515-1)

Digestion Blanks	THg (ng/trap)
PB-1	0.06
PB-2	0.05
PB-3	0.08
Average	0.07
St Dev	0.01
Estimated MDL (3 X St Dev)	0.04

CRM's and Spikes (Accuracy)	THg (% Rec.)
NIST 1641d (15.9 ng/L)	95.6%
Sample ID	S2935 A
Spiking Level (ng/digest)	560.0
Sample AS	105.5%
Sample ASD	102.9%

Sample Duplicates (Precision)	THg (ng/trap)
Sample ID	S2935 A
Sample Result	127.11
Sample Result AD	127.8
RPD	0.6%
Sample ID	S2935 A
Sample Result AS	718.1
Sample Result ASD	703.9
RPD	2.0%

MERCURY SAMPLE CALCULATION

Concentration

$$\frac{\mu\text{g}}{\text{m}^3} = \frac{\mu\text{g of sample}}{\text{dscf volume sampled} \times 0.02832 \frac{\text{m}^3}{\text{ft}^3}}$$

Emission Rate

$$\frac{\mu\text{g of sample} \times \frac{1 \times 10^{-6} \text{ grams}}{\mu\text{g}}}{453.6 \text{ gr/lb}} = \text{lbs of sample}$$

$$\frac{\text{lbs/sample}}{\text{Vm (std) sample}} \times \text{dscfm} \times 60 \frac{\text{min}}{\text{hr}} = \text{lbs/hr}$$

CALCULATIONS FOR SULFURIC ACID MIST INCLUDING SULFUR TRIOXIDE

$$V_{m(\text{std})} = 17.64 V_m Y \frac{P_{\text{bar}} + \frac{\Delta H}{13.6}}{T_m}$$

$$C_{\text{H}_2\text{SO}_4} = 1.0811 \times 10^{-4} \frac{(V_t - V_{\text{tb}}) N \left(\frac{V_{\text{soln}}}{V_a} \right)}{V_{m(\text{std})}}$$

$$\text{ppm H}_2\text{SO}_4 = 3.9289 \times 10^6 C_{\text{H}_2\text{SO}_4} \quad (\text{expressed as H}_2\text{SO}_4)$$

Where:

$C_{\text{H}_2\text{SO}_4}$ = Concentration of sulfuric acid (including sulfur trioxide), dry basis, corrected to standard conditions, lb/dscf

N = Normality of barium perchlorate titrant, meq/ml

P_{bar} = Barometric pressure at the exit orifice of the dry gas meter, in. Hg

P_{std} = Standard absolute pressure, 29.92 in. Hg

T_m = Dry gas meter average absolute temperature, °R

T_{std} = Standard absolute temperature, 528 °R

V_a = Volume of sample aliquot titrated, ml

V_m = Dry gas volume measured by dry gas meter, dcf

$V_{m(\text{std})}$ = Dry gas volume measured by dry gas meter, corrected to standard conditions, dscf

V_{soln} = Total volume of solution in which the sulfuric acid sample is contained, ml

V_t = Volume of barium perchlorate titrant used for the sample (average of replicate titrations), ml

V_{tb} = Volume of barium perchlorate titrant used for the blank, ml

Y = Dry gas meter calibration factor

ΔH = Average pressure differential across the orifice meter, in. H₂O

13.6 = Specific gravity of mercury (Hg)

17.64 = $T_{\text{std}}/P_{\text{std}}$

1.0811×10^{-4} = Equivalent weight of sulfuric acid, lb/g-meq

3.9289×10^6 = $\frac{\text{dscf}}{\text{lb}}$

EMISSION RATE CALCULATIONS

A pollutant emission rate (E), expressed as pounds of pollutant per million Btu heat input from the fuel combusted can be calculated by several methods as follows:

1. $C = C_s/7000$ where, C = pollutant concentration, lb/dscf
 c_s = pollutant concentration, grains/dscf
2. If fuel flow is monitored and the fuel combusted during the test is sampled and analyzed for gross calorific value, then:

$$E = \frac{Q_{sd} C}{\text{fuel flow rate (lb / hr) GCV}} \times 10^6$$

where, E = lbs per million Btu

GCV = gross calorific value, Btu / lb

Q_{sd} = dry volumetric gas flow at standard conditions, dscf / hr

3. If an integrated gas sample is taken during the test and analyzed for %CO₂ or %O₂, dry basis by volume, with an Orsat gas analyzer, then

$$E = C F_c \frac{100}{(\%CO_2)} \text{ or, } E = C F \frac{20.9}{(20.9 - \%O_2)} \text{ where,}$$

%CO₂ and %O₂ are expressed as percent; and, for example, for subbituminous and bituminous coals:

F_c = a factor representing a ratio of the volume of carbon dioxide generated to the calorific value of the fuel combusted, 1800 scf CO₂/million Btu.

F = a factor representing a ratio of the volume of dry flue gases generated to the calorific value of the fuel combusted, 9780 dscf/million Btu.

4. If fuel sample increments are taken and composited during the test and an ultimate analysis is performed and the GCV is determined, then

$$F_c = \frac{321 \times 10^3 (\%C)}{GCV} \text{ where, \%C = carbon content by weight expressed as percent}$$

$$F = \frac{[3.64 (\%H) + 1.53 (\%C) + 0.57 (\%S) + 0.14 (\%N) - 0.46 (\%O_2)]}{GVC} \times 10^6$$

where, H, C, S, N, and O are content by weight of hydrogen, carbon, sulfur, nitrogen, and oxygen (expressed as percent) respectively.

5. If fuels other than subbituminous and bituminous coals are fired, other F-factors than those above will apply; and, if combinations of different fuels are fired, the F-factors must be prorated according to the fraction of the total heat input derived from each type of fuel.

APPENDIX K TEST RESULTS

Date:	4/13/2006	Condition:	High Temp
Project:	P.S. of New Hampshire-Merrimack Station	Data Taken By:	ELE
Location:	Stack	Fuel Factor:	9780
Source:	Unit 2		

Test Number:	1A	Time:	9:25-10:25
Pressure, Barometric(Hg"):	28.870	Hg (ug)	0.1150
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.000
Pressure, Stack(Hg"):	28.870	Hg (ppb)	1.04
Initial Volume (liters)	0	Hg (ug/dncm)	8.70
Final Volume (liters)	14.22		
Meter Temperature (°F)	50.42		
Meter Volume (Normal liters)	13.23		
Meter Calibration (Y)	1.000		
Average Delta H (ΔH)	0.010		

Test Number:	2A	Time:	11:00-12:00
Pressure, Barometric(Hg"):	28.870	Hg (ug)	0.1166
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.000
Pressure, Stack(Hg"):	28.870	Hg (ppb)	0.99
Initial Volume (liters)	0	Hg (ug/dncm)	8.26
Final Volume (liters)	15.29		
Meter Temperature (°F)	53.50		
Meter Volume (Normal liters)	14.14		
Meter Calibration (Y)	1.000		
Average Delta H (ΔH)	0.010		

Test Number:	3A	Time:	12:35-13:35
Pressure, Barometric(Hg"):	28.870	Hg (ug)	0.1196
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.000
Pressure, Stack(Hg"):	28.870	Hg (ppb)	0.94
Initial Volume (liters)	0	Hg (ug/dncm)	7.87
Final Volume (liters)	15.59		
Meter Temperature (°F)	61.92		
Meter Volume (Normal liters)	15.22		
Meter Calibration (Y)	1.000		
Average Delta H (ΔH)	0.010		

APPENDIX K TEST RESULTS

Date: 4/13/2006
 Project: P.S. of New Hampshire-Merrimack Station
 Location: Stack
 Source: Unit 2

Condition: High Temp
 Data Taken By: ELE
 Fuel Factor: 9780

Test Number:	1B	Time:	9:25-10:25
Pressure, Barometric(Hg"):	28.870	Hg (ug)	0.1207
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.000
Pressure, Stack(Hg"):	28.870	Hg (ppb)	1.11
Initial Volume (liters)	0	Hg (ug/dncm)	9.29
Final Volume (liters)	13.99		
Meter Temperature (°F)	50.42		
Meter Volume (Normal liters)	13.01		
Meter Calibration (Y)	1.000		
Average Delta H (ΔH)	0.010		

Test Number:	2B	Time:	11:00-12:00
Pressure, Barometric(Hg"):	28.870	Hg (ug)	0.1364
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.000
Pressure, Stack(Hg"):	28.870	Hg (ppb)	1.16
Initial Volume (liters)	0	Hg (ug/dncm)	9.69
Final Volume (liters)	15.24		
Meter Temperature (°F)	53.50		
Meter Volume (Normal liters)	14.09		
Meter Calibration (Y)	1.000		
Average Delta H (ΔH)	0.010		

Test Number:	3B	Time:	12:35-13:35
Pressure, Barometric(Hg"):	28.870	Hg (ug)	0.1272
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.000
Pressure, Stack(Hg"):	28.870	Hg (ppb)	1.01
Initial Volume (liters)	0	Hg (ug/dncm)	8.44
Final Volume (liters)	15.45		
Meter Temperature (°F)	61.92		
Meter Volume (Normal liters)	15.08		
Meter Calibration (Y)	1.000		
Average Delta H (ΔH)	0.010		

METHOD 8A TEST RESULTS

Date: 4/13/2006	Condition: High Temp
Project: P.S. of New Hampshire-Merrimack Station	Data Taken By: RGO
Location: Stack	Fuel Factor: 9780
Source: Unit 2	

Test Number:	1	Time:	9:20-10:20
Pressure, Barometric(Hg"):	28.870	SO ₃ (mg):	3.7000
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.094
Pressure, Stack(Hg"):	28.870	SO ₃ (ppm):	1.77
Initial Volume (cu.ft.):	27.188		
Final Volume (cu.ft.):	45.25		
Meter Temperature (°F):	50.42		
Meter Volume (dscf):	18.15		
Meter Calibration (Y):	1.006		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	240.0		
Average Delta H (ΔH):	0.300		

Test Number:	2	Time:	11:00-12:00
Pressure, Barometric(Hg"):	28.870	SO ₃ (mg):	5.0000
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.090
Pressure, Stack(Hg"):	28.870	SO ₃ (ppm):	2.40
Initial Volume (cu.ft.):	52.444		
Final Volume (cu.ft.):	70.48		
Meter Temperature (°F):	53.50		
Meter Volume (dscf):	18.02		
Meter Calibration (Y):	1.006		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	238.0		
Average Delta H (ΔH):	0.300		

Test Number:	3	Time:	12:35-13:35
Pressure, Barometric(Hg"):	28.870	SO ₃ (mg):	4.4000
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.097
Pressure, Stack(Hg"):	28.870	SO ₃ (ppm):	2.41
Initial Volume (cu.ft.):	72.63		
Final Volume (cu.ft.):	88.71		
Meter Temperature (°F):	61.92		
Meter Volume (dscf):	15.80		
Meter Calibration (Y):	1.006		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	236.0		
Average Delta H (ΔH):	0.300		

APPENDIX K TEST RESULTS

Date:	4/14/2006	Condition:	Low Temp
Project:	P.S. of New Hampshire-Merrimack Station	Data Taken By:	ELE
Location:	Stack	Fuel Factor:	9780
Source:	Unit 2		

Test Number:	1A	Time:	8:30-9:30
Pressure, Barometric(Hg"):	29.010	Hg (ug):	0.1310
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.000
Pressure, Stack(Hg"):	29.010	Hg (ppb):	1.10
Initial Volume (liters):	0	Hg (ug/dncm):	9.18
Final Volume (liters):	15.14		
Meter Temperature (°F):	45.67		
Meter Volume (Normal liters):	14.28		
Meter Calibration (Y):	1.000		
Average Delta H (ΔH):	0.010		

Test Number:	2A	Time:	10:15-11:15
Pressure, Barometric(Hg"):	29.010	Hg (ug):	0.1362
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.000
Pressure, Stack(Hg"):	29.010	Hg (ppb):	1.17
Initial Volume (liters):	0	Hg (ug/dncm):	9.75
Final Volume (liters):	15.23		
Meter Temperature (°F):	59.42		
Meter Volume (Normal liters):	13.99		
Meter Calibration (Y):	1.000		
Average Delta H (ΔH):	0.010		

Test Number:	3A	Time:	11:50-12:50
Pressure, Barometric(Hg"):	29.010	Hg (ug):	0.1439
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.000
Pressure, Stack(Hg"):	29.010	Hg (ppb):	1.16
Initial Volume (liters):	0	Hg (ug/dncm):	9.71
Final Volume (liters):	15.25		
Meter Temperature (°F):	66.50		
Meter Volume (Normal liters):	14.83		
Meter Calibration (Y):	1.000		
Average Delta H (ΔH):	0.010		

APPENDIX K TEST RESULTS

Date: 4/14/2006
 Project: P.S. of New Hampshire-Merrimack Station
 Location: Stack
 Source: Unit 2

Condition: Low Temp
 Data Taken By: ELE
 Fuel Factor: 9780

Test Number:	1B	Time:	8:30-9:30
Pressure, Barometric(Hg"):	29.010	Hg (ug)	0.1357
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.000
Pressure, Stack(Hg"):	29.010	Hg (ppb)	1.14
Initial Volume (liters)	0	Hg (ug/dncm)	9.55
Final Volume (liters)	15.08		
Meter Temperature (°F)	45.67		
Meter Volume (Normal liters)	14.23		
Meter Calibration (Y)	1.000		
Average Delta H (ΔH)	0.010		

Test Number:	2B	Time:	10:15-11:15
Pressure, Barometric(Hg"):	29.010	Hg (ug)	0.1445
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.000
Pressure, Stack(Hg"):	29.010	Hg (ppb)	1.24
Initial Volume (liters)	0	Hg (ug/dncm)	10.34
Final Volume (liters)	15.23		
Meter Temperature (°F)	59.42		
Meter Volume (Normal liters)	13.99		
Meter Calibration (Y)	1.000		
Average Delta H (ΔH)	0.010		

Test Number:	3B	Time:	11:50-12:50
Pressure, Barometric(Hg"):	29.010	Hg (ug)	0.1476
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.000
Pressure, Stack(Hg"):	29.010	Hg (ppb)	1.20
Initial Volume (liters)	0	Hg (ug/dncm)	10.00
Final Volume (liters)	15.2		
Meter Temperature (°F)	66.50		
Meter Volume (Normal liters)	14.78		
Meter Calibration (Y)	1.000		
Average Delta H (ΔH)	0.010		

METHOD 8A TEST RESULTS

Date: 4/14/2006
 Project: AEP Conesville (ADA)
 Location: Stack
 Source: Unit 2

Condition: Low Temp
 Data Taken By: RGO
 Fuel Factor: 9780

Test Number:	1	Time:	8:30-9:30
Pressure, Barometric(Hg"):	29.010	SO ₃ (mg):	0.4000
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.084
Pressure, Stack(Hg"):	29.010	SO ₃ (ppm):	0.19
Initial Volume (cu.ft.):	6.551		
Final Volume (cu.ft.):	24.661		
Meter Temperature (°F):	45.67		
Meter Volume (dscf):	18.46		
Meter Calibration (Y):	1.006		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	236.0		
Average Delta H (ΔH):	0.300		

Test Number:	2	Time:	10:15-11:15
Pressure, Barometric(Hg"):	29.010	SO ₃ (mg):	1.2000
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.093
Pressure, Stack(Hg"):	29.010	SO ₃ (ppm):	0.58
Initial Volume (cu.ft.):	25.101		
Final Volume (cu.ft.):	43.18		
Meter Temperature (°F):	59.42		
Meter Volume (dscf):	17.94		
Meter Calibration (Y):	1.006		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	239.0		
Average Delta H (ΔH):	0.300		

Test Number:	3	Time:	11:50-12:50
Pressure, Barometric(Hg"):	29.010	SO ₃ (mg):	1.9000
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.099
Pressure, Stack(Hg"):	29.010	SO ₃ (ppm):	0.93
Initial Volume (cu.ft.):	43.383		
Final Volume (cu.ft.):	61.401		
Meter Temperature (°F):	66.50		
Meter Volume (dscf):	17.64		
Meter Calibration (Y):	1.006		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	241.0		
Average Delta H (ΔH):	0.300		

*Air flows taken from ESP Inlet data

CALIBRATION PROCEDURES

TEMPERATURE SENSING DEVICES

The potentiometer and thermocouples are calibrated against a mercury thermometer in a calibration well. Alternatively, readings are checked utilizing a NBS traceable millivolt source.

DRY GAS METERS

The test meters are calibrated according to Method 5, Section 5.3 and "Procedures for Calibrating and Using Dry Gas Volume Meters as Calibration Standards" by P.R. Westlin and R.T. Shigehara, March 10, 1978.

METER BOX CALIBRATION

Dry Gas Meter No.
Standard Meter No.
Standard Meter (Yr)

CM5
90605804
0.9914

Date: March 13, 2006
Calibrated By: J. Robertson
Barometric Pressure: 28.84

Run Number	Orifice Setting in H2O Chg (H)	Standard Meter Gas Volume Vr	Dry Meter Gas Volume Vd	Standard Meter Temp. F tr	Dry Gas Meter Inlet Temp. F tdi	Dry Gas Meter Outlet Temp. F tdo	Dry Gas Meter Avg. Temp. F td	Time Min.	Time Sec.	Chg (H@)
Final		591.019	958.463	59	63	62				
Initial		585.789	953.271	59	63	63				
Difference	1	0.20	5.230	59	63	63		18	6	1.014
Final		596.533	963.924	58	64	62				1.356
Initial		591.172	958.614	59	62	62				
Difference	2	0.50	5.361	59	63	62		12	1	1.016
Final		601.846	969.193	58	65	62				
Initial		596.712	964.091	59	63	62				
Difference	3	0.70	5.134	59	64	62		9	51	1.013
Final		607.073	974.462	58	66	62				
Initial		602.032	969.399	58	64	62				
Difference	4	0.90	5.041	58	65	62		8	37	1.004
Final		612.349	979.793	58	67	63				
Initial		607.293	974.692	58	65	62				
Difference	5	1.20	5.056	58	66	63		7	32	1.000
Final		617.787	985.326	58	68	63				
Initial		612.583	980.032	59	66	63				
Difference	6	2.00	5.204	59	67	63		6	13	0.990
Average										1.006
										1.469

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM **(FOR K-TYPE THERMOCOUPLES)**

EPA Control Module Number: CM5

Name: J. Robertson

Ambient Temperature: 64.3 °F

Date: March 13, 2006

Omega Engineering Calibrator Model No. CL23A Serial #

T-249465

Date Of Calibration Verification:

June 16, 2005

Primary Standards Directly Traceable to National Institute of Standards and Technology (NIST)

Reference ^a Source Temperature, (°F)	Test Thermometer Temperature, (°F)	Temperature Difference, %
0	-2	0.4
250	248	0.3
600	599	0.1
1200	1206	0.4

$$\frac{(\text{Ref. Temp., } ^\circ\text{F} + 460) - (\text{Test Therm. Temp., } ^\circ\text{F} + 460)}{\text{Ref. Temp., } ^\circ\text{F} + 460} * 100 \leq 1.5 \%$$

Client Name:	Platt Environmental Inc.	
Test ID:	#1 White Line - High Temp	Test Location: 1111 2 Street
Test Start (Date/Time):	11/13/06 9:20	Carbon Trap ID: S2930
Sampled by:	C. Chivers	Test End (Date/Time):
		Sampling Box ID: SW 75679

Date	Time	Stack Temperature (Indicate °F or °C)	Meter Temperature (Indicate °F or °C)	Heated Probe Temperature (Indicate °F or °C)	Sampling Flow Rate (cc/min)	Stack Gas Flow Rate (m³/min)	Gas Volume Totalizer (m³ elapsed)	Ambient Pressure (psi)	Comments
4/13/06	0925			225	0.25		0	28.87	0.025
	0930			223			1.06		
	0935			216			2.38		0.022
	0940			222			3.61		
	0945			218			4.89		
	0950			219			6.22		
	0955			219			7.34		
	1000			219			8.60		
	1005			219			9.67		
	1010			219			10.77		
	1015			219			12.01		
	1020			220			12.78		
	1025			220			14.22		
									0.022
Total/Average									

Sample Chain of Custody

Relinquished by: _____ Date: _____

Received by: _____ Date: _____

Relinquished by: _____ Date: _____

Received for Laboratory by: _____ Date: _____

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 206-622-6960
Please return Data Sheet along with sample to:

Frontier Geosciences, 414 Pontius Ave. N, Seattle, WA 98109

white

Appendix K (FSTM™ Trap) Field Data Sheet

Client Name: Platt Environmental Inc. Test Location: Fluegas Testing

Test ID: #2 White Line High Temp Carbon Trap ID: S2931

Test Start (Date/Time:): 4/13/06 Test End (Date/Time:): _____

Sampled by: E. White Sampling Box ID: _____

Date	Time	Stack Temperature (Indicate °F or °C)	Meter Temperature (Indicate °F or °C)	Heated Probe Temperature (Indicate °F or °C)	Sampling Flow Rate (sc/min)	Stack Gas Flow Rate (m³/min)	Gas Volume Totalizer (m³ elapsed)	Ambient Pressure (psi)	Comments
4/13/06	1100			220	0.20		0.000		
	1103			220			1.18		
	1105			220			2.76		
	1107			220			3.95		
	1120			220			5.05		
	1125			220			6.41		
	1130			220			7.28		
	1135			220			9.05		
	1140			220			10.32		
	1145			221			11.87		
	1152			220			12.91		
	1157			220			14.20		
	1200			220			15.29		
									LC 0.00
Total/Average									

Sample Chain of Custody

Relinquished by: _____ Date: _____

Received by: _____ Date: _____

Relinquished by: _____ Date: _____

Received for Laboratory by: _____ Date: _____

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 206-622-6960
Please return Data Sheet along with sample to:

Frontier Geosciences, 414 Pontius Ave. N, Seattle, WA 98109

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Fluegas Testing

Carbon Trap ID:

Test End (Date/Time:)

Test End (Date/Time): 5/13/2022

Sampling Box ID: SW 25723

[illegible]

Sample Chain of Custody

Relinquished by: _____

Received by: _____

Relinquished by: _____

Received for Laboratory by: _____

Date: _____

Date _____

Date _____

Date _____

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 206-622-6960
Please return Data Sheet along with sample to:

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Appendix K (FSTM™ Trap) Field Data Sheet

Client Name: Platt Environmental Inc. BSNH (30A) Test Location: Unit 2 Street Fluegas Testing
 Test ID: #1 Drayage Line - High Temp Carbon Trap ID: S2929
 Test Start (Date/Time): 4/13/06 Test End (Date/Time):
 Sampled by: C. Chabon Sampling Box ID: SN 11622

Date	Time	Stack Temperature (Indicate °F or °C)	Meter Temperature (Indicate °F or °C)	Heated Probe Temperature (Indicate °F or °C)	Sampling Flow Rate (cc/min)	Stack Gas Flow Rate (m³/min)	Gas Volume Totalizer (m³ elapsed)	Ambient Pressure (psi)	Comments
4/13/06	7:25			225	0.25		0	29.87	0.0461 v. 0.036
	9:30			223			1.16		0.2 back check v. 0.033
	9:35			216			2.33		
	9:40			222			3.48		
	9:45			218			4.76		
	9:50			219			6.03		
	9:55			219			7.11		
	10:00			219			8.34		
	10:05			219			9.42		
	10:10			219			10.50		
	10:15			219			11.73		
	10:20			219			13.03		
	10:25			220			13.99		0.0461 v. 0.036
Total/Average									

Sample Chain of Custody

Relinquished by: _____ Date: _____
 Received by: _____ Date: _____
 Relinquished by: _____ Date: _____
 Received for Laboratory by: _____ Date: _____

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 206-622-6960
 Please return Data Sheet along with sample to:

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Appendix K (FSTM™ Trap) Field Data Sheet

Client Name: Platt Environmental Inc. Q5-H-AOA Test Location: Unit 2 Stock Fluegas Testing
 Test ID: Tes1 #2 Orange Lake - High Temp Carbon Trap ID: S2941
 Test Start (Date/Time): 4/13/06 1100 Test End (Date/Time):
 Sampled by: K. G. G. Sampling Box ID: SN 11622

Date	Time	Stack Temperature (Indicate °F or °C)	Meter Temperature (Indicate °F or °C)	Heated Probe Temperature (Indicate °F or °C)	Sampling Flow Rate (cf/min)	Stack Gas Flow Rate (m³/min)	Gas Volume Totalizer (m³ elapsed)	Ambient Pressure (psi)	Comments
4/13/06	1120			220	0.25		0.00	28.87	LC 0.00
	1135			220			1.14		
	1150			220			2.78		
	1155			220			3.64		
	1120			220			5.00		
	1125			220			6.34		
	1130			220			7.72		
	1135			220			8.91		
	1140			220			10.24		
	1145			221			11.78		
	1150			220			12.85		
	1155			220			14.13		
	1200			220			15.24		LC 0.00
Total/Average									

Sample Chain of Custody

Relinquished by: _____ Date: _____
 Received by: _____ Date: _____
 Relinquished by: _____ Date: _____
 Received for Laboratory by: _____ Date: _____

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 206-622-6960
 Please return Data Sheet along with sample to:

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Client Name:	Platt Environmental Inc.	Test Location:	Unit 2 Stalk	Fluegas Testing
Test ID:	#3- High Temp Orange Line	Carbon Trap ID:		S2935
Test Start (Date/Time):	4/13/06 1235	Test End (Date/Time):		
Sampled by:	E. Ehlers	Sampling Box ID:	S21622	

[illegible]

Relinquished by: _____ Date: _____

Received by: _____ Date: _____

Relinquished by: _____ Date: _____

Received for Laboratory by: _____ Date: _____

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 206-622-6960
Please return Data Sheet along with sample to:

Frontier Geosciences, 414 Pontius Ave. N, Seattle, WA 98109

Appendix K (FSTM™ Trap) Field Data Sheet

Client Name: Platt Environmental Inc. 35 NW - ADA Test Location: Fluegas Testing
 Test ID: 4/14/06 Carbon Trap ID: S2939
 Test Start (Date/Time): 4/14/06 8:30 Test End (Date/Time): 4/14/06 9:30
 Sampled by: C. Shultz Sampling Box ID: SW 75659

Date	Time	Stack Temperature (Indicate °F or °C)	Meter Temperature (Indicate °F or °C)	Heated Probe Temperature (Indicate °F or °C)	Sampling Flow Rate (cc/min)	Stack Gas Flow Rate (m³/min)	Gas Volume Totalizer (m³ elapsed)	Ambient Pressure (psi)	Comments
4/14/06	8:30			220	0.25		0.0		0.0001 - 0.031
	8:35			220			1.28		6.0000
	8:40			220			2.53		
	8:45			220			3.80		
	8:50			220			5.04		
	8:55			220			6.32		
	9:00			220			7.57		
	9:05			220			8.82		
	9:10			220			10.07		
	9:15			220			11.37		
	9:20			220			12.62		
	9:25			220			13.88		
	9:30			220			15.14		6.0000
Total/Average									

Sample Chain of Custody

Relinquished by: _____ Date: _____
 Received by: _____ Date: _____
 Relinquished by: _____ Date: _____
 Received for Laboratory by: _____ Date: _____

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 206-622-6960
 Please return Data Sheet along with sample to:

Frontier Geosciences, 414 Pontius Ave. N, Seattle, WA 98109

Appendix K (FSTM™ Trap) Field Data Sheet

Client Name: Platt Environmental Inc. Test Location: Fluegas Testing

Test ID: #2 White - Low Temp Carbon Trap ID: S2937

Test Start (Date/Time): 4/14/06 10:15 Test End (Date/Time): 4/14/06 11:15

Sampled by: C. Ehlers Sampling Box ID: SN 75679

Date	Time	Stack Temperature (Indicate °F or °C)	Meter Temperature (Indicate °F or °C)	Heated Probe Temperature (Indicate °F or °C)	Sampling Flow Rate (cc/min)	Stack Gas Flow Rate (m³/min)	Gas Volume Totalizer (m³ elapsed)	Ambient Pressure (psi)	Comments
4/14/06	10:15			220	0.25		0.0		LC 0.00
	10:20			220			1.24		
	10:25			220			2.30		
	10:30			220			3.77		
	10:35			220			5.04		
	10:40			220			6.35		
	10:45			220			7.65		
	10:50			220			8.91		
	10:55			220			10.20		
	11:00			220			11.42		
	11:05			220			12.68		
	11:10			220			13.94		
	11:15			220			15.23		LC 0.00
Total/Average									

Sample Chain of Custody

Relinquished by: _____ Date: _____

Received by: _____ Date: _____

Relinquished by: _____ Date: _____

Received for Laboratory by: _____ Date: _____

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 206-622-6960
Please return Data Sheet along with sample to:

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Appendix K (FSTM™ Trap) Field Data Sheet

Client Name: Platt Environmental Inc. D3011-100A Test Location: Unit 3 Stack Fluegas Testing
 Test ID: #3 White Low Temp Carbon Trap ID: S2932
 Test Start (Date/Time): 4/14/06 1150 Test End (Date/Time): 4/14/06 1250
 Sampled by: C. C. G. G. Sampling Box ID: SN 75679

Date	Time	Stack Temperature (Indicate °F or °C)	Meter Temperature (Indicate °F or °C)	Heated Probe Temperature (Indicate °F or °C)	Sampling Flow Rate (cf/min)	Stack Gas Flow Rate (m³/min)	Gas Volume Totalizer (m³ elapsed)	Ambient Pressure (psi)	Comments
4/14/06	1150			220	2.5		0.0		
	1155			220			1.23		
	1200			220			2.5		
	1205			220			3.78		
	1210			220			5.06		
	1215			220			6.32		
	1220			220			7.60		
	1225			220			8.87		
	1230			220			10.14		
	1235			220			11.40		
	1240			220			12.66		
	1245			220			13.92		
	1250			220			15.18		
									LC 0.000
Total/Average									

Sample Chain of Custody

Relinquished by: _____ Date: _____
 Received by: _____ Date: _____
 Relinquished by: _____ Date: _____
 Received for Laboratory by: _____ Date: _____

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 206-622-6960
 Please return Data Sheet along with sample to:

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Appendix K (FSTM™ Trap) Field Data Sheet

Client Name:	Platt Environmental Inc. BSN ADA	Test Location:	Unit 3 Stalk	Fluegas Testing
Test ID:	#10, Long - Low Temp	Carbon Trap ID:	S2940	
Test Start (Date/Time):	4/14/06	Test End (Date/Time):		
Sampled by:	Sampling Box ID:			

[illegible]

Sample Chain of Custody

Relinquished by: _____ Date _____

Received by: _____ Date _____

Relinquished by: _____ Date _____

Received for Laboratory by: _____ Date _____

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 206-622-6960
Please return Data Sheet along with sample to:

Frontier Geosciences, 414 Pontius Ave. N, Seattle, WA 98109

Appendix K (FSTM™ Trap) Field Data Sheet

Client Name: Platt Environmental Inc. Test Location: Fluegas Testing

Test ID: A2 Orange - Low Temp Carbon Trap ID: S2942

Test Start (Date/Time): 4/14/06 10:55 Test End (Date/Time): 4/14/06 11:15

Sampled by: C. Chel Sampling Box ID: SN 11622

Date	Time	Stack Temperature (Indicate °F or °C)	Meter Temperature (Indicate °F or °C)	Heated Probe Temperature (Indicate °F or °C)	Sampling Flow Rate (cc/min)	Stack Gas Flow Rate (m³/min)	Gas Volume Totalizer (m³ elapsed)	Ambient Pressure (psi)	Comments
4/14/06	10:15			220	0.25		0.0		LC 0.000
	10:20			220			1.21		
	10:25			220			2.52		
	10:30			220			3.76		
	10:35			220			5.03		
	10:40			220			6.33		
	10:45			220			7.63		
	10:50			220			8.90		
	10:55			220			10.17		
	11:00			220			11.39		
	11:05			220			12.70		
	11:10			220			13.91		
	11:15			220			15.23		LC 0.000
Total/Average									

Sample Chain of Custody

Relinquished by: _____ Date: _____

Received by: _____ Date: _____

Relinquished by: _____ Date: _____

Received for Laboratory by: _____ Date: _____

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 206-622-6960
Please return Data Sheet along with sample to:

Frontier Geosciences, 414 Pontius Ave. N, Seattle, WA 98109

Appendix K (FSTM™ Trap) Field Data Sheet

Client Name: Platt Environmental Inc. PSNH-ADA Test Location: Unit 2 Stack Fluegas Testing
 Test ID: #3 Orange - Low Temp Carbon Trap ID: S2933
 Test Start (Date/Time): 4/14/06 11:50 Test End (Date/Time): 4/14/06 12:50
 Sampled by: G. Chaw Sampling Box ID: S-11622

Date	Time	Stack Temperature (Indicate °F or °C)	Meter Temperature (Indicate °F or °C)	Heated Probe Temperature (Indicate °F or °C)	Sampling Flow Rate (cc/min)	Stack Gas Flow Rate (m³/min)	Gas Volume Totalizer (m³ elapsed)	Ambient Pressure (psi)	Comments
4/14/06	11:50			221	0.25		0.00		LC 0.020
	11:51			220			1.21		
	12:00			220			3.47		
	12:05			220			3.74		
	12:10			220			5.01		
	12:15			220			6.27		
	12:20			220			7.55		
	12:25			220			8.82		
	12:30			220			10.08		
	12:35			220			11.37		
	12:40			220			12.62		
	12:45			220			13.93		
	12:50			220			15.20		LC 0.020
Total/Average									

Sample Chain of Custody

Relinquished by: _____ Date: _____
 Received by: _____ Date: _____
 Relinquished by: _____ Date: _____
 Received for Laboratory by: _____ Date: _____

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 206-622-6960
 Please return Data Sheet along with sample to:

Frontier Geosciences, 414 Pontius Ave. N, Seattle, WA 98109

0601049 ~~7049~~ 7049/01049

Appendix K (FSTM™ Trap) Field Data Sheet

Client Name:	Platt Environmental Inc.	Test Location:	Fluegas Testing
Test ID:		Carbon Trap ID:	S2938
Test Start (Date/Time:)		Test End (Date/Time:)	
Sampled by:		Sampling Box ID:	

[illegible]

Sample Chain of Custody

Relinquished by: _____	Date _____
Received by: <u>Robert A. Pratt</u>	Date <u>4-18-92</u>
Relinquished by: _____	Date _____
Received for Laboratory by: _____	Date _____

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 206-622-6960
Please return Data Sheet along with sample to:

Frontier Geosciences, 414 Pontius Ave. N, Seattle, WA 98109

2004-09-10
* 11/10/06

Appendix K (FSTM™ Trap) Field Data Sheet

~~* Postcard Project * 4/14/00~~

Fluegas Testing

Carbon Trap ID:

S2936

Test End (Date/Time:)

Sampling Box ID:

[illegible]

Station	Altitude	Notes
1	1000	1 red cup broken off end of trap.

Sample Chain of Custody

by: Dr. A. Prathy, FGS

Date 4-18-00 350

Date _____

Date _____

Questions? Contact Lucas Hawkins for additional information at Frontier Geosciences 206-622-6960
Please return Data Sheet along with sample to:

equipment returned with traps

- Digi Sense thermometer
- 15 glass tubes (clear).

Frontier Geosciences, 414 Pontius Ave. N, Seattle, WA 98109

Mercury Test Results Summary
Public Service Of New Hampshire
Merrimack Generating Station
Unit 2 Stack
April 13 and 14, 2006

Test No.	Date	Time	V _m (L)	ug detected	ppb	ug/dncm
High Temperature						
1A	4/13/2006	9:25-10:25	13.23	0.1150	1.04	8.70
1B	4/13/2006	9:25-10:25	13.01	0.1207	1.11	9.69
2A	4/13/2006	11:00-12:00	14.14	0.1166	0.99	8.26
2B	4/13/2006	11:00-12:00	14.09	0.1364	1.16	9.75
3A	4/13/2006	12:35-13:35	15.22	0.1196	0.94	7.87
3B	4/13/2006	12:35-13:35	15.08	0.1272	1.01	8.44
Average				0.1241	1.04	8.80
Low Temperature						
1A	4/14/2006	8:30-9:30	14.28	0.1310	1.10	9.18
1B	4/14/2006	8:30-9:30	14.23	0.1357	1.14	9.55
2A	4/14/2006	10:15-11:15	13.99	0.1362	1.17	9.75
2B	4/14/2006	10:15-11:15	13.99	0.1445	1.24	10.34
3A	4/14/2006	11:50-12:50	14.83	0.1439	1.16	9.71
3B	4/14/2006	11:50-12:50	14.78	0.1476	1.20	10.00
Average				0.1398	1.17	9.75

Sulfuric Acid Mist Test Results Summary

Public Service Of New Hampshire

Merrimack Generating Station

Unit 2 Stack

April 13 and 14, 2006

Test No.	Date	Time	V _m (L)	mg detected	ppm
High Temperature					
1	4/13/2006	9:20-10:20	513.96	3.7	1.77
2	4/13/2006	11:00-12:00	510.15	5.0	2.40
3	4/13/2006	12:35-13:35	447.48	4.4	2.41
Average				4.4	2.19
Low Temperature					
1	4/14/2006	8:30-9:30	522.69	0.4	0.19
2	4/14/2006	10:15-11:15	507.98	1.2	0.58
3	4/14/2006	11:50-12:50	499.46	1.9	0.93
Average				3.0	0.57

METHOD 8A TEST RESULTS

Date: 4/13/2006
 Project: P.S. of New Hampshire-Merrimack Station
 Location: Stack
 Source: Unit 2

Condition: High Temp
 Data Taken By: RGO
 Fuel Factor: 9780

Test Number:	1	Time:	9:20-10:20
Pressure, Barometric(Hg"):	28.870	SO ₃ (mg):	3.7000
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.094
Pressure, Stack(Hg"):	28.870	SO ₃ (ppm):	1.77
Initial Volume (cu.ft.):	27.188		
Final Volume (cu.ft.):	45.25		
Meter Temperature (°F):	50.42		
Meter Volume (dscf):	18.15		
Meter Calibration (Y):	1.006		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	240.0		
Average Delta H (ΔH):	0.300		

Test Number:	2	Time:	11:00-12:00
Pressure, Barometric(Hg"):	28.870	SO ₃ (mg):	5.0000
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.090
Pressure, Stack(Hg"):	28.870	SO ₃ (ppm):	2.40
Initial Volume (cu.ft.):	52.444		
Final Volume (cu.ft.):	70.48		
Meter Temperature (°F):	53.50		
Meter Volume (dscf):	18.02		
Meter Calibration (Y):	1.006		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	238.0		
Average Delta H (ΔH):	0.300		

Test Number:	3	Time:	12:35-13:35
Pressure, Barometric(Hg"):	28.870	SO ₃ (mg):	4.4000
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.097
Pressure, Stack(Hg"):	28.870	SO ₃ (ppm):	2.41
Initial Volume (cu.ft.):	72.63		
Final Volume (cu.ft.):	88.71		
Meter Temperature (°F):	61.92		
Meter Volume (dscf):	15.80		
Meter Calibration (Y):	1.006		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	236.0		
Average Delta H (ΔH):	0.300		

METHOD 8A TEST RESULTS

Date: 4/14/2006
 Project: AEP Conesville (ADA)
 Location: Stack
 Source: Unit 2

Condition: Low Temp
 Data Taken By: RGO
 Fuel Factor: 9780

Test Number:	1	Time:	8:30-9:30
Pressure, Barometric(Hg"):	29.010	SO ₃ (mg):	0.4000
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.084
Pressure, Stack(Hg"):	29.010	SO ₃ (ppm):	0.19
Initial Volume (cu.ft.):	6.551		
Final Volume (cu.ft.):	24.661		
Meter Temperature (°F):	45.67		
Meter Volume (dscf):	18.46		
Meter Calibration (Y):	1.006		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	236.0		
Average Delta H (ΔH):	0.300		

Test Number:	2	Time:	10:15-11:15
Pressure, Barometric(Hg"):	29.010	SO ₃ (mg):	1.2000
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.093
Pressure, Stack(Hg"):	29.010	SO ₃ (ppm):	0.58
Initial Volume (cu.ft.):	25.101		
Final Volume (cu.ft.):	43.18		
Meter Temperature (°F):	59.42		
Meter Volume (dscf):	17.94		
Meter Calibration (Y):	1.006		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	239.0		
Average Delta H (ΔH):	0.300		

Test Number:	3	Time:	11:50-12:50
Pressure, Barometric(Hg"):	29.010	SO ₃ (mg):	1.9000
Pressure, Static(H ₂ O"):	0.00	Water Vapor in Flue Gas (Bws):	0.099
Pressure, Stack(Hg"):	29.010	SO ₃ (ppm):	0.93
Initial Volume (cu.ft.):	43.383		
Final Volume (cu.ft.):	61.401		
Meter Temperature (°F):	66.50		
Meter Volume (dscf):	17.64		
Meter Calibration (Y):	1.006		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	241.0		
Average Delta H (ΔH):	0.300		

*Air flows taken from ESP Inlet data

H₂SO₄ VAPOR FIELD DATA SHEET (Method 8A)

Project: Public Service of New Hampshire (ADF) Date: 4/13/06

Sampling Location: Unit 2 Stacks Test #1

Source Condition: Normal - High Temp

Dry Gas Meter No. C145 Y = 1.006

Barometric Pressure 28.87 in. Hg

Leak Check: Pre-sampling 0.000 cfm @ 6 in. Hg vacuum

Post-sampling 0.000 cfm @ 6 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Stack (°F)	Probe (°F)	Filter	Condenser Water (≈140°F)	Coil Exit (°F)	Dry Gas Meter	
					Outlet (°F)			Inlet (°F)	Outlet (°F)
9 ²⁰	27.18	.3		440	501		167	50	50
9 ³⁰	30.17	.3		489	500		167	50	50
9 ⁴⁰	33.21	.3		497	500		167	50	50
9 ⁵⁰	36.20	.3		499	500		167	50	50
10 ⁰⁰	39.30	.3		499	500		167	51	51
10 ¹⁰	42.21	.3		499	500		166	52	51
10 ²⁰	45.25								
	18.062								
Avg.									

Comments: _____

Operator: RGO/EE

H₂SO₄ VAPOR FIELD DATA SHEET (Method 8A)

Project: Public Storage of New Hampshire (AQA) Date: 4/13/00

Sampling Location: Unit 2 Stack - Test #3

Source Condition: Normal - High Temp

Dry Gas Meter No. CM5 Y = 1.006

Barometric Pressure 28.87 in. Hg

Leak Check: Pre-sampling 0.000 cfm @ 6 in. Hg vacuum

Post-sampling 0.000 cfm @ 6 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Stack (°F)	Probe (°F)	Filter	Condenser Water (≈140°F)	Coil Exit (°F)	Dry Gas Meter	
					Outlet (°F)			Inlet (°F)	Outlet (°F)
11 ⁰⁰	52.44	.3		466	503		167	52	53
11 ¹⁰	55.47	.3		500	500		167	53	53
11 ²⁰	58.51	.3		499	500		167	53	52
11 ³⁰	61.45	.3		501	500		168	54	53
11 ⁴⁰	64.51	.3		499	500		167	54	53
11 ⁵⁰	67.42	.3		498	499		167	56	56
12 ⁰⁰	70.48								
Avg.									

Comments: _____

Operator: RG01 EE

H₂SO₄ VAPOR FIELD DATA SHEET (Method 8A)

Project: Public Services & New Hampshire (RDA) Date: 4/12/04

Sampling Location: Unit 2 stack - Test #3

Source Condition: Normal - High Temp

Dry Gas Meter No. CM5 Y = 1.006

Barometric Pressure 28.87 in. Hg

Leak Check: Pre-sampling 0.000 cfm @ 6 in. Hg vacuum

Post-sampling 0.000 cfm @ 6 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Stack (°F)	Probe (°F)	Filter	Condenser Water (≈140°F)	Coil Exit (°F)	Dry Gas Meter	
					Outlet (°F)			Inlet (°F)	Outlet (°F)
12 ³⁵	72.63	.3		470	502		167	61	61
12 ⁴⁵	75.60	.3		488	499		166	62	61
12 ⁵⁵	78.55	.3		498	501		167	62	62
13 ⁰⁵	81.58	.3		499	501		167	62	62
13 ¹⁵	84.62	.3		501	504		166	62	63
13 ²⁵	84.66	.3		502	508		166	62	63
13 ³⁵	88.71								
Avg.									

Comments: _____

Operator: RG0/EE

H₂SO₄ VAPOR FIELD DATA SHEET (Method 8A)

Project: Pub. Ser. of N.H. / ADA Date: 4/14/06

Sampling Location: Unit 2 Stack

Source Condition: Normal Load Low Temp Test ①

Dry Gas Meter No. CM5 Y = 1.006

Barometric Pressure 29.01 in. Hg

Leak Check: Pre-sampling 0.000 cfm @ 6 in. Hg vacuum

Post-sampling 0.000 cfm @ 6 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Stack (°F)	Probe (°F)	Filter	Condenser Water (≈140°F)	Coil Exit (°F)	Dry Gas Meter	
					Outlet (°F)			Inlet (°F)	Outlet (°F)
8 ³⁰	6.551	.3		467	496		171	43	42
8 ⁴⁰	9.61	.3		492	503		173	45	43
8 ⁵⁰	12.60	.3		500	501		170	47	44
9 ⁰⁰	15.54	.3		500	506		170	48	44
9 ¹⁰	18.61	.3		499	505		173	49	46
9 ²⁰	21.63	.3		499	496		172	50	47
9 ³⁰	24.66								
Avg.									

Comments: _____

Operator: RGO/EE

H₂SO₄ VAPOR FIELD DATA SHEET (Method 8A)

Project: Pub Ser of NH / ADA Date: 4/14/06

Sampling Location: Unit 2 Stock

Source Condition: Normal Load / Low Temp Test (2)

Dry Gas Meter No. CM5 Y = 1.006

Barometric Pressure 29.01 in. Hg

Leak Check: Pre-sampling 0.000 cfm @ 6 in. Hg vacuum

Post-sampling 0.000 cfm @ 6 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Stack (°F)	Probe (°F)	Filter	Condenser Water (≈140°F)	Coil Exit (°F)	Dry Gas Meter	
					Outlet (°F)			Inlet (°F)	Outlet (°F)
10 ¹⁵	25.101	.3		484	507		167	58	54
10 ²⁵	28.17	.3		488	501		168	58	55
10 ³⁵	31.21	.3		498	505		169	62	58
10 ⁴⁵	34.22	.3		500	497		171	61	59
10 ⁵⁵	37.16	.3		498	501		171	63	60
11 ⁰⁵	40.15	.3		500	498		174	64	61
11 ¹⁵	43.18								
Avg.									

Comments: _____

Operator: RGO / EE

H₂SO₄ VAPOR FIELD DATA SHEET
(Method 8A)

Project: Pub. Ser. of NH / ADA Date: 4/14/06

Sampling Location: Unit 2 Stack

Source Condition: Normal Load / Low Temp Test (3)

Dry Gas Meter No. CMS Y = 1.006

Barometric Pressure 29.01 in. Hg

Leak Check: Pre-sampling 0.000 cfm @ 6 in. Hg vacuum

Post-sampling 0.000 cfm @ 6 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Stack (°F)	Probe (°F)	Filter	Condenser Water (≈140°F)	Coil Exit (°F)	Dry Gas Meter	
					Outlet (°F)			Inlet (°F)	Outlet (°F)
11 ⁵⁰	43.383	.3		476	491		173	66	66
12 ⁰⁰	46.42	.3		481	506		173	68	66
12 ¹⁰	49.46	.3		490	506		174	67	66
12 ²⁰	52.50	.3		497	497		174	66	66
12 ³⁰	55.41	.3		498	496		176	67	66
12 ⁴⁰	58.43	.3		499	503		178	68	66
12 ⁵⁰	61.401								
Avg.									

Comments: _____

Operator: RGO / EE

APPENDIX M: September 2006 ASA Test Report

STACK SAMPLING REPORT
FOR
MERCURY AND FLOW RATE TESTING
ON THE
PUBLIC SERVICE OF NEW HAMPSHIRE
MERRIMACK STATION UNIT NO. 2

PROJECT NO. 06-054

SEPTEMBER 2006

PREPARED FOR:
ADA-ES, INC.
8100 SOUTHPARK WAY, UNIT B
LITTLETON, COLORADO 80120

PREPARED BY:
AIR SAMPLING ASSOCIATES, INC.
P.O. BOX 1175
LEWISVILLE, TEXAS 75067

(Total Number of Pages Including Cover: 153)

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EXECUTIVE SUMMARY

Air Sampling Associates, Inc. conducted source testing on the Public Service of New Hampshire (PSNH), Merrimack Station, Unit No. 2, located in Bow, New Hampshire. The testing was conducted for a Department of Energy (DOE) mercury control technology evaluation project. The purpose of the test was to characterize the flow rate and determine the mercury concentrations at the Inlet of the Original Electrostatic Precipitator (ESP), Outlet of the Original ESP, Inlet to the Supplemental ESP, Mid Duct to the Supplemental ESP, Stack Inlet from the Supplemental ESP, and the Stack sampling locations. The testing was conducted on September 26 through September 29, 2006.

The sampling team consisted of Mr. Gary Goldman, Mr. Patrick Selakovich, and Mr. Scot Jackson. Mr. Goldman was the test team leader.

The procedures set forth in Title 40 of the Code of Federal Regulations, Part 60 (40CFR60), Appendix A, Test Methods 1, 2, 3, and 4; and Proposed EPA Test Method 324 were followed during testing.

Billy J. Mullins, Jr. P.E., Q.E.P., D.E.E.

SUMMARY OF RESULTS

Table 1: Summary of EPA Method Tests 1, 2, 3, and 4 Sampling Results

Run No.	Stack	Stack Inlet from the Supplemental ESP (Port D)	Stack Inlet from the Supplemental ESP (Port B)	Stack Inlet from the Supplemental ESP (Port C)	Stack Inlet from the Supplemental ESP (Port A)
Test Date	09/28/06	09/28/06	09/28/06	09/28/06	09/28/06
Test Time	1109-1139	1530-1540	1555-1625	1625-1635	1730-1740
Flow Rate – DSCFIM*	678,754	539,643	374,287	357,206	321,077
Stack Temp. - ° F	330	334	333	332	332
O ₂ - %Vol. (dry)	12.7	13.0	5.3	13.0	13.0
CO ₂ - %Vol. (dry)	6.3	5.3	13.0	5.3	5.3
Percent Excess Air	41.5	32.4	32.4	32.4	32.4
Moisture Content - %	8.74	6.45	6.45	6.45	6.45

* 29.92" Hg, 68° F (760 mm Hg, 20 °C)

SUMMARY OF RESULTS

Table 2: Summary of EPA Method Tests 1, 2, 3, and 4 Sampling Results

Run No.	Mid Duct to Supplemental ESP (Port A)	Mid Duct to Supplemental ESP (Port B)	Mid Duct to Supplemental ESP (Port C)	Mid Duct to Supplemental ESP (Port D)	Outlet from the Original ESP	Inlet A to the Original ESP	Inlet B to the Original ESP	Inlet to Supplemental ESP
Test Date	09/29/06	09/29/06	09/29/06	09/29/06	09/29/06	09/29/06	09/29/06	09/29/06
Test Time	0940-0950	0950-0958	0958-1008	1008-1018	1120-1150	1723-1800	1805-1835	1833-1903
Flow Rate – DSCFM*	413,145	465,170	494,633	661,884	1,409,266	357,832	367,855	703,379
Stack Temp. - °F	341	342	340	335	334	344	345	335
O ₂ - %Vol. (dry)	4.7	4.7	4.7	4.7	4.7	11.1	11.1	4.7
CO ₂ - %Vol. (dry)	14.3	14.3	14.3	14.3	14.3	8.9	8.9	14.3
Percent Excess Air	28.0	28.0	28.0	28.0	28.0	109.9	109.9	28.0
Moisture Content - %	9.15	9.15	9.15	9.15	9.15	5.02	5.02	9.15

* 29.92" Hg, 68° F (760 mm Hg, 20 °C)

SUMMARY OF RESULTS

Table 3: Summary of Proposed Test Method 324 Sampling Results

Date	Time	Sampling Location	Trap ID	Sample Volume (L at EPA-STP)	ng of Hg on Section # 1	ng of Hg on Section # 2	Hg Concentration ug/m3	Comments
09/28/06	1117-1217	Stack	OL-26221	18.98	136	<5	7.17	
			OL-26222	19.49	166	<5	8.52	
09/28/06	1546-1646	Stack Inlet from the Supplemental ESP (Port D)	OL-26223	21.73	163		7.50	Section 2 lost due to breakage
			OL-26224	14.92	110	<5	7.37	
09/28/06	1721-1821	Stack Inlet from the Supplemental ESP (Port B)	OL-26225	21.03	158	<5	7.51	
			OL-26226	20.38	158	<5	7.75	
09/29/06	0752-0852	Inlet to the Supplemental ESP (Port C)	OL-26229	19.75	132	<5	6.68	
			OL-26230	17.23	120	<5	6.96	
09/29/06	0929-1029	Outlet from the Original ESP (Port G)	OL-26231	17.32	136	<5	7.85	
			OL-26232	18.22	149	<5	8.18	
09/29/06	1117-1217	Mid Duct to the Supplemental ESP (Port A)	OL-26233	19.58	142	<5	7.25	
			OL-26234	17.04	133	<5	7.81	
09/29/06	1255-1355	Outlet from the Original ESP (Port C)	OL-26235	21.02	157	<5	7.47	Section 2 not present at analysis
			OL-26236	22.65	174		7.68	
09/29/06	1655-1735	Inlet B of the Original ESP (Port F)	OL-26237	6.27	37	<5	5.90	Trap clogged due to excessive soot
			OL-26238		<5	<5	<0.03	Trap broke during sampling
09/29/06	1831-1931	Inlet B of the Original ESP (Port B)	OL-26239	9.15	38	<5	4.15	Trap clogged due to excessive soot
			OL-26241	9.22	32.9	5	3.57	Trap clogged due to excessive soot
09/29/06	2013-2044	Inlet A of the Original ESP (Port C)	OL-26242	5.15	36	<5	6.99	
			OL-26243	5.03	37	<5	7.36	
09/29/06	2116-2146	Inlet A of the Original ESP (Port G)	OL-26245	6.7	58	<5	8.66	
			OL-26246	5.98	57	<5	9.53

DISCUSSION OF SAMPLING RESULTS

Flow Rate

The tests for flow rate, using EPA Test Methods 1, 2, 3, and 4, appeared to be an accurate representation of the actual emissions during the tests. All leak checks performed on the reference method sampling train and pitot tubes showed no leaks before or after testing.

Mercury

The eleven tests for mercury using Proposed EPA Test Method 324 appeared to be an accurate representation of the actual emissions during the tests. All leak checks performed on the reference method sampling trains showed no leaks before or after testing.

DESCRIPTION OF SAMPLING LOCATION

The sampling ports on the Unit No. 2 Stack are approximately 232 feet 3 inches above the ground. The sampling ports are located 157 feet 3 inches (9.97 stack diameters) downstream from the inlet to the stack and 84 feet 1 inch (5.33 stack diameters) upstream from the outlet to the stack.

The sampling ports on the Stack Inlet from the Supplemental ESP are approximately 75 feet above the ground. The sampling ports are located in a transition zone in the duct.

The sampling ports on the Mid Duct to the Supplemental ESP are approximately 75 feet above the ground. The sampling ports are located in a transition zone in the duct.

The sampling ports on the Inlet to the Supplemental ESP are approximately 75 feet above the ground. The sampling ports are located in a transition zone in the duct.

The sampling ports on the Outlet to the Original ESP are approximately 75 feet above the ground. The sampling ports are located in a transition zone in the duct.

The sampling ports on the Inlet to the Original ESP are approximately 60 feet above the ground. The sampling ports are located in a transition zone in the duct.

DESCRIPTION SAMPLING LOCATION

Figure 1: Unit No. 2

SAMPLING AND ANALYTICAL PROCEDURES

The procedures set forth in the Code of Federal Regulations, Title 40, Chapter 1, Part 60, Appendix A, Test Methods 1, 2, 3, and 4; and Proposed EPA Test Method 324 were followed during testing.

Flow Rate

Velocity traverses were made according to EPA Test Method 2 at each port at the Stack, Stack Inlet from the Supplemental ESP (Port D), Stack Inlet from the Supplemental ESP (Port B), Inlet to the Supplemental ESP (Port C), Outlet from the Original ESP (Port G), Mid Duct to the Supplemental ESP (Port A), Outlet from the Original ESP (Port C), Inlet B of the Original ESP (Port F) Inlet B of the Original ESP (Port B), Inlet A of the Original ESP (Port C), and Inlet A of the Original ESP (Port G) sampling locations in order to determine the uniformity and magnitude of the flow. Multiple traverse points were sampled from each port. Diagrams of the sample points for each sampling location are provided in Appendix A.

The pitot tube lines were checked for leaks before and after each test under a vacuum and a pressure. The lines were also checked for clearance and the manometer was zeroed before each test.

Moisture samples were taken according to EPA Test Method 4 at the Stack, Stack Inlet from the Supplemental ESP, Inlet to the Supplemental ESP, and Inlet to the Original ESP sampling locations. For each run, samples of 30 minute duration were taken at a single traverse point. Data was recorded at 5-minute intervals.

The sampling train was leak-checked at the end of the sampling probe at 15" of mercury vacuum before each test, and again at the conclusion of each test at the highest vacuum recorded during sampling. This was done to predetermine the possibility of a diluted sample.

The 'front-half' of the sampling train contained the following components:

In-stack filter

Heated Stainless Steel probe @ $248^{\circ}\text{F} \pm 25^{\circ}\text{F}$

Heated Teflon line @ $248^{\circ}\text{F} \pm 25^{\circ}\text{F}$

The 'back-half' of the sampling train contained the following components:

Table 4: EPA Method 4 Condenser/Absorbing System

Impinger No.	Impinger Type	Absorbing Solution
1	Modified	100 ml H ₂ O
2	Greenburg-Smith	100 ml H ₂ O
3	Modified	Empty
4	Modified	~200 g silica gel

Grab ORSAT samples were taken according to EPA Test Method 3 at the Stack, Stack Inlet from the Supplemental ESP, Inlet to the Supplemental ESP, and Inlet to the Original ESP sampling locations to determine flue gas molecular weight.

Figure 2: EPA Test Methods 2 and 4 Sampling Train

Mercury

Mercury samples were taken according to Proposed EPA Test Method 324. Samples of 60 minute duration were taken from a single traverse point at the Stack, Stack Inlet from the Supplemental ESP (Port D), Stack Inlet from the Supplemental ESP (Port B), Inlet to the Supplemental ESP (Port C), Outlet from the Original ESP (Port G), Mid Duct to the Supplemental ESP (Port A), Outlet from the Original ESP (Port C), Inlet B of the Original ESP (Port F) Inlet B of the Original ESP (Port B) sampling locations. Samples of 30 minute duration were taken from a single traverse point at the Inlet A of the Original ESP (Port C) and Inlet A of the Original ESP (Port G) sampling locations. The reduced sampling duration at the Inlet A of the Original ESP (Port C) and Inlet A of the Original ESP (Port G) sampling locations was due to the high dust loading at those locations. Data was recorded manually at the beginning of each run and again at the conclusion of each run.

The sampling train was leak-checked at the end of the sampling probes at 15" of mercury vacuum before and after each test. This was done to predetermine the possibility of diluted samples.

The sampling train consisted of paired sorbent traps, dual heated sample probes, dual Teflon samples lines, and dual moisture removal systems.

Figure 3: Proposed Test Method 324 Sampling Train

TEST NARRATIVE

Air Sampling Associates, Inc. personnel arrived at the Public Service of New Hampshire, Merrimack Station, located in Bow, New Hampshire, at 10:15 a.m., on Tuesday, September 26, 2006. All times are reported as Eastern Standard Time. After meeting with plant personnel, the test trailer was set in place. The sampling equipment was moved onto the Unit No. 2 Stack and secured. Personnel departed the plant at 7:00 p.m.

Personnel returned to the plant at 7:30 a.m. on Wednesday, September 27, 2006. The sampling equipment was prepared for testing. Testing was postponed due to unit operational problems. The equipment was secured for the night and personnel departed the plant at 1:15 p.m.

Personnel returned to the plant at 7:30 a.m. on Thursday, September 28, 2006. The sampling equipment was prepared for testing. The first test for flow rate on the Unit No. 2 Stack began at 11:09 a.m. and was completed at 11:39 a.m. The first test for mercury on the Unit No. 2 Stack began at 11:17 a.m. and was completed at 12:17 a.m. The sorbent tubes were recovered and analyzed.

The sampling equipment was moved to the Stack Inlet from the Supplemental ESP and was prepared for testing. The first test for flow rate on the Stack Inlet from the Supplemental ESP began at 3:55 p.m. and was completed at 5:40 p.m. The first test for mercury on the Stack Inlet from the Supplemental ESP began at 3:46 p.m. Testing continued until the completion of the second test at 6:21 p.m. The sorbent tubes were recovered and analyzed. The sampling equipment was moved to the Mid Duct to the Supplemental ESP and secured for the night. Personnel departed the plant at 7:30 p.m.

Personnel returned to the plant at 7:00 a.m. on Friday, September 29, 2006. The sampling equipment was prepared for testing. The first test for flow rate on the Mid Duct to the Supplemental ESP began at 9:40 a.m. and was completed at 10:18 a.m. The sampling equipment was moved to the Outlet from the Original ESP and prepared for testing. The first test for flow rate on the Outlet from the Original ESP began at 11:20 a.m. and was completed at 11:50 a.m. The sampling equipment was moved to the Inlet to the Original ESP and prepared for testing. The first test for flow rate at the Inlet to the Original ESP began at 5:23 p.m. and was completed at 6:35 p.m. The sampling equipment was moved to the Inlet to the Supplemental ESP and prepared for testing. The first test for flow rate on the Inlet to the Supplemental ESP began at 6:33 p.m. and was completed at 7:03 p.m.

The first test for mercury on the Inlet to the Supplemental ESP began at 7:52 a.m. and was completed at 8:52 a.m. The sorbent tubes were recovered and analyzed. The sampling equipment was moved to the Outlet from the Original ESP and prepared for testing. The first test for mercury on the Outlet from the Original ESP began at 9:29 a.m. and was completed at 10:29 a.m. The sorbent tubes were recovered and analyzed. The sampling equipment was moved to the Mid Duct to the Supplemental ESP and prepared for testing. The first test for mercury on the Mid Duct to the Supplemental ESP began at 11:17 a.m. and was completed at 12:17 p.m. The sorbent tubes were recovered and analyzed. The sampling equipment was moved to the Outlet from the Original ESP and prepared for testing. The first test for mercury on the Outlet from the Original ESP began at 12:55 p.m. and was completed at 1:55 p.m. The sorbent tubes were recovered and analyzed. The sampling equipment was moved to the Inlet of the Original ESP and prepared for testing. The first test for mercury on the Inlet of the Original ESP began at 4:55 p.m. Testing continued until the completion of the fourth test at 9:46 p.m. The sorbent tubes were recovered and analyzed.

The sampling equipment was moved off of the sampling locations and loaded into the test trailer. The data was transported to Air Sampling Associates, Inc.'s office in Lewisville, Texas for further review.

Operations at the Public Service of New Hampshire, Merrimack Station, located in Bow, New Hampshire, for ADA-ES, Inc. were completed at 10:45 p.m. on Friday, September 29, 2006.

APPENDICES

Appendix A: Location of Traverse Points

Appendix B: Nomenclature and Equations for Calculation of Source Emissions

Appendix C: Calibration Data

Appendix D: EPA Test Methods 2, 3, and 4 Field Data

Appendix E: Proposed EPA Test Method 324 Field Data

Appendix F: Proposed EPA Test Method 324 Analytical Data

Appendix G: Resumes of Test Personnel

Appendix A:
Location of Traverse Points

Appendix A

Location of Traverse Points

Merrimack Unit No. 2 Stack

The sampling ports are located 157 feet 3 inches (9.97 stack diameters) downstream from the inlet to the stack and 84 feet 1 inch (5.33 stack diameters) upstream from the outlet to the stack. The locations of the traverse points were calculated as follows:

Table 5: Stack Location Traverse Points

Port & Wall Thickness = 40 1/16 inches		
Inside Stack Diameter = 189 3/16 inches		
Point Number*	Percent of Stack Diameter	Distance from Wall
1	4.4	8 5/16"
2	14.6	27 5/8"
3	29.6	56"

* Calculated as one-half of a six point traverse.

Appendix A

Figure 4: Unit No. 2 Stack Sampling Traverse Points

Not to scale.

Appendix A

Location of Traverse Points

Merrimack Unit No. 2 Stack Inlet from the Supplemental ESP

The sampling ports on the Stack Inlet from the Supplemental ESP are approximately 75 feet above the ground. The sampling ports are located in a transition zone in the duct.

**Figure 5: Stack Inlet from the Supplemental ESP
Location of Traverse Points (Ports A and B)**

Appendix A

**Figure 6: Stack Inlet from the Supplemental ESP
Location of Traverse Points (Port C)**

Appendix A

**Figure 7: Stack Inlet from the Supplemental ESP
Location of Traverse Points (Port D)**

Appendix A

Location of Traverse Points

Merrimack Unit No. 2 Inlet to the Supplemental ESP

The sampling ports on the Inlet to the Supplemental ESP are approximately 75 feet above the ground. The sampling ports are located in a transition zone in the duct.

Figure 8: Inlet to the Supplemental ESP Location of Traverse Points

Appendix A

Location of Traverse Points

Merrimack Unit No. 2 Mid Duct to the Supplemental ESP

The sampling ports on the Mid Duct to the Supplemental ESP are approximately 75 feet above the ground. The sampling ports are located in a transition zone in the duct.

**Figure 9: Stack Inlet from the Supplemental ESP
Location of Traverse Points (Port A)**

Appendix A

**Figure 10: Stack Inlet from the Supplemental ESP
Location of Traverse Points (Port B)**

Appendix A

**Figure 11: Stack Inlet from the Supplemental ESP
Location of Traverse Points (Port C)**

Appendix A

**Figure 12: Stack Inlet from the Supplemental ESP
Location of Traverse Points (Port D)**

Appendix A

Location of Traverse Points

Merrimack Unit No. 2 Outlet from the Original ESP

The sampling ports on the Outlet from the Original ESP are approximately 75 feet above the ground. The sampling ports are located in a transition zone in the duct.

Figure 13: Outlet from the Original ESP Location of Traverse Points

Appendix A

Location of Traverse Points

Merrimack Unit No. 2 Inlet to the Original ESP (Duct A)

The sampling ports on the Inlet to the Original ESP are approximately 60 feet above the ground. The sampling ports are located in a transition zone in the duct.

Figure 14: Inlet to the Original ESP (Duct A) Location of Traverse Points

Appendix A

Location of Traverse Points

Merrimack Unit No. 2 Inlet to the Original ESP (Duct B)

The sampling ports on the Inlet to the Original ESP are approximately 60 feet above the ground. The sampling ports are located in a transition zone in the duct.

Figure 15: Inlet to the Original ESP (Duct B) Location of Traverse Points

Appendix B:

Nomenclature and Equations for Calculation of Source Emissions

Nomenclature For Flow Rate and Moisture Calculations

<u>Symbol</u>	<u>English Units</u>	<u>Metric Units</u>	<u>Description</u>
A_s	in. ²	m ²	Stack Area
C_{an}	gr/dscf*	g/dscm*	Particulate – probe, cyclone, and filter
C_{ao}	gr/dscf*	g/dscm*	Particulate –total
C_{at}	gr/CF @ stack conditions	g/m ³	Particulate – probe, cyclone, and filter
C_{au}	gr/CF @ stack conditions	g/m ³	Particulate – total
C_{aw}	lbs/hr	kg/hr	Particulate – probe, cyclone, and filter
C_{ax}	lbs/hr	kg/hr	Particulate - total
C_p			Pitot Tube Calibration Factor
D_n	in.	m	Sampling Nozzle Diameter
%EA			Percent Excess Air at Sampling Point
g	32.2 ft/sec ²		Acceleration of gravity
%I			Percent Isokinetic
%M			Percent Moisture in the Stack Gas by Volume
M_d			Mole Fraction of Dry Gas
m_f	mg	mg	Particulate – probe, cyclone, and filter
mt	mg	mg	Particulate – total
M_{water}	18 lb/lb-mole		Molecular Weight of Water
MW	lb/lb-mole	g/g-mole	Molecular Weight of Stack Gas
MW_{air}	28.84 lb/lb-mole		Molecular Weight of Air

<u>Symbol</u>	<u>English Units</u>	<u>Metric Units</u>	<u>Description</u>
MW _d	lb/lb-mole	g/g-mole	Molecular Weight of Dry Stack Gas
P _b	"Hg Absolute	mm Hg	Barometric Pressure
P _m	"H ₂ O	mm H ₂ O	Orifice Pressure drop
P _s	"Hg Absolute	mm Hg	Stack Pressure
ΔP	"H ₂ O	mm H ₂ O	Velocity Head of Stack Gas
P _{std}	29.92" Hg	760 mm Hg	Standard Barometric Pressure
Q _a	ACFM	m ³ /hr	Stack Gas Volume at Actual Stack Conditions
Q _s	DSCFM*	dscm/hr*	Stack Gas Volume at 29.92" Hg, 528° R, dry
R	21.83" Hg-ft ³ /lb-mole °R		Universal Gas Constant
T _m	°F	°C	Average Gas Meter Temperature
T _t	min	min	Net Time of Test
T _s	°F	°C	Stack Temperature
T _{std}	528 °R	293 °K	Standard Temperature
V _m	ft ³	m ³	Volume of Dry Gas Sampled @ Meter Conditions
V _{mstd}	dscf*	dscm*	Volume of Dry Gas Sampled @ Standard Conditions
V _s	fpm	m/sec	Stack Velocity @ Stack Conditions
V _w	ml	ml	Total Water Collected in Impingers and Silica Gel
V _{wgas}	scf*	scm*	Volume of Water Vapor Collected @ Standard Conditions
ρ _{air}	0.0748 lbs/ft ³		Density of Air

<u>Symbol</u>	English <u>Units</u>	Metric <u>Units</u>	<u>Description</u>
ρ_{water}	1 g/ml		Density of Water
ρ_{man}	62.32 lbs/ft ³		Density of Manometer Oil
			(Inches of Water)

Standard Conditions: 29.92" Hg, 68° F (760 mm Hg, 20 °C)

EXAMPLE CALCULATIONS

1. Volume of dry gas sampled at standard conditions. *

$$V_{mstd} = V_m \left(\frac{T_{std}}{T_m + 460} \right) \left[\frac{P_b + \frac{P_m}{13.6}}{P_{std}} \right]$$

$$V_{mstd} = 17.65 V_m \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460} \right] = \text{dscf}$$

$$V_{mstd} = \text{dscf} \times 0.028317 = \text{dscm}$$

2. Volume of water vapor collected at standard conditions. *

$$V_{Wgas} = \frac{(V_w - \text{gms } SO_2 - \text{gms } H_2S) \rho_{water} RT_{std}}{P_{std} M_{water} 453.6}$$

$$V_{Wgas} = 0.0472 (V_w - \text{gms } SO_2 - \text{gms } H_2S) = \text{scf}$$

$$V_{Wgas} = \text{scf} \times 0.028317 = \text{scm}$$

3. Percent moisture in stack gas.

$$\%M = \frac{V_{Wgas}}{V_{mstd} + V_{Wgas}} \times 100 = \%$$

* 29.92" Hg, 68° F (760 mm Hg, 20 °C)

4. Mole fraction of dry gas.

$$M_d = \frac{100 - \%M}{100}$$

5. Average molecular weight of dry stack gas.

$$MW_d = \left[\%CO_2 \times \frac{44}{100} \right] + \left[\%O_2 \times \frac{32}{100} \right] + \left[\%N_2 \times \frac{28}{100} \right] + \left[\%CO \times \frac{28}{100} \right] = lb/lb - mole$$

$$= g/g - mole$$

6. Molecular weight of stack gas.

$$MW = MW_d \times M_d + 18 (1 - M_d) = \frac{lb}{lb - mole} = g/g - mole$$

7. Percent excess air at sampling point.

$$\%EA = \frac{100 [\%O_2 - (0.5 \%CO)]}{0.265 (\%N_2) - [\%O_2 - (0.5 \%CO)]}$$

8. Stack Pressure.

$$P_s = P_b + \frac{\text{Stack Pressure " H}_2\text{O}}{13.6} = \text{" Hg Absolute}$$

$$P_s = \text{" Hg Abs.} \times 25.4 = mm Hg$$

9. Stack velocity at stack conditions.

$$V_s = C_p 60 \left[\frac{2g \times \rho_{man} \times P_{std} \times MW_{air} \times (T_s + 460) \times \Delta P}{12 \times \rho_{air} \times P_s \times MW \times T_{std}} \right]^{1/2}$$

$$V_s = 5,123.8 C_p \left[\frac{(T_s + 460)}{P_s \times MW} \right]^{1/2} \sqrt{\Delta P} \text{ average} = fpm$$

$$V_s = fpm \times 0.00508 = m/sec$$

10. Dry stack gas volume at standard conditions. *

$$Q_s = \frac{1}{144} V_s \times A_s \times M_d \times \frac{T_{std}}{T_s + 460} \times \frac{P_s}{P_{std}}$$

$$Q_s = \frac{0.123 V_s \times A_s \times M_d \times P_s}{T_s + 460} = DSCFM$$

$$Q_s = DSCFM \times 1.6990 = dscm/hr$$

11. Actual stack gas volume at stack conditions.

$$Q_a = \frac{V_s \times A_s}{144} = ACFM$$

$$Q_a = ACFM \times 1.6990 = m^3/hr$$

12. Percent Isokinetic

$$\%I = \frac{V_{mstd} \times (T_s + 460) \times P_{std} \times 100 \times 144 \text{ in.}^2 / \text{ft}^2}{M_d \times T_{std} \times P_s \times T_t \times V_s \left(\frac{\pi \times D_n^2}{4} \right)}$$

$$\%I = \frac{1039 \times V_{mstd} \times (T_s + 460)}{M_d \times P_s \times T_t \times V_s \times D_n^2}$$

* 29.92" Hg, 68° F (760 mm Hg, 20 °C)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Stack

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
DATE			09/28/06		
BEGIN TIME			1109		
END TIME			1139		
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.76 (756.00)		
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	2.000 (50.800)		
	DGM CALIBRATION FACTOR		0.985		
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	22.690 (0.643)		
	LEAK CHECK VOLUME	ft.^3	0.000		
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	64 (18)		
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	22.857 (0.647)		
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	46.4		
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	2.190 (0.062)		
%M	MOISTURE IN STACK GAS BY VOLUME	%	8.74		
Md	MOL FRACTION OF DRY GAS		0.9126		
Tt	NET TIME OF TEST	MINUTES	30		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Stack

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
CO2		%	12.7		
O2		%	6.3		
CO		%	0.0		
N2		%	81.0		
%EA	EXCESS AIR @ SAMPLING POINT	%	41.5		
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.28 (30.28)		
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.21 (29.21)		
Cp	PITOT TUBE CALIBRATION		0.825		
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	2.013 (51.100)		
DELTA P ^{^(1/2)}		"H2O	1.419		
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	330 (166)		
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	29.69 (754.00) -0.90		
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	5,725 (29)		
As	STACK AREA	(SQ.INCHES) (SQ.METERS)	28,104 (18)		
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	678,754 (1,153,203)		
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	1,117,318 (1,898,323)		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Stack Inlet from Supplemental ESP (Moisture)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
DATE			09/28/06		
BEGIN TIME			1555		
END TIME			1625		
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.80 (757.00)		
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)		
	DGM CALIBRATION FACTOR		0.985		
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	22.100 (0.626)		
	LEAK CHECK VOLUME	ft.^3	0.000		
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	73 (23)		
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	21.911 (0.620)		
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	32.0		
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	1.510 (0.043)		
%M	MOISTURE IN STACK GAS BY VOLUME	%	6.45		
Md	MOL FRACTION OF DRY GAS		0.9355		
Tt	NET TIME OF TEST	MINUTES	30		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054

JOB NAME: ADA-ES

LOCATION: Bow, New Hampshire

UNIT TESTED: Merrimack Unit No. 2 Stack Inlet from Supplemental ESP (Moisture)

[illegible]

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Stack Inlet from Supplemental ESP (Port D)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
DATE			09/28/06		
BEGIN TIME			1530		
END TIME			1540		
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.80 (757.00)		
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)		
	DGM CALIBRATION FACTOR		0.985		
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	22.100 (0.626)		
	LEAK CHECK VOLUME	ft.^3	0.000		
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	73 (23)		
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	21.911 (0.620)		
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	32.0		
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	1.510 (0.043)		
%M	MOISTURE IN STACK GAS BY VOLUME	%	6.45		
Md	MOL FRACTION OF DRY GAS		0.9355		
Tt	NET TIME OF TEST	MINUTES	10		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Stack Inlet from Supplemental ESP (Port D)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
CO2		%	13.0		
O2		%	5.3		
CO		%	0.0		
N2		%	81.7		
%EA	EXCESS AIR @ SAMPLING POINT	%	32.4		
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.29 (30.29)		
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.50 (29.50)		
Cp	PITOT TUBE CALIBRATION		0.825		
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	1.160 (29.500)		
DELTA P ^{^(1/2)}		"H2O	1.076		
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	334 (168)		
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	30.02 (763.00) 3.00		
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	4,307 (22)		
As	STACK AREA	(SQ.INCHES) (SQ.METERS)	28,800 (19)		
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	539,643 (916,853)		
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	861,355 (1,463,442)		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Stack Inlet from Supplemental ESP (Port B)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
DATE			09/28/06		
BEGIN TIME			1610		
END TIME			1620		
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.80 (757.00)		
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)		
	DGM CALIBRATION FACTOR		0.985		
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	22.100 (0.626)		
	LEAK CHECK VOLUME	ft.^3	0.000		
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	73 (23)		
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	21.911 (0.620)		
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	32.0		
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	1.510 (0.043)		
%M	MOISTURE IN STACK GAS BY VOLUME	%	6.45		
Md	MOL FRACTION OF DRY GAS		0.9355		
Tt	NET TIME OF TEST	MINUTES	10		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Stack Inlet from Supplemental ESP (Port B)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
CO2		%	13.0		
O2		%	5.3		
CO		%	0.0		
N2		%	81.7		
%EA	EXCESS AIR @ SAMPLING POINT	%	32.4		
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.29 (30.29)		
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.50 (29.50)		
Cp	PITOT TUBE CALIBRATION		0.825		
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	0.854 (21.700)		
DELTA P ^{^(1/2)}		"H2O	0.918		
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	333 (167)		
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	30.02 (763.00) 3.00		
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	3,672 (19)		
As	STACK AREA	(SQ. INCHES) (SQ. METERS)	23,400 (15)		
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	374,287 (635,914)		
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	596,709 (1,013,809)		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Stack Inlet from Supplemental ESP (Port C)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
DATE			09/28/06		
BEGIN TIME			1625		
END TIME			1635		
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.80 (757.00)		
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)		
	DGM CALIBRATION FACTOR		0.985		
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	22.100 (0.626)		
	LEAK CHECK VOLUME	ft.^3	0.000		
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	73 (23)		
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	21.911 (0.620)		
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	32.0		
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	1.510 (0.043)		
%M	MOISTURE IN STACK GAS BY VOLUME	%	6.45		
Md	MOL FRACTION OF DRY GAS		0.9355		
Tt	NET TIME OF TEST	MINUTES	10		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Stack Inlet from Supplemental ESP (Port C)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
CO2		%	13.0		
O2		%	5.3		
CO		%	0.0		
N2		%	81.7		
%EA	EXCESS AIR @ SAMPLING POINT	%	32.4		
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.29 (30.29)		
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.50 (29.50)		
Cp	PITOT TUBE CALIBRATION		0.825		
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	0.696 (17.700)		
DELTA P ^{^(1/2)}		"H2O	0.813		
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	332 (167)		
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	30.02 (763.00) 3.00		
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	3,250 (17)		
As	STACK AREA	(SQ.INCHES) (SQ.METERS)	25,200 (16)		
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	357,206 (606,893)		
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m ^{^3} /HR)	568,749 (966,305)		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Stack Inlet from Supplemental ESP (Port A)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
DATE			09/28/06		
BEGIN TIME			1730		
END TIME			1740		
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.80 (757.00)		
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)		
	DGM CALIBRATION FACTOR		0.985		
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	22.100 (0.626)		
	LEAK CHECK VOLUME	ft.^3	0.000		
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	73 (23)		
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	21.911 (0.620)		
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	32.0		
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	1.510 (0.043)		
%M	MOISTURE IN STACK GAS BY VOLUME	%	6.45		
Md	MOL FRACTION OF DRY GAS		0.9355		
Tt	NET TIME OF TEST	MINUTES	10		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Stack Inlet from Supplemental ESP (Port A)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
CO2		%	13.0		
O2		%	5.3		
CO		%	0.0		
N2		%	81.7		
%EA	EXCESS AIR @ SAMPLING POINT	%	32.4		
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.29 (30.29)		
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.50 (29.50)		
Cp	PITOT TUBE CALIBRATION		0.825		
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	0.626 (15.900)		
DELTA P ^{^(1/2)}		"H2O	0.787		
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	332 (167)		
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	30.02 (763.00) 3.00		
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	3,146 (16)		
As	STACK AREA	(SQ. INCHES) (SQ. METERS)	23,400 (15)		
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	321,077 (545,510)		
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	511,235 (868,588)		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Inlet to Supplemental ESP (Moisture)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
DATE			09/29/06		
BEGIN TIME			0822		
END TIME			0852		
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.61 (752.00)		
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)		
	DGM CALIBRATION FACTOR		0.985		
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	21.971 (0.622)		
	LEAK CHECK VOLUME	ft.^3	0.000		
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	65 (18)		
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	21.974 (0.622)		
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	46.9		
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	2.214 (0.063)		
%M	MOISTURE IN STACK GAS BY VOLUME	%	9.15		
Md	MOL FRACTION OF DRY GAS		0.9085		
Tt	NET TIME OF TEST	MINUTES	30		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Inlet to Supplemental ESP (Moisture)

[illegible]

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Mid Duct To Supplemental ESP (Port A)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
DATE			09/29/06		
BEGIN TIME			0940		
END TIME			0950		
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.61 (752.00)		
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)		
	DGM CALIBRATION FACTOR		0.985		
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	21.971 (0.622)		
	LEAK CHECK VOLUME	ft.^3	0.000		
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	65 (18)		
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	21.974 (0.622)		
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	46.9		
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	2.214 (0.063)		
%M	MOISTURE IN STACK GAS BY VOLUME	%	9.15		
Md	MOL FRACTION OF DRY GAS		0.9085		
Tt	NET TIME OF TEST	MINUTES	10		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Mid Duct To Supplemental ESP (Port A)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
CO2		%	14.3		
O2		%	4.7		
CO		%	0.0		
N2		%	81.0		
%EA	EXCESS AIR @ SAMPLING POINT	%	28.0		
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.48 (30.48)		
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.33 (29.33)		
Cp	PITOT TUBE CALIBRATION		0.825		
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	0.594 (15.100)		
DELTA P ^{^(1/2)}		"H2O	0.757		
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	341 (172)		
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	29.88 (759.00) 3.70		
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	3,059 (16)		
As	STACK AREA	(SQ.INCHES) (SQ.METERS)	32,400 (21)		
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	413,145 (701,933)		
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	688,326 (1,169,466)		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Mid Duct To Supplemental ESP (Port B)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
DATE			09/29/06		
BEGIN TIME			0950		
END TIME			0958		
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.61 (752.00)		
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)		
	DGM CALIBRATION FACTOR		0.985		
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	21.971 (0.622)		
	LEAK CHECK VOLUME	ft.^3	0.000		
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	65 (18)		
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	21.974 (0.622)		
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	46.9		
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	2.214 (0.063)		
%M	MOISTURE IN STACK GAS BY VOLUME	%	9.15		
Md	MOL FRACTION OF DRY GAS		0.9085		
Tt	NET TIME OF TEST	MINUTES	8		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Mid Duct To Supplemental ESP (Port B)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
CO2		%	14.3		
O2		%	4.7		
CO		%	0.0		
N2		%	81.0		
%EA	EXCESS AIR @ SAMPLING POINT	%	28.0		
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.48 (30.48)		
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.33 (29.33)		
Cp	PITOT TUBE CALIBRATION		0.825		
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	0.672 (17.100)		
DELTA P ^{^(1/2)}		"H2O	0.808		
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	342 (172)		
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	29.88 (759.00) 3.70		
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	3,267 (17)		
As	STACK AREA	(SQ. INCHES) (SQ. METERS)	34,200 (22)		
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	465,170 (790,324)		
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	776,000 (1,318,424)		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Mid Duct To Supplemental ESP (Port C)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
DATE			09/29/06		
BEGIN TIME			0958		
END TIME			1008		
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.61 (752.00)		
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)		
	DGM CALIBRATION FACTOR		0.985		
V(m)	VOLUME DRY GAS SAMPLED	ft.^3	21.971		
	@ METER CONDITIONS	(m^3)	(0.622)		
	LEAK CHECK VOLUME	ft.^3	0.000		
T(m)	AVERAGE GAS METER	DEG.F	65		
	TEMPERATURE	(DEG.C)	(18)		
V(m[std])*	VOLUME DRY GAS SAMPLED	DSCF	21.974		
	@ STANDARD CONDITIONS*	(DSCM)	(0.622)		
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	46.9		
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	2.214 (0.063)		
%M	MOISTURE IN STACK GAS BY VOLUME	%	9.15		
Md	MOL FRACTION OF DRY GAS		0.9085		
Tt	NET TIME OF TEST	MINUTES	10		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Mid Duct To Supplemental ESP (Port C)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
CO2		%	14.3		
O2		%	4.7		
CO		%	0.0		
N2		%	81.0		
%EA	EXCESS AIR @ SAMPLING POINT	%	28.0		
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.48 (30.48)		
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.33 (29.33)		
Cp	PITOT TUBE CALIBRATION		0.825		
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	0.672 (17.100)		
DELTA P ^{^(1/2)}		"H2O	0.815		
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	340 (171)		
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	29.88 (759.00) 3.70		
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	3,292 (17)		
As	STACK AREA	(SQ.INCHES) (SQ.METERS)	36,000 (23)		
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	494,633 (840,381)		
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	822,891 (1,398,092)		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Mid Duct To Supplemental ESP (Port D)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
DATE			09/29/06		
BEGIN TIME			1008		
END TIME			1018		
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.61 (752.00)		
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)		
	DGM CALIBRATION FACTOR		0.985		
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	21.971 (0.622)		
	LEAK CHECK VOLUME	ft.^3	0.000		
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	65 (18)		
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	21.974 (0.622)		
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	46.9		
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	2.214 (0.063)		
%M	MOISTURE IN STACK GAS BY VOLUME	%	9.15		
Md	MOL FRACTION OF DRY GAS		0.9085		
Tt	NET TIME OF TEST	MINUTES	10		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Mid Duct To Supplemental ESP (Port D)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
CO2		%	14.3		
O2		%	4.7		
CO		%	0.0		
N2		%	81.0		
%EA	EXCESS AIR @ SAMPLING POINT	%	28.0		
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.48 (30.48)		
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.33 (29.33)		
Cp	PITOT TUBE CALIBRATION		0.825		
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	0.828 (21.000)		
DELTA P ^{^(1/2)}		"H2O	0.906		
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	335 (168)		
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	29.88 (759.00) 3.70		
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	3,648 (19)		
As	STACK AREA	(SQ.INCHES) (SQ.METERS)	43,200 (28)		
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	661,884 (1,124,541)		
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	1,094,291 (1,859,200)		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Outlet from Original ESP (Flow Rate)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER	
			1	
DATE			09/29/06	
BEGIN TIME			1120	
END TIME			1150	
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.61 (752.00)	
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)	
	DGM CALIBRATION FACTOR		0.985	
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	21.971 (0.622)	
	LEAK CHECK VOLUME	ft.^3	0.000	
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	65 (18)	
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	21.974 (0.622)	
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	46.9	
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	2.214 (0.063)	
%M	MOISTURE IN STACK GAS BY VOLUME	%	9.15	
Md	MOL FRACTION OF DRY GAS		0.9085	
Tt	NET TIME OF TEST	MINUTES	30	

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Outlet from Original ESP (Flow Rate)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
CO2		%	14.3		
O2		%	4.7		
CO		%	0.0		
N2		%	81.0		
%EA	EXCESS AIR @ SAMPLING POINT	%	28.0		
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.48 (30.48)		
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.33 (29.33)		
Cp	PITOT TUBE CALIBRATION		0.825		
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	0.072 (1.800)		
DELTA P ^{^(1/2)}		"H2O	0.260		
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	334 (168)		
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	29.85 (758.00) 3.20		
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	1,047 (5)		
As	STACK AREA	(SQ.INCHES) (SQ.METERS)	320,400 (207)		
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	1,409,266 (2,394,343)		
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	2,328,796 (3,956,624)		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Inlet A to Original ESP

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
DATE			09/29/06		
BEGIN TIME			1723		
END TIME			1800		
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.54 (750.00)		
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)		
	DGM CALIBRATION FACTOR		0.985		
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS LEAK CHECK VOLUME	ft.^3 (m^3) ft.^3	22.623 (0.641) 0.000		
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	80 (27)		
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	21.946 (0.621)		
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	24.6		
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	1.161 (0.033)		
%M	MOISTURE IN STACK GAS BY VOLUME	%	5.02		
Md	MOL FRACTION OF DRY GAS		0.9498		
Tt	NET TIME OF TEST	MINUTES	37		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Inlet A to Original ESP

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
CO2		%	8.9		
O2		%	11.1		
CO		%	0.0		
N2		%	80.0		
%EA	EXCESS AIR @ SAMPLING POINT	%	109.9		
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.87 (29.87)		
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.27 (29.27)		
Cp	PITOT TUBE CALIBRATION		0.825		
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	0.452 (11.500)		
DELTA P ^{^(1/2)}		"H2O	0.658		
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	344 (173)		
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	29.97 (761.00) 5.90		
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	2,663 (14)		
As	STACK AREA	(SQ.INCHES) (SQ.METERS)	30,856 (20)		
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	357,832 (607,957)		
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	570,588 (969,429)		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Inlet B to Original ESP

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
DATE			09/29/06		
BEGIN TIME			1805		
END TIME			1835		
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.54 (750.00)		
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)		
	DGM CALIBRATION FACTOR		0.985		
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS LEAK CHECK VOLUME	ft.^3 (m^3) ft.^3	22.623 (0.641) 0.000		
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	80 (27)		
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	21.946 (0.621)		
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	24.6		
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	1.161 (0.033)		
%M	MOISTURE IN STACK GAS BY VOLUME	%	5.02		
Md	MOL FRACTION OF DRY GAS		0.9498		
Tt	NET TIME OF TEST	MINUTES	30		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Inlet B to Original ESP

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
CO2		%	8.9		
O2		%	11.1		
CO		%	0.0		
N2		%	80.0		
%EA	EXCESS AIR @ SAMPLING POINT	%	109.9		
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.87 (29.87)		
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.27 (29.27)		
Cp	PITOT TUBE CALIBRATION		0.825		
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	0.471 (12.000)		
DELTA P ^{^(1/2)}		"H2O	0.677		
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	345 (174)		
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	29.97 (761.00) 5.80		
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	2,741 (14)		
As	STACK AREA	(SQ.INCHES) (SQ.METERS)	30,856 (20)		
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	367,855 (624,986)		
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	587,429 (998,042)		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION SURVEY

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Inlet to Supplemental ESP (Flow Rate)

SOURCE EMISSION CALCULATIONS

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
DATE			09/29/06		
BEGIN TIME			1833		
END TIME			1903		
P(b)	BAROMETRIC PRESSURE	"Hg Abs. (mm Hg)	29.61 (752.00)		
P(m)	ORIFICE PRESSURE DROP	"H2O (mm H2O)	1.900 (48.300)		
	DGM CALIBRATION FACTOR		0.985		
V(m)	VOLUME DRY GAS SAMPLED @ METER CONDITIONS	ft.^3 (m^3)	21.971 (0.622)		
	LEAK CHECK VOLUME	ft.^3	0.000		
T(m)	AVERAGE GAS METER TEMPERATURE	DEG.F (DEG.C)	65 (18)		
V(m[std])*	VOLUME DRY GAS SAMPLED @ STANDARD CONDITIONS*	DSCF (DSCM)	21.974 (0.622)		
V(w)	TOTAL WATER COLLECTED, IMPINGERS & SILICA GEL	ml	46.9		
V(w[gas])	VOLUME WATER VAPOR COLLECTED @ STANDARD CONDITIONS*	SCF (SCM)	2.214 (0.063)		
%M	MOISTURE IN STACK GAS BY VOLUME	%	9.15		
Md	MOL FRACTION OF DRY GAS		0.9085		
Tt	NET TIME OF TEST	MINUTES	30		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

SOURCE EMISSION CALCULATIONS

JOB NUMBER: 06-054
 JOB NAME: ADA-ES
 LOCATION: Bow, New Hampshire
 UNIT TESTED: Merrimack Unit No. 2 Inlet to Supplemental ESP (Flow Rate)

SYMBOL	DESCRIPTION	UNITS	RUN NUMBER		
			1		
CO2		%	14.3		
O2		%	4.7		
CO		%	0.0		
N2		%	81.0		
%EA	EXCESS AIR @ SAMPLING POINT	%	28.0		
MWd	MOLECULAR WEIGHT OF DRY STACK GAS	LB/LB-MOLE (g/g-MOLE)	30.48 (30.48)		
MW	MOLECULAR WEIGHT OF STACK GAS	LB/LB-MOLE (g/g-MOLE)	29.33 (29.33)		
Cp	PITOT TUBE CALIBRATION		0.825		
DELTA P	VELOCITY HEAD OF STACK GAS	"H2O (mm H2O)	0.984 (25.000)		
DELTA P ^{^(1/2)}		"H2O	0.963		
Ts	STACK TEMPERATURE	DEG. F (DEG. C)	335 (168)		
Ps	STACK PRESSURE	"Hg Abs. (mm Hg) "H2O	29.87 (759.00) 3.50		
Vs	STACK VELOCITY @ STACK CONDITIONS	FPM (m/SEC.)	3,878 (20)		
As	STACK AREA	(SQ.INCHES) (SQ.METERS)	43,200 (28)		
Qs	DRY STACK GAS VOLUME @ STANDARD CONDITIONS*	DSCFM (DSCM/HR)	703,379 (1,195,041)		
Qa	ACTUAL STACK GAS VOLUME @ STACK CONDITIONS	ACFM (m^3/HR)	1,163,332 (1,976,501)		

* 68 Deg.F, 29.92 "Hg (20 Deg.C, 760 mm Hg)

Appendix C:

Calibration Data

Appendix C

Table 6: Calibration Data

Pre-Test:

<u>Equipment</u>	<u>Calibration Factor</u>	<u>Calibration Date</u>
Dry Gas Meter 1-1	0.985	09/19/06
Digital Temperature Indicator 2-1		09/19/06
Dry Gas Meter 2-1 Orifice		09/19/06
Pitot Tube 1-1	0.825	09/20/06
Barometer 1	NIST Traceable	09/10/06

Post-Test:

<u>Equipment</u>	<u>Calibration Factor</u>	<u>Calibration Date</u>
Dry Gas Meter 1-1	0.989	10/27/06
Pitot Tube 1-1	0.823	11/06/06
Barometer 1	NIST Traceable	10/13/06

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-1
Date Calibration Performed: 09/19/06

ΔH Setting (" H ₂ O)	C _{DG}
0.50	0.984
1.00	0.986
1.50	0.985
2.00	0.987
3.00	0.984
4.00	0.983
Average	0.985

Variation +: 0.20%
Variation -: -0.20%

Certified by: Gary B. Goldman 09/19/06

Calibrator (Signature / Date)

Bill Hefley 09/19/06

QA Officer (Signature / Date)

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-1
Date Calibration Performed: 09/19/06

Run 1 at 0.5" ΔH Pb = 29.80 " Hg
Wet Test Meter C_f = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0

	Meter						
	Time	Reading	Temp.		P _m		
End	13:27	5.238	cf	83 °F	-0.1	" H ₂ O	
Start	13:14	0.000	cf	83 °F	-0.1	" H ₂ O	
Average		5.238	cf	83 °F	-0.1	" H ₂ O	

Dry Gas Meter

	Meter		Temperature				P _m	
	Reading		In	Out				
	913.384	cf	82 °F	83 °F	0.50	" H ₂ O		
	907.982	cf	82 °F	81 °F	0.50	" H ₂ O		
	5.402	cf	82 °F	82 °F	0.50	" H ₂ O		

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{5.164} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{5.249} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{0.984}$$

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-1
Date Calibration Performed: 09/19/06

Run 1 at 1.0" ΔH Pb = 29.80 " Hg
Wet Test Meter C_f = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0

	Meter					
	Time	Reading		Temp.	P _m	
End	13:40	5.015	cf	83 °F	-0.4	" H ₂ O
Start	13:31	0.000	cf	83 °F	-0.4	" H ₂ O
Average		5.015	cf	83 °F	-0.4	" H ₂ O

Dry Gas Meter

	Meter		Temperature				
	Reading		In	Out	P _m		
	918.875	cf	86 °F	83 °F	1.00	" H ₂ O	
	913.712	cf	83 °F	82 °F	1.00	" H ₂ O	
	5.163	cf	85 °F	83 °F	1.00	" H ₂ O	

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{4.940} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{5.009} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{0.986}$$

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-1
Date Calibration Performed: 09/19/06

Run 1 at 1.5" ΔH Pb = 29.80 " Hg
Wet Test Meter Cf = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0							Dry Gas Meter						
Meter							Temperature						
	Time	Reading		Temp.	P _m		Reading	In	Out	P _m			
End	14:00	10.038	cf	83 °F	-0.6	" H ₂ O	930.182	cf 91 °F	84 °F	1.50	" H ₂ O		
Start	13:45	0.000	cf	83 °F	-0.6	" H ₂ O	919.804	cf 86 °F	83 °F	1.50	" H ₂ O		
Average		10.038	cf	83 °F	-0.6	" H ₂ O	10.378	cf 89 °F	84 °F	1.50	" H ₂ O		

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{9.884} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{10.034} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{0.985}$$

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-1
Date Calibration Performed: 09/19/06

Run 1 at 2.0" ΔH Pb = 29.80 " Hg
Wet Test Meter Cf = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0

	Meter					
	Time	Reading	Temp.		P _m	
End	14:16	10.020	cf	83 °F	-0.7	" H ₂ O
Start	14:03	0.000	cf	83 °F	-0.7	" H ₂ O
Average		10.020	cf	83 °F	-0.7	" H ₂ O

Dry Gas Meter

Meter	Temperature					
<u>Reading</u>		<u>In</u>		<u>Out</u>		<u>P_m</u>
940.927	cf	94	°F	86	°F	2.00
930.552	cf	90	°F	85	°F	2.00
10.375	cf	92	°F	86	°F	2.00

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{9.863} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{9.993} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{0.987}$$

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-1
Date Calibration Performed: 09/19/06

Run 1 at 3.0" ΔH Pb = 29.80 " Hg
Wet Test Meter Cf = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0							Dry Gas Meter						
Meter							Temperature						
	Time	Reading		Temp.	P _m		Reading	In	Out	P _m			
End	14:29	10.407	cf	84 °F	-1.0	" H ₂ O	952.083	cf	97 °F	87 °F	3.00	" H ₂ O	
Start	14:18	0.000	cf	84 °F	-1.0	" H ₂ O	941.298	cf	92 °F	86 °F	3.00	" H ₂ O	
Average		10.407	cf	84 °F	-1.0	" H ₂ O	10.785	cf	95 °F	87 °F	3.00	" H ₂ O	

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{10.218} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{10.381} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{0.984}$$

Calibration Data
Dry Gas Meter Calibration

Meter Console No. ASAI 1-1
Date Calibration Performed: 09/19/06

Run 1 at 4.0" ΔH Pb = 29.80 " Hg
Wet Test Meter Cf = 1.018 Console Pump Vacuum = -5.0 " Hg

Wet Test Meter No. ASAI-0

Meter						
	Time	Reading		Temp.	P _m	
End	14:42	10.864 cf	84	°F	-1.3	" H ₂ O
Start	14:32	0.000 cf	84	°F	-1.3	" H ₂ O
Average		10.864 cf	84	°F	-1.3	" H ₂ O

Dry Gas Meter

Meter			Temperature				
	Reading		In	Out	P _m		
	963.826 cf	98	°F	88	°F	4.00	" H ₂ O
	952.552 cf	87	°F	96	°F	4.00	" H ₂ O
	11.274 cf	93	°F	92	°F	4.00	" H ₂ O

$$\text{Wet Test Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] \times C_f = \underline{10.659} \text{ dcsf}$$

$$\text{Dry Gas Meter } V_{mstd} = 17.65 \times V_m \left[\frac{P_b + \frac{P_m}{13.6}}{(T_m + 460)} \right] = \underline{10.843} \text{ dcsf}$$

$$\text{Calibration Factor } (C_{DG}) = \frac{\text{Wet Test Meter } V_{mstd}}{\text{Dry Gas Meter } V_{mstd}} = \underline{0.983}$$

Calibration Data
Digital Temperature Indicator Calibration

DTI Unit No. ASAI 1-1
Date Calibration Performed: 09/19/06

Reference Point	Time	ASTM	DTI
		Reference Thermometer (°F)	(°F)
Ice Bath	11:43	33° F	32° F
Ambient Air	11:39	82° F	82° F
Boiling Water	12:10	210° F	210° F
Oven	11:55	251° F	252° F
Oven	11:58	298° F	299° F
Oven	12:08	348° F	348° F
Oven	12:02	389° F	389° F

Meter Adjusted? No

ASTM Reference Thermometer:	SN: 5963	Range: +18+89°F
	SN: 1853	Range: +205+310°F
	SN: 992	Range: +295+400°F

Certified by: Gary B. Goldman 09/19/06
Calibrator (Signature / Date)

Bill Hefley 09/19/06
QA Officer (Signature / Date)

Orifice Curve ASAI 1-1 09/19/06

CALIBRATION DATA PITOT TUBE CALIBRATION DATA

Date: 09/20/06
I.D. # ASAI 1-1
C_{pstd}: 0.990

Time: 10:20
T_s: 78 °F
Pb: 29.73 " Hg

fps Mark	Desired Calibration Standard	Calibration Standard		√ Standard Average	High	√ High	Cal. Factor	Low	√ Low	Cal. Factor
Start	End									
20	0.09	0.09	0.09	0.300	0.13	0.361	0.824	0.13	0.361	0.824
30	0.20	0.20	0.20	0.447	0.29	0.539	0.822	0.29	0.539	0.822
40	0.36	0.36	0.36	0.600	0.52	0.721	0.824	0.52	0.721	0.824
50	0.56	0.56	0.56	0.748	0.80	0.894	0.828	0.80	0.894	0.828
60	0.80	0.80	0.80	0.894	1.15	1.072	0.826	1.15	1.072	0.826
70	1.09	1.10	1.10	1.049	1.60	1.265	0.821	1.60	1.265	0.821
80	1.43	1.40	1.40	1.183	2.00	1.414	0.828	2.00	1.414	0.828
90	1.81	1.80	1.80	1.342	2.60	1.612	0.824	2.60	1.612	0.824
50	0.56	0.56	0.56	0.748	0.80	0.894	0.828	0.80	0.894	0.828
50	0.56	0.56	0.56	0.748	0.80	0.894	0.828	0.80	0.894	0.828
Average							0.825			0.825

Summary of Results:

Normal high side calibration factor: 0.825
variation +: 0.36%
variation -: -0.48%
Normal low side calibration factor: 0.825
variation +: 0.36%
variation -: -0.48%

Certification:

I certify that the Type S pitot tube, the standard type pitot tube, and the calibration setup meet or exceed all specifications, criteria and/or applicable design features and hereby assign a pitot tube calibration factor C_p of: 0.825

Certified by: Patrick Selakovich 09/20/06
Calibrator (Signature/Date)

Bill Hefley 09/20/06
QA Officer (Signature/Date)

Calibration Data
Barometer Calibration Data

Date:	09/10/2006	Time:	1310
I.D. #:	ASAI - 1	Temperature:	94

Mercury Barometer ASAI - 0 Reading:	29.65" Hg
Aneroid Barometer Reading:	29.71" Hg
Difference:	0.06" Hg
Barometer Adjusted?	YES

Certified by:	<i>Billy J. Mullins, Jr.</i> 09/10/06	<i>Bill Hefley</i> 09/10/06
	Calibrator (Signature/Date)	QA Officer (Signature/Date)

Post-test Calibration Data:

METHOD 5 DRY GAS METER CALIBRATION USING CRITICAL ORIFICES

ENVIRONMENTAL SUPPLY COMPANY

- 1) Select three critical orifices to calibrate the dry gas meter which bracket the expected operating range.
- 2) Record barometric pressure before and after calibration procedure.
- 3) Run at tested vacuum (from Orifice Calibration Report), for a period of time necessary to achieve a minimum total volume of 5 cubic feet.
- 4) Record data and information in the GREEN cells, YELLOW cells are calculated.

ASAI 1-1 10-27-2006

DATE: 10/27/2006		METER SERIAL #: 1508		CRITICAL ORIFICE SET SERIAL #: 1426s		INITIAL		FINAL		AVG (P _{bar})		IF Y VARIATION EXCEEDS 2.00%, ORIFICE SHOULD BE RECALIBRATED							
METER PART #: C-5000-SO						BAROMETRIC PRESSURE (in Hg):		29.56		29.56									
ORIFICE #	RUN #	K' FACTOR (AVG)	TESTED VACUUM (in Hg)	DGM READINGS (FT ³)		TEMPERATURES °F				ELAPSED TIME (MIN)	DGM ΔH (in H ₂ O)	(1) V _m (STD)	(2) V _{cr} (STD)	(3) Y	Y VARIATION (%)	ΔH _e			
				INITIAL	FINAL	AMBIENT	DGM INLET	DGM INLET	DGM OUTLET								DGM OUTLET	DGM AVG	
24	1	0.6583	15	28.204	33.360	64	67	67	66	66	66.5	2.35	5.1393	5.1020	0.993		1.82		
	2	0.6583	15	33.360	38.525	64	67	68	66	66	66.75	2.35	5.1458	5.1020	0.991		1.82		
	3	0.6583	15	38.525	43.693	64	68	68	66	67	67.25	2.35	5.1439	5.1020	0.992		1.82		
19	1	0.5066	18	11.903	17.241	64	69	68	65	66	67	1.40	5.3032	5.2351	0.987		1.83		
	2	0.5066	18	17.241	22.590	64	68	67	66	66	66.75	1.40	5.3166	5.2351	0.985		1.83		
	3	0.5066	18	22.590	27.934	64	67	67	66	66	66.5	1.40	5.3142	5.2351	0.985		1.83		
	1										0								
	2										0								
	3										0								
												AVG =		0.989					
												AVG =		0.986					
												AVG =		0.986					

USING THE CRITICAL ORIFICES AS CALIBRATION STANDARDS:

The following equations are used to calculate the standard volumes of air passed through the DGM, V_m (std), and the critical orifice, V_{cr} (std), and the DGM calibration factor, Y. These equations are automatically calculated in the spreadsheet above.

$$(1) \quad V_{m(std)} = K_1 * V_m * \frac{P_{bar} + (\Delta H / 13.6)}{T_m} = \text{Net volume of gas sample passed through DGM, corrected to standard conditions}$$

K₁ = 17.64 °R/in. Hg (English), 0.3858 °K/mm Hg (Metric)
T_m = Absolute DGM avg. temperature (°R - English, °K - Metric)

$$(2) \quad V_{cr(std)} = K' * \frac{P_{bar} * \Theta}{\sqrt{T_{amb}}} = \text{Volume of gas sample passed through the critical orifice, corrected to standard conditions}$$

T_{amb} = Absolute ambient temperature (°R - English, °K - Metric)

$$(3) \quad Y = \frac{V_{cr(std)}}{V_{m(std)}} = \text{DGM calibration factor}$$

K' = Average K' factor from Critical Orifice Calibration

AVERAGE DRY GAS METER CALIBRATION FACTOR, Y = **0.989**

AVERAGE ΔH_e = **1.82**

$$\Delta H_e = \left(\frac{0.75 \theta}{V_{cr(std)}} \right)^2 \Delta H \left(\frac{V_m(std)}{V_m} \right)$$

**CALIBRATION DATA
PITOT TUBE CALIBRATION DATA**

Date: 11/06/06
I.D. # ASAI 1-1
C_{pstd}: 0.990

Time: 14:40
T_s: 70 °F
Pb: 29.62 " Hg

fps Mark	Desired Calibration Standard	Calibration Standard		v Standard Average	High	v High	Cal. Factor	Low	v Low	Cal. Factor
		Start	End							
20	0.09	0.09	0.09	0.300	0.13	0.361	0.824	0.13	0.361	0.824
30	0.20	0.20	0.20	0.447	0.29	0.539	0.822	0.29	0.539	0.822
40	0.36	0.36	0.36	0.600	0.52	0.721	0.824	0.52	0.721	0.824
50	0.56	0.56	0.56	0.748	0.82	0.906	0.818	0.81	0.900	0.823
60	0.81	0.80	0.80	0.894	1.15	1.072	0.826	1.15	1.072	0.826
70	1.10	1.10	1.10	1.049	1.60	1.265	0.821	1.60	1.265	0.821
80	1.44	1.40	1.40	1.183	2.00	1.414	0.828	2.00	1.414	0.828
90	1.83	1.80	1.80	1.342	2.60	1.612	0.824	2.60	1.612	0.824
50	0.56	0.56	0.56	0.748	0.82	0.906	0.818	0.81	0.900	0.823
50	0.56	0.56	0.56	0.748	0.82	0.906	0.818	0.81	0.900	0.823
Average							0.823			0.824

Summary of Results:

Normal high side calibration factor: 0.823
 variation +: 0.61%
 variation -: -0.61%
 Normal low side calibration factor: 0.824
 variation +: 0.49%
 variation -: -0.36%

Certification:

I certify that the Type S pitot tube, the standard type pitot tube, and the calibration setup meet or exceed all specifications, criteria and/or applicable design features and hereby assign a pitot tube calibration factor C_p of: 0.823

Certified by:

Patrick Selakovich 11/06/06

Calibrator (Signature/Date)

Bill Hefley 11/06/06

QA Officer (Signature/Date)

Calibration Data
Barometer Calibration Data

Date:	10/13/2006	Time:	1640
I.D. #:	ASAI – 1	Temperature:	73

Mercury Barometer ASAI – 0 Reading:	29.74" Hg
Aneroid Barometer Reading:	29.71" Hg
Difference:	0.03" Hg
Barometer Adjusted?	YES

Certified by:	<i>Bill Hefley 10/13/06</i>	<i>Billy J. Mallins, Jr. 10/13/06</i>
	Calibrator (Signature/Date)	QA Officer (Signature/Date)

Appendix D:
EPA Test Methods 2, 3, and 4 Field Data

06-054

Job Number

ADA-ES

Job Name

UNIT NO. 2 STACK

Run Number

9/28/06

Unit

GOWAN/JACKSON

Date

Meter Box No. (1-1)

Operator

Sample Box No. 1-1

P_mΔP_s

Pilot Leak Check Initial

Purge to:

Purge time:

Pilot Leak Check Initial

Final

Read and record at the start of each test point.

Moisture / Velocity Field Data

Ambient Temp. °F

Assumed Moisture %

Probe Length

C Factor

Initial Leak @ 15.0" Hg = 0.002 cfm

Final Leak @ 3.5" Hg = 0.000 cfm

to reference

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Point	Clock Time	Dry Gas Meter, CF	"Pilot" H ₂ O	Orifice ΔH H ₂ O Desired	Orifice ΔH H ₂ O Actual	Pump Vacuum "Hg Gauge	Stack Temp °F	Probe Temp °F	Oven Temp °F	Effluent Temp °F	Dry Gas Temp. °F Inlet	Dry Gas Temp. °F Outlet	Remarks
D2	1109	61.136	1.95	2.00	2.00	0.50	328	259	260	60	63	61	C3 1109-
	1114	65.00	2.00	2.00	2.00	0.50	328	264	258	60	64	61	C2
	1119	68.935	2.00	2.00	2.00	0.50	330	266	258	56	66	61	C1
	1124	72.700	—	2.00	2.00	0.50	—	267	258	55	67	62	
	1129	76.47	2.00	2.00	2.00	0.50	326	267	256	56	69	63	B3
	1134	80.315	2.00	2.00	2.00	0.50	330	269	260	58	69	63	B2
	1139	84.172	2.00	—	—	—	334	—	—	—	—	—	B1
	END		—				—						
			2.05				331						A3
			2.00				332						A2
			2.00				332						A1
			—				—						
			2.00				329						D3
			2.10				331						D2
			2.05				332						D1
	1148		—				—						
	END												

Pilot Tube Calibration Factor C, 0.825

Volume Collected V_m 22.690 ft³Water Collected V_w 46.4 mlTime of Test T_i 30 min.Stack Pressure P_s -0.90 "H₂O

Pilot Tube No. 1-1

Baro. Press. P_b 29.76 "HgProbe Tip Dia. D_p — in.% CO₂ 6.7 % CO 0.0% O₂ 6.3 % N₂ 81.0Area Stack A_s 28104 in²

Barometer No. 1

Total Volume of Leak Checks After Start: 0.000 ft³V_m X Dry Gas Meter Calibration Factor 0.985 X 23.036[Dry Gas Meter Reading — ft³ - (T_i — min. X Leak Rate — cfm)]

Barometer No. 1

Probe Tip No. NA

Total Volume of Leak Checks After Start: 0.000 ft³V_m X Dry Gas Meter Calibration Factor 0.985 X 23.036[Dry Gas Meter Reading — ft³ - (T_i — min. X Leak Rate — cfm)]

Impinger Box No. 1-1

		<u>Water Weight Gain</u>	
Impinger 1	Final Weight <u>752.4</u>	Impinger 1	<u>26.5</u>
	Initial Weight <u>725.9</u>	Impinger 2	<u>7.3</u>
	Increase	Impinger 3	<u>2.7</u>
Impinger 2	Final Weight <u>734.9</u>	Impinger 4	<u>9.9</u>
	Initial Weight <u>727.6</u>	Impinger 5	
	Increase	Impinger 6	
Impinger 3	Final Weight <u>632.8</u>	Impinger 7	
	Initial Weight <u>630.1</u>	Total	<u>46.4</u> = V_w
	Increase		
Impinger 4	Final Weight <u>976.5</u>		
	Initial Weight <u>966.6</u>		
	Increase		

Impinger 5	Final Weight	<u> </u>	$P_b = \frac{29.76}{\text{✓}}$	$\%CO_2 = \frac{12.7}{\text{✓}}$
	Initial Weight	<u> </u>	$V_m = \frac{22.690}{\text{✓}}$	$\%O_2 = \frac{6.3}{\text{✓}}$
	Increase	<u> </u>	$V_w = \frac{46.4}{\text{✓}}$	$\%CO = \frac{0.0}{\text{✓}}$
Impinger 6	Final Weight	<u> </u>	$P_m = \frac{2.000}{\text{✓}}$	$\%N_2 = \frac{81.0}{\text{✓}}$
	Initial Weight	<u> </u>	$Avg \Delta P = \frac{2.013}{\text{✓}}$	$A_s = \frac{28,104}{\text{✓}}$
	Increase	<u> </u>	$Avg \sqrt{\Delta P} = \frac{1.419}{\text{✓}}$	$D_n = \frac{\quad}{\text{✓}}$
Impinger 7	Final Weight	<u> </u>	$C_p = \frac{0.825}{\text{✓}}$	$T_i = \frac{30}{\text{✓}}$
	Initial Weight	<u> </u>	$P_s = \frac{0.90}{\text{✓}}$	$T_s = \frac{79.69}{\text{✓}}$
	Increase	<u> </u>	$T_m = \frac{64}{\text{✓}}$	$T_s = \frac{524}{\text{✓}}$
			$T_s = \frac{330}{\text{✓}}$	$T_s = \frac{790}{\text{✓}}$

Moisture Content: $\%M = \underline{8.74}$ $M_d = \underline{0.9126}$ $MW_c = \underline{30.284}$ $MW = \underline{29.21}$

$$Vm_{std} = 17.65 Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460} \right] = 17.65 \times 22.690 \left[\frac{29.76 + \frac{2.00}{13.6}}{64 + 460} \right] = \frac{22.857}{0.762} \frac{\text{scf}}{\text{scfm}}$$

$$VW_{gas} = 0.0472 \times V_w = 0.0472 \times \underline{46.4} = \underline{2.190} \text{ scf}$$

$$\% \text{ Moisture} = \frac{VW_{gas}}{Vm_{std} + VW_{gas}} \times 100 = \frac{2.190}{22.857 + 2.190} \times 100 = \underline{8.74} \%$$

$$V_s = 5123.8 \times \frac{0.825}{\sqrt{29.69 \times 29.21}} \times \frac{1.419}{\sqrt{790}} = \underline{5725} \text{ fpm}$$

$$\%I = \frac{1.039 \times \quad \times \quad \times \quad \times \quad}{\quad \times \quad \times \quad \times \quad \times \quad} = \underline{\quad} \%$$

ACFM: 1117318

SCFM: 678754

%EA: 41.5

PRELIMINARY VELOCITY TRAVERSE DATA
AND
SAMPLING LOCATION DATA

Job Number 06-054

Job Name ADA-ES

Sampling Location UNIT NO. 2 STACK

Date 9/26/06 Time 1109-1148

Stack Height 317 ft.

Sampling Port Height Above Ground 272' 11" ft.

	Port A	Port B	Port C	Port D	Average
Port & Inside Diameter (in.)	237.665	236.915	219.54	222.79	229.2275
Port & Wall Thickness (in.)	49.75	46.5	31.625	32.375	40.0625
Inside Stack Diameter (in.)	187.915	190.415	187.915	190.415	189.165

Sampling Ports are 157 ft. 3 in.

9.98 stack diameters) downstream from disturbance
(inlet, constriction, bend, expansion)

Sampling Ports are 84 ft. 1 in.

5.33 stack diameters) upstream from disturbance
(outlet, constriction, bend, expansion)

Point Number	Percent Diameter	Distance from Ref. Point (decimal in.)	Distance from Ref. Point (fractional in.)	Port A $\Delta P/T/\alpha$	Port B $\Delta P/T/\alpha$	Port C $\Delta P/T/\alpha$	Port D $\Delta P/T/\alpha$
1	4.4	8.323	8 5/16	2.00332+7	2.001331-3	2.008301 0	2.058321 0
2	14.6	27.618	27 5/8	2.003321 0	2.003301+3	2.001281 5	2.101331+7
3	29.6	55.993	56	2.058391+5	2.003361+5	1.958241-2	2.003291+3
4				1 1	1 1	1 1	1 1
5				1 1	1 1	1 1	1 1
6	3.2	6.053	6 1/16	1 1	1 1	1 1	1 1
7	10.5	19.862	19 7/8	1 1	1 1	1 1	1 1
8	19.4	36.698	36 11/16	1 1	1 1	1 1	1 1
9	32.3	61.100	61 1/8	1 1	1 1	1 1	1 1
10				1 1	1 1	1 1	1 1
11				1 1	1 1	1 1	1 1
12				1 1	1 1	1 1	1 1
13				1 1	1 1	1 1	1 1
14				1 1	1 1	1 1	1 1
15				1 1	1 1	1 1	1 1
16				1 1	1 1	1 1	1 1
17				1 1	1 1	1 1	1 1
18				1 1	1 1	1 1	1 1
19				1 1	1 1	1 1	1 1
20				1 1	1 1	1 1	1 1
21				1 1	1 1	1 1	1 1
22				1 1	1 1	1 1	1 1
23				1 1	1 1	1 1	1 1
24				1 1	1 1	1 1	1 1

Pitot Tube No. 1-1

$C_p = 0.825$
 $P_b = 29.76$ "Hg
 $P_s = -0.90$ "H₂O 29.69 "Hg
 $A_s = 28.04$ in.²

Average ΔP 2.013 ✓
 Average $\Delta P^{1/2}$ 1.419 ✓
 Average T_x 330 °F ✓
 Average α 3.33 degrees ✓

$$C = 2\pi r$$

$$r = \frac{C}{2\pi}$$

$$r = 134.645$$

Outside
Circumference

AB	211 1/2
BC	211 1/2
CD	211 1/2
DA	211 1/2

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	PORT		
33 A	39 1/4	6 1/4	16 3/4
29.825 B	36 1/8	6 1/4	16 8/8
14.5 C	19 7/8	5 3/8	17 1/8
15.875 D	22 8/8	6 3/4	16 1/2

$$AC = \frac{39.25 + 19.875}{2} = 29.5625$$

$$BD = \frac{36.125 + 22.625}{2} = 29.375$$

A	B	C	D
36.125	19.875	22.625	
16.625	17.125	16.5	
- 6.25	- 5.375	6.75	
10.375	11.75	9.75	
+ 36.125	+ 19.875	+ 22.625	
46.5	31.625	32.375	10.540

$$269.29 - (2 \cdot 29.5625) = 362.89$$

$$423 - (2 \cdot 29.375) = 364.25$$

$$\bar{X} = 364.0625$$

$$AC (49.75 + 31.625) = 187.915$$

$$BD (46.5 + 32.375) = 190.415$$

$$OD = 269.29 \times 189.165 = 50952.9$$

$$A_s = \pi \sqrt{\frac{189.165}{2}}^2$$

$$= \pi (104.5825)^2$$

$$= 34104 \text{ in}^2$$

Impinger Box No. 1-1

Impinger 1	Final Weight	<u>785.8</u>	<u>Water Weight Gain</u> 9/20/06	Impinger 1	<u>26.0</u>
	Initial Weight	<u>759.8</u>			
	Increase	26.0			
Impinger 2	Final Weight	<u>761.6</u>	9/20/06	Impinger 2	<u>1.6</u>
	Initial Weight	<u>760.0</u>			
	Increase	1.6			
Impinger 3	Final Weight	<u>633.0</u>	$V_w =$ $g SO_2 =$ $V_w =$	Impinger 3	<u>0.2</u>
	Initial Weight	<u>632.8</u>			
	Increase	0.2			
Impinger 4	Final Weight	<u>980.7</u>		Impinger 4	<u>4.2</u>
	Initial Weight	<u>976.5</u>			
	Increase	4.2			
Total					<u>32.0</u> = V_w

Impinger 5	Final Weight	_____	$P_b =$ <u>29.80</u> ✓	$\%CO_2 =$ <u>13.0</u> ✓
	Initial Weight	_____	$V_m =$ <u>22.100</u> ✓	$\%O_2 =$ <u>5.3</u> ✓
	Increase	_____	$V_w =$ <u>32.0</u> ✓	$\%CO =$ <u>0.0</u> ✓
Impinger 6	Final Weight	_____	$P_m =$ <u>1.900</u> ✓	$\%N_2 =$ <u>81.7</u> ✓
	Initial Weight	_____	Avg $\Delta P =$ _____	$A_n =$ _____
	Increase	_____	Avg $\sqrt{\Delta P} =$ _____	$D_n =$ _____
Impinger 7	Final Weight	_____	$C_p =$ <u>0.825</u>	$T_i =$ <u>30</u> ✓
	Initial Weight	_____	$P_s =$ _____	
	Increase	_____	$T_m =$ <u>73</u> ✓ °F	$T_s =$ _____ °F

Moisture Content: $\%M =$ 6.45 ✓ $M_d =$ 0.9355 ✓ $MW_c =$ 30292 ✓ $MW =$ 29.50 ✓

$$Vm_{std} = 17.65 Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460} \right] = 17.65 \times 22.100 \left[\frac{29.80 + \frac{1.900}{13.6}}{73 + 460} \right] = \frac{24.911}{0.730} \frac{sft^3}{scfm}$$

$$V_{w_{gas}} = 0.0472 \times V_w = 0.0472 \times 32.0 = 1.510 \text{ sft}^3$$

$$\% \text{ Moisture} = \frac{V_{w_{gas}}}{Vm_{std} + V_{w_{gas}}} \times 100 = \frac{1.510}{24.911 + 1.510} \times 100 = 6.45\% \text{ ✓}$$

$$V_s = 5123.8 \times 0.825 \times \frac{1}{x} \times \frac{1}{x} = \text{_____ tpm}$$

$$\%I = \frac{1.039 \times x}{x \times x \times x \times x} = \text{_____ \%}$$

ACFM: _____

SCFM: _____

$\%EA:$ 32.4 ✓

PRELIMINARY VELOCITY TRAVERSE DATA
AND
SAMPLING LOCATION DATA

Job Number 06-054

Job Name ADA-ES

Sampling Location STACK INLET

Date 9/26/06 Time 1530 - 1736
9/28/06

Stack Height _____ ft.

Sampling Port Height Above Ground _____ ft.

	Port A	Port B	Port C	Port D	Average
Port & Inside Diameter (in.)					
Port & Wall Thickness (in.)	<u>30 3/8</u>	<u>30 1/2</u>	<u>28 1/4</u>	<u>19 3/8</u>	
Inside Stack Diameter (in.)	<u>300</u>	<u>300</u>	<u>300</u>	<u>300</u>	

Sampling Ports are _____ ft. _____ in.

(_____ stack diameters) downstream from disturbance
(inlet, constriction, bend, expansion)

Sampling Ports are _____ ft. _____ in.

(_____ stack diameters) upstream from disturbance
(outlet, constriction, bend, expansion)

Point Number	Percent Diameter	Distance from Ref. Point (decimal in.)	Distance from Ref. Point (fractional in.)	1730 Port A $\Delta P/T, \alpha$	1610 Port B $\Delta P/T, \alpha$	1625 Port C $\Delta P/T, \alpha$	1530 Port D $\Delta P/T, \alpha$
1		30		0.75 B37 10	1.25 B35 10	1.40 B36 15	0.99 B31 B
2		90		0.74 B36 15	0.83 B36 15	0.85 B35 15	1.25 B36 18
3		150		0.65 B34 15	0.71 B35 10	0.54 B39 20	1.30 B37 10
4		210		0.40 B32 20	0.71 B33 15	0.59 B33 20	1.10 B32 15
5		270		0.59 B20 15	0.77 B25 8	0.50 B22 10	X 1 1
6				1 1	1 1	1 1	1 1
7				1 1	1 1	1 1	1 1
8				1 1	1 1	1 1	1 1
9				1 1	1 1	1 1	1 1
10				1 1	1 1	1 1	1 1
11				1 1	1 1	1 1	1 1
12				1 1	1 1	1 1	1 1
13				1 1	1 1	1 1	1 1
14				1 1	1 1	1 1	1 1
15				1 1	1 1	1 1	1 1
16				1 1	1 1	1 1	1 1
17				1 1	1 1	1 1	1 1
18				1 1	1 1	1 1	1 1
19				1 1	1 1	1 1	1 1
20				1 1	1 1	1 1	1 1
21				1 1	1 1	1 1	1 1
22				1 1	1 1	1 1	1 1
23				1 1	1 1	1 1	1 1
24				1 1	1 1	1 1	1 1

Pitot Tube No. 1-1

$C_p =$ 0.825

$P_b =$ 29.80 "Hg

$P_a =$ +3.00 "H₂O 30.02 "Hg

$A_s =$ _____ in.²

Average ΔP 0.817

Average $\Delta P^{1/2}$ 0.889

Average T_x 333 °F

Average α 12 degrees

X = unable to mark point

ports located
in transition
zone
depth = 25' for
all

Impinger Box No. 1-1

Impinger 1	Final Weight	<u>823.1</u>
	Initial Weight	<u>785.8</u>
	Increase	<u>37.3</u>
Impinger 2	Final Weight	<u>764.0</u>
	Initial Weight	<u>761.3</u>
	Increase	<u>2.7</u>
Impinger 3	Final Weight	<u>634.1</u>
	Initial Weight	<u>633.0</u>
	Increase	<u>1.1</u>
Impinger 4	Final Weight	<u>986.1</u>
	Initial Weight	<u>980.3</u>
	Increase	<u>5.8</u>

Water Weight Gain

Impinger 1	<u>37.3</u>
Impinger 2	<u>2.7</u>
Impinger 3	<u>1.1</u>
Impinger 4	<u>5.8</u>
Impinger 5	_____
Impinger 6	_____
Impinger 7	_____
Total	<u>46.9</u> = V_w

Impinger 5	Final Weight	_____
	Initial Weight	_____
	Increase	_____
Impinger 6	Final Weight	_____
	Initial Weight	_____
	Increase	_____
Impinger 7	Final Weight	_____
	Initial Weight	_____
	Increase	_____

$V_w =$ _____
 $g\ SO_2 =$ _____
 $V_w =$ _____
 $P_b =$ 29.61 ✓
 $V_m =$ 21.971 ✓
 $V_w =$ 46.9 ✓
 $P_m =$ 1.900 ✓
 $Avg\ \Delta P =$ _____
 $Avg\ \sqrt{\Delta P} =$ _____
 $C_p =$ _____
 $P_s =$ _____
 $T_m =$ 65 °F ✓
 $T_s =$ _____ °F
 $\%CO_2 =$ 14.3 ✓
 $\%O_2 =$ 4.7 ✓
 $\%CO =$ 0.0 ✓
 $\%N_2 =$ 81.0 ✓
 $A_s =$ _____
 $D_n =$ _____
 $T_t =$ 30 ✓
 $P_s =$ _____ °H₂O
 $T_m =$ 65 °F ✓
 $T_s =$ _____ °F
 $\%Hg =$ 525 ✓
 $\%R =$ _____
 $\%R =$ _____

Moisture Content:

$\%M =$ 9.15 ✓
 $M_d =$ 0.9085 ✓
 $MW_c =$ 30.476 ✓
 $MW =$ 29.33 ✓

$$Vm_{std} = 17.65 \ Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460} \right] = 17.65 \times 21.971 \left[\frac{29.61 + \frac{1.900}{13.6}}{65 + 460} \right] = \frac{21.974}{0.732} \frac{sft^3}{scfm}$$

$$V_{w_{gas}} = 0.0472 \times V_w = 0.0472 \times 46.9 = 2.214 \frac{sft^3}{scfm}$$

$$\% \text{ Moisture} = \frac{V_{w_{gas}}}{Vm_{std} + V_{w_{gas}}} \times 100 = \frac{2.214}{2.214 + 21.974} \times 100 = 9.15 \%$$

$$V_s = 5123.8 \times \frac{V_{w_{gas}}}{V_{w_{gas}} + Vm_{std}} \times \frac{1}{\sqrt{\frac{P_s}{P_b}}} = \text{_____} \text{ fpm}$$

ACFM: _____

SCFM: _____

$$\%I = \frac{1.039 \times \text{_____} \times \text{_____} \times \text{_____}}{\text{_____}^2} = \text{_____} \%$$

$\%EA =$ 28.0 ✓

PRELIMINARY VELOCITY TRAVERSE DATA
AND
SAMPLING LOCATION DATA

Job Number 06-054

Job Name ADA-ES

Sampling Location MID INLET DUCT TO SUPP. ESP

Date 9/26/06 Time 0940-1000

9/29/06

Stack Height _____ ft.

Sampling Port Height Above Ground _____ ft.

	Port A	Port B	Port C	Port D	Average
Port & Inside Diameter (in.)					
Port & Wall Thickness (in.)	<u>34 1/2</u>	<u>36 1/4</u>	<u>36 1/2</u>	<u>36 3/4</u>	
Inside Stack Diameter (in.)	<u>300</u>	<u>300</u>	<u>300</u>	<u>300</u>	<u>300</u>

Sampling Ports are _____ ft. _____ in.

(_____ stack diameters) downstream from disturbance
(inlet, constriction, bend, expansion)

Sampling Ports are _____ ft. _____ in.

(_____ stack diameters) upstream from disturbance
(outlet, constriction, bend, expansion)

Point Number	Percent Diameter	Distance from Ref. Point (decimal in.)	Distance from Ref. Point (fractional in.)	0940 Port A $\Delta P/T, \alpha$	0950 Port B $\Delta P/T, \alpha$	0958 Port C $\Delta P/T, \alpha$	1008 Port D $\Delta P/T, \alpha$
1		30		0.483510	0.483515	0.4834610	0.683530
2		90		0.883485	0.8834915	0.8034610	0.913425
3		150		0.863515	0.9534610	0.8534415	1.053395
4		210		0.4133510	0.6633210	0.6733510	0.8533110
5		270		0.3735010	0.3935010	0.5732910	0.6532210
6				8324	8339		
7				11	11	11	11
8				11	11	11	11
9				11	11	11	11
10				11	11	11	11
11				11	11	11	11
12				11	11	11	11
13				11	11	11	11
14				11	11	11	11
15				11	11	11	11
16				11	11	11	11
17				11	11	11	11
18				11	11	11	11
19				11	11	11	11
20				11	11	11	11
21				11	11	11	11
22				11	11	11	11
23				11	11	11	11
24				11	11	11	11

Pitot Tube No. 1-1

$C_p =$ 0.825

$P_b =$ 29.61 "Hg

$P_a =$ +3.70 "H₂O 29.88 "Hg

$A_s =$ _____ in.²

Average ΔP 0.692

Average $\Delta P^{1/2}$ 0.822

Average T_x 340 °F

Average α 6 degrees

CO₂ 13.7

O₂ 4.7

N₂ 81.6

MWD = 30.38

PRELIMINARY VELOCITY TRAVERSE DATA
AND
SAMPLING LOCATION DATA

Job Number 06-054

Job Name ADA-ES

Sampling Location OUTLET FROM ORIGINAL ESP

Date 9/29/06 Time 1100 - 1400

Stack Height _____ ft.

Sampling Port Height Above Ground _____ ft.

	Port A	B	Port C	D	Port E	F	Port G	H	Average
Port & Inside Diameter (in.)	332 1/2	332 1/2	337	330 1/4	332 3/8	340 1/2	340	340 5/8	335.5625
Port & Wall Thickness (in.)	32 1/2	32 3/4	32 3/8	32 1/4	32 3/8	40 1/2	40	40 5/8	35.5625
Inside Stack Diameter (in.)	300	300	300	300	300	300	300	300	300

Sampling Ports are _____ ft. _____ in.

(_____ stack diameters) downstream from disturbance
(inlet, constriction, bend, expansion)

Sampling Ports are _____ ft. _____ in.

(_____ stack diameters) upstream from disturbance
(outlet, constriction, bend, expansion)

Point Number	Percent Diameter	Distance from Ref. Point (decimal in.)	Distance from Ref. Point (fractional in.)	1120 Port A $\Delta P/T_x/\alpha$	1133 Port B $\Delta P/T_x/\alpha$	1142 Port C $\Delta P/T_x/\alpha$	1150 Port D $\Delta P/T_x/\alpha$
1		30"		0.073480	0.0333610	0.0633510	0.0732430
2		90"		0.0934715	0.123520	0.0333610	0.06323150
3		150"		0.053470	0.0113510	0.0733510	0.11323140
4		210"		0.0634710	0.073490	0.0432510	0.12314140
5		270"		0.053220	0.1034510	0.0334910	0.14301110
6				1112	111	111	111
7				111	111	111	111
8				111	111	111	111
9				13101	1330	1343	1350
10				PORT E	PORT F	PORT G	PORT H
11		30		0.0530225	0.0332610	0.023650	---
12		90		0.0533435	0.1113275	0.1036510	---
13		150		0.0733110	0.1232515	0.0933215	0.05362
14		210		0.1130810	0.0732410	0.0834210	0.08357
15		270		0.1429410	0.0630215	0.0733510	0.0533610
16				111	111	111	111
17				111	111	111	111
18				111	111	111	111
19				111	111	111	111
20				111	111	111	111
21				111	111	111	111
22				111	111	111	111
23				111	111	111	111
24				111	111	111	111

Pitot Tube No. 1-1
 $C_p = 0.025$
 $P_b = 29.54$ "Hg
 $P_s = +3.20$ "H₂O 29.78 "Hg
 $A_s = 320,400$ in.²

Average ΔP 0.072 X = unable to traverse
Average $\Delta P^{1/2}$ 0.260 CO₂ 13.0
Average T_x 334 °F O₂ 6.0
Average α 7 degrees N₂ 81.0
MWA = 30.32

PRELIMINARY VELOCITY TRAVERSE DATA
AND
SAMPLING LOCATION DATA

Job Number 06-054

Job Name ADA-ES

Sampling Location INLET TO SUPP. ESP

Date 7/26/06 Time 1800-1910
9/28/06

Stack Height _____ ft.

Sampling Port Height Above Ground _____ ft.

	Port A	Port B	Port C	Port D	Average
Port & Inside Diameter (in.)					
Port & Wall Thickness (in.)	<u>40 1/2</u>	<u>40 1/2</u>	<u>40 1/2</u>	<u>40 1/2</u>	
Inside Stack Diameter (in.)	<u>300</u>	<u>300</u>	<u>300</u>	<u>300</u>	

Sampling Ports are _____ ft. _____ in.

(_____ stack diameters) downstream from disturbance
(inlet, constriction, bend, expansion)

Sampling Ports are _____ ft. _____ in.

(_____ stack diameters) upstream from disturbance
(outlet, constriction, bend, expansion)

Point Number	Percent Diameter	Distance from Ref. Point (decimal in.)	Distance from Ref. Point (fractional in.)	1833 Port A $\Delta P/T/\alpha$	1800 Port B $\Delta P/T/\alpha$	1847 Port C $\Delta P/T/\alpha$	1859 Port D $\Delta P/T/\alpha$
1		30.000	30"	0.6733210	0.5533915	1.3033210	1.0533445
2		90.000	90"	0.39334310	0.8233615	1.35332915	1.85335110
3		150.000	150"	0.41334115	0.9133618	0.98332715	1.70336115
4		210.000	210"	0.32333915	0.82335115	1.60332918	1.65333215
5		270.000	270"	0.41333115	0.70332130	0.98331810	1.60333015
6				/ /	/ /	/ /	/ /
7				/ /	/ /	/ /	/ /
8				/ /	/ /	/ /	/ /
9				/ /	/ /	/ /	/ /
10				/ /	/ /	/ /	/ /
11				/ /	/ /	/ /	/ /
12				/ /	/ /	/ /	/ /
13				/ /	/ /	/ /	/ /
14				/ /	/ /	/ /	/ /
15				/ /	/ /	/ /	/ /
16				/ /	/ /	/ /	/ /
17				/ /	/ /	/ /	/ /
18				/ /	/ /	/ /	/ /
19				/ /	/ /	/ /	/ /
20				/ /	/ /	/ /	/ /
21				/ /	/ /	/ /	/ /
22				/ /	/ /	/ /	/ /
23				/ /	/ /	/ /	/ /
24				/ /	/ /	/ /	/ /

Pitot Tube No. 1-1
 $C_p =$ 0.825
 $P_b =$ 29.80 "Hg (24.61)
 $P_s =$ +3.50 "H₂O 30.02 "Hg
 $A_s =$ 90,000 in.² 43.200

Average ΔP 0.984
 Average $\Delta P^{1/2}$ 0.963
 Average T_x 335 °F
 Average α 13 degrees

4x5 grid
20pt.

Impinger Box No. 1-1

Impinger 1 Final Weight 836.2
 Initial Weight 822.7
 Increase

Impinger 2 Final Weight 766.1
 Initial Weight 763.5
 Increase

Impinger 3 Final Weight 635.6
 Initial Weight 633.7
 Increase

Impinger 4 Final Weight 990.1
 Initial Weight 983.5
 Increase

Impinger 5 Final Weight _____
 Initial Weight _____
 Increase

Impinger 6 Final Weight _____
 Initial Weight _____
 Increase

Impinger 7 Final Weight _____
 Initial Weight _____
 Increase

Water Weight Gain

Impinger 1 13.5

Impinger 2 2.6

Impinger 3 1.9

Impinger 4 6.6

Impinger 5 _____

Impinger 6 _____

Impinger 7 _____

Total 24.6 = V_w

$V_w =$
 $g\ SO_2 =$
 $V_w =$

$P_b = 29.54$
 $V_m = 22.623$
 $V_w = 24.6$
 $P_m = 1.900$

Avg $\Delta P =$

Avg $\sqrt{\Delta P} =$

$C_p =$
 $P_s = +5.80$
 $T_m = 80$
 $T_s =$

%CO₂ = 8.9
 %O₂ = 11.1
 %CO = 0.0
 %N₂ = 80.0
 $A_s =$
 $D_n =$
 $T_1 = 30$

29.97 °Hg
 _____ °R
 _____ °R

Moisture Content:

%M = 5.02 $M_d = 0.9498$ $MW_c = 29.868$ $MW = 29.27$

$$Vm_{std} = 17.65 \ Vm \left[\frac{P_b + \frac{P_m}{13.6}}{T_m + 460} \right] = 17.65 \times 22.623 \left[\frac{29.54 + \frac{1.900}{13.6}}{80 + 460} \right] = \frac{21.946}{0.732} \frac{sft^3}{scfm}$$

$$Vw_{gas} = 0.0472 \times Vw = 0.0472 \times 24.6 = 1.161 \text{ sft}^3$$

$$\% \text{ Moisture} = \frac{Vw_{gas}}{Vm_{std} + Vw_{gas}} \times 100 = \frac{1.161}{21.946 + 1.161} \times 100 = 5.02 \%$$

$$V_s = 5123.8 \times \frac{\sqrt{\quad}}{\quad} \times \quad = \quad \text{tpm}$$

ACFM: _____

SCFM: _____

$$\%I = \frac{1.039 \times \quad \times \quad \times \quad \times \quad}{\quad} = \quad \%$$

%EA: _____

PRELIMINARY VELOCITY TRAVERSE DATA
AND
SAMPLING LOCATION DATA

Job Number 06-054

Job Name ADA-ES

Sampling Location ESP "A" INLET / ~~ESP "B" INLET~~

Date 9/26/08 Time 1723-1800

9/29/08

Port & Inside Diameter (in.)

Port & Wall Thickness (in.)

Inside Stack Diameter (in.)

Port A	B	Port C	D	Port E	F	Port G	H	Average
87 3/4	X	87 3/4	X	87 3/4	X	87 3/4	X	
11 3/4	X	11 3/4	X	11 3/4	X	11 3/4	X	
76	X	76	X	76	X	76	X	

eq. diameter
128.033

Sampling Ports are 22 ft. 3 in.

2.09 stack diameters) downstream from disturbance
(inlet, constriction, bend, expansion)

Sampling Ports are 3 ft. 0 in.

0.28 stack diameters) upstream from disturbance
(outlet, constriction, bend, expansion)

Point Number	Percent Diameter	Distance from Ref. Point (decimal in.)	Distance from Ref. Point (fractional in.)	1723 Port A $\Delta P/T, \alpha$	Port B $\Delta P/T, \alpha$	1735 Port C $\Delta P/T, \alpha$	Port D $\Delta P/T, \alpha$
1		6.333	6 5/16	0.3934910	X	0.213680	X
2		19.000	19	0.4334710	X	0.4714625	X
3		31.667	31 1/16	0.3513425	X	0.0313600	X
4		44.333	44 5/16	0.3835410	X	0.2435115	X
5		57.000	57	0.5035910	X	0.4135710	X
6		69.667	69 1/16	0.7736410	X	0.4835310	X
7				1 1	1 1	1 1	1 1
8				1750	1 1	1755	1 1
9				Port E	Port F	Port G	Port H
10			6 5/16"	0.4613480	X	0.4613710	X
11			19	0.3933710	X	0.3213070	X
12			31 1/16	0.5633410	X	0.3633085	X
13			44 5/16	0.4833410	X	0.5033010	X
14			57	0.5334710	X	0.5633455	X
15			69 1/16	0.683445	X	0.7833420	X
16				1 1	1 1	1 1	1 1
17				1 1	1 1	1 1	1 1
18				1 1	1 1	1 1	1 1
19				1 1	1 1	1 1	1 1
20				1 1	1 1	1 1	1 1
21				1 1	1 1	1 1	1 1
22				1 1	1 1	1 1	1 1
23				1 1	1 1	1 1	1 1
24				1 1	1 1	1 1	1 1

Pitot Tube No. 1-1

$C_p =$ 0.825

$P_b =$ 29.54 "Hg

$P_s =$ +5.90 "H₂O 29.97 "Hg

$A_s =$ 30.856 in.²

Average ΔP 0.452

Average $\Delta P^{1/2}$ 0.658

Average T_x 344 °F

Average α 2 degrees

X - unable to access ports

PRELIMINARY VELOCITY TRAVERSE DATA
AND
SAMPLING LOCATION DATA

Job Number 06-054

Job Name ADA-ES

Sampling Location ESP "B" INLET DUCT

Date 9/26/06 Time 1805-1835

Stack Height _____ ft.

Sampling Port Height Above Ground _____ ft.

Port & Inside Diameter (in.)

Port & Wall Thickness (in.)

Inside Stack Diameter (in.)

Port A	B	Port C	D	Port E	F	Port G	H	Average
X	87 3/4	X	87 3/4	X	87 3/4	X	87 3/4	
X	11 3/4	X	11 3/4	X	11 3/4	X	11 3/4	
X	76	X	76	X	76	X	76	

Sampling Ports are 22 ft. 3 in.

(2.09 stack diameters) downstream from disturbance

(inlet, constriction, bend, expansion)

Sampling Ports are 3 ft. 0 in.

(0.281 stack diameters) upstream from disturbance

(outlet, constriction, bend, expansion)

Point Number	Percent Diameter	Distance from Ref. Point (decimal in.)	Distance from Ref. Point (fractional in.)	1805 Port A $\Delta P/T_s/\alpha$	Port B $\Delta P/T_s/\alpha$	Port C $\Delta P/T_s/\alpha$	1813 Port D $\Delta P/T_s/\alpha$
1		6.373	6 5/16	X	X	X	X
2		19.000	19	X	0.493061 0	X	X
3		31.667	31 11/16	X	0.4413031 0	X	0.421331.5
4		44.333	44 5/16	X	0.4413051 5	X	0.413351.5
5		57.000	57	X	0.5713081 5	X	0.433541 0
6		69.667	69 11/16	X	1.1013191 5	X	0.5613511 0
7				X	X	X	X
8				X	X	X	X
9				X	X	X	X
10				X	X	X	X
11			6 5/16	X	X	X	0.4213661 5
12			19	X	X	X	0.4913611 0
13			31 11/16	X	0.3113601 0	X	0.371368 5
14			44 5/16	X	0.4013651 0	X	0.401370 0
15			57	X	0.2513681 0	X	0.571368 5
16			69 11/16	X	0.4013601 10	X	0.7013601 5
17				X	X	X	X
18				X	X	X	X
19				X	X	X	X
20				X	X	X	X
21				X	X	X	X
22				X	X	X	X
23				X	X	X	X
24				X	X	X	X

Pitot Tube No. 1-1

$C_p = 0.825$
 $P_b = 29.54$ "Hg
 $P_s = +5.80$ "H₂O 29.97 "Hg
 $A_s = 30,856$ in.²

Average ΔP 0.471
Average $\Delta P^{1/2}$ 0.677
Average T_s 345 °F
Average α 3 degrees

X - unable to access port and/or point

$$\begin{bmatrix} A & B & C & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix} \quad \begin{matrix} \\ \\ A \text{ Input} \\ \\ \end{matrix}$$

$$\begin{bmatrix} A & B & C & D & E & F & G & H \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \quad \begin{matrix} \\ \\ B \text{ Input} \\ \\ \end{matrix}$$

2nd pot center

Sample ports are ~ 36" $\uparrow$ stream from X5000 zone
 Sample ports are ~ 26 7/8" $\downarrow$ stream from

Appendix E:
Proposed EPA Test Method 324 Field Data

APPENDIX K (PART 75 CAMR)

Plant/Source: Merrimack Station Power Plant Test Location: Unit #2 Stack (Bow, NH)Test ID: "A" Train Carbon Trap ID: OL ^{↓26221} A Train

Spiked At: _____

QA/QC Signature: _____

Sampled By: ASA1Sampling Console Ser# 1568 Cal. Factor: 1.006

Test Start

(Date/Time): 9/28/06 1117

Leak Check

Pass/Fail 0.000

Test End

(Date/Time) 9/28/06 1217

Leak Check

Pass/Fail 0.000

Date	Time	STACK	INLET/OUTLET	Flow Rate ($\frac{\text{L}}{\text{min}}$)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
		DUCT Temp (°F or °C)	Meter Temp (°F or °C)				
9/28/06	1117	163	16/16	0.35	8420.311		DGM Pressure: 5.2"
9/28/06	1217	163	21/21	0.33		8439.165	SAMPLE VACUUM: 23" Hg
						18.854	PROBE: 162°C FILTER: 167°C
Total/Average							

Chain of Custody

Relinquished by: <u>Peter S. [Signature]</u>	Date: <u>9/28/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

For Analysis contact us at 330-405-0837

Ohio Lumex Co., Inc. 9263 Ravenna Road Unit A-3, Twinsburg, OH 44087 USA

330-405-0837 Fax 330-405-0847 US Toll Free: 888-876-2611

APPENDIX K (PART 75 CAMR)

Plant/Source: Manumach Station Power Plant Test Location: Unit #2 Stack (Bow, NH)Test ID: "B" Train Carbon Trap ID: OL ^{↓26222 B Train}Spiked At: _____ QA/QC Signature: "g"Sampled By: ASA1 Sampling Console Ser# 1567 Cal. Factor: 0.989Test Start (Date/Time): 9/28/06 1117 Leak Check Pass/Fail 0.000 Test End (Date/Time): 9/28/06 1217 Leak Check Pass/Fail 0.000

Date	Time	STACK	INLET/OUTLET	Flow Rate (cc/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
		DUCT Temp (°F or °C)	Meter Temp (°F or °C)				
9/28/06	1117	163	14/14	0.34	5449.872		DGM Pressure: 5.4"
9/28/06	1217	163	19/18	0.32		5469.388	SAMPLE VACUUM: 22.5" Hg
						19.516	PROBE: 162°C FILTER: 167°C

Total/Average							
---------------	--	--	--	--	--	--	--

Chain of Custody

Relinquished by: <u>Patricia Schell</u>	Date: <u>9/28/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

For Analysis contact us at 330-405-0837
Ohio Lumex Co., Inc. 9263 Ravenna Road Unit A-3, Twinsburg, OH 44087 USA
330-405-0837 Fax 330-405-0847 US Toll Free: 888-876-2611

APPENDIX K (PART 75 CAMR)

Plant/Source: Merrimack Station Power Plant Test Location: STACK INLET "D" (Bow, NH)
FROM SUP. ESP
Test ID: "A" Train Carbon Trap ID: OL ↓26223 "A" TRAIN

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASA1 Sampling Console Ser# 1568 (Cal.: 1.006)

Test Start (Date/Time): 9/28/06 1546 Leak Check Pass/Fail 0.000 Test End (Date/Time): 9/28/06 1646 Leak Check Pass/Fail 0.000

INLET/OUTLET							
Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (cc/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/28/06	1546	166	21/21	0.40	8446.390	-	DGM PRESSURE: 5.7" SAMPLE VAC: 22.5" Hg
9/28/06	1646	167	22/22	0.38	-	8468.179	DGM PRESSURE: 5.6" SAMPLE VAC: 22" Hg
						21.789	PROBE: 164°C FILTER: 170°C

Total/Average							
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Chain of Custody

Relinquished by: <u>Peter Selig</u>	Date: <u>9/28/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

For Analysis contact us at 330-405-0837

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APPENDIX K (PART 75 CAMR)

Plant/Source: Morningstar Station Power Plant Test Location: STACK INLET "D" (BOW, NH)
FROM SUP. ESP ↓26224 "B" TRAIN
Test ID: "B" Train Carbon Trap ID: OL

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASA1 Sampling Console Ser# 1567 (Cal.: 0.989)

Test Start (Date/Time): 9/28/06 1546 Leak Check Pass/Fail 0.000 Test End (Date/Time): 9/28/06 1646 Leak Check Pass/Fail 0.000

		INLET/OUTLET					
Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (sc/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/28/06	1546	166	19/19	0.27	5476.230	-	DGM PRESSURE: 4.5" SAMPLE VAC: 23" P6
9/28/06	1646	167	20/20	0.25	-	5491.390	DGM PRESSURE: 4.4" SAMPLE VAC: 23" P6
						15.160	

Total/Average						
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Chain of Custody

Relinquished by: <u>Peter Selbach</u>	Date: <u>9/28/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR)

Plant/Source: Municipal Station Power Plant Test Location: STACK Duct "B" FROM SUPP. BSP ^{INLET}Test ID: "A" Train Carbon Trap ID: OL ↓26225

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASA1 Sampling Console Ser# 1568 (Cal.: 1.006)Test Start (Date/Time): 9/28/06 1721 Leak Check Pass/Fail 0.000 Test End (Date/Time): 9/28/06 1821 Leak Check Pass/Fail 0.000

Date	Time	DUCT Temp (°F or °C)	INLET/OUTLET		Flow Rate (L/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
			Meter Temp (°F or °C)					
9/28/06	1721	166	22/23		0.38	8470.579	—	DGM PRESS: 5.6 SAMP. VAC: 23"
9/28/06	1821	166	22/22		0.38	—	8491.701	DGM PRESS: 5.6 SAMP. VAC: 22.5"
							21.122	PROBE: 164°C FILTER: 170°C
Total/Average								

Chain of Custody

Relinquished by: <u>Patricia Selch</u>	Date: <u>9/28/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR)

Plant/Source: Merrimack Station Power Plant Test Location: STACK INLET DUCT "B" FROM SUPP. ESPTest ID: "B" TRAIN Carbon Trap ID: OL ↓26226

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASA1 Sampling Console Ser# 1567 (CAL 0.989)Test Start (Date/Time): 9/28/06 1721 Leak Check (Pass/Fail) 0.000 Test End (Date/Time): 9/28/06 1821 Leak Check (Pass/Fail) 0.000

INLET/OUTLET							
Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (cc/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/28/06	1721	166	21/21	0.35	5492.878	—	DGM PRESS: 15.5" SAMP. VAC: 22.5"
9/28/06	1821	166	20/20	0.34	—	5513.607	DGM PRESS: 5.6" SAMP. VAC: 21.5"
						20.729	

Total/Average							
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Chain of Custody

Relinquished by: <u>Patricia Selig</u>	Date: <u>9/28/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR)

Plant/Source: Memmach Station Power Plant Test Location: "A" INLET TO SUPP. ESPTest ID: "A" Train Carbon Trap ID: OL ^{↓26229}

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASA1 Sampling Console Ser# 1568 (Cal: 4.406)Test Start (Date/Time): 9/29/06 752 Leak Check Pass/Fail 0.000 Test End (Date/Time): 9/29/06 852 Leak Check Pass/Fail 0.000

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (SC/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	7:52	163	20/20	0.39	8495.541	-	06m: 5.6" SAM VAC: 23"
9/29/06	8:52	163	24/24	0.34	-	8515.395	06m: 5.1" SAM VAC: 23"
							Probe: 165°C Filter: 172°C

Total/Average							
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Chain of Custody

Relinquished by: <u>Patricia Selbach</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR) ^C ~~P~~Plant/Source: Merrimack Station Power Plant Test Location: "B" INLET TO SUPP. ESPTest ID: "B" Train Carbon Trap ID: OL ^{↓26230}

Spiked At: _____

QA/QC Signature: _____

Sampled By: ASA1Sampling Console Ser# 1567 (Cal: 0.989)

Test Start

(Date/Time): 9/29/06 752

Leak Check

(Pass/Fail) 0.000

Test End

(Date/Time): 9/29/06 852

Leak Check

(Pass/Fail) 0.000

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (g /min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	7:52	163	19/19	0.35	5517.389	-	DGM: 5.3" SAM VAC: 22.5"
9/29/06	8:52	163	22/22	0.26	-	5534.940	DGM: 4.6" SAM VAC: 23"

Total/Average

Chain of Custody

Relinquished by: <u>Patricia Salas</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR)

From orig. ESP

Plant/Source: Merrimack Station Power Plant Test Location: Outlet "G" to Supp. ESPTest ID: "A" Train Carbon Trap ID: OL ↓26231

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASR1 Sampling Console Ser# 1568 (Cal: 1.006)Test Start (Date/Time): 9/29/06 9:29 Leak Check Pass/Fail 0.000 Test End (Date/Time): 9/29/06 10:29 Leak Check Pass/Fail 0.000

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (sc/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	9:29	183	23/23	0.34	8516.647	—	DGM: 4.6 SAM VAC: 23.0
9/29/06	10:29	182	24/25	0.29	—	8534.210	DGM: 4.5 SAM VAC: 23.5
Total/Average							

Chain of Custody

Relinquished by: <u>Peter Seibert</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR)

from orig SP

Plant/Source: Minumach Station Power Plant Test Location: Outlet "G" to Supp ESPTest ID: "B" Train Carbon Trap ID: OL ↓26232

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASAI Sampling Console Ser# 1567 (Cal: 0.989)Test Start (Date/Time): 9/29/06 9:29 Leak Check Pass/Fail 6.000 Test End (Date/Time): 9/29/06 10:29 Leak Check Pass/Fail 0.000

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (cc/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	9:29	183	21/21	0.31	5535.921	-	D6m: 5.0 5.0m VAC: 22.5
9/29/06	10:29	182	22/22	0.29	-	5554.531	D6m: 4.9 5.0m VAC: 22.5
Total/Average							

Chain of Custody

Relinquished by: <u>Patricia Seligson</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR)

(PS)

Plant/Source: Merrimack Station Power Plant Test Location: "A" Midduct to Supp ESP
Outlet "C" to Supp. ESPTest ID: "A" Train Carbon Trap ID: OL ↓26233

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASA Sampling Console Ser# 1568 (cal: 1.006)Test Start (Date/Time): 9/29/06 1117 Leak Check (Pass/Fail) 0.000 Test End (Date/Time): 9/29/06 1217 Leak Check (Pass/Fail) 0.000

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (sc/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	1117	172	23/23	0.40	8535.001	—	DGM: 5.6" SAM. VAC: 20"
9/29/06	1217	171	24/25	0.34	—	8554.813	DGM SAM. VAC: Probe: 165°C Filter: 170°C

Total/Average							
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Chain of Custody

Relinquished by: <u>Patricia Jelenc</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR)

(P3)

"A" Mudduct to Supp ESP

Plant/Source: Mammoth Station Power Plant Test Location: Outlet "C" to Supp. ESP

↓26234

Test ID: "B" Train Carbon Trap ID: OL

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASA1 Sampling Console Ser# 1567 (cal: 0.989)Test Start (Date/Time): 9/29/06 1117 Leak Check (Pass/Fail) 0.000 Test End (Date/Time): 9/29/06 1217 Leak Check (Pass/Fail) 0.000

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (sc/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	1117	172	20/20	0.34	5555.518	-	DGM: 5.2" SAM. VAC: 21.5"
9/29/06	1217	171	23/22	0.28	-	5572.881	DGM: SAM. VAC:

Total/Average							
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Chain of Custody

Relinquished by: <u></u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR)

(from orig. EPS)

Plant/Source: Nemacolin Station Power Plant Test Location: Outlet "C" to Supp. ESPTest ID: "A" Train Carbon Trap ID: OL ↓26235

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASAJ Sampling Console Ser# 1568 (Cal: 1.006)Test Start (Date/Time): 9/29/06 1255 Leak Check (Pass/Fail) 0.000 Test End (Date/Time): 9/29/06 1355 Leak Check (Pass/Fail) 0.000

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (SC/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	1255	164	23/23	0.42	8556.731	-	DGM: 5.6" SAM VAC: 23"
9/29/06	1355	164		0.39	-	8577.910	DGM: SAM VAC:

Total/Average							
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Chain of Custody

Relinquished by: <u>Patricia Seligman</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR)

(from orig. ESP)

Plant/Source: Merrimack Station Power Plant Test Location: Outlet "C" to Supp ESPTest ID: "B" Train Carbon Trap ID: OL ↓26236

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASA Sampling Console Ser# 1567 (Cal: 0.989)Test Start (Date/Time): 9/29/06 1255 Leak Check (Pass/Fail) 0.000 Test End (Date/Time) 9/29/06 1355 Leak Check (Pass/Fail) _____

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (SC/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	1255	164	21/21	0.40	5574.739	-	DGM: 6.0" SAMP VAC: 22.5"
9/29/06	1355	164		0.36	-	5597.771	DGM: SAMP VAC:
Total/Average							

Chain of Custody

Relinquished by: <u>Patricia Selat</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR)

Plant/Source: Memorial Station Power Plant Test Location: Belted Duct (Port "F")Test ID: "A" Train Carbon Trap ID: OL ↓26237

Spiked At: _____

QA/QC Signature: _____

Sampled By: ASA1Sampling Console Ser# 1568 (Cal: 1.006)Test Start (Date/Time): 9/29/06 1655 Leak Check Pass/Fail 0.000 Test End (Date/Time): 9/29/06 1735 Leak Check Pass/Fail 0.000

		INLET/OUTLET						Comments
Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (cc/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final		
9/29/06	1655	181	22/21	0.39	8582.635	—		06m '5.6' 5Am VAC: 24'
9/29/06	1735	181	26/26	*0.05	—	8588.980	* *	06m '0.0' 5Am VAC: 0030'
	40 minutes							Probe: 163°C Filter: 168°C

Total/Average							
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Ⓢ 06m Fell off dramatically @ 1705 and 5am Vac increased
Ⓢ Tube became plugged

Chain of Custody

Relinquished by: <u>Patricia Seibert</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

Analysis contact us at 330-405-0837

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APPENDIX K (PART 75 CAMR)

Plant/Source: Memorial Station Power Plant Test Location: Bleed Duct (Port "F")Test ID: "B" Train Carbon Trap ID: OL ↓26238

Spiked At: _____ QA/QC Signature: _____

Sampled By: _____ Sampling Console Ser# 1567 (cal: 0.989)Test Start (Date/Time): 9/29/06 1655 Leak Check (Pass/Fail) 0.000 Test End (Date/Time): 9/29/06 1755 Leak Check (Pass/Fail) 0.026
0.850
0.876

Date	Time	DUCT Temp (°F or °C)	INLET/OUTLET		Flow Rate (cc/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
			Meter Temp (°F or °C)	Temp (°F or °C)				
9/29/06	1655	181	21/21	0.45	5603.079	—	0.6m ³ b. 7"	SAM. VAC: 22"
9/29/06	1755	181	25/25	0.48	—	5621.111	0.6m ³ b. 2"	SAM. VAC: 22"
	*40 minutes							
	* Tips of trap broken when pulled out. Possibly by debris							
			(particulate in duct)					

Total/Average							
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Chain of Custody

Relinquished by: <u>Patricia Sel...</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

For Analysis contact us at 330-405-0837

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APPENDIX K (PART 75 CAMR)

Plant/Source: Merrimack Test Location: B Outlet Duct (Port "B")Test ID: "A" Train Carbon Trap ID: OL ↓26239

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASA Sampling Console Ser# 1568 (Cal: 1.006)Test Start (Date/Time) 9/29/06 1831 Leak Check (Pass/Fail) 0.000 Test End (Date/Time) 9/29/06 1931 Leak Check (Pass/Fail) 0.000

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (SC/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	1831	158	27/27	0.45	8591.929	-	DGM PRES: 6.0 SAM VAC: 23.5
9/29/06	1901	158	27/27	⊗ 0.19	8598.650		DGM PRES: 26.1 SAM VAC: 25.1
9/29/06	1931	158	26/27	0.15	-	8601.310	Probe: 162°C Filter: 167°C DGM: 2.1" SAM VAC 24"

Total/Average							
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⊗ Thirty minutes into sampling, flow is dropping below 0.20 L/min
Chain of Custody

Relinquished by: <u>Peter Schuch</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

For Analysis contact us at 330-405-0837

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APPENDIX K (PART 75 CAMR)

Plant/Source: Merrimack Test Location: Belt Duct (Port "B")Test ID: "B" Train Carbon Trap ID: OL ↓26241

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASA1 Sampling Console Ser# 1567 (Cal: 0.989)Test Start (Date/Time): 9/29/06 1831 Leak Check (Pass/Fail) 0.000 Test End (Date/Time): 9/29/06 1931 Leak Check (Pass/Fail) 0.000

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (cc/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	1831	158	28/28	0.40	5624.550	—	DGM PRES: 5.9 SAM. VAC: 23"
9/29/06	1901	158	28/28	0.18	5636.780		DGM PRES: 2.2 SAM. VAC: 24"
9/29/06	1931	158	27/27	0.13	—	5634.202	DGM: 1.6 SAM: 25.5"

Total/Average							
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⊗ Thirty minutes into sampling, flow is dropping below 0.20 l/min.
Chain of Custody

Relinquished by: <u>Patricia S. [Signature]</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

For Analysis contact us at 330-405-0837

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APPENDIX K (PART 75 CAMR)

Plant/Source: Merrimack Station Power Plant Test Location: "A" Inlet Duct (Port C)Test ID: "A" Train Carbon Trap ID: OL ↓26242

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASA1 Sampling Console Ser# 1568 (Cal: 1.006)Test Start (Date/Time): 9/29/06 / 2013 Leak Check Pass/Fail 0.000 Test End (Date/Time): 9/29/06 / 2043 Leak Check Pass/Fail 0.000

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (cc/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	2013	178°	25/25	0.50	8603.549	—	DGM PRESS: 5.6 SAM VAC: 24"
"	2023	178	24/25	0.40	8606.270	—	DGM PRESS: 2.7 SAM VAC: 25
"	2033	178	25/25	0.30	8607.58	—	DGM PRESS: 2.1 SAM VAC: 25.5
"	2044	178	25/26	0.30	8608.80	→	DGM PRESS: 1.9 SAM VAC: 26.0
							Probe: 164°C Filter: 173°C

Total/Average							
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Chain of Custody

Relinquished by: <u>Peter Selander</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

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APPENDIX K (PART 75 CAMR)

Plant/Source: Merumel Station Power Plant Test Location: "A" inlet Duct (Port C)Test ID: "B" Train Carbon Trap ID: OL ↓26243

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASA1 Sampling Console Ser# 1567 (Cal: 0.989)Test Start (Date/Time): 9/29/06 / 2013 Leak Check Pass/Fail 0.000 Test End (Date/Time): 9/29/06 / 2043 Leak Check Pass/Fail 0.000

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (sc/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	2013	178°	24/24	0.46	5636.269	—	DGM PRESS: 5.5 SAMR VAC: 23
"	2023	178	24/24	0.40	5639.100	—	DGM PRESS 3.7 SAMR VAC 24
"	2033	178	24/23	0.21	5640.45	—	DGM PRESS 2.6 SAMR VAC 24
"	2044	178	24/24	0.20	5641.47	—	DGM PRESS 2.4 SAMR VAC 24.0

Total/Average							
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Chain of Custody

Relinquished by: <u>Peter Schmitt</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

For Analysis contact us at 330-405-0837

Ohio Lumex Co., Inc. 9263 Ravenna Road Unit A-3, Twinsburg, OH 44087 USA

330-405-0837 Fax 330-405-0847 US Toll Free: 888-876-2611

APPENDIX K (PART 75 CAMR)

Plant/Source: MERRIMACK STATION POWER PLANT Test Location: "A" INLET DUCT (PORT G)Test ID: "A" TRAIN Carbon Trap ID: OL ↓26245

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASAI Sampling Console Ser# 1568 (CAL: 1.006)Test Start (Date/Time): 9/29/06 | 2116 Leak Check Pass/Fail Test End (Date/Time): 9/29/06 | 2146 Leak Check Pass/Fail 6.000

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (<u>scf</u> /min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	2116	172	26/26	0.40	8609.860		DGM PRESS: 5.6 SAM. VAC.: 23.0
9/29/06	2126	171	26/26	0.40	8612.540		DGM PRESS: 5.0 SAM. VAC.: 23.5
9/29/06	2136	171	25/25	0.40	8614.865		DGM PRESS: 3.7 SAM. VAC.: 24.0
9/29/06	2146	171	25/25	0.40	8616.695		DGM PRESS: 2.9 SAM. VAC.: 25
							FILTER: 170 °C PROBE: 164 °C

Total/Average						
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Chain of Custody

Relinquished by: <u>[Signature]</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

For Analysis contact us at 330-405-0837

Ohio Lumex Co., Inc. 9263 Ravenna Road Unit A-3, Twinsburg, OH 44087 USA
330-405-0837 Fax 330-405-0847 US Toll Free: 888-876-2611

APPENDIX K (PART 75 CAMR)

Plant/Source: MERRIMACK STATION POWER PLANT Test Location: "A" INLET DUCT (PORT G)Test ID: "B" TRAIN Carbon Trap ID: OL ↓26246

Spiked At: _____ QA/QC Signature: _____

Sampled By: ASA1 Sampling Console Ser# 1567 (CAL: 0.989)Test Start (Date/Time): 9/29/06 / 2116 Leak Check Pass/Fail _____ Test End (Date/Time): 9/29/06 / 2146 Leak Check Pass/Fail 0.000

Date	Time	DUCT Temp (°F or °C)	Meter Temp (°F or °C)	Flow Rate (cc/min)	Dry Gas Meter Liters Initial	Dry Gas Meter Liters Final	Comments
9/29/06	2116	172	23/23	0.28	5641.879		DGM PRESS: 4.7 SAM. VAC.: 23.0
9/29/06	2126	171	22/22	0.30	5643.870		DGM PRESS: 4.5 SAM. VAC.: 23.5
9/29/06	2136	171	22/22	0.30	5646.130		DGM PRESS: 3.8 SAM. VAC.: 23.5
9/29/06	2146	171	22/21	0.30	5648.010		DGM PRESS: 3.5 SAM. VAC.: 24
							PROBE: 164°C FILTER: 170°C

Total/Average						
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Chain of Custody

Relinquished by: <u>[Signature]</u>	Date: <u>9/29/06</u>
Received by: _____	Date: _____
Relinquished by: _____	Date: _____
Received for Laboratory by: _____	Date: _____

For Analysis contact us at 330-405-0837

Ohio Lumex Co., Inc. 9263 Ravenna Road Unit A-3, Twinsburg, OH 44087 USA

330-405-0837 Fax 330-405-0847 US Toll Free: 888-876-2611

Appendix F:

Proposed EPA Test Method 324 Analytical Data

Ohio Lumex Trap Analyses, Merrimack Generating Station Bow New Hampshire

Date	Trap ID	Sample Volume (L at EPA-STP)	ng of Hg on Section # 1	ng of Hg on Section # 2	Hg Concentration ug/m3	Comments
September 28, 2006	OL-26221	18.98	136	<5	7.17	
	OL-26222	19.49	166	<5	8.52	
	OL-26223	21.73	163		7.50	Section 2 lost due to breakage
	OL-26224	14.92	110	<5	7.37	
September 29, 2006	OL-26225	21.03	158	<5	7.51	
	OL-26226	20.38	158	<5	7.75	
	OL-26229	19.75	132	<5	6.68	
	OL-26230	17.23	120	<5	6.96	
	OL-26231	17.32	136	<5	7.85	
	OL-26232	18.22	149	<5	8.18	
	OL-26233	19.58	142	<5	7.25	
	OL-26234	17.04	133	<5	7.81	
	OL-26235	21.02	157	<5	7.47	
	OL-26236	22.65	174		7.68	Section 2 not present at analysis
	OL-26237	6.27	37	<5	5.90	Trap clogged due to excessive soot
	OL-26238		<5	<5	<0.03	Trap broke during sampling
	OL-26239	9.15	38	<5	4.15	Trap clogged due to excessive soot
	OL-26241	9.22	32.9	5	3.57	Trap clogged due to excessive soot
	OL-26242	5.15	36	<5	6.99	
	OL-26243	5.03	37	<5	7.36	
	OL-26245	6.7	58	<5	8.66	
	OL-26246	5.98	57	<5	9.53	

ADA-ES Traps

Date	Trap ID	Sample Volume (L <u>not</u> EPA-STP)	ng of Hg on Section # 1	ng of Hg on Section # 2	Hg Conc. ug/m3 uncorrected !!	Comments
September 28, 2006	S3384	20.4	151	<5	7.40	
	S3385	22.7	171	<5	7.53	
	S3391	21.9	157	<5	7.17	
	S3392	23	163	<5	7.09	
	S3389	21	142	319 X	6.76	Section 2 too high to be breakthrough
	S3390	21.4	153	<5	7.15	
	S3387	19.7	149	<5	7.56	
	S3388	18.5	144	8	7.78	
September 29, 2006	S3386	21.4	156	<5	7.29	
	S3393	19.7	141	<5	7.16	
	S3394	22.4	164	<5	7.32	
	S3395	20.8	148	<5	7.12	
	S3396	21.9	150	<5	6.85	
	S3398	21.7	151	<5	6.96	

2017

2017

2017

Trap#	Sect. 1 Area	Sect. 1 mg Hg	Sect. 2 Area	Sect. 2 mg	L sampled	Sample Temp F°/K°	Sample Pressure ps	Sample Pressure (Vs. 29.92)	L Corrected	X mg/m
S 3384	18700	151	-17	<5	20.4	76°/29.740	29.96	20.1	7.51	
S 3385	21200	171	309	<5	22.7	76°/29.740	29.96	22.4	7.63	
S 3391	19500	157	453	<5	21.9	7.2				
S 3392	20200	163	93	<5	23.0	7.1				
L 26221	16900	136	-270	<5	18.85	15.5°/1.003	5.2°/1.003	18.977	7.11	
L 26222	20500	166	206	<5	19.516	8.5	5.4°/1.003	19.489	8.46	
S 3389	17600	142	39500	3190	21.0	6.8				
S 3390	19000	153	-7	<5	21.4	7.1				
L 26223	20200	163	60	5	21.789	7.5	5.65°/1.005	21.732	7.44	
L 26224	13700	110	-55	<5	15.160	7.5	4.45°/1.001	14.92	7.32	
S 3387	18448	149	50	<5	19.7	7.6				
S 3388	17900	144	935	7.6	18.5	7.8				
L 26225	19600	158	531	<5	21.122	7.5	5.6°/1.007	21.03	7.46	
L 26226	19600	158	216	<5	20.729	7.6	5.55°/1.004	20.38	7.69	
S 3386	19700	156	-420	<5	21.4	7.3				
S 3393	17900	141	-100	<5	19.7	7.2				
L 26229	16700	132	-100	<5	19.854	6.6	5.35°/1.007	19.75	6.68	
L 26230	15200	120	-82	<5	17.551	6.8	4.95°/1.002	17.23	6.96	
L 26231	17200	136	-140	<5	17.563	7.2	4.55°/1.014	17.32	7.8	
L 26232	18863	149	-310	<5	18.610	8.0	4.95°/1.005	18.22	8.18	

Trap #	Section 1 Area	Set 1 Wg (H ₂)	Section 2 Area	Set 2 Wg	Liters Sampled	Temp F @ No	Temp (V _s)	Pressure (V _s)	Relative Humidity (calculated)	Wg/m ³
DL 26233	18000	142	387	<5	19.812 7.2	240C	1.014	5.6" (9964)	19.58	7.25
DL 26234	16900	133	-310	<5	17.363 7.7	210C	1.003	5.2" (9954)	17.04	7.81
S 3394	20200	164	30	<5	22.4 7.3					
S 3395	18700	148	24	<5	20.8 7.1					
DL 26235	19900	157	34	<5	21.179 7.4	230C	1.010	5.6" (9964)	21.02	7.47
DL 26236	22000	174	Not Present		23.032 7.6	210C	1.003	6.0" (9974)	22.65	7.68
S 3396	19000	150	173	<5	21.9 6.8					
S 3398	19100	151	-39	<5	21.7 7.0					
DL 26237	41700	37	68	<5	6.345 17.321 230C	240C 230C	1.014 1.111	5.6" (9964) 6.45"	6.27	5.90
DL 26238	87	<5	476	<5	Broken 1111					<0.3
DL 26239	41800	38	278	<5	9.381 heavy soil 280C	270C	1.024	4.05" (9926) 3.75"	9.15	4.15
DL 26241	4259	32.9	673	5.3	9.652	280C	1.027	0.9918	9.22	3.57
DL 26242	4600	36	363	<5	5.251	250C	1.017	3.75" (9918) 0.9918	5.15	6.99
DL 26243	4760	37	0	<5	5.201	240C	1.014	3.95" (9923) 4.75"	5.03	7.35
DL 26245	7350	58	-110	<5	6.835	25.50C	1.019	4.75" (9931) 4.11"	6.70	8.66
DL 26246	7200	57	369	<5	6.131	230C	1.007	4.11" (9927)	5.98	9.54

sp#	Sect. 1 Area	Sect 1 mg Hg	Sect 2 Area	Sect 2 mg	L sample	Sample Temp F°/K°	Vs (68/293)	Sample Pressure (Vs. 29.92)	L Corrected	X (X Calib)	Y (Y Calib)
3384	18700	151	-17	<5	20.4	76°/297.40	(Vs. 29.92)	29.96	20.1	0.989	0.989
3385	21200	171	309	<5	22.7	76°/292.40	(Vs. 29.92)	29.96	22.4		
3391	19500	157	453	<5	21.9	7.2					
3392	20200	163	93	<5	23.0	7.1					
26221	16900	136	-270	<5	18.85	18.5°C	1.003	5.2° (.9954)	18.977	7.11	
26222	20500	166	206	<5	19.51	16°C	1.003	5.4° (.9959)	19.489	8.46	
3389	17600	142	39500	3190	21.0	6.8					
3390	19000	153	-7	<5	21.4	7.1					
26223	20200	163	0	5	21.78	21.5°C	1.005	5.65° (1.004)	21.732	7.44	
26224	13700	110	-55	<5	15.16	19.5°C	.9983	4.45° (1.001)	14.92	7.32	
3387	18448	149	50	<5	19.7	7.6					
3388	17900	144	935	7.6	18.5	7.8					
26225	19600	158	531	<5	21.12	22°C	1.007	5.6° (1.004)	21.03	7.46	
26226	19600	158	216	<5	20.72	20.5°C	1.002	5.55° (1.004)	20.38	7.69	
3386	19700	156	-420	<5	21.4	7.3					
3393	17900	141	-100	<5	19.7	7.2					
26229	16700	132	-100	<5	19.85	22°C	1.007	5.35° (.9958)	19.75	6.68	
26230	15200	120	-82	<5	17.55	20.5°C	1.002	4.95° (.9948)	17.23	6.96	
26231	17200	136	-140	<5	17.56	24°C	1.014	4.55° (.9938)	17.32	7.85	
26232	18863	149	-310	<5	18.61	21.5°C	1.005	4.95° (.9948)	18.22	8.18	

Trap #	Section 1 Area	Section 1 Ng (%)	Section 2 Area	Section 2 Ng	Liters Sampled	Temp (Vib. F/°C)	Temp Pressure (Vib. 29.92)	Wave (cm/sec)	ms/m ³
26733	18000	142	387	<5	19.812 7.2	24°C	5.6 [±] (1.014)	19.58	7.25
26234	16900	133	-310	<5	17.363 7.7	21°C	5.2 [±] (1.003)	17.04	7.81
3394	20200	164	30	<5	22.4 7.3				
3395	18700	148	24	<5	20.8 3.1				
26235	19900	157	341	<5	21.179 7.4	23°C	5.6 [±] (1.010)	21.02	7.47
26736	22000	174	Not Present		23.032 7.6	21°C	6.0 [±] (1.003)	22.65	7.68
3396	19000	150	173	<5	21.9 6.8				
3398	19100	151	-39	<5	21.7 7.0				
26237	41700	37	68	<5	6.345 17.321 24°C 22°C 22°C		5.6 [±] (1.014) 6.45 [±]	6.27	5.90
26238	87	<5	476	<5	Broken 9.381 27°C		4.05 [±] (1.024)	9.15	4.15
26239	41800	38	278	<5	Heavy Soil 9.652 28°C		3.75 [±] (1.027) 0.9918	9.22	3.57
26241	4259	32.9	673	5.3	5.251	25°C	3.75 [±] (1.017) 0.9918	5.15	6.99
26242	4600	36	363	<5			3.95 [±] (1.014) 0.9923	5.03	7.35
26243	41760	37	8	<5	5.201	24°C	4.25 [±] (1.019) 0.9931	6.70	8.66
26245	7350	58	-110	<5	6.835	25.5°C	4.15 [±] (1.007) 0.9927	5.98	9.54
26246	7200	57	369	<5	6.131	22°C			

Trap #	Sect. 1 Area	Sect 1 mg Hg	Sect 2 Area	Sect 2 mg	L sampled	Sample Temp F = °K × 1.8 + 32 (Vs. 29.92)	Sample Pressure	X (X cal. 6)	L Corrected	mg/m
S 3384	18700	151	-17	<5	20.4	76°/29.740	29.96		20.1	7.5
S 3385	21200	171	309	<5	22.7	76°/29.740	29.96		22.4	7.6
S 3391	19500	157	453	<5	21.9	7.2				
S 3392	20200	163	93	<5	23.0	7.1				
L 26221	16900	136	-270	<5	18.85	18.5°C 1.003	5.2°C (1.9954)		18.977	7.11
L 26222	20500	166	206	<5	19.516	8.5	16°C (1.003)	5.4°C (1.9959)	19.489	8.41
S 3389	17600	142	39500	3190	21.0	6.8				
S 3390	19000	153	-7	<5	21.4	7.1				
L 26223	20200	163	60	57	21.789	7.5	21.5°C 1.005	5.65°C (1.004)	21.732	7.41
L 26224	13700	110	-55	<5	15.160	7.5	19.5°C .9983	4.45°C (1.001)	14.92	7.3
S 3387	18448	149	50	<5	19.7	7.6				
S 3388	17900	144	935	7.6	18.5	7.8				
L 26225	19600	158	531	<5	21.122	7.5	22°C 1.007	5.6°C (1.004)	21.03	7.46
L 26226	19600	158	216	<5	20.729	7.6	20.5°C 1.002	5.55°C (1.004)	20.38	7.6
3386	19700	156	-420	<5	21.4	7.3				
3393	17900	141	-100	<5	19.7	7.2				
L 26229	16700	132	-100	<5	19.854	6.6	22°C 1.007	5.35°C (1.9958)	19.75	6.6
L 26230	15200	120	-82	<5	17.551	6.8	20.5°C 1.002	4.95°C (1.9948)	17.23	6.6
L 26231	17200	136	-140	<5	17.563	7.2	24°C 1.014	4.55°C (1.9938)	17.32	7.8
L 26232	18863	149	-310	<5	18.610	8.0	21.5°C 1.005	4.95°C (1.9948)	18.22	8.13

Appendix G:
Resumes of Test Personnel

BILLY J. MULLINS, JR.; President

Education Post Graduate Study Environmental Engineering at Southern Methodist University; Dallas, Texas 1970.

M.S. 1969, New York University; New York, New York, in Civil Engineering (Air Resources).

B.S. 1968, Texas Tech University; Lubbock, Texas, in Civil Engineering (Water Resources). Studies in Engineering at the U.S. Naval Academy; Annapolis, Maryland, 1963-1964

Professional Training Courses Attended Short Course on Air Pollution Engineering at the University of Texas at Austin, February 1970.

Attended four-week management course presented by the American Management Association, 1976.

Certification Registered Professional Engineer
Certified Visible Emissions Evaluator
Licensed Private Pilot (Multi-Engine-Land, Instrument)
Diplomat in the American Academy of Environmental Engineers
Inductee into the Stack Sampling Hall of Fame
Certified as Qualified Environmental Professional (QEP)

Professional Memberships **Air & Waste Management Association** – Past Chairman, Past Vice Chairman, and Past Board of Directors of North Texas Chapter and Southwest Section; Past Chairman, Consultants Committee; Past Chairman, Source Measurement Committee

Source Evaluations Society – Past President, Past Board of Directors

American Management Association

MULLINS (p. 2)

Publications

Authored "Real World Experience with USEPA's New Sampling and Analytical Methods for Conducting Risk Burn," May 1998.

Co-authored "Sulfur Compound Emissions of the Petroleum Production Industry," December 1974.

Co-authored "Field Procedure for Stabilizing Hydrogen Sulfide Samples to be Analyzed Using Modified Methylene Blue Technique," presented at the Conference on Ambient Air Quality Measurements, Austin, Texas, March 1975.

Co-authored "Atmospheric Emissions Survey of the Sour Gas Industry," October 1975.

Co-authored "Technique for Insuring the Validity of Samples for High Concentrations of Sulfur Dioxide Using the EPA Method 5 Sampling Train," presented at the Third National Conference on Energy and the Environment, College Corner, Ohio, September 1975.

Teaching
Experience

Conducted training seminars on sampling methods periodically since 1974 to present.

Conducted a one-day seminar on Part 75 Testing over ten times in 1993 and 1994.

Served as a lecturer in the Environmental Protection Agency's (EPA) training course number 450, "Source Sampling for Particulate Pollutants," for two years from January 1974 to October 1975 and March, 1992.

Conducted a two-day training course entitled "technical Assistance in Source Sampling" at Iowa State University, Ames, Iowa, for the Environmental Protection Agency (EPA), October 1974.

Conducted Environmental Protection Agency's (EPA) training course number 450, "Source Sampling for Particulate Pollutants," at Research Triangle Park, North Carolina, September 1975.

MULLINS (p. 3)

Teaching
Experience
(Cont'd)

Conducted a two-day short course entitled "Performing and Observing Source Sampling," Dallas, Texas, July 1976, May 1977, October 1977, November 1987 and November 1988; Lake Charles, Louisiana, May 1977; Casper Wyoming, May 1977; Point Comfort, Texas, November 1992.

Served as a lecturer in the Environmental Protection Agency's two-day seminar entitled "Asphalt Industry Environmental Solutions," presented in Dallas, Texas, March 21-22, 1979.

Conducted a two-day short course entitled "Performing and Observing Source Sampling," Phoenix, Arizona, August, 1990, for the State of Arizona, Department of Environmental Quality; Lincoln, Nebraska, March 1980, for the State of Nebraska, Air Quality Control Division.

Technical
Experience

Directed and performed stack sampling on over 2000 sources of which over 500 were sampled simultaneously using more than one sampling train at several points in the flue gas stream; 1972-present.

Directed and performed over 200 short-term ambient air studies using mobile sampling vans and various ambient air sampling equipment; 1972-present.

Designed, directed and operated over 20 permanent ambient air networks of various size and duration for a variety of parameters; 1972-present.

Designed surface and underground drainage systems for residential subdivisions, public works projects, and shopping centers; 1969-1972.

Designed several residential subdivisions including lot layout, street design, drainage design, and utility design; 1969-1972.

MULLINS (p. 4)

Research
Projects

Supervised and conducted a study made by the Hawaiian Sugar Planters' Association to characterize the emissions for several bagasse-fired boilers, April-May 1976.

Supervised and conducted a study made by the Rio Grande Valley Sugar Growers, Inc. to determine the area affected by the burning of sugarcane fields prior to harvesting, November 1974-April 1975.

Supervised and conducted a study by a lightweight aggregate manufacturer to develop a material balance around the process through sampling and analysis of several parameters, November 1973.

Conducted a study in New York City to attempt to develop a correlation in the ambient air between carbon dioxide and sulfur dioxide to provide a tool for predicting air pollution predicting air pollution episodes, January-May 1969.

Related
Projects

Served as Chairman of the Engineering Foundation Conference on Stack Sampling and Source Evaluation in Destin, Florida, 2002, and Santa Barbara, California, 1985.

Served as Co-Chairman of the Engineering Foundation Conference on Stack Sampling and Source Evaluation in Destin, Florida, 2001.

Served as Session Chairman at the Engineering Foundation Conference on Stack Sampling and Source Evaluation in Hershey, Pennsylvania, 1984; San Diego, California, 1993; and in Palm Coast, Florida, 1994.

GARY B. GOLDMAN; Associate

<u>Education</u>	B.S. 1993, University of Texas at Arlington; Arlington, Texas, in Geology.
<u>Professional Training</u>	<p>Attended 40-hour Occupational and Environmental Training Program on Hazardous Materials (CFR 1910.120) Dallas, Texas, April 1993.</p> <p>Attended HAZWOPER 8-hour refresher course, 1994-2005.</p> <p>Attended the following Environmental Protection Agency (EPA) Courses:</p> <ul style="list-style-type: none">Course 345, Emission Capture and Gas Handling System InspectionCourse 380, Fugitive Source InspectionCourse 400, Introduction to Hazardous Air PollutantsCourse 413, Control of Particulate EmissionsCourse 415, Control of Gaseous EmissionsCourse 418, Control of Nitrogen Oxide EmissionsCourse 427, Combustion EvaluationCourse 444, Air Pollution Field EnforcementCourse 445, Inspection of Particle Control DevicesCourse 446, Inspection Safety ProceduresCourse 450, Source Sampling for Particulate PollutantsCourse 452, Principles and Practice of Air Pollution ControlCourse 455, Inspection of Gas Control Devices and Selected IndustriesCourse 474, Continuous Emission MonitoringCourse 482, Sources and Control of Volatile Organic Air Pollutants <p>Attended the following California Air Resources Board (CARB) Courses</p> <ul style="list-style-type: none">Course 221, Continuous Emission MonitoringCourse 233, Solvent Cleaning: Degreasing OperationsCourse 242, Hot Mix Asphalt FacilitiesCourse 245, Cement PlantsCourse 270, Incinerators

GOLDMAN (p.2)

Certification

Certified Visible Emissions Evaluator

Technical
Experience

Senior Emissions Evaluator with the Texas Commission on Environmental Quality, responsible for oversight of all source testing activities within the State of Texas, Region 4, which encompasses 19 counties in the North Texas region, 1999-2005.

Participated in the sampling of over 750 sources, including several of which were sampled simultaneously utilizing more than one sampling train, 1994-1999.

Thoroughly trained in all EPA testing procedures specified in Title 40 of the Code of Federal Regulations, Part 60.

Thoroughly trained in Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 0010 Through 0100 Series.

Participated in EPA's 3-D probe study. May – August 1997.

Experienced in the analysis of commercial calibration gas cylinders for NO_x, SO₂, CO₂, and O₂.

Experienced with calibration techniques for all field testing equipment.

Thoroughly trained in the operation and routine maintenance of the following:

Anarad Model AR50-C Carbon Dioxide Analyzer
Anarad Model AR880 Oxides of Nitrogen Analyzer
Anarad Model AR23 Oxygen Analyzer
Anarad Model AR30C2 Sulfur Dioxide Analyzer
California Analytical Model 300-HFID Total Hydrocarbon Analyzer
Servomex Model 1440 Carbon Dioxide Analyzer
Servomex Model 1440 Oxygen Analyzer
Teledyne Model 326 Oxygen Analyzer
Thermo Environmental Model 10AR/S Oxides of Nitrogen Analyzer

GOLDMAN (p.3)

Thermo Electron Model 46C Oxides of Nitrogen Analyzer
Thermo Electron Model 48C Oxides of Nitrogen Analyzer
Western Research Model 721A Sulfur Dioxide Analyzer

PATRICK SELAKOVICH; Associate

<u>Education</u>	B.S.B.A. 1992, University of Arkansas; Fayetteville, Arkansas, in General Business.
<u>Professional Training</u>	<p>Attended 24-hour Occupational and Environmental Training Program on Hazardous Materials (CFR 1910.120) Dallas, Texas, April 1997.</p> <p>Attended 40-hour Occupational and Environmental Training Program on Hazardous Materials (CFR 1910.120) & 'Train the Trainer', Gettysburg, Pennsylvania, July 1998.</p> <p>Also attended an 8-hour refresher course January 2000, January 2001, and May 2004.</p> <p>Attended OSHA General Industry Safety and Health Training, May 1999.</p>
<u>Professional Memberships</u>	Society For Human Resource Management
<u>Technical Experience</u>	<p>Participated in the sampling of over 150 sources, including several of which were sampled simultaneously using more than one sampling train. Thoroughly trained in all EPA testing procedures, 1996-present.</p> <p>Participated in EPA's 3-D probe study. May – August 1997.</p> <p>Experience with calibration techniques for all field testing equipment.</p> <p>Thoroughly trained in the operation and routine maintenance of the following:</p> <p>California Analytical Model 300-HFID Total Hydrocarbon Analyzer Servomex Model 1440 Carbon Dioxide Analyzer Servomex Model 1440 Oxygen Analyzer Thermo Electron Model 46C Oxides of Nitrogen Analyzer Thermo Electron Model 48C Oxides of Nitrogen Analyzer Western Research Model 721A Sulfur Dioxide Analyzer</p>

SCOT JACKSON; Associate

Education B.S.B.A. May 1978, Mountain View Jr. College, in General Business.

Professional Training Purchasing Supervisor for METCO Environmental, Inc. in charge of inventory and supplies. January 1995 – April 2005.

Attended 40-hour Occupational and Environmental Training Program on Hazardous Materials (CFR 1910.120), Dallas, Texas, May 2000.

Attended Fed-Ex Hazardous Goods Shipping Training, June 2004.

Certification Certified Visible Emissions Evaluator

Technical Experience Participated in the sampling of over 100 sources, including several of which were sampled simultaneously using more than one sampling train. Thoroughly trained in all EPA testing procedures, 1995-present.

Experience with calibration techniques for all field testing equipment.

Thoroughly trained in the operation and routine maintenance of the following:

California Analytical Model 300-HFID Total Hydrocarbon Analyzer
Servomex Model 1440 Carbon Dioxide Analyzer
Servomex Model 1440 Oxygen Analyzer
Thermo Electron Model 42C Oxides of Nitrogen Analyzer
Thermo Electron Model 48C Oxides of Nitrogen Analyzer
Western Research Model 721A Sulfur Dioxide Analyzer

APPENDIX N: E.ON SO₃ Report

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		Fax:	+49-2096016403
		Report-No:	06-16-640285

SO₃ Test Report

- D R A F T -

Test period: 10/02 - 10/03/2006 and 10/31 - 11/01/2006

ordered by ADA-ES, Inc.

Name of Plant Owner: Public Service of New Hampshire (PSNH)
Plant Identification: Merrimack Station, Unit 2
Location of Plant: 97 River Road, Bow, NH 03304

address: E.ON Engineering GmbH, P.O.Box 20 02 55, 45837 Gelsenkirchen

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1 Task description

Public Service of New Hampshire (PSNH) operates two coal fired boilers with cyclone burners (Unit 1: 120 MW and Unit: 2: 330 MW) at Merrimack Station which is located in Bow, New Hampshire. ADA-ES, Inc. carries out a comprehensive research program for mercury mitigation at Merrimack Station and, in this context, was interested in the behaviour of sulphur trioxide (SO₃) along the flue gas path from the air heater outlet to the stack. For this reason E.ON Engineering GmbH was commissioned to carry out SO₃ baseline testing and SO₃ testing during sorbent injection at Merrimack Station, Unit 2.

2 Test schedule, SO₃ measurement locations

All the tests were performed at full load (332 MW_{gross}) when firing fuel blends of various low and mid sulfur coals. Unit 2 is equipped with a tubular heat exchanger (air heater) and soot blowers are not installed. The following test locations and measuring points for SO₃ testing were agreed:

For baseline testing (October 02-03, 2006):

- Air heater outlet, North and South): Two ducts, three ports, 1 point deep (ca. 1.8 m, 5.9 ft)
- Inter ESP: One duct, one port, 1 point deep (ca. 2.5 m, 8.2 ft)
- Downstream ESP II, upstream stack: One duct, one port, 1 point deep (ca. 2.5 m, 8.2 ft)

For testing during sorbent injection (October 31 and November 01, 2006):

- Inter ESP: One duct, one port, 1 point deep (ca. 2.5 m, 8.2 ft)

At the sampling location "air heater outlet" flue gas temperatures at the different sampling ports were provided by the client. It was agreed upon that SO₃ sampling was performed on three ports with highest, lowest and medium average temperatures along the measured points. The temperature profile of the ducts at air heater outlet is given in Annex 1.

A graphical representation of all test locations is given in Figures 1 and 2.

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Figure 1: Scheme of Merrimack Station, Unit 2, and location of sampling ports used for SO₃ sampling

Figure 2: Sampling ports at air heater outlet (used ports in black) and average flue gas temperatures

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3 Measuring and Analytical Methods

3.1 Measuring Parameter: Sulphur Trioxide (SO₃)

Measuring Method: (Modified) Controlled Condensation Method

The Controlled Condensation Method (VGB Method 4.5.2) was designed to measure the vapour phase of SO₃ by condensation as H₂SO₄ under controlled gas conditions, eliminating the potential for interference with sulphur dioxide. This method was applied during baseline testing.

The Controlled Condensation Method has been modified by E.ON Engineering for determining sulphuric acid emissions downstream of wet scrubbers or at wet stacks of coal fired power stations or where any alkaline ashes or sorbents are present in the flue gas which may react with the SO₃ on the filter. Instead of the typically used quartz filter, the E.ON method utilizes a tubular electrostatic precipitator (ESP) to remove the ash particles to the side walls away from the gas stream. The sulphuric acid aerosols, if present, are evaporated in the ESP without intensive contact to fly ash particles. The high residence time of the gas stream within the heated ESP and the operation of the ESP at a temperature level significantly higher than the acid dew point ensure that only gaseous SO₃ is entering the condenser. This Method was applied for testing during sorbent injection.

Sampling Equipment:

The following items were used for sample collection:

Sampling Train:

A schematic of the sampling train used is shown below in Figure 3. The schematic is similar to the Method 8A¹ train (as used in the US) except that the impingers for SO₂ determination are omitted and that - in case of the modified method - an electrostatic precipitator is used instead of the quartz filter. The dry gas meter was replaced by a wet gas meter eliminating the need for a silica gel drying tube.

Quartz wool filter:

Quartz tube with lateral inlet in direction of the flue gas flow and packed with quartz wool. The filter is heated by the flue gas (isothermal filter conditions).

Probe liner:

Quartz, straight tube approximately 10-mm inside diameter, with a heating element and a stainless steel jacket. The temperature of the probe is controlled by a thermocouple taped on the quartz tube insulated with glass wool. Probe temperature was set to 260 °C (500 °F).

¹ A Method from the National Council of the Paper Industry for Air and Stream Improvement

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Figure 3: Sulphuric Acid Sampling Train

Electrostatic Precipitator (ESP):

Tubular ESP heated up to 200 °C (392 °F).

High voltage: 2 to 24 kV. Maximum flow rate: 70 l/min.

View and schematic of the ESP is given in Figure 4.

The filter consists of an exchangeable tube with a removable precipitation foil and a spray electrode in the center. The filter is placed in a caloric isolated container. The heating is adjusted to 200 °C (392 °F). At a high voltage of 24 kV and a filter current of 0.5 mA the separation efficiency of the filter is > 99.5 % for a particle size of 0.1 to 10 µm.

Figure 4: View and Schematic of the ESP

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H₂SO₄ Condenser:

The condenser coil is made from borosilicate glass with 500 cm of 6 mm ID tubing. The condenser coil is placed in a water bath which is maintained at a temperature of 80-90 °C (175-195 °F).

Metering System:

This system consists of a vacuum gauge, leak-free pump, temperature sensors capable of measuring temperature to within 1 °C, wet gas meter (WGM) capable of measuring volume to within 2 percent, and related equipment, as shown in Figure 3.

Sample Recovery

After each sampling run, the condensation coil is removed from the water bath and cooled down to ambient air temperature. The condensation coil is then rinsed with deionised water in a volumetric flask. Multiple rinses are used for good washing. The volumetric flask is filled up with deionised water to exactly 200 ml.

Sample Analysis

With a graduated pipette a volume of 20 ml is taken from the volumetric flask (section 4.2.2.3) and transferred to a 250 ml Erlenmeyer flask. After adding 80 ml of 2-propanol (IPA) and 4 drops of Thorine as indicator the solution is titrated with barium-perchlorate. Based on the sampled gas volume and the titration test result, the sulphuric acid aerosol concentration present in the flue gas is calculated.

Limit of Determination: 1 mg/m³ at a sample volume of 0.1 m³

3.2 Measuring Parameter: Oxygen (O₂)

Oxygen was measured at the gas meter outlet of each SO₃ sampling train.

Analyzer: Manufacturer: M & C Company, Type: PMA 10

Measuring Range: 0 - 30 Vol.-%

Analyzer Calibration: Calibration Gas: Air (20.9 Vol.-%)

Limit of Determination: 0.1 Vol.-%

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4 Test Conditions and Results

4.1 Operating Conditions of the Plant during Testing

Normally all SO₃ tests were carried out during full load of the plant (321 MW_{gross}). On October 3rd 2006 initially baseline testing at full load with reduced air heater outlet temperature was intended. However, due to transformer troubles, boiler load had to be reduced to 232 MW_{gross} and therefore SO₃ testing was performed at reduced load. Detailed plant data of the testing period 10/02/2006 - 10/03/2006 are summarized in Annex 2.

4.2 Testing Results

Baseline Testing:

The results of the baseline testing during full load operation without injection of SO₃ sorbents at the three different sampling locations are summarized in Table 1. Detailed sampling and analysis data of each individual testing are documented in Annex 3.

Table 1: Summarized Results of SO₃ Baseline Testing*

Date	Location	Average Flue Gas Temperature [°F]	Number of Tests	Average SO ₃ Concentration [ppm at 3 % O ₂]	Comment
10/02/2006	Air heater outlet	344	12	12.9	three ports (7, 10, 16)
10/02/2006	Inter ESP	331	7	15.2	one port
10/02/2006	ESP II outlet	327	7	13.9	one port

* Tests on October 03, 2006 at reduced load are not considered in this table

Testing during Sorbent Injection:

Summarized results of testing with sorbent injection on October 31st and November 1st, 2006 are presented in Table 2. Detailed sampling and analysis data of each individual testing are documented in Annex 4.

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Table 2: Summarized Results of SO₃ Testing at Sampling Location "Inter ESP" during Sorbent Injection

Date	Time	Number of Tests	Average SO ₃ Concentration [ppm at 3 % O ₂]	Comment
10/31/2006	10:30-12:00	3	14.8	No injection
10/31/2006	16:30-18:00	3	10.2	With injection*
11/01/2006	10:10-10:40	2	8.8	Injection: 500 lb/h, drop temp. before pre-heater
11/01/2006	11:15-14:10	6	8.5	Injection: 625 lb/h, drop temp. before pre-heater
11/01/2006	14:55-16:15	4	7.3	Injection: 625 lb/h, normal temp. before pre-heater
11/01/2006	17:15-17:55	2	20.2	No injection, drop temp. before pre-heater

* One test without injection within this time period is not considered in these values.

PAU/May-Fe

12/20/2006

 Hans-Joachim Dieckmann

 Dr. Johannes Mayer

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5 Annex

Annex 1	Temperature Profile at Air Heater Outlet
Annex 2	Plant Data of October 02-03, 2006
Annex 3	Individual Results of SO ₃ Baseline Testing
Annex 4	Individual Results of SO ₃ Testing during Sorbent Injection

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Annex 1: Flue gas temperatures [°F] at air heater outlet, provided by the client

		Port no.															
		Duct North								Duct South							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Depth [inches]	6 5/16	349		368		340		317			-		-		-		366
	19	347		362		337		307		306			-		-		361
	31 11/16	342		360		334		308		303			331		360		363
	44 5/16	354		351		334		330		305			335		365		370
	51	359		357		347		345		308			354		368		368
	69	364		353		344		342		319			351		360		360
Average		352.5		358.5		339.3		324.8		308.2			342.8		363.3		364.7

Date of measurement: 09/29/2006

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Annex 2.1: Plant Data of October 02-03, 2006

Gross MW	Coal Burned	Cond Press LP in-Hg	Cond Press HP in-Hg	Primary SH Diff in-H2O	Secondary SH Diff in-H2O	Econo diff in-H2O	AH diff in-H2O	Gas Outlet in-H2O	Furnace pres in-H2O	Windbox pres in-H2O	FD Discharge 2A Press in-H2O	FD Discharge 2B Press in-H2O
AW2701020001.0001.PNT	AW2701020001.0001.PNT	AW2701020001.0001.PNT	AW2701020001.0001.PNT	AW2701020001.0001.PNT	AW2701020001.0001.PNT	AW2701020001.0001.PNT	AW2701020001.0001.PNT	AW2701020001.0001.PNT	AW2701020001.0001.PNT	AW2701020001.0001.PNT	AW2701020001.0001.PNT	AW2701020001.0001.PNT
314.1	235.9	1.61	1.95	4.99	1.83	1.67	7.21	5.93	27.37	59.38	65.41	66.88
314.3	236.4	1.61	1.95	4.96	1.82	1.66	7.15	5.93	27.21	59.33	65.26	66.79
314.2	236.9	1.61	1.95	5.02	1.81	1.69	7.26	5.96	27.51	59.60	65.62	67.15
314.8	236.9	1.61	1.95	5.04	1.83	1.70	7.24	5.94	27.57	59.65	65.71	67.18
313.7	236.0	1.66	1.96	4.96	1.82	1.67	7.02	5.94	26.97	59.01	65.80	66.48
314.0	236.0	1.61	1.95	4.96	1.82	1.68	7.12	5.94	27.07	59.17	65.14	66.64
324.7	245.4	1.61	1.95	5.16	1.95	1.76	7.46	6.10	28.63	60.57	67.00	68.34
325.3	244.2	1.61	1.95	5.21	1.91	1.77	7.48	6.14	28.62	60.63	66.96	68.46
325.2	244.7	1.61	1.95	5.09	1.89	1.70	7.11	6.03	27.64	59.25	67.45	68.92
324.9	244.4	1.61	1.95	5.23	1.80	1.63	7.41	6.04	28.29	60.37	66.66	68.08
324.8	244.9	1.61	1.95	5.26	1.81	1.63	7.40	6.04	28.49	60.50	66.80	68.27
325.2	245.4	1.61	1.95	5.24	1.82	1.64	7.40	6.04	28.49	60.53	66.86	68.27
325.2	244.9	1.61	1.95	5.27	1.78	1.63	7.40	6.04	28.38	60.40	66.73	68.21
324.8	244.8	1.61	2.04	5.26	1.83	1.64	7.40	6.04	28.49	60.50	66.88	68.29
325.2	244.8	1.66	2.05	5.27	1.83	1.64	7.43	6.04	28.57	60.65	67.01	68.43
325.1	244.8	1.72	2.05	5.24	1.77	1.64	7.40	6.04	28.46	60.47	66.76	68.17
324.9	244.6	1.72	2.05	5.27	1.79	1.64	7.39	6.04	28.39	60.48	66.79	68.21
325.1	243.9	1.72	2.05	5.24	1.82	1.63	7.38	6.04	28.25	60.31	66.56	68.02
324.9	244.4	1.72	2.05	5.21	1.84	1.64	7.40	6.04	28.37	60.38	66.73	68.08
326.7	246.3	1.72	2.05	5.32	1.85	1.66	7.56	6.04	28.85	60.87	67.29	68.71
327.2	246.3	1.72	2.05	5.30	1.86	1.66	7.53	6.04	28.97	61.04	67.49	68.88
325.8	245.5	1.72	2.05	5.27	1.86	1.65	7.55	6.04	28.81	60.83	67.22	68.67
325.0	244.7	1.81	2.05	5.21	1.87	1.63	7.51	6.04	28.61	60.61	66.97	68.36
324.6	245.4	1.88	2.05	5.22	1.86	1.62	7.47	6.04	28.50	60.57	66.86	68.35
324.7	246.0	2.08	2.17	5.25	1.86	1.64	7.49	6.04	28.73	60.74	67.09	68.53
325.0	246.4	2.25	2.25	5.24	1.90	1.65	7.48	6.04	28.64	60.89	67.30	68.79
318.0	239.8	2.00	2.14	5.06	1.85	1.77	7.20	5.87	27.59	59.72	65.85	67.31
305.0	228.4	1.79	1.97	4.77	1.86	1.66	6.76	5.48	25.69	57.80	63.42	64.91
304.9	229.2	1.76	1.94	4.80	1.77	1.69	6.81	5.48	26.08	58.14	63.82	65.36
305.1	229.4	1.76	1.94	4.80	1.79	1.69	6.77	5.43	25.95	58.01	63.64	65.15
319.2	240.0	1.76	1.99	5.10	1.90	1.80	7.23	5.61	27.90	59.91	66.01	67.53
324.7	243.3	1.76	2.04	5.20	1.94	1.83	7.42	6.01	28.60	60.65	66.94	68.48
325.2	243.6	1.76	2.04	5.21	1.92	1.83	7.43	6.01	28.65	60.78	67.12	68.47
325.0	243.6	1.71	2.04	5.19	1.93	1.82	7.47	6.01	28.57	60.67	67.03	68.51
324.8	243.3	1.66	2.04	5.21	1.93	1.82	7.42	6.01	28.51	60.63	66.91	68.37
325.2	243.3	1.66	2.04	5.19	1.99	1.82	7.42	6.01	28.52	60.65	66.99	68.44
325.1	243.8	1.66	2.04	5.18	1.97	1.82	7.47	6.01	28.52	60.64	66.96	68.44
325.0	244.0	1.66	2.04	5.26	1.96	1.83	7.51	6.01	28.79	60.86	67.24	68.93
325.2	243.9	1.71	2.04	5.21	1.93	1.83	7.48	6.01	28.68	60.83	67.24	68.92
325.7	243.3	1.69	2.04	5.20	1.96	1.82	7.39	6.01	28.59	60.69	67.04	68.71
325.6	242.8	1.68	2.04	5.22	1.93	1.83	7.52	6.01	28.75	60.83	67.20	68.89
325.0	241.0	1.69	2.04	5.19	1.90	1.61	7.40	6.01	28.46	60.55	66.84	68.53
324.9	240.7	1.76	2.04	5.16	1.89	1.61	7.42	6.01	28.50	60.57	66.89	68.52
324.5	240.5	1.76	2.04	5.16	1.90	1.62	7.41	6.01	28.49	60.56	66.85	68.58
325.3	241.0	1.76	2.04	5.17	1.99	1.82	7.42	6.01	28.58	60.71	67.08	68.78
262.9	192.9	1.76	1.88	3.96	1.50	1.40	5.61	4.18	21.05	53.36	57.91	59.46
231.4	175.2	1.77	1.83	3.75	1.40	1.33	5.30	3.78	19.76	51.88	56.13	57.74
233.0	177.9	1.80	1.83	3.79	1.44	1.34	5.37	3.78	20.04	52.13	56.43	57.94
232.9	176.5	1.86	1.85	3.81	1.45	1.35	5.30	3.89	20.16	52.26	56.58	58.14
233.0	179.2	1.96	1.96	3.84	1.45	1.36	5.34	4.04	20.32	52.35	56.70	58.29
233.0	179.1	2.01	1.97	3.89	1.46	1.37	5.36	4.20	20.41	52.54	56.96	58.47
233.1	176.4	1.82	1.83	3.84	1.46	1.36	5.36	4.15	20.32	52.46	56.82	58.37

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			Date:	12/20/2006
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ADA-ES, Merrimack Station, Unit #2 SO ₃ Test Report - <i>D R A F T</i> -			Phone:	+49-2096016284
			Fax:	+49-2096016403
			Report-No:	06-16-640285

Annex 2.2: Plant Data of October 02-03, 2006 (continued)

Wind turn diff inH ₂ O	U2 GFF 2A atm/s	U2 GFF 2B atm/s	AH gas out temp N	AH gas out temp N1	AH gas out temp S1	AH gas out temp S	AH cold end ave N temp	AH cold end ave S temp	AH ave cold end temp	AH air inlet 2B temp	AH air inlet 2A temp	Opacity
32.02	-0.17	84.72	342.9	305.2	305.4	343.1	251.1	255.3	253.0	183.1	177.8	6.95
32.12	-0.17	84.85	342.2	304.8	304.9	342.8	250.6	254.9	252.8	183.1	177.8	6.80
32.09	-0.17	84.71	341.8	304.4	304.5	342.7	250.6	254.6	252.5	182.7	178.1	6.76
32.08	-0.17	84.71	341.5	303.9	303.9	342.2	250.6	254.3	252.2	182.4	178.4	6.66
32.04	-0.17	84.89	340.5	303.7	303.9	342.2	250.8	254.3	252.3	183.6	178.4	6.78
32.10	-0.17	84.84	339.8	303.7	303.9	342.3	250.1	254.3	252.1	183.2	178.0	6.64
31.94	-0.17	84.55	340.8	303.4	304.0	342.2	250.0	254.1	252.2	182.5	178.4	6.66
32.01	-0.17	84.82	341.2	303.9	304.9	342.6	250.4	254.2	252.4	182.6	178.2	6.71
31.60	-0.17	84.90	340.5	303.7	304.7	342.7	250.1	254.2	252.4	183.0	178.4	6.76
32.08	-0.17	85.02	339.7	303.3	304.1	342.6	250.0	254.2	252.4	183.1	178.4	6.71
32.01	-0.17	84.76	339.2	302.4	302.9	342.1	250.0	253.5	251.6	183.0	178.9	6.77
32.04	-0.17	84.67	338.9	302.2	302.1	341.3	249.9	253.2	251.4	182.8	179.0	6.79
32.01	-0.17	84.97	338.5	301.9	301.9	341.1	249.5	252.7	251.3	183.1	179.0	6.72
32.01	-0.17	84.83	338.2	301.7	301.6	343.6	249.5	252.7	251.1	182.8	179.0	6.80
32.08	-0.17	84.69	338.3	301.8	301.8	344.1	249.5	252.8	251.3	182.8	179.2	7.34
32.01	-0.17	84.88	339.7	303.1	303.6	342.6	250.0	254.0	252.1	183.1	178.7	6.91
32.09	-0.17	84.95	340.2	303.4	303.9	342.2	250.0	254.3	252.2	183.1	178.4	6.56
32.07	-0.17	84.93	340.4	303.6	303.9	342.9	250.0	254.3	252.2	182.9	178.4	6.46
32.01	-0.17	84.93	340.3	303.6	304.4	342.7	250.0	254.3	252.4	183.1	178.4	6.48
32.01	-0.17	84.86	340.7	303.9	304.5	342.7	250.3	254.8	252.5	183.1	178.4	6.40
32.07	-0.17	84.96	340.8	304.0	304.5	342.7	250.5	254.8	252.5	183.1	178.4	6.78
32.02	-0.17	84.72	340.8	304.1	304.1	342.5	250.5	254.6	252.3	182.9	178.4	6.62
32.01	-0.17	84.98	340.8	304.0	304.0	342.0	250.5	254.3	252.2	182.7	178.4	6.60
32.06	-0.17	85.03	340.8	303.8	304.0	342.7	250.4	254.3	252.2	183.1	178.4	6.68
32.01	-0.17	84.87	341.2	303.7	303.5	342.6	250.5	253.9	252.1	182.5	178.4	6.69
32.05	-0.17	84.56	341.3	303.5	303.4	342.2	250.5	253.8	252.1	182.6	178.4	6.84
32.13	-0.17	85.13	341.2	303.4	303.3	342.0	250.4	253.8	252.0	182.7	178.4	6.71
32.10	-0.17	85.12	339.9	303.0	302.2	345.0	249.9	253.6	251.7	183.1	178.6	6.65
32.08	-0.17	84.53	338.8	302.1	300.6	343.6	249.9	252.6	251.0	183.0	178.9	6.71
32.06	-0.17	84.62	338.4	301.7	299.8	342.7	249.4	251.8	250.7	182.6	178.9	6.56
32.01	-0.17	84.52	339.1	302.0	300.0	342.8	249.9	251.8	250.9	181.9	178.4	6.79
32.06	-0.17	85.04	341.1	303.1	301.4	344.4	250.5	252.2	251.5	181.5	179.1	6.69
32.13	-0.17	85.05	342.2	304.0	302.6	345.0	250.5	253.0	251.9	181.8	178.5	6.71
32.10	-0.17	84.77	342.9	304.5	303.3	342.7	251.0	253.3	252.2	182.0	178.3	6.75
32.11	-0.17	84.99	343.3	304.8	303.6	342.2	251.0	253.6	252.4	182.0	178.1	6.74
32.13	-0.17	84.94	343.3	304.9	303.8	342.2	251.0	253.8	252.4	181.5	178.0	6.76
32.12	-0.17	84.77	343.3	304.9	303.7	342.2	251.0	253.8	252.3	181.7	178.1	6.87
32.07	-0.17	84.57	343.6	305.2	304.3	342.4	251.1	253.8	252.4	181.5	177.9	6.90
32.17	-0.17	84.79	344.2	305.4	304.6	345.1	251.4	253.9	252.7	181.7	177.8	7.00
32.11	-0.17	85.03	343.7	305.1	304.8	342.2	251.0	254.3	252.6	182.0	177.8	6.90
32.07	-0.17	84.76	343.2	304.9	304.6	342.6	251.0	253.9	252.5	181.6	177.6	6.81
32.09	-0.17	84.84	343.8	305.1	304.7	345.0	251.0	254.3	252.6	182.0	177.6	6.90
32.07	-0.17	84.56	343.8	305.2	305.1	345.2	251.0	254.3	252.8	182.1	177.8	6.99
32.07	-0.17	85.14	344.1	305.3	305.1	345.2	251.0	254.3	252.8	181.8	177.8	7.01
32.13	-0.17	85.09	341.2	304.6	303.7	342.7	250.3	254.3	252.2	182.9	177.5	6.70
32.30	-0.17	84.89	333.5	298.6	296.9	340.8	245.8	246.8	243.9	180.6	175.5	7.55
32.12	-0.17	84.94	326.7	292.5	290.5	333.0	242.4	245.8	242.1	179.7	175.1	7.13
32.09	-0.17	84.54	326.7	288.9	287.5	329.2	240.6	244.0	242.1	179.6	175.1	6.74
32.10	-0.17	84.97	323.4	288.9	287.5	329.2	240.6	243.5	241.6	179.7	175.1	6.69
32.03	-0.17	84.69	321.8	287.5	286.2	327.9	239.5	243.5	241.3	179.9	175.1	6.54
32.13	-0.17	84.83	321.0	287.2	285.8	327.6	239.5	243.3	241.3	179.9	175.1	6.54
32.14	-0.17	84.82	320.3	286.8	285.4	326.4	239.5	243.0	241.3	179.9	175.2	6.27

ADA-ES, Merrimack Station, Unit #2
SO₃ Test Report - *D R A F T* -

Annex 2.3: Plant Data of October 02-03, 2006 (continued)

	Coal Flow		Coal Flow		Coal Flow		Coal Flow		Coal Flow		Main steam		Turbine		Turbine		feedwater		O2 East		O2 West	
	2A kWhr	Avg (MW)	2B kWhr	Avg (MW)	2C kWhr	Avg (MW)	2E kWhr	Avg (MW)	2F kWhr	Avg (MW)	2G kWhr	Avg (MW)	inlet steam temp	inlet steam Pres	inlet steam temp	inlet steam Pres	flow	Avg (MW)	Avg (MW)	Avg (MW)	Avg (MW)	
10/2/2006 9:00	35.41	35.38	35.34	35.35	35.33	35.44	35.33	35.44	35.66	35.47	23.33	21.24	1001	23.75	21.02	23.75	21.02	2.41	2.41	2.24	2.24	
10/2/2006 9:30	35.41	35.36	35.34	35.35	35.64	35.66	35.64	35.64	35.66	23.47	23.47	21.26	1001	23.75	21.06	23.75	21.06	2.37	2.37	2.24	2.24	
10/2/2006 10:00	35.41	35.36	35.45	35.39	35.72	35.75	35.72	35.75	35.75	23.65	23.65	21.27	1001	23.75	21.10	23.75	21.10	2.34	2.34	2.21	2.21	
10/2/2006 10:30	35.41	35.31	35.34	35.30	35.44	35.42	35.44	35.44	35.42	23.44	23.44	21.31	1001	23.76	21.07	23.76	21.07	2.43	2.43	2.23	2.23	
10/2/2006 11:00	35.17	35.29	35.28	35.27	35.20	35.17	35.20	35.17	35.20	23.64	23.64	21.27	1002	23.75	20.96	23.75	20.96	2.37	2.37	2.20	2.20	
10/2/2006 11:30	35.36	35.39	35.36	35.35	35.20	35.24	35.26	35.20	35.24	23.26	23.26	21.30	1002	23.75	21.21	23.75	21.21	2.26	2.26	2.33	2.33	
10/2/2006 12:00	36.37	36.33	36.36	36.38	36.43	36.44	36.43	36.44	36.44	24.56	24.56	21.93	1001	23.73	21.71	23.73	21.71	2.21	2.21	2.23	2.23	
10/2/2006 12:30	35.37	35.35	35.31	35.32	35.33	35.33	35.33	35.33	35.33	23.33	23.33	21.90	1001	23.76	21.67	23.76	21.67	2.43	2.43	2.33	2.33	
10/2/2006 13:00	34.84	34.88	34.82	34.84	34.85	35.09	34.84	34.85	35.09	34.94	34.94	21.88	1001	23.75	21.62	23.75	21.62	2.29	2.29	2.33	2.33	
10/2/2006 13:30	34.84	34.88	34.82	34.84	34.71	34.77	34.77	34.77	34.77	34.94	34.94	21.86	1001	23.76	21.59	23.76	21.59	2.31	2.31	2.26	2.26	
10/2/2006 14:00	34.84	34.92	34.89	34.94	34.96	34.94	34.96	34.94	34.96	34.99	34.99	21.85	1001	23.75	21.69	23.75	21.69	2.32	2.32	2.33	2.33	
10/2/2006 14:30	34.98	34.97	34.97	34.94	35.03	35.13	35.06	35.13	35.06	21.68	21.68	21.85	1001	23.75	21.60	23.75	21.60	2.28	2.28	2.31	2.31	
10/2/2006 15:00	34.95	34.88	34.81	34.84	35.04	35.21	35.02	35.21	35.02	21.67	21.67	21.87	1002	23.75	21.60	23.75	21.60	2.22	2.22	2.29	2.29	
10/2/2006 15:30	34.92	34.92	34.90	34.89	34.90	34.96	34.96	34.90	34.96	35.00	35.00	21.85	1002	23.75	21.60	23.75	21.60	2.22	2.22	2.35	2.35	
10/2/2006 16:00	34.84	34.88	34.95	34.84	35.10	35.12	35.01	35.12	35.01	21.90	21.90	21.93	1002	23.76	21.65	23.76	21.65	2.35	2.35	2.29	2.29	
10/2/2006 16:30	34.90	34.88	34.91	34.84	35.04	34.99	35.07	35.07	35.07	21.93	21.93	21.93	1002	23.75	21.67	23.75	21.67	2.33	2.33	2.29	2.29	
10/2/2006 17:00	34.90	34.88	34.93	34.84	34.83	34.83	34.83	34.83	34.83	21.92	21.92	21.92	1002	23.76	21.67	23.76	21.67	2.32	2.32	2.27	2.27	
10/2/2006 17:30	34.90	34.88	34.78	34.84	34.82	34.72	34.83	34.72	34.84	21.94	21.94	21.94	1002	23.75	21.69	23.75	21.69	2.40	2.40	2.21	2.21	
10/2/2006 18:00	34.90	34.88	34.84	34.84	34.92	34.86	34.91	34.86	34.91	21.91	21.91	21.91	1001	23.76	21.67	23.76	21.67	2.37	2.37	2.21	2.21	
10/2/2006 18:30	35.17	35.15	35.16	35.12	35.20	35.21	35.20	35.21	35.20	22.01	22.01	22.01	1001	23.75	21.76	23.75	21.76	2.26	2.26	2.35	2.35	
10/2/2006 19:00	35.22	35.27	35.24	35.21	35.21	35.17	35.19	35.21	35.17	22.08	22.08	22.08	1002	23.75	21.61	23.75	21.61	2.31	2.31	2.30	2.30	
10/2/2006 19:30	34.85	35.11	35.15	35.10	35.10	35.13	35.13	35.10	35.13	21.96	21.96	21.96	1001	23.76	21.71	23.76	21.71	2.34	2.34	2.25	2.25	
10/2/2006 20:00	34.91	34.89	34.80	34.85	34.85	34.93	34.85	34.93	34.93	21.67	21.67	21.67	1001	23.76	21.61	23.76	21.61	2.36	2.36	2.26	2.26	
10/2/2006 20:30	35.00	34.95	35.18	35.15	35.16	35.16	35.16	35.16	35.16	21.68	21.68	21.68	1001	23.75	21.62	23.75	21.62	2.34	2.34	2.25	2.25	
10/2/2006 21:00	35.24	35.02	35.29	35.12	35.27	35.16	35.12	35.27	35.16	21.92	21.92	21.92	1001	23.75	21.64	23.75	21.64	2.31	2.31	2.25	2.25	
10/2/2006 21:30	35.39	35.38	35.29	35.36	35.27	35.16	35.12	35.27	35.16	22.01	22.01	22.01	1002	23.75	21.76	23.75	21.76	2.36	2.36	2.27	2.27	
10/2/2006 22:00	34.23	34.41	34.36	34.40	34.36	34.34	34.36	34.34	34.36	34.29	34.29	21.49	1001	23.78	21.18	23.78	21.18	2.28	2.28	2.30	2.30	
10/2/2006 22:30	32.50	32.69	32.66	32.65	32.67	32.69	32.67	32.69	32.64	20.72	20.72	20.72	1003	23.74	20.45	23.74	20.45	2.38	2.38	2.18	2.18	
10/2/2006 23:00	32.72	32.78	32.77	32.78	32.78	32.82	32.78	32.82	32.74	20.76	20.76	20.76	1001	23.75	20.45	23.75	20.45	2.40	2.40	2.20	2.20	
10/2/2006 23:30	32.88	32.77	32.83	32.69	32.81	32.74	32.81	32.74	32.74	20.76	20.76	20.76	1001	23.76	20.46	23.76	20.46	2.45	2.45	2.18	2.18	
10/3/2006 0:00	34.20	34.14	34.17	34.16	34.10	34.10	34.10	34.10	34.10	21.62	21.62	21.62	1002	23.73	21.37	23.73	21.37	2.41	2.41	2.19	2.19	
10/3/2006 0:30	34.83	34.83	34.82	34.85	34.78	34.78	34.78	34.78	34.78	21.93	21.93	21.93	1002	23.76	21.71	23.76	21.71	2.45	2.45	2.16	2.16	
10/3/2006 1:00	34.51	34.83	34.82	34.85	34.75	34.69	34.75	34.69	34.84	21.96	21.96	21.96	1001	23.75	21.73	23.75	21.73	2.36	2.36	2.24	2.24	
10/3/2006 1:30	34.86	34.83	34.82	34.85	34.76	34.69	34.76	34.69	34.80	21.91	21.91	21.91	1001	23.76	21.68	23.76	21.68	2.36	2.36	2.21	2.21	
10/3/2006 2:00	34.84	34.83	34.82	34.85	34.75	34.70	34.82	34.75	34.70	21.90	21.90	21.90	1002	23.75	21.65	23.75	21.65	2.39	2.39	2.22	2.22	
10/3/2006 2:30	34.82	34.83	34.82	34.85	34.78	34.74	34.80	34.78	34.74	21.89	21.89	21.89	1002	23.75	21.69	23.75	21.69	2.34	2.34	2.26	2.26	
10/3/2006 3:00	34.88	34.83	34.82	34.85	34.75	34.74	34.83	34.75	34.74	21.91	21.91	21.91	1001	23.76	21.68	23.76	21.68	2.44	2.44	2.15	2.15	
10/3/2006 3:30	34.86	34.83	34.82	34.85	34.80	34.77	34.82	34.80	34.77	21.89	21.89	21.89	1001	23.75	21.66	23.75	21.66	2.38	2.38	2.20	2.20	
10/3/2006 4:00	34.79	34.79	34.86	34.80	34.82	34.88	34.82	34.88	34.82	21.90	21.90	21.90	1001	23.76	21.67	23.76	21.67	2.45	2.45	2.20	2.20	
10/3/2006 4:30	34.85	34.84	34.85	34.85	34.74	34.68	34.82	34.74	34.68	21.88	21.88	21.88	1002	23.75	21.70	23.75	21.70	2.40	2.40	2.16	2.16	
10/3/2006 5:00	34.69	34.80	34.79	34.72	34.74	34.69	34.74	34.69	34.69	21.82	21.82	21.82	1002	23.76	21.65	23.76	21.65	2.43	2.43	2.17	2.17	
10/3/2006 5:30	34.21	34.39	34.42	34.35	34.36	34.44	34.36	34.44	34.36	21.91	21.91	21.91	1002	23.75	21.66	23.75	21.66	2.37	2.37	2.19	2.19	
10/3/2006 6:00	34.25	34.33	34.39	34.30	34.30	34.29	34.30	34.29	34.45	21.94	21.94	21.94	1002	23.75	21.70	23.75	21.70	2.43	2.43	2.16	2.16	
10/3/2006 6:30	34.27	34.30	34.33	34.30	34.31	34.36	34.31	34.36	34.37	21.93	21.93	21.93	1002	23.75	21.69	23.75	21.69	2.45	2.45	2.15	2.15	
10/3/2006 7:00	34.34	34.33	34.35	34.33	34.27	34.48	34.41	34.48	34.41	21.92	21.92	21.92	1001	23.77	21.69	23.77	21.69	2.39	2.39	2.22	2.22	
10/3/2006 7:30	27.65	27.75	27.72	27.76	27.69	27.68	27.69	27.68	27.68	18.06	18.06	18.06	1003	23.71	17.69	23.71	17.69	3.10	3.10	2.91	2.91	
10/3/2006 8:00	25.46	25.08	25.09	24.95	24.98	24.96	24.98	24.96	25.00	16.08	16.08	16.08	1000	23.75	15.73	23.75	15.73	4.15	4.15	4.08	4.08	
10/3/2006 8:30	25.36	25.44	25.52	25.43	25.40	25.37	25.40	25.37	25.36	16.21	16.21	16.21	1001	23.75	15.63	23.75	15.63	4.11	4.11	4.05	4.05	
10/3/2006 9:00	25.39	25.55	25.56	25.50	25.43	25.47	25.43	25.47	25.43	16.22	16.22	16.22	1001	23.75	15.63	23.75	15.63	4.13	4.13	4.03	4.03	
10/3/2006 9:30	25.60	25.55	25.56	25.60	25.50	25.54	25.50	25.54	25.50	16.24	16.24	16.24	1001	23.75	15.64	23.75	15.64	4.19	4.19	4.04	4.04	
10/3/2006 10:00	25.42	25.55	25.56	25.50	25.66	25.44	25.66	25.44	25.44	16.13	16.13	16.13	1001	23.75	15.64	23.75	15.64	4.02	4.02	4.11	4.11	
10/3/2006 10:30	25.47	25.55	25.56	25.60	25.51	25.46	25.51	25.46	25.46	16.18	16.18	16.18	1002	23.76	15.61	23.76	15.61	4.11	4.11	4.09	4.09

Environmental Services	B.-Unit:	PAU
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		Fax:	+49-2096016403
		Report-No:	06-16-640285

Annex 3.1: Individual Results of SO₃ Baseline Testing

Table A3-1: SO₃ test results at air heater outlet (ESP Inlet), 10/02/2006

test period	gas counter					titration	SO ₃ concentration (STP, dry)		comment
	V	p	t	O ₂	V ₀		actual O ₂	3 % O ₂	
[start - end]	[L]	[mbar]	[°C]	[Vol.-%]	[NL]	[mL]	[ppm]	[ppm]	
09:20-09:29	150	1022	23	5.1	136	1.15	9.5	10.8	port 7, 325 °F
09:55-10:03	150	1024	22	5.5	137	1.25	10.2	11.9	port 7, 325 °F
10:10-10:20	150	1024	22	5.2	137	1.25	10.2	11.6	port 7, 325 °F
						average:	10.0	11.4	port 7, 325 °F
10:44-10:54	150	1024	24	8.8	136	0.85	7.0	10.4	port 10, 308 °F
11:00-11:09	150	1023	24	8.6	135	0.90	7.5	10.8	port 10, 308 °F
11:44-11:54	150	1023	23	8.5	136	0.90	7.4	10.7	port 10, 308 °F
						average:	7.3	10.6	port 10, 308 °F
12:31-12:41	150	1023	21	3.0	137	1.90	15.5	15.5	port 16, 365 °F
14:20-14:30	150	1023	22	3.0	137	1.70	14.0	14.0	port 16, 365 °F
14:40-14:50	155	1023	21	3.0	142	1.80	14.2	14.2	port 16, 365 °F
						average:	14.6	14.6	port 16, 365 °F
15:32-15:42	150	1025	23	4.5	137	1.60	13.1	14.3	port 7, 325 °F, with ESP
16:27-16:38	205	1028	21	4.2	189	2.35	13.9	14.9	port 7, 325 °F
17:20-17:30	150	1020	19	4.5	138	1.70	13.8	15.1	port 7, 325 °F
						average:	13.6	14.8	port 7, 325 °F
						total average:	11.4	12.9	ports 7, 10, 16

Table A3-2: SO₃ test results inter ESP, 10/02/2006 (all testing without ESP)

test period	gas counter					titration	(STP, dry)		comment
	V	p	t	O ₂	V ₀		actual O ₂	3 % O ₂	
[start - end]	[L]	[mbar]	[°C]	[Vol.-%]	[NL]	[mL]	[ppm]	[ppm]	
09:40-09:48	160	1019	23	4.6	145	1.60	12.4	13.6	331 °F
10:45-10:53	165	1017	24	4.7	148	1.75	13.2	14.6	331 °F
12:34-12:42	160	1017	24	4.7	143	1.85	14.5	16.0	331 °F
15:12-15:20	160	1018	23	4.7	144	1.70	13.2	14.6	331 °F
15:49-15:57	160	1018	24	4.7	143	1.65	12.9	14.2	331 °F
16:25-16:33	160	1018	23	4.8	144	1.95	15.2	16.9	331 °F
17:24-17:32	160	1017	23	4.6	144	1.95	15.2	16.7	331 °F
						average:	13.8	15.2

Environmental Services	B.-Unit:	PAU
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Annex 3.2: Individual Results of SO₃ Baseline Testing (continued)

Table A3-3: SO₃ test results ESP II Outlet, 10/02/2006 (all testing without ESP)

test period	gas counter					titration Ba(ClO ₄) ₂ [mL]	(STP, dry)		comment
	V	p	t	O ₂	V ₀		actual O ₂	3 % O ₂	
	[L]	[mbar]	[°C]	[Vol.-%]	[NL]		[ppm]	[ppm]	
10:20-10:28	160	1017	24	5.5	143	1.35	10.6	12.3	327 °F
11:04-11:12	160	1017	24	5.6	143	1.45	11.3	13.3	327 °F
12:10-12:18	160	1017	24	5.6	143	1.60	12.5	14.6	327 °F
15:30-15:38	161	1018	24	5.6	145	1.40	10.8	12.7	327 °F
16:09-16:17	160	1018	24	5.6	144	1.55	12.1	14.1	327 °F
16:45-16:53	160	1018	23	5.6	144	1.60	12.5	14.6	327 °F
17:06-17:14	160	1018	24	5.5	144	1.75	13.6	15.9	327 °F
						average:	11.9	13.9	

Table A3-4: SO₃ test results ESP II Outlet, 10/03/2006 (all testing without ESP)

test period	gas counter					titration Ba(ClO ₄) ₂ [mL]	(STP, dry)		comment
	V	p	t	O ₂	V ₀		actual O ₂	3 % O ₂	
	[L]	[mbar]	[°C]	[Vol.-%]	[NL]		[ppm]	[ppm]	
08:35-08:45	150	1020	21	7.5	137	0.60	4.9	6.6	reduced load
08:55-09:04	150	1020	21	7.5	137	0.65	5.3	7.1	reduced load
09:55-10:10	200	1022	22	7.5	182	1.05	6.5	8.6	reduced load
10:20-10:33	200	1022	22	7.5	182	1.00	6.2	8.2	reduced load
						average:	5.7	7.6

Environmental Services	B.-Unit:	PAU
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Annex 4.1: Individual Results of SO₃ Testing during Sorbent Injection

Table A4-1: SO₃ test results inter ESP, 10/31/2006 (all testing with ESP)

test period [start - end]	gas counter					titration Ba(ClO ₄) ₂ [mL]	(STP, dry)		comment
	V [L]	p [mbar]	T [°C]	O ₂ [Vol.-%]	V ₀ [NL]		actual O ₂ [ppm]	3 % O ₂ [ppm]	
16:30-16:55	150	1017	22	5.7	136	1.10	9.1	10.7	with Injection
17:20-17:40	150	1014	22	5.6	135	1.00	8.3	9.7	with Injection
17:40 18:00	150	1013	22	5.6	135	1.05	8.7	10.2	with Injection
average:							8.7	10.2	with injection

Table A4-2: SO₃ test results inter ESP, 11/01/2006 (all testing with ESP)

test period [start - end]	gas counter					titration Ba(ClO ₄) ₂ [mL]	(STP, dry)		comment
	V [L]	p [mbar]	T [°C]	O ₂ [Vol.-%]	V ₀ [NL]		actual O ₂ [ppm]	3 % O ₂ [ppm]	
10:10 - 10:30	150	1019	22	5.7	136	0.90	7.4	8.7	drop temp. before pre-heater Injection = 500 lb/h
10:30 - 10:40	100	1017	22	5.8	90	0.60	7.4	8.8	
average:							7.4	8.8	drop temp. / 500 lb/h
11:15 - 11:35	150	1014	22	5.7	135	0.85	7.0	8.3	drop temp. before pre-heater Injection = 625 lb/h
11:35 - 11:55	150	1016	22	5.8	136	0.85	7.0	8.3	
11:55 - 12:15	170	1016	22	5.6	154	0.95	6.9	8.1	
12:15 - 12:35	150	1017	22	5.8	136	0.95	7.8	9.3	
13:30 - 13:50	160	1019	22	5.6	145	0.95	7.3	8.6	
13:50 - 14:10	150	1018	22	5.8	136	0.85	7.0	8.3	
average:							7.2	8.5	drop temp. / 625 lb/h
14:55 - 15:15	160	1018	23	5.7	144	0.85	6.6	7.8	normal temp. before pre-heater Injection = 625 lb/h
15:15 - 15:35	150	1017	23	5.8	135	0.80	6.6	7.9	
15:35 - 15:55	150	1017	23	5.5	135	0.70	5.8	6.8	
15:55 - 16:15	150	1019	23	5.7	135	0.70	5.8	6.8	
average:							6.2	7.3	normal temp. / 625 lb/h
17:15 - 17:35	150	1018	23	5.7	135	2.05	17.0	20.0	normal temp. before pre-heater No injection
17:35 - 17:55	150	1018	23	5.6	135	2.10	17.4	20.4	
average:							17.2	20.2	normal. / 0 lb/h

APPENDIX O: Eastmont, March 2008

Final Report

Particulate and Halide Removal Efficiency Testing during Trona and Carbon Injection - MK2

Prepared for . . .

ADA-ES, Inc.
Littleton, CO

Prepared by . . .

Eastmount Environmental Services, LLC
May 2008
Project No. 08-049

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- A1 – M5/26A Emission Calculations and Field Data Sheets – MK2, Inlet
- A2 – M5/26A Emission Calculations and Field Data Sheets – MK2, Outlet

- B1 – M5 Analytical Data – MK2, Inlet and Outlet
- B2 – M26A Analytical Data – MK2, Inlet and Outlet

- C – Facility Process Data

- D – Equipment Calibration Sheets

1.0 INTRODUCTION AND SUMMARY OF RESULTS

1.1 General Overview

Eastmount Environmental Services, LLC of Newburyport, Massachusetts was retained by ADA-ES, Inc. of Littleton, CO to conduct non-compliance emission testing on their behalf at Public Service of New Hampshire's (PSNH's) Merrimack Station. Testing was conducted in order to determine MK2 emission rates as well as Removal Efficiency (RE) for Particulate Matter (PM) and halides (HCl, HF, HBr) while Trona and carbon were being injected. A summary of the primary parties involved in this test program is presented in Table 1-1.

1.2 Test Program Summary

Emission testing consisted of one set of three 60-minute test runs conducted concurrently at the air pre-heater outlet (old ESP inlet) and the MK2 outlet stack platform. Each test run was comprised of measurements for PM and halides at both test locations. All measurements were conducted in accordance with EPA Methods 1 through 5 and 26A for PM and halides, respectively. The average particulate removal efficiency for the test program was 99.13% while all three halides experienced a negative removal efficiency. A complete summary of the air preheater outlet and MK2 outlet emission rates and removal efficiencies for each test run are presented in Tables 1-2 and 1-3, respectively.

1.3 Final Report Organization

The remainder of this Final Report is divided into three additional sections. Section 2 provides a facility/source and sampling location description. Section 3 provides a description of the flue gas monitoring procedures, while Section 4 addresses the quality assurance/quality control aspects of the program. Copies of all supporting emission calculations and field data sheets for the air preheater and stack outlets are presented in Appendices A1 and A2, respectively; while all M5 and M26A laboratory analyses are presented in Appendices B1 and B2, respectively. Additionally, facility process data is presented in Appendix C, while equipment certification sheets are presented in Appendix D.

Table 1-1 Test Program Informational Summary

Station/Source Information
Facility Name: PSNH / Merrimack Station Facility Address: 97 River Rd. Bow, NH 03304 Facility Contact: Mr. Roger Deshaies Phone: (603) 224-4081 x173
Client Information
Name: ADA-ES, Inc. Address: 8100 South Park Way, Unit B Littleton, CO 80120 Primary Contact: Mr. Tom Campbell Phone: (303) 981-7287
Test Firm Information
Test Organization: Eastmount Environmental Services, LLC Address: 65 Parker Street, Unit 3 Newburyport, MA 01950 Contact: Mr. David Caron Title: Vice President/Monitoring Services Phone: (978) 499-9300 x11 FAX: (978) 499-9303

Table 1-2 Air Pre-heater Outlet Emission Summary – MK2

- Summary of Emissions Parameters - PSNH Merrimack Unit 2 Air Pre-Heater Outlet -					
Parameter	Units	Run 1	Run 2	Run 3	Average
Particulate Matter	gr/dscf	1.63	1.33	1.08	1.35
	lb/hr	9744.0	8999.0	6339.9	8361.0
Hydrogen Chloride	ppm	33.09	22.77	41.88	32.58
	lb/hr	130.18	101.45	162.13	131.26
Hydrogen Fluoride	ppm	4.52	3.23	5.56	4.44
	lb/hr	9.76	7.89	11.82	9.82
Hydrogen Bromide	ppm	0.17	0.11	0.19	0.16
	lb/hr	1.48	1.13	1.65	1.42
- General Run Information -					
Parameter	Units	Run 1	Run 2	Run 3	Average
Test Date	MM/DD/YY	3/27/2008	3/27/2008	3/27/2008	-
Start Time	HH:MM	8:35	11:55	15:10	-
End Time	HH:MM	9:59	14:42	17:27	-
Stack Flow	dscfh	41,684,806	47,201,164	41,019,929	43,301,966
Stack Temp	F	340.3	351.2	340.3	343.9
Stack Moist.	%	5.2%	6.8%	8.0%	6.6%
Stack Velocity	ft/sec	42.9	50.5	43.9	45.7
Oxygen	%	7.30	5.30	3.50	5.37
Carbon Dioxide	%	11.50	14.00	14.20	13.23
Isokinetic Rate	%	92.2	96.8	99.2	96.1

Table 1-3 Stack Outlet Emission Summary – MK2

- Summary of Compliance Parameters - PSNH Merrimack Unit 2 Stack -					
Parameter	Units	Run 1	Run 2	Run 3	Average
Particulate Matter	gr/dscf	0.0172	0.0116	0.0081	0.0123
	lb/hr	104.32	69.85	48.46	74.21
	%RE	98.93	99.22	99.24	99.13
Hydrogen Chloride	ppm	39.22	35.10	38.47	37.60
	lb/hr	156.57	139.34	150.90	148.94
	%RE	-20.27	-37.35	6.93	-16.90
Hydrogen Fluoride	ppm	4.76	4.37	4.75	4.63
	lb/hr	10.44	9.52	10.21	10.06
	%RE	-6.90	-20.67	13.55	-4.67
Hydrogen Bromide	ppm	0.84	0.74	0.77	0.78
	lb/hr	7.46	6.50	6.73	6.90
	%RE	-403.97	-476.87	-308.33	-396.39
- General Run Information -					
Parameter	Units	Run 1	Run 2	Run 3	Average
Test Date	MM/DD/YY	3/27/2008	3/27/2008	3/27/2008	-
Start Time	HH:MM	8:35	11:55	15:10	-
End Time	HH:MM	9:59	14:42	17:27	-
Stack Flow	dscfh	42,295,317	42,057,113	41,560,073	41,970,834
Stack Temp	F	339.3	339.3	339.3	339.3
Stack Moist.	%	5.5%	6.4%	7.3%	6.4%
Stack Velocity	ft/sec	93.1	93.4	93.1	93.2
Oxygen	%	7.70	7.50	7.00	7.40
Carbon Dioxide	%	11.00	11.50	11.50	11.33
Isokinetic Rate	%	93.5	100.0	100.1	97.9

2.0 FACILITY / SOURCE DESCRIPTION AND SAMPLING POINT LOCATIONS SUMMARY

2.1 Facility Description

Merrimack Station is a fossil fuel fired electric generating facility located in Bow, New Hampshire. Merrimack Station is PSNH's prime base load plant, capable of generating 475 net megawatts of electricity. Merrimack Station is comprised of two coal-fired cyclone utility boilers (MK1 and MK2), two combustion turbines presently operating as load shaving units (CT1 and CT2), an emergency boiler, an emergency generator, primary and secondary coal crushers, and the necessary support equipment to generate electricity.

2.2 Source Description – MK2

Unit 2 is a multiple cyclone (7) coal-fired utility boiler rated at 320 MW net. The emission controls for the unit consist of two Electrostatic Precipitators (ESPs), operated in series, for reduction of particulate emissions and a Selective Catalytic Reduction (SCR) system for reduction of NO_x emissions. Unit 2 is equipped with a dilution based CEMS located on the exhaust stack. The CEMS measures and reports opacity, CO₂, SO₂, NO_x and gas flow rate in accordance with Part 75 requirements.

2.3 Sampling Configuration – MK2 Air Pre-Heater Outlet

Simultaneously with stack sampling, Eastmount conducted testing in accordance with EPA Method 1-5 and 26A at the air pre-heater outlet (old ESP inlet). This location consists of two horizontal breechings that are each 33' 10" wide and 6' 4" deep. Each breeching has multiple sampling ports. Eastmount selected four ports on each breeching and conducted a preliminary velocity traverse in accordance with Method 1 point selection at three traverse points per port, for a total of 24 traverse points. From the preliminary traverse, ports B, D and G were selected as being the most representative and one test run was conducted via a three point traverse during each test run. A schematic detailing the duct configuration and associated traverse points is presented in Figure 2-1.

2.4 Sampling Configuration – MK2 Stack

During the test program, Eastmount conducted measurements at the stack platform location in accordance with the requirements of EPA Methods 1-5 and 26A. Due to the large nature of the stack Eastmount utilized all four test ports (located at 90 degrees to each other) during each test run. A schematic detailing the stack configuration as well as the applicable traverse points is presented in Figure 2-2.

Figure 2-1 Sampling Configuration/Traverse Point Selection – MK2 Air Pre-Heater Outlet

Stack Configuration (Per Breaching)		
Description	Distance	Equivalent Diameters
Upstream (A)	6'	n/a
Downstream (B)	n/a	n/a
Width (C)	33' 10"	NA
Depth (D)	6' 4"	NA
Equivalent Diameter	10.7'	
Number of Ports / Breaching	4	
Traverse Points (per diameter)		
Traverse Points	% of diameter	Distance (inches)
1	n/a	12.7
2	n/a	38.0
3	n/a	63.3
Note: Fixed gases were determined via Fyrite (Method 3) analysis of integrated bags collected from points selected in accordance with EPA Method 1.

Figure 2-2 Sampling Configuration/Traverse Point Selection – MK2 Stack Outlet

3.0 TEST PROCEDURES

3.1 Overview

This section provides in depth detail to each of the components that as a whole comprised the compliance test program.

3.2 Methods 1-2 (Velocity and Temperature Profile)

All mass based emission limits during this test program required Eastmount to conduct velocity traverses in accordance with EPA Methods 1-2, 40CFR60, Appendix A. The system components necessary to conduct this testing are detailed below.

- **Pitot Tube** - A Type "S" pitot tube was used to measure all gas velocities during the compliance test program. The pitot tubes met all of the dimensional criteria set forth in Method 2, therefore a coefficient of 0.84 was used.
- **Pitot Lines** - The pitot tube was connected to a manometer via leak free Tygon and/or teflon tubing.
- **Manometer** - An inclined manometer capable of measuring up to ten inches of water column pressure drop was used.
- **Thermocouple** - A "K" type thermocouple was used to monitor the stack temperature at each traverse point.
- **Static Pressure** – One static pressure measurement was conducted during each test run by rotating the pitot tubes perpendicular to the direction of flow, disconnecting the negative pitot (if positive) and recording the deflection of the manometer.
- **Barometric Pressure** - The barometric pressure was determined on-site using an aneroid barometer that is previously calibrated at Eastmount's laboratory using a NIST traceable mercury barometer.
- **Gas Molecular Weight Determination** - The O₂ and CO₂ content of the sample gas was determined via Fyrite analysis conducted in accordance with EPA Method 3, 40CFR60, Appendix A. Prior to analysis, the sample was collected via a multipoint integrated collection procedure. The sample was collected from the exhaust port of the Method 5/26A sampling train dry gas meter which allows a portion of the stream to be diverted through a rotameter and into a flexible (tedlar bag).

3.3 Method 4 (Moisture)

Moisture from each isokinetic sampling train (Method 5/26A) was determined in accordance with procedures delineated in Section 2 (Reference Method) of EPA Method 4, 40 CFR 60, Appendix A. A synopsis of the procedure is presented below.

1. **Sample Train Preparation** – Sample train preparation consisted of the following:
 - Initially load train in accordance with Method 26A absorbing solutions (total of 200ml).
 - Place 200 grams of silica gel in the last impinger.
 - Record Initial volumes and weights on the field data for each impinger.
 - Assemble entire sampling train.
2. **Pre-Test Leak Check** - The system was leak checked at fifteen inches of vacuum (15"Hg). A leak rate of less than 0.02 CFM was achieved prior to the start of sampling.
3. **Sampling** – Collected a sample at an approximate rate of 0.75 dscfm. Recorded sample gas volume, system vacuum and dry gas meter temperatures (in and out) at regular intervals for the duration of each test run.
4. **Post-Test Leak Check** - Upon completion of each test run, the system was leak checked at or above the highest vacuum recorded during that run. All leak checks had to be less than 0.02 CFM to be considered acceptable.
5. **Sample Recovery** - The impingers were recovered quantitatively for determination of net condensate gain.

3.4 Method 5 (Particulate Matter)

Particulate matter was measured using EPA Methods 1 through 5. Particulate was measured in conjunction with the EPA Method 26A train. Method 5 measurements include the determination of the proper number of sampling points and their locations in the stack (RM1), stack velocity and volumetric flow rate (RM2), stack gas molecular weight (RM3) and stack gas moisture content (RM4). The train was an EPA Method 5-type isokinetic sampling train. Sampling was conducted isokinetically for a period of 60 minutes per run, collecting a minimum of 30 dry standard cubic feet.

The sampling train consisted of a metals nozzle, Teflon-coated stainless steel union, graphite ferrule, heated glass-lined probe, a glass filter holder, heated quartz glass filter, Teflon filter support, and a series of impingers. Please refer to Section 3.5 for a description of the impinger configuration. All glassware was thoroughly cleaned and sealed as per EPA Methods 5 and 26A prior to mobilization.

All filters and beakers were weighed before and after sampling in strict accordance with the Method and the EPA Quality Assurance Handbook. They were desiccated for at least 24 hours, and then weighed at six-hour intervals until two consecutive weighings demonstrated a constant weight, $\pm$ 0.5 milligrams.

Prior to sampling, the K-factor was established, the train was assembled and leak checked. After the probe and filter box reached the desired operating temperature, the probe was placed in the stack, and isokinetic sampling took place.

At the completion of isokinetic sampling, the train was leaked checked, disassembled, and sealed. All train recovery procedures were be conducted in accordance with EPA Method 5. The filter was carefully removed from the filter holder, placed in a labeled petri dish and stored in a portable desiccator. The nozzle, probe and filter holder front half were thoroughly brushed and rinsed with acetone into a container labeled for identification. Volumes were noted and liquid levels marked.

A set of reagent blanks were also taken for analysis along with the samples. The impinger condensate was measured in a graduated cylinder for determination of moisture in the flue gas.

Particulate samples were analyzed gravimetrically at Eastmount Environmental in accordance with the method. The acetone rinses were evaporated to dryness in tared beakers. All filters and beakers were desiccated before and after sampling for 24 hours, and weighed at 6-hour intervals until two consecutive weights were within ± 0.5 mg. Additional information can be found in the Quality Control Procedures section of this report.

3.5 Hydrogen Chloride, Hydrogen Fluoride, and Hydrogen Bromide - EPA Method 26A

HCl, HF and HBr emissions were measured utilizing EPA Method 26A at the back half of the EPA Method 5 train. This method utilizes a Method 5-type isokinetic sampling train with a glass nozzle, Teflon union (or Teflon-coated stainless steel union), glass-lined probe, a glass filter holder, heated quartz filter with Teflon support frit and five impingers. The first and second impingers were each loaded with 0.1N sulfuric acid (H_2SO_4). The third was empty. The fifth impinger contained a known amount of silica gel.

Prior to mobilization, all glass and Teflon train components were thoroughly cleaned in hot soapy water, thoroughly rinsed with DI water, allowed to dry, and sealed with parafilm.

In accordance with the method, all four impingers were measured before and after sampling and the data recorded. The first and second impinger solutions were quantitatively recovered from the train using deionized water, and transferred to a glass sample bottle with a Teflon-lined lid. These

impingers and their connecting glassware were rinsed three times with deionized water into the sample jar. Impinger 3 was measured for moisture gain, and the contents along with three DI H₂O rinses were added to the sample jar. The contents of impinger four were weighed and discarded.

Samples were analyzed via ion chromatography by Maxxam Analytics of Burlington, Ontario.

4.0 QUALITY ASSURANCE/QUALITY CONTROL

4.1 Overview

Strict QA/QC protocols were followed during all phases of this project. These protocols included:

- QA objectives for measurement data;
- Data reduction;
- Internal QC;
- Calibration of equipment;
- Corrective action, if necessary; and
- Use of standardized field data sheets.

The following sections summarize specific aspects of the compliance program.

4.2 Volumetric Flow Rate

The reference method sample trains were leak-checked prior to and following each test run. This ensured that a representative sample from the stack was drawn during each run.

Reference Method 1 was used for the selection of traverse points. Method 2 was used for the determination of volumetric flow. Method 3 was used for the collection of fixed gases during each test run and Method 4 was used for the determination of moisture.

4.2.1 Methods Equipment Calibrations

Eastmount's meter boxes, pitot tubes, thermocouples and barometers are maintained in accordance with specifications set forth in EPA "Quality Assurance Handbook for Air Pollution Measurement Systems - Volume III Stationary Source Specific Methods" Section 3.3.5 dated January 15, 1980 and with manufactures suggested procedures. A summary is presented below:

- **Dry Gas Meter and Orifice Meter/EPA Method 5** – All dry gas meters are calibrated using calibrated critical orifices, according to CFR 40, Part 60, Appendix A, Method 5, Section 16.2. The orifice meters in the meter control boxes are calibrated against the calibrated critical orifices and checked against the dry gas meters to which they are attached.
- **Balance** - All analytical balances are calibrated against Class M weights. A daily onsite check is also conducted using a Class S weight.

- **Thermocouples** - All type K thermocouples are calibrated against ASTM mercury in glass thermometers at three points. The first point is in an ice bath (0°C), the second point is in boiler water (100°C) and the third point is in heated oil (~220°C).
- **Pitot Tubes** - All Type "S" stainless steel pitot tubes are designed to meet the dimensional criteria set forth in Method 2, therefore a coefficient of 0.84 (Type "S") was used.

APPENDIX P: Platt SO₃ Report, March 2008

Sulfuric Acid Mist Emissions Test Report

Performed for
ADA-ES

at the

Public Service of New Hampshire
Merrimack Generating Station
Unit 2

SCR Inlet, SCR Outlet, Air Preheater Outlet,
Primary ESP Outlet, and Secondary ESP Outlet
Bow, New Hampshire
March 26 through 28, 2008

Platt Environmental Services, Inc.

Platt Environmental Services, Inc.

371 Balm Court
Wood Dale, IL 60191
630-521-9400
630-521-9494 fax

Sulfuric Acid Mist Emissions Test Report

Performed for
ADA-ES

at the

Public Service of New Hampshire
Merrimack Generating Station
Unit 2

SCR Inlet, SCR Outlet, Air Preheater Outlet,
Primary ESP Outlet, and Secondary ESP Outlet
Bow, New Hampshire
March 26 through 28, 2008

Prepared By

Platt Environmental Services, Inc.

Report No. M081310

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1.0 Introduction

PLATT ENVIRONMENTAL SERVICES, INC. (PES) conducted a sulfuric acid mist emissions test program at the Public Service of New Hampshire (PSNH) Merrimack Generating Station on Unit 2 in Bow, New Hampshire on March 26 and 28, 2008. This report summarizes the results of the test program and test methods used.

The test locations, test parameters, test dates are summarized below.

Test Overview

Test Locations	Test Parameter	Test Dates
Unit 2: SCR Inlet, SCR Outlet, Air Preheater Outlet, Primary ESP Outlet, Secondary ESP Outlet	Sulfuric acid mist (SO ₃ as H ₂ SO ₄)	March 26 through 28, 2008

The identification of individuals associated with the test program is summarized below.

Location	Address	Contact
Test Coordinator	ADA-ES, Inc. 8100 South Park Way Unit B Littleton, Colorado, 80120	Mr. Tom Campbell Manager, DOE Demonstrations 303-734-1727 (phone) 303-734-0330 (fax) tomc@adaes.com
Testing Company Representative	Platt Environmental Services, Inc. 371 Balm Court Wood Dale, Illinois 60191	Mr. Eric L. Ehlers (630) 521-9400 (phone) eehlers@plattenv.com

The test crew consisted of Messrs. L. Sorce and E. Ehlers of PES.

2.0 Executive Summary

Selected results of the test program are summarized below, in Table 1. A complete summary of emission test results follows the narrative portion of this report.

Three test runs were performed at each of the below test locations with trona injection of 500 lbs/hr, and the supplementary ESP outlet was rerun with a trona injection rate of 1000 lbs/hr.

Table 1
Test Results

Parameter	Test Location	Condition	Particulate Phase	Gaseous Phase
Sulfuric Acid Mist (ppm SO ₃ as H ₂ SO ₄)	Unit 2 SCR Inlet	500 lbs/hr trona injection rate	4.23	12.13
	Unit 2 SCR Outlet		5.71	8.52
	Unit 2 Air Preheater Outlet		3.96	6.68
	Unit 2 Primary ESP Outlet		2.89	6.40
	Unit 2 Supplementary ESP Outlet*		2.93	7.56
	Unit 2 Supplementary ESP Outlet	1000 lbs/hr trona injection rate	1.69	3.37

* Test 3 not included in the average as the particulate quartz plug was pulled into the coil and results of particulate and gaseous phase SO₃ are presented as one number.

3.0 Test Methodology

Emissions testing was conducted following the methods specified in 40 CFR, Part 60, Appendix A. A schematic of the sampling train used and copies of field data sheets for each test run are included in the Appendix.

The following methodology was used during the test program:

Consol Controlled Condensate Sulfuric Acid Mist (SO₃) Determination

Stack gas sulfuric acid mist (SO₃) concentrations were determined in accordance with the Consol Controlled Condensate Method. An Environmental Supply Company, Inc. sampling train was used to sample stack gas, in the manner specified in the Method.

The flue gas was extracted through a quartz-lined probe fitted with a quartz wool plug to remove particulate matter. SO₃ was then collected as the sample gas passed through a hot water cooled condenser that was also loosely packed with quartz wool. The condenser assembly was maintained at a temperature of 140°F. The sample was then passed through impingers loaded with 3% H₂O₂ to capture the sulfur dioxide (SO₂) passing through the system. The impingers were placed in an ice bath to maintain the exit gas from the last impinger containing silica gel below 68°F. Maintaining the temperature increases the efficiency of the silica gel in drying the metered gas. A leak check of the entire sample train was performed at a vacuum greater than the sampling vacuum after each sampling run in order to determine if any leakage had occurred during the test run. A leakage rate not in excess of 2% of the average sampling rate is considered acceptable.

Samples were recovered as follows: the quartz wool particulate plug was removed and the probe was rinsed with an 80% IPA solution and placed in one bottle, the quartz wool plug in the condenser coil was removed and the coil was rinsed with 80% IPA, and the impingers were measured for moisture determination and the H₂O₂ solution was kept for potential analysis for SO₂ concentration.

Samples were then taken to the plant laboratory and analyzed Mr. E. Ehlers of PES utilizing a barium thorin titration. Both particulate phase and gaseous phase SO₃ samples were brought up to a known volume and titrated as required by USEPA Method 6.

4.0 Test Result Summaries

Consol Controlled Condensate Titration Results Summary
Public Service of New Hampshire - Merrimack Station
Unit 2 SCR Inlet Duct
500 lbs/hr Trona Injection Rate
3/28/08

Particulate Phase SO ₃ , 80% IPA probe rinse								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	8:35-9:20	1.05	0.01023	50	10	4.13	1.15E-06	5.52
2	9:45-10:30	0.20	0.01023	50	10	4.08	2.21E-07	1.06
3	10:55-11:40	1.10	0.01023	50	10	3.92	1.27E-06	6.10
							Average	4.23

Gaseous Phase SO ₃ , 80% IPA Condenser Coil								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	8:35-9:20	2.10	0.01023	100	20	4.13	2.30E-06	11.05
2	9:45-10:30	2.60	0.01023	100	20	4.08	2.88E-06	13.84
3	10:55-11:40	2.075	0.01023	100	20	3.92	2.39E-06	11.50
							Average	12.13

Consol Controlled Condensate Titration Results Summary
Public Service of New Hampshire - Merrimack Station
Unit 2 SCR Outlet Duct
500 lbs/hr Trona Injection Rate
3/27/08

Particulate Phase SO ₃ , 80% IPA probe rinse								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	13:57-14:42	0.45	0.01023	200	20	4.31	9.43E-07	4.54
2	15:00-15:45	0.80	0.01023	200	20	4.81	1.50E-06	7.23
3	16:02-16:47	0.50	0.01023	200	20	4.06	1.11E-06	5.35
							Average	5.71

Gaseous Phase SO ₃ , 80% IPA Condenser Coil								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	13:57-14:42	0.85	0.01023	220	20	4.31	1.96E-06	9.43
2	15:00-15:45	1.20	0.01023	100	20	4.81	1.13E-06	5.42
3	16:02-16:47	1.00	0.01023	200	20	4.06	2.22E-06	10.70
							Average	8.52

**Consol Controlled Condensate Titration Results Summary
Public Service of New Hampshire - Merrimack Station
Unit 2 Air Preheater Outlet Duct
500 lbs/hr Trona Injection Rate
3/27/08**

Particulate Phase SO₃, 80% IPA probe rinse								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	9:05-9:50	0.70	0.01023	200	20	4.17	1.52E-06	7.29
2	10:15-11:00	0.50	0.01023	100	20	4.28	5.27E-07	2.54
3	11:20-12:05	0.40	0.01023	100	20	4.23	4.27E-07	2.05
Average								3.96

Gaseous Phase SO₃, 80% IPA Condenser Coil								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	9:05-9:50	0.70	0.01023	200	20	4.17	1.52E-06	7.29
2	10:15-11:00	1.40	0.01023	100	20	4.28	1.48E-06	7.11
3	11:20-12:05	1.10	0.01023	100	20	4.23	1.17E-06	5.65
Average								6.68

**Consol Controlled Condensate Titration Results Summary
Public Service of New Hampshire - Merrimack Station
Unit 2 Primary ESP Outlet Duct
500 lbs/hr Trona Injection Rate
3/26/08**

Particulate Phase SO₃, 80% IPA probe rinse								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	15:15-16:00	0.55	0.01023	100	20	4.06	6.11E-07	2.94
2	16:15-17:00	0.40	0.01023	100	20	4.12	4.38E-07	2.11
3	17:20-18:05	0.70	0.01023	100	20	4.21	7.51E-07	3.61
Average								2.89

Gaseous Phase SO₃, 80% IPA Condenser Coil								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	15:15-16:00	0.65	0.01023	100	10	4.06	1.45E-06	6.96
2	16:15-17:00	1.15	0.01023	100	20	4.12	1.26E-06	6.06
3	17:20-18:05	1.20	0.01023	100	20	4.21	1.29E-06	6.19
Average								6.40

**Consol Controlled Condensate Titration Results Summary
Public Service of New Hampshire - Merrimack Station
Unit 2 Supplementary ESP Outlet Duct
500 lbs/hr Trona Injection Rate
3/26/08**

Particulate Phase SO₃, 80% IPA probe rinse								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	11:45-12:30	0.45	0.01023	100	10	6.84	5.94E-07	2.86
2	13:00-13:45	0.40	0.01023	100	10	5.82	6.20E-07	2.99
3*	14:05-14:50	0.00	0.01023	100	10	4.00	0.00E+00	0.00
Average								2.93

Gaseous Phase SO₃, 80% IPA Condenser Coil								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	11:45-12:30	0.95	0.01023	100	10	6.84	1.25E-06	6.03
2	13:00-13:45	0.95	0.01023	100	10	5.82	1.47E-06	7.09
3*	14:05-14:50	1.00	0.01023	100	10	4.00	2.26E-06	10.86
Average								6.56

* Test 3 not included in the average as the particulate quartz plug was pulled into the coil and results of particulate and gaseous phase SO₃ are presented as one number.

**Consol Controlled Condensate Titration Results Summary
Public Service of New Hampshire - Merrimack Station
Unit 2 Supplementary ESP Outlet Duct
1000 lbs/hr Trona Injection Rate
3/28/08**

Particulate Phase SO₃, 80% IPA probe rinse								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	15:05-15:50	0.55	0.01023	50	10	4.24	5.86E-07	2.82
2	16:05-16:50	0.20	0.01023	50	10	4.28	2.11E-07	1.02
3	17:00-17:45	0.25	0.01023	50	10	4.41	2.56E-07	1.23
Average								1.69

Gaseous Phase SO₃, 80% IPA Condenser Coil								
Test No.	Time	Vt-Vtb	N	Vsoln	Va	Vm(std) ft ³	C SO ₃ (lbs/dscf)	ppm SO ₃
1	15:05-15:50	0.75	0.01023	100	20	4.24	7.98E-07	3.84
2	16:05-16:50	0.65	0.01023	100	20	4.28	6.86E-07	3.30
3	17:00-17:45	0.60	0.01023	100	20	4.41	6.14E-07	2.96
Average								3.37

5.0 Conclusion and Certification

PLATT ENVIRONMENTAL SERVICES, INC. is pleased to have been of service to ADA-ES. If you have any questions regarding this test report, please do not hesitate to contact us at 630-521-9400.

CERTIFICATION

As project manager, I hereby certify that this test report represents a true and accurate summary of emissions test results and the methodologies employed to obtain those results, and the test program was performed in accordance with the methods specified in this test report.

PLATT ENVIRONMENTAL SERVICES, INC.

Eric L. Ehlers

Program Manager

Scott W. Banach

Quality Assurance

Appendix

Consol Controlled Condensate – Sulfuric Acid Mist Sample Train Diagram

MOISTURE CALCULATIONS

$$V_{wc(std)} = \frac{(V_f - V_i) \rho_w R T_{std}}{P_{std} M_w} = 0.04707(V_f - V_i)$$

$$V_{wsg(std)} = \frac{(W_f - W_i) R T_{std}}{P_{std} M_w} = 0.04715(W_f - W_i)$$

$$V_{m(std)} = 17.64 V_m Y \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}$$

$$B_{ws} = \frac{V_{wc(std)} + V_{wsg(std)}}{V_{wc(std)} + V_{wsg(std)} + V_{m(std)}}$$

Where:

B_{ws} = Water vapor in gas stream, proportion by volume

M_w = Molecular weight of water, 18.015 lb/lb-mole

P_{bar} = Barometric pressure at the testing site, in. Hg

P_{std} = Standard absolute pressure, 29.92 in. Hg

R = Ideal gas constant, $0.048137 \text{ (in. Hg)(ft}^3\text{)/(g-mole)(}^\circ\text{R)} =$
 $[21.8348 \text{ (in. Hg)(ft}^3\text{)/(lb-mole)(}^\circ\text{R)}]/453.592 \text{ g-mole/lb-mole}$

T_m = Absolute average dry gas meter temperature, $^\circ\text{R}$

T_{std} = Standard absolute temperature, 528 $^\circ\text{R}$

V_f = Final volume of condenser water, ml

V_i = Initial volume of condenser water, ml

V_m = Dry gas volume measured by dry gas meter, dcf

$V_{m(std)}$ = Dry gas volume measured by dry gas meter, corrected to standard conditions, scf

$V_{wc(std)}$ = Volume of condensed water vapor, corrected to standard conditions, scf

$V_{wsg(std)}$ = Volume of water vapor collected in silica gel, corrected to standard conditions, scf

W_f = Final weight of silica gel, g

W_i = Initial weight of silica gel, g

Y = Dry gas meter calibration factor

ΔH = Average pressure exerted on dry gas meter outlet by gas sample bag, in. H_2O

ρ_w = Density of water, 0.9982 g/ml

13.6 = Specific gravity of mercury (Hg)

17.64 = T_{std}/P_{std}

0.04707 = ft^3/ml 0.04715 = ft^3/g

PLATT ENVIRONMENTAL SERVICES, INC.

Calculations For Sulfuric Acid Mist

$$V_{m(std)} = 17.647 V_m Y \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}$$

$$C_{H_2SO_4} = 1.0811 \times 10^{-4} \frac{(V_t - V_{tb}) N \left(\frac{V_{soln}}{V_a} \right)}{V_{m(std)}}$$

$$\text{ppm } H_2SO_4 = 3.9289 \times 10^6 C_{H_2SO_4} \quad (\text{expressed as } H_2SO_4)$$

Where:

$C_{H_2SO_4}$ = Concentration of sulfuric acid (including sulfur trioxide), dry basis, corrected to standard conditions, lb/dscf

N = Normality of barium chloride titrant, meq/ml

P_{bar} = Barometric pressure at the exit of the dry gas meter, inches of mercury

P_{std} = Standard pressure, 29.92 inches of mercury

T_{std} = Standard temperature, 528 °R

$17.647 = T_{std}/P_{std}$

V_a = Volume of sample aliquot titrated, ml

T_m = Dry gas meter average temperature, °R

V_m = Dry gas volume measured by dry gas meter, dcf

$V_{m(std)}$ = Dry gas volume measured by dry gas meter, corrected to standard conditions, dscf

V_{soln} = Total volume of solution in which the sulfuric acid sample is contained, ml

V_t = Volume of barium perchlorate titrant used for the sample, ml

V_{tb} = Volume of barium perchlorate titrant used for the blank, ml

Y = Dry gas meter calibration factor

ΔH = Average pressure differential across the orifice meter, inches of water

13.6 = Specific gravity of mercury

1.0811×10^{-4} = Equivalent weight of sulfuric acid, lb/g-meq

$3.9289 \times 10^6 = \frac{\text{dscf}}{\text{lb}}$ of sulfuric acid

PLATT ENVIRONMENTAL SERVICES, INC.

Coal Emission Rate Calculations

A pollutant emission rate (E), expressed as pounds of pollutant per million Btu heat input from the fuel combusted can be calculated by several methods as follows:

- A. $C = C_s/7000$ where, C = pollutant concentration, lb/dscf
 c_s = pollutant concentration, grains/dscf
- B. If fuel flow is monitored and the fuel combusted during the test is sampled and analyzed for gross calorific value, then:

$$E = \frac{Q_{sd} C}{\text{fuel flow rate (lb/hr) GCV}} \times 10^6$$

where, E = lbs per million Btu

GCV = gross calorific value, Btu / lb

Q_{sd} = dry volumetric gas flow at standard conditions, dscf / hr

- C. If an integrated gas sample is taken during the test and analyzed for %CO₂ or %O₂, dry basis by volume, with an approved USEPA Method 3 or 3A gas analyzer, then

$$E = C F_c \frac{100}{(\%CO_2)} \text{ or, } E = C F \frac{20.9}{(20.9 - \%O_2)} \text{ where,}$$

%CO₂ and %O₂ are expressed as percent values:

F_c = a factor representing a ratio of the volume of carbon dioxide generated to the calorific value of the fuel combusted, 1800 scf CO₂/million Btu.

F = a factor representing a ratio of the volume of dry flue gases generated to the calorific value of the fuel combusted, 9780 dscf/million Btu.

- D. If fuel sample increments are taken and composited during the test and an ultimate analysis is performed and the GCV is determined, then

$$F_c = \frac{321 \times 10^3 (\%C)}{GCV} \text{ where, \%C = carbon content by weight expressed as percent}$$

$$F = \frac{[3.64 (\%H) + 1.53 (\%C) + 0.57 (\%S) + 0.14 (\%N) - 0.46 (\%O_2)]}{GCV} \times 10^6$$

1. H = Hydrogen, percent
2. C = Carbon, percent
3. S = Sulfur, percent
4. N = Nitrogen, percent
5. O = Oxygen, percent

PLATT ENVIRONMENTAL SERVICES, INC.

Derivation of Factors Used in Sulfuric Acid Mist Calculations

Factors for calculating from lb/dscf to parts per million:

Using 22.414 liters of gas per gram-mole at 0°C and 1 atmosphere pressure,

One pound-mole of gas is contained in 359.04765 ft³ at 32°F and 29.92 in. Hg, or 385.31943 ft³ at 68°F and 29.92 in. Hg

$$\text{ppm} = \frac{M \text{ lb/lb-mole}}{385.31943 \text{ dscf/lb-mole} \times 10^6} = 2.5952494 \times 10^{-9} M \text{ lb/dscf}$$

Where M = pollutant molecular weight; H₂SO₄ = 98.076 lb/lb-mole

$$\text{Factor for ppm H}_2\text{SO}_4 = \frac{1}{98.076 \times 2.5952 \times 10^{-9}} = 3.9289 \times 10^6 \text{ dscf/lb}$$

Use 3.9289 × 10⁶

Factor for converting ppm to lbs/hr

$$\text{ppm H}_2\text{SO}_4 \times 2.545 \times 10^{-7} = \frac{\text{lbs H}_2\text{SO}_4}{\text{dscf}}$$

$$\frac{\text{lbs H}_2\text{SO}_4}{\text{dscf}} \times \frac{\text{dscf}}{\text{min}} \times \frac{60 \text{ min}}{\text{hr}} = \frac{\text{lbs H}_2\text{SO}_4}{\text{hr}}$$

Barium-Thorin Titrations

Project/Project Number: ADA - Public Service of New Hampshire Analyst: ELC Date: 3/26/08

Barium Titrant Standardization	Run No. 1	Run No. 2	Run No. 3
Volume 0.02 N H ₂ SO ₄ titrated (ml)	25	25	25
Volume BaCl ₂ added (ml)	24.1	24.3	24.6
Calculated BaCl ₂ normality	0.01025	0.01029	0.01016

Average BaCl₂ normality = 0.01023 N
Standardization Blank (25 ml Water + 100 ml isopropanol) = ml ; Must be <0.5 ml.

Sample Number	Sample Date	Sample Description	Total Volume	Sample Aliquot	Titration Volume for Sample		Titration Volume Corrected for Blank (V _t - V _{tb}) ml
Ammonium Sulfate-Controls	3/26/08	80% EPA Blank	20	20	Final Reading	Initial Reading = V _t ml	
		#1 Supplementary ESP out Unit 2 Coal River	100	10	0.9 - 0.8 1.0 - 0.9 Average = 0.1	= 0.1 = 0.1 Average = 0.1	
		#1 Supplementary ESP out Unit 2 Coal River	100	10	2.3 - 1.2 3.3 - 2.2 Average = 1.05	= 1.0 = 1.1 Average = 1.05	0.95
		#2 Supplementary ESP out U. 2 Coal River	100	10	3.8 - 3.3 4.5 - 3.9 Average = 2.55	= 0.5 = 0.6 Average = 2.55	0.45
		#2 Supplementary ESP out U. 2 Coal River	100	10	5.4 - 4.5 6.4 - 5.4 Average = 0.9	= 0.9 = 1.0 Average = 0.9	0.95
		#2 Sup. ESP out U. 2 Coal River	100	10	2.1 - 1.9 2.9 - 2.4 Average = 0.5	= 0.1 = 0.5 Average = 0.5	0.4
		#3 Sup. ESP out U. 2 Coal River			4.0 - 2.9 5.1 - 4.0 Average = 1.1	= 1.0 = 1.1 Average = 1.1	1.00
		H ₂ O ₂ Reagent Blank			- - Average =	= = Average =	V _{tb}

2.5
4.8
20.2
15.1
35.3

* All titrations must be performed in replicate with agreement of 0.1% or 0.2 ml, whichever is larger.

Barium-Thorin Titrations

Project/Project Number: _____

Analyst: _____

Page ____ of ____

Sample Number	Sample Date	Sample Description	Total Volume	Sample Aliquot	Titration Volume for Sample		Titration Volume Corrected for Blank ($V_t - V_{tb}$) ml
	3/26/04	#1 Primary ESP Dist U.2 Coil Rinse	100	10	0.8 - 0.0 1.5 - 0.2 Average = 0.75"		0.65"
		#1 Primary ESP Dist U.2 Quartz Wash Plug	100	20	2.1 - 1.5 2.8 - 2.1 Average = 0.65"		0.55"
		#2 Primary ESP Dist U.2 Coil Rinse	100	20	1.2 - 0.0 2.3 - 1.2 Average = 1.25"		1.15"
		#2 Primary ESP Dist U.2 Quartz Wash Plug	100	20	5.8 - 4.9 5.9 - 5.4 Average = 0.5"		0.40"
		#3 Prim. ESP Dist U.2 Coil Rinse	100	20	1.20 - 0.0 2.60 - 1.20 Average = 1.20"		1.20"
		#3 Prim ESP In U.2 Quartz Wash Plug	100	20	3.4 - 2.6 4.2 - 3.4 Average = 0.8"		0.70"
		#3 Suppl. ESP U.2 only 32 Imp ✓	210	20	3.8 - 2.0 - Average = 35.41"		35.3"
		#1 Primary ESP Dist U.2 502 Imp ✓	210	20	68.8 - 0.0 - Average = 68.8"		68.7"
					- - Average =		

* All titrations must be performed in replicate with agreement of 0.1% or 0.2 ml, whichever is larger.

Barium-Thorin Titrations

Project/Project Number: _____ Analyst: _____ Date: _____

Barium Titrant Standardization	Run No. 1	Run No. 2	Run No. 3
Volume 0.02 N H ₂ SO ₄ titrated (ml)			
Volume BaCl ₂ added (ml)			
Calculated BaCl ₂ normality			

Average BaCl₂ normality = _____ N
 Standardization Blank (25 ml Water + 100 ml isopropanol) = _____ ml ; Must be <0.5 ml.

Sample Number	Sample Date	Sample Description	Total Volume	Sample Aliquot	Titration Volume for Sample		Titration Volume Corrected for Blank (V _t - V _{tb}) ml
Ammonium Sulfate Controls	3/27/08	#1 U.2 Air Preheader Outlet Coil Rinse	200	20	5.3 - 4.5 6.8 - 5.3 Average = 0.8		0.70
		#1 U.2 Air Preheader Outlet Quartz w/val Probe	200	20	6.8 - 6.1 7.7 - 6.8 Average = 0.8		0.70
		#2 U.2 Air Preheader Outlet Coil Rinse	100	20	9.0 - 7.9 10.4 - 9.0 12.0 - 10.8 Average = 1.5		1.4
		#2 U.2 Air Preheader Outlet Quartz w/val Plug	100	20	12.6 - 12.0 13.2 - 12.6 Average = 0.6		0.5
		#3 U.2 Air Preheader Outlet Coil Rinse	100	20	1.2 - 0.0 2.4 - 1.3 4.1 - 2.9 Average = 1.2		1.1
		#3 U.2 Air Preheader Outlet Quartz w/val Plug	100	20	4.7 - 4.1 5.1 - 4.7 Average = 0.5		0.4
		H ₂ O ₂ Reagent Blank			- - Average =		V _{tb}

* All titrations must be performed in replicate with agreement of 0.1% or 0.2 ml, whichever is larger.

Barium-Thorin Titrations

Project/Project Number: _____ Analyst: _____ Page ____ of ____

Sample Number	Sample Date	Sample Description	Total Volume	Sample Aliquot	Titration Volume for Sample		Titration Volume Corrected for Blank ($V_t - V_{tb}$) ml
		#1 SCA out U.I. Coil Rinse	220	20	8.9 - 8.9 9.8 - 8.9 Average = 0.95	= 1.0 = 0.9 Average = 0.95	0.85
		#1 SCA out U.I. chloride wash Plug	200	20	7.7 - 7.7 7.9 - 7.7 Average = 0.25	= 0.3 = 0.2 Average = 0.25	0.15
		#2 SCA out U.I. Coil Rinse	100	20	1.3 - 0.0 2.6 - 1.3 Average = 1.3	= 1.3 = 1.3 Average = 1.3	1.20
		#2 SCA out chloride wash Plug	200	10	3.1 - 2.6 3.7 - 3.1 Average = 0.55	= 0.5 = 0.6 Average = 0.55	0.45
		#3 SCA out Coil Rinse	200	20	1.1 - 0.0 2.8 - 1.1 Average = 1.1	= 1.1 = 1.1 Average = 1.1	1.0
		#3 SCA out chloride wash Plug	200	20	0.4 - 0.0 1.0 - 0.4 Average = 0.5	= 0.4 = 0.6 Average = 0.5	0.4
		#1 SCA out Filled wash Plug	200	20	3.6 - 3.0 4.1 - 3.6 Average = 0.55	= 0.6 = 0.5 Average = 0.55	0.45
		#2 SCA out Filled wash Plug	200	20	5.2 - 4.2 6.0 - 5.2 Average = 0.9	= 1.0 = 0.8 Average = 0.9	0.80
		#3 SCA out Filled wash Plug	200	20	6.7 - 6.0 7.2 - 6.7 Average = 0.6	= 0.7 = 0.5 Average = 0.6	0.5

* All titrations must be performed in replicate with agreement of 0.1% or 0.2 ml, whichever is larger.

#3 SCA out S₂ 210 43.6 43.5
#2 AHA out S₂ 210 45.6 45.5

Barium-Thorin Titrations

Project/Project Number: _____

Analyst: _____

Page ____ of ____

Sample Number	Sample Date	Sample Description	Total Volume	Sample Aliquot	Titrant Volume for Sample		Titrant Volume Corrected for Blank ($V_t - V_{tb}$) ml
		#1 SCR In U2 Filled Coil Rinse	100	20	2.1 - 0.0 4.4 - 2.1 Average = 3.2		2.1
		#1 SCR In U2 Filled Sample Serial Filter	50	10	5.5 - 4.4 6.7 - 5.5 Average = 1.1		1.05
		#2 SCR In U2 Filled Coil Rinse	100	20	3.0 - 0.4 5.8 - 3.0 Average = 2.7		2.60
		#2 SCR In U2 Filled Coil Rinse	50	10	6.0 - 5.8 6.4 - 6.0 Average = 0.3		0.2
		#3 SCR In Filled Coil Rinse	100	20	2.25 - 0.0 4.35 - 2.25 Average = 2.475		2.075
		#3 SCR In Filled Plug Wash	50	10	5.6 - 4.4 6.8 - 5.6 Average = 1.2		1.1
		#1 Super. GSP Out Coil Rinse	100	20	1.4 - 0.2 2.5 - 1.4 Average = 1.3		1.2
		#1 Super. GSP Out Wash Plug	50	10	3.2 - 2.8 3.6 - 3.2 Average = 0.4		0.3
		#2 Super. GSP Out Coil	100	20	4.5 - 3.6 5.3 - 4.5 Average = 0.85		0.75

* All titrations must be performed in replicate with agreement of 0.1% or 0.2 ml, whichever is larger.

#2 Super. GSP Out 50 10 6.0 - 5.3 0.7
Wash Plug 6.6 - 6.0 0.6
0.65 0.55

Barium-Thorin Titrations

Project/Project Number: _____ Analyst: _____ Page ____ of ____

Sample Number	Sample Date	Sample Description	Total Volume	Sample Aliquot	Titration Volume for Sample		Titration Volume Corrected for Blank ($V_t - V_{t0}$) ml
		#3 Sup. GSP out Coil	100	20	0.9 - 0.1 1.6 - 0.9 Average = 0.75	= 0.8 = 0.7 Average = 0.75	0.65
		#3 Sup. GSP out Unad. Plug	50	10	1.8 - 1.6 2.2 - 1.8 Average = 0.3	= 0.2 = 0.4 Average = 0.3	0.2
		#4 Sup. GSP out Coil	100	20	2.9 - 2.2 3.6 - 2.9 Average = 0.7	= 0.7 = 0.7 Average = 0.7	0.6
		#4 Sup. GSP out Unad. Plug	50	10	3.9 - 3.6 4.3 - 3.9 Average = 0.35	= 0.3 = 0.4 Average = 0.35	0.25
					-	=	
					-	=	
					-	Average =	
					-	=	
					-	Average =	
					-	=	
					-	Average =	
					-	=	
					-	Average =	
					-	=	
					-	Average =	
					-	=	
					-	Average =	

* All titrations must be performed in replicate with agreement of 0.1% or 0.2 ml, whichever is larger.

CONSOL CONTROLLED CONDENSATE TEST RESULTS

Date: 3/26/2008 Condition: 500 lbs trona injection
 Project: P.S. of New Hampshire-Merrimack Station Data Taken By: ALS
 Location: Supplementary ESP Outlet Duct Fuel Factor: 9780
 Source: Unit 2

Test Number:	1	Time:	11:45-12:30
Pressure, Barometric(Hg"):	29.900		
Pressure, Static(H ₂ O"):	2.00	Water Vapor in Flue Gas (Bws):	0.094
Pressure, Stack(Hg"):	30.047		
Initial Volume (cu.ft.):	2.927		
Final Volume (cu.ft.):	9.75		
Meter Temperature (°F):	74.00		
Meter Volume (dscf):	6.84		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	215.0		
Average Delta H (ΔH):	0.040		

Test Number:	2	Time:	13:00-13:45
Pressure, Barometric(Hg"):	29.900		
Pressure, Static(H ₂ O"):	2.00	Water Vapor in Flue Gas (Bws):	0.089
Pressure, Stack(Hg"):	30.047		
Initial Volume (cu.ft.):	9.801		
Final Volume (cu.ft.):	15.643		
Meter Temperature (°F):	78.00		
Meter Volume (dscf):	5.82		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	212.0		
Average Delta H (ΔH):	0.020		

Test Number:	3	Time:	14:05-14:50
Pressure, Barometric(Hg"):	29.900		
Pressure, Static(H ₂ O"):	2.00	Water Vapor in Flue Gas (Bws):	0.086
Pressure, Stack(Hg"):	30.047		
Initial Volume (cu.ft.):	6.716		
Final Volume (cu.ft.):	10.76		
Meter Temperature (°F):	81.00		
Meter Volume (dscf):	4.00		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	208.0		
Average Delta H (ΔH):	0.020		

CONSOL CONTROLLED CONDENSATE TEST RESULTS

Date:	3/26/2008	Condition:	500 lbs trona injection
Project:	P.S. of New Hampshire-Merrimack Station	Data Taken By:	ALS
Location:	Primary ESP Outlet	Fuel Factor:	9780
Source:	Unit 2		

Test Number:	<u>1</u>	Time:	<u>15:15-16:00</u>
Pressure, Barometric(Hg"):	29.900		
Pressure, Static(H ₂ O"):	3.00	Water Vapor in Flue Gas (Bws):	0.104
Pressure, Stack(Hg"):	30.121		
Initial Volume (cu.ft.):	10.784		
Final Volume (cu.ft.):	14.86		
Meter Temperature (°F):	78.00		
Meter Volume (dscf):	4.06		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.020		

Test Number:	<u>2</u>	Time:	<u>16:15-17:00</u>
Pressure, Barometric(Hg"):	29.900		
Pressure, Static(H ₂ O"):	3.00	Water Vapor in Flue Gas (Bws):	0.103
Pressure, Stack(Hg"):	30.121		
Initial Volume (cu.ft.):	4.933		
Final Volume (cu.ft.):	8.993		
Meter Temperature (°F):	68.00		
Meter Volume (dscf):	4.12		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.020		

Test Number:	<u>3</u>	Time:	<u>17:20-18:05</u>
Pressure, Barometric(Hg"):	29.900		
Pressure, Static(H ₂ O"):	3.00	Water Vapor in Flue Gas (Bws):	0.101
Pressure, Stack(Hg"):	30.121		
Initial Volume (cu.ft.):	8.924		
Final Volume (cu.ft.):	13.015		
Meter Temperature (°F):	60.00		
Meter Volume (dscf):	4.21		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.020		

CONSOL CONTROLLED CONDENSATE TEST RESULTS

Date: 3/27/2008
 Project: P.S. of New Hampshire-Merrimack Station
 Location: Air Preheater Outlet
 Source: Unit 2

Condition: 500 lbs trona injection
 Data Taken By: ALS
 Fuel Factor: 9780

Test Number:	1	Time:	9:05-9:50
Pressure, Barometric(Hg"):	29.890		
Pressure, Static(H ₂ O"):	6.00	Water Vapor in Flue Gas (Bws):	0.101
Pressure, Stack(Hg"):	30.332		
Initial Volume (cu.ft.):	4.815		
Final Volume (cu.ft.):	8.975		
Meter Temperature (°F):	62.00		
Meter Volume (dscf):	4.17		
Meter Calibration (Y):	0.993		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.030		

Test Number:	2	Time:	10:15-11:00
Pressure, Barometric(Hg"):	29.890		
Pressure, Static(H ₂ O"):	6.00	Water Vapor in Flue Gas (Bws):	0.099
Pressure, Stack(Hg"):	30.332		
Initial Volume (cu.ft.):	9.087		
Final Volume (cu.ft.):	13.393		
Meter Temperature (°F):	67.00		
Meter Volume (dscf):	4.28		
Meter Calibration (Y):	0.993		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.030		

Test Number:	3	Time:	11:20-12:05
Pressure, Barometric(Hg"):	29.890		
Pressure, Static(H ₂ O"):	6.00	Water Vapor in Flue Gas (Bws):	0.100
Pressure, Stack(Hg"):	30.332		
Initial Volume (cu.ft.):	13.51		
Final Volume (cu.ft.):	17.76		
Meter Temperature (°F):	66.00		
Meter Volume (dscf):	4.23		
Meter Calibration (Y):	0.993		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.030		

*Air flows taken from ESP Inlet data

CONSOL CONTROLLED CONDENSATE TEST RESULTS

Date: 3/27/2008
 Project: P.S. of New Hampshire-Merrimack Station
 Location: SCR Outlet
 Source: Unit 2

Condition: 500 lbs trona injection
 Data Taken By: ALS
 Fuel Factor: 9780

Test Number:	<u>1</u>	Time:	<u>13:57-14:42</u>
Pressure, Barometric(Hg"):	29.890		
Pressure, Static(H ₂ O"):	13.00	Water Vapor in Flue Gas (Bws):	0.099
Pressure, Stack(Hg"):	30.847		
Initial Volume (cu.ft.):	3.132		
Final Volume (cu.ft.):	7.28		
Meter Temperature (°F):	55.00		
Meter Volume (dscf):	4.31		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.030		

Test Number:	<u>2</u>	Time:	<u>15:00-15:45</u>
Pressure, Barometric(Hg"):	29.890		
Pressure, Static(H ₂ O"):	13.00	Water Vapor in Flue Gas (Bws):	0.089
Pressure, Stack(Hg"):	30.847		
Initial Volume (cu.ft.):	7.373		
Final Volume (cu.ft.):	12.009		
Meter Temperature (°F):	56.00		
Meter Volume (dscf):	4.81		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.030		

Test Number:	<u>3</u>	Time:	<u>16:02-16:47</u>
Pressure, Barometric(Hg"):	29.890		
Pressure, Static(H ₂ O"):	13.00	Water Vapor in Flue Gas (Bws):	0.104
Pressure, Stack(Hg"):	30.847		
Initial Volume (cu.ft.):	2.19		
Final Volume (cu.ft.):	6.1		
Meter Temperature (°F):	56.00		
Meter Volume (dscf):	4.06		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.030		

*Air flows taken from ESP Inlet data

CONSOL CONTROLLED CONDENSATE TEST RESULTS

Date: 3/28/2008
 Project: P.S. of New Hampshire-Merrimack Station
 Location: SCR Inlet
 Source: Unit 2

Condition: 500 lbs trona injection
 Data Taken By: ALS
 Fuel Factor: 9780

Test Number:	1	Time:	8:35-9:20
Pressure, Barometric(Hg"):	29.460		
Pressure, Static(H ₂ O"):	18.00	Water Vapor in Flue Gas (Bws):	0.112
Pressure, Stack(Hg"):	30.785		
Initial Volume (cu.ft.):	6.055		
Final Volume (cu.ft.):	9.99		
Meter Temperature (°F):	43.00		
Meter Volume (dscf):	4.13		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	211.0		
Average Delta H (ΔH):	0.020		

Test Number:	2	Time:	9:45-10:30
Pressure, Barometric(Hg"):	29.460		
Pressure, Static(H ₂ O"):	18.00	Water Vapor in Flue Gas (Bws):	0.104
Pressure, Stack(Hg"):	30.785		
Initial Volume (cu.ft.):	0.011		
Final Volume (cu.ft.):	3.927		
Meter Temperature (°F):	47.00		
Meter Volume (dscf):	4.08		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.030		

Test Number:	3	Time:	10:55-11:40
Pressure, Barometric(Hg"):	29.460		
Pressure, Static(H ₂ O"):	18.00	Water Vapor in Flue Gas (Bws):	0.107
Pressure, Stack(Hg"):	30.785		
Initial Volume (cu.ft.):	4.027		
Final Volume (cu.ft.):	7.818		
Meter Temperature (°F):	50.00		
Meter Volume (dscf):	3.92		
Meter Calibration (Y):	1.015		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	210.0		
Average Delta H (ΔH):	0.040		

*Air flows taken from ESP Inlet data

CONSOL CONTROLLED CONDENSATE TEST RESULTS

Date:	3/28/2008	Condition:	1000 lbs trona injection
Project:	P.S. of New Hampshire-Merrimack Station	Data Taken By:	ALS
Location:	Supplementary ESP Outlet Duct	Fuel Factor:	9780
Source:	Unit 2		

Test Number:	1	Time:	15:05-15:50
Pressure, Barometric(Hg"):	29.460		
Pressure, Static(H ₂ O"):	2.00	Water Vapor in Flue Gas (Bws):	0.109
Pressure, Stack(Hg"):	29.607		
Initial Volume (cu.ft.):	1.059		
Final Volume (cu.ft.):	5.432		
Meter Temperature (°F):	73.00		
Meter Volume (dscf):	4.24		
Meter Calibration (Y):	0.993		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	211.0		
Average Delta H (ΔH):	0.020		

Test Number:	2	Time:	16:05-16:50
Pressure, Barometric(Hg"):	29.460		
Pressure, Static(H ₂ O"):	2.00	Water Vapor in Flue Gas (Bws):	0.117
Pressure, Stack(Hg"):	29.607		
Initial Volume (cu.ft.):	5.505		
Final Volume (cu.ft.):	9.935		
Meter Temperature (°F):	74.00		
Meter Volume (dscf):	4.28		
Meter Calibration (Y):	0.993		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	212.0		
Average Delta H (ΔH):	0.020		

Test Number:	3	Time:	17:00-17:45
Pressure, Barometric(Hg"):	29.460		
Pressure, Static(H ₂ O"):	2.00	Water Vapor in Flue Gas (Bws):	0.105
Pressure, Stack(Hg"):	29.607		
Initial Volume (cu.ft.):	10.003		
Final Volume (cu.ft.):	14.56		
Meter Temperature (°F):	73.00		
Meter Volume (dscf):	4.41		
Meter Calibration (Y):	0.993		
Initial Wt. (grms or mls):	200.0		
Final Wt. (grms or mls):	211.0		
Average Delta H (ΔH):	0.020		

PLATT ENVIRONMENTAL SERVICES, INC.

Procedures for Calibration

Dry Gas Meters

The test meters are calibrated according to Method 5, Section 5.3 and "Procedures for Calibrating and Using Dry Gas Volume Meters as Calibration Standards" by P.R. Westlin and R.T. Shigehara, March 10, 1978.

Analytical Balance

The accuracy of the analytical balance is checked with Class S, Stainless Steel Type 303 weights manufactured by F. Hopken and Son, Jersey City, New Jersey.

Temperature Sensing Devices

The potentiometer and thermocouples are calibrated utilizing a NBS traceable millivolt source.

Meter Box Calibration

Dry Gas Meter No.
Standard Meter No.
Standard Meter (Y)

CM 13
9605804
0.9993

Date:
Calibrated By:
Barometric Pressure:

March 3, 2008
S. Dyrá
29.07

Run Number	Orifice Setting in H ₂ O Chg (H)	Standard Meter Gas Volume vr	Dry Gas Meter Gas Volume vd	Standard Meter Temp. F° tr	Dry Gas Meter Inlet Temp. F° tdi	Dry Gas Meter Outlet Temp. F° tdo	Dry Gas Meter Avg. Temp. F° td	Time Min	Time Sec	Y	Chg (H)
Final		23.667	99.646	71	75	74					
Initial		18.082	93.978	71	76	73					
Difference	1	5.585	5.668	71	76	74	75	20	3	0.991	1.482
Final		33.811	109.899	71	77	72					
Initial		23.667	99.646	71	73	73					
Difference	2	10.144	10.253	71	75	73	74	23	37	0.993	1.560
Final		42.245	118.449	71	79	73					
Initial		33.811	109.899	71	76	73					
Difference	3	8.434	8.550	71	78	73	75	16	51	0.993	1.604
Final		47.360	23.619	71	80	73					
Initial		42.245	18.449	71	78	73					
Difference	4	5.115	5.170	71	79	73	76	9	8	0.996	1.645
Final		53.132	29.480	71	81	73					
Initial		47.360	23.619	71	78	73					
Difference	5	5.772	5.861	71	80	73	76	8	43	0.992	1.568
Final		17.933	93.841	71	80	72					
Initial		3.909	79.725	71	73	73					
Difference	6	14.024	14.116	71	77	73	75	16	33	0.995	1.601

Average 0.993 1.577

Stack Temperature Sensor Calibration

Meter Box # : CM 13

Name : S. Dyra

Ambient Temperature : 67.9 °F

Date : March 3, 2008

Calibrator Model # : CL23A

Serial # : T-249465

Date Of Certification : September 22, 2006

Primary Standards Directly Traceable National Institute of Standards and Technology (NIST)

Reference Source Temperature (°F)	Test Thermometer Temperature (°F)	Temperature Difference %
0	5	1.1
250	255	0.7
600	604	0.4
1200	1205	0.3

$$\frac{(\text{Ref. Temp., } ^\circ\text{F} + 460) - (\text{Test Therm. Temp., } ^\circ\text{F} + 460)}{\text{Ref. Temp., } ^\circ\text{F} + 460} * 100 \leq 1.5 \%$$

Ref. Temp., °F + 460

Meter Box Calibration

Dry Gas Meter No.
Standard Meter No.
Standard Meter (Y)

CM 16
9605804
0.9993

Date:
Calibrated By:
Barometric Pressure:

February 29, 2008
S. Dyrá
29.14

Run Number	Orifice Setting in H ₂ O Chg (H)	Standard Meter Gas Volume vr	Dry Gas Meter Gas Volume vd	Standard Meter Temp. F° tr	Dry Gas Meter Inlet Temp. F° tdi	Dry Gas Meter Outlet Temp. F° tdo	Dry Gas Meter Avg. Temp. F° td	Time Min	Time Sec	Y	Chg (H)
Final		21.748	49.230	68	73	72					
Initial		16.110	43.608	68	73	71					
Difference	1	5.638	5.622	68	73	72	72	20	9	1.010	1.455
Final		30.592	58.014	68	75	72					
Initial		21.748	49.230	68	72	72					
Difference	2	8.844	8.784	68	74	72	73	20	50	1.015	1.578
Final		43.225	70.573	68	77	73					
Initial		30.592	58.014	68	75	72					
Difference	3	12.633	12.559	68	76	73	74	24	56	1.016	1.547
Final		51.865	79.162	68	78	73					
Initial		43.225	70.573	69	76	73					
Difference	4	8.640	8.589	69	77	73	75	15	10	1.016	1.574
Final		64.596	91.838	68	76	73					
Initial		51.865	79.162	69	76	73					
Difference	5	12.731	12.676	69	76	73	75	19	33	1.013	1.608
Final		15.952	43.442	67	79	71					
Initial		7.851	35.407	66	75	71					
Difference	6	8.101	8.035	67	77	71	74	9	46	1.017	1.641
Average										1.015	1.567

Stack Temperature Sensor Calibration

Meter Box # : CM 16 Name : S. Dyra

Ambient Temperature : 67.1 °F Date : February 29, 2008

Calibrator Model # : CL23A

Serial # : T-249465

Date Of Certification : September 22, 2006

Primary Standards Directly Traceable National Institute of Standards and Technology (NIST)

Reference Source Temperature (°F)	Test Thermometer Temperature (°F)	Temperature Difference %
0	1	0.2
250	252	0.3
600	601	0.1
1200	1203	0.2

$$\frac{(\text{Ref. Temp., } ^\circ\text{F} + 460) - (\text{Test Therm. Temp., } ^\circ\text{F} + 460)}{\text{Ref. Temp., } ^\circ\text{F} + 460} * 100 \leq 1.5 \%$$

Ref. Temp., °F + 460

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: _____ Date: 3/26/08

Sampling Location: U2 Supplementary ESP Outlet

Source Condition: Normal

Dry Gas Meter No. CM-16 Y = 1.015

Barometric Pressure: 29.92 in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 5.0 in. Hg vacuum

Post-sampling 0. cfm @ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Stack ESP Vac 11 Hg	> 500° Probe (°F)	> 500° Filter Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
1145	2.927	.08	1.0	500	500	146	140	75	74
1150	4.12	.05	1.0	500	500	146	140	74	74
1155	5.05	.03	1.0	500	500	148	139	72	72
1200	5.74	.03	1.0	500	500	152	139	72	72
1205	6.56	.03	1.0	500	500	158	139	72	72
1210	7.28	.03	1.0	500	500	162	140	72	72
1215	7.79	.03	1.0	500	500	155	140	73	72
1220	8.52	.03	1.0	500	500	152	141	73	72
1225	9.15	.02	1.0	500	500	148	141	75	72
1230	9.75	.02	1.0	500	500	147	140	75	72
Avg.									

Operator: A-L. SORCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

PSNH MERRIMACK

Project/Project Number: M0813 Date: 3-26-08

Sampling Location: U2 Supplementary ESP OUTLET

Source Condition: Normal

Dry Gas Meter No. Cm-16 Y = 1.015

Barometric Pressure: 29.90 in. Hg

Leak Check: Pre-sampling 0 cfm @ 4.0 in. Hg vacuum

Post-sampling 0 cfm @ 4.0 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Vac 11 Hg Stack (FF)	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
1300	9.801	.02	1.0	500	500	146	140	81	78
1305	10.44	.02	1.0	500	500	148	141	83	79
1310	11.17	.02	1.0	500	500	147	140	84	81
1315	11.98	.02	1.0	500	500	145	140	80	80
1320	12.55	.02	1.0	500	500	146	139	80	80
1325	13.10	.02	1.0	500	500	146	139	74	76
1330	13.88	.02	1.0	500	500	147	141	76	74
1335	14.41	.02	1.0	500	500	147	140	76	75
1340	15.06	.02	1.0	500	500	147	139	76	76
1345	15.643								
Avg.									

Operator: A.L. SORCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH Merrimack Date: 3-26-08

Sampling Location: U2 Suppl. ESP-Outlet

Source Condition: Normal

Dry Gas Meter No. CM-16 Y = 1.015

Barometric Pressure: 29.90 in. Hg

Leak Check: Pre-sampling 0 0 cfm @ 4.0 in. Hg vacuum

Post-sampling 0 cfm @ _____ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			<u>Val</u> <u>1 1/2"</u> <u>Stack</u> <u>(25)</u>	> 500° Probe (°F)	> 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter Inlet (°F)	Dry Gas Meter Outlet (°F)
1405	6.716	.02	2.0	500	500	146	140	85	82
10	7.27	.02	2.0	500	500	147	140	83	84
15	7.80	.02	2.0	500	500	145	140	84	83
20	8.32	.02	2.0	500	500	145	140	84	83
25	8.76	.02	2.0	500	500	144	140	84	83
1430	9.15	.02	2.0	500	500	144	140	84	83
35	9.59	.02	2.0	500	500	144	140	82	83
40	9.92	.02	2.0	500	500	145	139	74	78
45	10.37	.02	2.0	500	500	146	139	72	75
1450	10.76								
Avg.									

Operator: A. L. SORCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH MERRIMACK Date: 3-26-08

Sampling Location: U2 Primary ESP- Outlet

Source Condition: NORMAL

Dry Gas Meter No. Cm-16 Y = 1.015

Barometric Pressure: 29.90 in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 5.0 in. Hg vacuum

Post-sampling 0.0 cfm @ 5.0 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			V/L 11 Hg Stack (°F)	> 500° Probe (°F)	> 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter Inlet (°F)	Outlet (°F)
1515	10.784	.02	2.0	500	500	147	139	71	71
20	11.19	.02	2.0	500	500	148	141	73	72
25	11.57	.02	2.0	500	500	148	141	74	73
30	12.00	.02	3.0	500	500	147	140	75	73
35	12.39	.02	3.0	500	500	148	140	76	74
40	12.80	.02	3.0	500	500	147	140	79	75
45	13.34	.02	3.0	500	500	146	140	79	76
50	13.86	.02	3.0	500	500	146	139	78	77
55	14.37	.02	4.0	500	500	147	139	80	76
1600	14.860								
Avg.									

Operator: A. L. SORCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH MERRIMACK Date: 3-26-08

Sampling Location: U2 PRIMARY ESP OUTLET

Source Condition: NORMAL

Dry Gas Meter No. CM-16 Y = 1.015

Barometric Pressure: 29.90 in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 6.0 in. Hg vacuum

Post-sampling 0. cfm @ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Vac 11 Hg Stack (PS)	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
								Inlet (°F)	Outlet (°F)
1615	4.933	.02	2.0	500	500	150	141	78	77
20	5.32	.02	2.0	500	500	149	140	79	77
25	5.73	.02	2.0	500	500	147	140	77	77
30	6.15	.02	2.0	500	500	146	140	74	75
35	6.61	.02	2.0	500	500	146	140	70	73
40	7.03	.02	2.0	500	500	146	140	70	66
45	7.50	.02	3.0	500	500	146	140	65	69
50	7.96	.02	3.0	500	500	145	140	63	66
55	8.41	.02	3.0	500	500	146	139	60	64
1700	8.993								
Avg.									

Operator: A. L. SORCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH Merrimack Date: 3-26-08

Sampling Location: U2 Primary ESP Outlet

Source Condition: Normal

Dry Gas Meter No. CM-16 Y = 1.015

Barometric Pressure: 29.9 in. Hg

Leak Check: Pre-sampling 0 cfm @ 6.0 in. Hg vacuum

Post-sampling 0 cfm @ _____ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Vac "H ₂ O" Stack (°F)	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
1720	8.924	.02	2.0	500	500	147	139	56	57
25	9.37	.02	2.0	500	500	149	140	58	58
30	9.77	.02	2.0	500	500	148	140	59	58
35	10.22	.02	2.0	500	500	149	140	60	59
40	10.64	.02	3.0	500	500	148	140	61	59
45	11.11	.02	3.0	500	500	147	140	61	60
50	11.54	.02	3.0	500	500	148	141	62	60
55	12.02	.02	3.0	500	500	147	140	62	60
1800	12.50	.02	3.0	500	500	147	140	63	61
1805	13.015								
Avg.									

Operator: A. L. Sorce

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH MEERIMACK Date: 3/27/08

Sampling Location: U2 PRE-HEATER- Outlet

Source Condition: Normal

Dry Gas Meter No. CM-13 Y = 0.993

Barometric Pressure: 29.89 in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 6.0 in. Hg vacuum

Post-sampling 0.0 cfm @ 9.0 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Vac " Hg Stack (°F)	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
0905	4.815	.02	3.0	500	500	150	140	54	51
10	5.32	.03	4.0	500	500	151	140	56	52
15	5.73	.04	5.0	500	500	151	141	58	54
20	6.16	.04	5.0	500	500	149	140	60	55
25	6.57	.04	5.0	500	500	145	140	62	57
30	7.02	.05	5.0	500	500	145	139	64	58
35	7.46	.04	6.0	500	500	143	140	65	60
40	7.96	.04	6.0	500	500	145	140	66	61
45	8.42	.04	6.0	500	500	146	140	67	62
0950	8.975								
Avg.									

Operator: A. L. SORCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH MERRIMACK Date: 3-27-08

Sampling Location: U2 PREHEATER OUTLET

Source Condition: NORMAL

Dry Gas Meter No. CM-13 Y = 0.993

Barometric Pressure: 29.90 in. Hg

Leak Check: Pre-sampling 0 cfm @ 10.0 in. Hg vacuum

Post-sampling 0 cfm @ 10.0 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Vac " Hg Static Probe	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
1015	9.087	.03	3.0	500	500	147	139	66	65
20	9.57	.03	3.0	500	500	148	140	67	65
25	10.08	.03	3.0	500	500	148	140	68	66
30	10.59	.03	3.0	500	500	149	141	68	66
35	11.08	.03	4.0	500	500	149	140	68	66
40	11.57	.03	4.0	500	500	148	140	68	66
45	12.03	.03	4.0	500	500	148	140	68	66
50	12.47	.03	4.0	500	500	148	140	68	67
55	12.90	.03	4.0	500	500	148	140	68	67
1100	13.393								
Avg.									

Operator: A.L. SORCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH Merrimack Date: 3-27-08

Sampling Location: U2 PREHEATER OUTLET

Source Condition: NORMAL

Dry Gas Meter No. CM-13 Y = 0.993

Barometric Pressure: 29.90 in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 10.0 in. Hg vacuum

Post-sampling 0. cfm @ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			VAC. " H ₂ Stack (°F)	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
1120	13.510	.03	4.0	500	500	148	140	67	68
1125	14.02	.03	5.0	500	500	148	140	67	68
1130	14.55	.03	5.0	500	500	149	140	66	68
1135	15.05	.03	5.0	500	500	150	140	66	68
1140	15.52	.03	5.0	500	500	150	141	66	68
1145	15.98	.03	5.0	500	500	150	140	66	68
1150	16.44	.03	5.0	500	500	150	140	66	68
1155	16.87	.03	5.0	500	500	149	139	66	68
1200	17.31	.03	5.0	500	500	149	140	66	67
1205	17.76								
Avg.									

Operator: A.L. SOURCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH Merrimack Date: 3-27-08

Sampling Location: U2 SCR Outlet

Source Condition: Normal

Dry Gas Meter No. CM-16 Y = 1.015

Barometric Pressure: 29.90 in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 10.0 in. Hg vacuum

Post-sampling 0.0 cfm @ 10.0 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Vac " Hg Stack (°F)	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
								Inlet (°F)	Outlet (°F)
1357	3.132	.03	3.0	500	500	148	141	54	53
1402	3.57	.03	3.0	500	500	147	140	54	54
07	4.02	.03	3.0	500	500	148	140	54	53
12	4.46	.03	3.0	500	500	148	140	55	54
17	4.99	.03	4.0	500	500	148	140	55	54
22	5.33	.03	4.0	500	500	147	139	55	54
27	5.82	.03	4.0	500	500	148	140	55	55
32	6.31	.03	4.0	500	500	149	140	55	55
37	6.75	.03	5.0	500	500	149	140	56	55
1442	7.280								
Avg.									

Operator: A.L. SORRE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH MERRIMACK Date: 3-27-08

Sampling Location: U2 SCR Outlet

Source Condition: NORMAL

Dry Gas Meter No. CM-16 Y = 1.015

Barometric Pressure: 29.90 in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 12.0 in. Hg vacuum

Post-sampling 0.0 cfm @ 12.0 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Vac 11 Hg Static	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
1602	2.190	.03	6.0	500	500	148	140	56	56
07	2.51	.03	7.0	500	500	148	140	56	56
12	2.93	.03	8.0	500	500	148	140	56	56
17	3.37	.02	8.0	500	500	148	140	56	56
22	3.78	.02	8.0	500	500	148	140	56	56
27	4.14	.03	8.0	500	500	148	140	56	56
32	4.65	.03	9.0	500	500	148	140	56	56
37	5.09	.03	10.0	500	500	148	140	56	57
42	5.53	.03	10.0	500	500	148	140	56	57
1647	6.10								
Avg.									

Operator: A. L. Sorce

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET

For Controlled Condensate (CCS)

(NCASI Method 8A)

Project/Project Number: PSNH Merrimack Date: 3-27-08

Sampling Location: U2 SCRE Outlet

Source Condition: NORMAL

Dry Gas Meter No. CM-16 Y = 1.015

Barometric Pressure: 29.90 in. Hg

Leak Check: Pre-sampling 0 0 cfm @ 10.0 in. Hg vacuum

Post-sampling 0 cfm @ _____ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Vac		Filter			Dry Gas Meter	
			"Hg Stack (°F)	> 500° Probe (°F)	> 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Inlet (°F)	Outlet (°F)
1500	7.373	.03	4.0	500	500	147	140	55	55
05	7.78	.03	7.0	500	500	148	140	55	55
10	8.35	.03	8.0	500	500	148	140	55	55
15	8.99	.03	8.0	500	500	148	140	55	55
20	9.46	.03	8.0	500	500	148	140	56	55
25	10.02	.03	8.0	500	500	148	140	56	56
30	10.52	.03	9.0	500	500	148	140	56	56
35	11.03	.03	9.0	500	500	148	140	57	56
40	11.52	.03	9.0	500	500	148	140	56	56
1545	12.009								
Avg.									

Operator: A.L. Sorrell

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH MERRIMACK Date: 3-28-08
 Sampling Location: U2 SCR INLET
 Source Condition: NORMAL
 Dry Gas Meter No. CM Y = 1.015
 Barometric Pressure: 29.46 in. Hg
 Leak Check: Pre-sampling 0.0 cfm @ 10.0 in. Hg vacuum
 Post-sampling 0.0 cfm @ 10.0 in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			<u>Vac</u> <u>11/16</u> <u>Stack</u> <u>(45)</u>	> 500° Probe (°F)	> 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
0835	6.055	.02	2.0	500	500	150	139	40	40
40	6.46	.02	2.0	500	500	155	139	42	40
45	6.74	.02	2.0	500	500	155	140	42	40
50	7.27	.02	2.0	500	500	160	140	42	40
55	7.78	.02	2.0	500	500	160	140	42	40
0900	8.15	.02	2.0	500	500	160	141	43	40
05	8.69	.02	2.0	500	500	160	140	44	41
10	9.02	.02	2.0	500	500	160	140	44	41
15	9.50	.02	2.0	500	500	160	140	44	42
0920	9.99								
Avg.									

Operator: A. L. Sorce

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH MERRIMACK Date: 3-28-08
 Sampling Location: U2 SCR INLET
 Source Condition: NORMAL
 Dry Gas Meter No. CM-16 Y = 1.015
 Barometric Pressure: 29.46 in. Hg
 Leak Check: Pre-sampling 0.0 cfm @ 10.0 in. Hg vacuum
 Post-sampling 0. cfm @ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			VAC 11 1/4 Stack (°F)	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
0945	0.011	.02	2.0	500	500	160	140	45	44
50	0.42	.03	2.0	500	500	157	140	46	44
55	0.74	.03	2.0	500	500	157	140	47	44
1000	1.22	.03	2.0	500	500	157	140	47	45
05	1.67	.03	3.0	500	500	158	141	48	45
10	2.09	.03	3.0	500	500	156	140	48	46
15	2.43	.03	3.0	500	500	155	140	48	46
20	2.77	.03	4.0	500	500	155	140	48	46
25	3.74	.03	4.0	500	500	155	140	48	46
1030	3.927								
Avg.									

Operator: A.L. Sacco

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH Merrimack Date: 3-28-08

Sampling Location: U2 SCR Inlet

Source Condition: Normal

Dry Gas Meter No. 0M-16 Y = 1.015

Barometric Pressure: _____ in. Hg

Leak Check: Pre-sampling 0. 0 cfm @ 10.0 in. Hg vacuum

Post-sampling 0. _____ cfm @ _____ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						Dry Gas Meter	
			Vac 11 H ₂ O Stack (°F)	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)			
1055	4.027	.04	3.0	500	500	153	140	49	47	
1100	4.48	.04	4.0	500	500	153	141	49	47	
05	4.76	.04	4.0	500	500	152	140	50	48	
10	5.18	.05	5.0	500	500	152	139	51	49	
15	5.55	.05	5.0	500	500	153	140	51	49	
20	5.98	.05	6.0	500	500	153	140	51	49	
25	6.43	.05	6.0	500	500	153	140	51	49	
30	6.85	.04	7.0	500	500	153	140	51	49	
35	7.24	.04	7.0	500	500	152	140	51	49	
1140	7.818									
Avg.										

Operator: A.L. Sorock

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSN14 MERRIMACK Date: 3-28-08

Sampling Location: P 112 Suppl. ESP Outlet

Source Condition: CONDITION 2

Dry Gas Meter No. CM-13 Y = 0.993

Barometric Pressure: _____ in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 10.0 in. Hg vacuum

Post-sampling 0.0 cfm @ _____ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			VAC 11 Hg Static Probe	> 500° Probe (°F)	> 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter Inlet (°F) Outlet (°F)	
1505	1.059	.02	3.0	500	500	146	140	73	71
10	1.50	.02	3.0	500	500	146	140	73	72
15	1.99	.02	3.0	500	500	146	140	73	72
20	2.47	.02	3.0	500	500	147	140	73	72
25	2.95	.02	3.0	500	500	148	141	74	72
30	3.39	.02	3.0	500	500	146	140	74	72
35	3.89	.02	3.0	500	500	146	140	74	73
40	4.42	.02	3.0	500	500	146	140	74	73
45	4.93	.02	3.0	500	500	146	140	74	73
1550	5.432								
Avg.									

Operator: A. L. SORCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH MERRIMACK Date: 3-28-08

Sampling Location: U2 Suppl. ESP Outlet

Source Condition: CONDITION 2

Dry Gas Meter No. CM-13 Y = 0.993

Barometric Pressure: _____ in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 9.0 in. Hg vacuum

Post-sampling 0. cfm @ _____ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			Vac 11 Hg Stack (°F)	> 500° Probe (°F)	Filter > 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
1605	5.505	.02	3.0	500	500	146	140	74	73
10	6.06	.02	3.0	500	500	146	140	74	73
15	6.58	.02	3.0	500	500	146	140	74	73
20	7.08	.02	3.0	500	500	146	140	74	73
25	7.57	.02	3.0	500	500	145	140	74	73
30	8.06	.02	3.0	500	500	146	140	74	73
35	8.52	.02	3.0	500	500	146	140	74	73
40	8.99	.02	3.0	500	500	146	140	74	73
45	9.48	.02	3.0	500	500	146	140	74	73
1650	9.935								
Avg.									

Operator: A. L. SORCE

Platt Environmental Services, Inc.

H₂SO₄ VAPOR FIELD DATA SHEET For Controlled Condensate (CCS) (NCASI Method 8A)

Project/Project Number: PSNH MERRIMACK Date: 3-28-08

Sampling Location: U2 Suppl. ESP Outlet

Source Condition: CONDITION 2

Dry Gas Meter No. CM-13 Y = 0.993

Barometric Pressure: _____ in. Hg

Leak Check: Pre-sampling 0.0 cfm @ 10.0 in. Hg vacuum

Post-sampling 0. cfm @ _____ in. Hg vacuum

Clock Time (24 hrs.)	Meter Volume (V _m) ft ³	Orifice Gauge Pressure (ΔH) in. H ₂ O	Temperature						
			<u>Vac</u> <u>11 Hg</u> <u>5.0</u>	> 500° Probe (°F)	> 500° Outlet (°F)	Condenser Water (°F)	140° Coil Exit (°F)	Dry Gas Meter	
1700	10.003	.02	5.0	500	500	145	140	74	72
05	10.57	.02	5.0	500	500	146	141	73	72
10	11.19	.02	5.0	500	500	145	140	73	72
15	11.69	.02	5.0	500	500	144	140	74	72
20	12.16	.02	5.0	500	500	143	140	75	73
25	12.63	.02	5.0	500	500	144	140	74	73
30	13.09	.02	5.0	500	500	144	139	74	73
35	13.56	.02	5.0	500	500	146	140	73	73
40	14.03	.02	5.0	500	500	146	140	73	72
1745	14.56								
Avg.									

Operator: A. L. Sorce

APPENDIX Q: Calculation Methodology

Calculations

C.1 Standard Calculations

C.1.1 Sorbent Injection Concentration

The convention for describing the concentration of sorbent injected into a duct is pounds per million actual cubic foot of flue gas or lb/MMacf. This value is referred to as the “injection ratio” or the “injection concentration.” The actual mass flow rate of sorbent is therefore dependent on the total volumetric flow of flue gas at the point of injection. The mass flow rate is determined by the following calculation:

$$\dot{m}_{sorbent} = \frac{\dot{Q}_{fluegas}}{10^6} \times Ratio * 60 \quad C-1$$

where,

$\dot{m}_{sorbent}$	lb/hr	mass feed rate of sorbent
$\dot{Q}_{fluegas}$	acfm	volumetric flow rate of flue gas
$Ratio$	lb/MMacf	sorbent injection ratio
60	min/hr	conversion factor

If the flue gas flow is provided in standard cubic feet per minute (scfm), the flowrate at actual temperature can be calculated as follows:

$$acfm = scfm * (459 + T_i) / (459 + 68) \quad C-2$$

where T_i = temperature in degrees Fahrenheit at the injection location.

The actual injection ratio can be calculated as follows:

$$Ratio = \frac{\dot{m}_{sorbent} / 60}{\dot{Q}_{fluegas} / 10^6} \quad C-3$$

C.1.2 Coal Mercury Concentration Conversion

The mercury concentration of the coal is typically reported by the lab in ng/g or µg/g. To convert ng/g to lb/TBtu, the gross calorific value (GCV) of the coal must be measured and both the mercury concentration and GCV must be on the same moisture basis (i.e. both dry or both wet). The following equation described the conversion:

$$I_{Hg} = W_{Hg} \times \frac{1}{GCV} \times \frac{10^{-9} lb}{n lb} \times \frac{10^{12} Btu}{TBtu} \quad C-4$$

where I = Hg lb/Tbtu, W = Hg ng/g

For example, if the coal mercury concentration were 54.3 ng/g and the GCV were 11942, both on a dry basis, then

$$I_{Hg} = 54.3 \text{ ng/g} / 11942 \times 10^3 = 4.55 \text{ lb/Tbtu}$$

C.1.3 Flue Gas Mercury Concentration Conversion

Thermo CEMS data are measured in $\mu\text{g}/\text{wetsm}^3$ and using guidelines provided in Method 19 in Appendix A to Part 60, which uses an EPA F Factor and CO_2 values, one can convert into units of lb/TBtu. Note that TBtu equals 10^{12} Btu, or 10^6 MMBtu. An F factor is the ratio of combustion gas volume to heat inputs, and it is used to calculate emission rates from concentrations.

CO_2 based F-factor (F_c)

If the CO_2 concentration is measured on a wet basis:

$$E = C_w \times F_c \times \frac{100}{\% \text{CO}_2} \times 10^6 \text{ MMBtu/TBtu} \quad \text{C-5}$$

Where,

E = emission rate in lb/TBtu

C_w = mercury concentration, wet basis, in lb Hg/scf. Convert from the CEMS basis of $\mu\text{g}/\text{wsm}^3$ as follows:

$$C_w (\text{lb/scf}) = C_w (\mu\text{g/wsm}^3) \times \frac{1\text{g}}{10^6 \mu\text{g}} \times \frac{1\text{lb}}{453.6\text{g}} \times \frac{1\text{m}^3}{35.31\text{ft}^3} \quad \text{C-6}$$

$\% \text{CO}_{2w}$ = concentration of CO_2 on a wet basis, in %

F_c = carbon dioxide-based F factor, in scf CO_2 /MMBtu

The F_c factor is calculated using the following equation:

$$F_c = 0.321 \times 10^6 (\%C) / \text{GCV} \quad \text{C-7}$$

Where,

$\%C$ = concentration of Carbon in coal, % dry basis

(from ultimate analysis if available)

GCV = gross calorific value, Btu/lb dry basis

If the CO_2 concentration is measured on a dry basis, you must adjust for the moisture fraction in the flue gas as follows:

$$E = \frac{C_w \times F_c}{1 - B_{ws}} \times \frac{100}{\% \text{CO}_{2d}} \times 10^6 \text{ MMBtu/TBtu} \quad \text{C-8}$$

All terms are the same as above with the exception of

B_{ws} = moisture fraction of the flue gas, in %

$\% \text{CO}_{2d}$ = concentration of CO_2 on a dry basis, in %

O₂ based F-factor (F_d)

If the O₂ concentration is measured on a wet basis:

$$E = C_w \times Fd \frac{20.9}{20.9(1 - B_{ws}) - \%O_{2w}} \quad \text{C-9}$$

If the O₂ concentration is measured on a dry basis, you must adjust for the moisture fraction in the flue gas as follows:

$$E = \frac{C_w \times Fd \times 20.9}{(1 - B_{ws})(20.9 - \%O_{2d})} \quad \text{C-10}$$

The F_D factor is calculated using the following equation:

$$F_D = \frac{3.64 \times W_H + 1.53 \times W_C + 0.57 \times W_S + 0.14 \times W_N - 0.46 \times W_O}{HHV} \times 10^6 \quad \text{C-11}$$

Where

- W_H = fraction of hydrogen in the coal
- W_C = fraction of carbon in the coal
- W_S = fraction of sulfur in the coal
- W_N = fraction of nitrogen in the coal
- W_O = fraction of oxygen in the coal
- HHV = higher heating value of the coal in lb/BTU

C_w is calculated as described above in Equation C-6.

C.1.4 Mercury Removed by Fly Ash

The mercury concentration in the fly ash is typically measured in ng/g. This can be converted to lb/TBtu using the following technique:

$$E_{\text{ash}} = \frac{\%A / 100}{GCV} \times K_1 \times K_2 \times C_{\text{ash}} \times 10^{12} (\text{Btu} / \text{TBtu}) \times 10^{-9} (\text{lb} / \text{nlb}) \quad \text{C-12}$$

Where

- E_{ash} is the mercury collected by the ash in lb/TBtu
- $\%A$ is the fraction of ash in the coal sample
- GCV is the gross caloric value in lb/Btu
- K_1 is the fraction of ash entering the ESP (nominally 0.85 for PC plants)
- K_2 is the collection efficiency of the first collection field (nominally 0.8 for many ESPs)
- C_{ash} is the concentration of mercury in the ash, ng/g