BACT Appendix Documents

Chena Power Plant BACT

Contents

05.28.2024 2024 Final Chena BACT Determination

03.29.2024 2024 Chena Power Plant $PM_{2.5}$ BACT MR&R Final

05.28.2024 2024 Chena Power Plant SO_2 BACT MR&R Final

03.27.2024 2024 Department DSI Cost Calcs

02.23.24 Statistical Analysis for $PM_{2.5}$ Emission Limit from 2011 Source Test

ADEC Confidentiality Form 01262024.signed

AE Supplemental BACT Analysis Cover Letter 01262024

10.25.23 Dept Preliminary Calcs for Chena Power Plant's Baghouse

10.10.23 ADEC – Preliminary Estimate of Increased Load on Chena Power Plant Baghouse

10.09.23 ADEC – Aurora Rail Samples for Coal

31430_Aurora_DSI_Opinion_of_Probable_Cost_F

AppxA&B_CPP-BACT_Tables_2024125

AQ3150RL03 Apr13,2012_335734

2010#1_2PM2.5Source Test

Enclosure 1

Enclosure 2

[redacted] Aurora Affordability Analysis LLC BACT Affordability Analysis

Fort Wainwright Power BACT

Contents

07.03.24 2024 Final Fort Wainwright BACT Determination

07.03.24 Ft Wainwright $PM_{2.5}$ BACT MR&R

03.27.24 Ft Wainwright SO_2 BACT MR&R

1. AQ0236TVP04 2023 FCE EU Inventory 10.16.2023 Rev

DU CHPP SO2 Reduction Analysis Public Notice

(CBI) Revised FWA CHPP SO2 Reduction Analysis Cover Letter

RE_USAG Alaska (Fort Wainwright) New Emergency Generator Specs (Email 2 of 2)

GVEA North Pole Power Plant BACT

03.23.24 2024 Final North Pole PP BACT Determination

03.27.24 North Pole Power Plant $PM_{2.5}$ BACT MR&R

03.27.24 North Pole Power Plant SO_2 BACT MR&R

GVEA Fuel Prices 2017-2018

GVEA AEE Rpts 03.27.20

AQ0110TVP04 NPPP FuelPrices Provided 02.24.2021

GVEA AEE Rpts 03.30.21

GVEA AEE Rpts 03.30.22

GVEA AEE Rpts 03.30.23

AQ0110TVP04 EU Inventory 04.28.23

GVEA, Updated Fuel Prices 12.29.23

Updated Department North Pole Power Plant SO_2 Controls Economic Analysis

GVEA Zehnder Power Plant BACT

Contents

03.23.24 2024 Final Zehnder BACT Determination

03.27.24 Ft Zehnder $PM_{2.5}$ BACT MR&R

03.27.24 Ft Zehnder SO_2 BACT MR&R

A04_FuelPrices_1810

Updated Department Zehnder Power Plant SO2 Controls Economic Analysis

UAF BACT

Contents

05.28.24 2024 Final UAF BACT Determination

03.27.24 UAF $PM_{2.5}$ BACT MR&R

03.27.24 UAF SO_2 BACT MR&R

06.12.23 FW 2023 BACT Analysis

AKDEC Letter 8-16-23 signed

Costs Assoc W Stack Replacement or CDS Jan2023

Department BACT AppxG Andritz CDS-CostEst

Department BACT AppxH BACT DSI CostEst Jan2023

Department BACT AppxH BACT TriMer_DSI-CostEst_Jan2023

Departments UAF_BACT AppxF EPA WFG CCM Est

EPA $PM_{2.5}$ Comments Cover Letter

EU27_Supplemental $PM_{2.5}$ BACT_July2023

Proposal Limit for CFB Boiler 12.22.23

Signed UAF Supplemental Comments on Proposed Rule

UAF BACT Appendix A-SO_2 Emissions Jan2023

UAF BACT Appendix B-WFGD Vendor Data Jan2023

UAF BACT Appendix C-SDA Vendor Data Jan2023

UAF BACT Appendix D-CDS Vendor Data Jan2023

UAF BACT Appendix E-DSI Vendor Data Jan2023

UAF BACT Appendix F-WFGD-Cost-Est-Jan2023

UAF BACT Appendix G-CDS-Cost-Est-Jan2023

UAF BACT Appendix H-DSI-Cost-Est-Jan2023

UAF BACT AppxF EPA WFGD CCM EstmateJan2023

UAF BACT AppxG Andritz CDS CostEst Jan2023

UAF BACT AppxH BACT DSI-CostEst Jan2023

UAF BACT AppxH TriMer DSI-CostEst Jan2023

UAF BACT Report Tables Jan2023

UAF Comments-EPA $PM_{2.5}$ SIP Final Document

UAF SO_2 BACT EU113 Jan2023

Updated Department Version of UAF BACT $PM_{2.5}$ Tables 4-X

Chena Power Plant Cover Page

Contents

05.28.2024 2024 Final Chena BACT Determination

03.29.2024 2024 Chena Power Plant $PM_{2.5}$ BACT MR&R Final

05.28.2024 2024 Chena Power Plant SO_2 BACT MR&R Final

03.27.2024 2024 Department DSI Cost Calcs

02.23.24 Statistical Analysis for $PM_{2.5}$ Emission Limit from 2011 Source Test

ADEC Confidentiality Form 01262024.signed

AE Supplemental BACT Analysis Cover Letter 01262024

10.25.23 Dept Preliminary Calcs for Chena Power Plant's Baghouse

10.10.23 ADEC – Preliminary Estimate of Increased Load on Chena Power Plant Baghouse

10.09.23 ADEC – Aurora Rail Samples for Coal

31430_Aurora_DSI_Opinion_of_Probable_Cost_F

AppxA&B_CPP-BACT_Tables_2024125

AQ3150RL03 Apr13,2012_335734

2010#1_2PM2.5Source Test

Enclosure 1

Enclosure 2

[redacted] Aurora Affordability Analysis LLC BACT Affordability Analysis

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Air Permits Program

BEST AVAILABLE CONTROL TECHNOLOGY DETERMINATION ADDENDUM
for
Chena Power Plant
Aurora Energy, LLC.

Prepared by: Dave Jones
Reviewed by: Moses Coss
Final Date: May 28, 2024

\\decjn-svrfile\decjn-svrfile\Groups\AQ\General\SIP_BACT_2017\2024 Updated BACT\Aurora\05.28.24 2024 Final Chena BACT Determination.docx

Table of Contents

1. INTRODUCTION 1
2. BACT EVALUATION 2
3. BACT DETERMINATION FOR NOX 4
4. BACT DETERMINATION FOR $PM_{2.5}$ 4
4.1 $PM_{2.5}$ BACT for the Industrial Coal-Fired Boilers 5
4.2 $PM_{2.5}$ BACT for Material Handling 8
5. BACT DETERMINATION FOR SO_2 11
5.1 SO_2 BACT for the Industrial Coal-Fired Boilers 11
6. BACT DETERMINATION SUMMARY 18

Abbreviations/Acronyms

AAC .....Alaska Administrative Code
AAAQS .....Alaska Ambient Air Quality Standards
Department .....Alaska Department of Environmental Conservation
BACT .....Best Available Control Technology
CFB……Circulating Fluidized Bed
CFR. .....Code of Federal Regulations
Cyclones…….Mechanical Separators
DFP……Diesel Particulate Filter
DLN.....Dry Low NOx
DOC……..Diesel Oxidation Catalyst
EPA .....Environmental Protection Agency
ESP…….Electrostatic Precipitator
EU.....Emission Unit
FITR……..Fuel Injection Timing Retard
GCPs……..Good Combustion Practices
HAP.....Hazardous Air Pollutant
ITR…….Ignition Timing Retard
LEA……Low Excess Air
LNB……Low NOx Burners
MR&Rs .....Monitoring, Recording, and Reporting
NESHAPS .....National Emission Standards for Hazardous Air Pollutants
NSCR…….Non-Selective Catalytic Reduction
NSPS .....New Source Performance Standards
ORL.....Owner Requested Limit
PSD.....Prevention of Significant Deterioration
PTE.....Potential to Emit
RICE, ICE .....Reciprocating Internal Combustion Engine, Internal Combustion Engine
SCR .....Selective Catalytic Reduction
SIP .....Alaska State Implementation Plan
SNCR…….Selective Non-Catalytic Reduction
ULSD .....Ultra Low Sulfur Diesel

Units and Measures

gal/hr.....gallons per hour
g/kWh .....grams per kilowatt hour
g/hp-hr .....grams per horsepower hour
hr/day.....hours per day
hr/yr .....hours per year
hp.....horsepower
lb/hr .....pounds per hour
lb/MMBtu.....pounds per million British thermal units
lb/1000 gal.....pounds per 1,000 gallons
kW .....kilowatts
MMBtu/hr.....million British thermal units per hour
MMscf/hr.....million standard cubic feet per hour
ppmv.....parts per million by volume
tpy.....tons per year

Pollutants

CO .....Carbon Monoxide
HAP.....Hazardous Air Pollutant
NOx .....Oxides of Nitrogen
SO_2 .....Sulfur Dioxide
$PM_{2.5}$.....Particulate Matter with an aerodynamic diameter not exceeding 2.5 microns
PM_{10} .....Particulate Matter with an aerodynamic diameter not exceeding 10 microns

1. INTRODUCTION

Chena Power Plant is a stationary source owned by Aurora Energy, LLC (Aurora) which consists of four boilers. Emission Units (EUs) 4 through 6, also identified as Chena 1, 2, and 3, are coal-fired overfeed traveling grate stokers with a maximum steam production rating of 50,000 lbs/hr each. Maximum design power production is 5 megawatts (MW) each. EU 4 was installed in 1954, while EUs 5 and 6 were installed in 1952. EU 7, also identified as Chena 5, is a coal-fired, spreader stoker boiler with a maximum steam production rating of 200,000 lbs/hr and maximum power production rating of 20 MW. Chena 5 was installed in 1970. Maximum coal consumption is 284,557 tons of coal per year, based on the capacities of EUs 4 through 7. Coal receiving and storage (handling) facilities are located on the north bank of the Chena River, and consist of a rail car receiving station, enclosed coal crusher (receiving building), open storage piles, conveyors, and elevators. Coal is transported by conveyors over the Chena River to the Chena Power Plant, located just above the south bank. In the late 1980's, the coal handling system was renovated.

In a letter dated April 24, 2015, the Alaska Department of Environmental Conservation (Department) requested the stationary sources expected to be major stationary sources in the particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers ($PM_{2.5}$) serious nonattainment area perform a voluntary Best Available Control Technology (BACT) review for $PM_{2.5}$ and its precursors in support of the state agency's required SIP submittal once the nonattainment area is re-classified as a Serious $PM_{2.5}$ nonattainment area. The designation of the area as "Serious" with regard to nonattainment of the 2006 24-hour $PM_{2.5}$ ambient air quality standards was published in Federal Register Vol. 82, No. 89, May 10, 2017, pages 21703-21706, with an effective date of June 9, 2017. [1]

The initial BACT Determination for Aurora was included in Part 5 of Appendix III.D.7.07 Control Strategies Chapter, in the State Air Quality Control Plan adopted on November 19, 2019, with amendments adopted on November 18, 2020, as part of a complete SIP package.[2] The *EPA's Air Plan Partial Approval and Partial Disapproval; AK, Fairbanks North Star Borough; 2006 24-hour $PM_{2.5}$ Serious Area and 189(d) Plan*[3] published in the Federal Register on December 5, 2023 (*88 Fed. Reg. 84654*) disapproved of Alaska's initial BACT determination for SO_2 controls and lack of determination for $PM_{2.5}$ controls.

This BACT Determination Addendum applies to the significant emissions units (EUs) listed in Operating Permit No. AQ0315TVP04 Revision 2 and establishes limits for $PM_{2.5}$ and SO_2air emissions with corresponding monitoring, recordkeeping and reporting requirements to ensure continuous compliance with such limits. This BACT Determination Addendum complements the Department's previous November 18, 2020 SIP adoption in response to EPA's comments listed in Memorandum dated August 24, 2022 from Zach

[1] **Federal Register, Vol. 82, No. 89, Wednesday May 10, 2017 (https://dec.alaska.gov/air/anpms/comm/docs/2017-09391-CFR.pdf).**

[2] **Background and detailed information regarding Fairbanks $PM_{2.5}$ State Implementation Plan (SIP) can be found at http://dec.alaska.gov/air/anpms/communities/fbks-pm2-5-serious-sip/.**

[3] **The EPA's Air Plan Partial Approval and Partial Disapproval; AK, Fairbanks North Star Borough; 2006 24-hour $PM_{2.5}$ Serious Area and 189(d) Plan can be found at https://www.regulations.gov/document/EPA-R10-OAR-2022-0115-0426.**

Hedgpeth, R10/LSASD/ECB and Larry Sorrels OAQPS/HEID/AEG to Matthew Jentgen, ARD.[4]

This BACT Determination Addendum provides the Department's review of the BACT analysis for $PM_{2.5}$, and the BACT analysis for sulfur dioxide (SO_2) emissions, which is a precursor pollutant that can form $PM_{2.5}$ in the atmosphere post combustion.

Since the SIP amendments adopted on November 18, 2020, the Department conducted extensive modeling and found that SO_2 emissions from stationary sources do not significantly contribute to ground level $PM_{2.5}$ concentrations, and that BACT emission limits are therefore not required for major stationary sources in the Fairbanks North Star Borough. BACT determinations have, however, been included in in this BACT Determination Addendum since an SO_2 precursor demonstration has not yet been approved by EPA.

Notwithstanding the SO_2 precursor demonstration mentioned above, this Addendum, does not address BACT to control oxides of nitrogen (NOx) emissions, which is also a precursor pollutant that can form $PM_{2.5}$ in the atmosphere post combustion, because the EPA has approved[3] of the Department's comprehensive NOx precursor demonstration under 40 C.F.R. 51.1006(a)(1) and 51.1010(a)(2)(ii).

2. BACT EVALUATION

A BACT analysis is an evaluation of all available control options for equipment emitting the triggered pollutants and a process for selecting the best option based on technical feasibility, economics, energy, and other impacts. 40 CFR 52.21(b)(12) defines BACT as a site-specific determination on a case-by-case basis. The Department's goal is to identify BACT for the **significant** EUs at the Chena Power Plant that emit $PM_{2.5}$ and SO_2, establish emission limits which represent BACT, and assess the level of monitoring, recordkeeping, and reporting (MR&Rs) necessary to ensure Chena Power Plant applies BACT for the EUs **on a continuous basis**. The Department based the BACT review on the five-step, top-down approach set forth in Federal Register Volume 61, Number 142, July 23, 1996 (Environmental Protection Agency).

Table A presents the significant EUs subject to BACT review.

Table A: Emission Units Subject to BACT Review

EU	Emission Unit Name	Emission Unit Description	Rating/Size	Installation or Construction Date
1	Coal Preparation Plant	Exhaust and Fugitive Emissions	75 tons/hr	1950[1]
2	Coal Stockpile	Fugitive Emissions	0.59 acre	1950[2]
3	Ash Vacuum Pump Exhaust	Ash System Baghouse Exhaust	24,187 tons ash/yr	1997

[4] **Document 000006_EPA Technical Support Document – Aurora BACT TSD v20220824: https://www.regulations.gov/document/EPA-R10-OAR-2022-0115-0212.**

4	Chena 1 Coal Fired Boiler	Full Stream Baghouse Exhaust	76 MMBtu/hr	1954
5	Chena 2 Coal Fired Boiler	Full Stream Baghouse Exhaust	76 MMBtu/hr	1952
6	Chena 3 Coal Fired Boiler	Full Stream Baghouse Exhaust	76 MMBtu/hr	1952
7	Chena 5 Coal Fired Boiler	Full Stream Baghouse Exhaust	269 MMBtu/hr	1970
8	**Truck Bay Ash Loadout**	**Bottom of Silo – Fugitive Emissions**	**N/A**	**1952**

Table Notes

1. **EU ID 1 was modified in 1990.**
2. **EU ID 2 was modified in 2013.**

Five-Step BACT Determinations

The following sections explain the steps used to determine BACT for $PM_{2.5}$ and SO_2 for the applicable equipment.

Step 1 Identify All Potentially Available Control Technologies

The Department identifies all available control technologies for the EUs and the pollutant under consideration. This includes technologies used throughout the world or emission reductions through the application of available control techniques, changes in process design, and/or operational limitations. To assist in identifying available controls, the Department reviews available controls listed on the Reasonably Available Control Technology (RACT), BACT, and Lowest Achievable Emission Rate (LAER) Clearinghouse (RBLC). The RBLC is an EPA database where permitting agencies nationwide post imposed BACT for PSD sources. It is usually the first stop for BACT research. In addition to the RBLC search, the Department used several search engines to look for emerging and tried technologies used to control $PM_{2.5}$ and SO_2 emissions from equipment similar to those listed in Table A. **Aurora has also identified and proposed multiple pollution control technologies.**

Step 2 Eliminate Technically Infeasible Control Technologies

The Department evaluates the technical feasibility of each control technology based on source specific factors in relation to each EU subject to BACT. Based on sound documentation and demonstration, the Department eliminates control technologies deemed technically infeasible due to physical, chemical, and engineering difficulties.

Step 3 Rank the Remaining Control Technologies by Control Effectiveness

The Department ranks the remaining control technologies in order of control effectiveness with the most effective at the top.

Step 4 Evaluate the Most Effective Controls and Document the Results as Necessary

The Department reviews the detailed information in the BACT analysis about the control efficiency, emission rate, emission reduction, cost, environmental, and energy impacts for each technology to decide the final level of control. The analysis must present an objective evaluation of both the beneficial and adverse energy, environmental, and economic impacts. A proposal to use the most effective option does not need to provide the detailed information for the less effective options. If cost is not an issue, a cost analysis is not required. Cost effectiveness for a control option is defined as the total net annualized cost of control divided by the tons of pollutant removed per year. Annualized cost includes annualized equipment purchase, erection,

electrical, piping, insulation, painting, site preparation, buildings, supervision, transportation, operation, maintenance, replacement parts, overhead, raw materials, utilities, engineering, start-up costs, financing costs, and other contingencies related to the control option. Sections 3 and 4 present the Department's BACT Determinations for $PM_{2.5}$ and SO_2.

Step 5 Select BACT

The Department selects the most effective control option not eliminated in Step 4 as BACT for the pollutant and EU under review and lists the final BACT requirements determined for each EU in this step. A project may achieve emission reductions through the application of available technologies, changes in process design, and/or operational limitations. The Department reviewed Aurora's BACT analysis and made BACT determinations for $PM_{2.5}$ and SO_2 for the Chena Power Plant. These BACT determinations are based on the information submitted by Aurora in their analysis, information from vendors, suppliers, sub-contractors, RBLC, and an exhaustive internet search.

3. BACT DETERMINATION FOR NOx

Through this BACT Determination Addendum, the Department removes the NOx BACT determinations and related requirements adopted on November 19, 2019, with amendments adopted on November 18, 2020,[2] for the Chena Power Plant in their entirety. This is due EPA's approval of the Department's precursor demonstration that NOx emitted from the stationary source does not significantly contribute to ground level concentrations of $PM_{2.5}$ formation. The Department prepared a comprehensive precursor demonstration (as allowed under 40 C.F.R. 51.1006(1) and 51.1010(a)(2)(ii)).

The $PM_{2.5}$ NAAQS Final SIP Requirements Rule states if the state determines through a precursor demonstration that additional emission controls for a precursor gas are not needed for attaining the standard, then the controls identified as BACT/BACM or Most Stringent Measure for the precursor gas are not required to be implemented.[5] The Department's NOx precursor demonstration was approved in *EPA's Air Plan Partial Approval and Partial Disapproval; AK, Fairbanks North Star Borough; 2006 24-hour $PM_{2.5}$ Serious Area and 189(d) Plan*[3] published in the Federal Register on December 5, 2023 (*88 Fed. Reg. 84654*).

For additional details, see the precursor demonstration for NOx in the Serious SIP Modeling Chapter III.D.7.8.[2]

4. BACT DETERMINATION FOR $PM_{2.5}$

The Department based its $PM_{2.5}$ assessment on BACT determinations found in the RBLC, internet research, and BACT analyses submitted to the Department by GVEA for the North Pole Power Plant and Zehnder Facility, Aurora for the Chena Power Plant, US Army for Fort Wainwright, and UAF for the Combined Heat and Power Plant.

[5] https://www.gpo.gov/fdsys/pkg/FR-2016-08-24/pdf/2016-18768.pdf

4.1 $PM_{2.5}$ BACT for the Industrial Coal-Fired Boilers

Possible $PM_{2.5}$ emission control technologies for coal-fired boilers were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process code 11.110, Coal Combustion in Industrial Size Boilers and Furnaces. The search results for the coal-fired boilers are summarized in Table 4-1.

Table 4-1. RBLC Summary of $PM_{2.5}$ Control for Industrial Coal-Fired Boilers

Control Technology	Number of Determinations	Emission Limits (lb/MMBtu)
Pulse Jet Fabric Filters	4	0.012 – 0.024
Electrostatic Precipitators	2	0.02 – 0.03

RBLC Review
A review of similar units in the RBLC indicates that fabric filters and electrostatic precipitators are the principle particulate matter control technologies installed on industrial coal-fired boilers. The lowest $PM_{2.5}$ emission rate listed in RBLC is 0.012 lb/MMBtu.

Step 1 - Identification of $PM_{2.5}$ Control Technologies for the Industrial Coal-Fired Boilers
From research, the Department identified the following technologies as available for control of $PM_{2.5}$ emissions from industrial coal-fired boilers:

(a) Fabric Filters
Fabric filters or baghouses are comprised of an array of filter bags contained in housing. Air passes through the filter media from the "dirty" to the "clean" side of the bag. These devices undergo periodic bag cleaning based on the build-up of filtered material on the bag as measured by pressure drop across the device. The cleaning cycle is set to allow operation within a range of design pressure drop. Fabric filters are characterized by the type of cleaning cycle: mechanical-shaker,[6] pulse-jet,[7] and reverse-air.[8] Fabric filter systems have control efficiencies of 95% to 99.9%, and are generally specified to meet a discharge concentration of filterable particulate (e.g., 0.01 grains per dry standard cubic feet). The Department considers fabric filters a technically feasible control technology for the industrial coal-fired boilers.

(b) Wet and Dry Electrostatic Precipitators (ESP)
ESPs remove particles from a gas stream by electrically charging particles with a discharge electrode in the gas path and then collecting the charged particles on grounded plates. The inlet air is quenched with water on a wet ESP to saturate the gas stream and ensure a wetted surface on the collection plate. This wetted surface along with a period deluge of water is what cleans the collection plate surface. Wet ESPs typically control streams with inlet grain loading values of 0.5 – 5 gr/ft^3 and

[6] https://www3.epa.gov/ttn/catc/dir1/ff-shaker.pdf
[7] https://www3.epa.gov/ttn/catc/dir1/ff-pulse.pdf
[8] https://www3.epa.gov/ttn/catc/dir1/ff-revar.pdf

have control efficiencies between 90% and 99.9%.[9] Wet ESPs have the advantage of controlling some amount of condensable particulate matter. The collection plates in a dry ESP are periodically cleaned by a rapper or hammer that sends a shock wave that knocks the collected particulate off the plate. Dry ESPs typically control streams with inlet grain loading values of 0.5 – 5 gr/ft^3 and have control efficiencies between 99% and 99.9%.[10] The Department considers ESP a technically feasible control technology for the industrial coal-fired boilers.

(c) Wet Scrubbers

Wet scrubbers use a scrubbing solution to remove PM/PM_{10}/$PM_{2.5}$ from exhaust gas streams. The mechanism for particulate collection is impaction and interception by water droplets. Wet scrubbers are configured as counter-flow, cross-flow, or concurrent flow, but typically employ counter-flow where the scrubbing fluid is in the opposite direction as the gas flow. Wet scrubbers have control efficiencies of 50% - 99%.[11] One advantage of wet scrubbers is that they can be effective on condensable particulate matter. A disadvantage of wet scrubbers is that they consume water and produce water and sludge. For fine particulate control, a venturi scrubber can be used, but typical loadings for such a scrubber are 0.1-50 grains/scf. The Department considers the use of wet scrubbers a technically feasible control technology for the industrial coal-fired boilers.

(d) Mechanical Collectors (Cyclones)

Cyclones are used in industrial applications to remove particulate matter from exhaust flows and other industrial stream flows. Dirty air enters a cyclone tangentially and the centrifugal force moves the particulate matter against the cone wall. The air flows in a helical pattern from the top down to the narrow bottom before exiting the cyclone straight up the center and out the top. Large and dense particles in the stream flow are forced by inertia into the walls of the cyclone where the material then falls to the bottom of the cyclone and into a collection unit. Cleaned air then exits the cyclone either for further treatment or release to the atmosphere. The narrowness of the cyclone wall and the speed of the air flow determine the size of particulate matter that is removed from the stream flow. Cyclones are most efficient at removing large particulate matter (PM_{10} or greater). Conventional cyclones are expected to achieve 0 to 40 percent $PM_{2.5}$ removal. High efficiency single cyclones are expected to achieve 20 to 70 percent $PM_{2.5}$ removal. The Department considers cyclones a technically feasible control technology for the industrial coal-fired boilers.

[9] https://www3.epa.gov/ttn/catc/dir1/fwespwpi.pdf
https://www3.epa.gov/ttn/catc/dir1/fwespwpl.pdf
[10] https://www3.epa.gov/ttn/catc/dir1/fdespwpi.pdf
https://www3.epa.gov/ttn/catc/dir1/fdespwpl.pdf
[11] https://www3.epa.gov/ttn/catc/dir1/fcondnse.pdf
https://www3.epa.gov/ttn/catc/dir1/fiberbed.pdf
https://www3.epa.gov/ttn/catc/dir1/fventuri.pdf

(e) Settling Chamber

Settling chambers appear only in the biomass fired boiler RBLC inventory for particulate control, not in the coal fired boiler RBLC inventory. This type of technology is a part of the group of air pollution control collectively referred to as "pre-cleaners" because the units are often used to reduce the inlet loading of particulate matter to downstream collection devices by removing the larger, abrasive particles. The collection efficiency of settling chambers is typically less than 10 percent for PM_{10}. The EPA fact sheet does not include a settling chamber collection efficiency for $PM_{2.5}$. The Department does not consider settling chambers a technically feasible control technology for the industrial coal-fired boilers.

(f) Good Combustion Practices (GCP)

Good combustion techniques for coal boilers take into account operator practices, maintenance knowledge, maintenance practices, adequate stoichiometric (fuel/air)ratio, combustion zone residence time, temperature, turbulence, fuel quality, combustion air distribution, fuel/waste dispersion. The Department considers GCPs a technically feasible control option for the coal-fired boilers.

Step 2 - Eliminate Technically Infeasible $PM_{2.5}$ Control Technologies for the Coal-Fired Boilers
As explained in Step 1 of Section 4.1, the Department does not consider a settling chamber as a technically feasible technology to control particulate matter emissions from the industrial coal-fired boilers.

Step 3 - Rank the Remaining $PM_{2.5}$ Control Technologies for the Industrial Coal-Fired Boilers
The following control technologies have been identified and ranked by efficiency for the control of $PM_{2.5}$ from the industrial coal-fired boilers:

(a)	**Fabric Filters**	**(99.9% Control)**
(b)	**Electrostatic Precipitator**	**(99.6% Control)**
(c)	**Wet Scrubber**	**(50% – 99% Control)**
(d)	**Cyclone**	**(20% – 70% Control)**
(f)	**Good Combustion Practices**	**(Less than 40% Control)**

Step 4 - Evaluate the Most Effective Controls proposed by Aurora Energy, LLC
Aurora has not proposed BACT limits for $PM_{2.5}$ for the Chena Power Plant.

Step 5 - Selection of $PM_{2.5}$ BACT for the Industrial Coal-Fired Boilers
The Department's finding is that BACT for $PM_{2.5}$ emissions from the coal-fired boilers is as follows:

(a) $PM_{2.5}$ emissions from EUs 4 through 7 shall be controlled by operating and maintaining fabric filters (full stream baghouse) at all times the units are in operation;

(b) $PM_{2.5}$ emissions from EUs 4 through 7 shall be controlled by maintaining good combustion practices at all times the units are in operation;

(c) $PM_{2.5}$ emissions from EUs 4 through 7 shall not exceed 0.045 lb/MMBtu[12] averaged over a 3-hour period;

(d) Initial compliance with the proposed $PM_{2.5}$ emission limit will be demonstrated by conducting a performance test for $PM_{2.5}$, including condensable PM; and

(e) Maintain compliance with State opacity standards listed under 50.055(a)(9).

Table 4-2 lists the proposed $PM_{2.5}$ BACT determination for this facility along with those for other industrial coal-fired boilers in the Serious $PM_{2.5}$ nonattainment area.

Table 4-2. Comparison of $PM_{2.5}$ BACT for Coal-Fired Boilers at Nearby Power Plants

Facility	Process Description	Capacity	Limitation	Control Method
Chena	4 Coal-Fired Boilers	497 MMBtu/hr	0.045 lb/MMBtu[12]	Full stream baghouse; Good Combustion Practices
Fort Wainwright	6 Coal-Fired Boilers	1380 MMBtu/hr	0.045 lb/MMBtu[12]	Full stream baghouse; Good Combustion Practices
UAF	Dual Fuel-Fired Boiler	295.6 MMBtu/hr	0.012 lb/MMBtu[13]	Fabric Filters; Good Combustion Practices

4.2 $PM_{2.5}$ BACT for Material Handling

Possible $PM_{2.5}$ emission control technologies for material handling were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process codes 99.100 - 190, Fugitive Dust Sources. The search results for material handling units are summarized in Table 4-3.

Table 4-3. RBLC Summary of $PM_{2.5}$ Control for Material Handling

Control Technology	Number of Determinations	Emission Limits (lb/MMBtu)
Fabric Filter / Baghouse	10	0.005

[12] **The 0.045 lb/MMBtu emission rate is calculated using EPA AP-42 Tables 1.1-5 (0.04 lb/MMBtu for spreader stoker boilers with a baghouse) and 1.1-6 (0.01A lb/ton for $PM_{2.5}$ sized particles for a boiler with a baghouse converted to lb/MMBtu using the typical gross as received heat value of 7,560 Btu/lb and an ash content (A) of 7 percent). Heat and ash content of the Usibelli coal is identified in the coal data sheet at: http://usibelli.com/coal/data-sheet.**

Source test data from the Chena Power Plant supports the chosen emission limit. From a 11/19/2011 source test on the common stack at the Chena Power Plant, the average source test result reported was 0.0272 lb/MMBtu, with emission results from each run ranging from 0.0211 to 0.0388 lb/MMBtu. The evaluation of an adequate emission factor requires consideration of statistical variability when limited empirical data exists. Using the results of the 3 source test runs conducted and applying a confidence level of 95% using a two-tailed t-distribution, this emission factor at the upper range would be 0.048 lb/MMBtu.

[13] **Boiler manufacturer Babcock & Wilcox's $PM_{2.5}$ emission guarantee, used to calculate potential to emit in Air Quality Permit AQ0316MSS06.**

Electrostatic Precipitator	**3**	**0.032**
Wet Suppressants / Watering	**3**	**29.9**
Enclosures / Minimizing Drop Height	**4**	**0.93**

RBLC Review

A review of similar units in the RBLC indicates good operational practices, enclosures, fabric filters, and minimizing drop heights are the principle $PM_{2.5}$ control technologies for material handling operations.

Step 1 - Identification of $PM_{2.5}$ Control Technologies for Material Handling

From research, the Department identified the following technologies as available for control of $PM_{2.5}$ emissions from material handling:

(a) Fabric Filters

The theory behind fabric filters was discussed in detail in the $PM_{2.5}$ BACT section for the industrial coal-fired boilers and will not be repeated here. The Department considers fabric filters a technically feasible control technology for material handling.

(b) Enclosure

Enclosure structures shelter material from wind entrainment and are used to control particulate emissions. Enclosures can either fully or partially enclose the source and control efficiency is dependent on the level of enclosure.

(c) Wet and Dry Electrostatic Precipitators

The theory behind ESPs was discussed in detail in the $PM_{2.5}$ BACT section for the industrial coal-fired boilers and will not be repeated here. The Department considers ESPs a technically feasible control technology for material handling.

(d) Wet Scrubbers

The theory behind wet scrubbers was discussed in detail in the $PM_{2.5}$ BACT section for the industrial coal-fired boilers and will not be repeated here. The Department considers wet scrubbers a technically feasible control technology for material handling.

(e) Mechanical Collectors (Cyclones)

The theory behind cyclones was discussed in detail in the $PM_{2.5}$ BACT section for the industrial coal-fired boilers and will not be repeated here. The Department considers cyclones a technically feasible control technology for material handling.

(f) Suppressants

The use of dust suppression to control particulate matter can be effective for stockpiles and transfer points exposed to the open air. Applying water or a chemical suppressant can bind the materials together into larger particles which reduces the ability to become entrained in the air either from wind or material handling activities. The Department considers the use of suppressants a technically feasible control technology for all of the material handling units.

(g) Wind Screens

A wind screen is similar to a solid fence which is used to lower wind velocities near stockpiles and material handling sites. As wind speeds increase, so do the fugitive emissions from the stockpiles, conveyors, and transfer points. The use of wind screens is appropriate for materials not already located in enclosures. The material handling units with the exception of the coal storage pile are operated in enclosures. Therefore, the Department does not consider wind screens a technically feasible control technology for the other material handling units.

(h) Vents/Closed System Vents/Negative Pressure Vents

Vents can control fugitive emissions by collecting fugitive emissions from enclosed loading, unloading, and transfer points and then venting emissions to the atmosphere or back into other equipment such as a storage silo. Other vent control designs include enclosing emission units and operating under a negative pressure. The Department considers vents to be a technically feasible control technology for the material handling units.

Step 2 - Eliminate Technically Infeasible $PM_{2.5}$ Controls for Material Handling
All of the identified control technologies are technically feasible for material handling.

Step 3 - Rank the Remaining $PM_{2.5}$ Control Technologies for the Material Handling
The following control technologies have been identified and ranked for control of particulates from the material handling equipment.

(a) Fabric Filters (50 - 99% Control)
(b) Enclosures (50 - 99% Control)
(d) Wet Scrubber (50% - 99% Control)
(c) Electrostatic Precipitator (>90% Control)
(e) Cyclone (20% -70% Control)
(f) Suppressants (less than 90% Control)
(h) Vents (less than 90% Control)

Step 4 - Evaluate the Most Effective Controls
Aurora has not proposed BACT limits for $PM_{2.5}$ for Material Handling.

Step 5 - Selection of $PM_{2.5}$ BACT for the Material Handling Equipment
The Department's finding is that BACT for $PM_{2.5}$ emissions from the material handling equipment is as follows:

(a) $PM_{2.5}$ emissions from EU 1 will be controlled by a partial enclosure;

(b) $PM_{2.5}$ emissions from EUs 3 and 8 will be controlled by a full enclosure;

(c) $PM_{2.5}$ emissions from the ash vacuum pump exhaust EU 3, will be controlled by installing, operating, and maintaining fabric filters;

(d) Compliance with the $PM_{2.5}$ emission rates for the material handling units shall be demonstrated by following the fugitive dust control plan and the manufacturer's operating and maintenance procedures at all times of operation; and

(e) Comply with the numerical emission limits listed in Table 4-4:

Table 4-4. $PM_{2.5}$ BACT Control Technologies for the Material Handling Units

EU ID	Process Description	Capacity	Limitation		Control Method
1	Coal Preparation Plant	75 tons/hr	0.34	tpy	Partial Enclosure & Fugitive Dust Control Plan
2	Coal Stockpile	0.59 acre	0.14	tpy	Fugitive Dust Control Plan
3	Ash Vacuum Pump Exhaust	24,187 tons ash/yr	0.23	tpy	Fabric Filter, Enclosure, & Fugitive Dust Control Plan
8	Truck Bay Ash Loadout	N/A	0.0004	tpy	Enclosure and Fugitive Dust Control Plan

5. BACT DETERMINATION FOR SO_2

The Department based its SO_2 assessment on BACT determinations found in the RBLC, internet research, and BACT analyses submitted to the Department by Aurora for the Chena Power Plant, US Army for Fort Wainwright, and UAF for the Combined Heat and Power Plant.

On December 5, 2023, EPA published a final rule approving in part and disapproving in part DEC's Serious PM2.5 SIP. ADEC withdrew the SO_2 BACT determinations for the stationary sources, including the Chena Power Plant, in a letter to EPA Region 10 dated September 25, 2023. In the preamble to the final rule, EPA references the withdrawal of the SO2 BACT determinations from the Serious PM2.5 SIP and states that because the Serious SIP does not identify, adopt, or implement BACT for SO_2, EPA has finalized partial disapproval of the SIP. Prior to the final disapproval, the EPA reviewed the BACT analysis from the major sources and has also independently performed their own cost effectiveness calculations and collected information from suppliers of DSI equipment and sorbent. These efforts have resulted in the conclusion that the current performance standard for a DSI system is 95% sulfur capture efficiency. Based on the information that they have collected; the EPA has requested that Aurora Energy revise their assessment to account for a DSI system with a 95% capture efficiency as opposed to the 80% efficient system previously provided. The EPA has also requested that Aurora Energy evaluate the technical feasibility of the other sulfur control technologies specifically with respect to the size of the equipment and the available space on plant property.

Aurora submitted a supplemental SO_2 BACT analysis for EUs 4 through 7 to provide ADEC with updated information to support the existing SO_2 BACT.

5.1 SO_2 BACT for the Industrial Coal-Fired Boilers

Possible SO_2 emission control technologies for coal-fired boilers were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process code 11.110, Coal Combustion in Industrial Size Boilers and Furnaces. The search results for the coal-fired boilers are summarized in Table 5-1.

Table 5-1. RBLC Summary of SO_2 Control for Industrial Coal-Fired Boilers

Control Technology	Number of Determinations	Emission Limits (lb/MMBtu)

Control Technology	Number of Determinations	Emission Limits (lb/MMBtu)
Flue Gas Desulfurization / Scrubber / Spray Dryer	10	0.06 – 0.12
Limestone Injection	10	0.055 – 0.114
Low Sulfur Coal	4	0.06 – 1.2

RBLC Review
A review of similar units in the RBLC indicates flue gas desulfurization (FGD) and low sulfur coal are the principle SO_2 control technologies installed on industrial coal-fired boilers. The lowest SO_2 emission rate in the RBLC is 0.055 lb/MMBtu.

Step 1- Identification of SO_2 Control Technology for the Coal-Fired Boilers
From research, the Department identified the following technologies as available for the control of SO_2 emissions from the industrial coal-fired boilers:

(a) Wet Scrubbers (AKA Wet Flue Gas Desulfurization, WFGD)
Post combustion flue gas desulfurization techniques can remove SO_2 formed during combustion by using an alkaline reagent to absorb SO_2 in the flue gas. Flue gasses can be treated using wet, dry, or semi-dry desulfurization processes. In the wet scrubbing system, flue gas is contacted with a solution or slurry of alkaline material in a vessel providing a relatively long residence time. The SO_2 in the flue reacts with the alkali solution or slurry by adsorption and/or absorption mechanisms to form liquid-phase salts. These salts are dried to about one percent free moisture by the heat in the flue gas. These solids are entrained in the flue gas and carried from the dryer to a PM collection device, such as a baghouse.

The lime and limestone wet scrubbing process uses a slurry of calcium oxide or limestone to absorb SO_2 in a wet scrubber. Control efficiencies in excess of 91 percent for lime and 94 percent for limestone over extended periods are possible. Sodium scrubbing processes generally employ a wet scrubbing solution of sodium hydroxide or sodium carbonate to absorb SO_2 from the flue gas. Sodium scrubbers are generally limited to smaller sources because of high reagent costs and can have SO_2 removal efficiencies of up to 96.2 percent. The double or dual alkali system uses a clear sodium alkali solution for SO_2 removal followed by a regeneration step using lime or limestone to recover the sodium alkali and produce a calcium sulfite and sulfate sludge. SO_2 removal efficiencies of 90 to 96 percent are possible. **Aurora's updated BACT submittal includes a finding from Stanley Consultants, Inc. (SCI) that the existing facility does not have enough space available on site to install and operate a WFGD control system.**

(b) Spray Dry Absorbers (SDA)
In SDA systems, an aqueous sorbent slurry with a higher sorbent ratio than that of a wet scrubber is injected into the hot flue gases. As the slurry mixes with the flue gas, the water is evaporated and the process forms a dry waste which is collected in a baghouse or electrostatic precipitator**. Aurora's updated BACT submittal includes a finding from SCI that the existing facility does not have enough space available on site to install and operate a SDA control system.**

(c) Dry Sorbent Injection (DSI)

DSI systems pneumatically inject a powdered sorbent directly into the furnace, the economizer, or the downstream ductwork depending on the temperature and the type of sorbent utilized. The dry waste is removed using a baghouse or electrostatic precipitator. Spray drying technology is less complex mechanically, and no more complex chemically, than wet scrubbing systems. The main advantages of the spray dryer is that this technology avoids two problems associated with wet scrubbing, corrosion and liquid waste treatment. Spray dry scrubbers are mostly used for small to medium capacity boilers and are preferable for retrofits**. Aurora's updated BACT submittal includes a finding from SCI that the existing facility does not have enough space available on site to install and operate a DSI control system. However, Aurora advanced this control technology past Step 2 of the BACT process, and their quote from SCI claimed that DSI will achieve the highest SO_2 removal rate of the various flue gas desulfurization (FGD) controls.**

The Department concurs with Aurora that DSI systems are less complex than the other SO_2 control technologies, including WFGD, CDS, and SDA. A DSI system typically requires less complex material handling and storage and transport equipment. The injection of the sorbent typically occurs in a section of duct work or in a simple reaction chamber. Based on Aurora's concern regarding space constraints and relative implementation costs, the Department agrees that DSI is the most technically and economically feasible SO_2 Control for the Chena Power Plant and has advanced this control for further consideration for the coal-fired boilers.

(d) Low Sulfur Coal

Aurora purchases coal from the Usibelli Coal Mine located in Healy, Alaska. This coal mine is located 115 miles south of Fairbanks. The coal mined at Usibelli is sub-bituminous coal and has a relatively low sulfur content with guarantees of less than 0.4 percent by weight. Usibelli Coal Data Sheets indicate a range of 0.08 to 0.28 percent Gross As Received (GAR) percent Sulfur (%S). According to the U.S. Geological Survey, coal with less than one percent sulfur is classified as low sulfur coal. The Department considers the use of low sulfur coal a technically feasible control technology for the industrial coal-fired boilers. **Because the Permittee already combusts low sulfur coal, this control option represents the baseline emissions rate, or a 0% emissions control.**

(e) Good Combustion Practices (GCPs)

GCPs during coal-firing means the boilers will be operated to obtain an optimum air/fuel mixture in the combustion zone as verified by periodic direct and indirect combustion chamber observations, maintaining overall excess oxygen levels high enough to complete combustion while maximizing boiler thermal efficiency, and by providing sufficient residence time to achieve complete combustion as provided by original equipment design.

Good combustion techniques for coal boilers take into account operator practices, maintenance knowledge, maintenance practices, stoichiometric (fuel/air)ratio),

combustion zone residence time, temperature, turbulence, fuel quality, combustion air distribution, fuel/waste dispersion. The Department considers GCPs a technically feasible control option for the coal-fired boilers.

(f) Circulating Dry Scrubber (CDS)
This demonstrated technology can achieve SO_2 removal rates comparable to WFGD. CDS technology utilizes a dry circulating fluid bed and an ESP or Fabric Filter for utility scale flue gas desulfurization. CDS technology lends well for small footprints and adequate SO_2 removal. CDS technology is designed for relatively small installations with limited space and perform well with medium-high sulfur coals. Aurora's updated BACT submittal includes a finding from SCI that the existing facility does not have enough space available on site to install and operate a CDS control system.

Step 2 - Eliminate Technically Infeasible SO_2 Control Technologies for Coal-Fired Boilers
As discussed in Step 1, After the Department's review of Aurora's January 25, 20024 submittal from SCI titled, "Best Available Control Technology Analysis – Independent Assessment of Technical Feasibility and Capital Cost, Addendum #1," the Department has eliminated WFGD, CDS, and SDA as technically infeasible due to physical space constraints at the Chena Power Plant.

Step 3 - Rank the Remaining SO_2 Control Technologies for Industrial Coal-Fired Boilers
The following control technologies have been identified and ranked by efficiency for the control of SO_2 emissions from the coal-fired industrial boilers:

(c)	Dry Sorbent Injection (Duct Sorbent Injection)	(90-95% Control)
(e)	Good Combustion Practices	(Less than 40% Control)
(d)	Low Sulfur Coal	(**0% Control, Baseline**)

Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

Step 4 - Evaluate the Most Effective Controls

Aurora BACT Proposal

On January 26, 2024 Aurora submitted a revised Supplemental BACT Analysis for the control of SO_2 emissions. Aurora provided an economic estimate from SCI for the costs of installing and operating a DSI control system that included estimates from BACT Process Systems, Inc. for the cost of the DSI system itself and from Andritz Inc. for the cost estimate of upgrading the existing baghouse system. A summary of the analysis is shown below:

Table 5-2. Aurora Economic Analysis for Technically Feasible SO_2 Controls

Control Alternative	Potential to Emit (tpy)	Emission Reduction (tpy)	Total Capital Investment ($)	Total Annualized Costs ($/year)	Cost Effectiveness ($/ton)
Dry Sorbent Injection	639.5	607.6	82,545,945	13,276,117	21,851

Control Alternative	Potential to Emit (tpy)	Emission Reduction (tpy)	Total Capital Investment ($)	Total Annualized Costs ($/year)	Cost Effectiveness ($/ton)
Capital Recovery Factor = 0.0931 of total capital investment (CRF = i(1+i) n / ((1+i) n -1) [CCM Section 1, Chapter 2, page 22] with an interest rate of 8.5% for a 30 year life cycle)					

While implementing DSI is technically feasible, Aurora contends that the economic analysis indicates the level of SO_2 reduction does not justify the use of DSI for the coal-fired boilers based on the perceived high implementation costs.

Aurora proposes the following as BACT for SO_2 emissions from the coal-fired boilers:

(a) Use of low sulfur coal at all times the boilers are in operation;

(b) Good combustion practices; and

(c) SO_2 emission limit from the coal-fired boilers not to exceed 0.301 lb/MMBtu (3-hr average).[14]

Department Evaluation of BACT for SO_2 Emissions from Industrial Coal-Fired Boilers
The Department revised Aurora's January 26, 2024's cost estimate provided for the installation of DSI by changing the Direct Installation Costs (DIC) and Total Indirect Costs (TIC) to reflect relative ratios that more closely align with Section 5 – SO_2 and Acid Gas Controls of the EPA Air Pollution Control Cost Manual (CCM).[15] The Department found that Aurora's January 26, 2024, cost estimate showed disproportionate ratios of TIC and Purchased Equipment and Material Cost (PEMC or PEC in the CCM), compared to the CCM's. In the CCM, direct and indirect costs represent approximately 75% and 45% of PEMC respectively, whereas in Aurora's latest cost estimate they represent approximately 380% each. Given that this portion of Aurora's estimates are not direct vendor quotes, but instead engineering estimates from a consultant, the Department re-calculated the TDC and TIC. The Department conservatively estimated the DIC at 150% of the PEC, which changed the value from approximately 36.3 million dollars to approximately 14.4 million dollars. Additionally, the Department changed the engineering services value from approximately 7.5 million dollars to approximately 1.9 million dollars, which is a conservative estimate of 20% of the PEMC. The Department notes that various other categories in the TIC were also lowered because they are calculated as a percentage of the DIC. Additionally, the Department notes that certain line items were left in the calculation to ensure a conservative estimate, such as profit, which is not part of the calculations included in the CCM, and the amount of sorbent needed per year. The Department left the sorbent amount unchanged which accounts for approximately 1.8 million dollars of the Department's calculated approximate 8.1-million-dollar value for Total Annual Costs. This is of note because of the relatively high ratio of unreacted $NaHCO_3$/used NaHCO3 expected

[14] Upon Aurora's request, on April 5, 2023, the SO_2 emission limit of 0.301 lb/MMBtu was incorporated into Condition 15 of the federally enforceable Title V Permit AQ0315TVP04, Revision 2, effective May 5, 2023.

[15] EPA Air Pollution Control Cost Manual and associated and associated cost spreadsheets are available at the following website: https://www.epa.gov/economic-and-cost-analysis-air-pollution-regulations/cost-reports-and-guidance-air-pollution.

in Aurora's calculations. Per Aurora's information regarding ash disposal, the amount of unreacted $NaHCO_3$ is about half of the $NaHCO_3$ used. In its ash generation due to DSI estimate, Aurora listed 1,590 tpy as unreacted $NaHCO_3$ vs 3,175 tpy of $NaHCO_3$ used.

The Department left other assumptions in Aurora's cost estimate for DSI unchanged, including the need for installing a larger baghouse to handle the additional loading of sorbent in the exhaust stream, estimation of annualized costs, using the combined unrestricted potential to emit for the four coal-fired boilers, a baseline emission rate of 0.301 lb SO_2/MMBtu,[14] an interest rate of 8.5%, and a 30 year equipment life to address EPA's comment regarding equipment lifetime.

A summary of the analysis is shown below:

Table 5-3. Department Economic Analysis for Technically Feasible SO_2 Controls

Control Alternative	Potential to Emit (tpy)	Emission Reduction (tpy)	Total Capital Investment ($)	Total Annual Costs ($/year)	Cost Effectiveness ($/ton)
Dry Sorbent Injection	639.5	607.6	$43,809,891	$8,122,262	$13,368
Capital Recovery Factor = 0.0931 of total capital investment (CRF = i(1+i) n / ((1+i) n -1) [CCM Section 1, Chapter 2, page 22] with an interest rate of 8.5% for a 30 year life cycle)					

The Department's economic analysis appears to indicate that the level of SO_2 reduction justifies the use of dry sorbent injection as BACT for the coal-fired boilers located in the Serious $PM_{2.5}$ nonattainment area. However, Aurora submitted a revised affordability analysis to the Department on March 15, 2024, (a redacted version of this submittal is included in the SIP Appendix to the Control Strategies Chapter), which claims that Aurora cannot afford to install DSI controls, referencing the financial indicators identified in Step 4 of the BACM/BACT process outlined in the Federal Register, Vol. 81, No.164, Wednesday August 24, 2016. pg. 58085.

Aurora's claim that DSI is cost prohibitive is based on the anticipated cost of installing and operating the new DSI control equipment divided by the anticipated sales of electricity and district heat, known as the cost/sales ratio. The EPA's November 2006 Small Business Regulatory Enforcement Fairness Act (SBREFA) Guidance Document[16] states the following about a cost/sales ratio of 3% or greater (the upper threshold), "The upper threshold defines a level of economic impact that would be unquestionably significant for a small entity." Aurora calculated a cost/sales ratio that was significantly higher than the 3% upper threshold found in the SBREFA Guidance Document. Therefore, based on the financial information provided by Aurora, the Department concurs that the implementation of DSI will yield an unacceptable adverse economic impact on the company, and therefore rejected as BACT.

[16] The EPA's SBREFA Guidance Document is available at: https://www.epa.gov/reg-flex/learn-about-regulatory-flexibility-act.

Step 5 - Selection of SO_2 BACT for the Industrial Coal-Fired Boilers
The Department's finding is that BACT for SO_2 emissions from the coal-fired boilers is as follows:

(a) SO_2 emissions from EUs 4 through 7 shall be controlled by operating and maintaining **Good Combustion Practices** at all times the units are in operation;

(b) SO_2 emissions from EUs 4 through 7 shall not exceed **0.301** lb/MMBtu[17] averaged over a 3-hour period; and

(c) Initial compliance with the SO_2 emission rate for the coal-fired boilers will be demonstrated by conducting a performance test to obtain an emission rate.

Table 4-4 lists the proposed SO_2 BACT determination for this facility along with those for other coal-fired boilers in the Serious $PM_{2.5}$ nonattainment area.

Table 5-4. Comparison of SO_2 BACT for Coal-Fired Boilers at Nearby Power Plants

Facility	Process Description	Capacity	Limitation	Control Method[18]
Fort Wainwright	6 Coal-Fired Boilers	1380 MMBtu/hr (combined)	**0.04 lb/MMBtu**[19]	Dry Sorbent Injection Limited Operation
UAF	Dual Fuel-Fired Boiler	295.6 MMBtu/hr	**0.10 lb/MMBtu**[20]	**Fluidized Bed Limestone Injection**
Chena	4 Coal-Fired Boilers	497 MMBtu/hr (combined)	**0.301 lb/MMBtu**[17]	**Good Combustion Practices**

[17] BACT limit is the average emissions rate from two recent SO_2 source test accepted by the Department, which occurred on November 19, 2011 and July 12, 2019.
[18] Note that the Department removed the reference to low sulfur coal, which was never selected as part of the top down BACT determination process and is already the only type of coal available to sources in Alaska.
[19] BACT limit is a vendor emissions guarantee.
[20] The Department selected the UAF BACT SO_2 emissions limit using a statistical analysis of historical CEMS emissions data.

6. BACT DETERMINATION SUMMARY

Table 6-1. Proposed NOx BACT Limits

EU ID	Description	Rating/Size	Proposed BACT Limit	Proposed BACT Control
4	Chena 1 Coal Fired Boiler	76 MMBtu/hr	**None** **EPA approved a comprehensive precursor demonstration for NOx** **See details in the Section 1 Introduction**	
5	Chena 2 Coal Fired Boiler	76 MMBtu/hr		
6	Chena 3 Coal Fired Boiler	76 MMBtu/hr		
7	Chena 5 Coal Fired Boiler	269 MMBtu/hr		

Table 6-2. Proposed $PM_{2.5}$ BACT Limits

EU ID	Description	Rating/Size	Proposed BACT Limit	Proposed BACT Control
4	Chena 1 Coal Fired Boiler	76 MMBtu/hr	0.045 lb/ MMBtu	Bag House Fabric Filter Good Combustion Practices
5	Chena 2 Coal Fired Boiler	76 MMBtu/hr		
6	Chena 3 Coal Fired Boiler	76 MMBtu/hr		
7	Chena 5 Coal Fired Boiler	269 MMBtu/hr		
1	Coal Preparation Plant	75 tons/hr	0.34 tpy	Partial Enclosure & Fugitive Dust Control Plan
2	Coal Stockpile	0.59 acre	0.14 tpy	Fugitive Dust Control Plan
3	Ash Vacuum Pump Exhaust	24,187 tons ash/yr	0.23 tpy	Fabric Filter, Enclosure, & Fugitive Dust Control Plan
8	Truck Bay Ash Loadout	N/A	0.0004 tpy	Enclosure and Fugitive Dust Control Plan

Table 6-3. Proposed SO_2 BACT Limits

EU ID	Description	Rating/Size	Proposed BACT Limit	Proposed BACT Control[18]
4	Chena 1 Coal Fired Boiler	76 MMBtu/hr	0.301 lb/MMBtu	Good Combustion Practices
5	Chena 2 Coal Fired Boiler	76 MMBtu/hr		

6	Chena 3 Coal Fired Boiler	76 MMBtu/hr		
7	Chena 5 Coal Fired Boiler	269 MMBtu/hr		

Chena Power Plant $PM_{2.5}$ BACT MR&R

Stationary Source: Chena Power Plant

Emission Units: EU IDs 4, 5, 6 (76 MMBtu/hr – Coal Boilers) and 7 (269 MMBtu/hr – Coal Boiler)

Pollutant of Concern: $PM_{2.5}$	
BACT Measure	Monitoring, Recordkeeping and Reporting Requirements [1]
0.045 lb/MMBtu (3-hr avg);	• Conduct a one-time performance test using EPA Method 201A and 202 at the maximum achievable load to demonstrate compliance and submit results to the Department. • Report source test results as required by Operating Permit.
Maintain compliance with State opacity standards listed under 50.055(a)(9)	• Monitor, record, and report visible emissions using Continuous Opacity Monitoring System (COMS) installed and maintained as directed in the current Operating Permit.
Good Combustion Practices	• Keep records of maintenance conducted on emission units to comply with this BACT measure. • Keep a copy of the manufacturer's and the operator's recommended maintenance procedures.
Use of full stream baghouse at all times the boilers are in operation	• Certify in Facility Operating Report that full stream baghouse is operated at all times the boilers are in operation. • Operate, inspect, and maintain the baghouses according to the manufacturer's instructions and recommendations. • Include a summary of inspection and maintenance conducted in each semi-annual operating report.

Emission Units: EU IDs 1, 2, 3, and 8 (Material Handling Units)

Pollutant of Concern: $PM_{2.5}$	
BACT Measure	Monitoring, Recordkeeping and Reporting Requirements [1]
0.34 tpy (EU ID 1); 0.14 tpy (EU ID 2); 0.23 tpy (EU ID 3); and 0.0004 tpy (EU ID 8)	• Follow stationary source's fugitive dust control plan and the manufacturer's operating and maintenance procedures at all times of operation.
Partial Enclosure (EU ID 1)	• Follow stationary source's fugitive dust control plan and the manufacturer's operating and maintenance procedures at all times of operation
Full Enclosure (EU IDs 3 & 8)	• Submit an initial compliance certification indicating that each material handling unit is enclosed.

[1] While the substantive requirements are described here, for any permit containing the requirement, the actual language may differ in non-substantive ways and include additional details.

	• Keep records identifying each time period that each of the EUs are operated outside an enclosure. • Monitor that overhead door(s) at ash loading building are closed while loading the trucks. Monitor that ash truck bodies are free of ash before they leave the building, and that their loads are tarped before they leave the building area. Monitor the implementation of a comprehensive fugitive dust control program that includes provisions to minimize fugitive dust from coal ash handling operations. • Report whenever any of the EUs are operated outside of an enclosure.
Fabric Filter (EU ID 3)	• Certify in each Facility Operating Report that fabric filters are operated at all times the ash vacuum pump is in operation. • Operate, inspect, and maintain the fabric filters according to the manufacturer's instructions and recommendations. • Include a summary of inspections and maintenance conducted in each semi-annual operating report.

Chena Power Plant SO_2 BACT MR&R

Stationary Source: Chena Power Plant

Emission Units: EU IDs 4, 5, 6 (76 MMBtu/hr – Coal Boilers) and 7 (269 MMBtu/hr – Coal Boiler)

Pollutant of Concern: SO_2	
BACT Measure	**Monitoring, Recordkeeping and Reporting Requirements**
0.301 lb/MMBtu (3-hr avg)	• Conduct an initial SO_2 source test at maximum load and report results as required in the corresponding Operating Permit.
Good Combustion Practices	• Keep records of maintenance conducted on emission units to comply with this BACT measure. • Keep a copy of the manufacturer's and the operator's recommended maintenance procedures.

Available SO_2 Emission Control Technologies
Wet Flue Gas Desulfurization (WFGD)
Circulating Dry Scrubber (CDS)
Spray Dry Absorber (SDA)
Dry Sorbent Injection (DSI)
Base Case: SO_2 Emission Limit, Low Sulfur Coal, and Good Combustion Practices

Technically Feasible SO_2 Emission Control Technologies
Wet Flue Gas Desulfurization (WFGD)
Circulating Dry Scrubber (CDS)
Spray Dry Absorber (SDA)
Dry Sorbent Injection (DSI)
Base Case: SO_2 Emission Limit, Low Sulfur Coal, and Good Combustion Practices

Ranking of Technically Feasible SO_2 Emission Control Technologies

Control Technology	Control Efficiency Compared to Base Case (pct.)	SO_2 Emission Rate (lb/MMBtu)	SO_2 Emission Rate (lb/hr)	Potential SO_2 Emissions (tpy)	Potential SO_2 Emissions Reduction (tpy)
Dry Sorbent Injection (DSI) [1]	95	0.015	7.3	32.0	607.6
Wet Flue Gas Desulfurization (WFGD) [2]	93.4	0.02	9.7	42.5	597.1
Circulating Dry Scrubber (CDS)	86.7	0.04	19.4	85.0	554.6
Spray Dry Absorber (SDA)	76.7	0.07	34.0	148.7	490.8
Base Case: SO_2 Emission Limit, Low Sulfur Coal, and Good Combustion Practices	0	0.301	146.0	639.5	0.0

Note:

[1] The SO_2 control efficiency, in terms of percentage, for DSI is the vendor-provided emission reduction capability.

[2] The SO_2 emission rates, in terms of lb/MMBtu, for WFGD, CDS, and SDA are the average values for the top 20 percent performing coal-fired power plants per Table 1.3 of Section 5, Chapter 1 of the EPA Air Pollution Control Cost Manual (2021).

SO_2 Cost-Effectiveness Summary

Control Technology	Total Capital Investment ($)[1]	Total Annual Cost ($/year)[2]	Emissions Reduction (tpy)[3]	Cost-Effectiveness ($/ton SO_2 Emissions Avoided)
Dry Sorbent Injection (DSI)	$43,809,891	$8,122,262	607.6	$13,368
Base Case: SO_2 Emission Limit, Low Sulfur Coal, and Good Combustion Practices	~	~	0.00	~

Notes:

[1]Total Capital Investment is calculated in Table B of Appendix B.

[2]Total Annual Cost is calculated in Table B of Appendix B.

[3]Emissions reductions are calculated in Table 3 of this report.

Table A. Potential to Emit Calculations for EUs 4 through 7 Supplemental BACT Analysis - SO_2 Emissions
Aurora Energy, LLC - Chena Power Plant

Emissions Unit		Fuel Type	SO_2 Emission Factor		Maximum Rating/Capacity	Allowable Annual Operation	Short Term SO_2 Emissions	Potential SO_2 Emissions
ID	*Description*		*Reference*	*Factor*				
4	Chena 1 Coal-Fired Boiler	Coal	Condition 15, Permit No. AQ0315TVP04, Revision 2	0.301 lb/MMBtu	76.8 MMBtu/hr	8,760 hr/yr	23.12 lb/hr	101.3 tpy
5	Chena 2 Coal-Fired Boiler				76.8 MMBtu/hr	8,760 hr/yr	23.12 lb/hr	101.3 tpy
6	Chena 3 Coal-Fired Boiler				76.8 MMBtu/hr	8,760 hr/yr	23.12 lb/hr	101.3 tpy
7	Chena 5 Coal-Fired Boiler				254.7 MMBtu/hr	8,760 hr/yr	76.66 lb/hr	335.8 tpy
							Total SO_2 Potential Emissions	**639.5 tpy**

Notes:

[1] Conversion factors:

Mass Conversion 2,000 lb/ton

[2] The combined SO_2 emissions from the common stack for EU IDs 4 through 7 are limited to 0.301 lb/MMBtu per Condition 15 of Permit No. AQ0315TVP04, Revision 2.

Table B. Dry Sorbent Injection (DSI) - Economic Analysis
Aurora Energy Chena Power Plant SO_2 BACT Analysis

CAPITAL COSTS

DIRECT COSTS		Quantity	Unit	Unit Cost	Total	Notes
1. Purchased Equipment and Material Costs (PEMC)						
	a. Basic equipment - DSI System	1	ea	$5,990,000	$5,990,000	BACT Process Systems, Inc. 7/28/2023 proposal
	b. Freight - DSI System	1	ea	$250,000	$250,000	BACT Process Systems, Inc. 7/28/2023 proposal
	c. Equipment - Baghouse system	1	ea	$2,900,000	$2,900,000	Stanley Consultants Jan 2024 cost estimate
	d. Freight - Baghouse system	1	ea	$348,000	$348,000	Stanley Consultants Jan 2024 cost estimate
	e. Continuous Emission Monitoring System	1	ea	$125,257	$125,257	Emerson 10/22/2019 cost estimate (equipment and shipping)
Purchased Equipment and Material Cost (PEMC)				***PEMC=***	***$9,613,257***	
2. Direct Installation Costs (DIC)						
	a. Field installation - DSI	1	ea	$488,847	N/A	
	b. Field installation - Baghouse	1	LOT	$322,667	N/A	
	c. Structural	1	LOT	$31,601,763	N/A	
	d. Mechanical	1	LOT	$610,884	N/A	
	e. Electrical	1	LOT	$1,355,710	N/A	
	f. Instrumentation and Controls	1	ea	$103,408	N/A	
	g. Heavy Equipment	1	LOT	$834,300	N/A	
	h. Demolition	1	LOT	$1,000,000	N/A	
Direct Installation Costs (DIC)				***DIC =***	***$14,419,886***	***Conservatively estimated at 150% of PEMC***
Total Direct Costs (TDC)				**TDC=PEMC+DIC=**	**$24,033,143**	

INDIRECT COSTS						
3. Engineering, Construction Support						
	a. Engineering Services	1	ea	$7,483,700	$1,922,651	***Conservatively estimated at 20% of PEMC***
	b. Mobilization/Demobilization	5	pct. TDC		$1,201,657	Value changed as it is based on a percentage of the DIC, which has been lowered.
	c. Prime Contractor Indirect Labor	10	pct.		$4,544,214	Stanley Consultants Jan 2024 cost estimate plus 10 pct. of CEMS PEMC.
	d. Contractor Overhead and Labor Burdens	15	pct. TDC		$3,604,971	Value changed as it is based on a percentage of the DIC, which has been lowered.
	e. Equipment and Small Tools	5	pct.		$1,159,942	Value changed as it is based on a percentage of the DIC, which has been lowered.
4. Contingency		10	pct.		$3,454,393	Default value of 10 percent of direct and indirect costs [CCM Section 5, Chapter 1, page 1-79]
5. Profit		10	pct.		$3,454,393	Value changed as it is based on a percentage of the DIC, which has been lowered.
6. Bond		1	pct.		$414,527	Value changed as it is based on a percentage of the DIC, which has been lowered.
7. Performance testing		1	ea	$20,000	$20,000	Initial emissions performance test and CEMS RATA. Estimate based on recent source test costs at Aurora Energy.
Total Indirect Costs (TIC)				**TIC=**	**$19,776,748**	
TOTAL CAPITAL INVESTMENT (TCI)				**TCI = TDC+TIC=**	**$43,809,891**	

ANNUAL COSTS

DIRECT COSTS		Quantity	Unit	Unit Cost	Total	Notes
1. Operating Labor		365	hours	$66.40	$24,236	Assumes 0.5 hours per shift, 12 hour shifts [CCM Section 5, Chapter 1]. Burdened operator labor rate is $66.40/hr per Table C, Aurora Energy, 2023.
2. Supervisory Labor		15	pct.		$3,635	Assumes 15% of operator labor [CCM Section 5, Chapter 1]
3. Maintenance Labor		365	hours	$66.40	$24,236	Assumes 0.5 hours per shift, 12 hour shifts [CCM Section 5, Chapter 1]. Burdened operator labor rate is $66.40/hr per Table C, Aurora Energy, 2023.
4. Maintenance Materials		100	pct.		$24,236	Assumes 100% of maintenance labor [CCM Section 5, Chapter 1]
5. Reagent		3,175.5	ton	$563	$1,787,807	Sodium bicarbonate. Feed rate of 0.3625 tons per hour; unit cost includes rail delivery per BACT Process Systems, Inc. 7/28/2023 proposal.
6. Utilities	a. Electricity	2,735,960	kWh	$0.093	$254,444	Steady state operating station service requirement for DSI equipment per demand in Table F at 8,760 hr/yr. Aurora Energy calculation of station service cost at $0.093/kWh for 2023.
	b. Waste Disposal (ash)	2,930	ton	$44	$128,931	Incremental increase in ash disposal cost due to DSI. Ash tonnage calculated in Table D. Unit cost is market rate in ash hauling contract.
Total Direct Annual Costs (TDAC)				***TDAC=***	***$2,247,525***	

INDIRECT COSTS						
7. Overhead		60	pct.		$45,806	60 percent of total labor and material costs [CCM Section 1, Chapter 2, page 35]
8 Administrative Charges		2	pct. TCI		$876,198	2 percent of TCI [CCM Section 1, Chapter 2, page 35]
9. Property Tax		1	pct. TCI		$438,099	1 percent of TCI [CCM Section 1, Chapter 2, page 35]
10. Insurance		1	pct. TCI		$438,099	1 percent of TCI [CCM Section 1, Chapter 2, page 35]
11. Capital Recovery					$4,076,536	CRF x TCI
	Capital Recovery Factor (CRF)	*0.0931*				*CRF = $i(1+i)^n$ / $((1+i)^n - 1)$ [CCM Section 1, Chapter 2, page 22]*
	i = interest rate	*8.50*	*pct.*			*Bank prime interest rate 7/27/2023 through 1/22/2024, https://www.federalreserve.gov/releases/h15/*
	n = life of control equipment	*30*	*years*			
Total Indirect Annual Costs (TIAC)				**TIAC=**	**$5,874,737**	
TOTAL ANNUALIZED COST (TAC)				**TAC = TDAC+TIAC=**	**$8,122,262**	

Table C. Full-time Burden Operator Labor Rate
Aurora Energy, LLC

		Per Hour*	CBA Section*
Operator Wage Rate Y1	$	43.07	17.1
Shift Diff.	$	1.29	17.2
401K (0.50/hr)	$	0.50	15.3
H&W (Annual cost/hrs)	$	9.82	15.1
Pension	$	10.00	15.2
Reg Rate	$	63.39	
OT Rate	$	84.93	
Grave Rate	$	64.69	
Grave OT Rate	$	86.87	
Reg Hours		838.50	5.2
OT Hours		113.75	5.2
Grave Reg Hours		1,118.00	5.2
Grave OT Hours		113.75	5.2
Reg Rate x Reg Hours	$	53,156.02	
OT Rate x OT Hours	$	9,660.69	
Grave Rate x Grave Reg Hours	$	72,319.26	
Grave OT Rate x Grave OT Hours	$	9,881.16	
Total Labor Cost for FT Burden Operator working day/graves	$	145,017.12	
x 2 for Adding two Operators		2.00	
Total Labor Cost for two FT Burden Operators	$	290,034.25	
Annual Working Hours		2,184.00	
Average Hourly Rate	$	66.40	

*Aurora Energy, LLC CBA 2023 - 2025

Table D. Projected Annual Ash Disposal Requirement for DSI
Aurora Energy Chena Power Plant SO_2 BACT Analysis

	Value	Unit
Ash Generation Based on Potential to Emit, No SO_2 Control		
Max Annual Heat Input	4,222,320,000,000	Btu/lb
Coal Heat Content	7,536.5	Btu/lb[1]
Coal Use per Year	560,251,775.7	lb/yr
Coal Use per Year	280,125.9	tpy
Coal Ash Content	0.07	Fraction[2]
Total	***18,301***	***tpy***

	Value	Unit
Ash Generation due to Dry Sorbent Injection		
Maximum SO_2 Emission Rate	0.301	lb/MMBtu
SO_2 Potential Emissions	1,270,918.32	lb/yr
SO_2 Potential Emissions	635.5	tpy
SO_2 Emission Reduction	603.7	tpy
$NaHCO_3$ Use	3,175.50	tpy
$2(NaHCO_3)/NaSO_4$	1.18	wt. ratio
Na_2SO_4/SO_2	2.22	wt. ratio
Na_2SO_4	1,339.43	tpy (in ash)
$NaHCO_3$	1,590.82	tpy (unreacted)
Total	***2,930***	***tpy***

Total Ash Disposal Requirement	**21,232**	**tpy**

Notes:

[1] Coal heat content based on 2022 deliveries, shown in Table E.

[2] Coal ash content based on 2022 deliveries, shown in Table E.

Table E. 2022 Rail Sample Analyses of Delivered Coal
Aurora Energy Chena Power Plant SO_2 BACT Analysis

	Sample Date	Cars	AR BTU	AR Moisture	AR Ash	AR Volatiles	AR Carbon	AR Sulfur	Location	Bench	Seam	Tons
AURORA ENERGY LLC	1/1/2022	13	7628	32.82	4.76	35.30	27.12	0.12	JD		4	1132.1
AURORA ENERGY LLC	1/3/2022	10	7598	32.33	5.60	34.64	27.43	0.13	JD		4	903.3
AURORA ENERGY LLC	1/4/2022	9	7545	32.52	5.62	34.79	27.08	0.14	JD		4	777.1
AURORA ENERGY LLC	1/5/2022	6	7814	30.17	5.42	35.48	28.93	0.12	JD		4	497.7
AURORA ENERGY LLC	1/6/2022	10	7542	32.71	5.29	34.59	27.41	0.13	JD		4	842.6
AURORA ENERGY LLC	1/7/2022	7	7672	31.53	5.43	35.60	27.44	0.15	JD		4	604.35
AURORA ENERGY LLC	1/10/2022	3	7590	32.30	5.34	34.74	27.63	0.13	JD		4	253.7
AURORA ENERGY LLC	1/11/2022	6	7590	32.18	5.37	34.72	27.73	0.14	JD		4	560.2
AURORA ENERGY LLC	1/13/2022	3	7611	32.06	5.36	35.02	27.57	0.12	JD		4	270.05
AURORA ENERGY LLC	1/14/2022	4	7612	32.59	4.66	34.50	28.26	0.10	JD		4	346.1
AURORA ENERGY LLC	1/17/2022	11	7610	32.86	4.47	34.51	28.16	0.09	JD		4	966.05
AURORA ENERGY LLC	1/18/2022	8	7617	32.96	4.14	34.85	28.06	0.08	JD		4	710.45
AURORA ENERGY LLC	1/19/2022	8	7817	31.76	3.63	35.63	28.99	0.08	JD		4	670.4
AURORA ENERGY LLC	1/20/2022	9	7815	31.82	4.10	35.91	28.18	0.09	JD		4	788.45
AURORA ENERGY LLC	1/21/2022	5	7617	32.73	4.43	34.54	28.31	0.09	JD		4	455.4
AURORA ENERGY LLC	1/24/2022	9	7697	31.34	5.51	35.23	27.93	0.13	JD		4	776.8
AURORA ENERGY LLC	1/25/2022	10	7749	31.18	5.08	35.54	28.21	0.12	JD		4	879.75
AURORA ENERGY LLC	1/26/2022	10	7693	31.76	5.02	34.62	28.61	0.13	JD		4	882.65
AURORA ENERGY LLC	1/27/2022	9	7594	32.10	5.77	34.69	27.45	0.14	JD		4	812.25
AURORA ENERGY LLC	1/28/2022	5	7555	32.33	5.95	34.64	27.09	0.14	JD		4	464.15
AURORA ENERGY LLC	1/31/2022	12	7641	32.68	4.46	35.13	27.73	0.11	JD		4	1047
AURORA ENERGY LLC	2/1/2022	8	7648	32.99	4.07	34.58	28.36	0.09	JD		4	674.7
AURORA ENERGY LLC	2/2/2022	7	7694	33.31	3.41	35.01	28.28	0.08	JD		4	605.35
AURORA ENERGY LLC	2/3/2022	10	7644	32.59	4.14	35.35	27.92	0.09	JD		4	882.15
AURORA ENERGY LLC	2/7/2022	12	7764	31.38	4.37	34.92	29.33	0.10	BDL/JD	Q3	3/4	1040.5
AURORA ENERGY LLC	2/8/2022	9	7785	30.61	4.82	35.49	29.09	0.09	BDL/JD	Q3	3/4	783.6
AURORA ENERGY LLC	2/9/2022	9	7647	32.23	4.40	34.64	28.73	0.09	BDL/JD	Q3	3/4	776.5
AURORA ENERGY LLC	2/10/2022	8	7645	31.13	5.42	34.39	29.06	0.11	BDL/JD	Q3	3/4	740.6
AURORA ENERGY LLC	2/11/2022	9	7624	31.36	5.56	34.73	28.36	0.10	JD/BDL	Q3	3/4	837.55
AURORA ENERGY LLC	2/14/2022	8	7671	30.99	5.47	34.91	28.64	0.09	BDL/JD	Q3	3/4	709.1
AURORA ENERGY LLC	2/15/2022	9	7723	30.12	5.93	34.93	29.02	0.09	BDL/JD	Q3	3/4	824.6
AURORA ENERGY LLC	2/16/2022	8	7702	30.64	5.53	34.59	29.24	0.10	BDL/JD	Q3	3/4	699.25
AURORA ENERGY LLC	2/17/2022	8	7751	30.73	5.22	35.39	28.66	0.10	BDL/JD	Q3	3/4	707.6
AURORA ENERGY LLC	2/18/2022	6	7588	33.19	4.14	34.74	27.94	0.09	JD		4	517.75
AURORA ENERGY LLC	2/22/2022	10	7613	31.52	5.42	34.58	28.48	0.11	JD		4	882.3
AURORA ENERGY LLC	2/23/2022	10	7519	33.57	4.30	34.33	27.80	0.09	JD		4	851.3
AURORA ENERGY LLC	2/24/2022	9	7559	31.66	5.84	34.10	28.40	0.11	BDL/JD	Q3	3/4	798.65
AURORA ENERGY LLC	2/25/2022	9	7551	32.32	5.12	34.25	28.32	0.10	BDL/JD	Q3	3/4	787.1
AURORA ENERGY LLC	2/28/2022	9	7697	31.27	5.38	34.68	28.67	0.09	BDL/JD	Q3	3/4	769.55
AURORA ENERGY LLC	3/1/2022	12	7472	31.97	6.54	33.63	27.87	0.10	BDL/JD	Q3	3/4	1065.2
AURORA ENERGY LLC	3/2/2022	7	7505	31.68	6.95	33.68	27.70	0.11	BDL/JD	Q3	3/4	649.25
AURORA ENERGY LLC	3/3/2022	7	7479	31.34	7.31	33.64	27.72	0.12	BDL/JD	Q3	3/4	653.3
AURORA ENERGY LLC	3/4/2022	7	7525	31.10	6.70	34.24	27.97	0.12	BDL/JD	Q3	3/4	625.6
AURORA ENERGY LLC	3/7/2022	11	7569	31.12	6.77	34.07	28.03	0.12	BDL/JD	Q3	3/4	993.2
AURORA ENERGY LLC	3/8/2022	10	7586	30.46	6.88	34.67	28.00	0.11	BDL/JD	Q3	3/4	920.1
AURORA ENERGY LLC	3/9/2022	16	7406	31.55	7.47	33.68	27.30	0.11	JD/BDL	Q3	3/3	1493.55
AURORA ENERGY LLC	3/11/2022	8	7505	31.68	6.59	33.87	27.87	0.10	JD/BDL	Q3	3/3	748.8
AURORA ENERGY LLC	3/21/2022	8	7446	32.11	6.73	34.05	27.11	0.11	JD/BDL	Q3	3/3	689.6
AURORA ENERGY LLC	3/22/2022	9	7397	31.72	7.80	33.59	26.90	0.12	JD/BDL	Q3	3/3	774.75
AURORA ENERGY LLC	3/23/2022	20	7196	32.16	8.54	32.64	26.67	0.12	JD/BDL	Q3	3/3	1794.5
AURORA ENERGY LLC	3/28/2022	6	7411	31.13	7.96	33.84	27.08	0.13	JD/BDL	Q3	3/3	565
AURORA ENERGY LLC	3/29/2022	6	7551	30.51	7.23	34.42	27.84	0.12	JD/BDL	Q3	3/3	547.95
AURORA ENERGY LLC	3/30/2022	7	7403	31.59	7.36	34.02	27.04	0.12	JD/BDL	Q3	3/3	644.4
AURORA ENERGY LLC	3/31/2022	6	7525	31.40	6.66	34.44	27.49	0.10	JD/BDL	Q3	3/3	561.65
AURORA ENERGY LLC	4/5/2022	7	7558	30.50	7.10	34.51	27.89	0.10	JD/BDL	Q3	3/3	654.65
AURORA ENERGY LLC	4/6/2022	4	7566	30.39	6.83	34.79	27.99	0.09	JD/BDL	Q3	3/3	331.2
AURORA ENERGY LLC	4/7/2022	5	7583	31.00	6.41	35.26	27.34	0.09	JD/BDL	Q3	3/3	390.6
AURORA ENERGY LLC	4/8/2022	5	7635	30.87	6.09	35.04	28.01	0.09	JD/BDL	Q3	3/3	446.25
AURORA ENERGY LLC	4/12/2022	15	7647	31.00	5.98	34.68	28.35	0.10	JD/BDL	Q3	3/3	1371.05
AURORA ENERGY LLC	4/13/2022	15	7621	30.15	7.20	34.57	28.09	0.11	JD/BDL	Q3	3/3	1402.05
AURORA ENERGY LLC	4/14/2022	15	7657	30.54	6.68	34.63	28.16	0.11	JD/BDL	Q3	3/3	1410.35
AURORA ENERGY LLC	4/15/2022	15	7548	30.56	7.12	34.73	27.60	0.13	JD/BDL	Q3	3/3	1435.95
AURORA ENERGY LLC	4/19/2022	13	7572	30.38	7.20	34.52	27.90	0.10	JD/BDL	Q3	3/3	1208.8
AURORA ENERGY LLC	4/20/2022	12	7713	30.15	6.06	35.39	28.40	0.09	JD/BDL	Q3	3/3	1092.9
AURORA ENERGY LLC	4/21/2022	13	7656	31.04	6.01	34.87	28.09	0.09	JD/BDL	Q3	3/3	1228.6
AURORA ENERGY LLC	4/22/2022	12	7605	31.45	5.77	35.18	27.61	0.09	JD/BDL	Q3	3/3	1131.95

Table E. 2022 Rail Sample Analyses of Delivered Coal
Aurora Energy Chena Power Plant SO_2 BACT Analysis

	Sample Date	Cars	AR BTU	AR Moisture	AR Ash	AR Volatiles	AR Carbon	AR Sulfur	Location	Bench	Seam	Tons
AURORA ENERGY LLC	4/26/2022	12	7541	30.86	7.35	34.13	27.67	0.10	JD/BDL	Q3	3/3	1140.5
AURORA ENERGY LLC	4/27/2022	12	7493	30.66	7.77	33.93	27.65	0.12	JD/BDL	Q3	3/3	1132.4
AURORA ENERGY LLC	4/28/2022	10	7468	31.44	7.12	33.96	27.49	0.10	JD/BDL	Q3	3/3	943.8
AURORA ENERGY LLC	4/29/2022	4	7495	32.17	6.17	33.95	27.72	0.11	BDL/JD	Q3	3/4	357.5
AURORA ENERGY LLC	4/29/2022	5	7233	33.64	6.33	33.33	26.70	0.10	BDL/JD	Q3	3/4	454.7
AURORA ENERGY LLC	4/29/2022	4	7439	31.92	6.54	33.94	27.60	0.12	BDL/JD	Q3	3/4	364.55
AURORA ENERGY LLC	4/29/2022	6	7636	30.24	6.94	34.64	28.19	0.10	JD/BDL	Q3	3/3	562.95
AURORA ENERGY LLC	5/3/2022	9	7627	29.95	6.90	34.99	28.16	0.10	JD/BDL	Q3	3/3	846.05
AURORA ENERGY LLC	5/4/2022	9	7592	30.48	6.82	34.43	28.27	0.10	JD/BDL	Q3	3/3	860.15
AURORA ENERGY LLC	5/5/2022	9	7486	31.83	6.54	34.19	27.44	0.10	JD/BDL	Q3	3/3	858.9
AURORA ENERGY LLC	5/6/2022	9	7548	30.79	7.12	34.64	27.45	0.10	JD/BDL	Q3	3/3	878.4
AURORA ENERGY LLC	5/10/2022	25	7211	31.34	9.59	32.92	26.16	0.13	JD/BDL	Q3	3/3	2321.85
AURORA ENERGY LLC	5/12/2022	8	7146	31.33	9.61	33.12	25.94	0.11	JD/BDL	Q3	3/3	740.4
AURORA ENERGY LLC	5/16/2022	4	6819	33.93	9.51	31.36	25.21	0.13	JD/BDL	Q3	3/3	401.75
AURORA ENERGY LLC	5/19/2022	6	7324	32.12	7.41	33.55	26.93	0.09	JD/JD		3/4	550.9
AURORA ENERGY LLC	5/23/2022	18	7537	31.30	6.16	34.85	27.69	0.09	JD/JD		3/4	1607
AURORA ENERGY LLC	5/25/2022	17	7543	31.08	6.69	34.54	27.70	0.08	JD/JD		3/4	1537.05
AURORA ENERGY LLC	5/26/2022	13	7483	31.17	7.05	35.04	26.75	0.09	JD/JD		3/4	1208.8
AURORA ENERGY LLC	5/31/2022	17	7454	31.52	6.66	34.73	27.09	0.09	JD/JD		4/3	1602.4
AURORA ENERGY LLC	6/1/2022	17	7594	32.01	5.24	34.99	27.75	0.08	JD/JD		3/4	1579.7
AURORA ENERGY LLC	6/2/2022	14	7613	31.51	5.43	35.22	27.85	0.07	JD/JD		3/4	1245.35
AURORA ENERGY LLC	6/3/2022	9	7695	31.14	5.25	35.57	28.05	0.07	JD/JD		3/4	821.8
AURORA ENERGY LLC	6/6/2022	11	7652	31.47	5.45	35.24	27.84	0.08	JD/JD		3/4	1019.8
AURORA ENERGY LLC	6/7/2022	12	7552	31.34	6.18	34.88	27.61	0.08	JD/JD		3/4	1129.25
AURORA ENERGY LLC	6/9/2022	11	7000	32.01	10.81	32.42	24.76	0.13	JD/JD		3/4	1045.6
AURORA ENERGY LLC	6/10/2022	12	7416	31.67	6.93	34.36	27.05	0.10	JD/JD		3/4	1120.9
AURORA ENERGY LLC	6/20/2022	4	7628	31.21	6.07	35.68	27.03	0.10	JD/JD		3/4	374.6
AURORA ENERGY LLC	6/21/2022	5	7488	31.72	6.23	34.64	27.41	0.12	JD/JD		3/4	444.7
AURORA ENERGY LLC	6/23/2022	4	7652	31.98	5.15	35.25	27.63	0.09	JD/JD		3/4	377.85
AURORA ENERGY LLC	6/24/2022	7	7623	30.92	5.86	35.29	27.92	0.10	JD/JD		3/4	659.15
AURORA ENERGY LLC	6/27/2022	14	7680	30.93	5.60	35.63	27.84	0.10	JD/JD		3/4	1327
AURORA ENERGY LLC	6/28/2022	14	7584	30.87	6.30	34.88	27.96	0.11	JD/JD		3/4	1333.5
AURORA ENERGY LLC	6/30/2022	14	7480	32.09	6.34	34.45	27.13	0.10	JD/JD		3/4	1316
AURORA ENERGY LLC	7/1/2022	13	7199	32.37	8.34	33.50	25.79	0.14	JD/JD		3/4	1260
AURORA ENERGY LLC	7/5/2022	11	7518	31.44	6.77	35.06	26.73	0.13	JD/JD		3/4	1023.35
AURORA ENERGY LLC	7/6/2022	8	7581	31.46	6.08	35.00	27.46	0.12	JD/JD		3/4	711.65
AURORA ENERGY LLC	7/7/2022	14	7581	31.51	6.05	35.03	27.41	0.12	JD/JD		3/4	1281.7
AURORA ENERGY LLC	7/8/2022	11	7727	30.79	5.65	35.98	27.59	0.12	JD/JD		3/4	1006.05
AURORA ENERGY LLC	7/11/2022	12	7644	30.96	6.17	35.43	27.46	0.12	JD/JD		3/4	1097.95
AURORA ENERGY LLC	7/12/2022	11	7449	31.29	7.26	34.22	27.24	0.14	JD/JD		3/4	1027.95
AURORA ENERGY LLC	7/14/2022	12	7658	29.29	6.75	35.89	28.07	0.13	JD/BDL	Q3	3/3	1096.2
AURORA ENERGY LLC	7/15/2022	11	7213	33.05	7.32	33.43	26.20	0.11	JD/JD		3/4	1032.2
AURORA ENERGY LLC	7/18/2022	10	7568	31.61	5.58	34.99	27.82	0.12	JD/JD		3/4	927
AURORA ENERGY LLC	7/19/2022	10	7534	31.67	6.17	34.72	27.45	0.12	JD/JD		3/4	935.75
AURORA ENERGY LLC	7/21/2022	10	7534	31.54	6.21	35.13	27.12	0.12	JD/JD		3/4	976.5
AURORA ENERGY LLC	7/22/2022	10	7498	32.28	6.20	34.37	27.16	0.12	JD/JD		3/4	928.1
AURORA ENERGY LLC	7/25/2022	14	7507	31.16	6.93	34.70	27.22	0.13	JD/JD		3/4	1324.5
AURORA ENERGY LLC	7/26/2022	12	7138	32.23	9.28	33.02	25.47	0.15	JD/JD		4/3	1096.35
AURORA ENERGY LLC	7/28/2022	13	7588	31.86	5.76	34.68	27.71	0.13	JD/JD		3/4	1215.85
AURORA ENERGY LLC	7/29/2022	11	7569	31.81	5.80	34.89	27.49	0.12	JD/JD		3/4	1045.65
AURORA ENERGY LLC	8/1/2022	12	7499	31.77	6.28	34.96	26.99	0.12	JD/JD		3/4	1149.8
AURORA ENERGY LLC	8/2/2022	11	7470	31.82	6.63	34.23	27.33	0.13	JD/JD		3/4	1037
AURORA ENERGY LLC	8/4/2022	12	7517	31.82	6.50	35.04	26.65	0.14	JD/JD		3/4	1188.55
AURORA ENERGY LLC	8/5/2022	11	7428	31.96	6.83	33.92	27.30	0.13	JD/JD		3/4	1022.65
AURORA ENERGY LLC	8/8/2022	8	7353	31.99	7.32	34.07	26.63	0.13	JD/JD		3/4	734.35
AURORA ENERGY LLC	8/9/2022	8	7487	32.62	6.16	34.63	26.59	0.13	JD/JD		3/4	766.8
AURORA ENERGY LLC	8/11/2022	8	7173	32.48	8.30	33.53	25.68	0.15	JD/JD		3/4	755.35
AURORA ENERGY LLC	8/12/2022	7	7169	31.93	8.81	33.61	25.66	0.18	JD/JD		3/4	651.75
AURORA ENERGY LLC	8/15/2022	9	7194	31.92	8.75	33.55	25.79	0.14	JD/JD		3/4	842.55
AURORA ENERGY LLC	8/16/2022	10	6944	32.83	9.54	32.64	24.99	0.15	JD/JD		3/4	924.1
AURORA ENERGY LLC	8/18/2022	9	7416	30.21	8.27	34.46	27.06	0.18	BDL/JD	R4	4/4	838.5
AURORA ENERGY LLC	8/19/2022	10	7603	28.64	8.20	35.29	27.87	0.19	BDL/JD	R4	4/3	895.05
AURORA ENERGY LLC	8/22/2022	9	7472	30.68	7.71	34.11	27.51	0.18	BDL/JD	R4	4/3	857.05
AURORA ENERGY LLC	8/23/2022	10	7499	30.12	7.98	34.39	27.52	0.16	BDL/JD	R4	4/3	966
AURORA ENERGY LLC	8/25/2022	9	7539	30.60	7.30	34.60	27.51	0.15	JD/BDL	R4	3/4	870.1
AURORA ENERGY LLC	8/26/2022	10	7477	30.96	7.31	34.35	27.38	0.14	BDL/JD	R4	4/3	943
AURORA ENERGY LLC	8/29/2022	21	7171	31.58	9.25	33.22	25.94	0.17	BDL/JD	R4	4/3	1979.6

Table E. 2022 Rail Sample Analyses of Delivered Coal
Aurora Energy Chena Power Plant SO_2 BACT Analysis

	Sample Date	Cars	AR BTU	AR Moisture	AR Ash	AR Volatiles	AR Carbon	AR Sulfur	Location	Bench	Seam	Tons
AURORA ENERGY LLC	8/30/2022	4	7235	32.28	8.14	33.51	26.07	0.17	BDL/JD	R4	4/3	375.4
AURORA ENERGY LLC	9/1/2022	14	7267	30.75	9.00	34.33	25.92	0.18	BDL/JD	R4	4/3	1329.3
AURORA ENERGY LLC	9/2/2022	10	7374	30.66	8.03	34.31	27.01	0.19	JD/STK		3	931.75
AURORA ENERGY LLC	9/6/2022	33	7120	30.19	10.12	33.45	26.25	0.19	JD/STK		3	3088.6
AURORA ENERGY LLC	9/9/2022	8	7671	30.24	6.82	34.89	28.05	0.14	JD/BDL	R4	3/4	775.55
AURORA ENERGY LLC	9/13/2022	17	7167	30.01	10.56	33.43	26.01	0.18	JD/BDL	R4	3/4	1640.35
AURORA ENERGY LLC	9/14/2022	11	7154	30.47	10.29	33.68	25.56	0.19	JD/BDL	R4	3/4	1035.55
AURORA ENERGY LLC	9/14/2022	13	7184	30.90	9.67	33.87	25.57	0.20	JD/BDL	R4	3/4	1281.7
AURORA ENERGY LLC	9/16/2022	6	7429	28.55	8.66	34.96	27.84	0.21	BDL/STK	R4	4	566.25
AURORA ENERGY LLC	9/19/2022	13	7405	30.20	8.38	34.35	27.08	0.22	BDL/STK	R4	4	1276.65
AURORA ENERGY LLC	9/20/2022	12	7486	29.78	8.59	34.41	27.21	0.21	JD/BDL	R4	3/4	1112.05
AURORA ENERGY LLC	9/21/2022	10	7704	29.41	7.12	35.43	28.04	0.20	JD/BDL	R4	3/4	954.5
AURORA ENERGY LLC	9/24/2022	14	7225	30.97	9.23	33.64	26.16	0.21	JD/BDL	R4	3/4	1290.25
AURORA ENERGY LLC	9/26/2022	14	7551	30.63	7.36	34.64	27.37	0.17	JD/BDL	R4	3/4	1306.3
AURORA ENERGY LLC	9/27/2022	8	7537	30.77	7.34	34.40	27.51	0.16	JD/BDL	R4	3/4	752.5
AURORA ENERGY LLC	9/28/2022	8	7572	31.28	6.45	34.78	27.49	0.14	JD/BDL	R4	3/4	770.75
AURORA ENERGY LLC	9/30/2022	14	7582	30.91	6.47	34.86	27.76	0.14	JD/BDL	R4	3/4	1312.9
AURORA ENERGY LLC	10/4/2022	16	7589	30.72	6.73	35.14	27.41	0.13	JD/BDL	R4	3/4	1467.9
AURORA ENERGY LLC	10/5/2022	15	7599	30.54	6.81	34.83	27.82	0.13	JD/BDL	R4	3/4	1468.8
AURORA ENERGY LLC	10/6/2022	6	7448	31.04	7.50	34.34	27.14	0.14	JD/BDL	R4	3/4	557.25
AURORA ENERGY LLC	10/7/2022	19	7610	29.93	7.11	35.08	27.88	0.14	JD/BDL	R4	3/4	1837.1
AURORA ENERGY LLC	10/11/2022	17	7586	30.46	7.13	35.37	27.05	0.13	JD/BDL	R4	3/4	1552.7
AURORA ENERGY LLC	10/12/2022	12	7451	30.71	7.88	35.16	26.26	0.16	JD/BDL	R4	3/4	1153.45
AURORA ENERGY LLC	10/13/2022	12	7531	31.30	6.81	34.42	27.47	0.15	JD/BDL	R4	3/4	1137.95
AURORA ENERGY LLC	10/14/2022	13	7584	30.06	7.44	34.66	27.85	0.16	JD/BDL	R4	3/4	1251.4
AURORA ENERGY LLC	10/18/2022	11	7636	29.78	7.41	34.86	27.95	0.19	JD/BDL	R4	3/4	1066.5
AURORA ENERGY LLC	10/19/2022	11	7629	29.91	7.34	34.84	27.92	0.19	JD/BDL	R4	3/4	1064.9
AURORA ENERGY LLC	10/20/2022	11	7606	30.47	7.02	34.78	27.74	0.16	JD/BDL	R4	3/4	1059.2
AURORA ENERGY LLC	10/21/2022	11	7503	31.61	6.74	34.41	27.25	0.16	JD/BDL	R4	3/4	1041.9
AURORA ENERGY LLC	10/25/2022	14	7586	30.33	7.64	34.71	27.32	0.16	JD/BDL	R4	3/4	1353.65
AURORA ENERGY LLC	10/26/2022	15	7600	30.20	7.66	34.77	27.38	0.16	JD/BDL	R4	3/4	1447.15
AURORA ENERGY LLC	10/28/2022	15	7627	29.42	7.92	35.27	27.39	0.17	JD/BDL	R4	3/4	1462.15
AURORA ENERGY LLC	11/2/2022	15	7651	30.26	6.93	35.71	27.11	0.13	JD/BDL	R4	3/4	1439.85
AURORA ENERGY LLC	11/3/2022	11	7630	30.15	7.03	34.94	27.88	0.14	JD/BDL	R4	3/4	1035.1
AURORA ENERGY LLC	11/4/2022	16	7593	29.85	7.23	34.98	27.95	0.13	JD/BDL	R4	3/4	1404.15
AURORA ENERGY LLC	11/8/2022	9	7516	31.10	7.07	34.48	27.35	0.13	JD/BDL	R4	3/4	840.55
AURORA ENERGY LLC	11/9/2022	10	7660	30.50	6.21	35.17	28.13	0.11	JD/BDL	R4	3/4	945.5
AURORA ENERGY LLC	11/10/2022	9	7696	29.90	6.48	35.18	28.45	0.13	JD/BDL	R4	3/4	858.65
AURORA ENERGY LLC	11/11/2022	10	7629	30.16	6.29	34.91	28.66	0.13	JD/BDL	R4	3/4	942.5
AURORA ENERGY LLC	11/15/2022	12	7487	31.02	6.87	34.24	27.87	0.13	JD/BDL	R4	3/4	1149.05
AURORA ENERGY LLC	11/16/2022	11	7600	31.54	5.68	34.78	28.00	0.11	JD/JD		4/3	993.7
AURORA ENERGY LLC	11/17/2022	11	7740	31.60	4.77	35.80	27.84	0.10	JD/JD		3/4	1007.85
AURORA ENERGY LLC	11/18/2022	11	7736	31.95	4.42	35.63	28.00	0.09	JD/JD		3/4	1030.85
AURORA ENERGY LLC	11/21/2022	13	7741	31.55	4.58	35.71	28.17	0.09	JD/JD		4/3	1172.2
AURORA ENERGY LLC	11/22/2022	12	7717	31.45	4.78	35.19	28.58	0.10	JD/JD		3/4	1095.6
AURORA ENERGY LLC	11/23/2022	5	7675	31.74	5.06	35.20	28.00	0.13	JD/JD		4/3	461
AURORA ENERGY LLC	11/25/2022	14	7698	31.36	5.10	35.32	28.23	0.12	JD/JD		4/3	1299.6
AURORA ENERGY LLC	11/29/2022	11	7314	31.86	7.79	33.41	26.95	0.14	JD/BDL	R4	4/4	893.5
AURORA ENERGY LLC	11/30/2022	8	7463	32.33	6.21	34.02	27.45	0.13	JD/BDL	R4	4/4	645.8
AURORA ENERGY LLC	12/1/2022	11	7697	31.08	5.60	35.41	27.92	0.14	JD/BDL	R4	4/4	920.5
AURORA ENERGY LLC	12/2/2022	8	7745	30.45	5.72	35.60	28.24	0.13	JD/BDL	R4	4/4	667.3
AURORA ENERGY LLC	12/6/2022	12	7714	31.23	4.92	36.00	27.86	0.13	JD/BDL	R4	4/4	1097.55
AURORA ENERGY LLC	12/7/2022	14	7680	31.32	5.33	35.78	27.57	0.14	JD/BDL	R4	4/4	1262.6
AURORA ENERGY LLC	12/8/2022	15	7737	31.70	4.44	35.66	28.21	0.10	JD/BDL	R4	4/4	1353.6
AURORA ENERGY LLC	12/9/2022	13	7703	31.17	5.00	36.02	27.82	0.12	JD/BDL	R4	4/4	1125.15
AURORA ENERGY LLC	12/13/2022	12	7731	31.32	5.01	35.74	27.93	0.13	JD/BDL	R4	4/4	1061.9
AURORA ENERGY LLC	12/14/2022	14	7701	31.62	4.79	36.02	27.58	0.11	JD/BDL	R4	4/4	1190.25
AURORA ENERGY LLC	12/15/2022	6	7589	32.69	4.73	34.93	27.66	0.14	JD/BDL	R4	4/4	520.55
AURORA ENERGY LLC	12/20/2022	4	7493	31.56	6.50	34.51	27.43	0.10	JD/STK		4	362
Annual Average			7536	31.31	6.53	34.63	27.53	0.12				

AR = as received

Table F. Estimated Station Service Electrical Load for DSI Equipment
Aurora Energy Chena Power Plant SO_2 BACT Analysis

Do not use for electrical equipment sizing. Use only for approximating actual kW consumption under normal operating conditions.

EQUIPMENT Equip Tag	Load Name	MCC Starter Size	MCC Starter Type	Voltage [V]	Load [VA]	Load [HP]	Load [KW]	FLA	Load Factor	Adjusted Load (kVA)	PF	Adjusted Load (kW)	Notes
05B3A	Unloading Blower	5	FVNR	480		125		150.36	0.10	12.5	0.85	10.6	Only used for unloading
05B3B	Air Cooler for Unloading Blower	1	FVNR	480		1		1.20	0.10	0.1	0.80	0.1	Only used for unloading
06B3A	Bin Vent Exhaust Fan	1	FVNR	480		7.5		9.02	0.87	6.5	0.80	5.2	
06B3B	Bin Discharger Silo #1	1	FVNR	480		3		3.61	0.87	2.6	0.80	2.1	
06B3B	Bin Discharger Silo #2	1	FVNR	480		3		3.61	0.87	2.6	0.80	2.1	
08B3A	Transfer Blower for Day Bins A	3	FVNR	480		50		60.14	0.25	12.5	0.85	10.6	Only used to transfer to plant
08B3A	Transfer Blower for Day Bins B	3	FVNR	480		50		60.14	0.00	0.0	0.85	0.0	Spare
08B3A	Air Cooler for Transfer Blower	3	FVNR	480		1		1.20	0.25	0.3	0.80	0.2	Only used to transfer to plant
09B3B	Airlock Silo #1	1	FVNR	480		1		1.20	0.25	0.3	0.80	0.2	Only used to transfer to plant
09B3B	Airlock Silo #2	1	FVNR	480		1		1.20	0.25	0.3	0.80	0.2	Only used to transfer to plant
	Unloading Skid heater			480	5000.0		5000.00	6.01	0.10	0.5	1.00	0.5	Only used for unloading
	Silo #1 Heater			480	5000.0		5000.00	6.01	1.00	5.0	1.00	5.0	
	Silo #2 Heater			480	5000.0		5000.00	6.01	1.00	5.0	1.00	5.0	
	Silo #1 Exhaust Fan	1	FVNR	480		2		2.41	0.87	1.7	0.80	1.4	
	Silo #2 Exhaust Fan	1	FVNR	480		2		2.41	0.87	1.7	0.80	1.4	
	Air Compressor	3	FVNR	480		30		36.09	0.87	26.1	0.85	22.2	For continuous supply of fluidizing air
	Area Lighting		100A BKR	480	1500.0		1500.00	1.80	1.00	1.5	0.90	1.4	
	Receptacles			480	1500.0		1500.00	1.80	1.00	1.5	0.90	1.4	
	Total	25				276.5		354.24				**69.5**	
05B3A	Bin Vent Exhaust Fan #1	1	FVNR	480		3		3.61	0.87	2.6	0.8	2.1	
05B3A	Bin Vent Exhaust Fan #2	1	FVNR	480		3		3.61	0.87	2.6	0.8	2.1	
	Bin Discharger #1	1	FVNR	480		1.5		1.80	0.87	1.3	0.8	1.0	
	Bin Discharger #2	1	FVNR	480		1.5		1.80	0.87	1.3	0.8	1.0	
	Feeder #1	1	FVNR	480		1		1.20	0.87	0.9	0.8	0.7	
	Feeder #2	1	FVNR	480		2		2.41	0.87	1.7	0.8	1.4	
	Feeder #3	1	FVNR	480		2		2.41	0.00	0.0	0.8	0.0	Spare
	Grinding Motor #1	3	FVNR	480		30		36.09	0.87	26.1	0.85	22.2	
	Grinding Motor #2	4	FVNR	480		60		72.17	0.87	52.2	0.85	44.4	
	Grinding Motor #3	3	FVNR	480		30		36.09	0.00	0.0	0.85	0.0	Spare
	Classifier Motor #1	1	FVNR	480		3		3.61	0.87	2.6	0.8	2.1	
	Classifier Motor #2	1	FVNR	480		6		7.22	0.87	5.2	0.8	4.2	
	Classifier Motor #3	1	FVNR	480		3		3.61	0.00	0.0	0.8	0.0	Spare
	Injection Blower Boiler #1	2	FVNR	480		25		30.07	0.87	21.8	0.85	18.5	
	Backup Injection Blower Boiler #1 (25HP)	2	FVNR	480				0.00	0.87	0.0	0.85	0.0	Spare
	Injection Blower Boiler #2	2	FVNR	480		25		30.07	0.87	21.8	0.85	18.5	
	Backup Injection Blower Boiler #2 (25HP)	2	FVNR	480				0.00	0.87	0.0	0.85	0.0	Spare
	Injection Blower Boiler #3	2	FVNR	480		25		30.07	0.87	21.8	0.85	18.5	
	Backup Injection Blower Boiler #3 (25HP)	2	FVNR	480				0.00	0.87	0.0	0.85	0.0	Spare
	Injection Blower Boiler #5	4	FVNR	480		75		90.21	0.87	65.3	0.85	55.5	
	Backup Injection Blower Boiler #5 (75HP)	4	FVNR	480				0.00	0.87	0.0	0.85	0.0	Spare
	Air Cooler #1	1	FVNR	480		2		2.41	0.87	1.7	0.8	1.4	
	Air Cooler #2	1	FVNR	480		2		2.41	0.87	1.7	0.8	1.4	
	Air Cooler #3	1	FVNR	480		2		2.41	0.87	1.7	0.8	1.4	
	Air Cooler #5	1	FVNR	480		2		2.41	0.87	1.7	0.8	1.4	
	Exhaust Fan Mill #1	2	FVNR	480		15		18.04	0.87	13.1	0.8	10.4	
	Exhaust Fan Mill #2	2	FVNR	480		15		18.04	0.87	13.1	0.8	10.4	
	Exhaust Fan Mill #3	2	FVNR	480		15		18.04	0.87	13.1	0.8	10.4	
	Exhaust Fan Mill #4	2	FVNR	480		15		18.04	0.87	13.1	0.8	10.4	
	Airlock Mill #1	1	FVNR	480		0.25		0.30	0.87	0.2	0.8	0.2	
	Airlock Mill #2	1	FVNR	480		0.25		0.30	0.87	0.2	0.8	0.2	
	Airlock Mill #3	1	FVNR	480		0.25		0.30	0.87	0.2	0.8	0.2	

EQUIPMENT Equip Tag	Load Name	MCC Starter Size	MCC Starter Type	Voltage [V]	Load [VA]	Load [HP]	Load [KW]	FLA	Load Factor	Adjusted Load (kVA)	PF	Adjusted Load (kW)	Notes
	Airlock Mill #4	1	FVNR	480		0.25		0.30	0.87	0.2	0.8	0.2	
	Area Lighting		100A BKR	480	1500.0		1500.00	1.80	1.00	1.5	0.9	1.4	
	Receptacles			480	1500.0		1500.00	1.80	1.00	1.5	0.9	1.4	
	Total	56				365		442.65				**242.8**	

Total	**312.3**

Statistical Analysis From 2011 Source Test at the Chena Power Plan

(Prepared by Moses Coss, ADEC) Prepared on: 2/23/2024

Source Test Date: 11/19/2011
Emission Units: Combined Boiler (Chena 1, 2, 3 and 5) Baghouse Stack
Source of individual source test Run info:
Aurora's Source Test Report (pg 40 of PDF doc)

	Run No	Units
Run 1	0.0211	lb/MMBtu
Run 2	0.0217	lb/MMBtu
Run 3	0.0388	lb/MMBtu

Calculation of Standard Deviation:

	Run No	Units	Xi - mu	(Xi - mu)^2
Run 1	0.0211	lb/MMBtu	-0.0061	0.00003721
Run 2	0.0217	lb/MMBtu	-0.0055	0.00003025
Run 3	0.0388	lb/MMBtu	0.0116	0.00013456
			Sum:	0.00020202

No of values (N): 3
Population Avg: 0.0272 lb/MMBtu
Std Dev (sigma) 0.0082061 (sample size less than 30)

Calculation	Formula	Notes
Population Standard Deviation	$\sigma = \sqrt{\frac{\Sigma (X_i - \mu)^2}{N}}$	μ = population average X = individual values in population N = count of values in population

Calculating Confidence Interval:

$$CI = \bar{x} \pm z\frac{s}{\sqrt{n}}$$

CI = confidence interval
$\bar{x}$ = sample mean
z = confidence level value
s = sample standard deviation
n = sample size

At a confidence level of 95%:
Since sample size is small, we use the t distribution for a 2 tailed test. For 95% confidence and df = n-1 =2, t=4.303
t 4.303
t*s/SQRT(n): 0.020387

Lower Interval: 0.007 lb/MMBtu
Upper Interval: **0.048** lb/MMBtu

Summary of 2010 Source Test on Boiler 1 - UAF

Source Test Date: 11/2-4/2010
Emission Units: Boiler 1
Source of individual source test Run info:
Alaska Source Testing, January 19, 2011 Report

	Run No	Units	Coal ton/hr	lb/MMBtu
Run 1	2.75	lb/hr	5.09	0.035732
Run 2	2.53	lb/hr	4.92	0.03401
BTU content:	7,560	btu/lb		
Average:				0.034871

Aurora Energy, LLC BACT Affordability Analysis

Prepared by: Ed King, Principal Economist

King Economics Group

2/18/24

Contents

Background 6

Economic Infeasibility Criteria 7

Points for Consideration 9

Aurora lacks the required capital. 9

Aurora lacks the debt capacity to borrow capital. 11

Pass-through to electricity buyers is not possible. 12

Pass-through to heat customers is not feasible. 13

Cost reductions from feedstock are not available. 13

Closing the Plant is not an economically effective control. 14

Market Analysis 16

Electricity Market 16

Electricity Demand 17

Electricity Demand Elasticity 17

Electricity Supply 18

Heating Market 19

Heating Demand 21

Heating Supply 21

Heat Demand Elasticity 22

Cross-Price Elasticity of Heat Demand 22

Financial Analysis 25

Corporate structure 25

Balance Sheet 26

Income statement 28

Cash flows 30

DSI Cost Estimates 31

Discussion 31

Capital costs 31

Operating costs 32

Impact Analysis 34

Baseline 36

Baseline Breakeven Prices 36

DSI impacts 37

Electric customer response 38

Electric Supply Response 38

Heating customer response 39

Scenario 1: DSI cost placed completely on heat business 40

Scenario 2: DSI cost fully on Electric 42

Scenario 3: DSI cost shared between heat and power 46

Conclusion 49

Figure 1- GVEA Marginal Cost of Power 17
Figure 2 - Aurora Heat Delivery Systems 19
Figure 3- Conversion Decision Matrix 23
Figure 5 - Ownership Comparison 25
Figure 6 - Balance Sheet 26
Figure 7 - Income Statement 28
Figure 8- Consolidated Cash Flows 29
Figure 9 - Construction Cost Estimate 32
Figure 10 - Operating Cost Estimate 34
Figure 11 – Baseline Analysis 36
Figure 12 - GVEA Power Costs 38
Figure 13 - Scenario 1 Results 40
Figure 14 - Scenario 2 Results 42
Figure 15 – Scenario 2 Electric Supply Shift 43
Figure 16 - Scenario 3 Results 45
Figure 17 - Scenario 3 Electric Supply Shift 46
Figure 18 - Fuel Cost Comparison 47
Figure 19 - Interior Gas Utility Distribution System 48

Background

The Fairbanks, Alaska region was designated a serious nonattainment area, which necessitates an approved state implementation plan (SIP)[1]. As part of the SIP, the Alaska Department of Environmental Conservation (ADEC) must determine the best available control technology (BACT) for SO_2 capture at the Chena Power Plant (CPP) — Which is owned and operated by Aurora Energy, LLC (Aurora).

In its draft SIP, ADEC concluded that Dry Sorbent Injection (DSI) is BACT for the CPP. Other technologies that provide higher removal rates were deemed to be economically infeasible by ADEC. Aurora contended that DSI was not affordable for its operation and should not be considered BACT at CPP. ADEC agreed with Aurora in the amended draft SIP, based on the unbearable financial burden it would place on Aurora.

The Environmental Protection Agency (EPA) responded with an intent to deny the draft SIP[2], disagreeing with ADEC's economic infeasibility findings. The EPA objected to both the elimination of higher removal technologies as economically infeasible and to the finding that DSI was not affordable at CPP. EPA's comments contend that the information provided "does not provide a comprehensive picture of the incremental costs of installation and operations of potential BACT controls." The EPA requested additional information to substantiate ADEC's findings.

[1] https://dec.alaska.gov/air/anpms/communities/fbks-pm2-5-serious-sip/
[2] https://www.epa.gov/ak/fairbanks-air-quality-plan

This report was prepared to satisfy the EPA's request for a more comprehensive picture of Aurora's financial capacity. It also evaluates the economic viability of Aurora given the current and projected customer base. Per the EPA, an unaffordability declaration places a burden on the source owner to provide the basis for the regulating agencies to consider[3]. That is the primary purpose of this report.

This analysis includes a review of Aurora's financial statements and an evaluation of the market conditions facing Aurora. While not stated in the Federal Register, an affordability analysis cannot be complete without considering the source of funds required to install the BACT. If the company cannot raise the capital to complete the installation, it will not achieve any removal or reduction in emissions.

Economic Infeasibility Criteria

The EPA regulation regarding economic infeasibility is found at 40 CFR 51.1010(c)(3)(ii). It reads "For purposes of evaluating the economic feasibility of a potential control measure, the state may consider capital costs, operating and maintenance costs, and cost-effectiveness of the measure."

More clarity around the interpretation of this language is found in Federal Register volume 81, number 164, page 58042. It states:

> "The EPA believes that it is appropriate for states to give substantial weight to cost-effectiveness in evaluating the economic feasibility of an emission reduction measure or technology. The cost-effectiveness of a measure is its annualized cost ($/year) divided by

[3] https://www.govinfo.gov/app/details/FR-2016-08-24

> the emissions reduced (tons/year) which yields a cost per amount of emission reduction ($/ton) relative to the cost borne by similarly situated entities. In considering what level of control is reasonable, the EPA does not recommend a specific fixed dollar per ton cost threshold for economic feasibility of controls…"

This language describes the process for the state agency (ADEC) to decide if a technology passes step 4 (technological and economic feasibility) of the evaluation and should be considered in step 5. As noted by the EPA, there is no bright line that determines what level of cost-effectiveness is economically infeasible. The determination is an administrative decision by ADEC and EPA based primarily on comparisons to other regions and facilities. This report does not attempt to elucidate the economic infeasibility based on cost-effectiveness.

However, such an agency evaluation and decision does not consider the unique circumstances facing a specific source. The EPA acknowledges that such factors should be considered with the next sentence in the register:

> "In addition, if a source contends that a source-specific control level should not be established because the source cannot afford the control measure or technology that is demonstrated to be economically feasible for purposes of BACM for other sources in its source category, the source should make its claim known to the state and support the claim with information regarding the impact of imposing the identified control measure or technology on the following financial indicators, to the extent applicable:
>
> 1. Fixed and variable production costs ($/ unit);
> 2. Product supply and demand elasticity;
> 3. Product prices (cost absorption vs. cost pass-through);

4. Expected costs incurred by competitors;

5. Company profits;

6. Employment costs;

7. Other costs (e.g., for BACM implemented by public sector entities)."

The reference and guidance on how a source-specific control can be deemed unaffordable imply that a second allowable justification for economic infeasibility exists. The listed factors are primarily related to the ability of the business to absorb or recapture the capital costs necessary to install a BACT, not the cost-effectiveness of it. By implication, the EPA acknowledges that a control is economically infeasible if the business cannot comply with the requirement due to financial constraints.

Points for Consideration

Aurora lacks the required capital.

[redacted]

This level of cash reserves is not enough for prudent operating cost management. Aurora's financial statements indicate a very high insolvency risk with any decrease in sales or interruption in payment from its customers. With zero available reserves, Aurora does not have the necessary capital to install any technology deemed to be BACT.

[redacted]

Further, a DSI system does not result in a greater volume of production or a higher-value product. The expense only preserves the current revenue stream (minus any auxiliary power needs) rather than adding to it. [redacted] This would be the same conclusion drawn from an attempted equity raise from outside investors. [redacted]

Aurora is also not a subsidiary of a larger entity that could supply the capital required to install a required control. From an outside perspective, the overlapping business ownership between Aurora and Usibelli Coal Mine, Inc. (Usibelli) might suggest that the larger company could subsidize the Chena Power Plant.

However, providing the necessary capital to Aurora would decrease the value of Usibelli ownership to the benefit of Aurora owners. For all shareholders without ownership in both companies, this action may violate the corporate fiduciary duty of the board.

[4] Stanley report, updated 8/29/23

Aurora lacks the debt capacity to borrow capital.

[redacted]

Pass-through to electricity buyers is not possible.

It may be possible for Aurora to find a lender willing to hypothecate an increase in revenues sufficient to service the debt. However, these anticipated revenues must be underpinned by a firm purchase agreement for the life of the loan.

The Golden Valley Electric Association (GVEA) is the only buyer capable of entering into such an agreement. GVEA already has a power purchase agreement in place with Aurora, which does not expire until 2030. The terms include a contractually limited price per kilowatt. The contractual price cannot be unilaterally altered. These terms were mutually agreed upon given the cost structure in place at the time of execution. They included a sales price sufficient to cover operations, maintenance, administration, and debt service, but left little room for profit.

Aurora could attempt to renegotiate the terms of the contract before expiration. However, there is no incentive for GVEA to voluntarily agree to a price increase. The risk of losing the supply from Aurora may spark conversations, but the price would still be limited by the next best price GVEA has available.

Aurora is currently among the lowest cost of power supply for GVEA. If the cost of power from Aurora increases above the cost GVEA can get from Matanuska Electric Authority (MEA) or Chugach Electric (CE), GVEA will choose the lower-cost option. The current rates GVEA pays per kWh are $0.108 from MEA and $0.114 from CE. As shown in scenario 3, placing only a proportional share of expense on the electric side of the business results in a required price of over $0.14/kWh.

While those numbers may appear competitive, each additional $0.001 per kWh results in a cost difference of $171,781 for the power Aurora provides. Because GVEA has better

options, it is unlikely that it will renegotiate the contract with Aurora. Therefore, Aurora cannot secure funding by issuing debt secured by a firm power purchase agreement until 2030.

Pass-through to heat customers is not feasible.

It may be possible for Aurora to get RCA approval for a district heating rate increase due to the increased cost of operations after installing the BACT. Nonetheless, the market determines the price a customer is willing to pay.

As shown in the impact analysis, the switching decision is rooted in comparing the cost of conversion to the difference in the price of fuel. Aurora could only increase its heating price to the extent that the price difference is insufficient to push customers to another option. The larger the price delta becomes, the more lucrative the conversion appears to the customer.

Putting the full burden of the technology on the heating systems (due to the inability to raise electric rates) would increase the required average price to $152.71/MMBTU. If Aurora were able to renegotiate the price of electricity so that the heating business only had to recover a proportional share of costs, the price would need to be $39.14/MMBTU. As shown in the impact analysis, even this price increase would very likely result in conversions away from district heat.

Cost reductions from feedstock are not available.

Aurora buys its feedstock from Usibelli. Due to overlapping ownership interests, it is a reasonable question to ask if Aurora's financials appear so poor because the profits are shifted to Usibelli through exorbitant coal prices. If so, the regulating agencies may argue that the BACT is affordable by reducing the cost of coal.

[redacted]

The nature of the relationship between the companies does not appear to result in profit shifting from Aurora to Usibelli. Therefore, an assertion that reducing the cost of coal is a viable path to making BACT installation affordable appears invalid.

Closing the Plant is not an economically effective control.

Given that any required expenditure to install control technology is unaffordable, it may be tempting to consider whether shutting down the coal plant is an acceptable alternative. In any shutdown scenario, the result is a need for GVEA to replace the lost power supply. The most likely option is to purchase additional power from the utilities in Southcentral.

While an economic impact analysis is beyond the scope of this report, providing some high-level estimates is worthwhile. First, the direct result is a redirection of the $14.7 million currently paid to Aurora toward a power generation company in a different economic region.

Additionally, the cost of power on residents would increase by the difference between the price currently paid to Aurora and the price paid to replace that power. The lowest cost option would be to purchase from Matanuska Electric Association (MEA) at the price GVEA currently pays (assuming supply becomes available). The higher electricity costs result in Fairbanks residents shifting $3.4 million from economic consumption in the region toward paying for a more expensive utility bill — which then flows out of the region.

A similar impact would fall on Aurora's hot water and steam heating customers. As the power plant cannot afford to operate its heating business without electrical generation, the current customer base would need to find alternatives. Assuming residents are rational and are using the most cost-effective heating source today, it is a safe assumption that the price of space heating would go up. An investment in a replacement heating system would also be required. The net effect is diverting some level of disposable household income away from discretionary items such as restaurants, entertainment, and other local services.

That money would instead flow toward retailers, contractors, distributors, and other participants in the heating supply chain. It is unclear what the net effect would be on the economy without further analysis. Similarly, the choice of any alternative heating method necessarily represents an increase in ground source CO2 emissions. Such a strong assertion is warranted due to the zero net emissions generated by selling waste heat from the electrical generation process.

While the heating change impacts are not easily estimated, the net result from alternative electrical generation is. The direct effect is $18.1 million leaking from the Fairbanks economy due to increasing electricity costs. A study from the Institute of Social and Economic Research[5] estimated the economic multiplier in Anchorage to be between 1.3 and 1.6. Using the high end of that range as a proxy for Fairbanks, the full impact of the electrical cost shift generates around $29 million of economic loss. In terms of jobs, that is equal to 449 full-time

[5] Institute of Social and Economic Research, Interim Report

employees at the mean salary in the state[6] — a meaningful impact on an economy the size of Fairbanks'.

Those economic impacts include direct cost increases to customers, indirect economic degradation due to lower disposable income in the population, and induced effects as the economy adjusts to the flow of funds toward utilities and away from commercial activity. Consideration of these factors does not appear in the EPA implementation rule when considering economic infeasibility. Even still, the regulating bodies should consider them.

Market Analysis

The Chena Power Plan is a cogeneration facility that sells both heat and power. Consequently, the business operates in two markets. The electricity market is confined to a single buyer. Meanwhile, the heat market has several contracted and potential customers.

Electricity Market

The electrical grid in Fairbanks, Alaska is operated by Golden Valley Electric Association (GVEA). It is owned as a cooperative with all metered customers being part owners. GVEA operates as a regulated monopoly, subject to oversight and rate approval by the regulatory commission of Alaska (RCA). GVEA also has monopsony power in the market for electrical generation. As GVEA is the only buyer, the demand curve Aurora faces is the demand curve for GVEA alone.

[6] $32.22 per hour in 2022(https://www.bls.gov/regions/west/news-release/occupationalemploymentandwages_anchorage.htm)

Electricity Demand

The Fairbanks area uses roughly 1.3 billion kilowatt hours per year, all of which are supplied by GVEA. Power is required for lighting, cooking, heating system operations, and block heaters for cars. Fairbanks residents cannot survive without power and GVEA is the only supplier. GVEA meets Fairbanks' demand by several means. It generates power from its facilities, purchases power from the intertie, and buys power from independent power producers like Aurora. The price it pays is subject to review by the RCA. The GVEA board also has an implicit obligation to obtain the lowest cost power available, although they appear willing to pay a premium for renewable energy.

Electricity Demand Elasticity

Electricity customers do not have a good alternative to whatever rate GVEA charges. That is why it is regulated by the RCA. Whether the rate increase is due to increased costs from Aurora or from replacing the power the CPP provides, GVEA customers will pay for it. Therefore, the demand from Aurora's only customer (GVEA) is unlikely to change unless the region grows.

This implies that the demand elasticity facing GVEA, and consequently the demand elasticity facing Aurora, is nonexistent. Importantly, GVEA mitigates price risk through long-term power purchase agreements for a stable volume of demand. Because the SIP timeline requires near-immediate installation of the selected BACT, the relevant analysis is short-run elasticity. And, because the power purchase agreement in place does not allow for a price change until 2030, the elasticity of demand from GVEA in the short run is nonexistent.

Electricity Supply

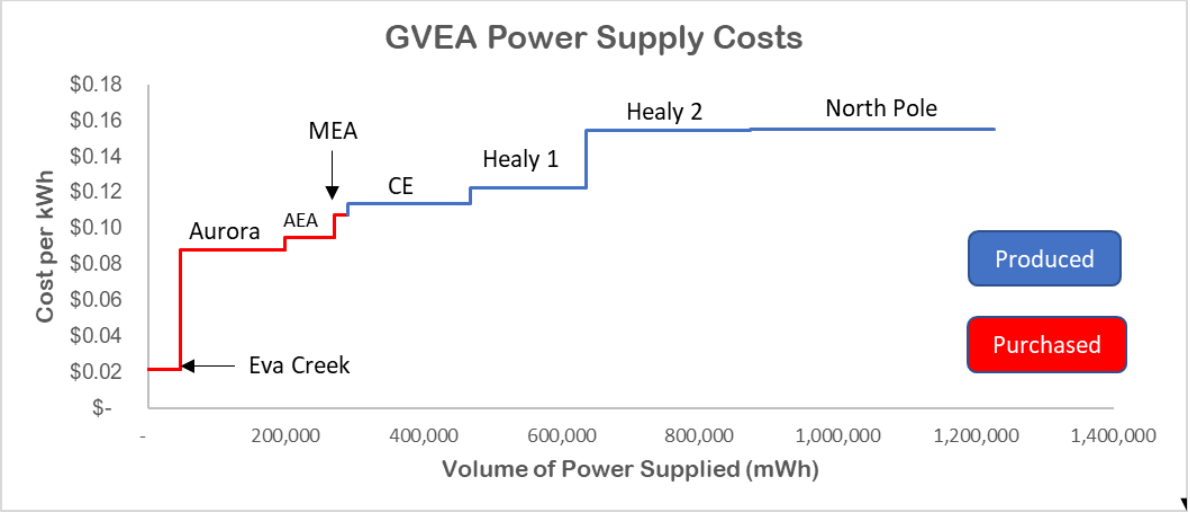


Figure 1- GVEA Marginal Cost of Power

Figure 1 shows the volume and price GVEA spent on power purchase and generation in 2022. Apart from Aurora, all power used in Fairbanks originated from a regulated utility. Because a regulated utility is not allowed to generate supernormal profits, the cost of power paid by GVEA is an excellent proxy for the supply curve GVEA faces.

As seen in Figure 1, GVEA can produce power for itself at an average cost of $0.116 per kWh. GVEA purchases power below that production cost threshold. By implication, if the cost of power from Aurora becomes higher, the supply curve shifts accordingly[7]. If no available power supply exists below $0.116 per, GVEA is likely better off increasing power generation at existing facilities or investing in new facilities that expand its generating capacity.

[7] This supply curve shifting is seen in the Implication Analysis.

The rest of the suppliers, shown in red in Figure 1, represent direct competitors to Aurora for the purchase agreements from GVEA. Removing GVEA's power generation from owned facilities leaves the market for wholesale electricity sales — Of which Aurora currently holds a 34% market share.

Heating Market

Aurora has a second revenue stream from the CPP. It sells heat energy through hot water and steam heating systems within the city limits of Fairbanks. The potential market for heating customers is limited to the 15 miles of piping in the system, as shown in Figure 2.

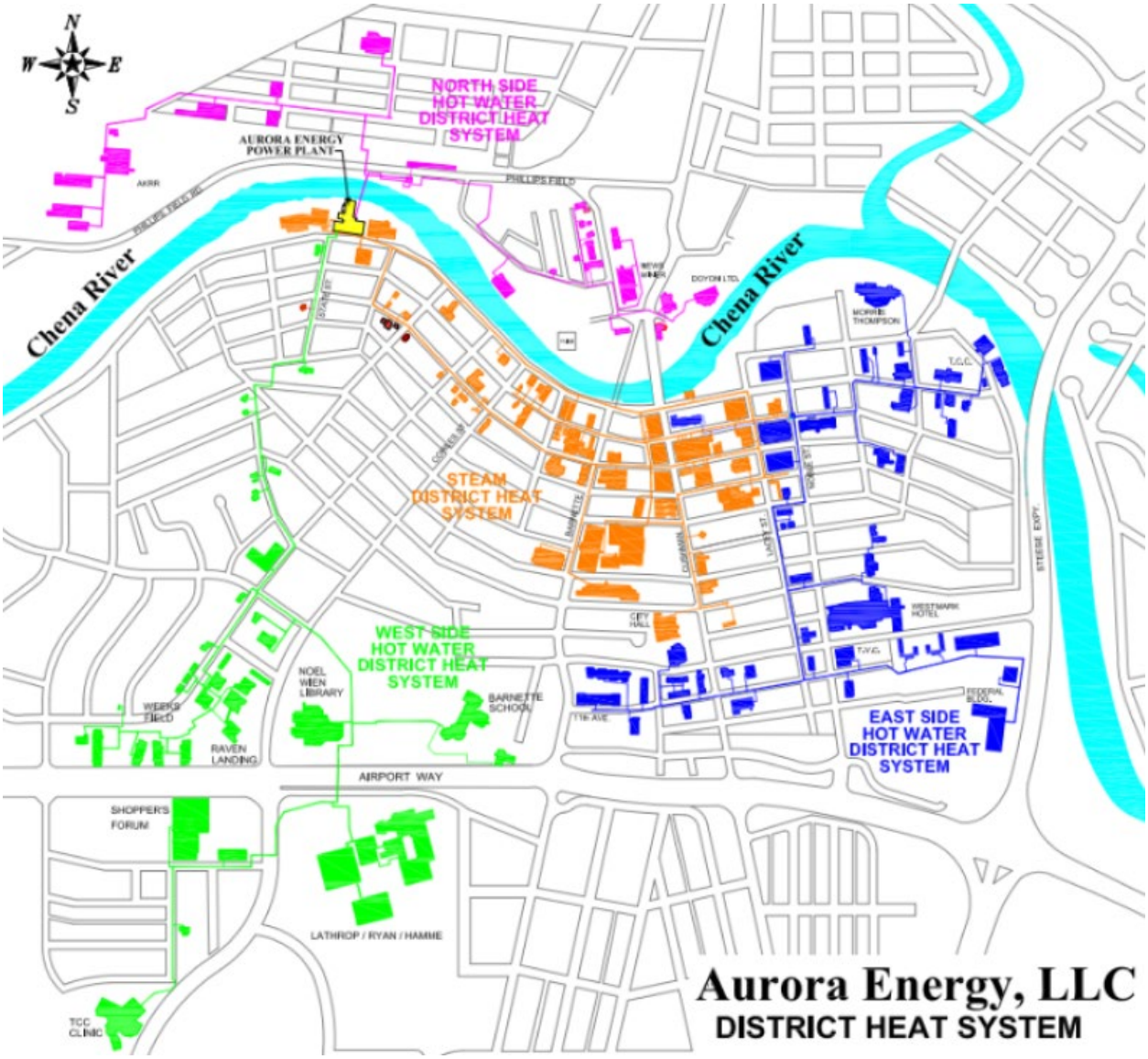


Figure 2 - Aurora Heat Delivery Systems

Heating Demand

[redacted]

As shown in figure 2, the steam heat delivery system covers the downtown core. There are three closed loop hot water transportation systems, which travel further from the city center. Customer demand stems from the need for space heating in Fairbanks during the winter.

The downtown steam system provides heat for the Golden Heart Utility headquarters building, a small number of residential customers, and most of the downtown commercial spaces[redacted]

[redacted]

Heating Supply

[redacted]

[8] RCA filing, 2022 Annual Report
[9] *Id.*
[10] DOE report, 2022

[redacted]

Heat Demand Elasticity

This analysis relies on a study by Hirst, Goeltz, and Carney[12] as a proxy for space heating demand elasticity in Fairbanks. The study estimates the own-price elasticity of heating needs at 0.2 —A 10% increase in price results in a 2% decrease in consumption. This elasticity factor demonstrates a relatively low sensitivity for heating customers, likely due to limited alternatives — such as turning down the thermostat and increasing the use of secondary devices. This analysis assumes the elasticity is constant across the demand curve.

Cross-Price Elasticity of Heat Demand

Unlike the electricity market, there is also cross-price elasticity between fuel types in the heating market. Given the difficulty and cost of converting to a different fuel source, switching decisions are sticky — If a customer installs a new system, it won't switch back if prices return to the previous level. The implication is that Aurora's heating source is a perfect substitute relative to natural gas, propane, coal, and heating oil systems.

[11] Values reported from Aurora personnel in Fairbanks.
[12] Energy Economics, Vol. 4, Issue 2, Pages 74-82

As perfect substitutes, the cross-price elasticity between these heating fuel options is zero below the switching price and infinite at the point of conversion. The strength of the impact on the heating demand curve cannot be calculated across all prices and volumes. The individual customers each face unique options, costs, and access to capital that will impact their decision. But a generic substitution table yields insight into where the likelihood of conversion lies.

To develop this relationship table, this analysis uses available data from various sources. A general cost estimate based on the size of a building was generated using the calculations found on the company website of an HVAC installation company[13]. These costs were used to develop how economies of scale impact conversion costs. The spreadsheet calculation then adjusts those costs to Alaska by comparing the average cost of conversion in the Lower 48 states to the cost in Alaska provided by the Interior Gas Utility in Fairbanks[14]. The economies of scale in the Lower 48 were then applied to Alaska price to generate a proxy for understanding the cost of conversion for different building sizes. Data from the Alaska Housing Finance Corporation[15] provided an estimate for energy needs per square foot.

With these data, an approximation of heating costs can be generated based on different building sizes. The resulting cost is assumed to be funded by consumer debt at the prime rate of 5.5% fixed over a 10-year term. Conversion is more likely to occur as the price charged by Aurora increases relative to the conversion cost. Figure 3 shows the results of holding the price

[13] https://www.pickhvac.com/calculator/heating-btu/
[14] https://interiorenergyproject.com/conversion/
[15] AHFC Final Fairbanks North Star Borough Summary

of natural gas constant while Aurora increases district heating prices to pay for the BACT installation. The matrix compares the potential savings from switching to natural gas against the cost of conversion. The green boxes suggest that converting to natural gas would be a financially wise decision.

Net Present Value of Conversion														
		Square Feet												
	-19727.5571	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000
Price of District or Hot Water Heating ($/MMBTU)	$ 19.00	$ (9,839)	$ (12,413)	$ (14,820)	$ (18,239)	$ (21,657)	$ (25,076)	$ (28,495)	$ (31,914)	$ (35,333)
	$ 20.00	$ (9,169)	$ (11,407)	$ (13,480)	$ (16,563)	$ (19,647)	$ (22,731)	$ (25,815)	$ (28,898)	$ (31,982)
	$ 21.00	$ (8,499)	$ (10,402)	$ (12,140)	$ (14,888)	$ (17,637)	$ (20,386)	$ (23,134)	$ (25,883)	$ (28,632)
	$ 22.00	$ (7,829)	$ (9,397)	$ (10,799)	$ (13,213)	$ (15,627)	$ (18,040)	$ (20,454)	$ (22,867)	$ (25,281)
	$ 23.00	$ (7,159)	$ (8,392)	$ (9,459)	$ (11,538)	$ (13,616)	$ (15,695)	$ (17,773)	$ (19,852)	$ (21,931)
	$ 24.00	$ (6,489)	$ (7,387)	$ (8,119)	$ (9,862)	$ (11,606)	$ (13,350)	$ (15,093)	$ (16,837)	$ (18,580)
	$ 25.00	$ (5,819)	$ (6,382)	$ (6,779)	$ (8,187)	$ (9,596)	$ (11,004)	$ (12,413)	$ (13,821)	$ (15,230)
	$ 26.00	$ (5,149)	$ (5,377)	$ (5,439)	$ (6,512)	$ (7,585)	$ (8,659)	$ (9,732)	$ (10,806)	$ (11,879)
	$ 27.00	$ (4,479)	$ (4,372)	$ (4,098)	$ (4,837)	$ (5,575)	$ (6,314)	$ (7,052)	$ (7,790)	$ (8,529)
	$ 28.00	$ (3,809)	$ (3,366)	$ (2,758)	$ (3,162)	$ (3,565)	$ (3,968)	$ (4,372)	$ (4,775)	$ (5,178)
	$ 29.00	$ (3,139)	$ (2,361)	$ (1,418)	$ (1,486)	$ (1,555)	$ (1,623)	$ (1,691)	$ (1,760)	$ (1,828)
	$ 30.00	$ (2,468)	$ (1,356)	$ (78)	$ 189	$ 456	$ 722	$ 989	$ 1,256	$ 1,523
	$ 31.00	$ (1,798)	$ (351)	$ 1,262	$ 1,864	$ 2,466	$ 3,068	$ 3,670	$ 4,271	$ 4,873
	$ 32.00	$ (1,128)	$ 654	$ 2,603	$ 3,539	$ 4,476	$ 5,413	$ 6,350	$ 7,287	$ 8,224
	$ 33.00	$ (458)	$ 1,659	$ 3,943	$ 5,215	$ 6,486	$ 7,758	$ 9,030	$ 10,302	$ 11,574
	$ 34.00	$ 212	$ 2,664	$ 5,283	$ 6,890	$ 8,497	$ 10,104	$ 11,711	$ 13,318	$ 14,924
	$ 35.00	$ 882	$ 3,670	$ 6,623	$ 8,565	$ 10,507	$ 12,449	$ 14,391	$ 16,333	$ 18,275
	$ 36.00	$ 1,552	$ 4,675	$ 7,963	$ 10,240	$ 12,517	$ 14,794	$ 17,071	$ 19,348	$ 21,625
	$ 37.00	$ 2,222	$ 5,680	$ 9,303	$ 11,916	$ 14,528	$ 17,140	$ 19,752	$ 22,364	$ 24,976
	$ 38.00	$ 2,892	$ 6,685	$ 10,644	$ 13,591	$ 16,538	$ 19,485	$ 22,432	$ 25,379	$ 28,326
	$ 39.00	$ 3,562	$ 7,690	$ 11,984	$ 15,266	$ 18,548	$ 21,830	$ 25,112	$ 28,395	$ 31,677
	$ 40.00	$ 4,232	$ 8,695	$ 13,324	$ 16,941	$ 20,558	$ 24,176	$ 27,793	$ 31,410	$ 35,027

Figure 3- Conversion Decision Matrix

Figure 3 also illustrates how larger buildings[16] are more likely to convert at a smaller price difference. At any average price above $30/MMBTU, Aurora is likely to begin losing its largest customers, which represent the vast majority of Aurora's sales.

[16] Cost data for large buildings is not directly available. If economies of scale continue past 2000 ft^2, even smaller price deltas than shown may encourage conversion of large users.

Financial Analysis

Corporate structure

Aurora is affiliated with Usibelli through supply agreements and a common registered agent. However, the companies are independently owned and managed. Aurora is not a subsidiary of Usibelli. Here are the ownership interests listed on the business records filed with the Department of Commerce[17]:

Aurora Energy, LLC.	
Estate of Rosalie Whyel	34%
Joseph Emil Usibelli Administrative Trust	44%
Joseph Usibelli	6%
Other minority owners	16%

Usibelli Coal Mine	
Anna Tavener	8%
Catherine Usibelli	9%
Estate of Rosalie Whyel	7%
Joseph E Usibelli Jr.	11%
Julia Whyel	7%
Mitchel Usibelli	8%
Richard Abel	7%
Robert Usibelli	8%
Roslyn McMillan	7%
Sean Usibelli	8%
Shelley Heizer	7%
Other minority owners	16%

Figure 4 - Ownership Comparison

There are some overlapping business interests between the companies, but it is not sufficient to be considered a vertically integrated business operation. As Usibelli is the only

[17] https://www.commerce.alaska.gov/cbp/main/search/entities

supplier of coal in the state, Aurora would be required to purchase its fuel from Usibelli regardless of ownership.

Balance Sheet

The following is a summary of Aurora's balance sheet for the past three years:

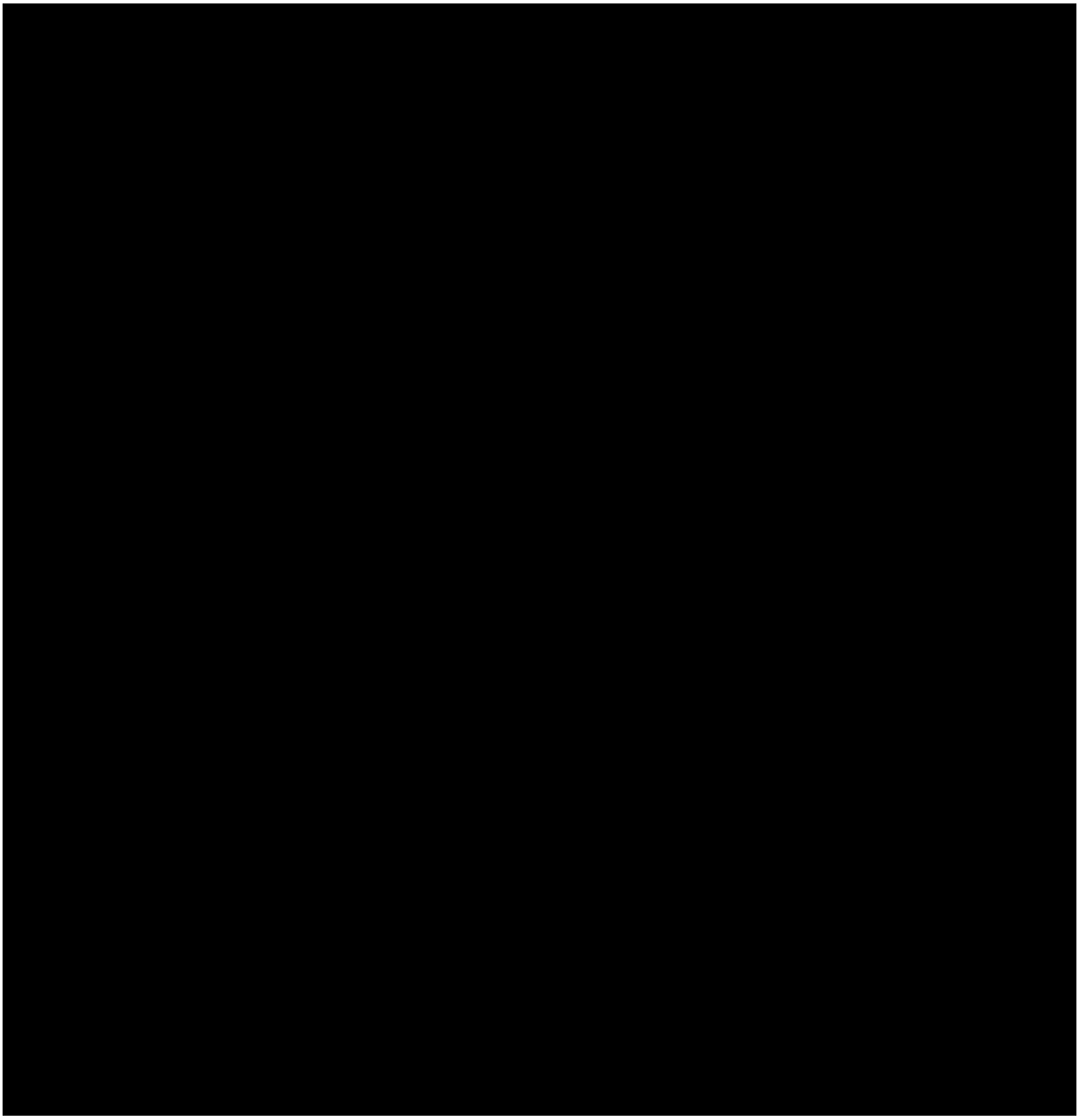


Figure 5 -Balance Sheet

[redacted]

[18] https://hbr.org/2015/07/a-refresher-on-debt-to-equity-ratio

Income statement

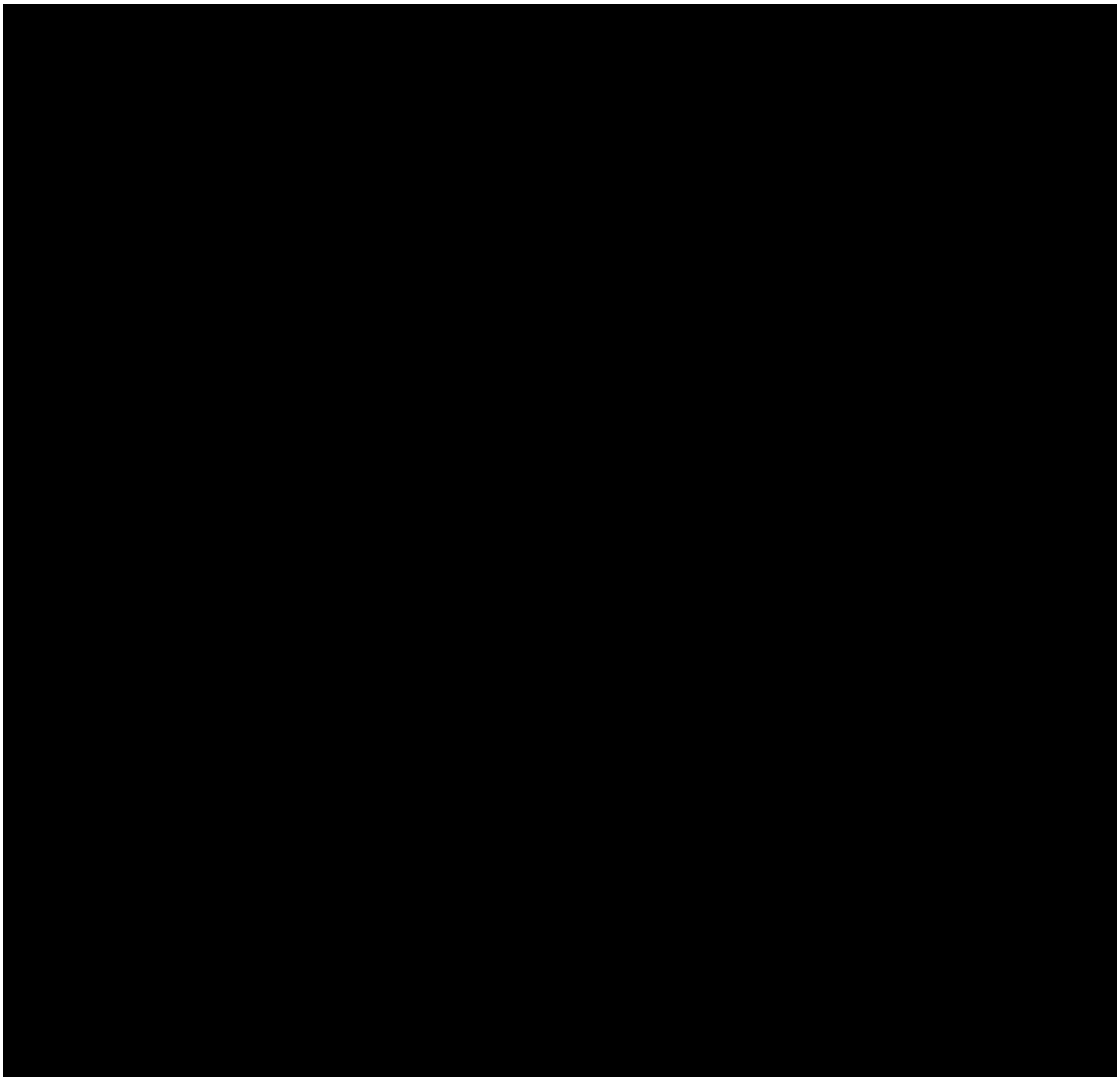


Figure 6 - Income statement

Operating Profit Margin

[redacted]

Total Profit Margin

[redacted]

Cash flows

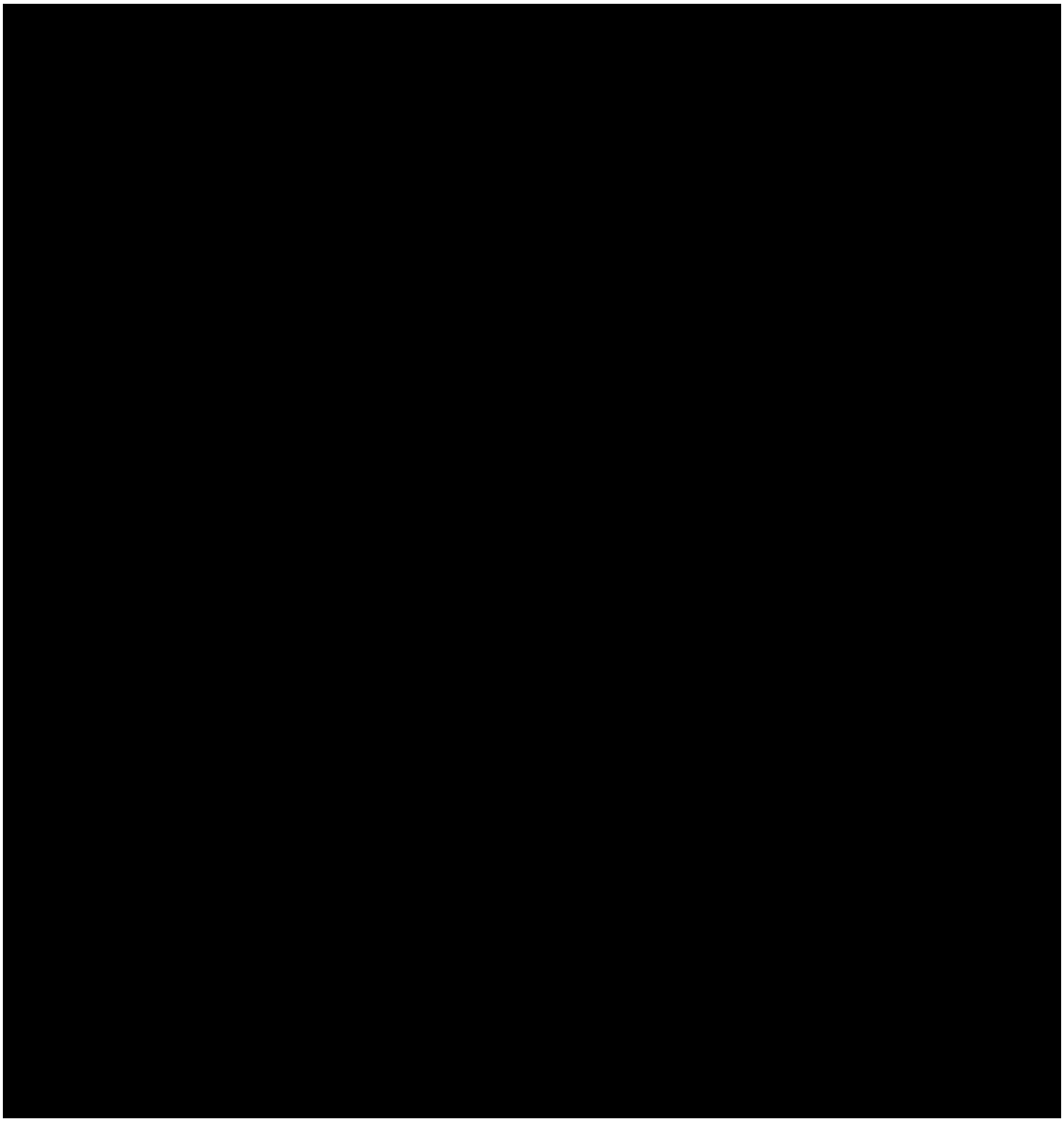


Figure 7 - Cash Flows

[redacted]

DSI Cost Estimates

Discussion

Aurora engaged Stanley Consultants to provide an opinion of probable costs for installing DSI technology. The report was completed in 2019 and updated in 2023. This report relies on the Stanley Consultants report.

The EPA has suggested that Aurora pays for two vendor quotes for each control technology. To date, there are no cost estimates for technologies deemed economically infeasible by ADEC. Preliminary values were previously estimated using spreadsheets prepared for the EPA. The EPA dismissed those cost estimates as unreliable.

There is no data available to assess these alternative BACT options in this report. However, a finding that DSI is unaffordable necessarily eliminates any higher cost option as unaffordable as well — without the need for direct analysis.

Capital Costs

The capital costs required for DSI installation include updates to existing infrastructure to offload the sorbent, constructing silos for storing the sorbent, adding infrastructure to move the

sorbent to the injection point, and the installation of the injection system itself. The total cost for the system, along with the structural, mechanical, and electrical alterations necessary to implement it, was estimated to cost $82.5 million. The following table shows the estimated costs by category.

Capital Costs (Stanley Report)		
(+) Purchased Equipment and Material Cost (PEMC)	$	9,613,257
(+) Direct Installation Costs (DIC)	$	36,317,579
(=) Total Direct Costs (TDC)	**$**	**45,930,836**
(+) Engineering, Construction Support	$	23,468,908
(+) Profit	$	6,191,604
(+) Bond	$	742,993
(+) Performance Testing	$	20,000
(+) Contingency	$	6,191,604
(=) Total Indirect Costs (TIC)	**$**	**36,615,109**
TOTAL CAPITAL INVESTMENT (TCI) = TDC + TIC	**$**	**82,545,945**

Figure 8 - Capital Cost Estimate

Operating costs

Stanley Consultants also prepared an incremental operating cost estimate within its report. This report uses those same values for consistency.

The primary incremental operating cost for the DSI system is the cost of the reagent. The price of sodium bicarbonate fluctuates and is difficult to price. An estimate from BACT Process Systems, Inc. estimates a cost of $563 per ton of sodium bicarbonate, including transportation costs[19].

[19] Email correspondence

The amount of sorbent required for the CPP was estimated to be 725 pounds per hour in the Stanley report. This equals 3,178 tons per year, which equates to an estimated delivered cost for sorbent of $1.8 million per year.

An additional cost will be incurred to dispose of the removed sulfur. Stanley Consultants estimate the incremental waste ash production from the DSI to be 2,930 tons per year. Utilizing a waste disposal site under Aurora ownership would cost an estimated $44 per ton[20], bringing the disposal cost estimate to $128,931 per year.

Next, the new DSI system will require additional labor to operate. The facility's average fully burdened cost for a first-year operator is $145,017 per year[21]. Adding two operators to the plant staff to manage the DSI system would add labor cost of $290,034 annually. However, this report uses the much more conservative estimate of $52,107 based on the Control Cost Manual guidance.

Finally, calculating the estimated annualized capital recovery calculation yields $7,680,948 per year. This calculation assumes an 8.5% interest rate spread over a 30-year life of capital assets. While actual debt terms are likely less favorable, the report uses the EPA methodology.

In total, the incremental annual operating, maintenance, and capital recovery cost associated with installing the DSI is expected to be $13.3 million per year.

[20] Aurora estimate
[21] Total labor costs for a first-year operator under current labor contract

Operating Costs (Stanley Report)		
(+) Reagent	$	1,787,807
(+) Utilities	$	383,375
(+) Labor	$	52,107
(+) Maintenance	$	24,236
(=) Total Direct Annual Costs (TDAC)	**$**	**2,247,525**
Interest Rate		8.5%
Term		30
Capital Recovery Factor		0.0931
(+) Annualize Capital Recovery	$	7,680,948
(+) Overhead	$	45,806
(+) Administrative	$	1,650,919
(+) Property Tax	$	825,459
(+) Insurance	$	825,459
(=) Total Indirect Annual Costs (TIAC)	**$**	**11,028,591**
TOTAL ANNUALIZED COST (TAC) = TDAC + TIAC	**$**	**13,276,116**

Figure 9 - Operating Cost Estimate

Impact Analysis

As demonstrated in the financial analysis, it is very unlikely that Aurora could raise the required capital to install the DSI system. Nonetheless, the EPA implementation rule requires an analysis of the business impacts to determine affordability. The following analysis is meant to satisfy that requirement.

Cost to Sales Ratio

Specific to the question of affordability, the EPA might consider evaluating a company's cost-to-sales ratio as a measure of regulatory burden. The sales ratio represents the percentage of a company's revenues required to pay for the best available control technology, which gives an idea of how large a burden the BACT places on a private company relative to the size of the business.

A ratio larger than 100% represents a cost that is greater than the company's gross margin, meaning that the company doesn't generate enough revenue to pay for the cost of compliance alone — even before considering payroll, materials, utilities, etc. A ratio larger than the company's operating margin implies that the BACT would push the company into negative net operating revenue, leading to a shutdown decision.

[redacted] The annualized cost of compliance is estimated to be $13,276,116. The simple division results in an annual cost-to-sales ratio of [redacted]

Doing a similar calculation considering all the costs over the life of the BACT, and assuming no change in revenues, results in a discounted cost to sales ratio. Making this calculation assumes a 30-year life of the control technology and an 8.5% discount rate[22]. [redacted] On the expenditure side, the net present value of annual costs amounts to $65,241,480. Adding the capital cost estimate of $82,545,945, which is already in net present value terms, results in total discounted costs of $147,787,425. [redacted]

Such a high cost-to-sales ratio represents an expenditure that is clearly unaffordable.

[22] For consistency, this discount rate matches the rate at which the annualized capital recovery was calculated.

Baseline

This analysis uses the average of each business unit during the last three years to establish a baseline. Each of the scenarios below is compared to the baseline to determine the price required to cover the cost of operations. The price should be compared to the market price to determine the ability to pass the incremental cost onto the customer base. [redacted]

Baseline Breakeven Prices

Evaluating each cost component for correlation with changes in production volume demonstrates which costs are fixed and which are variable. The cost of coal is the only definable variable cost within the available data.

Coal cost is completely dependent on the quantity of power Aurora generates. Other cost categories that would be assumed to be variable are operating and labor costs[23]. However, the data shows insufficient correlation to justify the assumption. Therefore, we cannot reject the null hypothesis that a correlation does not exist.

The cost of coal is not dependent on the quantity it purchases from Usibelli. As such, dividing the average cost of coal by the average power generation provides the marginal cost of supply. [redacted]

[23] Given the relatively small crew, hiring and layoffs are not feasible to adjust for production variation. Therefore, the variable component is restricted to overtime.

[redacted]

Because heat is a byproduct of the electrical generation process, reducing heat sales does not result in fewer tons of tons being purchased. Therefore, the electric side has a marginal cost associated with coal while the heat side does not. The implication is that 100% of every MMBTU sold as heat is a producer surplus.

[redacted]

DSI impacts

The additional costs associated with installing a DSI system were defined in the cost analysis. The capital cost was estimated at $82.5 million with incremental operating cost increase of approximately $13.3 per year, including capital recovery.

In the scenarios that follow, the cost of power to run the DSI system are modeled explicitly as reduced power sales. The result is a shift of these costs from a direct expenditure to

an indirect revenue loss. The auxiliary power required to run the DSI system is estimated to be 2,735,960 kWh per year[24].

Electric customer response

In the following scenarios, there is no demand response to a price increase of generated power. This assumption is based on the fact that no viable alternatives exist for end users, causing the demand for power from GVEA to be perfectly inelastic.

Electric Supply Response

As the cost of power generation increases, the supply curve will shift. In this case, Aurora is the only major GVEA supplier facing the DSI cost increase. All other purchased power is generated outside the nonattainment area. Therefore, as illustrated in figures 12 and 14, the power supply from Aurora will move up the curve and all suppliers above Aurora's current price will shift left.

GVEA will purchase all power available to the left of its demand curve. If the price of the cheapest competitor with adequate capacity is below Aurora's price, Aurora's power is no longer economically attractive to GVEA[25]. Consequently, the power sales from Aurora would fall to zero.

---

[24] Estimate provided by Aurora Energy

[25] This report focuses purely on the financial considerations. Additional value metrics may exist. For example, GVEA members may be willing to pay more for lower carbon emission generation. The value of that preference is not monetized is this report.

Heating customer response

Heating customers have some elasticity of demand. It exists in the ability to turn down the heat or run a secondary device. There is a demand response built into the scenarios to account for that elasticity. The magnitude of the response used in this report relies on the determination found in a research paper by Hirst, Goeltz, and Carney previously mentioned. They estimated the own-price demand elasticity at 0.2 — A 2% decrease in consumption per 10% increase in price.

Scenario 1: DSI cost placed completely on heat business

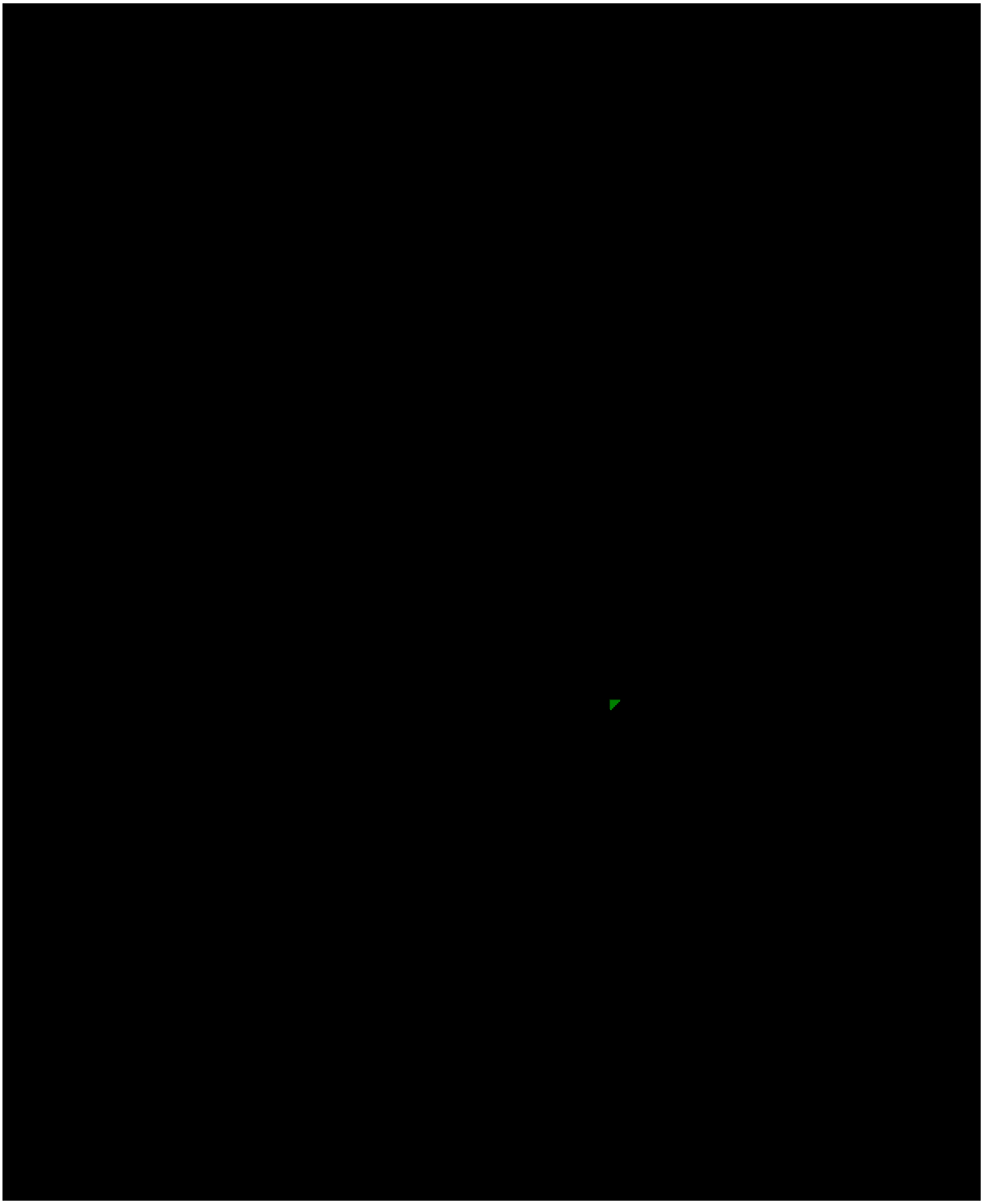


Figure 10 - Scenario 1 Results

[redacted]

Scenario 2: DSI cost fully on Electric

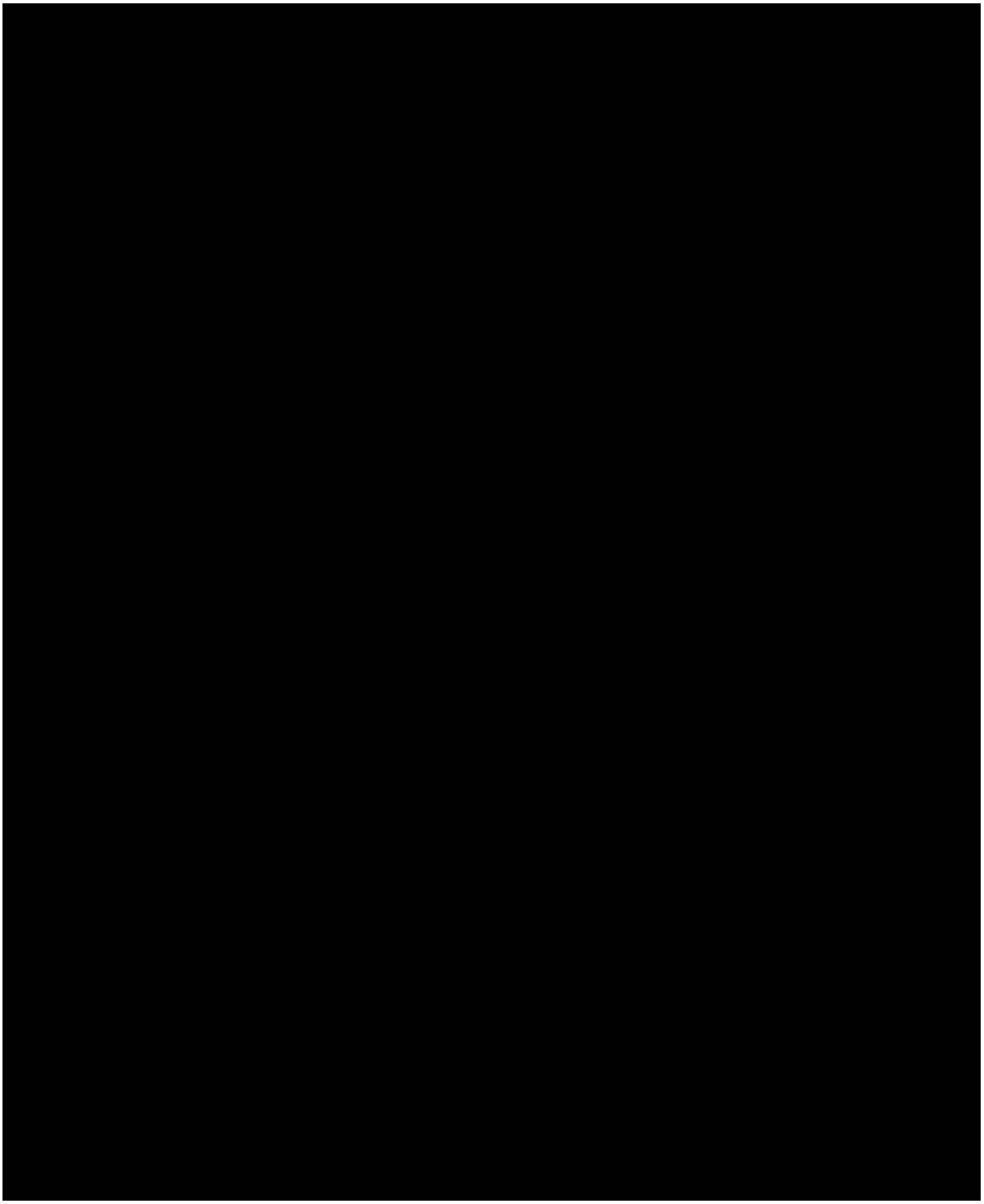


Figure 11 - Scenario 2 Results

[redacted]

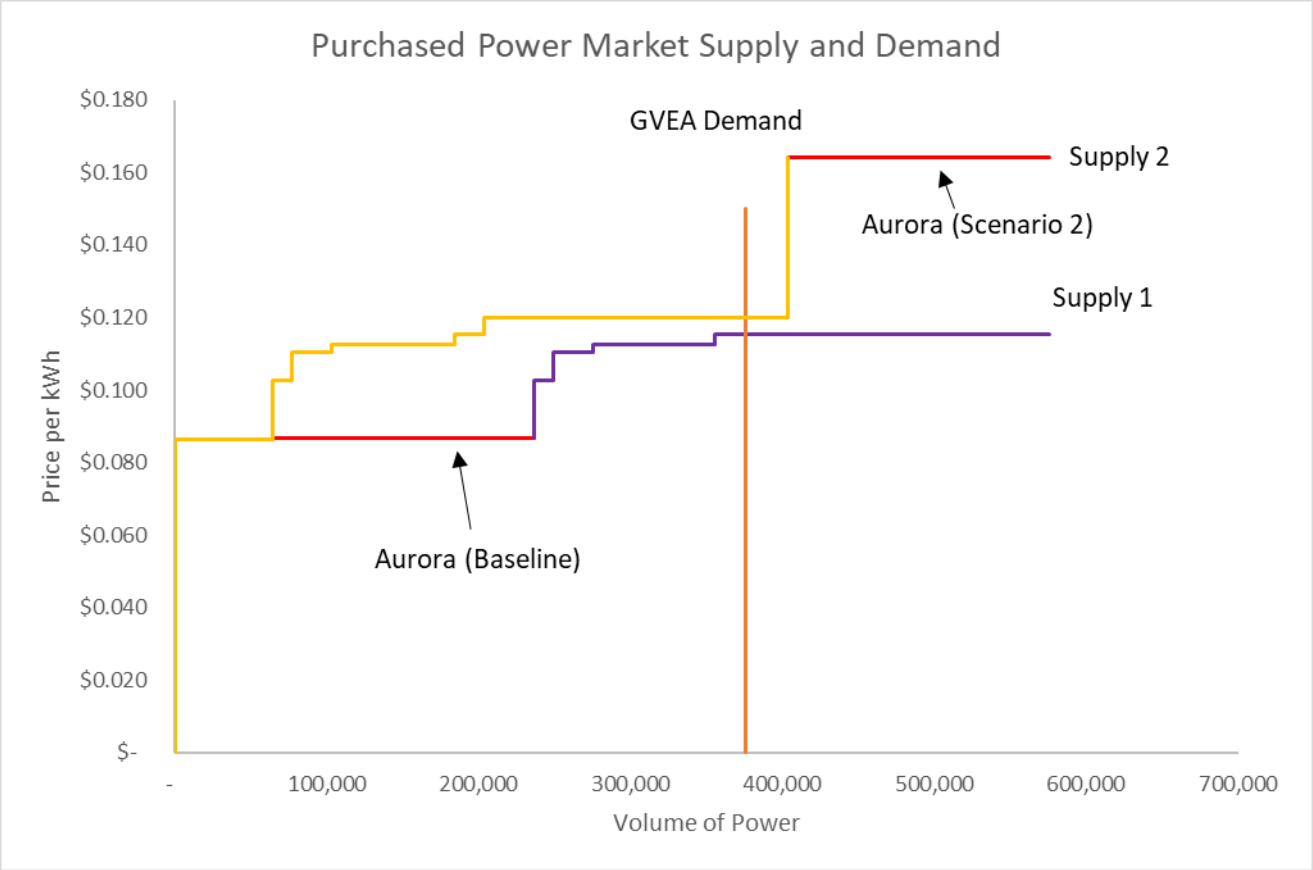


Figure 12 - Scenario 2 Market Adjustment

As seen in Figure 12, the resulting price of this scenario is more expensive than what GVEA currently pays to the Alaska Energy Authority (AEA), Matanuska Electric Association (MEA), Chugach Electric (CE), the University of Alaska Fairbanks (UAF), or Homer Electric Association (HEA).

Given that Aurora loses its competitive edge due to the asymmetric cost increase, GVEA would logically seek alternatives. Assuming there is enough power available from the intertie to

replace Aurora's contribution at $0.12/kWh[26], this scenario prices Aurora out of the market. If there is not sufficient capacity, GVEA would likely be better off building new generating capacity rather than paying Aurora's adjusted price of over $0.16/kWh.

[26] Many parallel efforts are underway to expand the supply of natural gas to the southcentral utilities. It is a reasonable assumption that the expanded supply will allow expanded generation to ship up the intertie.

Scenario 3: DSI cost shared between heat and power

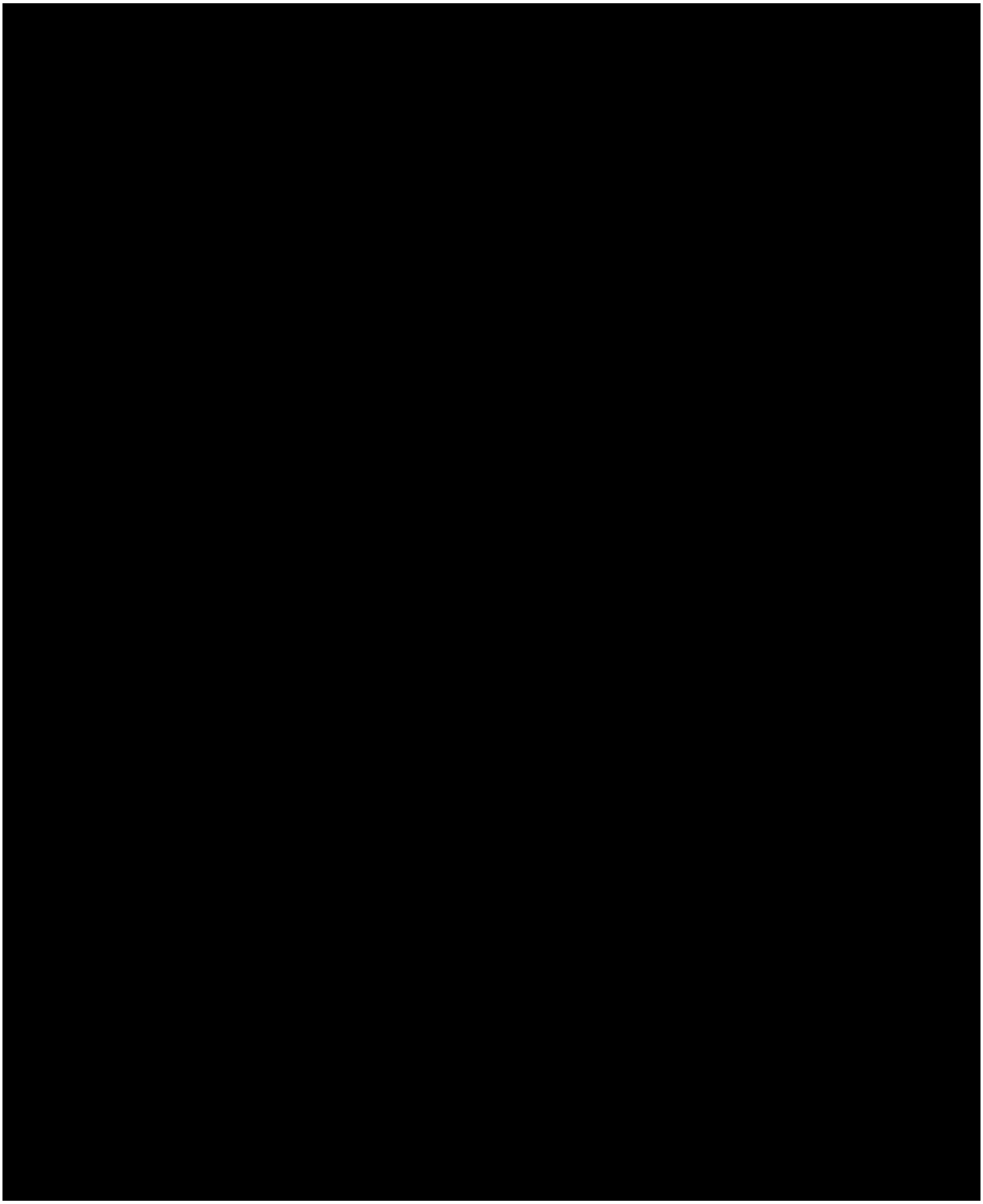


Figure 13 - Scenario 3 Results

[redacted]

Figure 14 shows where Aurora fits on the supply curve in this scenario. As shown, it becomes more expensive than AEA, MEA, and CE at this price point. Consequently, GVEA would have an incentive to seek increased power supply from existing suppliers.

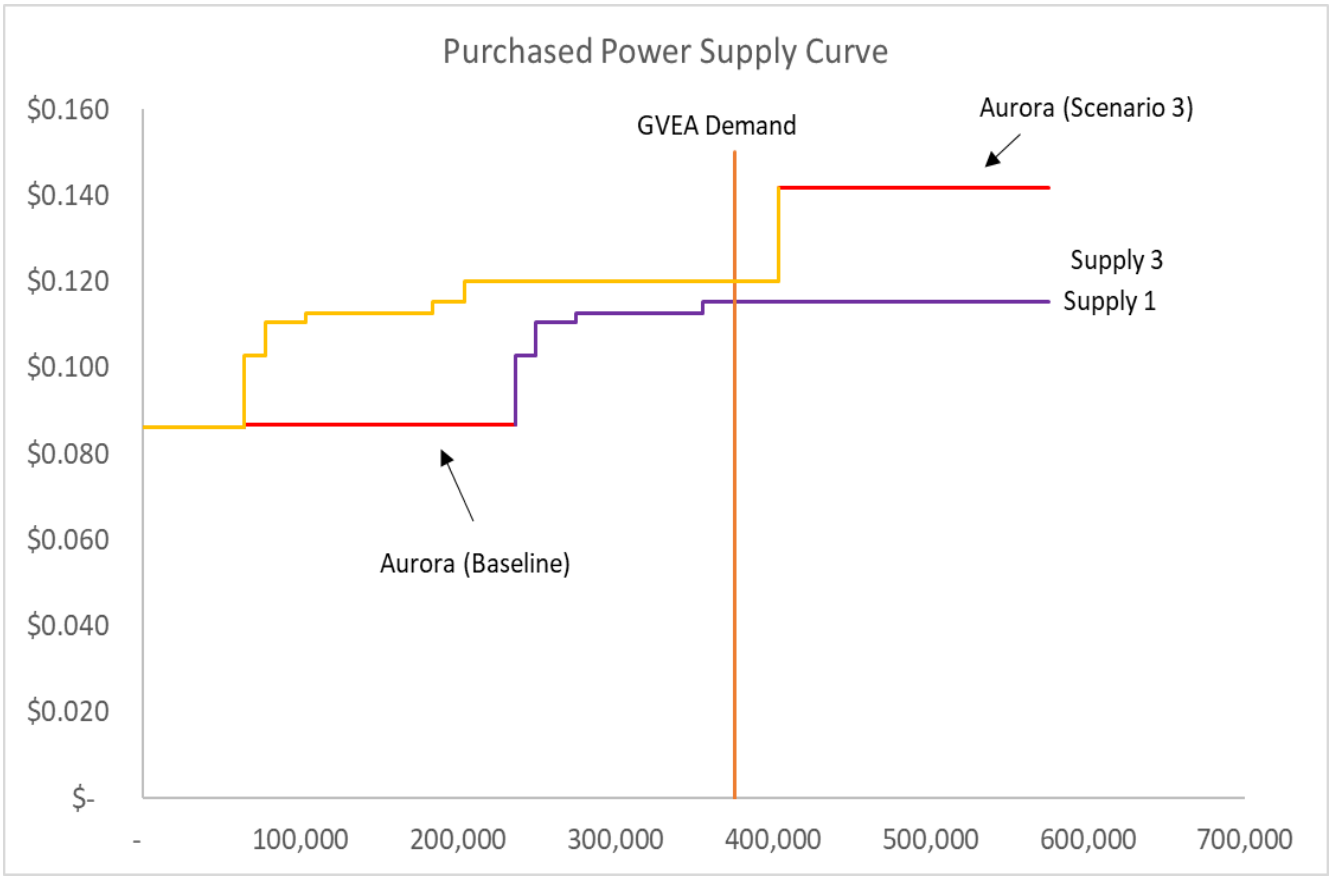


Figure 14 - Scenario 3 Electric Supply Shift

[redacted]

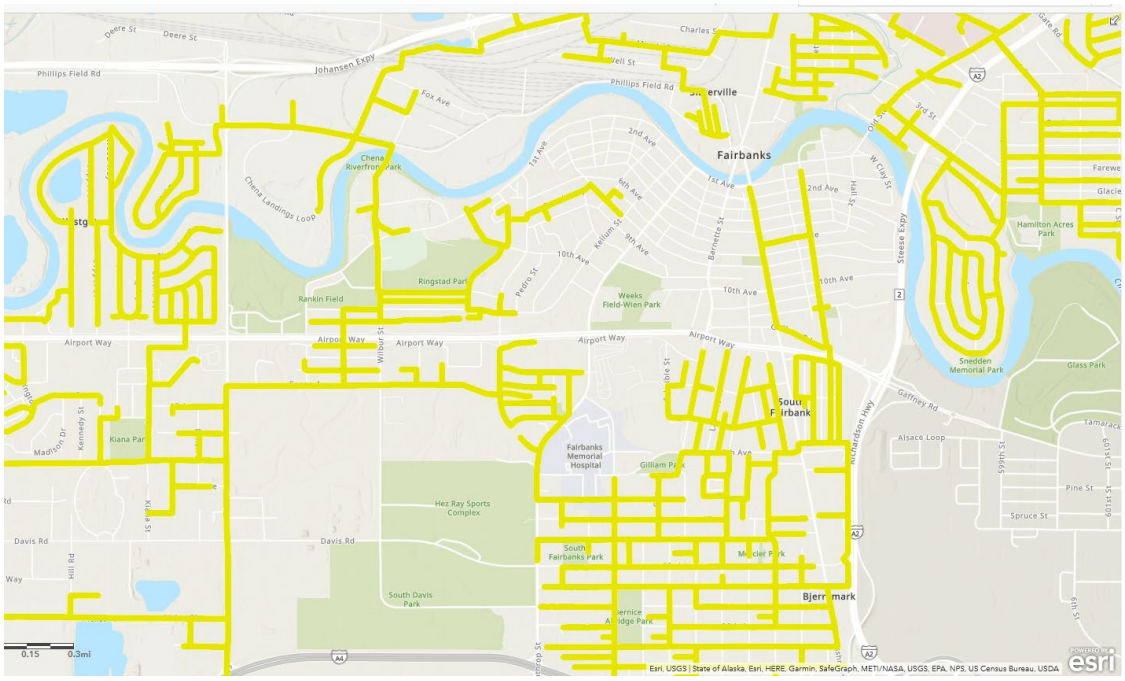


Figure 15 - IGU Distribution System[27]

The Fairbanks natural gas delivery system overlaps the entirety of Aurora's hot water systems but not the steam heat system in the downtown core. Downtown customers' only

[27] https://www.interiorgas.com/maps/

viable option is to install a heating oil system if they desire to switch away from steam heat. It may appear that district steam heating would remain marginally competitive with heating oil. However, as the hot water system customers move to natural gas, the steam heat customers must make up for the lost revenue.

[redacted]

Conclusion

According to the EPA and ADEC, DSI technology appears to pass the economic feasibility test based on cost-effectiveness. After evaluating Aurora's financial statements, along with the capital and operating costs of installing a DSI system, it is clear that the technology is unaffordable for Aurora specifically. [redacted]

[redacted]

[redacted]

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION

CONFIDENTIALITY OF RECORDS APPLICATION AND CERTIFICATION

STATE OF Alaska)
: **ss.**
Fourth **JUDICIAL DISTRICT**)

Applicants Name David Fish
Applicants Title Environmental Manager
Representing Aurora Energy, LLC
Address 100 Cushman Street, Suite 210, Fairbanks, AK 99701
Telephone 907-457-0230
Facsimile _____

In accordance with the provisions of the Alaska Statute dealing with confidentiality of records (AS 46.14.520), application is hereby made to the Alaska Department of Environmental Conservation to protect the following records from public disclosure, and consider these records to be confidential records of the department, for a period of indefinite years, unless the applicant gives prior written approval for disclosure to a third party. I understand that records, reports, and information, and parts of records, reports, and information that contain emissions data are public records and must be disclosed upon request.

RECORDS SUBJECT TO AS 46.14.520:

Aurora Energy, LLC BACT Affordability Analysis

I hereby certify, under oath, that (1) public disclosure would tend to adversely affect the owner's and operator's competitive position; and (2) the records, reports, or information, or parts of the records, reports or information, would divulge production figures, sales figures, processes, production techniques, or financial data of the owner and operator that are entitled to protection as trade secrets under AS 45.50.910 – 45.50.945 (Alaska Uniform Trade Secrets Act).

I further certify that I have authority to apply on behalf of Aurora Energy, LLC.

David Fish
Applicant's Signature

THIS CERTIFIES that on this 26th day of January, 2024, David Fish appeared before me, a notary public in and for the State of Alaska, for the purposes stated herein.

IN WITNESS WHEREOF, I have affixed my signature and seal on the day and year first above written.

NICOLE E. GARCIA
Notary Public
State of Alaska
My Commission Expires
April 01, 2024

Notary Public, State of Alaska
My commission expires: 04/01/2024

January 26, 2024

Subject: Aurora Energy, LLC's (Aurora) Supplemental Best Available Control Technology (BACT) Analysis Addendum.

The Environmental Protection Agency (EPA) released the Air Plan Partial Approval and Partial Disapproval of Alaska's Fairbanks North Star Borough 2006 24-Hour $PM_{2.5}$ Serious Area and 189(d) Plan on January 10, 2023. The EPA's proposed rule addresses and disapproves the State Implementation Plan's (SIPs) Best Available Control Technology (BACT) determination for point sources including Aurora's Central Heat and Power Plant (CHPP). The Alaska Department of Environmental Conservation (ADEC) determined that BACT for the facility was Dry Sorbent Injection (DSI) after evaluating several technologies using the EPA's own Integrated Planning Model (IPM). The EPA has indicated that use of the IPM model to determine capital cost isn't relevant, stating "vendor quotes for cost analyses for wet flue gas desulfurization (WFGD) and spray-dry absorbers (SDA) were not based on study-level vendor quotes", and that "preparation of a revised BACT analysis based on +/-30%, study-level cost information" would allow a greater likelihood of an approvable BACT determination by the EPA.

On December 5, 2023, EPA published a final rule[1] approving in part and disapproving in part the Serious $PM_{2.5}$ SIP. ADEC withdrew the SO_2 BACT determinations for the stationary sources, including the Chena Power Plant, in a letter to EPA Region 10 dated September 25, 2023.[2] In the preamble to the final rule, EPA references the withdrawal of the SO_2 BACT determinations from the Serious $PM_{2.5}$ SIP and states that because the Serious SIP does not identify, adopt, or implement BACT for SO_2, EPA has finalized partial disapproval of the SIP. Prior to the final disapproval, the EPA reviewed the BACT analysis from the major sources and has also independently performed their own cost effectiveness calculations and collected information from suppliers of DSI equipment and sorbent. These efforts have resulted in the conclusion that the current performance standard for a DSI system is 95% sulfur capture efficiency. Based on the information that they have collected; the EPA has requested that Aurora Energy revise their assessment to account for a DSI system with a 95% capture efficiency as opposed to the 80% efficient system previously provided. The EPA has also requested that Aurora Energy evaluate the technical feasibility of the other sulfur control technologies specifically with respect to the size of the equipment and the available space on plant property.

While Aurora believes that the existing Alaska Serious SIP SO_2 BACT determinations for EUs 4 through 7 reach the correct conclusions. Aurora is submitting this supplemental SO_2 BACT analysis for EUs 4 through 7 to provide ADEC with updated information to support the existing SO_2 BACT determinations for a future SIP submittal to the EPA.

[1] FR Vol. 88, No. 232, December 5, 2023.

[2] Letter from Emma Pokon, ADEC, to Casey Sixkiller, EPA Region 10, dated September 25, 2023. Docket Document ID EPA-R10-OAR-2022-0115-0428.

Aurora is also providing, as an enclosure, an affordability analysis which supports the economic infeasibility of Aurora to implement SO_2 BACT. A report was prepared to satisfy the EPA's request for a more comprehensive picture of Aurora's financial capacity. The report also evaluates the economic viability of Aurora given the current and projected customer base. Per the EPA, an unaffordability declaration places a burden on the source owner to provide the basis for the regulating agencies to consider[3]. The provided document does just that. Due to the sensitive nature of Aurora's finances, the assessment is being provided both as an unredacted and redacted version so that certain business information can remain confidential. Provided with the document is a Confidentiality of Records Application and Certification Form.

The irony of this supplemental BACT submittal is that the ADEC, as mentioned, has withdrawn the SO_2 BACT determinations for the stationary sources. In its stead, the ADEC will be providing EPA with an SO_2 precursor demonstration that will "indicate the major point sources within the Nonattainment Area do not significantly contribute to the particulate matter pollution during winter-time episodic conditions".[4] If the determination is accepted by the EPA, that would eliminate the need for any assessment of control technologies for the major point sources. Aurora is providing the additional documentation in support of a BACT analysis, justifying DSI as BACT, and an economic infeasibility determination as preemptive measures in the event the EPA does not find the proposed SO_2 precursor demonstration compelling enough evidence to not mandate sulfur emission controls for the major sources within the area.

Please feel free to contact me with any questions regarding the material provided. I can be reached at dfish@usibelli.com or by phone at (907) 457-0230.

Regards,

David Fish

David Fish
Environmental Manager
Enclosure(s):

1 – Best Available Control Technology Analysis, Independent Assessment of Technical Feasibility and Capital Cost Addendum #1.

2 – Supplemental Sulfur Dioxide Best Available Control Technology Analysis, Rev. 1.

3 – Aurora Energy, LLC BACT Affordability Analysis.

[3] https://www.govinfo.gov/app/details/FR-2016-08-24

[4] Letter from Jason Brune, to Casey Sixkiller, EPA Region 10, dated July 24, 2023.

ADEC by: Moses Coss 10/25/23

Preliminary analysis of Aurora's claim that a DSI retrofit requires the replacement of the existing baghouse with a larger one.

Background: Stanley Group Consultants determined that the current baghouse is 10-15% undersized by modern standards. This was determined based on the specifications of the existing baghouse:

Flakt Inc

R. J. REYNOLDS TOBACCO COMPANY
BAILEY UTILITY PLANT
OPERATION AND MAINTENANCE MANUAL
DESIGN DATA

Project 615
March 31, 1987
SECTION 3
Page 3-1

3.0 DESIGN DATA

3.1	Gas Flow Capacity, ACFM	- 250,000
3.2	Temperature of Dust Laden Gases, °F	- 350
3.3	Type of Filter Bag	- Woven Fiberglass FMD-648E
3.4	Number of Modules	- 11
3.5	Number of Branch Headers per Module	- 19
3.6	Number of Bags per Branch Header	- 14
3.7	Total Number of Bags per Module	- 266
3.8	Total Square Feet of Filter Cloth	- 61,153
3.9	Air-to-Cloth Ratio:	
3.9.1	All Modules On Line	- 4.09:1
3.9.2	One Module Off Line for Cleaning	- 4.50:1
3.10	Recommended Pressure Drop Across Cloth, Inches of W.G.	- 3 - 6
3.11	Type of Dust	- Fly Ash
3.12	Design Pressure Inches of W.G.	- ± 25
3.13	Dry Compressed Air Pressure PSIG	- 100

From Flakt spec above:

ACFM: 210,000 @ 350°F & 5" H_2O ± 5" H_2O

A/C: 4.5:1 (max. during cleaning cycles)
: 4.0:1 (all modules on line)

From the Operating Permit for the Chena Power Plant:

Boiler Ratings: Chena 1: 76.8 MMBtu/hr
Chena 2: 76.8 MMBtu/hr
Chena 3: 76.8 MMBtu/hr
Chena 5: 254 MMBtu/hr
total: 485.1 MMBtu/hr

max.
Flue gas flowrate from boilers ($Flow_T$)

F-factor from EPA Method 19:

F_w = 10,640 scf/10^6 Btu (bituminous coal)

$$Flow_T = 485.1 \frac{MMBtu}{hr} \times \frac{10,640}{10^6 Btu} \times \frac{10^6 Btu}{MMBtu} = 5,161,464 \frac{scf}{hr}$$

$$5,161,464 \frac{scf}{hr} \times \frac{hr}{60 min} = 86,024 \frac{scf}{min}$$

Converting to non-standard conditions assuming ideal gas: $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \Rightarrow V_2 = \frac{P_1 V_1}{T_1} \cdot \frac{T_2}{P_2}$

@ outlet conditions (-5" H_2O)

$$V_2 = \frac{1 atm \cdot 86,024 scf}{(70°F + 460) R} \cdot \frac{(350°F + 460) R}{(406.8 - 5)" H_2O} \times \frac{406.8" H_2O}{atm}$$

V_2 = 133,107 cfm (stoichiometric exhaust flow)

Adjustment for excess air:

$$\%\ \text{Excess Air} = \frac{\%\ O_2}{20.9 - \%\ O_2} \times 100$$

From 10/12/21 source test: Avg $\%\ O_2 = 7.3\%$

⇒ % Excess Air @ $7.3\%\ O_2$:

$$\%\ \text{Excess air} = \frac{20.9}{20.9 - 7.3} \times 100\% = 153.7\%$$

(cross air correction factor)

Total exhaust flow = stoichiometric flow × 1.54

= 133,107 scfm · 1.54

= 204,554 acfm

Adjusting for higher A/C ratio:

4:1 → 4.5:1 ≈ 12% increase

204,554 acfm · 1.12 = 229,100 acfm

Since 229,100 < 250,000 acfm, the existing bag house should accommodate the more conservative A/C ratio.

Additional Loading from potential DSI Controls at the Chena Power Plant

Prepared on: 10/10/2023

Stationary Source: Aurora Energy, LLC - Chena Power Plant by: Moses C.

Analysis Description:

Preliminar worst case scenario estimate of additional particulate matter processed by baghouse system from DSI using NaHCO3 at the Chena Power Plant, considering the highest expected sulfur content in the coal received at the Power Plant. A more realistic estimate will take into account excess unreacted NaHCO3, and other solid compounds derived from non-targeted compounds such as halogenated compounds.

Assumptions:

% S content in coal:	0.25	
Chemical fate reaction for S:	Na2SO4	
% Natural S retention:	0	(~10? due to presence of naturally occuring Na, Ca, Al and Si compounds in the coal)
% Target Control Efficiency:	90	
Excess NaHCO3 (wt%):	5	(pending additional research)
% Fly Ash from total ash:	80	(Canpolat, 2011) (pending additional research)
% of NaHCO3 into fly ash:	100	

Controlling stoichiometric Reaction: $2\ NaHCO_3 + SO_2 + \frac{1}{2}\ O2 \rightarrow Na_2SO_4 + 2\ CO_2 + H_2O$

Weighted Average Summary of Rail Sample Analysis reported in 1H23 FOR March, 2023 (highest month reported in FOR):

Tons of coal:	**21677**
Btu/lb:	7655
H2O %:	32.01
Ash %:	4.64
Volatiles %:	35.84
Carbon %:	27.51
Sulfur %:	0.09

Mol. Weight		
M S:	32.06	g/mol
M SO2:	64.066	g/mol
M Na2SO4:	142.04	g/mol
M NaHCO3:	84.007	g/mol

Based on the month of March 2023 and a potential of 0.25 % S									
tons of coal/month	**tons of ash/month**	**%S**	**Tons S/month**	**tons S/day**	**Moles SO2/day**	**tons/day of Na2SO4**	**Unreacted NaHCO3 ton/day**	**tons ash/day**	**% of Na2SO4 to ash (day avg)**
21677	804.65024	0.25	54.2	1.7	24754.4	3.5	0.2	26.8	**13.77**

Date	Cars	BTU/lbs	ASH percentage	Tons	tons total	pounds of ash	total btu output	btu/lbs of ash	lbs ash/mmbtu	check
1/4/2023	10.00	7667.00	4.59	879.55						
1/9/2023	12.00	7653.00	6.02	1030.60						
1/10/2023	9.00	7599.00	6.43	795.85						
1/11/2023	15.00	7556.00	5.91	1380.05						
1/12/2023	11.00	7480.00	6.46	971.90						
1/13/2023	12.00	7636.00	5.07	1080.15						
1/16/2023	15.00	7637.00	4.67	1365.25						
1/17/2023	13.00	7640.00	4.33	1210.10						
1/18/2023	13.00	7628.00	4.99	1164.90						
1/19/2023	13.00	7609.00	5.69	1207.35						
1/20/2023	14.00	7472.00	5.81	1214.35						
1/23/2023	11.00	7696.00	4.82	964.05						
1/24/2023	11.00	7754.00	4.77	943.10						
1/25/2023	11.00	7571.00	5.52	988.40						
1/26/2023	11.00	7694.00	4.68	1000.60						
1/27/2023	11.00	7662.00	4.67	978.25						
1/30/2023	9.00	7768.00	4.18	796.55						
1/31/2023	9.00	7730.00	4.95	807.65						
average	11.67	7636.22	5.20	1043.26	18778.65	108452.4996	15933104937	146913.2108	6.806739807	108452.4996
2/1/2023	8.00	7770.00	4.99	712.20						
2/2/2023	9.00	7753.00	4.20	778.75						
2/3/2023	9.00	7726.00	4.52	812.00						
2/6/2023	10.00	7720.00	4.84	886.90						
2/7/2023	10.00	7697.00	4.55	890.30						
2/8/2023	10.00	7804.00	4.27	910.05						
2/9/2023	11.00	7812.00	4.55	1001.00						
2/10/2023	10.00	7798.00	4.58	903.75						
2/13/2023	10.00	7572.00	5.84	892.10						
2/14/2023	8.00	7749.00	4.83	727.55						
2/15/2023	11.00	7784.00	5.08	978.05						
2/16/2023	10.00	7689.00	5.24	903.55						
2/17/2023	9.00	7712.00	5.23	793.10						
2/21/2023	10.00	7904.00	4.49	900.35						
2/24/2023	12.00	7826.00	4.20	1066.60						
2/27/2023	11.00	7811.00	4.64	949.35						
2/28/2023	12.00	7786.00	5.15	1051.80						
average	10.00	7759.59	4.78	891.61	15157.40	85175.1474	13837080320	162454.4335	6.155572233	85175.1474
3/1/2023	11.00	7757.00	5.24	964.30						
3/2/2023	11.00	7748.00	4.55	979.15						
3/3/2023	12.00	7727.00	4.44	1032.45						
3/6/2023	11.00	7670.00	4.35	951.70						
3/7/2023	11.00	7638.00	4.30	973.65						
3/8/2023	11.00	7597.00	3.87	1001.65						
3/9/2023	10.00	7768.00	4.06	904.15						
3/10/2023	11.00	7509.00	4.07	977.55						
3/13/2023	13.00	7491.00	4.57	1171.25						
3/14/2023	13.00	7567.00	4.80	1125.05						
3/15/2023	8.00	7588.00	4.44	705.80						
3/16/2023	12.00	7667.00	4.94	1082.20						
3/17/2023	12.00	7728.00	4.28	1082.55						
3/20/2023	12.00	7719.00	4.62	1071.95						
3/21/2023	13.00	7666.00	5.01	1180.75						
3/22/2023	12.00	7719.00	4.46	1046.70						
3/23/2023	11.00	7558.00	5.56	1008.75						
3/24/2023	11.00	7737.00	4.54	975.99						
3/27/2023	12.00	7606.00	6.37	1121.05						
3/28/2023	11.00	7756.00	4.69	981.80						
3/29/2023	8.00	7622.00	4.28	722.35						
3/30/2023	7.00	7532.00	3.83	616.50						
average	11.05	7653.18	4.60	985.33	21677.29	90713.16744	15081836675	166258.5168	6.014729465	90713.16744
4/3/2023	3.00	7618.00	3.96	275.70						
4/4/2023	4.00	7545.00	4.82	361.90						
4/5/2023	4.00	7645.00	5.21	357.00						
4/6/2023	4.00	7566.00	5.24	383.50						
4/7/2023	3.00	7574.00	5.54	271.10						
4/11/2023	3.00	7683.00	4.97	263.30						
4/12/2023	3.00	7696.00	4.63	268.45						
4/13/2023	5.00	7790.00	3.62	433.25						
4/14/2023	3.00	7815.00	3.83	276.25						
4/18/2023	14.00	7910.00	4.12	1254.85						
4/19/2023	15.00	7754.00	5.69	1325.75						
4/20/2023	10.00	7217.00	6.70	899.60						
4/21/2023	19.00	7708.00	4.90	1720.15						
4/25/2023	12.00	7562.00	5.77	1022.50						
4/26/2023	13.00	7848.00	3.74	1172.60						
4/27/2023	11.00	7692.00	4.75	992.55						
4/28/2023	9.00	7675.00	3.99	791.35						
average	7.94	7664.59	4.79	709.99	12069.80	68058.63696	10883534951	159914.0893	6.253357688	68058.63696
5/2/2023	14.00	7692.00	4.06	1276.00						
5/3/2023	15.00	7718.00	4.26	1330.35						
5/4/2023	7.00	7702.00	4.58	645.85						
5/5/2023	13.00	7801.00	4.34	1169.05						
5/11/2023	10.00	7668.00	4.55	875.80						
5/12/2023	5.00	7773.00	4.25	449.00						
5/16/2023	4.00	7701.00	4.87	352.60						
5/17/2023	4.00	7807.00	4.74	357.95						
5/18/2023	3.00	7701.00	5.80	269.65						
5/19/2023	3.00	7743.00	5.44	272.90						
5/26/2023	4.00	7892.00	6.41	377.65						
5/30/2023	12.00	7829.00	6.39	1137.40						
average	7.83	7752.25	4.97	709.52	8514.20	70585.08306	11000701158	155850.2262	6.416416739	70585.08306
6/1/2023	13.00	7762.00	5.95	1214.75						
6/2/2023	13.00	7778.00	5.61	1188.95						
6/6/2023	12.00	7810.00	5.50	1147.80						
6/8/2023	13.00	7784.00	5.06	1160.55						
6/9/2023	14.00	7793.00	4.62	1260.40						
6/13/2023	16.00	7604.00	5.51	1468.05						
6/15/2023	16.00	7542.00	5.71	1482.20						
6/16/2023	8.00	7504.00	5.63	736.20						
6/20/2023	23.00	7116.00	5.05	2118.10						
6/22/2023	3.00	7517.00	5.88	269.65						
6/23/2023	4.00	7622.00	5.18	373.10						
6/27/2023	12.00	7832.00	4.22	1049.60						
6/28/2023	12.00	7794.00	4.19	1080.60						
6/29/2023	12.00	7674.00	6.18	1123.75						
6/30/2023	9.00	7652.00	6.31	827.70						
average	12.00	7652.27	5.37	1100.09	16501.40	118223.3636	16836415090	142411.9107	7.021884583	118223.3636
		7910.00								
		7116.00								

Date	Cars	BTU/lbs	ASH percentage	Tons	tons total	pounds of ash	total btu output	btu/lbs of ash	lbs ash/mmbtu	check
1/4/2023	10.00	7667.00	4.59	879.55						
1/9/2023	12.00	7653.00	6.02	1030.60						
1/10/2023	9.00	7599.00	6.43	795.85						
1/11/2023	15.00	7556.00	5.91	1380.05						
1/12/2023	11.00	7480.00	6.46	971.90						
1/13/2023	12.00	7636.00	5.07	1080.15						
1/16/2023	15.00	7637.00	4.67	1365.25						
1/17/2023	13.00	7640.00	4.33	1210.10						
1/18/2023	13.00	7628.00	4.99	1164.90						
1/19/2023	13.00	7609.00	5.69	1207.35						
1/20/2023	14.00	7472.00	5.81	1214.35						
1/23/2023	11.00	7696.00	4.82	964.05						
1/24/2023	11.00	7754.00	4.77	943.10						
1/25/2023	11.00	7571.00	5.52	988.40						
1/26/2023	11.00	7694.00	4.68	1000.60						
1/27/2023	11.00	7662.00	4.67	978.25						
1/30/2023	9.00	7768.00	4.18	796.55						
1/31/2023	9.00	7730.00	4.95	807.65						
2/1/2023	8.00	7770.00	4.99	712.20						
2/2/2023	9.00	7753.00	4.20	778.75						
2/3/2023	9.00	7726.00	4.52	812.00						
2/6/2023	10.00	7720.00	4.84	886.90						
2/7/2023	10.00	7697.00	4.55	890.30						
2/8/2023	10.00	7804.00	4.27	910.05						
2/9/2023	11.00	7812.00	4.55	1001.00						
2/10/2023	10.00	7798.00	4.58	903.75						
2/13/2023	10.00	7572.00	5.84	892.10						
2/14/2023	8.00	7749.00	4.83	727.55						
2/15/2023	11.00	7784.00	5.08	978.05						
2/16/2023	10.00	7689.00	5.24	903.55						
2/17/2023	9.00	7712.00	5.23	793.10						
2/21/2023	10.00	7904.00	4.49	900.35						
2/24/2023	12.00	7826.00	4.20	1066.60						
2/27/2023	11.00	7811.00	4.64	949.35						
2/28/2023	12.00	7786.00	5.15	1051.80						
3/1/2023	11.00	7757.00	5.24	964.30						
3/2/2023	11.00	7748.00	4.55	979.15						
3/3/2023	12.00	7727.00	4.44	1032.45						
3/6/2023	11.00	7670.00	4.35	951.70						
3/7/2023	11.00	7638.00	4.30	973.65						
3/8/2023	11.00	7597.00	3.87	1001.65						
3/9/2023	10.00	7768.00	4.06	904.15						
3/10/2023	11.00	7509.00	4.07	977.55						
3/13/2023	13.00	7491.00	4.57	1171.25						
3/14/2023	13.00	7567.00	4.80	1125.05						
3/15/2023	8.00	7588.00	4.44	705.80						
3/16/2023	12.00	7667.00	4.94	1082.20						
3/17/2023	12.00	7728.00	4.28	1082.55						
3/20/2023	12.00	7719.00	4.62	1071.95						
3/21/2023	13.00	7666.00	5.01	1180.75						
3/22/2023	12.00	7719.00	4.46	1046.70						
3/23/2023	11.00	7558.00	5.56	1008.75						
3/24/2023	11.00	7737.00	4.54	975.99						
3/27/2023	12.00	7606.00	6.37	1121.05						
3/28/2023	11.00	7756.00	4.69	981.80						
3/29/2023	8.00	7622.00	4.28	722.35						
3/30/2023	7.00	7532.00	3.83	616.50						
4/3/2023	3.00	7618.00	3.96	275.70						
4/4/2023	4.00	7545.00	4.82	361.90						
4/5/2023	4.00	7645.00	5.21	357.00						
4/6/2023	4.00	7566.00	5.24	383.50						
4/7/2023	3.00	7574.00	5.54	271.10						
4/11/2023	3.00	7683.00	4.97	263.30						
4/12/2023	3.00	7696.00	4.63	268.45						
4/13/2023	5.00	7790.00	3.62	433.25						
4/14/2023	3.00	7815.00	3.83	276.25						
4/18/2023	14.00	7910.00	4.12	1254.85						
4/19/2023	15.00	7754.00	5.69	1325.75						
4/20/2023	10.00	7217.00	6.70	899.60						
4/21/2023	19.00	7708.00	4.90	1720.15						
4/25/2023	12.00	7562.00	5.77	1022.50						
4/26/2023	13.00	7848.00	3.74	1172.60						
4/27/2023	11.00	7692.00	4.75	992.55						
4/28/2023	9.00	7675.00	3.99	791.35						
5/2/2023	14.00	7692.00	4.06	1276.00						
5/3/2023	15.00	7718.00	4.26	1330.35						
5/4/2023	7.00	7702.00	4.58	645.85						
5/5/2023	13.00	7801.00	4.34	1169.05						
5/11/2023	10.00	7668.00	4.55	875.80						
5/12/2023	5.00	7773.00	4.25	449.00						
5/16/2023	4.00	7701.00	4.87	352.60						
5/17/2023	4.00	7807.00	4.74	357.95						
5/18/2023	3.00	7701.00	5.80	269.65						
5/19/2023	3.00	7743.00	5.44	272.90						
5/26/2023	4.00	7892.00	6.41	377.65						
5/30/2023	12.00	7829.00	6.39	1137.40						
6/1/2023	13.00	7762.00	5.95	1214.75						
6/2/2023	13.00	7778.00	5.61	1188.95						
6/6/2023	12.00	7810.00	5.50	1147.80						
6/8/2023	13.00	7784.00	5.06	1160.55						
6/9/2023	14.00	7793.00	4.62	1260.40						
6/13/2023	16.00	7604.00	5.51	1468.05						
6/15/2023	16.00	7542.00	5.71	1482.20						
6/16/2023	8.00	7504.00	5.63	736.20						
6/20/2023	23.00	7116.00	5.05	2118.10						
6/22/2023	3.00	7517.00	5.88	269.65						
6/23/2023	4.00	7622.00	5.18	373.10						
6/27/2023	12.00	7832.00	4.22	1049.60	Max:	7910.00				
6/28/2023	12.00	7794.00	4.19	1080.60	Min:	7116.00				
6/29/2023	12.00	7674.00	6.18	1123.75	Average:	7681.62				
6/30/2023	9.00	7652.00	6.31	827.70	std Deviation:	123.317				

Stanley Consultants INC.

Rev. 1 Job No. 31430.01.00 Page No. 1

Subject: Aurora Energy Chena - Dry Sorbent Injection

Computed by: J. Smith / S. Worcester/ D. Bacon Date 2/8/2019

Updated by: J. Solan Date 1/22/2023

Updatded Opinion of Probable Cost

Sheet No. 1 of 1

Item Description		Quantity No. of Unit	Quantity UOM	Unit Cost (2019)	Unit Cost (2023)	Total Cost	Chem. Eng PCI - 2018 603.1 Chem. Eng PCI - 2022 816 Cost Escallation Factor 135.30%
Engineering Services							**Data Source/Notes**
Engineering services provided throughout the project to assist with BOP design, technical specifications, procurement, bid evaluation, and construction observation.		1	EA		$7,483,700.00	$7,483,700	10% of PROBABLE EQUIPMENT AND CONSTRUCTION COST
Dry Sorbent Injection System Supply							
DSI	Includes Railcar offloading, long term storage silos, day storage silos, milling, metering and feed.	1	EA		$5,990,000.00	$5,990,000	Per Revised BACT Estimate
DSI Installation	Field Installation	1	EA		$488,847.07	$488,847	Escalated from 2019 to 2023
DSI Equipment Freight	DDP jobsite	1	EA		$250,000.00	$250,000	Per Revised BACT Estimate
Baghouse	Includes the baghouse casing itself, cleaning system, support steel, local access, stairtower, local instruments, piping from pulse valves to receiver at grade, and an allowance for field service support, but reusing the plant air system for cleaning	1	EA		$2,900,000.00	$2,900,000	Per Andritz Email
Baghouse Installation	Field Installation	1	EA		$322,667.41	$322,667	Per Haskell Estimate
Baghouse Freight	DDP jobsite	1	EA		$348,000.00	$348,000	Per Andritz Shipping Email 12% of equipment cost
Demolition							
Existing Warehouse		1	EA		$500,000.00	$500,000	
Existing Baghouse and ID Fan Buidling		1	EA		$500,000.00	$500,000	
Structural							
Silo Foundation		2	EA		$186,396.00	$372,792	Per Haskell Estimate
Sorbent Building Substructure		1	EA		$183,008.80	$183,009	Per Haskell Estimate
Sorbent Building Superstructure		1	EA		$2,754,613.11	$2,754,613	Per Haskell Estimate
Sorbent Building Exterior Closure		1	EA		$642,600.00	$642,600	Per Haskell Estimate
Sorbent Building Roofing		1	EA		$140,940.00	$140,940	Per Haskell Estimate
Baghouse Substructure		1	EA		$567,933.10	$567,933	Per Haskell Estimate
Baghouse Superstructure		1	EA		$4,087,081.61	$4,087,082	Per Haskell Estimate
Baghouse Exterior Closure		1	EA		$987,425.03	$987,425	Per Haskell Estimate
Baghouse Roofing		1	EA		$437,542.63	$437,543	Per Haskell Estimate
Railcar Unloading Skid Foundation		5	CY	$1,500.00	$2,029.51	$10,148	Per Haskell Estimate
Transfer Skid Enclosure Foundation		5	CY	$1,500.00	$2,029.51	$10,148	Per Haskell Estimate
MCC Foundation		4	CY	$1,500.00	$2,029.51	$8,118	Per Haskell Estimate
Pipe Bridge by Silos - Steel	coal yard front end loader drive under.	4	TONS	$10,800.00	$14,612.50	$58,450	Per Haskell Estimate
Pipe Bridge by Silos - Foundations		6	CY	$1,250.00	$1,691.26	$10,148	Per Haskell Estimate
Outside Pipe Supports - Steel		10.0	TONS	$10,800.00	$14,612.50	$146,125	Per Haskell Estimate
Outside Pipe Supports - Foundations		40	CY	$1,000.00	$1,353.01	$54,120	Per Haskell Estimate
Inside Pipe Supports - Steel		3.00	TONS	$10,800.00	$14,612.50	$43,838	Per Haskell Estimate
Ductwork	600' Feet of Ductwork to accommodate new baghouse and new DSI reactors	50.00	TONS		$27,571.66	$1,378,583	Per Haskell Estimate. 12.5 tons/100 ft.
Stack	Concrete cylinder with stainless steel flue	1.00	EA	$958,150.00	$958,150.00	$958,150	Per UAF. Not adjusted for inflation
ID Fan Building	3000 sqft * $500/sqft	1.00	EA	$1,500,000.00	$1,500,000.00	$1,500,000	Per Johnson River $/sqft estimate. Costs reduced due to simplicity of building compared to warehouse.
Warehouse Building	23,000 sqft * $750/sqft	1.00	EA	$17,250,000.00	$17,250,000.00	$17,250,000	Per Johnson River $/sqft estimate.
Mechanical							
Unit 1 Aggregate Piping Cost: 6" Sch 80 Pipe/Fittings/Flanges/Supports - Sorbent Prep to Injection Location		300	LF	$350.00	$473.55	$142,066	Per Haskell Estimate
Unit 2 Aggregate Piping Cost: 6" Sch 80 Pipe/Fittings/Flanges/Supports - Sorbent Prep to Injection Location		310	LF	$350.00	$473.55	$146,802	Per Haskell Estimate
Unit 3 Aggregate Piping Cost: 6" Sch 80 Pipe/Fittings/Flanges/Supports - Sorbent Prep to Injection Location		280	LF	$350.00	$473.55	$132,595	Per Haskell Estimate
Unit 5 Aggregate Piping Cost: 6" Sch 80 Pipe/Flanges/Supports - Sorbent Prep to Injection Location		200	LF	$350.00	$473.55	$94,711	Per Haskell Estimate
Baghouse Ash Piping: 6" Sch 80		200	LF	$350.00	$473.55	$94,711	Per Haskell Estimate
Electrical							
Medium Voltage Switchgear	Mtl & Labor	1	EA		$192,750.00	$192,750	2023 Vendor Quote + RSMeans Labor
13.8kV to 480V Transformers	Mtl	2	EA		$110,000.00	$220,000	2023 Vendor Quote
480V MCC	Mtl & Labor	2	EA		$103,750.00	$207,500	2021 Vendor Quote + RSMeans Labor
480V Panelboard and Xfmr	Mtl & Labor	2	EA		$11,805.00	$23,610	2021 Vendor Quote + RSMeans Labor
Cable - 15kV, 3 Cond, #2 AWG	Mtl & Labor	2,500	LF		$35.00	$87,500	Vendor Quote
Cable - 480V - MCC, Loads	Mtl & Labor	9000	LF		$20.00	$180,000	5600 ft of 3#12, 500 ft of 3#2/0, 800ft of
Conduit - RGS	Mtl & Labor	9300	LF		$30.00	$279,000	2" Average conduit size. Price from
Cable Terminations (Mat'l)	480V Material & Labor	496	EA		$100.00	$49,600	Per Haskell Estimate
Light Fixtures Interior/Exterior	Surface mounted LED light fixtures (Mtl & Labor)	50	EA		$2,000.00	$100,000	Per Haskell Estimate
Ground Grid extension	Mtl & Labor	1050	LF		$15.00	$15,750	Per Haskell Estimate
Instrumentation & Controls							
BOP DCS Aspects		1	EA	$76,428.00	$103,407.81	$103,408	
Heavy Equipment							
All Terrain Forklift	45' lift, 35' reach, 9000 lb. capacity	24	WK		$7,200.00	$172,800	Per Haskell Estimate
Hydraulic Crane	80-ton	135	DY		$4,900.00	$661,500	Per Haskell Estimate
				Furnish and Erection Subtotal		$45,805,579	
				MOBILIZATION / DEMOBILIZATION & MISC COSTS	5%	$2,290,279	Per Haskell Estimate
				PRIME CONTRACTOR INDIRECT LABOR	10%	$4,531,688	Per Haskell Estimate
				CONTRACTOR OH & LABOR BURDENS ON PRIME CONTRACTORS LABOR	15%	$6,870,837	Per Haskell Estimate
				EQUIPMENT & SMALL TOOLS	5%	$2,248,564	Per Haskell Estimate
				CONTINGENCY	10%	$6,174,695	Cost Manual
				PROFIT	10%	$6,174,695	Per Haskell Estimate
				BOND	1%	$740,963	Per Haskell Estimate
				Total Construction Cost		$74,837,299	
				PROBABLE EQUIPMENT & CONSTRUCTION COST		$74,837,000	
				PROBABLE ENGINEERING, EQUIPMENT & CONSTRUCTION COST		**$82,321,000**	

Note: All costs presented in this document are Stanley Consultants' opinions of probable project, construction, and/or operation and maintenance costs. This estimate of probable construction cost is based on our experience and represent our best judgment. We have no control over cost of labor, materials, equipment, contractor's methods, or over competitive bidding or market conditions. Therefore, we do not guarantee that proposals, bids, or actual construction costs will not vary from estimates of project costs, construction, and/or operation and maintenance costs presented. The costs identified are based on Means Building Construction Cost Data, Engineering News Record Construction Cost Index, and/or vendor quotes.

Stanley Consultants INC.

Rev. 1 | Job No. 31430.01.00 | Page No. 1

Subject: Aurora Energy Chena - Dry Sorbent Injection

Computed by: J. Smith / S. Worcester/ D. Bacon | Date 2/8/2019

Updated by: J. Solan | Date 9/7/2023

Approved by: | Date | Sheet No. 1 of 1

Updated Opinion of Probable Cost

Item Description		Quantity No. of Unit	Quantity UOM	Unit Cost (2019)	Unit Cost (2023)	Total Cost
Engineering Services						
Engineering services provided throughout the project to assist with BOP design, technical specifications, procurement, bid evaluation, and construction observation.		1	EA		$0.00	$0
Dry Sorbent Injection System Supply						
DSI	Includes Railcar offloading, long term storage silos, day storage silos, milling, metering and feed.	1	EA		$5,990,000.00	$5,990,000
DSI Installation	Field Installation	1	EA	$1,550,000.00	$2,097,164.65	$2,097,165
DSI Equipment Freight	FOB jobsite	1	EA		$250,000.00	$250,000
Baghouse	Includes the baghouse casing itself, cleaning system, support steel, local access, stairtower, local instruments, piping from pulse valves to receiver at grade, and an allowance for field service support, but reusing the plant air system for cleaning	1	EA		$2,900,000.00	$2,900,000
Baghouse Installation	Field Installation	1	EA		$0.00	$0
Baghouse Freight	DDP jobsite	1	EA		$0.00	$0
Structural						
Silo Foundation		2	EA	$244,304.00	$330,545.62	$661,091
Sorbent Building Substructure		1	EA	$247,047.00	$334,256.93	$334,257
Sorbent Building Superstructure		1	EA	$183,067.00	$247,691.38	$247,691
Sorbent Building Exterior Closure		1	EA	$160,334.00	$216,933.42	$216,933
Sorbent Building Roofing		1	EA	$12,149.00	$16,437.71	$16,438
Baghouse Substructure		1	EA	$247,047.00	$334,256.93	$334,257
Baghouse Superstructure		1	EA	$183,067.00	$247,691.38	$247,691
Baghouse Exterior Closure		1	EA	$160,334.00	$216,933.42	$216,933
Baghouse Roofing		1	EA	$12,149.00	$16,437.71	$16,438
Railcar Unloading Skid Foundation		5	CY	$1,500.00	$2,029.51	$10,148
Transfer Skid Enclosure Foundation		5	CY	$1,500.00	$2,029.51	$10,148
MCC Foundation		4	CY	$1,500.00	$2,029.51	$8,118
Pipe Bridge by Silos - Steel	coal yard front end loader drive under.	4	TONS	$10,800.00	$14,612.50	$58,450
Pipe Bridge by Silos - Foundations		6	CY	$1,250.00	$1,691.26	$10,148
Outside Pipe Supports - Steel		10.0	TONS	$10,800.00	$14,612.50	$146,125
Outside Pipe Supports - Foundations		40	CY	$1,000.00	$1,353.01	$54,120
Inside Pipe Supports - Steel		3.00	TONS	$10,800.00	$14,612.50	$43,838
Ductwork	1000' Feet of Ductwork to accommodate new baghouse	50.00	TONS	$15,000.00	$20,295.14	$1,014,757
Mechanical						
Unit 1 Aggregate Piping Cost: 6" Sch 80 Pipe/Fittings/Flanges/Supports - Sorbent Prep to Injection Location		300	LF	$350.00	$473.55	$142,066
Unit 2 Aggregate Piping Cost: 6" Sch 80 Pipe/Fittings/Flanges/Supports - Sorbent Prep to Injection Location		310	LF	$350.00	$473.55	$146,802
Unit 3 Aggregate Piping Cost: 6" Sch 80 Pipe/Fittings/Flanges/Supports - Sorbent Prep to Injection Location		280	LF	$350.00	$473.55	$132,595
Unit 5 Aggregate Piping Cost: 6" Sch 80 Pipe/Flanges/Supports - Sorbent Prep to Injection Location		200	LF	$350.00	$473.55	$94,711
Baghouse Ash Piping: 6" Sch 80		200	LF	$350.00	$473.55	$94,711
Instrumentation & Controls						
BOP DCS Aspects		1	EA	$76,428.00	$103,407.81	$103,408
Heavy Equipment						

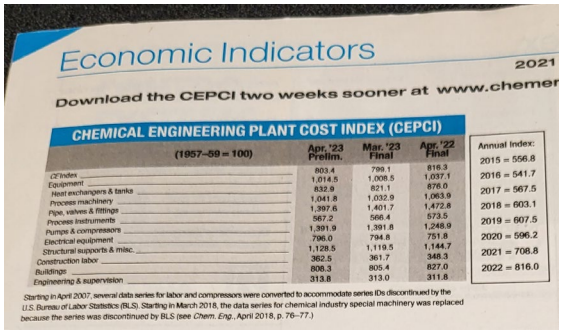
Chem. Eng PCI - 2018	603.1
Chem. Eng PCI - 2022	816
Cost Escallation Factor	135.30%

Data Source	Based in 2023 dollars QTY	UOM	HOURS	LABOR DOLLARS	MATERIAL	SUBCONTRACT	TOTAL	NOTES
							$0.00	
10% of PROBABLE EQUIPMENT AND CONSTRUCTION COST							$0.00	
							$0.00	
Per Revised BACT Estimate							$0.00	
								Includes silo, pump, day bin and and filter receiver installation based on Eielson. Used a current boilermaker journeymen rate ($88.77/hr) x 3% because the wage change happens at the end of September 2023.
Escalated from 2019 to 2023	1.00	LS	5346.5	$488,847.07			$488,847.07	
Per Revised BACT Estimate							$0.00	
								UAF was a six hopper pulse jet fabric filter. Used a current boilermaker journeymen rate ($88.77/hr) x 3% because the wage change happens at the end of September 2023.
Per Andritz Email	6.00	CELL	3529	$322,667.41			$322,667.41	
							$0.00	See if the person that gave you the quote can give you the approximate number of loads that need to be shipped.
							$0.00	
							$0.00	
								Used the SF dimenions of the Eielson sorbent silo foundation. Assumed a thickness of 3'. Includes formwork, rebar and concrete labor and material. Used a laborer rate of $70.12 per hour x 1.03 because the rate expired in June 2023.
Escalated from 2019 to 2023	177.22	CY	1,772.22	$124,268.22	$62,127.78		$186,396.00	
								Used the floor SF from the Eielson sorbent building and used a thickness of 3'. Includes formwork, rebar and concrete labor and material. Used a laborer rate of $70.12 per hour x 1.03 because the rate expired in June 2023.
Escalated from 2019 to 2023	174.00	CY	1,740.00	$122,008.80	$61,000.00		$183,008.80	
								Ratioed the tons of steel based on the tons of steel per SF for the UAF baghouse building. Used a current ironworker journeymen rate ($83.94/hr) x 3% because the wage change happened in July 2023. Material pricing is based on current price charged for the Healy structure.
Escalated from 2019 to 2023	186.12	TN	2,792	$241,379.33	$2,513,233.78		$2,754,613.11	Used the height, length and width from the Eielson sorbent building. The subcontract includes material and labor for siding and is based on siding and roofing pricing for our SCR building at Healy.
Escalated from 2019 to 2023	7,140.00	SF				$642,600.00	$642,600.00	Used length and width from the Eielson sorbent building. The subcontract includes material and labor for siding and is based on siding and roofing pricing for our SCR building at Healy.
Escalated from 2019 to 2023	1,566.00	SF				$140,940.00	$140,940.00	
Escalated from 2019 to 2023	540.18	CY	5,401.76	$378,771.47	$189,161.63		$567,933.10	Used the floor SF of the baghouse drawing supplied by Solan and assumed a foundation 3' thick. Includes formwork, rebar and concrete labor and material.
Escalated from 2019 to 2023	286.00	TN	2605	$225,223.61	$3,861,858.00		$4,087,081.61	Used UAF baghouse quantity. Used a current ironworker journeymen rate ($83.94/hr) x 3% because the wage change happened in July 2023. Material pricing is based on current price charged for the Healy structure.
Escalated from 2019 to 2023	10,971.39	SF				$987,425.03	$987,425.03	Quantities are based on baghouse sketch supplied by Solan. 20% was added for additional hieght above and below the baghouse. The subcontract includes material and labor for siding and is based on siding and roofing pricing for our SCR building at Healy.
Escalated from 2019 to 2023	4,861.58	SF				$437,542.63	$437,542.63	Quantities are based on baghouse sketch supplied by Solan. 100% was added for room around the baghouse. The subcontract includes material and labor for siding and is based on siding and roofing pricing for our SCR building at Healy.
Haskell 2019 Estimate. Escalated from 2019 to 2023							$0.00	Orignal estimate in column J still "ok"
Haskell 2019 Estimate. Escalated from 2019 to 2023							$0.00	Orignal estimate in column J still "ok"
Haskell 2019 Estimate. Escalated from 2019 to 2023							$0.00	Orignal estimate in column J still "ok"
Haskell 2019 Estimate. Escalated from 2019 to 2023							$0.00	Orignal estimate in column J still "ok"
Haskell 2019 Estimate. Escalated from 2019 to 2023							$0.00	Orignal estimate in column J still "ok"
Haskell 2019 Estimate. Escalated from 2019 to 2023							$0.00	Orignal estimate in column J still "ok"
Haskell 2019 Estimate. Escalated from 2019 to 2023							$0.00	Orignal estimate in column J still "ok"
Haskell 2019 Estimate. Escalated from 2019 to 2023. Confirm ductwork tonage	50.00	TN	2,500.00	$228,582.75	$1,150,000.00		$1,378,582.75	Used boilermaker wage rate x 50 hours per ton, which comes from a recently (2023) awarded project. Used $23000 per ton based on a recent quote. This does not include refractory.
							$0.00	
							$0.00	
Haskell 2019 Estimate. Escalated from 2019 to 2023							$0.00	Orignal estimate in column J still "ok"
Haskell 2019 Estimate. Escalated from 2019 to 2023							$0.00	Orignal estimate in column J still "ok"
Haskell 2019 Estimate. Escalated from 2019 to 2023							$0.00	Orignal estimate in column J still "ok"
Haskell 2019 Estimate. Escalated from 2019 to 2023							$0.00	Orignal estimate in column J still "ok"
Haskell 2019 Estimate. Escalated from 2019 to 2023							$0.00	Orignal estimate in column J still "ok"
							$0.00	
							$0.00	
							$0.00	
Escalated from 2019 to 2023							$0.00	
							$0.00	
							$0.00	
							$0.00	

All Terrain Forklift	45' lift, 35' reach, 9000 lb. capacity	24	WK		$7,200.00		$172,800	Haskell Estimate	$0.00	Orignal estimate in column J still "ok"
Hydraulic Crane	80-ton	135	DY		$4,900.00		$661,500	Haskell Estimate	$0.00	Orignal estimate in column J still "ok"
									$0.00	
						Furnish and Erection Subtotal			$0.00	
									$0.00	
				MOBILIZATION / DEMOBILIZATION & MISC COSTS	5%			Haskell Estimate	$0.00	Orignal estimate in column J still "ok"
				PRIME CONTRACTOR INDIRECT LABOR	10%			Haskell Estimate	$0.00	Orignal estimate in column J still "ok"
				CONTRACTOR OH & LABOR BURDENS ON PRIME CONTRACTORS LABOR	15%			Haskell Estimate	$0.00	Orignal estimate in column J still "ok"
				EQUIPMENT & SMALL TOOLS	5%			Haskell Estimate	$0.00	Orignal estimate in column J still "ok"
				CONTINGENCY	10%			Cost Manual	$0.00	Orignal estimate in column J still "ok"
				PROFIT	10%			Haskell Estimate	$0.00	Orignal estimate in column J still "ok"
				BOND	1%			Haskell Estimate	$0.00	Orignal estimate in column J still "ok"
						Total Construction Cost			$0.00	
									$0.00	
						PROBABLE EQUIPMENT & CONSTRUCTION COST			$0.00	
						PROBABLE ENGINEERING, EQUIPMENT & CONSTRUCTION COST			$0.00	

									$0.00	Orignal estimate in column J still "ok"
									$0.00	Orignal estimate in column J still "ok"
									$0.00	
									$0.00	
									$0.00	
									$0.00	Orignal estimate in column J still "ok"
									$0.00	Orignal estimate in column J still "ok"
									$0.00	Orignal estimate in column J still "ok"
									$0.00	Orignal estimate in column J still "ok"
									$0.00	Orignal estimate in column J still "ok"
									$0.00	Orignal estimate in column J still "ok"
									$0.00	Orignal estimate in column J still "ok"
									$0.00	
									$0.00	
									$0.00	
									$0.00	

Note: All costs presented in this document are Stanley Consultants' opinions of probable project, construction, and/or operation and maintenance costs. This estimate of probable construction cost is based on our experience and represent our best judgment. We have no control over cost of labor, materials, equipment, contractor's methods, or over competitive bidding or market conditions. Therefore, we do not guarantee that proposals, bids, or actual construction costs will not vary from estimates of project costs, construction, and/or operation and maintenance costs presented. The costs identified are based on Means Building Construction Cost Data, Engineering News Record Construction Cost Index, and/or vendor quotes.



Economic Indicators 2021

Download the CEPCI two weeks sooner at www.chemer

CHEMICAL ENGINEERING PLANT COST INDEX (CEPCI)

(1957–59 = 100)	Apr. '23 Prelim.	Mar. '23 Final	Apr. '22 Final
CE Index	803.4	799.1	816.3
Equipment	1,014.5	1,008.5	1,037.1
Heat exchangers & tanks	832.9	821.1	876.0
Process machinery	1,041.8	1,032.9	1,063.9
Pipe, valves & fittings	1,397.6	1,401.7	1,472.8
Process instruments	567.2	566.4	573.5
Pumps & compressors	1,391.9	1,391.8	1,248.9
Electrical equipment	796.0	794.8	751.8
Structural supports & misc.	1,128.5	1,119.5	1,144.7
Construction labor	362.5	361.7	348.3
Buildings	808.3	805.4	827.0
Engineering & supervision	313.8	313.0	311.6

Annual Index:
2015 = 556.8
2016 = 541.7
2017 = 567.5
2018 = 603.1
2019 = 607.5
2020 = 596.2
2021 = 708.8
2022 = 816.0

Starting in April 2007, several data series for labor and compressors were converted to accommodate series IDs discontinued by the U.S. Bureau of Labor Statistics (BLS). Starting in March 2018, the data series for chemical industry special machinery was replaced because the series was discontinued by BLS (see *Chem. Eng.*, April 2018, p. 76–77.)

Available SO_2 Emission Control Technologies
Wet Flue Gas Desulfurization (WFGD)
Circulating Dry Scrubber (CDS)
Spray Dry Absorber (SDA)
Dry Sorbent Injection (DSI)
Base Case: SO_2 Emission Limit, Low Sulfur Coal, and Good Combustion Practices

Technically Feasible SO_2 Emission Control Technologies
Wet Flue Gas Desulfurization (WFGD)
Circulating Dry Scrubber (CDS)
Spray Dry Absorber (SDA)
Dry Sorbent Injection (DSI)
Base Case: SO_2 Emission Limit, Low Sulfur Coal, and Good Combustion Practices

Ranking of Technically Feasible SO_2 Emission Control Technologies

Control Technology	Control Efficiency Compared to Base Case (pct.)	SO_2 Emission Rate (lb/MMBtu)	SO_2 Emission Rate (lb/hr)	Potential SO_2 Emissions (tpy)	Potential SO_2 Emissions Reduction (tpy)
Dry Sorbent Injection (DSI) [1]	95	0.015	7.3	32.0	607.6
Wet Flue Gas Desulfurization (WFGD) [2]	93.4	0.02	9.7	42.5	597.1
Circulating Dry Scrubber (CDS)	86.7	0.04	19.4	85.0	554.6
Spray Dry Absorber (SDA)	76.7	0.07	34.0	148.7	490.8
Base Case: SO_2 Emission Limit, Low Sulfur Coal, and Good Combustion Practices	0	0.301	146.0	639.5	0.0

Note:

[1] The SO_2 control efficiency, in terms of percentage, for DSI is the vendor-provided emission reduction capability.

[2] The SO_2 emission rates, in terms of lb/MMBtu, for WFGD, CDS, and SDA are the average values for the top 20 percent performing coal-fired power plants per Table 1.3 of Section 5, Chapter 1 of the EPA Air Pollution Control Cost Manual (2021).

SO_2 Cost-Effectiveness Summary

Control Technology	Total Capital Investment ($)[1]	Total Annual Cost ($/year)[2]	Emissions Reduction (tpy)[3]	Cost-Effectiveness ($/ton SO_2 Emissions Avoided)
Dry Sorbent Injection (DSI)	$82,545,945	$13,276,117	607.6	$21,851
Base Case: SO_2 Emission Limit, Low Sulfur Coal, and Good Combustion Practices	~	~	0.00	~

Notes:

[1]Total Capital Investment is calculated in Table B of Appendix B.

[2]Total Annual Cost is calculated in Table B of Appendix B.

[3]Emissions reductions are calculated in Table 3 of this report.

Table A. Potential to Emit Calculations for EUs 4 through 7 Supplemental BACT Analysis - SO_2 Emissions
Aurora Energy, LLC - Chena Power Plant

Emissions Unit		Fuel Type	SO_2 Emission Factor		Maximum Rating/Capacity	Allowable Annual Operation	Short Term SO_2 Emissions	Potential SO_2 Emissions
ID	*Description*		*Reference*	*Factor*				
4	Chena 1 Coal-Fired Boiler	Coal	Condition 15, Permit No. AQ0315TVP04, Revision 2	0.301 lb/MMBtu	76.8 MMBtu/hr	8,760 hr/yr	23.12 lb/hr	101.3 tpy
5	Chena 2 Coal-Fired Boiler				76.8 MMBtu/hr	8,760 hr/yr	23.12 lb/hr	101.3 tpy
6	Chena 3 Coal-Fired Boiler				76.8 MMBtu/hr	8,760 hr/yr	23.12 lb/hr	101.3 tpy
7	Chena 5 Coal-Fired Boiler				254.7 MMBtu/hr	8,760 hr/yr	76.66 lb/hr	335.8 tpy
							Total SO_2 Potential Emissions	**639.5 tpy**

Notes:

[1] Conversion factors:

Mass Conversion 2,000 lb/ton

[2] The combined SO_2 emissions from the common stack for EU IDs 4 through 7 are limited to 0.301 lb/MMBtu per Condition 15 of Permit No. AQ0315TVP04, Revision 2.

Table B. Dry Sorbent Injection (DSI) - Economic Analysis
Aurora Energy Chena Power Plant SO_2 BACT Analysis

CAPITAL COSTS

DIRECT COSTS		Quantity	Unit	Unit Cost	Total	Notes
1. Purchased Equipment and Material Costs (PEMC)						
	a. Basic equipment - DSI System	1	ea	$5,990,000	$5,990,000	BACT Process Systems, Inc. 7/28/2023 proposal
	b. Freight - DSI System	1	ea	$250,000	$250,000	BACT Process Systems, Inc. 7/28/2023 proposal
	c. Equipment - Baghouse system	1	ea	$2,900,000	$2,900,000	Stanley Consultants Jan 2024 cost estimate
	d. Freight - Baghouse system	1	ea	$348,000	$348,000	Stanley Consultants Jan 2024 cost estimate
	e. Continuous Emission Monitoring System	1	ea	$125,257	$125,257	Emerson 10/22/2019 cost estimate (equipment and shipping)
Purchased Equipment and Material Cost (PEMC)				***PEMC=***	***$9,613,257***	
2. Direct Installation Costs (DIC)						
	a. Field installation - DSI	1	ea	$488,847	$488,847	Stanley Consultants Jan 2024 cost estimate
	b. Field installation - Baghouse	1	LOT	$322,667	$322,667	Stanley Consultants Jan 2024 cost estimate
	c. Structural	1	LOT	$31,601,763	$31,601,763	Stanley Consultants Jan 2024 cost estimate
	d. Mechanical	1	LOT	$610,884	$610,884	Stanley Consultants Jan 2024 cost estimate
	e. Electrical	1	LOT	$1,355,710	$1,355,710	Stanley Consultants Jan 2024 cost estimate
	f. Instrumentation and Controls	1	ea	$103,408	$103,408	Stanley Consultants Jan 2024 cost estimate
	g. Heavy Equipment	1	LOT	$834,300	$834,300	Stanley Consultants Jan 2024 cost estimate
	h. Demolition	1	LOT	$1,000,000	$1,000,000	Stanley Consultants Jan 2024 cost estimate
Direct Installation Costs (DIC)				***DIC =***	***$36,317,579***	
Total Direct Costs (TDC)				**TDC=PEMC+DIC=**	**$45,930,836**	

INDIRECT COSTS						
3. Engineering, Construction Support						
	a. Engineering Services	1	ea	$7,483,700	$7,483,700	Stanley Consultants Jan 2024 cost estimate
	b. Mobilization/Demobilization	5	pct. TDC		$2,296,542	Calculation consistent with Stanley Consultants Jan 2024 cost estimate. TDC calculated in this table also includes CEMS equipment cost in PEMC.
	c. Prime Contractor Indirect Labor	10	pct.		$4,544,214	Stanley Consultants Jan 2024 cost estimate plus 10 pct. of CEMS PEMC.
	d. Contractor Overhead and Labor Burdens	15	pct. TDC		$6,889,625	Stanley Consultants Jan 2024 cost estimate. TDC calculated in this table also includes CEMS equipment cost in PEMC.
	e. Equipment and Small Tools	5	pct.		$2,254,827	Calculation consistent with Stanley Consultants Jan 2024 cost estimate. TDC calculated in this table also includes CEMS equipment cost in PEMC.
4. Contingency		10	pct.		$6,191,604	Default value of 10 percent of direct and indirect costs [CCM Section 5, Chapter 1, page 1-79]
5. Profit		10	pct.		$6,191,604	Calculation consistent with Stanley Consultants Jan 2024 cost estimate. TDC calculated in this table also includes CEMS equipment cost in PEMC.
6. Bond		1	pct.		$742,993	Calculation consistent with Stanley Consultants Jan 2024 cost estimate. TDC calculated in this table also includes CEMS equipment cost in PEMC.
7. Performance testing		1	ea	$20,000	$20,000	Initial emissions performance test and CEMS RATA. Estimate based on recent source test costs at Aurora Energy.
Total Indirect Costs (TIC)				**TIC=**	**$36,615,109**	
TOTAL CAPITAL INVESTMENT (TCI)				**TCI = TDC+TIC=**	**$82,545,945**	

ANNUAL COSTS

DIRECT COSTS		Quantity	Unit	Unit Cost	Total	Notes
1. Operating Labor		365	hours	$66.40	$24,236	Assumes 0.5 hours per shift, 12 hour shifts [CCM Section 5, Chapter 1]. Burdened operator labor rate is $66.40/hr per Table C, Aurora Energy, 2023.
2. Supervisory Labor		15	pct.		$3,635	Assumes 15% of operator labor [CCM Section 5, Chapter 1]
3. Maintenance Labor		365	hours	$66.40	$24,236	Assumes 0.5 hours per shift, 12 hour shifts [CCM Section 5, Chapter 1]. Burdened operator labor rate is $66.40/hr per Table C, Aurora Energy, 2023.
4. Maintenance Materials		100	pct.		$24,236	Assumes 100% of maintenance labor [CCM Section 5, Chapter 1]
5. Reagent		3,175.5	ton	$563	$1,787,807	Sodium bicarbonate. Feed rate of 0.3625 tons per hour; unit cost includes rail delivery per BACT Process Systems, Inc. 7/28/2023 proposal.
6. Utilities	a. Electricity	2,735,960	kWh	$0.093	$254,444	Steady state operating station service requirement for DSI equipment per demand in Table F at 8,760 hr/yr. Aurora Energy calculation of station service cost at $0.093/kWh for 2023.
	b. Waste Disposal (ash)	2,930	ton	$44	$128,931	Incremental increase in ash disposal cost due to DSI. Ash tonnage calculated in Table D. Unit cost is market rate in ash hauling contract.
Total Direct Annual Costs (TDAC)				***TDAC=***	***$2,247,525***	

INDIRECT COSTS						
7. Overhead		60	pct.		$45,806	60 percent of total labor and material costs [CCM Section 1, Chapter 2, page 35]
8 Administrative Charges		2	pct. TCI		$1,650,919	2 percent of TCI [CCM Section 1, Chapter 2, page 35]
9. Property Tax		1	pct. TCI		$825,459	1 percent of TCI [CCM Section 1, Chapter 2, page 35]
10. Insurance		1	pct. TCI		$825,459	1 percent of TCI [CCM Section 1, Chapter 2, page 35]
11. Capital Recovery					$7,680,948	CRF x TCI
	Capital Recovery Factor (CRF)	*0.0931*				*CRF = $i(1+i)^n$ / $((1+i)^n-1)$ [CCM Section 1, Chapter 2, page 22]*
	i = interest rate	*8.50*	*pct.*			*Bank prime interest rate 7/27/2023 through 1/22/2024, https://www.federalreserve.gov/releases/h15/*
	n = life of control equipment	*30*	*years*			
Total Indirect Annual Costs (TIAC)				**TIAC=**	**$11,028,591**	
TOTAL ANNUALIZED COST (TAC)				**TAC = TDAC+TIAC=**	**$13,276,117**	

Table C. Full-time Burden Operator Labor Rate
Aurora Energy, LLC

		Per Hour*	CBA Section*
Operator Wage Rate Y1	$	43.07	17.1
Shift Diff.	$	1.29	17.2
401K (0.50/hr)	$	0.50	15.3
H&W (Annual cost/hrs)	$	9.82	15.1
Pension	$	10.00	15.2
Reg Rate	$	63.39	
OT Rate	$	84.93	
Grave Rate	$	64.69	
Grave OT Rate	$	86.87	
Reg Hours		838.50	5.2
OT Hours		113.75	5.2
Grave Reg Hours		1,118.00	5.2
Grave OT Hours		113.75	5.2
Reg Rate x Reg Hours	$	53,156.02	
OT Rate x OT Hours	$	9,660.69	
Grave Rate x Grave Reg Hours	$	72,319.26	
Grave OT Rate x Grave OT Hours	$	9,881.16	
Total Labor Cost for FT Burden Operator working day/graves	$	145,017.12	
x 2 for Adding two Operators		2.00	
Total Labor Cost for two FT Burden Operators	$	290,034.25	
Annual Working Hours		2,184.00	
Average Hourly Rate	$	66.40	

*Aurora Energy, LLC CBA 2023 - 2025

Table D. Projected Annual Ash Disposal Requirement for DSI
Aurora Energy Chena Power Plant SO_2 BACT Analysis

	Value	Unit
Ash Generation Based on Potential to Emit, No SO_2 Control		
Max Annual Heat Input	4,222,320,000,000	Btu/lb
Coal Heat Content	7,536.5	Btu/lb[1]
Coal Use per Year	560,251,775.7	lb/yr
Coal Use per Year	280,125.9	tpy
Coal Ash Content	0.07	Fraction[2]
Total	***18,301***	***tpy***

	Value	Unit
Ash Generation due to Dry Sorbent Injection		
Maximum SO_2 Emission Rate	0.301	lb/MMBtu
SO_2 Potential Emissions	1,270,918.32	lb/yr
SO_2 Potential Emissions	635.5	tpy
SO_2 Emission Reduction	603.7	tpy
$NaHCO_3$ Use	3,175.50	tpy
$2(NaHCO_3)/NaSO_4$	1.18	wt. ratio
Na_2SO_4/SO_2	2.22	wt. ratio
Na_2SO_4	1,339.43	tpy (in ash)
$NaHCO_3$	1,590.82	tpy (unreacted)
Total	***2,930***	***tpy***

Total Ash Disposal Requirement	**21,232**	**tpy**

Notes:

[1] Coal heat content based on 2022 deliveries, shown in Table E.

[2] Coal ash content based on 2022 deliveries, shown in Table E.

Table E. 2022 Rail Sample Analyses of Delivered Coal
Aurora Energy Chena Power Plant SO_2 BACT Analysis

	Sample Date	Cars	AR BTU	AR Moisture	AR Ash	AR Volatiles	AR Carbon	AR Sulfur	Location	Bench	Seam	Tons
AURORA ENERGY LLC	1/1/2022	13	7628	32.82	4.76	35.30	27.12	0.12	JD		4	1132.1
AURORA ENERGY LLC	1/3/2022	10	7598	32.33	5.60	34.64	27.43	0.13	JD		4	903.3
AURORA ENERGY LLC	1/4/2022	9	7545	32.52	5.62	34.79	27.08	0.14	JD		4	777.1
AURORA ENERGY LLC	1/5/2022	6	7814	30.17	5.42	35.48	28.93	0.12	JD		4	497.7
AURORA ENERGY LLC	1/6/2022	10	7542	32.71	5.29	34.59	27.41	0.13	JD		4	842.6
AURORA ENERGY LLC	1/7/2022	7	7672	31.53	5.43	35.60	27.44	0.15	JD		4	604.35
AURORA ENERGY LLC	1/10/2022	3	7590	32.30	5.34	34.74	27.63	0.13	JD		4	253.7
AURORA ENERGY LLC	1/11/2022	6	7590	32.18	5.37	34.72	27.73	0.14	JD		4	560.2
AURORA ENERGY LLC	1/13/2022	3	7611	32.06	5.36	35.02	27.57	0.12	JD		4	270.05
AURORA ENERGY LLC	1/14/2022	4	7612	32.59	4.66	34.50	28.26	0.10	JD		4	346.1
AURORA ENERGY LLC	1/17/2022	11	7610	32.86	4.47	34.51	28.16	0.09	JD		4	966.05
AURORA ENERGY LLC	1/18/2022	8	7617	32.96	4.14	34.85	28.06	0.08	JD		4	710.45
AURORA ENERGY LLC	1/19/2022	8	7817	31.76	3.63	35.63	28.99	0.08	JD		4	670.4
AURORA ENERGY LLC	1/20/2022	9	7815	31.82	4.10	35.91	28.18	0.09	JD		4	788.45
AURORA ENERGY LLC	1/21/2022	5	7617	32.73	4.43	34.54	28.31	0.09	JD		4	455.4
AURORA ENERGY LLC	1/24/2022	9	7697	31.34	5.51	35.23	27.93	0.13	JD		4	776.8
AURORA ENERGY LLC	1/25/2022	10	7749	31.18	5.08	35.54	28.21	0.12	JD		4	879.75
AURORA ENERGY LLC	1/26/2022	10	7693	31.76	5.02	34.62	28.61	0.13	JD		4	882.65
AURORA ENERGY LLC	1/27/2022	9	7594	32.10	5.77	34.69	27.45	0.14	JD		4	812.25
AURORA ENERGY LLC	1/28/2022	5	7555	32.33	5.95	34.64	27.09	0.14	JD		4	464.15
AURORA ENERGY LLC	1/31/2022	12	7641	32.68	4.46	35.13	27.73	0.11	JD		4	1047
AURORA ENERGY LLC	2/1/2022	8	7648	32.99	4.07	34.58	28.36	0.09	JD		4	674.7
AURORA ENERGY LLC	2/2/2022	7	7694	33.31	3.41	35.01	28.28	0.08	JD		4	605.35
AURORA ENERGY LLC	2/3/2022	10	7644	32.59	4.14	35.35	27.92	0.09	JD		4	882.15
AURORA ENERGY LLC	2/7/2022	12	7764	31.38	4.37	34.92	29.33	0.10	BDL/JD	Q3	3/4	1040.5
AURORA ENERGY LLC	2/8/2022	9	7785	30.61	4.82	35.49	29.09	0.09	BDL/JD	Q3	3/4	783.6
AURORA ENERGY LLC	2/9/2022	9	7647	32.23	4.40	34.64	28.73	0.09	BDL/JD	Q3	3/4	776.5
AURORA ENERGY LLC	2/10/2022	8	7645	31.13	5.42	34.39	29.06	0.11	BDL/JD	Q3	3/4	740.6
AURORA ENERGY LLC	2/11/2022	9	7624	31.36	5.56	34.73	28.36	0.10	JD/BDL	Q3	3/4	837.55
AURORA ENERGY LLC	2/14/2022	8	7671	30.99	5.47	34.91	28.64	0.09	BDL/JD	Q3	3/4	709.1
AURORA ENERGY LLC	2/15/2022	9	7723	30.12	5.93	34.93	29.02	0.09	BDL/JD	Q3	3/4	824.6
AURORA ENERGY LLC	2/16/2022	8	7702	30.64	5.53	34.59	29.24	0.10	BDL/JD	Q3	3/4	699.25
AURORA ENERGY LLC	2/17/2022	8	7751	30.73	5.22	35.39	28.66	0.10	BDL/JD	Q3	3/4	707.6
AURORA ENERGY LLC	2/18/2022	6	7588	33.19	4.14	34.74	27.94	0.09	JD		4	517.75
AURORA ENERGY LLC	2/22/2022	10	7613	31.52	5.42	34.58	28.48	0.11	JD		4	882.3
AURORA ENERGY LLC	2/23/2022	10	7519	33.57	4.30	34.33	27.80	0.09	JD		4	851.3
AURORA ENERGY LLC	2/24/2022	9	7559	31.66	5.84	34.10	28.40	0.11	BDL/JD	Q3	3/4	798.65
AURORA ENERGY LLC	2/25/2022	9	7551	32.32	5.12	34.25	28.32	0.10	BDL/JD	Q3	3/4	787.1
AURORA ENERGY LLC	2/28/2022	9	7697	31.27	5.38	34.68	28.67	0.09	BDL/JD	Q3	3/4	769.55
AURORA ENERGY LLC	3/1/2022	12	7472	31.97	6.54	33.63	27.87	0.10	BDL/JD	Q3	3/4	1065.2
AURORA ENERGY LLC	3/2/2022	7	7505	31.68	6.95	33.68	27.70	0.11	BDL/JD	Q3	3/4	649.25
AURORA ENERGY LLC	3/3/2022	7	7479	31.34	7.31	33.64	27.72	0.12	BDL/JD	Q3	3/4	653.3
AURORA ENERGY LLC	3/4/2022	7	7525	31.10	6.70	34.24	27.97	0.12	BDL/JD	Q3	3/4	625.6
AURORA ENERGY LLC	3/7/2022	11	7569	31.12	6.77	34.07	28.03	0.12	BDL/JD	Q3	3/4	993.2
AURORA ENERGY LLC	3/8/2022	10	7586	30.46	6.88	34.67	28.00	0.11	BDL/JD	Q3	3/4	920.1
AURORA ENERGY LLC	3/9/2022	16	7406	31.55	7.47	33.68	27.30	0.11	JD/BDL	Q3	3/3	1493.55
AURORA ENERGY LLC	3/11/2022	8	7505	31.68	6.59	33.87	27.87	0.10	JD/BDL	Q3	3/3	748.8
AURORA ENERGY LLC	3/21/2022	8	7446	32.11	6.73	34.05	27.11	0.11	JD/BDL	Q3	3/3	689.6
AURORA ENERGY LLC	3/22/2022	9	7397	31.72	7.80	33.59	26.90	0.12	JD/BDL	Q3	3/3	774.75
AURORA ENERGY LLC	3/23/2022	20	7196	32.16	8.54	32.64	26.67	0.12	JD/BDL	Q3	3/3	1794.5
AURORA ENERGY LLC	3/28/2022	6	7411	31.13	7.96	33.84	27.08	0.13	JD/BDL	Q3	3/3	565
AURORA ENERGY LLC	3/29/2022	6	7551	30.51	7.23	34.42	27.84	0.12	JD/BDL	Q3	3/3	547.95
AURORA ENERGY LLC	3/30/2022	7	7403	31.59	7.36	34.02	27.04	0.12	JD/BDL	Q3	3/3	644.4
AURORA ENERGY LLC	3/31/2022	6	7525	31.40	6.66	34.44	27.49	0.10	JD/BDL	Q3	3/3	561.65
AURORA ENERGY LLC	4/5/2022	7	7558	30.50	7.10	34.51	27.89	0.10	JD/BDL	Q3	3/3	654.65
AURORA ENERGY LLC	4/6/2022	4	7566	30.39	6.83	34.79	27.99	0.09	JD/BDL	Q3	3/3	331.2
AURORA ENERGY LLC	4/7/2022	5	7583	31.00	6.41	35.26	27.34	0.09	JD/BDL	Q3	3/3	390.6
AURORA ENERGY LLC	4/8/2022	5	7635	30.87	6.09	35.04	28.01	0.09	JD/BDL	Q3	3/3	446.25
AURORA ENERGY LLC	4/12/2022	15	7647	31.00	5.98	34.68	28.35	0.10	JD/BDL	Q3	3/3	1371.05
AURORA ENERGY LLC	4/13/2022	15	7621	30.15	7.20	34.57	28.09	0.11	JD/BDL	Q3	3/3	1402.05
AURORA ENERGY LLC	4/14/2022	15	7657	30.54	6.68	34.63	28.16	0.11	JD/BDL	Q3	3/3	1410.35
AURORA ENERGY LLC	4/15/2022	15	7548	30.56	7.12	34.73	27.60	0.13	JD/BDL	Q3	3/3	1435.95
AURORA ENERGY LLC	4/19/2022	13	7572	30.38	7.20	34.52	27.90	0.10	JD/BDL	Q3	3/3	1208.8
AURORA ENERGY LLC	4/20/2022	12	7713	30.15	6.06	35.39	28.40	0.09	JD/BDL	Q3	3/3	1092.9
AURORA ENERGY LLC	4/21/2022	13	7656	31.04	6.01	34.87	28.09	0.09	JD/BDL	Q3	3/3	1228.6
AURORA ENERGY LLC	4/22/2022	12	7605	31.45	5.77	35.18	27.61	0.09	JD/BDL	Q3	3/3	1131.95

Table E. 2022 Rail Sample Analyses of Delivered Coal
Aurora Energy Chena Power Plant SO_2 BACT Analysis

	Sample Date	Cars	AR BTU	AR Moisture	AR Ash	AR Volatiles	AR Carbon	AR Sulfur	Location	Bench	Seam	Tons
AURORA ENERGY LLC	4/26/2022	12	7541	30.86	7.35	34.13	27.67	0.10	JD/BDL	Q3	3/3	1140.5
AURORA ENERGY LLC	4/27/2022	12	7493	30.66	7.77	33.93	27.65	0.12	JD/BDL	Q3	3/3	1132.4
AURORA ENERGY LLC	4/28/2022	10	7468	31.44	7.12	33.96	27.49	0.10	JD/BDL	Q3	3/3	943.8
AURORA ENERGY LLC	4/29/2022	4	7495	32.17	6.17	33.95	27.72	0.11	BDL/JD	Q3	3/4	357.5
AURORA ENERGY LLC	4/29/2022	5	7233	33.64	6.33	33.33	26.70	0.10	BDL/JD	Q3	3/4	454.7
AURORA ENERGY LLC	4/29/2022	4	7439	31.92	6.54	33.94	27.60	0.12	BDL/JD	Q3	3/4	364.55
AURORA ENERGY LLC	4/29/2022	6	7636	30.24	6.94	34.64	28.19	0.10	JD/BDL	Q3	3/3	562.95
AURORA ENERGY LLC	5/3/2022	9	7627	29.95	6.90	34.99	28.16	0.10	JD/BDL	Q3	3/3	846.05
AURORA ENERGY LLC	5/4/2022	9	7592	30.48	6.82	34.43	28.27	0.10	JD/BDL	Q3	3/3	860.15
AURORA ENERGY LLC	5/5/2022	9	7486	31.83	6.54	34.19	27.44	0.10	JD/BDL	Q3	3/3	858.9
AURORA ENERGY LLC	5/6/2022	9	7548	30.79	7.12	34.64	27.45	0.10	JD/BDL	Q3	3/3	878.4
AURORA ENERGY LLC	5/10/2022	25	7211	31.34	9.59	32.92	26.16	0.13	JD/BDL	Q3	3/3	2321.85
AURORA ENERGY LLC	5/12/2022	8	7146	31.33	9.61	33.12	25.94	0.11	JD/BDL	Q3	3/3	740.4
AURORA ENERGY LLC	5/16/2022	4	6819	33.93	9.51	31.36	25.21	0.13	JD/BDL	Q3	3/3	401.75
AURORA ENERGY LLC	5/19/2022	6	7324	32.12	7.41	33.55	26.93	0.09	JD/JD		3/4	550.9
AURORA ENERGY LLC	5/23/2022	18	7537	31.30	6.16	34.85	27.69	0.09	JD/JD		3/4	1607
AURORA ENERGY LLC	5/25/2022	17	7543	31.08	6.69	34.54	27.70	0.08	JD/JD		3/4	1537.05
AURORA ENERGY LLC	5/26/2022	13	7483	31.17	7.05	35.04	26.75	0.09	JD/JD		3/4	1208.8
AURORA ENERGY LLC	5/31/2022	17	7454	31.52	6.66	34.73	27.09	0.09	JD/JD		4/3	1602.4
AURORA ENERGY LLC	6/1/2022	17	7594	32.01	5.24	34.99	27.75	0.08	JD/JD		3/4	1579.7
AURORA ENERGY LLC	6/2/2022	14	7613	31.51	5.43	35.22	27.85	0.07	JD/JD		3/4	1245.35
AURORA ENERGY LLC	6/3/2022	9	7695	31.14	5.25	35.57	28.05	0.07	JD/JD		3/4	821.8
AURORA ENERGY LLC	6/6/2022	11	7652	31.47	5.45	35.24	27.84	0.08	JD/JD		3/4	1019.8
AURORA ENERGY LLC	6/7/2022	12	7552	31.34	6.18	34.88	27.61	0.08	JD/JD		3/4	1129.25
AURORA ENERGY LLC	6/9/2022	11	7000	32.01	10.81	32.42	24.76	0.13	JD/JD		3/4	1045.6
AURORA ENERGY LLC	6/10/2022	12	7416	31.67	6.93	34.36	27.05	0.10	JD/JD		3/4	1120.9
AURORA ENERGY LLC	6/20/2022	4	7628	31.21	6.07	35.68	27.03	0.10	JD/JD		3/4	374.6
AURORA ENERGY LLC	6/21/2022	5	7488	31.72	6.23	34.64	27.41	0.12	JD/JD		3/4	444.7
AURORA ENERGY LLC	6/23/2022	4	7652	31.98	5.15	35.25	27.63	0.09	JD/JD		3/4	377.85
AURORA ENERGY LLC	6/24/2022	7	7623	30.92	5.86	35.29	27.92	0.10	JD/JD		3/4	659.15
AURORA ENERGY LLC	6/27/2022	14	7680	30.93	5.60	35.63	27.84	0.10	JD/JD		3/4	1327
AURORA ENERGY LLC	6/28/2022	14	7584	30.87	6.30	34.88	27.96	0.11	JD/JD		3/4	1333.5
AURORA ENERGY LLC	6/30/2022	14	7480	32.09	6.34	34.45	27.13	0.10	JD/JD		3/4	1316
AURORA ENERGY LLC	7/1/2022	13	7199	32.37	8.34	33.50	25.79	0.14	JD/JD		3/4	1260
AURORA ENERGY LLC	7/5/2022	11	7518	31.44	6.77	35.06	26.73	0.13	JD/JD		3/4	1023.35
AURORA ENERGY LLC	7/6/2022	8	7581	31.46	6.08	35.00	27.46	0.12	JD/JD		3/4	711.65
AURORA ENERGY LLC	7/7/2022	14	7581	31.51	6.05	35.03	27.41	0.12	JD/JD		3/4	1281.7
AURORA ENERGY LLC	7/8/2022	11	7727	30.79	5.65	35.98	27.59	0.12	JD/JD		3/4	1006.05
AURORA ENERGY LLC	7/11/2022	12	7644	30.96	6.17	35.43	27.46	0.12	JD/JD		3/4	1097.95
AURORA ENERGY LLC	7/12/2022	11	7449	31.29	7.26	34.22	27.24	0.14	JD/JD		3/4	1027.95
AURORA ENERGY LLC	7/14/2022	12	7658	29.29	6.75	35.89	28.07	0.13	JD/BDL	Q3	3/3	1096.2
AURORA ENERGY LLC	7/15/2022	11	7213	33.05	7.32	33.43	26.20	0.11	JD/JD		3/4	1032.2
AURORA ENERGY LLC	7/18/2022	10	7568	31.61	5.58	34.99	27.82	0.12	JD/JD		3/4	927
AURORA ENERGY LLC	7/19/2022	10	7534	31.67	6.17	34.72	27.45	0.12	JD/JD		3/4	935.75
AURORA ENERGY LLC	7/21/2022	10	7534	31.54	6.21	35.13	27.12	0.12	JD/JD		3/4	976.5
AURORA ENERGY LLC	7/22/2022	10	7498	32.28	6.20	34.37	27.16	0.12	JD/JD		3/4	928.1
AURORA ENERGY LLC	7/25/2022	14	7507	31.16	6.93	34.70	27.22	0.13	JD/JD		3/4	1324.5
AURORA ENERGY LLC	7/26/2022	12	7138	32.23	9.28	33.02	25.47	0.15	JD/JD		4/3	1096.35
AURORA ENERGY LLC	7/28/2022	13	7588	31.86	5.76	34.68	27.71	0.13	JD/JD		3/4	1215.85
AURORA ENERGY LLC	7/29/2022	11	7569	31.81	5.80	34.89	27.49	0.12	JD/JD		3/4	1045.65
AURORA ENERGY LLC	8/1/2022	12	7499	31.77	6.28	34.96	26.99	0.12	JD/JD		3/4	1149.8
AURORA ENERGY LLC	8/2/2022	11	7470	31.82	6.63	34.23	27.33	0.13	JD/JD		3/4	1037
AURORA ENERGY LLC	8/4/2022	12	7517	31.82	6.50	35.04	26.65	0.14	JD/JD		3/4	1188.55
AURORA ENERGY LLC	8/5/2022	11	7428	31.96	6.83	33.92	27.30	0.13	JD/JD		3/4	1022.65
AURORA ENERGY LLC	8/8/2022	8	7353	31.99	7.32	34.07	26.63	0.13	JD/JD		3/4	734.35
AURORA ENERGY LLC	8/9/2022	8	7487	32.62	6.16	34.63	26.59	0.13	JD/JD		3/4	766.8
AURORA ENERGY LLC	8/11/2022	8	7173	32.48	8.30	33.53	25.68	0.15	JD/JD		3/4	755.35
AURORA ENERGY LLC	8/12/2022	7	7169	31.93	8.81	33.61	25.66	0.18	JD/JD		3/4	651.75
AURORA ENERGY LLC	8/15/2022	9	7194	31.92	8.75	33.55	25.79	0.14	JD/JD		3/4	842.55
AURORA ENERGY LLC	8/16/2022	10	6944	32.83	9.54	32.64	24.99	0.15	JD/JD		3/4	924.1
AURORA ENERGY LLC	8/18/2022	9	7416	30.21	8.27	34.46	27.06	0.18	BDL/JD	R4	4/4	838.5
AURORA ENERGY LLC	8/19/2022	10	7603	28.64	8.20	35.29	27.87	0.19	BDL/JD	R4	4/3	895.05
AURORA ENERGY LLC	8/22/2022	9	7472	30.68	7.71	34.11	27.51	0.18	BDL/JD	R4	4/3	857.05
AURORA ENERGY LLC	8/23/2022	10	7499	30.12	7.98	34.39	27.52	0.16	BDL/JD	R4	4/3	966
AURORA ENERGY LLC	8/25/2022	9	7539	30.60	7.30	34.60	27.51	0.15	JD/BDL	R4	3/4	870.1
AURORA ENERGY LLC	8/26/2022	10	7477	30.96	7.31	34.35	27.38	0.14	BDL/JD	R4	4/3	943
AURORA ENERGY LLC	8/29/2022	21	7171	31.58	9.25	33.22	25.94	0.17	BDL/JD	R4	4/3	1979.6

Table E. 2022 Rail Sample Analyses of Delivered Coal
Aurora Energy Chena Power Plant SO_2 BACT Analysis

	Sample Date	Cars	AR BTU	AR Moisture	AR Ash	AR Volatiles	AR Carbon	AR Sulfur	Location	Bench	Seam	Tons
AURORA ENERGY LLC	8/30/2022	4	7235	32.28	8.14	33.51	26.07	0.17	BDL/JD	R4	4/3	375.4
AURORA ENERGY LLC	9/1/2022	14	7267	30.75	9.00	34.33	25.92	0.18	BDL/JD	R4	4/3	1329.3
AURORA ENERGY LLC	9/2/2022	10	7374	30.66	8.03	34.31	27.01	0.19	JD/STK		3	931.75
AURORA ENERGY LLC	9/6/2022	33	7120	30.19	10.12	33.45	26.25	0.19	JD/STK		3	3088.6
AURORA ENERGY LLC	9/9/2022	8	7671	30.24	6.82	34.89	28.05	0.14	JD/BDL	R4	3/4	775.55
AURORA ENERGY LLC	9/13/2022	17	7167	30.01	10.56	33.43	26.01	0.18	JD/BDL	R4	3/4	1640.35
AURORA ENERGY LLC	9/14/2022	11	7154	30.47	10.29	33.68	25.56	0.19	JD/BDL	R4	3/4	1035.55
AURORA ENERGY LLC	9/14/2022	13	7184	30.90	9.67	33.87	25.57	0.20	JD/BDL	R4	3/4	1281.7
AURORA ENERGY LLC	9/16/2022	6	7429	28.55	8.66	34.96	27.84	0.21	BDL/STK	R4	4	566.25
AURORA ENERGY LLC	9/19/2022	13	7405	30.20	8.38	34.35	27.08	0.22	BDL/STK	R4	4	1276.65
AURORA ENERGY LLC	9/20/2022	12	7486	29.78	8.59	34.41	27.21	0.21	JD/BDL	R4	3/4	1112.05
AURORA ENERGY LLC	9/21/2022	10	7704	29.41	7.12	35.43	28.04	0.20	JD/BDL	R4	3/4	954.5
AURORA ENERGY LLC	9/24/2022	14	7225	30.97	9.23	33.64	26.16	0.21	JD/BDL	R4	3/4	1290.25
AURORA ENERGY LLC	9/26/2022	14	7551	30.63	7.36	34.64	27.37	0.17	JD/BDL	R4	3/4	1306.3
AURORA ENERGY LLC	9/27/2022	8	7537	30.77	7.34	34.40	27.51	0.16	JD/BDL	R4	3/4	752.5
AURORA ENERGY LLC	9/28/2022	8	7572	31.28	6.45	34.78	27.49	0.14	JD/BDL	R4	3/4	770.75
AURORA ENERGY LLC	9/30/2022	14	7582	30.91	6.47	34.86	27.76	0.14	JD/BDL	R4	3/4	1312.9
AURORA ENERGY LLC	10/4/2022	16	7589	30.72	6.73	35.14	27.41	0.13	JD/BDL	R4	3/4	1467.9
AURORA ENERGY LLC	10/5/2022	15	7599	30.54	6.81	34.83	27.82	0.13	JD/BDL	R4	3/4	1468.8
AURORA ENERGY LLC	10/6/2022	6	7448	31.04	7.50	34.34	27.14	0.14	JD/BDL	R4	3/4	557.25
AURORA ENERGY LLC	10/7/2022	19	7610	29.93	7.11	35.08	27.88	0.14	JD/BDL	R4	3/4	1837.1
AURORA ENERGY LLC	10/11/2022	17	7586	30.46	7.13	35.37	27.05	0.13	JD/BDL	R4	3/4	1552.7
AURORA ENERGY LLC	10/12/2022	12	7451	30.71	7.88	35.16	26.26	0.16	JD/BDL	R4	3/4	1153.45
AURORA ENERGY LLC	10/13/2022	12	7531	31.30	6.81	34.42	27.47	0.15	JD/BDL	R4	3/4	1137.95
AURORA ENERGY LLC	10/14/2022	13	7584	30.06	7.44	34.66	27.85	0.16	JD/BDL	R4	3/4	1251.4
AURORA ENERGY LLC	10/18/2022	11	7636	29.78	7.41	34.86	27.95	0.19	JD/BDL	R4	3/4	1066.5
AURORA ENERGY LLC	10/19/2022	11	7629	29.91	7.34	34.84	27.92	0.19	JD/BDL	R4	3/4	1064.9
AURORA ENERGY LLC	10/20/2022	11	7606	30.47	7.02	34.78	27.74	0.16	JD/BDL	R4	3/4	1059.2
AURORA ENERGY LLC	10/21/2022	11	7503	31.61	6.74	34.41	27.25	0.16	JD/BDL	R4	3/4	1041.9
AURORA ENERGY LLC	10/25/2022	14	7586	30.33	7.64	34.71	27.32	0.16	JD/BDL	R4	3/4	1353.65
AURORA ENERGY LLC	10/26/2022	15	7600	30.20	7.66	34.77	27.38	0.16	JD/BDL	R4	3/4	1447.15
AURORA ENERGY LLC	10/28/2022	15	7627	29.42	7.92	35.27	27.39	0.17	JD/BDL	R4	3/4	1462.15
AURORA ENERGY LLC	11/2/2022	15	7651	30.26	6.93	35.71	27.11	0.13	JD/BDL	R4	3/4	1439.85
AURORA ENERGY LLC	11/3/2022	11	7630	30.15	7.03	34.94	27.88	0.14	JD/BDL	R4	3/4	1035.1
AURORA ENERGY LLC	11/4/2022	16	7593	29.85	7.23	34.98	27.95	0.13	JD/BDL	R4	3/4	1404.15
AURORA ENERGY LLC	11/8/2022	9	7516	31.10	7.07	34.48	27.35	0.13	JD/BDL	R4	3/4	840.55
AURORA ENERGY LLC	11/9/2022	10	7660	30.50	6.21	35.17	28.13	0.11	JD/BDL	R4	3/4	945.5
AURORA ENERGY LLC	11/10/2022	9	7696	29.90	6.48	35.18	28.45	0.13	JD/BDL	R4	3/4	858.65
AURORA ENERGY LLC	11/11/2022	10	7629	30.16	6.29	34.91	28.66	0.13	JD/BDL	R4	3/4	942.5
AURORA ENERGY LLC	11/15/2022	12	7487	31.02	6.87	34.24	27.87	0.13	JD/BDL	R4	3/4	1149.05
AURORA ENERGY LLC	11/16/2022	11	7600	31.54	5.68	34.78	28.00	0.11	JD/JD		4/3	993.7
AURORA ENERGY LLC	11/17/2022	11	7740	31.60	4.77	35.80	27.84	0.10	JD/JD		3/4	1007.85
AURORA ENERGY LLC	11/18/2022	11	7736	31.95	4.42	35.63	28.00	0.09	JD/JD		3/4	1030.85
AURORA ENERGY LLC	11/21/2022	13	7741	31.55	4.58	35.71	28.17	0.09	JD/JD		4/3	1172.2
AURORA ENERGY LLC	11/22/2022	12	7717	31.45	4.78	35.19	28.58	0.10	JD/JD		3/4	1095.6
AURORA ENERGY LLC	11/23/2022	5	7675	31.74	5.06	35.20	28.00	0.13	JD/JD		4/3	461
AURORA ENERGY LLC	11/25/2022	14	7698	31.36	5.10	35.32	28.23	0.12	JD/JD		4/3	1299.6
AURORA ENERGY LLC	11/29/2022	11	7314	31.86	7.79	33.41	26.95	0.14	JD/BDL	R4	4/4	893.5
AURORA ENERGY LLC	11/30/2022	8	7463	32.33	6.21	34.02	27.45	0.13	JD/BDL	R4	4/4	645.8
AURORA ENERGY LLC	12/1/2022	11	7697	31.08	5.60	35.41	27.92	0.14	JD/BDL	R4	4/4	920.5
AURORA ENERGY LLC	12/2/2022	8	7745	30.45	5.72	35.60	28.24	0.13	JD/BDL	R4	4/4	667.3
AURORA ENERGY LLC	12/6/2022	12	7714	31.23	4.92	36.00	27.86	0.13	JD/BDL	R4	4/4	1097.55
AURORA ENERGY LLC	12/7/2022	14	7680	31.32	5.33	35.78	27.57	0.14	JD/BDL	R4	4/4	1262.6
AURORA ENERGY LLC	12/8/2022	15	7737	31.70	4.44	35.66	28.21	0.10	JD/BDL	R4	4/4	1353.6
AURORA ENERGY LLC	12/9/2022	13	7703	31.17	5.00	36.02	27.82	0.12	JD/BDL	R4	4/4	1125.15
AURORA ENERGY LLC	12/13/2022	12	7731	31.32	5.01	35.74	27.93	0.13	JD/BDL	R4	4/4	1061.9
AURORA ENERGY LLC	12/14/2022	14	7701	31.62	4.79	36.02	27.58	0.11	JD/BDL	R4	4/4	1190.25
AURORA ENERGY LLC	12/15/2022	6	7589	32.69	4.73	34.93	27.66	0.14	JD/BDL	R4	4/4	520.55
AURORA ENERGY LLC	12/20/2022	4	7493	31.56	6.50	34.51	27.43	0.10	JD/STK		4	362
Annual Average			7536	31.31	6.53	34.63	27.53	0.12				

AR = as received

Table F. Estimated Station Service Electrical Load for DSI Equipment
Aurora Energy Chena Power Plant SO_2 BACT Analysis

Do not use for electrical equipment sizing. Use only for approximating actual kW consumption under normal operating conditions.

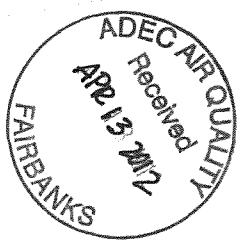
EQUIPMENT Equip Tag	Load Name	MCC Starter Size	MCC Starter Type	Voltage [V]	Load [VA]	Load [HP]	Load [KW]	FLA	Load Factor	Adjusted Load (kVA)	PF	Adjusted Load (kW)	Notes
05B3A	Unloading Blower	5	FVNR	480		125		150.36	0.10	12.5	0.85	10.6	Only used for unloading
05B3B	Air Cooler for Unloading Blower	1	FVNR	480		1		1.20	0.10	0.1	0.80	0.1	Only used for unloading
06B3A	Bin Vent Exhaust Fan	1	FVNR	480		7.5		9.02	0.87	6.5	0.80	5.2	
06B3B	Bin Discharger Silo #1	1	FVNR	480		3		3.61	0.87	2.6	0.80	2.1	
06B3B	Bin Discharger Silo #2	1	FVNR	480		3		3.61	0.87	2.6	0.80	2.1	
08B3A	Transfer Blower for Day Bins A	3	FVNR	480		50		60.14	0.25	12.5	0.85	10.6	Only used to transfer to plant
08B3A	Transfer Blower for Day Bins B	3	FVNR	480		50		60.14	0.00	0.0	0.85	0.0	Spare
08B3A	Air Cooler for Transfer Blower	3	FVNR	480		1		1.20	0.25	0.3	0.80	0.2	Only used to transfer to plant
09B3B	Airlock Silo #1	1	FVNR	480		1		1.20	0.25	0.3	0.80	0.2	Only used to transfer to plant
09B3B	Airlock Silo #2	1	FVNR	480		1		1.20	0.25	0.3	0.80	0.2	Only used to transfer to plant
	Unloading Skid heater			480	5000.0		5000.00	6.01	0.10	0.5	1.00	0.5	Only used for unloading
	Silo #1 Heater			480	5000.0		5000.00	6.01	1.00	5.0	1.00	5.0	
	Silo #2 Heater			480	5000.0		5000.00	6.01	1.00	5.0	1.00	5.0	
	Silo #1 Exhaust Fan	1	FVNR	480		2		2.41	0.87	1.7	0.80	1.4	
	Silo #2 Exhaust Fan	1	FVNR	480		2		2.41	0.87	1.7	0.80	1.4	
	Air Compressor	3	FVNR	480		30		36.09	0.87	26.1	0.85	22.2	For continuous supply of fluidizing air
	Area Lighting		100A BKR	480	1500.0		1500.00	1.80	1.00	1.5	0.90	1.4	
	Receptacles			480	1500.0		1500.00	1.80	1.00	1.5	0.90	1.4	
	Total	25				276.5		354.24				**69.5**	
05B3A	Bin Vent Exhaust Fan #1	1	FVNR	480		3		3.61	0.87	2.6	0.8	2.1	
05B3A	Bin Vent Exhaust Fan #2	1	FVNR	480		3		3.61	0.87	2.6	0.8	2.1	
	Bin Discharger #1	1	FVNR	480		1.5		1.80	0.87	1.3	0.8	1.0	
	Bin Discharger #2	1	FVNR	480		1.5		1.80	0.87	1.3	0.8	1.0	
	Feeder #1	1	FVNR	480		1		1.20	0.87	0.9	0.8	0.7	
	Feeder #2	1	FVNR	480		2		2.41	0.87	1.7	0.8	1.4	
	Feeder #3	1	FVNR	480		2		2.41	0.00	0.0	0.8	0.0	Spare
	Grinding Motor #1	3	FVNR	480		30		36.09	0.87	26.1	0.85	22.2	
	Grinding Motor #2	4	FVNR	480		60		72.17	0.87	52.2	0.85	44.4	
	Grinding Motor #3	3	FVNR	480		30		36.09	0.00	0.0	0.85	0.0	Spare
	Classifier Motor #1	1	FVNR	480		3		3.61	0.87	2.6	0.8	2.1	
	Classifier Motor #2	1	FVNR	480		6		7.22	0.87	5.2	0.8	4.2	
	Classifier Motor #3	1	FVNR	480		3		3.61	0.00	0.0	0.8	0.0	Spare
	Injection Blower Boiler #1	2	FVNR	480		25		30.07	0.87	21.8	0.85	18.5	
	Backup Injection Blower Boiler #1 (25HP)	2	FVNR	480				0.00	0.87	0.0	0.85	0.0	Spare
	Injection Blower Boiler #2	2	FVNR	480		25		30.07	0.87	21.8	0.85	18.5	
	Backup Injection Blower Boiler #2 (25HP)	2	FVNR	480				0.00	0.87	0.0	0.85	0.0	Spare
	Injection Blower Boiler #3	2	FVNR	480		25		30.07	0.87	21.8	0.85	18.5	
	Backup Injection Blower Boiler #3 (25HP)	2	FVNR	480				0.00	0.87	0.0	0.85	0.0	Spare
	Injection Blower Boiler #5	4	FVNR	480		75		90.21	0.87	65.3	0.85	55.5	
	Backup Injection Blower Boiler #5 (75HP)	4	FVNR	480				0.00	0.87	0.0	0.85	0.0	Spare
	Air Cooler #1	1	FVNR	480		2		2.41	0.87	1.7	0.8	1.4	
	Air Cooler #2	1	FVNR	480		2		2.41	0.87	1.7	0.8	1.4	
	Air Cooler #3	1	FVNR	480		2		2.41	0.87	1.7	0.8	1.4	
	Air Cooler #5	1	FVNR	480		2		2.41	0.87	1.7	0.8	1.4	
	Exhaust Fan Mill #1	2	FVNR	480		15		18.04	0.87	13.1	0.8	10.4	
	Exhaust Fan Mill #2	2	FVNR	480		15		18.04	0.87	13.1	0.8	10.4	
	Exhaust Fan Mill #3	2	FVNR	480		15		18.04	0.87	13.1	0.8	10.4	
	Exhaust Fan Mill #4	2	FVNR	480		15		18.04	0.87	13.1	0.8	10.4	
	Airlock Mill #1	1	FVNR	480		0.25		0.30	0.87	0.2	0.8	0.2	
	Airlock Mill #2	1	FVNR	480		0.25		0.30	0.87	0.2	0.8	0.2	
	Airlock Mill #3	1	FVNR	480		0.25		0.30	0.87	0.2	0.8	0.2	

EQUIPMENT Equip Tag	Load Name	MCC Starter Size	MCC Starter Type	Voltage [V]	Load [VA]	Load [HP]	Load [KW]	FLA	Load Factor	Adjusted Load (kVA)	PF	Adjusted Load (kW)	Notes
	Airlock Mill #4	1	FVNR	480		0.25		0.30	0.87	0.2	0.8	0.2	
	Area Lighting		100A BKR	480	1500.0		1500.00	1.80	1.00	1.5	0.9	1.4	
	Receptacles			480	1500.0		1500.00	1.80	1.00	1.5	0.9	1.4	
	Total	56				365		442.65				**242.8**	

Total	**312.3**

AURORA
ENERGY, LLC
Keeping Fairbanks warm

Hand Delivered



April 12, 2012

Moses Coss
Title V Supervisor
Department of Environmental Conservation
Air Quality Division
601 University Avenue
Fairbanks, Alaska 99709

Dear Mr. Coss,

Aurora Energy, LLC submitted a new Owner Requested Limit (ORL) application on March 20, 2012. At that time we had not received the final November 2011 Source Test Report from TRC; Attachment B of the ORL application package. This letter serves as transmittal and certification of the enclosed report titled - "Emission Test Report, Aurora Energy, LLC Chena Power Plant Fairbanks, Alaska" dated April 4, 2012.

Based on information and belief formed after reasonable inquiry, I certify that the statements and information in and attached to this document are true, accurate, and complete.

If you have any questions regarding this matter please contact Tammy Scholten at 907-750-9580 or Tammy@Usibelli.com.

Sincerely,

Buki Wright
President

cc: Files

100 Cushman Street, Suite 210 Fairbanks, Alaska 99701-4674 Tel. 907-452-8767 Fax. 907-451-6543

ADEC AIR QUALITY
Received
APR 13 2012
FAIRBANKS

EMISSION TEST REPORT

AURORA ENERGY, LLC
CHENA POWER PLANT - FAIRBANKS, ALASKA

COMBINED BOILER BAGHOUSE EXHAUST

Prepared for:

Aurora Energy, LLC
100 Cushman Street #210
Fairbanks, AK 99701
Attn: Ms. Tammy Scholten

Prepared by:

19874 141st Ave NE
Woodinville, WA 98072
(425) 489-1938

TRC Project No. 187446-0000-0000
Report #2011W-AE002

Initial Report Date: January 4, 2012
Revised Report Date: April 4, 2012

Hand Delivered

EMISSION TEST REPORT

AURORA ENERGY, LLC
CHENA POWER PLANT - FAIRBANKS, ALASKA

COMBINED BOILER BAGHOUSE EXHAUST

Prepared for:

Aurora Energy, LLC
100 Cushman Street #210
Fairbanks, AK 99701
Attn: Ms. Tammy Scholten

Prepared by:

19874 141st Ave NE
Woodinville, WA 98072
(425) 489-1938

TRC Project No. 187446-0000-0000
Report #2011W-AE002

Initial Report Date: January 4, 2012
Revised Report Date: April 4, 2012

TRC

REPORT CERTIFICATION

Aurora Energy, LLC
Report #2011W-AE002

SUBMITTAL DATE
Initial Report Date: January 4, 2012
Revised Report Date: April 4, 2012

I certify that to the best of my knowledge:

- Testing data and all corresponding information have been checked for accuracy and completeness.
- Sampling and analysis have been conducted in accordance with the approved protocol and applicable reference methods (as applicable).
- All deviations, method modifications, or sampling and analytical anomalies are summarized in the appropriate report narrative(s).

Judith Aasland

for Ken Allmendinger
Project Manager

04/04/2012

TRC was operating in conformance with the requirements of ASTM D7036-04 during this test program.

Jeffrey W. Burdette
TRC Air Measurements Technical Director

Section ***Page #***

1.0 INTRODUCTION 1
1.1 Overview 1
Table 1.1.1 – Brief Overview of November 2011 Emissions Test Program 1
Table 1.1.2 – List of Project Participants 2

2.0 SUMMARY OF RESULTS
2.1 Presentation of Results 3
Table 2.1.1 – EPA Method 201A/202 3
Table 2.1.2 – EPA Methods 3A, 6C, 7E, 10, & 25A 4
Table 2.1.3 – EPA Method 26A 5
Table 2.1.4 – EPA Method 30B 6
2.2 Project Deviations & Exceptions 6

3.0 PROCESS DESCRIPTION 7
Table 3.0 – Summary of Process Data 7

4.0 SAMPLING AND ANALYTICAL PROCEDURES 8
4.1 Overview 8
4.2 Field Program Description 8
4.3 Testing Methodology 8
4.3.1 Traverse Point Location (EPA Method 1) 8
4.3.2 Stack Gas Velocity and Volumetric Flow Rate (EPA Method 2) 8
4.3.3 O_2 & CO_2 Concentrations/Molecular Weight (EPA Method 3) 9
4.3.4 Stack Gas Moisture (EPA Method 4) 9
4.3.5 Total Particulate Matter (PM10 & PM2.5) (EPA Method 201A/202) 9
4.3.6 HCl & HF (EPA Method 26A) 10
4.3.7 Hg (EPA Method 30B) 10
4.4 TRC CEMS 11
4.4.1 Instrument Checks and System Integrity; Setup Day 12
4.4.2 CEMS Calibrations 12
4.4.2.1 Methods 3A, 6C, 7E, and 10 12
4.4.2.2 Method 25A 12
4.4.3 Bias Checks 13
4.4.3.1 Methods 3A, 6C, 7E and 10 13
4.4.3.2 Method 25A 13
4.4.4 CEMS Data Acquisition System 14
4.4.5 CEMS Components 14
4.4.5.1 O2 and CO2 Measurements (EPA Method 3A) 14
Table 4.4.5.1 – TRC O2/CO2 CEMS Zero and Span Gas Ranges 15
4.4.5.2 SO_2 Measurements (EPA Method 6C) 15
Table 4.4.5.2 – TRC SO2 CEMS Zero and Span Gas Ranges 16
4.4.5.3 NOx Measurements (EPA Method 6E) 16
Table 4.4.5.3 – TRC NOx CEMS Zero and Span Gas Ranges 16
4.4.5.4 CO Measurements (EPA Method 10) 16
Table 4.4.5.4 – TRC CO CEMS Zero and Span Gas Ranges 17
4.4.5.5 VOC (as Propane) Measurements (EPA Method 10) 17
Table 4.4.5.5 – TRC VOC (as Propane) CEMS Zero and Span Gas Ranges 17

5.0 QUALITY ASSURANCE 19
5.1 Overview 19
5.2 Field Quality Control Summary 19
5.2.1 Calibration Procedures 19
5.2.2 Calibration Gases 19
5.2.3 Reagent Certifications 19
5.2.4 Equipment Leak Checks 19
5.2.5 Sampling Handling Quality Assurance/Quality Control 19
5.3 Data Reduction, Validation, and Reporting 19
5.3.1 Field Data Reduction 20
5.3.2 Data Validation 20
5.3.3 Data Reporting 20

APPENDICES

A Computer Printouts of Results A-1
EPA Methods 3A, 6C, 7E, 10 & 25A A-2
EPA Method 26A A-3
EPA Method 201A/202 ..... A-10
EPA Method 30B A-20

B Laboratory Analysis Results B-1
Condensable PM & HCl/HF Emission Results – Chester LabNet B-2
Hg Results - Frontier Geosciences B-15

C Facility Process Data C-1

D Manual Calculations and Field Data D-1
Bias Correction for SO_2 ..... D-2
EPA Method 6C (SO_2) D-3
EPA Method 7E (NOx) D-4
EPA Method 10 (CO) D-5
EPA Method 25A Total Hydrocarbons (THC) (as propane) D-6
EPA Method 201A/202 – Total Particulate Matter D-7
EPA Method 26A – HCl/HF D-11
EPA Method 30B – Hg D-16

E Equipment Calibrations E-1
Standard Pitot Calibration Information E-2
M201A Pitot Calibration Informaiton E-3
Dry Gas Meter Calibrations E-4
Standard Dry Gas Meter Calibration E-8
Mettler Balance Calibration E-9
Calibration Gas Certificates E-12

F Project Participants F-1

TABLES/FIGURES

Table		***Page #***
1.1.1	Brief Overview of November 2011 Emissions Test Program	1
1.1.2	List of Project Participants	2
2.1.1	EPA Method 201A/202	3
2.1.2	EPA Methods 3A, 6C, 7E, 10, & 25A	4
2.1.3	EPA Method 26A	5
2.1.4	EPA Method 30B	6
3.0	Summary of Process Data	7
4.4.5.1	TRC O2/CO2 CEMS Zero and Span Gas Ranges	15
4.4.5.2	TRC SO2 CEMS Zero and Span Gas Ranges	16
4.4.5.3	TRC NOx CEMS Zero and Span Gas Ranges	16
4.4.5.4	TRC CO CEMS Zero and Span Gas Ranges	17
4.4.5.5	TRC VOC (as Propane) CEMS Zero and Span Gas Ranges	17

1.0 - INTRODUCTION

1.1 Overview

The scope of this test program involved emissions testing at the combined boiler baghouse exhaust from Chena units 1, 2, 3, and 5 at Aurora Energy, LLC's steam production facility in Fairbanks, Alaska. Emissions results are reported to determine compliance with the proposed CAM plan, emission factors for annual rate of emission calculations, and MACT applicability confirmation. Included in Table 1.1 below is a summary of the test program along with the applicable test methods used. These emissions tests were performed to also demonstrate compliance with ADEC's Permit #AQ315RVP01 emissions testing requirements.

Table 1.1.1 – Brief Overview of November 2011 Emissions Test Program
Aurora Energy, LLC's Chena Power Plant - Fairbanks, Alaska

Combined Boiler (Chena 1, 2, 3, & 5) Baghouse Stack			
Item #	**Test Method**	**Sampling Parameter**	**Test Duration**
1	1, 2, 3A, & 4	Velocity, Flow Rate, O_2/CO_2, Moisture Content	Included during each Method 201A/202 and 26A test
2	201A/202	Total Particulate Matter (PM_{10} and PM2.5)	60 minutes
3	6C	Sulfur dioxide (SO_2)	60 minutes
4	7E	Nitrogen oxides (NOx)	60 minutes
5	10	Carbon monoxide (CO)	60 minutes
6	25A	Volatile Organic Carbon (VOC) as Total hydrocarbons (THC)	60 minutes
7	26A	Hydrogen Chloride (HCl) and Hydrogen Fluoride (HF)	60 minutes
8	30B	Mercury (Hg)	60 minutes

All testing procedures were conducted in accordance with the guidelines published in the July 2011 edition of the EPA document Title 40, Code of Federal Regulations, Part 60 (40 CFR 60), Appendix A; and in Subpart M of 40 CFR 51.

- Method 1 — Sample and Velocity Traverses for Stationary Sources
- Method 2 — Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)
- Method 3A — Gas Analysis for the Determination of Dry Molecular Weight
- Method 4 — Determination of Moisture Content in Stack Gases
- Method 201A — Determination of PM_{10} and $PM_{2.5}$ Emissions from Stationary Sources (Constant Sampling Rate Procedure)
- Method202 — Dry Impinger Method for Determining Condensable Particulate Matter Emissions From Stationary Sources
- Method 6C — Determination of Sulfur Dioxide Emissions from Stationary Sources
- Method 7E — Determination of Nitrogen Oxides Emissions from Stationary Sources
- Method 10 — Determination of Carbon Monoxides Emissions from Stationary Sources (Instrumental Analyzer Procedure)
- Method 25A — Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer
- Method 26A — Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources
- Method 30B — Determination of Total Vapor Phase Mercury Emissions from Stationary Sources

Table 1.1.2 – List of Project Participants

Proposed Emissions Test Program Aurora Energy, LLC – Chena Power Plant Fairbanks, Alaska		
Program Role	**Company**	**Contact Information**
Source/Test Coordinator	Aurora Energy, LLC 100 Cushman Street #210 Fairbanks, AK 99701	Tammy Scholten, PE, PMP Senior Environmental Engineer office – 907-683-9734 tammy@usibelli.com
Testing Company	TRC Environmental Corporation 19874 141st Place NE Woodinville, WA 98072 USA	Ken Allmendinger, Project Manager office - 425-489-1938 fax - 425-489-9564 cell – 425-691-0104 kallmendinger@trcsolutions.com
Subcontract Laboratory (PM/CPM, HCl, HF)	Chester LabNet 12242 SW Garden Place Tigard, OR 97223-8246	Paul Duda, Project Manager Office – 503-624-2183 ext. 100 Fax – 503-624-2653 pduda@chesterlab.net http:\\www.chesterlab.net
Subcontract Laboratory (Hg)	Frontier Global Sciences 414 Pontius Ave. North Seattle, WA 98109	Gerard Van der Jagt , Project Coordinator Office - 206-622-6960 gerardj@frontiergs.com

2.0 – SUMMARY OF RESULTS

2.1 Presentation of Results

Included below in Table 2.1 is the summary of the emissions test results for the test program performed at Aurora Energy, LLC's combined boiler baghouse stack on November 19, 2011.

Table 2.1.1 – EPA Method 201A/202
Particulate Matter Emissions Results
Aurora Energy, LLC – Chena Power Plant – Fairbanks, AK

Combined Boiler Baghouse Stack						
Test Identification	**Emission Unit**	**Run 1**	**Run 2**	**Run 3**	**Average**	**Permit Limit**
Test Date	---	11/19/2011	11/19/2011	11/19/2011	---	---
Start Time	---	1112	1405	1710	---	---
Stop Time	---	1232	1517	1826	---	---
Sample Length	**minutes**	59.75	60.5	57.75	**59.33**	---
Sample Volume	**dscf**	21.091	21.935	20.277	**21.101**	---
Stack Diameter	**inches**	90	90	90	---	---
SOURCE PARAMETERS						
O_2	**%**	9.5	9.4	9.5	**9.5**	---
CO_2	**%**	10.3	10.4	10.4	**10.4**	---
M201A/202 Stack Gas Airflow	**dscf/min**	141,700	139,882	136,997	**139,526**	---
SAMPLING RESULTS						
PM > 2.5 microns	**gr/dscf**	0.0014	0.0047	0.0024	**0.0028**	---
	lb/hr	1.69	5.65	2.86	**3.40**	---
PM < 2.5 microns	**gr/dscf**	0.0002	0.0023	0.0021	**0.0015**	
	lb/hr	0.267	2.78	2.41	**1.82**	
Total Filterable PM	**gr/dscf**	0.0016	0.0070	0.0045	**0.0044**	***0.01***
	lb/hr	1.96	8.44	5.27	**5.22**	---
Condensable Organic PM	**gr/dscf**	0.0020	0.0020	0.0016	**0.0018**	---
	lb/hr	2.40	2.36	1.88	**2.21**	---
Inorganic Condensable PM	**gr/dscf**	0.0080	0.0063	0.0152	**0.0098**	---
	lb/hr	9.69	7.51	17.9	**11.7**	---
Total Condensable PM	**gr/dscf**	0.0100	0.0082	0.0168	**0.0117**	---
	lb/hr	12.1	9.87	19.8	**13.9**	---
PM < 2.5 including Condensable PM	**gr/dscf**	0.0102	0.0106	0.0189	**0.0132**	---
	lb/hr	12.4	12.7	22.2	**15.7**	---
Total PM (< 2.5 & > PM2.5) including Condensable PM	**gr/dscf**	0.0116	0.0153	0.0213	**0.0160**	---
	lb/hr	14.0	18.3	25.0	**19.1**	---

Table 2.1.2 – EPA Methods 3A, 6C, 7E, 10, & 25A
SO_2, NO_x, CO, & THC Emissions Results
Aurora Energy, LLC – Chena Power Plant – Fairbanks, AK

Combined Boiler Baghouse Stack						
Test Identification	**Emission Unit**	**Run 1**	**Run 2**	**Run 3**	**Average**	**Permit Limit**
Test Date	---	11/19/2011	11/19/2011	11/19/2011	---	---
Start Time	---	1112	1404	1704	---	---
Stop Time	---	1230	1517	1824	---	---
Sample Length	**minutes**	60	60	60	---	---
Sample Volume	**dscf**	44.660	47.544	45.479	**45.894**	---
Stack Diameter	**inches**	90	90	90	---	---
SOURCE PARAMETERS						
O_2	**%**	9.5	9.4	9.5	**9.5**	---
CO_2	**%**	10.3	10.4	10.4	**10.4**	---
M26A Stack Gas Airflow	**dscf/min**	144,849	140,489	139,492	**141,610**	---
SAMPLING RESULTS						
SO_2	**ppm**	133.9	131.5	137.5	**134.3**	---
	lb/hr	193.2	184.0	191.0	**189.4**	---
NO_x	**ppm**	218.4	154.9	148.7	**174.0**	---
	lb/hr	226.6	155.9	148.6	**177.0**	---
CO	**ppm**	106.6	213.3	191.3	**170.4**	---
	lb/hr	67.4	130.7	116.4	**104.8**	---
THC (as Propane)	**ppm (dry)**	1.2	0.6	0.0	**0.6**	---
	lb/hr	1.20	0.534	0.000	**0.577**	---

Table 2.1.3 – EPA Method 26A
HCl & HF Emissions Results
Aurora Energy, LLC – Chena Power Plant – Fairbanks, AK

Combined Boiler Baghouse Stack						
Test Identification	**Emission Unit**	**Run 1**	**Run 2**	**Run 3**	**Average**	**Permit Limit**
Test Date	---	11/19/2011	11/19/2011	11/19/2011	---	---
Start Time	---	1112	1320	1710	---	---
Stop Time	---	1230	1517	1824	---	---
Sample Length	**minutes**	60	60	60	---	---
Sample Volume	**dscf**	44.660	47.544	45.479	**45.894**	---
Stack Diameter	**inches**	90	90	90	---	---
SOURCE PARAMETERS						
O_2	**%**	9.5	9.4	9.5	**9.5**	---
CO_2	**%**	10.3	10.4	10.4	**10.4**	---
M26A Stack Gas Airflow	**dscf/min**	144,849	140,489	139,492	**141,610**	---
SAMPLING RESULTS						
Hydrogen Chloride (HCl)	**µg**	1,660	1,790	1,730	**1,727**	---
	mg/dscm	1.350	1.368	1.382	**1.367**	---
	lb/hr	0.733	0.720	0.722	**0.725**	---
Hydrogen Fluoride (HF)	**µg**	1,020	1,620	1,580	**1,407**	---
	mg/dscm	0.850	1.267	1.292	**1.136**	---
	lb/hr	0.461	0.667	0.675	**0.601**	---

Table 2.1.4 – EPA Method 30B
Hg Emissions Results
Aurora Energy, LLC – Chena Power Plant – Fairbanks, AK

Combined Boiler Baghouse Stack						
Test Identification	**Emission Unit**	**Run 1**	**Run 2**	**Run 3**	**Average**	**Permit Limit**
Test Date	---	11/19/2011	11/19/2011	11/19/2011	---	---
Start Time	---	1119	1404	1710	---	---
Stop Time	---	1223	1517	1819	---	---
Sample Length	**minutes**	60	60	60	---	---
Sample Volume	**Liters**	44.222	40.569	42.608		---
Sample Volume	**dscm**	4.62	5.17	4.63		
Stack Diameter	**inches**	90	90	90	---	---
SOURCE PARAMETERS						
O_2	**%**	9.5	9.4	9.5	**9.5**	---
CO_2	**%**	10.3	10.4	10.4	**10.4**	---
M26A Stack Gas Airflow	**dscf/min**	144,849	140,489	139,492	**141,610**	---
SAMPLING RESULTS						
Mercury (Hg)	**ng**	51.1	52.7	49.3	**51.0**	---
	µg/dscm	2.31	2.58	2.32	**2.40**	---
	mg/min	9.47	10.3	9.15	**9.63**	---
	lb/hr	0.001	0.001	0.001	**0.001**	---

2.2 Project Deviations & Exceptions

An initial first run was aborted on November 18, 2011 due to uneven firing conditions from large chunks of frozen coal. Aurora Energy personnel instructed TRC to stop testing for the day and return on November 19, 2011 to complete the test program. Subsequent test runs were labeled as Runs 1, 2, and 3.

Chester LabNet's has noted in their case narrative for the Method 26A samples that a peak doublet was present at the F elution time. Based on the spike results, Chester LabNet further states that the peaks in the doublet were comprised of F and a F compound, possibly fluorosilicate. Per the test method, only F data is reported, therefore the second peak was not taken into account. Aurora Energy's permit conditions are for HF which is determined by the measurement of the F ion in solution. Since the doublet peak detected by Chester LabNet is not a lone F ion and cannot be HF due to the ionic nature of HF in solution, the doublet peak can be dismissed as not being related to HF emissions.

Due to unforeseen equipment issues, TRC's EPA Method 25A CEMS was calibrated by introducing the calibration gas at the CEMS probe inlet in an 80 Liter Tedlar gas bag. This method of calibration still met all of the EPA Method 25A requirements pertaining to the use and introduction of calibration gas to the Method 25A CEMS. While this is a alteration from

normal TRC operating procedures, it is still a viable method of performing the calibrations under EPA regulations. It should also be noted that TRC's DAS applied the more stringent CEMS calibrations and bias check criteria from EPA Method 7E to the Method 25A test data.

3.0 – PROCESS DESCRIPTION

Aurora Energy, LLC operates a power generation facility located on the Chena River in Fairbanks, Alaska. The Chena Power Plant operates under State of Alaska Department of Environmental Conservation (ADEC) Permit No. AQ315TVP01 and includes four (4) coal-fired boilers identified as Chena 1 (EU4), 2 (EU5), 3 (EU6), and 5 (EU7). Emissions from the boilers are controlled by multiclones and a common baghouse system. Prior to exhausting to the atmosphere, exhaust gas from Chena 1, 2, 3, and 5 vents to the baghouse system through an existing stack formerly used by Chena 5. Chena 1, 2, and 3 are rated at 50,000 pounds per hours of steam production (Mlb/hr). Chena 5 is rates at 200 Mlb/hr steam production. Included in table 3.0 are the average steam production rates achieved on the test day.

Table 3.0 - Summary of Process Data
Steam Production Rates
Aurora Energy, LLC – Chena Power Plant – Fairbanks, AK

		Combined Boiler Baghouse Stack			
		Run 1	Run 2	Run 3*	Average
	Test Date	11/19/2011	11/19/2011	11/19/2011	
	Test Time	1115-1227	1407-1520	1710-1825	
STEAM PRODUCTION					
Boiler #1	lb/hr	50,000	47,900	47,300	**48,400**
Boiler #2	lb/hr	45,200	44,900	46,600	**45,567**
Boiler #3	lb/hr	40,000	40,600	40,800	**40,467**
Boiler #5	lb/hr	232,000	228,000	228,000	**229,333**
TOTAL Steam Production Rate	**lb/hr**	**367,200**	**361,400**	**362,700**	**363,767**
COAL USAGE					
Boiler #1	lb	11,120	11,280	10,020	**10,807**
Boiler #2	lb	11,820	9,820	8,640	**10,093**
Boiler #3	lb	9,780	8,820	8,660	**9,087**
Boiler #5	lb	36,966	35,831	34,876	**35,891**
TOTAL Coal Usage	**lb**	**69,686**	**65,751**	**62,196**	**65,878**

*Aurora Energy personnel conducted soot blowing function during this test run.

The baghouse system was manufactured by Flakt, Inc. ESD equipment. The baghouse contains 2926 8-inch by 14-foot bags. The bags are cleaned using pulsed air. The dust that is collected in the bags is air transported to the ash silo and disposed as fill by an ash hauling contractor. The pressure drop across the bags is not continuously recorded, but documentation indicates the pressure drop is between 3.5" H_2O to 6". The set point for operation and cleaning is between 4 to 5". Process data supplied by Aurora Energy is included in Appendix C of this report.

4.0 – SAMPLING AND ANALYTICAL PROCEDURES

4.1 Overview

All testing procedures were conducted in accordance with the guidelines published in the July 2011 edition of the EPA document Title 40, Code of Federal Regulations, Part 60 (40 CFR 60), Appendix A; and in Subpart M of 40CFR51.

This section describes the procedures that TRC followed during the field-sampling program.

4.2 Field Program Description

TRC personnel conducted the field sampling and the following test methods were used:

- Method 1 — Sample and Velocity Traverses for Stationary Sources
- Method 2 — Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)
- Method 3A — Gas Analysis for the Determination of Dry Molecular Weight
- Method 4 — Determination of Moisture Content in Stack Gases
- Method 201A — Determination of PM_{10} and $PM_{2.5}$ Emissions from Stationary Sources (Constant Sampling Rate Procedure)
- Method 202 — Dry Impinger Method for Determining Condensable Particulate Matter Emissions From Stationary Sources
- Method 6C — Determination of Sulfur Dioxide Emissions from Stationary Sources
- Method 7E — Determination of Nitrogen Oxides Emissions from Stationary Sources
- Method 10 — Determination of Carbon Monoxides Emissions from Stationary Sources (Instrumental Analyzer Procedure)
- Method 25A — Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer
- Method 26A — Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources
- Method 30B — Determination of Total Vapor Phase Mercury Emissions from Stationary Sources

4.3 Testing Methodology

4.3.1 Traverse Point Location (EPA Method 1)

The procedures specified by EPA Method 1, "Sample and Velocity Traverses for Stationary Sources", were followed to determine the number and location of traverse points used for each test. The number of straight run stack diameters (equivalent diameters) upstream and downstream from the sample ports were used to determine the minimum number of traverse points required.

During theEPA Method 26A tests, velocity and temperature traverses each consisting of twelve (12) traverse points in each of the two (2) test ports was performed during each run. Copies of the stack schematics with the actual traverse points used for each type of test are included in the appendices of this report.

4.3.2 Stack Gas Velocity and Volumetric Flow Rate (EPA Method 2)

The procedures delineated by EPA Method 2, "Determination of Stack Gas Velocity and Volumetric Flow Rate (Type-S Pitot tube)," are used to determine the stack gas velocity and volumetric flow rate. The sample probe, including a Type-S Pitot tube and K-Type thermocouple, was positioned at each traverse point. The Pitot tube differential pressure and exhaust gas temperature data was recorded on field data sheets. The Pitot tube was connected to an inclined-vertical oil manometer and the thermocouple was connected digital temperature

readout. The thermocouple and readout devices were calibrated in accordance with US EPA Emission Measurement Centers Approved Alternative Method Alt-011 requirements after field use.

4.3.3 O_2 & CO_2 Concentrations/Molecular Weight (EPA Method 3)

During each test period, percent dry O_2 and CO_2 emission concentration data were collected for use in supporting flow rate, emission concentration, and emission rate calculations. For each test run, the molecular weight of the stack gas was calculated per Method 3 based on concurrent O_2 and CO_2 stack gas concentrations.

4.3.4 Stack Gas Moisture Content (EPA Method 4)

The moisture content of the stack gas was determined gravimetrically from the weight gain in each impinger and the weight gain of the silica gel impinger from the EPA Method 201A/202 and 26A sampling trains.

4.3.5 EPA Method 201A/202 – Total Particulate Matter (PM_{10} and $PM_{2.5}$)

The combined EPA Method 201A and EPA Method 202 sample train consists of a stainless steel nozzle attached to an in-stack particle sizing device (cyclone), and a heated glass lined stainless steel sheath probe. A thermocouple and S-type Pitot tube are permanently attached to the probe for measurement of stack gas temperature and velocity. Sample gas is drawn through the nozzle, particle sizing device, probe and then through a tared glass fiber filter. The gas stream temperature across the filter were kept at stack temperature.

Particulate matter collected in the cylcone, on the filter, within the probe, and all connecting glassware from the filter holder top to the probe end were recovered, desiccated, and weighed to determine the total particulate catch per EPA Method 201A procedures. In the TRC laboratory, reagent and filter blanks were carried throughout the gravimetric analysis procedures. Each gravimetric sample was weighed to constant weights of $\pm$ 0.5 milligrams following desiccation in a cabinet desiccator. The Mettler AB204-S electronic balance used to obtain weights is set to a time integrating mode with a readability of 0.01 milligrams. The balance is calibrated prior to every weighing session. The balance is also certified by Mettler on an annual basis.

Upon exiting the filter, the gas was drawn through a series of four impingers, comprising the back-half portion of the sampling train. The impinger system was as follows: 1st and 2nd impingers are empty, a back-half filter, a 3rd impinger containing 100 ml of deionized H_2O and the 4th contained approximately 200g of silica gel. Following the impinger system the gas was drawn through a dry gas meter, a calibrated orifice, and a leak-free pump.

Leak checks on the particulate train were performed before and after each sampling run. All leak checks and leakage rates are documented on the relevant field test data sheets. The acceptance criterion for the particulate train is a leak rate of < 0.02 cfm at the highest vacuum obtained during the run.

Prior to the recovery of the condensable back-half portion of the train, a one hour nitrogen purge of the condensable section of the train were performed at a minimum of 14 liters per

minute of nitrogen. As per the method, the contents of impingers 1 and 2 and connecting glassware were recovered with duplicate DI water rinses (CPM Container #1) followed by an acetone rinse and duplicate hexanes rinses (CPM Container #2). The back-half filters were also recovered from the sample trains (CPM Container #3).

4.3.6 EPA Method 26A –Hydrochloric Acid (HCl) & Hydrogen Fluoride (HF)

The EPA Method 26A sample train consisted of a glass nozzle attached to a heated, glass lined, stainless steel sheath probe. A thermocouple and S-type Pitot tube are permanently attached to the probe for measurement of stack gas temperature and velocity. Sample gas was drawn through the nozzle and probe and then through a heated glass fiber filter. The gas stream temperature across the filter was kept at greater than 248°F. Each test run was approximately 60 minutes in duration.

Upon exiting the filter, the gas was drawn through a series of four impingers, comprising the back-half portion of the sampling train. The impinger system was as follows: 1st and 2nd impingers each contained 100 ml of 0.1 Normal sulfuric acid (H_2SO_4), 3rd and 4th impingers each contained 100 mL of 0.1 Normal sodium hydroxide (NaOH), and the 5th impinger contained approximately 200g of silica gel. The two impingers containing NaOH were discarded since only HCl and HF were required. Following the impinger system the gas was drawn through a dry gas meter, a calibrated orifice, and a leak-free pump. Sampling was conducted using the traverse points referenced in EPA Method 1. Copies of the stack schematics with the traverse points used are included this final report.

Leak checks on the Method 26A train were performed before and after each sampling run. All leakage rates are documented on the relevant field test data sheets. The posttest leak check was performed at a minimum vacuum setting equal to or greater than the highest vacuum recorded during the test run. The acceptance criterion for each isokinetic train is a leak rate of < 0.02 cfm at the highest vacuum obtained during the run, or 4% of the sample rate.

The contents of the 1st and 2nd impingers containing condensate and 0.1 N H_2SO_4 were quantitatively transferred to a sample bottle. For each test, the impingers and connecting glassware were rinsed with deionized water and these rinsates were added to the impinger solution in the sample bottle. The samples were submitted to Chester LabNet in Tigard, Oregon for chloride and fluoride analysis using ion chromatography.

4.3.7 EPA Method 30B – Mercury

Hg emissions were determined according to, "*Determination of Total Vapor Phase Mercury Emissions from Coal-Fired Combustion Sources Using Carbon Sorbent Traps*" (40 CFR Part 60 Appendix A). Each test run were 60 minutes in duration. Method 30B utilizes in-stack sorbent media coupled with analysis of the integrated samples. Known volumes of flue gas are extracted from a stack through paired, in-stack, sorbent media traps at an appropriate nominal flow rate. Collection of Hg on the sorbent media in the stack mitigates potential loss of Hg during

transport through a probe/sample line. The use of paired train sampling is used to determine measurement precision and verify acceptability of the measured emissions data.

The Method 30B sampling train consists of a heated probe, the paired sorbent traps, an umbilical line, moisture removal components, an airtight sample pump, and a dry gas meter. Sampling data were recorded electronically through the use of an automated data acquisition and handling system.

The monitoring system samples the stack gas at a constant flow rate. The sampling were conducted on a batch process. Using the sample volume measured by the dry gas meter and the results of the analyses of the sorbent traps, the average mercury concentration in the stack gas for each sampling period were determined in units of micrograms per dry standard cubic meter (µg/dscm). The following is a general outline of the sample collection procedure:

1. Perform an initial leak check with the sorbent traps in place. Draw a vacuum in each sample train. Adjust the vacuum in the sample train to > 15" Hg. Using the dry gas meter, determine leak rate. The leakage rate must not exceed 4 percent of the target sampling rate. Once the leak check passes this criterion, carefully release the vacuum in the sample train then seal the sorbent trap inlet until the probe is ready for insertion into the stack or duct.
2. Prior to placement of the probe into the stack, remove the plug from the end of each sorbent trap and store each plug in a clean sorbent trap storage container. Remove the stack or duct port cap and insert the probe(s). Secure the probe(s) and ensure that no leakage occurs between the duct and environment.
3. Record initial data including the sorbent trap ID, start time, starting dry gas meter readings, initial temperatures, set-points, and any other appropriate information.
4. Obtain essential operating data for the facility during the test period from the automated sampling console that automatically records temperature, pressure, and dry meter volumes.
5. When sampling is completed, turn off the sample pump, remove the probe/sorbent trap from the port and carefully re-plug the end of each sorbent trap. Perform a leak check with the sorbent traps in place, at the maximum vacuum reached during the sampling period. Use the same general approach described for the initial leak check. Record the leakage rate and vacuum. The leakage rate must not exceed 4 percent of the average sampling rate for the data collection period. Following the leak check, carefully release the vacuum in the sample train.
6. Recover each sampled sorbent trap by removing it from the probe, sealing both ends. Wipe any deposited material from the outside of the sorbent trap. Place the sorbent trap into an appropriate sample storage container and store/preserve in appropriate manner.

The Method 30B charcoal sorbent trap consists of two fractions each separated by a layer of glass wool. The first section is the sample fraction. The second fraction is analyzed for breakthrough. The two fractions from each trap are summed, and the total mercury analyzed is used to determine concentration. For this test program, one train from the field tests and the field blank trains were spiked with 100 ng of mercury to demonstrate acceptable post-test recoveries. Analysis of each paired sorbent trap were performed by the subcontract laboratory, Frontier Geosciences in Seattle, Washington.

4.4 TRC CEMS

Gaseous measurements were conducted at the facility with the use of TRC's CEMS. The TRC CEM system is a complete mobile laboratory that houses the RM instrumentation and data acquisition system necessary to support continuous stack gas measurements. TRC uses an

extractive system for sample gas collection and measurement, and reports pollutant data in concentration on a dry basis.

4.4.1 Instrument Checks and System Integrity; Setup Day

EPA Methods 3A, 6C, 7E, 10, and 25A include strict quality control performance specifications for the CEMS measurement system. EPA Methods 3A, 6C, and 10 all reference EPA Method 7E for applicable CEMS calibration specifications whereas EPA Method 25A follows specific calibration criteria as outlined in the method. Prior to the initiation of the field sampling, TRC conducted a "setup period" that involved a number of initial system checks, site evaluations, and general acceptance runs. All of these checks were guided by TRC Standard Operating Procedures and were completed prior to the conducting of the official test runs.

4.4.2 CEMS Calibrations

4.4.2.1 Methods 3A, 6C, 7E, and 10

The following sequence of operations was conducted to calibrate each Method 3A, 6C, 7E, and 10 analyzer. This activity preceded the system bias, response time, stratification, or other measurements made through the CEMS.

- Completed the analyzer setup as described by the manufacturer's specifications and allowed the instruments to stabilize. Adjusted each analyzer by introducing zero and calibration gases in any sequence making all necessary adjustments.
- After the measurement system for the Method 3A, 6C, 7E, and 10 analyzers were prepared for use, a calibration error test was performed by introducing the zero or low-range (< 20% of the analyzer span), mid-range (40 to 60 percent of the analyzer span), and high-range (100 percent of the analyzer span) calibration gases to each analyzer. During this check, no adjustments were made to the system except those necessary to achieve the correct calibration gas flow rate to the analyzers. The analyzers were allowed to stabilize and the result recorded.
- Calculated the analyzer percent difference or calibration error. Calibration responses for the Method 3A, 6C, 7E, and 10 analyzers must be within 2 percent of the calibration span which is equal to the certified concentration of the calibration span gas.

4.4.2.2 Method 25A

The following sequence of operations was conducted to calibrate each Method 25A. This activity preceded the system bias, response time, stratification, or other measurements made through the CEMS.

- Completed the analyzer setup as described by the manufacturer's specifications and allowed the instruments to stabilize. Adjusted each analyzer by introducing zero and calibration gases in any sequence making all necessary adjustments.
- After the measurement system for the Method 25A analyzer was prepared for use, a calibration error test was performed by introducing the zero, low-level (25 to 35% of the applicable span value), mid-level (45 to 55% of the applicable span value), and high level (80 to 90% of the applicable span value) calibration gases.
- Within 2 hours of the start of the test, zero and high-level calibration gases were introduced to the calibration valve assembly with the analyzer output manually adjusted to the appropriate levels, if necessary. Low and mid-level calibrations

gases were then successively introduced to the measurement system. The DAS recorded the analyzer responses for the low and mid-level calibration gases based on a linear response line between zero and high level responses. The differences must be less than 5 percent of the respective calibration gas value. As noted in Section 2.2 of this report, TRC utilized a DAS which applied the more stringent specifications from EPA Method 7E.

4.4.3 Bias Checks

4.4.3.1 Methods 3A, 6C, 7E, & 10

The following sequence of operations was conducted to determine the basis of the sampling system for the specific source and setup configuration. This activity preceded the system calibration and was conducted before the response time or other measurements made through the CEMS.

- Aligned the sampling system for calibration.
- Documented the system bias checks using the DAS.
- The DAS recorded the start and stop of the CEMS bias check procedure. Zero air was then introduced into the sampling system. The analyzer(s) were then allowed to reach a stable output. The analyzer response for the zero gas was recorded on the DAS printout.
- An upscale calibration gas (either the high-range or mid-range calibration, whichever most closely matches the stack gas concentration for that parameter) was introduced to the sampling system. The analyzer was allowed to reach a stable output. The analyzer response was recorded on the DAS printout for the upscale calibration gas.
- The procedures were repeated for each parameter. It should be noted that zero gas can be used as a zero for multiple analyzers, and it is not necessary to repeat this procedure as long as the zero measurement is made for each analyzer.
- The CEMS bias was calculated for each analyzer. The system bias for each Method 3A, 6C, 7E and 10 analyzer must be within ± 5 percent of the span value.
- Method 3A, 6C, 7E, and 10 CEMS system drifts were calculated by comparing the system response to the zero and upscale calibration gas from the system response during the previous bias check. Post-test zero and calibration drift must be within ± 3 percent of the calibration span which is equal to the certified concentration of the calibration span gas.

4.4.3.2 Method 25A

The following sequence of operations was conducted to determine the basis of the sampling system for the specific source and setup configuration. This activity preceded the system calibration and was conducted before the response time or other measurements made through the CEMS.

- Aligned the sampling system for calibration.
- The DAS recorded the start and stop of the CEMS bias check procedure. Zero air or calibration gas was introduced into the sampling system. The analyzer(s) was then allowed to reach a stable output. The analyzer response for the zero gas was recorded on the DAS printout.
- An upscale calibration gas (either the high-range or mid-range calibration, whichever most closely matches the stack gas concentration for that parameter)

was introduced to the sampling system. The analyzer was allowed to reach a stable output. The analyzer response was recorded on the DAS printout for the upscale calibration gas.

- Method 25A CEMS system drifts were calculated by comparing the system response to the zero and upscale calibration gas from the system response during the previous bias check. Zero and calibration drift must be within ± 3 percent of the analyzer span value.

4.4.4 CEMS Data Acquisition System

The output of the analyzers of the CEMS were connected to STRATA, a data acquisition system. The output voltage that is sent to the data acquisition system, for each specific instrument is a voltage that is linear and directly proportional to the concentration of the specific gas being measured.

The DAS system included a STRATA analog/digital data recorder for hard copy and download to PC utilizing data acquisition software. Data for each analyzer were recorded in 10-second intervals. One minute average values were recorded on the DAS printouts. Data for the test periods were averaged and corrected for calibration error, bias and drift using STRATA. The data segments, representing individual tests, were adjusted for response time and bias following prescribed procedures for reporting final concentration data for each parameter.

4.4.5 CEMS Components

All continuous monitors used in the TRC CEMS have been proven to be accurate and operated with minimal downtime. The monitoring system was provided by TRC's Woodinville, Washington office. TRC conducted emissions monitoring at each applicable exhaust stack for % level concentrations of O_2 and CO_2 (EPA Method 3A), and ppm concentrations of SO_2 (EPA Method 6C), NO_x, (EPA Method 7E), CO (EPA Method 10), and VOC (EPA Method 25A).

With the exception of EPA Method 25A, the sampling-train started with a stainless steel sampling probe. The sample stream was then drawn through heated (248°F ± 25°F) Teflon® sample line and a sample conditioner to remove the moisture from the gas stream. The sample was then drawn through Teflon® tubing by a leak-free Teflon® diaphragm pump to a sample manifold with an atmospheric bypass rotameter. The analyzers drew samples from this manifold. As per EPA Method 25A, an unheated sample line was utilized for a direct line into the hot wet flame ionization analyzer.

Prior to the first run, TRC performed a 3-point stratification test per Section 8.1.2 of EPA Method 7E. For the generator unit, sampling was performed at 16.7, 50.0 and 83.3 % of the measurement line for a minimum of twice the system response time at each traverse point. The concentrations of each traverse point differed by no more than ± 5 percent of the mean concentration, or ± 0.5 ppm (whichever is less restrictive) to allow single point testing. If the concentration differed by > 5% and was < 10%, a 3-point traverse was performed. If the concentration was > 10% of the mean concentration, a 12-point traverse was performed during each test period.

After the test program, TRC also performed a NO_2 to NO Conversion Efficiency Test per Section 8.2.4 of EPA Method 7E. These tests were performed to verify that the TRC CEMS accurately converted NO_2 to NO before being analyzed for NO_x.

4.4.5.1 O_2 and CO_2 Measurements (EPA Method 3A)

O_2 concentrations were determined using a paramagnetic oxygen analyzer. The analyzer measures the paramagnetic susceptibility of the sample gas by means of a magneto-dynamic type-measuring cell. The measuring cell consists of a dumbbell of diamagnetic material, which is temperature controlled electronically at 50°C. The higher the oxygen concentration, the greater the dumbbell is deflected from its rest position. This deflection is detected by an optical system connected to an amplifier. Surrounding the dumbbell is a coil of wire. A current is passed through this coil to return the dumbbell to its original position. The current applied is linearly proportional to the percent oxygen concentration in the sample gas.

CO_2 concentrations were measured using a NDIR analyzer. The analyzer measures gas concentration based on the principal that each type of gas component shows a unique absorption line spectrum in the infrared region. The instrument consists of an infrared light source, a chopper, a measuring cell and a detector filled with a gas mixture containing the gas component to be measured. The infrared light source emits infrared light in all directions. The light emitted forward is transmitted and reflected into the detectors.

The infrared light emitted backward is reflected by a reflecting surface and is added to the infrared light emitted forward. Arranged between the infrared light source and measuring cell is a chopper blade which rotates to modulate the infrared light beam at regular frequency. The modulated infrared light beam thus formed passes through the measuring cell filled with a sample gas where the light energy is partially absorbed or attenuated before it reaches the front chamber of the detector. Both the front and the rear chambers of the detector are filled with the gas component to be measured.

The infrared light energy is partially absorbed in the front chamber and residual light is absorbed in the rear chamber, thereby increasing pressures in both the chambers, respectively. Since the detector is designed to produce a pressure difference between the front and rear chambers, a slight gas flow is produced through a path communicating these chambers with each other.

The slight flow is converted into an AC electrical signal by a microflow sensor arranged in the communicating path. The AC signal is amplified and rectified to a DC voltage supplied to the output terminals and indicator.

Table 4.4.5.1 - TRC O_2/CO_2 CEMS Zero and Span Gas Ranges

RANGE	O_2 ANALYZER	CO_2 ANALYZER
Zero-range	Nitrogen gas	Nitrogen gas
Mid-range	13.11%	13.64%

High-range	23.92%	23.79%

All readings were reported within EPA Method 3A criteria.

4.4.5.2 SO_2 Measurements (EPA Method 6C)

The analyzer used to measure SO_2 was a photometric SO_2 monitor. The instrument operation is based on the principal. The microprocessor-based photometric analyzer measures, at two discrete wavelengths, the absorbances of ultraviolet radiation (light) by a gas sample. The concentrations of the components absorbing the light (absorbers) are then determined from relationships developed through the application of the ideal gas law in concert with the laws of Bouguer, Beer and Lambert.

Table 4.4.5.2 - TRC SO_2 CEMS Zero and Span Gas Ranges

RANGE	SO_2 ANALYZER
Zero-range	Nitrogen gas
Mid-range	200.7 ppm
High-range	495.2 ppm

All readings were reported within EPA Method 6C criteria.

4.4.5.3 NO_x Measurements (EPA Method 7E)

The analyzer used to measure NO_x was a chemiluminescent NO/NO_x monitor. The instrument operation is based on the principal of the chemiluminescent reaction of NO and O_3. When emissions are electrically excited, NO_2 molecules revert to their ground state. To measure NO concentrations, the gas sample to be analyzed is blended with O_3 in the instrument's reaction chamber. The resulting chemiluminescence is monitored through an optical filter by a highly sensitive PMT positioned at one end of the reaction chamber. The filter/photomultiplier combination responds to light in a narrow wavelength band unique to this chemiluminescent reaction (detailed below) the filter assists and eliminates interferences in this wavelength:

$$NO + O_3 \rightarrow NO_2 + O_2 + hv$$

To measure NO_x concentrations (NO plus NO_2), the sample gas flow is diverted through a NO_2-to-NO converter. The chemiluminescent response in the reaction chamber to the converter effluent is linearly proportional to the NO_x concentration entering the converter (sample gas). The system was operated in the NO_x mode during all phases of the program.

Table 4.4.5.3 - TRC NO_x CEMS Zero and Span Gas Ranges

RANGE	NO_x ANALYZER
Zero-range	Nitrogen gas
Mid-range	201.5 ppm
High-range	510 ppm

All readings were reported within EPA Method 7E criteria.

4.5.5.4 CO Measurements (EPA Method 10)

An analyzer based on the principle of GFC was utilized for the measurement of CO. GFC offers improved specificity and sensitivity over conventional NDIR techniques. GFC spectroscopy is based upon comparison of the detailed structure of the infrared absorption spectrum of the measured gas to that of other gases also present in the sample being analyzed. The technique is implemented by using a high concentration sample of the measured gas, through the analyzer, hence the term GFC.

Radiation from an IR source is chopped and then passed through a gas filter alternating between CO and N_2 due to rotation of the filter wheel. The radiation then passes through a narrow bandpass interference filter and enters a multiple optical pass cell where absorption by the sample gas occurs. The IR radiation then exits the sample cell and falls on an IR detector.

The CO gas filter acts to produce a reference beam, which cannot be further attenuated by CO in the sample cell. The N_2 side of the filter wheel is transparent to the IR radiation and therefore produces a measure beam that can be absorbed by CO in the cell. The chopped detector signal is modulated by the alternation between the two gas filters with amplitude related to the concentration of CO in the sample cell. Other gases do not cause modulation of the detector signal since they absorb the reference and measure beams equally. In this way, the GFC system responds specifically to CO.

Table 4.4.5.4 - TRC CO CEMS Zero and Span Gas Ranges

RANGE	CO ANALYZER
Zero-range	Nitrogen gas
Mid-range	201.5 ppm
High-range	501.8 ppm

All readings were reported within EPA Method 10 criteria.

4.4.5.5 VOC (as Propane) Measurements (EPA Method 25A)

VOC (as Propane) was continuously monitored in accordance with EPA Method 25A, *"Determination of Total Gaseous Organic Concentration using a Flame Ionization Analyzer."* VOC (as Propane) concentrations were measured on a hot, wet basis using Method 25A, which is an instrumental method. The gas was drawn from the source through a heated stainless steel probe, an out-of-stack heated filter, and a heated Teflon® sample line to prevent condensation. The analyzer was multi-point calibrated before the testing program and a system drift check was

performed before and after each individual run. The following criteria apply to instrument operation:

Table 4.4.5.5 - TRC VOC (as Propane) CEMS Zero and Span Gas Ranges

RANGE	THC ANALYZER
Zero-range	Nitrogen gas
Low-range	30.15 ppm
Mid-range	50.52 ppm
High-range	85.4 ppm

All readings were reported within EPA Method 25A criteria.

The VOC analyzer detects the concentration of VOC in a sample stream using a FID unit which is housed within a heated oven. Hydrocarbons in the gas sample are ionized in the hydrogen flame of the analyzers. The burner tips are positioned between each of the two highly charged (about 300 VDC) plates. As ions are produced for the combustion of hydrocarbons in the sample, a current is developed from the migration of ions between the plates. The current is directly proportional to the amount of hydrocarbons present in the gas stream.

The resulting currents are detected and amplified by an electrometer/amplifier circuit. The output of the amplifier provides a signal for direct readout on a meter and was recorded continuously on a wet concentration basis (ppm) using a digital logger and downloaded directly to a personal computer. Concurrent moisture data collected during each test period were used to correct average ppm wet VOC (as Propane) data to a dry basis.

5.0 – QUALITY ASSURANCE

5.1 Overview

This section highlights the specific QA/QC procedures that were followed on this test program and followed those describe in more detail in the Test Protocol.

5.2 Field Quality Control Summary

5.2.1 Calibration Procedures

Calibrations of the field sampling equipment were performed prior to the field sampling effort. Copies of the calibration sheets are presented in Appendix E.

5.2.2 Calibration Gases

All calibration gases used to conduct instrument calibrations were prepared in accordance with EPA Protocol 1 and are traceable to National Bureau of Standards Reference Materials. Included in the appendix of this report are copies of the pertinent calibration gas certifications.

5.2.3 Reagent Certifications

All reagents used for this project conform to the specifications established by the Committee on Analytical Reagents or the ACS, or the best available grade.

For this project, field reagent blanks were analyzed and reported along side the EPA Method 5 gravimetric samples. For the Method 5 tests, reagent blank corrections were not applied to the samples.

5.2.4 Equipment Leak Checks

Prior to sampling, each sampling train was leak checked according to the procedures outlined in EPA Reference Method 5. During the course of a test run, a leak check was conducted before and after every test, or if replacement of a component becomes necessary. Both pre-test and post-test leak checks were performed. All leakage rates were recorded on the appropriate field data sheet. All leakage rates were less than the allowable limit.

5.2.5 Sample Handling Quality Assurance/Quality Control

Shipping and Packing of Samples - All samples were transported to TRC's Woodinville office for IATA packaging and delivery to the subcontract laboratory.

Sample Traceability and Integrity – Traceability of all the samples were maintain using completed Chain of Custody forms.
Sample integrity was maintained throughout the testing program by insuring that the samples were:

- In a person's physical possession, and/or
- In direct view of a person after acquiring possession, and/or.
- Secured by a person in the field laboratory trailer.

Labeling - Sample identification labels were used by TRC to ensure that the required information was affixed to every sample container. This information identified each container as to its sample type, test run, and sample fraction. When the sample batches were shipped, a sample-packing list occupied the shipment.

Chain-of-Custody Procedures - When the sampling trains were broken down and various samples were recovered, these samples were recorded on the Chain-of-Custody Form. All chain-of-custody sheets were maintained by TRC.

5.3 Data Reduction, Validation, and Reporting

Specific QC measures were used to ensure the generation of accurate and reliable data.

5.3.1 Field Data Reduction

Appendix A contains copies of the computer generated data sets. Appendix B contains copies of the subcontract laboratory data. Appendix C contains copies of Aurora Energy, LLC's process data. Appendix D contains copies of the example calculations and field data sheets. This collected data was reviewed in the field by the Field Team Leader. Any errors or discrepancies were corrected and initialed. An additional in house review of the raw data was conducted. Appendix E contains copies of the calibration data for the test equipment and gases used on the project.

5.3.2 Data Validation

The following criteria were used to evaluate the field sampling data:

- Use of approved test procedures;
- Proper operation of the process being tested;
- Use of properly operating and calibrated equipment;
- Leak checks conducted before and after tests;
- Proper chain-of-custody maintained.
- The criteria listed below was used to evaluate the analytical data:
- Use of approved analytical procedures;
- Use of properly operating and calibrated instrumentation;
- Acceptable results from analyses of QC samples.

5.3.3 Data Reporting

All data has been reported in standard units depending on the measurement and the ultimate use of the data. The bulk of the data was computer processed and reported as follows:

- Exhaust Gas Stream

  Gas Properties:

  a. Moisture, dscf and percent by volume
  b. Flow rate, dscfm and acfm
  c. Pressure, mm of Hg
  d. Temperature, °F

Gas Diluents and Pollutants:

a. Method 3A - O_2 and CO_2 - percent, dry
b. Method 201A/202 – PM– gr/dscf, lb/hr
c. Method 6C – SO2 – ppm, lb/hr
d. Method 7E – NOx – ppm, lb/hr
e. Method 10 – CO - ppm, lb/hr
f. Method 25A – THC - ppm, lb/hr
h. Method 26A – HCl and HF – ppm, lb/hr
j. Method 30B – Hg - ppm, lb/hr

APPENDIX A

COMPUTER PRINTOUTS OF RESULTS

EMISSION MEASUREMENTS DEPARTMENT

19874 141st Place N.E.
Woodinville, WA
Phone: (425) 489-1938
Fax: (425) 489-9564

CLIENT: Aurora Energy, LLC
LOCATION: Chena Power Plant
UNIT: Combined Boiler (Chena 1, 2, 3 & 5) Baghouse Stack

DATE: 11/19/11
PROJECT NO.: 187446
PERSONNEL: R. Radonski

REPORTING SHEET

The table below contains the results of testing and calculations performed by TRC on the date(s) listed.

Emissions Calculations - Measured

EPA Methods 3A, 6C, 7E, 10, & 25A

Emissions Test Results						
Test Number			**Run 1**	**Run 2**	**Run 3**	**Average**
Test Date			11/19/11	11/19/11	11/19/11	
Start Time			1112	1320	1704	
Stop Time			1225	1517	1819	
Calculated Data	**SYMBOL**	**UNITS**				
Stack Gas Oxygen Content	O_2	%	9.5	9.4	9.5	9.5
Percent Moisture	Bws		0.0863	0.0976	0.0877	0.0905
EPA Method 5 Dry Stack Gas Flow Rate (DRY, STP),	Qsd	dscf/min	144,849	140,489	139,492	141,610
Qsd = 17.647 * Q * (1-Bws)* (Ps/Ts)		dscm/min	4,100.7	3,977.2	3,949.0	4,009.0
Method 6C - Sulfur Dioxide						
SO_2 Emission Concentration	ppm	SO_2	133.9	131.5	137.5	134.3
SO_2 Emission Rate	lb/dscf	SO_2	2.22E-05	2.18E-05	2.28E-05	2.23E-05
SO_2 Emission Rate	lb/hr	SO_2	193.2	184.0	191.0	189.4
Method 7E - Nitrogen Oxides						
NO_X Emission Concentration	ppm	NO_X	218.4	154.9	148.7	174.0
NO_X Emission Concentration	ppm @ 15% O_2	NO_X	113.0	79.5	77.0	89.8
NO_X Emission Rate	lb/dscf	NO_X	2.61E-05	1.85E-05	1.78E-05	2.08E-05
NO_X Emission Rate	lb/hr	NO_X	226.6	155.9	148.6	177.0
Method 10 Carbon Monoxide						
CO Emission Concentration	ppm	CO	106.6	213.3	191.3	170.4
CO Emission Concentration	ppm @ 15% O_2	CO	55.2	109.4	99.0	87.9
CO Emission Rate	lb/hr	CO	67.4	130.7	116.4	104.8
Method 25A - Total Hydrocarbons (THC)						
THC Emission Concentration (wet)	ppm, wet	THC	1.1	0.5	0.0	0.5
THC Emission Concentration (dry)	ppm, dry	THC	1.2	0.6	0.0	0.6
THC Emission Rate	lb/hr	THC	1.20	0.534	0.0	0.577

TEST DATA SUMMARIES

Aurora Energy, LLC
Chena Power Plant
Fairbanks, Alaska
Combined Boiler Baghouse Stack

EPA Method 26A

	Run 1	Run 2	Run 3
Dates:	11/19/11	11/19/11	11/19/11
Barometric Pressure at Sampling Location:	29.79	29.79	29.79
Height of Sampling Location Above Ref. Bar. (ft):	0	0	0
Barometric Pressure at Sampling Location:	29.79	29.79	29.79

TABLE OF CONTENTS:

Data Input Sheet
Calculation Sheet
Run Sheet - Run 1
Run Sheet - Run 2
Run Sheet - Run 3
Particulate Matter Calculations
Acid Calculations

Sampling Data Summary				
Parameter	Run 1	Run 2	Run 3	3-RUN AVG.
Total Sampling Time, Min.	60	60	60	
Stack Gas Oxygen Content, O_2%	9.5	9.4	9.5	9.5
Stack Gas Carbon Dioxide Content, CO_2%	10.3	10.4	10.4	10.4
Gas Sample Volume at Standard Conditions, cu. ft.	44.660	47.544	45.479	45.894
cu. m.	1.264	1.346	1.288	1.299
Dry Stack Gas Flow Rate (Dry, STP), dscf/min	144,849	140,489	139,492	141,610
dscm/min	4,100.7	3,977.2	3,949.0	4,009.0

TRC
19874 141st Place NE
Woodinville, WA 980
Phone: (425) 489-1938
Fax: (425) 489-9564

Project Number **187446.0000.0000**

EMISSION MEASUREMENTS DEPARTMENT

19874 141st Place NE
Woodinville, WA 980
Phone: (425) 489-1938
Fax: (425) 489-9564

CLIENT:	Aurora Energy, LLC	DATE:	11/19/11
LOCATION:	Chena Power Plant	PROJECT NO.:	187446.0000.0000
UNIT:	Combined Boiler Baghouse Stack	PERSONNEL:	KBA

Data Input Sheet

The table below contains the results of testing and calculations performed by TRC on the date(s) listed.

EPA Method 26A

Parameter	SYMBOL	UNITS	DATA			
Test Number			Run 1	Run 2	Run 3	
Test Date			11/19/11	11/19/11	11/19/11	
Start Time			1112	1404	1710	
Stop Time			1230	1517	1824	3-RUN AVG.
Stack Diameter	ds	inches	90	90	90	
Nozzle Diameter	dn	inches	0.210	0.210	0.210	
Barometric Pressure at Sampling Location	Pbar	inches Hg	29.79	29.79	29.79	29.79
Stack Static Pressure	Pg	inches H_2O	0.90	0.90	0.90	0.90
Pitot Coefficient	cp	none	0.84	0.84	0.84	0.84
Meter Calibration Factor	Y	none	0.9889	0.9889	0.9889	
	DH@	none	1.6075	1.6075	1.6075	
Stack Gas Oxygen Content	O_2	percent	9.5	9.4	9.5	9.5
Stack Gas Carbon Dioxide Content	CO_2	percent	10.3	10.4	10.4	10.4
Net Moisture Gain (Impingers w/Silica Gel)	Ww	grams	89.5	109.1	92.7	97.1
Average Stack Temperature	ts	deg F	296.6	299.5	295.8	297.3
Average Meter Temperature	tm	deg F	67.8	76.0	67.52	70.4
Avg Delta H	dH	inches H_2O	1.854	2.113	1.863	1.94
Average Square Root Delta H	ASR dH	inches H_2O	1.341	1.434	1.348	1.374
Avg Velocity Head	dP	inches H_2O	1.69	1.62	1.56	1.62
Average Square Root Delta P	ASR dP	inches H_2O	1.279	1.256	1.233	1.256
Gas Sample Volume	Vm	cubic feet	45.130	48.765	45.937	46.611
Total Sampling Time	min	minutes	60	60	60	

EMISSION MEASUREMENTS DEPARTMENT

19874 141st Place NE
Woodinville, WA 980
Phone: (425) 489-1938
Fax: (425) 489-9564

CLIENT:	Aurora Energy, LLC	DATE:	11/19/11
LOCATION:	Chena Power Plant	PROJECT NO.:	187446.0000.0000
UNIT:	Combined Boiler Baghouse Stack	PERSONNEL:	KBA

Calculation Sheet

The table below contains the results of testing and calculations performed by TRC on the date(s) listed.

EPA Method 26A

Parameter	SYMBOL	UNITS	DATA			
Test Number			Run 1	Run 2	Run 3	
Test Date			11/19/11	11/19/11	11/19/11	
Start Time			1112	1404	1710	
Stop Time			1230	1517	1824	
Calculated Data						3-RUN AVG.
Nozzle Area, An=3.14159*(dn/2)^2	An	square inches	0.0346	0.0346	0.0346	
Stack Area,As=3.14159*((Ds/12)/2)^2	As	sq.ft.	44.18	44.18	44.18	44.18
Avg Stack Temperature, Ts=ts+460	Ts	deg R	756.6	759.5	755.8	757.3
Meter Pressure, Pm=Pb+Dh/13.6	Pm	in. Hg	29.93	29.95	29.93	29.93
Avg Meter Temperature, Tm=tm+460	Tm	deg R	527.8	536.0	527.5	530.4
Gas Sample Volume at Standard Conditions, Vm(std)= 528/29.92*Y*Vm*Pm/Tm	Vm(std)	cubic feet	44.660	47.544	45.479	45.894
		cubic meters	1.264	1.346	1.288	1.299
Net Moisture Gain (Impingers w/SiGel)	Ww	grams	89.5	109.1	92.7	97.1
Volume of Water Vapor, Vw(std)= 0.04715*Wlc	Vw(std)	cubic feet	4.220	5.144	4.371	4.578
Moisture Fraction, Bws = Vw(Std)/(Vm(Std)+Vw(Std))*100	Bws	percent	8.63%	9.76%	8.77%	9.05%
Dry Stack Gas Molecular Weight, Md = (0.32*O2)+(0.44*CO2)+(0.28*(100-(O2+CO2)))	Mwd	g/g-mole	30.02	30.04	30.04	30.03
Wet Stack Gas Molecular Weight Mw = Md* (1-Bws)+(18*(Bws))	Mws	g/g-mole	28.98	28.86	28.99	28.95
Absolute Stack Pressure, Ps = Pbar + Pg/13.6	Ps	inches Hg	29.86	29.86	29.86	29.86
Stack Gas Velocity Vs= 85.49*Cp*ASRdP*((Ts)/((Ps)*(Mw)))^0.5	Vs	ft/sec	85.9	84.7	82.7	84.4
Vsm = 0.3048* Vs	Vsm	m/sec	26.2	25.8	25.2	25.7
Actual Stack Gas Flow Rate, Qa = 60*Vs*As	Qa	acf/min	227,668	224,441	219,329	223,813
Stack Gas Flow Rate (STP), Qsw = 528/29.92 * Qa * (Ps/Ts)	Qsw	scf/min	158,536	155,689	152,898	155,707
Dry Stack Gas Flow Rate (Dry, STP),	Qsd	dscf/min	144,849	140,489	139,492	141,610
Qsd = 528/29.92 * Qa * (1-Bws)* (Ps/Ts)		dscm/min	4,100.7	3,977.2	3,949.0	4,009.0
Isokinetic Rate, I=100*As*Vm(std)/min*(An/144)*Qsd	I	percent	94.4	103.6	99.8	99.3
Meter Calibration (Alternate Method) Yqa=Min/Vm*((0.0319*Tm*29)/(DH@*(Pbar+dH/13.6)*Md))^0.5 *ASRdH	Yqa	none	1.0364	1.0334	1.0230	1.0310
Meter Quality Assurance/Quality Check =100*(Y-Yqa)/Y		% Difference	-4.8%	-4.5%	-3.4%	-4.3% PASS

Sampling Data Summary						
Parameter	SYMBOL	UNITS	Run 1	Run 2	Run 3	3-RUN AVG.
Total Sampling Time	min	minutes	60	60	60	60
Stack Gas Oxygen Content	O_2	percent	9.5	9.4	9.5	9.5
Stack Gas Carbon Dioxide Content	CO_2	percent	10.3	10.4	10.4	10.4
Gas Sample Volume at Standard Conditions,	Vm(std)	cu. ft.	44.660	47.544	45.479	45.894
		cu. m.	1.264	1.346	1.288	1.299
Dry Stack Gas Flow Rate (Dry, STP),	Qsd	dscf/min	144,849	140,489	139,492	141,610
		dscm/min	4,100.7	3,977.2	3,949.0	4,009.0

EMISSION MEASUREMENTS DEPARTMENT

19874 141st Place NE
Woodinville, WA 980
Phone: (425) 489-1938
Fax: (425) 489-9564

CLIENT:	Aurora Energy, LLC	DATE:	11/19/11
LOCATION:	Chena Power Plant	PROJECT NO.:	187446.0000.0000
UNIT:	Combined Boiler Baghouse Stack	PERSONNEL:	KBA

Field Data Run Sheets

The table below contains the results of testing and calculations performed by TRC on the date(s) listed.

EPA Method 26A

RUN NO: Run 1 Start Time: 1112
Minutes per point: 2.5 Stop Time: 1230 OPERATOR: KBA
number of points: 24

POINT NUMBER	TIME	DGM READING	VEL. Dp (in. H_2O)	Sqrt. Dp	DIFF PRESS. DH	DIFF PRESS. Sqrt.	STACK TEMP. (°F)	DRY GAS METER TEMP (°F) INLET	DRY GAS METER TEMP (°F) OUTLET
A 6	0.0	487.551	2.50	1.581	2.80	1.673	296	60	62
5	2.5		3.00	1.732	3.30	1.817	296	59	62
4	5.0		2.60	1.612	2.90	1.703	299	59	62
3	7.5		2.20	1.483	2.40	1.549	296	61	62
2	10.0		2.00	1.414	2.20	1.483	296	63	63
1	12.5		2.20	1.483	2.40	1.549	296	65	64
B 6	15.0		2.10	1.449	2.30	1.517	297	67	65
5	17.5		2.20	1.483	2.40	1.549	296	67	65
4	20.0		2.20	1.483	2.40	1.549	296	69	65
3	22.5		2.00	1.414	2.20	1.483	296	71	66
2	25.0		1.60	1.265	1.80	1.342	296	72	66
1	27.5		1.70	1.304	1.90	1.378	296	74	66
C 6	30.0		1.50	1.225	1.70	1.304	296	72	67
5	32.5		1.20	1.095	1.30	1.140	297	73	67
4	35.0		1.20	1.095	1.30	1.140	297	73	67
3	37.5		1.20	1.095	1.30	1.140	297	74	67
2	40.0		1.10	1.049	1.20	1.095	297	74	68
1	42.5		1.00	1.000	1.10	1.049	297	74	68
D 6	45.0		1.50	1.225	1.70	1.304	297	72	68
5	47.5		1.20	1.095	1.30	1.140	297	73	68
4	50.0		0.90	0.949	0.99	0.995	297	75	70
3	52.5		0.95	0.975	1.00	1.000	299	74	68
2	55.0		1.30	1.140	1.40	1.183	297	74	68
1	57.5		1.10	1.049	1.20	1.095	295	74	69
	60.0	532.681							
	Total	Total	Avg.	Avg.	Avg.	Avg.	Avg.	Avg.	
	60.0	45.130	1.685	1.279	1.854	1.341	296.6	67.8	

Impinger Gain

impinger 1:	659.7	628.1	31.6
impinger 2:	771.4	733.0	38.4
impinger 3:	622.2	611.0	11.2
impinger 4:	936.4	928.1	8.3
		Total	89.5

Static Pressure ("H_2O)

Port A 0.9

EMISSION MEASUREMENTS DEPARTMENT

19874 141st Place NE
Woodinville, WA 980
Phone: (425) 489-1938
Fax: (425) 489-9564

CLIENT:	Aurora Energy, LLC	DATE:	11/19/11
LOCATION:	Chena Power Plant	PROJECT NO.:	187446.0000.0000
UNIT:	Combined Boiler Baghouse Stack	PERSONNEL:	KBA

Field Data Run Sheets

The table below contains the results of testing and calculations performed by TRC on the date(s) listed.

EPA Method 26A

RUN NO: Run 2 Start Time: 1404
Minutes per point: 2.5 Stop Time: 1517 OPERATOR: KBA
number of points: 24

POINT NUMBER	TIME	DGM READING	VEL. Dp (in. H_2O)	Sqrt. Dp	DIFF PRESS. DH	DIFF PRESS. Sqrt.	STACK TEMP. (°F)	DRY GAS METER TEMP (°F) INLET	DRY GAS METER TEMP (°F) OUTLET
A 6	0.0	533.429	1.40	1.183	1.8	1.342	298	70	71
5	2.5		1.10	1.049	1.4	1.183	300	72	71
4	5.0		1.20	1.095	1.6	1.265	298	75	71
3	7.5		1.00	1.000	1.3	1.140	298	77	71
2	10.0		0.93	0.964	1.2	1.095	298	78	71
1	12.5		1.20	1.095	1.6	1.265	298	79	71
B 6	15.0		1.70	1.304	2.2	1.483	299	76	72
5	17.5		1.30	1.140	1.7	1.304	300	78	72
4	20.0		1.00	1.000	1.3	1.140	300	80	72
3	22.5		1.30	1.140	1.7	1.304	300	80	72
2	25.0		1.10	1.049	1.4	1.183	300	81	72
1	27.5		0.92	0.959	1.2	1.095	300	81	72
C 6	30.0		2.20	1.483	2.9	1.703	297	78	72
5	32.5		2.00	1.414	2.6	1.612	301	80	72
4	35.0		2.30	1.517	3.0	1.732	301	81	72
3	37.5		2.00	1.414	2.6	1.612	301	83	72
2	40.0		1.50	1.225	2.0	1.414	302	83	73
1	42.5		1.60	1.265	2.1	1.449	301	83	73
D 6	45.0		2.50	1.581	3.3	1.817	296	81	73
5	47.5		2.50	1.581	3.3	1.817	301	83	73
4	50.0		2.30	1.517	3.0	1.732	300	84	73
3	52.5		1.80	1.342	2.3	1.517	302	84	74
2	55.0		1.80	1.342	2.3	1.517	299	84	74
1	57.5		2.20	1.483	2.9	1.703	299	84	74
	60.0	582.194							
	Total	Total	Avg.	Avg.	Avg.	Avg.	Avg.	Avg.	
	60.0	48.765	1.619	1.256	2.113	1.434	299.5	76.0	

Impinger Gain

impinger 1:	768.0	736.5	31.5
impinger 2:	780.0	739.0	41.0
impinger 3:	636.0	615.3	20.7
impinger 4:	911.1	895.2	15.9
		Total	109.1

Static Pressure (" H_2O)

Port A 0.9

EMISSION MEASUREMENTS DEPARTMENT

19874 141st Place NE
Woodinville, WA 980
Phone: (425) 489-1938
Fax: (425) 489-9564

CLIENT:	Aurora Energy, LLC	DATE:	11/19/11
LOCATION:	Chena Power Plant	PROJECT NO.:	187446.0000.0000
UNIT:	Combined Boiler Baghouse Stack	PERSONNEL:	KBA

Field Data Run Sheets

The table below contains the results of testing and calculations performed by TRC on the date(s) listed.

EPA Method 26A

RUN NO: Run 3 Start Time: 1710
Minutes per point: 2.5 Stop Time: 1824 OPERATOR: KBA
number of points: 24

POINT NUMBER	TIME	DGM READING	VEL. Dp (in. H_2O)	Sqrt. Dp	DIFF PRESS. DH	DIFF PRESS. Sqrt.	STACK TEMP. (°F)	DRY GAS METER TEMP (°F) INLET	DRY GAS METER TEMP (°F) OUTLET
A 6	0.0	582.817	2.40	1.549	2.9	1.703	295	61	62
5	2.5		1.90	1.378	2.3	1.517	295	61	62
4	5.0		2.20	1.483	2.6	1.612	296	61	63
3	7.5		2.40	1.549	2.9	1.703	296	63	63
2	10.0		1.90	1.378	2.3	1.517	296	65	63
1	12.5		2.20	1.483	2.6	1.612	296	66	63
B 6	15.0		2.00	1.414	2.4	1.549	297	67	63
5	17.5		2.10	1.449	2.5	1.581	297	68	63
4	20.0		1.90	1.378	2.3	1.517	296	70	63
3	22.5		1.60	1.265	1.9	1.378	296	71	64
2	25.0		1.20	1.095	1.4	1.183	296	72	64
1	27.5		1.50	1.225	1.8	1.342	296	73	64
C 6	30.0		1.10	1.049	1.3	1.140	295	71	65
5	32.5		1.10	1.049	1.3	1.140	295	72	65
4	35.0		1.00	1.000	1.2	1.095	295	73	65
3	37.5		1.10	1.049	1.3	1.140	295	74	66
2	40.0		0.95	0.975	1.1	1.049	295	74	66
1	42.5		1.30	1.140	1.6	1.265	296	74	66
D 6	45.0		1.50	1.225	1.8	1.342	296	73	67
5	47.5		1.70	1.304	2.0	1.414	296	74	67
4	50.0		1.30	1.140	1.6	1.265	296	75	67
3	52.5		1.10	1.049	1.3	1.140	296	76	68
2	55.0		0.98	0.990	1.2	1.095	296	76	68
1	57.5	628.754	0.95	0.975	1.1	1.049	296	76	68
	Total	Total	Avg.	Avg.	Avg.	Avg.	Avg.	Avg.	
	60.0	45.937	1.558	1.233	1.863	1.348	295.8	67.5	

Impinger Gain

impinger 1:	654.9	629.8	25.1
impinger 2:	773.3	732.8	40.5
impinger 3:	630.1	613.0	17.1
impinger 4:	946.4	936.4	10.0
		Total	92.7

Static Pressure (" H_2O)

Port A 0.9

EMISSION MEASUREMENTS DEPARTMENT

19874 141st Place N.E.
Woodinville, WA 98072
Phone: (425) 489-1938
Fax: (425) 489-9564

CLIENT:	Aurora Energy, LLC	DATE:	11/19/11
LOCATION:	Fairbanks, Alaska	PROJECT NO.:	187446.0000.0000
UNIT:	Combined Boiler Baghouse Stack	PERSONNEL:	KBA

Calculation Sheet

The table below contains the results of testing and calculations performed by TRC on the date(s) listed.

EPA Method 26A

Sampling Data Summary						
Parameter	**SYMBOL**	**UNITS**	**Run 1**	**Run 2**	**Run 3**	**Average**
Total Sampling Time	min	minutes	60	60	60	
Stack Gas Oxygen Content	O_2	%	9.5	9.4	9.5	9.5
Stack Gas Carbon Dioxide Content	CO_2	%	10.3	10.4	10.4	10.4
Gas Sample Volume at Standard Conditions,	Vm(std)	cu. ft.	44.660	47.544	45.479	45.894
		cu. m.	1.264	1.346	1.288	1.299
Dry Stack Gas Flow Rate (Dry, STP),	Qsd	dscf/min	144,849	140,489	139,492	141,610
		dscm/min	4,100.7	3,977.2	3,949.0	4,009.0

HCl & HF Emissions Summary					
Hydrogen Chloride (HCl)					
Sample Volume	mL	505	490	507	
Cl^- Emission Concentration	ug	1660	1790	1730	1726.7
HCl Emission Concentration	mg/dscm	1.350	1.368	1.382	1.367
HCl Emission Concentration	ppm	1.0	1.0	1.0	1.0
HCl Emission Rate	lb/hr	0.733	0.720	0.722	0.725
Hydrogen Fluoride (HF)					
Sample Volume	mL	505	490	507	
F^- Emission Concentration	ug	1020	1620	1580	1407
HF Emission Concentration	mg/dscm	0.850	1.267	1.292	1.136
HF Emission Concentration	ppm	1.0	1.5	1.5	1.3
HF Emission Rate	lb/hr	0.461	0.667	0.675	0.601

Aurora Energy
Fairbanks, AK

Combined Boiler (Chena 1, 2, 3 & 5) Baghouse Stack

EPA Method 201A/202

TEST DATA:						
Run number	201A/202 - 1		201A/202 - 2		201A/202 - 3	
Date	11/19/2011		11/19/2011		11/19/2011	
Start Time	1112		1405		1710	
Finish Time	1232		1517		1826	
Laboratory	Chester LabNet		Chester LabNet		Chester LabNet	
PARTICULATE GRAVIMETRIC RESULTS (grams)						
Filterable Particulate Matter < PM 2.5 (EPA Method 201A)						
Filter weight gain, grams	**0.0000**	0%	**0.0002**	6%	**0.0000**	0%
Acetone rinse weight gain, grams	**0.0003**	100%	**0.0031**	94%	**0.0027**	100%
Total Filterable PM < 2.5 Microns	0.0003		0.0033		0.0027	
Particulate Matter > than PM 2.5 (EPA Method 201A)						
PM2.5 Cyclone Catch & Acetone rinse, grams	**0.0019**		**0.0067**		**0.0032**	
Condensable Particulate Matter (EPA Method 202)						
Organic condensable PM weight gain, grams	**0.0027**	23%	**0.0028**	29%	**0.0021**	10%
Inorganic condensable PM weight gain, grams	**0.0109**	94%	**0.0089**	92%	**0.0200**	100%
Field Blank Correction, grams (2.0 mg Max)	**0.0020**		**0.0020**		**0.0020**	
Total Condensable PM	0.0116		0.0097		0.0201	
Total PM/PM 2.5 (EPA Methods 201A and 202)						
Total filterable PM, grams	0.0022	16%	0.0100	51%	0.0059	23%
Total condensable PM, grams	0.0116	84%	0.0097	49%	0.0201	77%
Total Filterable and Condensable PM, grams	**0.0138**		**0.0197**		**0.0260**	

NOTE: Condensable PM results were blank corrected based on the reagent blank results per EPA Method 202
Filterable PM results were not corrected based on the acetone reagent blank results per EPA Method 201A

TABLE 2-1
PM 2.5 AND CONDENSABLE PARTICULATE MATTER RESULTS
Aurora Energy - Combined Boiler (Chena 1, 2, 3 & 5) Baghouse Stack

	201A/202 - 1	201A/202 - 2	201A/202 - 3	Average
PM > 2.5 Microns				
Concentration, grains/dscf	0.0014	0.0047	0.0024	0.0028
Emission Rate, lb/hr	1.69	5.65	2.86	3.40
Emission Rate, lb/mmBtu	0.0029	0.0097	0.0050	0.0059
PM < 2.5 Microns				
Concentration, grains/dscf	0.0002	0.0023	0.0021	0.0015
Emission Rate, lb/hr	0.267	2.78	2.41	1.82
Emission Rate, lb/mmBtu	0.0005	0.0048	0.0042	0.0031
Total Filterable PM				
Concentration, grains/dscf	0.0016	0.0070	0.0045	0.0044
Emission Rate, lb/hr	1.96	8.44	5.27	5.22
Emission Rate, lb/mmBtu	0.0033	0.0144	0.0092	0.0090
Condensable Organic PM				
Concentration, grains/dscf	0.0020	0.0020	0.0016	0.0018
Emission Rate, lb/hr	2.40	2.36	1.88	2.21
Emission Rate, lb/mmBtu	0.0041	0.0040	0.0033	0.0038
Inorganic Condensable PM				
Concentration, grains/dscf	0.0080	0.0063	0.0152	0.0098
Emission Rate, lb/hr	9.69	7.51	17.9	11.7
Emission Rate, lb/mmBtu	0.0165	0.0129	0.0313	0.0202
Total Condensable PM				
Concentration, grains/dscf	0.0100	0.0082	0.0168	0.0117
Emission Rate, lb/hr	12.1	9.87	19.8	13.9
Emission Rate, lb/mmBtu	0.0206	0.0169	0.0345	0.0240
PM < 2.5 Including Condensable PM				
Concentration, grains/dscf	0.0102	0.0106	0.0189	0.0132
Emission Rate, lb/hr	12.4	12.7	22.2	15.7
Emission Rate, lb/mmBtu	0.0211	0.0217	0.0388	0.0272
Total PM including Condensable PM				
Concentration, grains/dscf	0.0116	0.0153	0.0213	0.0160
Emission Rate, lb/hr	14.0	18.3	25.0	19.1
Emission Rate, lb/mmBtu	0.0240	0.0314	0.0438	0.0330

PM 2.5 AND CONDENSABLE PARTICULATE MATTER RESULTS
Aurora Energy
Combined Boiler (Chena 1, 2, 3 & 5) Baghouse Stack

	Run Number	201A/202 - 1	201A/202 - 2	201A/202 - 3	
	Test Date	11/19/2011	11/19/2011	11/19/2011	Average
	Run Start Time	1112	1405	1710	
	Run Finish Time	1232	1517	1826	
	Net Traverse Points	24	24	24	
Theta	Net Run Time, Minutes	59.75	60.5	57.75	
Dia	Nozzle Diameter, Inches	0.144	0.144	0.144	
C_p	Pitot tube Coeffecient	0.74	0.74	0.74	
Y	Dry Gas Meter Calibration Factor	0.983	0.983	0.983	
P_{bar}	Barometric Pressure, "Hg	29.79	29.79	29.79	
Delta H	Average Differential Pressure of Orifice, ft^3	0.40	0.40	0.39	0.40
V_m	Volume of Metered Gas Sample, ft^3	21.600	22.411	20.641	21.551
t_m	Average Temp. of Dry Gas Meter, °F	69.8	68.5	66.5	68.3
V_{mstd}	Volume of Stack Gas Metered, Standard Conditions, ft^3	21.091	21.935	20.277	21.101
vl	Volume of Liquid Collected in Impingers, g	33.2	47.3	41.5	40.7
V_{wstd}	Volume of Water Standard	1.563	2.226	1.953	1.914
% H20	Percent Moisture by Volume	6.90	9.21	8.79	8.30
Mfd	Dry Mole Fraction	0.931	0.908	0.912	0.917
$\%CO_2$	Percent Carbon Dioxide	10.3	10.4	10.4	10.37
$\%O_2$	Percent Oxygen	9.5	9.4	9.5	9.47
$\%CO\text{-}N_2$	Percent Carbon Monoxide and Nitrogen	80.20	80.20	80.10	80.17
Md	Gas Molecular Weight, Dry	30.03	30.04	30.04	30.04
Mw	Gas Molecular Weight, Wet	29.20	28.93	28.99	29.04
P_g	Static Pressure, "H_2O	0.9	-0.9	-0.9	-0.31
P_s	Absolute Flue Gas Pressure, "Hg	29.86	29.72	29.72	29.77
t_s	Average Flue Gas Temp., °F	298.8	302.6	298.0	299.8
Delta-p	Average Velocity Head, "H_2O	1.964	2.014	1.906	1.961
vs	Flue Gas Velocity, ft/sec	82.72	84.55	81.91	83.06
A	Stack/Duct Area, in^2	6,361.7	6,361.7	6,361.7	6,361.7
Q_{aw}	Volumetric Flow, ACFM	219,281	224,118	217,130	220,176
Q_{sd}	Volumetric Flow, DSCFM	141,700	139,882	136,997	139,526
Q_{sd}	Volumetric Flow, DSCFH	8,501,971	8,392,945	8,219,794	8,371,570
%I	**Percent IsoKinetics**	**97.3**	**101.2**	**100.1**	**99.5**
F_c	F-Factor	1,495	1,495	1,495	1,495
u	Stack Gas Viscosity	226.71	225.47	224.85	225.68
Qs	Sample Flow @ Cyclone Conditions, ACFM	0.546	0.581	0.556	0.561
N_{re}	Reynolds Number Actual	**2,390.8**	**2,508.8**	**2,429.6**	**2,443.1**
C_{act}	Cunningham Correction Factor @ Stack Conditions	1.09	1.09	1.09	1.09
If Nre <3162					
D_{50} (N_{re}<3162)	Particulate Cut Diameter for N_{re}<3162 for Cyclone	2.59	2.42	2.53	2.51
C_r	Re-estimated Cunningham Correction Factor	1.09	1.09	1.09	1.09
$D_{50\text{-}1}$	Re-calculate Particle Cut Diameter for N_{re}<3162	2.59	2.42	2.53	2.52
Z (N_{re}<3162)	Ratio (Z) Between D_{50} and $D_{50\text{-}1}$ Values	1.001	0.999	1.000	1.000
	Acceptance Criteria for Z Values (N_{re}<3163) [0.99 - 1.01]	PASS	PASS	PASS	

PM 2.5 AND CONDENSABLE PARTICULATE MATTER RESULTS
Aurora Energy
Combined Boiler (Chena 1, 2, 3 & 5) Baghouse Stack

	Run Number	201A/202 - 1	201A/202 - 2	201A/202 - 3	Average
mg Catch > PM2.5	PM Greater than 2.5 Microns, mg	1.9	6.7	3.2	3.93
mg Catch < PM2.5	PM Less then 2.5 Microns, mg	0.3	3.3	2.7	2.10
%>PM2.5	Percent greater than 2.5 Microns	86	67	54	69
%<PM2.5	Percent less than 2.5 Microns	14	33	46	31
mg Catch Organic CPM	Organic Condensable PM, mg	2.7	2.8	2.1	2.53
mg Catch Inorganic CPM	Inorganic Condensable PM, mg	10.9	8.9	20.0	13.27
mg Catch Total CPM	Total CPM	13.6	11.7	22.1	15.80
PM >2.5 Microns	Total Milligrams Collected in Cyclone	1.9	6.7	3.2	3.9
gr/DSCF	Concentration, grains/DSCF	0.0014	0.0047	0.0024	0.0028
lb/hr	PM >2.5 Emission Rate, lb/hr	1.69	5.65	2.86	3.40
lb/mmBtu	PM >2.5 Emission Rate, lb/mmBtu	0.0029	0.0097	0.0050	0.0059
PM <2.5 Microns	Total Milligrams Collected After Cyclone	0.3	3.3	2.7	2.1
gr/DSCF	Concentration, grains/DSCF	0.0002	0.0023	0.0021	0.0015
lb/hr	PM <2.5 Emission Rate, lb/hr	0.267	2.78	2.41	1.82
lb/mmBtu	PM <2.5 Emission Rate, lb/mmBtu	0.0005	0.0048	0.0042	0.0031
Total Filterable PM	Total mg Collected in Cyclone and on Filter (Filterable PM)	2.2	10.0	5.9	6.0
gr/DSCF	Concentration, grains/DSCF	0.0016	0.0070	0.0045	0.0044
lb/hr	Total Filterable PM Emission Rate, lb/hr	1.96	8.44	5.27	5.22
lb/mmBtu	Total Filterable PM Emission Rate, lb/mmBtu	0.0033	0.0144	0.0092	0.0090
Organic Condensible PM	Total Milligrams of Organic Condensable PM	2.7	2.8	2.1	2.5
gr/DSCF	Concentration, grains/DSCF	0.0020	0.0020	0.0016	0.0018
lb/hr	Organic Condensible PM Emission Rate, lb/hr	2.40	2.36	1.88	2.21
lb/mmBtu	Organic Condensible PM Emission Rate, lb/mmBtu	0.0041	0.0040	0.0033	0.0038
Inorganic Condensible PM	Total Milligrams of Inorganic Condensable PM	10.9	8.9	20.0	13.3
gr/DSCF	Concentration, grains/DSCF	0.0080	0.0063	0.0152	0.0098
lb/hr	Inorganic Condensible PM Emission Rate, lb/hr	9.69	7.51	17.9	11.7
lb/mmBtu	Inorganic Condensible PM Emission Rate, lb/mmBtu	0.0165	0.0129	0.0313	0.0202
Total Condensible PM	Total Milligrams of Organic and Inorganic Condensable PM	13.6	11.7	22.1	15.8
gr/DSCF	Concentration, grains/DSCF	0.0100	0.0082	0.0168	0.0117
lb/hr	Total Condensible PM Emission Rate, lb/hr	12.1	9.87	19.8	13.9
lb/mmBtu	Total Condensible PM Emission Rate, lb/mmBtu	0.0206	0.0169	0.0345	0.0240
PM <2.5 Including CPM	Total Milligrams Collected After Cyclone (Filterable and CPM)	13.9	15.0	24.8	17.9
gr/DSCF	Concentration, grains/DSCF	0.0102	0.0106	0.01887	0.0132
lb/hr	PM <2.5 including CPM Emission Rate, lb/hr	12.4	12.7	22.2	15.7
lb/mmBtu	PM <2.5 including CPM Emission Rate, lb/mmBtu	0.0211	0.0217	0.0388	0.0272
Total PM Including CPM	Total Milligrams Collected in Sample Train (Filterable PM and CP	15.8	21.7	28.0	21.8
gr/DSCF	Concentration, grains/DSCF	0.0116	0.0153	0.0213	0.0160
lb/hr	Total PM Including CPM Emission Rate, lb/hr	14.0	18.3	25.0	19.1
lb/mmBtu	Total PM Including CPM Emission Rate, lb/mmBtu	0.0240	0.0314	0.0438	0.0330

PM 10/2.5 SET-UP DATA

Plant Name	Aurora Energy
Sampling Location	Combined Boiler (Chena 1, 2, 3 & 5) Baghouse Stack
City/State	Fairbanks, AK

Duct Diameter, in.	90
Width, in. (if rectangular)	
Duct Area, in^2	6362
Pitot Tube Coeffecient	0.74
Meter Box ID	1420
Meter Box Gamma (Y)	0.9830
Meter Box delta $H_@$, in. H_2O	1.653
Estimated Meter Box Temperature, °F	60
Barometric Pressure, in. Hg	29.79
Flue Gas Static Pressure, in. H_2O	0.9
Stack Pressure	29.86
Estimated % H_2O	9.5
Desired Run Time, min	60
Number of Points	24
Base time per Point, min	2.5
Stack Gas O_2, %	9.5
Stack Gas CO_2, %	10.5
N_2+CO	80
Dry Molecular Weight, lb/lb-mole	30.06
Wet Molecular Weight, lb/lb-mole	28.91
Dry Gas Mole Fraction	0.905
Viscocity of Stack Gas, micropoise	225.76
Cunningham Correction Factor	1.09

Nozzle Selection Calculations

From Traverse

delta P low, in. H_2O	1.30
delta P high, in. H_2O	3.10
Average dP, in H_2O	2.039
Average Stack Temp, ° F	304.8

2.5	Particle diameter

	Nre <3162	Nre >3162
Lower Limit Cut for Cyc. I	9.99	10.56
Cut Diameter for Cyc. I - Middle of Overla	10.50	10.78
Cyclone Flow Rate (Ideal), ft^3/min	0.577	0.556
Reynolds Number	2493.7	2401.9
Cyclone Flow Rate Used , ft^3/min	0.577	
Velocity of Stack Gas	85.034	
Calculated Nozzle Diameter	**0.144**	**<--Ideal Nozzle Diameter**
Velocity of Gas in Nozzle	85.065	0.144 <--Actual Nozzle Diameter

Preliminary Measurements

Port	Point	delta P in. H_2O	Sqrt dP	Stack Temp. ° F	
A-	1	3.10	1.761	304	1
	2	3.00	1.732	305	2
	3	2.70	1.643	305	3
	4	2.60	1.612	305	4
	5	2.10	1.449	305	5
	6	2.00	1.414	304	6
B	1	2.20	1.483	304	7
	2	2.60	1.612	304	8
	3	2.10	1.449	304	9
	4	2.10	1.449	304	10
	5	2.00	1.414	305	11
	6	2.00	1.414	305	12
C	1	1.60	1.265	304	13
	2	1.40	1.183	305	14
	3	1.40	1.183	305	15
	4	1.40	1.183	305	16
	5	1.30	1.140	305	17
	6	1.50	1.225	305	18
D	1	2.20	1.483	305	19
	2	2.70	1.643	305	20
	3	2.70	1.643	305	21
	4	1.40	1.183	305	22
	5	1.50	1.225	305	23
	6	2.20	1.483	306	24
	*Average:	**2.039**	**1.428**	**304.8**	

Nozzle #	1	2	3	4	5	6	7	8	9	10	11	
Dn in.	0.123	0.144	0.150	0.163	0.174	0.201	0.222	0.249	0.296	0.320	0.360	<-- Input from Calibration S
Vn	116.592	85.065	78.396	66.390	58.261	43.660	35.791	28.450	20.132	17.226	13.610	
R min.	0.767	0.746	0.739	0.720	0.700	0.636	0.560	0.360	#NUM!	#NUM!	#NUM!	
R max.	1.223	1.237	1.242	1.253	1.264	1.296	1.327	1.375	1.477	1.538	1.653	
Vmin.	89.42	63.46	57.90	47.78	40.81	27.77	20.04	14.22	#NUM!	#NUM!	#NUM!	
Vmax	142.61	105.21	97.33	83.18	73.63	56.60	47.51	39.11	29.73	25.84	20.42	
Dp min.	**2.256**	**1.136**	**0.946**	**0.644**	**0.470**	**0.218**	**0.113**	**0.057**	**#NUM!**	**#NUM!**	**#NUM!**	
Dp max.	**5.738**	**3.123**	**2.673**	**1.952**	**1.530**	**0.904**	**0.637**	**0.432**	**0.249**	**0.188**	**0.118**	

Plant Name	Aurora Energy			Run I.D.	201A/202 - 1
Sampling Location	Combined Boiler (Chena 1, 2, 3 & 5) Baghouse Stack			Date	11/19/2011
City/State	Fairbanks, AK			Time	Start 1112
					Finish 1232
Nozzle I.D.	PM2.5-B4	Delta-P min	1.136	delta H	0.39
Nozzle Diameter (in.)	0.144	Delta-P max	3.123	delta H (Ts+50)	0.34
		Average delta-P	2.039	delta H (Ts-50)	0.45
Barometric Pressure	29.79				
Static Pressure	0.9				

	Dwell Time (min.)	Elapsed Time (min.)	Point	DGM Reading (ft^3)	Delta-P (in. H_2O)	Meter Temp. (° F)	Stack Temp. (° F)	Delta-H (in. H_2O)
1	**2.50**	0.0	D-1	263.300	**2.1**	66	299	**0.4**
2	**2.25**	0:02:30	2	264.250	**1.5**	65	297	**0.4**
3	**2.25**	0:04:45	3	265.080	**1.6**	65	297	**0.4**
4	**2.00**	0:07:00	4	265.930	**1.3**	66	298	**0.4**
5	**2.00**	0:09:00	5	266.710	**1.3**	67	298	**0.4**
6	**2.00**	0:11:00	6	267.470	**1.4**	68	298	**0.4**
7	**2.25**	0:13:00	C-1	268.135	**1.0**	69	298	**0.4**
8	**2.25**	0:15:15	2	269.000	**1.6**	69	298	**0.4**
9	**2.25**	0:17:30	3	269.830	**1.6**	69	298	**0.4**
10	**2.25**	0:19:45	4	270.700	**1.6**	70	298	**0.4**
11	**2.25**	0:22:00	5	271.550	**1.5**	70	299	**0.4**
12	**2.25**	0:24:15	6	272.390	**1.5**	71	299	**0.4**
13	**2.75**	0:26:30	B-1	273.250	**2.5**	71	298	**0.4**
14	**2.75**	0:29:15	2	274.290	**2.5**	71	299	**0.4**
15	**2.75**	0:32:00	3	275.300	**2.3**	71	299	**0.4**
16	**2.25**	0:34:45	4	276.330	**1.6**	71	299	**0.4**
17	**2.50**	0:37:00	5	277.210	**2.1**	71	299	**0.4**
18	**2.50**	0:39:30	6	278.130	**2.2**	72	300	**0.4**
19	**3.25**	0:42:00	A-1	279.079	**3.4**	72	300	**0.4**
20	**3.00**	0:45:15	2	280.320	**3.0**	72	300	**0.4**
21	**3.00**	0:48:15	3	281.500	**2.9**	72	300	**0.4**
22	**3.00**	0:51:15	4	283.800	**2.7**	72	300	**0.4**
23	**2.75**	0:54:15	5	283.800	**2.6**	72	300	**0.4**
24	**2.75**	0:57:00	6	284.880	**2.5**	72	300	**0.4**
25		0:59:45		285.881				
26								
27								
28								
29								
30								

Total Run Time	Total Sample Volume (ft^3)	Average delta-P	Average Meter Temp	Average Stack Temp	Average delta-H
59.75	22.581	1.964	69.8	298.8	0.40

PM 10/2.5 SET-UP DATA

Plant Name	Aurora Energy
Sampling Location	Combined Boiler (Chena 1, 2, 3 & 5) Baghouse Stack
City/State	Fairbanks, AK

Nozzle Selection Calculations

Duct Diameter, in.	90	From Traverse	
Width, in. (if rectangular)		delta P low, in. H_2O	1.30
Duct Area, in^2	6362	delta P high, in. H_2O	3.40
Pitot Tube Coeffecient	0.74	Average dP, in H_2O	1.991
Meter Box ID	1420	Average Stack Temp, ° F	304.8
Meter Box Gamma (Y)	0.9830		
Meter Box delta $H_@$, in. H_2O	1.653		
Estimated Meter Box Temperature, °F	70		
Barometric Pressure, in. Hg	29.8		
Flue Gas Static Pressure, in. H_2O	0.9		
Stack Pressure	29.87		
Estimated % H_2O	9.5		
Desired Run Time, min	60		
Number of Points	24		
Base time per Point, min	2.5		
Stack Gas O_2, %	9.5		
Stack Gas CO_2, %	10.5		
N_2+CO	80		
Dry Molecular Weight, lb/lb-mole	30.06		
Wet Molecular Weight, lb/lb-mole	28.91		
Dry Gas Mole Fraction	0.905		
Viscocity of Stack Gas, micropoise	225.76		
Cunningham Correction Factor	1.10	2.25	Particle diameter

	Nre <3162	Nre >3162
Lower Limit Cut for Cyc. I	10.02	10.60
Cut Diameter for Cyc. I - Middle of Overla	10.51	10.80
Cyclone Flow Rate (Ideal), ft^3/min	0.576	0.554
Reynolds Number	2489.7	2395.9

Cyclone Flow Rate Used , ft^3/min	0.576	
Velocity of Stack Gas	83.999	
Calculated Nozzle Diameter	**0.145**	**<--Ideal Nozzle Diameter**
Velocity of Gas in Nozzle	84.899	0.144 <--Actual Nozzle Diameter

Preliminary Measurements

Port	Point	delta P in. H_2O	Sqrt dP	Stack Temp. ° F	
A-	1	2.10	1.449	304	1
	2	1.50	1.225	305	2
	3	1.60	1.265	305	3
	4	1.30	1.140	305	4
	5	1.30	1.140	305	5
	6	1.40	1.183	304	6
B	1	1.50	1.225	304	7
	2	1.60	1.265	304	8
	3	1.60	1.265	304	9
	4	1.60	1.265	304	10
	5	1.50	1.225	305	11
	6	1.50	1.225	305	12
C	1	2.50	1.581	304	13
	2	2.50	1.581	305	14
	3	2.30	1.517	305	15
	4	1.60	1.265	305	16
	5	2.10	1.449	305	17
	6	2.20	1.483	305	18
D	1	3.40	1.844	305	19
	2	3.00	1.732	305	20
	3	2.90	1.703	305	21
	4	2.70	1.643	305	22
	5	2.60	1.612	305	23
	6	2.50	1.581	306	24
	*Average:	1.991	1.411	304.8	

Nozzle #	1	2	3	4	5	6	7	8	9	10	11	
Dn in.	0.123	0.136	0.145	0.163	0.174	0.201	0.222	0.249	0.296	0.320	0.360	<-- Input from Calibration S
Vn	116.363	95.181	83.732	66.260	58.147	43.575	35.721	28.394	20.093	17.192	13.584	
R min.	0.767	0.755	0.745	0.720	0.700	0.636	0.559	0.357	#NUM!	#NUM!	#NUM!	
R max.	1.223	1.231	1.238	1.253	1.264	1.297	1.328	1.375	1.477	1.539	1.654	
Vmin.	89.24	71.84	62.35	47.68	40.72	27.70	19.97	14.20	#NUM!	#NUM!	#NUM!	
Vmax	142.34	117.19	103.63	83.02	73.50	56.50	47.43	39.04	29.68	25.79	20.38	
Dp min.	**2.248**	**1.457**	**1.097**	**0.641**	**0.468**	**0.217**	**0.113**	**0.057**	**#NUM!**	**#NUM!**	**#NUM!**	
Dp max.	**5.718**	**3.876**	**3.031**	**1.945**	**1.524**	**0.901**	**0.635**	**0.430**	**0.249**	**0.188**	**0.117**	

Plant Name	Aurora Energy			Run I.D.	201A/202 - 2		
Sampling Location	Combined Boiler (Chena 1, 2, 3 & 5) Baghouse Stack			Date	11/19/2011		
City/State	Fairbanks, AK			Time	Start	1405	
					Finish	1517	
Nozzle I.D.	PM2.5-B4	Delta-P min	1.132	delta H		0.40	
Nozzle Diameter (in.)	0.144	Delta-P max	3.112	delta H (Ts+50)		0.35	
		Average delta-P	1.991	delta H (Ts-50)		0.45	
Barometric Pressure	29.79						
Static Pressure	-0.92						

	Dwell Time (min.)	Elapsed Time (min.)	Point	DGM Reading (ft^3)	Delta-P (in. H_2O)	Meter Temp. (° F)	Stack Temp. (° F)	Delta-H (in. H_2O)
1	3.00	0.0	D-1	286.000	3.1	66	300	0.40
2	3.00	0:03:00	2	287.160	3.0	65	300	0.40
3	3.00	0:06:00	3	288.270	2.5	65	301	0.40
4	3.00	0:09:00	4	289.400	2.8	65	301	0.40
5	3.00	0:12:00	5	290.530	2.7	66	302	0.40
6	2.75	0:15:00	6	291.650	2.6	66	302	0.40
7	2.75	0:17:45	C-1	292.660	2.5	66	302	0.40
8	2.75	0:20:30	2	293.690	2.6	67	302	0.40
9	2.75	0:23:15	3	294.750	2.5	68	303	0.40
10	2.75	0:26:00	4	295.790	2.2	68	303	0.40
11	2.50	0:28:45	5	296.800	2.1	68	303	0.40
12	2.75	0:31:15	6	297.670	2.2	69	303	0.40
13	2.25	0:34:00	B-1	298.677	1.6	66	303	0.40
14	2.00	0:36:15	2	299.510	1.4	69	303	0.40
15	2.00	0:38:15	3	300.250	1.4	70	303	0.40
16	2.00	0:40:15	4	300.990	1.4	70	303	0.40
17	2.00	0:42:15	5	301.770	1.3	71	304	0.40
18	2.00	0:44:15	6	302.510	1.3	71	303	0.40
19	2.50	0:46:15	A-1	303.225	1.8	69	303	0.40
20	2.25	0:48:45	2	304.200	1.5	71	305	0.40
21	2.50	0:51:00	3	304.980	1.8	71	305	0.40
22	2.50	0:53:30	4	305.930	2.0	72	303	0.40
23	2.25	0:56:00	5	306.850	1.5	72	304	0.40
24	2.25	0:58:15	6	307.700	1.5	73	302	0.40
25		60.5		308.581				
26								
27								
28								
29								
30								

Total Run Time	Total Sample Volume (ft^3)	Average delta-P	Average Meter Temp	Average Stack Temp	Average delta-H
60.5	22.581	2.014	68.5	302.6	0.40

PM 10/2.5 SET-UP DATA

Plant Name	Aurora Energy
Sampling Location	Combined Boiler (Chena 1, 2, 3 & 5) Baghouse Stack
City/State	Fairbanks, AK

Nozzle Selection Calculations

Duct Diameter, in.	90	From Traverse	
Width, in. (if rectangular)		delta P low, in. H_2O	1.30
Duct Area, in^2	6362	delta P high, in. H_2O	3.10
Pitot Tube Coeffecient	0.74	Average dP, in H_2O	2.032
Meter Box ID	1420	Average Stack Temp, ° F	302.6
Meter Box Gamma (Y)	0.9830		
Meter Box delta $H_@$, in. H_2O	1.653		
Estimated Meter Box Temperature, °F	70		
Barometric Pressure, in. Hg	29.79		
Flue Gas Static Pressure, in. H_2O	-0.95		
Stack Pressure	29.72		
Estimated % H_2O	9.5		
Desired Run Time, min	60		
Number of Points	24		
Base time per Point, min	2.5		
Stack Gas O_2, %	7.6		
Stack Gas CO_2, %	10.4		
N_2+CO	82		
Dry Molecular Weight, lb/lb-mole	29.97		
Wet Molecular Weight, lb/lb-mole	28.83		
Dry Gas Mole Fraction	0.905		
Viscocity of Stack Gas, micropoise	224.26		
Cunningham Correction Factor	1.10	2.25	Particle diameter

	Nre <3162	Nre >3162
Lower Limit Cut for Cyc. I	10.01	10.60
Cut Diameter for Cyc. I - Middle of Overla	10.50	10.80
Cyclone Flow Rate (Ideal), ft^3/min	0.574	0.552
Reynolds Number	2482.7	2388.1

Cyclone Flow Rate Used , ft^3/min	0.574	
Velocity of Stack Gas	85.074	
Calculated Nozzle Diameter	**0.144**	**<--Ideal Nozzle Diameter**
Velocity of Gas in Nozzle	59.935	**0.171** <--Actual Nozzle Diameter

Preliminary Measurements

Port	Point	delta P in. H_2O	Sqrt dP	Stack Temp. ° F	
A-	1	3.10	1.761	300	1
	2	3.00	1.732	300	2
	3	3.00	1.732	301	3
	4	2.80	1.673	301	4
	5	2.70	1.643	302	5
	6	2.60	1.612	302	6
B	1	2.50	1.581	302	7
	2	2.60	1.612	302	8
	3	2.50	1.581	303	9
	4	2.20	1.483	303	10
	5	2.10	1.449	303	11
	6	2.20	1.483	303	12
C	1	1.60	1.265	303	13
	2	1.40	1.183	303	14
	3	1.40	1.183	303	15
	4	1.40	1.183	303	16
	5	1.30	1.140	304	17
	6	1.30	1.140	303	18
D	1	1.80	1.342	303	19
	2	1.50	1.225	305	20
	3	1.80	1.342	305	21
	4	2.00	1.414	303	22
	5	1.50	1.225	304	23
	6	1.50	1.225	302	24
	*Average:	2.032	1.425	302.6	

Nozzle #	1	2	3	4	5	6	7	8	9	10	11	
Dn in.	0.123	0.136	0.145	0.163	0.174	0.201	0.222	0.249	0.296	0.320	0.360	<-- Input from Calibration S
Vn	115.841	94.753	83.356	65.963	57.886	43.379	35.560	28.267	20.003	17.115	13.523	
R min.	0.767	0.755	0.745	0.720	0.700	0.636	0.560	0.360	#NUM!	#NUM!	#NUM!	
R max.	1.223	1.231	1.238	1.253	1.264	1.296	1.327	1.375	1.477	1.538	1.653	
Vmin.	88.85	71.53	62.08	47.47	40.55	27.60	19.91	14.13	#NUM!	#NUM!	#NUM!	
Vmax	141.69	116.66	103.16	82.64	73.16	56.24	47.20	38.86	29.54	25.67	20.28	
Dp min.	2.217	1.437	1.082	0.633	0.462	0.214	0.111	0.056	#NUM!	#NUM!	#NUM!	
Dp max.	5.638	3.821	2.988	1.918	1.503	0.888	0.626	0.424	0.245	0.185	0.116	

Plant Name	Aurora Energy			Run I.D.	201A/202 - 3		
Sampling Location	Combined Boiler (Chena 1, 2, 3 & 5) Baghouse Stack				Date	11/19/2011	
City/State	Fairbanks, AK			Time	Start	1710	
					Finish	1826	
Nozzle I.D.	PM2.5-B4	Delta-P min	1.116	delta H		0.39	
Nozzle Diameter (in.)	0.144	Delta-P max	3.069	delta H (Ts+50)		0.34	
		Average delta-P	2.032	delta H (Ts-50)		0.45	
Barometric Pressure	29.79						
Static Pressure	-0.90						

	Dwell Time (min.)	Elapsed Time (min.)	Point	DGM Reading (ft^3)	Delta-P (in. H_2O)	Meter Temp. (° F)	Stack Temp. (° F)	Delta-H (in. H_2O)
1	2.25	0.0	A-1	311.700	1.5	62	297	**0.39**
2	2.25	0:02:15	2	312.550	1.6	62	297	**0.39**
3	2.25	0:04:30	3	313.410	1.5	62	298	**0.39**
4	2.25	0:06:45	4	314.270	1.5	62	300	**0.39**
5	2.00	0:09:00	5	315.130	1.3	63	299	**0.39**
6	2.00	0:11:00	6	315.880	1.3	63	299	**0.39**
7	2.00	0:13:00	B-1	316.710	1.4	64	298	**0.39**
8	2.00	0:15:00	2	317.010	1.4	65	298	**0.39**
9	2.00	0:17:00	3	317.210	1.4	67	298	**0.39**
10	2.25	0:19:00	4	318.060	1.5	66	297	**0.39**
11	2.00	0:21:15	5	318.770	1.4	66	297	**0.39**
12	2.00	0:23:15	6	319.610	1.3	66	297	**0.39**
13	2.50	0:25:15	C-1	320.357	2.1	66	297	**0.39**
14	2.50	0:27:45	2	321.340	2.2	69	297	**0.39**
15	2.50	0:30:15	3	322.290	2.1	68	298	**0.39**
16	2.25	0:32:45	4	323.230	2.1	68	298	**0.39**
17	2.50	0:35:00	5	324.080	2.0	69	298	**0.39**
18	2.50	0:37:30	6	325.070	2.0	69	298	**0.39**
19	3.00	0:40:00	D-1	326.069	3.1	67	297	**0.39**
20	3.00	0:43:00	2	327.210	3.0	69	299	**0.39**
21	3.00	0:46:00	3	328.320	2.9	70	298	**0.39**
22	3.00	0:49:00	4	329.460	2.9	72	299	**0.39**
23	3.00	0:52:00	5	330.580	2.7	71	299	**0.39**
24	2.75	0:55:00	6	331.730	2.6	71	299	**0.39**
25		0:57:45		332.821				
26								
27								
28								
29								
30								

Total Run Time	Total Sample Volume (ft^3)	Average delta-P	Average Meter Temp	Average Stack Temp	Average delta-H
57.75	21.121	1.906	66.5	298.0	0.39

TRC
19874 141st Place N.E.
Woodinville, WA 98072
Phone: (425) 489-1938
Fax: (425) 489-9564

EMISSIONS MEASUREMENTS DEPARTMENT

CLIENT: Aurora Energy
LOCATION: Fairbanks, Alaska
UNIT: Combined Boiler Baghouse Stack

DATE: 11/19/11
PROJECT NO.: 187446
PERSONNEL: MC

EPA Method 30B - Summary of Laboratory Results & Emissions Calculations

Run	Initial Vol (L)	Final Vol (L)	V_m (L)	P_{baro} (in Hg)	$T_{m\text{-}avg}$ (°F)	$T_{m\text{-}avg}$ (°R)	T_{std} (°R)	P_{std} (in Hg)	$V_{m\text{-}std}$ (L)
2A	0.000	22.217	22.217	29.79	54.40	514.4	528	29.92	22.705
2B	0.000	21.120	21.120	29.79	56.00	516.0	528	29.92	21.517
3A	0.000	21.937	21.937	29.79	61.00	521.0	528	29.92	22.135
3B	0.000	18.304	18.304	29.79	62.00	522.0	528	29.92	18.434
4A	0.000	21.498	21.498	29.79	61.00	521.0	528	29.92	21.692
4B	0.000	20.788	20.788	29.79	62.50	522.5	528	29.92	20.916

Run	Trap ID #	Hg-A Concentration (ng/sample)	Hg Spike (ng)	Hg-B Concentration (ng/sample)	Total Hg (A + B - Spike) (ng)	$V_{m\text{-}std}$ (L)	$V_{m\text{-}std}$ (m^3)	Total Hg (µg/m^3)	Stack Gas Airflow (dscf/min)	Total Hg (mg/min)	Total Hg (lb/hr)
2A	13947	52.2	0	0.6	52.8	22.705	0.023	2.33	*144,849*	*9.54*	*0.001*
2B	12654	148.0	100	1.3	49.3	21.517	0.022	2.29	*144,849*	*9.40*	*0.001*
Average Run 2		***100.1***		***1.0***	***51.1***	***22.111***	***0.022***	***2.31***	***144,849***	***9.47***	***0.001***
3A	13822	60.4	0	0.4	60.8	22.135	0.022	2.75	*140,489*	*10.9*	*0.001*
3B	13974	44.2	0	0.4	44.6	18.434	0.018	2.42	*140,489*	*9.63*	*0.001*
Average Run 3		***52.3***		***0.4***	***52.7***	***20.285***	***0.020***	***2.58***	***140,489***	***10.3***	***0.001***
4A	13939	45.1	0	0.4	45.5	21.692	0.022	2.10	*139,492*	*8.29*	*0.001*
4B	13942	51.9	0	1.1	53.0	20.916	0.021	2.53	*139,492*	*10.0*	*0.001*
Average Run 4		***48.5***		***0.8***	***49.3***	***21.304***	***0.021***	***2.32***	***139,492***	***9.15***	***0.001***
Average Runs 2-4 Emissions Results				***0.7***	***51.0***	***21.2***	***0.0***	***2.4***	***141,610***	***9.63***	***0.001***
FBA	12981	104.0	100	0.0	4.0	22.178	0.022	0.180	*141,610*	*0.723*	*0.000*
FBB	14089	0.0	0	0.0	0.0	22.178	0.022	0.000	*141,610*	-	-
FB Results		***52.0***		***0.0***	***2.0***	***22.178***	***0.022***	***0.090***	***141,610***	***0.362***	***0.00005***

RUN 1

Configuration File: Aurora Nov 2011 run 2.pro
File Exported: 11/19/2011 6:35:37 PM (PC Time).
Company Name: Aurora Energy
11/19/11 07:38:51 AM: Sample A: PRE-Leak Test PASSED at Maximum vacuum with Flow Rate 0 ccm (Max. allowed 16 ccm)
11/19/11 07:38:51 AM: Sample B: PRE-Leak Test PASSED at Maximum vacuum with Flow Rate 0 ccm (Max. allowed 16 ccm)
Trap ID-A: FGS13947
Trap ID-B: FGS12654

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 7m
Averaging Period : 1 min.

	Stack F	Probe F	Chiller F	HSRL F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (L) Corr-Vol	DEL_P in
AVERAGES AND TEST SUMMARIES	295.7	228.6	34.4	257.4	54.4	56	294	64.3	0.402	1.3	21.826	0.401	1.2	20.817	-
11/19/2011 11:19:14 AM :	295	227	35	258	52	54	292	62	0	0	0	0.019	0	0	-
11/19/2011 11:20:13 AM :	295	227	35	258	52	54	292	63	0.52	1.4	0.51	0.486	1.2	0.386	-
11/19/2011 11:21:13 AM :	295	226	35	257	52	54	292	63	0.403	1.2	0.956	0.402	1.2	0.677	-
11/19/2011 11:22:13 AM :	295	226	35	257	52	54	292	63	0.401	1.2	1.327	0.402	1.2	1.033	-
11/19/2011 11:23:13 AM :	295	226	35	257	53	55	292	64	0.401	1.3	1.712	0.401	1.2	1.39	-
11/19/2011 11:24:13 AM :	295	226	34	257	53	55	293	64	0.401	1.3	2.026	0.4	1.2	1.782	-
11/19/2011 11:25:13 AM :	295	227	34	256	53	55	293	65	0.401	1.3	2.39	0.4	1.2	2.142	-
11/19/2011 11:26:13 AM :	295	228	34	257	53	55	293	65	0.401	1.3	2.701	0.4	1.2	2.459	-
11/19/2011 11:27:13 AM :	295	229	34	257	53	55	293	65	0.4	1.3	3.124	0.4	1.2	2.786	-
11/19/2011 11:28:13 AM :	295	230	34	257	53	55	293	65	0.4	1.3	3.485	0.4	1.2	3.063	-
11/19/2011 11:29:13 AM :	295	230	34	257	54	55	293	65	0.401	1.3	3.953	0.401	1.3	3.412	-
11/19/2011 11:30:13 AM :	287	231	34	257	54	55	293	65	0.399	1.3	4.291	0.4	1.2	3.704	-
11/19/2011 11:31:13 AM :	294	231	34	257	54	56	293	65	0.401	1.3	4.658	0.4	1.2	4.115	-
11/19/2011 11:32:13 AM :	295	231	34	257	54	56	293	65	0.401	1.3	4.986	0.4	1.3	4.446	-
11/19/2011 11:33:13 AM :	295	230	34	257	54	56	293	65	0.4	1.3	5.313	0.4	1.3	4.866	-
11/19/2011 11:34:13 AM :	295	229	34	258	54	56	293	65	0.401	1.3	5.668	0.4	1.3	5.163	-
11/19/2011 11:35:13 AM :	295	229	34	258	54	56	293	64	0.4	1.3	6.034	0.4	1.3	5.513	-
11/19/2011 11:36:13 AM :	295	228	34	258	54	56	293	64	0.4	1.3	6.466	0.4	1.3	5.784	-
11/19/2011 11:37:13 AM :	295	227	34	258	54	56	293	64	0.4	1.3	6.83	0.4	1.3	6.125	-
11/19/2011 11:38:13 AM :	295	226	34	258	54	56	293	64	0.401	1.3	7.22	0.4	1.3	6.419	-
11/19/2011 11:39:13 AM :	295	225	34	258	54	56	293	64	0.399	1.3	7.527	0.4	1.2	6.8	-
11/19/2011 11:40:13 AM :	295	225	34	258	54	56	293	64	0.4	1.2	7.875	0.399	1.2	7.155	-
11/19/2011 11:41:13 AM :	295	225	34	258	54	56	294	64	0.401	1.2	8.184	0.4	1.2	7.555	-
11/19/2011 11:42:13 AM :	295	225	34	258	55	56	294	64	0.401	1.2	8.56	0.4	1.2	7.88	-
11/19/2011 11:43:13 AM :	295	226	34	258	55	56	294	64	0.399	1.2	8.91	0.399	1.2	8.211	-
11/19/2011 11:44:13 AM :	295	227	34	258	55	56	294	64	0.4	1.2	9.345	0.399	1.2	8.488	-
11/19/2011 11:45:13 AM :	295	228	34	258	54	56	294	64	0.4	1.2	9.693	0.4	1.2	8.814	-
11/19/2011 11:46:13 AM :	295	229	34	258	54	56	294	64	0.4	1.2	10.073	0.401	1.2	9.1	-
11/19/2011 11:47:13 AM :	295	230	34	258	54	56	294	64	0.399	1.2	10.369	0.4	1.2	9.457	-
11/19/2011 11:48:13 AM :	295	230	34	258	55	56	294	64	0.4	1.2	10.723	0.399	1.2	9.808	-

Configuration File: Aurora Nov 2011 run 2.pro
File Exported: 11/19/2011 6:35:37 PM (PC Time).
Company Name: Aurora Energy
11/19/11 07:38:51 AM: Sample A: PRE-Leak Test PASSED at Maximum vacuum with Flow Rate 0 ccm (Max. allowed 16 ccm)
11/19/11 07:38:51 AM: Sample B: PRE-Leak Test PASSED at Maximum vacuum with Flow Rate 0 ccm (Max. allowed 16 ccm)
Trap ID-A: FGS13947
Trap ID-B: FGS12654

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 7m
Averaging Period : 1 min.

		Stack F	Probe F	Chiller F	HSRL F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (L) Corr-Vol	DEL_P in
AVERAGES AND TEST SUMMARIES		295.7	228.6	34.4	257.4	54.4	56	294	64.3	0.402	1.3	21.826	0.401	1.2	20.817	-
11/19/2011	11:48:19 AM :	295	230	34	258	55	56	294	64	0.4	1.2	10.763	0.399	1.2	9.839	-
11/19/2011	11:51:13 AM :Resumed	295	230	34	258	55	56	294	64	0.39	0.7	10.869	0.391	0.7	10.001	-
11/19/2011	11:52:03 AM :	295	230	34	258	55	56	294	64	0.39	0.7	11.145	0.391	0.7	10.366	-
11/19/2011	11:52:13 AM :Resumed	295	230	34	258	55	56	294	64	0.401	1.2	11.207	0.399	1.1	10.416	-
11/19/2011	11:53:13 AM :	295	230	34	258	55	56	294	64	0.401	1.4	11.565	0.401	1.3	10.743	-
11/19/2011	11:54:13 AM :	295	230	34	258	55	56	294	64	0.4	1.4	11.974	0.4	1.3	11.104	-
11/19/2011	11:55:13 AM :	295	230	34	258	55	56	294	64	0.4	1.4	12.352	0.4	1.3	11.391	-
11/19/2011	11:56:13 AM :	295	230	34	258	55	56	294	64	0.401	1.4	12.728	0.4	1.3	11.745	-
11/19/2011	11:58:13 AM :	295	229	34	258	55	56	294	64	0.4	1.4	13.389	0.401	1.3	12.463	-
11/19/2011	11:59:13 AM :	295	227	34	258	54	56	294	64	0.401	1.4	13.69	0.401	1.3	12.827	-
11/19/2011	12:00:13 PM :	296	226	34	258	54	56	294	64	0.4	1.4	14.064	0.401	1.3	13.263	-
11/19/2011	12:01:13 PM :	296	226	34	258	54	56	294	63	0.401	1.5	14.42	0.401	1.3	13.582	-
11/19/2011	12:02:13 PM :	296	225	34	258	54	56	294	63	0.401	1.4	14.853	0.401	1.3	13.946	-
11/19/2011	12:03:13 PM :	296	225	34	258	54	56	294	64	0.4	1.4	15.213	0.401	1.3	14.227	-
11/19/2011	12:04:13 PM :	296	225	34	258	54	56	295	63	0.401	1.4	15.591	0.401	1.3	14.596	-
11/19/2011	12:05:13 PM :	296	226	34	258	54	56	295	64	0.399	1.4	15.893	0.401	1.3	14.896	-
11/19/2011	12:06:13 PM :	296	226	34	258	54	56	295	63	0.4	1.5	16.244	0.401	1.3	15.325	-
11/19/2011	12:06:38 PM :	296	226	34	258	54	56	295	63	0.4	1.5	16.385	0.401	1.3	15.458	-
11/19/2011	12:11:13 PM :Resumed	296	229	34	258	54	56	295	63	0.392	1.1	16.559	0.394	0.9	15.717	-
11/19/2011	12:12:13 PM :	296	232	34	258	54	56	295	63	0.399	1.6	16.946	0.4	1.2	16.145	-
11/19/2011	12:13:13 PM :	296	232	34	258	54	56	295	63	0.401	1.6	17.291	0.399	1.3	16.456	-
11/19/2011	12:14:13 PM :	296	232	34	258	54	56	295	63	0.401	1.5	17.738	0.399	1.4	16.814	-
11/19/2011	12:15:13 PM :	296	232	34	258	54	56	295	63	0.401	1.5	18.07	0.399	1.4	17.103	-
11/19/2011	12:16:13 PM :	296	232	34	258	54	56	295	63	0.401	1.5	18.46	0.399	1.4	17.46	-
11/19/2011	12:17:13 PM :	296	232	34	257	54	56	295	63	0.401	1.5	18.742	0.4	1.3	17.785	-
11/19/2011	12:18:13 PM :	296	231	34	258	54	56	295	63	0.401	1.5	19.115	0.4	1.4	18.195	-
11/19/2011	12:19:13 PM :	296	230	34	258	54	56	295	63	0.401	1.5	19.403	0.4	1.3	18.567	-
11/19/2011	12:20:13 PM :	296	229	34	258	54	55	295	63	0.4	1.5	19.813	0.4	1.3	18.967	-
11/19/2011	12:21:13 PM :	296	228	34	258	54	55	295	63	0.401	1.5	20.158	0.4	1.2	19.281	-
11/19/2011	12:22:13 PM :	296	227	34	258	54	55	295	64	0.4	1.5	20.599	0.399	1.4	19.623	-
11/19/2011	12:23:13 PM :	296	226	34	258	54	55	295	64	0.401	1.5	20.931	0.399	1.4	19.9	-

Configuration File: Aurora Nov 2011 run 2.pro
File Exported: 11/19/2011 6:35:37 PM (PC Time).
Company Name: Aurora Energy
11/19/11 07:38:51 AM: Sample A: PRE-Leak Test PASSED at Maximum vacuum with Flow Rate 0 ccm (Max. allowed 16 ccm)
11/19/11 07:38:51 AM: Sample B: PRE-Leak Test PASSED at Maximum vacuum with Flow Rate 0 ccm (Max. allowed 16 ccm)
Trap ID-A: FGS13947
Trap ID-B: FGS12654

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 7m
Averaging Period : 1 min.

	Stack F	Probe F	Chiller F	HSRL F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (L) Corr-Vol	DEL_P in
AVERAGES AND TEST SUMMARIES	295.7	228.6	34.4	257.4	54.4	56	294	64.3	0.402	1.3	21.826	0.401	1.2	20.817	-
11/19/2011 12:24:13 PM :	296	226	34	258	54	55	295	64	0.401	1.5	21.3	0.399	1.3	20.258	-
11/19/2011 12:25:13 PM :	296	225	34	258	54	55	295	64	0.401	1.5	21.604	0.399	1.3	20.56	-
11/19/2011 12:25:50 PM :	296	225	34	258	54	55	295	64	0.401	1.5	21.826	0.399	1.3	20.817	-

'

'---------- LOGGED EVENTS ----------
11/19/11 11:19:14 AM: Test START
11/19/11 11:48:19 AM: Test Paused by External Source
11/19/11 11:48:19 AM: PAUSE_EVENT [External Pause]
11/19/11 11:50:51 AM: Test Resumed
11/19/11 11:52:03 AM: Test Paused by External Source
11/19/11 11:52:08 AM: Test Resumed
11/19/11 12:06:38 PM: Test Paused by External Source
11/19/11 12:10:35 PM: Test Resumed
11/19/11 12:25:50 PM: Actual Sampling Time: 0d 1h 0m 0s
11/19/11 12:25:50 PM: Test END
11/19/11 1:00:15 PM: PAUSE_EVENT - with Flow Rate of 0 ccm (Max. allowed 16 ccm)
11/19/11 12:37:17 PM: Sample A: POST-Leak Test PASSED with minimal vacuum of 5 inHg
11/19/11 12:37:17 PM: Maximum Observed Vacuum for A was 1.9 inHg with Flow Rate of 0 ccm (Max. allowed 16 ccm)
11/19/11 12:37:17 PM: Sample B: POST-Leak Test PASSED with minimal vacuum of 5 inHg
11/19/11 12:37:17 PM: Maximum Observed Vacuum for B was 1.6 inHg
' *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B

Configuration File: Aurora Nov 2011 run 2.pro
File Exported: 11/19/2011 6:35:37 PM (PC Time).
Company Name: Aurora Energy
11/19/11 07:38:51 AM: Sample A: PRE-Leak Test PASSED at Maximum vacuum with Flow Rate 0 ccm (Max. allowed 16 ccm)
11/19/11 07:38:51 AM: Sample B: PRE-Leak Test PASSED at Maximum vacuum with Flow Rate 0 ccm (Max. allowed 16 ccm)
Trap ID-A: FGS13947
Trap ID-B: FGS12654

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 7m
Averaging Period : 1 min.

	Stack F	Probe F	Chiller F	HSRL F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (L) Corr-Vol	DEL_P in
AVERAGES AND TEST SUMMARIES	295.7	228.6	34.4	257.4	54.4	56	294	64.3	0.402	1.3	21.826	0.401	1.2	20.817	-

'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'---------- END OF ALARM LEDGENDS ----------

'---------- CONSOLE INFO ----------
' Console Name: TRC - 3221
' Console ID: XC30B-3221
' DAC Board ID: 5452-4320-2D20-3332
'Dry Gas Meter-A ID/Gamma: 1902132 / 0.9989
'Dry Gas Meter-B ID/Gamma: 1902142 / 1.0101
' DGM cm3/Pulse: 1.93

' RTC ROM ID: 73E5-014B-0000-00EF
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT ----------
' Software-Firmware Ver: 0320L-116
'

'---------- PROFILE INFORMATION ----------

'Profile used	OK
' 01. System Use Only	11/18/2011 10:49:00 AM
' 02. System Use Only - Date/Time	0320L
' 03. System Use Only - Software Version	110
' 04. System Use Only - Profile Version	
' 05. System Use Only	
' 06. System Use Only	
' 07. System Use Only	
' 08. System Use Only	Aurora Nov 2011 run 2.pro
' 09. System Use Only	

Configuration File: Aurora Nov 2011 run 2.pro
File Exported: 11/19/2011 6:35:37 PM (PC Time).
Company Name: Aurora Energy
11/19/11 07:38:51 AM: Sample A: PRE-Leak Test PASSED at Maximum vacuum with Flow Rate 0 ccm (Max. allowed 16 ccm)
11/19/11 07:38:51 AM: Sample B: PRE-Leak Test PASSED at Maximum vacuum with Flow Rate 0 ccm (Max. allowed 16 ccm)
Trap ID-A: FGS13947
Trap ID-B: FGS12654

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 7m
Averaging Period : 1 min.

	Stack F	Probe F	Chiller F	HSRL F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (L) Corr-Vol	DEL_P in
AVERAGES AND TEST SUMMARIES	295.7	228.6	34.4	257.4	54.4	56	294	64.3	0.402	1.3	21.826	0.401	1.2	20.817	-
' 10. System Use Only						Aurora Energy									
' 11. Client Information Name															
' 12. Client Information Address 1															
' 13. Client Information Address 2						State									
' 14. Client Information City Zip						TRC Woodinville									
' 15. Testing Company Name															
' 16. Testing Company Address 1															
' 17. Testing Company Address 2						State									
' 18. Testing Company City Zip						Ken Allmendinger									
' 19. Testing Personnel Manger						JimMcSweeney									
' 20. Testing Personnel Operator															
' 21. Testing Personnel Assistant 1															
' 22. Testing Personnel Assistant 2						Stack									
' 23. Stack Location						Circular									
' 24. Stack Geometry						Coal									
' 25. Stack Fuel Source/Type															
' 26. Stack F-Factor						4									
' 27. Stack Port Available						4									
' 28. Stack Port Used						94.25									
' 29. Stack Velocity Far Wall Distance						4.25									
' 30. Stack Velocity near Wall Distance						75									
' 31. Stack Distance Upstream (B)						31									
' 32. Stack Distance downstream (A)						Velocity									
' 33. Stack Particulate or Velocity Traverse															
' 34. Test Equipment Console ID						XC30B									
' 35. Test Equipment Console Model															
' 36. Test Equipment Console Calibration Factor															
' 37. Test Equipment Pitot ID						0.84									
' 38. Test Equipment Pitot Coefficient															
' 39. Test Equipment Probe ID						FGS13947									
' 40. Test Equipment Cartridge A ID						FGS12654									

Configuration File: Aurora Nov 2011 run 2.pro
File Exported: 11/19/2011 6:35:37 PM (PC Time).
Company Name: Aurora Energy
11/19/11 07:38:51 AM: Sample A: PRE-Leak Test PASSED at Maximum vacuum with Flow Rate 0 ccm (Max. allowed 16 ccm)
11/19/11 07:38:51 AM: Sample B: PRE-Leak Test PASSED at Maximum vacuum with Flow Rate 0 ccm (Max. allowed 16 ccm)
Trap ID-A: FGS13947
Trap ID-B: FGS12654

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 7m
Averaging Period : 1 min.

		Stack	Probe	Chiller	HSRL	DGM-A	DGM-B	Trap	Console	MAS-A	VAC-A	DGM-A (L)	MAS-B	VAC-B	DGM-B (L)	DEL_P
		F	F	F	F	F	F	F	F	LPM	in-Hg	Corr-Vol	LPM	in-Hg	Corr-Vol	in
AVERAGES AND TEST SUMMARIES		295.7	228.6	34.4	257.4	54.4	56	294	64.3	0.402	1.3	21.826	0.401	1.2	20.817	-
' 41. Test Equipment Cartridge B ID							15									
' 42. Alarm Proportional/Consta	20	10	D				14									
' 43. Alarm High Vacumm	20	10	D				60									
' 44. Alarm Modbus Timeout	10	D					20									
' 45. Alarm FLOW/MOISTURE	10	D					50									
' 46. Alarm TRAP and PROBE	20	10	A				4									
' 47. Alarm CHILLER TC (F)	20	10	A				285									
' 48. Alarm SAMPLE/AUX TC (	335	20	10	D			60									
' 49. Alarm Delay During Startup/Resume							1									
' 50. Alarm Return From Powe	D															
' 51. STACK_TEMP_LOW																
' 52. STACK_TEMP_LOW_ENABLED																
' 53. STACK_TEMP_HI																
' 54. STACK_TEMP_HI_ENABLED																
' 55. STACK_TEMP_ACTION																
' 56. CHILLER_TEMP_LO																
' 57. CHILLER_TEMP_LO_ENABLED																
' 58. CHILLER_TEMP_HI																
' 59. CHILLER_TEMP_HI_ENABLED																
' 60. CHILLER_TEMP_ACTION																
' 61. PROBE_TEMP_LO																
' 62. PROBE_TEMP_LO_ENABLED																
' 63. PROBE_TEMP_HI																
' 64. PROBE_TEMP_HI_ENABLED																
' 65. Alarm Probe Action							0									
' 66. Test Duration Days							1									
' 67. Test Duration Hours							0									
' 68. Test Duration Minutes							1									
' 69. Test Average Period							0									
' 70. Test Zero Internal Pitot Transducer							Constant									
' 71. Test Flow Control Select							SquareRoot									

Configuration File: Aurora Nov 2011 run 2.pro
File Exported: 11/19/2011 6:35:37 PM (PC Time).
Company Name: Aurora Energy
11/19/11 07:38:51 AM: Sample A: PRE-Leak Test PASSED at Maximum vacuum Flow Rate 0 ccm (Max. allowed 16 ccm)
11/19/11 07:38:51 AM: Sample B: PRE-Leak Test PASSED at Maximum vacuum Flow Rate 0 ccm (Max. allowed 16 ccm)
Trap ID-A: FGS13947
Trap ID-B: FGS12654

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 7m
Averaging Period : 1 min.

	Stack F	Probe F	Chiller F	HSRL F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (L) Corr-Vol	DEL_P in
AVERAGES AND TEST SUMMARIES	295.7	228.6	34.4	257.4	54.4	56	294	64.3	0.402	1.3	21.826	0.401	1.2	20.817	-
' 72. Test External Input Type						Current (4-20mA)									
' 73. Test External Signal Type						4									
' 74. Test External Input Lo Value						0									
' 75. Test External Input Lo Value Translated						20									
' 76. Test External Input Hi Value						1000									
' 77. Test External Input Hi Value Translated															
' 78. Test External Input Translated Value Unit						400									
' 79. Target Flow Rate						250									
' 80. Probe Heater Set Temperature (F)						34									
' 81. Chiller Set Temperature (F)						Constant									
' 82. MAC Flow Control Select						9.3									
' 83. MAC Constant Value (if selected)						Current (4-20mA)									
' 84. MAC External Input Type						4									
' 85. MAC External Input LO Value						0									
' 86. MAC External Input LO Translated						20									
' 87. MAC External Input HI Value						100									
' 88. MAC External Input HI Translated						0.85									
' 89. Pitot tube coefficient						0									
' 90. MAC Enabled						0									
' 91. DGM_Backup						60									
' 92. Baseline Time						2									
' 93. External Pause						0									
' 94. Modbus_ASCII_Mode						0									
' 95. AUTO_PAUSE_CONTROL						102									
' 96. AUTO_PAUSE_PORT_POINT						0									
' 97. AUTO_PAUSE_COUNTDOWN_MIN						0									
' 98. PRO_AUTO_PAUSE_RESTART_MIN															
' 99. <Future use>						'260420251181032828374131722321'									
'File Validation String:'															

Baro in-Hg	STD Vol_A	STD Vol_B	*Extern Flow_In	Const. Moist.	Target Flow	% Valve_A	% Valve_B	%Proportional Flow_A	%Proportional Flow_B	*Alarm_Bits
29.64	22.217	21.12	0	9.3						
29.69	0	0	-	-	400	63.5	63.5	-	4.7	
29.69	0.522	0.394	-	-	400	46.7	48.2	-	-	
29.69	0.978	0.69	-	-	400	45.5	47.1	100.7	100.5	
29.69	1.358	1.053	-	-	400	44.7	46.3	100.2	100.5	
29.69	1.752	1.416	-	-	400	44.3	45.9	100.2	100.2	
29.69	2.072	1.815	-	-	400	43.9	45.1	100.2	100	
29.68	2.445	2.182	-	-	400	43.5	45.1	100.2	100	
29.68	2.762	2.504	-	-	400	43.1	44.7	100.2	100	
29.66	3.193	2.836	-	-	400	42.7	44.3	100	100	
29.66	3.562	3.117	-	-	400	42.4	44.3	100	100	
29.66	4.038	3.472	-	-	400	42.4	43.9	100.2	100.2	
29.65	4.384	3.769	-	-	400	42	43.9	99.7	100	
29.65	4.757	4.186	-	-	400	42	43.9	100.2	100	
29.65	5.091	4.522	-	-	400	42	43.5	100.2	100	
29.65	5.424	4.947	-	-	400	42	43.5	100	100	
29.64	5.785	5.248	-	-	400	41.6	43.5	100.2	100	
29.65	6.158	5.604	-	-	400	41.6	43.5	100	100	
29.65	6.597	5.879	-	-	400	41.6	43.5	100	100	
29.64	6.968	6.225	-	-	400	41.6	43.5	100	100	
29.64	7.365	6.523	-	-	400	41.6	43.5	100.2	100	
29.65	7.677	6.909	-	-	400	41.6	43.5	99.7	100	
29.64	8.032	7.269	-	-	400	41.6	43.1	100	99.7	
29.64	8.346	7.674	-	-	400	41.6	43.1	100.2	100	
29.64	8.727	8.004	-	-	400	41.6	43.1	100.2	100	
29.64	9.084	8.34	-	-	400	41.2	43.1	99.7	99.7	
29.64	9.525	8.621	-	-	400	41.6	43.1	100	99.7	
29.64	9.88	8.952	-	-	400	41.2	43.1	100	100	
29.63	10.266	9.241	-	-	400	41.2	43.1	100	100.2	
29.63	10.567	9.603	-	-	400	41.2	43.1	99.7	100	
29.63	10.927	9.959	-	-	400	41.2	43.1	100	99.7	

Baro in-Hg	STD Vol_A	STD Vol_B	*Extern Flow_In	Const. Moist.	Target Flow	% Valve_A	% Valve_B	%Proportional Flow_A	%Proportional Flow_B	*Alarm_Bits
29.64	22.217	21.12	0	9.3						
29.63	10.968	9.991	-	-	400	41.2	43.1	100	99.7	
29.63	11.075	10.155	-	-	400	41.6	43.5	-	-	
29.63	11.355	10.525	-	-	400	41.6	43.5	97.5	97.7	
29.63	11.418	10.576	-	-	400	42	43.5	-	-	
29.63	11.783	10.907	-	-	400	41.6	43.5	100.2	100.2	
29.64	12.198	11.273	-	-	400	41.6	43.5	100	100	
29.64	12.583	11.564	-	-	400	41.6	43.5	100	100	
29.64	12.964	11.923	-	-	400	41.6	43.5	100.2	100	
29.63	13.636	12.65	-	-	400	41.6	43.5	100	100.2	
29.63	13.942	13.02	-	-	400	41.6	43.5	100.2	100.2	
29.63	14.322	13.461	-	-	400	42	43.5	100	100.2	
29.63	14.685	13.785	-	-	400	41.6	43.5	100.2	100.2	
29.63	15.125	14.155	-	-	400	41.6	43.5	100.2	100.2	
29.63	15.491	14.439	-	-	400	41.6	43.5	100	100.2	
29.63	15.875	14.813	-	-	400	41.6	43.5	100.2	100.2	
29.63	16.183	15.117	-	-	400	41.6	43.5	99.7	100.2	
29.63	16.54	15.552	-	-	400	42	43.5	100	100.2	
29.63	16.683	15.686	-	-	400	41.6	43.5	100	100.2	
29.63	16.86	15.949	-	-	400	41.6	43.5	-	-	
29.63	17.254	16.383	-	-	400	42	43.5	99.7	100	
29.63	17.604	16.698	-	-	400	41.6	43.5	100.2	99.7	
29.63	18.059	17.061	-	-	400	41.6	43.5	100.2	99.7	
29.63	18.396	17.354	-	-	400	42	43.5	100.2	99.7	
29.63	18.793	17.715	-	-	400	42	43.5	100.2	99.7	
29.63	19.08	18.045	-	-	400	41.6	43.5	100.2	100	
29.63	19.459	18.461	-	-	400	41.6	43.5	100.2	100	
29.62	19.751	18.838	-	-	400	41.6	43.5	100.2	100	
29.62	20.169	19.243	-	-	400	42	43.5	100	100	
29.62	20.52	19.562	-	-	400	41.6	43.5	100.2	100	
29.62	20.969	19.909	-	-	400	41.6	43.1	100	99.7	
29.62	21.306	20.19	-	-	400	41.6	43.5	100.2	99.7	

Baro in-Hg	STD Vol_A	STD Vol_B	*Extern Flow_In	Const. Moist.	Target Flow	% Valve_A	% Valve_B	%Proportional Flow_A	%Proportional Flow_B	*Alarm_Bits
29.64	22.217	21.12	0	9.3						
29.62	21.682	20.553	-	-	400	41.6	43.5	100.2	99.7	
29.62	21.992	20.859	-	-	400	41.6	43.5	100.2	99.7	
29.62	22.217	21.12	-	-	400	41.6	43.1	100.2	99.7	

Configuration File: Aurora Energy run 2.pro
File Exported: 11/19/2011 6:35:42 PM (PC Time).
Company Name: Aurora Energy
11/19/11 01:[illegible] with Flow Rate 0 ccm (Max. allowed 16 ccm)
11/19/11 01:[illegible] with Flow Rate 0 ccm (Max. allowed 16 ccm)
Trap ID-A: FGS13822
Trap ID-B: FGS13974

RUN 2

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 13m
Averaging Period : 1 min.

		Stack F	Probe F	Chiller F	HSRL F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (L) Corr-Vol
AVERAGES AND TEST SUMMARIES		299	228.7	34.3	258.6	57.7	59.1	289.4	65.7	0.402	1.3	21.768	0.401	0.8	18.21
11/19/2011	2:04:41 PM :	297	221	34	259	57	58	268	63	0	0	0	0.035	0	0
11/19/2011	2:05:40 PM :	297	220	34	258	56	58	268	63	0.524	1.2	0.466	0.49	0.9	0.468
11/19/2011	2:06:40 PM :	297	219	34	258	56	58	269	63	0.403	1.1	0.821	0.402	0.7	0.79
11/19/2011	2:07:40 PM :	297	218	34	258	56	58	269	63	0.402	1	1.172	0.402	0.7	1.164
11/19/2011	2:08:40 PM :	297	218	34	258	56	58	270	63	0.401	1	1.588	0.401	0.7	1.457
11/19/2011	2:09:40 PM :	297	219	34	258	56	58	271	63	0.401	1.1	1.957	0.401	0.7	1.776
11/19/2011	2:10:40 PM :	297	220	34	258	56	58	272	63	0.401	1.1	2.348	0.401	0.7	2.055
11/19/2011	2:11:40 PM :	297	221	34	258	57	58	273	63	0.4	1.1	2.662	0.401	0.8	2.312
11/19/2011	2:12:40 PM :	297	223	34	258	57	58	274	63	0.4	1.1	3.016	0.401	0.8	2.643
11/19/2011	2:13:40 PM :	297	225	34	258	57	58	275	63	0.401	1.1	3.323	0.4	0.8	2.901
11/19/2011	2:14:40 PM :	297	227	34	258	57	58	276	64	0.4	1.3	3.694	0.4	0.8	3.27
11/19/2011	2:15:40 PM :	297	229	34	258	57	58	277	64	0.401	1.4	4.049	0.4	0.8	3.597
11/19/2011	2:16:40 PM :	297	231	34	259	57	58	278	64	0.401	1.4	4.484	0.4	0.8	3.979
11/19/2011	2:17:40 PM :	297	233	34	259	57	58	279	64	0.401	1.3	4.841	0.4	0.8	4.277
11/19/2011	2:18:40 PM :	297	234	34	259	57	58	280	64	0.4	1.3	5.224	0.4	0.8	4.603
11/19/2011	2:19:40 PM :	297	234	34	259	57	58	281	64	0.4	1.4	5.523	0.4	0.8	4.88
11/19/2011	2:19:45 PM :	297	234	34	259	57	58	281	64	0.4	1.4	5.549	0.4	0.8	4.897
11/19/2011	2:19:46 PM :Resumed	297	234	34	259	57	58	281	64	0.4	1.4	5.549	0.4	0.8	4.897
11/19/2011	2:20:06 PM :User Paused	298	235	34	259	57	58	282	65	0.401	1.3	5.68	0.402	0.8	4.993
11/19/2011	2:26:46 PM :Resumed	297	233	34	259	57	58	285	65	0.389	1	5.999	0.392	0.6	5.268
11/19/2011	2:27:46 PM :	298	230	34	260	57	59	287	65	0.401	1.4	6.345	0.4	0.7	5.519
11/19/2011	2:28:46 PM :	298	229	34	259	57	59	287	64	0.401	1.3	6.709	0.401	0.7	5.784
11/19/2011	2:29:46 PM :	298	228	34	259	57	59	288	64	0.4	1.3	7.123	0.4	0.7	6.133
11/19/2011	2:30:46 PM :	298	227	34	259	57	59	288	64	0.4	1.4	7.502	0.399	0.7	6.419
11/19/2011	2:31:46 PM :	298	225	34	259	57	58	289	64	0.4	1.3	7.892	0.4	0.7	6.769
11/19/2011	2:32:46 PM :	299	225	34	259	57	58	289	64	0.401	1.4	8.203	0.397	0.7	7.039
11/19/2011	2:33:46 PM :	299	225	34	259	57	58	290	64	0.4	1.4	8.558	0.399	0.7	7.301
11/19/2011	2:34:46 PM :	299	225	34	259	57	58	290	64	0.401	1.4	8.868	0.399	0.8	7.605
11/19/2011	2:35:46 PM :	299	225	34	259	57	58	291	64	0.4	1.3	9.24	0.4	0.8	7.831
11/19/2011	2:36:46 PM :	299	226	34	259	57	58	291	64	0.401	1.4	9.6	0.4	0.8	8.112

Configuration File: Aurora Energy run 2.pro
File Exported: 11/19/2011 6:35:42 PM (PC Time).
Company Name: Aurora Energy
11/19/11 01:(with Flow Rate 0 ccm (Max. allowed 16 ccm)
11/19/11 01:(with Flow Rate 0 ccm (Max. allowed 16 ccm)
Trap ID-A: FGS13822
Trap ID-B: FGS13974

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 13m
Averaging Period : 1 min.

		Stack F	Probe F	Chiller F	HSRL F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (L) Corr-Vol
AVERAGES AND TEST SUMMARIES		299	228.7	34.3	258.6	57.7	59.1	289.4	65.7	0.402	1.3	21.768	0.401	0.8	18.21
11/19/2011	2:37:46 PM :	299	227	34	259	57	58	292	64	0.4	1.4	10.033	0.399	0.8	8.358
11/19/2011	2:38:46 PM :	299	228	34	259	57	58	292	65	0.401	1.4	10.386	0.4	0.8	8.672
11/19/2011	2:39:46 PM :	299	229	34	259	57	58	292	65	0.399	1.3	10.765	0.399	0.8	9.009
11/19/2011	2:40:24 PM :	299	229	34	259	57	58	292	65	0.399	1.3	10.948	0.399	0.8	9.192
11/19/2011	2:40:25 PM :Resumed	299	229	34	259	57	58	292	65	0.399	1.3	10.95	0.399	0.8	9.194
11/19/2011	2:40:39 PM :User Paused	299	231	34	259	57	58	293	65	0.392	1.3	11.028	0.4	0.8	9.261
11/19/2011	2:45:24 PM :Resumed	299	230	34	259	57	58	293	65	0.376	1.3	11.043	0.379	0.8	9.282
11/19/2011	2:46:24 PM :	300	230	34	259	57	58	294	65	0.409	1.1	11.397	0.407	0.7	9.66
11/19/2011	2:47:24 PM :	299	230	34	259	57	58	294	65	0.4	1.4	11.698	0.402	0.9	9.905
11/19/2011	2:48:24 PM :	300	229	34	259	57	59	295	65	0.399	1.4	12.084	0.398	0.8	10.173
11/19/2011	2:49:24 PM :	299	229	34	259	57	58	295	65	0.4	1.4	12.431	0.4	0.8	10.437
11/19/2011	2:50:24 PM :	300	229	34	259	57	58	295	65	0.4	1.4	12.875	0.397	0.9	10.658
11/19/2011	2:51:24 PM :	300	229	34	259	57	58	295	65	0.4	1.3	13.209	0.4	0.9	10.96
11/19/2011	2:52:24 PM :	300	229	34	259	57	58	296	66	0.4	1.4	13.601	0.401	0.9	11.225
11/19/2011	2:53:24 PM :	300	229	34	259	57	58	296	66	0.4	1.4	13.885	0.4	1	11.55
11/19/2011	2:54:24 PM :	300	228	34	259	57	58	296	66	0.4	1.4	14.256	0.4	0.9	11.869
11/19/2011	2:55:24 PM :	300	228	34	259	57	58	296	66	0.401	1.4	14.54	0.401	0.9	12.194
11/19/2011	2:56:24 PM :	300	228	34	259	57	58	296	66	0.4	1.4	14.955	0.402	0.9	12.567
11/19/2011	2:57:24 PM :	300	227	34	259	57	58	297	66	0.399	1.4	15.294	0.401	0.9	12.822
11/19/2011	2:58:24 PM :	300	227	34	259	57	58	297	66	0.399	1.4	15.741	0.402	0.9	13.13
11/19/2011	2:59:24 PM :	300	228	34	259	57	58	297	66	0.4	1.3	16.07	0.402	0.9	13.38
11/19/2011	3:00:15 PM :	300	228	34	259	57	58	297	66	0.4	1.3	16.406	0.402	0.9	13.625
11/19/2011	3:03:24 PM :Resumed	299	229	34	259	57	58	297	66	0.4	1.1	16.59	0.399	0.8	13.824
11/19/2011	3:04:24 PM :	299	231	34	259	58	59	297	67	0.399	1.2	16.938	0.4	0.8	14.085
11/19/2011	3:05:24 PM :	299	232	34	259	58	59	297	67	0.4	1.2	17.243	0.399	0.8	14.424
11/19/2011	3:06:24 PM :	299	232	34	259	58	59	297	67	0.4	1.2	17.623	0.401	0.8	14.726
11/19/2011	3:07:24 PM :	299	232	34	259	58	59	298	67	0.399	1.4	17.973	0.4	0.8	15.097
11/19/2011	3:08:24 PM :	298	233	34	259	58	59	298	67	0.399	1.4	18.413	0.401	0.8	15.416
11/19/2011	3:09:24 PM :	298	233	34	259	58	59	298	67	0.4	1.4	18.752	0.401	0.9	15.682
11/19/2011	3:10:24 PM :	298	232	34	259	58	59	298	67	0.401	1.4	19.14	0.402	0.9	15.992
11/19/2011	3:11:24 PM :	298	232	34	259	58	59	298	67	0.399	1.4	19.431	0.399	0.9	16.233

Configuration File: Aurora Energy run 2.pro
File Exported: 11/19/2011 6:35:42 PM (PC Time).
Company Name: Aurora Energy
11/19/11 01: with Flow Rate 0 ccm (Max. allowed 16 ccm)
11/19/11 01: with Flow Rate 0 ccm (Max. allowed 16 ccm)
Trap ID-A: FGS13822
Trap ID-B: FGS13974

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 13m
Averaging Period : 1 min.

		Stack F	Probe F	Chiller F	HSRL F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (L) Corr-Vol
AVERAGES AND TEST SUMMARIES		299	228.7	34.3	258.6	57.7	59.1	289.4	65.7	0.402	1.3	21.768	0.401	0.8	18.21
11/19/2011	3:12:24 PM :	298	232	34	259	58	59	298	67	0.4	1.4	19.801	0.4	0.9	16.528
11/19/2011	3:13:24 PM :	297	231	34	259	58	59	298	68	0.401	1.4	20.094	0.4	0.9	16.783
11/19/2011	3:14:24 PM :	297	231	34	259	58	59	298	68	0.401	1.4	20.508	0.4	0.9	17.105
11/19/2011	3:15:24 PM :	297	230	34	259	58	59	298	68	0.401	1.4	20.856	0.4	0.9	17.442
11/19/2011	3:16:24 PM :	297	229	34	259	58	59	298	68	0.4	1.4	21.3	0.401	0.9	17.742
11/19/2011	3:17:24 PM :	297	228	34	259	58	59	298	68	0.399	1.4	21.636	0.401	0.9	18.113
11/19/2011	3:17:42 PM :	297	228	34	259	58	59	298	68	0.399	1.4	21.768	0.401	0.9	18.21

---------- LOGGED EVENTS ----------
11/19/11 2:04:41 PM: Test START
11/19/11 2:19:45 PM: Test Paused by External Source
11/19/11 2:19:45 PM: PAUSE_EVENT [External Pause]
11/19/11 2:19:46 PM: Test Resumed
11/19/11 2:20:06 PM: Test Paused by User
11/19/11 2:20:06 PM: PAUSE_EVENT [Manual Pause]
11/19/11 2:25:49 PM: Test Resumed
11/19/11 2:40:24 PM: Test Paused by External Source
11/19/11 2:40:24 PM: PAUSE_EVENT [External Pause]
11/19/11 2:40:25 PM: Test Resumed
11/19/11 2:40:39 PM: Test Paused by User
11/19/11 2:40:39 PM: PAUSE_EVENT [Manual Pause]
11/19/11 2:45:21 PM: Test Resumed
11/19/11 3:00:15 PM: Test Paused by External Source
11/19/11 3:00:15 PM: PAUSE_EVENT [External Pause]
11/19/11 3:02:46 PM: Test Resumed
11/19/11 3:17:42 PM: Actual Sampling Time: 0d 1h 0m 0s
11/19/11 3:17:42 PM: Test END
11/19/11 3:45:52 PM: PAUSE_EVENT -
11/19/11 03:22:56 PM: Sample A: POST-Leak Test PASSED with minimal vacuum of 5 inHg with Flow Rate of 0 ccm (Max. allowed 16 ccm)
11/19/11 03:22:56 PM: Maximum Observed Vacuum for A was 1.8 inHg
11/19/11 03:22:56 PM: Sample B: POST-Leak Test PASSED with minimal vacuum of 5 inHg with Flow Rate of 0 ccm (Max. allowed 16 ccm)

Configuration File: Aurora Energy run 2.pro
File Exported: 11/19/2011 6:35:42 PM (PC Time).
Company Name: Aurora Energy
11/19/11 01:[illegible] with Flow Rate 0 ccm (Max. allowed 16 ccm)
11/19/11 01:[illegible] with Flow Rate 0 ccm (Max. allowed 16 ccm)
Trap ID-A: FGS13822
Trap ID-B: FGS13974

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 13m
Averaging Period : 1 min.

	Stack F	Probe F	Chiller F	HSRL F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (L) Corr-Vol
AVERAGES AND TEST SUMMARIES	299	228.7	34.3	258.6	57.7	59.1	289.4	65.7	0.402	1.3	21.768	0.401	0.8	18.21

11/19/11 03:22:56 PM: Maximum Observed Vacuum for B was 1.5 inHg
' *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used
'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'---------- END OF ALARM LEDGENDS ----------

'---------- CONSOLE INFO ----------
' Console Name: TRC - 3221
' Console ID: XC30B-3221
' DAC Board ID: 5452-4320-2D20-3332
'Dry Gas Meter-A ID/Gamma: 1902132 / 0.9989
'Dry Gas Meter-B ID/Gamma: 1902142 / 1.0101
' DGM cm3/Pulse: 1.93

' RTC ROM ID: 73E5-014B-0000-00EF
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT ----------
' Software-Firmware Ver: 0320L-116

Configuration File: Aurora Energy run 2.pro
File Exported: 11/19/2011 6:35:42 PM (PC Time).
Company Name: Aurora Energy
11/19/11 01:[illegible] with Flow Rate 0 ccm (Max. allowed 16 ccm)
11/19/11 01:[illegible] with Flow Rate 0 ccm (Max. allowed 16 ccm)
Trap ID-A: FGS13822
Trap ID-B: FGS13974

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 13m
Averaging Period : 1 min.

	Stack F	Probe F	Chiller F	HSRL F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (L) Corr-Vol
AVERAGES AND TEST SUMMARIES	299	228.7	34.3	258.6	57.7	59.1	289.4	65.7	0.402	1.3	21.768	0.401	0.8	18.21

'---------- PROFILE INFORMATION ----------
'Profile used
' 01. System Use Only — OK
' 02. System Use Only - Date/Time — 11/18/2011 10:49:22 AM
' 03. System Use Only - Software Version — 0320L
' 04. System Use Only - Profile Version — 110
' 05. System Use Only
' 06. System Use Only
' 07. System Use Only
' 08. System Use Only
' 09. System Use Only — Aurora Nov 2011 run 2.pro
' 10. System Use Only
' 11. Client Information Name — Aurora Energy
' 12. Client Information Address 1
' 13. Client Information Address 2
' 14. Client Information City Zip — State
' 15. Testing Company Name — TRC Woodinville
' 16. Testing Company Address 1
' 17. Testing Company Address 2
' 18. Testing Company City Zip — State
' 19. Testing Personnel Manger — Ken Allmendinger
' 20. Testing Personnel Operator — JimMcSweeney
' 21. Testing Personnel Assistant 1
' 22. Testing Personnel Assistant 2
' 23. Stack Location — Stack
' 24. Stack Geometry — Circular
' 25. Stack Fuel Source/Type — Coal
' 26. Stack F-Factor
' 27. Stack Port Available — 4
' 28. Stack Port Used — 4

Configuration File: Aurora Energy run 2.pro
File Exported: 11/19/2011 6:35:42 PM (PC Time).
Company Name: Aurora Energy
11/19/11 01:: with Flow Rate 0 ccm (Max. allowed 16 ccm)
11/19/11 01:: with Flow Rate 0 ccm (Max. allowed 16 ccm)
Trap ID-A: FGS13822
Trap ID-B: FGS13974

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 13m
Averaging Period : 1 min.

					Stack	Probe	Chiller	HSRL	DGM-A	DGM-B	Trap	Console	MAS-A	VAC-A	DGM-A (L)	MAS-B	VAC-B	DGM-B (L)
					F	F	F	F	F	F	F	F	LPM	in-Hg	Corr-Vol	LPM	in-Hg	Corr-Vol
AVERAGES AND TEST SUMMARIES					299	228.7	34.3	258.6	57.7	59.1	289.4	65.7	0.402	1.3	21.768	0.401	0.8	18.21
' 29. Stack Velocity Far Wall Distance															94.25			
' 30. Stack Velocity near Wall Distance															4.25			
' 31. Stack Distance Upstream (B)															75			
' 32. Stack Distance downstream (A)															31			
' 33. Stack Particulate or Velocity Traverse															Velocity			
' 34. Test Equipment Console ID																		
' 35. Test Equipment Console Model															XC30B			
' 36. Test Equipment Console Calibration Factor																		
' 37. Test Equipment Pitot ID																		
' 38. Test Equipment Pitot Coefficient															0.84			
' 39. Test Equipment Probe ID																		
' 40. Test Equipment Cartridge A ID															FGS13822			
' 41. Test Equipment Cartridge B ID															FGS13974			
' 42. Alarm Proportional/Conste	20	10	D												15			
' 43. Alarm High Vacumm	20	10	D												14			
' 44. Alarm Modbus Timeout	10	D													60			
' 45. Alarm FLOW/MOISTURE	10	D													20			
' 46. Alarm TRAP and PROBE	20	10	A												50			
' 47. Alarm CHILLER TC (F)	20	10	A												4			
' 48. Alarm SAMPLE/AUX TC (	335	20	10	D											285			
' 49. Alarm Delay During Startup/Resume															60			
' 50. Alarm Return From Powe D															1			
' 51. STACK_TEMP_LOW																		
' 52. STACK_TEMP_LOW_ENABLED																		
' 53. STACK_TEMP_HI																		
' 54. STACK_TEMP_HI_ENABLED																		
' 55. STACK_TEMP_ACTION																		
' 56. CHILLER_TEMP_LO																		
' 57. CHILLER_TEMP_LO_ENABLED																		
' 58. CHILLER_TEMP_HI																		
' 59. CHILLER_TEMP_HI_ENABLED																		

Configuration File: Aurora Energy run 2.pro
File Exported: 11/19/2011 6:35:42 PM (PC Time).
Company Name: Aurora Energy
11/19/11 01:[illegible] with Flow Rate 0 ccm (Max. allowed 16 ccm)
11/19/11 01:[illegible] with Flow Rate 0 ccm (Max. allowed 16 ccm)
Trap ID-A: FGS13822
Trap ID-B: FGS13974

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 13m
Averaging Period : 1 min.

	Stack F	Probe F	Chiller F	HSRL F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (L) Corr-Vol
AVERAGES AND TEST SUMMARIES	299	228.7	34.3	258.6	57.7	59.1	289.4	65.7	0.402	1.3	21.768	0.401	0.8	18.21
' 60. CHILLER_TEMP_ACTION														
' 61. PROBE_TEMP_LO														
' 62. PROBE_TEMP_LO_ENABLED														
' 63. PROBE_TEMP_HI														
' 64. PROBE_TEMP_HI_ENABLED														
' 65. Alarm Probe Action														
' 66. Test Duration Days											0			
' 67. Test Duration Hours											1			
' 68. Test Duration Minutes											0			
' 69. Test Average Period											1			
' 70. Test Zero Internal Pitot Transducer											0			
' 71. Test Flow Control Select											Constant			
' 72. Test External Input Type											SquareRoot			
' 73. Test External Signal Type											Current (4-20mA)			
' 74. Test External Input Lo Value											4			
' 75. Test External Input Lo Value Translated											0			
' 76. Test External Input Hi Value											20			
' 77. Test External Input Hi Value Translated											1000			
' 78. Test External Input Translated Value Unit														
' 79. Target Flow Rate											400			
' 80. Probe Heater Set Temperature (F)											250			
' 81. Chiller Set Temperature (F)											34			
' 82. MAC Flow Control Select											Constant			
' 83. MAC Constant Value (if selected)											9.3			
' 84. MAC External Input Type											Current (4-20mA)			
' 85. MAC External Input LO Value											4			
' 86. MAC External Input LO Translated											0			
' 87. MAC External Input HI Value											20			
' 88. MAC External Input HI Translated											100			
' 89. Pitot tube coefficient											0.85			
' 90. MAC Enabled											0			

Configuration File: Aurora Energy run 2.pro
File Exported: 11/19/2011 6:35:42 PM (PC Time).
Company Name: Aurora Energy
11/19/11 01:[illegible] with Flow Rate 0 ccm (Max. allowed 16 ccm)
11/19/11 01:[illegible] with Flow Rate 0 ccm (Max. allowed 16 ccm)
Trap ID-A: FGS13822
Trap ID-B: FGS13974

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 13m
Averaging Period : 1 min.

	Stack F	Probe F	Chiller F	HSRL F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg	DGM-B (L) Corr-Vol
AVERAGES AND TEST SUMMARIES	299	228.7	34.3	258.6	57.7	59.1	289.4	65.7	0.402	1.3	21.768	0.401	0.8	18.21
' 91. DGM_Backup											0			
' 92. Baseline Time											60			
' 93. External Pause											2			
' 94. Modbus_ASCII_Mode											0			
' 95. AUTO_PAUSE_CONTROL											0			
' 96. AUTO_PAUSE_PORT_POINT											102			
' 97. AUTO_PAUSE_COUNTDOWN_MIN											0			
' 98. PRO_AUTO_PAUSE_RESTART_MIN											0			
' 99. <Future use>														
'File Validation String:'											'243910983195892831181060313921'			

DEL_P in	Baro in-Hg	STD Vol_A	STD Vol_B	*Extern Flow_In	Const. Moist.	Target Flow	% Valve_A	% Valve_B	%Proportional Flow_A	%Proportional Flow_B	*Alarm_Bits
-	29.54	21.937	18.304	0	9.3						
-	29.57	0	0	-	-	400	63.5	63.5	-	8.8	
-	29.57	0.471	0.471	-	-	400	47.1	48.2	-	-	
-	29.57	0.83	0.796	-	-	400	45.9	47.1	100.7	100.5	
-	29.57	1.184	1.172	-	-	400	45.1	46.3	100.5	100.5	
-	29.57	1.605	1.468	-	-	400	44.3	45.9	100.2	100.2	
-	29.57	1.978	1.789	-	-	400	43.9	45.5	100.2	100.2	
-	29.57	2.374	2.07	-	-	400	43.5	45.1	100.2	100.2	
-	29.56	2.69	2.329	-	-	400	43.1	44.7	100	100.2	
-	29.56	3.047	2.663	-	-	400	42.7	44.3	100	100.2	
-	29.57	3.358	2.922	-	-	400	42.7	44.3	100.2	100	
-	29.56	3.732	3.293	-	-	400	42.4	43.9	100	100	
-	29.56	4.09	3.622	-	-	400	42.4	43.9	100.2	100	
-	29.56	4.53	4.006	-	-	400	42.4	43.9	100.2	100	
-	29.56	4.889	4.306	-	-	400	42	43.5	100.2	100	
-	29.56	5.277	4.634	-	-	400	42	43.5	100	100	
-	29.56	5.578	4.913	-	-	400	42	43.5	100	100	
-	29.56	5.604	4.93	-	-	400	42	43.5	100	100	
-	29.56	5.604	4.93	-	-	400	42	43.5	-	-	
-	29.55	5.736	5.027	-	-	400	42.7	43.9	-	-	
-	29.55	6.059	5.303	-	-	400	42.4	43.1	-	-	
-	29.55	6.407	5.556	-	-	400	42	43.1	100.2	100	
-	29.55	6.774	5.822	-	-	400	42.4	43.1	100.2	100.2	
-	29.55	7.192	6.173	-	-	400	42	43.1	100	100	
-	29.55	7.573	6.46	-	-	400	42	43.1	100	99.7	
-	29.55	7.967	6.812	-	-	400	42.4	43.1	100	100	
-	29.55	8.28	7.084	-	-	400	42.4	43.1	100.2	99.2	
-	29.54	8.638	7.347	-	-	400	42	43.1	100	99.7	
-	29.54	8.951	7.653	-	-	400	42	43.1	100.2	99.7	
-	29.54	9.325	7.88	-	-	400	42	43.1	100	100	
-	29.54	9.689	8.163	-	-	400	42	43.1	100.2	100	

DEL_P in	Baro in-Hg	STD Vol_A	STD Vol_B	*Extern Flow_In	Const. Moist.	Target Flow	% Valve_A	% Valve_B	%Proportional Flow_A	%Proportional Flow_B	*Alarm_Bits
-	29.54	21.937	18.304	0	9.3						
-	29.54	10.125	8.41	-	-	400	42	43.1	100	99.7	
-	29.54	10.481	8.725	-	-	400	42	43.1	100.2	100	
-	29.54	10.864	9.065	-	-	400	42	43.1	99.7	99.7	
-	29.54	11.048	9.248	-	-	400	42	43.1	99.7	99.7	
-	29.54	11.05	9.25	-	-	400	42	43.1	-	-	
-	29.54	11.129	9.317	-	-	400	42.4	43.5	-	-	
-	29.54	11.144	9.339	-	-	400	44.7	45.9	-	-	
-	29.53	11.501	9.719	-	-	400	42	43.1	102.2	101.7	
-	29.53	11.804	9.965	-	-	400	42	42.7	100	100.5	
-	29.53	12.193	10.234	-	-	400	42	42.7	99.7	99.5	
-	29.53	12.543	10.5	-	-	400	42	43.1	100	100	
-	29.53	12.989	10.721	-	-	400	42	43.1	100	99.2	
-	29.52	13.326	11.025	-	-	400	42	43.5	100	100	
-	29.52	13.721	11.292	-	-	400	42	43.5	100	100.2	
-	29.53	14.007	11.619	-	-	400	42	43.1	100	100	
-	29.53	14.381	11.939	-	-	400	42	43.1	100	100	
-	29.53	14.667	12.266	-	-	400	42	43.5	100.2	100.2	
-	29.52	15.084	12.64	-	-	400	42	43.1	100	100.5	
-	29.52	15.426	12.897	-	-	400	42	43.1	99.7	100.2	
-	29.52	15.876	13.207	-	-	400	42	43.5	99.7	100.5	
-	29.52	16.208	13.457	-	-	400	42	43.1	100	100.5	
-	29.52	16.546	13.704	-	-	400	42	43.1	100	100.5	
-	29.52	16.731	13.904	-	-	400	42	43.1	-	-	
-	29.52	17.082	14.166	-	-	400	42	43.1	99.7	100	
-	29.52	17.388	14.506	-	-	400	42	43.1	100	99.7	
-	29.52	17.77	14.809	-	-	400	42	43.1	100	100.2	
-	29.52	18.122	15.181	-	-	400	42	43.1	99.7	100	
-	29.51	18.564	15.502	-	-	400	42	43.1	99.7	100.2	
-	29.52	18.906	15.768	-	-	400	42	43.1	100	100.2	
-	29.52	19.296	16.08	-	-	400	42	43.1	100.2	100.5	
-	29.52	19.588	16.322	-	-	400	42	43.1	99.7	99.7	

DEL_P in	Baro in-Hg	STD Vol_A	STD Vol_B	*Extern Flow_In	Const. Moist.	Target Flow	% Valve_A	% Valve_B	%Proportional Flow_A	%Proportional Flow_B	*Alarm_Bits
-	29.54	21.937	18.304	0	9.3						
-	29.51	19.961	16.618	-	-	400	42.4	43.1	100	100	
-	29.51	20.255	16.873	-	-	400	42.4	43.1	100.2	100	
-	29.51	20.672	17.197	-	-	400	42.4	43.1	100.2	100	
-	29.51	21.021	17.535	-	-	400	42.4	43.1	100.2	100	
-	29.51	21.467	17.836	-	-	400	42.4	43.1	100	100.2	
-	29.51	21.805	18.207	-	-	400	42.4	43.5	99.7	100.2	
-	29.51	21.937	18.304	-	-	400	42	43.1	99.7	100.2	

Configuration File: Aurora Energy run 3.pro
File Exported: 11/19/2011 6:35:47 PM (PC Time).
Company Name: Aurora Energy
11/19/11 03:48:5(with Flow Rate 0 ccm (Max. allowed 16 ccm)
11/19/11 03:48:5(with Flow Rate 0 ccm (Max. allowed 16 ccm)
Trap ID-A: FGS13939
Trap ID-B: FGS13942

RUN 3

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 9m
Averaging Period : 1 min.

		Stack F	Probe F	Chiller F	HSRL F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg
AVERAGES AND TEST SUMMARIES		294.3	230.6	34.4	159.8	61	62.5	285.1	68	0.4	1.8	21.546	0.401	1.1
11/19/2011	5:10:05 PM :	293	221	34	open	61	63	268	67	0	0	0	0.017	0
11/19/2011	5:11:04 PM :	293	219	34	open	61	62	268	66	0.517	1	0.491	0.487	1.1
11/19/2011	5:12:04 PM :	293	217	34	open	61	62	268	66	0.404	0.8	0.825	0.401	1
11/19/2011	5:13:04 PM :	293	215	34	open	61	62	268	66	0.401	0.8	1.143	0.401	1
11/19/2011	5:14:04 PM :	293	215	34	open	61	62	269	66	0.401	0.8	1.496	0.401	1
11/19/2011	5:15:04 PM :	293	214	34	open	61	63	269	66	0.401	0.8	1.855	0.4	1.1
11/19/2011	5:16:04 PM :	294	215	34	open	61	63	270	66	0.401	0.8	2.276	0.4	1.1
11/19/2011	5:17:04 PM :	294	216	34	open	61	63	271	66	0.401	0.8	2.643	0.401	1.1
11/19/2011	5:18:04 PM :	294	218	34	open	61	63	272	66	0.401	0.9	3.035	0.4	1.1
11/19/2011	5:19:04 PM :	294	219	34	open	61	63	273	66	0.4	0.9	3.35	0.4	1.1
11/19/2011	5:20:04 PM :	294	222	34	open	61	63	273	66	0.401	0.9	3.705	0.4	1.1
11/19/2011	5:21:04 PM :	294	225	34	open	61	63	274	66	0.4	0.9	4.016	0.4	1.1
11/19/2011	5:22:04 PM :	294	227	34	open	61	63	275	66	0.4	0.9	4.399	0.4	1.1
11/19/2011	5:23:04 PM :	294	230	34	open	61	63	276	66	0.4	0.9	4.758	0.4	1.1
11/19/2011	5:24:04 PM :	294	232	34	open	61	63	277	66	0.401	0.9	5.205	0.4	1.1
11/19/2011	5:24:39 PM :	294	232	34	open	61	63	277	66	0.401	0.9	5.404	0.4	1.1
11/19/2011	5:28:04 PM :Resumed	294	235	34	open	61	63	279	66	0.4	0.7	5.564	0.397	0.9
11/19/2011	5:29:04 PM :	294	237	34	open	61	63	280	67	0.401	0.9	5.961	0.4	1
11/19/2011	5:30:04 PM :	294	237	34	open	61	62	281	67	0.401	0.9	6.252	0.4	1.1
11/19/2011	5:31:04 PM :	294	237	34	open	61	62	282	67	0.399	0.9	6.626	0.4	1.1
11/19/2011	5:32:04 PM :	294	237	34	open	61	62	283	67	0.4	0.9	6.923	0.401	1
11/19/2011	5:33:04 PM :	294	238	34	open	61	62	284	67	0.4	0.9	7.334	0.4	1.1
11/19/2011	5:34:04 PM :	294	238	34	open	61	62	284	67	0.4	0.9	7.706	0.399	1.1
11/19/2011	5:35:04 PM :	294	239	34	open	61	62	285	67	0.4	0.9	8.126	0.4	1.1
11/19/2011	5:36:04 PM :	294	239	34	open	61	62	285	67	0.399	0.9	8.493	0.4	1.1
11/19/2011	5:37:04 PM :	294	239	34	open	61	62	286	67	0.399	0.9	8.827	0.4	1.1
11/19/2011	5:38:04 PM :	294	239	34	open	61	62	286	67	0.4	0.9	9.163	0.399	1.1
11/19/2011	5:39:04 PM :	294	239	34	open	61	62	287	67	0.401	0.9	9.482	0.4	1.1
11/19/2011	5:40:04 PM :	294	239	34	open	61	62	287	67	0.401	0.9	9.844	0.401	1.1
11/19/2011	5:41:04 PM :	294	239	34	open	61	62	288	67	0.401	0.9	10.197	0.4	1.1

Configuration File: Aurora Energy run 3.pro
File Exported: 11/19/2011 6:35:47 PM (PC Time).
Company Name: Aurora Energy
11/19/11 03:48:5i with Flow Rate 0 ccm (Max. allowed 16 ccm)
11/19/11 03:48:5i with Flow Rate 0 ccm (Max. allowed 16 ccm)
Trap ID-A: FGS13939
Trap ID-B: FGS13942

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 9m
Averaging Period : 1 min.

		Stack F	Probe F	Chiller F	HSRL F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg
AVERAGES AND TEST SUMMARIES		294.3	230.6	34.4	159.8	61	62.5	285.1	68	0.4	1.8	21.546	0.401	1.1
11/19/2011	5:42:04 PM :	294	239	34	open	61	62	288	67	0.4	0.9	10.636	0.4	1.1
11/19/2011	5:43:04 PM :	294	239	34	open	61	62	288	68	0.4	0.9	11.003	0.401	1.1
11/19/2011	5:43:08 PM :	294	239	34	open	61	62	288	68	0.4	0.9	11.03	0.401	1.1
11/19/2011	5:46:04 PM :Resumed	292	237	34	open	61	62	289	68	0.381	0.5	11.122	0.401	0.6
11/19/2011	5:47:04 PM :	293	236	34	open	61	62	289	68	0.396	0.8	11.515	0.4	1
11/19/2011	5:48:04 PM :	293	234	34	open	61	62	289	68	0.399	0.9	11.799	0.4	1.1
11/19/2011	5:49:04 PM :	293	232	34	open	61	62	289	68	0.399	0.9	12.173	0.4	1.1
11/19/2011	5:50:04 PM :	293	231	34	open	61	62	290	68	0.399	0.9	12.465	0.4	1.1
11/19/2011	5:51:04 PM :	293	230	34	open	61	62	290	68	0.4	0.9	12.873	0.399	1.1
11/19/2011	5:52:04 PM :	293	229	34	open	61	62	290	68	0.4	0.9	13.225	0.4	1.1
11/19/2011	5:53:04 PM :	293	227	34	open	61	62	290	68	0.4	0.9	13.663	0.4	1.1
11/19/2011	5:54:04 PM :	293	226	34	open	61	62	290	68	0.4	0.9	14.026	0.4	1.1
11/19/2011	5:55:04 PM :	293	226	34	open	61	62	291	68	0.399	0.9	14.364	0.399	1.1
11/19/2011	5:56:04 PM :	293	226	34	open	61	62	291	68	0.4	0.9	14.694	0.4	1.1
11/19/2011	5:57:04 PM :	293	226	34	open	61	62	291	68	0.399	0.9	15.018	0.399	1.1
11/19/2011	5:58:04 PM :	294	227	34	open	60	62	291	68	0.4	0.9	15.373	0.399	1.1
11/19/2011	5:59:04 PM :	293	228	34	open	60	62	291	68	0.401	0.9	15.736	0.399	1.1
11/19/2011	6:00:04 PM :	294	229	34	open	60	62	291	68	0.401	0.9	16.163	0.4	1.1
11/19/2011	6:00:50 PM :	294	229	34	open	60	62	291	68	0.401	0.9	16.464	0.4	1.1
11/19/2011	6:05:04 PM :Resumed	293	231	34	open	60	62	292	68	0.4	0.8	16.838	0.399	1
11/19/2011	6:06:04 PM :	294	233	34	open	61	62	292	68	0.4	0.9	17.166	0.399	1.1
11/19/2011	6:07:04 PM :	294	233	34	open	61	62	292	68	0.399	0.9	17.503	0.4	1.1
11/19/2011	6:08:04 PM :	294	233	34	open	61	62	292	68	0.398	0.9	17.815	0.399	1.1
11/19/2011	6:09:04 PM :	294	233	34	open	60	62	292	68	0.398	0.9	18.184	0.4	1.1
11/19/2011	6:10:04 PM :	294	233	34	open	60	62	292	68	0.401	0.9	18.533	0.399	1.1
11/19/2011	6:11:04 PM :	294	232	34	open	60	62	292	68	0.4	0.9	18.97	0.399	1.1
11/19/2011	6:12:04 PM :	294	232	34	47	60	62	292	68	0.401	1	19.335	0.399	1.1
11/19/2011	6:13:04 PM :	294	232	34	102	60	61	292	68	0.401	1	19.722	0.4	1.1
11/19/2011	6:14:04 PM :	294	231	34	142	60	61	293	69	0.399	1.6	20.033	0.4	1.1
11/19/2011	6:15:04 PM :	294	231	34	170	60	61	293	69	0.397	5.3	20.378	0.4	1.2
11/19/2011	6:16:04 PM :	294	230	34	190	60	61	293	69	0.397	10	20.682	0.399	1.2

Configuration File: Aurora Energy run 3.pro
File Exported: 11/19/2011 6:35:47 PM (PC Time).
Company Name: Aurora Energy
11/19/11 03:48:5[illegible] with Flow Rate 0 ccm (Max. allowed 16 ccm)
11/19/11 03:48:5[illegible] with Flow Rate 0 ccm (Max. allowed 16 ccm).
Trap ID-A: FGS13939
Trap ID-B: FGS13942

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 9m
Averaging Period : 1 min.

		Stack F	Probe F	Chiller F	HSRL F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg
AVERAGES AND TEST SUMMARIES		294.3	230.6	34.4	159.8	61	62.5	285.1	68	0.4	1.8	21.546	0.401	1.1
11/19/2011	6:17:04 PM :	294	230	34	203	60	61	293	69	0.384	14.5	21.037	0.4	1.2
11/19/2011	6:18:04 PM :	294	229	34	212	60	61	293	69	0.35	18.4	21.331	0.399	1.2
11/19/2011	6:19:01 PM :	294	229	34	212	60	61	293	69	0.35	18.4	21.546	0.399	1.2

'

'---------- LOGGED EVENTS ----------
11/19/11 5:10:05 PM: Test START
11/19/11 5:24:39 PM: Test Paused by External Source
11/19/11 5:24:39 PM: PAUSE_EVENT [External Pause]
11/19/11 5:27:39 PM: Test Resumed
11/19/11 5:43:08 PM: Test Paused by External Source
11/19/11 5:45:49 PM: Test Resumed
11/19/11 6:00:50 PM: Test Paused by External Source
11/19/11 6:04:05 PM: Test Resumed
11/19/11 6:19:01 PM: Actual Sampling Time: 0d 1h 0m 0s
11/19/11 6:19:01 PM: Test END
11/19/11 06:23:16 PM: Sample A: POST-Leak Test PASSED at maximum observed vacuum at 22.3 inHg with Flow Rate of 0 ccm (Max. allowed 16 ccm)
11/19/11 06:23:16 PM: Maximum Observed Vacuum for A was 22.3 inHg
11/19/11 06:23:16 PM: Sample B: POST-Leak Test PASSED with minimal vacuum of 5 inHg with Flow Rate of 0 ccm (Max. allowed 16 ccm)
11/19/11 06:23:16 PM: Maximum Observed Vacuum for B was 1.5 inHg
' *ALARMS LEGEND
'A - Not Used
'B - Not Used
'C - Not Used
'D - Current Loop failure for External FLOW Input
'E - Current Loop failure for External MOISTURE Input
'F - Modbus inactivity timeout
'G - Unable to maintain proportional flow for A
'H - Unable to maintain proportional flow for B
'I - High Vac-A
'J - High Vac-B
'K - Not Used

Configuration File: Aurora Energy run 3.pro
File Exported: 11/19/2011 6:35:47 PM (PC Time).
Company Name: Aurora Energy
11/19/11 03:48:5[illegible] with Flow Rate 0 ccm (Max. allowed 16 ccm)
11/19/11 03:48:5[illegible] with Flow Rate 0 ccm (Max. allowed 16 ccm)
Trap ID-A: FGS13939
Trap ID-B: FGS13942

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 9m
Averaging Period : 1 min.

	Stack F	Probe F	Chiller F	HSRL F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg
AVERAGES AND TEST SUMMARIES	294.3	230.6	34.4	159.8	61	62.5	285.1	68	0.4	1.8	21.546	0.401	1.1

'L - Trap Temperature Out of Range
'M - Probe Temperature Out of Range
'N - Chiller Temperature Out of Range
'O - Sample Line Temperature Out of Range
'P - Console Returned from power failure
'---------- END OF ALARM LEDGENDS ----------

'---------- CONSOLE INFO ----------
' Console Name: TRC - 3221
' Console ID: XC30B-3221
' DAC Board ID: 5452-4320-2D20-3332
'Dry Gas Meter-A ID/Gamma: 1902132 / 0.9989
'Dry Gas Meter-B ID/Gamma: 1902142 / 1.0101
' DGM cm3/Pulse: 1.93

' RTC ROM ID: 73E5-014B-0000-00EF
'------ SOFTWARE AND FIRMWARE VERSIONS USED FOR THIS DATA EXPORT ----------
' Software-Firmware Ver: 0320L-116
'

'---------- PROFILE INFORMATION ----------
'Profile used
' 01. System Use Only — OK
' 02. System Use Only - Date/Time — 11/18/2011 10:49:22 AM
' 03. System Use Only - Software Version — 0320L
' 04. System Use Only - Profile Version — 110
' 05. System Use Only
' 06. System Use Only
' 07. System Use Only
' 08. System Use Only
' 09. System Use Only — Aurora Energy run 2.pro
' 10. System Use Only

Configuration File: Aurora Energy run 3.pro
File Exported: 11/19/2011 6:35:47 PM (PC Time).
Company Name: Aurora Energy
11/19/11 03:48:5i with Flow Rate 0 ccm (Max. allowed 16 ccm)
11/19/11 03:48:5i with Flow Rate 0 ccm (Max. allowed 16 ccm)
Trap ID-A: FGS13939
Trap ID-B: FGS13942

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 9m
Averaging Period : 1 min.

		Stack F	Probe F	Chiller F	HSRL F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg
AVERAGES AND TEST SUMMARIES		294.3	230.6	34.4	159.8	61	62.5	285.1	68	0.4	1.8	21.546	0.401	1.1
' 11. Client Information Name										Aurora Energy				
' 12. Client Information Address 1														
' 13. Client Information Address 2														
' 14. Client Information City	Zip									State				
' 15. Testing Company Name										TRC Woodinville				
' 16. Testing Company Address 1														
' 17. Testing Company Address 2														
' 18. Testing Company City	Zip									State				
' 19. Testing Personnel Manger										Ken Allmendinger				
' 20. Testing Personnel Operator										JimMcSweeney				
' 21. Testing Personnel Assistant 1														
' 22. Testing Personnel Assistant 2														
' 23. Stack Location										Stack				
' 24. Stack Geometry										Circular				
' 25. Stack Fuel Source/Type										Coal				
' 26. Stack F-Factor														
' 27. Stack Port Available										4				
' 28. Stack Port Used										4				
' 29. Stack Velocity Far Wall Distance										94.25				
' 30. Stack Velocity near Wall Distance										4.25				
' 31. Stack Distance Upstream (B)										75				
' 32. Stack Distance downstream (A)										31				
' 33. Stack Particulate or Velocity Traverse										Velocity				
' 34. Test Equipment Console ID														
' 35. Test Equipment Console Model										XC30B				
' 36. Test Equipment Console Calibration Factor														
' 37. Test Equipment Pitot ID														
' 38. Test Equipment Pitot Coefficient										0.84				
' 39. Test Equipment Probe ID														
' 40. Test Equipment Cartridge A ID										FGS13939				
' 41. Test Equipment Cartridge B ID										FGS13942				

Configuration File: Aurora Energy run 3.pro
File Exported: 11/19/2011 6:35:47 PM (PC Time).
Company Name: Aurora Energy
11/19/11 03:48:5i with Flow Rate 0 ccm (Max. allowed 16 ccm)
11/19/11 03:48:5i with Flow Rate 0 ccm (Max. allowed 16 ccm)
Trap ID-A: FGS13939
Trap ID-B: FGS13942

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 9m
Averaging Period : 1 min.

		Stack	Probe	Chiller	HSRL	DGM-A	DGM-B	Trap	Console	MAS-A	VAC-A	DGM-A (L)	MAS-B	VAC-B
		F	F	F	F	F	F	F	F	LPM	in-Hg	Corr-Vol	LPM	in-Hg
AVERAGES AND TEST SUMMARIES		294.3	230.6	34.4	159.8	61	62.5	285.1	68	0.4	1.8	21.546	0.401	1.1
' 42. Alarm Proportional/Constant Flow Toler	20	10	D							15				
' 43. Alarm High Vacumm	20	10	D							14				
' 44. Alarm Modbus Timeout	10	D								60				
' 45. Alarm FLOW/MOISTURE Current Loop:	10	D								20				
' 46. Alarm TRAP and PROBE TC (F)	20	10	A							50				
' 47. Alarm CHILLER TC (F)	20	10	A							4				
' 48. Alarm SAMPLE/AUX TC (F)	335	20	10	D						285				
' 49. Alarm Delay During Startup/Resume										60				
' 50. Alarm Return From Power Failure D										1				
' 51. STACK_TEMP_LOW														
' 52. STACK_TEMP_LOW_ENABLED														
' 53. STACK_TEMP_HI														
' 54. STACK_TEMP_HI_ENABLED														
' 55. STACK_TEMP_ACTION														
' 56. CHILLER_TEMP_LO														
' 57. CHILLER_TEMP_LO_ENABLED														
' 58. CHILLER_TEMP_HI														
' 59. CHILLER_TEMP_HI_ENABLED														
' 60. CHILLER_TEMP_ACTION														
' 61. PROBE_TEMP_LO														
' 62. PROBE_TEMP_LO_ENABLED														
' 63. PROBE_TEMP_HI														
' 64. PROBE_TEMP_HI_ENABLED														
' 65. Alarm Probe Action														
' 66. Test Duration Days										0				
' 67. Test Duration Hours										1				
' 68. Test Duration Minutes										0				
' 69. Test Average Period										1				
' 70. Test Zero Internal Pitot Transducer										0				
' 71. Test Flow Control Select										Constant				
' 72. Test External Input Type										SquareRoot				

Configuration File: Aurora Energy run 3.pro
File Exported: 11/19/2011 6:35:47 PM (PC Time).
Company Name: Aurora Energy
11/19/11 03:48:5i with Flow Rate 0 ccm (Max. allowed 16 ccm)
11/19/11 03:48:5i with Flow Rate 0 ccm (Max. allowed 16 ccm)
Trap ID-A: FGS13939
Trap ID-B: FGS13942

Test Duration (Planned): 0d 1h 0m
Test Duration (Actual) : 0d 1h 9m
Averaging Period : 1 min.

	Stack F	Probe F	Chiller F	HSRL F	DGM-A F	DGM-B F	Trap F	Console F	MAS-A LPM	VAC-A in-Hg	DGM-A (L) Corr-Vol	MAS-B LPM	VAC-B in-Hg
AVERAGES AND TEST SUMMARIES	294.3	230.6	34.4	159.8	61	62.5	285.1	68	0.4	1.8	21.546	0.401	1.1
' 73. Test External Signal Type									Current (4-20mA)				
' 74. Test External Input Lo Value									4				
' 75. Test External Input Lo Value Translated									0				
' 76. Test External Input Hi Value									20				
' 77. Test External Input Hi Value Translated									1000				
' 78. Test External Input Translated Value Unit													
' 79. Target Flow Rate									400				
' 80. Probe Heater Set Temperature (F)									250				
' 81. Chiller Set Temperature (F)									34				
' 82. MAC Flow Control Select									Constant				
' 83. MAC Constant Value (if selected)									9.3				
' 84. MAC External Input Type									Current (4-20mA)				
' 85. MAC External Input LO Value									4				
' 86. MAC External Input LO Translated									0				
' 87. MAC External Input HI Value									20				
' 88. MAC External Input HI Translated									100				
' 89. Pitot tube coefficient									0.85				
' 90. MAC Enabled									0				
' 91. DGM_Backup									0				
' 92. Baseline Time									60				
' 93. External Pause									2				
' 94. Modbus_ASCII_Mode									0				
' 95. AUTO_PAUSE_CONTROL									0				
' 96. AUTO_PAUSE_PORT_POINT									102				
' 97. AUTO_PAUSE_COUNTDOWN_MIN									0				
' 98. PRO_AUTO_PAUSE_RESTART_MIN									0				
' 99. <Future use>													
'File Validation String:'									'2548196111404417722976871152l1'				

DGM-B (L) Corr-Vol	DEL_P in	Baro in-Hg	STD Vol_A	STD Vol_B	*Extern Flow_In	Const. Moist.	Target Flow	% Valve_A	% Valve_B	%Proportional Flow_A	%Proportional Flow_B	*Alarm_Bits
20.893	-	29.43	21.498	20.788	0	9.3						
0	-	29.45	0	0	-	-	400	63.5	63.5	-	4.2	
0.453	-	29.45	0.491	0.45	-	-	400	47.5	48.6	-	-	
0.795	-	29.45	0.824	0.791	-	-	400	45.9	47.8	101	100.2	
1.086	-	29.44	1.141	1.081	-	-	400	45.1	47.1	100.2	100.2	
1.413	-	29.44	1.494	1.406	-	-	400	44.7	46.3	100.2	100.2	
1.719	-	29.44	1.851	1.711	-	-	400	43.9	45.9	100.2	100	
2.094	-	29.44	2.272	2.083	-	-	400	43.5	45.5	100.2	100	
2.453	-	29.44	2.637	2.44	-	-	400	43.5	45.1	100.2	100.2	
2.862	-	29.44	3.028	2.846	-	-	400	43.1	44.7	100.2	100	
3.191	-	29.44	3.342	3.174	-	-	400	43.1	44.7	100	100	
3.552	-	29.44	3.696	3.532	-	-	400	42.7	44.7	100.2	100	
3.84	-	29.44	4.006	3.819	-	-	400	42.7	44.3	100	100	
4.184	-	29.44	4.388	4.161	-	-	400	42.4	44.3	100	100	
4.484	-	29.44	4.746	4.459	-	-	400	42.4	44.3	100	100	
4.87	-	29.44	5.192	4.842	-	-	400	42.4	44.3	100.2	100	
5.102	-	29.44	5.39	5.073	-	-	400	42.4	43.9	100.2	100	
5.244	-	29.44	5.549	5.215	-	-	400	42.4	43.9	-	-	
5.66	-	29.44	5.946	5.627	-	-	400	42.4	43.9	100.2	100	
5.975	-	29.44	6.236	5.941	-	-	400	42.4	43.9	100.2	100	
6.308	-	29.44	6.608	6.273	-	-	400	42.4	43.5	99.7	100	
6.591	-	29.44	6.906	6.554	-	-	400	42.4	44.3	100	100.2	
6.913	-	29.44	7.315	6.874	-	-	400	42.4	44.3	100	100	
7.232	-	29.43	7.686	7.192	-	-	400	42.4	44.3	100	99.7	
7.589	-	29.43	8.106	7.547	-	-	400	42.4	44.3	100	100	
7.966	-	29.43	8.471	7.921	-	-	400	42.4	44.3	99.7	100	
8.371	-	29.44	8.805	8.324	-	-	400	42.4	44.3	99.7	100	
8.735	-	29.44	9.14	8.687	-	-	400	42.4	44.3	100	99.7	
9.075	-	29.44	9.458	9.025	-	-	400	42.4	44.3	100.2	100	
9.391	-	29.44	9.82	9.339	-	-	400	42.4	43.9	100.2	100.2	
9.701	-	29.44	10.172	9.648	-	-	400	42.4	43.9	100.2	100	

DGM-B (L) Corr-Vol	DEL_P in	Baro in-Hg	STD Vol_A	STD Vol_B	*Extern Flow_In	Const. Moist.	Target Flow	% Valve_A	% Valve_B	%Proportional Flow_A	%Proportional Flow_B	*Alarm_Bits
20.893	-	29.43	21.498	20.788	0	9.3						
10.026	-	29.44	10.611	9.971	-	-	400	42.4	44.3	100	100	
10.366	-	29.43	10.976	10.309	-	-	400	42.4	44.3	100	100.2	
10.397	-	29.43	11.003	10.341	-	-	400	42.4	44.3	100	100.2	
10.525	-	29.43	11.095	10.468	-	-	400	42	43.5	-	-	
10.894	-	29.43	11.488	10.835	-	-	400	42.4	43.9	99	100	
11.305	-	29.43	11.771	11.244	-	-	400	42.4	43.9	99.7	100	
11.642	-	29.43	12.143	11.579	-	-	400	42.4	43.9	99.7	100	
11.991	-	29.43	12.435	11.926	-	-	400	42.4	43.5	99.7	100	
12.28	-	29.43	12.842	12.213	-	-	400	42.4	43.9	100	99.7	
12.615	-	29.43	13.194	12.547	-	-	400	42.4	43.9	100	100	
12.915	-	29.43	13.63	12.846	-	-	400	42.4	43.9	100	100	
13.298	-	29.43	13.992	13.227	-	-	400	42.4	43.9	100	100	
13.65	-	29.43	14.33	13.578	-	-	400	42.4	43.9	99.7	99.7	
14.074	-	29.43	14.659	14	-	-	400	42.4	43.5	100	100	
14.403	-	29.43	14.983	14.327	-	-	400	42.4	43.5	99.7	99.7	
14.764	-	29.42	15.337	14.686	-	-	400	42.4	43.5	100	99.7	
15.05	-	29.42	15.699	14.972	-	-	400	42.4	43.9	100.2	99.7	
15.387	-	29.42	16.126	15.307	-	-	400	42.4	43.9	100.2	100	
15.633	-	29.42	16.426	15.552	-	-	400	42.4	43.9	100.2	100	
15.971	-	29.42	16.8	15.888	-	-	400	42.4	43.5	-	-	
16.362	-	29.42	17.127	16.277	-	-	400	42	43.9	100	99.7	
16.746	-	29.42	17.462	16.66	-	-	400	42.4	43.9	99.7	100	
17.138	-	29.42	17.774	17.05	-	-	400	42	43.9	99.5	99.7	
17.47	-	29.42	18.142	17.38	-	-	400	42.4	43.9	99.5	100	
17.801	-	29.42	18.49	17.709	-	-	400	42.4	43.9	100.2	99.7	
18.105	-	29.41	18.927	18.012	-	-	400	42.4	43.9	100	99.7	
18.442	-	29.41	19.291	18.348	-	-	400	42.4	43.9	100.2	99.7	
18.782	-	29.41	19.678	18.686	-	-	400	42.4	43.9	100.2	100	
19.174	-	29.41	19.988	19.076	-	-	400	42.7	43.9	99.7	100	
19.564	-	29.41	20.332	19.465	-	-	400	43.9	43.9	99.2	100	
19.949	-	29.41	20.636	19.849	-	-	400	45.5	43.9	99.2	99.7	

DGM-B (L) Corr-Vol	DEL_P in	Baro in-Hg	STD Vol_A	STD Vol_B	*Extern Flow_In	Const. Moist.	Target Flow	% Valve_A	% Valve_B	%Proportional Flow_A	%Proportional Flow_B	*Alarm_Bits
20.893	-	29.43	21.498	20.788	0	9.3						
20.277	-	29.41	20.99	20.175	-	-	400	47.5	43.9	96	100	
20.61	-	29.41	21.283	20.507	-	-	400	51.4	43.9	87.5	99.7	
20.893	-	29.41	21.498	20.788	-	-	400	91	43.9	87.5	99.7	

APPENDIX B

LABORATORY ANALYSIS RESULTS

TRC ENVIRONMENTAL
WOODINVILLE, WA

AURORA ENERGY

CLIENT # T026
REPORT # 11-528

SUBMITTED BY:
CHESTER LabNet
12242 S.W. GARDEN PLACE
TIGARD, OR 97223
(503)624-2183/FAX (503)624-2653
www.ChesterLab.Net

Client: T026 - TRC-Woodinville
Report Number: 11-528

Lab ID: 11-M1492
Client ID: AE-M26A-R2-H2SO4
Site: Aurora Energy
Sample Date: 11/19/11
Sample Volume: 505. mL

Analyte	µg/mL Conc.	µg/mL MDL	µg/sample Conc.	µg/sample MDL
HF	2.03	0.053	1,020	26.6
HCl	3.28	0.051	1,660	26.0

Lab ID: 11-M1493
Client ID: AE-M26A-R3-H2SO4
Site: Aurora Energy
Sample Date: 11/19/11
Sample Volume: 490. mL

Analyte	µg/mL Conc.	µg/mL MDL	µg/sample Conc.	µg/sample MDL
HF	3.31	0.053	1,620	25.8
HCl	3.65	0.051	1,790	25.2

Lab ID: 11-M1494
Client ID: AE-M26A-R4-H2SO4
Site: Aurora Energy
Sample Date: 11/19/11
Sample Volume: 507. mL

Analyte	µg/mL Conc.	µg/mL MDL	µg/sample Conc.	µg/sample MDL
HF	3.11	0.053	1,580	26.7
HCl	3.42	0.051	1,730	26.1

Lab ID: 11-M1495
Client ID: AE-M26A-RB-H2SO4
Site: Aurora Energy
Sample Date: 11/19/11
Sample Volume: 209. mL

Analyte	µg/mL Conc.	µg/mL MDL	µg/sample Conc.	µg/sample MDL
HF	< MDL	0.053	< MDL	11.0
HCl	0.813	0.051	170.	10.7

QA/QC Report

Client Name: TRC-Woodinville
Project Number: T026
Analytical Technique: Ion Chromatography
Sample Description: Impinger solution
Report Number: 11-528

Blank Data

Analyte	Sample ID	Measured Conc. mg/L	MDL Conc. mg/L
F	ICB	< MDL	0.050
F	CCB	< MDL	0.050
Cl	ICB	< MDL	0.050
Cl	CCB	< MDL	0.050

Calibration QC

Analyte	Sample ID	Standard Conc. mg/L	Measured Conc. mg/L	Percent Recovery
F	ICV_LO	1.00	0.96	96.5
F	ICV_MID	10.0	10.1	101.3
F	CCV_LO	1.00	0.96	95.8
F	CCV_MID	10.0	10.1	101.0
Cl	ICV_LO	1.00	0.95	95.0
Cl	ICV_MID	10.0	9.32	93.2
Cl	CCV_LO	1.00	0.94	94.4
Cl	CCV_MID	10.0	9.28	92.8

Duplicate Data

All samples analyzed in duplicate. The reported concentrations are the average of the two measurements.

Laboratory Control Sample/Matrix Spike Analysis

Analyte	Sample ID	Sample Conc. mg/L	Spike Conc. mg/L	Spike Amount mg/L	Percent Recovery
F	11-M1492	1.92	5.63	10.0	37.0
Cl	11-M1492	3.20	11.9	10.0	87.2

*: per EPA CLP protocol, control limits do not apply if spike concentration is less than 25% of the sample concentration

QA/QC Limits
Continuing Calibration: ± 10% *LCS: ± 20%*
Duplicates: ± 20% RPD *Spikes: ± 25%*

Ion Chromatography Raw Data

Available upon request

TRC Woodinville
Aurora Energy Method 202 Data

Sample ID	Client ID	Sample Date	Net Weight (mg) Aqueous Phase	Net Weight (mg) Organic Phase	Comments
Lab_Blk			0.5	0.2	
Prep_Blk			0.5	0.8	
11-M1496	AE-M202-R2	11/19/11	10.9	2.7	
11-M1497	AE-M202-R3	11/19/11	8.9	2.8	
11-M1498	AE-M202-R4	11/19/11	20.0	2.1	
11-M1499	AE-M202-Field Train Recovery Blank	11/19/11	7.5	1.5	
11-M1500	AE-M202-Acetone Reagent Blank	11/19/11		0.3	
11-M1501	AE-M202-Hexane Reagent Blank	11/19/11		0.2	
11-M1502	AE-M202-Water Reagent Blank	11/19/11	0.8		

Analysis performed by: ***CHESTER LabNet***
12242 SW Garden Place ♦ Tigard, OR 97223
(503) 624-2183 ♦ www.chesterlab.net

54 DATE SUBJECT ~~Rhodes II 488 titrations~~ Woodinville II-528 New 20Zs PROJECT NO.

Tare In: 12-6-11 RS 1434 2.5% 21.3 AQ Gross In: 12-13-11 SH @ 0656 4.0% 20.3C Org. Gross In: 12-20-11 SH @ 0944 5.2% 19.3C

Tare 1: 12-8-11 RS 0739 1.8% 21.4 AQ Gross 1: 12-14-11 RS @ 0724 1.7% 20.2C Org Gross 1: 12-12-11 RS @ 0954 1.7% 20.3C

Tare 2: 12-9-11 RS 1403 5.1% 21.5 AQ Gross 2: 12-14-11 RS @ 1554 4.0% 21.2C Org. Gross 2: 12-13-11 RS @ 1127 2.8% 21.2C

AQ

Sx	Tare 1	Tare 2	Gross 1	Gross 2
QC 200mg	0.2000g	0.2000	0.2000	0.2000
3g	3.0000	3.0000	3.0000	3.0000
5g	5.0000	5.0000	5.0000	5.0000
Lab blk	1.8913	1.8915	1.8916	1.8916
Prep. blk	1.8925	1.8924	1.8931	1.8932
IIM-1496	1.8970	1.8972	1.9103	1.9104
1497	1.8960	1.8961	1.9064	1.9070
1498	1.8960	1.8962	1.9144	1.9145
1499	1.9070	1.9070	1.9145	1.9146
1502	1.9035	1.9037	1.9043	1.9045

ORG

Sx	Tare 1	Tare 2	Gross 1	Gross 2
QC 200mg	See AQ	above 12-8-11 RS	0.2000g	0.2000
3g			3.0000g	3.0000
5g			5.0000g	5.0000
Lab blk	1.9056	1.9057	1.9058	1.9060
Prep blk	1.9017	1.9019	1.9025	1.9025
IIM-1496	1.8994	1.8994	1.9021	1.9022
1497	1.9077	1.9076	1.9105	1.9105
1498	1.9108	1.9108	1.9129	1.9131
1499	1.8937	1.8935	1.8952	1.8952
1500	1.9057	1.9057	1.9060	1.9061
1501	1.8901	1.8901	1.8903	1.8903

WITNESSED AND UNDERSTOOD

All masses in grams (g)			"New" M202: Woodinville 11-528					
		Aqueous Phase						
Sx ID	Tare	Tare QC	Tare - QC	Gross	Gross QC	Gross - QC	*net (g)	net (mg)**
date/init:	12/8/2011 RJ	12/8/2011 RJ		12/14/2011 RJ	12/14/2011 RJ		(total mass liq)	less NH3
time:	0739	1403		0724	1355			
Rel. Humidity	1.70%	5.10%		1.70%	4.00%			
Temp (C/F)	21.4 C/70.5 F	21.5 C/70.7 F		20.2 C/68.4 F	21.2 C/70.2 F			
0.2000g QC	0.2000	0.2000		0.2000	0.2000			
3.0000g QC	3.0000	3.0000		3.0000	3.0000			
5.0000g QC	5.0000	5.0000		5.0000	5.0000			
Lab Blank	1.8913	1.8915	-0.0002	1.8918	1.8918	0.0000	0.0005	0.5
Prep Blank	1.8925	1.8924	0.0001	1.8931	1.8932	-0.0001	0.0006	0.5
11M 1496	1.8970	7.0060	-5.1090	1.9103	1.9104	-0.0001	0.0133	10.9
11M 1497	1.8960	1.8961	-0.0001	1.9068	1.9070	-0.0002	0.0108	8.9
11M 1498	1.8960	1.8962	-0.0002	1.9184	1.9185	-0.0001	0.0224	20.0
11M 1499	1.9070	1.9070	0.0000	1.9145	1.9146	-0.0001	0.0075	7.5
11M 1502	1.9035	1.9037	-0.0002	1.9043	1.9045	-0.0002	0.0008	0.8
*net mass = tare - gross								
**corrected net mass = net mass - (Normality NH4OH x mL NH4OH x 17.03 mg NH3/mmol)								
		Organic Phase						
Sx ID	Tare	Tare QC	Tare - QC	Gross	Gross QC	Gross - QC	*net (g)	net (mg)
date/init	12/8/2011 RJ	12/8/2011 RJ		12/12/2011 RJ	12/13/2011 RJ			
time:	0739	1403		0954	1127		(total mass liq)	
Rel. Humidity	1.70%	5.10%		1.70%	2.80%			
Temp (C/F)	21.4 C/70.5 F	21.5 C/70.7 F		20.3 C/68.5 F	21.2 C/70.2 F			
0.2000g QC	0.2000	0.2000		0.2000	0.2000			
3.0000g QC	3.0000	3.0000		3.0000	3.0000			
5.0000g QC	5.0000	5.0000		5.0000	5.0000			
Lab Blank	1.9056	1.9057	-0.0001	1.9058	1.9060	-0.0002	0.0002	0.2
Prep Blank	1.9017	1.9019	-0.0002	1.9025	1.9025	0.0000	0.0008	0.8
11M 1496	1.8994	1.8994	0.0000	1.9021	1.9022	-0.0001	0.0027	2.7
11M 1497	1.9077	1.9076	0.0001	1.9105	1.9105	0.0000	0.0028	2.8
11M 1498	1.9108	1.9108	0.0000	1.9129	1.9131	-0.0002	0.0021	2.1
11M 1499	1.8937	1.8935	0.0002	1.8952	1.8952	0.0000	0.0015	1.5
11M 1500	1.9057	1.9057	0.0000	1.9060	1.9061	-0.0001	0.0003	0.3
11M 1501	1.8901	1.8901	0.0000	1.8903	1.8903	0.0000	0.0002	0.2
*net mass = tare - gross								

DATE SUBJECT Woodinville 11-524 Titrations PROJECT NO. 55

12.9.11 RS

0.1 NH4OH: Rocky Mountain Reagents 11-0077 x 6.24.13
pH 4 buffer: CP A054-09 x 2.24.13
pH 7 buffer: CP A173-15 x 6.23.13

% Nernst: 98.3%
pH 4: 4.010
pH 7: 7.006

Sx	Start pH	End pH	ml NH4OH added
PB	5.713	7.067	0.05
1496	2.940	7.033	1.4375
QC pH 7	6.972	—	—
1497	3.038	7.045	1.125
1498	3.069	7.071	1.425
QC pH 7	7.010	—	—

12.12.11 RS

Same reagents used as above.

% Nernst: 97.6
pH 4: 4.014
pH 7: 7.009

Sx	pH start	pH end	ml NH4OH added
1499	9.020	9.018	0
QC pH 7	7.007	—	—

WITNESSED AND UNDERSTOOD

SIGNED DATE SIGNED

SIGNED DATE DATE

				"New" M202: Woodinville 11-528		
date/init:	12/9/11 RJ					
		pH-start	pH-end	mL NH4OH	mass NH3 (mg)	
12/9/11 RJ	Prep Blank	5.713	7.062	0.0500	0.09	
12/9/11 RJ	11M 1496	2.940	7.033	1.438	2.45	
12/9/11 RJ	11M 1497	3.038	7.045	1.125	1.92	
12/9/11 RJ	11M 1498	3.069	7.071	1.425	2.43	
12/12/11 RJ	11M 1499	9.020	9.018	0.000	0.00	
	mass NH3 = 0.1N NH4OH x mL NH4OH x 17.03 mg NH3/mmol					
12/9/11 RJ	QC:					
	% Nernst slope:		98.30%			
	pH 4.000		4.010			
	pH 7.000		7.006			
	pH 7.000		6.972			
	pH 7.000		7.010			
12/12/11 RJ	QC:					
	% Nernst slope:		97.60%			
	pH 4.000		4.014			
	pH 7.000		7.009			
	pH 7.000		7.007			

CHESTER LABNET
SOURCE SAMPLE RECEIPT CHECKLIST

Client TRC – Woodinville Date 12-6-24

Runs 3 +blanks Time 1040
M26 & M202

Custody Seals Inspected, If Present	—	
Chain-of-Custody Form Inspected	✓	
CoC present with samples?	✓	*
CoC indicate analytical methodology to be used? (eg M29 etc)	✓	!!
CoC indicate if compliance testing? (esp. M26)	✓	!!
M26 samples have Thiosulfate added in field?	—	!!
M29 indicate FH/BH separate or combined?	—	!!
Has Form Been Signed?	✓	
Have Date and Time Custody Released Been Noted on Form?	✓	
All Sample Containers Inspected	✓	
Does Number of Samples Match Number on CoC Form?	✓	!!
Do All Sample ID Numbers Match Those on the CoC Form?	✓	!!
Did client mark sample volumes prior to shipment?	NO	*
If required by method, did client vent samples prior to shipment?	—	
Are the Sample Containers Intact?	✓	!!
Are signs of leakage present?	NO	*
Chain-of-Custody Form Signed and Dated by CLN	✓	
Corrective Actions		
Client Contacted Due to Mismatching Sample ID Numbers		
Client Contacted Due to Broken Sample Container(s)		
Client Contacted Due to Leaking Sample Container(s)		
Client contacted for verification of methodology?		
Corrective Actions Documented?		
Corrective Actions Accomplished?		

*Items marked !! shall be addressed **prior to any analytical work being started**.*
*Items marked * shall be **noted in case narrative** upon reporting of results to client.*

Signed [signature]

Notes _____

CHAIN OF CUSTODY RECORD

11-528
T026

Project Name: Aurora Energy
Project No.: 187446
Sampling Date(s): 11/19/2011
Laboratory: Chester LabNet
Laboratory P.O.:
Shipping Date(s): 12/5/2011
Shipper's Name: Judith Aasland

Sample Code	ILM	Sampled Date	Container Size	Container G/P	MATRIX: Aqueous	Organic Solvent	Ash/Soil/Sediment (Solid)	Acidic	Basic	Filter	Description	ANALYSIS: HCl	HF	Particulate Matter	Comments
AE-M26A-R2-H2SO4	1492	11/19/2011	500 mL	P				X			H2SO4	X	X		Compliance
AE-M26A-R3-H2SO4	1493	11/19/2011	500 mL	P				X			H2SO4	X	X		per guck
AE-M26A-R4-H2SO4	1494	11/19/2011	500 mL	P				X			H2SO4	X	X		
AE-M26A-RB-H2SO4	1495	11/19/2011	500 mL	P				X			H2SO4	X	X		
AE-M202-R2-CPMFILT	1496	11/19/2011	petri	P						X	Filter			X	
AE-M202-R3-CPMFILT	1497	11/19/2011	petri	P						X	Filter			X	
AE-M202-R4-CPMFILT	1498	11/19/2011	petri	P						X	Filter			X	
AE-M202-BT-CPMFILT	1499	11/19/2011	petri	P						X	Filter			X	
AE-M202-R2-H2O	1496	11/19/2011	500 mL	G	X						H2O			X	
AE-M202-R2-ACE/HEX	1496	11/19/2011	500 mL	G		X					Acetone/Hexanes			X	
AE-M202-R3-H2O	1497	11/19/2011	500 mL	G	X						H2O			X	
AE-M202-R3-ACE/HEX	1497	11/19/2011	500 mL	G		X					Acetone/Hexanes			X	
AE-M202-R4-H2O	1498	11/19/2011	500 mL	G	X						H2O			X	
AE-M202-R4-ACE/HEX	1498	11/19/2011	500 mL	G		X					Acetone/Hexanes			X	
AE-M202-BT-H2O	1499	11/19/2011	500 mL	G	X						H2O			X	
AE-M202-BT-ACE/HEX	1499	11/19/2011	500 mL	G		X					Acetone/Hexanes			X	
AE-M202-Acetone	1500	11/19/2011	500 mL	G		X					Acetone Reagent Blank			X	200 mL
AE-M202- Hexanes	1501	11/19/2011	500 mL	G		X					Hexanes Reagent Blank			X	200 mL

Relinquished by:	**Date/Time:** 12-6-11 / 1040	**Relinquished by:**	**Date/Time:**
Received by: Erin Hollobaugh	**Date/Time:** 12-6-11 1040	**Received by:**	**Date/Time:**

Remarks (*):
Please record all sample volumes.

TRC

CHAIN OF CUSTODY RECORD

Project Name: Aurora Energy
Project No.: 187446
Sampling Date(s): 11/19/2011
Laboratory: Chester LabNet
Laboratory P.O.:
Shipping Date(s): 12/5/2011
Shipper's Name: Judith Aasland

Sample Code	Sampled Date	Container Size	Container G/P	MATRIX: Aqueous	Organic Solvent	Ash/Soil/Sediment (Solid)	Acidic	Basic	Other	Source Description	ANALYSIS: HCl	HF	Particulate Matter	Comments
AE-M202- H2O 1502	11/19/2011	500 mL	G	X						H2O Reagent Blank			X	200 mL

Relinquished by: [signature] **Date/Time:** 12/6/2011 1040
Received by: [signature] **Date/Time:** 12-6-11 1040
Relinquished by: **Date/Time:**
Received by: **Date/Time:**
Remarks (*):

TRC

Ken Allmendinger | Project: Aurora Energy | 11047.5
TRC
Results: Method 30B RATA
Ryan Nelson - Frontier Global Sciences Inc. 12/8/2011

TABLE 1: A Trap Hg Results - Method 30B

Lab Sample ID	Client Sample ID	Hg-A (ng/trap)	Hg-A+ spike	Hg-B (ng /trap)	Total (A + B Trap) (ng /trap)	Sample Volume (Liters)	Total Hg (ng/m3)	RD
1111244-01	AE-M30B-R1-13947-A	52.2 ng		0.6 ng	52.8 ng		#DIV/0!	
1111244-02	AE-M30B-R1-12654-B	148.0 ng	100.0 ng	1.3 ng	49.3 ng		#DIV/0!	#DIV/0!
1111244-03	AE-M30B-R2-13822-A	60.4 ng		0.4 ng	60.8 ng		#DIV/0!	
1111244-04	AE-M30B-R2-13974-B	44.2 ng		0.4 ng	44.6 ng		#DIV/0!	#DIV/0!
1111244-05	AE-M30B-R3-13939-A	45.1 ng		0.4 ng	45.5 ng		#DIV/0!	
1111244-06	AE-M30B-R3-13942-A	51.9 ng		1.1 ng	53.0 ng		#DIV/0!	#DIV/0!
1111244-07	AE-M30B-BL-12981	104.0 ng	100.0 ng	ND	4.0 ng		NA	
111124(-08	AE-M30B-BL-14089	ND		ND	ND		NA	NA
		ND < 0.34ng/trap					Average >	#DIV/0!

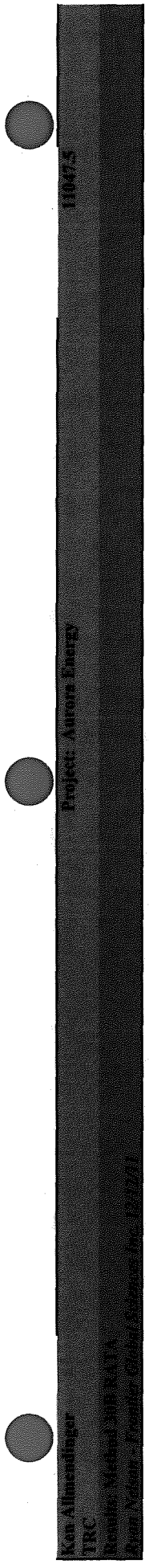
Ken Allmendinger
TRC
Results: Method 30B RATA
Ryan Nelson - Praxair Global Reference Svc, (937)237

Project: Aurora Energy

11047.5

TABLE 2 - 8 Test Hg Results Spiked and Recoveries (40CFR, Section 3.)

Lab Sample ID	Client Sample ID	Hg-B (ug/trap)	Breakthrough %	QA Criteria <10% if Section A >1 ug/m3, <20% if Section A <=1 ug/m3
1111244-01	AE-M30B-R1-13947-A	0.61 ng	1.17%	Pass
1111244-02	AE-M30B-R1-12654-B	1.32 ng	0.89%	Pass
1111244-03	AE-M30B-R2-13822-A	0.37 ng	0.00%	Pass
1111244-04	AE-M30B-R2-13974-B	0.35 ng	0.75%	Pass
1111244-05	AE-M30B-R3-13939-A	0.37 ng	0.00%	Pass
1111244-06	AE-M30B-R3-13942-A	1.08 ng	0.00%	Pass
1111244-07	AE-M30B-BL-12981	ND	0.00%	Pass
1111240-08	AE-M30B-BL-14089	ND	0.00%	Pass


Project: Aurora Energy
11047.5
Ken Allmendinger
TRC

Ken Allmendinger | **Project: Aurora Energy** | **11047.5**
TRC
Results: Method 30B RATA
Ryan Nelson - Frontier Global Sciences Inc. 1/9/2025

TABLE 3: Spike / Field Recovery QA

Sample ID	Hg-A (ng/trap)	Sample Volume (Liters)	C Rm	Calculated Spike Recovery	QA Criteria
AE-M30B-R1-13947-A	52.2 ng	0.00			
AE-M30B-R1-12654-B	148.0 ng	0.00	#DIV/0!	#DIV/0!	85%-115%
			Average >	#REF!	85%-115%

TABLE 4: Sample Mass QA/QC

Sample ID	8.2.3 Minimum Sample Mass (ng)	8.2.3 Low Point of Analytical Bias Test (ng)	8.2.3 High Point of Analytical Bias Test (ng)	Sample Mass (ng)
AE-M30B-R1-13947-A	5	2.2	738.8	52.2
AE-M30B-R1-12654-B	5	2.2	738.8	49.3
AE-M30B-R2-13822-A	5	2.2	738.8	60.5
AE-M30B-R2-13974-B	5	2.2	738.8	44.6
AE-M30B-R3-13939-A	5	2.2	738.8	45.5
AE-M30B-R3-13942-A	5	2.2	738.8	53.0
AE-M30B-BL-12981	5	2.2	738.8	4.0
AE-M30B-BL-14089	5	2.2	738.8	ND

TABLE 6: Target Volume Check Spike Sample (Acceptance per Appendix B.6.4.)

Sample ID	Sample Volume	Test Run (Sampled Trap) Volume / Field Recovery (Spiked Trap) Volume	80/120 QC Range
AE-M30B-R1-13947-A	0.000	#DIV/0!	80%-120%
AE-M30B-R1-12654-B	0.000		80%-120%
AE-M30B-R2-13822-A	0.000	#DIV/0!	80%-120%
AE-M30B-R2-13974-B	0.000		80%-120%
AE-M30B-R3-13939-A	0.000	#DIV/0!	80%-120%
AE-M30B-R3-13942-A	0.000		80%-120%
AE-M30B-BL-12981	0.000	#DIV/0!	80%-120%
AE-M30B-BL-14089	0.000		80%-120%

TABLE 7: Reagent Blanks - Method 30B

Client Sample ID	Hg
F111256-BLK1	ND
F111256-BLK2	ND
F111256-BLK3	ND
Average =	N/A
Standard Deviation (SD) =	#N/A
Relative Standard Deviation (RSD) =	N/A

Public Review Draft
August 19, 2024
Appendix III.D.7.7-381

Ken Allmendinger | **Project: Aurora Energy** | **11047.5**

TRC

Results: Method 30B RATA

Ryan Nelson - Frontier Global Sciences Inc. 12/12/11

TABLE 8: Analyte QA/QC Performance Summary - SRM Results

QC Parameter	Observed Value	True Value	SRM % Recovery	QA/QC Range
1K23011-ICV1	4.99 ng/L	5.00 ng/L	99.8%	90%-110%

TABLE 9: Frontier Geosciences Analytical Spike Recovery

Client Sample ID	Measured (ng/Trap)	Net Measured (ng/Trap)	Expected (ng/Trap)	% Recovery	QA/QC Range	RPD
F111256-MS1	197.10 ng	144.93	160.00	90.6%	75%-125%	
F111256-MSD1	210.00 ng	157.83	160.00	98.6%	75%-125%	6.3%

TABLE 10: Lab Replicate Results

Sample ID	Replicate#1 (ng/Trap)	Replicate#2 (ng/Trap)	RPD	QA/QC Range
F111256-DUP1	52.170 ng	51.580 ng	1.1%	0% - 25% RPD

Ken Allmendinger
TRC
Results: Method 30B RATA
Ryan Nelson - Frontier Global Sciences Inc. 12/2/24

TABLE 1: Analytical Calibration Curves (Primary Standard)

QC ID	Measured	True Value	% Rec.	QA/QC Acceptance
1K23011-CAL1	0.99 ng/L	1.00	99.0%	90%-110%
1K23011-CAL2	4.74 ng/L	5.00	94.8%	90%-110%
1K23011-CAL3	20.61 ng/L	20.00	103.1%	90%-110%
1K23011-CAL4	41.77 ng/L	40.00	104.4%	90%-110%
1K23011-CAL5	0.50 ng/L	0.50	100.8%	90%-110%
	Curve Statistics	y = 189.99x	R2 = 0.9998	R2 >= 0.99

TABLE 2: Continued Calibration Blanks (CCBs)

CCB ID	ICB/CCB (ng Hg/Sample)	QA/QC Acceptance
1K23011-IBL1	0.002 ng/L	< 0.50
1K23011-IBL2	0.010 ng/L	< 0.50
1K23011-IBL3	ND	< 0.50
1K23011-IBL4	ND	< 0.50
1K23011-CCB1	ND	< 0.50
1K23011-CCB2	ND	< 0.50
1K23011-CCB3	0.020 ng/L	< 0.50
1K23011-CCB4	0.020 ng/L	< 0.50

ND < 0.00ng/L

TABLE 3: Continued Calibration Verification (Secondary Standard)

CCV ID	Measured	True Value	% Rec.	QA/QC Acceptance
1K23011-CCV1	20.510 ng/L	20.00	102.6%	90% - 110%
1K23011-CCV2	20.530 ng/L	20.00	102.7%	90% - 110%
1K23011-CCV3	21.350 ng/L	20.00	106.8%	90% - 110%
1K23011-CCV4	5.190 ng/L	5.00	103.8%	90% - 110%

Ken Allmendinger
TRC
Results: Method 30B RATA
Ryan Nelson - Premier Global Science, Inc. 12/12/11

Analytical Matrix Interference Test Results
THg11-080319-1 | 080319_111000
Instrument sensitivity: 99.5% - 99.9% (CCV: 99.6%)

Dilution Ratio (Diluent:Diluent)	Spike Amount (ng)	Aliquot Size (mL)	Recovery
9.98:10	80	1	93.1%
1:02	80	1	94.2%
1:05	80	1	94.8%
1:10	80	1	93.8%
1:20	80	1	94.8%
1:100	80	1	94.2%
0:10	80	1	92.7%

Ken Allmendinger
TRC
Results: Method 30B RATA
Ryan Nelson – Frontier Global Sciences Inc. 12/12/11

Analytical Bias Test Results Hg^0: THg26002-080905-1, F809131, 8119003 and THg13-080910-1, F809130, 8114002 $HgCl_2$: THg17-080916-1, F809129, 8119004			
Standard	**Spiking Level (ng/trap)**	**Mean % Recovery of 3 reps**	**% Relative Std. Deviation (RSD) of 3 reps**
$HgCl_2$	2.2	97.0%	0.5
$HgCl_2$	738.8	94.5%	0.8
Hg^0	2	100.3%	4.4
Hg^0	17	96.3%	1.4
Hg^0	50	95.6%	0.7
Hg^0	145	93.1%	3.2
Hg^0	1,000	104.5%	3.9

Ken Allmendinger
TRC
Results: Method 30B RATA
Ryan Nelson - Frontier Global Sciences Inc. 12/12/11

Frontier Spiking Validation Test
Dataset: TRG12-000210-1

Spiking Level (ng/trap)	Sample ID	Result (ng/trap)	Spike Recovery	Average Recovery	QA/QC Acceptance	Pass?
2	2ng-1	1.91	95.4%	102%	80%-110%	Y
	2ng-2	2.08	104.2%		80%-110%	Y
	2ng-3	2.03	101.4%		80%-110%	Y
	2ng-4	2.18	108.9%		80%-110%	Y
	2ng-5	2.02	101.0%		80%-110%	Y
	2ng-6	2.00	100.1%		80%-110%	Y
17	17ng-1	16.58	97.5%	97%	80%-110%	Y
	17ng-2	16.15	95.0%		80%-110%	Y
	17ng-3	16.23	95.5%		80%-110%	Y
	17ng-4	16.79	98.8%		80%-110%	Y
	17ng-5	16.45	96.8%		80%-110%	Y
	17ng-6	16.36	96.3%		80%-110%	Y
50	50ng-1	47.32	94.6%	96%	80%-110%	Y
	50ng-2	47.97	95.9%		80%-110%	Y
	50ng-3	47.75	95.5%		80%-110%	Y
	50ng-4	47.97	95.9%		80%-110%	Y
	50ng-5	48.40	96.8%		80%-110%	Y
	50ng-6	48.40	96.8%		80%-110%	Y
145	145ng-1	141.74	97.8%	97%	80%-110%	Y
	145ng-2	139.15	96.0%		80%-110%	Y
	145ng-3	139.58	96.3%		80%-110%	Y
	145ng-4	145.62	100.4%		80%-110%	Y
	145ng-5	142.17	98.0%		80%-110%	Y
	145ng-6	139.15	96.0%		80%-110%	Y

These are the results of traps that were pulled at random from the spiking batch that produced the spiked traps used for this RATA. They were analyzed prior to the start of field testing.

CHAIN OF CUSTODY RECORD

Project Name: Aurora Energy
Project No.: 187446
Sampling Date(s): 11/19/11
Laboratory: FGS
Laboratory P.O.:
Shipping Date(s):
Shipper's Name:

Sample Code	Sampled Date	Container Size	Container G/P	MATRIX: Aqueous	Organic Solvent	Ash/Soil/Sediment (Solid)	Acidic	Basic	Filter	Description	ANALYSIS: Trace Metals*	Mercury	HCl/HF	Cl2	Particulate Matter	PCDD/PCDF	Semivolatile Organics	Voalitle Organics	Physical Parameters*	Ammonia				Comments
AE-M30B-R1-13947-A	11/19/11					X				EPA Method 30B Tubes		X												FGS 13947
AE-M30B-R1-12654-B	11/19/11					X				EPA Method 30B Tubes - Spiked		X												FGS 12654
AE-M30B-R2-13822-A	11/19/11					X				EPA Method 30B Tubes		X												FGS 13822
AE-M30B-R2-13974-B	11/19/11					X				EPA Method 30B Tubes		X												FGS 13974
AE-M30B-R3-13939-A	11/19/11					X				EPA Method 30B Tubes		X												FGS 13939
AE-M30B-R3-13942-B	11/19/11					X				EPA Method 30B Tubes		X												FGS 13942
AE-M30B-BL-12981	11/19/11					X				EPA Method 30B Tubes - Spiked		X												FGS 12981
AE-M30B-BL-14089	11/19/11					X				EPA Method 30B Tubes		X												FGS 14089
0	11/19/11									0														
0	11/19/11									0														↑ all FGS
0	11/19/11									0														ID's notated
0	11/19/11									0														by AMB, FGS
0	11/19/11									0														11-22-11
0	11/19/11									0														
0	11/19/11									0														
0	11/19/11									0														
0	11/19/11									0														
0	11/19/11									0														

Relinquished by:		**Relinquished by:**	**Date/Time:**
Received by: ALEX BAHM, FGS	**Date/Time:** 11-22-11	**Received by:**	**Date/Time:**

Remarks (*):
FEDEX 8704 4086 9486

TRC

APPENDIX C

FACILITY PROCESS DATA

Aurora Energy Stack Test								
Date	11/19/2011							
Test # 1	Boiler # 1	Boiler # 2	Boiler # 3	Boiler # 5		Start Time	Stop Time	Elapse time
Steam Flow Start	437,100	408100	362600	2,059,000		11:15	12:27	72 min.
Steam Flow Finish	487,100	453300	402600	2,291,000				
Total # Steam Flow	**50,000**	**45,200**	**40,000**	**232,000**				
Pounds of Coal	**11,120**	**11,820**	**9,780**	**36,966**				
						Start Time	Stop Time	Elapse time
Test # 2	Boiler # 1	Boiler # 2	Boiler # 3	Boiler # 5		14:07	15:20	73 min.
Steam Flow Start	552,200	514,000	457,000	2,599,000				
Steam Flow Finish	600,100	558,900	497,600	2,827,000				
Total # Steam Flow	**47,900**	**44,900**	**40,600**	**228,000**				
Pounds of Coal	**11,280**	**9,820**	**8,820**	**35,831**				
						Start Time	Stop Time	Elapse time
Test # 3	Boiler # 1	Boiler # 2	Boiler # 3	Boiler # 5		17:10	18:25	75 min.
Steam Flow Start	674,800	628,700	559,500	3,170,000				
Steam Flow Finish	722,100	675,300	600,300	3,398,000				
Total # Steam Flow	**47,300**	**46,600**	**40,800**	**228,000**				
Pounds of Coal	**10,020**	**8,640**	**8,660**	**34,876**				

AURORA
ENERGY, LLC
Keeping Fairbanks warm

Date: 11/29/11

To: Ken Almendinger

From: Marc Brazeau

Ken,

Enclosed are the data sheets from our source test you performed on November 19, 2011. If there is anything else we can provide or questions to answer, please contact us.

Thanks Again,

Marc Brazeau
Aurora Energy LLC
907-451-6331
907-378-8746

Aurora Energy, LLC / 100 Cushman St., Suite 210 / Fairbanks, AK 99701-4659
Telephone: (907) 452-8767 / Fax: (907) 451-6543

Steam flow TOTALS

		test #1		Source test
Start		#	#	#
C-5	2059	1 437.1	2 408.1	3 362.6
Finish	2291	487.1	453.3	402.6
	23,200#	50,000	45,200#	40,000#
		test #2		
Start C-5	2598	# 1 553.2	# 2 514.0	# 3 457.0
Finish	2827	600.1	558.9	497.6
	228,000#	47,900	44,900	40,600
		test #3		
Start C-5	3170	# 1 674.8	# 2 628.7	# 3 559.5
Finish	3398	722.1	675.3	600.3
	228,000	47,300	46,600	40,800

Coal Scale Reading Source test

test #1

Start	#1 45.80	#2 39.26	#3 38.07
finish	51.36	45.17	42.96
	5.56	5.91	5.89
	5,560#	5,910#	5,890#

test #2

Start	#1 58.41	#2 51.17	#3 48.66
finish	64.05	56.08	53.07
	5.64	4.91	4.41
	5,640#	4,910#	4,410#

test #3

Start	#1 72.03	#2 63.06	#3 59.65
finish	77.04	67.38	63.98
	5.01	4,320	4.33
	5,010	4,320#	4,330#

C-5 COAL

TOTAL STEAM FLOW ÷ TOTAL ELAPSE TIME = STEAM FLOW/MIN.

STEAM FLOW/MIN X 60 MIN = STEAM FLOW PER RUN

STEAM FLOW PER RUN ÷ 5.23 (EVAP. AVERAGE.) = #'s COAL PER RUN

216

11-19-11 Saturday

0430 called Lee Addison in Out of Coal old side

0430 Lee Addison out

0500 - Terry Addison

0600 - 1800 Baysinger, Brown, Lyons, Hocking

Online Blr #1 #2 #3 #5 / TG3 / #2 #5 / HX-1, P-4, NHX-1+2

0804 - 0833 C-5

0842 - 0847 #1

0908 - 0912 #2 Soot Blow B

0914 - 0917 #3

1115 - Started #1 Source test

1227 - Stop Source test #1

1407 - Started #2 Source test

1419 - 1448 C-5

1450 - 1455 #1

1455 - 1500 #2 Soot Blow B

1506 - 1505 #3 Blow soot for Source test #2

1520 - Stop Source Test #2

1830 - Kevin Lincoln Out

1845 - Terry Addison Out

1710 - Started #3 Source test

1825 - Stop Source test #3

01830 - 0400 Lincoln, Roberts, Pederson / Blr 1 2 3 5 / TG 1 2 5 / HX-1 P-4 NHX 1 2

0630 Murray L 4 tech B out

2129 - 2133 #1

2133 - 2139 #2 } SB KL

2139 - 2144 #3 }

Usibelli Coal Mine Customer Report

USIBELLI COAL MINE, INC.

Customer **AURORA ENERGY LLC** Report Period: 11/16/11 to 11/16/11

Train **1111160634** *Order* *Weighbill* *Ticket* *Rail Car* *Gross* *Tare* *Net*

AEL1	80848	139617	16128	249900	67600	182300
		139618	16163	247600	67200	180400
		139619	16133	242300	67500	174800
		139620	16114	243900	67500	176400
		139621	16177	245000	67500	177500
		139622	16110	242800	67500	175300
		139623	16157	242100	67300	174800
		139624	16142	238500	67200	171300
		139625	16167	239700	67500	172200
		139616	16153	246300	67500	178800
	80849	139628	16441	240500	60000	180500
		139627	16459	242500	60300	182200
		139629	16057	236000	64700	171300
		139630	16105	238400	67400	171000
		139631	20079	244800	64800	180000
		139632	20054	250000	64800	185200
		139633	16048	247200	64800	182400
		139626	61998	243100	64200	178900

A Train

These cars to be spotted source list

458-6034

Friday, November 18, 2011 *Page 1*

Aurora Energy LLC
1245 1st Ave, Fairbanks, AK 99701
Alaska Railroad Coal Car Shipping Request

1047,180

DATE: 11-29-11

Chena 5

Car #	Waybill #	Date	Ash %	LB	Start Time	Stop Time	Coal Scale	Coal Condition
5	16120	308788	11-16	9%	175300	5:30	7:20	3612897	softball 0-5%
4	16172	"	"	"	177500	7:45	8:45		
3	16114	"	"	"	88200	8:50	9:20	3613 227	
2	16173	"	"	"	180400	9:30	10:00	3613 317	
88	16128	"	"	"	45373	2:00	3:10		
9	16153	"	"	"	177300	3:15	4:15	3613 381	
								3613 474	

Chena 5 Total 401

Old Plant

1	16192	308788	11-16	9%	177300	7:30	8:25	3612716	softball 0-5%
10	16157	"	"	"	177800				
8	16114	"	"	"	88200	9:25	10:00	3613 095	
6	16133	"	"	"	177800	10:25	11:15		
64	16128	"	"	"	136725	12:45	1:35		

Old Plant Total 377

Chena 5 & Old Plant Total 778

Total 778

Fax to 907-683-2253 UCI
Fax to 451-4410 Steve
Fax to 451-6543 Buki

# of Cars to be left on siding 0

# of Cars to be spotted 9

Sent By Joe Terry

Car Mover Stowed YES NO

Shaker Up Yes

Car mover gear box checked Yes

Screen Running YES NO

Temp 88

Unload 88 Tunnel 0 Class 57 Control 88

572,000

Check Scrappers Every Day

	# 1 Belt	# 2 Belt	# 3 Belt	Chena 5
Primary	X	X	X	X
Secondary	X	X	X	X
Air Pres.		All Wheel Chocks are in Building		

1589,100

Wed. Coal Facility Air Comp. Water Drained

Comments: Shoveled under belt #2 cleaned office and toolshed

Ele. Meter

Water Meter

Revised 2/7/08 sdr

Stock Pile

Electric Meter

Water Meter

Turbine & Boiler Log #2

11/19/11

Hr	O2	% of Smoke	AIR HEATER AIR 1 In	AIR HEATER AIR 2 Out	AIR HEATER GAS 3 In	AIR HEATER GAS 4 Out	Comb Air Htr Inlet	GRATE TEMPERATURES A 5.0	B 6.0	C 7.0	D 8.0	E 9.0	Over Fire Fan Outlet	FDR Demand	Inlet Steam 10.0	Outlet Steam 11.0	Conductivity Hot Well	Conductivity Gly-col	Conductivity Boiler
1.0	5.4	9.6	133	340	446	294	1.6	422	454	401	407	398	90	70	675	669	10.1	9.7	499
2.0	4.1	9.5	131	337	441	288	1.3	439	496	398	405	401	88	65	680	679	10.1	9.7	500
3.0	4.5	9.6	128	337	450	290	1.8	426	471	398	406	391	84	72	677	644	10.3	9.8	500
4.0	4.6	9.6	126	340	453	292	1.8	433	477	399	407	401	83	68	683	650	10.3	9.8	508
5.0	5.2	9.6	121	343	467	297	2.1	435	456	401	407	401	85	80	680	631	10.4	9.9	505
6.0	4.4	10.0	121	342	460	294	2.3	431	461	397	404	397	85	79	684	634	10.4	9.9	509
7.0	4.1	9.6	125	341	456	292	1.9	421	456	397	403	395	84	80	679	647	10.3	9.8	505
8.0	4.1	9.6	120	342	466	295	2.4	417	454	395	401	392	83	84	682	611	10.4	10.0	507
9.0	2.3	10.2	116	339	470	294	2.6	420	455	394	399	393	80	90	684	607	10.5	10.0	504
10.0	4.3	10.3	121	340	463	293	2.5	426	461	397	402	391	83	83	688	649	10.5	10.0	501
11.0	6.3	9.8	117	338	472	294	3.0	413	447	391	399	395	62	74	673	607	10.6	10.1	496
12.0	5.9	9.9	120	340	470	295	2.7	411	449	395	404	391	60	79	673	640	10.7	10.1	503
13.0	6.1	10.3	122	343	472	299	2.5	419	459	392	407	395	80	80	668	634	10.7	10.2	498
14.0	5.7	10.0	123	341	468	296	2.7	410	446	392	399	389	87	72	673	638	10.8	10.2	494
15.0	5.7	9.9	124	342	468	298	2.5	417	444	390	400	390	61	73	677	625	10.7	10.0	499
16.0	5.8	10.0	124	342	471	298	2.5	408	441	393	399	390	83	78	670	624	10.6	10.1	502
17.0	5.6	10.0	125	341	467	295	2.6	412	442	389	398	389	87	77	673	636	10.7	10.2	500
18.0	5.7	10.1	124	341	468	296	2.6	410	448	394	400	391	61	77	675	640	11.0	10.3	498
19.0	5.9	10.3	122	340	471	296	3.2	411	442	392	398	390	76	74	673	662	11.1	10.5	500
20.0	4.2	10.0	129	341	458	294	1.9	419	450	393	400	390	85	78	683	657	11.3	10.6	502
21.0	1.5	10.1	124	341	471	296	2.7	411	446	392	400	390	87	85	679	638	11.5	10.6	501
22.0	6.3	10.2	123	339	468	295	3.0	407	438	387	395	388	89	86	667	635	11.3	10.4	503
23.0	4.2	10.1	130	338	451	291	1.7	422	451	390	396	386	88	70	681	670	11.1	10.4	495
24.0	4.4	10.1	133	337	444	289	1.6	423	448	391	400	396	87	72	685	656	11.2	10.5	492
Avg	4.9	9.9	124	340	462	294	2	419	454	394	401	393	81	77	678	641	10.7	10.1	501

Turbine & Boiler Log #2

11/19/11

Hr	Draft Guage Readings													Baghouse	
	Air Heat Out	Under Grate Left	Under Grate Right	Over Fire Out	Over Fire Left	Over Fire Right	Fur-nace Press	Super Heat Out	Boiler Out	AH Gas Out	Dust Coll Out	Econimizer Inlet Temp	Furnace Draft	Fan Amps	Fan Flow CFM
1.0	0.0	0.5	0.5	27	27	21	-0.02	0.0	-1.4	-5.2	-8.5	730	-0.07	513-IT-50/A	0
2.0	0.0	0.4	0.4	27	27	21	-0.06	0.0	-1.2	-4.2	-6.7	726	-0.21	513-IT-50/A	0
3.0	0.0	0.5	0.5	27	27	21	-0.06	0.0	-1.5	-5.2	-8.4	745	-0.04	513-IT-50/A	0
4.0	0.0	0.5	0.5	27	27	21	0.00	0.0	-1.6	-5.1	-8.3	748	-0.10	513-IT-50/A	0
5.0	0.0	0.6	0.7	27	27	21	-0.01	0.1	-1.7	-6.0	-9.8	776	0.00	513-IT-50/A	0
6.0	0.0	0.7	0.7	27	27	21	0.02	0.1	-1.5	-5.7	-9.3	766	-0.07	513-IT-50/A	0
7.0	0.0	0.5	0.6	27	27	21	-0.02	0.1	-1.4	-5.3	-8.5	755	-0.04	513-IT-50/A	0
8.0	0.0	0.7	0.8	27	27	21	-0.03	0.0	-1.6	-6.0	-9.9	776	-0.07	513-IT-50/A	0
9.0	0.0	0.8	0.8	27	27	21	-0.04	0.0	-1.9	-6.7	-10.8	783	-0.11	513-IT-50/A	0
10.0	0.0	0.7	0.8	27	27	21	0.01	0.1	-1.7	-6.1	-9.9	772	-0.03	513-IT-50/A	0
11.0	0.0	0.9	1.0	28	28	21	-0.03	0.1	-2.0	-7.0	-11.6	790	-0.06	513-IT-50/A	0
12.0	0.0	0.8	0.9	27	26	21	0.02	0.1	-1.9	-6.8	-11.0	775	-0.08	513-IT-50/A	0
13.0	0.0	0.7	0.8	27	27	21	-0.01	0.1	-1.8	-6.7	-10.9	777	-0.05	513-IT-50/A	0
14.0	0.0	0.8	0.8	27	27	21	0.04	0.1	-1.8	-6.4	-10.5	775	-0.06	513-IT-50/A	0
15.0	0.0	0.7	0.7	27	27	21	-0.02	0.0	-1.8	-6.5	-10.5	772	-0.01	513-IT-50/A	0
16.0	0.0	0.7	0.7	27	27	21	-0.01	0.0	-1.9	-6.6	-10.6	778	-0.09	513-IT-50/A	0
17.0	0.0	0.8	0.8	27	27	21	0.00	0.1	-1.7	-6.4	-10.3	768	-0.11	513-IT-50/A	0
18.0	0.0	0.8	0.8	27	27	21	0.03	0.1	-1.7	-6.3	-10.3	771	-0.05	513-IT-50/A	0
19.0	0.0	0.9	1.0	27	26	20	0.00	0.1	-2.1	-7.3	-11.8	775	-0.08	513-IT-50/A	0
20.0	0.0	0.5	0.6	27	27	21	0.00	0.1	-1.4	-5.2	-8.5	752	-0.04	513-IT-50/A	0
21.0	0.0	0.8	0.9	27	27	21	-0.01	0.1	-1.9	-6.7	-10.8	783	-0.12	513-IT-50/A	0
22.0	0.0	1.0	1.1	27	27	21	0.07	0.1	-1.9	-6.9	-11.2	777	0.03	513-IT-50/A	0
23.0	0.0	0.5	0.5	27	27	21	0.00	0.1	-1.4	-4.9	-7.9	743	-0.05	513-IT-50/A	0
24.0	0.0	0.5	0.5	27	27	21	-0.03	0.0	-1.3	-4.7	-7.6	737	-0.05	513-IT-50/A	0
Avg	0.0	0.7	0.7	27	27	21	-0.01	0.1	-1.7	-6.0	-9.7	765	-0.06	#DIV/0!	0

Hr	Totalizers										
	Throttle Steam (k lbs)	Steam Flow (k lbs)	Feed Water (k lbs)	Attemp (k lbs)	PCV 3 (k lbs)	PCV 4 (k lbs)	Total (PCV 3 + PCV 4) (k lbs)	1st Ave (k lbs)	3rd Ave (k lbs)	Desuper-heater 600 lb Stm (k lbs)	Desuper-heater 50 lb Stm (k lbs)
24.0	3931	4432	4246	106	577	0	577	1020	62	16	5

Turbine & Boiler Log #2

11/19/11

Hr	Air Htr Cold Avg Tmp	Stack O2 Trim			1st Ave Steam		3rd Ave Steam		50 lb Steam		600 lb Steam	
		AT-02	AT-03	AT-12	Press	Temp	Press	Temp	Press	Temp	Press	Temp
1.0	214	4.41	0.00	6.46	46	360	44	326	45	286	10-PT-250/	779
2.0	209	3.21	0.00	4.88	46	360	44	319	46	286	10-PT-250/	774
3.0	209	3.54	0.00	5.86	45	354	43	329	44	286	10-PT-250/	782
4.0	209	3.61	0.00	5.74	46	359	45	324	45	286	10-PT-250/	772
5.0	209	3.72	0.00	6.58	44	354	43	331	43	286	10-PT-250/	770
6.0	207	3.12	0.00	5.47	49	360	48	345	49	286	10-PT-250/	782
7.0	209	2.90	0.00	5.39	47	363	45	355	46	286	10-PT-250/	646
8.0	207	2.80	0.00	5.39	45	362	44	353	45	286	10-PT-250/	691
9.0	205	3.21	0.00	6.16	44	353	42	354	43	286	10-PT-250/	782
10.0	207	2.96	0.00	5.46	41	354	40	356	41	286	10-PT-250/	764
11.0	206	4.54	0.00	7.93	49	356	47	358	48	286	10-PT-250/	779
12.0	207	4.37	0.00	7.59	44	352	42	353	43	286	10-PT-250/	765
13.0	210	4.59	0.00	7.68	46	358	44	347	45	286	10-PT-250/	764
14.0	210	4.22	0.00	7.18	49	359	47	357	48	286	10-PT-250/	764
15.0	211	4.20	0.00	7.16	49	355	47	353	48	286	10-PT-250/	766
16.0	211	4.33	0.00	7.66	45	358	44	348	45	286	10-PT-250/	764
17.0	210	4.24	0.00	7.23	48	360	47	351	48	286	10-PT-250/	758
18.0	210	4.29	0.00	7.18	49	358	47	343	48	286	10-PT-250/	759
19.0	209	4.12	0.00	7.63	46	356	44	339	45	286	10-PT-250/	731
20.0	211	2.79	0.00	5.54	48	359	47	335	48	286	10-PT-250/	674
21.0	210	2.99	0.00	6.09	48	356	47	336	47	286	10-PT-250/	786
22.0	209	4.92	0.00	7.53	48	361	47	331	47	286	10-PT-250/	775
23.0	210	3.05	0.00	5.15	48	357	47	332	47	286	10-PT-250/	769
24.0	211	3.31	0.00	5.38	47	356	46	316	46	286	10-PT-250/	761
Avg	209	3.73	0.00	6.43	46	357	45	341	46	286	#DIV/0!	757

Turbine & Boiler Log #2

11/19/11

Hr	Draft Guage Readings													Baghouse	
	Air Heat Out	Under Grate Left	Under Grate Right	Over Fire Out	Over Fire Left	Over Fire Right	Fur-nace Press	Super Heat Out	Boiler Out	AH Gas Out	Dust Coll Out	Econimizer Inlet Temp	Furnace Draft	Fan Amps	Fan Flow CFM
1.0	0.0	0.5	0.5	27	27	21	-0.02	0.0	-1.4	-5.2	-8.5	730	-0.07	513-IT-50/A	0
2.0	0.0	0.4	0.4	27	27	21	-0.06	0.0	-1.2	-4.2	-6.7	726	-0.21	513-IT-50/A	0
3.0	0.0	0.5	0.5	27	27	21	-0.06	0.0	-1.5	-5.2	-8.4	745	-0.04	513-IT-50/A	0
4.0	0.0	0.5	0.5	27	27	21	0.00	0.0	-1.6	-5.1	-8.3	748	-0.10	513-IT-50/A	0
5.0	0.0	0.6	0.7	27	27	21	-0.01	0.1	-1.7	-6.0	-9.8	776	0.00	513-IT-50/A	0
6.0	0.0	0.7	0.7	27	27	21	0.02	0.1	-1.5	-5.7	-9.3	766	-0.07	513-IT-50/A	0
7.0	0.0	0.5	0.6	27	27	21	-0.02	0.1	-1.4	-5.3	-8.5	755	-0.04	513-IT-50/A	0
8.0	0.0	0.7	0.8	27	27	21	-0.03	0.0	-1.6	-6.0	-9.9	776	-0.07	513-IT-50/A	0
9.0	0.0	0.8	0.8	27	27	21	-0.04	0.0	-1.9	-6.7	-10.8	783	-0.11	513-IT-50/A	0
10.0	0.0	0.7	0.8	27	27	21	0.01	0.1	-1.7	-6.1	-9.9	772	-0.03	513-IT-50/A	0
11.0	0.0	0.9	1.0	28	28	21	-0.03	0.1	-2.0	-7.0	-11.6	790	-0.06	513-IT-50/A	0
12.0	0.0	0.8	0.9	27	26	21	0.02	0.1	-1.9	-6.8	-11.0	775	-0.08	513-IT-50/A	0
13.0	0.0	0.7	0.8	27	27	21	-0.01	0.1	-1.8	-6.7	-10.9	777	-0.05	513-IT-50/A	0
14.0	0.0	0.8	0.8	27	27	21	0.04	0.1	-1.8	-6.4	-10.5	775	-0.06	513-IT-50/A	0
15.0	0.0	0.7	0.7	27	27	21	-0.02	0.0	-1.8	-6.5	-10.5	772	-0.01	513-IT-50/A	0
16.0	0.0	0.7	0.7	27	27	21	-0.01	0.0	-1.9	-6.6	-10.6	778	-0.09	513-IT-50/A	0
17.0	0.0	0.8	0.8	27	27	21	0.00	0.1	-1.7	-6.4	-10.3	768	-0.11	513-IT-50/A	0
18.0	0.0	0.8	0.8	27	27	21	0.03	0.1	-1.7	-6.3	-10.3	771	-0.05	513-IT-50/A	0
19.0	0.0	0.9	1.0	27	26	20	0.00	0.1	-2.1	-7.3	-11.8	775	-0.08	513-IT-50/A	0
20.0	0.0	0.5	0.6	27	27	21	0.00	0.1	-1.4	-5.2	-8.5	752	-0.04	513-IT-50/A	0
21.0	0.0	0.8	0.9	27	27	21	-0.01	0.1	-1.9	-6.7	-10.8	783	-0.12	513-IT-50/A	0
22.0	0.0	1.0	1.1	27	27	21	0.07	0.1	-1.9	-6.9	-11.2	777	0.03	513-IT-50/A	0
23.0	0.0	0.5	0.5	27	27	21	0.00	0.1	-1.4	-4.9	-7.9	743	-0.05	513-IT-50/A	0
24.0	0.0	0.5	0.5	27	27	21	-0.03	0.0	-1.3	-4.7	-7.6	737	-0.05	513-IT-50/A	0
Avg	0.0	0.7	0.7	27	27	21	-0.01	0.1	-1.7	-6.0	-9.7	765	-0.06	#DIV/0!	0

Hr	Totalizers										
	Throttle Steam (k lbs)	Steam Flow (k lbs)	Feed Water (k lbs)	Attemp (k lbs)	PCV 3 (k lbs)	PCV 4 (k lbs)	Total (PCV 3 + PCV 4) (k lbs)	1st Ave (k lbs)	3rd Ave (k lbs)	Desuper-heater 600 lb Stm (k lbs)	Desuper-heater 50 lb Stm (k lbs)
24.0	3931	4432	4246	106	577	0	577	1020	62	16	5

Turbine & Boiler Log #2

11/19/11

Hr	O2	% of Smoke	AIR HEATER AIR 1 In	AIR HEATER AIR 2 Out	AIR HEATER GAS 3 In	AIR HEATER GAS 4 Out	Comb Air Htr Inlet	GRATE TEMPERATURES A 5.0	B 6.0	C 7.0	D 8.0	E 9.0	Over Fire Fan Outlet	FDR Demand	Inlet Steam 10.0	Outlet Steam 11.0	Conductivity Hot Well	Gly-col	Boiler
1.0	5.4	9.6	133	340	446	294	1.6	422	454	401	407	398	90	70	675	669	10.1	9.7	499
2.0	4.1	9.5	131	337	441	288	1.3	439	496	398	405	401	88	65	680	679	10.1	9.7	500
3.0	4.5	9.6	128	337	450	290	1.8	426	471	398	406	391	84	72	677	644	10.3	9.8	500
4.0	4.6	9.6	126	340	453	292	1.8	433	477	399	407	401	83	68	683	650	10.3	9.8	508
5.0	5.2	9.6	121	343	467	297	2.1	435	456	401	407	401	85	80	680	631	10.4	9.9	505
6.0	4.4	10.0	121	342	460	294	2.3	431	461	397	404	397	85	79	684	634	10.4	9.9	509
7.0	4.1	9.6	125	341	456	292	1.9	421	456	397	403	395	84	80	679	647	10.3	9.8	505
8.0	4.1	9.6	120	342	466	295	2.4	417	454	395	401	392	83	84	682	611	10.4	10.0	507
9.0	2.3	10.2	116	339	470	294	2.6	420	455	394	399	393	80	90	684	607	10.5	10.0	504
10.0	4.3	10.3	121	340	463	293	2.5	426	461	397	402	391	83	83	688	649	10.5	10.0	501
11.0	6.3	9.8	117	338	472	294	3.0	413	447	391	399	395	62	74	673	607	10.6	10.1	496
12.0	5.9	9.9	120	340	470	295	2.7	411	449	395	404	391	60	79	673	640	10.7	10.1	503
13.0	6.1	10.3	122	343	472	299	2.5	419	459	392	407	395	80	80	668	634	10.7	10.2	498
14.0	5.7	10.0	123	341	468	296	2.7	410	446	392	399	389	87	72	673	638	10.8	10.2	494
15.0	5.7	9.9	124	342	468	298	2.5	417	444	390	400	390	61	73	677	625	10.7	10.0	499
16.0	5.8	10.0	124	342	471	298	2.5	408	441	393	399	390	83	78	670	624	10.6	10.1	502
17.0	5.6	10.0	125	341	467	295	2.6	412	442	389	398	389	87	77	673	636	10.7	10.2	500
18.0	5.7	10.1	124	341	468	296	2.6	410	448	394	400	391	61	77	675	640	11.0	10.3	498
19.0	5.9	10.3	122	340	471	296	3.2	411	442	392	398	390	76	74	673	662	11.1	10.5	500
20.0	4.2	10.0	129	341	458	294	1.9	419	450	393	400	390	85	78	683	657	11.3	10.6	502
21.0	1.5	10.1	124	341	471	296	2.7	411	446	392	400	390	87	85	679	638	11.5	10.6	501
22.0	6.3	10.2	123	339	468	295	3.0	407	438	387	395	388	89	86	667	635	11.3	10.4	503
23.0	4.2	10.1	130	338	451	291	1.7	422	451	390	396	386	88	70	681	670	11.1	10.4	495
24.0	4.4	10.1	133	337	444	289	1.6	423	448	391	400	396	87	72	685	656	11.2	10.5	492
Avg	4.9	9.9	124	340	462	294	2	419	454	394	401	393	81	77	678	641	10.7	10.1	501

Turbine & Boiler Log #2

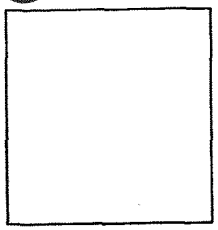
11/19/11

Hr	Boiler 5 Temp	Boiler 5 Press	Drum Press	% Air Flow	in Hg BP	Steam Flow lb/hr	Turbine Steam Flow	Attemp Flow	Super Heater Temp	Super Heater Press	Trottle Steam Temp	1st Extrac Press	2nd Extrac Press	3rd Extrac Press	4th Extrac Press	1st Stg Stm Press	Aux. Steam Press	PVC3 Steam Flow	PVC4 Steam Flow	Intertie Steam Flow	50 lb Steam Flow
1.0	883	857	880	70	1.32	165861	140679	2789	885	853	903	144	50	14	20	404	298	0	0	5	1
2.0	899	863	884	65	1.32	158394	139658	2805	902	858	919	144	50	13	21	406	298	0	0	5	1
3.0	891	855	882	74	1.44	179609	151745	4055	892	850	910	159	56	16	22	443	297	0	0	5	1
4.0	905	863	889	74	1.55	176000	156676	4265	907	858	925	166	59	18	23	461	298	0	0	3	-4
5.0	902	861	892	79	1.70	190745	168781	5083	906	855	923	180	65	20	24	498	299	0	0	3	1
6.0	892	860	891	81	1.65	191481	168442	5156	895	854	912	180	63	19	24	499	299	60000	0	3	15684
7.0	891	860	889	77	1.70	189026	172795	4223	893	853	911	185	65	21	24	513	299	60000	0	5	1
8.0	901	860	892	83	1.80	196129	176778	6039	904	853	921	191	68	22	25	527	298	60000	0	5	1
9.0	903	857	892	85	1.74	205447	176753	6630	905	850	923	190	67	21	25	527	298	60000	0	6	1
10.0	902	860	893	83	1.75	198171	174427	5044	906	853	922	188	67	21	25	520	299	60000	0	6	1
11.0	903	868	897	80	1.64	188404	169596	5559	906	861	923	181	62	19	24	506	300	60000	0	8	1
12.0	897	860	889	79	1.61	186356	168485	4271	900	853	918	178	61	19	23	496	298	60000	0	5	1
13.0	893	862	890	78	1.70	186923	169072	4247	895	855	913	180	65	20	24	498	298	60000	0	3	1
14.0	897	863	892	79	1.62	187151	168283	4380	901	856	918	180	62	19	24	499	299	60000	0	5	1
15.0	894	864	893	78	1.61	185979	167560	4968	898	858	915	178	62	19	24	494	299	60000	0	6	1
16.0	899	861	890	78	1.69	186456	168428	4774	901	855	919	179	65	20	24	496	299	60000	0	5	1
17.0	894	860	889	78	1.71	185261	166450	4370	896	854	914	178	65	20	24	492	299	0	0	5	1
18.0	897	862	890	79	1.71	186019	167738	4337	900	855	917	179	65	20	24	494	298	0	0	3	1
19.0	902	859	890	82	1.71	187379	167862	3613	908	853	924	179	65	20	24	495	299	0	0	6	2
20.0	890	863	890	76	1.74	183473	168171	3859	893	856	910	180	66	21	25	497	299	0	0	3	2
21.0	913	856	892	85	1.72	204003	167620	5256	916	850	933	180	65	20	24	498	299	0	0	17528	1
22.0	897	855	885	87	1.71	189587	166924	4224	900	849	917	180	65	20	24	495	299	0	0	6	2
23.0	887	867	893	73	1.52	175787	153173	2811	889	861	907	162	57	17	22	449	299	0	0	6	1
24.0	900	861	885	72	1.50	171845	152589	4038	902	855	919	160	57	17	22	445	298	0	0	5	1
Avg	897	861	890	78	1.63	185645	164529	4450	900	854	917	175	62	19	24	486	299	27500	0	735	654

11/19/11

BOILER ONE DATA

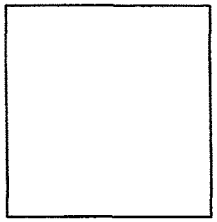
Hr.	Steam Flow	Press.	Temp.	Grate Drive Hz	FD Fan Drive Hz	% Opacity	Total Steam *1K	Total Feedwater	Total Coal (Tons)
1.0	35130.2	599.7	767.3	35.5	60.0	105.0	36.8	36.0	3.8
2.0	42939.5	600.1	767.7	35.0	60.0	105.0	74.1	72.3	6.0
3.0	35846.9	599.6	758.3	35.0	60.0	105.0	111.9	109.8	8.8
4.0	39421.8	600.0	766.8	36.0	60.0	105.0	147.7	144.8	13.1
5.0	38988.3	599.9	763.9	35.5	60.0	105.0	185.1	181.4	17.4
6.0	39341.3	600.6	771.3	35.5	60.0	105.0	224.0	219.5	21.8
7.0	42734.2	605.0	777.7	32.6	56.2	105.0	266.2	260.5	26.7
8.0	41971.0	600.2	773.1	34.0	60.0	105.0	308.5	302.0	31.5
9.0	42494.6	599.4	774.9	34.0	60.0	105.0	350.4	343.4	36.2
10.0	32826.3	592.2	761.8	33.5	60.0	105.0	391.8	384.6	40.6
11.0	33418.5	607.1	765.0	27.6	36.8	105.0	429.7	421.5	44.9
12.0	39727.2	604.1	761.1	30.6	48.9	105.0	469.9	460.6	49.3
13.0	40539.0	602.7	759.1	29.5	46.5	105.0	510.3	499.9	53.7
14.0	40133.5	606.8	760.5	27.8	42.5	105.0	549.0	537.9	57.9
15.0	38489.4	608.4	766.4	26.6	33.5	105.0	588.4	576.9	62.6
16.0	39151.0	601.1	765.0	33.0	53.8	105.0	628.3	615.7	67.1
17.0	43513.1	604.7	753.6	28.3	34.2	105.0	668.6	655.1	71.4
18.0	38101.0	601.6	751.0	31.7	46.1	105.0	707.5	693.3	75.4
19.0	40833.7	601.0	758.1	32.5	60.0	105.0	745.7	730.5	79.8
20.0	41111.2	604.7	757.2	30.8	50.5	105.0	785.0	768.8	84.2
21.0	36472.0	600.6	756.4	32.5	54.0	105.0	822.9	806.2	88.3
22.0	36383.3	599.0	759.2	32.5	60.0	105.0	860.2	843.3	92.4
23.0	37705.1	595.4	756.3	32.5	60.0	105.0	896.6	878.8	96.7
24.0	36635.1	599.5	760.1	32.5	60.0	105.0	933.8	915.3	100.7



11/19/11

BOILER TWO DATA

Hr.	Steam Flow	Press.	Temp.	Grate Drive Hz	FD Fan Drive Hz	% Opacity	Total Steam *1K	Total Feedwater	Total Coal (Tons)
1.0	33806.9	600.0	693.8	29.5	54.0	105.0	38.2	38.1	3.8
2.0	33413.5	600.0	690.5	29.5	54.0	105.0	74.6	73.9	7.6
3.0	33276.2	600.0	695.3	29.0	54.0	105.0	110.1	108.9	11.0
4.0	36436.3	600.3	698.6	29.5	54.0	105.0	143.9	141.8	14.7
5.0	37389.0	600.3	696.1	29.5	54.0	105.0	179.9	176.8	16.7
6.0	33977.9	600.9	693.2	29.5	54.0	105.0	215.0	211.1	19.6
7.0	36252.4	605.0	707.8	27.0	56.1	105.0	249.0	243.8	24.2
8.0	37906.8	600.4	701.4	27.0	60.0	105.0	287.7	281.6	27.9
9.0	25647.2	599.1	673.0	27.0	60.0	105.0	326.1	320.0	31.7
10.0	39167.9	593.1	700.3	28.0	60.0	105.0	361.7	354.3	35.8
11.0	50417.6	608.7	698.0	23.7	36.7	105.0	399.9	391.3	39.0
12.0	36374.7	604.4	693.0	25.6	48.9	105.0	437.2	427.9	43.4
13.0	38635.3	603.1	689.5	24.8	46.6	105.0	474.2	463.8	47.1
14.0	36365.1	607.0	693.5	23.4	42.6	105.0	511.1	499.8	50.8
15.0	40365.9	608.8	691.8	22.9	40.1	105.0	546.9	534.7	54.8
16.0	37450.9	601.4	695.2	28.0	53.8	105.0	585.2	572.1	58.7
17.0	36294.3	604.8	677.7	24.2	34.3	105.0	623.2	609.2	62.4
18.0	38859.6	602.2	693.7	26.8	46.2	105.0	660.9	645.7	63.8
19.0	34267.6	601.2	695.0	27.5	60.0	105.0	698.8	682.6	67.7
20.0	39300.2	605.2	689.2	26.2	50.4	105.0	737.0	719.7	71.6
21.0	29187.7	600.8	690.0	27.5	54.0	105.0	773.7	755.8	75.4
22.0	39547.7	599.7	701.5	27.5	54.0	105.0	807.7	789.0	79.1
23.0	35608.0	595.8	695.7	27.5	60.0	105.0	845.8	826.3	82.8
24.0	36967.0	600.0	695.0	27.5	60.0	105.0	881.6	861.0	86.2



11/19/11

BOILER THREE DATA

Hr.	Steam Flow	Press.	Temp.	Grate Drive Hz	FD Fan Drive Hz	% Opacity	Total Steam *1K	Total Feedwater	Total Coal (Tons)
1.0	31477.8	594.3	744.5	34.5	54.0	105.0	33.6	33.7	3.4
2.0	32564.7	594.6	741.3	34.5	54.0	105.0	64.1	63.9	6.8
3.0	30162.6	594.4	740.0	34.5	54.0	105.0	97.5	97.5	10.1
4.0	33752.9	595.0	745.0	34.5	54.0	105.0	129.7	129.5	13.4
5.0	31247.6	594.5	735.5	35.5	54.0	105.0	161.5	160.9	16.1
6.0	32832.1	595.9	733.7	35.5	54.0	105.0	192.4	191.6	19.4
7.0	34555.1	600.0	723.6	32.3	50.4	105.0	223.6	222.4	24.0
8.0	33573.3	594.6	728.3	33.0	54.0	105.0	257.2	256.1	27.7
9.0	29115.4	594.0	722.6	31.4	54.0	105.0	290.9	289.7	31.4
10.0	30592.0	587.7	737.1	30.0	54.0	105.0	323.5	322.8	34.6
11.0	29125.8	601.6	736.1	25.6	36.8	105.0	356.3	355.3	37.7
12.0	30983.9	599.0	742.0	29.8	49.0	105.0	388.2	387.0	41.4
13.0	31876.2	597.0	745.7	28.7	46.7	105.0	421.1	419.6	44.8
14.0	32437.1	601.6	740.0	26.9	42.5	105.0	454.4	452.3	48.3
15.0	33476.5	603.1	737.5	26.0	39.7	105.0	486.9	484.3	52.0
16.0	34127.0	595.9	736.5	32.5	54.0	105.0	520.8	518.5	55.5
17.0	32546.9	599.3	744.4	27.6	34.2	105.0	555.1	552.4	59.0
18.0	31838.6	596.6	745.8	31.2	46.3	105.0	588.3	585.5	62.5
19.0	35102.8	596.2	738.1	32.0	54.0	105.0	621.7	618.2	66.1
20.0	35018.5	600.1	743.5	30.2	50.0	105.0	656.7	652.7	69.9
21.0	29864.2	595.2	736.7	32.0	54.0	105.0	691.9	688.2	73.7
22.0	36102.2	594.8	735.6	32.0	54.0	105.0	723.3	719.5	77.2
23.0	34733.9	590.6	741.3	32.5	54.0	105.0	756.9	752.8	80.7
24.0	32722.3	594.8	742.1	32.5	54.0	105.0	789.9	785.4	84.1

Calibration Certificate

2 March 2011 Tag # 112 MT 05 S/N 0047335

Rosemount 3095MV Multivariable Mass Flow Transmitter

Calibration checked with Ametek Pneumatic Deadweight Tester

Model PK II-854WC-SS S/N 84903

Transmitter was checked with the following values:

0"h2o, 62"h2o, 125"h2o, 187"h2o, & 250"h2o.

Here are the results:

0" h2o applied	0.08"h2o recorded
62" h2o applied	62.56"h2o recorded
125"h2o applied	125.28"h2o recorded
187"h2o applied	187.50"h2o recorded
250"h2o applied	250.30"h2o recorded

All values fell within the 0.075% specification from the manufacturer

Test conducted by Bill Lathrop Aurora Energy LLC E & I Foreman

STEAM FLOW
CALIBRATIONS
1, 2, 3, 5 BARS

Calibration Certificate

8 March 2011 Tag # 212 MT 05 S/N 0047334

Rosemount 3095MV Multivariable Mass Flow Transmitter

Calibration checked with Ametek Pneumatic Deadweight Tester

Model PK II-854WC-SS S/N 84903

Transmitter was checked with the following values:

0"h2o, 62"h2o, 125"h2o, 187"h2o, & 250"h2o.

Here are the results:

0" h2o applied	0.04"h2o recorded
62" h2o applied	61.94"h2o recorded
125"h2o applied	124.87"h2o recorded
187"h2o applied	186.81"h2o recorded
250"h2o applied	249.86"h2o recorded

All values fell within the 0.075% specification from the manufacturer

Test conducted by Bill Lathrop Aurora Energy LLC E & I Foreman

Calibration Certificate

8 March 2011 Tag # 312 MT 05 S/N 0041043

Rosemount 3095MV Multivariable Mass Flow Transmitter

Calibration checked with Ametek Pneumatic Deadweight Tester

Model PK II-854WC-SS S/N 84903

Transmitter was checked with the following values:

0"h2o, 62"h2o, 125"h2o, 187"h2o, & 250"h2o.

Here are the results:

0" h2o applied	-0.01"h2o recorded
62" h2o applied	62.08"h2o recorded
125"h2o applied	125.05"h2o recorded
187"h2o applied	186.89"h2o recorded
250"h2o applied	250.02"h2o recorded

All values fell within the 0.075% specification from the manufacturer

Test conducted by Bill Lathrop Aurora Energy LLC E & I Foreman

Calibration Certificate

15 March 2011 Tag # 512 MT 05 S/N0032838

Rosemount 3095MV Multivariable Mass Flow Transmitter

Calibration checked with Ametek Pneumatic Deadweight Tester

Model PK II-854WC-SS S/N 84903

Transmitter was checked with the following values:

0"h2o, 62"h2o, 125"h2o, 187"h2o, & 250"h2o.

Here are the results:

0" h2o applied	0.15"h2o recorded
62" h2o applied	62.17"h2o recorded
125"h2o applied	125.15"h2o recorded
187"h2o applied	187.12"h2o recorded
250"h2o applied	249.95"h2o recorded

All values fell within the 0.075% specification from the manufacturer

Test conducted by Bill Lathrop Aurora Energy LLC E & I Foreman

APPENDIX D

MANUAL CALCUALTIONS & FIELD DATA

Example Calculation
Bias Correction Calculation

Client: Aurora Energy

Location: Chena Power Plant - Fairbanks, AK

Site Location: Combined Boiler (Chena 1, 2, 3 & 5) Baghouse Stack

Run #: 3

Date: 11/19/2011

instrument averaged 119.19 ppm SO_2 during the run

$$C_{GAS} = (C_{AVG} - C_O)\ \frac{(C_{MA})}{C_M - C_O}$$

$$\frac{(119.19 - 0.29)}{C_{AVG}\quad C_O}\qquad \frac{C_{MA}\ (200.7)}{(173.84 - 0.29)\ C_M\quad C_O} = 137.51 \text{ ppm } SO_2\ (C_{GAS})$$

C_{GAS} = Average effluent gas concentration adjusted for bias, ppm
C_{AVG} = Average unadjusted gas concentration indicated by data recorder for the test run, ppmv
C_O = Average of the initial and final system calibration bias (or 2-point system calibration error) check responses from the low-level (or zero) calibration gas, ppmv
C_{MA} = Actual concentration of the upscale calibration gas, ppmv
C_M = Average of the initial and final system calibration bias (or 2-point system calibration error) check responses for the upscale calibration gas, ppmv

EPA Method 6C - Sulfur Dioxide (SO_2) Example Calculations

Client: Aurora Energy LLC

Site Location: Fairbanks, AK · Combined Boiler Baghouse Exhaust

Run #: 2

Date: 11-19-2011

Emission Concentration Results

instrument averaged 131.5 ppm SO_2 during the run

131.5 ppm x $[1.660 \times 10^{-7}]$* = 2.18×10^{-5} lb/dscf SO_2

*Conversion factor obtained from 40 CFR 60, Appendix A, Method 19

Emission Rate Results

2.18×10^{-5} $\frac{lb}{dscf}$ x 140849 $\frac{dscf}{min}$ x 60 $\frac{min}{hr}$ = 184.00 lb/hr SO_2

EPA Method 7E - Nitrogen Oxides (NO_x) Example Calculations

Client: Aurora Energy LLC

Site Location: Fairbanks, AK · Combined Boiler Baghouse Exhaust·

Run #: 2

Date: 11·19·2011

Emission Concentration Results

instrument averaged 154.9 ppm NO_x during the run

154.9 ppm x [1.194 x 10^{-7}]* = 1.85×10^{-5} lb/dscf NO_x

*Conversion factor obtained from 40 CFR 60, Appendix A, Method 19

Emission Rate Results

1.85×10^{-5} lb/dscf x 140469 dscf/min x 60 min/hr = 155.9 lb/hr NO_x

EPA Method 10 - Carbon Monoxide (CO) Example Calculations

Client: Aurora Energy, LLC

Site Location: Fairbanks, AK. Combined Boiler Baghouse Exhaust

Run #: 2

Date: 11-19-2011

Emission Concentration Results

instrument averaged 213.3 ppm CO during the run

$$213.3 \text{ ppm} \times \frac{(20.9 - ____ \%O_2)}{(20.9 - ____ \%O_2)_{measured}} = \text{NA ppm CO @ } ____ \%O_2$$

Emission Rate Results

$$213.3 \text{ ppm} \times \frac{28.01 \text{ lb/lb-mole}}{385.3 \times 10^6 \text{ ft}^3 \text{ lb-mole, ppm}} \times 140489 \frac{\text{dscf}}{\text{min}} \times 60 \frac{\text{min}}{\text{hr}} = 130.7 \text{ lb/hr CO}$$

EPA Method 25A – Total Hydrocarbons (THC) (as Propane) Example Calculations

Client: Aurora Energy LLC

Location: Fairbanks, AK

Site Location: Combined Boiler Baghouse Stack

Run #: 2

Date: 11/19/2011

Emission Concentration Results

0.5 ppm, wet THC during the run

$$0.5 \text{ ppm, wet} \times \frac{1}{(1 - 0.0976 \text{ bws})} = 0.6 \text{ ppm, dry THC}$$

Emission Rate Results

$$0.6 \text{ ppm} \times \frac{44.09 \text{ g/g-mole}}{[385.3 \times 10^6]^1} \times 140489 \frac{\text{dscf}}{\text{min}} \times 60 \frac{\text{min}}{\text{hr}} = 0.534 \text{ lb/hr}$$

[1]Conversion factor used to convert ppm to lb/ft^3.

Example Calculations

Aurora Energy
Combined Boiler (Chena 1, 2, 3 & 5) Baghouse Stack
Fairbanks, AK
Run Number: 201A/202 - 1 Test Date: 11/19/2011

1. Volume of dry gas sampled at standard conditions (68 °F, 29.92 "Hg), dscf

$$Vm(std) = \frac{528 \times Y \times Vm \times \left(Pbar + \frac{\text{delta H}}{13.6}\right)}{29.92 \times (Tm + 460)}$$

$$Vm(std) = \frac{528 \times 0.983 \times 21.600 \times \left(29.79 + \frac{0.40}{13.6}\right)}{29.92 \times (69.8 + 460)}$$

Vm(std) = **21.091** ft^3

2. Volume of water vapor corrected to standasrd conditions, scf

Vw(std) = 0.04707 x Vwc

Vw(std) = 0.04707 x 33.2

Vw(std) = **1.563** ft^3

3. Moisture Content

$$Bws = \frac{Vw(std)}{Vw(std) + Vm(std)}$$

$$Bws = \frac{1.563}{1.563 + 21.091}$$

Bws = **0.0690 or 6.90 %**

4. Mole fraction of dry gas

Mfd = 1 - Bws

Mfd = 1 - 0.0690

Mfd = **0.931**

5. Dry molecular weight of gas stream, lb/lb-mole

$Md = (0.440 \times \%CO_2) + (0.320 \times \%O_2) + (0.280 \times (\%N_2 + \%CO))$

Md = (0.440 x 10.30) + (0.320 x 9.50) + (0.280 x (80.20))

Md = **30.03** **lb/lb-mole**

6. Wet molecular weight of flue gas, lb/lb-mole

Ms = (Md x Mfd) + (18 x (1-Mfd))

Ms = (30.03 x 0.931) + (18 x (1 - 0.931))

Ms = **29.20** **lb/lb-mole**

7. Absolute stack gas pressure, "Hg

$$Ps = Pbar + \frac{Pg}{13.6}$$

$$Ps = 29.79 + \frac{0.90}{13.6}$$

Ps = **29.86** **"Hg**

8. Average velocity of gas stream at actual conditions, ft/sec.

$$vs = 85.49 \times Cp \times \left(\frac{dP_{ave} \times (ts + 460)}{(Ps \times Mw)} \right)^{0.5}$$

$$vs = 85.49 \times 0.74 \times \left(\frac{1.964 \times (298.8 + 460)}{(29.86 \times 29.20)} \right)^{0.5}$$

vs = **82.72** ft/sec

9. Average gas stream volumetric flowrate at actual conditions, wacf/min.

Qaw = (60 / 144) x vs x As

Qaw = (60 / 144) x 82.72 x 6,361.7

Qaw = **219,280.5** ACFM

10. Average gas stream dry volumetric flowrate at standard conditions, dscf/min.

$$Qsd = 17.64 \times Mfd \times \frac{Ps}{(ts + 460)} \times Qaw$$

$$Qsd = 17.64 \times 0.931 \times \frac{29.86}{(298.8 + 460)} \times 219{,}280.5$$

Qsd = **141,699.5** DSCFM

11. Percent isokinetic of sampling rate, %

$$\%I = \frac{100 \times (ts + 460) \times Vmstd \times 29.92}{60 \times vs \times \Theta \times Ps \times Mfd \times 528 \times (PI \times (Dn / 2)^2)}$$

$$\%I = \frac{100 \times (298.8 + 460) \times 21.091 \times 29.92}{60 \times 82.72 \times 59.8 \times 29.86 \times 0.931 \times 528 \times (3.142 \times (0.144 / 2)2)}$$

%I = **97.27** %

12. Stack Gas Viscocity, micropoise

$$\mu s = -150.3162 + (13.4622 \times \sqrt{(ts + 460)}) + (3{,}861{,}530 \times (ts + 460)^{-2}) + (0.591123 \times \%O_2 \times Mfd) - (91.9723 \times Bws) + (1.51761 \times 10^{-5} \times Bws \times (ts + 460)^2)$$

$$\mu s = -150.3162 + (13.4622 \times \sqrt{(298.8 + 460)}) + (3{,}861{,}530 \times (298.8 + 460)\text{-}2) + (0.591123 \times 9.5 \times 0.931) - (91.9723 \times 0.0690) + (1.51761\text{x}10\text{-}5 \times 0.0690 \times (298.8 +$$

μs = 226.71 **micropoise**

13. Cyclone flow rate, CFM

$$Qs = \frac{29.92 \times (ts + 460)}{528 \times Ps} \times \frac{Vmstd}{Mfd \times \Theta}$$

$$Qs = \frac{29.92 \times (298.8 + 460)}{528 \times 29.86} \times \frac{21.091}{0.931 \times 59.75}$$

Qs = **0.546** ft^3/min

14. Nozzle Velocity, ft/sec.

$$Vn = \frac{3.056 \times Qs}{Dn^2}$$

$$Vn = \frac{3.056 \times 0.546}{0.020736}$$

Vn = **80.474** ft/sec

15. Particulate cut size for Cyclone I, microns

$$D_{50} = 0.15625 \left(\frac{(ts + 460)}{(Mw \times Ps)} \right)^{0.2091} \times \left(\frac{\mu s}{Qs} \right)^{0.7091}$$

$$D_{50} = 0.15625 \times \frac{(298.8 + 460)}{(29.20 \times 29.86)}^{0.2091} \times \frac{226.71}{0.546}^{0.7091}$$

D_{50} = **10.91** **microns**

16. Limit Calculations, ft/sec (Used in calculating the deltaP min and max)

$$V_{min} = Vn \times \left[0.2457 + \left[0.3072 - \frac{0.2603 \times (Qs)^{0.5} \times \mu s}{Vn^{1.5}}\right]^{0.5}\right]$$

$$V_{min} = 80.474 \times 0.2457 + \left[0.3072 - \frac{0.2603 \times (0.546)^{0.5} \times 226.71}{(80.474)^{1.5}}\right]^{0.5}$$

V_{min} = **59.752** **ft/sec**

17. Delta P limit calculations, "H_2O

$$\Delta P_{min} = 1.3686 \times 10^{-4} \times \left[\frac{Ps \times Mw \times (V_{min})^2}{(ts + 460) \times (Cp)^2}\right]$$

$$\Delta P_{min} = 1.3686 \times 10^{-4} \times \left[\frac{29.86 \times 29.20 \times (3{,}570.302)}{(298.8 + 460) \times (0.74)}\right]$$

ΔP_{min} = **1.0251** **"H_2O**

18. Dwell time calculations, min.

18.1 Point 1

$$t_1 = \left[\frac{\Delta P'_1}{\Delta P'_{avg}}\right]^{0.5} \times \frac{\Theta}{\#\text{ of points}}$$

$$t_1 = \left[\frac{3.10}{2.04}\right]^{0.5} \times \frac{60}{24}$$

t_1 = **3.08 or 2.50 when rounded to the quarter minute.**

18.2 Rest of points

$$t_n = \frac{t_1}{(\Delta P_1)^{0.5}} \times (\Delta P_n)^{0.5} \quad [\, n = 2,3, \ldots \text{ total number of sampling points} \,]$$

$$t_n = \frac{2.54}{(2.1)^{0.5}} \times (1.5)^{0.5} \quad [\, n = 2 \text{ for example calculation} \,]$$

t_n = **2.14 or 2.25 when rounded to the quarter minute.**

19. Reynolds Number Actual

$$N_{re} = 8.64 \times 10^5 \times \left[\frac{P_s \times M_w}{t_s + 460}\right] \times \left[\frac{Q_s}{\mu}\right]$$

$$N_{re} = 8.64 \times 10^5 \times \left[\frac{29.86 \times 29.20}{298.8 + 460}\right] \times \left[\frac{141{,}699.5}{226.71}\right]$$

N_{re} = **2,390.8**

20. Cunningham Correction Factor @ Stack Conditions

$$C = 1 + 0.0057193 \times \left[\frac{\mu}{P_s \times D_p}\right] \times \left[\frac{t_s + 460}{M_w}\right]^{0.5}$$

$$C = 1 + 0.0057193 \times \left[\frac{226.71}{29.86 \times 2.5}\right] \times \left[\frac{298.8 + 460}{29.20}\right]^{0.5}$$

C = **1.09**

21. Particulate < PM2.5 concentration, gr/dscf

$$\text{gr/dscf} = \frac{7{,}000}{453.592} \times \frac{\text{mg}/10^3\ (\text{g})}{\text{Vmstd}}$$

$$\text{gr/dscf} = \frac{7{,}000}{453.592} \times \frac{0.0003}{21.091}$$

gr/dscf = **0.00022**

22. Particulate < PM2.5 concentration, mg/dscm

$$\text{mg/dscm} = \frac{\text{mg}}{\text{Vmstd}} \times 35.314475$$

$$\text{mg/dscm} = \frac{0.3}{21.091} \times 35.314475$$

mg/dscm = **0.5**

23. Particulate < PM2.5 emission rate, lb/hr

$$\text{lb/hr} = \frac{\text{gr/dscf}}{7{,}000} \times \text{Qsd} \times 60$$

$$\text{lb/hr} = \frac{0.0002}{7{,}000} \times 141{,}699.5 \times 60$$

lb/hr = **0.2**

EPA Method 26A – Example Calculations

Client: Aurora Energy LLC

Location: Fairbanks, AK

Site Location: Combined Boiler Baghouse Exhaust

Run #: 2

Date: 11-19-2011

Nomenclature:

A_n = cross-sectional area of nozzle, ft^2

A_s = cross-sectional area of stack, $ft.^2$

B_{ws} = water vapor in the gas stream, proportion by volume

C_p = pitot tube coefficient, dimensionless

C_S = concentration of particulate mater in stack gas

ΔH = average ΔH, inches H_2O

K_p = pitot tube constant = 85.49 ft/sec $\sqrt{\frac{(lb/lb-mole)(inches\ Hg)}{(^oR)(inches\ H_2O)}}$

M_d = molecular weight of stack gas, dry basis, lb./lb.-mole

M_s = molecular weight of stack gas, wet basis, lb./lb.-mole
$= M_d(1- B_{ws}) + 18(B_{ws})$

$\sqrt{\Delta P}_{avg}$ = average velocity head of stack gas, $\sqrt{inches\ H_2O}$

P_s = absolute stack gas pressure, inches Hg

P_{static} = static pressure of the stack, inches H_2O

P_{std} = standard absolute pressure, 29.92 inches Hg

Q = Actual stack gas flow rate, acf/min

Q_{sd} = stack flow rate, dscfh

θ = sample time, minutes

T_s = average stack temperature, °F

T_{std} = standard absolute temperature, 528°R

T_s = Average absolute stack temperature,°R

V_{mstd} = corrected meter volume, dscf

V_S = average stack gas velocity, ft./sec.

V_{lc} = volume of water gain in the impingers, ml

1. Volume of metered sample gas at standard conditions:

$$P_m = P_{bar} + \frac{\Delta H}{13.6}$$

$$P_m = \frac{29.79}{} + \frac{2.113}{13.6} = \frac{29.95}{} \text{ inches Hg}$$

$$V_{m(std)} = \frac{(V_m)(T_{std})(P_m)(Y)}{(T_m + 460)(P_{std})}$$

$$V_{m(std)} = \frac{(48.765)(528)(29.95)(0.9889)}{(76.0 + 460)(29.92)} = \frac{47.544}{} \text{ dscf}$$

2. Moisture Content:

$$V_{w(std)} = (0.04715 \text{ ft}^3/\text{gram water})(V_{lc})$$ 1 gram water ≡ 1 ml water

$$V_{w(std)} = (0.04715)(\underline{109.1}) = \underline{5.144} \text{ scf}$$

$$B_{ws} = \frac{V_{w(std)}}{V_{w(std)} + V_{m(std)}}$$

$$B_{ws} = \frac{5.144}{5.144 + 47.544} = \underline{0.0976} \text{ water vapor fraction}$$

3. Molecular Weight:

Dry:

$M_d = (0.44 * \%CO_2) + (0.32 * \%O_2) + (0.28 * (100 - \%CO_2 - \%O_2))$

$= (0.44 * \underline{10.4}) + (0.32 * \underline{9.4}) + (0.28 * (100 - \underline{10.4} - \underline{9.4}))$

$= \underline{30.04}$ lb/lb-mole

Wet:

$M_w = M_d * (1 - B_{ws}) + (18 * (B_{ws}))$

$= (\underline{30.04}) * (1 - \underline{0.0976}) + (18 * (\underline{0.0976}))$

$= \underline{28.86}$ lb/lb-mole

4. Average Velocity of Stack Gas:

$$P_s = P_{bar} + \frac{P_{static}}{13.6}$$

$$P_s = \underline{29.79} + \frac{0.90}{13.6} = \underline{29.86}$$

$$V_s = K_p * C_p * \sqrt{\Delta P_{avg}} \sqrt{\frac{T_s}{M_w * P_s}}$$

$$V_s = 85.49 * \underline{0.84} * \underline{1.256} \sqrt{\frac{759.5}{\underline{28.86} * \underline{29.86}}} = \underline{84.7} \; ft/\sec$$

5. Stack Gas Volumetric Flow Rate (standard conditions, dry basis):

$$Q_{sd} = \left(\frac{528}{29.92}\right)(Q)\left(\frac{P_s}{T_s}\right)(1 - B_{ws})$$

$Q = 84.7 \frac{ft}{sec} \times 44.18 ft^2 \times 60 \frac{sec}{min} = 224,441 \frac{act}{min}$

($90^2 * 3.14159/4/144$)

$$Q_{sd} = \left(\frac{528}{29.92}\right) * \underline{224441} * \left(\frac{\underline{29.86}}{\underline{759.5}}\right) * (1 - \underline{0.0976}) = \underline{140489} \; dscfm$$

6. Percent Isokinetic:

$$I = 100 * A_s * \frac{V_{m(std)}}{\theta * \left(\frac{A_n}{144}\right) * Q_{sd}}$$

$$I = 100 * \frac{44.18}{\left(\frac{47.544}{60 * \left(\frac{0.0346}{144}\right) * 140489}\right)} = 103.6\ \%$$

7. Hydrogen Chloride (HCl):

1/456590 = conversion of mg to pounds
36.461 = molecular weight of HCL in mg
35.453 = molecular weight of Cl^-

as mg/dscm:

$$\frac{1790}{}\ \mu gCl^- * \frac{36.461 mgHCl}{m-mole} * \frac{m-mole}{35.453 mgCl^-} * \frac{1mg}{1000\mu g} * \frac{1}{1.346\ dscm} = \frac{1.368}{}\ \frac{mg}{dscm}$$

as ppm:

$$\frac{1.368}{}\ \frac{mg}{dscm} * \frac{22.045ml}{m-mole} * \frac{m-mole}{36.461 mgHCL} * \frac{293.15°K}{273.15°K} * \frac{m^3}{10^6 ml} * \frac{10^6\ ppm}{1} = \frac{1.0}{}\ ppm$$

as lb/hr:

$$\frac{1.368}{}\ \frac{mg}{dscm} * \frac{m^3}{35.31 ft^3} * \frac{140489}{\min}\ \frac{dscf}{} * \frac{1lb}{453590 mg} * \frac{60\min}{hr} = \frac{0.720}{}\ \frac{lb}{hr}$$

8. Hydrogen Fluoride (HF):

1/456590 = conversion of mg to pounds
20.006 = molecular weight of HF in mg
18.998 = molecular weight of F^-

as mg/dscm:

$$\frac{1620}{}\ \mu gCl^- * \frac{20.006 mgHF}{m-mole} * \frac{m-mole}{18.998 mgF^-} * \frac{1mg}{1000\mu g} * \frac{1}{1.346\ dscm} = \frac{1.267}{}\ \frac{mg}{dscm}$$

as ppm:

$$\frac{1.267}{}\ \frac{mg}{dscm} * \frac{22.045ml}{m-mole} * \frac{m-mole}{20.006mgHF} * \frac{293.15°K}{273.15°K} * \frac{m^3}{10^6 ml} * \frac{10^6\ ppm}{1} = \frac{1.5}{}\ ppm$$

as lb/hr:

$$\frac{1.267}{}\ \frac{mg}{dscm} * \frac{m^3}{35.31ft^3} * \frac{140489}{}\ \frac{dscf}{\min} * \frac{1lb}{453590mg} * \frac{60\min}{hr} = \frac{0.667}{}\ \frac{lb}{hr}$$

EPA Method 30B – Mercury Example Calculations

Client: Aurora Energy LLC

Location: Fairbanks, AK

Site Location: Combined Boiler Exhaust Stack

Run #: 3A

Date: 11-19-2011

Sample Volume Correction to Standard Conditions of 528° F & 29.92" Hg

$$V_{m(std)} = \frac{(V_m)(528)(Pbar)}{(T_m + 460)(29.92)}$$

$$V_{m(std)} = \frac{(21.937)(528)(29.79)}{(61\ °F + 460)(29.92)} = 22.135 \text{ Trap } Vm_{(std)} \text{ (Liters)}$$

22.135 Trap 3A $Vm_{(std)}$ (Liters) * 0.001[1] = 0.022 dscm

[1]0.001 = 1 L/1,000 m^3

Emission Concentration Results

(0.4 ng * 0.001[2])/0.022 dscm = 2.75 µg/dscm

[2]0.001 = 1 µg/1,000 ng

Emission Rate Results

$$\frac{2.75\ \mu g}{dscm} * \frac{1\ mg}{1{,}000\ \mu g} * \frac{140489\ dscf}{min} \times \frac{1\ m^3}{35.31\ ft^3} = 10.9 \text{ mg/min}$$

$$\frac{10.9\ mg}{min} * \frac{1\ g}{1{,}000\ mg} * \frac{lb}{453.6\ g} * \frac{60\ min}{hr} = 0.001 \text{ lb/hr}$$

TRC

Page of

40 CFR 60 Method 1 -- TRAVERSE POINT LOCATIONS

Project No.	187446	**Date**	11/17/11
Client	Aurora Energy	**Operator**	KBA
Facility	Fairbanks, AK	**Source**	Stack

Dimensions

Circular		Rectangular	
Far Wall to Outside of Port (in.)	94.25	Stack Width (in.)	
Port Length (in.)	4.25	Depth (in.)	
Stack Diameter or Depth (in.)	90.00	Equiv. Stack Diameter (in.)	######

Point No.	A Internal Dimension (in.)	B Internal Dimension (%)	(A x B) Distance from Inside Wall (in.)	C Port Length (in.)	(A x B) + C Point Location (in.)
1	90.00	2.1	1.89	4.25	6.1
2	90.00	6.7	6.03	4.25	10.3
3	90.00	11.8	10.62	4.25	14.9
4	90.00	17.7	15.93	4.25	20.2
5	90.00	25	22.50	4.25	26.8
6	90.00	35.6	32.04	4.25	36.3
7					
8					
9					
10					
11					
12					

Comments:

Stack / Ports Stack Type: __X__ Circular ____ Rectangular

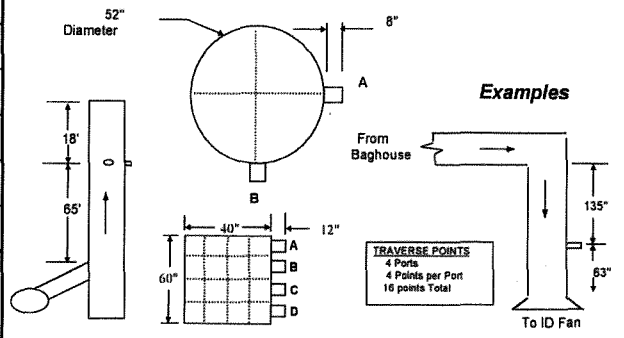
Number and Type of Ports Available	4
Port Inside Diameter (in.)	

Distance to Flow Disturb. Reference: ___ Disturbance __X_ Port

	Distance (ft)	Diameters
Upstream (U)	31	4.1
Downstream (D)	75	10
Number of Traverse Points	Particulates	Velocity
Minimum Required	24	
Number of Ports Used	4	
Points per Port	6	

Test Location Schematic(s)

1. Include distances to disturbances and note what they are.
2. Show and label all ports. Note which was used for each test type.
3. Indicate the air flow direction.



NA = Not Applicable
Rev. 1 (5/2005)

Checked By: Kurt B. Hallquist 3/6/12 (Project Manager or QA Manager - sign and date)

TRC **ISOKINETIC FIELD DATA SHEET Method: 26A** Page of

Project No.	187446	Date	11:19:11
Client	Aurora Energy	Operator	
Facility	Fairbanks, AK		
Source	Chena Power Plant	Condition	
Sampling Location	Stack	Run No.	1

Assumed Moisture (%)	Ambient Temp. (°F)	Filter No.	Probe Liner Material	Probe Setting (°F)	Probe Length (ft)	Barometric Pressure (in. Hg)	Static Pressure (in. Hg)	Stack Diameter (in.)
9.5	–		glass	250	4	29.79	-.9	90.0
K Factor 1.1								

Pitot Tube				DGM - Meter Box			Nozzle	
	Pre-test: Pass?	Post-test: Pass?	ID No.	PTCF or Cp	Meter No.	ΔH @	DGMCF or Y	ID No.	Diameter (in)
+	Y	Y	P22	.84	1424	1.6075	.9885		.210
-	Y	Y							

Traverse Point	Time (24 hr)	DGM Volume (ft^3)	Pitot ΔP (in. H_2O)	Orifice ΔH (in. H_2O)	Temperature (°F) Stack Flue Gas	Probe	Filter Box	Impingers Exit	DGM Meter In	DGM Meter Out	CPM Filter	Pump Vacuum (in. Hg)
A 6	0	487.551	2.5	2.8	296	249	252	3	60	62		0
5	2.5	490.30	3.0	3.3	296	251	254	10	59	62		0
4	5	493.37	2.6	2.9	299	258	258	13	59	62		0
3	7.5	496.76	2.2	2.4	296	262	253	14	61	62		0
2	10	497.01	2.0	2.2	296	260	264	16	63	63		0
1	12.5	499.02	2.2	2.4	296	256	261	20	65	64		0
B 6	15	501.042	2.1	2.3	297	262	253	21	67	65		0
5	17.5	503.18	2.2	2.4	296	264	246	23	67	65		0
4	20	505.31	2.2	2.4	296	254	256	23	69	65		0
3	22.5	507.52	2.0	2.2	296	260	256	25	71	65		0
2	25	509.62	1.6	1.8	296	259	256	26	72	65		0
1	27.5	511.37	1.7	1.9	296	261	256	28	74	66		0
C 6	30	513.256	1.5	1.7	296	258	249	28	72	67		0
5	32.5	515.47	1.2	1.3	297	258	248	32	73	67		0
4	35	516.74	1.2	1.3	297	255	249	34	73	67		0
3	37.5	518.47	1.2	1.3	297	258	253	37	74	67		0
2	40	519.56	1.1	1.2	297	253	249	39	74	68		0
1	42.5	521.48	1.0	1.1	297	253	253	43	74	68		0
D 6	45	522.973	1.5	1.7	297	257	253	42	72	68		0
5	47.5	524.89	1.2	1.3	297	256	253	42	73	68		0

Sample Train Leak Checks (e.g., pre-test, at each port change, post-test)

Port / AWFCO		Volume (ft^3) Start	Volume (ft^3) Stop	Time (sec.)	Vacuum (in Hg)	Leak Rate (cfm)
Port:	Before			60	15	0.011
	After			60	5	0.005
Port:	Before					
	After					
Port:	Before					
	After					

Comments: *Note:* Test Location Schematic is presented separately.

start 11:12

End 12:30

DN: .210 .210 .205

TRC **ISOKINETIC FIELD DATA SHEET (Continued) Method: 26A** Page of

Project No.	187446	Date	~~11.18.11~~ 11.19.11
Client	Aurora Energy	Operator	[illegible]
Facility	Fairbanks, AK		
Source	Chena Power Plant	Condition	
Sampling Location	Stack	Run No.	~~2~~ 1

Traverse Point	Time (24 hr)	DGM Volume (ft^3)	Pitot ΔP (in. H_2O)	Orifice ΔH (in. H_2O)	Temperature (°F) Stack Flue Gas	Probe	Filter Box	Impingers Exit	DGM Meter In	DGM Meter Out	CPM Filter	Pump Vacuum (in. Hg)
4	50	526.72	.50	.89	297	~~258~~	251	40	75	70		0
3	52.5	527.90	.95	1.0	299	265	~~255~~	41	74	68		0
2	55	529.57	1.3	1.4	297	~~258~~	251	42	74	68		0
1	525	531.28	1.1	1.2	~~295~~	253	251	43	74	69		0
END	60	532.681										
			1.285	✓								
			1.279	1.854	✓							
		45.130	~~1.550~~	~~1.9406~~	296.6				67.8			

Sample Train Leak Checks (e.g., pre-test, at each port change, post-test)

Port / AWFCO		Volume (ft^3) Start	Volume (ft^3) Stop	Time (sec.)	Vacuum (in Hg)	Leak Rate (cfm)
Port:	Before					
	After					
Port:	Before					
	After					
Port:	Before					
	After					

Comments:

TRC

ISOKINETIC FIELD DATA SHEET Method: 26A

Page of

Project No.	187446	Date	11·19·11
Client	Aurora Energy	Operator	JCox
Facility	Fairbanks, AK		
Source	Chena Power Plant	Condition	
Sampling Location	Stack	Run No.	2

Assumed Moisture (%)	Ambient Temp. (°F)	Filter No.	Probe Liner Material	Probe Setting (°F)	Probe Length (ft)	Barometric Pressure (in. Hg)	Static Pressure (in. Hg)	Stack Diameter (in.)
9.5	-10		glass	250	4	29.79	.9	90
K Factor 1.5								

Pitot Tube: Pitot Pre-test: Pass?	Pitot Post-test: Pass?	ID No.	PTCF or Cp	DGM - Meter Box: Meter No.	ΔH@	DGMCF or Y	Nozzle: ID No.	Diameter (in)
+/ Y ___ N; -/ Y ___ N	+/ Y ___ N; -/ Y ___ N	P22	.84	1424	1.6075	.9889		.210

Traverse Point	Time (24 hr)	DGM Volume (ft^3)	Pitot ΔP (in. H_2O)	Orifice ΔH (in. H_2O)	Temperature (°F): Stack Flue Gas	Probe	Filter Box	Impingers Exit	DGM Meter In	DGM Meter Out	CPM Filter	Pump Vacuum (in. Hg)
A 6	0	533.429	1.4	1.8	298	261	251	14	70	71		0
5	2.5	535.43	1.1	1.4	300	269	250	19	72	71		0
4	5	537.01	1.2	1.6	298	257	255	22	75	71		0
3	7.5	538.80	1.0	1.3	298	258	252	21	77	71		0
2	10	540.50	.93	1.2	298	257	256	20	78	71		0
1	12.5	542.12	1.2	1.6	298	258	252	19	79	71		0
B 6	15	543.870	1.7	2.2	299	253	249	16	76	72		1
5	17.5	546.05	1.3	1.7	300	254	251	19	78	72		1
4	20	548.00	1.0	1.3	300	255	251	20	80	72		1
3	22.5	549.51	1.3	1.7	300	256	249	22	80	72		1
2	25	551.56	1.1	1.4	300	254	249	24	81	72		1
1	27.5	553.12	.92	1.2	300	253	250	26	81	72		1
C 6	30	554.700	2.2	2.9	297	259	250	31	78	72		4
5	32.5	557.11	2.0	2.6	301	258	249	34	80	72		3
4	35	559.44	2.3	3.0	301	250	251	36	81	72		4
3	37.5	561.77	2.0	2.6	301	253	248	41	83	72		3
2	40	564.08	1.5	2.0	302	253	248	49	83	73		3
1	42.5	566.03	1.6	2.1	301	251	252	55	83	73		3
D 6	45.0	568.046	2.5	3.3	296	253	248	58	81	73		5
5	~~47.5~~ 45	570.74	2.5	3.3	301	255	248	62	83	73		5

Sample Train Leak Checks (e.g., pre-test, at each port change, post-test)

Port / AWFCO		Volume (ft^3) Start	Volume (ft^3) Stop	Time (sec.)	Vacuum (in Hg)	Leak Rate (cfm)
Port:	Before			60	15	0.009
	After			60	10	0.005
Port:	Before					
	After					
Port:	Before					
	After					

Comments: Note: Test Location Schematic is presented separately.

start 1404

End 1517

TRC **ISOKINETIC FIELD DATA SHEET (Continued) Method: 26A** Page of

Project No.	187446	Date	11-19-11
Client	Aurora Energy	Operator	JRA
Facility	Fairbanks, AK		
Source	Chena Power Plant	Condition	
Sampling Location	Stack	Run No.	2

Traverse Point	Time (24 hr)	DGM Volume (ft^3)	Pitot ΔP (In. H_2O)	Oriface ΔH (In. H_2O)	Temperature (°F)							Pump Vacuum (in. Hg)
					Stack Flue Gas	Probe	Filter Box	Impingers Exit	DGM Meter In	DGM Meter Out	CPM Filter	
	50	573.11	2.3	3.0	300	255	248	66	84	73		3
	52.5	575.58	1.8	2.3	302	259	252	66	84	74		3
	55	577.70	1.8	2.3	299	257	248	66	84	74		3
	57.5	580.02	2.2	2.9	299	255	250	64	84	74		4
END	60	582.194										
			1.256									
		48.765	~~1.679~~	2.713	299.5				76.0			

Sample Train Leak Checks (e.g., pre-test, at each port change, post-test)						
Port / AWFCO		Volume (ft^3) Start	Volume (ft^3) Stop	Time (sec.)	Vacuum (in Hg)	Leak Rate (cfm)
Port:	Before					
	After					
Port:	Before					
	After					
Port:	Before					
	After					

Comments:

TRC

ISOKINETIC FIELD DATA SHEET Method: 26A

Page of

Project No.	187446	Date	11.19.11
Client	Aurora Energy	Operator	KBA
Facility	Fairbanks, AK		
Source	Chena Power Plant	Condition	
Sampling Location	Stack	Run No.	3

Assumed Moisture (%)	Ambient Temp. (°F)	Filter No.	Probe Liner Material	Probe Setting (°F)	Probe Length (ft)	Barometric Pressure (in. Hg)	Static Pressure (in. Hg)	Stack Diameter (in.)
	-14		glass	250	4	29.79	.9	90.00
K Factor 1.2								

Pitot Tube				DGM - Meter Box			Nozzle	
	ID No.	PTCF or Cp	Meter No.	ΔH @	DGMCF or Y	ID No.	Diameter (in)	
Pitot Pre-test: Pass? + ✓ Y ___ N - ___ Y ___ N								
Pitot Post-test: Pass? + ✓ Y ___ N - ✓ Y ___ N	P22	.84	1424	1.6075	.9889		.210	

Traverse Point	Time (24 hr)	DGM Volume (ft^3)	Pitot ΔP (in. H_2O)	Orifice ΔH (in. H_2O)	Temperature (°F) Stack Flue Gas	Probe	Filter Box	Impingers Exit	DGM Meter In	DGM Meter Out	CPM Filter	Pump Vacuum (in. Hg)
A 6	0	582.817	2.4	2.9	295	259	252	24	61	62		0
5	2.5	585.36	1.9	2.3	295	259	252	27	61	62		0
4	5	587.48	2.2	2.6	296	253	251	27	61	63		0
3	7.5	589.80	2.4	2.9	296	254	251	26	63	63		0
2	10	591.92	1.9	2.3	296	256	251	24	65	63		0
1	12.5	594.05	2.2	2.6	296	254	252	25	66	63		0
B 6	15	596.329	2.0	2.4	297	254	251	25	67	63		0
5	17.5	598.62	2.1	2.5	297	254	250	27	68	63		0
4	20	600.67	1.9	2.3	296	255	250	29	70	63		0
3	22.5	602.78	1.6	1.9	296	255	249	31	71	64		0
2	25	604.70	1.2	1.4	296	255	249	35	72	64		0
1	27.5	606.42	1.5	1.8	296	252	250	38	73	64		0
C 6	30	608.290	1.1	1.3	295	256	251	30	71	65		0
5	32.5	609.97	1.1	1.3	295	256	251	30	72	65		0
4	35	611.72	1.0	1.2	295	255	251	29	73	65		0
3	37.5	613.24	1.1	1.3	295	255	250	30	74	66		0
2	40	615.00	.95	1.1	295	257	251	28	74	66		0
1	42.5	616.47	1.3	1.6	296	257	251	27	74	66		0
D 6	45	618.250	1.5	1.8	296	256	256	31	73	67		0
5	47.5	620.30	1.7	2.0	296	256	258	37	74	67		0

Sample Train Leak Checks (e.g., pre-test, at each port change, post-test)

Port / AWFCO		Volume (ft^3) Start	Volume (ft^3) Stop	Time (sec.)	Vacuum (in Hg)	Leak Rate (cfm)
Port:	Before			60	15	.015
	After			60	8	.007
Port:	Before					
	After					
Port:	Before					
	After					

Comments: Note: Test Location Schematic is presented separately.

~~start~~ 1710
End 1824

TRC **ISOKINETIC FIELD DATA SHEET (Continued) Method: 26A** Page of

Project No.	187446	Date	11.19.24
Client	Aurora Energy	Operator	[illegible]
Facility	Fairbanks, AK		
Source	Chena Power Plant	Condition	
Sampling Location	Stack	Run No.	3

Traverse Point	Time (24 hr)	DGM Volume (ft^3)	Pitot ΔP (in. H_2O)	Orifice ΔH (in. H_2O)	Temperature (°F)							Pump Vacuum (in. Hg)
					Stack Flue Gas	Probe	Filter Box	Impingers Exit	DGM Meter In	DGM Meter Out	CPM Filter	
4	50	622.26	1.3	1.6	296	260	258	37	75	67		0
3	52.5	623.07	1.1	1.3	296	259	258	38	76	68		0
2	55	625.74	.98	1.2	296	257	257	37	76	68		0
1	57.5	627.21	.95	1.1	296	256	256	39	76	68		0
End	60	628.754										
		45.937	1.233	1.863	295.8				67.5			

Sample Train Leak Checks (e.g., pre-test, at each port change, post-test)

Port / AWFCO		Volume (ft^3) Start	Volume (ft^3) Stop	Time (sec.)	Vacuum (in Hg)	Leak Rate (cfm)
Port:	Before					
	After					
Port:	Before					
	After					
Port:	Before					
	After					

Comments:

TRC

SAMPLING TRAIN SET UP AND RECOVERY

Page of

			Set Up	Recovery
Project No.	187446	Date 11/18/11	MSC	
Client	Aurora Energy	Set-up/Recovery Person		
Facility	Fairbanks, AK			
Source	Stack	Condition		

Run No. 1

Train Type Method 26A

Sample ID ~~AE-M26A/202-R1~~ AE-M26A-R1

FRONT HALF Filter No. / Thimble No. (NA, unless noted)

IMPINGERS

Impinger No.	1	2	3	4	5			
Reagent	0.1N H_2SO_4	0.1N H_2SO_4	MT					
Vol. Added (ml)	100	100	—					
Final Weight (g)	654.1	751.0	636.0					
Initial Weight (g)	625.2	711.4	620.6					
Net Collected (g)	28.9	39.6	15.4					

Silica Gel Imp. No.			
Final Weight (g)	828.7		
Initial Weight (g)	617.4		
Net Collected (g)	11.3		

TOTAL MOISTURE (Impingers and Silica gel) (g)

Run No. 1 ~~2~~

Train Type Method 26A

Sample ID ~~AE-M26A/202-R2~~ AE-M26A-R~~2~~1

FRONT HALF Filter No. / Thimble No. (NA, unless noted)

IMPINGERS

Impinger No.	1	2	3	4	5			
Reagent	H_2SO_4	0.1N	MT					
Vol. Added (ml)	100	100	—					
Final Weight (g)	659.7	771.4	622.2					
Initial Weight (g)	628.1	733.0	611.0					
Net Collected (g)	31.6	38.4	11.2					81.2

Silica Gel Imp. No.			
Final Weight (g)	936.4		
Initial Weight (g)	928.1		
Net Collected (g)	8.3		

TOTAL MOISTURE (Impingers and Silica gel) (g) 89.5

Run No. 2 ~~2~~

Train Type Method 26A

Sample ID ~~AE-M26A/202-R3~~ AEM26A-R~~3~~2 Train #3

FRONT HALF Filter No. / Thimble No. (NA, unless noted)

IMPINGERS

Impinger No.	1	2	3	4	5			
Reagent	H_2SO_4	0.1N	MT					
Vol. Added (ml)	100	100						
Final Weight (g)	768.0	780.0	636.0					
Initial Weight (g)	736.6	739.0	615.3					
Net Collected (g)	31.5	41.0	20.7					93.2

Silica Gel Imp. No.			
Final Weight (g)	911.1		
Initial Weight (g)	895.2		
Net Collected (g)	15.9		

TOTAL MOISTURE (Impingers and Silica gel) (g) 109.1

NA = Not Applicable
Rev. 1 (5/2005)

Checked By: Kevin A. Oberg 3-6-12 (Project Manager or QA Manager - sign and date)

TRC

SAMPLING TRAIN SET UP AND RECOVERY

Page of

			Set Up	Recovery
Project No.	187446	Date 11/19/11	RMM	
Client	Aurora Energy	Set-up/Recovery Person	RMM	
Facility	Fairbanks, AK			
Source	Stack	Condition		

Run No. 3

Train Type Method 26A

Sample ID AE-M26A-~~R1~~ R# 3

FRONT HALF Imp Set 2

Filter No.

Thimble No. (NA, unless noted)

IMPINGERS

Impinger No.	1	2	3	4	5			
Reagent	0.1N H_2SO_4		MT					
Vol. Added (ml)	100	100	MT					
Final Weight (g)	654.9	773.3	630.1					
Initial Weight (g)	629.8	732.8	613.0					
Net Collected (g)	25.1	40.5	17.1					82.7

Silica Gel Imp. No.			
Final Weight (g)	946.4		
Initial Weight (g)	936.4		
Net Collected (g)	10.0		

TOTAL MOISTURE (Impingers and Silica gel) (g): 92.7

Run No. 2

Train Type Method 26A

Sample ID AE-M26A-R2

FRONT HALF

Filter No.

Thimble No. (NA, unless noted)

IMPINGERS

Impinger No.	1	2	3	4	5			
Reagent								
Vol. Added (ml)								
Final Weight (g)								
Initial Weight (g)								
Net Collected (g)								

Silica Gel Imp. No.			
Final Weight (g)			
Initial Weight (g)			
Net Collected (g)			

TOTAL MOISTURE (Impingers and Silica gel) (g):

Run No. 3

Train Type Method 26A

Sample ID AE-M26A-R3

FRONT HALF

Filter No.

Thimble No. (NA, unless noted)

IMPINGERS

Impinger No.	1	2	3	4	5			
Reagent								
Vol. Added (ml)								
Final Weight (g)								
Initial Weight (g)								
Net Collected (g)								

Silica Gel Imp. No.			
Final Weight (g)			
Initial Weight (g)			
Net Collected (g)			

TOTAL MOISTURE (Impingers and Silica gel) (g):

NA = Not Applicable
Rev. 1 (5/2005)

Checked By: Kenneth Allen 3-6-12 (Project Manager or QA Manager - sign and date)

PM 2.5 FIELD DATA SHEET

TRC Environmental Corporation

Page 1 of 1

Client Name	Aurora Energy	Run Number	1 2 JAA
Plant Name	Chena Power	Job Number	187446
City / State	Fairbanks, AK	Test Date	11.18.11
Sampling Location	Stack	Start Time	1112
Test Personnel	KBA / JEM Operator Signature	Stop Time	1232

Filter/XAD	Tare	P barometer (in. Hg)	P static (in H2O)	Meterbox ID #	Meterbox Delta H@	Meterbox Y (Gamma)	Nozzle ID #	Nozzle Diameter	Pitot Tube ID #	Pitot Tube Cp	Probe ID #	Liner Material
		29.79	0	1420	1.653	.983		0.144		.84	—	GLASS

Equipment Leak Checks		Sample Train Leak Check Initial	Final	Interm 1	Interm 2	Interm 3	Interm 4	Fyrites Time	%O2	%CO2	Orsat Check
✓	Pitot, pretest	Vacuum, in Hg 10	5								
✓	Pitot, post-test	Leak Rate, cfm 0.010	0.010								Bag ID
	Positive DGM, pretest	Start Volume									
	Positive DGM, post-test	Stop Volume									

K Factor Setup Data		K =									
Delta H@	Meter Y	Nozzle Dia.	Avg DeltaP	% H2O	T stack	T meter	Pbar	Pstatic	% O2	%CO2	Cp

Line	Point No.	Time Dwell (min)	Time Elapsed (min)	Dry Gas Meter Reading (cu. ft.)	Pitot Reading (in. H2O)	Delta H Actual (in. H2O)	DGM Temp (°F)	Stack Temp (°F)	Probe Temp (°F)	Filter/Box Temp (°F)	Gauge Vacuum (in. Hg)	Imp Exit Temp (°F)	Cond Temp (°F)	BH Filter Temp (°F)
1	A 1	2.5	0.0	263.300	2.1	0.4	66	299	250	NA	3	66	NA	67
2	2	2.25	2:30	264.25	1.5	0.4	65	297	246		3	65		68
3	3	2.25	4:45	265.08	1.6	0.4	65	297	247		3	65		69
4	4	2.00	7:00	265.93	1.3	0.4	66	298	250		3	66		69
5	5	2.00	9:00	266.71	1.3	0.4	67	298	251		3	67		68
6	6	2.00	11:00	267.47	1.4	0.4	68	298	255		3	68		68
7	B 1	2.25	13:00	268.135	1.5	0.4	69	298	255		3	65		69
8	2	2.25	15:15	269.00	1.6	0.4	69	298	250		3	51		70
9	3	2.25	17:30	269.83	1.6	0.4	69	298	245		3	47		67
10	4	2.25	19:45	270.70	1.6	0.4	70	298	244		3	52		68
11	5	2.25	22.00	271.55	1.5	0.4	70	299	244		3	56		68
12	6	2.25	24:15	272.39	1.5	0.4	71	299	247		3	58		68
13	C 1	2.75	26:30	273.25	2.5	0.4	71	298	245		3	51		70
14	2	2.75	29:15	274.29	2.5	0.4	71	299	243		3	53		72
15	3	2.75	32:00	275.30	2.3	0.4	71	299	245		3	57		74
16	4	2.25	34.45	276.33	1.6	0.4	71	299	244		3	59		74
17	5	2.50	37:00	277.21	2.1	0.4	71	299	246		3	60		75
18	6	2.50	39:30	278.13	2.2	0.4	72	300	247		3	60		74
19	D 1	3.25	42:00	279.079	3.4	0.4	72	300	249		3	60		74
20	2	3.00	45:15	280.32	3.0	0.4	72	300	247		3	59		73
21	3	3.00	48:15	281.50	2.9	0.4	72	300	246		3	60		75
22	4	3.00	51:15	283.80	2.7	0.4	72	300	247		3	64		76
23	5	2.75	54:15	283.80	2.6	0.4	72	300	245		3	64		77
24	6	2.75	57:00	284.88	2.5	0.4	72	300	241		3	64		77
25			59:45	285.891										

Run Time	Total Volume	RMS Delta P	Delta H	Tmeter Avg	Tstack Avg
59:45	22.591	1.991	0.4	69.8	298.8

Checked By: Ken Allmendinger (sign) Ken Allmendinger 3/6/12 (print)
(Project Manager or QA Manager)

PM 2.5 FIELD DATA SHEET

TRC Environmental Corporation

Page 1 of 1

Client Name	Aurora Energy	Run Number	Z 3 JAA
Plant Name	Chena Power	Job Number	187446
City / State	Fairbanks, AK	Test Date	11/19/11
Sampling Location	Stack	Start Time	14:05
Test Personnel	KBA / JEM Operator Signature	Stop Time	15:17

Filter/XAD	Tare	P barometer (in. Hg)	P static (in H2O)	Meterbox ID #	Meterbox Delta H@	Meterbox Y (Gamma)	Nozzle ID #	Nozzle Diameter	Pitot Tube ID #	Pitot Tube Cp	Probe ID #	Liner Material
		29.79	.9	1420	1.653	0.983				.74		GL

Equipment Leak Checks		Sample Train Leak Check Initial	Final	Interm 1	Interm 2	Interm 3	Interm 4	Fyrites Time	%O2	%CO2	Orsat Check
✓ Pitot, pretest	Vacuum, in Hg	10									
✓ Pitot, post-test	Leak Rate, cfm	0.005									Bag ID
Positive DGM, pretest	Start Volume										
Positive DGM, post-test	Stop Volume										

K Factor Setup Data	K =									
Delta H@	Meter Y	Nozzle Dia.	Avg DeltaP	% H2O	T stack	T meter	Pbar	Pstatic	% O2	%CO2	Cp

Line	Point No.	Time Dwell (min)	Time Elapsed (min)	Dry Gas Meter Reading (cu. ft.)	Pitot Reading (in. H2O)	Delta H Actual (in. H2O)	DGM Temp (°F)	Stack Temp (°F)	Probe Temp (°F)	Filter/Box Temp (°F)	Gauge Vacuum (in. Hg)	Imp Exit Temp (°F)	Cond Temp (°F)	BH Filter Temp (°F)
1	D1	3.00	0	286.000	3.1	0.4	66	300	247	NA	3	42	NA	68
2	2	3.00	3:00	287.16	3.0	0.4	65	300	242		3	41		67
3	3	3.00	6:00	288.27	2.5	0.4	65	301	245		3	40		66
4	4	3.00	9:00	289.40	2.8	0.4	65	301	247		3	40		66
5	5	3.00	12:00	290.53	2.7	0.4	66	302	249		3	45		67
6	6	2.75	14:00	291.65	2.6	0.4	66	302	249		3	46		68
7	C1	2.75	17:45	292.660	2.5	0.4	66	302	247		3	40		69
8	2	2.75	20:30	293.69	2.6	0.4	67	302	249		3	58		70
9	3	2.75	23:15	294.75	2.5	0.4	68	303	246		3	50		70
10	4	2.75	26:00	295.79	2.2	0.4	68	303	245		3	44		68
11	5	2.50	28.45	296.80	2.1	0.4	68	303	246		3	45		67
12	6	2.75	31:15	297.67	2.2	0.4	69	303	245		3	45		68
13	B1	2.25	34:00	298.677	1.6	0.4	66	303	247		3	35		67
14	2	2.00	36:15	299.51	1.4	0.4	69	303	254		3	45		69
15	3	2.00	38:15	300.25	1.4	0.4	70	303	251		3	55		69
16	4	2.00	40:15	300.99	1.4	0.4	70	303	248		3	59		70
17	5	2.00	42:15	301.77	1.3	0.4	71	304	248		3	59		68
18	6	2.00	44:15	302.51	1.3	0.4	71	303	247		3	60		72
19	A1	2.50	46:15	303.225	1.8	0.4	69	303	249		3	52		68
20	2	2.25	48:45	304.20	1.5	0.4	71	305	248		3	56		70
21	3	2.50	51:00	304.98	1.8	0.4	71	305	250		3	56		70
22	4	2.50	53:30	305.93	2.0	0.4	72	303	249		3	57		72
23	5	2.25	56:00	306.85	1.5	0.4	72	304	245		3	61		77
24	6	2.25	58:15	307.70	1.5	0.4	73	302	247		3	58		79
25			60:30	308.581										

Run Time	Total Volume	RMS Delta P	Delta H	Tmeter Avg	Tstack Avg
60.5	22.581		0.4	68.5	302.64

Checked By: Ken. Allmendinger (sign) Ken Allmendinger 3/6/12 (print)
(Project Manager or QA Manager)

PM 2.5 FIELD DATA SHEET

TRC Environmental Corporation

Page 1 of 1

Client Name	Aurora Energy	Run Number	3 4 JAA
Plant Name	Chena Power	Job Number	187446
City / State	Fairbanks, AK	Test Date	11.19.11
Sampling Location	Stack	Start Time	1710
Test Personnel	KBA / JM Operator Signature	Stop Time	1826

Filter/XAD	Tare	P barometer (in. Hg)	P static (in H2O)	Meterbox ID #	Meterbox Delta H@	Meterbox Y (Gamma)	Nozzle ID #	Nozzle Diameter	Pitot Tube ID #	Pitot Tube Cp	Probe ID #	Liner Material
		29.79	0.9	1420	1.653	0.983		0.144		.74		GL

Equipment Leak Checks		Sample Train Leak Check Initial	Final	Interm 1	Interm 2	Interm 3	Interm 4	Fyrites Time	%O2	%CO2	Orsat Check
✓ Pitot, pretest	Vacuum, in Hg	10	5								
✓ Pitot, post-test	Leak Rate, cfm	0.011	0.001								Bag ID
Posltive DGM, pretest	Start Volume										
Positive DGM, post-test	Stop Volume										

K Factor Setup Data		K =									
Delta H@	Meter Y	Nozzle Dia.	Avg DeltaP	% H2O	T stack	T meter	Pbar	Pstatic	% O2	%CO2	Cp

Line	Point No.	Time Dwell (min)	Time Elapsed (min)	Dry Gas Meter Reading (cu. ft.)	Pitot Reading (in. H2O)	Delta H Actual (in. H2O)	DGM Temp (°F)	Stack Temp (°F)	Probe Temp (°F)	Filter/Box Temp (°F)	Gauge Vacuum (in. Hg)	Imp Exit Temp (°F)	Cond Temp (°F)	BH Filter Temp (°F)
1	A 1	2.25	0	309.311.700	1.5	0.4	62	297	247	NA	3	47	NA	69
2	2	2.25	2:15	312.55	1.6	0.4	62	297	245		3	58		77
3	3	2.25	4:30	313.41	1.5	0.4	62	298	247		3	60		78
4	4	2.25	6:45	314.27	1.5	0.4	62	300	246		3	61		78
5	5	2.00	9:00	315.13	1.3	0.4	63	299	246		3	61		78
6	6	2.00	11:00	315.88	1.3	0.4	63	299	245		3	62		78
7	B 1	2.00	13:00	316.71	1.4	0.4	64	298	247		3	61		72
8	2	2.00	15:00	317.01	1.4	0.4	65	298	246		3	62		69
9	3	2.00	17:00	317.21	1.4	0.4	67	298	249		3	61		69
10	4	2.25	19:00	318.06	1.5	0.4	66	297	246		3	58		70
11	5	2.00	21:15	318.77	1.4	0.4	66	297	245		3	53		70
12	6	2.00	23:15	319.61	1.3	0.4	66	297	247		3	52		67
13	C 1	2.50	25:15	320.357	2.1	0.4	66	297	248		3	46		68
14	2	2.50	27:45	321.34	2.2	0.4	69	297	248		3	52		67
15	3	2.50	30:15	322.29	2.1	0.4	68	298	248		3	54		69
16	4	2.25	32:45	323.23	2.1	0.4	68	298	246		3	55		69
17	5	2.50	35:15	324.08	2.0	0.4	69	298	247		3	56		70
18	6	2.50	37:45	325.07	2.0	0.4	69	298	245		3	56		70
19	D 1	3.00	40:15	326.069	3.1	0.4	67	297	250		3	55		69
20	2	3.00	43:15	327.21	3.0	0.4	69	299	254		3	55		69
21	3	3.00	46:15	328.32	2.9	0.4	70	298	243		3	51		70
22	4	3.00	49:15	329.46	2.9	0.4	72	299	246		3	51		70
23	5	3.00	52:15	330.58	2.7	0.4	71	299	247		3	50		71
24	6	2.75	55:15	331.73	2.6	0.4	71	299	250		3	50		71
25			58.00	332.821										

Run Time	Total Volume	RMS Delta P	Delta H	Tmeter Avg	Tstack Avg
58.0	21.121		0.4	66.5	298.0

Checked By: Ken A Kalgin (sign) Ken Allmendinger 3/6/12 (print)
(Project Manager or QA Manager)

TRC

SAMPLING TRAIN SET UP AND RECOVERY

Page of

			Set Up	Recovery
Project No.	187446	Date 11/19/11 11/19/11	MSL	MSL
Client	Aurora Energy	Set-up/Recovery Person		
Facility	Fairbanks, AK			
Source	Stack	Condition		

Run No. 1 — Train Type ~~Method 26A~~ 201A/202 — Sample ID AE-M201A/202-R1 — **FRONT HALF** Train #1 — Filter No. ~~647-003~~ NOR — Thimble No. (NA, unless noted)

IMPINGERS

Impinger No.	1	2	3	4	5			
Reagent	—	—	H_2O					
Vol. Added (ml)	MT	MT	100					
Final Weight (g)	~~605.1~~	~~540.1~~	~~698.0~~ NOR					
Initial Weight (g)	583.4	526.6	696.7					
Net Collected (g)								

Silica Gel Imp. No.			
Final Weight (g)	~~750.4~~ NOR		
Initial Weight (g)	894.0		
Net Collected (g)			

TOTAL MOISTURE (Impingers and Silica gel) (g)

Run No. 2 — Train Type ~~Method 26A~~ 201A/202 — Sample ID AE-M201A/202-R2 — **FRONT HALF** Train #2 — Filter No. 647-003 — Thimble No. (NA, unless noted)

IMPINGERS

Impinger No.	1	2	3	4	5			
Reagent	—	—	H_2O					
Vol. Added (ml)	MT	MT	100					
Final Weight (g)	605.1	540.1	698.0					
Initial Weight (g)	583.7	526.6	711.5					
Net Collected (g)	21.4	13.5	-13.5					

11/19/11

Silica Gel Imp. No.			
Final Weight (g)	950.4		
Initial Weight (g)	938.6		
Net Collected (g)	11.8		

TOTAL MOISTURE (Impingers and Silica gel) (g) 33.2 ✓

Run No. 3 — Train Type ~~Method 26A~~ 201A/202 — Sample ID AE-M201A/202-R3 — **FRONT HALF** Train #3 — Filter No. 647-005 — Thimble No. (NA, unless noted)

IMPINGERS

Impinger No.	1	2	~~3~~	#3	5			
Reagent	—	—	~~H_2O~~	H_2O				
Vol. Added (ml)	MT	MT	~~100~~	100				
Final Weight (g)	621.1	656.6	~~621.3~~	723.7				
Initial Weight (g)	596.1	642.7		720.2				
Net Collected (g)	25.0	13.9	~~621.3~~	3.5				

Silica Gel Imp. No.	4		
Final Weight (g)	830.3		
Initial Weight (g)	825.4		
Net Collected (g)	4.9		

TOTAL MOISTURE (Impingers and Silica gel) (g) 47.3 ✓

NA = Not Applicable
Rev. 1 (5/2005)

Checked By: Kevin A. Colgin 3/6/12 (Project Manager or QA Manager - sign and date)

TRC

SAMPLING TRAIN SET UP AND RECOVERY

Page of

			Set Up	Recovery
Project No.	187446	Date		
Client	Aurora Energy	Set-up/Recovery Person		
Facility	Fairbanks, AK			
Source	Stack	Condition		

Run No. 4

Train Type ~~Method 26A~~ 201A/202 — Train #1 — **FRONT HALF** — Filter No. 647-007

Sample ID AE-M26A-R1 — Thimble No. (NA, unless noted)

IMPINGERS

Impinger No.	1	2	3	4	5			
Reagent			H_2O					
Vol. Added (ml)	MT	MT	100					
Final Weight (g)	607.3	539.1	704.5					
Initial Weight (g)	589.9	527.6	700.4					
Net Collected (g)	17.4	11.5	4.1					

Silica Gel Imp. No.			
Final Weight (g)	909.5		
Initial Weight (g)	901.0		
Net Collected (g)	8.5		

TOTAL MOISTURE (Impingers and Silica gel) (g): 41.5 ✓

Run No. 2

Train Type Method 26A — **FRONT HALF** — Filter No.

Sample ID AE-M26A-R2 — Thimble No. (NA, unless noted)

IMPINGERS

Impinger No.	1	2	3	4	5			
Reagent								
Vol. Added (ml)								
Final Weight (g)								
Initial Weight (g)								
Net Collected (g)								

Silica Gel Imp. No.			
Final Weight (g)			
Initial Weight (g)			
Net Collected (g)			

TOTAL MOISTURE (Impingers and Silica gel) (g):

Run No. 3

Train Type Method 26A — **FRONT HALF** — Filter No.

Sample ID AE-M26A-R3 — Thimble No. (NA, unless noted)

IMPINGERS

Impinger No.	1	2	3	4	5			
Reagent								
Vol. Added (ml)								
Final Weight (g)								
Initial Weight (g)								
Net Collected (g)								

Silica Gel Imp. No.			
Final Weight (g)			
Initial Weight (g)			
Net Collected (g)			

TOTAL MOISTURE (Impingers and Silica gel) (g):

NA = Not Applicable
Rev. 1 (5/2005)

Checked By: Kent A. Pfaff 3/6/12 (Project Manager or QA Manager - sign and date)

TRC Front-Half Gravimetric Particulate Matter Analysis Data Sheet

Client Name/Facility: Aurora Energy
City/State: Fairbanks, AK

Job No: 187446
Analyst: TVW/MC

Combined Boiler Baghouse Stack

Run Identification	units	1	2	3
FH Filter Analysis				
Filter Appearance				
Filter ID		110-003	110-005	110-007
Filter Tare Weight	g	**0.1467**	**0.1448**	**0.1449**
In Desicator: Date/Time	---	12/13/2011; 0830	12/13/2011; 0830	12/13/2011; 0830
Weight #1: Date/Time 12/14; 0955 %RH/Temp 31%/67.8°F	g	0.1463	0.1448	0.1441
Weight #2: Date/Time 12/15; 0848 %RH/Temp 33%/66.7°F	g	0.1463	0.1451	0.1441
	g	**Avg**	**Avg**	**Avg**
	g	**0.1467**	**0.1450**	**0.1441**
PM On Filter	g	0.0000	0.0002	0.0000
FH Acetone Rinse Analysis - < 2.5 µm				
Dried PM Rinse Appearance				
Any Loss? If Yes, Estimate Amount	g			
Sample Volume	mL	41	46	37
Beaker ID		280	281	284
Beaker Tare	g	**105.7954**	**106.2109**	**105.1569**
In Desicator: Date/Time	---	12/14/2011; 0800	12/14/2011; 0800	12/14/2011; 0800
Weight #1: Date/Time 12/15; 0900 %RH/Temp 33%/66.7°F	g	105.7958	106.2142	105.1576
Weight #2: Date/Time 12/16; 0841 %RH/Temp 36%/66.9°F	g	105.7956	106.2138	105.1598
Weight #3: Date/Time 12/19; 1020 %RH/Temp 36%/68.2°F	g			105.1593
	g	**Avg**	**Avg**	**Avg**
	g	**105.7957**	**106.2140**	**105.1596**
PM in FH Acetone Rinse - < 2.5 µm	g	0.0003	0.0031	0.0027
FH Acetone Rinse Analysis - < 10 & > 2.5 µm				
Dried PM Rinse Appearance				
Any Loss? If Yes, Estimate Amount	g			
Sample Volume	mL	51	50	43
Beaker ID		279	282	285
Beaker Tare	g	**104.4486**	**105.2147**	**105.8625**
In Desicator: Date/Time	---	12/14/2011; 0800	12/14/2011; 0800	12/14/2011; 0800
Weight #1: Date/Time 12/15; 0900 %RH/Temp 33%/66.7°F	g	104.4493	105.2182	105.8637
Weight #2: Date/Time 12/16; 0841 %RH/Temp 36%/66.9°F	g	104.4495	105.2183	105.8648
Weight #3: Date/Time 12/19; 1020 %RH/Temp 36%/68.2°F	g			105.8645
	g	**Avg**	**Avg**	**Avg**
	g	**104.4494**	**105.2183**	**105.8647**
PM in FH Acetone Rinse - < 10 & > 2.5 µm	g	0.0008	0.0036	0.0022
FH Acetone Rinse Analysis - > 10 µm				
Dried PM Rinse Appearance				
Any Loss? If Yes, Estimate Amount	g			
Sample Volume	mL	52	64	49
Beaker ID		278	283	286
Beaker Tare	g	**105.7388**	**104.5696**	**105.4271**
In Desicator: Date/Time	---	12/14/2011; 0800	12/14/2011; 0800	12/14/2011; 0800
Weight #1: Date/Time 12/15; 0900 %RH/Temp 33%/66.7°F	g	105.7399	104.5726	105.4278
Weight #2: Date/Time 12/16; 0841 %RH/Temp 36%/66.9°F	g	105.7399	104.5727	105.4283
	g	**Avg**	**Avg**	**Avg**
	g	**105.7399**	**104.5727**	**105.4281**
PM in FH Acetone Rinse - > 10 µm	g	0.0011	0.0031	0.0010
Total Front-Half PM	mg	0.0022	0.0100	0.0059

_____ - 2 — FH FILTER TARE WEIGHTS — AURORA ENERGY
BOOK PAGE

TITLE PROJECT DATE

Continued from page Filter No!	Project No.	Run No.	Tare Weight	Date/Time	Tare Weight	Date/Time	FINAL AVG TARE WT.	In. Desi.
001			0.1492	10/28 1645	0.1494	10/31 0819		
002			0.1475		0.1476			
003	187446	2 (1)	0.1467		0.1467		Avg = 0.1467	
004			0.1446		0.1447			
005	187446	3 (2)	0.1446		0.1449		Avg = 0.1448	
006			0.1437		0.1440			
007	187446	4 (3)	0.1447		0.1450		Avg = 0.1449	
008			0.1432		0.1435			
009			0.1448		0.1451			
010			0.1436	↓	0.1440	↓		

Continued to page

SIGNATURE DATE

DISCLOSED TO AND UNDERSTOOD BY DATE

- FH FILTER FINAL WEIGHTS - AURORA ENERGY BOOK - 3 PAGE

TITLE PROJECT DATE

Continued from page

Filter No.	1st Weight	Date/Time	2nd Weight	Date/Time	FINAL AVG WT.				In Desi
001									
002									
003	0.1463	12/14 0955	0.1463	12/15 0848	0.1463			/	12/13 850
004									
005	0.1448	12/14 0955	0.1451	12/15 0848	0.1450			/	12/13 850
006									
007	0.1441	12/14 0958	0.1441	12/15 0848	0.1441			/	12/13 830
008									
009									
010									

Continued to page

SIGNATURE DATE

DISCLOSED TO AND UNDERSTOOD BY DATE

PROPRIETARY INFORMATION

250mL - 2
BOOK PAGE

- ACETONE FH BEAKER TARE WEIGHTS -

LE PROJECT DATE

Continued from page				①		②		③		FINAL		IN
BKR #	RUN	PROJECT	TARE WEIGHT	DATE	TARE WEIGHT	DATE	TARE WEIGHT	DATE	TARE AVG.		DESC
260	1	187318	106.5171	11/14 0956	106.5164	11/14 1600	106.5163	11/15 0936	106.5164	/	11/10 11:00
261	2	187318	104.0364		104.0354		104.0356		104.0355	/	
262	3	187318	105.3589		105.3580		105.3580		105.3580	/	
263	—	—	104.2853		104.2841		104.2847		—	—	
264	1	187318	106.5046		106.5036		106.5041		106.5039	/	
265	2	187318	103.9832		103.9822		103.9826		103.9824	/	
266	3	187318	105.1929		105.1916		105.1920		105.1918	/	
267	1	187318	105.4944		105.4933		105.4933		105.4933	/	
268	2	187318	104.6489		104.6477		104.6475		104.6476	/	
269	—	—	106.5183		106.5174		106.5181		—	—	
270	1	187318	106.0539		106.0529		106.0532		106.0531	/	
271	2	187318	106.7604		106.7594		106.7596		106.7595	/	
272	1	187318	105.9173		105.9163		105.9167		105.9165	/	
273	2	187318	106.5948		106.5935		106.5938		106.5937	/	
274	1	187318	106.9153		106.9144		106.9146		106.9145	/	
275	2	187318	105.7342		105.7334		105.7337		105.7336	/	
276	—	—	105.5227		105.5217		105.5225		—	—	
277	B	187318	102.8354		102.8341		102.8346		102.8344	/	
278	2	187446	105.7389		~~105.7380~~		105.7386		105.7388	—	
279	2	187446	104.4493		104.4485		104.4487		104.4486	/	
280	2	187446	105.7962		105.7952		105.7955		105.7954	/	
281	3	187446	106.2111		106.2096		~~106.2086~~		106.2109	—	
282	3	187446	105.2160		105.2149		105.2144		105.2147	/	
283	3	187446	104.5709		104.5698		104.5693		104.5696	/	
284	4	187446	~~105.1582~~		105.1571		105.1567		105.1569	/	
285	4	187446	105.8636		105.8627		105.8622		105.8625	/	
286	4	187446	105.4281		105.4273		105.4268		105.4271	/	↓
~~287~~											

Continued to page

SIGNATURE DATE

DISCLOSED TO AND UNDERSTOOD BY DATE

PROPRIETARY INFORMATION

250mL - 3
BOOK PAGE

– ACETONE FH BEAKER FINAL WEIGHTS –

TLE PROJECT DATE

...d from page

BKR #	① WEIGHT	DATE	② WEIGHT	DATE				VOL. mL	CLIENT/ SITE	IN DESC.	
260	106.5995	11/18 1430	106.6004	11/18 1430	TVW			125mL		11/17/11 1222	
261	104.0680		104.0685	11/21/11 [illegible]				175mL			
262	105.4526		105.4531	1500				220mL			
263	—		—					—		—	
264	106.5103		106.5108					120mL		11/17/11 1222	
265	103.9963		103.9964					200mL			
266	105.2210		105.2211					160mL			
267	105.5183		105.5185					110mL			
268	104.6604		104.6606					116mL			
269	—		—					—		—	
270	106.0891		106.0892					151mL		11/17/11 1222	
271	106.7801		106.7806					130mL			
272	105.9293		105.9290					110mL			
273	106.6223		106.6222					125mL			
274	106.9372		106.9374					110mL			
275	105.7512		105.7510					115mL			
276	—		—					—		—	
277	102.8348	—	102.8344					120mL	Blank	11/17/11 1222	
278	105.7399	12/15 0900	105.7399	12/16 0801			105.7399	52mL	710	12/14 0800	R2
279	104.4493		104.4495				104.4494	51mL	<10>2.5		
280	105.7958		105.7956				105.7957	41mL	<2.5		
281	106.2142		106.2138				106.2140	46mL	<2.5		
282	105.2182		105.2183				105.2183	50mL	<10>2.5		R3
283	104.5726		104.5727				104.5727	64mL	710		
284	105.1576		105.1588		105.1593	12/19 1020	105.1596	37mL	<2.5		
285	105.8637		105.8648		105.8645	⊥	105.8647	43mL	<10>2.5		R4
286	105.4278	↓	105.4283	↓			105.4281	49mL	>10	↓	

Continued to page

...URE DATE

...ISCLOSED TO AND UNDERSTOOD BY DATE PROPRIETARY INFORMATION

DATE	TIME	ROOM RH%	TEMP	100g	50g	1g	Cal ok?	Initials	Des. RH	S.B. ok
10/31/2011	0816	40%	68.4	99.9999	50.0001	1.0000	✓	TVW	<20	✓
11/14/2011	1021	36%	68.7	99.9993	49.9995	1.0000	✓	TVW	<20	✓
11/15/2011	0930	34%	66.2	99.9994	49.9997	1.0000	✓	TVW	<22	✓
11/16/2011	0935	30%	70.0	99.9990	49.9996	1.0000	✓	TVW	<20	✓
11/18/2011	1428	29%	73.9	99.9983	49.9990	1.0000	✓	TVW	<10	✓
11/21/2011	0805	31%	67.3	99.9993	49.9999	0.9997	✓	TVW	<10	✓
12/14/2011	0942	31%	67.8	100.0000	49.9999	0.9997	✓	MSL	<20	✓
12/15/2011	0839	33%	66.7	99.9998	49.9999	0.9997	✓	MSL	<20	✓
12/16/2011	0821	36%	66.9	99.9998	49.9999	1.0000	✓	MSL	<20	✓
12/19/2011	1017	36%	68.2	99.9998	49.9998	1.0000	✓	TVW	<20	✓

RH% | °F TEMP | LOG

②

STRATA Configuration Page 1
11-19-2011 07:57:48
File Name: C:\Documents and Settings\kallmendinger.EMPLOYEES\My Documents\Aurora Energy\aur

Operator:	RDR
Plant Name:	Aurora Energy
Location:	Fairbanks
Run Length:	60 minutes
Sample Rate:	30 per minute
Average Calibration Results:	0.1 minutes
Automatic Sequence, Calibration Error:	No
Automatic Sequence, System Bias:	No
Max Response Time:	Manual
Max Response Time:	1 minutes
Traverse During Run:	No

Active	Chan.	Analyte Name	Units	Span Units	Span Volts	Offset Volts
Yes	1	O2	%	23.92	0.95	0
Yes	2	CO2	%	23.79	4.38	0
Yes	3	CO	ppm	501.8	2.51	0
Yes	4	NOx	ppm	510	2.55	0
Yes	5	SO2	ppm	495.2	0.5	0
Yes	6	THC	ppm	100	5	0

Measurement System Preparation Table

Gas Name	Reference Cylinder Numbers 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
O2	Z	M	H					L								
CO2	Z	M	H					L								
CO	Z			M	H				L							
NOx	Z			M	H				L							
SO2	Z			M	H				L							
THC	Z					M	H			L						

STRATA Configuration Page 2

Gas Name	Zero Reference Cylinder No.	Conc	ID Number	Low Reference Cylinder No.	Conc	ID Number
O2	1	0	nitrogen	8	4	
CO2	1	0	nitrogen	8	4	
CO	1	0	nitrogen	9	20	
NOx	1	0	nitrogen	9	20	
SO2	1	0	nitrogen	9	20	
THC	1	0	nitrogen	10	30.15	CC218900

Gas Name	Mid Reference Cylinder No.	Conc	ID Number	High Reference Cylinder No.	Conc	ID Number
O2	2	13.11	CC23875	3	23.92	CC192898
CO2	2	13.64	CC23875	3	23.79	CC192898
CO	4	201.5	CC237881	5	501.8	CC215591
NOx	4	201.5	CC237881	5	510	CC215591
SO2	4	200.7	CC237881	5	495.2	CC215591
THC	6	50.52	SG9115079	7	85.4	CC40330

Seq Num	Calibration Error Test Sequence O2	CO2	CO	NOx	SO2	THC
1	Zero	Zero	Zero	Zero	Zero	
2	High	High				
3	Mid	Mid				
4			High	High	High	
5			Mid	Mid	Mid	
6						Zero
7						High
8						Mid
9						Low
10						
11						
12						
13						
14						
15						

Seq Num	Calibration Error Valve Sequence 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	X															
2			X													
3		X														
4					X											
5				X												
6	X															
7							X									
8						X										
9										X						
10																
11																
12																
13																
14																
15																

STRATA Configuration Page 3

Seq Num	System Bias Check Sequence					
	O2	CO2	CO	NOx	SO2	THC
1	Zero	Zero	Zero	Zero	Zero	Zero
2	Mid	Mid				
3			Mid	Mid	Mid	
4						Mid
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Seq Num	System Bias Valve Sequence															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	X															
2		X														
3				X												
4						X										
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																

STRATA Configuration End

Calibration Error Test, Run 1 STRATA Version 2.01

	O2	CO2	CO	NOx	SO2	THC
	%	%	ppm	ppm	ppm	ppm
11-19-2011 08:05:33	5.388	0.125	1.16	1.94	3.31	2.16
11-19-2011 08:06:32	10.816	10.210	-0.41	-1.00	-0.94	2.11
11-19-2011 08:07:32	23.637	23.712	-0.41	-1.03	-3.24	2.11
11-19-2011 08:08:32	14.441	15.296	-0.38	-0.61	-0.95	2.07
11-19-2011 08:09:33	7.392	7.973	64.92	32.06	129.69	2.10
11-19-2011 08:10:33	0.046	0.114	510.73	444.04	486.63	2.04
11-19-2011 08:11:33	0.042	0.107	531.30	496.33	482.34	2.00
11-19-2011 08:12:32	0.037	0.103	524.37	499.05	488.63	2.01
11-19-2011 08:13:32	0.034	0.101	492.69	504.45	487.18	2.01
11-19-2011 08:14:33	0.100	0.129	489.98	502.63	352.39	2.01
11-19-2011 08:15:33	0.030	0.094	238.45	199.37	172.50	2.07
11-19-2011 08:16:33	0.029	0.097	236.85	169.39	168.92	2.12
11-19-2011 08:17:32	0.014	0.096	224.53	180.04	186.94	2.01
11-19-2011 08:18:32	0.021	0.098	202.59	194.35	188.34	2.01
11-19-2011 08:19:33	8.428	0.176	88.03	117.73	23.79	2.01
11-19-2011 08:20:33	1.210	0.100	-0.38	0.86	-0.12	2.05
11-19-2011 08:21:32	0.152	0.096	-0.40	-0.08	-4.32	2.63
11-19-2011 08:22:32	0.135	0.093	-0.42	-0.43	-3.13	2.68
11-19-2011 08:23:34	0.128	0.094	-0.41	-0.43	-3.66	2.68
11-19-2011 08:24:33	0.041	0.095	-0.39	-0.86	0.32	2.68
11-19-2011 08:25:33	0.131	0.096	-0.37	-1.03	-2.56	2.68
11-19-2011 08:26:32	0.048	0.180	-0.38	-0.53	2.80	2.72
11-19-2011 08:27:32	11.832	0.171	-0.38	-0.43	0.46	0.66
11-19-2011 08:28:33	18.948	0.164	-0.38	-0.43	-3.60	-0.03
11-19-2011 08:29:33	19.255	0.168	-0.41	-0.43	-1.64	1.35
11-19-2011 08:30:32	19.285	0.174	-0.24	-0.41	0.37	3.36
11-19-2011 08:31:32	19.290	0.175	-0.19	-0.42	-2.24	4.65
11-19-2011 08:32:34	19.301	0.191	-0.26	-0.42	-5.49	14.96
11-19-2011 08:33:33	19.296	0.192	-0.26	-0.43	0.13	50.93
11-19-2011 08:34:33	19.296	0.183	-0.43	-0.43	-2.47	87.57
11-19-2011 08:35:32	19.312	0.184	-0.45	-0.43	-2.66	87.57
11-19-2011 08:36:32	19.318	0.184	-0.45	-0.43	-4.83	87.57
11-19-2011 08:37:33	19.240	0.185	-0.45	-0.45	-2.01	86.69
11-19-2011 08:38:33	1.456	0.098	-0.38	1.59	-1.07	85.44
11-19-2011 08:39:32	1.116	0.092	-0.39	-0.38	-0.76	17.42
11-19-2011 08:40:32	17.760	0.138	-0.42	-0.88	-0.87	2.63
11-19-2011 08:41:33	20.528	0.148	-0.42	-1.04	-2.08	2.59
11-19-2011 08:42:33	8.484	0.168	-0.44	-0.92	-3.45	2.58
11-19-2011 08:43:32	9.381	0.186	-0.43	-0.44	-2.29	24.77
11-19-2011 08:44:32	18.580	0.192	-0.44	-0.46	-2.29	47.97
11-19-2011 08:45:33	19.263	0.190	-0.44	-0.46	-5.90	49.46
11-19-2011 08:46:33	8.959	0.135	-0.45	-0.81	-8.54	49.28
11-19-2011 08:47:33	2.432	0.094	-0.45	-0.85	-2.84	40.84
11-19-2011 08:48:32	2.446	0.096	-0.46	-1.08	-0.51	2.57
11-19-2011 08:49:32	2.438	0.096	-0.78	-1.33	-9.39	2.52
11-19-2011 08:50:34	15.030	0.131	-0.48	-1.09	-4.55	2.57
11-19-2011 08:51:33	20.533	0.148	-0.47	-1.09	-7.06	2.33
11-19-2011 08:52:33	19.600	0.165	-0.47	-1.09	-2.67	2.44
11-19-2011 08:53:32	19.309	0.183	-0.48	-0.96	-1.60	2.24

Calibration Error Test at Run 1
Operator: RDR
Plant Name: Aurora Energy
Location: Fairbanks

Reference Cylinder Numbers

	Zero	Low-range	Mid-range	High-range
O2	nitrogen		CC23875	CC192898
CO2	nitrogen		CC23875	CC192898
CO	nitrogen		CC237881	CC215591
NOx	nitrogen		CC237881	CC215591
SO2	nitrogen		CC237881	CC215591
THC	nitrogen	CC218900	SG9115079	CC40330

Date/Time 11-19-2011 08:54:11 PASSED

Analyte	O2	CO2	CO	NOx	SO2	THC
Units	%	%	ppm	ppm	ppm	ppm
Zero Ref Cyl	0.000	0.000	0.00	0.00	0.00	0.00
Zero Avg	0.034	0.092	-0.43	-1.03	0.51	-0.02
Zero Error%	0.1%	0.4%	0.1%	0.2%	0.1%	0.0%
Low Ref Cyl						30.15
Low Avg						29.85
Low Error%						0.3%
Mid Ref Cyl	13.110	13.640	201.50	201.50	200.70	50.52
Mid Avg	13.020	13.642	196.20	194.17	193.53	49.32
Mid Error%	0.4%	0.0%	1.1%	1.4%	1.4%	1.2%
High Ref Cyl	23.920	23.790	501.80	510.00	495.20	85.40
High Avg	23.651	23.721	507.32	510.57	488.69	85.44
High Error%	1.1%	0.3%	1.1%	0.1%	1.3%	0.0%

Calibration Error Test End

Initial System Bias Check, Run 1 STRATA Version 2.01

	O2	CO2	CO	NOx	SO2	THC
	%	%	ppm	ppm	ppm	ppm
11-19-2011 08:55:46	9.534	0.113	-0.52	-0.93	-5.06	29.81
11-19-2011 08:56:45	0.149	0.086	-0.46	-1.08	-3.03	10.24
11-19-2011 08:57:44	0.141	0.089	-0.50	-1.11	-2.72	2.45
11-19-2011 08:58:46	0.131	0.084	-0.45	-1.08	-6.01	2.43
11-19-2011 08:59:46	0.125	0.083	-0.46	-1.07	-2.00	2.41
11-19-2011 09:00:45	9.748	7.361	-0.48	-1.09	-7.98	2.41
11-19-2011 09:01:45	13.899	11.911	-0.51	-1.11	-3.77	2.43
11-19-2011 09:02:46	13.021	12.881	-0.46	-1.09	-1.47	2.45
11-19-2011 09:03:46	0.290	0.264	118.10	71.82	131.10	2.40
11-19-2011 09:04:45	0.134	0.105	215.33	163.34	163.43	2.36
11-19-2011 09:05:45	0.131	0.095	213.03	164.67	166.31	2.41
11-19-2011 09:06:45	0.123	0.098	205.21	174.80	165.18	2.41
11-19-2011 09:07:46	0.117	0.091	196.80	200.49	160.91	2.46
11-19-2011 09:08:46	0.120	0.094	196.67	200.44	172.13	2.46
11-19-2011 09:09:45	3.572	0.095	195.73	200.45	172.38	2.46
11-19-2011 09:10:45	20.675	0.148	48.94	97.07	14.61	2.46
11-19-2011 09:11:44	12.353	0.128	0.43	2.90	4.22	2.46
11-19-2011 09:12:46	2.082	0.092	-0.39	0.37	-4.66	2.44
11-19-2011 09:13:46	2.035	0.097	-0.46	-0.30	-1.89	2.43
11-19-2011 09:14:45	2.412	0.093	-0.46	-0.50	2.61	2.44
11-19-2011 09:15:45	19.195	0.140	3.85	5.32	1.35	2.35
11-19-2011 09:16:46	20.706	0.143	-0.41	-0.14	1.51	2.19
11-19-2011 09:17:46	20.716	0.147	-0.47	-0.49	1.31	2.40
11-19-2011 09:18:46	20.082	0.158	-0.20	-0.52	-2.92	2.36
11-19-2011 09:19:45	19.317	0.180	-0.48	-0.01	-5.00	2.36
11-19-2011 09:20:45	19.276	0.182	-0.47	0.06	-1.84	2.14

Initial System Bias Check for Run 1
Operator: RDR
Plant Name: Aurora Energy
Location: Fairbanks

	Reference Cylinder Numbers	
	Zero	Span
O2	nitrogen	CC23875
CO2	nitrogen	CC23875
CO	nitrogen	CC237881
NOx	nitrogen	CC237881
SO2	nitrogen	CC237881
THC	nitrogen	SG9115079

Date/Time 11-19-2011 09:21:10 PASSED

Analyte	O2	CO2	CO	NOx	SO2	THC
Units	%	%	ppm	ppm	ppm	ppm
Zero Ref Cyl	0.000	0.000	0.00	0.00	0.00	0.00
Zero Cal	0.034	0.092	-0.43	-1.03	0.51	-0.02
Zero Avg	0.362	0.086	-0.43	-1.05	-6.80	2.41
Zero Bias%	1.4%	0.0%	0.0%	0.0%	1.5%	2.4%
Zero Drift%						
Span Ref Cyl	13.110	13.640	201.50	201.50	200.70	50.52
Span Cal	13.020	13.642	196.20	194.17	193.53	49.32
Span Avg	13.041	13.586	197.51	200.45	190.47	49.62
Span Bias%	0.1%	0.2%	0.3%	1.2%	0.6%	0.3%
Span Drift%						

System Bias Check End

STRATA Configuration Page 1
11-19-2011 09:22:17
File Name: C:\Documents and Settings\kallmendinger.EMPLOYEES\My Documents\Aurora Energy\aur

Operator:	RDR
Plant Name:	Aurora Energy
Location:	Fairbanks
Run Length:	60 minutes
Sample Rate:	30 per minute
Average Calibration Results:	0.1 minutes
Automatic Sequence, Calibration Error:	No
Automatic Sequence, System Bias:	No
Max Response Time:	Manual
Max Response Time:	1 minutes
Traverse During Run:	No

Active	Chan.	Analyte Name	Units	Span Units	Span Volts	Offset Volts
Yes	1	O2	%	23.92	0.95	0
Yes	2	CO2	%	23.79	4.38	0
Yes	3	CO	ppm	501.8	2.51	0
Yes	4	NOx	ppm	510	2.55	0
Yes	5	SO2	ppm	495.2	0.5	0
Yes	6	THC	ppm	100	5	0

Measurement System Preparation Table

Gas Name	Reference Cylinder Numbers 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
O2	Z	M	H					L								
CO2	Z	M	H					L								
CO	Z			M	H				L							
NOx	Z			M	H				L							
SO2	Z			M	H				L							
THC	Z					M	H			L						

STRATA Configuration Page 2

Gas Name	Zero Reference Cylinder No.	Conc	ID Number	Low Reference Cylinder No.	Conc	ID Number
O2	1	0	nitrogen	8	4	
CO2	1	0	nitrogen	8	4	
CO	1	0	nitrogen	9	20	
NOx	1	0	nitrogen	9	20	
SO2	1	0	nitrogen	9	20	
THC	1	0	nitrogen	10	30.15	CC218900

Gas Name	Mid Reference Cylinder No.	Conc	ID Number	High Reference Cylinder No.	Conc	ID Number
O2	2	13.11	CC23875	3	23.92	CC192898
CO2	2	13.64	CC23875	3	23.79	CC192898
CO	4	201.5	CC237881	5	501.8	CC215591
NOx	4	201.5	CC237881	5	510	CC215591
SO2	4	200.7	CC237881	5	495.2	CC215591
THC	6	50.52	SG9115079	7	85.4	CC40330

Seq Num	Calibration Error Test Sequence O2	CO2	CO	NOx	SO2	THC
1	Zero	Zero	Zero	Zero	Zero	
2	High	High				
3	Mid	Mid				
4			High	High	High	
5			Mid	Mid	Mid	
6						Zero
7						High
8						Mid
9						Low
10						
11						
12						
13						
14						
15						

Seq Num	Calibration Error Valve Sequence 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	X															
2			X													
3		X														
4					X											
5				X												
6	X															
7							X									
8						X										
9										X						
10																
11																
12																
13																
14																
15																

STRATA Configuration Page 3

Seq Num	System Bias Check Sequence O2	CO2	CO	NOx	SO2	THC
1	Zero	Zero	Zero	Zero	Zero	Zero
2	Mid	Mid				
3			Mid	Mid	Mid	
4						Mid
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Seq Num	System Bias Valve Sequence 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	X															
2		X														
3				X												
4						X										
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																

STRATA Configuration End

```
Test Run 4  STRATA Version 2.01
                          NOx
                          ppm
Begin calculating run averages
11-19-2011 22:07:56      50.68
11-19-2011 22:08:56      51.23
11-19-2011 22:09:57      51.38
11-19-2011 22:10:56      51.00
11-19-2011 22:11:56      51.74
11-19-2011 22:12:57      51.77
11-19-2011 22:13:56      51.69
11-19-2011 22:14:56      51.26
11-19-2011 22:15:57      51.28
11-19-2011 22:16:56      51.58
Run Averages                NOx
                            ppm
11-19-2011 22:16:56      51.36
Operator:              RDR
Plant Name:            Aurora Energy
Location:              Fairbanks
Test Run 4  End
```

NOx Converter check

52.1 NO cylinder

CC241254

Test Run 1 STRATA Version 2.01

	O2 %	CO2 %	CO ppm	NOx ppm	SO2 ppm	THC ppm
Begin calculating run averages						
11-19-2011 11:13:20	9.169	10.523	104.28	222.88	115.89	4.27
11-19-2011 11:14:20	9.127	10.566	161.53	227.01	119.26	4.18
11-19-2011 11:15:20	9.268	10.446	153.65	227.83	116.39	4.24
11-19-2011 11:16:20	9.462	10.234	116.77	224.52	117.93	4.24
11-19-2011 11:17:19	9.503	10.191	49.87	221.94	116.08	4.14
11-19-2011 11:18:19	9.443	10.250	41.81	221.41	117.81	4.11
11-19-2011 11:19:20	9.368	10.313	48.83	219.36	116.69	4.13
11-19-2011 11:20:20	9.448	10.230	16.44	218.26	118.04	4.07
11-19-2011 11:21:20	9.376	10.300	-1.01	218.61	118.11	4.03
11-19-2011 11:22:19	9.364	10.302	-13.39	220.43	128.66	3.97
11-19-2011 11:23:19	9.400	10.253	-17.29	223.00	124.42	3.86
11-19-2011 11:24:19	9.402	10.259	-22.65	224.00	118.29	3.97
11-19-2011 11:25:19	9.524	10.134	-20.16	226.00	114.57	3.97
11-19-2011 11:26:19	9.482	10.166	3.40	227.59	120.36	3.89
11-19-2011 11:27:20	9.366	10.272	63.09	226.19	117.22	4.08
Pause						
11-19-2011 11:28:20	7.005	7.707	94.44	224.02	124.62	4.21
11-19-2011 11:29:19	0.131	0.121	147.35	274.31	160.23	4.26
11-19-2011 11:30:19	3.343	3.245	105.82	294.21	160.66	4.21
11-19-2011 11:31:18	9.472	10.146	154.00	235.40	118.10	4.22
End Pause						
11-19-2011 11:32:20	9.475	10.139	159.15	221.77	121.38	4.37
11-19-2011 11:33:20	9.362	10.236	158.74	221.92	116.66	4.33
11-19-2011 11:34:19	9.519	10.088	158.80	222.18	127.02	4.29
11-19-2011 11:35:19	9.284	10.317	158.59	223.20	115.97	4.29
11-19-2011 11:36:19	9.197	10.405	153.19	221.83	124.74	4.29
11-19-2011 11:37:20	9.222	10.387	154.99	221.55	122.84	4.53
11-19-2011 11:38:20	9.365	10.254	145.96	221.68	117.27	4.55
11-19-2011 11:39:19	9.411	10.208	149.72	224.95	117.88	4.59
11-19-2011 11:40:19	9.336	10.262	149.00	226.74	119.19	4.67
11-19-2011 11:41:19	9.295	10.317	152.00	225.54	123.12	4.55
11-19-2011 11:42:19	9.334	10.275	155.51	224.34	120.73	4.50
11-19-2011 11:43:20	9.432	10.185	158.77	223.66	120.12	4.55
11-19-2011 11:44:20	9.514	10.103	174.91	224.89	122.63	4.61
11-19-2011 11:45:20	9.309	10.287	180.32	223.24	123.65	4.71
11-19-2011 11:46:20	9.378	10.213	181.11	220.86	126.92	4.74
Pause						
11-19-2011 11:47:19	9.529	10.061	188.67	225.38	119.57	4.84
11-19-2011 11:48:19	9.458	10.115	189.98	229.15	125.47	4.90
11-19-2011 11:49:19	9.410	10.169	196.63	227.07	122.45	4.95
11-19-2011 11:50:20	9.524	10.060	192.76	227.25	121.83	4.67
11-19-2011 11:51:19	9.505	10.065	197.75	229.62	119.12	4.61
End Pause						
11-19-2011 11:52:19	9.458	10.116	184.50	230.25	120.93	3.74
11-19-2011 11:53:18	9.517	10.070	180.72	228.89	119.87	3.93
11-19-2011 11:54:20	9.510	10.079	170.67	229.06	120.73	4.20
11-19-2011 11:55:20	9.490	10.107	168.05	228.17	122.44	4.18
11-19-2011 11:56:19	9.444	10.155	173.22	228.02	122.85	4.36
11-19-2011 11:57:19	9.423	10.201	173.47	225.58	127.91	4.53
11-19-2011 11:58:20	9.589	10.028	178.20	226.56	124.31	4.38
11-19-2011 11:59:20	9.567	9.992	173.70	229.05	126.20	4.63
11-19-2011 12:00:19	9.560	10.003	173.49	230.06	129.60	4.67
11-19-2011 12:01:19	9.518	10.068	174.55	232.30	123.74	4.32
11-19-2011 12:02:19	9.588	9.995	177.29	236.12	130.84	4.90
11-19-2011 12:03:20	9.554	10.047	172.04	234.08	129.95	5.04
11-19-2011 12:04:20	9.509	10.090	162.69	232.26	130.09	4.92
11-19-2011 12:05:20	9.563	10.005	154.13	231.68	129.30	4.98
11-19-2011 12:06:19	9.525	10.037	166.65	230.45	126.77	4.66
Pause						
11-19-2011 12:07:19	9.480	10.100	138.80	229.14	128.76	4.67
11-19-2011 12:08:20	9.481	10.108	161.75	228.36	129.77	4.29
11-19-2011 12:09:20	9.499	10.108	147.91	227.79	129.76	4.04
11-19-2011 12:10:19	9.429	10.155	145.78	227.65	132.24	4.62
11-19-2011 12:11:19	9.317	10.255	126.33	229.65	136.18	4.96
End Pause						
11-19-2011 12:12:19	9.339	10.235	93.82	233.43	136.69	4.29
11-19-2011 12:13:20	9.444	10.135	73.92	234.62	137.85	4.15
11-19-2011 12:14:20	9.443	10.113	83.66	234.03	140.90	4.84
11-19-2011 12:15:19	9.464	10.102	64.49	223.98	143.09	4.79
11-19-2011 12:16:19	9.469	10.127	53.10	218.37	137.30	4.89
11-19-2011 12:17:18	9.361	10.249	26.50	215.18	140.57	5.07
11-19-2011 12:18:20	9.327	10.287	27.05	211.17	138.03	4.60
11-19-2011 12:19:20	9.319	10.288	35.64	208.36	141.62	4.80
11-19-2011 12:20:20	9.410	10.212	2.79	208.84	142.52	4.63
11-19-2011 12:21:19	9.425	10.170	12.54	210.69	142.21	4.54
11-19-2011 12:22:19	9.322	10.236	-0.76	210.82	145.95	4.74
11-19-2011 12:23:19	9.122	10.459	-9.84	210.30	142.93	4.90
11-19-2011 12:24:20	9.441	10.166	-20.69	215.42	141.54	4.74
11-19-2011 12:25:19	9.474	10.163	-22.51	148.64	145.62	4.42
Run Averages	O2 %	CO2 %	CO ppm	NOx ppm	SO2 ppm	THC ppm
11-19-2011 12:26:07	9.411	10.205	101.78	219.85	126.62	4.45
Operator:	RDR					
Plant Name:	Aurora Energy					

Final System Bias Check, Run 1 STRATA Version 2.01

	O2	CO2	CO	NOx	SO2	THC
	%	%	ppm	ppm	ppm	ppm
11-19-2011 12:58:30	0.364	0.107	-0.36	5.36	6.59	4.46
11-19-2011 12:59:30	12.525	12.985	-0.02	4.71	8.30	3.75
11-19-2011 13:00:29	7.859	8.628	14.24	4.54	36.80	3.60
11-19-2011 13:01:29	0.175	0.111	189.34	199.28	156.23	4.07
11-19-2011 13:02:31	0.163	0.092	209.10	282.66	166.99	4.31
11-19-2011 13:03:30	0.163	0.085	204.06	199.44	168.32	4.16
11-19-2011 13:04:30	0.140	0.080	199.40	199.50	163.36	3.95
11-19-2011 13:05:29	0.123	0.080	200.22	199.65	162.97	3.73
11-19-2011 13:06:30	0.138	0.077	202.64	199.65	167.79	3.60
11-19-2011 13:07:29	0.165	0.077	203.49	199.62	163.22	3.53
11-19-2011 13:08:29	0.159	0.073	200.55	199.73	159.16	3.56
11-19-2011 13:09:31	0.155	0.075	201.40	200.33	168.07	3.53
11-19-2011 13:10:30	2.728	2.602	196.12	203.63	178.94	3.67
11-19-2011 13:11:30	14.077	5.943	151.11	160.02	86.51	3.46
11-19-2011 13:12:29	19.678	0.239	7.70	32.60	6.65	3.50
11-19-2011 13:13:29	19.717	0.181	1.78	3.17	1.43	3.55
11-19-2011 13:14:31	19.737	0.160	1.77	2.39	3.88	3.47
11-19-2011 13:15:30	19.745	0.147	1.40	1.33	-1.99	3.55
11-19-2011 13:16:30	19.751	0.138	0.30	0.90	0.21	3.64
11-19-2011 13:17:29	19.754	0.136	0.36	0.89	5.01	3.63
11-19-2011 13:18:29	19.389	0.138	1.42	0.67	9.80	3.73
11-19-2011 13:19:30	18.895	0.144	1.36	0.26	3.41	3.50
11-19-2011 13:20:30	18.883	0.144	1.31	0.27	-2.87	3.43
11-19-2011 13:21:30	18.870	0.149	1.93	0.26	0.36	16.15

Final System Bias Check for Run 1
Operator: RDR
Plant Name: Aurora Energy
Location: Fairbanks

	Reference Cylinder Numbers	
	Zero	Span
O2	nitrogen	CC23875
CO2	nitrogen	CC23875
CO	nitrogen	CC237881
NOx	nitrogen	CC237881
SO2	nitrogen	CC237881
THC	nitrogen	SG9115079

Date/Time	11-19-2011		13:21:45		PASSED	
Analyte	O2	CO2	CO	NOx	SO2	THC
Units	%	%	ppm	ppm	ppm	ppm
Zero Ref Cyl	0.000	0.000	0.00	0.00	0.00	0.00
Zero Cal	0.034	0.092	-0.43	-1.03	0.51	-0.02
Zero Avg	0.124	0.098	-0.37	4.89	4.10	4.46
Zero Bias%	0.4%	0.0%	0.0%	1.2%	0.7%	4.5%
Zero Drift%	-1.0%	0.1%	0.0%	1.2%	2.2%	2.0%
Span Ref Cyl	13.110	13.640	201.50	201.50	200.70	50.52
Span Cal	13.020	13.642	196.20	194.17	193.53	49.32
Span Avg	12.727	13.505	187.96	205.48	190.34	50.07
Span Bias%	1.2%	0.6%	1.6%	2.2%	0.6%	0.7%
Span Drift%	-1.3%	-0.3%	-1.9%	1.0%	0.0%	0.4%
Ini Zero Avg	0.362	0.086	-0.43	-1.05	-6.80	2.41
Ini Span Avg	13.041	13.586	197.51	200.45	190.47	49.62
Run Avg	9.411	10.205	101.78	219.85	126.62	4.45
Co	0.243	0.092	-0.40	1.92	-1.35	3.43
Cm	12.884	13.546	192.74	202.97	190.40	49.84
Correct Avg	9.509	10.253	106.61	218.42	133.94	1.11

System Bias Check End

Test Run 2 Begin. STRATA Version 2.01
Operator: RDR
Plant Name: Aurora Energy
Location: Fairbanks

		O2	CO2	CO	NOx	SO2	THC
		%	%	ppm	ppm	ppm	ppm
11/19/2011	13:21:47	18.852	0.144	1.68	0.24	4.08	50.06
11/19/2011	13:21:49	18.829	0.145	1.66	0.23	4.64	50.06
11/19/2011	13:21:51	18.836	0.144	1.67	0.24	3.93	50.07
11/19/2011	13:21:53	18.841	0.142	1.67	0.23	1.04	50.06
11/19/2011	13:21:56	18.841	0.144	1.67	0.23	-1.52	50.06
11/19/2011	13:21:58	18.837	0.143	1.68	0.23	-4.83	50.06
11/19/2011	13:22:00	18.83	0.14	1.68	0.23	-6.76	50.06
11/19/2011	13:22:02	18.875	0.145	1.67	0.23	-7.1	50.06
11/19/2011	13:22:04	18.832	0.142	1.59	0.17	-5.89	50.06
11/19/2011	13:22:06	18.825	0.145	1.69	0.24	-4.87	50.06
11/19/2011	13:22:08	18.833	0.142	1.71	0.24	-4.34	50.06
11/19/2011	13:22:11	18.832	0.142	1.67	0.23	-5.48	50.06
11/19/2011	13:22:13	18.826	0.145	1.68	0.23	-6.66	50.06
11/19/2011	13:22:15	18.826	0.148	1.72	0.24	-7.14	50.06
11/19/2011	13:22:17	18.821	0.147	1.76	0.31	-6.82	50.06
11/19/2011	13:22:19	18.825	0.147	1.68	0.24	-5.75	50.06
11/19/2011	13:22:21	18.816	0.146	1.67	0.23	-4.35	50.06
11/19/2011	13:22:23	18.812	0.15	1.66	0.24	-2.45	50.07
11/19/2011	13:22:25	18.816	0.149	1.66	0.24	0.54	50.06
11/19/2011	13:22:28	18.815	0.147	1.75	0.32	1.66	50.06
11/19/2011	13:22:30	18.812	0.145	1.67	0.24	3.04	50.06
11/19/2011	13:22:32	18.822	0.147	1.67	-0.35	3.63	50.07
11/19/2011	13:22:34	18.819	0.147	1.69	-0.34	3.93	50.02
11/19/2011	13:22:36	18.816	0.145	1.65	-0.39	3.17	50.01
11/19/2011	13:22:38	18.811	0.143	1.59	-0.34	3.9	50.02
11/19/2011	13:22:40	18.811	0.144	1.68	-0.34	4.78	50.01
11/19/2011	13:22:42	18.823	0.141	1.67	-0.35	5.3	50.01
11/19/2011	13:22:45	18.797	0.141	1.67	-0.34	5.44	50.02
11/19/2011	13:22:47	18.808	0.142	1.79	-0.26	4.49	50.01
11/19/2011	13:22:49	18.819	0.141	1.69	-0.34	4.09	50.01
11/19/2011	13:22:51	18.812	0.144	1.69	-0.35	3.21	50.01
11/19/2011	13:22:53	18.808	0.14	1.8	-0.26	1.6	50.01
11/19/2011	13:22:55	18.815	0.141	1.78	-0.27	0.22	50.01
11/19/2011	13:22:57	18.814	0.145	1.79	-0.26	-1.97	50.01
11/19/2011	13:22:59	18.814	0.148	1.69	-0.34	-4.87	50.01
11/19/2011	13:23:02	18.809	0.148	-0.14	-0.26	-6.73	50.01
11/19/2011	13:23:04	18.811	0.146	-0.18	-0.26	-7.06	50.01
11/19/2011	13:23:06	18.804	0.144	-0.28	-0.35	-5.71	50.01
11/19/2011	13:23:08	18.84	0.142	-0.37	-0.42	-3.66	50.01
11/19/2011	13:23:10	19.643	0.153	-0.29	-0.37	-1.96	50.01
11/19/2011	13:23:12	19.647	0.191	1.67	-0.35	-0.01	50.01

11/19/2011	13:23:14	19.819	0.235	1.67	-0.34	1.21	50.01
11/19/2011	13:23:16	19.047	0.241	1.75	-0.27	0.52	50.01
11/19/2011	13:23:19	18.647	0.177	1.67	-0.33	-1.27	50.01
11/19/2011	13:23:21	19.383	0.142	1.75	-0.27	-2.7	50.01
11/19/2011	13:23:23	19.732	0.132	1.77	-0.27	-3.66	50.01
11/19/2011	13:23:25	19.902	0.129	1.78	-0.26	-4.08	50.01
11/19/2011	13:23:27	19.973	0.127	1.78	-0.26	-4.27	50.02
11/19/2011	13:23:29	19.997	0.124	1.68	-0.35	-4.21	50.01
11/19/2011	13:23:31	20.016	0.124	1.69	0.24	-5.5	50.01
11/19/2011	13:23:33	20.015	0.126	1.77	0.31	-7.7	50.01
11/19/2011	13:23:36	20.028	0.13	1.78	0.3	-8.16	50.01
11/19/2011	13:23:38	20.039	0.131	1.63	0.23	-7.26	50.01
11/19/2011	13:23:40	20.03	0.132	1.69	0.23	-5.73	2.22
11/19/2011	13:23:42	20.045	0.13	1.68	0.26	-4	2.22
11/19/2011	13:23:44	20.049	0.135	1.68	0.23	-1.5	2.22
11/19/2011	13:23:46	20.055	0.135	1.73	0.31	0.56	2.22
11/19/2011	13:23:48	20.063	0.136	1.62	0.22	2.6	2.22
11/19/2011	13:23:51	20.045	0.134	1.77	0.31	3.02	2.22
11/19/2011	13:23:53	20.054	0.137	1.78	0.31	0.96	2.22
11/19/2011	13:23:55	20.031	0.136	1.69	0.23	-1.54	2.22
11/19/2011	13:23:57	20.037	0.131	1.78	0.31	-3.8	2.22
11/19/2011	13:23:59	20.037	0.134	1.69	0.24	-4.48	2.22
11/19/2011	13:24:01	20.033	0.138	1.7	0.23	-3.96	2.22
11/19/2011	13:24:03	20.038	0.135	1.7	0.24	-2.55	2.22
11/19/2011	13:24:05	20.037	0.133	1.68	0.23	0.83	2.22
11/19/2011	13:24:08	20.045	0.128	1.77	0.31	4.24	2.22
11/19/2011	13:24:10	20.051	0.131	1.7	0.23	7.18	2.22
11/19/2011	13:24:12	20.055	0.128	1.78	0.31	9.96	2.22
11/19/2011	13:24:14	20.059	0.13	1.54	0.14	11.67	2.22
11/19/2011	13:24:16	20.045	0.129	1.78	0.31	11.47	2.22
11/19/2011	13:24:18	20.051	0.131	1.78	0.31	10.36	2.22
11/19/2011	13:24:20	20.047	0.13	1.77	0.31	7.7	2.22
11/19/2011	13:24:23	20.044	0.13	1.78	0.31	3.84	2.21
11/19/2011	13:24:25	20.053	0.132	1.68	0.23	2.15	2.22
11/19/2011	13:24:27	20.049	0.129	1.7	0.23	-0.02	2.22
11/19/2011	13:24:29	20.07	0.13	1.69	0.23	-2.79	2.22
11/19/2011	13:24:31	20.042	0.131	1.65	0.22	-5.25	2.22
11/19/2011	13:24:33	20.055	0.133	1.74	0.3	-5.98	2.22
11/19/2011	13:24:35	20.058	0.134	1.67	0.2	-6.41	2.22
11/19/2011	13:24:37	20.068	0.134	1.77	0.31	-5.63	2.22
11/19/2011	13:24:40	20.07	0.132	1.67	0.23	-5.1	2.22
11/19/2011	13:24:42	20.053	0.131	1.76	0.24	-5.48	2.22
11/19/2011	13:24:44	20.071	0.133	1.67	0.23	-6.25	3.82
11/19/2011	13:24:46	20.072	0.135	1.66	0.22	-6.36	3.82
11/19/2011	13:24:48	20.101	0.137	1.68	0.24	-5.75	3.82
11/19/2011	13:24:50	20.091	0.139	1.68	0.23	-5	3.82
11/19/2011	13:24:52	20.099	0.136	-0.19	0.31	-4.54	3.82

11/19/2011	13:24:54	20.098	0.133	-0.26	0.23	-4.82	3.82
11/19/2011	13:24:57	20.11	0.133	-0.28	0.24	-4.6	3.82
11/19/2011	13:24:59	20.091	0.129	-0.28	0.23	-4.06	3.82
11/19/2011	13:25:01	20.047	0.135	-0.29	0.23	-3.62	3.82
11/19/2011	13:25:03	20.037	0.175	1.67	0.23	-2.17	3.82
11/19/2011	13:25:05	20.05	0.188	1.66	0.24	-1.65	3.82
11/19/2011	13:25:07	20.062	0.163	1.74	0.31	-2.1	3.82
11/19/2011	13:25:09	20.049	0.158	1.8	0.31	-1.74	3.82
11/19/2011	13:25:12	20.047	0.182	1.65	0.3	-1.18	3.82
11/19/2011	13:25:14	20.043	0.191	1.62	0.15	-1.57	3.82
11/19/2011	13:25:16	20.051	0.203	1.66	0.22	-1.99	3.82
11/19/2011	13:25:18	20.072	0.19	1.6	0.16	-2.21	3.82
11/19/2011	13:25:20	20.077	0.165	1.68	0.23	-2.15	3.82
11/19/2011	13:25:22	20.104	0.16	1.67	0.23	-2.75	3.82
11/19/2011	13:25:24	20.1	0.152	1.68	0.23	-4.06	3.82
11/19/2011	13:25:26	20.112	0.141	1.68	0.22	-5.4	3.82
11/19/2011	13:25:29	20.124	0.136	1.68	0.24	-4.54	3.82
11/19/2011	13:25:31	20.126	0.136	1.76	0.31	-3.11	3.82
11/19/2011	13:25:33	20.125	0.135	1.67	0.23	-2.23	3.82
11/19/2011	13:25:35	20.13	0.132	1.69	0.24	-1.2	3.82
11/19/2011	13:25:37	20.133	0.131	1.68	0.23	-0.36	3.82
11/19/2011	13:25:39	20.138	0.131	1.61	0.2	-0.1	3.82
11/19/2011	13:25:41	20.137	0.13	1.67	0.22	0.05	3.82
11/19/2011	13:25:43	20.133	0.13	1.67	0.24	-1.26	3.82
11/19/2011	13:25:46	20.143	0.129	1.67	0.23	-1.95	3.82
11/19/2011	13:25:48	20.147	0.132	1.65	0.22	-2.44	3.82
11/19/2011	13:25:50	20.158	0.132	1.67	0.23	-3.05	3.82
11/19/2011	13:25:52	20.168	0.131	1.66	0.22	-3.73	3.82
11/19/2011	13:25:54	20.17	0.131	1.75	0.3	-4.58	3.82
11/19/2011	13:25:56	20.163	0.14	1.67	0.22	-5.75	3.82
11/19/2011	13:25:58	20.17	0.153	1.64	0.23	-6.48	3.82
11/19/2011	13:26:00	20.185	0.155	1.74	0.3	-6.45	3.82
11/19/2011	13:26:03	20.131	0.144	1.64	0.18	-4.83	3.82
11/19/2011	13:26:05	20.008	0.149	1.76	0.24	-1.55	3.82
11/19/2011	13:26:07	16.413	0.173	1.67	0.22	7.41	3.82
11/19/2011	13:26:09	8.986	0.163	1.66	0.23	26.96	3.82
11/19/2011	13:26:11	4.158	0.124	1.65	0.23	55.72	3.82
11/19/2011	13:26:13	1.872	0.086	17.69	0.23	90.68	3.82
11/19/2011	13:26:15	0.858	0.074	17.67	0.22	125.03	3.82
11/19/2011	13:26:17	0.404	0.07	17.68	0.24	184.95	3.82
11/19/2011	13:26:20	0.275	0.068	17.67	0.22	219.09	3.82
11/19/2011	13:26:22	0.209	0.069	169.79	0.3	248.3	3.82
11/19/2011	13:26:24	0.164	0.071	169.79	0.3	270.78	3.82
11/19/2011	13:26:26	0.134	0.072	169.78	0.23	291.85	3.82
11/19/2011	13:26:28	0.115	0.069	169.79	247.88	308.48	3.82
11/19/2011	13:26:30	0.126	0.071	169.71	247.81	322.26	3.82
11/19/2011	13:26:32	0.12	0.076	335.8	247.8	333.39	3.82

11/19/2011	13:26:34	0.116	0.076	335.86	247.87	345.05	3.82
11/19/2011	13:26:37	0.106	0.076	335.8	247.78	351.04	3.82
11/19/2011	13:26:39	0.11	0.076	335.86	247.8	356.43	3.81
11/19/2011	13:26:41	0.093	0.073	335.8	247.79	359.9	3.82
11/19/2011	13:26:43	0.102	0.062	443.9	247.78	362.9	3.82
11/19/2011	13:26:45	0.099	0.062	443.81	247.77	365.58	3.82
11/19/2011	13:26:48	0.101	0.06	443.9	247.79	367.99	3.82
11/19/2011	13:26:50	0.099	0.059	443.9	247.79	369.94	3.82
11/19/2011	13:26:53	0.105	0.06	461.86	247.79	370.38	3.82
11/19/2011	13:26:55	0.102	0.06	461.86	505.95	371.56	3.71
11/19/2011	13:26:57	0.091	0.061	461.85	505.92	373.28	3.71
11/19/2011	13:26:59	0.101	0.063	461.86	505.95	375.01	3.71
11/19/2011	13:27:01	0.101	0.067	461.96	506.02	375.85	3.71
11/19/2011	13:27:03	0.088	0.068	472.01	506.02	376.06	3.72
11/19/2011	13:27:05	0.142	0.069	472.01	506.02	375.63	3.71
11/19/2011	13:27:07	0.331	0.073	471.91	518.89	375.5	3.71
11/19/2011	13:27:10	0.485	0.076	471.91	518.89	375.51	3.71
11/19/2011	13:27:12	0.566	0.075	479.93	518.89	375.05	3.71
11/19/2011	13:27:14	0.601	0.073	479.93	518.9	374.24	3.71
11/19/2011	13:27:16	0.581	0.071	479.92	518.88	372.44	3.71
11/19/2011	13:27:18	0.369	0.072	480.04	518.97	370.27	3.71
11/19/2011	13:27:20	0.215	0.072	479.92	519.49	367.5	3.71
11/19/2011	13:27:22	0.15	0.068	481.88	519.49	365.52	3.71
11/19/2011	13:27:24	0.103	0.068	481.94	519.57	365.84	3.71
11/19/2011	13:27:27	0.104	0.068	481.86	519.49	367.3	3.71
11/19/2011	13:27:29	0.1	0.067	481.87	519.49	369.1	3.71
11/19/2011	13:27:31	0.089	0.069	481.86	519.49	371.35	3.71
11/19/2011	13:27:33	0.089	0.068	475.92	521.25	373.57	3.71
11/19/2011	13:27:35	0.081	0.069	476	521.32	374.75	3.71
11/19/2011	13:27:37	0.085	0.069	475.89	521.17	376.16	3.71
11/19/2011	13:27:39	0.095	0.069	475.94	521.24	376.93	3.71
11/19/2011	13:27:41	0.081	0.072	487.86	521.24	376.8	3.71
11/19/2011	13:27:44	0.094	0.075	487.87	521.24	377.4	3.71
11/19/2011	13:27:46	0.081	0.075	487.88	521.25	377.86	3.71
11/19/2011	13:27:48	0.077	0.074	487.88	525.98	378.65	3.71
11/19/2011	13:27:50	0.09	0.072	487.96	526.04	379.33	3.71
11/19/2011	13:27:52	0.089	0.072	479.9	525.89	379.57	3.71
11/19/2011	13:27:54	0.084	0.073	479.99	526.04	380.94	3.71
11/19/2011	13:27:56	0.084	0.071	480.01	526.04	383.22	3.71
11/19/2011	13:27:58	0.079	0.069	480.01	526.04	387.46	3.71
11/19/2011	13:28:01	0.092	0.069	480.01	526.04	388.89	4.09
11/19/2011	13:28:03	0.085	0.067	489.88	525.96	389.24	4.09
11/19/2011	13:28:05	0.091	0.069	489.99	526.04	388.39	4.09
11/19/2011	13:28:07	0.089	0.07	489.9	527.16	387.07	4.09
11/19/2011	13:28:09	0.093	0.07	489.9	527.16	385.57	4.09
11/19/2011	13:28:11	0.219	0.068	497.61	527.22	384.46	4.09
11/19/2011	13:28:13	0.405	0.069	499.99	527.15	382.56	4.09

11/19/2011	13:28:15	0.513	0.07	500.04	527.23	380.37	4.09
11/19/2011	13:28:18	0.56	0.071	499.95	527.15	379.91	4.09
11/19/2011	13:28:20	0.584	0.071	499.98	527.15	379.45	4.09
11/19/2011	13:28:22	0.486	0.069	481.88	527.16	379.34	4.09
11/19/2011	13:28:24	0.276	0.065	481.8	527.1	379.6	4.09
11/19/2011	13:28:26	0.162	0.061	481.96	527.23	380.53	4.09
11/19/2011	13:28:28	0.122	0.061	481.96	527.22	381.28	4.09
11/19/2011	13:28:30	0.103	0.062	481.88	527.15	382.08	4.09
11/19/2011	13:28:33	0.081	0.065	473.9	525.35	382.89	4.09
11/19/2011	13:28:35	0.067	0.067	474	525.43	384.2	4.09
11/19/2011	13:28:37	0.085	0.066	474.01	525.44	385.16	4.09
11/19/2011	13:28:39	0.079	0.068	473.91	525.37	386.09	4.09
11/19/2011	13:28:41	0.077	0.069	474	525.44	386.23	4.09
11/19/2011	13:28:43	0.073	0.069	480	525.43	386.05	4.09
11/19/2011	13:28:45	0.065	0.069	479.95	525.35	385.47	4.09
11/19/2011	13:28:47	0.079	0.071	479.91	525.34	384.18	4.08
11/19/2011	13:28:50	0.079	0.069	479.91	525.35	383.63	4.09
11/19/2011	13:28:52	0.07	0.069	484.7	525.36	383.18	4.09
11/19/2011	13:28:54	0.086	0.072	483.95	525.43	382.94	4.09
11/19/2011	13:28:56	0.081	0.077	484.69	525.39	382.42	4.08
11/19/2011	13:28:58	0.065	0.074	484.74	525.9	382.61	4.08
11/19/2011	13:29:00	0.083	0.07	484.85	525.97	382.52	4.08
11/19/2011	13:29:02	0.073	0.071	497.96	525.96	382.49	4.09
11/19/2011	13:29:04	0.056	0.066	499.07	525.84	383.28	4.12
11/19/2011	13:29:07	0.073	0.07	497.95	525.96	384.09	4.14
11/19/2011	13:29:09	0.072	0.07	498.03	526.03	384.9	4.14
11/19/2011	13:29:11	0.066	0.069	497.96	525.96	385.97	4.14
11/19/2011	13:29:13	0.084	0.068	487.89	525.96	386.21	4.14
11/19/2011	13:29:15	0.106	0.068	487.88	525.96	386.43	4.14
11/19/2011	13:29:17	0.297	0.068	487.98	526.03	385.67	4.14
11/19/2011	13:29:19	0.451	0.07	487.89	525.96	383.15	4.14
11/19/2011	13:29:21	0.531	0.071	478.02	526.03	381.59	4.14
11/19/2011	13:29:24	0.57	0.069	477.99	526.03	381.4	4.14
11/19/2011	13:29:26	0.567	0.07	477.99	526.64	380.75	4.14
11/19/2011	13:29:28	0.369	0.072	477.95	526.55	379.8	4.14
11/19/2011	13:29:30	0.218	0.074	477.82	526.48	379.57	4.14
11/19/2011	13:29:32	0.141	0.075	481.94	526.63	379.71	4.14
11/19/2011	13:29:34	0.099	0.073	481.85	526.55	379.32	4.14
11/19/2011	13:29:36	0.083	0.074	481.84	526.54	378.16	4.14
11/19/2011	13:29:38	0.074	0.071	481.85	526.56	376.62	4.14
11/19/2011	13:29:41	0.083	0.07	481.93	526.63	375.71	4.14
11/19/2011	13:29:43	0.076	0.07	469.87	526.51	375.64	4.14
11/19/2011	13:29:45	0.061	0.07	469.89	526.63	376.09	4.14
11/19/2011	13:29:47	0.067	0.06	469.97	526.63	376.99	4.14
11/19/2011	13:29:49	0.075	0.06	469.98	526.63	378.14	4.14
11/19/2011	13:29:51	0.068	0.06	473.97	527.22	378.7	4.14
11/19/2011	13:29:53	0.069	0.061	473.97	527.22	378.83	4.14

11/19/2011	13:29:56	0.068	0.059	473.98	527.22	378.56	4.14
11/19/2011	13:29:58	0.075	0.063	473.88	527.14	378.73	4.14
11/19/2011	13:30:00	0.069	0.066	473.88	527.14	379.26	4.14
11/19/2011	13:30:02	0.077	0.067	467.96	527.21	379.42	4.14
11/19/2011	13:30:04	0.064	0.069	467.96	527.81	379.44	4.14
11/19/2011	13:30:06	0.07	0.074	467.95	527.81	379.92	4.14
11/19/2011	13:30:08	0.064	0.074	467.98	527.81	381.45	4.14
11/19/2011	13:30:10	0.065	0.073	467.97	527.81	383.07	4.09
11/19/2011	13:30:13	0.065	0.072	481.85	527.73	383	4.09
11/19/2011	13:30:15	0.072	0.072	481.84	527.79	382.92	4.09
11/19/2011	13:30:17	0.07	0.073	481.94	527.81	383.69	4.09
11/19/2011	13:30:19	0.076	0.062	481.84	527.72	383.98	4.09
11/19/2011	13:30:21	0.181	0.06	467.96	527.81	383.34	4.09
11/19/2011	13:30:23	0.376	0.062	467.95	528.39	382.68	4.09
11/19/2011	13:30:25	0.496	0.061	467.95	528.39	382.28	4.09
11/19/2011	13:30:27	0.549	0.062	467.86	528.31	385.17	4.09
11/19/2011	13:30:30	0.563	0.061	467.87	528.32	387.29	4.09
11/19/2011	13:30:32	0.464	0.06	477.97	528.38	388.36	4.09
11/19/2011	13:30:34	0.259	0.064	477.87	528.32	389.76	4.09
11/19/2011	13:30:36	0.152	0.068	477.97	527.21	390.04	4.09
11/19/2011	13:30:38	0.102	0.068	477.97	527.2	388.8	4.09
11/19/2011	13:30:40	0.078	0.07	477.97	527.2	387.02	4.09
11/19/2011	13:30:42	0.076	0.072	479.98	527.2	386.21	4.09
11/19/2011	13:30:45	0.069	0.073	479.88	527.12	385.96	4.09
11/19/2011	13:30:47	0.078	0.075	479.86	527.13	386.16	4.09
11/19/2011	13:30:49	0.074	0.073	479.89	527.11	385.85	4.09
11/19/2011	13:30:51	0.05	0.071	479.9	528.3	385.67	4.09
11/19/2011	13:30:53	0.061	0.073	479.99	528.38	385.32	4.09
11/19/2011	13:30:55	0.061	0.072	479.98	528.38	385.23	4.09
11/19/2011	13:30:57	0.06	0.07	479.89	528.31	385.92	4.09
11/19/2011	13:30:59	0.065	0.07	479.99	528.39	386.83	4.09
11/19/2011	13:31:02	0.052	0.068	483.86	528.3	387.41	4.09
11/19/2011	13:31:04	0.06	0.069	483.94	528.98	387.67	4.09
11/19/2011	13:31:06	0.058	0.069	483.85	528.9	386.75	4.09
11/19/2011	13:31:08	0.063	0.067	483.95	528.98	385.02	4.09
11/19/2011	13:31:10	0.071	0.069	483.94	528.98	382.6	4.09
11/19/2011	13:31:12	0.065	0.069	481.94	528.97	380.63	4.09
11/19/2011	13:31:14	0.066	0.069	481.88	528.9	379.43	4.2
11/19/2011	13:31:16	0.06	0.07	481.85	528.9	380.82	4.19
11/19/2011	13:31:19	0.05	0.073	481.95	528.98	382.08	4.19
11/19/2011	13:31:21	0.057	0.075	481.84	528.9	383.42	4.19
11/19/2011	13:31:23	0.056	0.075	495.87	528.91	384.23	4.2
11/19/2011	13:31:25	0.05	0.074	495.95	528.98	385.04	4.19
11/19/2011	13:31:27	0.155	0.077	495.94	528.98	384.93	4.19
11/19/2011	13:31:29	0.094	0.079	495.95	528.38	382.77	4.19
11/19/2011	13:31:31	0.043	0.074	407.91	528.38	380.76	4.19
11/19/2011	13:31:33	0.033	0.07	407.83	528.31	379.09	4.19

11/19/2011	13:31:36	0.027	0.069	407.82	528.3	378.26	4.19
11/19/2011	13:31:38	0.04	0.068	407.79	528.29	377.2	4.19
11/19/2011	13:31:40	0.021	0.068	407.92	528.38	376.85	4.19
11/19/2011	13:31:42	0.027	0.068	389.88	529.57	377.99	4.19
11/19/2011	13:31:44	0.031	0.067	389.87	529.57	379.68	4.19
11/19/2011	13:31:46	0.036	0.069	389.89	529.57	381.05	4.19
11/19/2011	13:31:48	0.037	0.069	389.9	529.57	382.51	4.19
11/19/2011	13:31:50	0.034	0.069	389.8	529.48	385.17	4.19
11/19/2011	13:31:53	0.039	0.064	417.79	529.48	387.64	4.19
11/19/2011	13:31:55	0.024	0.065	417.79	530.08	390.13	4.2
11/19/2011	13:31:57	0.024	0.065	417.86	530.16	391.71	4.19
11/19/2011	13:31:59	0.021	0.065	417.89	530.15	392.15	4.19
11/19/2011	13:32:01	0.021	0.063	457.92	530.15	391.85	4.19
11/19/2011	13:32:03	0.02	0.062	457.92	530.15	391.1	4.19
11/19/2011	13:32:05	0.025	0.063	457.83	530.07	389.59	4.2
11/19/2011	13:32:08	0.021	0.066	457.83	530.08	388.53	4.19
11/19/2011	13:32:10	0.028	0.067	457.91	530.15	388.48	4.19
11/19/2011	13:32:12	0.025	0.065	463.8	530.07	389.3	4.19
11/19/2011	13:32:14	0.034	0.065	463.91	530.15	390.9	4.19
11/19/2011	13:32:16	0.019	0.065	463.93	530.16	392.15	4.19
11/19/2011	13:32:18	0.015	0.063	463.82	530.07	390.87	4.19
11/19/2011	13:32:20	0.025	0.064	463.81	530.06	388.7	1.33
11/19/2011	13:32:22	0.019	0.065	479.98	530.15	386.63	1.33
11/19/2011	13:32:25	0.03	0.063	479.89	530.07	384.85	1.33
11/19/2011	13:32:27	0.036	0.064	479.89	530.07	383.82	1.33
11/19/2011	13:32:29	0.015	0.063	479.99	530.14	384.26	1.33
11/19/2011	13:32:31	0.022	0.066	479.98	530.15	384.89	1.33
11/19/2011	13:32:33	0.011	0.07	479.87	529.98	384.46	1.32
11/19/2011	13:32:35	0.023	0.07	479.97	530.14	384.75	1.33
11/19/2011	13:32:37	0.022	0.07	479.97	530.15	385.56	1.33
11/19/2011	13:32:39	0.025	0.07	479.79	530	386.03	1.32
11/19/2011	13:32:42	0.021	0.069	483.84	530.65	386.29	1.33
11/19/2011	13:32:44	0.016	0.07	483.93	530.73	385.92	1.33
11/19/2011	13:32:46	0.021	0.069	483.91	530.73	385.45	1.33
11/19/2011	13:32:48	0.008	0.063	483.84	530.64	385.18	1.33
11/19/2011	13:32:50	0.025	0.06	483.93	530.73	384.73	1.32
11/19/2011	13:32:52	0.017	0.06	493.92	530.73	383.95	1.33
11/19/2011	13:32:54	0.021	0.058	493.78	531.83	383.34	1.33
11/19/2011	13:32:57	0.018	0.058	493.95	531.92	382.07	1.33
11/19/2011	13:32:59	0.011	0.057	493.95	531.92	381.62	1.33
11/19/2011	13:33:01	0.021	0.057	493.86	531.83	381.57	1.33
11/19/2011	13:33:03	0.017	0.059	477.88	531.84	382.34	1.33
11/19/2011	13:33:05	0.019	0.062	477.97	531.91	384.48	1.33
11/19/2011	13:33:07	0.017	0.064	477.97	531.9	387.41	1.33
11/19/2011	13:33:09	0.027	0.067	477.97	531.92	390.91	1.33
11/19/2011	13:33:11	0.025	0.069	457.8	531.82	397.53	1.33
11/19/2011	13:33:14	0.025	0.07	457.81	531.84	402.91	1.33

11/19/2011	13:33:16	0.024	0.068	457.9	531.92	408.49	1.33
11/19/2011	13:33:18	0.027	0.067	457.81	531.83	413.88	1.33
11/19/2011	13:33:20	0.012	0.066	457.91	462.36	418.83	1.33
11/19/2011	13:33:22	0.013	0.066	425.89	462.37	422.27	1.33
11/19/2011	13:33:24	0.021	0.071	425.89	462.37	426.62	2.11
11/19/2011	13:33:26	0.014	0.068	425.89	462.37	432.42	2.11
11/19/2011	13:33:28	0.013	0.067	425.89	462.37	438.43	2.11
11/19/2011	13:33:31	0.011	0.066	425.89	462.36	441.07	2.11
11/19/2011	13:33:33	0.013	0.067	441.87	394.5	444.53	2.11
11/19/2011	13:33:35	0.026	0.068	441.87	394.5	447.92	2.11
11/19/2011	13:33:37	0.014	0.067	441.96	394.58	451.87	2.11
11/19/2011	13:33:39	0.026	0.066	441.89	394.52	454.46	2.11
11/19/2011	13:33:41	0.024	0.068	473.99	394.58	455.51	2.11
11/19/2011	13:33:43	0.005	0.069	473.94	394.51	455.69	2.11
11/19/2011	13:33:45	0.025	0.067	473.89	394.51	456.23	2.11
11/19/2011	13:33:48	0.009	0.071	473.89	400.99	457.02	2.11
11/19/2011	13:33:50	0.011	0.074	473.99	401.06	458.76	2.11
11/19/2011	13:33:52	0.013	0.071	421.82	400.99	461.2	2.11
11/19/2011	13:33:54	0.02	0.071	421.81	401	464.14	2.11
11/19/2011	13:33:56	0.013	0.071	421.87	401.06	466.55	2.11
11/19/2011	13:33:58	0.022	0.071	421.78	401.06	468.46	2.11
11/19/2011	13:34:00	0.017	0.069	421.81	408.65	470.16	2.11
11/19/2011	13:34:02	0.016	0.071	441.87	408.56	471.4	2.11
11/19/2011	13:34:05	0.02	0.07	441.86	408.64	472.68	2.11
11/19/2011	13:34:07	0.01	0.069	441.95	408.72	475.33	2.11
11/19/2011	13:34:09	0.016	0.067	441.86	408.64	477.77	2.11
11/19/2011	13:34:11	0.01	0.067	405.91	408.72	480.61	2.11
11/19/2011	13:34:13	0.008	0.064	405.9	412.81	484.1	2.11
11/19/2011	13:34:15	0.024	0.066	405.81	412.73	486.56	2.1
11/19/2011	13:34:17	0.013	0.068	405.82	412.74	487.21	2.1
11/19/2011	13:34:19	0.014	0.068	405.9	412.82	486.67	2.11
11/19/2011	13:34:22	0.02	0.068	439.82	412.72	486.44	2.11
11/19/2011	13:34:24	0.013	0.068	439.84	412.75	484.78	2.11
11/19/2011	13:34:26	0.034	0.069	439.98	413.42	483.16	2.1
11/19/2011	13:34:28	0.001	0.071	439.87	413.35	482.51	2.11
11/19/2011	13:34:30	0.016	0.074	439.9	413.43	481.48	2.16
11/19/2011	13:34:32	0.017	0.073	453.82	413.42	479.54	2.16
11/19/2011	13:34:34	0.013	0.073	453.89	413.42	476.42	2.16
11/19/2011	13:34:36	0.006	0.069	453.89	413.42	470.54	2.16
11/19/2011	13:34:39	0.027	0.069	453.9	413.43	467.75	2.16
11/19/2011	13:34:41	0.014	0.07	453.89	413.42	465.64	2.16
11/19/2011	13:34:43	0.009	0.068	451.78	413.34	463.17	2.16
11/19/2011	13:34:45	0.013	0.065	451.85	413.35	461.43	2.16
11/19/2011	13:34:47	0.012	0.066	451.88	413.43	459.99	2.16
11/19/2011	13:34:49	0.01	0.063	451.89	413.41	460.99	2.16
11/19/2011	13:34:51	0.016	0.061	455.77	413.34	463.52	2.16
11/19/2011	13:34:53	0.017	0.061	455.78	413.33	465.53	2.16

11/19/2011	13:34:56	0.017	0.06	455.8	413.35	465.55	2.16
11/19/2011	13:34:58	-0.002	0.059	455.81	411.58	465.35	2.16
11/19/2011	13:35:00	0.01	0.06	455.83	411.53	466.18	2.16
11/19/2011	13:35:02	0.003	0.06	427.79	411.58	467.62	2.16
11/19/2011	13:35:04	-0.005	0.06	427.88	411.65	470.79	2.16
11/19/2011	13:35:06	0.009	0.063	427.79	411.58	473.44	2.16
11/19/2011	13:35:08	0.009	0.064	427.77	411.57	476.18	2.16
11/19/2011	13:35:10	0.019	0.066	427.78	410.4	477.65	2.16
11/19/2011	13:35:13	0.021	0.066	437.83	410.35	479.37	2.16
11/19/2011	13:35:15	0.005	0.065	437.82	410.4	480.5	2.16
11/19/2011	13:35:17	0.014	0.063	437.82	410.39	481.82	2.16
11/19/2011	13:35:19	0.01	0.061	437.91	410.47	482.73	2.16
11/19/2011	13:35:21	0.007	0.064	431.76	410.4	482.67	2.16
11/19/2011	13:35:23	0.02	0.064	431.79	410.4	483.23	2.16
11/19/2011	13:35:25	0.017	0.063	431.88	410.48	482.73	2.16
11/19/2011	13:35:27	0.006	0.063	431.77	410.4	476.33	2.16
11/19/2011	13:35:30	0.009	0.061	431.77	410.39	467.71	2.16
11/19/2011	13:35:32	0.021	0.062	329.85	410.48	456.69	2.16
11/19/2011	13:35:34	0.036	0.061	329.76	410.41	444.56	2.26
11/19/2011	13:35:36	0.02	0.062	329.84	410.48	432.66	2.27
11/19/2011	13:35:38	0.006	0.066	329.74	410.41	422.91	2.26
11/19/2011	13:35:40	0.126	0.069	329.83	410.47	412.97	2.26
11/19/2011	13:35:42	0.187	0.07	381.81	410.41	401.3	2.26
11/19/2011	13:35:45	0.44	0.069	381.89	410.48	389.96	2.27
11/19/2011	13:35:47	6.019	0.082	381.75	410.4	371.16	2.26
11/19/2011	13:35:49	10.958	0.087	381.79	410.41	344.58	2.26
11/19/2011	13:35:51	13.966	0.109	301.82	472.97	310.68	2.26
11/19/2011	13:35:53	17.184	0.118	301.7	472.85	265.73	2.26
11/19/2011	13:35:55	18.737	0.135	301.71	472.89	223.99	2.26
11/19/2011	13:35:57	19.446	0.139	301.71	472.89	189.58	2.26
11/19/2011	13:35:59	19.818	0.138	301.66	472.89	139.6	2.26
11/19/2011	13:36:02	20.002	0.137	191.83	472.97	110.98	2.26
11/19/2011	13:36:04	20.097	0.136	191.74	472.89	87.56	2.26
11/19/2011	13:36:06	20.133	0.137	191.77	472.9	68.76	2.26
11/19/2011	13:36:08	20.151	0.136	191.84	472.97	53.79	2.26
11/19/2011	13:36:10	20.165	0.137	191.66	472.9	41.2	2.26
11/19/2011	13:36:12	20.169	0.14	101.66	472.9	30.61	2.26
11/19/2011	13:36:14	20.176	0.144	101.67	472.84	22.59	2.26
11/19/2011	13:36:16	20.18	0.141	101.68	286.62	15.79	2.26
11/19/2011	13:36:19	20.173	0.14	101.66	286.61	12.42	2.26
11/19/2011	13:36:21	20.178	0.141	101.66	286.61	9.98	2.26
11/19/2011	13:36:23	20.178	0.141	33.64	286.63	7.43	2.26
11/19/2011	13:36:25	20.184	0.138	33.64	286.62	4.94	2.26
11/19/2011	13:36:27	20.189	0.133	33.65	286.63	3.05	2.26
11/19/2011	13:36:29	20.188	0.13	33.61	286.62	0.94	2.26
11/19/2011	13:36:31	20.183	0.13	7.64	286.62	-1.35	2.26
11/19/2011	13:36:33	20.183	0.131	7.66	286.62	-1.43	2.26

11/19/2011	13:36:36	20.194	0.13	7.66	286.62	-1.47	2.26
11/19/2011	13:36:38	20.201	0.131	7.66	286.62	-0.72	2.26
11/19/2011	13:36:40	20.187	0.135	7.64	286.62	0.57	2.41
11/19/2011	13:36:42	20.2	0.136	1.64	286.62	2.52	2.41
11/19/2011	13:36:44	20.194	0.135	1.63	24.92	3.83	2.41
11/19/2011	13:36:46	20.206	0.132	1.64	24.99	5.4	2.41
11/19/2011	13:36:48	20.204	0.129	1.48	24.91	5.93	2.41
11/19/2011	13:36:51	20.207	0.129	1.63	24.99	6.65	2.41
11/19/2011	13:36:53	20.21	0.131	1.64	24.98	8.08	2.41
11/19/2011	13:36:55	20.198	0.132	1.64	24.97	9.58	2.41
11/19/2011	13:36:57	20.193	0.134	1.63	9.63	10.11	2.41
11/19/2011	13:36:59	20.186	0.133	1.62	9.65	8.77	2.41
11/19/2011	13:37:01	20.185	0.135	1.64	9.65	6.32	2.41
11/19/2011	13:37:03	20.198	0.136	1.64	9.57	4.5	2.41
11/19/2011	13:37:05	20.193	0.138	1.69	9.65	1.61	2.41
11/19/2011	13:37:08	20.194	0.138	1.66	9.64	-1.16	2.41
11/19/2011	13:37:10	20.207	0.137	1.63	9.64	-3.8	2.41
11/19/2011	13:37:12	20.198	0.136	1.63	9.64	-5.73	2.41
11/19/2011	13:37:14	20.196	0.135	1.64	9.64	-7.48	2.41
11/19/2011	13:37:16	20.189	0.133	1.73	6.19	-8.87	2.41
11/19/2011	13:37:18	20.187	0.134	1.64	6.11	-9.14	2.41
11/19/2011	13:37:20	20.203	0.135	1.72	6.2	-8.09	2.41
11/19/2011	13:37:22	20.192	0.135	1.65	6.12	-4.56	2.41
11/19/2011	13:37:25	20.192	0.135	1.63	6.12	-2.86	2.41
11/19/2011	13:37:27	20.192	0.135	1.63	6.18	-1.71	2.41
11/19/2011	13:37:29	20.173	0.138	1.72	4.42	-0.89	2.41
11/19/2011	13:37:31	20.144	0.173	1.73	4.43	-0.11	2.41
11/19/2011	13:37:33	20.141	0.215	1.63	4.35	1	2.41
11/19/2011	13:37:35	20.159	0.212	1.64	4.36	1.27	2.41
11/19/2011	13:37:37	20.148	0.192	1.55	4.36	1.12	2.41
11/19/2011	13:37:39	20.135	0.192	1.63	4.35	0.32	2.41
11/19/2011	13:37:42	20.126	0.213	1.63	3.76	-0.25	2.41
11/19/2011	13:37:44	20.137	0.223	1.64	3.76	-1.25	3.66
11/19/2011	13:37:46	20.146	0.204	1.72	3.84	-0.98	3.66
11/19/2011	13:37:48	20.175	0.209	1.72	3.84	0.36	3.66
11/19/2011	13:37:50	20.201	0.18	1.06	3.25	1.45	3.66
11/19/2011	13:37:52	20.209	0.152	1.05	3.25	0.52	3.66
11/19/2011	13:37:54	20.212	0.136	1.54	3.09	-2.18	3.66
11/19/2011	13:37:57	20.22	0.13	1.64	3.17	-3.77	3.65
11/19/2011	13:37:59	20.201	0.13	1.71	3.24	-4.72	3.66
11/19/2011	13:38:01	20.196	0.127	1.71	3.24	-6.09	3.66
11/19/2011	13:38:03	20.207	0.132	1.63	3.17	-5.44	3.66
11/19/2011	13:38:05	20.196	0.13	1.71	3.24	-4.32	3.65
11/19/2011	13:38:07	20.211	0.13	1.72	3.24	-4.18	3.65
11/19/2011	13:38:09	20.216	0.131	1.65	3.17	-6.03	3.66
11/19/2011	13:38:11	20.204	0.13	1.62	3.17	-8.61	3.65
11/19/2011	13:38:14	20.22	0.132	1.62	3.17	-9.04	3.66

11/19/2011	13:38:16	20.202	0.132	1.62	3.18	-8.72	3.66
11/19/2011	13:38:18	20.207	0.132	1.71	3.25	-7.04	3.66
11/19/2011	13:38:20	20.213	0.133	1.63	3.17	-4.35	3.65
11/19/2011	13:38:22	20.21	0.131	1.65	2.56	-1.1	3.65
11/19/2011	13:38:24	20.207	0.135	1.6	2.54	0.66	3.65
11/19/2011	13:38:26	20.207	0.135	1.64	2.55	1.46	3.65
11/19/2011	13:38:28	20.208	0.135	1.7	2.63	0.84	3.65
11/19/2011	13:38:31	20.207	0.135	1.7	2.63	0.96	3.65
11/19/2011	13:38:33	20.205	0.133	1.58	2.47	0.95	3.65
11/19/2011	13:38:35	20.211	0.133	1.64	2.5	-0.05	3.65
11/19/2011	13:38:37	20.214	0.133	1.65	2.56	-1.02	3.65
11/19/2011	13:38:39	20.201	0.138	1.64	2.55	-2.1	3.65
11/19/2011	13:38:41	20.209	0.138	1.72	2.63	-3.29	3.65
11/19/2011	13:38:43	20.206	0.14	1.71	2.63	-2.68	3.65
11/19/2011	13:38:45	20.206	0.137	1.72	2.63	-2.78	3.65
11/19/2011	13:38:48	20.21	0.134	1.72	2.06	-3.03	3.65
11/19/2011	13:38:50	20.209	0.134	1.63	1.98	-3.33	3.55
11/19/2011	13:38:52	20.222	0.133	1.72	2.06	-4.58	3.55
11/19/2011	13:38:54	20.229	0.134	1.74	2.06	-5.03	3.55
11/19/2011	13:38:56	20.219	0.135	1.72	2.06	-5.71	3.54
11/19/2011	13:38:58	20.223	0.135	1.72	2.06	-5.89	3.55
11/19/2011	13:39:00	20.235	0.136	1.65	1.3	-6.37	3.55
11/19/2011	13:39:02	20.228	0.138	1.72	1.46	-8.43	3.55
11/19/2011	13:39:05	20.196	0.137	1.61	1.38	-9.49	3.55
11/19/2011	13:39:07	20.186	0.143	1.62	1.39	-10.58	3.55
11/19/2011	13:39:09	20.177	0.171	1.64	1.37	-11	3.55
11/19/2011	13:39:11	20.205	0.165	1.71	1.46	-9.7	3.55
11/19/2011	13:39:13	20.204	0.152	1.71	1.47	-7.97	3.55
11/19/2011	13:39:15	20.17	0.141	1.64	1.38	-5.47	3.55
11/19/2011	13:39:17	20.13	0.167	1.72	1.46	-2.68	3.55
11/19/2011	13:39:20	20.14	0.225	1.58	1.36	0.26	3.55
11/19/2011	13:39:22	20.164	0.223	1.59	1.3	1.38	3.55
11/19/2011	13:39:24	20.182	0.191	1.63	1.38	1.62	3.55
11/19/2011	13:39:26	20.187	0.172	1.64	1.39	0.63	3.55
11/19/2011	13:39:28	20.178	0.177	1.72	1.46	-0.26	3.55
11/19/2011	13:39:30	20.164	0.177	1.62	1.37	-0.44	3.55
11/19/2011	13:39:32	20.132	0.191	1.67	1.37	-0.53	3.55
11/19/2011	13:39:34	20.116	0.229	1.74	1.46	-0.52	3.55
11/19/2011	13:39:37	20.138	0.237	1.59	1.34	-0.09	3.55
11/19/2011	13:39:39	20.155	0.242	1.64	1.38	-0.03	3.55
11/19/2011	13:39:41	20.136	0.204	1.71	1.45	-0.47	3.55
11/19/2011	13:39:43	20.141	0.207	1.72	1.46	-1.75	3.55
11/19/2011	13:39:45	20.142	0.231	1.67	1.46	-3.7	3.55
11/19/2011	13:39:47	20.146	0.232	1.63	1.38	-5.28	3.55
11/19/2011	13:39:49	20.175	0.225	1.71	1.46	-7.24	3.55
11/19/2011	13:39:51	20.18	0.194	1.63	1.39	-8.87	3.55
11/19/2011	13:39:54	20.184	0.175	1.62	1.34	-9.27	3.55

11/19/2011	13:39:56	20.194	0.166	1.63	1.4	-10.23	3.55
11/19/2011	13:39:58	20.218	0.165	1.62	1.39	-10.04	3.55
11/19/2011	13:40:00	20.21	0.168	1.7	1.47	-9.36	3.55
11/19/2011	13:40:02	20.199	0.168	1.71	1.46	-8.67	3.55
11/19/2011	13:40:04	20.175	0.189	1.62	1.38	-8.08	3.55
11/19/2011	13:40:06	20.187	0.206	1.71	1.46	-7.33	3.55
11/19/2011	13:40:08	20.164	0.205	1.63	1.39	-6.67	3.55
11/19/2011	13:40:11	20.159	0.205	1.72	1.46	-6.86	3.55
11/19/2011	13:40:13	20.181	0.206	1.63	1.38	-6.31	3.55
11/19/2011	13:40:15	20.166	0.176	1.62	1.38	-5.9	3.55
11/19/2011	13:40:17	20.147	0.178	1.72	1.46	-6.4	3.55
11/19/2011	13:40:19	20.137	0.209	1.73	1.46	-7.1	3.55
11/19/2011	13:40:21	20.123	0.234	1.71	1.45	-6.92	3.55
11/19/2011	13:40:23	20.13	0.24	1.59	1.38	-6.33	3.55
11/19/2011	13:40:26	20.16	0.231	1.71	1.46	-5.77	3.55
11/19/2011	13:40:28	20.188	0.207	1.71	1.45	-4.41	3.55
11/19/2011	13:40:30	20.203	0.159	1.61	1.37	-2.9	3.55
11/19/2011	13:40:32	20.149	0.149	1.72	1.46	-1.84	3.55
11/19/2011	13:40:34	20.116	0.201	1.63	1.38	0.09	3.55
11/19/2011	13:40:36	20.107	0.252	1.71	1.46	1.36	3.55
11/19/2011	13:40:38	20.116	0.273	1.71	1.46	0.93	3.55
11/19/2011	13:40:40	20.119	0.235	1.71	1.46	-2.41	3.55
11/19/2011	13:40:43	20.107	0.247	1.61	1.37	-4.66	3.55
11/19/2011	13:40:45	20.113	0.259	1.61	1.38	-5.38	3.55
11/19/2011	13:40:47	20.14	0.254	1.72	1.45	-5.2	3.55
11/19/2011	13:40:49	20.181	0.213	1.62	1.39	-3.76	3.55
11/19/2011	13:40:51	20.201	0.18	3.72	1.46	-2.27	3.55
11/19/2011	13:40:53	20.207	0.157	3.63	1.37	-1.85	3.55
11/19/2011	13:40:55	20.201	0.144	3.73	1.46	-1.56	3.55
11/19/2011	13:40:57	20.161	0.155	3.63	1.37	0.46	3.55
11/19/2011	13:41:00	20.164	0.189	3.63	1.38	2.51	3.6
11/19/2011	13:41:02	20.178	0.221	1.51	1.37	4.26	3.6
11/19/2011	13:41:04	20.19	0.204	1.62	1.39	5.2	3.6
11/19/2011	13:41:06	20.169	0.198	1.7	1.45	5.42	3.6
11/19/2011	13:41:08	20.177	0.217	1.7	1.45	5.25	3.6
11/19/2011	13:41:10	20.178	0.22	1.66	1.45	4.47	3.6
11/19/2011	13:41:12	20.192	0.198	1.7	1.45	3.72	3.6
11/19/2011	13:41:14	20.183	0.194	1.61	1.37	3.46	3.6
11/19/2011	13:41:17	20.214	0.18	1.64	1.39	2.1	3.6
11/19/2011	13:41:19	20.187	0.17	1.61	1.29	0.34	3.6
11/19/2011	13:41:21	20.196	0.169	1.62	1.39	-1.02	3.6
11/19/2011	13:41:23	20.197	0.181	1.61	1.38	-1.79	3.6
11/19/2011	13:41:25	20.202	0.181	1.62	1.38	-2.19	3.6
11/19/2011	13:41:27	20.177	0.178	1.62	1.37	-1.64	3.6
11/19/2011	13:41:29	20.165	0.191	1.64	1.38	-0.83	3.6
11/19/2011	13:41:31	20.169	0.208	1.61	1.38	-0.01	3.6
11/19/2011	13:41:34	20.14	0.207	1.62	1.38	0.65	3.6

11/19/2011	13:41:36	20.142	0.239	1.7	1.45	0.42	3.6
11/19/2011	13:41:38	20.156	0.251	1.64	1.38	-1.19	3.6
11/19/2011	13:41:40	20.178	0.22	1.62	1.37	-2.17	3.6
11/19/2011	13:41:42	20.156	0.197	1.62	1.38	-2.59	3.6
11/19/2011	13:41:44	20.156	0.219	1.69	1.45	-2.64	3.6
11/19/2011	13:41:46	20.165	0.223	1.68	1.46	-2.44	3.6
11/19/2011	13:41:48	20.176	0.213	1.73	1.46	-2.34	3.6
11/19/2011	13:41:51	20.181	0.203	1.57	1.39	-3.24	3.6
11/19/2011	13:41:53	20.162	0.191	1.62	1.35	-3.88	3.6
11/19/2011	13:41:55	20.17	0.204	1.63	1.38	-3.96	3.6
11/19/2011	13:41:57	20.171	0.204	1.63	1.38	-4.73	3.6
11/19/2011	13:41:59	20.167	0.206	1.63	1.45	-4.76	3.6
11/19/2011	13:42:01	20.162	0.215	1.72	1.45	-4.63	3.6
11/19/2011	13:42:03	20.156	0.224	1.72	1.46	-5.16	3.6
11/19/2011	13:42:05	20.165	0.229	1.63	1.38	-7.79	3.51
11/19/2011	13:42:08	20.179	0.213	1.54	1.31	-8.39	3.51
11/19/2011	13:42:10	20.2	0.189	1.64	1.38	-7.88	3.51
11/19/2011	13:42:12	20.204	0.178	3.72	1.46	-6.63	3.51
11/19/2011	13:42:14	20.189	0.178	3.72	1.45	-5.57	3.51
11/19/2011	13:42:16	20.194	0.195	3.64	1.37	-5.72	3.51
11/19/2011	13:42:18	20.195	0.2	3.72	1.46	-5.11	3.51
11/19/2011	13:42:20	20.194	0.2	3.71	1.46	-4.55	3.51
11/19/2011	13:42:23	20.191	0.182	1.7	1.45	-4.69	3.51
11/19/2011	13:42:25	20.174	0.167	1.61	1.36	-5.33	3.51
11/19/2011	13:42:27	20.16	0.212	1.7	1.45	-5.79	3.51
11/19/2011	13:42:29	20.16	0.23	1.7	1.45	-6.3	3.51
11/19/2011	13:42:31	20.163	0.216	1.7	1.45	-6.6	3.51
11/19/2011	13:42:33	20.151	0.214	1.55	1.37	-6.27	3.51
11/19/2011	13:42:35	20.188	0.229	1.62	1.38	-7.03	3.51
11/19/2011	13:42:37	20.199	0.19	1.71	1.45	-7.49	3.51
11/19/2011	13:42:40	20.202	0.176	1.61	1.37	-8.07	3.51
11/19/2011	13:42:42	20.182	0.181	1.72	1.45	-8.46	3.51
11/19/2011	13:42:44	20.188	0.191	1.7	1.45	-9.39	3.51
11/19/2011	13:42:46	20.188	0.188	1.7	1.45	-9.55	3.51
11/19/2011	13:42:48	20.174	0.203	1.7	1.45	-10.23	3.51
11/19/2011	13:42:50	20.167	0.195	1.71	1.45	-9.76	3.51
11/19/2011	13:42:52	20.153	0.21	1.7	1.46	-8.04	3.51
11/19/2011	13:42:54	20.152	0.23	1.62	1.38	-7.79	3.51
11/19/2011	13:42:57	20.17	0.238	1.61	1.37	-8.28	3.51
11/19/2011	13:42:59	20.188	0.211	1.57	1.34	-7.14	3.51
11/19/2011	13:43:01	20.202	0.183	1.61	1.38	-5.69	3.51
11/19/2011	13:43:03	20.193	0.175	1.6	1.31	-4.6	3.51
11/19/2011	13:43:05	20.198	0.188	1.57	1.35	-2.9	3.51
11/19/2011	13:43:07	20.176	0.185	1.7	1.45	-1.08	3.51
11/19/2011	13:43:09	20.151	0.188	1.71	1.45	0.31	3.55
11/19/2011	13:43:11	20.166	0.238	1.61	1.37	1.88	3.55
11/19/2011	13:43:14	20.187	0.236	1.64	1.39	1.67	3.54

11/19/2011	13:43:16	20.204	0.202	1.7	1.45	0.62	3.55
11/19/2011	13:43:18	20.196	0.196	1.62	1.39	-0.34	3.55
11/19/2011	13:43:20	20.222	0.197	1.55	1.3	-0.77	3.55
11/19/2011	13:43:22	20.205	0.179	1.71	1.45	-1.48	3.55
11/19/2011	13:43:24	20.166	0.191	1.7	1.45	-2.51	3.55
11/19/2011	13:43:26	20.171	0.229	1.7	1.45	-4.18	3.55
11/19/2011	13:43:28	20.168	0.222	1.7	1.45	-6.66	3.55
11/19/2011	13:43:31	20.169	0.214	1.62	1.37	-8.54	3.55
11/19/2011	13:43:33	20.173	0.217	1.54	1.39	-10.25	3.55
11/19/2011	13:43:35	20.191	0.211	1.61	1.37	-10.82	3.55
11/19/2011	13:43:37	20.23	0.181	1.61	1.38	-11.22	3.55
11/19/2011	13:43:39	20.233	0.154	1.72	1.45	-10.79	3.55
11/19/2011	13:43:41	20.239	0.147	1.7	1.45	-10.8	3.55
11/19/2011	13:43:43	20.233	0.144	1.7	1.45	-10.58	3.55
11/19/2011	13:43:45	20.238	0.139	1.72	1.45	-10.65	3.55
11/19/2011	13:43:48	20.247	0.136	1.7	1.11	-10.79	3.55
11/19/2011	13:43:50	20.239	0.139	1.62	0.8	-11.09	3.55
11/19/2011	13:43:52	20.239	0.144	1.62	0.8	-10.77	3.55
11/19/2011	13:43:54	20.234	0.146	1.7	0.87	-10.32	3.55
11/19/2011	13:43:56	20.247	0.144	1.7	0.87	-7.38	3.55
11/19/2011	13:43:58	20.25	0.136	1.71	0.88	-4.15	3.55
11/19/2011	13:44:00	20.258	0.136	1.61	0.8	-1.2	3.55
11/19/2011	13:44:03	20.243	0.129	1.71	0.88	2.42	3.55
11/19/2011	13:44:05	20.241	0.13	1.61	0.8	4.64	3.55
11/19/2011	13:44:07	20.222	0.138	1.62	0.8	6.14	3.55
11/19/2011	13:44:09	20.22	0.147	1.7	0.87	6.61	3.55
11/19/2011	13:44:11	20.221	0.16	1.71	0.87	5.52	3.55
11/19/2011	13:44:13	20.218	0.155	1.62	0.81	3.29	3.55
11/19/2011	13:44:15	20.215	0.16	1.6	0.79	0.72	3.65
11/19/2011	13:44:17	20.239	0.16	1.63	0.8	-3.41	3.65
11/19/2011	13:44:20	20.237	0.153	1.71	0.87	-5.32	3.65
11/19/2011	13:44:22	20.219	0.166	1.61	0.79	-5.96	3.65
11/19/2011	13:44:24	20.235	0.182	1.71	0.87	-5.76	3.65
11/19/2011	13:44:26	20.244	0.175	1.62	0.79	-5.69	3.65
11/19/2011	13:44:28	20.254	0.153	1.62	0.8	-5.33	3.65
11/19/2011	13:44:30	20.246	0.141	1.61	0.79	-5.11	3.65
11/19/2011	13:44:32	20.243	0.137	1.71	0.87	-4.48	3.65
11/19/2011	13:44:35	20.245	0.137	1.62	0.79	-4.08	3.65
11/19/2011	13:44:37	20.235	0.132	1.7	0.87	-4.09	3.65
11/19/2011	13:44:39	20.232	0.15	1.7	0.87	-3.99	3.65
11/19/2011	13:44:41	20.234	0.153	1.71	0.87	-4.16	3.65
11/19/2011	13:44:44	20.209	0.145	1.61	0.79	-3.17	3.65
11/19/2011	13:44:46	20.206	0.159	1.61	0.79	-2.16	3.65
11/19/2011	13:44:48	20.209	0.181	1.62	0.23	-0.21	3.65
11/19/2011	13:44:50	20.226	0.168	1.63	0.19	1.09	3.65
11/19/2011	13:44:52	20.216	0.153	1.62	0.19	2.43	3.65
11/19/2011	13:44:54	20.223	0.16	1.61	0.19	3.65	3.66

11/19/2011	13:44:56	20.226	0.153	1.72	0.26	5.65	3.65
11/19/2011	13:44:58	20.235	0.154	1.61	0.18	6.39	3.65
11/19/2011	13:45:01	20.236	0.156	1.61	0.17	5.42	3.65
11/19/2011	13:45:03	20.247	0.144	1.61	0.18	4.7	3.65
11/19/2011	13:45:05	20.232	0.136	1.62	0.17	3.08	3.65
11/19/2011	13:45:07	20.245	0.145	1.62	0.18	1.77	3.66
11/19/2011	13:45:09	20.235	0.153	1.7	0.26	-0.11	3.65
11/19/2011	13:45:11	20.217	0.146	1.7	0.26	-2.63	3.65
11/19/2011	13:45:13	20.236	0.172	1.7	0.26	-4.87	3.65
11/19/2011	13:45:15	20.237	0.161	1.7	0.26	-6.5	3.65
11/19/2011	13:45:18	20.215	0.144	1.7	0.26	-6.3	3.65
11/19/2011	13:45:20	20.197	0.16	1.47	0.12	-5.46	3.6
11/19/2011	13:45:22	20.214	0.186	1.62	0.19	-3.52	3.6
11/19/2011	13:45:24	20.223	0.189	1.7	0.26	-2.32	3.6
11/19/2011	13:45:26	20.24	0.18	1.61	0.26	-1.52	3.6
11/19/2011	13:45:28	20.235	0.158	1.71	0.26	-1.53	3.6
11/19/2011	13:45:30	20.211	0.154	1.7	0.26	-3.19	3.6
11/19/2011	13:45:32	20.219	0.185	1.7	0.26	-6.63	3.6
11/19/2011	13:45:35	20.193	0.199	1.62	0.19	-7.85	3.6
11/19/2011	13:45:37	20.208	0.184	1.61	0.18	-7.75	3.6
11/19/2011	13:45:39	20.212	0.179	1.7	0.26	-7.14	3.6
11/19/2011	13:45:41	20.213	0.185	1.7	0.26	-6.69	3.6
11/19/2011	13:45:43	20.208	0.181	1.7	0.26	-5.71	3.6
11/19/2011	13:45:45	20.21	0.185	1.69	0.25	-4.08	3.6
11/19/2011	13:45:47	20.217	0.177	1.61	0.18	-1.81	3.6
11/19/2011	13:45:49	20.221	0.166	1.7	0.26	2.11	3.6
11/19/2011	13:45:52	20.221	0.166	1.6	0.18	3.24	3.6
11/19/2011	13:45:54	20.234	0.161	1.5	0.14	3.08	3.6
11/19/2011	13:45:56	20.235	0.15	1.7	0.26	3.03	3.6
11/19/2011	13:45:58	20.216	0.145	1.61	0.18	2.9	3.6
11/19/2011	13:46:00	20.21	0.172	1.7	0.26	1.6	3.6
11/19/2011	13:46:02	20.194	0.192	1.7	0.25	-0.33	3.6
11/19/2011	13:46:04	20.173	0.197	1.64	0.17	-2.21	3.6
11/19/2011	13:46:06	20.18	0.226	1.62	0.18	-3.24	3.6
11/19/2011	13:46:09	20.185	0.229	1.61	0.18	-4.26	3.6
11/19/2011	13:46:11	20.203	0.202	1.7	0.26	-4.15	3.6
11/19/2011	13:46:13	20.22	0.191	1.7	0.26	-2.91	3.6
11/19/2011	13:46:15	20.238	0.167	1.7	0.26	-2.4	3.6
11/19/2011	13:46:17	20.249	0.155	1.6	0.18	-2.94	3.6
11/19/2011	13:46:19	20.239	0.154	1.61	0.19	-4.13	3.6
11/19/2011	13:46:21	20.232	0.156	1.61	0.18	-5.4	3.6
11/19/2011	13:46:23	20.24	0.167	1.6	0.17	-6.98	3.6
11/19/2011	13:46:26	20.242	0.162	1.7	0.26	-7.74	3.65
11/19/2011	13:46:28	20.273	0.147	1.7	0.26	-8.11	3.65
11/19/2011	13:46:30	20.264	0.14	1.7	0.26	-6.69	3.66
11/19/2011	13:46:32	20.268	0.136	1.71	0.26	-5.94	3.66
11/19/2011	13:46:34	20.271	0.135	1.7	0.26	-6.6	3.65

11/19/2011	13:46:36	20.262	0.137	1.59	0.17	-6.36	3.65
11/19/2011	13:46:38	20.226	0.148	1.71	0.26	-6.29	3.65
11/19/2011	13:46:40	20.221	0.184	1.61	0.18	-7.16	3.65
11/19/2011	13:46:43	20.23	0.186	1.7	0.26	-7.51	3.65
11/19/2011	13:46:45	20.221	0.174	1.68	0.25	-8.21	3.65
11/19/2011	13:46:47	20.222	0.173	1.61	0.18	-8.96	3.65
11/19/2011	13:46:49	20.242	0.17	1.67	0.26	-10.19	3.66
11/19/2011	13:46:51	20.253	0.154	1.69	0.26	-11.54	3.65
11/19/2011	13:46:53	20.258	0.142	1.71	0.25	-11.99	3.66
11/19/2011	13:46:55	20.253	0.135	1.7	0.25	-12.11	3.65
11/19/2011	13:46:57	20.246	0.133	1.7	0.26	-12.98	3.65
11/19/2011	13:47:00	20.249	0.136	1.6	0.18	-13.17	3.65
11/19/2011	13:47:02	20.271	0.136	1.69	0.25	-13.94	3.65
11/19/2011	13:47:04	20.259	0.132	1.6	0.17	-14.53	3.65
11/19/2011	13:47:06	20.254	0.133	1.69	0.25	-14.43	3.65
11/19/2011	13:47:08	20.255	0.139	1.69	0.25	-13.86	3.65
11/19/2011	13:47:10	20.249	0.135	1.71	0.25	-13.64	3.65
11/19/2011	13:47:12	20.257	0.134	1.6	0.18	-12.35	3.65
11/19/2011	13:47:14	20.256	0.132	1.7	0.26	-9.02	3.65
11/19/2011	13:47:17	20.25	0.13	1.61	0.18	-6.43	3.65
11/19/2011	13:47:19	20.249	0.131	1.7	0.26	-4.06	3.65
11/19/2011	13:47:21	20.257	0.131	1.7	0.26	-2.04	3.65
11/19/2011	13:47:23	20.261	0.131	1.53	0.12	0.13	3.65
11/19/2011	13:47:25	20.266	0.131	1.7	0.26	1.92	3.65
11/19/2011	13:47:27	20.262	0.13	1.6	0.18	2.52	3.65
11/19/2011	13:47:29	20.249	0.131	1.6	0.18	2.14	3.76
11/19/2011	13:47:31	20.26	0.13	1.6	0.18	1.87	3.76
11/19/2011	13:47:34	20.267	0.136	1.63	0.18	2.2	3.76
11/19/2011	13:47:36	20.271	0.135	1.61	0.19	2.89	3.76
11/19/2011	13:47:38	20.278	0.134	1.61	0.19	3.63	3.76
11/19/2011	13:47:40	20.268	0.135	1.69	0.26	4.58	3.76
11/19/2011	13:47:42	20.283	0.133	1.61	0.19	5.33	3.76
11/19/2011	13:47:44	20.262	0.135	1.61	0.18	5.16	3.76
11/19/2011	13:47:46	20.255	0.134	1.61	0.18	4.19	3.76
11/19/2011	13:47:48	20.255	0.135	1.6	0.18	3.53	3.76
11/19/2011	13:47:51	20.243	0.134	1.62	0.18	3.4	3.76
11/19/2011	13:47:53	20.263	0.134	1.61	0.18	2.07	3.76
11/19/2011	13:47:55	20.252	0.141	1.62	0.19	0.15	3.76
11/19/2011	13:47:57	20.259	0.137	1.62	0.18	-2.32	3.76
11/19/2011	13:47:59	20.271	0.136	1.61	0.18	-4.26	3.76
11/19/2011	13:48:01	20.26	0.135	1.6	0.18	-5.28	3.76
11/19/2011	13:48:03	20.26	0.135	1.62	0.19	-5.69	3.76
11/19/2011	13:48:05	20.266	0.134	1.62	0.19	-5.47	3.76
11/19/2011	13:48:08	20.258	0.135	1.6	0.18	-4.45	3.76
11/19/2011	13:48:10	20.254	0.134	1.61	0.19	-4.41	3.76
11/19/2011	13:48:12	20.262	0.133	1.6	0.18	-4.8	3.76
11/19/2011	13:48:14	20.258	0.134	1.61	0.19	-3.89	3.76

11/19/2011	13:48:16	20.259	0.129	1.61	0.19	-2.58	3.76
11/19/2011	13:48:18	20.263	0.133	1.61	0.18	-2.06	3.76
11/19/2011	13:48:20	20.263	0.133	1.7	0.26	-1.5	3.77
11/19/2011	13:48:22	20.253	0.134	1.61	0.19	-1.37	3.76
11/19/2011	13:48:25	20.263	0.134	1.61	0.19	-2.34	3.76
11/19/2011	13:48:27	20.261	0.133	1.62	0.19	-3.88	3.76
11/19/2011	13:48:29	20.253	0.134	1.61	0.19	-5.62	3.76
11/19/2011	13:48:31	20.257	0.134	1.62	0.19	-7.78	3.76
11/19/2011	13:48:33	20.257	0.134	1.7	0.26	-9.68	3.76
11/19/2011	13:48:35	20.262	0.136	1.6	0.18	-10.87	3.66
11/19/2011	13:48:37	20.266	0.137	1.55	0.11	-10.11	3.65
11/19/2011	13:48:39	20.275	0.136	1.51	0.1	-9.6	3.66
11/19/2011	13:48:42	20.276	0.137	1.61	0.18	-7.62	3.65
11/19/2011	13:48:44	20.279	0.138	1.62	0.19	-5.68	3.66
11/19/2011	13:48:46	20.28	0.139	1.59	0.13	-4.11	3.66
11/19/2011	13:48:48	20.274	0.139	1.69	0.26	-3.75	3.66
11/19/2011	13:48:50	20.263	0.14	1.7	0.26	-4.85	3.66
11/19/2011	13:48:52	20.275	0.139	1.6	0.18	-5.97	3.66
11/19/2011	13:48:54	20.269	0.139	1.71	0.26	-7.13	3.66
11/19/2011	13:48:56	20.265	0.139	1.6	0.19	-6.9	3.66
11/19/2011	13:48:59	20.281	0.138	1.61	0.19	-5.6	3.66
11/19/2011	13:49:01	20.249	0.14	1.6	0.19	-3.51	3.66
11/19/2011	13:49:03	20.258	0.139	1.61	0.19	-1.26	3.66
11/19/2011	13:49:05	20.26	0.138	1.61	0.18	0.07	3.66
11/19/2011	13:49:07	20.267	0.133	1.6	0.19	0.49	3.66
11/19/2011	13:49:09	20.257	0.132	1.71	0.26	0.05	3.66
11/19/2011	13:49:11	20.258	0.132	1.63	0.18	0.56	3.66
11/19/2011	13:49:14	20.257	0.134	1.6	0.19	1.67	3.66
11/19/2011	13:49:16	20.264	0.131	1.61	0.19	1.39	3.65
11/19/2011	13:49:18	20.253	0.13	0.94	-0.38	0.3	3.66
11/19/2011	13:49:20	20.261	0.131	0.96	-0.39	-1.12	3.66
11/19/2011	13:49:22	20.266	0.132	0.96	-0.38	-2.94	3.66
11/19/2011	13:49:24	20.262	0.131	0.96	-0.39	-4.49	3.66
11/19/2011	13:49:26	20.264	0.131	0.95	-0.39	-5.72	3.65
11/19/2011	13:49:28	20.257	0.129	1.6	0.19	-5	3.66
11/19/2011	13:49:31	20.269	0.132	1.6	0.19	-4.1	3.66
11/19/2011	13:49:33	20.259	0.132	1.55	0.18	-2.78	3.65
11/19/2011	13:49:35	20.266	0.135	1.54	-0.47	-1.97	3.66
11/19/2011	13:49:37	20.265	0.139	1.6	-0.39	-2.54	3.66
11/19/2011	13:49:39	20.262	0.136	1.59	-0.4	-3.24	3.65
11/19/2011	13:49:41	20.257	0.136	1.58	-0.42	-2.76	3.66
11/19/2011	13:49:43	20.273	0.137	1.6	-0.4	-1.08	3.66
11/19/2011	13:49:46	20.267	0.138	1.59	-0.39	-0.77	3.65
11/19/2011	13:49:48	20.276	0.137	1.6	-0.39	-0.56	3.66
11/19/2011	13:49:50	20.282	0.137	1.61	-0.39	-0.19	3.65
11/19/2011	13:49:52	20.268	0.136	1.71	-0.32	0.96	3.66
11/19/2011	13:49:54	20.264	0.13	1.61	-0.4	2.44	3.66

11/19/2011	13:49:56	20.267	0.13	1.61	-0.38	3.52	3.65
11/19/2011	13:49:58	20.263	0.13	1.62	-0.39	2.77	3.66
11/19/2011	13:50:00	20.265	0.13	1.59	-0.4	0.88	3.66
11/19/2011	13:50:03	20.262	0.136	1.59	-0.39	-0.18	3.65
11/19/2011	13:50:05	20.263	0.13	1.61	-0.39	-1.45	3.65
11/19/2011	13:50:07	20.256	0.137	1.6	-0.39	-3.3	3.65
11/19/2011	13:50:09	20.259	0.139	1.62	-0.4	-4.78	3.66
11/19/2011	13:50:11	20.269	0.137	1.62	-0.4	-4.73	3.65
11/19/2011	13:50:13	20.266	0.137	1.62	-0.4	-4.15	3.65
11/19/2011	13:50:15	20.267	0.135	1.62	-0.39	-3.67	3.65
11/19/2011	13:50:17	20.276	0.134	1.62	-0.4	-2.89	3.66
11/19/2011	13:50:20	20.263	0.133	1.62	-0.39	-1.41	3.65
11/19/2011	13:50:22	20.261	0.134	1.62	-0.39	-0.02	3.65
11/19/2011	13:50:24	20.276	0.135	1.62	-0.4	0.15	3.66
11/19/2011	13:50:26	20.247	0.134	1.61	-0.4	-0.47	3.66
11/19/2011	13:50:28	20.258	0.133	1.61	-0.41	-1.85	3.65
11/19/2011	13:50:30	20.27	0.135	1.7	-0.33	-3.24	3.65
11/19/2011	13:50:32	20.269	0.135	1.62	-0.41	-4.65	3.65
11/19/2011	13:50:34	20.263	0.133	1.6	-0.4	-5.69	3.65
11/19/2011	13:50:37	20.272	0.133	1.52	-0.47	-6.69	3.65
11/19/2011	13:50:39	20.255	0.134	1.52	-0.46	-8.02	3.65
11/19/2011	13:50:41	20.259	0.134	1.58	-0.45	-9.59	3.65
11/19/2011	13:50:43	20.266	0.133	1.68	-0.32	-10.35	3.65
11/19/2011	13:50:45	20.248	0.133	1.68	-0.33	-9.81	3.55
11/19/2011	13:50:47	20.283	0.134	1.67	-0.33	-8.95	3.55
11/19/2011	13:50:49	20.282	0.134	1.59	-0.41	-7.66	3.55
11/19/2011	13:50:51	20.272	0.133	1.59	-0.4	-5.94	3.55
11/19/2011	13:50:54	20.28	0.133	1.59	-0.4	-5.28	3.55
11/19/2011	13:50:56	20.278	0.134	1.59	-0.4	-5.16	3.55
11/19/2011	13:50:58	20.28	0.132	1.59	-0.4	-4.72	3.55
11/19/2011	13:51:00	20.273	0.135	1.59	-0.4	-4.67	3.55
11/19/2011	13:51:02	20.26	0.132	1.58	-0.4	-5.09	3.55
11/19/2011	13:51:04	20.269	0.132	1.61	-0.4	-5.79	3.55
11/19/2011	13:51:06	20.265	0.135	1.6	-0.4	-6	3.55
11/19/2011	13:51:08	20.255	0.135	1.58	-0.4	-5.18	3.54
11/19/2011	13:51:11	20.27	0.143	1.6	-0.4	-4.58	3.55
11/19/2011	13:51:13	20.273	0.139	1.57	-0.41	-4.72	3.55
11/19/2011	13:51:15	20.262	0.137	1.59	-0.4	-4.54	3.55
11/19/2011	13:51:17	20.266	0.131	1.59	-0.4	-4.33	3.55
11/19/2011	13:51:19	20.257	0.132	1.59	-0.41	-4.62	3.55
11/19/2011	13:51:21	20.266	0.131	1.58	-0.42	-5.73	3.55
11/19/2011	13:51:23	20.272	0.137	1.58	-0.4	-7.83	3.55
11/19/2011	13:51:25	20.268	0.139	1.58	-0.42	-8.21	3.55
11/19/2011	13:51:28	20.275	0.137	1.58	-0.4	-7.43	3.55
11/19/2011	13:51:30	20.277	0.138	1.6	-0.4	-6.68	3.55
11/19/2011	13:51:32	20.263	0.14	1.59	-0.4	-6.72	3.55
11/19/2011	13:51:34	20.259	0.144	1.6	-0.4	-6.97	3.55

11/19/2011	13:51:36	20.255	0.15	1.61	-0.4	0.74	3.55
11/19/2011	13:51:38	20.261	0.151	1.6	-0.4	0.43	3.55
11/19/2011	13:51:40	20.244	0.152	1.69	-0.33	-2.36	3.55
11/19/2011	13:51:42	20.252	0.165	1.5	-0.48	-4.85	3.55
11/19/2011	13:51:46	20.259	0.153	1.57	-0.41	-5.92	3.55
11/19/2011	13:51:48	20.267	0.136	1.59	-0.41	-6.9	3.55
11/19/2011	13:51:50	20.264	0.136	1.67	-0.33	-7.04	3.6
11/19/2011	13:51:52	20.278	0.137	1.6	-0.41	-6.01	3.6
11/19/2011	13:51:55	20.278	0.136	1.69	-0.33	-4.15	3.6
11/19/2011	13:51:57	20.267	0.136	1.54	-0.43	-3.32	3.6
11/19/2011	13:51:59	20.27	0.135	1.61	-0.4	-3.63	3.6
11/19/2011	13:52:01	20.276	0.135	1.6	-0.33	-3.84	3.6
11/19/2011	13:52:03	20.275	0.135	1.65	-0.34	-3.86	3.6
11/19/2011	13:52:05	20.261	0.134	1.6	-0.42	-3.39	3.6
11/19/2011	13:52:07	20.269	0.134	1.61	-0.4	-2.98	3.6
11/19/2011	13:52:09	20.266	0.131	1.61	-0.4	-3.51	3.6
11/19/2011	13:52:12	20.265	0.13	1.61	-0.4	-5.79	3.6
11/19/2011	13:52:14	20.265	0.135	1.58	-0.4	-7.58	3.6
11/19/2011	13:52:16	20.258	0.137	1.64	-0.4	-8.39	3.6
11/19/2011	13:52:18	20.265	0.136	1.51	-0.45	-8.27	3.6
11/19/2011	13:52:20	20.268	0.137	1.7	-0.33	-7.24	3.6
11/19/2011	13:52:22	20.276	0.138	1.62	-0.41	-6.4	3.6
11/19/2011	13:52:24	20.267	0.139	1.62	-0.41	-4.42	3.6
11/19/2011	13:52:27	20.274	0.139	1.62	-0.41	-1.72	3.6
11/19/2011	13:52:29	20.262	0.138	1.56	-0.44	0.12	3.6
11/19/2011	13:52:31	20.262	0.138	1.57	-0.4	1.04	3.6
11/19/2011	13:52:33	20.256	0.135	1.58	-0.4	1.92	3.6
11/19/2011	13:52:35	20.266	0.137	1.67	-0.33	2.84	3.6
11/19/2011	13:52:37	20.26	0.134	1.6	-0.41	3.09	3.6
11/19/2011	13:52:39	20.274	0.135	1.6	-0.4	2.19	3.6
11/19/2011	13:52:41	20.263	0.13	1.6	-0.4	1.19	3.6
11/19/2011	13:52:44	20.24	0.13	1.56	-0.42	2	3.6
11/19/2011	13:52:46	20.215	0.152	1.61	-0.41	2.77	3.6
11/19/2011	13:52:48	20.224	0.195	1.59	-0.41	4.37	3.6
11/19/2011	13:52:50	20.243	0.182	1.6	-0.4	6.32	3.6
11/19/2011	13:52:52	20.252	0.161	1.67	-0.33	8.43	3.6
11/19/2011	13:52:54	20.267	0.146	1.68	-0.34	10.92	3.76
11/19/2011	13:52:56	20.27	0.139	1.61	-0.4	13.74	3.76
11/19/2011	13:52:58	20.283	0.136	1.59	0.18	13.95	3.76
11/19/2011	13:53:01	20.284	0.133	-0.25	0.24	11.74	3.76
11/19/2011	13:53:03	20.272	0.132	-0.36	0.16	10.12	3.76
11/19/2011	13:53:05	20.279	0.131	-0.35	0.17	8.51	3.76
11/19/2011	13:53:07	20.286	0.133	-0.34	0.17	5.96	3.76
11/19/2011	13:53:09	20.271	0.129	-0.36	0.16	4.31	3.76
11/19/2011	13:53:11	20.265	0.132	1.69	0.24	2.79	3.76
11/19/2011	13:53:13	20.271	0.132	1.6	0.17	1.11	3.76
11/19/2011	13:53:15	20.27	0.132	1.59	0.16	-0.17	3.76

11/19/2011	13:53:18	20.267	0.132	1.53	0.16	-0.49	3.76
11/19/2011	13:53:20	20.267	0.132	1.71	0.25	-1.31	3.76
11/19/2011	13:53:22	20.262	0.131	1.62	0.17	-1.75	3.76
11/19/2011	13:53:24	20.268	0.132	1.6	0.17	-1.68	3.76
11/19/2011	13:53:26	20.268	0.131	1.61	0.17	-0.64	3.76
11/19/2011	13:53:28	20.272	0.132	1.61	0.16	0.57	3.76
11/19/2011	13:53:30	20.273	0.131	-0.34	0.18	1.66	3.76
11/19/2011	13:53:32	20.271	0.13	-0.34	0.17	2.43	3.76
11/19/2011	13:53:35	20.247	0.133	-0.34	0.17	2.63	3.76
11/19/2011	13:53:37	20.254	0.134	-0.34	0.17	3.2	3.76
11/19/2011	13:53:39	20.269	0.135	-0.34	0.17	3.32	3.76
11/19/2011	13:53:41	20.256	0.134	1.6	0.17	3.83	3.76
11/19/2011	13:53:43	20.264	0.132	1.6	0.17	5.6	3.76
11/19/2011	13:53:45	20.259	0.134	1.5	0.08	7.61	3.76
11/19/2011	13:53:47	20.257	0.133	1.6	0.17	9.9	3.76
11/19/2011	13:53:49	20.277	0.135	1.6	0.17	10.92	3.76
11/19/2011	13:53:52	20.264	0.133	1.59	0.17	10.07	3.76
11/19/2011	13:53:54	20.276	0.132	1.68	0.24	8.76	3.76
11/19/2011	13:53:56	20.259	0.132	1.59	0.17	7.84	3.76
11/19/2011	13:53:58	20.268	0.131	1.58	0.16	7.05	3.76
11/19/2011	13:54:00	20.268	0.132	1.61	0.17	5.75	3.81
11/19/2011	13:54:02	20.271	0.131	1.68	0.24	4.5	3.81
11/19/2011	13:54:04	20.287	0.13	1.62	0.15	4.32	3.81
11/19/2011	13:54:06	20.287	0.131	1.59	0.14	4.57	3.81
11/19/2011	13:54:09	20.29	0.132	1.6	0.17	4.47	3.81
11/19/2011	13:54:11	20.284	0.13	1.58	-0.5	4.3	3.81
11/19/2011	13:54:13	20.285	0.137	1.59	-0.41	3.19	3.81
11/19/2011	13:54:15	20.27	0.136	1.57	-0.49	1.89	3.81
11/19/2011	13:54:17	20.273	0.137	1.67	-0.34	1.4	3.81
11/19/2011	13:54:19	20.269	0.136	1.67	-0.34	1.36	3.81
11/19/2011	13:54:21	20.265	0.138	1.53	-0.43	1.91	3.81
11/19/2011	13:54:23	20.266	0.138	1.67	-0.34	2.21	3.81
11/19/2011	13:54:26	20.27	0.139	1.57	-0.42	2.63	3.81
11/19/2011	13:54:28	20.28	0.138	1.58	-0.42	3.71	3.81
11/19/2011	13:54:30	20.272	0.138	1.66	-0.34	4.02	3.81
11/19/2011	13:54:32	20.273	0.138	1.58	-0.41	3.4	3.81
11/19/2011	13:54:34	20.269	0.137	1.57	-0.41	2.46	3.81
11/19/2011	13:54:36	20.264	0.138	1.67	-0.34	1.32	3.81
11/19/2011	13:54:38	20.277	0.137	1.64	-0.34	0.02	3.81
11/19/2011	13:54:40	20.27	0.136	1.59	-0.42	0.81	3.81
11/19/2011	13:54:43	20.268	0.136	1.54	-0.44	1.99	3.81
11/19/2011	13:54:45	20.273	0.135	1.57	-0.43	2.16	3.81
11/19/2011	13:54:47	20.278	0.138	1.67	-0.34	1.43	3.81
11/19/2011	13:54:49	20.26	0.139	1.59	-0.41	0.88	3.81
11/19/2011	13:54:51	20.277	0.138	1.69	-0.34	0.11	3.81
11/19/2011	13:54:53	20.27	0.138	1.59	-0.41	-1.58	3.81
11/19/2011	13:54:55	20.269	0.138	1.67	-0.34	-2.06	3.81

11/19/2011	13:54:57	20.275	0.138	1.67	-0.34	-1.73	3.81
11/19/2011	13:55:00	20.267	0.138	1.68	-0.34	-1.2	3.81
11/19/2011	13:55:02	20.264	0.137	1.66	-0.34	-0.97	3.81
11/19/2011	13:55:04	20.264	0.133	1.57	-0.43	-0.25	3.7
11/19/2011	13:55:06	20.264	0.138	1.59	-0.43	0.04	3.7
11/19/2011	13:55:08	20.29	0.131	2.86	-0.41	-0.06	3.7
11/19/2011	13:55:10	20.297	0.131	0.91	-0.33	1.05	3.7
11/19/2011	13:55:12	20.289	0.131	0.78	-0.37	2.09	3.7
11/19/2011	13:55:15	20.281	0.129	0.61	-0.35	2.74	3.7
11/19/2011	13:55:17	20.284	0.13	0.72	-0.32	3.23	3.7
11/19/2011	13:55:19	20.279	0.133	1.06	-0.31	4.24	3.7
11/19/2011	13:55:21	20.259	0.131	1.53	-0.42	5.51	3.7
11/19/2011	13:55:23	20.258	0.131	2.71	-0.43	6.77	3.7
11/19/2011	13:55:25	20.253	0.134	3.08	-0.35	7.25	3.7
11/19/2011	13:55:27	20.27	0.131	1.66	-0.34	7.63	3.7
11/19/2011	13:55:29	20.264	0.131	1.68	-0.34	8.37	3.7
11/19/2011	13:55:32	20.272	0.132	-0.28	-0.34	9.75	3.7
11/19/2011	13:55:34	20.28	0.133	-0.36	-0.41	10.39	3.7
11/19/2011	13:55:36	20.269	0.131	-0.36	-0.42	8.78	3.7
11/19/2011	13:55:38	20.274	0.134	-0.38	-0.43	5.99	3.7
11/19/2011	13:55:40	20.278	0.136	1.56	-0.43	3.33	3.7
11/19/2011	13:55:42	20.274	0.133	1.68	-0.34	1.37	3.71
11/19/2011	13:55:44	20.263	0.13	1.67	-0.35	-0.58	3.7
11/19/2011	13:55:46	20.268	0.138	1.57	-0.42	-2.83	3.71
11/19/2011	13:55:49	20.263	0.139	1.67	-0.34	-3.45	3.7
11/19/2011	13:55:51	20.246	0.132	1.57	-0.41	-4.5	3.7
11/19/2011	13:55:53	20.255	0.155	1.56	-0.42	-6.38	3.71
11/19/2011	13:55:55	20.262	0.157	1.5	-0.48	-7.46	3.7
11/19/2011	13:55:57	20.262	0.138	1.59	-0.41	-7.85	3.7
11/19/2011	13:55:59	20.28	0.13	1.57	-0.41	-7.3	3.7
11/19/2011	13:56:01	20.252	0.13	1.56	-0.42	-6.35	3.7
11/19/2011	13:56:03	20.256	0.135	1.56	-0.42	-3.54	3.71
11/19/2011	13:56:06	20.26	0.138	1.58	-0.41	-1.21	3.71
11/19/2011	13:56:08	19.828	0.139	1.56	-0.42	3.65	3.71
11/19/2011	13:56:10	16.816	0.297	1.56	-0.41	11.65	3.6
11/19/2011	13:56:12	13.172	3.567	3.67	-0.34	23.65	3.6
11/19/2011	13:56:14	11.073	8.012	3.48	-0.49	36.88	3.6
11/19/2011	13:56:16	10.155	9.485	3.56	-0.43	50.03	3.6
11/19/2011	13:56:18	9.771	9.936	3.57	-0.43	63.09	3.6
11/19/2011	13:56:20	9.617	10.046	47.56	-0.42	75.08	3.6
11/19/2011	13:56:23	9.663	10.075	47.57	-0.42	83.59	3.6
11/19/2011	13:56:25	9.704	9.964	47.54	-0.43	92.11	3.6
11/19/2011	13:56:27	9.727	9.841	47.55	-0.43	98.41	3.6
11/19/2011	13:56:29	9.737	9.809	47.66	65.66	103.54	3.6
11/19/2011	13:56:31	9.725	9.813	115.73	65.66	107.28	3.6
11/19/2011	13:56:33	9.608	9.806	115.64	65.58	109.36	3.6
11/19/2011	13:56:35	9.512	9.91	115.61	65.55	112.25	3.6

11/19/2011	13:56:37	9.474	10.044	115.64	65.59	114.25	3.6
11/19/2011	13:56:40	9.472	10.073	115.64	65.58	115.37	3.6
11/19/2011	13:56:42	9.438	10.077	163.6	65.59	115.6	3.6
11/19/2011	13:56:44	9.445	10.088	163.59	65.58	116.36	3.6
11/19/2011	13:56:46	9.441	10.094	163.69	65.66	116.92	3.6
11/19/2011	13:56:48	9.449	10.092	163.59	65.58	117.49	3.6
11/19/2011	13:56:50	9.474	10.067	189.75	65.66	118.37	3.6
11/19/2011	13:56:52	9.479	10.046	189.66	65.58	119.72	3.6
11/19/2011	13:56:54	9.511	10.031	189.6	140.34	120.98	3.6
11/19/2011	13:56:57	9.513	10.016	189.67	140.41	120.07	3.6
11/19/2011	13:56:59	9.513	10.001	189.66	140.41	118.84	3.6
11/19/2011	13:57:01	9.506	10.004	201.63	140.41	117.58	3.6
11/19/2011	13:57:03	9.499	10.006	201.61	140.4	117.09	3.6
11/19/2011	13:57:05	9.485	10.015	201.61	140.4	118.1	3.6
11/19/2011	13:57:07	9.46	10.023	201.61	150.46	119.7	3.6
11/19/2011	13:57:09	9.456	10.043	201.58	150.41	121.09	3.6
11/19/2011	13:57:11	9.435	10.047	201.63	150.46	122.65	3.6
11/19/2011	13:57:14	9.445	10.044	201.61	150.44	121.56	3.6
11/19/2011	13:57:16	9.444	10.06	201.58	150.45	119.88	3.51
11/19/2011	13:57:18	9.416	10.06	201.6	150.4	117.73	3.5
11/19/2011	13:57:20	9.431	10.067	201.7	151.71	117.05	3.51
11/19/2011	13:57:22	9.428	10.072	201.6	151.63	116.91	3.51
11/19/2011	13:57:24	9.434	10.072	201.63	151.64	117.1	3.51
11/19/2011	13:57:26	9.505	10.078	201.61	151.63	118.56	3.51
11/19/2011	13:57:28	9.597	10.013	201.6	151.63	118.75	3.51
11/19/2011	13:57:31	9.653	9.885	197.62	151.63	117.42	3.51
11/19/2011	13:57:33	9.686	9.838	197.63	151.64	116.4	3.51
11/19/2011	13:57:35	9.674	9.8	197.7	151.11	114.86	3.51
11/19/2011	13:57:37	9.611	9.805	197.62	151.03	114.1	3.51
11/19/2011	13:57:39	9.443	9.862	197.61	151.03	114.49	3.51
11/19/2011	13:57:41	9.342	10.069	191.68	151.02	114.24	3.51
11/19/2011	13:57:43	9.287	10.186	191.66	151.02	113.27	3.51
11/19/2011	13:57:45	9.246	10.232	191.77	151.1	111.7	3.51
11/19/2011	13:57:48	9.201	10.262	191.67	151.02	111.57	3.51
11/19/2011	13:57:50	9.192	10.292	191.68	151.02	112.68	3.51
11/19/2011	13:57:52	9.175	10.306	185.65	151.02	114.44	3.51
11/19/2011	13:57:54	9.162	10.31	185.57	149.77	117.29	3.51
11/19/2011	13:57:57	9.126	10.337	185.74	149.92	119.43	3.51
11/19/2011	13:57:59	9.12	10.352	185.66	149.85	120.21	3.51
11/19/2011	13:58:01	9.118	10.371	189.6	149.78	120.14	3.51
11/19/2011	13:58:03	9.096	10.361	189.68	149.84	120.07	3.5
11/19/2011	13:58:05	9.105	10.374	189.64	149.84	119.95	3.51
11/19/2011	13:58:07	9.095	10.364	189.69	148.64	120.74	3.51
11/19/2011	13:58:09	9.105	10.37	189.69	148.65	121.26	3.51
11/19/2011	13:58:11	9.08	10.374	189.68	148.64	121.47	3.51
11/19/2011	13:58:14	9.072	10.393	189.66	148.63	121.17	3.51
11/19/2011	13:58:16	9.079	10.397	189.66	148.65	121.11	3.51

11/19/2011	13:58:18	9.096	10.389	189.63	148.64	120.89	3.51
11/19/2011	13:58:20	9.095	10.383	193.71	148.12	121.17	3.35
11/19/2011	13:58:22	9.101	10.371	193.64	148.04	121.34	3.35
11/19/2011	13:58:24	9.088	10.361	193.65	147.98	122.01	3.35
11/19/2011	13:58:26	9.088	10.371	193.62	148.04	122.46	3.35
11/19/2011	13:58:28	9.09	10.388	193.73	148.12	121.76	3.35
11/19/2011	13:58:31	9.139	10.378	197.62	148.04	121.35	3.35
11/19/2011	13:58:33	9.269	10.365	197.71	147.53	121.22	3.35
11/19/2011	13:58:35	9.354	10.217	197.65	147.46	120.82	3.35
11/19/2011	13:58:37	9.397	10.106	197.64	147.45	121.32	3.35
11/19/2011	13:58:39	9.421	10.061	197.7	147.53	121.18	3.35
11/19/2011	13:58:41	9.405	10.058	207.63	147.45	120.27	3.35
11/19/2011	13:58:43	9.27	10.069	207.62	147.37	119.25	3.35
11/19/2011	13:58:45	9.169	10.217	207.63	146.29	118.09	3.35
11/19/2011	13:58:48	9.113	10.358	207.62	146.28	117.24	3.35
11/19/2011	13:58:50	9.087	10.403	207.63	146.28	116.04	3.35
11/19/2011	13:58:53	9.082	10.435	211.62	146.27	115.11	3.35
11/19/2011	13:58:55	9.072	10.443	211.61	146.28	115.82	3.35
11/19/2011	13:58:57	9.079	10.432	211.53	146.26	116.05	3.35
11/19/2011	13:58:59	9.062	10.443	211.61	145.7	116.6	3.35
11/19/2011	13:59:01	9.066	10.443	211.54	145.63	116.96	3.35
11/19/2011	13:59:03	9.084	10.444	211.61	145.7	116.34	3.35
11/19/2011	13:59:05	9.105	10.432	211.61	145.69	115.32	3.35
11/19/2011	13:59:07	9.138	10.412	211.61	145.69	114.19	3.35
11/19/2011	13:59:10	9.162	10.38	211.61	145.69	112.77	3.35
11/19/2011	13:59:12	9.19	10.349	205.64	145.11	111.38	3.35
11/19/2011	13:59:14	9.199	10.323	205.54	145.05	111.16	3.35
11/19/2011	13:59:16	9.204	10.317	205.65	145.11	111.57	3.35
11/19/2011	13:59:18	9.229	10.32	205.63	145.1	112.01	3.35
11/19/2011	13:59:20	9.284	10.31	207.63	145.1	111.68	3.35
11/19/2011	13:59:22	9.24	10.296	207.57	145.02	111.54	3.35
11/19/2011	13:59:24	9.248	10.286	207.62	145.1	111.83	3.3
11/19/2011	13:59:27	9.254	10.286	207.64	145.7	110.82	3.29
11/19/2011	13:59:29	9.244	10.287	207.65	145.7	110.52	3.29
11/19/2011	13:59:31	9.251	10.291	197.63	145.69	111.77	3.3
11/19/2011	13:59:33	9.24	10.292	197.62	145.69	113.81	3.3
11/19/2011	13:59:35	9.264	10.305	197.62	145.69	116.72	3.29
11/19/2011	13:59:37	9.378	10.3	197.71	145.77	118.73	3.29
11/19/2011	13:59:39	9.498	10.177	197.71	145.77	119.8	3.3
11/19/2011	13:59:41	9.564	10.04	191.66	145.69	120.2	3.29
11/19/2011	13:59:44	9.609	9.955	191.67	145.69	120.26	3.3
11/19/2011	13:59:46	9.625	9.915	191.67	145.69	120.89	3.29
11/19/2011	13:59:48	9.53	9.893	191.66	145.68	121	3.3
11/19/2011	13:59:50	9.443	9.983	185.68	145.68	121.53	3.3
11/19/2011	13:59:52	9.396	10.129	185.66	146.27	121.81	3.3
11/19/2011	13:59:54	9.378	10.163	185.75	146.35	121.63	3.3
11/19/2011	13:59:56	9.386	10.176	185.65	146.26	120.09	3.3

11/19/2011	13:59:58	9.381	10.172	185.67	146.27	118.81	3.3
11/19/2011	14:00:01	9.383	10.166	187.68	146.27	116.51	3.3
11/19/2011	14:00:03	9.376	10.161	187.68	146.27	115.96	3.29
11/19/2011	14:00:05	9.375	10.166	187.63	146.23	116.42	3.3
11/19/2011	14:00:07	9.362	10.165	187.56	146.18	115.66	3.3
11/19/2011	14:00:09	9.361	10.179	187.68	146.27	116.29	3.3
11/19/2011	14:00:11	9.364	10.185	185.66	146.87	117.04	3.29
11/19/2011	14:00:13	9.373	10.183	185.69	146.86	117.75	3.3
11/19/2011	14:00:15	9.373	10.174	185.65	146.86	117.41	3.29
11/19/2011	14:00:18	9.368	10.173	185.66	146.87	116.74	3.29
11/19/2011	14:00:20	9.35	10.186	187.66	146.87	115.7	3.3
11/19/2011	14:00:22	9.347	10.202	187.58	146.79	114.97	3.29
11/19/2011	14:00:24	9.348	10.216	187.75	148.71	115.47	3.29
11/19/2011	14:00:26	9.36	10.219	187.68	148.65	115.77	3.3
11/19/2011	14:00:28	9.372	10.207	187.74	148.71	115.63	3.3
11/19/2011	14:00:30	9.387	10.191	187.66	148.63	116.03	3.4
11/19/2011	14:00:33	9.393	10.165	187.67	148.63	116.97	3.41
11/19/2011	14:00:35	9.396	10.162	187.67	148.63	116.61	3.4
11/19/2011	14:00:38	9.398	10.161	187.67	149.83	116.29	3.4
11/19/2011	14:00:40	9.401	10.159	189.75	149.91	115.81	3.41
11/19/2011	14:00:42	9.516	10.161	189.66	149.83	116.63	3.4
11/19/2011	14:00:44	9.622	10.061	189.64	149.83	117.52	3.4
11/19/2011	14:00:46	9.68	9.916	189.64	149.83	117.61	3.4
11/19/2011	14:00:48	9.713	9.849	189.65	149.84	115.81	3.4
11/19/2011	14:00:50	9.719	9.819	189.64	151.01	113.4	3.4
11/19/2011	14:00:52	9.621	9.814	189.66	151.01	112.11	3.4
11/19/2011	14:00:55	9.479	9.891	189.73	151.08	111.5	3.4
11/19/2011	14:00:57	9.393	10.074	189.64	151.01	111.14	3.4
11/19/2011	14:00:59	9.35	10.181	189.64	151.01	111.01	3.41
11/19/2011	14:01:01	9.309	10.219	183.65	151	111.57	3.4
11/19/2011	14:01:03	9.283	10.241	183.62	152.15	112.87	3.4
11/19/2011	14:01:05	9.271	10.268	183.63	152.19	114.88	3.4
11/19/2011	14:01:07	9.265	10.279	183.57	152.12	116.41	3.4
11/19/2011	14:01:09	9.267	10.282	183.73	152.26	118.89	3.4
11/19/2011	14:01:12	9.274	10.28	197.61	152.19	120.67	3.4
11/19/2011	14:01:14	9.28	10.269	197.55	152.16	120.97	3.4
11/19/2011	14:01:16	9.289	10.26	197.63	152.8	120.75	3.41
11/19/2011	14:01:18	9.294	10.263	197.61	152.79	120.9	3.41
11/19/2011	14:01:20	9.288	10.251	197.53	152.77	120.99	3.41
11/19/2011	14:01:23	9.287	10.256	197.62	152.72	121.48	3.4
11/19/2011	14:01:25	9.281	10.258	197.6	152.79	121.23	3.41
11/19/2011	14:01:27	9.267	10.284	197.53	152.72	120.17	3.41
11/19/2011	14:01:30	9.267	10.29	197.6	152.17	118.87	3.41
11/19/2011	14:01:32	9.244	10.288	207.7	152.27	118.24	3.4
11/19/2011	14:01:34	9.238	10.302	207.61	152.2	117.32	3.46
11/19/2011	14:01:36	9.242	10.319	207.64	152.18	117.18	3.46
11/19/2011	14:01:38	9.238	10.321	207.58	152.18	117.66	3.46

11/19/2011	14:01:40	9.26	10.321	209.58	152.18	117.68	3.46
11/19/2011	14:01:42	9.258	10.3	209.58	152.2	116.88	3.45
11/19/2011	14:01:44	9.276	10.3	209.57	152.15	116.33	3.46
11/19/2011	14:01:47	9.363	10.299	209.58	152.19	118.27	3.45
11/19/2011	14:01:49	9.479	10.223	209.68	152.25	119.07	3.46
11/19/2011	14:01:51	9.542	10.075	205.61	152.21	118.16	3.46
11/19/2011	14:01:53	9.574	9.984	205.69	152.26	117.07	3.46
11/19/2011	14:01:55	9.598	9.954	205.62	151.61	116.39	3.46
11/19/2011	14:01:57	9.507	9.949	206.76	151.66	115.1	3.45
11/19/2011	14:01:59	9.356	10.011	206.53	151.55	114.1	3.45
11/19/2011	14:02:01	9.268	10.202	203.77	151.64	113.56	3.45
11/19/2011	14:02:04	9.216	10.305	202.97	151.5	114.16	3.45
11/19/2011	14:02:06	9.199	10.35	201.61	151.61	115.81	3.46
11/19/2011	14:02:08	9.169	10.362	202.68	151.56	116.78	3.45
11/19/2011	14:02:10	9.161	10.385	202.6	150.87	118.07	3.45
11/19/2011	14:02:12	9.152	10.403	203.67	151.01	119.08	3.45
11/19/2011	14:02:14	9.162	10.402	201.62	150.99	120.31	3.45
11/19/2011	14:02:16	9.149	10.39	202.25	150.89	120.18	3.45
11/19/2011	14:02:18	9.163	10.388	202.23	151	121.8	3.45
11/19/2011	14:02:21	9.165	10.381	206.22	150.84	122.57	3.44
11/19/2011	14:02:23	9.182	10.375	206.65	150.96	123.8	3.45
11/19/2011	14:02:25	9.186	10.375	205.59	151	124.51	3.46
11/19/2011	14:02:27	9.179	10.376	205.61	151	124.22	3.46
11/19/2011	14:02:29	9.168	10.384	205.62	150.42	123.59	3.46
11/19/2011	14:02:31	9.175	10.387	205.59	150.42	123.27	3.46
11/19/2011	14:02:33	9.18	10.377	205.59	150.35	122.15	3.46
11/19/2011	14:02:35	9.188	10.37	206.02	150.47	120.49	3.46
11/19/2011	14:02:38	9.199	10.363	205.53	150.42	120.48	3.46
11/19/2011	14:02:40	9.197	10.352	207.59	150.41	120.31	3.45
11/19/2011	14:02:42	9.203	10.345	207.6	149.81	119.38	3.46
11/19/2011	14:02:44	9.226	10.348	207.61	149.82	119.28	3.46
11/19/2011	14:02:46	9.229	10.344	207.95	149.87	120.15	3.45
11/19/2011	14:02:48	9.243	10.336	208.11	149.95	120.44	3.45
11/19/2011	14:02:50	9.28	10.334	206	149.87	120.61	3.46
11/19/2011	14:02:52	9.411	10.317	206.05	149.88	120.78	3.46
11/19/2011	14:02:55	9.502	10.176	206.02	149.28	119.85	3.46
11/19/2011	14:02:57	9.555	10.048	206.1	149.36	117.88	3.46
11/19/2011	14:02:59	9.58	9.996	205.97	149.28	116.83	3.46
11/19/2011	14:03:01	9.576	9.978	204.15	149.38	115.95	3.46
11/19/2011	14:03:03	9.453	9.972	204.18	149.3	115.46	3.46
11/19/2011	14:03:05	9.342	10.098	203.6	149.24	116.07	3.46
11/19/2011	14:03:07	9.298	10.256	204.17	148.69	116.85	3.46
11/19/2011	14:03:09	9.284	10.287	203.6	148.62	119.59	3.46
11/19/2011	14:03:12	9.28	10.278	203.58	148.62	122.48	3.46
11/19/2011	14:03:14	9.294	10.288	203.52	148.55	124.59	3.46
11/19/2011	14:03:16	9.307	10.272	203.59	148.62	125.38	3.46
11/19/2011	14:03:18	9.329	10.264	203.59	148.63	125.11	3.46

11/19/2011	14:03:20	9.328	10.239	201.59	148.62	124.9	3.45
11/19/2011	14:03:22	9.339	10.233	201.5	148.55	124.52	3.46
11/19/2011	14:03:24	9.367	10.227	201.59	148.61	123.48	3.45
11/19/2011	14:03:26	9.374	10.204	201.69	148.7	122.57	3.46
11/19/2011	14:03:29	9.393	10.18	201.6	148.61	121.59	3.45
11/19/2011	14:03:31	9.411	10.176	203.62	148.62	120.28	3.46
11/19/2011	14:03:33	9.449	10.158	203.59	148.62	118.95	3.46
11/19/2011	14:03:35	9.456	10.135	203.58	148.54	118.2	3.46
11/19/2011	14:03:37	9.47	10.107	203.6	148.63	117	3.46
11/19/2011	14:03:39	9.476	10.107	203.59	148.61	115.46	3.45
11/19/2011	14:03:41	9.465	10.098	211.58	148.62	113.21	3.46
11/19/2011	14:03:44	9.464	10.098	211.58	148.61	112.21	3.45
11/19/2011	14:03:46	9.477	10.09	211.68	148.69	110.29	3.4
11/19/2011	14:03:48	9.492	10.086	212.31	149.21	108.16	3.4
11/19/2011	14:03:50	9.49	10.081	214.37	149.25	106.85	3.4
11/19/2011	14:03:52	9.485	10.086	214.35	149.22	107.3	3.4
11/19/2011	14:03:55	9.485	10.093	214.27	149.2	107.92	3.4
11/19/2011	14:03:57	9.634	10.077	214.24	149.25	109.61	3.4
11/19/2011	14:03:59	9.721	9.952	214.43	149.27	112.03	3.4
11/19/2011	14:04:01	9.761	9.825	214.61	149.27	116.03	3.4
11/19/2011	14:04:03	9.782	9.778	214.63	149.21	118.45	3.4
11/19/2011	14:04:06	9.777	9.771	214.55	149.27	120.75	3.4
11/19/2011	14:04:08	9.673	9.776	214.58	149.29	123.6	3.4
11/19/2011	14:04:10	9.543	9.873	211.61	149.23	126.08	3.4
11/19/2011	14:04:12	9.484	10.046	211.69	149.3	126.75	3.4
11/19/2011	14:04:14	9.452	10.113	211.6	149.81	126.34	3.4
11/19/2011	14:04:16	9.443	10.127	211.52	149.75	125.92	3.4
11/19/2011	14:04:18	9.426	10.136	211.59	149.82	126.66	3.4
11/19/2011	14:04:20	9.413	10.15	211.59	149.81	127.18	3.4
11/19/2011	14:04:23	9.397	10.152	211.59	149.81	127.31	3.4
11/19/2011	14:04:25	9.381	10.169	211.59	149.74	126.67	3.4
11/19/2011	14:04:27	9.374	10.188	211.7	150.49	125.06	3.4
11/19/2011	14:04:29	9.37	10.201	211.61	150.41	123.03	3.4
11/19/2011	14:04:31	9.372	10.196	205.58	150.41	121.28	3.4
11/19/2011	14:04:33	9.37	10.2	205.69	150.49	119.27	3.4
11/19/2011	14:04:35	9.363	10.198	205.63	150.42	116.82	3.4
11/19/2011	14:04:38	9.359	10.198	205.67	150.49	115.19	3.4
11/19/2011	14:04:40	9.358	10.207	203.59	150.42	113.69	3.4
11/19/2011	14:04:42	9.355	10.207	203.59	150.41	113.8	3.4
11/19/2011	14:04:44	9.335	10.205	203.58	150.41	115.41	3.4
11/19/2011	14:04:46	9.321	10.211	203.59	150.41	117.66	3.4
11/19/2011	14:04:48	9.317	10.222	203.58	150.36	119.34	3.4
11/19/2011	14:04:50	9.284	10.244	211.57	150.4	120.57	3.51
11/19/2011	14:04:52	9.28	10.274	211.67	150.49	121.27	3.51
11/19/2011	14:04:56	9.248	10.3	211.58	150.4	120.58	3.51
11/19/2011	14:04:58	9.223	10.327	211.55	149.8	117.93	3.51
11/19/2011	14:05:00	9.237	10.346	217.61	149.82	114.11	3.5

11/19/2011	14:05:02	9.34	10.343	217.59	149.8	111.28	3.51
11/19/2011	14:05:04	9.425	10.226	217.71	149.89	108.82	3.51
11/19/2011	14:05:07	9.446	10.117	217.6	149.81	109.74	3.51
11/19/2011	14:05:09	9.451	10.079	217.6	149.81	111.13	3.5
11/19/2011	14:05:11	9.45	10.086	199.69	149.89	112.81	3.51
11/19/2011	14:05:13	9.308	10.088	199.69	149.88	115.15	3.5
11/19/2011	14:05:15	9.177	10.22	199.59	149.78	117.54	3.5
11/19/2011	14:05:17	9.125	10.402	199.6	149.81	120.07	3.51
11/19/2011	14:05:19	9.106	10.461	199.51	149.74	121.52	3.51
11/19/2011	14:05:21	9.107	10.471	195.6	149.8	122.67	3.51
11/19/2011	14:05:24	9.1	10.45	195.59	149.8	122.99	3.51
11/19/2011	14:05:26	9.114	10.456	195.68	149.29	123.42	3.51
11/19/2011	14:05:28	9.119	10.443	195.61	149.22	124.34	3.51
11/19/2011	14:05:30	9.124	10.436	199.61	149.22	125.07	3.5
11/19/2011	14:05:32	9.13	10.428	199.68	149.29	125.84	3.5
11/19/2011	14:05:34	9.118	10.424	199.59	149.21	125.8	3.51
11/19/2011	14:05:36	9.148	10.426	199.58	149.21	125.34	3.5
11/19/2011	14:05:38	9.15	10.412	199.68	148.69	124.04	3.51
11/19/2011	14:05:41	9.183	10.391	211.58	148.6	122.48	3.5
Begin calculating run averages							
11/19/2011	14:05:45	9.162	10.36	212.93	148.69	119.84	3.5
11/19/2011	14:05:47	9.145	10.375	211.61	148.61	120.69	3.51
11/19/2011	14:05:49	9.148	10.405	211.56	148.6	121.72	3.51
11/19/2011	14:05:51	9.121	10.41	211.6	148.6	122.61	3.51
11/19/2011	14:05:53	9.09	10.437	211.61	148.61	122.99	3.51
11/19/2011	14:05:55	9.088	10.448	211.61	148.6	122.85	3.51
11/19/2011	14:05:58	9.093	10.454	211.59	148.61	122.95	3.5
11/19/2011	14:06:00	9.085	10.463	221.6	148.6	122.44	3.51
11/19/2011	14:06:02	9.071	10.469	221.6	148.56	119.96	3.5
11/19/2011	14:06:04	9.074	10.486	221.7	148.68	117.18	3.51
11/19/2011	14:06:06	9.135	10.507	221.55	148.6	115.71	3.51
11/19/2011	14:06:08	9.249	10.45	221.61	148.6	115.54	3.51
11/19/2011	14:06:10	9.297	10.306	219.64	148.61	116.99	3.5
11/19/2011	14:06:13	9.328	10.24	219.61	148.6	117.84	3.5
11/19/2011	14:06:15	9.333	10.225	219.61	148.6	117.21	3.51
11/19/2011	14:06:17	9.28	10.221	219.62	148.6	116.98	3.51
11/19/2011	14:06:19	9.138	10.252	219.61	148.6	117.47	3.51
11/19/2011	14:06:21	9.055	10.416	215.62	148.61	118.56	3.51
11/19/2011	14:06:23	8.998	10.526	215.52	148.54	119.71	3.5
11/19/2011	14:06:25	8.984	10.564	215.59	148.6	120.91	3.51
11/19/2011	14:06:27	8.986	10.586	215.61	148.61	122.95	3.51
11/19/2011	14:06:30	8.975	10.586	225.57	148.6	126.11	3.51
11/19/2011	14:06:32	8.972	10.578	225.56	148.6	127.88	3.5
11/19/2011	14:06:34	8.961	10.586	225.66	148.68	129.02	3.51
11/19/2011	14:06:36	8.95	10.592	225.56	148.6	130.65	3.51
11/19/2011	14:06:38	8.952	10.594	225.65	148.66	131.86	3.5
11/19/2011	14:06:40	8.951	10.594	223.61	148.6	132.03	3.5

11/19/2011	14:06:42	8.965	10.577	223.62	148.6	133.09	3.51
11/19/2011	14:06:44	8.963	10.58	223.51	149.15	135.19	3.51
11/19/2011	14:06:47	8.986	10.58	224.85	149.2	135.72	3.5
11/19/2011	14:06:49	9.001	10.558	225.03	149.2	136.16	3.5
11/19/2011	14:06:51	9.012	10.542	229.56	149.21	136.45	3.51
11/19/2011	14:06:53	9.025	10.534	230.52	149.26	136.06	3.51
11/19/2011	14:06:55	9.029	10.517	230.46	149.26	135.95	3.51
11/19/2011	14:06:57	9.013	10.514	229.66	149.29	136.47	3.51
11/19/2011	14:06:59	9.014	10.534	230.36	149.28	135.05	3.51
11/19/2011	14:07:01	9.017	10.534	231.57	149.21	134.12	3.51
11/19/2011	14:07:04	9.007	10.533	231.59	148.61	134.3	3.51
11/19/2011	14:07:06	9.02	10.543	231.57	148.6	133.04	3.51
11/19/2011	14:07:08	9.034	10.539	231.57	148.6	130.83	3.51
11/19/2011	14:07:10	9.052	10.522	235.86	148.53	128.24	3.5
11/19/2011	14:07:12	9.175	10.498	236.39	148.62	125.99	3.51
11/19/2011	14:07:14	9.265	10.387	235.66	148.68	125.41	3.5
11/19/2011	14:07:16	9.318	10.266	236.49	148.04	125.1	3.51
11/19/2011	14:07:18	9.346	10.212	235.51	147.96	126.71	3.51
11/19/2011	14:07:21	9.352	10.191	233.66	148.08	126.34	3.51
11/19/2011	14:07:23	9.255	10.184	233.51	148	125.33	3.5
11/19/2011	14:07:25	9.116	10.279	233.54	148	124.34	3.51
11/19/2011	14:07:27	9.061	10.447	233.55	147.99	123.06	3.5
11/19/2011	14:07:29	9.052	10.507	233.38	147.86	122.34	3.51
11/19/2011	14:07:31	9.049	10.505	227.52	148	121.86	3.51
11/19/2011	14:07:33	9.055	10.49	227.45	147.99	121.27	3.51
11/19/2011	14:07:35	9.078	10.484	227.62	148.08	121.15	3.51
11/19/2011	14:07:38	9.068	10.475	227.53	148	121.1	3.5
11/19/2011	14:07:40	9.072	10.473	221.57	148.01	120.93	3.5
11/19/2011	14:07:42	9.072	10.469	221.56	147.99	121.58	3.51
11/19/2011	14:07:44	9.07	10.473	221.57	148	121.81	3.51
11/19/2011	14:07:46	9.079	10.484	221.57	148	121.71	3.51
11/19/2011	14:07:48	9.085	10.477	221.56	148	120.98	3.51
11/19/2011	14:07:50	9.102	10.47	229.63	148.08	119.93	3.51
11/19/2011	14:07:52	9.116	10.445	229.53	147.99	119.44	3.51
11/19/2011	14:07:55	9.13	10.424	229.54	148	120.33	3.5
11/19/2011	14:07:57	9.148	10.413	229.53	147.99	121.23	3.5
11/19/2011	14:07:59	9.154	10.406	229.61	148.08	122.1	3.51
11/19/2011	14:08:01	9.17	10.393	233.5	147.98	123.36	3.5
11/19/2011	14:08:03	9.17	10.377	233.53	148	125.85	3.51
11/19/2011	14:08:05	9.153	10.382	233.55	148.01	127.62	3.4
11/19/2011	14:08:07	9.157	10.391	233.53	148	127.75	3.4
11/19/2011	14:08:10	9.151	10.397	245.62	148.59	125.78	3.4
11/19/2011	14:08:12	9.127	10.415	245.61	148.6	123.7	3.4
11/19/2011	14:08:14	9.108	10.421	245.6	148.6	122.47	3.4
11/19/2011	14:08:16	9.141	10.451	245.53	148.6	121.73	3.4
11/19/2011	14:08:18	9.237	10.443	245.73	148.66	121.29	3.4
11/19/2011	14:08:20	9.325	10.31	229.54	148.59	120.99	3.4

11/19/2011	14:08:22	9.36	10.215	229.56	148.6	120.23	3.4
11/19/2011	14:08:24	9.375	10.173	229.55	148.59	119.68	3.4
11/19/2011	14:08:27	9.351	10.163	229.55	148.6	119.63	3.4
11/19/2011	14:08:29	9.23	10.169	229.54	148.59	119.09	3.4
11/19/2011	14:08:31	9.151	10.313	227.53	148.59	119.29	3.4
11/19/2011	14:08:33	9.102	10.422	227.5	148.59	119.78	3.4
11/19/2011	14:08:35	9.076	10.462	227.53	148.6	119.37	3.4
11/19/2011	14:08:37	9.084	10.47	227.54	148.59	118.63	3.4
11/19/2011	14:08:39	9.079	10.465	235.49	148.55	117.29	3.4
11/19/2011	14:08:42	9.083	10.465	235.55	148.59	117.81	3.4
11/19/2011	14:08:44	9.086	10.46	235.65	148.68	119.69	3.4
11/19/2011	14:08:46	9.1	10.453	235.55	148.6	120.93	3.4
11/19/2011	14:08:48	9.105	10.443	235.66	148.67	122.4	3.4
11/19/2011	14:08:50	9.091	10.443	229.54	148.51	122.99	3.4
11/19/2011	14:08:52	9.095	10.443	229.56	148.59	122.77	3.4
11/19/2011	14:08:54	9.085	10.447	229.55	148.59	122.14	3.4
11/19/2011	14:09:00	9.082	10.454	229.52	148.51	121.1	3.4
11/19/2011	14:09:02	9.075	10.467	231.65	149.28	118.41	3.4
11/19/2011	14:09:04	9.078	10.466	231.47	149.16	118.52	3.4
11/19/2011	14:09:06	9.086	10.47	231.55	149.2	118.3	3.4
11/19/2011	14:09:08	9.087	10.458	231.56	149.21	117.26	3.4
11/19/2011	14:09:10	9.079	10.451	233.56	149.2	115.18	3.54
11/19/2011	14:09:12	9.068	10.459	233.56	149.21	112.09	3.54
11/19/2011	14:09:14	9.077	10.479	233.52	149.19	110.88	3.54
11/19/2011	14:09:17	9.084	10.482	233.56	149.2	110.34	3.54
11/19/2011	14:09:19	9.094	10.467	233.55	149.21	110.21	3.54
11/19/2011	14:09:21	9.18	10.452	231.56	149.2	111.73	3.54
11/19/2011	14:09:23	9.346	10.391	231.56	149.21	113.35	3.54
11/19/2011	14:09:25	9.422	10.204	231.56	149.2	114.31	3.54
11/19/2011	14:09:27	9.499	10.091	231.56	149.21	114.45	3.54
11/19/2011	14:09:29	9.536	10.034	235.55	149.2	115.75	3.54
11/19/2011	14:09:32	9.516	10.002	235.65	149.28	116.75	3.54
11/19/2011	14:09:34	9.395	10.013	235.55	149.86	116.6	3.54
11/19/2011	14:09:36	9.319	10.15	235.48	149.72	116.35	3.54
11/19/2011	14:09:38	9.283	10.252	235.65	149.87	116.42	3.54
11/19/2011	14:09:40	9.281	10.28	225.52	149.79	116.97	3.54
11/19/2011	14:09:42	9.282	10.281	225.56	149.8	118.09	3.54
11/19/2011	14:09:44	9.299	10.264	225.55	149.8	118.73	3.54
11/19/2011	14:09:46	9.309	10.259	225.46	150.31	120.61	3.54
11/19/2011	14:09:49	9.322	10.242	225.54	150.39	123	3.54
11/19/2011	14:09:51	9.335	10.226	239.64	150.46	125.02	3.54
11/19/2011	14:09:53	9.355	10.214	239.56	150.38	125.85	3.54
11/19/2011	14:09:55	9.34	10.198	239.55	150.39	125.49	3.54
11/19/2011	14:09:57	9.333	10.211	239.53	150.38	125.03	3.54
11/19/2011	14:09:59	9.333	10.213	239.54	151.58	124.36	3.55
11/19/2011	14:10:01	9.336	10.208	233.54	151.58	122.79	3.54
11/19/2011	14:10:03	9.316	10.22	233.51	151.52	119.52	3.54

11/19/2011	14:10:06	9.304	10.232	233.55	151.57	119.2	3.54
11/19/2011	14:10:08	9.279	10.251	233.65	151.65	119.73	3.54
11/19/2011	14:10:10	9.26	10.267	233.56	151.56	121.37	3.54
11/19/2011	14:10:12	9.248	10.295	233.66	151.65	123.4	3.54
11/19/2011	14:10:14	9.248	10.307	233.57	152.74	124.27	3.86
11/19/2011	14:10:16	9.225	10.304	233.57	152.75	124.72	3.86
11/19/2011	14:10:18	9.216	10.32	233.56	152.75	125.18	3.86
11/19/2011	14:10:20	9.207	10.339	245.61	152.75	123.96	3.86
11/19/2011	14:10:23	9.183	10.359	245.62	152.74	121.47	3.86
11/19/2011	14:10:25	9.176	10.372	245.63	152.74	117.76	3.86
11/19/2011	14:10:27	9.287	10.378	245.61	153.92	115.15	3.86
11/19/2011	14:10:29	9.384	10.289	245.71	154	112.81	3.86
11/19/2011	14:10:31	9.448	10.139	235.55	153.92	111.31	3.86
11/19/2011	14:10:33	9.473	10.073	235.55	153.93	110.82	3.86
11/19/2011	14:10:35	9.48	10.054	235.48	153.86	111.92	3.86
11/19/2011	14:10:37	9.389	10.051	235.56	153.93	113.35	3.86
11/19/2011	14:10:40	9.296	10.117	231.56	154.51	115.35	3.86
11/19/2011	14:10:42	9.247	10.273	231.57	154.52	117.68	3.86
11/19/2011	14:10:44	9.238	10.317	231.65	154.6	119.1	3.86
11/19/2011	14:10:46	9.256	10.32	231.54	154.52	120.81	3.86
11/19/2011	14:10:48	9.274	10.293	231.49	154.52	122.45	3.86
11/19/2011	14:10:50	9.309	10.271	233.53	154.51	122.79	3.86
11/19/2011	14:10:52	9.323	10.239	233.55	155.68	121.09	3.86
11/19/2011	14:10:54	9.329	10.222	233.53	155.68	119.4	3.86
11/19/2011	14:10:57	9.337	10.209	233.63	155.77	118.58	3.86
11/19/2011	14:10:59	9.318	10.206	233.53	155.68	117.53	3.86
11/19/2011	14:11:01	9.306	10.23	233.63	155.77	117.65	3.86
11/19/2011	14:11:04	9.292	10.244	233.54	155.7	118.14	3.86
11/19/2011	14:11:06	9.267	10.256	233.53	156.87	118.39	3.86
11/19/2011	14:11:08	9.255	10.273	233.63	156.96	119.08	3.86
11/19/2011	14:11:10	9.242	10.294	229.53	156.87	120.82	3.86
11/19/2011	14:11:12	9.232	10.309	229.54	156.88	122.37	3.86
11/19/2011	14:11:14	9.211	10.321	229.55	156.88	125.2	3.86
11/19/2011	14:11:16	9.205	10.336	229.53	156.95	128.62	3.86
11/19/2011	14:11:18	9.234	10.343	229.53	157.46	130.45	3.86
11/19/2011	14:11:21	9.24	10.323	231.54	157.45	132.06	3.8
11/19/2011	14:11:23	9.27	10.306	231.48	157.41	133.42	3.8
11/19/2011	14:11:25	9.295	10.281	231.53	157.46	133.94	3.8
11/19/2011	14:11:27	9.323	10.263	231.63	157.52	133.85	3.8
11/19/2011	14:11:29	9.36	10.231	229.52	157.44	132.62	3.8
11/19/2011	14:11:31	9.47	10.196	229.63	157.53	131.56	3.8
11/19/2011	14:11:33	9.607	10.112	229.48	157.44	129.17	3.8
11/19/2011	14:11:36	9.687	9.934	229.52	157.44	126.75	3.81
11/19/2011	14:11:38	9.727	9.845	229.53	159.22	124.89	3.8
11/19/2011	14:11:40	9.75	9.804	237.55	159.23	123.39	3.8
11/19/2011	14:11:42	9.682	9.782	237.54	159.23	122.36	3.81
11/19/2011	14:11:44	9.532	9.823	237.54	159.22	120.99	3.8

11/19/2011	14:11:46	9.43	10.024	237.54	159.23	119.47	3.8
11/19/2011	14:11:48	9.375	10.147	237.54	159.22	118.43	3.8
11/19/2011	14:11:50	9.33	10.2	231.5	159.78	118.7	3.8
11/19/2011	14:11:53	9.295	10.227	231.54	159.82	118.84	3.8
11/19/2011	14:11:55	9.252	10.252	231.54	159.82	119.08	3.8
11/19/2011	14:11:57	9.21	10.286	231.54	159.82	119.64	3.8
11/19/2011	14:11:59	9.187	10.329	231.55	159.81	119.78	3.8
11/19/2011	14:12:01	9.156	10.362	237.63	159.89	119.7	3.8
11/19/2011	14:12:03	9.124	10.387	237.54	160.42	118.93	3.8
11/19/2011	14:12:05	9.11	10.405	237.5	160.98	118.56	3.8
11/19/2011	14:12:07	9.1	10.421	237.56	161	119.21	3.8
11/19/2011	14:12:10	9.075	10.428	235.63	161.07	118.05	3.8
11/19/2011	14:12:12	9.089	10.444	235.58	161	116.73	3.81
11/19/2011	14:12:14	9.062	10.456	235.58	160.99	117.33	3.8
11/19/2011	14:12:16	9.052	10.457	235.66	161.08	118.73	3.8
11/19/2011	14:12:18	9.06	10.463	235.54	162.17	120.85	3.8
11/19/2011	14:12:20	9.048	10.465	237.55	162.18	123.08	3.8
11/19/2011	14:12:22	9.044	10.46	237.58	162.19	124.5	3.8
11/19/2011	14:12:24	9.035	10.472	237.46	162.11	124.11	3.97
11/19/2011	14:12:27	9.022	10.485	237.63	162.26	122.55	3.97
11/19/2011	14:12:29	9.017	10.51	237.63	162.26	121.21	3.97
11/19/2011	14:12:31	9.023	10.519	243.63	162.75	121.08	3.97
11/19/2011	14:12:33	9.017	10.51	243.62	162.75	121.45	3.97
11/19/2011	14:12:35	9.049	10.512	243.57	162.71	121.86	3.97
11/19/2011	14:12:37	9.175	10.504	243.62	162.75	122.47	3.97
11/19/2011	14:12:39	9.288	10.375	231.48	162.74	123.72	3.97
11/19/2011	14:12:41	9.365	10.222	231.41	162.67	125.29	3.97
11/19/2011	14:12:44	9.405	10.149	231.56	162.75	126.71	3.97
11/19/2011	14:12:46	9.437	10.108	231.55	162.74	126.57	3.97
11/19/2011	14:12:48	9.346	10.079	231.63	162.81	125.16	3.97
11/19/2011	14:12:50	9.25	10.151	239.63	162.82	124.28	3.97
11/19/2011	14:12:52	9.219	10.291	239.56	162.73	123.88	3.97
11/19/2011	14:12:54	9.211	10.323	239.54	162.73	124.13	3.97
11/19/2011	14:12:56	9.228	10.32	239.55	162.75	124.66	3.97
11/19/2011	14:12:58	9.248	10.302	239.5	162.73	124.65	3.97
11/19/2011	14:13:01	9.269	10.283	233.53	162.69	123.55	3.97
11/19/2011	14:13:03	9.26	10.269	233.54	162.68	123.73	3.97
11/19/2011	14:13:05	9.255	10.256	233.63	162.81	124.86	3.97
11/19/2011	14:13:07	9.245	10.266	233.46	162.69	125.66	3.97
11/19/2011	14:13:09	9.217	10.29	237.55	162.17	125	3.97
11/19/2011	14:13:11	9.188	10.315	237.56	162.17	124.3	3.97
11/19/2011	14:13:13	9.175	10.336	237.53	162.18	123.85	3.97
11/19/2011	14:13:15	9.175	10.364	237.54	162.12	122.46	3.97
11/19/2011	14:13:18	9.173	10.361	237.55	162.17	120.94	3.97
11/19/2011	14:13:20	9.189	10.353	235.55	162.18	119.9	3.97
11/19/2011	14:13:22	9.193	10.333	235.55	162.17	120.53	3.97
11/19/2011	14:13:24	9.213	10.317	235.5	160.92	121.56	3.97

11/19/2011	14:13:26	9.257	10.315	235.53	160.99	122.06	3.97
11/19/2011	14:13:28	9.274	10.268	235.53	161	122.3	3.97
11/19/2011	14:13:30	9.294	10.24	237.5	160.92	123.35	3.91
11/19/2011	14:13:32	9.306	10.223	237.55	161	125.75	3.91
11/19/2011	14:13:35	9.308	10.227	237.52	160.99	127.13	3.91
11/19/2011	14:13:37	9.312	10.223	237.61	160.47	126.98	3.91
11/19/2011	14:13:39	9.339	10.212	237.63	160.47	124.56	3.91
11/19/2011	14:13:41	9.417	10.196	237.53	160.4	121.19	3.91
11/19/2011	14:13:43	9.564	10.141	237.53	160.39	117.79	3.91
11/19/2011	14:13:45	9.662	9.963	237.45	160.37	115.83	3.91
11/19/2011	14:13:47	9.708	9.851	237.46	160.32	113.99	3.91
11/19/2011	14:13:49	9.725	9.801	243.7	160.47	113.3	3.91
11/19/2011	14:13:52	9.689	9.789	243.59	160.39	114.34	3.91
11/19/2011	14:13:54	9.537	9.82	243.7	160.47	115.81	3.91
11/19/2011	14:13:56	9.414	10.001	243.61	159.23	116.86	3.91
11/19/2011	14:13:58	9.356	10.144	243.62	159.22	118.61	3.91
11/19/2011	14:14:00	9.312	10.197	235.52	159.22	120.63	3.91
11/19/2011	14:14:02	9.297	10.223	235.54	159.22	122.71	3.91
11/19/2011	14:14:04	9.282	10.235	235.54	159.22	123.93	3.91
11/19/2011	14:14:06	9.271	10.243	235.55	159.22	123.95	3.91
11/19/2011	14:14:09	9.27	10.254	235.62	158.71	123.86	3.91
11/19/2011	14:14:11	9.279	10.252	243.61	158.57	123.51	3.91
11/19/2011	14:14:13	9.279	10.241	243.7	158.71	123.33	3.91
11/19/2011	14:14:15	9.279	10.241	243.6	158.62	122.71	3.91
11/19/2011	14:14:17	9.276	10.248	243.59	158.66	122.39	3.91
11/19/2011	14:14:19	9.275	10.244	241.61	158.62	122.66	3.91
11/19/2011	14:14:21	9.272	10.25	241.64	158.02	122.73	3.91
11/19/2011	14:14:23	9.272	10.248	241.61	158.02	120.87	3.91
11/19/2011	14:14:26	9.278	10.249	241.6	158.01	119.9	3.91
11/19/2011	14:14:28	9.272	10.257	241.6	158.02	119.71	3.91
11/19/2011	14:14:30	9.281	10.255	243.62	158.02	120.03	3.91
11/19/2011	14:14:32	9.299	10.24	243.6	158.02	120.51	3.91
11/19/2011	14:14:34	9.309	10.233	243.7	158.1	120.6	3.75
11/19/2011	14:14:36	9.3	10.212	243.61	158.02	119.43	3.75
11/19/2011	14:14:38	9.302	10.213	243.59	158.01	116.92	3.75
11/19/2011	14:14:40	9.295	10.224	247.73	158.09	114.13	3.75
11/19/2011	14:14:43	9.294	10.232	247.61	158.01	112.39	3.75
11/19/2011	14:14:45	9.305	10.242	247.62	158.02	112.14	3.75
11/19/2011	14:14:47	9.442	10.232	247.72	157.52	112.97	3.75
11/19/2011	14:14:49	9.55	10.114	247.63	157.45	114.76	3.75
11/19/2011	14:14:51	9.613	9.964	247.55	157.36	116.09	3.75
11/19/2011	14:14:53	9.631	9.896	247.61	157.44	116.95	3.75
11/19/2011	14:14:55	9.637	9.877	247.61	157.43	118.28	3.75
11/19/2011	14:14:57	9.537	9.878	247.58	157.39	118.18	3.75
11/19/2011	14:15:00	9.409	9.955	233.53	157.45	117.14	3.75
11/19/2011	14:15:02	9.347	10.13	233.53	157.42	115.95	3.75
11/19/2011	14:15:04	9.315	10.211	233.54	157.43	115.84	3.75

11/19/2011	14:15:06	9.313	10.23	233.62	157.51	117.19	3.75
11/19/2011	14:15:08	9.304	10.217	233.54	157.44	120.21	3.75
11/19/2011	14:15:10	9.315	10.211	235.55	157.45	122.8	3.75
11/19/2011	14:15:12	9.322	10.213	235.54	157.44	123.82	3.75
11/19/2011	14:15:14	9.34	10.211	235.45	156.78	123.47	3.75
11/19/2011	14:15:17	9.348	10.192	235.63	156.93	122.81	3.75
11/19/2011	14:15:19	9.354	10.175	235.54	156.86	121.77	3.75
11/19/2011	14:15:21	9.37	10.163	231.55	156.86	121.66	3.75
11/19/2011	14:15:23	9.372	10.155	231.55	156.82	121.52	3.75
11/19/2011	14:15:25	9.39	10.148	231.52	156.79	122.1	3.75
11/19/2011	14:15:27	9.393	10.134	231.53	156.86	122.3	3.75
11/19/2011	14:15:29	9.4	10.118	243.68	156.94	122.71	3.75
11/19/2011	14:15:31	9.397	10.12	243.62	156.87	122.42	3.75
11/19/2011	14:15:34	9.392	10.131	243.6	156.86	122.32	3.75
11/19/2011	14:15:36	9.376	10.134	243.52	156.8	123.24	3.75
11/19/2011	14:15:38	9.373	10.137	243.67	156.94	123.95	3.75
11/19/2011	14:15:40	9.372	10.137	239.52	156.29	123.86	4.02
11/19/2011	14:15:42	9.368	10.149	239.53	156.27	123.2	4.02
11/19/2011	14:15:44	9.353	10.157	239.5	156.27	123.35	4.02
11/19/2011	14:15:46	9.338	10.173	239.53	156.28	123.59	4.02
11/19/2011	14:15:48	9.298	10.191	239.51	156.2	124.72	4.02
11/19/2011	14:15:51	9.325	10.231	227.43	156.2	125.65	4.02
11/19/2011	14:15:53	9.436	10.236	227.5	155.67	125.44	4.02
11/19/2011	14:15:55	9.497	10.1	227.6	155.75	124.34	4.03
11/19/2011	14:15:57	9.528	10.009	227.52	155.68	123.01	4.02
11/19/2011	14:15:59	9.531	9.985	227.59	155.75	121.03	4.02
11/19/2011	14:16:01	9.502	9.983	227.47	155.67	120	4.02
11/19/2011	14:16:03	9.363	9.993	227.61	155.75	119.23	4.02
11/19/2011	14:16:05	9.231	10.169	227.58	155.75	120.67	4.02
11/19/2011	14:16:08	9.172	10.321	227.6	155.75	122.11	4.02
11/19/2011	14:16:10	9.144	10.369	219.55	155.67	123.52	4.02
11/19/2011	14:16:12	9.134	10.397	219.64	154.58	123.62	4.02
11/19/2011	14:16:14	9.142	10.391	219.55	154.49	123.08	4.02
11/19/2011	14:16:16	9.151	10.39	219.55	154.49	122.12	4.02
11/19/2011	14:16:18	9.155	10.372	219.49	154.49	121.22	4.02
11/19/2011	14:16:21	9.166	10.357	211.55	154.5	120.8	4.02
11/19/2011	14:16:23	9.174	10.351	211.54	154.49	121.12	4.02
11/19/2011	14:16:25	9.179	10.348	211.63	154.58	123.08	4.02
11/19/2011	14:16:27	9.166	10.352	211.53	154.5	125.74	4.02
11/19/2011	14:16:29	9.166	10.348	213.51	154.5	127.42	4.02
11/19/2011	14:16:31	9.192	10.34	213.56	154.5	128.66	4.02
11/19/2011	14:16:33	9.198	10.324	213.53	154.49	131.29	4.02
11/19/2011	14:16:35	9.215	10.319	213.63	154.57	133.27	4.02
11/19/2011	14:16:38	9.223	10.307	213.54	154.49	133.86	4.02
11/19/2011	14:16:40	9.209	10.302	217.63	153.99	134	4.02
11/19/2011	14:16:42	9.215	10.31	217.54	153.91	133.62	4.02
11/19/2011	14:16:44	9.223	10.309	217.53	153.91	132.68	3.69

11/19/2011	14:16:46	9.225	10.301	217.53	153.91	132.59	3.69
11/19/2011	14:16:48	9.238	10.294	217.54	153.91	133.3	3.7
11/19/2011	14:16:50	9.239	10.288	217.52	153.9	133.08	3.7
11/19/2011	14:16:53	9.23	10.29	217.53	153.23	131.79	3.7
11/19/2011	14:16:55	9.227	10.302	217.53	153.29	131.42	3.69
11/19/2011	14:16:57	9.344	10.311	217.45	153.23	131.3	3.7
11/19/2011	14:16:59	9.454	10.214	214.94	153.3	130.56	3.69
11/19/2011	14:17:01	9.515	10.056	209.44	153.28	129.4	3.7
11/19/2011	14:17:03	9.539	9.981	209.5	153.29	127.2	3.7
11/19/2011	14:17:05	9.549	9.97	209.61	152.8	125.52	3.69
11/19/2011	14:17:07	9.455	9.975	209.51	152.72	124.85	3.69
11/19/2011	14:17:10	9.312	10.041	209.52	152.73	125.05	3.7
11/19/2011	14:17:12	9.253	10.226	209.61	152.8	124.55	3.7
11/19/2011	14:17:14	9.215	10.307	209.52	152.73	123.34	3.7
11/19/2011	14:17:16	9.232	10.325	209.51	152.72	121.99	3.7
11/19/2011	14:17:18	9.23	10.306	209.52	152.13	121.13	3.7
11/19/2011	14:17:20	9.225	10.293	211.53	152.12	121.52	3.7
11/19/2011	14:17:22	9.242	10.285	211.53	152.13	122.41	3.7
11/19/2011	14:17:24	9.234	10.268	211.54	152.12	122.95	3.7
11/19/2011	14:17:27	9.254	10.266	211.52	152.13	122.97	3.7
11/19/2011	14:17:29	9.27	10.259	211.62	152.21	123.44	3.69
11/19/2011	14:17:31	9.285	10.234	211.62	152.21	123.31	3.69
11/19/2011	14:17:33	9.293	10.219	211.54	152.12	122.9	3.7
11/19/2011	14:17:35	9.291	10.216	211.53	152.05	122.07	3.7
11/19/2011	14:17:37	9.302	10.218	211.54	152.14	120.91	3.7
11/19/2011	14:17:39	9.306	10.212	213.53	152.14	118.69	3.7
11/19/2011	14:17:41	9.315	10.22	213.54	152.12	117.02	3.7
11/19/2011	14:17:44	9.316	10.218	213.53	152.13	116.69	3.7
11/19/2011	14:17:46	9.306	10.212	213.53	152.14	116.91	3.7
11/19/2011	14:17:48	9.297	10.211	213.63	152.22	117.46	3.7
11/19/2011	14:17:50	9.281	10.213	209.42	152.05	118.83	3.9
11/19/2011	14:17:52	9.263	10.231	209.52	152.13	118.99	3.91
11/19/2011	14:17:54	9.243	10.266	209.6	152.2	119.31	3.91
11/19/2011	14:17:56	9.216	10.287	209.5	152.09	119.75	3.9
11/19/2011	14:17:58	9.213	10.304	209.44	151.51	121.49	3.91
11/19/2011	14:18:01	9.253	10.312	203.58	151.54	122.01	3.91
11/19/2011	14:18:03	9.394	10.3	203.59	151.55	122.43	3.91
11/19/2011	14:18:05	9.469	10.138	203.59	151.55	121.86	3.91
11/19/2011	14:18:07	9.534	10.023	203.67	151.62	120.84	3.91
11/19/2011	14:18:09	9.535	9.985	197.57	151.47	120.9	3.91
11/19/2011	14:18:11	9.517	9.966	197.57	151.55	121.53	3.91
11/19/2011	14:18:13	9.387	9.979	197.58	151.56	122.41	3.91
11/19/2011	14:18:15	9.279	10.124	197.57	151.55	122.65	3.91
11/19/2011	14:18:18	9.238	10.257	197.58	151.57	122.47	3.91
11/19/2011	14:18:20	9.213	10.299	197.57	151.54	122.14	3.9
11/19/2011	14:18:22	9.209	10.311	197.57	151.55	121.65	3.9
11/19/2011	14:18:24	9.201	10.316	197.66	151.63	122.11	3.91

11/19/2011	14:18:26	9.201	10.311	197.58	151.56	123.05	3.91
11/19/2011	14:18:28	9.204	10.307	197.58	151.52	122.92	3.91
11/19/2011	14:18:30	9.207	10.311	199.57	150.93	123.24	3.91
11/19/2011	14:18:32	9.203	10.305	199.66	151.01	123.04	3.91
11/19/2011	14:18:35	9.195	10.299	199.56	150.93	121.77	3.91
11/19/2011	14:18:37	9.194	10.315	199.66	151.01	119.94	3.91
11/19/2011	14:18:39	9.172	10.32	193.56	150.94	118.56	3.91
11/19/2011	14:18:41	9.173	10.337	193.57	150.93	117.88	3.91
11/19/2011	14:18:43	9.172	10.338	193.56	150.93	117.98	3.91
11/19/2011	14:18:45	9.175	10.33	193.57	150.93	118.85	3.91
11/19/2011	14:18:47	9.178	10.335	193.56	150.93	120.03	3.91
11/19/2011	14:18:49	9.181	10.33	197.66	151.01	121.35	3.91
11/19/2011	14:18:52	9.174	10.322	197.55	150.93	122.16	3.91
11/19/2011	14:18:54	9.163	10.336	197.57	150.94	121.87	3.7
11/19/2011	14:18:56	9.156	10.344	197.56	150.35	121.09	3.69
11/19/2011	14:18:58	9.135	10.35	197.66	150.44	120.86	3.7
11/19/2011	14:19:00	9.118	10.377	201.49	150.29	120.52	3.69
11/19/2011	14:19:02	9.104	10.404	201.56	150.35	120.19	3.69
11/19/2011	14:19:04	9.087	10.416	201.65	150.43	120.49	3.7
11/19/2011	14:19:06	9.201	10.424	201.56	150.35	121.62	3.69
11/19/2011	14:19:09	9.321	10.35	201.58	150.35	120.83	3.7
11/19/2011	14:19:11	9.39	10.181	195.57	150.34	118.71	3.7
11/19/2011	14:19:13	9.442	10.093	195.67	150.43	115.88	3.7
11/19/2011	14:19:15	9.465	10.06	195.46	150.31	113.88	3.69
11/19/2011	14:19:17	9.387	10.037	195.48	150.36	112.88	3.7
11/19/2011	14:19:19	9.241	10.08	205.56	150.35	113.15	3.7
11/19/2011	14:19:21	9.159	10.281	205.57	150.27	113.28	3.69
11/19/2011	14:19:23	9.115	10.378	205.56	149.76	113.84	3.7
11/19/2011	14:19:26	9.1	10.401	205.57	149.77	114.69	3.7
11/19/2011	14:19:28	9.091	10.41	205.65	149.84	115.15	3.7
11/19/2011	14:19:30	9.076	10.419	199.56	149.75	115.33	3.7
11/19/2011	14:19:32	9.089	10.418	199.5	149.71	116.73	3.69
11/19/2011	14:19:34	9.098	10.403	199.54	149.75	118.53	3.69
11/19/2011	14:19:36	9.108	10.399	199.55	149.17	120.97	3.69
11/19/2011	14:19:38	9.116	10.388	199.65	149.25	122.56	3.7
11/19/2011	14:19:41	9.11	10.388	201.63	149.24	125.36	3.7
11/19/2011	14:19:43	9.102	10.39	201.54	149.17	126.7	3.69
11/19/2011	14:19:45	9.105	10.404	201.55	149.16	126.56	3.69
11/19/2011	14:19:47	9.102	10.403	201.53	149.16	126.37	3.7
11/19/2011	14:19:49	9.098	10.396	199.49	149.15	125.01	3.7
11/19/2011	14:19:51	9.096	10.41	199.54	149.16	123.64	3.69
11/19/2011	14:19:53	9.107	10.41	199.64	149.24	121.76	3.7
11/19/2011	14:19:55	9.114	10.397	199.53	149.17	117.87	3.7
11/19/2011	14:19:58	9.107	10.396	199.53	149.16	115.53	3.7
11/19/2011	14:20:00	9.089	10.399	201.55	149.17	113.25	3.75
11/19/2011	14:20:02	9.107	10.418	201.55	149.17	110.88	3.75
11/19/2011	14:20:04	9.114	10.415	201.56	149.18	109.14	3.75

11/19/2011	14:20:06	9.116	10.402	201.45	149.09	108.75	3.75
11/19/2011	14:20:08	9.123	10.408	201.55	149.17	109.96	3.75
11/19/2011	14:20:10	9.15	10.401	197.54	149.16	111	3.75
11/19/2011	14:20:12	9.268	10.385	197.64	149.25	111.76	3.75
11/19/2011	14:20:15	9.371	10.257	197.54	148.56	111.58	3.75
11/19/2011	14:20:17	9.418	10.125	197.55	148.56	111.51	3.75
11/19/2011	14:20:19	9.444	10.078	201.56	148.56	113.4	3.75
11/19/2011	14:20:21	9.438	10.055	200.98	148.06	115.45	3.75
11/19/2011	14:20:23	9.295	10.047	201.56	148.56	117.86	3.75
11/19/2011	14:20:25	9.191	10.188	201.56	148.56	120.7	3.75
11/19/2011	14:20:27	9.146	10.348	201.65	148.63	122.63	3.75
11/19/2011	14:20:29	9.112	10.381	203.56	148.56	125.59	3.75
11/19/2011	14:20:32	9.099	10.398	203.56	148.55	129.1	3.75
11/19/2011	14:20:34	9.062	10.416	203.52	148.55	132.68	3.75
11/19/2011	14:20:36	9.035	10.436	203.57	148.48	133.45	3.75
11/19/2011	14:20:38	9.016	10.47	203.56	148.56	132.78	3.75
11/19/2011	14:20:40	9.013	10.488	199.55	148.55	131.14	3.75
11/19/2011	14:20:42	9.016	10.494	199.65	148.64	128.91	3.75
11/19/2011	14:20:44	9.022	10.499	199.58	148.56	126.99	3.75
11/19/2011	14:20:46	9.028	10.481	199.56	148.56	122.09	3.75
Pause							
11/19/2011	14:20:49	8.999	10.458	204.01	147.54	117.52	3.7
11/19/2011	14:20:51	9.08	10.453	210.59	147.99	116.52	3.75
11/19/2011	14:20:53	9.124	10.418	209.53	147.96	115.81	3.75
11/19/2011	14:20:55	9.151	10.388	209.53	147.97	116	3.75
11/19/2011	14:20:57	9.172	10.348	209.52	147.96	117.61	3.75
11/19/2011	14:20:59	9.182	10.336	209.54	147.96	120.04	3.75
11/19/2011	14:21:01	9.192	10.322	209.52	148.56	121.55	3.75
11/19/2011	14:21:03	9.217	10.314	209.43	148.49	122.65	3.75
11/19/2011	14:21:06	9.221	10.294	209.62	148.63	122.75	3.75
11/19/2011	14:21:08	9.24	10.274	209.44	148.56	122.4	3.75
11/19/2011	14:21:10	9.25	10.264	203.56	148.57	121.52	3.75
11/19/2011	14:21:12	9.273	10.256	203.55	148.55	119.43	3.75
11/19/2011	14:21:14	9.278	10.245	203.55	148.57	116.13	3.75
11/19/2011	14:21:16	9.363	10.234	203.56	148.56	113.53	3.75
11/19/2011	14:21:18	9.489	10.176	203.56	148.57	112.74	3.75
11/19/2011	14:21:20	9.554	10.023	201.54	148.56	112.05	3.75
11/19/2011	14:21:23	9.601	9.939	201.54	148.55	110.48	3.75
11/19/2011	14:21:25	9.618	9.899	201.53	148.56	110.02	3.75
11/19/2011	14:21:27	9.576	9.89	201.51	149.14	110.27	3.75
11/19/2011	14:21:29	9.441	9.912	199.54	149.17	110.16	3.75
11/19/2011	14:21:31	9.351	10.081	199.48	149.16	109.35	3.75
11/19/2011	14:21:33	9.311	10.186	199.54	149.17	108.47	3.75
11/19/2011	14:21:35	9.28	10.222	199.63	149.25	108.95	3.75
11/19/2011	14:21:43	9.28	10.23	199.53	149.17	110.49	3.75
11/19/2011	14:21:45	9.281	10.231	199.63	149.25	115.48	3.75
11/19/2011	14:21:47	9.28	10.224	199.55	149.17	116.61	3.75

11/19/2011	14:21:49	9.278	10.226	209.52	149.18	118.34	3.75
11/19/2011	14:21:51	9.267	10.233	209.6	149.25	119.67	3.75
11/19/2011	14:21:53	9.255	10.247	209.43	150.31	118.38	3.75
11/19/2011	14:21:56	9.267	10.251	209.61	150.44	116.63	3.75
11/19/2011	14:21:58	9.263	10.249	209.5	150.36	114.62	3.75
11/19/2011	14:22:00	9.251	10.247	199.53	150.36	113.22	3.75
11/19/2011	14:22:02	9.257	10.264	199.47	150.33	112.3	3.75
11/19/2011	14:22:04	9.263	10.254	199.53	150.35	112.16	3.75
11/19/2011	14:22:06	9.232	10.259	199.63	150.44	112.7	3.75
11/19/2011	14:22:09	9.199	10.272	199.53	150.35	113.76	3.75
11/19/2011	14:22:11	9.157	10.308	207.63	150.42	114.81	3.34
11/19/2011	14:22:13	9.144	10.342	207.53	150.36	115.21	3.34
11/19/2011	14:22:15	9.116	10.375	207.62	150.44	115.98	3.35
11/19/2011	14:22:17	9.091	10.397	207.55	150.36	117.22	3.34
11/19/2011	14:22:20	9.061	10.424	205.53	150.36	119.17	3.34
11/19/2011	14:22:22	9.15	10.454	205.62	150.43	120.2	3.35
11/19/2011	14:22:24	9.254	10.383	205.53	150.36	120.77	3.35
11/19/2011	14:22:26	9.287	10.25	205.63	150.43	120.66	3.35
11/19/2011	14:22:28	9.312	10.199	205.53	150.36	120.51	3.35
11/19/2011	14:22:30	9.323	10.186	205.53	150.35	121.1	3.35
11/19/2011	14:22:32	9.262	10.179	205.53	151.54	121.9	3.34
11/19/2011	14:22:34	9.155	10.221	205.53	151.54	122.35	3.34
11/19/2011	14:22:37	9.119	10.368	205.62	151.62	122.27	3.35
11/19/2011	14:22:39	9.095	10.411	205.54	151.55	121.88	3.35
11/19/2011	14:22:41	9.108	10.415	205.54	151.54	120.88	3.34
11/19/2011	14:22:43	9.118	10.404	205.63	151.62	120.81	3.35
11/19/2011	14:22:45	9.117	10.388	205.62	151.62	120.48	3.34
11/19/2011	14:22:47	9.129	10.381	205.54	156.26	119.8	3.34
11/19/2011	14:22:49	9.143	10.377	201.53	156.26	117.57	3.34
11/19/2011	14:22:51	9.14	10.366	201.53	156.22	116.63	3.34
11/19/2011	14:22:54	9.142	10.363	201.63	156.34	116.33	3.35
11/19/2011	14:22:56	9.14	10.35	201.53	156.25	116.7	3.34
11/19/2011	14:22:58	9.133	10.357	201.62	156.34	116.35	3.34
11/19/2011	14:23:00	9.109	10.373	203.49	156.24	116.98	3.35
11/19/2011	14:23:02	9.083	10.394	203.54	156.26	117.46	3.34
11/19/2011	14:23:04	9.061	10.42	203.53	156.26	118.78	3.34
11/19/2011	14:23:06	9.039	10.454	203.54	159.2	121.04	3.34
11/19/2011	14:23:08	9.03	10.465	203.55	159.19	122.44	3.34
11/19/2011	14:23:11	9.027	10.471	203.54	159.2	122.8	3.35
11/19/2011	14:23:13	9.011	10.473	203.55	159.21	122.64	3.34
11/19/2011	14:23:15	8.994	10.477	203.54	159.2	122.96	3.5
11/19/2011	14:23:17	9.004	10.486	203.62	159.27	122.98	3.5
11/19/2011	14:23:19	9.015	10.491	203.53	160.36	123.52	3.5
11/19/2011	14:23:21	9.022	10.487	203.54	160.38	123.81	3.5
11/19/2011	14:23:23	9.006	10.483	203.64	160.45	123.97	3.5
11/19/2011	14:23:25	9.046	10.495	203.53	160.37	124.49	3.5
11/19/2011	14:23:28	9.178	10.478	203.54	160.38	125.31	3.5

11/19/2011	14:23:30	9.259	10.325	209.52	160.37	126.73	3.5
11/19/2011	14:23:32	9.302	10.207	209.62	160.45	126.88	3.5
11/19/2011	14:23:34	9.301	10.181	209.53	160.38	125.74	3.5
11/19/2011	14:23:36	9.329	10.172	209.51	160.37	123.62	3.5
11/19/2011	14:23:38	9.225	10.153	209.51	160.37	121.45	3.5
11/19/2011	14:23:40	9.125	10.253	207.64	160.45	120.45	3.5
11/19/2011	14:23:42	9.107	10.382	207.53	160.36	120.95	3.5
11/19/2011	14:23:45	9.095	10.41	207.54	159.2	121.18	3.5
11/19/2011	14:23:47	9.094	10.399	207.56	159.21	121.34	3.5
11/19/2011	14:23:49	9.095	10.395	205.63	159.28	120.97	3.5
11/19/2011	14:23:51	9.094	10.393	205.53	159.2	119.03	3.5
11/19/2011	14:23:53	9.096	10.397	205.53	159.19	116.48	3.5
11/19/2011	14:23:55	9.096	10.388	205.53	159.2	114.29	3.5
11/19/2011	14:23:57	9.123	10.378	205.54	159.2	112.97	3.5
11/19/2011	14:23:59	9.109	10.367	207.54	159.19	113.62	3.5
11/19/2011	14:24:02	9.116	10.373	207.63	159.27	114.83	3.5
11/19/2011	14:24:04	9.105	10.388	207.55	159.19	116.55	3.5
11/19/2011	14:24:06	9.119	10.386	207.64	159.27	117.48	3.5
11/19/2011	14:24:08	9.114	10.367	207.55	159.2	118.52	3.5
11/19/2011	14:24:10	9.129	10.361	203.49	159.19	119.49	3.5
11/19/2011	14:24:12	9.143	10.352	203.62	159.27	120.88	3.5
11/19/2011	14:24:14	9.168	10.331	203.53	159.2	121.25	3.5
11/19/2011	14:24:16	9.167	10.321	203.47	159.18	118.98	3.5
11/19/2011	14:24:19	9.152	10.324	213.44	159.12	117.21	3.5
11/19/2011	14:24:21	9.151	10.321	213.55	159.2	116.1	3.29
11/19/2011	14:24:23	9.166	10.328	213.54	159.2	115.09	3.29
11/19/2011	14:24:25	9.178	10.326	213.56	158.62	114.11	3.29
11/19/2011	14:24:27	9.185	10.32	213.56	158.62	113.23	3.29
11/19/2011	14:24:29	9.188	10.313	215.63	158.69	112.43	3.29
11/19/2011	14:24:31	9.283	10.306	215.56	158.62	110.46	3.29
11/19/2011	14:24:33	9.422	10.221	215.54	158.61	109.29	3.29
11/19/2011	14:24:36	9.49	10.052	215.54	158.61	110.59	3.29
11/19/2011	14:24:38	9.528	9.968	215.54	158.6	111.96	3.29
11/19/2011	14:24:40	9.561	9.933	221.56	158.62	112.4	3.29
11/19/2011	14:24:42	9.534	9.918	221.64	158.69	112.43	3.29
11/19/2011	14:24:44	9.43	9.936	221.55	158.61	111.7	3.29
11/19/2011	14:24:46	9.351	10.078	221.55	158.62	109.94	3.29
11/19/2011	14:24:48	9.33	10.153	221.64	158.69	108.01	3.29
11/19/2011	14:24:50	9.331	10.169	221.55	157.43	107.87	3.29
11/19/2011	14:24:53	9.327	10.169	221.55	157.44	108.42	3.29
11/19/2011	14:24:55	9.329	10.173	221.54	157.42	108.83	3.29
11/19/2011	14:24:57	9.331	10.165	221.54	157.42	109.22	3.29
11/19/2011	14:24:59	9.335	10.155	215.55	157.44	111.42	3.29
11/19/2011	14:25:01	9.318	10.164	215.52	157.36	114.25	3.29
11/19/2011	14:25:03	9.307	10.164	215.66	156.35	116.32	3.29
11/19/2011	14:25:05	9.279	10.179	215.56	156.27	117.71	3.29
11/19/2011	14:25:07	9.257	10.201	215.57	156.28	117.57	3.29

11/19/2011	14:25:10	9.216	10.225	227.61	156.35	117.15	3.29
11/19/2011	14:25:13	9.201	10.265	227.52	156.27	116.79	3.29
11/19/2011	14:25:15	9.152	10.307	227.61	156.34	116.75	3.29
11/19/2011	14:25:17	9.127	10.333	227.53	156.27	116.63	3.29
11/19/2011	14:25:19	9.087	10.366	231.53	156.27	116.98	3.29
11/19/2011	14:25:22	9.058	10.398	231.53	156.28	118.34	3.29
11/19/2011	14:25:24	9.029	10.422	231.54	155.68	120.59	3.3
11/19/2011	14:25:26	8.979	10.452	231.63	155.74	123.05	3.4
11/19/2011	14:25:28	8.968	10.499	231.53	155.67	125.34	3.4
11/19/2011	14:25:30	8.953	10.537	239.55	155.67	127.43	3.4
11/19/2011	14:25:32	8.942	10.523	239.62	155.74	128.77	3.4
11/19/2011	14:25:34	8.951	10.528	239.53	155.67	128.71	3.4
11/19/2011	14:25:36	9.068	10.531	239.51	155.67	128.32	3.4
11/19/2011	14:25:39	9.204	10.443	241.58	155.68	128.64	3.39
11/19/2011	14:25:41	9.275	10.27	241.52	155.67	129.41	3.4
11/19/2011	14:25:43	9.307	10.187	241.57	155.67	129.53	3.4
11/19/2011	14:25:45	9.329	10.147	241.58	155.68	129.74	3.4
11/19/2011	14:25:47	9.3	10.135	241.47	155.62	129.94	3.4
11/19/2011	14:25:49	9.163	10.149	241.57	155.66	129.88	3.4
11/19/2011	14:25:51	9.089	10.315	241.57	155.67	129.89	3.39
11/19/2011	14:25:53	9.03	10.414	241.54	155.66	130.86	3.4
11/19/2011	14:25:56	9.009	10.461	241.48	155.62	131.16	3.4
11/19/2011	14:25:58	8.986	10.483	241.67	155.75	129.99	3.4
11/19/2011	14:26:00	8.977	10.486	231.51	155.66	128.74	3.4
11/19/2011	14:26:02	8.962	10.489	231.52	155.67	127.44	3.4
11/19/2011	14:26:04	8.947	10.517	231.52	155.67	127.27	3.4
11/19/2011	14:26:06	8.927	10.531	231.53	155.68	127.55	3.4
11/19/2011	14:26:08	8.9	10.555	231.54	155.68	129.05	3.4
11/19/2011	14:26:10	8.864	10.586	243.61	155.68	130.75	3.4
11/19/2011	14:26:13	8.851	10.6	243.59	155.67	132.41	3.4
11/19/2011	14:26:15	8.843	10.609	243.6	155.75	133.35	3.4
11/19/2011	14:26:17	8.835	10.616	243.62	156.29	133.25	3.4
11/19/2011	14:26:19	8.815	10.631	257.57	156.28	133.23	3.4
11/19/2011	14:26:21	8.818	10.654	257.54	156.28	133.03	3.4
11/19/2011	14:26:23	8.823	10.646	257.55	156.27	133.61	3.4
11/19/2011	14:26:25	8.831	10.633	257.58	156.29	135.52	3.4
11/19/2011	14:26:27	8.837	10.634	257.64	156.36	137.59	3.4
11/19/2011	14:26:30	8.863	10.625	257.56	156.86	138.73	3.7
11/19/2011	14:26:32	8.897	10.6	257.65	156.94	139.26	3.7
11/19/2011	14:26:34	8.914	10.57	257.58	156.87	138.41	3.7
11/19/2011	14:26:36	8.948	10.543	257.58	156.89	137.56	3.7
11/19/2011	14:26:38	8.966	10.525	257.58	156.89	136.88	3.7
11/19/2011	14:26:40	9.043	10.493	255.62	156.88	136.58	3.7
11/19/2011	14:26:42	9.171	10.443	255.59	157.44	137.19	3.7
11/19/2011	14:26:44	9.28	10.279	255.63	157.47	138.14	3.7
11/19/2011	14:26:47	9.358	10.166	255.63	157.48	139.51	3.7
11/19/2011	14:26:49	9.421	10.095	253.63	157.47	141.19	3.7

11/19/2011	14:26:51	9.445	10.041	253.65	157.47	142.39	3.7
11/19/2011	14:26:53	9.356	9.998	253.62	157.46	142.53	3.7
11/19/2011	14:26:55	9.279	10.088	253.63	158.04	143.2	3.7
11/19/2011	14:26:57	9.247	10.227	253.65	158.05	143.02	3.7
11/19/2011	14:26:59	9.243	10.255	253.64	158.05	141.95	3.7
11/19/2011	14:27:01	9.238	10.252	253.72	158.13	141.16	3.7
11/19/2011	14:27:04	9.237	10.241	253.63	158.05	140.92	3.7
11/19/2011	14:27:06	9.227	10.235	253.71	158.13	141.05	3.7
11/19/2011	14:27:08	9.253	10.237	253.64	158.05	141.29	3.7
End Pause							
11/19/2011	14:27:10	9.275	10.232	255.65	158.05	140.25	3.7
11/19/2011	14:27:15	9.284	10.203	255.63	157.98	139.5	3.7
11/19/2011	14:27:18	9.297	10.178	255.65	158.06	136.49	3.7
11/19/2011	14:27:20	9.318	10.166	261.62	158.12	136.32	3.7
11/19/2011	14:27:22	9.309	10.159	261.6	158.05	136.66	3.7
11/19/2011	14:27:24	9.315	10.164	261.7	158.12	137.15	3.7
11/19/2011	14:27:26	9.321	10.156	261.58	158.04	137.55	3.7
11/19/2011	14:27:28	9.343	10.152	261.63	158.06	137.89	3.7
11/19/2011	14:27:30	9.361	10.132	263.6	158.05	137.44	3.7
11/19/2011	14:27:32	9.358	10.119	263.6	158.05	138.13	3.7
11/19/2011	14:27:35	9.364	10.116	263.6	158.04	140.33	3.14
11/19/2011	14:27:37	9.371	10.113	263.7	158.13	142.63	3.14
11/19/2011	14:27:39	9.403	10.101	269.59	158	144.1	3.14
11/19/2011	14:27:41	9.424	10.079	269.56	158.03	144.61	3.14
11/19/2011	14:27:43	9.439	10.055	269.71	158.13	143.54	3.14
11/19/2011	14:27:45	9.477	10.044	269.59	158.05	141.99	3.14
11/19/2011	14:27:47	9.616	10.022	269.67	158.13	140.91	3.14
11/19/2011	14:27:49	9.691	9.88	267.59	158.05	140.52	3.14
11/19/2011	14:27:52	9.715	9.762	267.6	158.04	140.73	3.14
11/19/2011	14:27:54	9.716	9.739	267.7	156.97	140.95	3.14
11/19/2011	14:27:56	9.697	9.735	267.6	156.89	142.06	3.14
11/19/2011	14:27:58	9.583	9.741	267.69	156.97	143.44	3.14
11/19/2011	14:28:00	9.466	9.863	265.6	156.89	144.87	3.13
11/19/2011	14:28:02	9.397	10.026	265.59	156.9	144.85	3.14
11/19/2011	14:28:04	9.368	10.091	265.68	156.97	144.3	3.14
11/19/2011	14:28:06	9.359	10.111	265.6	155.71	143.67	3.14
11/19/2011	14:28:09	9.354	10.116	273.62	155.71	143.04	3.14
11/19/2011	14:28:11	9.35	10.115	273.62	155.71	142.58	3.14
11/19/2011	14:28:13	9.32	10.128	273.61	155.71	142.06	3.13
11/19/2011	14:28:16	9.306	10.138	273.61	155.7	141.84	3.14
11/19/2011	14:28:18	9.293	10.17	273.61	155.71	140.06	3.14
11/19/2011	14:28:20	9.279	10.183	287.64	155.13	137.25	3.14
11/19/2011	14:28:22	9.281	10.188	287.71	155.21	134.98	3.14
11/19/2011	14:28:24	9.274	10.187	287.6	155.12	133.49	3.14
11/19/2011	14:28:26	9.273	10.187	287.64	155.13	132.41	3.14
11/19/2011	14:28:28	9.284	10.187	284.21	155.07	131.58	3.14
11/19/2011	14:28:30	9.298	10.179	277.63	155.14	131.88	3.14

11/19/2011	14:28:33	9.32	10.156	277.73	155.22	132.75	3.14
11/19/2011	14:28:35	9.324	10.142	277.6	155.14	132.53	3.14
11/19/2011	14:28:37	9.328	10.138	277.61	155.14	133.05	3.14
11/19/2011	14:28:39	9.319	10.136	285.63	155.14	133.68	3.4
11/19/2011	14:28:41	9.323	10.133	285.58	155.14	133.19	3.4
11/19/2011	14:28:43	9.3	10.14	285.59	155.14	133.04	3.4
11/19/2011	14:28:47	9.276	10.161	285.59	155.14	133.94	3.4
11/19/2011	14:28:49	9.218	10.222	285.61	154.54	136.54	3.4
11/19/2011	14:28:51	9.29	10.26	285.7	154.62	137.93	3.4
11/19/2011	14:28:54	9.403	10.207	285.57	154.52	137.47	3.4
11/19/2011	14:28:56	9.469	10.052	285.7	154.62	136.55	3.4
11/19/2011	14:28:58	9.502	9.98	285.62	154.54	136.56	3.4
11/19/2011	14:29:00	9.524	9.946	271.59	155.14	137.59	3.4
11/19/2011	14:29:02	9.443	9.938	271.67	155.22	138.68	3.4
11/19/2011	14:29:04	9.334	9.971	271.6	155.15	139.07	3.4
11/19/2011	14:29:06	9.282	10.148	271.58	155.13	138.83	3.4
11/19/2011	14:29:08	9.252	10.209	277.69	155.22	136.91	3.4
11/19/2011	14:29:11	9.255	10.229	277.58	155.14	135.98	3.4
11/19/2011	14:29:13	9.265	10.228	277.61	155.71	136.12	3.4
11/19/2011	14:29:15	9.265	10.205	277.59	155.7	136.04	3.4
11/19/2011	14:29:17	9.281	10.2	277.6	155.72	135.01	3.4
11/19/2011	14:29:19	9.277	10.193	274.42	155.65	133.54	3.4
11/19/2011	14:29:21	9.256	10.195	273.6	155.72	132.11	3.4
11/19/2011	14:29:23	9.242	10.195	273.59	155.72	130.13	3.4
11/19/2011	14:29:25	9.213	10.218	273.6	157.48	128.55	3.4
11/19/2011	14:29:28	9.215	10.241	273.58	157.48	128.48	3.4
11/19/2011	14:29:30	9.207	10.271	275.69	157.56	128.62	3.4
11/19/2011	14:29:32	9.199	10.284	275.6	157.48	127.65	3.4
11/19/2011	14:29:34	9.189	10.275	275.52	157.42	125.48	3.4
11/19/2011	14:29:36	9.178	10.273	275.53	157.47	123.48	3.4
11/19/2011	14:29:38	9.171	10.283	275.64	158.66	122.47	3.4
11/19/2011	14:29:40	9.161	10.298	271.57	158.65	121.32	3.4
11/19/2011	14:29:42	9.156	10.304	271.57	158.66	119.26	3.4
11/19/2011	14:29:45	9.151	10.301	271.56	158.65	118.16	3.45
11/19/2011	14:29:47	9.185	10.301	271.58	158.66	117.64	3.45
11/19/2011	14:29:49	9.182	10.282	263.67	158.74	116.26	3.45
11/19/2011	14:29:51	9.177	10.284	263.58	158.66	115.4	3.45
11/19/2011	14:29:53	9.175	10.29	263.58	158.66	114.93	3.45
11/19/2011	14:29:55	9.172	10.299	263.58	158.66	114.24	3.45
11/19/2011	14:29:57	9.292	10.304	263.59	158.67	114.68	3.45
11/19/2011	14:29:59	9.367	10.182	271.59	159.26	116.33	3.45
11/19/2011	14:30:02	9.401	10.07	271.58	159.25	117.65	3.45
11/19/2011	14:30:04	9.41	10.042	271.58	159.25	118.75	3.45
11/19/2011	14:30:06	9.396	10.038	271.58	159.26	120.13	3.45
11/19/2011	14:30:08	9.269	10.035	271.58	159.25	121.48	3.45
11/19/2011	14:30:10	9.161	10.159	267.6	159.25	121.51	3.45
11/19/2011	14:30:12	9.107	10.314	267.58	159.85	119.6	3.45

11/19/2011	14:30:14	9.075	10.373	267.57	159.85	115.65	3.45
11/19/2011	14:30:17	9.076	10.385	267.61	159.85	112.54	3.45
11/19/2011	14:30:19	9.067	10.383	263.68	159.92	109.99	3.45
11/19/2011	14:30:21	9.068	10.398	263.49	159.82	108.65	3.45
11/19/2011	14:30:23	9.058	10.403	263.58	159.84	108.26	3.45
11/19/2011	14:30:25	9.067	10.384	263.6	161.04	108.78	3.45
11/19/2011	14:30:27	9.061	10.384	263.69	161.1	110.48	3.45
11/19/2011	14:30:29	9.054	10.393	263.67	161.1	112.57	3.45
11/19/2011	14:30:31	9.039	10.399	263.57	161.02	114.57	3.45
11/19/2011	14:30:34	9.013	10.406	263.58	161.02	115.69	3.45
11/19/2011	14:30:36	9.012	10.426	263.57	161.02	115.76	3.45
11/19/2011	14:30:38	9.014	10.437	263.57	161.02	115.82	3.45
11/19/2011	14:30:40	9.004	10.449	259.67	161.11	115.69	3.45
11/19/2011	14:30:42	9.004	10.445	259.56	161.02	115.94	3.45
11/19/2011	14:30:44	8.996	10.446	259.57	161.02	116.71	3.45
11/19/2011	14:30:46	8.986	10.458	259.68	161.11	117.64	3.45
11/19/2011	14:30:48	8.984	10.474	261.48	161.02	119.33	3.45
11/19/2011	14:30:51	8.974	10.473	261.57	161.61	121.68	3.54
11/19/2011	14:30:53	8.969	10.483	261.57	161.61	123.44	3.54
11/19/2011	14:30:55	8.951	10.489	261.67	161.69	124.5	3.54
11/19/2011	14:30:57	8.92	10.505	261.57	161.61	125.28	3.54
11/19/2011	14:30:59	8.904	10.54	261.67	161.69	126.18	3.54
11/19/2011	14:31:01	8.961	10.554	261.59	161.61	126.04	3.54
11/19/2011	14:31:03	9.09	10.512	261.58	162.21	124.38	3.54
11/19/2011	14:31:05	9.135	10.357	261.59	162.22	122.22	3.54
11/19/2011	14:31:08	9.177	10.281	261.59	162.22	120.86	3.54
11/19/2011	14:31:10	9.215	10.253	241.69	162.29	119.84	3.54
11/19/2011	14:31:12	9.18	10.216	241.7	162.28	120.68	3.54
11/19/2011	14:31:14	9.067	10.234	241.56	162.14	121.82	3.54
11/19/2011	14:31:17	9.001	10.39	241.58	162.76	122.46	3.54
11/19/2011	14:31:19	9.012	10.475	235.55	162.78	123.9	3.54
11/19/2011	14:31:22	9.025	10.453	235.54	162.77	124.15	3.54
11/19/2011	14:31:24	9.052	10.42	235.54	162.77	124.61	3.54
11/19/2011	14:31:26	9.062	10.401	235.55	162.77	123.57	3.54
11/19/2011	14:31:28	9.08	10.393	235.57	162.78	122.7	3.54
11/19/2011	14:31:30	9.087	10.385	245.62	163.39	120.73	3.54
11/19/2011	14:31:32	9.107	10.372	245.61	163.39	118.46	3.54
11/19/2011	14:31:34	9.131	10.354	245.63	163.39	115.62	3.54
11/19/2011	14:31:36	9.124	10.345	245.61	163.37	111.86	3.54
11/19/2011	14:31:39	9.149	10.325	245.61	163.37	110.61	3.54
11/19/2011	14:31:41	9.164	10.307	245.44	163.27	109.83	3.54
11/19/2011	14:31:43	9.181	10.297	245.62	163.96	110.04	3.54
11/19/2011	14:31:45	9.184	10.29	245.65	163.96	109.93	3.54
11/19/2011	14:31:47	9.211	10.275	245.63	163.97	110.68	3.54
11/19/2011	14:31:49	9.216	10.266	241.61	163.97	111.19	3.54
11/19/2011	14:31:51	9.218	10.245	241.62	163.97	112.2	3.54
11/19/2011	14:31:53	9.206	10.233	241.61	163.97	113.9	3.54

11/19/2011	14:31:56	9.229	10.24	241.6	163.91	115.03	3.65
11/19/2011	14:31:58	9.244	10.236	241.62	163.97	116.11	3.64
11/19/2011	14:32:00	9.241	10.229	247.73	164.04	118.18	3.65
11/19/2011	14:32:02	9.236	10.231	247.63	163.96	120.21	3.65
11/19/2011	14:32:04	9.233	10.234	247.63	163.96	121.84	3.65
11/19/2011	14:32:06	9.301	10.242	247.64	163.97	123.65	3.65
11/19/2011	14:32:08	9.343	10.205	241.54	163.97	125.11	3.65
11/19/2011	14:32:10	9.372	10.123	241.62	163.97	125.42	3.65
11/19/2011	14:32:13	9.438	10.101	241.62	163.97	123.1	3.65
11/19/2011	14:32:15	9.47	10.039	241.7	164.04	120.31	3.65
11/19/2011	14:32:17	9.437	10.001	241.6	163.96	116.92	3.65
11/19/2011	14:32:19	9.31	9.996	239.57	163.97	115.2	3.65
11/19/2011	14:32:21	9.223	10.166	239.52	163.96	114.12	3.65
11/19/2011	14:32:23	9.177	10.279	239.53	163.96	113.64	3.65
11/19/2011	14:32:25	9.186	10.319	239.55	163.97	113.89	3.65
11/19/2011	14:32:27	9.199	10.308	239.66	164.04	116.71	3.65
11/19/2011	14:32:30	9.199	10.288	239.56	163.96	118.44	3.65
11/19/2011	14:32:32	9.225	10.272	239.58	163.97	120.21	3.65
11/19/2011	14:32:34	9.236	10.26	239.46	163.96	120.35	3.65
11/19/2011	14:32:36	9.228	10.242	239.56	163.97	119.75	3.65
11/19/2011	14:32:38	9.217	10.238	239.56	163.97	118.84	3.65
11/19/2011	14:32:40	9.201	10.241	229.46	163.9	118.55	3.65
11/19/2011	14:32:42	9.165	10.27	229.55	163.96	118.48	3.65
11/19/2011	14:32:44	9.136	10.304	229.54	163.96	119.33	3.65
11/19/2011	14:32:47	9.116	10.334	229.54	163.96	120.27	3.65
11/19/2011	14:32:49	9.1	10.355	229.55	163.97	121	3.65
11/19/2011	14:32:51	9.09	10.371	229.54	163.96	121.19	3.65
11/19/2011	14:32:53	9.063	10.372	229.57	163.97	121.78	3.65
11/19/2011	14:32:55	9.069	10.385	229.58	163.38	122.05	3.65
11/19/2011	14:32:58	9.069	10.391	229.57	163.39	122.15	3.65
11/19/2011	14:33:00	9.065	10.398	229.55	163.38	122.12	4.08
11/19/2011	14:33:02	9.048	10.398	229.55	163.38	122.32	4.08
11/19/2011	14:33:04	9.024	10.418	229.54	163.38	123.35	4.08
11/19/2011	14:33:06	9.012	10.44	229.65	163.46	124.4	4.08
11/19/2011	14:33:08	9.011	10.444	233.54	162.76	125.36	4.08
11/19/2011	14:33:10	9.032	10.455	233.54	162.76	126.12	4.08
11/19/2011	14:33:12	9.175	10.45	233.57	162.77	125.81	4.07
11/19/2011	14:33:15	9.267	10.31	233.55	162.77	124.46	4.08
11/19/2011	14:33:17	9.31	10.18	233.54	162.76	123.26	4.08
11/19/2011	14:33:19	9.331	10.132	235.57	162.78	122.21	4.08
11/19/2011	14:33:21	9.308	10.12	235.56	161.62	121.47	4.08
11/19/2011	14:33:23	9.17	10.135	235.53	161.61	121.2	4.08
11/19/2011	14:33:25	9.022	10.273	235.55	161.62	120.74	4.08
11/19/2011	14:33:27	8.962	10.458	235.55	161.61	120.89	4.08
11/19/2011	14:33:29	8.959	10.525	235.54	161.62	121.34	4.08
11/19/2011	14:33:32	8.96	10.517	235.55	161.62	122.21	4.08
11/19/2011	14:33:34	8.969	10.504	235.56	160.43	123.63	4.08

11/19/2011	14:33:36	8.985	10.489	235.55	160.44	124.71	4.08
11/19/2011	14:33:38	8.988	10.469	235.54	160.43	124.63	4.08
11/19/2011	14:33:40	8.989	10.462	223.59	160.43	123.33	4.07
11/19/2011	14:33:42	8.984	10.469	223.51	160.42	121.72	4.08
11/19/2011	14:33:44	8.986	10.474	223.58	160.43	120.31	4.08
11/19/2011	14:33:46	8.98	10.472	223.6	160.44	120.03	4.08
11/19/2011	14:33:49	8.983	10.471	215.6	159.25	119.86	4.08
11/19/2011	14:33:51	8.978	10.477	215.59	159.26	120.36	4.08
11/19/2011	14:33:53	8.988	10.482	215.68	159.33	120.75	4.08
11/19/2011	14:33:55	8.996	10.461	215.6	159.25	121.28	4.08
11/19/2011	14:33:57	9.001	10.457	215.59	159.25	121.56	4.08
11/19/2011	14:33:59	8.989	10.451	215.6	159.24	121.4	4.08
11/19/2011	14:34:01	8.976	10.464	215.71	158.14	119.64	4.08
11/19/2011	14:34:03	8.976	10.482	215.6	158	117.7	4.08
11/19/2011	14:34:06	8.974	10.485	215.61	158.06	116.35	7.04
11/19/2011	14:34:08	8.99	10.485	215.61	158.07	114.78	7.04
11/19/2011	14:34:10	8.973	10.486	213.7	158.14	114.05	7.04
11/19/2011	14:34:12	8.991	10.492	213.59	158.06	113.33	7.04
11/19/2011	14:34:14	8.994	10.484	213.6	157.48	112.59	7.04
11/19/2011	14:34:16	9.069	10.486	213.69	157.56	111.88	7.04
11/19/2011	14:34:18	9.114	10.429	211.59	157.48	109.84	7.04
11/19/2011	14:34:27	9.26	10.192	211.6	157.57	110.11	7.04
11/19/2011	14:34:29	9.148	10.17	211.59	157.49	112.49	7.04
11/19/2011	14:34:31	9.09	10.314	211.59	157.49	114.46	7.04
11/19/2011	14:34:33	9.074	10.411	211.7	156.99	115.43	7.04
11/19/2011	14:34:35	9.069	10.406	211.59	156.9	115.1	7.04
11/19/2011	14:34:37	9.065	10.399	211.68	157	113.52	7.04
11/19/2011	14:34:39	9.068	10.4	205.61	156.91	112.21	7.04
11/19/2011	14:34:41	9.079	10.402	205.61	156.91	111.28	7.04
11/19/2011	14:34:44	9.106	10.391	205.58	156.91	109.58	7.04
11/19/2011	14:34:46	9.108	10.357	205.6	157.49	108.26	7.04
11/19/2011	14:34:48	9.115	10.35	205.59	157.49	107.32	7.04
11/19/2011	14:34:50	9.139	10.346	205.6	157.49	105.82	7.04
11/19/2011	14:34:52	9.158	10.333	205.59	157.49	105.21	7.04
11/19/2011	14:34:54	9.173	10.32	205.66	157.57	105.51	7.04
11/19/2011	14:34:56	9.181	10.295	205.57	157.49	106.88	7.04
11/19/2011	14:34:58	9.155	10.293	199.67	157.9	109.02	7.04
11/19/2011	14:35:01	9.138	10.318	199.59	158.07	111.91	7.04
11/19/2011	14:35:03	9.12	10.337	199.58	158.06	114.55	7.05
11/19/2011	14:35:05	9.104	10.364	199.58	158.07	115.98	7.04
11/19/2011	14:35:07	9.079	10.371	199.58	158.06	116.07	7.04
11/19/2011	14:35:09	9.067	10.39	213.66	158.14	115.6	3.65
11/19/2011	14:35:11	9.072	10.412	213.58	158.07	115.14	3.65
11/19/2011	14:35:13	9.064	10.413	213.58	158.08	114.49	3.65
11/19/2011	14:35:16	9.051	10.413	213.57	158.07	113.6	3.65
11/19/2011	14:35:18	9.052	10.423	213.56	158.06	114.05	3.65
11/19/2011	14:35:20	9.062	10.429	217.58	158.07	116.02	3.65

11/19/2011	14:35:22	9.175	10.431	217.66	158.15	118.52	3.65
11/19/2011	14:35:24	9.276	10.318	217.57	158.06	120.41	3.65
11/19/2011	14:35:26	9.332	10.188	217.57	158.07	121.51	3.65
11/19/2011	14:35:28	9.37	10.126	227.53	158.06	121.46	3.65
11/19/2011	14:35:30	9.395	10.093	227.55	158.07	121.26	3.65
11/19/2011	14:35:33	9.308	10.068	227.54	158.07	121.02	3.65
11/19/2011	14:35:35	9.211	10.13	227.56	158.07	120.49	3.65
11/19/2011	14:35:37	9.144	10.28	227.53	158.08	120.39	3.65
11/19/2011	14:35:39	9.119	10.338	213.58	157.49	119.77	3.65
11/19/2011	14:35:41	9.1	10.369	213.57	157.49	117.79	3.65
11/19/2011	14:35:43	9.089	10.369	213.59	157.49	116.04	3.65
11/19/2011	14:35:45	9.082	10.376	213.6	157.49	115.22	3.65
11/19/2011	14:35:47	9.073	10.379	213.61	157.46	115.12	3.65
11/19/2011	14:35:50	9.06	10.393	219.43	157.43	115.77	3.65
11/19/2011	14:35:52	9.058	10.4	219.64	156.99	116.82	3.65
11/19/2011	14:35:54	9.047	10.41	219.6	156.91	116.97	3.65
11/19/2011	14:35:56	9.051	10.416	219.6	156.92	116.07	3.65
11/19/2011	14:35:58	9.038	10.422	225.57	156.91	116.19	3.65
11/19/2011	14:36:00	9.01	10.43	225.57	156.93	115.81	3.65
11/19/2011	14:36:02	8.989	10.456	225.57	156.92	115.99	3.65
11/19/2011	14:36:04	8.968	10.477	225.57	156.34	117.41	3.66
11/19/2011	14:36:07	8.971	10.488	225.57	156.34	117.64	3.65
11/19/2011	14:36:09	8.977	10.494	221.7	156.41	117.88	3.65
11/19/2011	14:36:11	8.98	10.493	221.6	156.33	118.57	3.65
11/19/2011	14:36:13	8.966	10.486	221.62	156.34	118.85	3.65
11/19/2011	14:36:15	8.966	10.492	221.6	156.25	118.38	5.98
11/19/2011	14:36:17	8.951	10.507	221.61	156.33	117.62	5.98
11/19/2011	14:36:19	8.938	10.516	221.6	155.7	114.57	5.98
11/19/2011	14:36:21	8.935	10.525	221.61	155.73	112.22	5.98
11/19/2011	14:36:24	8.933	10.534	221.62	155.72	110.21	5.98
11/19/2011	14:36:26	8.996	10.538	221.62	155.73	110.68	5.98
11/19/2011	14:36:28	9.14	10.505	221.61	155.73	112.52	5.98
11/19/2011	14:36:30	9.225	10.329	217.62	155.73	114.78	5.98
11/19/2011	14:36:32	9.288	10.216	217.68	155.81	117.62	5.98
11/19/2011	14:36:34	9.311	10.166	217.62	155.73	118.87	5.98
11/19/2011	14:36:36	9.269	10.153	217.6	155.64	118.41	5.98
11/19/2011	14:36:38	9.123	10.169	215.61	155.74	118.65	5.98
11/19/2011	14:36:41	9.031	10.33	215.56	155.66	119.05	5.98
11/19/2011	14:36:43	9.011	10.465	215.61	155.72	118.74	5.98
11/19/2011	14:36:45	8.998	10.476	215.62	155.74	118	5.98
11/19/2011	14:36:47	9.018	10.472	215.7	155.81	116.99	5.98
11/19/2011	14:36:49	9.046	10.444	213.6	155.72	116.96	5.98
11/19/2011	14:36:51	9.076	10.416	213.68	155.8	117.31	5.98
11/19/2011	14:36:53	9.092	10.396	213.59	155.73	116.71	5.98
11/19/2011	14:36:55	9.121	10.365	213.51	155.65	115.97	5.98
11/19/2011	14:36:58	9.147	10.356	213.61	155.73	116.22	5.98
11/19/2011	14:37:00	9.156	10.318	209.57	155.77	116.71	5.98

11/19/2011	14:37:02	9.185	10.291	209.58	155.74	117.31	5.98
11/19/2011	14:37:04	9.192	10.279	209.63	156.42	117.98	5.98
11/19/2011	14:37:06	9.189	10.263	209.67	156.41	118.55	5.98
11/19/2011	14:37:08	9.183	10.268	219.62	156.33	119.18	5.98
11/19/2011	14:37:10	9.186	10.265	219.6	156.34	120.66	5.98
11/19/2011	14:37:12	9.157	10.282	219.59	156.34	124.9	5.98
11/19/2011	14:37:15	9.139	10.312	219.59	156.33	126.06	5.98
11/19/2011	14:37:17	9.125	10.328	219.58	156.33	125.75	5.98
11/19/2011	14:37:19	9.095	10.341	217.67	156.41	124.62	5.98
11/19/2011	14:37:21	9.085	10.365	217.59	156.33	123.63	7.05
11/19/2011	14:37:25	9.082	10.389	217.58	156.32	122.09	7.05
11/19/2011	14:37:27	9.05	10.419	217.6	156.33	119.08	7.05
11/19/2011	14:37:29	9.053	10.432	219.62	156.34	116.7	7.05
11/19/2011	14:37:32	9.147	10.429	219.64	156.34	116.83	7.05
11/19/2011	14:37:34	9.256	10.351	219.62	156.33	116.96	7.05
11/19/2011	14:37:36	9.289	10.206	219.63	156.34	117.51	7.05
11/19/2011	14:37:38	9.302	10.15	211.59	156.33	117.65	7.05
11/19/2011	14:37:40	9.326	10.156	211.6	156.34	117.62	7.05
11/19/2011	14:37:42	9.246	10.154	211.49	156.33	118.01	7.05
11/19/2011	14:37:44	9.103	10.206	211.6	156.33	118.85	7.05
11/19/2011	14:37:46	9.025	10.384	211.58	156.33	118.86	7.05
11/19/2011	14:37:49	9.006	10.479	211.59	156.34	118.4	7.05
11/19/2011	14:37:51	9.001	10.499	211.51	156.33	117.27	7.05
11/19/2011	14:37:53	9.006	10.482	211.59	156.34	116.22	7.05
11/19/2011	14:37:55	9.034	10.463	211.61	156.35	114.56	7.05
11/19/2011	14:37:57	9.046	10.438	211.61	156.34	113.64	7.05
11/19/2011	14:37:59	9.066	10.426	211.5	156.26	114.03	7.05
11/19/2011	14:38:01	9.092	10.405	211.7	156.42	115.14	7.05
11/19/2011	14:38:03	9.121	10.382	211.61	156.34	115.04	7.05
11/19/2011	14:38:06	9.135	10.35	211.6	156.33	115.89	7.05
11/19/2011	14:38:08	9.155	10.327	211.59	156.33	117.04	7.05
11/19/2011	14:38:10	9.173	10.31	209.6	156.34	118.17	7.05
11/19/2011	14:38:12	9.188	10.29	209.61	156.35	117.85	7.05
11/19/2011	14:38:14	9.19	10.276	209.59	156.34	117.37	7.05
11/19/2011	14:38:16	9.18	10.286	209.57	156.34	117.31	7.05
11/19/2011	14:38:18	9.168	10.299	215.62	156.34	117.78	7.05
11/19/2011	14:38:20	9.146	10.312	215.62	156.34	119.23	7.05
11/19/2011	14:38:23	9.15	10.33	215.72	156.42	120.29	7.05
11/19/2011	14:38:25	9.147	10.339	215.54	156.34	120.58	5.98
11/19/2011	14:38:27	9.148	10.329	215.62	156.34	120.46	5.98
11/19/2011	14:38:29	9.161	10.325	205.59	156.3	117.9	5.98
11/19/2011	14:38:31	9.158	10.316	205.73	156.42	114.52	5.98
11/19/2011	14:38:33	9.158	10.328	205.63	156.35	113.82	5.98
11/19/2011	14:38:35	9.212	10.32	205.62	156.34	114.33	5.98
11/19/2011	14:38:37	9.347	10.287	205.71	156.42	114.86	5.98
11/19/2011	14:38:40	9.418	10.143	201.61	156.33	114.59	5.98
11/19/2011	14:38:43	9.466	10.009	201.63	156.35	113.82	5.98

11/19/2011	14:38:45	9.479	9.993	201.63	156.35	113.14	5.98
11/19/2011	14:38:48	9.369	9.988	201.62	156.34	112.3	5.98
11/19/2011	14:38:50	9.262	10.073	199.63	155.74	111.55	5.98
11/19/2011	14:38:52	9.199	10.231	199.61	155.74	110.92	5.98
11/19/2011	14:38:54	9.188	10.302	199.71	155.82	110.73	5.98
11/19/2011	14:38:56	9.179	10.307	199.62	155.74	110.4	5.98
11/19/2011	14:38:58	9.175	10.309	199.62	155.75	110.59	5.98
11/19/2011	14:39:00	9.199	10.31	199.62	155.74	110.77	5.98
11/19/2011	14:39:02	9.209	10.298	199.61	155.73	110.9	5.98
11/19/2011	14:39:05	9.23	10.265	199.72	155.83	111.48	5.98
11/19/2011	14:39:07	9.25	10.257	199.62	155.74	112.22	5.98
11/19/2011	14:39:09	9.27	10.238	197.71	155.82	112.18	5.98
11/19/2011	14:39:11	9.28	10.211	197.61	155.74	112.37	5.98
11/19/2011	14:39:13	9.301	10.208	197.56	155.74	113.37	5.98
11/19/2011	14:39:15	9.308	10.196	197.56	155.66	113.99	5.98
11/19/2011	14:39:17	9.33	10.171	197.62	155.75	114.57	5.98
11/19/2011	14:39:19	9.347	10.156	203.62	155.74	115.9	5.98
11/19/2011	14:39:22	9.335	10.15	203.56	155.14	116.46	5.98
11/19/2011	14:39:25	9.349	10.145	203.56	155.09	117.24	5.98
11/19/2011	14:39:27	9.344	10.137	203.63	155.17	117.49	5.98
11/19/2011	14:39:29	9.339	10.138	205.62	155.17	118.49	5.77
11/19/2011	14:39:32	9.325	10.148	205.63	155.18	119.06	5.77
11/19/2011	14:39:34	9.325	10.161	205.61	155.17	118.2	5.77
11/19/2011	14:39:36	9.302	10.177	205.62	155.74	117.74	5.77
11/19/2011	14:39:38	9.282	10.195	201.62	155.74	117.92	5.77
11/19/2011	14:39:40	9.302	10.222	201.72	155.83	118.26	5.77
11/19/2011	14:39:42	9.425	10.216	201.63	155.75	118.57	5.77
11/19/2011	14:39:44	9.508	10.078	201.54	155.66	117.35	5.77
11/19/2011	14:39:46	9.557	9.955	201.73	155.83	113.92	5.77
11/19/2011	14:39:49	9.576	9.901	207.64	155.75	111.92	5.77
11/19/2011	14:39:51	9.575	9.881	207.64	155.76	110.67	5.77
11/19/2011	14:39:53	9.442	9.88	207.64	155.76	109.61	5.77
11/19/2011	14:39:55	9.326	9.994	207.64	155.74	108.28	5.77
11/19/2011	14:39:57	9.245	10.186	207.64	155.75	107.99	5.77
11/19/2011	14:39:59	9.201	10.271	201.63	155.75	107.87	5.77
11/19/2011	14:40:01	9.185	10.311	201.74	155.25	108.45	5.77
11/19/2011	14:40:03	9.188	10.321	201.63	155.17	111.98	5.77
11/19/2011	14:40:06	9.178	10.305	201.64	155.18	115.48	5.77
11/19/2011	14:40:08	9.17	10.303	201.73	155.25	119.37	5.77
11/19/2011	14:40:10	9.159	10.306	211.62	155.17	122.18	5.77
11/19/2011	14:40:12	9.164	10.322	211.62	155.16	123.66	5.77
11/19/2011	14:40:14	9.17	10.318	211.64	155.18	124.16	5.77
11/19/2011	14:40:16	9.191	10.306	211.63	155.11	124.91	5.77
11/19/2011	14:40:18	9.219	10.29	203.64	155.17	124.36	5.77
11/19/2011	14:40:20	9.232	10.273	203.63	155.17	122.99	5.77
11/19/2011	14:40:23	9.248	10.249	203.6	155.16	122.76	5.77
11/19/2011	14:40:25	9.271	10.238	203.55	155.09	122.88	5.77

11/19/2011	14:40:27	9.27	10.214	203.62	155.17	121.46	5.77
11/19/2011	14:40:29	9.274	10.205	209.59	155.17	119.36	5.77
11/19/2011	14:40:31	9.281	10.209	209.59	155.17	117.15	5.77
11/19/2011	14:40:33	9.277	10.201	209.59	155.17	114.84	5.77
11/19/2011	14:40:35	9.258	10.214	209.59	155.17	113.27	6.52
11/19/2011	14:40:37	9.253	10.228	209.59	155.17	113.83	6.52
11/19/2011	14:40:40	9.243	10.245	197.72	155.26	114.88	6.52
11/19/2011	14:40:42	9.232	10.267	197.6	155.15	117.25	6.52
11/19/2011	14:40:44	9.239	10.265	197.61	155.17	120.15	6.52
11/19/2011	14:40:46	9.309	10.252	197.61	155.17	121.88	6.52
11/19/2011	14:40:48	9.404	10.205	191.76	155.25	122.95	6.52
11/19/2011	14:40:50	9.439	10.061	191.67	155.18	124.95	6.52
11/19/2011	14:40:52	9.503	10.031	191.65	155.17	127.02	6.52
11/19/2011	14:40:54	9.541	9.975	191.66	155.18	127.22	6.52
11/19/2011	14:40:57	9.523	9.919	191.66	155.18	125.44	6.52
11/19/2011	14:40:59	9.428	9.926	189.67	155.17	123.41	6.51
11/19/2011	14:41:01	9.361	10.061	189.68	155.18	121.93	6.52
11/19/2011	14:41:03	9.349	10.139	189.78	155.26	120.86	6.52
11/19/2011	14:41:05	9.338	10.159	189.6	155.1	119.8	6.52
11/19/2011	14:41:07	9.329	10.161	189.74	155.26	117.96	6.51
11/19/2011	14:41:09	9.34	10.158	183.67	155.18	115.92	6.52
11/19/2011	14:41:11	9.356	10.152	183.68	155.18	115.55	6.52
11/19/2011	14:41:14	9.362	10.129	183.68	155.19	115.93	6.52
11/19/2011	14:41:16	9.389	10.12	183.69	155.18	115.79	6.52
11/19/2011	14:41:18	9.372	10.102	193.72	155.26	115.84	6.52
11/19/2011	14:41:20	9.378	10.088	193.62	155.18	116.53	6.52
11/19/2011	14:41:22	9.359	10.092	193.63	155.19	117.57	6.52
11/19/2011	14:41:24	9.347	10.107	193.53	155.18	118.23	6.52
11/19/2011	14:41:26	9.32	10.139	193.62	155.18	118.17	6.52
11/19/2011	14:41:28	9.312	10.162	201.56	155.18	117.65	6.51
11/19/2011	14:41:31	9.301	10.177	201.63	155.19	117.33	6.51
11/19/2011	14:41:33	9.306	10.187	201.61	155.15	116.78	6.51
11/19/2011	14:41:35	9.313	10.192	201.62	155.18	116.78	6.52
11/19/2011	14:41:37	9.316	10.179	201.73	155.26	118.19	6.52
11/19/2011	14:41:39	9.344	10.157	207.63	155.75	121.06	4.14
11/19/2011	14:41:41	9.351	10.135	207.61	155.76	122.84	4.14
11/19/2011	14:41:43	9.388	10.113	207.64	155.76	122.99	4.14
11/19/2011	14:41:45	9.394	10.101	207.64	155.77	119.24	4.14
11/19/2011	14:41:48	9.412	10.08	207.64	155.75	116.81	4.14
11/19/2011	14:41:50	9.43	10.074	195.54	155.75	114.19	4.14
11/19/2011	14:41:52	9.576	10.057	195.64	155.75	111.96	4.14
11/19/2011	14:41:54	9.669	9.932	195.64	155.75	109.72	4.14
11/19/2011	14:41:56	9.723	9.787	195.63	155.75	109.09	4.14
11/19/2011	14:41:58	9.756	9.736	195.73	155.84	110.08	4.14
11/19/2011	14:42:00	9.757	9.713	195.64	155.75	112.32	4.14
11/19/2011	14:42:02	9.675	9.704	195.73	155.84	114.9	4.14
11/19/2011	14:42:05	9.556	9.773	195.64	155.76	115.82	4.14

11/19/2011	14:42:07	9.494	9.942	195.64	155.76	116.54	4.14
11/19/2011	14:42:09	9.474	10.014	187.68	155.76	116.12	4.14
11/19/2011	14:42:11	9.465	10.024	187.6	155.68	114.58	4.14
11/19/2011	14:42:13	9.456	10.024	187.78	155.84	113.81	4.14
Pause							
11/19/2011	14:42:15	9.449	10.035	187.68	155.76	113.13	4.14
11/19/2011	14:42:17	9.346	10.023	192.65	154.86	111.03	4.04
11/19/2011	14:42:19	9.444	10.035	190.9	155.79	115.66	4.14
11/19/2011	14:42:22	9.435	10.042	189.71	155.76	117.95	4.14
11/19/2011	14:42:24	9.428	10.054	189.71	155.76	118.13	4.14
11/19/2011	14:42:26	9.425	10.059	189.69	155.75	117.44	4.14
11/19/2011	14:42:28	9.427	10.065	193.63	155.76	115.84	4.14
11/19/2011	14:42:30	9.422	10.052	193.68	155.84	114.64	4.14
11/19/2011	14:42:32	9.421	10.059	193.63	156.36	113.22	4.14
11/19/2011	14:42:34	9.427	10.055	193.62	156.36	111.54	4.14
11/19/2011	14:42:36	9.411	10.064	193.63	156.37	110.36	4.14
11/19/2011	14:42:39	9.398	10.071	195.65	156.37	110.13	4.15
11/19/2011	14:42:41	9.343	10.09	195.75	156.44	109.54	4.14
11/19/2011	14:42:43	9.336	10.139	195.63	156.36	108.78	4.14
11/19/2011	14:42:45	9.344	10.154	195.64	156.37	108.83	5.88
11/19/2011	14:42:47	9.336	10.139	195.64	156.36	108.98	5.88
11/19/2011	14:42:49	9.351	10.151	205.71	156.45	109.12	5.88
11/19/2011	14:42:51	9.378	10.142	205.63	156.36	109.03	5.88
11/19/2011	14:42:53	9.396	10.117	205.74	156.45	110.17	5.88
11/19/2011	14:42:56	9.424	10.1	205.65	156.37	110.97	5.88
11/19/2011	14:42:59	9.656	9.978	195.73	155.85	113.03	5.88
11/19/2011	14:43:01	9.74	9.821	195.64	155.76	113.39	5.88
11/19/2011	14:43:04	9.765	9.733	195.65	155.76	112.57	5.88
11/19/2011	14:43:06	9.796	9.702	195.64	155.76	110.98	5.88
11/19/2011	14:43:08	9.687	9.678	189.67	155.77	109.97	5.88
11/19/2011	14:43:10	9.583	9.763	189.68	155.76	109.21	5.88
11/19/2011	14:43:12	9.513	9.919	189.77	155.84	108.89	5.88
11/19/2011	14:43:14	9.49	9.97	189.6	155.69	108.45	5.88
11/19/2011	14:43:16	9.469	10	189.77	155.85	107.36	5.88
11/19/2011	14:43:18	9.45	10.014	187.69	155.76	105.9	5.88
11/19/2011	14:43:21	9.44	10.042	187.69	155.77	104.91	5.88
11/19/2011	14:43:23	9.418	10.056	187.68	155.76	105.1	5.88
11/19/2011	14:43:25	9.406	10.068	187.69	155.77	105.02	5.88
11/19/2011	14:43:27	9.362	10.079	187.69	155.76	104.37	5.88
11/19/2011	14:43:29	9.345	10.106	195.63	155.76	103.57	5.88
11/19/2011	14:43:31	9.329	10.134	195.61	155.77	104.07	5.88
11/19/2011	14:43:33	9.304	10.157	195.64	155.77	104.07	5.88
11/19/2011	14:43:35	9.271	10.184	195.65	155.76	102.38	5.88
11/19/2011	14:43:38	9.256	10.215	195.63	155.76	102.19	5.88
11/19/2011	14:43:40	9.238	10.235	195.64	155.77	103.12	5.88
11/19/2011	14:43:42	9.198	10.262	195.64	155.76	104.9	5.88
11/19/2011	14:43:44	9.167	10.295	195.73	155.84	107.27	5.88

11/19/2011	14:43:46	9.16	10.329	195.64	155.75	110.44	5.88
11/19/2011	14:43:48	9.158	10.333	189.67	155.76	113.03	5.88
11/19/2011	14:43:50	9.171	10.326	189.69	155.77	116.13	6.1
11/19/2011	14:43:52	9.182	10.317	189.68	155.76	119.09	6.1
11/19/2011	14:43:55	9.182	10.321	189.69	155.77	119.18	6.09
11/19/2011	14:43:57	9.182	10.302	189.79	156.45	117.9	6.09
11/19/2011	14:43:59	9.201	10.3	189.68	156.36	116.13	6.09
11/19/2011	14:44:01	9.285	10.294	189.77	156.44	114.7	6.09
11/19/2011	14:44:03	9.441	10.23	189.68	156.32	113.73	6.09
11/19/2011	14:44:05	9.527	10.047	189.78	156.45	113.88	6.09
11/19/2011	14:44:07	9.584	9.937	189.69	156.37	114.66	6.09
11/19/2011	14:44:09	9.627	9.887	195.64	158.1	114.98	6.09
11/19/2011	14:44:12	9.61	9.846	195.66	158.11	114.18	6.09
11/19/2011	14:44:14	9.508	9.833	195.63	158.1	112.57	6.09
11/19/2011	14:44:16	9.462	9.967	195.74	158.18	110.74	6.09
11/19/2011	14:44:18	9.446	10.047	197.65	158.11	109.65	6.1
11/19/2011	14:44:20	9.438	10.048	197.64	158.1	108.89	6.09
11/19/2011	14:44:22	9.457	10.038	197.74	158.78	108.66	6.09
11/19/2011	14:44:24	9.469	10.029	197.57	158.72	107.51	6.09
11/19/2011	14:44:26	9.473	10.008	197.63	158.71	107.56	6.1
11/19/2011	14:44:29	9.485	10.003	199.65	158.72	108	6.09
11/19/2011	14:44:31	9.473	10.001	199.65	158.73	108.47	6.09
11/19/2011	14:44:33	9.473	10.003	199.74	158.8	109.37	6.1
11/19/2011	14:44:35	9.466	10.006	199.55	158.65	110.81	6.1
11/19/2011	14:44:37	9.455	10.014	199.75	160.56	111.86	6.09
11/19/2011	14:44:39	9.446	10.026	203.64	160.47	113.09	6.1
11/19/2011	14:44:41	9.434	10.033	203.75	160.56	113.32	6.1
11/19/2011	14:44:43	9.425	10.04	203.65	160.48	113.84	6.1
11/19/2011	14:44:46	9.403	10.066	203.64	160.47	114.93	6.1
11/19/2011	14:44:48	9.39	10.091	197.64	160.48	116.33	6.09
11/19/2011	14:44:50	9.39	10.09	197.64	161.67	116.52	6.1
11/19/2011	14:44:52	9.381	10.098	197.64	161.67	115.23	6.1
11/19/2011	14:44:54	9.37	10.113	197.74	161.75	114.82	5.57
11/19/2011	14:44:56	9.356	10.12	197.59	161.66	114.95	5.57
11/19/2011	14:44:59	9.347	10.135	201.58	161.67	114.97	5.57
11/19/2011	14:45:01	9.321	10.158	201.72	161.75	115.65	5.58
11/19/2011	14:45:03	9.321	10.165	201.65	162.82	115.25	5.57
11/19/2011	14:45:05	9.356	10.154	201.65	162.83	114.31	5.57
11/19/2011	14:45:08	9.473	10.147	197.72	162.82	115.14	5.57
11/19/2011	14:45:10	9.569	10.01	197.64	162.82	116.51	5.57
11/19/2011	14:45:12	9.603	9.892	197.65	162.84	117.68	5.57
11/19/2011	14:45:14	9.645	9.843	197.65	162.83	118.73	5.57
11/19/2011	14:45:16	9.653	9.815	197.66	163.44	119.17	5.57
11/19/2011	14:45:18	9.536	9.814	193.65	163.45	119.2	5.57
11/19/2011	14:45:20	9.464	9.922	193.56	163.38	119.38	5.57
11/19/2011	14:45:22	9.43	10.046	193.66	163.45	120.39	5.57
11/19/2011	14:45:25	9.42	10.081	193.64	163.44	121.63	5.57

11/19/2011	14:45:27	9.432	10.069	193.63	163.43	122.42	5.57
11/19/2011	14:45:29	9.446	10.056	201.64	163.98	122.05	5.57
11/19/2011	14:45:31	9.453	10.024	201.65	163.99	121.68	5.57
11/19/2011	14:45:33	9.449	10.03	201.66	164.02	120.33	5.57
11/19/2011	14:45:35	9.429	10.03	201.74	164.11	117.78	5.57
11/19/2011	14:45:37	9.441	10.03	201.65	164.02	116.85	5.57
11/19/2011	14:45:40	9.404	10.037	205.59	164	116.45	5.57
11/19/2011	14:45:42	9.421	10.044	205.65	164.02	115.83	5.57
11/19/2011	14:45:44	9.396	10.061	205.65	164.02	115.26	5.57
11/19/2011	14:45:46	9.386	10.066	205.64	164.02	115.2	5.57
11/19/2011	14:45:48	9.367	10.082	205.65	164.03	116.07	5.57
11/19/2011	14:45:50	9.352	10.092	205.65	164.03	116.95	5.57
11/19/2011	14:45:52	9.325	10.111	205.65	164.03	117.02	5.57
11/19/2011	14:45:54	9.281	10.146	205.65	164.03	117.23	5.57
11/19/2011	14:45:57	9.262	10.182	205.64	164.05	117.36	5.57
11/19/2011	14:45:59	9.219	10.214	205.65	164.03	115.91	5.57
11/19/2011	14:46:01	9.202	10.252	205.63	163.44	114.52	5.16
11/19/2011	14:46:03	9.182	10.286	205.66	163.45	113.71	5.16
11/19/2011	14:46:05	9.148	10.306	205.65	163.45	113.84	5.16
11/19/2011	14:46:07	9.116	10.329	205.65	163.45	113.72	5.16
11/19/2011	14:46:09	9.08	10.36	197.64	163.45	113.04	5.16
11/19/2011	14:46:11	9.163	10.378	197.64	163.44	112.83	5.16
11/19/2011	14:46:14	9.28	10.331	197.64	162.84	113.43	5.16
11/19/2011	14:46:16	9.331	10.18	197.64	162.83	114.89	5.16
11/19/2011	14:46:18	9.347	10.107	183.69	162.84	116.7	5.16
11/19/2011	14:46:20	9.353	10.095	183.69	162.84	118.62	5.16
11/19/2011	14:46:22	9.268	10.104	183.71	162.85	119.89	5.16
11/19/2011	14:46:24	9.137	10.166	183.7	162.74	119.7	5.16
11/19/2011	14:46:26	9.081	10.353	182.95	162.17	120.12	5.17
11/19/2011	14:46:28	9.057	10.419	173.63	162.26	119.54	5.16
End Pause							
11/19/2011	14:46:32	9.032	10.406	177.64	161.6	116.27	5.08
11/19/2011	14:46:34	9.105	10.397	173.7	162.36	117.35	5.16
11/19/2011	14:46:36	9.143	10.364	173.61	162.28	118.14	5.16
11/19/2011	14:46:38	9.165	10.338	171.6	162.24	118.94	5.16
11/19/2011	14:46:40	9.199	10.302	171.52	162.19	119.75	5.16
11/19/2011	14:46:42	9.223	10.279	171.73	162.36	120.99	5.16
11/19/2011	14:46:45	9.242	10.239	171.61	162.28	122.13	5.16
11/19/2011	14:46:47	9.262	10.226	171.61	162.27	123.78	5.16
11/19/2011	14:46:49	9.29	10.197	183.69	162.28	125.31	5.16
11/19/2011	14:46:51	9.316	10.166	183.69	162.27	126.64	5.16
11/19/2011	14:46:53	9.336	10.156	183.71	161.68	127.39	5.16
11/19/2011	14:46:55	9.333	10.135	183.7	161.67	126.44	5.16
11/19/2011	14:46:57	9.337	10.127	183.79	161.76	125.38	5.16
11/19/2011	14:46:59	9.34	10.139	185.7	161.68	124.79	5.16
11/19/2011	14:47:02	9.345	10.139	185.69	161.67	124.4	5.16
11/19/2011	14:47:04	9.348	10.138	185.79	161.76	123.71	5.67

11/19/2011	14:47:06	9.368	10.136	185.69	161.68	123.07	5.67
11/19/2011	14:47:08	9.365	10.119	187.69	161.68	121.58	5.67
11/19/2011	14:47:10	9.374	10.112	187.69	161.68	118.9	5.67
11/19/2011	14:47:12	9.376	10.113	187.7	161.68	116.69	5.67
11/19/2011	14:47:14	9.363	10.105	187.8	161.77	116.38	5.67
11/19/2011	14:47:16	9.469	10.112	187.7	161.68	118.04	5.67
11/19/2011	14:47:19	9.587	10.03	189.71	161.68	119.27	5.67
11/19/2011	14:47:21	9.646	9.861	189.69	161.67	120.31	5.67
11/19/2011	14:47:23	9.669	9.8	189.7	161.67	119.72	5.67
11/19/2011	14:47:25	9.688	9.776	189.69	161.68	118.97	5.67
11/19/2011	14:47:27	9.598	9.773	189.65	161.67	118.29	5.67
11/19/2011	14:47:29	9.451	9.831	181.67	161.67	116.94	5.67
11/19/2011	14:47:33	9.36	10.107	181.7	161.11	115.26	5.67
11/19/2011	14:47:35	9.332	10.131	181.78	161.17	115.08	5.67
11/19/2011	14:47:37	9.312	10.142	181.68	161.1	115.59	5.67
11/19/2011	14:47:39	9.287	10.166	177.68	161.08	116.16	5.67
11/19/2011	14:47:41	9.277	10.185	177.67	161.09	117.55	5.67
11/19/2011	14:47:44	9.255	10.183	177.68	161.09	118.89	5.67
11/19/2011	14:47:46	9.28	10.196	177.78	161.18	118.92	5.67
11/19/2011	14:47:48	9.279	10.199	175.62	161.09	118.77	5.67
11/19/2011	14:47:50	9.287	10.192	175.62	161.1	118.24	5.67
11/19/2011	14:47:52	9.281	10.19	175.63	161.1	116.53	5.67
11/19/2011	14:47:54	9.285	10.192	175.63	161.1	114.59	5.67
11/19/2011	14:47:56	9.283	10.194	175.64	161.1	114.05	5.67
11/19/2011	14:47:58	9.287	10.175	171.62	161.68	114.43	5.67
11/19/2011	14:48:02	9.282	10.182	171.55	161.66	114.64	5.67
11/19/2011	14:48:04	9.281	10.19	171.63	161.68	115.15	5.67
11/19/2011	14:48:06	9.279	10.199	171.62	161.67	114.75	5.67
11/19/2011	14:48:08	9.289	10.204	175.62	161.68	114.32	5.67
11/19/2011	14:48:10	9.289	10.19	175.61	161.6	114.54	5.98
11/19/2011	14:48:12	9.317	10.183	175.61	161.68	114.43	5.98
11/19/2011	14:48:14	9.322	10.173	175.61	161.68	113.86	5.99
11/19/2011	14:48:16	9.323	10.151	175.63	161.69	112.43	5.98
11/19/2011	14:48:19	9.323	10.156	175.72	161.76	111.7	5.98
11/19/2011	14:48:21	9.362	10.151	175.62	161.68	110.76	5.98
11/19/2011	14:48:23	9.39	10.128	175.58	161.6	109.65	5.99
11/19/2011	14:48:25	9.389	10.061	175.62	161.68	109.51	5.99
11/19/2011	14:48:27	9.433	10.082	175.55	161.61	108.54	5.99
11/19/2011	14:48:29	9.507	10.038	175.62	161.68	106.98	5.99
11/19/2011	14:48:31	9.539	9.968	175.53	161.61	105.32	5.99
11/19/2011	14:48:33	9.438	9.895	175.62	161.68	104.12	5.99
11/19/2011	14:48:36	9.351	10.007	175.63	161.69	103.42	5.98
11/19/2011	14:48:38	9.324	10.13	175.63	161.68	103.03	5.99
11/19/2011	14:48:40	9.306	10.166	175.74	161.75	102.93	5.99
11/19/2011	14:48:42	9.292	10.167	175.63	161.68	104.01	5.99
11/19/2011	14:48:44	9.279	10.177	175.63	161.68	105.23	5.99
11/19/2011	14:48:46	9.267	10.193	175.73	161.76	106.21	5.99

11/19/2011	14:48:48	9.25	10.213	175.61	161.64	107.77	5.99
11/19/2011	14:48:50	9.244	10.215	175.63	161.68	109.71	5.99
11/19/2011	14:48:52	9.232	10.227	175.63	161.69	110.14	5.98
11/19/2011	14:48:55	9.203	10.235	175.62	161.69	111.63	5.99
11/19/2011	14:48:57	9.21	10.263	175.62	161.67	114.26	5.99
11/19/2011	14:48:59	9.203	10.259	171.63	161.69	116.43	5.99
11/19/2011	14:49:03	9.191	10.269	171.63	161.68	117.99	5.99
11/19/2011	14:49:05	9.181	10.303	171.63	161.68	121.6	5.99
11/19/2011	14:49:08	9.187	10.3	175.64	161.68	121.63	5.99
11/19/2011	14:49:10	9.17	10.291	175.63	161.69	121.23	5.98
11/19/2011	14:49:12	9.165	10.303	175.61	162.28	121.22	5.98
11/19/2011	14:49:14	9.17	10.309	175.61	162.28	121.86	2.94
11/19/2011	14:49:16	9.163	10.293	175.62	162.27	123.1	2.94
11/19/2011	14:49:18	9.158	10.294	177.68	162.29	123.86	2.94
11/19/2011	14:49:20	9.147	10.31	176.97	161.66	123.5	2.94
11/19/2011	14:49:22	9.139	10.329	177.66	162.27	122.58	2.94
11/19/2011	14:49:27	9.141	10.334	177.67	162.84	120.8	2.94
11/19/2011	14:49:29	9.348	10.262	177.76	162.45	118.55	2.94
11/19/2011	14:49:31	9.408	10.12	177.67	162.83	118.14	2.94
11/19/2011	14:49:33	9.442	10.052	177.67	162.84	117.41	2.94
11/19/2011	14:49:35	9.47	10.021	177.57	162.84	116.49	2.94
11/19/2011	14:49:37	9.419	10.005	177.67	163.45	115.12	2.94
11/19/2011	14:49:39	9.291	10.035	169.61	163.45	113.96	2.94
11/19/2011	14:49:41	9.227	10.2	169.61	163.45	112.26	2.94
11/19/2011	14:49:43	9.214	10.274	169.61	163.45	111.48	2.94
11/19/2011	14:49:46	9.202	10.285	169.62	163.45	112.1	2.94
11/19/2011	14:49:48	9.191	10.28	183.78	163.53	114.09	2.95
11/19/2011	14:49:50	9.181	10.28	183.68	163.97	116.39	2.94
11/19/2011	14:49:52	9.206	10.278	183.69	164.04	117.85	2.94
11/19/2011	14:49:54	9.206	10.264	183.69	164.03	119.64	2.94
11/19/2011	14:49:56	9.225	10.253	183.79	164.1	121.21	2.94
11/19/2011	14:49:58	9.247	10.235	185.7	164.03	121.84	2.94
11/19/2011	14:50:01	9.269	10.208	185.69	164.03	120.9	2.94
11/19/2011	14:50:03	9.288	10.196	185.68	164.62	120.43	2.94
11/19/2011	14:50:05	9.316	10.173	185.69	164.62	119.74	2.94
11/19/2011	14:50:07	9.322	10.16	185.69	164.62	119.03	2.94
11/19/2011	14:50:09	9.337	10.148	183.79	164.72	118.29	2.94
11/19/2011	14:50:11	9.345	10.138	183.69	164.63	116.73	2.94
11/19/2011	14:50:13	9.36	10.129	183.69	164.63	115.94	2.94
11/19/2011	14:50:16	9.369	10.108	183.63	164.64	116.11	2.94
11/19/2011	14:50:18	9.391	10.098	189.71	165.22	116.77	2.94
11/19/2011	14:50:20	9.388	10.085	189.69	165.2	117.6	5.58
11/19/2011	14:50:22	9.426	10.072	189.69	165.21	118.19	5.57
11/19/2011	14:50:24	9.447	10.06	189.68	165.21	119.09	5.57
11/19/2011	14:50:26	9.447	10.041	189.68	165.2	119.17	5.58
11/19/2011	14:50:28	9.468	10.039	187.7	165.22	118.94	5.58
11/19/2011	14:50:30	9.509	10.034	187.69	165.21	118.43	5.58

11/19/2011	14:50:33	9.654	9.991	187.7	165.21	117.95	5.57
11/19/2011	14:50:35	9.753	9.835	187.8	165.29	117.31	5.57
11/19/2011	14:50:37	9.774	9.711	187.79	165.3	116.61	5.58
11/19/2011	14:50:39	9.817	9.667	189.61	165.16	115.86	5.57
11/19/2011	14:50:41	9.803	9.662	189.64	165.15	114.95	5.58
11/19/2011	14:50:43	9.683	9.655	189.7	165.21	113.89	5.57
11/19/2011	14:50:45	9.575	9.785	189.7	165.21	113.04	5.57
11/19/2011	14:50:47	9.537	9.935	191.8	165.3	112.29	5.57
11/19/2011	14:50:50	9.533	9.978	191.71	164.64	113.02	5.57
11/19/2011	14:50:52	9.526	9.979	191.7	164.64	114.19	5.58
11/19/2011	14:50:54	9.526	9.972	191.7	164.63	115.31	5.57
11/19/2011	14:50:56	9.542	9.956	191.61	164.57	115.18	5.58
11/19/2011	14:50:58	9.541	9.948	187.7	164.64	115.05	5.58
11/19/2011	14:51:00	9.539	9.943	187.7	164.56	116.09	5.57
11/19/2011	14:51:02	9.534	9.942	187.71	165.21	117.67	5.58
11/19/2011	14:51:04	9.506	9.951	187.69	165.21	117.95	5.58
11/19/2011	14:51:07	9.49	9.98	187.67	165.17	118.38	5.57
11/19/2011	14:51:09	9.492	9.992	189.8	165.28	118.53	5.58
11/19/2011	14:51:11	9.471	9.994	189.7	165.21	118.56	5.58
11/19/2011	14:51:14	9.461	10.007	189.71	165.21	118.14	5.58
11/19/2011	14:51:16	9.451	10.027	189.72	164.64	118.27	5.58
11/19/2011	14:51:18	9.447	10.023	187.7	164.64	118.24	5.58
11/19/2011	14:51:20	9.445	10.037	187.71	164.63	118.24	5.58
11/19/2011	14:51:22	9.434	10.041	187.7	164.64	118.33	5.58
11/19/2011	14:51:24	9.439	10.039	187.71	164.64	118.69	6.31
11/19/2011	14:51:26	9.434	10.045	187.78	164.72	118.59	6.31
11/19/2011	14:51:28	9.439	10.058	181.69	164.62	117.85	6.31
11/19/2011	14:51:30	9.446	10.056	181.69	164.65	117.57	6.31
11/19/2011	14:51:33	9.426	10.046	181.77	164.72	117.36	6.31
11/19/2011	14:51:35	9.424	10.055	181.68	164.65	117.09	6.31
11/19/2011	14:51:37	9.526	10.061	181.68	164.64	116.4	6.31
11/19/2011	14:51:39	9.616	9.974	175.61	164.64	114.48	6.31
11/19/2011	14:51:41	9.635	9.847	175.54	163.97	113.07	6.31
11/19/2011	14:51:43	9.663	9.802	175.62	164.04	111.91	6.31
11/19/2011	14:51:45	9.674	9.801	175.72	164.13	111.69	6.31
11/19/2011	14:51:47	9.572	9.779	173.62	164.04	112.78	6.31
11/19/2011	14:51:50	9.458	9.85	173.63	164.04	113.44	6.31
11/19/2011	14:51:52	9.396	10.032	173.72	164.13	113.97	6.31
11/19/2011	14:51:54	9.381	10.091	173.62	162.85	114.19	6.31
11/19/2011	14:51:56	9.36	10.112	173.72	162.93	114.95	6.31
11/19/2011	14:51:58	9.356	10.109	175.62	162.78	115.8	6.31
11/19/2011	14:52:00	9.329	10.111	175.63	162.85	116.62	6.31
11/19/2011	14:52:02	9.315	10.135	175.72	162.94	117.93	6.31
11/19/2011	14:52:04	9.313	10.147	175.63	162.8	118.55	6.31
11/19/2011	14:52:07	9.297	10.162	175.62	162.86	119.08	6.31
11/19/2011	14:52:09	9.285	10.165	175.72	162.38	119.02	6.31
11/19/2011	14:52:11	9.295	10.165	175.72	162.38	119.17	6.31

11/19/2011	14:52:13	9.29	10.165	175.63	162.28	118.59	6.31
11/19/2011	14:52:15	9.288	10.174	175.63	162.29	118.46	6.31
11/19/2011	14:52:17	9.284	10.17	175.73	162.35	118.04	6.31
11/19/2011	14:52:19	9.302	10.17	175.62	162.28	117.94	6.31
11/19/2011	14:52:22	9.313	10.168	175.73	161.19	116.51	6.31
11/19/2011	14:52:24	9.311	10.153	175.73	161.19	113.92	6.31
11/19/2011	14:52:26	9.313	10.146	175.64	161.11	112.03	6.31
11/19/2011	14:52:28	9.314	10.152	175.64	161.1	111.04	6.31
11/19/2011	14:52:30	9.318	10.154	175.58	161.08	110.95	5.73
11/19/2011	14:52:32	9.324	10.161	175.64	161.1	111.16	5.73
11/19/2011	14:52:34	9.32	10.145	175.54	160.5	112.2	5.73
11/19/2011	14:52:36	9.313	10.148	175.74	160.58	113.67	5.73
11/19/2011	14:52:39	9.318	10.166	177.7	160.5	115.41	5.73
11/19/2011	14:52:41	9.383	10.174	177.81	160.58	117.22	5.72
11/19/2011	14:52:43	9.524	10.119	177.71	160.5	118.89	5.73
11/19/2011	14:52:45	9.63	9.94	177.7	160.5	120.08	5.73
11/19/2011	14:52:47	9.678	9.817	177.63	160.43	120.65	5.73
11/19/2011	14:52:49	9.71	9.769	171.63	160.5	120.36	5.73
11/19/2011	14:52:51	9.698	9.742	171.65	160.52	118.22	5.73
11/19/2011	14:52:53	9.579	9.739	171.64	159.92	115.12	5.73
11/19/2011	14:52:56	9.511	9.879	171.58	159.84	111.2	5.72
11/19/2011	14:52:58	9.468	9.987	169.65	159.92	107.34	5.72
11/19/2011	14:53:00	9.464	10.011	169.73	160	104.56	5.72
11/19/2011	14:53:02	9.46	10.014	169.63	159.92	103.56	5.72
11/19/2011	14:53:04	9.463	10.004	169.74	160	103.71	5.72
11/19/2011	14:53:06	9.481	10.002	169.63	159.92	105.49	5.72
11/19/2011	14:53:08	9.472	9.997	171.63	159.92	108.08	5.73
11/19/2011	14:53:10	9.491	9.987	171.62	159.92	112.83	5.73
11/19/2011	14:53:13	9.462	10	171.74	160.01	115.25	5.72
11/19/2011	14:53:15	9.468	10.014	171.63	159.92	116.59	5.72
11/19/2011	14:53:17	9.45	10.029	171.73	160	117.32	5.72
11/19/2011	14:53:19	9.458	10.025	173.64	160.5	116.82	5.73
11/19/2011	14:53:21	9.458	10.019	173.63	160.43	115.77	5.72
11/19/2011	14:53:23	9.457	10.015	173.63	160.49	114.76	5.73
11/19/2011	14:53:25	9.457	10.016	173.73	160.58	114.1	5.72
11/19/2011	14:53:27	9.454	10.009	175.65	160.43	113.07	5.72
11/19/2011	14:53:30	9.453	10.008	175.73	160.58	112.34	5.72
11/19/2011	14:53:32	9.456	10.014	175.63	160.5	111.68	5.73
11/19/2011	14:53:34	9.434	10.021	175.73	160.59	111.03	5.52
11/19/2011	14:53:36	9.425	10.034	175.64	160.5	110.79	5.52
11/19/2011	14:53:38	9.403	10.055	175.62	160.5	111.02	5.52
11/19/2011	14:53:40	9.397	10.077	175.63	160.5	111.61	5.52
11/19/2011	14:53:42	9.377	10.095	175.63	160.51	112.97	5.52
11/19/2011	14:53:44	9.373	10.112	175.73	160.59	114.9	5.52
11/19/2011	14:53:47	9.464	10.125	175.73	160.59	115.86	5.52
11/19/2011	14:53:49	9.577	10.051	175.63	160.5	116.06	5.52
11/19/2011	14:53:51	9.629	9.892	175.63	160.5	116.89	5.52

11/19/2011	14:53:53	9.675	9.823	175.62	160.51	117.15	5.52
11/19/2011	14:53:55	9.705	9.805	175.63	160.5	116.43	5.52
11/19/2011	14:53:57	9.641	9.78	169.53	160.49	114.72	5.52
11/19/2011	14:53:59	9.523	9.813	169.65	160.41	112.63	5.52
11/19/2011	14:54:01	9.453	9.98	169.63	160.51	110.7	5.52
11/19/2011	14:54:04	9.418	10.05	169.63	160.51	109.44	5.52
11/19/2011	14:54:06	9.442	10.061	169.74	160.6	108.41	5.52
11/19/2011	14:54:08	9.414	10.055	169.62	160.51	109.66	5.52
11/19/2011	14:54:10	9.406	10.053	169.62	160.51	110.71	5.52
11/19/2011	14:54:12	9.381	10.074	169.71	161.78	112.11	5.52
11/19/2011	14:54:14	9.353	10.098	169.61	161.69	113.45	5.52
11/19/2011	14:54:16	9.334	10.121	169.71	161.78	113	5.52
11/19/2011	14:54:18	9.315	10.15	169.61	161.69	112.77	5.52
11/19/2011	14:54:21	9.307	10.173	169.62	161.7	112.97	5.52
11/19/2011	14:54:23	9.284	10.192	169.56	161.67	113.17	5.52
11/19/2011	14:54:25	9.287	10.194	169.62	162.3	112.81	5.52
11/19/2011	14:54:27	9.288	10.199	169.71	162.38	112.33	5.52
11/19/2011	14:54:29	9.279	10.2	165.61	162.3	112.86	5.52
11/19/2011	14:54:31	9.276	10.206	165.61	162.27	114.06	5.52
11/19/2011	14:54:33	9.281	10.205	165.54	162.21	115.35	5.52
11/19/2011	14:54:35	9.281	10.21	165.7	162.38	115.78	5.52
11/19/2011	14:54:38	9.27	10.202	163.6	162.86	116.83	5.52
11/19/2011	14:54:40	9.279	10.194	163.63	162.86	116.68	5.16
11/19/2011	14:54:42	9.277	10.197	163.72	162.95	117.22	5.16
11/19/2011	14:54:44	9.266	10.201	163.62	162.86	118.66	5.16
11/19/2011	14:54:46	9.246	10.218	163.73	162.94	120.05	5.16
11/19/2011	14:54:48	9.206	10.248	161.58	162.84	121.15	5.16
11/19/2011	14:54:50	9.236	10.272	161.54	162.8	121.86	5.16
11/19/2011	14:54:52	9.337	10.277	161.63	163.48	122.5	5.17
11/19/2011	14:54:55	9.389	10.165	161.72	163.55	123.63	5.16
11/19/2011	14:54:57	9.411	10.069	161.63	163.46	123.9	5.16
11/19/2011	14:54:59	9.415	10.047	165.72	163.55	122.83	5.16
11/19/2011	14:55:01	9.405	10.052	165.63	163.47	120.65	5.16
11/19/2011	14:55:03	9.281	10.064	165.64	163.47	120.24	5.17
11/19/2011	14:55:05	9.2	10.172	165.63	163.46	121.55	5.16
11/19/2011	14:55:07	9.16	10.303	161.7	163.55	123.71	5.17
11/19/2011	14:55:13	9.168	10.311	161.62	163.46	125.81	5.17
11/19/2011	14:55:15	9.213	10.273	161.73	162.93	127.46	5.16
11/19/2011	14:55:17	9.217	10.26	161.63	162.86	128.32	5.16
11/19/2011	14:55:19	9.215	10.265	157.76	162.93	128.57	5.17
11/19/2011	14:55:21	9.207	10.255	157.66	162.86	128.38	5.16
11/19/2011	14:55:23	9.197	10.248	157.68	162.86	128.47	5.16
11/19/2011	14:55:25	9.205	10.252	157.67	162.86	126.76	5.16
11/19/2011	14:55:27	9.18	10.261	163.72	162.94	125.73	5.16
11/19/2011	14:55:30	9.16	10.275	163.64	162.86	124.78	5.17
11/19/2011	14:55:32	9.145	10.301	163.62	162.85	124.2	5.16
11/19/2011	14:55:34	9.127	10.326	163.62	162.77	123.39	5.16

11/19/2011	14:55:36	9.108	10.342	163.62	162.86	122.94	5.17
11/19/2011	14:55:38	9.112	10.356	155.67	162.29	123.47	5.17
11/19/2011	14:55:42	9.104	10.36	155.66	162.29	123.37	5.17
11/19/2011	14:55:44	9.147	10.344	155.67	162.3	121.62	5.16
11/19/2011	14:55:46	9.15	10.319	155.69	162.3	121.21	5.17
11/19/2011	14:55:48	9.185	10.307	155.68	162.3	120.89	5.17
11/19/2011	14:55:50	9.206	10.279	155.66	161.09	120.36	5.17
11/19/2011	14:55:52	9.204	10.265	155.67	161.12	117.61	5.17
11/19/2011	14:55:54	9.21	10.266	155.68	161.11	114.45	5.17
11/19/2011	14:55:57	9.282	10.266	155.61	161.05	111.87	5.17
11/19/2011	14:55:59	9.333	10.202	159.67	161.11	110.71	5.17
11/19/2011	14:56:01	9.383	10.121	159.58	161.12	110.92	5.17
11/19/2011	14:56:03	9.432	10.06	159.68	160.51	111.15	5.16
11/19/2011	14:56:05	9.481	10.013	159.68	160.52	111.97	5.16
11/19/2011	14:56:07	9.424	9.972	153.67	160.52	112.74	5.17
11/19/2011	14:56:09	9.303	10	153.66	160.51	113.54	5.17
11/19/2011	14:56:12	9.221	10.175	153.66	160.51	114.31	5.16
11/19/2011	14:56:14	9.213	10.244	153.68	160.51	115.06	5.17
11/19/2011	14:56:16	9.186	10.268	153.67	160.51	116.83	5.16
11/19/2011	14:56:18	9.181	10.283	153.67	160.51	117.66	5.16
11/19/2011	14:56:20	9.174	10.291	153.76	160.59	117.81	5.17
11/19/2011	14:56:22	9.183	10.288	153.67	160.51	117.38	5.17
11/19/2011	14:56:24	9.152	10.299	153.68	160.52	117.07	5.16
11/19/2011	14:56:26	9.124	10.298	153.67	160.51	116.12	5.17
11/19/2011	14:56:29	9.086	10.34	155.68	160.51	115.2	5.17
11/19/2011	14:56:31	9.041	10.374	155.68	159.94	114.06	5.17
11/19/2011	14:56:33	9.017	10.428	155.77	160.02	113.36	5.16
11/19/2011	14:56:35	8.983	10.452	155.67	159.93	113.1	5.16
11/19/2011	14:56:37	8.98	10.475	157.67	159.93	113.76	5.17
11/19/2011	14:56:39	8.987	10.487	157.66	159.93	114.04	5.16
11/19/2011	14:56:41	8.989	10.487	157.76	160	113.54	5.16
11/19/2011	14:56:43	8.976	10.47	157.68	159.94	114.22	5.16
11/19/2011	14:56:46	9.013	10.471	157.68	159.94	116.17	5.17
11/19/2011	14:56:48	9.022	10.456	157.66	159.93	117.38	5.16
11/19/2011	14:56:50	9.043	10.433	157.77	160.02	117.76	3.36
11/19/2011	14:56:52	9.05	10.414	157.68	159.93	118.49	3.37
11/19/2011	14:56:54	9.076	10.405	157.59	159.84	119.8	3.37
11/19/2011	14:56:56	9.094	10.385	157.52	160.35	121.26	3.37
11/19/2011	14:56:58	9.101	10.376	159.76	160.59	121.86	3.37
11/19/2011	14:57:00	9.135	10.362	159.65	160.51	120.14	3.36
11/19/2011	14:57:03	9.271	10.349	159.75	160.6	117.99	3.36
11/19/2011	14:57:05	9.35	10.207	159.66	160.51	117.16	3.36
11/19/2011	14:57:07	9.387	10.087	159.66	160.5	117.98	3.36
11/19/2011	14:57:09	9.389	10.051	153.66	159.94	118.82	3.36
11/19/2011	14:57:11	9.383	10.056	153.75	160.02	119.04	3.36
11/19/2011	14:57:13	9.229	10.062	153.66	159.94	119.41	3.36
11/19/2011	14:57:15	9.101	10.225	153.63	159.92	120.65	3.36

11/19/2011	14:57:17	9.023	10.396	149.66	159.94	121.26	3.36
11/19/2011	14:57:20	8.989	10.465	149.58	159.91	121.76	3.36
11/19/2011	14:57:22	8.974	10.486	149.75	160.02	121.61	3.36
11/19/2011	14:57:24	8.957	10.497	149.64	159.92	120.7	3.37
11/19/2011	14:57:26	8.959	10.489	149.65	159.94	119.95	3.37
11/19/2011	14:57:28	8.96	10.495	151.76	160.59	119.79	3.36
11/19/2011	14:57:30	8.962	10.497	151.65	160.51	119.52	3.36
11/19/2011	14:57:32	8.942	10.494	151.6	160.48	118.79	3.36
11/19/2011	14:57:34	8.903	10.511	151.78	160.59	117.79	3.36
11/19/2011	14:57:37	8.857	10.545	151.69	160.52	117.68	3.37
11/19/2011	14:57:39	8.829	10.598	145.66	160.51	118.28	3.37
11/19/2011	14:57:41	8.778	10.635	145.76	160.6	119.7	3.37
11/19/2011	14:57:43	8.742	10.67	145.65	160.51	120.84	3.36
11/19/2011	14:57:45	8.734	10.708	145.66	160.51	123.14	3.36
11/19/2011	14:57:47	8.713	10.728	149.68	160.52	124.35	3.36
11/19/2011	14:57:49	8.698	10.737	149.78	160.58	124.54	3.37
11/19/2011	14:57:51	8.724	10.744	149.65	160.47	125.12	3.37
11/19/2011	14:57:54	8.755	10.729	149.66	160.44	127.1	3.36
11/19/2011	14:57:56	8.804	10.693	149.76	160.59	129.16	5.11
11/19/2011	14:57:58	8.846	10.649	147.77	160.6	130.21	5.12
11/19/2011	14:58:00	8.848	10.614	147.65	160.51	130.43	5.11
11/19/2011	14:58:02	8.881	10.598	147.57	160.44	129.5	5.11
11/19/2011	14:58:04	8.88	10.58	147.65	160.51	127.8	5.12
11/19/2011	14:58:06	8.989	10.565	147.64	160.51	126.4	5.12
11/19/2011	14:58:08	9.109	10.502	151.67	160.51	124.4	5.11
11/19/2011	14:58:11	9.158	10.354	151.66	160.5	122.75	5.12
11/19/2011	14:58:13	9.152	10.291	151.76	160.59	121.54	5.11
11/19/2011	14:58:15	9.163	10.281	151.67	160.5	121.3	5.11
11/19/2011	14:58:17	9.1	10.287	151.68	160.5	122.17	5.12
11/19/2011	14:58:19	8.933	10.329	151.67	160.52	124.17	5.11
11/19/2011	14:58:21	8.855	10.525	151.67	160.51	126.77	5.11
11/19/2011	14:58:23	8.816	10.633	151.67	160.49	127.99	5.11
11/19/2011	14:58:25	8.814	10.665	151.67	160.5	128.45	5.11
11/19/2011	14:58:28	8.835	10.658	153.76	160.59	127.88	5.11
11/19/2011	14:58:30	8.866	10.628	153.66	160.5	127.42	5.11
11/19/2011	14:58:32	8.901	10.581	153.77	160.58	126.43	5.12
11/19/2011	14:58:34	8.939	10.543	153.66	161.11	125.36	5.11
11/19/2011	14:58:36	8.949	10.526	153.66	161.11	125.53	5.11
11/19/2011	14:58:38	8.948	10.514	151.66	161.11	124.97	5.12
11/19/2011	14:58:40	8.927	10.517	151.78	161.19	123.37	5.12
11/19/2011	14:58:42	8.889	10.538	151.67	161.1	123.32	5.11
11/19/2011	14:58:45	8.842	10.573	151.67	161.1	123.89	5.12
11/19/2011	14:58:47	8.818	10.608	151.66	161.69	125.29	5.11
11/19/2011	14:58:49	8.792	10.648	163.64	161.68	126.42	5.11
11/19/2011	14:58:51	8.774	10.681	163.62	161.69	126.65	5.11
11/19/2011	14:58:53	8.778	10.687	163.64	161.69	127.11	5.12
11/19/2011	14:58:55	8.778	10.688	163.63	161.7	127.67	5.11

11/19/2011	14:58:57	8.815	10.667	167.64	161.7	125.97	5.12
11/19/2011	14:58:59	8.85	10.644	167.64	162.28	124.26	5.36
11/19/2011	14:59:02	8.876	10.61	167.66	162.29	121.97	5.36
11/19/2011	14:59:04	8.916	10.574	167.73	162.38	120.27	5.36
11/19/2011	14:59:06	8.95	10.546	167.56	162.21	118.77	5.37
11/19/2011	14:59:08	8.948	10.522	167.66	162.3	117.51	5.37
11/19/2011	14:59:10	8.962	10.51	167.72	162.37	118.01	5.36
11/19/2011	14:59:14	9.036	10.518	167.62	162.85	118.44	5.37
11/19/2011	14:59:17	9.017	10.433	167.64	162.85	120.09	5.37
11/19/2011	14:59:19	9.057	10.443	167.66	162.85	121.76	5.37
11/19/2011	14:59:21	9.074	10.397	167.76	162.86	124.01	5.37
11/19/2011	14:59:23	8.956	10.381	167.69	162.87	125.57	5.36
11/19/2011	14:59:25	8.843	10.484	167.66	162.8	126.35	5.36
11/19/2011	14:59:27	8.8	10.626	165.64	163.46	126.6	5.36
11/19/2011	14:59:29	8.804	10.67	165.63	163.46	125.62	5.37
11/19/2011	14:59:31	8.833	10.657	165.62	163.46	123.97	5.36
11/19/2011	14:59:34	8.87	10.633	165.63	163.46	121.74	5.37
11/19/2011	14:59:36	8.923	10.582	165.72	163.55	119.16	5.37
11/19/2011	14:59:38	8.964	10.535	163.73	163.54	117.97	5.37
11/19/2011	14:59:40	9.001	10.486	163.64	163.45	117.88	5.37
11/19/2011	14:59:42	9.026	10.451	163.63	163.47	118.44	5.36
11/19/2011	14:59:44	9.052	10.423	163.64	163.47	119.75	5.36
11/19/2011	14:59:46	9.1	10.39	163.63	163.46	121.57	5.37
11/19/2011	14:59:48	9.089	10.374	167.64	163.46	122.44	5.37
11/19/2011	14:59:51	9.097	10.359	167.63	163.46	122.4	5.37
11/19/2011	14:59:53	9.111	10.359	167.63	163.41	122.52	5.37
11/19/2011	14:59:55	9.088	10.362	167.73	163.47	122.51	5.37
11/19/2011	14:59:57	9.084	10.368	163.62	163.45	121.44	5.37
11/19/2011	14:59:59	9.072	10.37	163.72	163.55	119.77	5.36
11/19/2011	15:00:01	9.058	10.377	163.64	163.47	117.37	5.36
11/19/2011	15:00:03	9.049	10.395	163.61	163.46	114.55	5.37
11/19/2011	15:00:05	9.035	10.41	163.5	163.38	111.55	2.58
11/19/2011	15:00:08	9.02	10.43	163.62	163.46	111.07	2.58
11/19/2011	15:00:10	9.013	10.443	163.63	163.46	112.22	2.58
11/19/2011	15:00:12	9.013	10.455	163.63	162.25	114.71	2.58
11/19/2011	15:00:14	9.003	10.462	163.62	162.29	117.81	2.57
11/19/2011	15:00:16	9.078	10.471	163.64	162.29	120.35	2.57
11/19/2011	15:00:18	9.194	10.427	163.74	162.37	121.3	2.58
11/19/2011	15:00:20	9.232	10.268	163.64	162.29	121.8	2.58
11/19/2011	15:00:22	9.248	10.208	163.63	162.29	121.79	2.58
11/19/2011	15:00:25	9.237	10.194	163.63	159.9	122.49	2.57
11/19/2011	15:00:27	9.174	10.21	163.73	160.01	122.25	2.58
11/19/2011	15:00:29	9.017	10.263	157.67	159.94	121.99	2.58
11/19/2011	15:00:31	8.931	10.456	157.68	159.94	121.25	2.58
11/19/2011	15:00:33	8.899	10.563	157.68	159.93	120.12	2.57
11/19/2011	15:00:35	8.896	10.587	157.67	159.93	118.44	2.57
11/19/2011	15:00:37	8.902	10.576	155.66	156.4	116.01	2.58

11/19/2011	15:00:39	8.912	10.565	155.77	156.48	114.37	2.58
11/19/2011	15:00:42	8.928	10.545	155.75	156.48	113.4	2.58
11/19/2011	15:00:44	8.959	10.539	155.67	156.4	112.82	2.57
11/19/2011	15:00:46	8.967	10.517	155.77	156.48	111.4	2.58
11/19/2011	15:00:48	8.956	10.503	157.66	156.37	110.69	2.58
11/19/2011	15:00:50	8.949	10.508	157.66	156.39	110.69	2.58
11/19/2011	15:00:52	8.937	10.522	157.66	155.2	111.53	2.58
11/19/2011	15:00:54	8.93	10.526	157.67	155.21	112.7	2.58
11/19/2011	15:00:57	8.915	10.539	157.76	155.3	113.37	2.58
11/19/2011	15:00:59	8.926	10.55	159.66	155.22	114.68	2.58
11/19/2011	15:01:01	8.921	10.541	159.67	155.22	115.82	2.58
11/19/2011	15:01:03	8.933	10.534	159.67	155.22	115.67	2.58
11/19/2011	15:01:05	8.934	10.536	159.67	156.96	115.3	2.58
11/19/2011	15:01:07	8.941	10.535	163.75	157.07	115.88	2.58
11/19/2011	15:01:09	8.963	10.529	163.63	156.97	116.88	4.51
11/19/2011	15:01:11	8.973	10.507	163.56	156.92	117.6	4.51
11/19/2011	15:01:14	9.009	10.49	163.65	156.98	116.52	4.51
11/19/2011	15:01:16	9.038	10.464	163.62	156.98	115.48	4.51
11/19/2011	15:01:18	9.047	10.433	169.63	157.56	115.38	4.51
11/19/2011	15:01:20	9.093	10.416	169.64	157.57	116.24	4.51
11/19/2011	15:01:22	9.236	10.393	169.62	157.49	116.12	4.5
11/19/2011	15:01:24	9.348	10.252	169.65	157.56	115.71	4.51
11/19/2011	15:01:26	9.408	10.102	169.64	157.57	115.97	4.51
11/19/2011	15:01:28	9.448	10.041	167.73	157.64	117.38	4.51
11/19/2011	15:01:31	9.448	10.02	167.59	158.1	118.2	4.51
11/19/2011	15:01:33	9.341	10	167.66	158.13	118.44	4.51
11/19/2011	15:01:35	9.216	10.094	167.63	158.13	118.6	4.51
11/19/2011	15:01:37	9.179	10.255	169.64	158.14	118.24	4.51
11/19/2011	15:01:39	9.124	10.317	170.62	157.98	116.94	4.49
11/19/2011	15:01:41	9.132	10.336	170.88	158.22	116.03	4.51
Pause							
11/19/2011	15:01:43	9.147	10.33	169.65	156.98	115.18	4.51
11/19/2011	15:01:45	9.143	10.327	169.64	156.98	114.31	4.51
11/19/2011	15:01:48	9.128	10.332	169.64	156.98	114.19	4.51
11/19/2011	15:01:50	9.115	10.349	169.64	156.99	114.65	4.51
11/19/2011	15:01:52	9.102	10.357	169.64	156.99	114.63	4.51
11/19/2011	15:01:54	9.076	10.372	169.64	156.98	115.11	4.51
11/19/2011	15:01:56	9.057	10.385	169.66	156.99	116.08	4.51
11/19/2011	15:01:58	9.049	10.413	165.64	156.98	116.81	4.51
11/19/2011	15:02:00	9.034	10.416	165.63	156.98	116.68	4.51
11/19/2011	15:02:02	9.025	10.421	165.63	156.97	115.96	4.51
11/19/2011	15:02:05	9.028	10.424	165.64	156.97	115.29	4.51
11/19/2011	15:02:07	9.008	10.426	165.73	157.06	114.67	4.51
11/19/2011	15:02:09	8.969	10.451	171.64	156.99	114.81	4.51
11/19/2011	15:02:11	8.936	10.486	171.64	156.98	116.06	4.51
11/19/2011	15:02:13	8.914	10.533	171.63	156.97	118.33	4.51
11/19/2011	15:02:15	8.868	10.572	171.65	156.99	120.71	4.85

11/19/2011	15:02:17	8.832	10.596	167.64	156.38	122.04	4.85
11/19/2011	15:02:19	8.821	10.636	167.76	156.48	123.74	4.85
11/19/2011	15:02:22	8.791	10.664	167.66	156.39	125.53	4.85
11/19/2011	15:02:24	8.775	10.685	167.64	156.39	126.92	4.85
11/19/2011	15:02:26	8.854	10.705	167.64	156.39	127.27	4.85
11/19/2011	15:02:28	9.008	10.659	171.73	156.48	127.66	4.85
11/19/2011	15:02:30	9.095	10.459	171.64	156.39	127.66	4.85
11/19/2011	15:02:32	9.152	10.342	171.64	156.39	127.22	4.85
11/19/2011	15:02:34	9.182	10.298	171.63	156.38	127.92	4.85
11/19/2011	15:02:36	9.15	10.276	171.74	156.48	129.45	4.85
11/19/2011	15:02:39	9.009	10.292	177.71	156.4	129.42	4.85
11/19/2011	15:02:41	8.9	10.453	177.69	156.39	128.72	4.85
11/19/2011	15:02:43	8.822	10.585	177.72	156.39	128.28	4.85
11/19/2011	15:02:45	8.772	10.655	177.79	156.48	128.59	4.85
11/19/2011	15:02:47	8.719	10.693	177.71	156.4	128.75	4.85
11/19/2011	15:02:49	8.675	10.748	177.7	156.39	129.38	4.85
11/19/2011	15:02:51	8.655	10.785	177.7	156.4	129.5	4.85
11/19/2011	15:02:53	8.642	10.809	177.79	156.48	129.45	4.85
11/19/2011	15:02:56	8.628	10.827	177.68	157.57	128.98	4.85
11/19/2011	15:02:58	8.643	10.835	167.67	157.56	128.27	4.85
11/19/2011	15:03:00	8.654	10.817	167.72	157.65	127.97	4.85
11/19/2011	15:03:02	8.682	10.8	167.64	157.57	127.84	4.85
11/19/2011	15:03:04	8.716	10.773	167.75	157.65	126.93	4.85
11/19/2011	15:03:06	8.734	10.729	167.59	157.55	125.85	4.85
11/19/2011	15:03:08	8.763	10.703	167.63	158.14	124.29	4.85
11/19/2011	15:03:10	8.764	10.697	167.65	158.15	123.05	4.85
11/19/2011	15:03:13	8.754	10.702	167.73	158.22	122.44	4.85
11/19/2011	15:03:15	8.738	10.713	167.56	158.07	121.91	4.85
11/19/2011	15:03:17	8.719	10.728	167.64	158.1	121.52	4.85
11/19/2011	15:03:19	8.687	10.754	167.64	158.15	122.66	4.77
11/19/2011	15:03:21	8.668	10.776	167.72	159.42	123.94	4.77
11/19/2011	15:03:23	8.676	10.789	167.64	159.33	124.97	4.77
11/19/2011	15:03:25	8.671	10.809	167.63	159.34	124.91	4.77
11/19/2011	15:03:27	8.673	10.815	163.62	159.35	124.53	4.77
11/19/2011	15:03:30	8.701	10.806	163.71	159.42	123.72	4.77
11/19/2011	15:03:32	8.827	10.776	163.62	159.33	122.52	4.77
11/19/2011	15:03:34	8.952	10.664	163.62	159.34	120.83	4.77
11/19/2011	15:03:36	9.02	10.508	163.64	158.76	119.44	4.77
11/19/2011	15:03:38	9.075	10.43	163.61	158.7	118.92	4.77
11/19/2011	15:03:40	9.102	10.377	163.62	158.73	118.54	4.77
11/19/2011	15:03:42	9.03	10.349	163.61	158.74	118.54	4.77
11/19/2011	15:03:44	8.894	10.417	163.63	158.74	119.73	4.77
11/19/2011	15:03:49	8.819	10.593	163.63	158.75	121.15	4.77
11/19/2011	15:03:51	8.733	10.717	163.72	158.83	124.03	4.77
End Pause							
11/19/2011	15:03:54	8.712	10.742	163.64	158.75	125.23	4.77
11/19/2011	15:03:56	8.677	10.756	163.62	158.75	126.91	4.77

11/19/2011	15:03:58	8.656	10.783	162.82	158.63	127.96	4.75
11/19/2011	15:04:00	8.67	10.799	161.6	158.17	129.51	4.77
11/19/2011	15:04:02	8.678	10.797	161.71	158.22	129.43	4.77
11/19/2011	15:04:04	8.708	10.781	161.61	158.14	129.44	4.77
11/19/2011	15:04:06	8.731	10.759	161.62	158.15	129.34	4.77
11/19/2011	15:04:09	8.777	10.723	163.63	158.15	129.19	4.77
11/19/2011	15:04:11	8.814	10.686	163.64	158.15	127.89	4.77
11/19/2011	15:04:13	8.85	10.646	163.62	158.14	126.13	4.77
11/19/2011	15:04:15	8.882	10.61	163.63	158.14	124.48	4.77
11/19/2011	15:04:17	8.914	10.583	167.64	158.16	123.16	4.77
11/19/2011	15:04:19	8.91	10.565	167.64	158.15	121.86	4.77
11/19/2011	15:04:21	8.896	10.556	167.66	157.58	120.87	4.77
11/19/2011	15:04:23	8.878	10.567	167.64	157.59	119.19	4.77
11/19/2011	15:04:26	8.864	10.594	167.75	157.65	118.02	4.35
11/19/2011	15:04:28	8.878	10.6	167.73	157.65	116.95	4.35
11/19/2011	15:04:30	8.871	10.61	167.63	157.52	117.52	4.35
11/19/2011	15:04:32	8.855	10.607	167.64	157.57	118.61	4.35
11/19/2011	15:04:34	8.854	10.609	167.65	157.58	119.46	4.35
11/19/2011	15:04:36	8.953	10.612	167.66	157.57	120.86	4.36
11/19/2011	15:04:38	9.053	10.552	173.63	157.57	122.68	4.35
11/19/2011	15:04:40	9.115	10.406	173.64	157.57	124.03	4.35
11/19/2011	15:04:43	9.159	10.338	173.73	157.65	123.44	4.36
11/19/2011	15:04:45	9.203	10.292	173.61	157.53	121.8	4.36
11/19/2011	15:04:47	9.159	10.26	169.74	157.65	120.71	4.36
11/19/2011	15:04:49	9.022	10.274	169.64	157.57	120.07	4.36
11/19/2011	15:04:51	8.939	10.434	169.63	157.57	118.89	4.35
11/19/2011	15:04:53	8.873	10.556	169.61	157.54	118.5	4.36
11/19/2011	15:04:55	8.815	10.612	169.58	157.49	118.8	4.36
11/19/2011	15:04:57	8.796	10.653	167.75	157.65	119.19	4.36
11/19/2011	15:05:00	8.778	10.676	167.74	157.08	119.41	4.36
11/19/2011	15:05:02	8.791	10.701	167.58	156.88	119.04	4.36
11/19/2011	15:05:04	8.783	10.691	167.67	157	119.02	4.36
11/19/2011	15:05:06	8.808	10.674	167.65	156.93	120.07	4.36
11/19/2011	15:05:08	8.806	10.651	171.64	156.99	121.26	4.36
11/19/2011	15:05:10	8.817	10.643	171.65	156.99	122.07	4.36
11/19/2011	15:05:12	8.815	10.631	171.74	157.66	122.54	4.36
11/19/2011	15:05:14	8.829	10.625	171.64	157.57	124.06	4.36
11/19/2011	15:05:17	8.852	10.62	170.31	157.65	126.37	4.36
11/19/2011	15:05:19	8.842	10.615	167.65	157.57	128.72	4.36
11/19/2011	15:05:21	8.821	10.617	167.49	157.41	129.48	4.36
11/19/2011	15:05:23	8.839	10.627	167.72	157.65	128.54	4.36
11/19/2011	15:05:25	8.842	10.621	167.64	157.57	126.89	4.36
11/19/2011	15:05:27	8.832	10.63	171.65	157.59	124.52	4.36
11/19/2011	15:05:29	8.816	10.639	171.73	157.66	122.66	4.3
11/19/2011	15:05:31	8.806	10.646	171.63	157.59	121.29	4.31
11/19/2011	15:05:34	8.815	10.652	171.64	157.58	120.54	4.31
11/19/2011	15:05:36	8.809	10.664	171.63	157.49	119.8	4.3

11/19/2011	15:05:38	8.768	10.674	169.63	157.58	116.95	4.3
11/19/2011	15:05:40	8.781	10.693	169.62	157.56	113.87	4.3
11/19/2011	15:05:42	8.917	10.696	169.62	157.49	111.1	4.3
11/19/2011	15:05:44	9.026	10.562	169.62	157.56	109.44	4.3
11/19/2011	15:05:46	9.105	10.408	169.62	157.57	109.32	4.3
11/19/2011	15:05:48	9.138	10.344	167.73	157.66	110.63	4.3
11/19/2011	15:05:51	9.148	10.308	167.63	157.57	111.63	4.3
11/19/2011	15:05:53	9.041	10.298	167.74	157.66	112.76	4.3
11/19/2011	15:05:55	8.921	10.395	167.64	157.57	113.61	4.3
11/19/2011	15:05:57	8.864	10.569	165.62	157.58	114.25	4.31
11/19/2011	15:05:59	8.825	10.627	165.74	157.66	114.69	4.3
11/19/2011	15:06:01	8.822	10.657	165.63	157.58	114.58	4.31
11/19/2011	15:06:03	8.813	10.654	165.73	157.65	114.53	4.3
11/19/2011	15:06:05	8.806	10.652	165.63	157.57	116.15	4.3
11/19/2011	15:06:08	8.798	10.659	167.74	157.66	115.83	4.3
11/19/2011	15:06:10	8.8	10.65	167.71	157.66	115.71	4.31
11/19/2011	15:06:12	8.788	10.655	167.66	157.58	116.47	4.31
11/19/2011	15:06:14	8.781	10.662	167.67	157.58	118.34	4.3
11/19/2011	15:06:16	8.771	10.665	167.73	157.66	119.41	4.3
11/19/2011	15:06:18	8.795	10.678	169.74	157.08	120.56	4.3
11/19/2011	15:06:20	8.78	10.675	169.65	156.99	120.69	4.3
11/19/2011	15:06:22	8.787	10.669	169.73	157.08	120.97	4.3
11/19/2011	15:06:25	8.78	10.668	169.65	157	121.26	4.3
11/19/2011	15:06:27	8.769	10.673	173.66	157.01	120.85	4.3
11/19/2011	15:06:29	8.77	10.685	173.65	157	120.1	4.3
11/19/2011	15:06:31	8.773	10.677	173.64	157	119.49	4.3
11/19/2011	15:06:33	8.779	10.674	173.64	156.95	120.57	4.3
11/19/2011	15:06:35	8.766	10.674	173.63	157	122.39	5.42
11/19/2011	15:06:37	8.772	10.673	173.63	156.41	125.84	5.42
11/19/2011	15:06:39	8.766	10.692	173.63	156.42	127.93	5.42
11/19/2011	15:06:42	8.778	10.694	173.63	156.41	129.3	5.42
11/19/2011	15:06:44	8.755	10.686	173.67	156.42	129.82	5.42
11/19/2011	15:06:46	8.815	10.692	173.76	156.5	128.86	5.42
11/19/2011	15:06:48	8.944	10.669	171.63	156.41	126.91	5.42
11/19/2011	15:06:50	9.012	10.517	171.64	156.41	126.08	5.41
11/19/2011	15:06:52	9.027	10.421	171.76	155.31	125.01	5.42
11/19/2011	15:06:54	9.036	10.401	171.66	155.24	122.41	5.42
11/19/2011	15:06:56	9.006	10.412	171.75	155.32	120.84	5.42
11/19/2011	15:06:59	8.877	10.423	167.65	155.24	120.47	5.42
11/19/2011	15:07:01	8.796	10.567	167.69	155.23	120.34	5.42
11/19/2011	15:07:03	8.767	10.681	167.65	155.24	121.25	5.42
11/19/2011	15:07:05	8.741	10.709	167.65	152.87	121.86	5.42
11/19/2011	15:07:07	8.73	10.703	171.55	152.81	121.9	5.42
11/19/2011	15:07:09	8.733	10.716	171.73	152.95	121.83	5.42
11/19/2011	15:07:11	8.742	10.712	171.63	152.88	122.69	5.41
11/19/2011	15:07:13	8.745	10.708	171.64	152.87	125.57	5.42
11/19/2011	15:07:16	8.764	10.704	171.65	152.82	126.69	5.42

11/19/2011	15:07:18	8.766	10.697	171.63	152.21	126.31	5.41
11/19/2011	15:07:20	8.781	10.688	171.75	152.36	124.93	5.41
11/19/2011	15:07:22	8.811	10.68	171.74	152.35	123.1	5.42
11/19/2011	15:07:24	8.816	10.662	171.65	152.27	121.84	5.42
11/19/2011	15:07:26	8.851	10.634	171.65	152.21	122.06	5.42
11/19/2011	15:07:28	8.871	10.607	175.55	152.27	122.76	5.42
11/19/2011	15:07:30	8.909	10.576	175.56	151.63	122.79	5.42
11/19/2011	15:07:33	8.928	10.54	175.74	151.78	121.52	5.42
11/19/2011	15:07:35	8.946	10.523	175.74	151.78	120.08	5.42
11/19/2011	15:07:37	8.961	10.515	169.63	151.7	118.48	5.42
11/19/2011	15:07:39	8.973	10.49	169.64	151.69	118.14	3.98
11/19/2011	15:07:41	9.001	10.474	169.64	151.7	118.67	3.99
11/19/2011	15:07:43	8.996	10.453	169.65	151.71	119.43	3.99
11/19/2011	15:07:45	8.999	10.463	169.63	151.7	120.2	3.99
11/19/2011	15:07:47	8.976	10.47	173.7	151.78	122.19	3.99
11/19/2011	15:07:50	8.971	10.481	173.63	151.69	123.11	3.99
11/19/2011	15:07:52	9.088	10.492	173.73	151.78	123.17	3.99
11/19/2011	15:07:54	9.206	10.403	173.56	151.7	121.78	3.99
11/19/2011	15:07:56	9.259	10.24	173.63	151.69	119.38	3.99
11/19/2011	15:07:58	9.277	10.187	169.61	151.66	116.85	3.99
11/19/2011	15:08:00	9.28	10.171	169.64	151.7	113.98	3.98
11/19/2011	15:08:02	9.194	10.18	169.65	151.69	112.32	3.99
11/19/2011	15:08:04	9.035	10.256	169.64	151.71	113.18	3.98
11/19/2011	15:08:07	8.97	10.447	171.63	151.7	113.1	3.99
11/19/2011	15:08:09	8.925	10.531	171.74	151.79	112.41	3.99
11/19/2011	15:08:11	8.904	10.558	171.64	152.21	112.44	3.99
11/19/2011	15:08:13	8.874	10.59	171.65	152.29	112.85	3.99
11/19/2011	15:08:15	8.858	10.599	171.64	152.27	114.56	3.99
11/19/2011	15:08:17	8.851	10.62	175.64	152.26	117.54	3.99
11/19/2011	15:08:19	8.846	10.622	175.66	152.28	121.26	3.99
11/19/2011	15:08:21	8.837	10.619	175.65	152.28	122.8	3.99
11/19/2011	15:08:24	8.837	10.619	175.74	152.96	122.97	3.99
11/19/2011	15:08:26	8.841	10.628	175.64	152.87	121.77	3.99
11/19/2011	15:08:28	8.821	10.628	175.75	152.96	120.71	3.99
11/19/2011	15:08:30	8.823	10.636	175.58	152.8	119.7	3.99
11/19/2011	15:08:32	8.799	10.645	175.57	152.86	119.35	3.99
11/19/2011	15:08:34	8.797	10.661	175.66	152.88	120.34	3.99
11/19/2011	15:08:36	8.778	10.666	175.65	154.06	122.81	3.99
11/19/2011	15:08:38	8.769	10.685	181.64	154.05	123.07	3.99
11/19/2011	15:08:41	8.756	10.7	181.71	154.05	123.08	3.99
11/19/2011	15:08:43	8.746	10.713	181.82	154.14	123.09	3.99
11/19/2011	15:08:45	8.72	10.718	181.72	154.06	123.29	4.95
11/19/2011	15:08:47	8.737	10.718	177.72	154.06	124.47	4.95
11/19/2011	15:08:49	8.716	10.729	177.72	154.05	124.77	4.95
11/19/2011	15:08:51	8.735	10.737	177.72	154.06	124.62	4.95
11/19/2011	15:08:53	8.715	10.738	177.73	154.06	122.28	4.95
11/19/2011	15:08:55	8.749	10.746	177.72	155.25	120.02	4.95

11/19/2011	15:08:58	8.885	10.742	183.79	155.33	118.51	4.95
11/19/2011	15:09:00	8.96	10.587	183.69	155.24	116.79	4.95
11/19/2011	15:09:02	8.988	10.48	183.81	155.32	115.85	4.95
11/19/2011	15:09:04	9.001	10.448	183.71	155.24	116.37	4.95
11/19/2011	15:09:06	8.971	10.448	183.63	155.24	117.66	4.95
11/19/2011	15:09:08	8.814	10.462	185.71	156.43	118.61	4.95
11/19/2011	15:09:10	8.682	10.635	185.79	156.5	120.88	4.95
11/19/2011	15:09:12	8.625	10.802	185.7	156.42	122.7	4.95
11/19/2011	15:09:15	8.602	10.86	185.8	156.5	123.37	4.95
11/19/2011	15:09:17	8.577	10.874	181.72	156.41	122.75	4.95
11/19/2011	15:09:19	8.587	10.878	181.69	156.42	121.47	4.95
11/19/2011	15:09:22	8.572	10.876	181.7	157.59	120.72	4.95
11/19/2011	15:09:24	8.587	10.871	181.8	157.67	119.9	4.95
11/19/2011	15:09:26	8.606	10.856	181.81	157.67	120.65	4.95
11/19/2011	15:09:28	8.615	10.845	177.69	157.59	121.62	4.95
11/19/2011	15:09:31	8.61	10.838	177.7	157.59	122.69	4.95
11/19/2011	15:09:33	8.615	10.836	177.69	157.58	123.9	4.95
11/19/2011	15:09:35	8.616	10.828	177.79	158.85	124.7	4.95
11/19/2011	15:09:37	8.613	10.833	181.71	158.77	124.56	4.95
11/19/2011	15:09:39	8.639	10.831	181.7	158.68	125.38	4.96
11/19/2011	15:09:41	8.641	10.824	181.7	158.76	126.35	4.96
11/19/2011	15:09:43	8.656	10.809	181.7	158.75	127.92	4.95
11/19/2011	15:09:45	8.674	10.794	181.71	158.77	128.6	4.96
11/19/2011	15:09:48	8.69	10.781	185.73	158.77	129.03	4.95
11/19/2011	15:09:50	8.696	10.77	185.62	158.77	128.8	4.51
11/19/2011	15:09:52	8.699	10.753	185.73	158.77	127.4	4.51
11/19/2011	15:09:54	8.707	10.751	185.73	158.78	126.11	4.51
11/19/2011	15:09:56	8.691	10.757	185.83	158.85	125.07	4.51
11/19/2011	15:09:58	8.69	10.757	189.68	158.74	123.45	4.51
11/19/2011	15:10:00	8.735	10.771	191.13	159.38	121.29	4.51
11/19/2011	15:10:02	8.816	10.751	192.47	159.13	120.23	4.46
11/19/2011	15:10:05	8.92	10.618	189.73	159.36	121.79	4.51
11/19/2011	15:10:07	8.939	10.511	185.08	159.38	121.64	4.51
11/19/2011	15:10:09	8.931	10.5	185.1	159.39	120.69	4.51
11/19/2011	15:10:11	8.872	10.521	186.46	159.19	118.35	4.47
11/19/2011	15:10:13	8.732	10.553	185.13	159.4	117.93	4.51
11/19/2011	15:10:15	8.606	10.707	185.13	159.34	117.36	4.51
11/19/2011	15:10:17	8.521	10.887	187.1	159.41	118.58	4.51
11/19/2011	15:10:20	8.475	10.958	185.74	159.37	121.62	4.51
11/19/2011	15:10:22	8.446	10.993	185.83	159.44	124.47	4.51
11/19/2011	15:10:24	8.378	11.007	188.24	159.09	127.68	4.47
11/19/2011	15:10:26	8.399	11.025	187.12	159.4	133.17	4.51
11/19/2011	15:10:28	8.362	11.051	185.74	159.96	136.94	4.51
11/19/2011	15:10:30	8.312	11.06	187.97	159.72	136.76	4.46
11/19/2011	15:10:32	8.318	11.099	187.09	159.99	136.95	4.51
11/19/2011	15:10:34	8.295	11.12	187.19	160.08	135.52	4.51
11/19/2011	15:10:37	8.288	11.132	193.13	159.92	134.07	4.51

11/19/2011	15:10:39	8.28	11.143	193.1	159.99	132.68	4.51
11/19/2011	15:10:41	8.24	11.136	194.23	160.22	131.05	4.45
11/19/2011	15:10:43	8.301	11.142	193.16	160.6	131.76	4.51
11/19/2011	15:10:45	8.338	11.123	193.15	160.56	132.85	4.51
11/19/2011	15:10:47	8.37	11.094	191.74	160.55	134.15	4.51
11/19/2011	15:10:49	8.381	11.062	191.74	160.54	133.9	4.51
11/19/2011	15:10:52	8.419	11.039	191.75	160.55	132.35	4.51
11/19/2011	15:10:54	8.443	11.009	191.72	161.14	130.76	4.51
11/19/2011	15:10:56	8.458	10.993	191.72	161.15	129.16	4.77
11/19/2011	15:10:58	8.481	10.984	189.72	161.14	127.32	4.77
11/19/2011	15:11:00	8.502	10.974	189.74	161.15	124.9	4.77
11/19/2011	15:11:02	8.523	10.949	189.81	161.23	123.19	4.77
11/19/2011	15:11:04	8.557	10.932	189.73	161.16	123.44	4.77
11/19/2011	15:11:06	8.684	10.905	191.73	161.16	125.74	4.77
11/19/2011	15:11:09	8.824	10.805	191.72	161.14	128.21	4.77
11/19/2011	15:11:11	8.89	10.622	191.72	161.15	130.08	4.77
11/19/2011	15:11:13	8.931	10.548	191.72	161.73	131.58	4.77
11/19/2011	15:11:15	8.955	10.526	191.72	161.73	131.58	4.77
11/19/2011	15:11:17	8.884	10.504	181.82	161.81	131.61	4.77
11/19/2011	15:11:19	8.745	10.541	181.71	161.74	130.67	4.77
11/19/2011	15:11:21	8.674	10.725	181.72	161.72	130.36	4.77
11/19/2011	15:11:23	8.645	10.81	181.72	161.73	129.29	4.77
11/19/2011	15:11:25	8.648	10.828	181.82	161.23	127.66	4.77
11/19/2011	15:11:28	8.639	10.822	183.73	161.15	125.22	4.77
11/19/2011	15:11:30	8.675	10.813	183.74	161.15	122.79	4.77
11/19/2011	15:11:32	8.687	10.803	183.73	161.15	120.68	4.77
11/19/2011	15:11:34	8.693	10.783	183.82	161.23	119.22	4.77
11/19/2011	15:11:36	8.702	10.77	183.73	161.15	118.26	4.77
11/19/2011	15:11:38	8.691	10.762	189.82	161.82	118.28	4.77
11/19/2011	15:11:40	8.708	10.752	189.74	161.73	118.34	4.77
11/19/2011	15:11:42	8.702	10.752	189.62	161.66	117.71	4.77
11/19/2011	15:11:45	8.714	10.76	189.72	161.74	116.95	4.77
11/19/2011	15:11:47	8.716	10.76	191.72	161.73	117.23	4.77
11/19/2011	15:11:49	8.719	10.762	191.73	161.73	117.85	4.77
11/19/2011	15:11:51	8.745	10.75	191.71	161.73	119.55	4.77
11/19/2011	15:11:53	8.762	10.729	191.7	161.73	122.2	4.77
11/19/2011	15:11:55	8.788	10.702	191.8	161.81	124.27	4.77
11/19/2011	15:11:57	8.814	10.68	193.67	161.74	125.81	4.77
11/19/2011	15:12:00	8.824	10.662	193.66	161.73	127.07	4.56
11/19/2011	15:12:02	8.839	10.641	193.56	161.73	127.68	4.56
11/19/2011	15:12:04	8.861	10.63	193.68	161.74	127.83	4.56
11/19/2011	15:12:06	8.864	10.619	193.69	161.73	127.36	4.56
11/19/2011	15:12:08	8.852	10.614	193.69	161.73	126.14	4.56
11/19/2011	15:12:10	8.889	10.628	193.67	161.72	125.2	4.56
11/19/2011	15:12:12	9.009	10.62	193.68	161.73	123.22	4.56
11/19/2011	15:12:14	9.088	10.492	193.78	161.81	121.93	4.56
11/19/2011	15:12:17	9.141	10.364	193.69	161.73	121.37	4.56

11/19/2011	15:12:19	9.154	10.316	193.63	161.14	121.24	4.56
11/19/2011	15:12:21	9.16	10.31	193.78	161.23	121.18	4.56
11/19/2011	15:12:24	9.048	10.306	193.68	161.14	121.05	4.56
11/19/2011	15:12:26	8.893	10.507	193.78	161.23	121.48	4.56
11/19/2011	15:12:28	8.873	10.608	191.74	161.15	122.58	4.57
11/19/2011	15:12:30	8.859	10.631	191.68	161.14	124.02	4.56
11/19/2011	15:12:33	8.863	10.635	191.84	161.23	124.89	4.56
11/19/2011	15:12:35	8.858	10.626	191.74	161.15	125.1	4.56
11/19/2011	15:12:37	8.872	10.614	189.73	161.14	125.15	4.56
11/19/2011	15:12:39	8.873	10.606	189.75	161.15	125.33	4.56
11/19/2011	15:12:41	8.885	10.6	189.74	161.15	124.62	4.56
11/19/2011	15:12:43	8.897	10.588	189.74	161.14	125.2	4.56
11/19/2011	15:12:45	8.918	10.566	189.63	160.47	126.08	4.56
11/19/2011	15:12:47	8.917	10.558	187.76	160.55	127.38	4.56
11/19/2011	15:12:50	8.922	10.547	187.74	160.55	128.2	4.56
11/19/2011	15:12:52	8.931	10.547	187.7	160.55	129.04	4.56
11/19/2011	15:12:55	8.933	10.545	187.7	160.54	129.56	4.56
11/19/2011	15:12:57	8.933	10.542	191.75	160.54	129.36	4.56
11/19/2011	15:12:59	8.954	10.535	191.76	159.97	129.32	4.56
11/19/2011	15:13:01	8.941	10.539	191.83	160.05	129.56	4.56
11/19/2011	15:13:03	8.942	10.536	191.75	159.97	129.76	4.56
11/19/2011	15:13:05	8.949	10.537	191.74	159.93	130.11	4.45
11/19/2011	15:13:07	8.937	10.531	189.75	159.97	130.57	4.45
11/19/2011	15:13:09	8.932	10.532	189.84	160.05	130.73	4.46
11/19/2011	15:13:12	8.908	10.554	189.84	159.45	129.74	4.45
11/19/2011	15:13:14	8.906	10.562	189.75	159.33	127.54	4.46
11/19/2011	15:13:16	8.972	10.577	189.74	159.37	125.49	4.46
11/19/2011	15:13:18	9.062	10.545	189.77	159.38	124.31	4.46
11/19/2011	15:13:20	9.103	10.412	189.64	159.32	122.8	4.46
11/19/2011	15:13:22	9.159	10.375	189.73	159.36	120.47	4.46
11/19/2011	15:13:24	9.185	10.327	189.66	159.31	117.32	4.46
11/19/2011	15:13:26	9.174	10.286	189.86	159.45	117.13	4.45
11/19/2011	15:13:29	9.041	10.281	189.74	159.37	118.53	4.45
11/19/2011	15:13:31	8.959	10.441	189.75	158.79	120.52	4.46
11/19/2011	15:13:33	8.93	10.538	189.76	158.78	122.52	4.46
11/19/2011	15:13:35	8.909	10.565	189.76	158.77	124.35	4.45
11/19/2011	15:13:37	8.905	10.566	187.85	158.86	125.51	4.46
11/19/2011	15:13:39	8.91	10.572	187.75	158.79	126.41	4.45
11/19/2011	15:13:41	8.9	10.574	187.85	158.86	127.27	4.45
11/19/2011	15:13:44	8.908	10.572	187.84	158.86	127.07	4.45
11/19/2011	15:13:46	8.883	10.57	187.61	158.71	125.47	4.45
11/19/2011	15:13:48	8.887	10.573	191.73	158.77	124.54	4.45
11/19/2011	15:13:50	8.898	10.583	191.76	158.78	124.33	4.45
11/19/2011	15:13:52	8.885	10.588	191.73	158.78	124.6	4.46
11/19/2011	15:13:54	8.88	10.591	191.83	158.86	124.27	4.45
11/19/2011	15:13:56	8.875	10.595	195.69	158.17	122.54	4.45
11/19/2011	15:13:58	8.869	10.598	195.69	158.17	118.3	4.46

11/19/2011	15:14:01	8.885	10.604	195.77	158.25	115.44	4.46
11/19/2011	15:14:03	8.873	10.594	195.7	158.18	113.95	4.46
11/19/2011	15:14:05	8.878	10.596	195.69	158.17	113.01	4.46
11/19/2011	15:14:07	8.885	10.59	199.78	158.26	113.06	4.45
11/19/2011	15:14:09	8.904	10.574	199.68	157.6	114.05	3.2
11/19/2011	15:14:11	8.917	10.568	199.7	157.6	115.85	3.21
11/19/2011	15:14:13	8.934	10.556	199.78	157.67	116.87	3.21
11/19/2011	15:14:15	8.934	10.539	199.69	157.62	118.2	3.21
11/19/2011	15:14:18	8.935	10.542	199.79	157.69	119.22	3.21
11/19/2011	15:14:20	8.925	10.558	199.7	157.5	119.73	3.21
11/19/2011	15:14:22	9.036	10.571	199.7	157.6	119.02	3.21
11/19/2011	15:14:29	9.124	10.478	199.69	156.44	118.56	3.2
11/19/2011	15:14:32	9.057	10.365	201.8	156.52	119.17	3.21
11/19/2011	15:14:34	8.903	10.395	201.7	156.44	119	3.2
11/19/2011	15:14:36	8.814	10.574	201.72	156.44	118.83	3.21
11/19/2011	15:14:38	8.797	10.681	203.71	156.43	118.31	3.21
11/19/2011	15:14:40	8.784	10.692	203.71	156.44	117	3.2
11/19/2011	15:14:42	8.798	10.699	203.71	156.43	115.72	3.2
11/19/2011	15:14:44	8.799	10.687	203.71	156.43	115.3	3.2
11/19/2011	15:14:46	8.797	10.687	207.7	156.44	115.83	3.21
11/19/2011	15:14:48	8.808	10.673	207.62	156.37	116.65	3.21
11/19/2011	15:14:51	8.796	10.67	207.69	156.43	118.54	3.21
11/19/2011	15:14:53	8.778	10.668	207.81	156.52	121.27	3.21
11/19/2011	15:14:56	8.769	10.683	207.7	156.44	123.62	3.21
11/19/2011	15:14:58	8.747	10.695	205.69	156.44	126.18	3.21
11/19/2011	15:15:00	8.739	10.715	205.69	156.44	127.4	3.21
11/19/2011	15:15:02	8.732	10.721	205.69	155.83	127.62	3.21
11/19/2011	15:15:04	8.716	10.723	205.64	155.75	126.57	3.21
11/19/2011	15:15:06	8.713	10.736	207.69	155.83	124.69	3.21
11/19/2011	15:15:08	8.701	10.741	207.8	155.91	124.32	3.21
11/19/2011	15:15:11	8.686	10.766	207.69	155.83	123.92	3.2
11/19/2011	15:15:13	8.678	10.777	207.68	155.76	123.99	3.21
11/19/2011	15:15:15	8.66	10.781	207.8	155.34	124.36	4.67
11/19/2011	15:15:17	8.651	10.797	209.68	155.26	124.91	4.66
11/19/2011	15:15:19	8.632	10.809	209.67	155.26	125.46	4.67
11/19/2011	15:15:21	8.631	10.82	209.69	155.25	125.45	4.67
11/19/2011	15:15:23	8.639	10.831	209.68	155.26	126.42	4.67
11/19/2011	15:15:25	8.694	10.824	209.63	155.25	126.18	4.66
11/19/2011	15:15:28	8.844	10.785	215.8	155.34	125.47	4.66
11/19/2011	15:15:30	8.942	10.624	215.71	155.26	125.74	4.66
11/19/2011	15:15:32	8.977	10.499	215.7	155.26	125.61	4.66
11/19/2011	15:15:34	9.023	10.459	215.71	155.26	124.94	4.66
11/19/2011	15:15:36	9.018	10.433	215.7	155.26	124.75	4.66
11/19/2011	15:15:38	8.897	10.42	211.8	155.34	125.26	4.67
11/19/2011	15:15:40	8.809	10.552	211.66	155.19	126.42	4.67
11/19/2011	15:15:42	8.772	10.676	211.69	155.26	126.07	4.67
11/19/2011	15:15:45	8.764	10.701	211.78	155.34	123.91	4.67

11/19/2011	15:15:47	8.786	10.69	205.7	155.26	120.46	4.67
11/19/2011	15:15:49	8.781	10.672	205.66	154.63	117.39	4.67
11/19/2011	15:15:51	8.791	10.661	205.62	154.66	115.4	4.66
11/19/2011	15:15:53	8.793	10.659	205.71	154.67	114.58	4.67
11/19/2011	15:15:55	8.787	10.657	205.55	154.62	115.02	4.67
11/19/2011	15:15:57	8.791	10.66	205.79	154.72	116.68	4.67
11/19/2011	15:15:59	8.786	10.662	205.63	154.65	117.82	4.67
11/19/2011	15:16:02	8.78	10.669	205.71	154.08	118.96	4.67
11/19/2011	15:16:04	8.772	10.683	205.8	154.09	119.49	4.67
11/19/2011	15:16:06	8.769	10.688	205.8	154.16	119.45	4.67
11/19/2011	15:16:08	8.767	10.691	209.78	154.16	120.28	4.67
11/19/2011	15:16:10	8.765	10.69	209.69	154.08	121.4	4.67
11/19/2011	15:16:12	8.742	10.685	209.67	154.07	122.5	4.67
11/19/2011	15:16:14	8.735	10.706	209.78	154.16	123.94	4.67
11/19/2011	15:16:16	8.729	10.714	203.72	154.08	124.75	4.67
11/19/2011	15:16:19	8.721	10.726	203.71	154.08	125.57	4.67
11/19/2011	15:16:21	8.719	10.728	203.7	154.06	124.95	4.25
11/19/2011	15:16:23	8.726	10.733	203.66	153.99	123.65	4.25
11/19/2011	15:16:25	8.741	10.729	203.68	154	122.1	4.25
11/19/2011	15:16:27	8.754	10.724	209.67	154.07	121.55	4.25
11/19/2011	15:16:29	8.779	10.703	209.69	154.08	121.59	4.25
11/19/2011	15:16:31	8.873	10.689	209.68	154.08	122.04	4.25
11/19/2011	15:16:33	9.01	10.619	209.67	154.07	122.43	4.25
11/19/2011	15:16:36	9.101	10.445	209.78	154.16	121.96	4.25
11/19/2011	15:16:38	9.153	10.353	217.81	154.15	120.32	4.25
11/19/2011	15:16:40	9.192	10.29	217.71	154.08	119.06	4.25
11/19/2011	15:16:42	9.134	10.26	217.69	154.07	118.85	4.25
11/19/2011	15:16:44	9.013	10.286	217.71	154.08	119.21	4.25
11/19/2011	15:16:46	8.949	10.451	209.68	154.06	119.78	4.25
11/19/2011	15:16:48	8.928	10.543	209.77	154.16	120.91	4.25
11/19/2011	15:16:50	8.926	10.554	209.69	154.08	122.24	4.25
11/19/2011	15:16:53	8.94	10.544	209.68	153.47	122.49	4.25
11/19/2011	15:16:55	8.941	10.534	209.69	153.48	122.8	4.25
11/19/2011	15:16:57	8.939	10.523	211.64	153.38	122.51	4.25
11/19/2011	15:16:59	8.951	10.525	211.8	153.55	121.31	4.25
11/19/2011	15:17:01	8.945	10.524	211.69	153.46	120.94	4.25
11/19/2011	15:17:03	8.914	10.53	211.68	153.46	120.87	4.25
11/19/2011	15:17:05	8.92	10.54	211.7	153.46	120.59	4.25
11/19/2011	15:17:07	8.913	10.55	211.79	154.15	121.1	4.25
11/19/2011	15:17:10	8.923	10.555	211.79	154.15	120.68	4.25
11/19/2011	15:17:12	8.924	10.55	211.79	154.15	119.96	4.25
11/19/2011	15:17:14	8.927	10.547	211.69	154.07	118.5	4.25
11/19/2011	15:17:16	8.933	10.543	211.79	154.15	117.14	4.25
11/19/2011	15:17:18	8.938	10.542	217.7	154.07	116.73	4.25
11/19/2011	15:17:20	8.943	10.535	217.72	154.08	117.58	4.25
11/19/2011	15:17:22	8.965	10.525	217.7	154.15	121.81	4.25
11/19/2011	15:17:24	8.958	10.506	217.8	154.15	123.63	3.99

11/19/2011	15:17:27	8.964	10.502	221.64	153.99	124.35	3.99
11/19/2011	15:17:29	8.979	10.498	221.72	154.08	124.66	3.99
11/19/2011	15:17:31	8.997	10.482	221.81	154.16	124.93	3.99
11/19/2011	15:17:33	8.995	10.486	221.66	154.07	124.23	3.99
11/19/2011	15:17:35	9.025	10.483	221.8	154.15	123.49	3.99
11/19/2011	15:17:37	9.178	10.478	215.7	154.07	122.8	3.99
11/19/2011	15:17:39	9.281	10.335	215.7	154.07	123.14	3.99
11/19/2011	15:17:41	9.341	10.172	215.7	154.07	121.88	3.99
11/19/2011	15:17:44	9.382	10.108	215.7	154.08	119.86	3.99
11/19/2011	15:17:46	9.397	10.085	215.7	154.66	117.61	3.99
11/19/2011	15:17:48	9.28	10.071	219.7	154.66	116.83	3.99
11/19/2011	15:17:50	9.161	10.177	219.82	154.74	117.35	3.99
11/19/2011	15:17:52	9.103	10.346	219.71	154.66	117.8	3.99
11/19/2011	15:17:54	9.076	10.405	219.71	154.67	119.15	3.99
11/19/2011	15:17:56	9.054	10.426	213.67	154.66	121.33	3.99
11/19/2011	15:17:59	9.043	10.431	213.71	154.67	123.65	3.99
11/19/2011	15:18:01	9.034	10.44	213.62	154.6	125.74	3.99
11/19/2011	15:18:03	9.026	10.443	213.65	154.63	126.15	3.99
11/19/2011	15:18:05	9.008	10.445	213.71	155.27	125.8	3.99
11/19/2011	15:18:07	9.004	10.462	211.7	155.27	125.1	3.99
11/19/2011	15:18:09	9.005	10.466	211.71	155.27	124.95	3.99
11/19/2011	15:18:11	9.006	10.466	211.68	155.25	125.23	3.99
11/19/2011	15:18:13	9.003	10.476	211.68	155.26	124.27	3.99
11/19/2011	15:18:16	8.988	10.475	211.7	155.27	122.64	3.99
11/19/2011	15:18:18	8.949	10.493	213.71	155.85	122.56	3.99
11/19/2011	15:18:20	8.918	10.518	213.71	155.85	122.22	3.99
11/19/2011	15:18:22	8.893	10.549	213.69	155.84	121.48	3.99
11/19/2011	15:18:24	8.882	10.57	213.72	155.85	120.87	3.99
11/19/2011	15:18:26	8.884	10.581	217.69	155.83	120.47	3.99
11/19/2011	15:18:28	8.882	10.593	217.79	155.92	117.91	3.99
11/19/2011	15:18:30	8.892	10.587	217.7	155.83	116.9	3.82
11/19/2011	15:18:33	8.92	10.569	217.7	156.44	117.43	3.82
Average of Test Run		O2 %	CO2 %	CO ppm	NOx ppm	SO2 ppm	THC ppm
11/19/2011	15:18:33	9.133	10.351	203.16	157.47	120.6	4.47

Test Run 2 End

Final System Bias Check, Run 2 STRATA Version 2.01

	O2	CO2	CO	NOx	SO2	THC
	%	%	ppm	ppm	ppm	ppm
11-19-2011 15:19:41	1.278	1.704	109.31	114.79	44.32	3.80
11-19-2011 15:20:41	2.457	2.142	0.02	4.34	3.90	3.65
11-19-2011 15:21:41	12.668	13.365	-0.35	1.12	2.33	3.31
11-19-2011 15:22:41	4.822	5.431	55.95	35.97	66.80	4.11
11-19-2011 15:23:40	0.168	0.122	197.20	181.10	158.17	3.62
11-19-2011 15:24:41	0.157	0.109	199.25	178.82	175.31	3.49
11-19-2011 15:25:40	0.155	0.102	199.84	181.94	167.63	3.68
11-19-2011 15:26:40	0.154	0.099	197.06	191.43	169.58	3.67
11-19-2011 15:27:41	0.150	0.097	199.50	163.14	161.94	3.56
11-19-2011 15:28:41	0.146	0.095	200.06	187.21	167.30	3.47
11-19-2011 15:29:40	0.129	0.092	203.32	204.46	158.73	3.48
11-19-2011 15:30:40	0.090	0.087	199.39	201.55	168.69	3.73
11-19-2011 15:31:40	0.244	0.177	89.52	197.50	97.42	4.00
11-19-2011 15:32:41	0.379	0.206	5.00	89.17	14.26	3.33
11-19-2011 15:33:41	0.418	0.204	1.71	11.70	11.35	4.08

Final System Bias Check for Run 2

Operator: RDR
Plant Name: Aurora Energy
Location: Fairbanks

	Reference Cylinder Numbers	
	Zero	Span
O2	nitrogen	CC23875
CO2	nitrogen	CC23875
CO	nitrogen	CC237881
NOx	nitrogen	CC237881
SO2	nitrogen	CC237881
THC	nitrogen	SG9115079

Date/Time 11-19-2011 15:33:58 PASSED

Analyte	O2	CO2	CO	NOx	SO2	THC
Units	%	%	ppm	ppm	ppm	ppm
Zero Ref Cyl	0.000	0.000	0.00	0.00	0.00	0.00
Zero Cal	0.034	0.092	-0.43	-1.03	0.51	-0.02
Zero Avg	0.073	0.121	-0.37	3.14	-2.37	3.66
Zero Bias%	0.2%	0.1%	0.0%	0.8%	0.6%	3.7%
Zero Drift%	-0.2%	0.1%	0.0%	-0.3%	-1.3%	-0.8%
Span Ref Cyl	13.110	13.640	201.50	201.50	200.70	50.52
Span Cal	13.020	13.642	196.20	194.17	193.53	49.32
Span Avg	12.649	13.453	195.80	201.90	176.92	48.82
Span Bias%	1.6%	0.8%	0.1%	1.5%	3.4%	0.5%
Span Drift%	-0.3%	-0.2%	1.6%	-0.7%	-2.7%	-1.2%
Ini Zero Avg	0.124	0.098	-0.37	4.89	4.10	4.46
Ini Span Avg	12.727	13.505	187.96	205.48	190.34	50.07
Run Avg	9.133	10.351	203.16	157.47	120.60	4.47
Co	0.098	0.110	-0.37	4.02	0.86	4.06
Cm	12.688	13.479	191.88	203.69	183.63	49.44
Correct Avg	9.409	10.448	213.32	154.85	131.49	0.46

System Bias Check End

Test Run 3 STRATA Version 2.01

	O2 %	CO2 %	CO ppm	NOx ppm	SO2 ppm	THC ppm
11-19-2011 17:05:03	9.134	10.339	187.14	145.44	127.27	2.33
11-19-2011 17:06:05	9.008	10.457	185.06	145.92	116.05	2.38
11-19-2011 17:07:04	9.055	10.407	178.48	147.48	112.66	2.43
11-19-2011 17:08:04	9.096	10.364	187.83	148.81	122.12	2.46
11-19-2011 17:09:03	9.120	10.338	184.69	148.68	126.51	2.41
11-19-2011 17:10:03	9.248	10.221	178.38	148.70	120.11	2.41
Begin calculating run averages						
11-19-2011 17:11:38	9.282	10.173	177.81	147.39	117.06	2.62
11-19-2011 17:12:37	9.369	10.090	179.15	147.40	118.92	2.73
11-19-2011 17:13:37	9.137	10.308	184.55	149.39	117.72	2.68
11-19-2011 17:14:39	9.149	10.294	185.56	149.28	123.49	2.63
11-19-2011 17:15:38	9.208	10.238	172.78	150.28	113.42	2.80
11-19-2011 17:16:38	9.371	10.069	170.40	153.84	116.68	2.88
11-19-2011 17:17:38	9.404	10.047	167.20	153.13	116.35	2.83
11-19-2011 17:18:39	9.370	10.074	168.15	152.50	117.74	2.78
11-19-2011 17:19:38	9.309	10.132	170.76	152.51	113.36	2.83
11-19-2011 17:20:38	9.302	10.153	168.33	153.23	120.56	2.88
11-19-2011 17:21:37	9.535	9.921	170.20	155.21	118.59	3.04
11-19-2011 17:22:39	9.508	9.946	171.11	158.17	110.85	2.96
11-19-2011 17:23:39	9.413	10.036	171.08	162.27	111.35	2.85
11-19-2011 17:24:38	9.477	9.968	171.52	165.46	114.55	2.86
11-19-2011 17:25:38	9.450	10.009	171.87	164.59	121.46	2.86
Pause						
11-19-2011 17:26:37	9.341	10.107	171.33	164.23	113.80	2.88
11-19-2011 17:27:37	9.317	10.130	160.69	161.64	114.95	2.92
11-19-2011 17:28:39	9.387	10.070	157.43	156.93	112.29	2.71
End Pause						
11-19-2011 17:29:37	9.244	10.191	153.89	154.03	111.90	2.62
11-19-2011 17:30:37	9.123	10.328	150.65	150.87	121.76	2.57
11-19-2011 17:31:39	9.105	10.347	151.60	150.77	113.22	2.63
11-19-2011 17:32:38	9.212	10.241	152.99	153.10	114.86	3.06
11-19-2011 17:33:38	9.101	10.341	156.59	157.40	118.53	3.05
11-19-2011 17:34:37	9.131	10.321	161.90	160.38	126.15	2.97
11-19-2011 17:35:39	9.133	10.312	158.41	159.68	123.33	2.94
11-19-2011 17:36:39	9.194	10.256	155.62	157.38	118.12	2.97
11-19-2011 17:37:37	9.190	10.266	153.23	155.51	119.70	3.02
11-19-2011 17:38:38	9.097	10.355	152.36	155.34	114.70	3.02
11-19-2011 17:39:38	8.944	10.506	154.31	154.39	119.94	2.97
11-19-2011 17:40:38	8.985	10.455	157.28	151.85	120.59	2.90
11-19-2011 17:41:37	8.868	10.566	158.50	149.50	118.60	2.79
11-19-2011 17:42:38	9.004	10.448	153.93	149.09	118.89	2.83
11-19-2011 17:43:39	9.048	10.403	153.56	150.39	122.66	2.73
Pause						
11-19-2011 17:44:38	9.002	10.443	154.96	148.89	117.17	2.78
11-19-2011 17:45:38	9.034	10.408	164.13	148.47	118.23	2.64
11-19-2011 17:46:37	8.994	10.448	180.82	147.74	121.07	2.58
End Pause						
11-19-2011 17:47:37	8.915	10.528	195.44	146.52	119.99	2.53
11-19-2011 17:48:39	9.015	10.432	205.80	147.23	125.38	2.48
11-19-2011 17:49:38	9.154	10.289	210.42	147.93	124.08	2.53
11-19-2011 17:50:38	9.169	10.273	204.86	149.51	120.52	2.57
11-19-2011 17:51:38	8.930	10.503	210.61	150.48	118.99	2.57
11-19-2011 17:52:37	9.002	10.453	210.44	151.07	127.85	2.66
11-19-2011 17:53:39	9.101	10.344	211.82	152.29	121.77	2.80
11-19-2011 17:54:38	9.003	10.424	216.02	152.52	118.53	2.71
11-19-2011 17:55:38	9.042	10.399	210.07	151.22	123.13	2.63
11-19-2011 17:56:38	9.146	10.291	204.38	150.61	117.95	2.68
11-19-2011 17:57:37	9.168	10.283	203.24	150.49	116.69	2.83
11-19-2011 17:58:40	9.100	10.342	210.77	150.62	123.26	2.69
11-19-2011 17:59:38	9.160	10.286	214.26	150.32	114.71	2.77
11-19-2011 18:00:39	9.249	10.202	216.41	149.50	126.93	2.90
11-19-2011 18:01:38	9.295	10.149	210.80	148.76	114.01	3.01
Pause						
11-19-2011 18:02:38	9.210	10.227	216.99	148.30	120.62	2.98
11-19-2011 18:03:37	9.174	10.268	216.26	148.97	116.49	3.02
11-19-2011 18:04:39	9.175	10.273	216.23	148.39	116.91	3.10
End Pause						
11-19-2011 18:05:38	9.130	10.324	212.02	147.90	121.21	3.06
11-19-2011 18:06:38	9.208	10.235	204.72	146.64	117.48	3.01
11-19-2011 18:07:38	9.214	10.224	205.06	147.13	114.63	3.02
11-19-2011 18:08:37	9.155	10.288	207.30	146.68	120.37	2.89
11-19-2011 18:09:39	9.202	10.250	207.03	145.62	119.80	2.89
11-19-2011 18:10:40	9.237	10.211	211.56	145.06	118.21	2.89
11-19-2011 18:11:38	9.141	10.293	215.26	145.46	121.30	2.94
11-19-2011 18:12:37	9.205	10.243	207.21	144.31	115.69	2.94
11-19-2011 18:13:39	9.218	10.222	205.17	145.86	121.18	2.98
11-19-2011 18:14:38	9.091	10.352	208.94	144.76	124.87	2.96
11-19-2011 18:15:38	9.132	10.323	207.92	145.58	125.48	2.91
11-19-2011 18:16:37	9.106	10.341	209.94	146.97	121.87	2.92
11-19-2011 18:17:37	9.064	10.387	204.29	148.29	120.18	2.97
11-19-2011 18:18:39	9.254	10.201	198.34	149.09	122.44	2.94
11-19-2011 18:19:38	9.204	10.245	192.82	149.74	118.22	2.84
Run Averages	O2 %	CO2 %	CO ppm	NOx ppm	SO2 ppm	THC ppm
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.83
11-19-2011 18:20:13	9.181	10.265	185.87	151.22	119.19	

Final System Bias Check, Run 3 STRATA Version 2.01

	O2	CO2	CO	NOx	SO2	THC
	%	%	ppm	ppm	ppm	ppm
11-19-2011 18:21:21	1.491	1.925	90.77	99.86	37.31	2.79
11-19-2011 18:22:20	5.066	4.886	-0.13	2.97	4.68	2.87
11-19-2011 18:23:20	12.664	13.331	-0.36	1.11	3.30	2.85
11-19-2011 18:24:19	3.067	3.607	77.16	41.97	91.55	2.74
11-19-2011 18:25:19	0.162	0.125	201.67	201.44	153.38	2.74
11-19-2011 18:26:21	0.156	0.115	197.11	198.18	156.06	2.76
11-19-2011 18:27:20	0.134	0.107	200.30	190.20	159.33	2.69
11-19-2011 18:28:20	0.098	0.105	201.63	205.07	157.19	2.69
11-19-2011 18:29:20	0.100	0.104	200.41	205.29	162.91	2.82
11-19-2011 18:30:19	13.862	0.150	132.29	193.47	85.79	2.75
11-19-2011 18:31:19	18.373	0.206	3.52	27.20	15.26	2.83
11-19-2011 18:32:21	18.400	0.215	0.97	2.06	-1.80	2.63
11-19-2011 18:33:20	18.293	0.214	0.92	1.10	-3.15	2.78
11-19-2011 18:34:20	18.122	0.213	0.17	0.84	-0.79	2.74
11-19-2011 18:35:20	17.923	0.209	0.03	0.38	-1.32	2.61
11-19-2011 18:36:19	17.783	0.208	-0.29	0.23	-0.91	2.58
11-19-2011 18:37:19	17.811	0.206	-0.14	0.21	-6.83	2.42
11-19-2011 18:38:21	17.919	0.202	-0.08	0.20	1.33	2.18
11-19-2011 18:39:20	18.094	0.197	-0.28	0.21	1.49	2.20
11-19-2011 18:40:20	18.272	0.199	-0.29	0.21	-3.23	2.39
11-19-2011 18:41:19	18.419	0.203	-0.28	0.21	-0.30	2.34
11-19-2011 18:42:19	18.528	0.199	-0.30	0.20	6.43	11.40
11-19-2011 18:43:21	18.612	0.200	-0.27	0.22	-1.78	45.44
11-19-2011 18:44:20	18.668	0.198	-0.24	0.23	-1.51	45.53
11-19-2011 18:45:20	18.712	0.198	-0.25	0.61	4.66	45.53

Final System Bias Check for Run 3

Operator: RDR
Plant Name: Aurora Energy
Location: Fairbanks

	Reference Cylinder Numbers	
	Zero	Span
O2	nitrogen	CC23875
CO2	nitrogen	CC23875
CO	nitrogen	CC237881
NOx	nitrogen	CC237881
SO2	nitrogen	CC237881
THC	nitrogen	SG9115079

Date/Time 11-19-2011 18:45:35 PASSED

Analyte	O2	CO2	CO	NOx	SO2	THC
Units	%	%	ppm	ppm	ppm	ppm
Zero Ref Cyl	0.000	0.000	0.00	0.00	0.00	0.00
Zero Cal	0.034	0.092	-0.43	-1.03	0.51	-0.02
Zero Avg	0.057	0.124	-0.31	4.49	2.95	2.84
Zero Bias%	0.1%	0.1%	0.0%	1.1%	0.5%	2.9%
Zero Drift%	-0.1%	0.0%	0.0%	0.3%	1.1%	-0.8%
Span Ref Cyl	13.110	13.640	201.50	201.50	200.70	50.52
Span Cal	13.020	13.642	196.20	194.17	193.53	49.32
Span Avg	12.633	13.390	195.75	205.32	170.76	45.58
Span Bias%	1.6%	1.1%	0.1%	2.2%	4.6%	3.7%
Span Drift%	-0.1%	-0.3%	0.0%	0.7%	-1.2%	-3.2%*
Ini Zero Avg	0.073	0.121	-0.37	3.14	-2.37	3.66
Ini Span Avg	12.649	13.453	195.80	201.90	176.92	48.82
Run Avg	9.181	10.265	185.87	151.22	119.19	2.83
Co	0.065	0.123	-0.34	3.82	0.29	3.25
Cm	12.641	13.422	195.77	203.61	173.84	47.20
Correct Avg	9.503	10.403	191.32	148.66	137.51	-0.48

System Bias Check End

APPENDIX E

EQUIPMENT CALIBRATIONS

APEX SOURCE TESTING EQUIPMENT INSTRUMENTS

9 January, 2012

Certificate of Conformance

Type S Pitot Tubes

Apex Instruments, Inc. hereby certifies that the design of the following Pitot Tubes manufactured by Apex Instruments, Inc. conform with the construction design criteria and specifications cited in USEPA Method 2, Code of Federal Regulations (40 CFR Part 60) and hereby are assigned a baseline calibration coefficient (C_P) of 0.84

Modular Type S Pitot Tubes for Probe Assemblies

MPT-6-181	Modular Pitot Tip, 3/8 inch Tube, Std length for Method 5 probes
MPT-6-320	Type Modular Pitot Tip, 3/8 inch Tube, Extended for SFA-300 & PM10
MPT-6-218	Type Modular Pitot Tip, 3/8 inch Tube, Extended for SFA-47
MPT-6-421	Extended Pitot Tip for PM2.

Method 5 Probes and Sheaths

(including, but not limited to the following part numbers)

PA-6S	6' SS Method 5 probe assembly
PA-8S	8' SS Method 5 probe assembly
IPS-6	6' inconel Method 5 probe assembly
IPS-8	8' inconel Method 5 probe assembly
IPS-10	10' inconel Method 5 probe assembly

John Stauber
Sales Manager

Apex Instruments, Inc. 125 Quantum Street; Holly Springs, North Carolina 27540 USA

Environmental Supply Company, Inc.
Quality Source Sampling Systems & Accessories

Wind Tunnel Pitot Calibration

S-type Pitot ID:	P-702	Date:	14-Apr-11
Standard Pitot ID:	001	Personnel:	WB
Cp(std):	0.99	Cp(actual):	0.7361
Part Number:	PPS12-Y-PM10S	P(bar):	29.48
Test Velocity (fps):	50	T(°F):	65

A-SIDE

ΔP_{std} (in. H_2O)	ΔP_s (in. H_2O)	Cp(s)	Deviation*
0.5610	1.0174	0.7351	-0.0009
0.5615	1.0150	0.7363	0.0003
0.5616	1.0140	0.7368	0.0007
	AVERAGE	0.7361	0.0006
		Std deviation	0.0008

NOTES: This Cp is only for use with PM10 cyclone in place. Must maintain 1" spacing with PM10 cyclone.

$$Cp(s) = Cp(std)\sqrt{\frac{\Delta P(std)}{\Delta P(s)}}$$

*Deviation = {Cp(s) - *AVG* Cp(s)} {must be <0.010}

Standard deviation of the deviations must be less than 0.02 for both sides.

Pitot tube S/N P-702 was calibrated in accordance with the CFR 40, Part 60 Appendix A, Method 2, Section 10.

William Burkett
Signature

4/14/2011
Date

2142 E. Geer Street, Durham, North Carolina 27704 www.environsupply.com 919-956-9688 FAX: 919-682-0333

METER BOX CALIBRATIONS
Pre-test

Meter No.	9739325
Console No.	1424

Calibration test type/meter No.	Dry gas/28610	Date:	3/23/2011
Pbar	29.95	Operator:	MLE

			Meter Volume	Temperatures, °F Meter In	Temperatures, °F Meter Out	CTM Volume	CTM Temp., °F	CTM Y_d	CTM Flow Rate (SCFM)
Delta H	0.5	Start	25.748	69	67	99.922	63		
				69	67		63		
				69	67		63		
Time (min)	15.00	Stop	32.306	70	67	106.352	63		
		Total	6.558			6.430	63.00		
		Average		68.13				0.9970	0.432
			Meter Volume	Temperatures, °F Meter In	Temperatures, °F Meter Out	CTM Volume	CTM Temp., °F	CTM Y_d	CTM Flow Rate (SCFM)
Delta H	1.0	Start	71.898	76	71	145.084	64		
				76	71		64		
				76	71		64		
Time (min)	15.00	Stop	80.971	77	71	153.934	64		
		Total	9.073			8.850	64.00		
		Average		73.63				0.9970	0.593
			Meter Volume	Temperatures, °F Meter In	Temperatures, °F Meter Out	CTM Volume	CTM Temp., °F	CTM Y_d	CTM Flow Rate (SCFM)
Delta H	1.5	Start	81.480	75	71	154.428	64		
				75	71		65		
				78	71		65		
Time (min)	15.00	Stop	92.729	79	72	165.430	64		
		Total	11.249			11.002	64.50		
		Average		74.00				0.9970	0.737
			Meter Volume	Temperatures, °F Meter In	Temperatures, °F Meter Out	CTM Volume	CTM Temp., °F	CTM Y_d	CTM Flow Rate (SCFM)
Delta H	2.0	Start	93.127	80	72	165.828	65		
				80	72		65		
				80	72		65		
Time (min)	15.00	Stop	105.360	80	72	177.785	65		
		Total	12.233			11.957	65.00		
		Average		76.00				0.9970	0.800
			Meter Volume	Temperatures, °F Meter In	Temperatures, °F Meter Out	CTM Volume	CTM Temp., °F	CTM Y_d	CTM Flow Rate (SCFM)
Delta H	3.0	Start	106.120	82	73	178.535	66		
				82	73		66		
				82	73		66		
Time (min)	15.00	Stop	121.274	82	73	193.387	65		
		Total	15.154			14.852	65.75		
		Average		77.50				0.9970	0.993

Acceptable Tolerances:
Y = +/- 0.02 from the average
dH@ = +/- 0.2 from the average

t	dH	Y	Variation	Delta H@	Variation
1	0.5	0.9859	-0.0030	1.5029	-0.1046
2	1.0	0.9879	-0.0010	1.5783	-0.0292
3	1.5	0.9891	0.0002	1.5356	-0.0719
4	2.0	0.9901	0.0011	1.7324	0.1249
5	3.0	0.9917	0.0027	1.6885	0.0810
Average	Average	0.9889		1.6075	
			PASSED		PASSED

QA/QC: _____

Date: _____

TEMPERATURE DISPLAY CALIBRATION

Meter Console Number: **1424**
Reference Calibrator Make: **Fluke** Model: **714** Serial No.: **8340051**
Operator: **M.Ellis** Date: **3/24/11**

Pretest

Thermocouple Number	Reference Temp #1	Meter Temp	Criteria
T.C. # 1	100	100	0.00
T.C. #2	220	220	0.00
T.C. #3	220	220	0.00
T.C. #4	30	30	0.00
T.C.#5	30	30	0.00
T.C. #6	25	25	0.00
T.C. #7	25	25	0.00

Thermocouple Number	Reference Temp #2	Meter Temp	Criteria
T.C. # 1	200	200	0.00
T.C. #2	255	255	0.00
T.C. #3	255	255	0.00
T.C. #4	45	45	0.00
T.C.#5	45	45	0.00
T.C. #6	50	50	0.00
T.C. #7	50	50	0.00

Thermocouple Number	Reference Temp #3	Meter Temp	Criteria
T.C. # 1	300	300	0.00
T.C. #2	290	290	0.00
T.C. #3	290	290	0.00
T.C. #4	60	60	0.00
T.C.#5	60	60	0.00
T.C. #6	75	75	0.00
T.C. #7	75	75	0.00

Thermocouple Number	Reference Temp #4	Meter Temp	Criteria
T.C. # 1	400	400	0.00
T.C. #2	325	325	0.00
T.C. #3	325	325	0.00
T.C. #4	75	75	0.00
T.C.#5	75	75	0.00
T.C. #6	100	100	0.00
T.C. #7	100	100	0.00

Criteria: Percent difference between the Reference Temperature and the Average Temperature can only be + or - 1.5% R.

Equation: $\frac{\text{(Ref. Temp. + 460) - (Temp. Reading + 460) X 100}}{\text{(Ref. Temp. + 460)}}$

METER BOX CALIBRATIONS
Pre-test

Meter No.	9366861
Console No.	1420

Calibration test type/meter No.	Dry gas/28610	Date:	4/11/2011
Pbar	29.98	Operator:	MLE

			Meter Volume	Temperatures, °F Meter In	Temperatures, °F Meter Out	CTM Volume	CTM Temp., °F	CTM Y_d	CTM Flow Rate (SCFM)
Delta H	0.5	Start	461.078	72	71	459.423	67		
				73	71		66		
				74	71		67		
Time (min)	15.00	Stop	467.494	75	71	465.681	67		
		Total	6.416			6.258	66.75		
		Average		72.25				0.9970	0.418
			Meter Volume	Temperatures, °F Meter In	Temperatures, °F Meter Out	CTM Volume	CTM Temp., °F	CTM Y_d	CTM Flow Rate (SCFM)
Delta H	1.0	Start	467.875	77	72	466.053	67		
				77	72		67		
				78	72		68		
Time (min)	15.00	Stop	476.838	79	72	474.772	67		
		Total	8.963			8.719	67.25		
		Average		74.88				0.9970	0.582
			Meter Volume	Temperatures, °F Meter In	Temperatures, °F Meter Out	CTM Volume	CTM Temp., °F	CTM Y_d	CTM Flow Rate (SCFM)
Delta H	1.5	Start	476.838	82	74	474.772	68		
				82	74		68		
				82	74		68		
Time (min)	15.00	Stop	487.688	82	74	485.324	68		
		Total	10.850			10.552	68.00		
		Average		78.00				0.9970	0.703
			Meter Volume	Temperatures, °F Meter In	Temperatures, °F Meter Out	CTM Volume	CTM Temp., °F	CTM Y_d	CTM Flow Rate (SCFM)
Delta H	2.0	Start	488.086	81	74	485.713	68		
				81	74		68		
				84	75		68		
Time (min)	15.00	Stop	500.491	84	75	497.776	68		
		Total	12.405			12.063	68.00		
		Average		78.50				0.9970	0.804
			Meter Volume	Temperatures, °F Meter In	Temperatures, °F Meter Out	CTM Volume	CTM Temp., °F	CTM Y_d	CTM Flow Rate (SCFM)
Delta H	3.0	Start	501.217	82	75	498.474	68		
				82	75		68		
				84	75		68		
Time (min)	15.00	Stop	516.735	85	76	513.578	68		
		Total	15.518			15.104	68.00		
		Average		79.25				0.9970	1.006

Acceptable Tolerances:
Y = +/- 0.02 from the average
dH@ = +/- 0.2 from the average

t	dH	Y	Variation	Delta H@	Variation
1	0.5	0.9814	-0.0016	1.5954	-0.0576
2	1.0	0.9815	-0.0015	1.6408	-0.0122
3	1.5	0.9844	0.0014	1.6774	0.0244
4	2.0	0.9840	0.0010	1.7119	0.0588
5	3.0	0.9838	0.0008	1.6396	-0.0134
Average	Average	0.9830		1.6530	
			PASSED		PASSED

QA/QC: _____

Date: _____

TEMPERATURE DISPLAY CALIBRATION

Meter Console Number: **1420**
Reference Calibrator Make: **Fluke** Model: **714** Serial No.: **8340051**
Operator: **M.Ellis** Date: **3/24/11**

Pretest

Thermocouple Number	Reference Temp #1	Meter Temp	Criteria
T.C. # 1	100	100	0.00
T.C. #2	220	220	0.00
T.C. #3	220	220	0.00
T.C. #4	30	30	0.00
T.C.#5	30	30	0.00
T.C. #6	25	25	0.00
T.C. #7	25	25	0.00

Thermocouple Number	Reference Temp #2	Meter Temp	Criteria
T.C. # 1	200	200	0.00
T.C. #2	255	255	0.00
T.C. #3	255	255	0.00
T.C. #4	45	45	0.00
T.C.#5	45	45	0.00
T.C. #6	50	50	0.00
T.C. #7	50	50	0.00

Thermocouple Number	Reference Temp #3	Meter Temp	Criteria
T.C. # 1	300	300	0.00
T.C. #2	290	290	0.00
T.C. #3	290	290	0.00
T.C. #4	60	60	0.00
T.C.#5	60	60	0.00
T.C. #6	75	75	0.00
T.C. #7	75	75	0.00

Thermocouple Number	Reference Temp #4	Meter Temp	Criteria
T.C. # 1	400	400	0.00
T.C. #2	325	325	0.00
T.C. #3	325	325	0.00
T.C. #4	75	75	0.00
T.C.#5	75	75	0.00
T.C. #6	100	100	0.00
T.C. #7	100	100	0.00

Criteria: Percent difference between the Reference Temperature and the Average Temperature can only be + or - 1.5% R.

Equation: $$\frac{\text{(Ref. Temp. + 460) - (Temp. Reading + 460) X 100}}{\text{(Ref. Temp. + 460)}}$$

Environmental Supply Company, Inc.
Quality Source Sampling Systems & Accessories

15 POINT SECONDARY REFERENCE METER CALIBRATION

Date: 2/1/2011
Customer: TRC Environmental

DGM Model: T-110
DGM S/N: 28610
Reference Prover: Cert.# A-610 Tape # 26727

Pb: 29.96 in Hg

Approx. Flow Rate (cfm) Q	Prover Volume (ft^3) V_w	DGM Volume (ft^3) V_{ds}	Temperature		Time (min) Φ	Flow Rate (cfm) Q	Meter Coefficient Y_{ds}	Average Meter Coefficient Y_{ds}
			Prover (°F) t_w	DGM (°F) t_{ds}				
0.40	2.000	2.000	70.2	70.2	5.005	0.398	1.000	
0.40	2.000	1.999	70.5	70.5	4.990	0.399	1.001	
0.40	2.000	1.999	70.2	70.2	4.987	0.400	1.001	1.000
0.60	2.000	2.005	70.6	70.6	3.308	0.602	0.998	
0.60	2.000	2.003	70.9	70.9	3.305	0.602	0.999	
0.60	2.000	2.007	71.1	71.1	3.303	0.602	0.997	0.998
0.80	2.000	2.005	71.5	71.5	2.565	0.775	0.998	
0.80	2.000	2.011	71.5	71.5	2.563	0.776	0.995	
0.80	2.000	2.008	71.8	71.8	2.565	0.775	0.996	0.996
1.00	2.000	2.010	71.8	71.8	1.148	1.731	0.995	
1.00	2.000	2.015	71.6	71.6	1.145	1.737	0.993	
1.00	2.000	2.012	71.3	71.3	1.147	1.735	0.994	0.994
1.20	2.000	2.006	71.5	71.5	1.865	1.066	0.997	
1.20	2.000	2.006	71.5	71.5	1.872	1.063	0.997	
1.20	2.000	2.001	71.4	71.4	1.867	1.066	1.000	0.998

AVERAGE Y_{ds} 0.997

$$Y_{ds} = \frac{V_w(t_{ds} + t_{std})}{V_{ds}(t_w + t_{std})} * \frac{P_{bar}}{\left(P_{bar} + P_m/13.6\right)} \qquad Q = 17.64 \frac{P_{bar}}{(t_w + t_{std})} \frac{Vw}{\Phi}$$

Dry gas meter Serial Number 28610 was calibrated in accordance with the Code of Federal Regulations, Title 40, Part 60, Appendix A, Method 5 Section 16.1.1

Signature

2142 E. Geer Street, Durham, North Carolina 27704 www.environsupply.com 919-956-9688 FAX: 919-682-0333

Certificate No.: NA1086-100-020311

Mettler Toledo
Service Business Unit Laboratory
1900 Polaris Parkway
Columbus, OH 43240
1-800-METTLER

METTLER TOLEDO

ISO 9001 : 2000 Registered

Calibration Certificate

Customer

Company:	TRC Environmental		
Address:	19874 141st PL. NE		
City:	Woodinville	*State/Province:*	WA
Zip/Postal:	98072		

Device

Manufacturer:	Mettler Toledo	*Asset No.:*	
Serial No.:	1121031038	*Dept./Room:*	
Max Capacity:	220 g	*Readability:*	0.0001 g
Model:	AB204-S		
Procedure Statement:	The device referenced in this document has been metrologically tested in accordance with METTLER TOLEDO Work Instruction VW0152A. All translations into other languages are based on the referenced work instruction, which is in English. This certificate refers to: As Found and As Left		
Test Date:	3-Feb-2011	*Next Cal. Due Date:*	29-Feb-2012
Service Technician:	Attila Tocik	*Signature:*	

Reference Weights

Traceability of Test Equipment:	All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1

Weight Set No.:	487	*Date of Issue:*	27-Jul-2010
Calibration Due Date:	31-Jul-2011	*NIST Traceability No.*	MT5061/MT00191
Class:	E2		

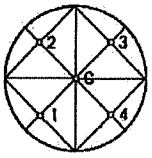
© METTLER TOLEDO

Certificate No.: NA1086-100-020311

METTLER TOLEDO

Measuring Results

Eccentricity



Test Weight	Position	As Found		As Left	
		Displayed Value	Deviation	Displayed Value	Deviation
C: 100 g	Center	0.0000 g	N/A	0.0000 g	N/A
1: 100 g	Left Front	0.0000 g	0.0000 g	0.0000 g	0.0000 g
2: 100 g	Left Rear	0.0000 g	0.0000 g	0.0000 g	0.0000 g
3: 100 g	Right Rear	0.0000 g	0.0000 g	0.0000 g	0.0000 g
4: 100 g	Right Front	0.0000 g	0.0000 g	0.0000 g	0.0000 g
Eccentric Load Deviation:		0.0000 g		0.0000 g	
Manufacturer Specifications:		0.0004 g		0.0004 g	
Manufacturer Specifications Rounded to Resolution of Eccentric Load Deviation:		0.0004		0.0004	
Specifications Met:		YES		YES	

Sensitivity

Reference Weight	As Found			As Left		
	Displayed Value		Deviation	Displayed Value		Deviation
	Without Reference Weight	With Reference Weight		Without Reference Weight	With Reference Weight	
200.0000 g	0.0000 g	199.9993 g	-0.0007 g	0.0000 g	199.9997 g	-0.0003 g
	Sensitivity Offset:		0.0007 g	Sensitivity Offset:		0.0003 g
	Manufacturer Specifications:		N/A	Manufacturer Specifications:		0.0004 g
	Manufacturer Specifications Rounded to Resolution of Sensitivity Offset:		N/A	Manufacturer Specifications Rounded to Resolution of Sensitivity Offset:		0.0004 g
	Specifications Met:		N/A	Specifications Met:		YES

© METTLER TOLEDO

Certificate No.: NA1086-100-020311

METTLER TOLEDO

Linearity - Differential Method

Test Weight 50.0000 g

		As Found			As Left		
		Displayed Value		Deviation *	Displayed Value		Deviation *
	Preload Weight	Preload	Test Weight		Preload	Test Weight	
1	0 g	0.0000 g	50.0000 g	0.00010 g	0.0000 g	49.9999 g	-0.00008 g
2	50 g	49.9998 g	99.9995 g	-0.00010 g	49.9999 g	99.9999 g	-0.00006 g
3	100 g	99.9995 g	149.9995 g	0.00000 g	99.9997 g	149.9997 g	-0.00004 g
4	150 g	149.9994 g	199.9993 g	0.00000 g	149.9997 g	199.9997 g	-0.00002 g
		Linearity Deviation:		0.00010 g	*Linearity Deviation:*		0.00008 g
		Manufacturer Specifications:		0.0002 g	*Manufacturer Specifications:*		0.0002 g
		Manufacturer Specifications Rounded to Resolution of Linearity Deviation:		0.00020 g	*Manufacturer Specifications Rounded to Resolution of Linearity Deviation:*		0.00020 g
		Specifications Met:		YES	*Specifications Met:*		YES

* This Linearity Deviation is zero point offset and sensitivity error compensated.

Remarks

Cleaned, serviced, and calibrated balance.

© METTLER TOLEDO

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number:	E03NI74E15A38Q6	Reference Number:	48-124259451-4
Cylinder Number:	CC23875	Cylinder Volume:	153 Cu.Ft.
Laboratory:	ASG - Los Angeles - CA	Cylinder Pressure:	2015 PSIG
PGVP Number:	B32011	Valve Outlet:	590
		Analysis Date:	Apr 07, 2011

Expiration Date: Apr 07, 2014

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed. Analytical Methodology does not require correction for analytical interferences. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 150 psig.i.e. 1 Mega Pascal

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
CARBON DIOXIDE	10.00 %	10.04 %	G1	±1.1% NIST traceable
OXYGEN	14.00 %	13.91 %	G1	±1.1% NIST traceable
NITROGEN	Balance			

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Expiration Date
NTRM	32458	SG9168429	14.04% OXYGEN	Dec 01, 2016
NTRM	070510	SG9154071	10.81% CARBON DIOXIDE/NITROGEN	May 15, 2012

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS NDIR	NDIR	Mar 31, 2011
Siemens MO2	PARAMAGNETIC	Mar 21, 2011

Triad Data Available Upon Request

Notes:

Signature on file

Approved for Release

Airgas

Airgas Specialty Gases
12722 S. Wentworth Avenue
Chicago, IL 60628
1-773-785-3000
FAX: 1-773-785-1928
www.airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number:	E03NI52E15A38Q7	Reference Number:	54-124220520-1
Cylinder Number:	CC192898	Cylinder Volume:	164 Cu.Ft.
Laboratory:	ASG - Chicago - IL	Cylinder Pressure:	2015 PSIG
Analysis Date:	May 27, 2010	Valve Outlet:	296

Expiration Date: May 27, 2013

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed. Analytical Methodology does not require correction for analytical interferences. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 150 psig.i.e. 1 Mega Pascal

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
CARBON DIOXIDE	7.00 %	7.010 %	G1	+/- 1% NIST Traceable
OXYGEN	10.00 %	10.02 %	G1	+/- 1% NIST Traceable
NITROGEN	Balance			

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Expiration Date
NTRM/02	061201	CC195929	9.898% OXYGEN/	Oct 02, 2012
NTRM	1	CC214614	6.986% CARBON DIOXIDE/NITROGEN	May 01, 2011

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
(CO2-1)HORIBA VIA-510	NDIR	May 03, 2010
(O2-1)HORIBA MPA-510	Paramagnetic	May 03, 2010

Triad Data Available Upon Request

Notes:

Approved for Release

CC237881

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number:	E04NI99E15A55K9	Reference Number:	48-124218599-5
Cylinder Number:	CC237881	Cylinder Volume:	144 Cu.Ft.
Laboratory:	ASG - Los Angeles - CA	Cylinder Pressure:	2015 PSIG
PGVP Number:	B32011	Valve Outlet:	660
Analysis Date:	May 19, 2010		

Expiration Date: May 19, 2012

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed. Analytical Methodology does not require correction for analytical interferences. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 150 psig.i.e. 1 Mega Pascal

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
CARBON MONOXIDE	200.0 PPM	201.5 PPM	G1	+/- 1% NIST Traceable
NITRIC OXIDE	200.0 PPM	200.9 PPM	G1	+/- 1% NIST Traceable
SULFUR DIOXIDE	200.0 PPM	200.7 PPM	G1	+/- 1% NIST Traceable
NITROGEN	Balance			
Total oxides of nitrogen		201.5 PPM		For Reference Only

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Expiration Date
NTRM	080603	CC255363	250.0PPM CARBON MONOXIDE/NITROGEN	May 15, 2012
NTRM	080616	CC255675	247.0PPM SULFUR DIOXIDE/NITROGEN	Oct 15, 2012
NTRM	090603	CC274196	250.6PPM NITRIC OXIDE/NITROGEN	Feb 01, 2011

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801551 CO	FTIR	May 03, 2010
Nicolet 6700 AHR0801551 NO	FTIR	May 04, 2010
Nicolet 6700 AHR0801551 SO2	FTIR	May 08, 2010

Triad Data Available Upon Request

Notes:

Signature on file

Approved for Release

CC215391

Airgas

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Airgas Specialty Gases
11711 S. Alameda Street
Los Angeles, CA 90059-2130
(323) 357-6891 Fax: (323) 567-3686
http://www.airgas.com

Part Number:	E04NI99E15A08F9	Reference Number:	48-124251015-1
Cylinder Number:	CC215391	Cylinder Volume:	144 Cu.Ft.
Laboratory:	ASG - Los Angeles - CA	Cylinder Pressure:	2015 PSIG
Analysis Date:	Feb 10, 2011	Valve Outlet:	660

Expiration Date: Feb 10, 2013

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed. Analytical Methodology does not require correction for analytical interferences. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 150 psig.i.e. 1 Mega Pascal

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
CARBON MONOXIDE	500.0 PPM	501.8 PPM	G1	+/- 1% NIST Traceable
NITRIC OXIDE	500.0 PPM	509.6 PPM	G1	+/- 1% NIST Traceable
SULFUR DIOXIDE	500.0 PPM	495.2 PPM	G1	+/- 1% NIST Traceable
NITROGEN	Balance			
Total oxides of nitrogen		510.0 PPM		For Reference Only

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Expiration Date
NTRM	071203	CC240065	496.2PPM SULFUR DIOXIDE/NITROGEN	May 11, 2011
NTRM	090604	CC287249	501.3PPM CARBON MONOXIDE/NITROGEN	Feb 01, 2013
NTRM	100604	CC316079	495.6PPM NITRIC OXIDE/NITROGEN	Feb 01, 2016

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS CARBON MONOXIDE	NDIR	Jan 17, 2011
Nicolet 6700 AMP0900118 NO	FTIR	Feb 04, 2011
Nicolet 6700 AMP0900118 SO2	FTIR	Feb 08, 2011

Triad Data Available Upon Request

Notes:

Approved for Release

Airgas

Airgas Specialty Gases
11711 S. Alameda St.
Los Angeles, CA 90059
(323) 568-2203 Fax: (323) 567-3686
www.airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number:	E02NI99E15A0930	Reference Number:	48-124285879-4
Cylinder Number:	CC218900	Cylinder Volume:	144 Cu.Ft.
Laboratory:	ASG - Los Angeles - CA	Cylinder Pressure:	2015 PSIG
PGVP Number:	B32011	Valve Outlet:	350
		Analysis Date:	Oct 13, 2011

Expiration Date: Oct 13, 2014

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed. Analytical Methodology does not require correction for analytical interferences. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 150 psig.i.e. 1 Mega Pascal

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
PROPANE	30.00 PPM	30.16 PPM	G1	+/- 1% NIST Traceable
NITROGEN	Balance			

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Expiration Date
NTRM	080610	CC263076	49.62PPM PROPANE/AIR	Jul 15, 2012

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801551 C3H8	FTIR	Sep 21, 2011

Triad Data Available Upon Request

Notes:

Approved for Release

Airgas

Airgas Specialty Gases
11711 S. Alameda St.
Los Angeles, CA 90059
(323) 568-2203 Fax: (323) 567-3686
www.airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number:	E02NI99E15A0931	Reference Number:	48-124285879-5
Cylinder Number:	SG9115079BAL	Cylinder Volume:	144 Cu.Ft.
Laboratory:	ASG - Los Angeles - CA	Cylinder Pressure:	2015 PSIG
PGVP Number:	B32011	Valve Outlet:	350
		Analysis Date:	Oct 13, 2011

Expiration Date: Oct 13, 2014

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed. Analytical Methodology does not require correction for analytical interferences. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 150 psig.i.e. 1 Mega Pascal

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
PROPANE	50.00 PPM	50.52 PPM	G1	+/- 1% NIST Traceable
NITROGEN	Balance			

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Expiration Date
NTRM	080610	CC263076	49.62PPM PROPANE/AIR	Jul 15, 2012

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801551 C3H8	FTIR	Sep 21, 2011

Triad Data Available Upon Request

Notes:

Approved for Release

Airgas

Airgas Specialty Gases
11711 S. Alameda St.
Los Angeles, CA 90059
(323) 568-2203 Fax: (323) 567-3686
www.airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number:	E02NI99E15A0581	Reference Number:	48-124285879-3
Cylinder Number:	CC40330	Cylinder Volume:	144 Cu.Ft.
Laboratory:	ASG - Los Angeles - CA	Cylinder Pressure:	2015 PSIG
PGVP Number:	B32011	Valve Outlet:	350
		Analysis Date:	Oct 13, 2011

Expiration Date: Oct 13, 2014

Certification performed in accordance with "EPA Traceability Protocol (Sept. 1997)" using the assay procedures listed. Analytical Methodology does not require correction for analytical interferences. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 150 psig.i.e. 1 Mega Pascal

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
PROPANE	85.00 PPM	85.40 PPM	G1	+/- 1% NIST Traceable
NITROGEN	Balance			

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Expiration Date
NTRM	090617	CC301753	97.82PPM PROPANE/AIR	Oct 02, 2013

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801551 C3H8	FTIR	Sep 21, 2011

Triad Data Available Upon Request

Notes:

Approved for Release

APPENDIX F

PROJECT PARTICIPANTS

PROJECT PARTICIPANTS

TRC Environmental Corporation
Ken Allmendinger – Project Manager
Ryan Radonski - Senior Environmental Specialist
Matt Caron – Technical Specialist, Laboratory Manager
Jim McSweeney – Senior Environmental Specialist
Judith Aasland – Sr. Technical Writer, QA/QC
Tsunami Van Winkle – Technical Assistant

Aurora Energy, LLC.
Ms. Tammy Scholten

Summary of Test Results
University of Alaska Fairbanks
Campus Power Plant - AQ0316TVP02
$PM_{2.5}$ Emissions
Emission Units 1 and 2
November 5, 2010

Prepared for:

University of Alaska Fairbanks
P.O. Box 757420
Fairbanks, AK 99705

Prepared by:
Alaska Source Testing, LLC
520 W 58th Unit A
Anchorage, Alaska 99518

January 19, 2011

Report Certification

As Principal Project Engineer and project manager, I certify that the testing was performed in accordance with approved methods and the data, calculations and results described in this report are true and accurate.

William M. Hudson

Signature

Date

Table of Contents **Page**

Report Certification ii

Table of Contents iii

1. INTRODUCTION 1
2. SUMMARY OF RESULTS 1
3. DESCRIPTION OF THE SOURCE 2
4. DESCRIPTION OF SAMPLE LOCATION 2
5. DESCRIPTION OF SOURCE OPERATIONS AND TEST CONDITIONS 2
6. DESCRIPTION OF TEST PROCEDURES 3
   - 6.1 Test Methods 3
   - 6.2 Description of $O_2$and CO_2 Test Procedures 3
   - 6.3 Description of $PM_{2.5}$ Test Procedures and Equipment 4
7. CALCULATIONS 11
8. QUALITY ASSURANCE 12

List of Tables **Page**

2-1 Summary of Emissions 1
5-1 Operational Data 3

List of Figures **Page**

4-1 Sample Port Location and Traverse Points 2
6-4 $PM_{2.5}$ Sample Train Configuration 5
Figure 1 Schematic of Condensable Particulate Sampling Train 6
Figure 2 Nitrogen Purge Train Configuration 7

Appendices

A **Summary of Results with Example Calculations**
Calculation Spreadsheets
$PM_{2.5}$ Example Calculations

B **Field Data**
Field Data Sheets

C **Laboratory Data**
$PM_{2.5}$ Analysis Laboratory Data

D **Operational Data**
Operational Data Sheets (Unit electrical output and load percent)

E **Quality Assurance Data**
Dry Gas Meter Calibration Sheet
Pitot Tube Calibration
$PM_{2.5}$ Nozzle Calibration

F **Project Participants**

G **Project Correspondence**

1. Introduction

The University of Alaska Fairbanks (UAF) operates the Campus Power Plant; permit AQ0316TVP02. The facility includes two coal-fired boilers (Emission Units 1 – 2).

UAF engaged Alaska Source Testing LLC (AST) to perform source testing to measure the concentration of particulate matter ($PM_{2.5}$) while operating under normal conditions; both boilers operating at approximately 46,000 pounds of steam per hour. ADEC requested $PM_{2.5}$ data from UAF because Fairbanks is in non-attainment for $PM_{2.5}$ and UAF is participating in the research to return Fairbanks to attainment status.

AST performed total particulate testing on each boiler November 2 – 4, 2010; the December 13, 2010 report has previously been submitted to the Department.

The testing was conducted in compliance with the performance testing provisions of *40 CFR Part 60,* Appendix A, Methods 1 – 3A, 201a and OTM-28.

The testing took place November 5, 2010. Bill Hudson was the onsite Project Manager and test team leader. Buck Hudson was the on-site technician. Mr. Adam Saaid of the Alaska Department of Environmental Conservation was on site to witness the testing.

This report summarizes the results of the test data. Detailed test information and documentation is provided in the appendices of this report.

2. SUMMARY OF RESULTS

Table 2-1 Summary of Emissions

Run Number	Run Start Time (120 min runs)	Opacity %	Load klbs-steam/hr	$PM_{2.5}$ gr/scf	$PM_{2.5}$ lb/hr
1	1450	1	92.7	0.0085	2.75
2	1915	1	91.2	0.0078	2.53
Average		**1**	**92.0**	**0.0082**	**2.64**

Boiler 1 operated at 45.5 and 47.2 klbs-steam/hr and Boiler 2 operated at 45.7 and 45.5 klbs-steam/hr for runs 1 and 2, respectively.

A more detailed summary of results and example calculations are provided in Appendix A. The field data is presented Appendix C.

3. DESCRIPTION OF THE SOURCE

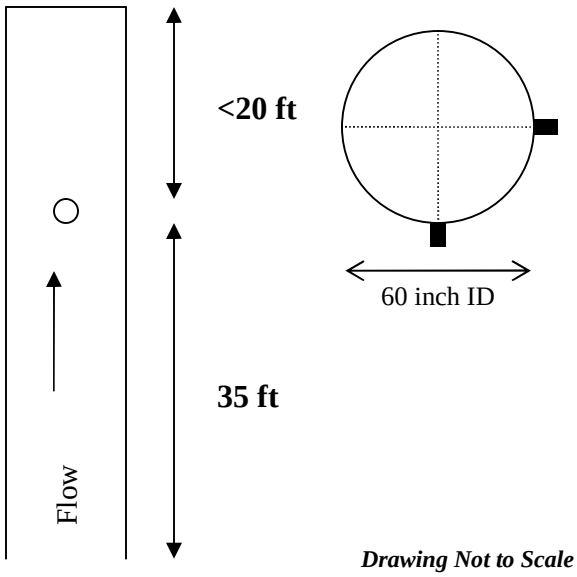
Emission Units 1 – 2 are Erie City Coal-Fired boilers rated at 140.4 MMBtu/hr. The units were installed in 1962.

.

4. DESCRIPTION OF THE SAMPLE LOCATIONS

The boilers exhaust into a shared five-foot diameter stack. The stack is equipped with two, six-inch sample ports. The sample ports are located 35 feet downstream of the nearest flow disturbance and more than 20 feet upstream of the stack exit; they are accessible via the roof. The ports meet USEPA Method 1 siting criteria.

Figure 4-1 Port and Traverse Point Locations.



Drawing Not to Scale

Method 1, Table 1 – 2
Traverse Points (inches)

1	2.4
2	8.8
3	17.8
4	42.2
5	51.2
6	57.4

Six points on each diameter per OTM 27, 8.3.1(b)(c)

5. DESCRIPTION OF SOURCE OPERATIONS AND TEST CONDITIONS

There were no plant upsets during the testing. Average operational data collected during the source test is found in Table 5-1. Detailed operational data are located in Appendix D. Testing was challenging due to ambient temperatures. Great care was taken to ensure that the sample train was leak tight prior to testing. Extra heat tracing and insulation was added to the train and umbilical lines.

Table 5-1 Operational Data Collected, Sample Run Average

Boiler	*Run*	*Fuel Input (ton/hr)*	*Steam Flow (klbs/hr)*	*Draft Fan Speed (%)*	*COMS Output (%)*	*Oxygen (%)*	*Bag House DP ("H_20)*
1	*1*	*4.50*	*45.45*	*88.15*	*1.27*	*4.78*	*6.64*
2	*1*	*4.72*	*45.73*	*85.07*	*1.27*	*4.89*	*6.74*
1	*2*	*4.67*	*47.16*	*88.77*	*1.17*	*4.37*	*6.68*
2	*2*	*4.70*	*45.48*	*84.54*	*1.17*	*4.66*	*6.79*

6. DESCRIPTION OF TEST PROCEDURES

6.1 Test Methods

The emission-testing program was performed in accordance with USEPA Reference Methods as prescribed in *40 CFR 60*, Appendix A. The specific methods follow.

- Method 1 — Sample and Velocity Traverses for Stationary Sources
- Method 2 — Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot tube)
- Method 3A — Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)
- Method 201A — Determination of PM_{10} Emissions (Constant Sampling Rate Procedure)
- OTM-28 — Dry Impinger Method for Determining Condensable Particulate Emissions From Stationary Sources

6.2 Description of O_2 and CO_2 Test Procedures

For O_2/CO_2 determination, two Tedlar bags were filled during each sampling run. The bags were leak-checked before and after each run. Sample gas was obtained from the exit of the DGM for the Tedlar bags. For analysis, the Tedlar bag was connected to the O_2/CO_2 analyzers via Teflon tubing. The analyzer output was recorded on the field data sheet.

Combustion gas analysis for O_2 and CO_2 was performed with a Servomex Model 1400B Analyzer. The instrument specifications are listed below.

Oxygen Analyzer Components	Carbon Dioxide Components
Principle of Operation: Paramagnetic	Principle of Operation: Infrared
Span: 0-5, 10, 20, 25, 50, 100%	Span: 0-5, 10, 25, 50, 100%
Linearity: Better than ± 0.1 % full scale	Linearity: Better than ± 1 % full scale
Zero/Span Drift: Less than ± 1 % full scale in 24 hours	Zero/Span Drift: Less than ± 1 % full scale in 24 hours

6.3 Description of Particulate ($PM_{2.5}$) Test Procedures

The particulate testing consisted of 2, two-hour sample runs at full load while both boilers were operating. Both runs were performed in accordance with Reference Methods 1 – 3A, 201A and OTM-28. There were no problems with the testing equipment.

The sample train had to be modified because the railing around the sample ports interfered with the movement of the combined train sample traverses. A split box train was used. A ten-foot section of heat-traced and insulated fuel grade 5/8 inch hose was used to connect the smaller split box to the back half impinger train. The impinge train then sat on the platform grating at sample port height. This modification could have effected to results. The hose was washed out prior to testing. Any water that might have accumulated in the line was drained into the first impinger. The hose was not rinsed with any solvents.

Prior to the start of testing a velocity/temperature traverse was performed on each stack. This data was used to calculate the desired sample flow rate (Q_s), meter box delta H, acceptable nozzle diameters and the dwell times. An exhaust gas sample was extracted at a constant flow rate through a cyclone device which separates PM greater than $PM_{2.5}$. The particulate mass was determined gravimetrically in accordance with Method 201A and OTM-28. All D-50 values were between 9 and 11.

Exhaust gas samples were collected using an Environmental Supply Company (ESC) Model C-5000 Source Sampling System. A schematic of the particulate sample train is shown in Figure 6-4. The sample system components are described below.

Figure 6-4 Method 201A Sampling Train

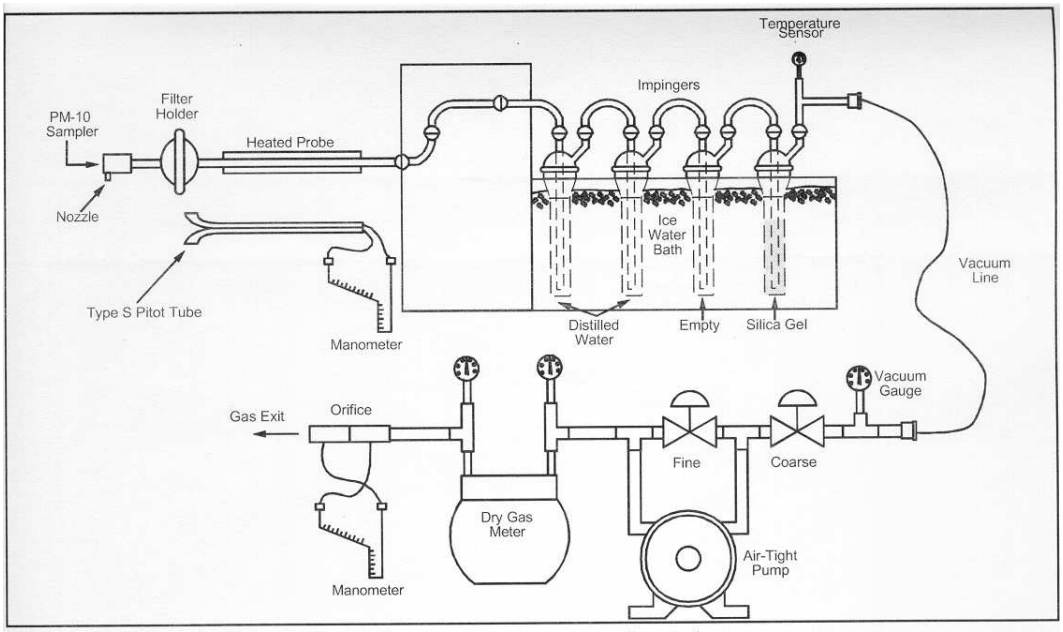


Figure 1. Method 201A Sampling Train

FIGURE 6-4

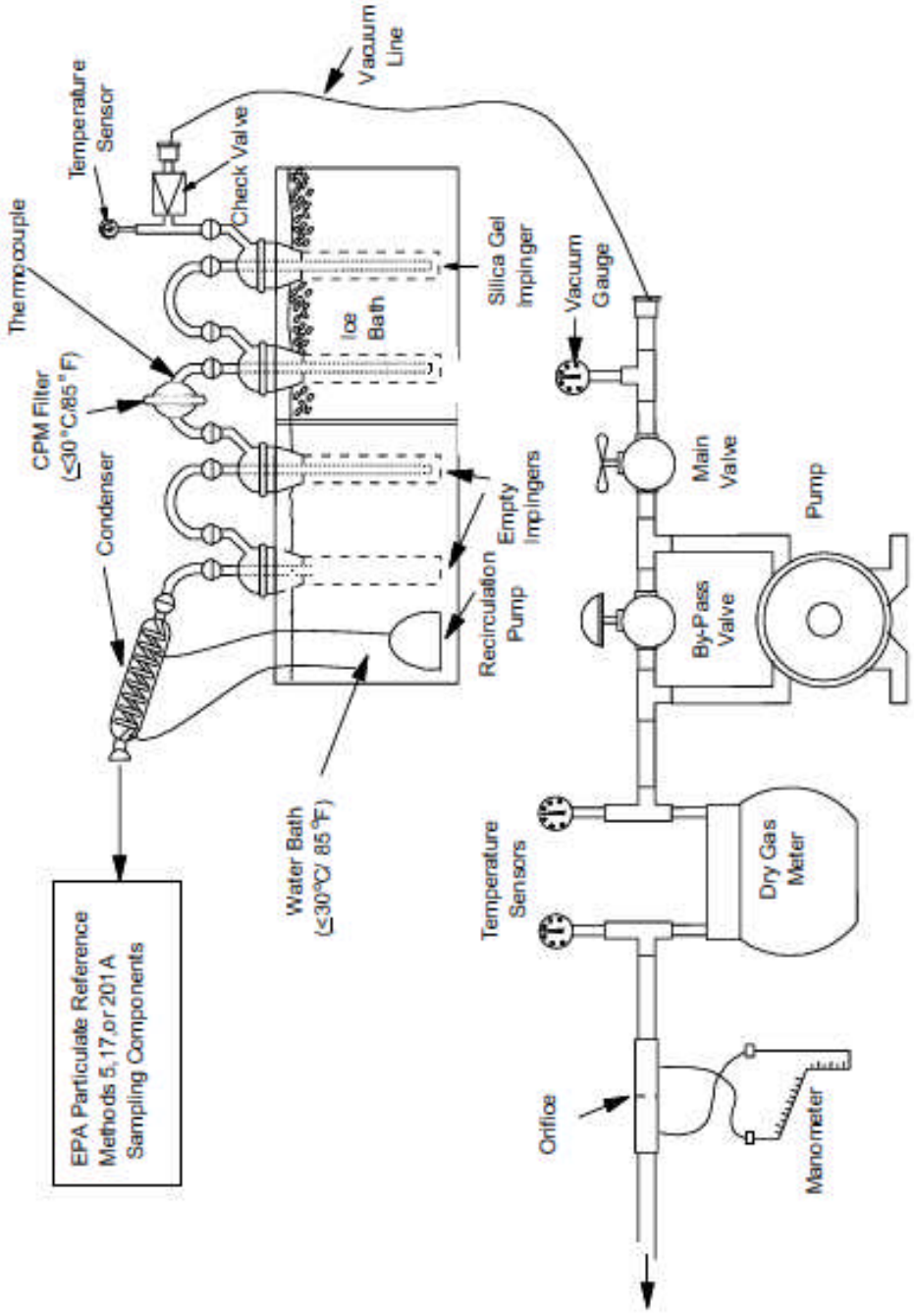


Figure 1. Schematic of Condensable Particulate Sampling Train

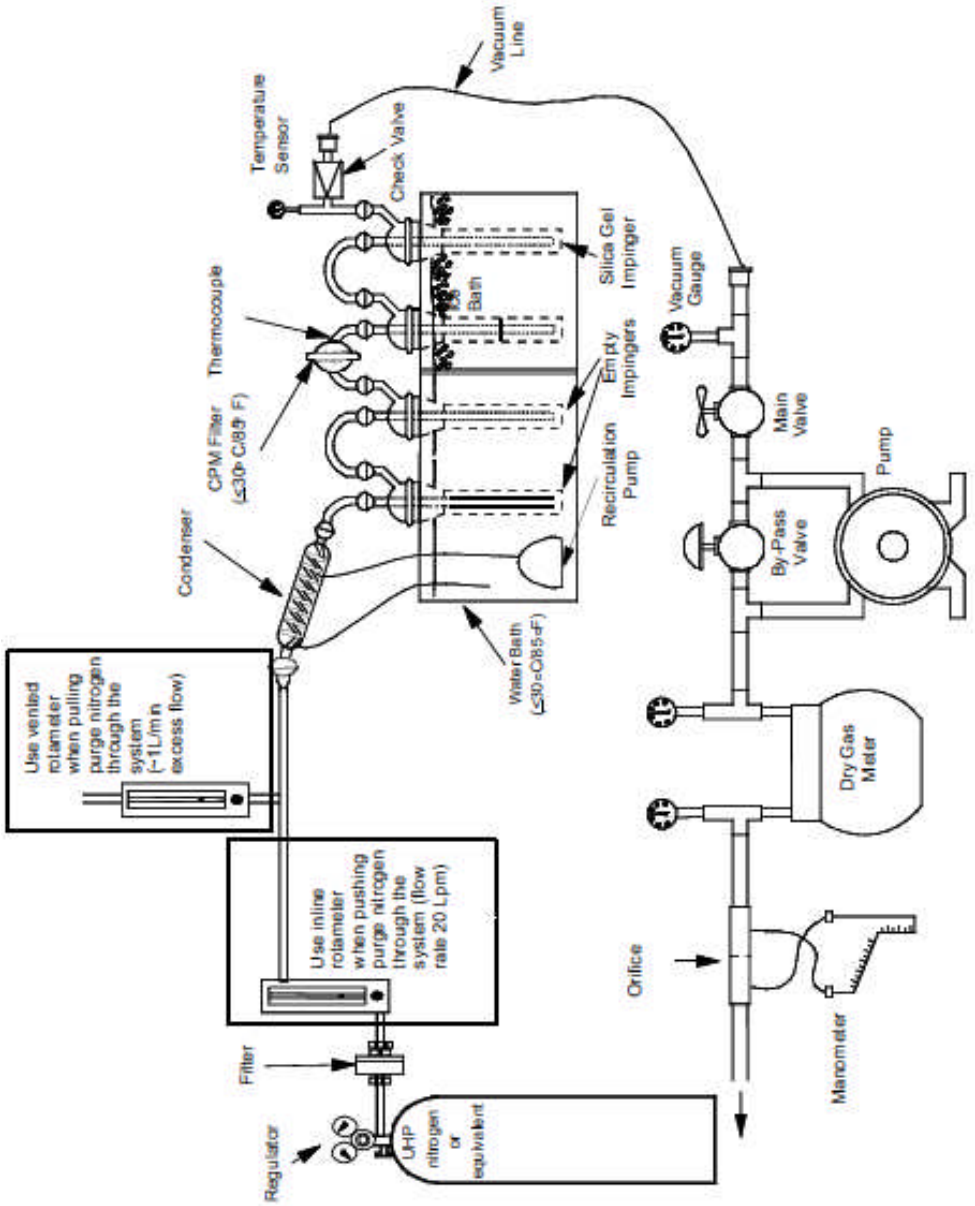


Figure 2. Nitrogen Purge Train Configuration

Sample Nozzle: The sample nozzle was constructed of 316 stainless steel with a sharp, tapered, leading edge. Environmental Supply Company (ESC) manufactured the 11-piece nozzle set. The nozzles selected for this testing program was 0.196 inches. Please refer to the $PM_{2.5}$ Nozzle Selection Spreadsheets in Appendix A.

$PM_{2.5}$ Sizer: The $PM_{2.5}$ sizer was a stainless steel cyclone, capable of separating the $PM_{2.5}$ fraction. The cyclone was manufactured by ESC and met the specifications in Method 210A. The sizer attached directly to an in-stack filter holder.

In-stack filter holder: A stainless steel in-stack filter holder that uses 47mm filters was used. The filter holder attached directly to the end of a conventional Method 5 probe.

Probe Assembly: This assembly includes the glass probe liner, a stainless steel probe sheath, stainless steel S-type Pitot tube and a K-type thermocouple sensor to monitor stack gas temperature. A two-foot stainless steel probe was used for this project. The probe liner was made of glass and was electrically heat traced. A K-type thermocouple temperature is attached to the probe liner exterior surface to monitor the probe temperature. The stainless steel probe sheath houses the glass probe liner. A tube fitting is welded to the front of the sheath to connect the sample nozzle. The S-type Pitot is tack welded to the exterior of the probe sheath. The K-type thermocouple sensor for stack gas temperature is attached to the Pitot tube. The tips of the Pitot tube and the thermocouple sensor were extended to coincide with the tip of the $PM_{2.5}$ sample nozzle.

Note: *To facilitate leak-free operations, all sample train connections from the probe liner to filter assembly and impinger train are made with ball and socket joints equipped with either Viton or Teflon O-rings.*

Control Console: The control console is the heart of the sample system. Components include a rotary vane vacuum pump with valves to draw and control the flow of sample gases through the system. The sample gas passes from the sample pump through a dry gas meter (DGM) that measures the sample volume to an accuracy of 0.001 cubic feet. K-type thermocouples are located on the DGM inlet and outlet to monitor average temperature. A flow orifice is attached to the outlet of the DGM. The console is equipped with a gauge to monitor system vacuum. Two digital temperature controllers are included to maintain probe and sample box temperatures. Double incline oil-filled manometers (0-10" H_2O) are located on the console front panel to indicate the differential pressures from the flow orifice (ΔH) and the Pitot measurement of stack gas velocity head (ΔP). A digital thermocouple readout is located on the panel. Quick-connect connectors are provided for sample and Pitot lines. Connections for the umbilical electrical line and thermocouple inputs are also provided in the front panel.

Barometric pressure was recorded.

In order to maintain a cut size of 2.5 µm in the sizing device, the flow rate through the sizing device was maintained at a constant, discrete value during the run. The calculated orifice head (ΔH) was determined. Data from the nozzle selection tests were used to determine the appropriate nozzle diameter. The dwell time was determined proportionately with the point velocity at each traverse point. Please refer to Appendix A for detailed calculations used. In general, the dwell times were the same for each point because the velocity profiles were flat across the stack.

The particulate testing consisted of 2 sample runs, each sample run consisted of 12 individual traverse points, 6 points for each of the sample ports. Each traverse point was sampled for 10 minutes totaling a run length of 120 minutes. Dwell time calculations were not performed as the velocity profile was flat. The sample train was then assembled with a pre-weighed glass-fiber filter, the probe heat and sample box heaters were engaged and the system allowed to heat up to the set point temperature. A pre-run leak test was then performed with a vacuum up to 20" of mercury (Hg). Leak checks were also performed on the Pitot tube and Combustion gas sample lines. Once all of the leak tests had been successfully completed, the initial DGM reading was recorded. The stack port was opened and the sample train nozzle positioned to the first traverse point. The ΔP reading was recorded and sample flow initiated. Data were recorded for ΔH, sample box temperature, impinger train exit temperature, DGM inlet/outlet temperature and system vacuum. At the conclusion of sample point time the probe was immediately moved to the next point. This procedure was repeated for each successive point along the traverse. At the conclusion of the sample run the sample pump valve was closed and the probe was removed from the stack. The final sample volume was recorded from the DGM. A post-run leak check was performed at a vacuum equal to or greater than the highest vacuum recorded during the run.

Both runs met the Aerodynamic Cut Size (D_{50}) criteria and were, therefore, valid. Please refer to the D_{50} calculation spreadsheets found in Appendix A.

The condensable particulate matter (CPM) was collected in dry impingers the filterable particulate material was collected on filters in the Method 201A sample train (Figure 1).

Once the system had cooled, sample recovery began by disassembling the train. The nozzle, cyclone, probe assembly, and filter assembly were sealed with aluminum foil and removed to a clean location for recovery of the particulate sample.

The probe extension, condenser, and front half of the CPM filter housing were then washed twice with water and the contents were placed in a container

labeled CPM container #1. The probe extension, condenser, and front half of the CPM filter housing were then rinsed once with acetone and twice with methylene chloride ($MeCl_2$). The acetone/$MeCl_2$ rinses were placed in a container labeled CPM container #2. The samples were sealed and transported to the AST lab. The OTM-28 impinger train was sealed and transported to the AST lab.

At the AST lab, the impinger contents were purged with nitrogen to remove dissolved sulfur dioxide gases from the impinger (Figure 2). The impinger train was disassembled and final weights determined for each impinger (to the nearest 0.5 grams). The total grams of water captured was calculated and recorded on the field data sheet.

After transferring the impinger catches to the probe wash sample bottle, each impinger and connecting glassware was rinsed twice with water and the rinses were added to the wash sample (CPM container #1).

The impingers and connecting glassware were then rinsed with acetone, followed by two $MeCl_2$ rinses, and the rinse was added to the field acetone/$MeCl_2$ rinse (CPM container #2).

The cold impinger water (CPM container #4) and silica gel absorbent (CPM container #5) impingers were weighed and the data recorded. Field blanks for acetone, water, and $MeCl_2$ rinses were also collected (CPM containers #6-8).

Each filter sample was recovered from the in stack filter assembly. Using a stainless steel spatula and forceps the filter was removed and placed in a Petri dish labeled with the filter identification number. A camelhair brush was used to remove any loose particulate from the front half of the filter assembly and brushed onto the filter. The labeled Petri dishes were sealed and shipped to the AST laboratory (CPM container #3). Due to the nature of the $PM_{2.5}$ filter holder and in stack process conditions many of the filters were torn and tattered during the recovery process. Great care was taken to recover as many of the pieces as possible; some pieces were noted in the $MeCl_2$ rinses.

At the AST laboratory, the filters from the high temperature portion of the train were weighed with an AND brand electronic analytical balance to the nearest 0.0001 grams. This is reported on the AST spreadsheets as front-half particulate matter. A filter blank was prepared and analyzed by the identical procedures as used for the test samples.

The CPM filter (from the low temperature portion of the train) was folder in quarters and placed in a 50 mL extraction tube with enough deionized ultra-filtered water to cover the filter. The extractor tube was placed in a sonication bath for a minimum of 2 minutes. The aqueous extract was placed in CPM container #1 and the extraction was repeated two more times. (OTM-28, 11.2.1.1)

Next, the filter was covered with sufficient $MeCl_2$ to cover the filter. The extraction tube was placed into the sonication bath for a minimum of 2 minutes and the extract was placed in CPM container #2; this was done three times (OTM-28, 11.2.1.2).

The contents of CPM container #1 were placed into a separatory funnel. Approximately 30 mL of $MeCl_2$ were added, the solution was mixed well, and the lower organic phase was drained off. This was repeated three times; the organic phase from each extraction was combined and added to the organic train rinse in container #2.

The organic phase was placed in a clean glass beaker and evaporated at room temperature and pressure to not less than 10 mL. The contents were quantitatively transferred to a pre-weighed tin and evaporated to dryness. Following evaporation, the organic fraction was desiccated for 24 hours. The sample was weighed at intervals of at least 6 hours to a constant weight and the results recorded on the Condensable Particulate Matter Work Table (Appendix C, Laboratory Data).

The inorganic fraction was transferred to a clean beaker and evaporated to no less than 10 mL liquid on a hot plate and allowed to dray at room temperature. The residue was redissolved in 100 mL of deionized distilled ultra-filtered water. The solution was titrated to neutral with 0.1N ammonium hydroxide. The volume of titrant used was recorded on the Condensable Particulate Matter Work Table.

The inorganic fraction was then evaporated to approximately 10 mL on a hot plate. The contents were quantitatively transferred to a 50-mL pre-weighed tin, evaporated to dryness at room temperature/pressure, and then the residue was desiccated for 24 hours. The tins were weighed at intervals of at least 6 hours to a constant weight and the results reported on the Condensable Particulate Matter Work Table.

7. CALCULATIONS

All calculations were checked by a second party. Hand calculations have been performed to verify the spreadsheet calculations. Please refer to Appendix A for a printout of the spreadsheets and for the example hand calculations.

The major steps and basic principles of the Method 201A equations are as follows:

- Determine the orifice pressure head needed for cyclone flow rate;
- Determine nozzle selection, maximum/minimum velocities and dwell times;

- Correct the sample extraction volume measured by the control console dry gas meter to standard conditions;
- Determine the moisture content of the stack gas from the volume of the water collected in the impinger train and convert to an equivalent volume of water vapor in sample gas;
- Weight the total particulate recovered and divide the result by the corrected sample volume;
- Determine the actual stack velocity based on the Pitot tube readings;
- Determine the stack gas viscosity based on temperature;
- Determine the calculated cyclone flow rate and the PM_{10} flow rate at actual cyclone conditions; and
- Calculate the D_{50} comparison of the corrected sample volume and the corrected stack velocity. This comparison validates that the correct volume of sample gas was extracted at the correct sample rate. This value must be between 9.0 – 11.0 for the run to be valid.

CPM calculations were performed in accordance with OTM-28, Section 12.

8. QUALITY ASSURANCE

To ensure the collection of high quality and accurate data AST strictly adhered to all the U.S. EPA Reference Methods and the *Quality Assurance Handbook for Air Pollution Measurement Systems: Volume III* used during this testing program. In all other aspects of the testing, AST followed its own corporate Quality Program Manual QPM-1, 10/31/97.

AST incorporated several measures to ensure successful, accurate sample collection and analysis. These measures are discussed below.

1) The ESC C-5000 source sampling train and other components used by AST meet or exceed method requirements.
2) AST performed pre and post-run leak tests to ensure sample collection integrity. AST also performed pre and post-test calibrations of the ESC C-5000 dry gas meter
3) A single laboratory blank was performed. A comparison of the tare weight to the final weight was 0.1 mg.

Documentation for all quality control/quality assurance activities for the sample collection is presented in Appendix F, including the PM-2.5 Cyclone Nozzle Set Calibration, and Dry Gas Meter Calibration.

Quality assurance data for the gravimetric analyses of the field and laboratory blanks are presented with the laboratory data in Appendix D.

Appendix A

Emission Results With Example Calculation

Run Number			1	2
Date			11/5/2010	11/5/2010
Run Start Time			1450	1915
DGM Volume	V_m	cubic feet	49.113	48.295
DGM Y Factor	Y	-	1.00	1.00
DGM Average Temperature	T_m	Degrees R	518	510
Barometric Pressure	P_{bar}	Inches Hg	29.88	29.20
Delta H	ΔH	Inches Water	0.66	0.66
Sample Volume at Standard Conditions	V_{mstd}	Standard	50.08	48.88
Total Volume of Water collected	V_{lc}	Milliliters		
Standard Volume of Water	V_{wstd}	Standard Cubic	0.000	0.000
Stack Gas Moisture Content	B_{ws}	-	0.1000	0.1000
Pitot Tube Coefficient	C_p	-	0.84	0.84
Average Pitot differential pressure	ΔP	Inches Water	0.660	0.670
Square Root of Differential Pressure		-	0.812	0.819
Average Stack Gas Temperature	$T_{s(ave)}$	Degrees R	869	865
Measured Stack Pressure	P_g	Inches Water	-0.1	-0.1
Absolute Stack Pressure	P_s	Inches Hg	29.9	29.2
Stack $\%O_2$		%	8.7	8.8
Stack $\%CO_2$		%	11.4	11.7
Stack $\%N_2$ + %CO		%	79.9	79.5
Stack Gas Dry Molecular Weight	M_d		30.2	30.2
Stack Gas Wet Molecular Weight	M_s	lb/lb mole	28.95	29.00
Actual Average Velocity	V_s	ft/sec	58.47	59.41
Stack Diameter		ft	5.00	5.00
Stack Area	A	sq ft	19.63	19.63
Standard Stack Gas Volumetric Flow	Q_{sd}	Standard Dry Cubic Feet/min	37750.3	37656.2
Front Half PM-10		mg	-0.5	2.3
Back Half PM-10		mg	28.1	22.6
Total PM Collected	M_n	mg	27.6	24.9
Particulate Concentration	C_s	gr/scf	0.0085	0.0078
Particulate Emission		lb/hr	2.7493	2.5348

D-50 Calculations

Nozzle Selected

D-50			
Run Number		1	2
DGM Volume	cubic feet	49.113	48.295
DGM Y Factor	-	1.00	1.00
DGM Average Temperature	Degrees R	518	510
Barometric Pressure	Inches Hg	29.88	29.20
Delta H	Inches Water	0.68	0.68
Sample Volume at Standard Conditions (Vmstd)	Standard Cubic Feet	50.078	48.880
Total Volume of Water	Milliliters		
Standard Volume of Water (Vwstd)	Standard Cubic Feet	0.000	0.000
Stack Gas Moisture Content	-	0.1000	0.1000
Average Stack Gas	Degrees R	869	865
Measured Stack	Inches		
Absolute Stack Pressure	Inches Hg	29.88	29.20
Stack Oxygen	%	8.7	8.8
Stack CO2	%	11.4	11.7
Stack N2	%	69.9	69.5
Stack Gas Wet Molecular Weight	lb/lb mole	29.2	29.2
Sample Time	min	120	120
Stack Gas viscosity	**micro poise**	**252.610**	**251.610**
Cyclone flow rate(Qs1)	cubic feet/min	0.6880	0.6840
D50	**µm**	**10.2867**	**10.3360**

Method 201A, Figure 4
PM-2.5 Nozzle Selection

Run		1	2
DGM Average Temperature	Degrees R	518	510
Barometric Pressure	Inches Hg	29.88	29.20
Stack Gas Moisture Content	-	0.1000	0.1000
Pitot Tube Coefficient	-	0.84	0.84
Average Pitot differential pressure	Inches Water	0.660	0.670
Square Root of Differential Pressure	-	0.812	0.819
Average Stack Gas	Degrees R	869	865
Measured Stack Pressure	Inches Water	-0.1	-0.1
Absolute Stack Pressure	Inches Hg	29.873	29.193
Stack Oxygen	%	8.7	8.8
Stack CO2	%	11.4	11.7
Stack N2	%	69.9	69.5
Stack Gas Wet Molecular Weight	lb/lb mole	29.2	29.2
Stack Gas Dry Molecular Weight	lb/lb mole	30.2	30.2
Stack Gas viscosity	micro poise	252.609705	251.610126
Calculated Sample Flow rate (Qs)	cubic feet/min	0.7161	0.7167
Nozzle Diameter	inches	0.196	0.196
Nozzle Velocity (Vn)	ft/sec	56.9627	57.0163
R min	Neg# = use Eq1	0.6673	0.6681
Equation 1 (Rmin LT .5 or imag number)	vmin	28.4814	28.5081
Equation 2	v min	38.0133	38.0918
R max		1.2814	1.2810
Equation 3	v max	85.4441	85.5244
Equation 4	v max	72.9930	73.0401
delta p min	Inches Water	0.2811	0.2776
delta p max	Inches Water	1.0363	1.0206
Run Min Pitot Reading	in. Water	0.45	0.50
Run Maximum Pitot	in, Water	0.75	0.75
Nozzle Diameter	inches	0.196	0.196

UAF
Example Method 5 and Method 201A Calculations
Run 1

Dry Gas Meter (DGM) Volume V_m : 49.113 cubic feet
DGM Y Factor: 1.00
DGM Average Temperature T_m : 518 ° R
Barometric Pressure P_{bar} : 29.88 " Hg
Average Delta H dH: 0.66 " H_2O

Sample Volume at Standard Conditions V_{mstd} (USEPA Method 5 Eq. 5-1)

$V_{mstd} = K_1 V_m Y ((P_{bar} + dH/13.6)/T_m)$

K_1= 17.64 °R/ in. Hg

V_{mstd} = 17.64 °R/ in. Hg * 49.113 ft^3 * 1.00 ((29.88 in Hg + 0.66 " H_2O/13.6)/ 518 ° R)

V_{mstd} = 50.075 Standard Cubic Feet

Moisture Content V_{wstd} (USEPA Method 5)

Total Water Collected in Sample Train: _____ ml

$V_{wstd} = K_2 V_{lc}$ (Eq. 5.2)

Where:

V_{wstd} = Volume of water vapor in the gas sample in standard cubic feet

K_2 = 0.04707 ft^3/ml

V_{lc} = total volume of liquid collect in ml at standard conditions

V_{wstd} = 0.04707 (_____ ml)

V_{wstd} = _____ sft^3

$B_{ws} = V_{wstd}/(V_{mstd} + V_{wstd})$ (Eq. 5-3)

Where:

B_{ws} = Moisture content of the sample gas expressed as a fraction

B_{ws} = _____/(_____ + _____)

B_{ws} = 0.1000 ASSUMED

Average MW (Molecular weight of stack gas (dry basis) M_d

$\%N_2 + \%CO$ = 79.9 % (Method 3, 12.2 (100-$\%O_2$ - $\%CO_2$))

Average MW (M_d) = 0.44($\%CO_2$) + 0.32($\%O_2$) + 0.28($\%N_2$ + %CO) (Method 3, Eq. 3-1)

Average MW (M_d) = *0.44(11.4) + 0.32(8.7) + 0.28(79.9)* = 30.17 lb/lb mole

Average MW (wet basis) M_s

$M_s = M_d(1 - B_{ws}) + 18(B_{ws})$ (Method 2, Eq. 2-6)

$M_s = 30.17\ (1 - 0.1000\ ) + 18(0.1000\ ) =$ 28.95 lb/lb mole

Absolute Stack Pressure:

P_s = Ambient Pressure + Stack Pressure

1 inch H_2O = 0.0736 inches Hg

Measured Stack Pressure = −0.1

P_s = 29.88 " Hg + (−0.1 "H_2O)(.0736)in. Hg/in. H_2O = 29.87 " Hg

Velocity Calculation (40 CFR 60 App. A Method 2)

Average Pitot differential pressure (Δp): 0.66 " H_2O
Average stack temperature (T_s): 869 °R
Measured Stack Static Pressure: −0.1 " H_2O

$V_s = K_p * C_p * \sqrt{(\Delta p)_{av}} * \sqrt{(T_{s(av)}/P_s M_s)}$ (Eq. 2.9)

Where:

V_s = Velocity in Standard Feet per Sec (fps)
K_p = 85.49 ft/s[(lb/lb mole)(in. Hg)/(°R)(in. H_2O)]$^{1/2}$
C_p = Pitot tube coefficient = 0.84 (dimensionless)
Δp = Measured velocity head in inches of H_2O
T_s = Average Stack temperature in °R
P_s = Absolute Stack Pressure in inches of Hg
M_s = Molecular weight of the Stack gas (wet)

P_s = Ambient Pressure + Stack Pressure

1 inch H_2O = 0.0736 inches Hg

P_s = 29.88 " Hg + (−0.1 "H_2O)(.0736)in. Hg/in. H_2O = 29.87 " Hg

V_s = 85.49(.84)($\sqrt{0.66}$)* $\sqrt{(\ 869\ /(29.87 * 28.95))}$ = 58.48 fps

Volumetric Calculation (Method 2)

Stack Diameter: 5 ft
Stack Area: 19.63 ft^2

$Q_{sd} = 60\ (1-B_{ws})V_sA(T_{STD}/T_{s\ av})(P_s/P_{STD})$ (Eq. 2-10)

Where:
Q_{sd} = Dry volumetric stack gas flow rate corrected to standard conditions (dscf/min)
B_{ws} = Volume of water vapor in stack gas (%/100)
V_s = Average velocity (ft/sec)
A = Stack cross sectional area (ft^2)
T_{STD} = 530° R
P_{STD} = 29.92 in Hg

Q_{sd} = 60(1- 0.102)(58.48)(19.63)(530/ 869)(29.87 /29.92) = 37796.6 **dscf/min**

Particulate Concentration

Total PM Collected (M_n) : 27.6 mg

$C_s = ((0.001\ g/mg)(M_n)\ /V_{mstd}$

C_s = 0.001 (27.6)/ 56.075

C_s = 0.000551 g/ft^3

1 g/ft^3 = 15.43 $grains/ft^3$

C_s = 0.0085 $grains/ft^3$

Method 201A Nomenclature

B_{ws} = Moisture fraction of stack, by volume, dimensionless.
C_1 = Viscosity constant, 51.12 micropoise for °K (51.05 micropoise for °R).
C_2 = Viscosity constant, 0.372 micropoise/°K (0.207 micropoise/°R).
C_3 = Viscosity constant, 1.05×10^{-4} micropoise/$°K^2$ (3.24×10^{-5} micropoise/$°R^2$).
C_4 = Viscosity constant, 53.147 micropoise/fraction O_2.
C_5 = Viscosity constant, 74.143 micropoise/fraction H_2O.
D_{50} = Diameter of particles having a 50 percent probability of penetration, µm.
f_{02} = Stack gas fraction O_2 , by volume, dry basis.
K_1 = 0.3858 °K/mm Hg (17.64 °R/in. Hg)
M_w = Wet molecular weight of mixed gas through the PM_{10} cyclone, lb/lb-mole.
M_d = Dry molecular weight of stack gas, lb/lb-mole.
P_{bar} = Barometric pressure at sampling site, mm Hg (in. Hg).
P_s = Absolute stack pressure, mm Hg (in. Hg).
Q_s = Total cyclone flow rate at wet cyclone conditions, m^3 /min (ft^3 /min).
$Q_{s\ (std)}$ = Total cyclone flow rate at standard conditions, dscm/min (dscf/min).

T_m = Average absolute temperature of dry meter, °K (°R).
T_s = Average absolute stack gas temperature, °K (°R).
V_{wstd} = Volume of water vapor in gas sample (standard conditions), scm (scf).
θ = Total sampling time, min.
μ_{cyc} = Viscosity of mixed cyclone gas, micropoise. (also referred to as μ_s within Method 201A)
μ_{std} = Viscosity of standard air, 180.1 micropoise.

Stack Gas Viscosity: (Method 201A, 6.3.4)

$\mu_{cyc} = C_1 + C_2T_s + C_3T_s^2 + C_4f_{O2} - C_5B_{ws}$

$\mu_{cyc} = 51.05 + (0.207)(869) + (3.24 \times 10^{-5})(869)^2 + (53.147)(8.7/100) - (74.143)(0.10)$

$= 252.6$ micro poise

$PM_{2.5}$ Flow Rate at actual cyclone conditions (Method 201A, 6.3.4.1)

$Q_{s1} = (T_s/(K_1P_s))[(V_{m(std)}/\theta) + (V_{wstd}/\theta)]$

$Q_{s1} = (869\ °R/(17.64\ °R/in.\ Hg)(29.87 in Hg))[((50.075 scf)/(120 min)) + ((0 scf)/(120 min))]$

$= 0.688$ scf/min

Calculated Cyclone Flow Rate (Method 201A, Figure 4 Example Worksheet 1)

$Q_{s2} = 0.002837\ \mu_{cyc}(T_s/M_wP_s)^{0.2949}$

$Q_{s2} = 0.002837\ (252.6 micropoise)((869\ °R/(28.95 lb-lbmole)(29.87 in. Hg))^{0.2949}$

$= 0.718\ ft^3/min$

Orifice Pressure Head Needed for Cyclone Flow Rate (Method 201A, Figure 4 Example Worksheet 1)

$\Delta H = [(Q_{s2}(1 - B_{ws})P_s)/T_s]^2[(T_mM_d(1.083)\Delta H\partial)/P_{bar}]$

Where $\Delta H\partial = 1.95$ in. H_2O

$\Delta H = [((0.718 scf-min)(1 - 0.10)(29.87 in. Hg))/869\ °R]^2\ [((869\ °R)(28.95)(1.083)(1.6 in. H_2O))/(29.88 in. Hg)] = 0.720$ in. H_2O

Diameter of Particles having 50% probability of penetration (Method 201A, 6.3.4.3)

$D_{50} = \beta_1(T_s/M_wP_s)^{0.2091}(\mu_{cyc}/Q_s)^{0.7091}$

Where $\beta_1 = 0.027754$ for metric units (0.15625 for English units)

D_{50} = 0.15625((869 °R)/(29.87 lb/lb-mole)(28.95 in. Hg))$^{0.2091}$

((252.6 micro poise)/.688 scf/min))$^{0.7091}$ = 10.30 µm

Nozzle Selection (Method 201A, Figure 4 Example Worksheet 2)

Stack viscosity, μ_s	252.6 micropoise
Absolute stack pressure, P_s	29.87 in. Hg.
Average stack temperature, T_s	869 °R
Cyclone flow rate, Q_{sc}	0.716 scf/min
Nozzle diameter, D_n	0.196 in.
Method 201A pitot coefficient, C_p	0.84

Nozzle Velocity, $v_n = ((3.056)Q_s)/D_n^2$

= ((3.056)(0.716 scf-min))/(.196 in)^2 = 56.96 ft/sec

Maximum and Minimum Velocities:

$R_{min} = 0.2457 + [0.3072 - (((0.2603)(Q_s)^{0.5}(\mu_s))/v_n^{1.5})]^{0.5}$

$R_{min} = 0.2457 + [0.3072 - (((0.2603)(.716 \text{ scf-min})^{0.5}(252.6 \text{ micropoise}))/(56.96 \text{ ft/sec})^{1.5})]^{0.5}$

0.12942

R_{min} = 0.6673

If R_{min} <0.5, or if an imaginary number occurs when calculating R_{min}, use Eq-1 to calculate v_{min}. Otherwise, use Eq-2.

Eq-1 $v_{min} = v_n(0.5)$ = (_____ ft-sec)(0.5) = _____ ft/sec

Eq-2 $v_{min} = v_n R_{min}$ = (56.96 ft-sec)(.6673) = 38.01 ft/sec

$R_{max} = 0.4457 + [0.5690 - (((0.2603)(Q_s)^{0.5}(\mu_s))/v_n^{1.5})]^{0.5}$

$R_{max} = 0.4457 + [0.5690 - (((0.2603)(.716 \text{ scf-min})^{0.5}(252.6 \text{ micropoise}))/(56.96 \text{ in})^{1.5})]^{0.5}$

R_{max} = 1.28

If R_{max} >1.5, use Eq-3 to calculate v_{max}. Otherwise, use Eq-4.

Eq-3 $v_{max} = v_n(1.5)$ = (_____ ft-sec)(1.5) = _____ ft/sec

Eq-4 $v_{max} = v_n R_{max}$ = (56.96 ft-sec)(1.28) = 72.91 ft/sec

Maximum and minimum velocity head values:

$\Delta p_{min} = 1.3686 \times 10^{-4}[(P_s M_w (v_{min})^2)/(T_s C_p^2)$

$\Delta p_{min} = 1.3686 \times 10^{-4}[((29.87 \text{ in. Hg})(28.95 \text{ lb-lbmole})(3801 \text{ ft-sec})^2)/((869 \text{ °R})(0.84^2))$

)/(613.1664)

Δp_{min} = 0.28 in. H_2O

$\Delta p_{max} = 1.3686 \times 10^{-4}[(P_s M_w (v_{max})^2)/(T_s C_p^2)$

$\Delta p_{max} = 1.3686 \times 10^{-4}[((29.87)$ in. Hg)(28.95) lb-lbmole)$(\cancel{3}291$ ft-sec)$^2)/((869$ °R)$(.84^2))$

Δp_{max} = 1.03 in. H_2O

Dwell Time (Method 201A, Example Worksheet 3) Flat Velocity

Total run time, minutes = 120 Same time @ each pt.

Number of traverse points = ~~24~~

$t_1 = (\Delta p'_1/\Delta p'_{avg})^{0.5}$(Total run time/Number of points)

Where:

t_1 = dwell time at first traverse point, minutes.

$\Delta p'_1$ = the velocity head at the first traverse point (from a previous traverse), in H_2O

$\Delta p'_{avg}$ = the square of the average square root of the Δp's (from a previous velocity traverse), in H_2O.

$t_1 = (2.5/3.2)^{0.5}(120/24) = 4.4$ (*East Stack, point one*)

old example

At subsequent traverse points, measure the velocity Δp and calculate the dwell time by using the following equation:

$t_n = (t_1/\Delta p_1^{0.5})(\Delta p_n^{0.5})$, n = 2,3,...total number of sampling points

Where:

t_n = dwell time at traverse point n, minutes.

Δp_n = measured velocity head at point n, in. H_2O

Δp_1 = measured velocity head at point 1, in. H_2O

$t_n = (4.4/2.5^{0.5})(3.2^{0.5}) = 4.98$ (*East Stack, point two*)

Note: Small differences from spreadsheets may be the result of rounding.

Appendix B

Field Data Sheets

Alaska Source Testing Field Data Sheet

Client/Location: UAF		Test Date: 11/5/16	Run #: 1
Test Personnel: HL		Plant Assistance:	
Unit ID:	Equip. Type:	Control Equip:	
Rate:	Fuel:	O2: 8.6/8.7	CO2: 11.6/11.2
Baro: 29.29	Nozzle Diam 1: .196 2: 3:	Stack Press: -.1	Kf: —
Pitot leak	pre 0/0 post	Sample System Leak Check (CFM) pre 0	Vacuum 10"
Pressure	9"	post	Vacuum

Special Notes and Stack Dimensions/port locations: PM2.5 1 hr leak check 568.318 to 568.345

Points/Traverse: 6	Total Points: 12	Minutes/Point: 10	Run Length: 120
Pitot/Probe ID: 6-3	Meter Box ID: M-2	Bell/Filter Number: 1	
Initial Meter Reading: 544.165	Adjustments:	**Final Meter Reading:** 593.305	
Run Start Time: 2:50	Run End Time: 17:02	**Meter Volume:**	

Point	Timer	Meter Reading	Pitot Reading	Delta H	Stack Temp	Dryer Outlet	DGM In	DGM out	Vac	Filter Box/Probe
1	10	548.1	.7	.64	406	—	52	52	1	254/246
2	20	552.6	.72		406	—	52	52	1	245/251
3	30	556.1	.72		406	—	52	52	1	250/251
4	40	560.0	.65		407	—	56	55	1	255/249
5	50	564.0	.65		405	—	58	55	1	254/250
6	60	568.3	.5		409	—	55	58	1	250/251
1	10	572.1	.72		410	—	61	61	1	250/247
2	20	576.1	.75		405	—	62	61	1	250/251
3	30	580.2	.73		402	—	62	62	1	250/251
4	40	584.6	.7		405	—	62	62	1	250/251
5	50	589.6	.6		409	—	62	62	1	250/252
6	60		.45		416		61	61	1	251/252

Assume 10% moisture

flat velocity

AVERAGES 0.66 408 +460= °R 58 +460= °R

Alaska Source Testing Field Data Sheet

Client/Location: UAF		Test Date: 11/5/18	Run #: 2
Test Personnel: FH2		Plant Assistance:	
Unit ID:	Equip. Type:	Control Equip:	
Rate:	Fuel:	O2: 13.7	CO2: 11.7 / 11.6
Baro: 29.20	Nozzle Diam 1: .162: .163:	Stack Press: -, 1	Kf:
Pitot leak	pre 0.0 / post 0.0	Sample System Leak Check (CFM) pre 0	Vacuum 10
Pressure	5" / 8.5"	post 0	Vacuum 5

Special Notes and Stack Dimensions/port locations:

P: 12.5

Points/Traverse: 6	Total Points: 12	Minutes/Point: 10	Run Length: 120
Pitot/Probe ID: S-3	Meter Box ID: M-2	Bell/Filter Number: 1	
Initial Meter Reading: 593.462	Adjustments:	**Final Meter Reading:** 641.757	
Run Start Time: 19:15	Run End Time: 21:25	**Meter Volume:**	

Point	Timer	Meter Reading	Pitot Reading	Delta H	Stack Temp	Dryer Outlet	DGM In	DGM out	Vac	Filter Box/Probe
	10	597.4	.73	.66	400		48	49	1	250/250
	20	601.5	.72		400		48	48	1	—
	30	605.5	.72		401		49	48	1	—
	40	609.6	.65		402		49	48	1	250/250
	50	613.7	.65		402		50	48	1	-
	60	617.8	.5		405		50	49	1	249/250
	10	621.9	.73		407		51	50	1	249/250
	20	626.0	.75		406		52	51	1	—
	30	630.0	.73		407		51	51	1	—
	40	634.1	.62		406		50	50	1	250/250
	50	638.2	.65		409		51	50	1	250/250
	60		.51		405		50	50	1	250/251

Appendix C

Laboratory Data

Calculations for Recovery of Condensable Particulate Matter (CPM)

Plant UAF

Date

Run No. 1 & 2

Sample Preparation - CPM Containers No. 1 and 2 (Section 11.1)

Was significant volume of water lost during transport? Yes or (No)			
If Yes, measure the volume received.			
Estimate the volume lost during transport.			mL
Was significant volume of organic rinse lost during transport? Yes or (No)			
If Yes, measure the volume received.			
Estimate the volume lost during transport.			mL
	RUN 1	RUN 2	
For Titration			
Normality of NH_4OH (N) (Section 10.2)	0.1	0.1	N
Volume of titrant (V_t) (Section 11.2.2.4)	1.5	3.0	mL
Mass of NH_4 added (m_c) (Equation 1) (17.03 x 1.5 x 0.1)	2.55	5.11	mg
For CPM Blank Weights			
Inorganic Train Field Blank Mass (m_{ib}) (Section 9.9)	0	0	mg
Organic Train Field blank Mass (m_{ob}) (Section 9.9)	0	0	mg
Mass of Train Field Blank (M_{fb}) (max. 2 mg) (Equation 2)	0	0	mg
For CPM Train Weights			
Mass of Organic CPM (m_o) (Section 11.2.2.2)	13.1	11.1	mg
Mass of Inorganic CPM (m_i) (Equation 3)	15.0 - 2.55 = 12.45	11.5 - 5.11 = 6.39	mg
Total CPM Mass (m_{cpm}) (Equation 4)	25.55	17.49	mg

Field Train Blank Condensable Particulate Calculations	
Plant	
Date	
Blank No.	
CPM Filter No.	
Water volume added to purge train (V_p)	ml 100
Field Reagent Blank Mass	
Water (Section 11.2.6)	mg 100
Acetone (Section 11.2.5)	mg 100
Methylene Chloride (Section 11.2.7)	mg 100
Field Train Reagent Blank Mass	
Mass of Organic CPM (m_{ob}) (Section 11.2.2.2)	mg 0
Mass of Inorganic CPM (m_{ib}) (Equation 3)	mg 0
Mass of the Field Train Blank (not to exceed 2.0 mg) (Equation 2)	mg 0

Figure 3. Field Train Blank Condensable Particulate Calculations

Other Field Train Sample Condensable Particulate Data	
Plant	
Date	
Run No. 1	
CPM Filter No.	
Water volume added to purge train [max 50 mL] (V_p)	ml 100
Date	
Run No. 2	
CPM Filter No.	
Water volume added to purge train [max 50 mL] (V_p)	ml 100
Date	
Run No.	
CPM Filter No.	
Water volume added to purge train [max 50 mL] (V_p)	0 ml

Figure 4. Other Field Train Sample Condensable Particulate Data

Public Review Draft

Appendix III.D.7.7-582

Field Train Blank Condensable Particulate Calculations	
Plant UAF	
Date 11/5/10	
Blank No. 1	
CPM Filter No. 1c	
Water volume added to purge train (V_p)	ml 0
Field Reagent Blank Mass	
Water (Section 11.2.6)	mg 0
Acetone (Section 11.2.5)	~~mg~~ ml 100
Methylene Chloride (Section 11.2.7)	~~mg~~ ml 100
Field Train Reagent Blank Mass	
Mass of Organic CPM (m_{ob}) (Section 11.2.2.2)	mg 0
Mass of Inorganic CPM (m_{ib}) (Equation 3)	mg 0
Mass of the Field Train Blank (not to exceed 2.0 mg) (Equation 2)	mg 0

Figure 3. Field Train Blank Condensable Particulate Calculations

August 19, 2024

Public Review Draft

Appendix M.D. 7-5-8

Other Field Train Sample Condensable Particulate Data	
Plant UAF	
Date 11/5/10	
Run No. 1	
CPM Filter No. 1a	
Water volume added to purge train [max 50 mL] (V_p)	ml 0
Date 11/5/10	
Run No. 2	
CPM Filter No. 2a	
Water volume added to purge train [max 50 mL] (V_p)	ml 0
Date	
Run No.	
CPM Filter No.	
Water volume added to purge train [max 50 mL] (V_p)	ml

Figure 4. Other Field Train Sample Condensable Particulate Data

August 19, 2024

Alaska Source Testing	Method 5 Acetone Rinse Analysis	11/10/2010
Client: UAF	Analyst: Hudson	

Front Half Analysis

Run #	Filter #	Final Weight	Petri Tare	Filter Tare					Front Half mg
1	914	8.1935	8.0613	0.1327					-0.0005
2	915	8.1258	7.9927	0.1308					0.0023
blank									
blank									

Back Half Analysis

Run #	DCM Tin #	Tare	Final Weight	Organic PM, mg	DCM Tin #	Tare	Final Weight	Inorganic PM, mg	Back Half mg
1	1	1.6543	1.6674	0.0131	3	1.5981	1.6131	0.0150	0.0281
2	2	1.6307	1.6418	0.0111	4	1.6276	1.6391	0.0115	0.0226
blank									
	ck wt	100.0000							
	scale	100.0001							

UAF 2.5 11/10/86

Note weighing in Petri dish

Run	total	Petri tare	F. ter 914
1	8.1935	8.0613	.1327
2	8.1258	7.9927	.1308

Run	Tin	Stack Half tare	wt
1	1	1.6543	1.6674
OR		6307	
2	2	1.6037	1.6413
Not 1	3	1.5981 (1.5 mL)	1.6131
2	4	1.6276 (3.0 mL)	1.6391

OM 28 Ammonium Hydroxide Volume.

Appendix D

Operational Data

Time	Boiler 1 data ID fan speed % 1SI020	Steam flow klb/hr 1FC50	Opacity % 1AI87A	O2 percent % 1AC60A	Coal burned tons/hr 1FQ43HR	Baghouse DP in water 1PDI85
Start Run 1						
02-Nov-10 15:45:00	98.90	51.94	0.66	3.90	4.86	7.58
02-Nov-10 15:46:00	98.90	52.56	0.78	3.99	4.93	7.53
02-Nov-10 15:47:00	98.92	52.39	0.77	3.87	5.00	7.61
02-Nov-10 15:48:00	98.91	52.27	0.71	4.11	5.01	7.69
02-Nov-10 15:49:00	98.90	52.48	0.53	4.17	5.05	7.63
02-Nov-10 15:50:00	98.88	52.26	0.85	3.88	4.85	7.36
02-Nov-10 15:51:00	98.92	52.76	0.74	4.06	4.93	7.30
02-Nov-10 15:52:00	98.90	52.94	0.57	4.03	4.97	7.29
02-Nov-10 15:53:00	98.90	52.93	0.56	4.01	5.11	7.49
02-Nov-10 15:54:00	98.90	52.67	0.77	3.93	5.09	7.66
02-Nov-10 15:55:00	98.89	52.43	1.00	4.11	5.07	7.68
02-Nov-10 15:56:00	98.88	52.78	3.37	4.17	4.90	7.38
02-Nov-10 15:57:00	98.90	52.81	3.31	4.07	5.05	7.21
02-Nov-10 15:58:00	98.90	52.61	2.59	4.25	4.90	7.32
02-Nov-10 15:59:00	98.90	52.59	4.01	4.36	4.88	7.13
02-Nov-10 16:00:00	98.88	52.82	1.02	4.35	4.86	7.03
02-Nov-10 16:01:00	98.89	52.97	0.84	4.28	5.11	6.61
02-Nov-10 16:02:00	98.90	52.79	0.57	4.10	5.09	6.89
02-Nov-10 16:03:00	98.90	52.98	0.66	3.98	5.09	6.93
02-Nov-10 16:04:00	98.90	52.67	0.95	4.22	4.93	6.82
02-Nov-10 16:05:00	98.88	52.47	0.87	4.34	5.12	6.66
02-Nov-10 16:06:00	98.91	52.32	0.39	4.17	5.12	7.33
02-Nov-10 16:07:00	98.88	52.69	0.48	4.15	4.95	7.34
02-Nov-10 16:08:00	98.89	52.79	0.70	4.14	5.04	6.67
02-Nov-10 16:09:00	98.89	52.69	0.45	4.11	5.03	6.80
02-Nov-10 16:10:00	98.90	52.84	0.49	4.18	4.96	6.96
02-Nov-10 16:11:00	98.90	52.54	0.49	4.29	5.05	7.23
02-Nov-10 16:12:00	98.90	52.32	0.63	4.08	5.05	7.63
02-Nov-10 16:13:00	98.90	52.91	0.94	3.98	5.08	7.46
02-Nov-10 16:14:00	98.90	52.91	1.02	4.00	5.09	7.02
02-Nov-10 16:15:00	98.92	52.87	0.74	3.94	4.85	7.31
02-Nov-10 16:16:00	98.90	52.92	0.28	3.84	5.14	7.58
02-Nov-10 16:17:00	98.90	53.00	0.86	4.13	5.12	7.68
02-Nov-10 16:18:00	98.90	53.06	0.70	4.15	5.09	7.72
02-Nov-10 16:19:00	98.90	53.24	0.75	3.86	4.95	7.55
02-Nov-10 16:20:00	98.92	53.29	0.76	4.12	5.11	7.60
02-Nov-10 16:21:00	98.92	53.14	0.47	4.13	4.95	7.54
02-Nov-10 16:22:00	98.91	53.09	0.18	4.03	4.96	7.56
02-Nov-10 16:23:00	98.88	53.11	0.70	3.90	5.14	7.64
02-Nov-10 16:24:00	98.90	53.52	0.59	3.88	5.14	7.61
02-Nov-10 16:25:00	98.90	53.49	0.79	3.62	5.02	7.42
02-Nov-10 16:26:00	98.89	53.00	0.90	3.81	4.98	7.52
02-Nov-10 16:27:00	98.90	53.12	0.46	3.89	4.98	7.56
02-Nov-10 16:28:00	98.90	53.19	0.50	4.06	4.83	7.68
02-Nov-10 16:29:00	98.90	53.01	0.74	3.83	4.86	7.49
02-Nov-10 16:30:00	98.92	52.70	0.89	3.96	4.94	7.63
Stop Run 1 - Ave	**98.90**	**52.80**	**0.91**	**4.05**	**5.01**	**7.36**

Time	Boiler 1 data ID fan speed % 1SI020	Steam flow klb/hr 1FC50	Opacity % 1AI87A	O2 percent % 1AC60A	Coal burned tons/hr 1FQ43HR	Baghouse DP in water 1PDI85

Restart Run 1						
03-Nov-10 09:00:00	98.90	52.12	0.34	4.30	5.15	7.41
03-Nov-10 09:01:00	98.90	52.27	0.47	4.18	5.22	7.40
03-Nov-10 09:02:00	98.90	52.19	4.01	4.14	5.09	7.44
03-Nov-10 09:03:00	98.90	52.25	1.87	4.32	5.16	7.26
03-Nov-10 09:04:00	98.90	52.16	2.22	4.38	5.00	7.11
03-Nov-10 09:05:00	98.90	52.19	1.14	4.22	5.00	7.11
03-Nov-10 09:06:00	98.92	52.21	0.57	4.04	5.14	7.15
03-Nov-10 09:07:00	98.91	52.35	0.54	4.28	5.07	7.16
03-Nov-10 09:08:00	98.90	52.08	0.70	4.20	5.22	7.23
03-Nov-10 09:09:00	98.91	51.67	0.32	4.01	5.26	7.24
03-Nov-10 09:10:00	98.92	51.86	0.43	4.10	5.09	7.34
03-Nov-10 09:11:00	98.91	51.88	0.32	4.09	5.24	7.30
03-Nov-10 09:12:00	98.90	51.81	0.50	4.07	5.23	7.34
03-Nov-10 09:13:00	98.92	51.51	0.74	4.23	5.17	7.37
03-Nov-10 09:14:00	98.90	51.68	3.76	4.21	5.12	7.46
03-Nov-10 09:15:00	98.90	51.73	3.75	4.32	5.04	7.26
03-Nov-10 09:16:00	98.90	51.62	4.28	4.22	5.02	7.00
03-Nov-10 09:17:00	98.90	52.06	0.92	4.31	4.95	6.91
03-Nov-10 09:18:00	98.90	51.79	0.53	4.16	4.95	7.04
03-Nov-10 09:19:00	98.90	51.86	0.73	4.18	5.18	6.97
03-Nov-10 09:20:00	98.90	51.75	0.60	4.30	5.02	7.06
03-Nov-10 09:21:00	98.90	52.19	0.55	4.00	4.93	7.01
03-Nov-10 09:22:00	98.90	52.30	0.44	3.88	5.14	6.88
03-Nov-10 09:23:00	98.90	52.23	0.58	4.12	5.02	7.00
03-Nov-10 09:24:00	98.90	52.19	0.58	4.01	5.28	6.85
03-Nov-10 09:25:00	98.90	52.28	0.47	3.94	5.37	7.12
03-Nov-10 09:26:00	98.90	52.11	0.88	3.94	5.00	6.90
03-Nov-10 09:27:00	98.91	52.07	0.34	3.95	4.95	6.89
03-Nov-10 09:28:00	98.92	51.82	0.31	4.04	5.07	7.12
03-Nov-10 09:29:00	98.90	51.56	0.17	3.60	5.14	6.93
03-Nov-10 09:30:00	98.90	51.81	0.18	3.90	5.15	7.03
03-Nov-10 09:31:00	98.90	52.05	0.30	3.83	5.17	7.29
03-Nov-10 09:32:00	98.90	52.00	0.42	3.73	5.17	7.35
03-Nov-10 09:33:00	98.90	51.57	0.30	3.90	5.07	7.33
03-Nov-10 09:34:00	98.90	51.55	0.31	4.13	5.00	7.31
03-Nov-10 09:35:00	98.90	51.39	0.56	3.95	5.03	7.24
03-Nov-10 09:36:00	98.90	51.66	0.72	3.74	5.08	7.28
03-Nov-10 09:37:00	98.90	51.63	0.40	3.70	5.13	7.25
03-Nov-10 09:38:00	98.90	51.39	0.57	3.74	5.14	7.42
03-Nov-10 09:39:00	98.90	51.84	0.30	3.62	5.06	7.51
03-Nov-10 09:40:00	98.88	51.66	0.15	3.62	5.00	7.38
03-Nov-10 09:41:00	98.90	51.76	0.26	3.57	5.06	7.42
03-Nov-10 09:42:00	98.90	51.94	0.46	3.96	4.95	7.44
03-Nov-10 09:43:00	98.90	51.52	0.33	3.77	4.96	7.48
03-Nov-10 09:44:00	98.90	51.65	0.54	3.81	5.03	7.52
03-Nov-10 09:45:00	98.92	51.27	4.82	3.76	5.05	7.43
End Run 1						
Average	**98.90**	**51.88**	**0.95**	**4.01**	**5.09**	**7.22**

Time	Boiler 1 data ID fan speed % 1SI020	Steam flow klb/hr 1FC50	Opacity % 1AI87A	O2 percent % 1AC60A	Coal burned tons/hr 1FQ43HR	Baghouse DP in water 1PDI85
Start Run 2						
03-Nov-10 11:20:00	98.90	50.87	1.25	4.58	4.78	7.15
03-Nov-10 11:21:00	98.90	50.63	0.32	4.92	5.02	7.23
03-Nov-10 11:22:00	98.90	50.49	0.55	4.91	4.80	7.32

03-Nov-10 11:23:00	98.90	50.57	0.58	4.79	4.77	7.29
03-Nov-10 11:24:00	98.91	50.65	0.62	4.57	4.75	7.21
03-Nov-10 11:25:00	98.92	50.81	0.69	4.58	5.04	7.17
03-Nov-10 11:26:00	98.90	50.83	0.61	4.60	4.88	7.30
03-Nov-10 11:27:00	98.90	50.70	0.83	4.70	4.92	7.38
03-Nov-10 11:28:00	98.90	50.65	0.52	4.71	4.75	7.34
03-Nov-10 11:29:00	98.90	50.71	0.53	4.75	4.75	7.35
03-Nov-10 11:30:00	98.90	50.43	0.88	4.81	4.75	7.35
03-Nov-10 11:31:00	98.90	50.91	0.61	4.68	4.97	7.34
03-Nov-10 11:32:00	98.88	50.63	0.83	4.81	4.85	7.27
03-Nov-10 11:33:00	98.90	50.81	0.13	4.81	4.86	7.33
03-Nov-10 11:34:00	98.90	50.60	0.80	4.56	4.96	7.41
03-Nov-10 11:35:00	98.90	51.26	5.19	4.65	4.97	7.28
03-Nov-10 11:36:00	98.90	50.98	4.64	4.66	5.11	7.06
03-Nov-10 11:37:00	98.90	51.40	4.27	4.64	4.91	7.05
03-Nov-10 11:38:00	98.90	51.15	0.58	4.58	4.95	7.04
03-Nov-10 11:39:00	98.90	51.43	0.37	4.84	4.83	7.02
03-Nov-10 11:40:00	98.90	51.22	0.55	4.75	4.83	7.01
03-Nov-10 11:41:00	98.90	51.52	0.52	4.76	5.14	6.93
03-Nov-10 11:42:00	98.90	51.36	0.58	4.77	4.94	6.97
03-Nov-10 11:43:00	98.90	51.98	0.42	4.45	4.90	7.05
03-Nov-10 11:44:00	98.90	51.53	0.53	3.96	5.33	7.09
03-Nov-10 11:45:00	98.92	51.95	0.75	4.33	5.11	7.16
03-Nov-10 11:46:00	98.90	51.63	0.82	4.40	5.10	7.18
03-Nov-10 11:47:00	98.90	51.80	0.53	4.64	5.02	7.18
03-Nov-10 11:48:00	98.90	51.72	0.56	4.67	4.85	7.33
03-Nov-10 11:49:00	98.90	51.70	0.62	4.54	5.07	7.34
03-Nov-10 11:50:00	98.92	51.99	0.85	4.55	4.86	7.27
03-Nov-10 11:51:00	98.91	52.03	0.54	4.42	4.88	7.16
03-Nov-10 11:52:00	98.92	51.87	0.29	4.41	4.91	7.21
03-Nov-10 11:53:00	98.90	52.52	0.75	4.30	5.05	7.24
03-Nov-10 11:54:00	98.90	52.25	0.83	4.10	4.97	7.20
03-Nov-10 11:55:00	98.90	52.07	0.93	4.26	5.05	7.30
03-Nov-10 11:56:00	98.90	52.15	0.77	4.44	5.05	7.32
03-Nov-10 11:57:00	98.90	51.77	0.77	4.39	5.05	7.27
03-Nov-10 11:58:00	98.90	52.23	0.95	4.46	4.85	7.42
03-Nov-10 11:59:00	98.90	51.47	4.98	4.55	5.04	7.22
03-Nov-10 12:00:00	98.90	51.59	2.85	4.57	4.93	6.94
03-Nov-10 12:01:00	98.90	51.32	3.79	4.70	4.88	6.98
03-Nov-10 12:02:00	98.90	50.55	1.06	4.53	4.85	6.93
03-Nov-10 12:03:00	98.90	51.08	1.01	4.41	4.84	6.94
03-Nov-10 12:04:00	98.90	50.84	0.87	4.71	4.86	6.98
03-Nov-10 12:05:00	98.90	50.77	0.58	4.94	4.82	7.02
03-Nov-10 12:06:00	98.90	50.73	0.79	4.95	4.83	7.27
03-Nov-10 12:07:00	98.90	50.98	0.83	4.84	4.97	7.07
03-Nov-10 12:08:00	98.90	50.94	0.77	4.42	4.97	7.03
03-Nov-10 12:09:00	98.90	50.71	0.84	4.55	4.74	7.00
03-Nov-10 12:10:00	98.90	51.22	0.39	4.39	4.90	7.07
03-Nov-10 12:11:00	98.90	51.35	0.41	4.38	4.90	7.13
03-Nov-10 12:12:00	98.90	50.83	0.92	4.38	4.88	7.16
03-Nov-10 12:13:00	98.92	51.30	0.73	4.39	4.90	7.26
03-Nov-10 12:14:00	98.90	51.08	0.70	4.30	4.91	7.38
03-Nov-10 12:15:00	98.90	51.39	0.61	4.24	4.77	7.22
03-Nov-10 12:16:00	98.90	51.25	0.39	4.26	4.81	7.17
03-Nov-10 12:17:00	98.90	51.32	0.88	4.02	4.95	7.23
03-Nov-10 12:18:00	98.90	51.37	0.96	4.34	4.95	7.25
03-Nov-10 12:19:00	98.92	50.93	0.67	4.60	4.94	7.27

03-Nov-10 12:20:00	98.88	50.44	0.50	4.44	4.91	7.36
03-Nov-10 12:21:00	98.90	51.40	4.46	4.33	5.00	7.34
03-Nov-10 12:22:00	98.90	51.48	4.56	4.38	4.90	7.24
03-Nov-10 12:23:00	98.92	51.37	4.74	4.46	5.05	6.99
03-Nov-10 12:24:00	98.90	51.72	0.90	4.41	5.05	6.90
03-Nov-10 12:25:00	98.90	51.45	0.45	4.58	4.95	6.89
03-Nov-10 12:26:00	98.90	51.45	0.83	4.51	4.90	6.96
03-Nov-10 12:27:00	98.90	51.70	0.95	4.55	4.93	7.04
03-Nov-10 12:28:00	98.91	51.24	0.80	4.63	4.85	7.16
03-Nov-10 12:29:00	98.90	50.91	0.64	4.59	4.86	7.12
03-Nov-10 12:30:00	98.90	51.37	0.95	4.80	4.97	7.09
03-Nov-10 12:31:00	98.90	51.62	0.58	4.78	4.75	7.07
03-Nov-10 12:32:00	98.90	51.71	0.74	4.82	5.12	7.25
03-Nov-10 12:33:00	98.90	51.33	0.95	4.87	4.85	7.40
03-Nov-10 12:34:00	98.92	51.22	1.02	4.77	4.87	7.23
03-Nov-10 12:35:00	98.90	51.56	0.70	4.71	4.89	7.11
03-Nov-10 12:36:00	98.90	52.00	0.53	4.59	4.88	7.06
03-Nov-10 12:37:00	98.90	52.02	0.84	4.43	5.00	7.19
03-Nov-10 12:38:00	98.90	52.23	0.76	4.39	4.95	7.42
03-Nov-10 12:39:00	98.90	52.25	0.66	4.50	4.93	7.34
03-Nov-10 12:40:00	98.90	51.34	0.39	4.69	4.88	7.37
03-Nov-10 12:41:00	98.90	51.63	0.51	4.69	5.02	7.23
03-Nov-10 12:42:00	98.90	51.34	0.78	4.57	4.85	7.33
03-Nov-10 12:43:00	98.90	51.74	0.94	4.62	5.11	7.44
03-Nov-10 12:44:00	98.90	51.55	0.67	4.58	4.82	7.50
03-Nov-10 12:45:00	98.90	51.76	0.81	4.40	4.82	7.21
03-Nov-10 12:46:00	98.90	51.54	1.02	4.49	4.95	7.26
03-Nov-10 12:47:00	98.90	51.69	0.49	4.13	4.90	7.43
03-Nov-10 12:48:00	98.90	51.96	0.53	4.28	5.14	7.51
03-Nov-10 12:49:00	98.90	51.66	0.64	4.20	4.69	7.42
03-Nov-10 12:50:00	98.90	51.62	0.52	4.52	4.88	7.64
03-Nov-10 12:51:00	98.90	52.20	0.65	4.41	4.89	7.54
03-Nov-10 12:52:00	98.90	51.50	0.39	4.31	4.96	7.53
03-Nov-10 12:53:00	98.90	51.68	0.43	4.64	4.93	7.40
03-Nov-10 12:54:00	98.90	51.72	0.46	4.51	4.75	7.42
03-Nov-10 12:55:00	98.90	51.78	0.73	4.54	4.98	7.54
03-Nov-10 12:56:00	98.90	51.36	1.05	4.38	4.97	7.55
03-Nov-10 12:57:00	98.90	51.78	1.02	4.46	4.88	7.34
03-Nov-10 12:58:00	98.92	51.44	0.75	4.47	4.90	7.56
03-Nov-10 12:59:00	98.90	51.41	0.79	4.59	4.81	7.65
03-Nov-10 13:00:00	98.90	51.22	1.20	4.66	4.97	7.85
03-Nov-10 13:01:00	98.91	51.34	1.06	4.61	4.94	7.66
03-Nov-10 13:02:00	98.90	51.28	0.44	4.68	4.91	7.69
03-Nov-10 13:03:00	98.90	51.26	0.65	4.75	4.93	7.71
03-Nov-10 13:04:00	98.90	50.50	0.64	4.67	4.89	7.69
03-Nov-10 13:05:00	98.90	51.39	0.76	4.69	4.82	7.79
03-Nov-10 13:06:00	98.90	51.14	2.34	4.55	4.79	7.69
03-Nov-10 13:07:00	98.90	50.78	0.55	4.54	4.72	7.87
End Run 2 - Ave	**98.90**	**51.36**	**1.02**	**4.55**	**4.92**	**7.27**

Time	Boiler 1 data ID fan speed % 1SI020	Steam flow klb/hr 1FC50	Opacity % 1AI87A	O2 percent % 1AC60A	Coal burned tons/hr 1FQ43HR	Baghouse DP in water 1PDI85
Start Run 3						
03-Nov-10 15:00:00	98.90	50.81	0.88	4.78	4.80	7.14
03-Nov-10 15:01:00	98.90	51.08	0.74	4.59	4.77	7.13
03-Nov-10 15:02:00	98.90	51.33	0.58	4.39	4.75	7.19

03-Nov-10 15:03:00	98.90	51.91	0.63	4.00	4.91	7.32
03-Nov-10 15:04:00	98.90	52.28	0.84	3.74	5.14	7.17
03-Nov-10 15:05:00	98.90	52.10	0.95	3.67	5.17	7.17
03-Nov-10 15:06:00	98.90	52.43	0.78	3.71	5.24	7.27
03-Nov-10 15:07:00	98.90	52.31	1.17	3.69	4.97	7.82
03-Nov-10 15:08:00	98.90	52.06	0.86	3.86	4.97	7.61
03-Nov-10 15:09:00	98.90	50.77	1.05	4.75	5.11	7.64
03-Nov-10 15:10:00	98.90	49.69	1.16	4.46	4.85	7.67
03-Nov-10 15:11:00	98.92	49.48	1.17	2.50	5.27	7.53
03-Nov-10 15:12:00	98.89	48.62	0.98	2.97	5.05	7.69
03-Nov-10 15:13:00	98.89	49.70	0.81	3.38	5.10	7.86
03-Nov-10 15:14:00	98.90	49.15	0.96	3.39	5.16	8.08
03-Nov-10 15:15:00	98.88	49.32	1.02	3.36	5.04	8.13
03-Nov-10 15:16:00	98.91	49.40	0.73	2.37	5.39	8.06
03-Nov-10 15:17:00	98.92	49.51	0.93	1.85	5.18	7.94
03-Nov-10 15:18:00	98.91	51.23	1.17	1.57	5.11	7.72
03-Nov-10 15:19:00	98.92	51.71	0.80	2.72	5.50	8.12
03-Nov-10 15:20:00	98.91	53.03	0.82	2.76	5.33	8.27
03-Nov-10 15:21:00	98.90	53.68	1.30	2.58	5.34	8.36
03-Nov-10 15:22:00	98.92	53.83	0.53	2.78	5.30	8.42
03-Nov-10 15:23:00	98.90	54.23	0.79	2.77	5.18	8.31
03-Nov-10 15:24:00	98.91	53.99	0.90	2.97	4.95	8.57
03-Nov-10 15:25:00	98.92	53.56	1.17	3.37	5.22	8.48
03-Nov-10 15:26:00	98.91	53.37	1.04	3.47	4.85	8.40
03-Nov-10 15:27:00	98.90	53.36	0.64	3.59	5.11	8.51
03-Nov-10 15:28:00	98.90	52.94	1.02	3.73	5.11	8.57
03-Nov-10 15:29:00	98.90	52.76	1.04	3.77	4.90	8.58
03-Nov-10 15:30:00	98.90	53.55	1.02	3.62	5.04	8.67
03-Nov-10 15:31:00	98.90	52.96	1.06	3.56	4.98	8.69
03-Nov-10 15:32:00	98.90	52.88	1.24	3.69	4.94	8.62
03-Nov-10 15:33:00	98.90	53.01	1.00	3.54	5.11	8.57
03-Nov-10 15:34:00	98.91	53.34	0.95	3.21	5.11	8.52
03-Nov-10 15:35:00	98.90	53.36	0.98	3.39	5.12	8.58
03-Nov-10 15:36:00	98.92	53.26	1.13	3.40	5.02	8.57
03-Nov-10 15:37:00	98.90	53.27	1.25	3.41	4.98	8.67
03-Nov-10 15:38:00	98.90	53.27	1.00	3.62	4.88	8.68
03-Nov-10 15:39:00	98.90	52.99	1.10	3.75	4.98	8.68
03-Nov-10 15:40:00	98.92	52.66	0.70	3.99	4.98	8.94
03-Nov-10 15:41:00	98.90	52.81	0.57	4.16	4.82	8.75
03-Nov-10 15:42:00	98.90	52.39	0.77	4.09	4.79	8.77
03-Nov-10 15:43:00	98.90	52.45	1.14	3.71	5.11	8.74
03-Nov-10 15:44:00	98.90	52.85	0.85	3.66	4.90	8.78
03-Nov-10 15:45:00	98.90	52.55	0.72	3.53	4.92	8.76
03-Nov-10 15:46:00	98.90	52.62	0.98	3.53	5.02	8.87
03-Nov-10 15:47:00	98.90	52.72	1.08	3.50	5.02	8.73
03-Nov-10 15:48:00	98.90	52.65	1.21	3.41	5.18	8.80
03-Nov-10 15:49:00	98.90	52.70	1.43	3.66	5.00	8.80
03-Nov-10 15:50:00	98.92	52.67	0.93	3.62	4.99	8.90
03-Nov-10 15:51:00	98.90	52.26	1.00	3.67	4.97	8.94
03-Nov-10 15:52:00	98.90	52.61	0.81	3.79	4.83	9.06
03-Nov-10 15:53:00	98.90	52.37	0.83	3.42	4.98	8.90
03-Nov-10 15:54:00	98.88	52.07	0.79	3.56	4.97	8.90
03-Nov-10 15:55:00	98.90	52.23	0.77	3.84	4.90	8.92
03-Nov-10 15:56:00	98.90	51.79	7.43	3.91	4.90	8.71
03-Nov-10 15:57:00	98.90	52.36	5.32	4.26	4.87	8.33
03-Nov-10 15:58:00	98.90	52.05	5.13	4.21	4.85	8.32
03-Nov-10 15:59:00	98.92	52.39	6.82	4.00	4.93	8.08

03-Nov-10 16:00:00	98.91	52.17	0.77	4.12	4.98	8.22
03-Nov-10 16:01:00	98.90	52.36	0.97	4.15	4.94	8.20
03-Nov-10 16:02:00	98.88	52.34	0.80	4.09	4.88	8.20
03-Nov-10 16:03:00	98.90	52.17	5.57	4.08	5.04	8.06
03-Nov-10 16:04:00	98.90	52.57	3.74	4.11	4.91	7.60
03-Nov-10 16:05:00	98.90	52.22	3.39	4.02	4.86	7.47
03-Nov-10 16:06:00	98.90	52.01	5.60	4.25	5.09	7.46
03-Nov-10 16:07:00	98.91	52.08	3.89	4.58	5.09	7.50
03-Nov-10 16:08:00	98.92	51.73	4.79	4.56	4.72	7.48
03-Nov-10 16:09:00	98.90	51.80	2.84	4.64	4.98	7.44
03-Nov-10 16:10:00	98.90	51.63	3.63	4.84	4.75	7.08
03-Nov-10 16:11:00	98.92	51.27	3.55	4.82	4.81	6.87
03-Nov-10 16:12:00	98.91	51.83	1.37	4.72	4.98	6.84
03-Nov-10 16:13:00	98.90	51.82	0.77	4.68	5.05	6.87
03-Nov-10 16:14:00	98.90	51.21	0.90	4.72	4.78	6.88
03-Nov-10 16:15:00	98.90	51.88	1.09	4.63	4.97	6.87
End Run 3 - Ave	**98.90**	**52.13**	**1.59**	**3.73**	**5.01**	**8.12**

Time	Boiler 2 data ID fan speed % 2SI020	Steam flow klb/hr 2FC50	Opacity % 1AI87A	O2 percent % 2AC60A	Coal burned tons/hr 2FQ43HR	Baghouse DP in water 2PDI85
Run 1						
04-Nov-10 09:05:00	93.34	52.55	1.80	4.15	6.05	7.12
04-Nov-10 09:06:00	93.40	51.69	1.36	4.61	5.29	7.09
04-Nov-10 09:07:00	93.67	53.42	1.23	4.06	5.31	6.90
04-Nov-10 09:08:00	94.36	53.28	1.30	3.73	5.33	7.14
04-Nov-10 09:09:00	94.95	53.55	1.54	3.97	5.45	7.17
04-Nov-10 09:10:00	94.68	53.08	1.55	4.17	5.81	7.19
04-Nov-10 09:11:00	95.56	53.75	1.77	4.15	5.54	7.36
04-Nov-10 09:12:00	95.28	52.95	9.41	4.06	5.41	7.32
04-Nov-10 09:13:00	95.61	52.93	5.65	4.26	5.50	7.27
04-Nov-10 09:14:00	95.00	53.15	5.59	4.21	5.58	7.40
04-Nov-10 09:15:00	96.60	53.25	6.31	3.94	5.33	7.76
04-Nov-10 09:16:00	99.28	53.37	1.65	4.16	5.58	6.70
04-Nov-10 09:17:00	99.33	52.60	1.42	4.28	5.41	7.01
04-Nov-10 09:18:00	99.33	52.82	1.39	4.68	5.41	6.96
04-Nov-10 09:19:00	99.33	53.28	1.48	3.95	5.14	7.00
04-Nov-10 09:20:00	99.31	53.04	1.31	3.82	5.58	7.11
04-Nov-10 09:21:00	99.30	53.55	1.33	4.37	5.54	7.17
04-Nov-10 09:22:00	99.30	53.49	1.46	3.90	5.41	7.10
04-Nov-10 09:23:00	99.31	53.36	1.51	3.50	5.58	7.11
04-Nov-10 09:24:00	99.31	53.38	1.48	3.97	5.54	7.17
04-Nov-10 09:25:00	99.32	53.07	1.11	4.52	5.33	7.23
04-Nov-10 09:26:00	99.31	52.73	1.57	4.17	5.31	7.26
04-Nov-10 09:27:00	99.32	53.11	1.35	4.17	5.45	7.31
04-Nov-10 09:28:00	99.33	53.17	1.39	4.40	5.45	7.27
04-Nov-10 09:29:00	99.33	53.07	1.33	4.15	5.26	7.39
04-Nov-10 09:30:00	99.31	53.63	1.48	3.49	5.63	7.41
04-Nov-10 09:31:00	99.35	53.11	1.55	3.48	5.59	7.33
04-Nov-10 09:32:00	99.33	53.29	1.29	4.11	5.33	7.29
04-Nov-10 09:33:00	99.34	53.56	1.40	3.84	5.33	7.38
04-Nov-10 09:34:00	99.34	53.64	1.45	3.16	5.63	7.34
04-Nov-10 09:35:00	99.33	53.61	1.34	3.40	5.41	7.41
04-Nov-10 09:36:00	99.33	53.48	1.77	3.46	5.41	7.45
04-Nov-10 09:37:00	99.34	53.12	8.00	3.71	5.41	7.44
04-Nov-10 09:38:00	99.34	53.81	5.30	3.72	5.11	7.21
04-Nov-10 09:39:00	99.33	53.04	5.60	3.69	5.71	7.28
04-Nov-10 09:40:00	99.31	53.32	6.95	3.83	5.29	7.26
04-Nov-10 09:41:00	99.35	53.32	5.10	3.76	5.37	7.34
04-Nov-10 09:42:00	99.34	53.13	1.79	3.44	5.22	7.32
04-Nov-10 09:43:00	99.34	53.38	1.47	3.70	5.54	7.34
04-Nov-10 09:44:00	99.33	53.40	1.76	3.56	5.26	7.43
04-Nov-10 09:45:00	99.31	53.32	3.14	3.22	5.71	7.34
04-Nov-10 09:46:00	99.30	53.71	3.56	3.49	5.71	7.13
04-Nov-10 09:47:00	99.30	52.98	2.30	3.92	5.45	7.05
04-Nov-10 09:48:00	99.30	53.78	1.49	3.88	5.41	6.98
04-Nov-10 09:49:00	99.30	53.38	1.70	3.47	5.54	7.10
04-Nov-10 09:50:00	99.30	53.56	1.33	3.12	5.29	7.12
04-Nov-10 09:51:00	99.32	54.05	1.27	3.91	5.54	7.14
04-Nov-10 09:52:00	99.35	53.53	1.31	3.50	5.33	7.08
04-Nov-10 09:53:00	99.30	53.64	1.39	3.28	5.37	7.04
04-Nov-10 09:54:00	99.30	53.63	1.42	3.03	5.58	6.98
04-Nov-10 09:55:00	99.30	52.89	1.58	3.53	5.57	7.17
04-Nov-10 09:56:00	99.30	53.73	1.65	3.23	5.50	7.22
04-Nov-10 09:57:00	99.32	53.50	1.39	2.71	5.67	7.30

Time	Boiler 2 data ID fan speed %	Steam flow klb/hr	Opacity %	O2 percent %	Coal burned tons/hr	Baghouse DP in water
04-Nov-10 09:58:00	99.30	53.28	1.27	3.43	5.37	7.28
04-Nov-10 09:59:00	99.30	53.32	1.16	3.37	5.50	7.37
04-Nov-10 10:00:00	99.33	53.60	1.51	3.46	5.22	7.37
04-Nov-10 10:01:00	99.32	53.28	1.52	3.58	5.50	7.30
04-Nov-10 10:02:00	99.31	53.22	1.44	3.83	6.00	7.29
04-Nov-10 10:03:00	99.34	53.59	1.43	3.55	5.29	7.32
04-Nov-10 10:04:00	99.33	53.45	1.58	3.10	5.35	7.30
04-Nov-10 10:05:00	99.33	53.75	1.50	3.61	5.63	7.35
04-Nov-10 10:06:00	99.32	53.25	1.52	3.55	5.63	7.38
04-Nov-10 10:07:00	99.31	53.76	1.58	3.36	5.14	7.28
04-Nov-10 10:08:00	99.33	53.43	1.68	3.28	5.58	7.42
04-Nov-10 10:09:00	99.31	53.45	8.02	3.17	5.29	7.48
04-Nov-10 10:10:00	99.32	53.41	7.19	3.95	5.50	7.43
End Run 1 - Ave	**98.56**	**53.32**	**2.40**	**3.75**	**5.46**	**7.24**

Time	Boiler 2 data ID fan speed % 2SI020	Steam flow klb/hr 2FC50	Opacity % 1AI87A	O2 percent % 2AC60A	Coal burned tons/hr 2FQ43HR	Baghouse DP in water 2PDI85
Start Run 2						
04-Nov-10 11:30:00	99.32	50.92	9.42	4.50	5.08	7.46
04-Nov-10 11:31:00	99.33	51.12	5.75	4.84	5.04	7.46
04-Nov-10 11:32:00	99.30	51.36	2.42	4.76	4.90	7.45
04-Nov-10 11:33:00	99.30	51.83	1.64	4.43	5.45	7.49
04-Nov-10 11:34:00	99.30	51.96	1.56	3.98	5.29	7.52
04-Nov-10 11:35:00	99.32	51.80	1.68	4.02	5.29	7.60
04-Nov-10 11:36:00	99.30	52.09	1.74	3.65	5.29	7.65
04-Nov-10 11:37:00	99.30	51.88	6.72	3.44	5.11	7.60
04-Nov-10 11:38:00	99.33	52.07	8.02	3.60	5.50	7.34
04-Nov-10 11:39:00	99.31	51.94	6.24	3.07	5.11	7.36
04-Nov-10 11:40:00	99.30	52.01	1.64	2.97	5.19	7.40
04-Nov-10 11:41:00	99.31	52.12	2.03	3.57	5.33	7.50
04-Nov-10 11:42:00	99.32	51.66	3.17	3.81	5.07	7.29
04-Nov-10 11:43:00	99.31	51.73	3.09	4.10	5.08	7.03
04-Nov-10 11:44:00	99.31	52.41	2.71	4.00	5.14	7.10
04-Nov-10 11:45:00	99.30	52.13	1.37	3.54	5.29	7.06
04-Nov-10 11:46:00	99.30	52.05	1.47	3.91	5.45	7.05
04-Nov-10 11:47:00	99.32	52.43	1.59	3.89	5.26	7.12
04-Nov-10 11:48:00	99.31	52.04	1.42	3.09	5.29	7.07
04-Nov-10 11:49:00	99.31	52.17	1.54	3.30	5.18	7.10
04-Nov-10 11:50:00	99.34	51.85	1.39	3.87	5.19	7.14
04-Nov-10 11:51:00	99.34	51.78	1.47	4.05	5.22	7.20
04-Nov-10 11:52:00	99.31	51.36	1.17	3.77	5.11	7.28
04-Nov-10 11:53:00	99.32	51.38	1.34	3.88	5.41	7.27
04-Nov-10 11:54:00	99.35	51.82	1.48	4.25	5.18	7.27
04-Nov-10 11:55:00	99.30	51.58	1.59	3.76	5.24	7.26
04-Nov-10 11:56:00	99.31	51.71	1.55	3.16	5.26	7.26
04-Nov-10 11:57:00	99.33	51.52	1.73	3.77	5.13	7.32
04-Nov-10 11:58:00	99.33	51.86	1.50	4.20	5.11	7.39
04-Nov-10 11:59:00	99.31	52.17	1.49	3.83	5.26	7.43
04-Nov-10 12:00:00	99.33	52.08	1.74	3.67	5.22	7.47
04-Nov-10 12:01:00	99.33	52.20	10.59	3.71	5.37	7.47
04-Nov-10 12:02:00	99.30	52.58	12.42	3.49	5.37	7.38
04-Nov-10 12:03:00	99.34	52.53	11.11	3.36	5.40	7.44
04-Nov-10 12:04:00	99.30	53.13	2.46	3.39	5.41	7.42
04-Nov-10 12:05:00	99.31	52.09	2.21	3.61	5.40	7.48

Time	Boiler 2 data ID fan speed %	Steam flow klb/hr	Opacity %	O2 percent %	Coal burned tons/hr	Baghouse DP in water
04-Nov-10 12:06:00	99.33	51.93	5.82	4.06	5.37	7.63
04-Nov-10 12:07:00	99.33	51.82	4.31	4.15	5.22	7.19
04-Nov-10 12:08:00	99.30	52.36	4.03	4.37	5.29	7.42
04-Nov-10 12:09:00	99.33	51.95	2.97	4.90	4.90	7.07
04-Nov-10 12:10:00	99.30	52.50	1.50	4.75	5.18	7.32
04-Nov-10 12:11:00	99.30	51.88	1.51	4.64	5.00	7.35
04-Nov-10 12:12:00	99.32	51.28	1.30	4.69	5.00	7.21
04-Nov-10 12:13:00	99.33	51.43	1.73	4.74	5.11	7.53
04-Nov-10 12:14:00	99.32	51.71	8.97	4.68	5.18	7.22
04-Nov-10 12:15:00	99.33	51.89	1.42	4.50	5.00	7.23
04-Nov-10 12:16:00	99.35	51.99	1.32	4.56	5.37	7.25
04-Nov-10 12:17:00	99.33	52.02	1.55	4.34	5.07	7.34
04-Nov-10 12:18:00	99.35	51.70	1.61	4.51	5.33	7.34
04-Nov-10 12:19:00	99.31	51.72	1.54	4.42	5.33	6.75
04-Nov-10 12:20:00	99.33	51.70	1.60	4.66	4.90	6.93
04-Nov-10 12:21:00	99.33	51.61	1.42	4.58	5.14	7.68
04-Nov-10 12:22:00	99.30	51.44	1.59	4.33	5.14	7.58
04-Nov-10 12:23:00	99.30	51.55	1.37	4.43	5.21	7.77
04-Nov-10 12:24:00	99.30	51.49	1.66	4.37	5.11	7.69
04-Nov-10 12:25:00	99.33	52.03	1.46	4.25	5.11	7.56
04-Nov-10 12:26:00	99.30	51.67	1.34	4.15	5.15	7.59
04-Nov-10 12:27:00	99.34	51.78	1.31	4.21	5.11	7.65
04-Nov-10 12:28:00	99.35	52.17	1.93	4.06	5.26	8.04
04-Nov-10 12:29:00	99.31	51.78	8.58	4.04	5.04	7.81
04-Nov-10 12:30:00	99.30	52.27	6.50	4.04	5.09	7.23
04-Nov-10 12:31:00	99.31	51.50	7.15	4.04	5.41	7.45
04-Nov-10 12:32:00	99.34	50.93	4.34	4.34	5.41	7.31
04-Nov-10 12:33:00	99.33	51.51	7.98	4.33	4.97	7.72
04-Nov-10 12:34:00	99.33	51.12	9.47	4.33	5.11	7.30
04-Nov-10 12:35:00	99.32	50.90	7.31	4.46	5.26	7.16
04-Nov-10 12:36:00	99.30	51.16	7.90	4.29	5.00	7.11
04-Nov-10 12:37:00	99.30	50.53	10.34	4.40	4.98	7.42
04-Nov-10 12:38:00	99.33	50.63	7.86	4.77	4.94	7.38
04-Nov-10 12:39:00	99.33	50.11	6.50	4.97	4.93	7.56
04-Nov-10 12:40:00	99.35	51.10	6.78	4.72	5.04	7.40
04-Nov-10 12:41:00	99.35	51.20	7.37	4.46	5.07	7.22
04-Nov-10 12:42:00	99.33	50.99	4.14	4.24	5.09	7.51
04-Nov-10 12:43:00	99.35	51.49	3.31	4.50	5.16	7.39
End Run 2 - Ave	**99.32**	**51.73**	**3.77**	**4.12**	**5.18**	**7.37**

Time	Boiler 2 data ID fan speed % 2SI020	Steam flow klb/hr 2FC50	Opacity % 1AI87A	O2 percent % 2AC60A	Coal burned tons/hr 2FQ43HR	Baghouse DP in water 2PDI85
Start Run 3						
04-Nov-10 14:00:00	99.31	51.79	4.73	4.71	5.24	7.19
04-Nov-10 14:01:00	99.34	51.68	5.82	4.32	5.26	7.27
04-Nov-10 14:02:00	99.33	52.15	4.27	4.18	5.29	7.17
04-Nov-10 14:03:00	99.30	51.65	5.15	4.45	5.00	7.67
04-Nov-10 14:04:00	99.32	51.67	11.15	4.75	5.37	7.67
04-Nov-10 14:05:00	99.31	51.84	11.58	4.45	5.07	7.27
04-Nov-10 14:06:00	99.33	51.59	8.44	3.89	5.33	6.95
04-Nov-10 14:07:00	99.30	51.95	1.96	4.37	5.33	6.88
04-Nov-10 14:08:00	99.32	51.53	1.59	5.04	5.11	7.55
04-Nov-10 14:09:00	99.35	51.28	1.75	4.99	5.11	7.68
04-Nov-10 14:10:00	99.33	51.00	1.62	5.02	4.83	7.45

Boiler 2 data

Time	ID fan speed %	Steam flow klb/hr	Opacity %	O2 percent %	Coal burned tons/hr	Baghouse DP in water
04-Nov-10 14:11:00	99.33	51.22	2.42	3.00	5.76	7.51
04-Nov-10 14:12:00	99.31	47.33	2.68	3.88	5.14	7.76
04-Nov-10 14:13:00	99.33	48.67	2.30	2.87	5.16	7.74
04-Nov-10 14:14:00	99.33	49.35	1.91	4.36	5.18	8.17
04-Nov-10 14:15:00	99.31	49.39	1.93	3.05	5.54	7.71
04-Nov-10 14:16:00	99.32	48.57	2.04	1.88	5.54	7.67
04-Nov-10 14:17:00	99.30	51.19	2.08	2.30	5.26	7.83
04-Nov-10 14:18:00	99.31	51.45	1.81	3.98	5.33	8.37
04-Nov-10 14:19:00	99.34	51.66	1.88	3.95	5.41	7.98
04-Nov-10 14:20:00	99.34	51.44	1.93	3.79	5.22	8.19
04-Nov-10 14:21:00	99.34	51.79	1.88	4.05	5.19	8.35
04-Nov-10 14:22:00	99.31	51.31	2.20	4.22	5.11	8.30
04-Nov-10 14:23:00	99.30	51.36	2.36	4.19	4.97	8.36
04-Nov-10 14:24:00	99.31	51.59	2.35	4.27	5.18	8.40
04-Nov-10 14:25:00	99.35	51.55	2.12	4.67	5.04	8.50
04-Nov-10 14:26:00	99.33	50.89	2.18	4.83	5.00	8.57
04-Nov-10 14:27:00	99.32	50.79	2.50	4.79	4.97	8.70
04-Nov-10 14:28:00	99.30	50.30	3.25	4.61	4.83	8.48
04-Nov-10 14:29:00	99.32	50.48	10.80	4.77	5.18	8.35
04-Nov-10 14:30:00	99.31	50.57	10.66	4.88	4.93	8.09
04-Nov-10 14:31:00	99.32	50.46	10.97	5.05	4.97	8.14
04-Nov-10 14:32:00	99.30	50.33	11.43	4.77	4.83	8.30
04-Nov-10 14:33:00	99.34	50.12	9.98	4.47	4.83	8.41
04-Nov-10 14:34:00	99.33	51.16	7.86	4.49	5.18	8.27
04-Nov-10 14:35:00	99.35	50.51	4.75	4.55	4.93	8.10
04-Nov-10 14:36:00	99.33	51.06	5.45	4.55	5.33	7.86
04-Nov-10 14:37:00	99.33	50.99	7.13	4.54	5.11	7.69
04-Nov-10 14:38:00	99.33	51.07	6.26	4.48	5.12	7.87
04-Nov-10 14:39:00	99.33	51.24	6.60	4.57	5.14	7.57
04-Nov-10 14:40:00	99.35	50.70	1.58	4.40	5.14	7.87
04-Nov-10 14:41:00	99.33	50.78	1.53	4.45	5.00	7.95
04-Nov-10 14:42:00	99.35	50.42	1.83	4.31	5.02	7.69
04-Nov-10 14:43:00	99.33	50.99	1.58	4.18	5.22	7.82
04-Nov-10 14:44:00	99.33	50.50	1.63	4.29	5.04	8.14
04-Nov-10 14:45:00	99.34	50.83	2.77	4.60	5.05	8.02
04-Nov-10 14:46:00	99.34	50.63	16.54	4.48	5.11	7.97
04-Nov-10 14:47:00	99.35	51.13	11.01	4.39	5.09	7.86
04-Nov-10 14:48:00	99.33	51.07	11.40	4.32	5.04	7.61
04-Nov-10 14:49:00	99.34	50.73	15.21	4.61	5.29	7.62
04-Nov-10 14:50:00	99.31	50.64	11.03	4.74	4.86	7.61
04-Nov-10 14:51:00	99.32	50.61	1.51	4.39	4.86	7.61
04-Nov-10 14:52:00	99.34	50.64	1.49	4.74	5.14	7.85
04-Nov-10 14:53:00	99.35	50.70	1.50	4.80	5.09	7.63
04-Nov-10 14:54:00	99.33	50.62	1.43	4.68	5.07	7.93
04-Nov-10 14:55:00	99.35	50.73	1.45	4.68	5.12	8.20
04-Nov-10 14:56:00	99.33	50.82	1.10	4.53	5.33	8.14
04-Nov-10 14:57:00	99.34	50.75	1.24	4.53	5.15	8.03
04-Nov-10 14:58:00	99.35	50.44	1.30	4.58	4.97	8.02
04-Nov-10 14:59:00	99.32	50.60	1.51	4.63	5.18	7.89
04-Nov-10 15:00:00	99.31	50.54	1.53	4.52	5.07	7.94
04-Nov-10 15:01:00	99.33	50.31	1.48	4.65	5.07	7.47
04-Nov-10 15:02:00	99.34	50.58	1.38	4.95	4.90	7.95
04-Nov-10 15:03:00	99.33	50.04	1.23	4.99	5.33	8.00
04-Nov-10 15:04:00	99.33	49.96	1.46	4.77	5.33	8.06
04-Nov-10 15:05:00	99.31	50.26	1.55	4.80	4.97	8.12

Boiler 2 data

Time	ID fan speed %	Steam flow klb/hr	Opacity %	O2 percent %	Coal burned tons/hr	Baghouse DP in water
04-Nov-10 15:06:00	99.34	50.45	1.76	4.74	4.97	8.17
04-Nov-10 15:07:00	99.32	50.29	1.54	4.96	5.14	8.00
04-Nov-10 15:08:00	99.30	50.60	1.54	3.81	4.93	8.24
04-Nov-10 15:09:00	99.34	50.47	1.44	3.67	4.93	8.29
04-Nov-10 15:10:00	99.32	50.24	1.60	4.52	5.07	8.22
04-Nov-10 15:11:00	99.35	50.37	1.72	4.65	5.00	7.96
04-Nov-10 15:12:00	99.31	50.17	1.56	4.60	5.26	8.31
04-Nov-10 15:13:00	99.33	50.32	1.62	4.57	5.07	8.50
04-Nov-10 15:14:00	99.33	50.78	7.45	4.49	5.07	8.13
04-Nov-10 15:15:00	99.33	50.60	10.18	4.65	5.07	7.92
04-Nov-10 15:16:00	99.33	50.87	10.43	4.81	5.11	7.84
04-Nov-10 15:17:00	99.32	50.63	11.02	4.31	5.11	7.92
04-Nov-10 15:18:00	99.35	51.32	12.85	4.23	5.14	7.99
04-Nov-10 15:19:00	99.35	51.16	11.62	4.07	5.18	7.93
04-Nov-10 15:20:00	99.33	51.29	5.67	4.33	5.63	7.76
End Run 3 - Ave	**99.33**	**50.76**	**4.56**	**4.39**	**5.13**	**7.93**

UAF Operational Data
PM2.5 Source Test

	Boiler 1 data						Boiler 2 data					
Time	ID fan speed %	Steam flow klb/hr	Opacity %	O2 %	Coal burned tons/hr	Bag house DP in	ID fan speed %	Steam flow klb/hr	Opacity %	O2 %	Coal burned tons/hr	Bag house DP in
05-Nov-10 14:50:00	88.13	45.18	2.60	5.11	4.50	6.77	84.24	45.15	2.60	5.52	4.56	6.87
05-Nov-10 14:51:00	88.43	45.50	2.54	5.02	4.32	6.45	85.14	45.27	2.54	5.00	4.68	7.02
05-Nov-10 14:52:00	88.86	45.33	2.30	4.95	4.35	6.53	85.62	44.95	2.30	4.51	4.80	7.21
05-Nov-10 14:53:00	89.11	45.14	1.07	4.82	4.35	6.35	85.12	44.88	1.07	4.46	4.80	7.16
05-Nov-10 14:54:00	88.37	45.10	1.02	4.98	4.41	6.30	85.00	44.85	1.02	4.79	4.50	7.21
05-Nov-10 14:55:00	87.83	45.01	0.98	5.23	4.42	6.25	84.60	45.29	0.98	4.83	4.61	7.15
05-Nov-10 14:56:00	87.80	44.61	0.80	5.19	4.44	6.15	83.59	45.30	0.80	4.70	4.62	7.04
05-Nov-10 14:57:00	87.70	45.02	1.01	5.19	4.46	6.27	83.54	45.73	1.01	4.99	4.62	7.01
05-Nov-10 14:58:00	87.75	44.49	1.16	5.22	4.26	6.27	84.18	44.97	1.16	5.03	4.74	7.04
05-Nov-10 14:59:00	87.85	44.18	1.24	5.18	4.31	6.30	84.35	44.86	1.24	4.92	4.44	7.11
05-Nov-10 15:00:00	88.29	45.17	0.94	5.10	4.56	6.47	84.03	45.09	0.94	4.92	4.71	7.01
05-Nov-10 15:01:00	88.33	45.58	0.94	5.07	4.56	6.64	84.39	45.15	0.94	5.24	4.71	7.03
05-Nov-10 15:02:00	88.24	44.96	0.91	5.06	4.34	6.38	85.06	45.20	0.91	4.69	4.59	7.21
05-Nov-10 15:03:00	88.13	45.60	1.00	4.77	4.38	6.40	84.99	45.31	1.00	4.77	4.71	7.18
05-Nov-10 15:04:00	88.13	45.26	1.15	4.92	4.69	6.36	84.70	44.76	1.15	5.13	4.71	7.20
05-Nov-10 15:05:00	88.19	44.91	1.17	5.08	4.69	6.25	84.16	44.81	1.17	5.73	4.71	6.93
05-Nov-10 15:06:00	88.09	44.86	0.96	5.02	4.19	6.33	83.96	44.59	0.96	5.21	4.50	7.06
05-Nov-10 15:07:00	87.84	45.30	1.03	4.90	4.51	6.41	84.15	45.27	1.03	5.26	4.53	7.17
05-Nov-10 15:08:00	87.65	45.00	1.06	4.86	4.51	6.47	83.56	44.96	1.06	5.23	4.74	7.17
05-Nov-10 15:09:00	87.74	44.21	2.10	4.92	4.68	6.25	83.83	44.67	2.10	5.09	4.70	6.75
05-Nov-10 15:10:00	88.04	44.98	2.57	5.06	4.24	6.38	83.62	45.14	2.57	5.26	4.61	6.21
05-Nov-10 15:11:00	88.68	45.48	2.40	4.93	4.53	6.59	84.11	45.13	2.40	5.31	4.59	6.24
05-Nov-10 15:12:00	88.89	44.71	1.51	5.00	4.54	6.56	84.23	44.54	1.51	5.58	4.52	6.15
05-Nov-10 15:13:00	88.41	44.67	0.84	4.90	4.57	6.44	84.30	44.92	0.84	5.55	4.68	6.01
05-Nov-10 15:14:00	88.28	45.29	0.78	4.85	4.35	6.64	84.38	45.45	0.78	5.55	4.68	6.10
05-Nov-10 15:15:00	88.60	44.55	0.79	4.86	4.47	6.60	84.35	44.72	0.79	5.62	4.42	5.98
05-Nov-10 15:16:00	87.27	45.25	1.06	4.95	4.43	6.15	84.14	45.34	1.06	5.90	4.53	6.19
05-Nov-10 15:17:00	87.17	45.17	0.90	4.91	4.40	6.25	83.72	45.31	0.90	5.56	4.55	6.41
05-Nov-10 15:18:00	88.11	45.68	0.89	4.72	4.39	6.50	84.18	44.91	0.89	5.43	4.59	6.33
05-Nov-10 15:19:00	88.04	45.48	0.97	4.97	4.53	6.29	83.43	44.62	0.97	5.62	4.53	6.11
05-Nov-10 15:20:00	88.66	45.91	1.06	4.92	4.53	6.54	84.21	45.46	1.06	5.60	4.47	6.14
05-Nov-10 15:21:00	88.63	46.23	1.10	4.77	4.40	6.76	85.08	45.80	1.10	4.96	4.60	6.22
05-Nov-10 15:22:00	89.29	45.71	0.87	4.77	4.66	6.55	85.18	45.96	0.87	4.98	4.65	6.21
05-Nov-10 15:23:00	89.59	45.38	1.03	4.80	4.63	6.71	85.41	45.74	1.03	5.30	4.97	6.26
05-Nov-10 15:24:00	89.57	45.95	0.95	4.78	4.62	6.63	85.93	45.78	0.95	5.16	4.80	6.39
05-Nov-10 15:25:00	89.15	45.73	0.93	4.70	4.47	6.62	85.36	45.52	0.93	4.95	4.44	6.35
05-Nov-10 15:26:00	88.39	45.07	0.94	4.95	4.65	6.47	84.64	45.05	0.94	4.81	4.44	6.31
05-Nov-10 15:27:00	87.87	45.27	0.86	4.84	4.39	6.62	84.42	45.44	0.86	5.22	4.62	6.40
05-Nov-10 15:28:00	88.32	44.89	0.84	4.84	4.26	6.64	84.60	45.57	0.84	5.05	4.59	6.26
05-Nov-10 15:29:00	88.20	45.39	1.02	5.00	4.66	6.30	84.69	45.62	1.02	5.10	4.44	6.28
05-Nov-10 15:30:00	88.05	45.26	1.17	4.84	4.32	6.31	84.60	45.83	1.17	5.15	4.44	6.25
05-Nov-10 15:31:00	88.49	45.19	1.18	4.67	4.72	6.43	85.45	46.37	1.18	4.94	4.86	6.33
05-Nov-10 15:32:00	88.99	45.38	1.11	4.55	4.72	6.51	85.38	46.49	1.11	5.00	4.59	6.42
05-Nov-10 15:33:00	88.93	45.02	0.69	4.86	4.59	6.68	85.34	46.24	0.69	4.93	5.18	6.40
05-Nov-10 15:34:00	88.59	44.93	1.01	4.77	4.56	6.69	85.89	45.91	1.01	5.19	4.79	6.15
05-Nov-10 15:35:00	88.65	45.09	1.01	4.75	4.40	6.99	85.68	45.82	1.01	4.93	4.39	6.15
05-Nov-10 15:36:00	88.16	45.16	1.04	4.88	4.41	6.73	85.24	45.77	1.04	5.08	4.97	6.19
05-Nov-10 15:37:00	88.21	45.34	1.04	5.12	4.48	6.52	85.08	45.78	1.04	5.32	4.50	6.14

UAF Operational Data
PM2.5 Source Test

Time	ID fan speed %	Steam flow klb/hr	Opacity %	O2 %	Coal burned tons/hr	Bag house DP in	ID fan speed %	Steam flow klb/hr	Opacity %	O2 %	Coal burned tons/hr	Bag house DP in
05-Nov-10 15:38:00	88.12	45.41	0.96	4.90	4.40	6.34	85.24	45.94	0.96	5.33	4.80	6.19
05-Nov-10 15:39:00	88.77	45.56	0.92	4.79	4.42	6.72	84.96	45.98	0.92	5.32	4.80	6.20
05-Nov-10 15:40:00	88.57	45.67	1.13	4.84	4.49	6.86	85.21	45.95	1.13	5.22	4.68	6.26
05-Nov-10 15:41:00	88.74	45.22	1.05	4.63	4.80	7.07	84.98	45.40	1.05	5.41	4.65	6.33
05-Nov-10 15:42:00	88.54	45.24	1.12	4.61	4.39	7.03	84.76	45.35	1.12	5.31	4.90	6.37
05-Nov-10 15:43:00	88.88	45.16	1.17	4.72	4.41	6.96	85.00	45.32	1.17	5.40	4.90	6.40
05-Nov-10 15:44:00	88.58	45.43	0.76	4.82	4.49	6.73	85.15	45.60	0.76	5.45	4.53	6.32
05-Nov-10 15:45:00	88.52	45.44	0.88	4.86	4.54	6.83	85.46	45.74	0.88	5.49	4.65	6.52
05-Nov-10 15:46:00	88.56	44.70	1.23	4.60	4.48	6.92	85.60	45.39	1.23	5.00	4.74	6.65
05-Nov-10 15:47:00	87.71	45.05	1.24	4.66	4.54	6.63	85.19	45.70	1.24	5.00	4.65	6.50
05-Nov-10 15:48:00	87.77	45.33	1.24	4.71	4.56	6.63	84.58	46.01	1.24	5.34	4.65	6.44
05-Nov-10 15:49:00	87.35	45.20	0.86	4.54	4.40	6.46	84.71	45.82	0.86	5.23	4.71	6.51
05-Nov-10 15:50:00	88.11	45.30	1.02	4.61	4.53	6.56	84.79	46.15	1.02	4.85	4.68	6.50
05-Nov-10 15:51:00	88.32	45.76	1.11	4.54	4.53	6.90	85.25	46.18	1.11	4.99	4.83	6.63
05-Nov-10 15:52:00	88.79	45.70	1.14	4.56	4.39	7.21	85.23	45.76	1.14	5.28	4.83	6.65
05-Nov-10 15:53:00	88.49	45.01	1.24	4.64	4.60	7.03	85.06	45.05	1.24	4.98	4.68	6.57
05-Nov-10 15:54:00	89.02	45.25	1.48	4.96	4.40	7.06	86.04	45.83	1.48	4.57	4.90	6.74
05-Nov-10 15:55:00	87.67	45.33	0.92	4.77	4.40	7.05	85.86	45.77	0.92	4.80	4.77	6.76
05-Nov-10 15:56:00	87.98	44.80	0.91	4.72	4.40	6.90	85.51	45.46	0.91	4.84	4.86	7.02
05-Nov-10 15:57:00	87.96	44.38	1.04	4.71	4.62	6.78	85.58	45.21	1.04	4.68	4.86	7.01
05-Nov-10 15:58:00	87.08	44.79	1.04	4.89	4.22	6.68	85.16	45.39	1.04	4.61	4.74	6.91
05-Nov-10 15:59:00	87.50	45.49	1.10	4.84	4.22	6.72	84.44	45.71	1.10	4.81	4.62	6.88
05-Nov-10 16:00:00	87.25	44.80	1.25	4.76	4.44	6.74	84.50	45.38	1.25	4.44	4.77	6.93
05-Nov-10 16:01:00	87.27	44.99	1.05	4.58	4.44	6.73	84.85	45.58	1.05	4.41	4.76	6.81
05-Nov-10 16:02:00	87.63	45.04	0.95	4.65	4.45	7.01	85.03	46.11	0.95	4.64	4.74	6.69
05-Nov-10 16:03:00	87.37	45.23	0.89	4.66	4.47	7.06	86.17	46.36	0.89	4.73	4.93	6.66
05-Nov-10 16:04:00	88.05	44.92	1.10	4.89	4.21	7.39	85.97	46.07	1.10	4.59	4.65	6.67
05-Nov-10 16:05:00	88.06	45.04	1.11	4.67	4.71	7.11	86.05	45.90	1.11	4.34	4.83	7.12
05-Nov-10 16:06:00	87.91	45.12	1.27	4.69	4.71	7.05	85.77	45.23	1.27	4.51	4.83	6.83
05-Nov-10 16:07:00	87.99	45.30	1.19	4.83	4.49	6.89	85.40	45.53	1.19	4.36	4.65	7.19
05-Nov-10 16:08:00	87.30	45.57	1.05	4.92	4.35	6.77	85.67	45.96	1.05	4.37	4.62	7.19
05-Nov-10 16:09:00	87.64	46.07	1.04	4.51	4.59	6.87	84.75	46.03	1.04	4.45	4.62	7.22
05-Nov-10 16:10:00	87.65	45.94	1.06	4.52	4.62	6.88	84.81	45.74	1.06	4.72	4.65	7.22
05-Nov-10 16:11:00	87.76	45.35	1.15	4.62	4.69	7.04	84.42	45.85	1.15	4.38	4.66	7.03
05-Nov-10 16:12:00	87.60	45.48	1.24	4.75	4.53	6.94	85.13	46.23	1.24	4.45	4.62	7.28
05-Nov-10 16:13:00	87.89	44.99	1.32	4.68	4.36	6.86	85.42	45.95	1.32	4.39	4.77	7.16
05-Nov-10 16:14:00	87.84	45.54	0.95	4.63	4.36	6.94	85.82	46.52	0.95	4.42	4.75	7.26
05-Nov-10 16:15:00	88.51	45.56	0.95	4.46	4.56	7.05	85.73	46.40	0.95	4.21	4.74	7.31
05-Nov-10 16:16:00	88.71	45.15	1.17	4.45	4.43	7.14	85.92	45.54	1.17	4.09	5.00	7.25
05-Nov-10 16:17:00	88.05	45.45	1.35	4.64	4.48	7.02	85.32	45.50	1.35	4.51	4.74	7.24
05-Nov-10 16:18:00	87.89	45.37	1.45	4.73	4.45	7.04	85.38	45.97	1.45	4.34	4.76	7.25
05-Nov-10 16:19:00	87.32	45.22	1.73	4.83	4.43	6.89	84.79	45.92	1.73	4.31	4.77	7.47
05-Nov-10 16:20:00	87.71	46.17	3.86	4.58	4.33	6.88	84.71	46.08	3.86	4.42	4.62	7.13
05-Nov-10 16:21:00	87.88	45.98	3.97	4.50	4.63	6.88	85.02	46.04	3.97	4.53	4.97	6.87
05-Nov-10 16:22:00	87.60	44.93	3.54	4.71	4.63	6.92	83.93	45.28	3.54	4.49	4.59	6.69
05-Nov-10 16:23:00	87.83	45.49	1.24	4.78	4.46	7.06	84.86	45.98	1.24	4.69	4.80	6.74
05-Nov-10 16:24:00	87.96	45.65	1.34	4.75	4.39	7.01	84.95	46.27	1.34	4.48	4.80	6.78
05-Nov-10 16:25:00	87.93	45.06	1.03	4.72	4.43	7.13	85.31	45.94	1.03	4.34	4.97	6.70
05-Nov-10 16:26:00	88.11	45.52	0.86	4.70	4.43	7.36	86.05	46.43	0.86	4.26	4.83	7.03
05-Nov-10 16:27:00	87.93	45.77	1.29	4.60	4.57	7.26	86.07	46.22	1.29	4.51	4.83	7.15

UAF Operational Data
PM2.5 Source Test

Time	ID fan speed %	Steam flow klb/hr	Opacity %	O2 %	Coal burned tons/hr	Bag house DP in	ID fan speed %	Steam flow klb/hr	Opacity %	O2 %	Coal burned tons/hr	Bag house DP in
05-Nov-10 16:28:00	88.00	45.09	1.16	4.71	4.65	7.19	85.62	45.62	1.16	4.50	4.71	7.13
05-Nov-10 16:29:00	87.19	45.27	1.26	4.81	4.25	6.87	84.55	45.73	1.26	4.35	4.71	6.96
05-Nov-10 16:30:00	87.31	45.82	1.14	4.89	4.25	6.92	84.35	45.69	1.14	4.52	4.74	6.99
05-Nov-10 16:31:00	88.03	45.71	1.36	4.92	4.43	7.12	84.43	46.00	1.36	4.75	4.56	6.76
05-Nov-10 16:32:00	87.58	45.54	2.44	4.92	4.47	6.63	85.05	45.90	2.44	4.63	4.93	6.86
05-Nov-10 16:33:00	87.72	45.59	2.17	4.76	4.66	6.28	85.43	46.18	2.17	4.44	4.77	6.88
05-Nov-10 16:34:00	87.93	45.68	2.47	4.78	4.66	6.32	85.56	46.18	2.47	4.77	4.77	6.88
05-Nov-10 16:35:00	88.38	45.63	1.40	4.82	4.43	6.34	85.43	46.29	1.40	4.97	4.93	6.84
05-Nov-10 16:36:00	88.14	45.52	1.20	4.77	4.69	6.34	85.32	46.29	1.20	4.76	4.84	6.93
05-Nov-10 16:37:00	87.95	45.46	1.10	4.67	4.53	6.44	85.37	45.78	1.10	4.50	4.90	7.01
05-Nov-10 16:38:00	87.95	45.54	0.73	4.65	4.36	6.38	85.25	45.67	0.73	4.86	4.83	7.12
05-Nov-10 16:39:00	87.65	45.68	1.22	4.64	4.65	6.20	85.82	46.76	1.22	4.72	4.65	7.07
05-Nov-10 16:40:00	87.84	46.17	1.25	4.48	4.42	5.93	85.21	46.61	1.25	4.54	4.68	7.08
05-Nov-10 16:41:00	88.03	46.33	1.29	4.64	4.46	6.16	85.05	46.42	1.29	4.82	4.93	7.14
05-Nov-10 16:42:00	88.16	46.49	1.29	4.70	4.59	6.35	85.00	47.04	1.29	4.87	4.80	7.03
05-Nov-10 16:43:00	88.30	46.24	1.04	4.52	4.63	6.34	85.70	47.47	1.04	4.33	4.82	7.15
05-Nov-10 16:44:00	88.65	45.76	1.81	4.61	4.65	6.37	86.23	46.93	1.81	4.36	4.89	7.14
05-Nov-10 16:45:00	88.25	45.10	4.28	4.75	4.64	6.38	85.54	46.21	4.28	4.86	4.84	6.53
05-Nov-10 16:46:00	88.45	45.67	3.00	4.97	4.56	6.43	85.77	46.79	3.00	4.93	4.80	6.41
05-Nov-10 16:47:00	88.21	45.25	1.48	4.96	4.31	6.54	86.38	46.65	1.48	4.72	5.04	6.49
05-Nov-10 16:48:00	88.27	45.48	0.99	4.74	4.47	6.61	86.49	47.01	0.99	4.53	5.04	6.61
05-Nov-10 16:49:00	88.15	45.60	1.16	4.71	4.66	6.56	86.18	46.94	1.16	4.88	4.80	6.71
05-Nov-10 16:50:00	87.66	45.72	1.07	4.76	4.66	6.28	86.38	46.88	1.07	4.72	5.11	6.78
05-Nov-10 16:51:00	87.70	45.49	1.14	4.75	4.60	6.26	85.04	46.13	1.14	4.79	4.80	6.66
05-Nov-10 16:52:00	88.22	45.95	1.05	4.76	4.60	6.39	85.12	46.17	1.05	5.05	4.68	6.71
05-Nov-10 16:53:00	88.20	46.72	1.33	4.74	4.60	6.34	85.11	45.78	1.33	5.42	4.66	6.63
05-Nov-10 16:54:00	88.58	46.83	0.92	4.65	4.61	6.46	85.71	46.21	0.92	4.91	4.59	6.61
05-Nov-10 16:55:00	89.34	46.56	0.76	4.48	4.68	6.64	85.70	45.81	0.76	4.95	4.93	6.60
05-Nov-10 16:56:00	88.74	46.76	0.91	4.45	4.69	6.75	86.14	45.61	0.91	5.03	4.68	6.52
05-Nov-10 16:57:00	89.18	46.95	1.10	4.44	4.67	6.84	85.58	45.63	1.10	5.01	4.80	6.65
05-Nov-10 16:58:00	88.18	47.19	1.07	4.49	4.60	6.53	85.88	45.77	1.07	4.80	4.80	6.80
05-Nov-10 16:59:00	88.72	46.49	1.29	4.15	4.59	6.60	86.07	44.90	1.29	4.71	4.74	6.82
05-Nov-10 17:00:00	88.09	46.96	1.04	4.47	4.71	6.54	85.33	45.62	1.04	5.30	4.90	6.74
05-Nov-10 17:01:00	88.16	46.90	0.72	4.57	4.56	6.49	84.83	45.58	0.72	5.09	4.74	6.71
05-Nov-10 17:02:00	88.10	47.03	0.85	4.68	4.54	6.24	84.96	46.12	0.85	4.77	4.78	6.73
Average	**88.15**	**45.45**	**1.27**	**4.78**	**4.50**	**6.64**	**85.07**	**45.73**	**1.27**	**4.89**	**4.72**	**6.74**

UAF Operational Data
PM2.5 Source Test

Time	ID fan speed %	Steam flow klb/hr	Opacity %	O2 %	Coal burned tons/hr	Bag house DP in	ID fan speed %	Steam flow klb/hr	Opacity %	O2 %	Coal burned tons/hr	Bag house DP in
	Boiler 1 data						Boiler 2 data					
Time	ID fan sp % 1SI020	Steam klb/hr 1FC50	Opacit % 1AI87	O2 pe % 1AC6(	Coal bu tons/hr 1FQ43H	Baghou in water 1PDI85	ID fan sp % 2SI020	Steam klb/hr 2FC50	Opacity % 1AI87A	O2 pe % 2AC6	Coal burr tons/hr 2FQ43HI	Baghouse DP in water 2PDI85
05-Nov-10 19:15:00	87.95	46.20	0.89	4.67	4.57	6.31	83.87	44.77	0.89	4.50	4.47	6.70
05-Nov-10 19:16:00	87.15	46.52	0.91	4.81	4.74	6.39	83.16	44.62	0.91	4.73	4.65	6.69
05-Nov-10 19:17:00	87.86	46.73	1.26	4.50	4.47	6.26	83.78	44.88	1.26	4.65	4.36	6.84
05-Nov-10 19:18:00	87.82	46.30	1.11	4.57	4.78	6.29	83.37	44.85	1.11	4.31	5.29	6.55
05-Nov-10 19:19:00	88.49	46.82	0.82	4.57	4.76	6.44	83.61	44.69	0.82	4.35	4.42	6.63
05-Nov-10 19:20:00	88.97	47.10	0.86	4.20	4.72	6.88	83.22	44.96	0.86	4.43	4.42	6.53
05-Nov-10 19:21:00	88.73	46.67	1.24	4.32	4.54	6.79	84.21	45.40	1.24	4.26	4.83	6.48
05-Nov-10 19:22:00	88.16	46.29	1.23	4.47	4.61	6.63	84.79	45.73	1.23	4.09	4.86	6.72
05-Nov-10 19:23:00	88.66	46.34	0.90	4.58	4.67	6.58	84.25	45.49	0.90	4.46	4.47	6.68
05-Nov-10 19:24:00	89.07	46.26	0.69	4.64	4.68	6.47	84.30	45.46	0.69	4.45	4.48	6.97
05-Nov-10 19:25:00	88.47	46.29	0.87	4.54	4.71	6.42	84.28	45.51	0.87	4.39	4.53	6.71
05-Nov-10 19:26:00	88.13	46.36	1.04	4.59	4.54	6.47	84.61	45.25	1.04	4.39	4.86	6.80
05-Nov-10 19:27:00	88.28	46.27	0.95	4.71	4.59	6.50	83.90	45.08	0.95	4.59	4.56	6.67
05-Nov-10 19:28:00	88.12	46.31	0.85	4.57	4.61	6.49	83.00	45.11	0.85	4.85	4.55	6.66
05-Nov-10 19:29:00	88.10	46.39	0.62	4.55	4.60	6.52	83.62	45.13	0.62	4.68	4.53	6.69
05-Nov-10 19:30:00	88.36	46.43	0.98	4.60	4.74	6.61	83.61	45.05	0.98	4.62	4.68	6.74
05-Nov-10 19:31:00	88.20	46.53	1.20	4.46	4.77	6.60	83.48	44.69	1.20	4.97	4.63	6.64
05-Nov-10 19:32:00	88.18	46.60	1.06	4.44	4.72	6.76	83.56	44.59	1.06	4.94	4.86	6.79
05-Nov-10 19:33:00	88.63	46.72	0.80	4.41	4.69	6.76	84.09	44.77	0.80	4.98	4.86	6.76
05-Nov-10 19:34:00	88.97	46.29	0.83	4.64	4.66	6.92	84.02	44.71	0.83	4.98	4.56	6.96
05-Nov-10 19:35:00	88.05	45.92	1.02	4.69	4.46	6.68	83.53	44.79	1.02	5.11	4.52	6.91
05-Nov-10 19:36:00	87.66	46.09	1.03	4.65	4.41	6.64	83.22	44.64	1.03	5.31	4.50	6.89
05-Nov-10 19:37:00	87.76	45.74	1.01	4.69	4.36	6.50	83.39	44.79	1.01	4.72	4.50	6.92
05-Nov-10 19:38:00	87.80	46.06	0.93	4.62	4.66	6.47	83.13	44.82	0.93	4.96	4.61	6.70
05-Nov-10 19:39:00	87.57	45.86	0.81	4.47	4.59	6.38	82.58	44.57	0.81	4.83	4.56	6.69
05-Nov-10 19:40:00	87.79	45.37	0.84	4.61	4.51	6.59	83.00	44.84	0.84	4.98	4.93	6.75
05-Nov-10 19:41:00	87.96	45.53	0.94	4.74	4.52	6.59	82.89	44.57	0.94	5.09	4.93	6.65
05-Nov-10 19:42:00	88.05	46.03	1.15	4.69	4.53	6.78	83.18	45.11	1.15	5.47	4.53	6.82
05-Nov-10 19:43:00	88.57	46.78	1.07	4.43	4.53	6.81	83.67	45.32	1.07	5.11	4.83	6.88
05-Nov-10 19:44:00	88.55	46.78	0.86	4.36	4.82	6.70	84.23	45.26	0.86	5.00	4.62	7.00
05-Nov-10 19:45:00	88.56	46.68	0.87	4.51	4.81	6.86	83.15	44.94	0.87	5.03	4.60	6.87
05-Nov-10 19:46:00	88.54	46.19	0.80	4.55	4.78	6.84	83.62	44.85	0.80	5.16	4.59	7.09
05-Nov-10 19:47:00	88.67	46.01	1.16	4.70	4.60	6.64	83.50	45.03	1.16	4.94	4.74	7.06
05-Nov-10 19:48:00	88.00	46.03	1.24	4.73	4.57	6.71	83.75	44.73	1.24	4.89	4.42	7.05
05-Nov-10 19:49:00	87.60	46.19	1.04	4.64	4.62	6.71	82.61	44.50	1.04	5.36	4.43	6.83
05-Nov-10 19:50:00	87.92	46.02	0.82	4.64	4.63	6.73	82.81	44.69	0.82	4.95	4.44	6.79
05-Nov-10 19:51:00	88.57	46.19	0.95	4.57	4.43	6.68	83.43	44.95	0.95	4.84	4.44	6.93
05-Nov-10 19:52:00	88.27	46.42	1.02	4.54	4.54	6.88	83.51	44.66	1.02	4.95	4.65	6.93
05-Nov-10 19:53:00	88.33	46.51	1.13	4.54	4.54	7.00	83.37	44.88	1.13	4.99	4.65	6.89
05-Nov-10 19:54:00	88.65	46.72	0.91	4.58	4.78	6.97	84.21	45.48	0.91	4.87	4.90	7.11
05-Nov-10 19:55:00	88.72	46.70	1.00	4.55	4.65	6.93	84.45	45.81	1.00	4.79	4.47	7.24
05-Nov-10 19:56:00	88.92	46.61	0.73	4.54	4.74	7.03	83.56	45.72	0.73	4.94	4.77	7.16
05-Nov-10 19:57:00	88.67	47.51	0.99	4.42	4.54	6.74	84.03	46.56	0.99	5.25	4.75	7.22
05-Nov-10 19:58:00	88.79	47.67	1.11	4.16	4.54	6.88	84.00	46.82	1.11	4.51	4.74	7.23
05-Nov-10 19:59:00	89.02	48.11	1.25	3.89	4.69	6.97	83.57	46.15	1.25	4.68	4.65	7.19

UAF Operational Data
PM2.5 Source Test

Time	ID fan speed %	Steam flow klb/hr	Opacity %	O2 %	Coal burned tons/hr	Bag house DP in	ID fan speed %	Steam flow klb/hr	Opacity %	O2 %	Coal burned tons/hr	Bag house DP in
05-Nov-10 20:00:00	89.21	47.97	1.18	4.01	5.00	6.99	83.45	46.14	1.18	4.94	4.74	7.00
05-Nov-10 20:01:00	89.25	47.18	1.11	4.16	4.72	7.02	83.86	45.99	1.11	4.73	4.76	6.99
05-Nov-10 20:02:00	88.79	47.60	0.81	4.27	4.72	7.10	84.95	45.92	0.81	4.54	4.80	7.15
05-Nov-10 20:03:00	89.51	47.18	0.87	4.45	4.51	7.11	84.14	46.09	0.87	4.54	4.93	6.99
05-Nov-10 20:04:00	88.91	46.71	1.67	4.58	4.77	7.11	84.93	46.39	1.67	4.32	4.59	7.30
05-Nov-10 20:05:00	89.53	47.07	2.46	4.34	4.84	7.34	84.96	46.40	2.46	4.39	4.77	6.72
05-Nov-10 20:06:00	89.07	47.48	3.10	4.16	4.69	6.89	84.77	46.73	3.10	4.49	5.18	6.57
05-Nov-10 20:07:00	88.92	47.56	2.70	4.02	4.71	6.21	84.26	46.41	2.70	4.71	5.18	6.39
05-Nov-10 20:08:00	88.25	47.32	2.00	4.09	4.77	6.18	84.55	46.21	2.00	4.39	4.93	6.47
05-Nov-10 20:09:00	89.16	47.87	1.58	4.16	4.78	6.30	84.11	46.33	1.58	4.48	4.65	6.38
05-Nov-10 20:10:00	89.08	48.04	1.09	4.13	4.77	6.33	83.90	45.81	1.09	4.66	4.67	6.22
05-Nov-10 20:11:00	89.21	47.84	0.69	4.16	4.66	6.34	84.48	46.12	0.69	4.56	4.80	6.28
05-Nov-10 20:12:00	89.22	48.06	0.96	4.08	4.66	6.43	83.97	46.36	0.96	4.33	4.80	6.35
05-Nov-10 20:13:00	89.53	47.83	1.27	4.20	4.83	6.37	84.15	46.07	1.27	4.51	5.00	6.28
05-Nov-10 20:14:00	89.80	47.60	1.04	4.28	4.95	6.53	84.17	45.52	1.04	4.77	4.77	6.31
05-Nov-10 20:15:00	89.25	47.87	0.87	4.20	4.66	6.38	84.62	45.33	0.87	4.62	4.71	6.41
05-Nov-10 20:16:00	89.60	47.97	0.85	4.20	4.63	6.56	84.72	45.79	0.85	4.51	4.68	6.54
05-Nov-10 20:17:00	88.98	47.76	0.58	4.16	4.59	6.50	84.85	45.59	0.58	4.65	4.50	6.51
05-Nov-10 20:18:00	89.19	48.42	1.08	3.96	4.80	6.32	84.34	45.37	1.08	4.55	4.97	6.57
05-Nov-10 20:19:00	89.40	48.41	1.00	4.01	4.88	6.38	83.99	45.60	1.00	4.58	4.74	6.48
05-Nov-10 20:20:00	89.46	47.66	0.81	4.13	4.75	6.36	84.05	45.35	0.81	4.23	4.56	6.43
05-Nov-10 20:21:00	89.34	48.10	0.70	4.18	4.73	6.46	83.45	45.28	0.70	4.67	4.56	6.33
05-Nov-10 20:22:00	89.64	48.14	0.75	4.26	4.71	6.47	84.00	45.24	0.75	4.88	4.80	6.52
05-Nov-10 20:23:00	90.14	47.77	0.84	4.31	4.75	6.90	84.36	45.28	0.84	4.18	4.65	6.42
05-Nov-10 20:24:00	90.13	48.09	1.09	4.29	4.82	6.75	84.53	45.21	1.09	4.66	4.67	6.29
05-Nov-10 20:25:00	89.77	47.91	1.04	4.20	4.71	6.75	84.31	45.30	1.04	4.47	4.68	6.37
05-Nov-10 20:26:00	89.57	47.51	0.82	4.36	4.71	6.54	84.71	45.52	0.82	4.30	4.68	6.43
05-Nov-10 20:27:00	89.40	48.05	0.80	4.29	4.75	6.48	84.29	46.22	0.80	4.28	4.83	6.40
05-Nov-10 20:28:00	89.37	48.10	0.92	4.21	4.57	6.64	84.40	45.34	0.92	4.56	4.76	6.45
05-Nov-10 20:29:00	89.81	48.12	0.98	4.28	4.86	6.66	84.24	45.65	0.98	4.56	4.74	6.68
05-Nov-10 20:30:00	89.09	48.22	1.01	4.27	4.79	6.34	83.93	45.98	1.01	4.04	4.56	6.56
05-Nov-10 20:31:00	89.83	48.27	0.72	4.20	4.72	6.65	84.11	45.79	0.72	3.67	4.74	6.55
05-Nov-10 20:32:00	89.60	48.19	0.70	4.23	4.82	6.52	84.04	45.74	0.70	3.86	4.76	6.50
05-Nov-10 20:33:00	89.00	47.76	0.97	4.36	4.75	6.54	84.80	45.99	0.97	3.60	4.77	6.54
05-Nov-10 20:34:00	90.22	47.77	1.01	4.23	4.57	6.99	84.75	45.99	1.01	3.66	4.77	6.63
05-Nov-10 20:35:00	89.51	47.24	1.03	4.29	4.57	6.83	84.65	45.55	1.03	3.93	4.80	6.69
05-Nov-10 20:36:00	89.47	47.72	0.78	4.34	4.78	6.84	84.79	45.60	0.78	4.30	5.07	6.72
05-Nov-10 20:37:00	89.23	47.86	0.73	4.25	4.66	6.69	85.07	45.81	0.73	3.75	4.68	6.80
05-Nov-10 20:38:00	89.70	47.53	0.88	4.19	4.83	6.83	84.47	45.77	0.88	3.78	4.65	6.77
05-Nov-10 20:39:00	89.29	47.54	1.02	4.40	4.80	6.50	84.31	45.60	1.02	4.60	4.62	6.84
05-Nov-10 20:40:00	88.72	47.80	1.03	4.31	4.75	6.67	83.94	45.57	1.03	4.06	4.59	6.82
05-Nov-10 20:41:00	89.05	47.24	1.00	4.34	4.43	6.80	83.42	45.54	1.00	4.10	4.77	6.65
05-Nov-10 20:42:00	88.10	47.31	0.83	4.41	4.72	6.47	83.64	45.50	0.83	3.82	4.83	6.66
05-Nov-10 20:43:00	89.01	47.23	0.64	4.39	4.72	6.59	83.88	45.43	0.64	4.17	4.83	6.61
05-Nov-10 20:44:00	88.64	47.26	0.70	4.31	4.72	6.74	83.83	45.36	0.70	3.88	4.59	6.76
05-Nov-10 20:45:00	89.50	47.50	0.97	4.28	4.83	6.94	84.40	44.72	0.97	4.02	4.77	6.82
05-Nov-10 20:46:00	89.22	47.14	1.07	4.44	4.71	6.91	83.66	45.22	1.07	4.64	4.70	6.93
05-Nov-10 20:47:00	88.94	47.86	1.07	4.48	4.69	6.91	84.53	45.80	1.07	4.71	4.77	6.86
05-Nov-10 20:48:00	89.47	47.61	0.90	4.37	4.56	6.92	84.16	45.62	0.90	3.74	4.77	7.05
05-Nov-10 20:49:00	88.58	48.07	0.70	4.32	4.56	6.53	84.11	46.09	0.70	3.70	4.77	7.14

UAF Operational Data
PM2.5 Source Test

Time	ID fan speed %	Steam flow klb/hr	Opacity %	O2 %	Coal burned tons/hr	Bag house DP in	ID fan speed %	Steam flow klb/hr	Opacity %	O2 %	Coal burned tons/hr	Bag house DP in
05-Nov-10 20:50:00	88.83	47.73	0.96	4.36	4.88	6.79	84.57	45.64	0.96	4.35	4.68	7.24
05-Nov-10 20:51:00	89.05	47.40	1.08	4.54	4.66	6.73	84.85	45.70	1.08	4.11	4.70	7.04
05-Nov-10 20:52:00	88.86	47.20	1.11	4.47	4.64	6.38	85.03	45.64	1.11	3.97	4.71	7.11
05-Nov-10 20:53:00	88.68	47.29	0.97	4.43	4.63	6.72	85.23	45.17	0.97	4.29	4.77	7.03
05-Nov-10 20:54:00	88.86	47.67	0.80	4.27	4.65	6.79	85.87	45.48	0.80	4.48	4.59	7.00
05-Nov-10 20:55:00	89.47	47.40	0.79	4.24	4.65	6.92	86.38	45.69	0.79	4.65	4.65	7.21
05-Nov-10 20:56:00	89.33	47.12	2.68	4.32	4.72	7.05	86.47	45.65	2.68	4.59	4.70	7.22
05-Nov-10 20:57:00	89.57	47.67	5.10	4.35	4.76	6.89	85.90	45.27	5.10	4.89	4.71	6.97
05-Nov-10 20:58:00	88.97	47.84	5.59	4.26	4.78	6.88	85.94	45.56	5.59	4.77	4.86	6.86
05-Nov-10 20:59:00	89.05	47.87	1.46	4.21	4.74	6.69	86.00	45.89	1.46	4.16	4.90	6.88
05-Nov-10 21:00:00	88.68	47.91	1.05	4.23	4.64	6.84	85.62	45.66	1.05	4.84	4.71	6.83
05-Nov-10 21:01:00	88.73	47.35	0.95	4.26	4.62	6.97	85.24	45.63	0.95	5.20	4.69	6.92
05-Nov-10 21:02:00	89.13	47.06	0.87	4.25	4.62	6.41	85.59	45.80	0.87	5.19	4.61	6.90
05-Nov-10 21:03:00	88.95	47.30	0.92	4.04	4.71	6.84	85.40	45.99	0.92	4.61	4.56	6.82
05-Nov-10 21:04:00	88.80	47.43	0.95	4.16	4.69	6.98	86.06	45.96	0.95	4.79	4.77	6.89
05-Nov-10 21:05:00	89.31	47.52	1.14	4.11	4.74	7.06	86.19	45.83	1.14	4.62	4.73	6.88
05-Nov-10 21:06:00	89.13	47.49	1.18	4.16	4.62	7.15	86.87	45.86	1.18	4.47	4.68	7.02
05-Nov-10 21:07:00	88.68	47.61	0.85	4.27	4.62	7.02	87.15	45.58	0.85	4.83	4.71	7.16
05-Nov-10 21:08:00	88.82	47.24	0.87	4.39	4.67	7.18	86.58	45.37	0.87	5.22	4.73	7.09
05-Nov-10 21:09:00	88.22	47.48	1.04	4.43	4.72	7.04	86.32	45.52	1.04	5.16	4.68	7.15
05-Nov-10 21:10:00	88.34	47.16	0.63	4.61	4.73	6.91	86.07	45.61	0.63	5.12	4.68	7.26
05-Nov-10 21:11:00	88.63	47.38	0.66	4.66	4.75	6.98	85.85	45.66	0.66	5.42	4.68	7.18
05-Nov-10 21:12:00	88.24	47.43	0.90	4.32	4.60	6.94	85.31	45.98	0.90	5.30	4.56	7.08
05-Nov-10 21:13:00	88.83	47.26	0.99	4.35	4.63	7.04	86.09	45.93	0.99	5.31	4.83	7.16
05-Nov-10 21:14:00	88.51	46.94	0.95	4.34	4.62	7.09	86.06	45.97	0.95	5.10	4.83	7.09
05-Nov-10 21:15:00	88.62	47.13	0.74	4.46	4.61	7.26	86.64	45.70	0.74	5.64	4.56	7.15
05-Nov-10 21:16:00	88.24	47.20	0.65	4.35	4.59	7.28	87.10	45.60	0.65	5.33	4.80	7.31
05-Nov-10 21:17:00	88.46	47.03	4.99	4.24	4.63	7.01	87.16	45.32	4.99	5.14	4.59	6.85
05-Nov-10 21:18:00	88.32	47.01	4.90	4.44	4.86	6.72	87.19	45.31	4.90	5.15	4.66	6.65
05-Nov-10 21:19:00	87.78	46.74	4.14	4.48	4.54	6.36	86.45	45.13	4.14	5.44	4.74	6.66
05-Nov-10 21:20:00	88.39	46.66	1.11	4.43	4.54	6.26	86.35	45.15	1.11	5.40	4.77	6.73
05-Nov-10 21:21:00	87.97	47.00	0.83	4.52	4.44	5.82	86.62	45.70	0.83	5.33	4.50	6.76
05-Nov-10 21:22:00	88.08	46.94	0.90	4.25	4.74	5.98	85.50	45.55	0.90	5.47	4.74	6.68
05-Nov-10 21:23:00	88.10	46.93	1.05	4.21	4.72	6.13	85.52	44.95	1.05	5.30	4.73	6.52
05-Nov-10 21:24:00	88.27	46.72	0.93	4.37	4.69	6.10	85.96	45.58	0.93	5.37	4.65	6.38
05-Nov-10 21:25:00	87.65	46.91	0.92	4.37	4.46	6.09	86.36	45.76	0.92	5.33	4.68	6.49
Average	**88.77**	**47.16**	**1.17**	**4.37**	**4.67**	**6.68**	**84.54**	**45.48**	**1.17**	**4.66**	**4.70**	**6.79**

Appendix E

Quality Assurance Data

Public Review Draft

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 readings in outlined boxes below, other columns are automatically calculated.

DATE: 9/30/2010
METER PART #:
METER SERIAL #: M2
CRITICAL ORIFICE SET SERIAL #:

BAROMETRIC PRESSURE (in Hg):	INITIAL	FINAL	AVG (P_{bar})
	29.39	29.39	29.39

IF Y VARIATION EXCEEDS 2.00%, ORIFICE SHOULD BE RECALIBRATED

ORIFICE #	RUN #	K' FACTOR (AVG)	TESTED VACUUM (in Hg)	DGM READINGS (FT^3) INITIAL	DGM READINGS (FT^3) FINAL	DGM READINGS (FT^3) NET (V_m)	TEMPERATURES °F AMBIENT	DGM INLET INITIAL	DGM INLET FINAL	DGM OUTLET INITIAL	DGM OUTLET FINAL	DGM AVG	ELAPSED TIME (MIN) θ	DGM ΔH (in H_2O)	(1) V_m (STD)	(2) V_{cr} (STD)	(3) Y	Y VARIATION (%)	$\Delta H_@$
	1	0.4208	20	573.678	581.820	8.142	59	59	63	59	63	61	15	0.87	8.1245	8.1454	1.0026		1.6596
	2	0.4208	20	581.820	587.288	5.468	60	63	65	63	64	63.75	10	0.87	5.4276	5.4250	0.9995		1.6628
	3	0.4208	20	587.288	593.309	6.021	61	64	66	63	64	64.25	11	0.87	5.9708	5.9618	0.9985		1.6660
																AVG =	1.0002	-0.09	
	1	0.5032	20	593.309	599.829	6.520	61	64	68	63	65	65	10	1.2	6.4617	6.4811	1.0030		1.6070
	2	0.5032	20	599.829	608.328	8.499	62	68	70	65	66	67.25	13	1.2	8.3870	8.4174	1.0036		1.6100
	3	0.5032	20	608.328	614.891	6.563	62	70	72	66	67	68.75	10	1.2	6.4581	6.4749	1.0026		1.6100
																AVG =	1.0031	0.19	
	1	0.6384	20	614.891	622.397	7.506	63	70	73	72	69	71	9	2.1	7.3713	7.3861	1.0020		1.7539
23	2	0.6384	20	622.397	628.246	5.849	63	73	75	69	70	71.75	7	2.2	5.7373	5.7447	1.0013		1.8374
	3	0.6384	20	628.246	634.130	5.884	63	75	75	70	70	72.5	7	2.1	5.7621	5.7447	0.9970		1.7539
																AVG =	1.0001	-0.10	

Appendix III.D.7.7-605

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.

AVERAGE DRY GAS METER CALIBRATION FACTOR, Y = 1.0011

AVERAGE $\Delta H_@$ = 1.6845

(1) $V_m\,(std) = K_1\, V_m \dfrac{P_{bar} + (\Delta H/13.6)}{T_m}$ = Net volume of gas sample passed through DGM, corrected to standard conditions

K_1 = 17.64 °R/in. Hg (English), 0.3858 °K/mm Hg (Metric)

T_m = Absolute DGM avg. temperature (°R - English, °K - Metric)

(2) $V_{cr}\,(std) = K' \sqrt{\dfrac{P_{bar}\,\theta}{T_{amb}}}$ = 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

(3) $Y = \dfrac{V_{cr}\,(std)}{V_m\,(std)}$ = DGM calibration factor

$\Delta H_@ = \left(\dfrac{0.75\,\theta}{V_{cr}(std)}\right)^2 \Delta H$

August 19, 2024