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February 9, 2015

SUBMITTED ELECTRONICALLY

Director, Air Enforcement Division
Office of Civil Enforcement (2242A)
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Washington, DC 20004

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U.S. EPA, Region 5
77 West Jackson Blvd. (C-14J)
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Re: **United States, et.al. v. BP products North America Inc.**
Northern District of Indiana, Hammond Division
Civil Action No. 2:12 CV 207
Part VIII and Benzene Waste NESHAP Semi-Annual Report

NO EPA ACTION REQUIRED: Information is being submitted for information purposes only.

In accordance with Part VIII and ¶ 62 of the referenced Consent Decree, attached is the semi-annual report. The report is certified pursuant to ¶ 102.

I certify under penalty of law that this information was prepared under my direction or supervision by personnel qualified to properly gather and evaluate the information submitted. Based on my directions and after reasonable inquiry of the person(s) directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete.

If you require additional information, please contact Linda Wilson at (219) 473-3287.

Sincerely,

Jorge Lanza
Refinery Manager
BP Whiting Refinery

Attachment

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9G12

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Part VIII and Benzene Waste NESHAP Report
BP Whiting Refinery

INTRODUCTION

The purpose of this document is to fulfill the Part VIII and ¶ 62 semi-annual reporting requirements of the BP Whiting 2012 Consent Decree. The reporting period covered by this report is limited to the period between July 1 – December 31, 2014.

REPORT OUTLINE

The format of this report follows a process where Paragraphs from the Consent Decree which include reporting requirements for the Whiting Refinery are quoted in a text box, followed by a statement of applicability and reporting as appropriate.

The report has been divided into two sections. The first section fulfills the reporting requirements of Part VIII of the Consent Decree, and the latter section fulfills the benzene waste NESHAP reporting requirements outlined in ¶ 62 of the Consent Decree.

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Section I: Semi-Annual Part VIII Report

Reporting and Recordkeeping – CD ¶ 98
On or before February 15 and August 15 each year, BPP shall submit to EPA and IDEM a semi-annual report as provided in this Part. Each semi-annual report shall contain the following information for the previous six month period (*i.e.*, January to June to be addressed in the report to be submitted by August 15, and July to December to be addressed in the report submitted by February 15).

A detailed response, meeting the Part VIII reporting requirements delineated in ¶ 98 are outlined in the section below.

Summary of Emissions – CD ¶ 98.a.
…… For the period covered by the report, a summary of the emissions data for the Whiting Refinery that is specifically required by the reporting requirements of the Consent Decree for the period covered by the report.

This requirement is not due in this reporting period. Consent Decree ¶ 99 specifically states this reporting is due in the semi-annual report to be submitted by August 15 of each calendar year.

NOx emissions for each heater and boiler > 40 mmBtu/hr – CD ¶ 99.a.
…… NOx emissions in tons per year for each heater and boiler greater than 40 mmBTU/hr maximum fired duty.

This requirement is not due in this reporting period. Consent Decree ¶ 99 specifically states this reporting is due in the semi-annual report to be submitted by August 15 of each calendar year.

Sum of NOx emissions for all heaters and boilers < 40 mmBtu/hr – CD ¶ 99.b.
…… NOx emissions in tons per year as a sum for all heaters and boilers less than 40 mmBTU/hr maximum fired duty.

This requirement is not due in this reporting period. Consent Decree ¶ 99 specifically states this reporting is due in the semi-annual report to be submitted by August 15 of each calendar year.

SO2, CO and PM emissions for all heaters and boilers – CD ¶ 99.c.
…… SO_2, CO and PM emissions in tons per year as a sum for all heaters and boilers.

This requirement is not due in this reporting period. Consent Decree ¶ 99 specifically states this reporting is due in the semi-annual report to be submitted by August 15 of each calendar year.

SO2 Emissions from the Sulfur Recovery Plant– CD ¶ 99.d.
…… SO_2 emissions from the Sulfur Recovery Plant in tons per year.

This requirement is not due in this reporting period. Consent Decree ¶ 99 specifically states this reporting is due in the semi-annual report to be submitted by August 15 of each calendar year.

SO2 emissions from all Acid Gas Flaring and Tail Gas Incidents by flare – CD ¶ 99.e.
…… SO_2 emissions from all Acid Gas Flaring and Tail Gas Incidents by flare in tons per year.

This requirement is not due in this reporting period. Consent Decree ¶ 99 specifically states this reporting is due in the semi-annual report to be submitted by August 15 of each calendar year.

NOx, SO2, PM and CO emissions for all other units – CD ¶ 99.f.
…… NOx, SO_2, PM and CO emissions in tons per year as a sum for all other emissions units for which emissions information is required to be included in the facilities' annual emissions summaries and that are not identified above.

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This requirement is not due in this reporting period. Consent Decree ¶ 99 specifically states this reporting is due in the semi-annual report to be submitted by August 15 of each calendar year.

NOx, SO2, CO and PM emissions for each FCCU – CD ¶ 99.g.
…… NOx, SO_2, CO and PM emissions in tons per year for each FCCU.

This requirement is not due in this reporting period. Consent Decree ¶ 99 specifically states this reporting is due in the semi-annual report to be submitted by August 15 of each calendar year.

Emissions from Covered Flares and the LPG Flare – CD ¶ 99.h.
…… Emissions from Covered Flares and the LPG Flare as specified in Paragraph 73 of Appendix D.

This requirement is not due in this reporting period. Consent Decree ¶ 99 specifically states this reporting is due in the semi-annual report to be submitted by August 15 of each calendar year.

Basis for the emissions estimate – CD ¶ 99.i.
…… For each of the estimates or calculations in Subparagraphs 99.a through 99.h above, the basis for the emissions estimate or calculation (*i.e.*, stack tests, CEMS, emission factor, etc.).

This requirement is not due in this reporting period. Consent Decree ¶ 99 specifically states this reporting is due in the semi-annual report to be submitted by August 15 of each calendar year.

Description of any problems – CD ¶ 98.b.
…… A description of any problems that have occurred or are anticipated with respect to meeting the requirements of this Consent Decree at the Whiting Refinery.

There have been no significant problems in meeting the requirements of this Consent Decree for this reporting period, and, at the present time, no such problems are anticipated.

Description of Supplemental Environmental Project – CD ¶ 98.c.
…… A description of the Supplemental Environmental Project and implementation activity in accordance with this Consent Decree.

The Fence Line Monitoring Supplemental Environmental Project (SEP) update includes the following:
Summary of implementation activity - All four monitoring shelter locations were identified with input from the Community Advisory Committee (CAC) on July 2, 2012 as well as the U.S. EPA on August 16, 2012. A Quality Assurance Project Plan (QAPP) was completed and submitted on December 20, 2012, pursuant to Appendix E of the Consent Decree. The four fixed point monitoring

stations were operational and the website was populated and activated on May 5, 2014. The website has continually been populated with weekly monitoring data during this reporting period (July 1, 2014 to December 31, 2014). Required quarterly CEMS reports and QA/QC data summaries have also been uploaded to the web site.

Monitoring Instrument/Equipment Downtime – CD ¶ 98.d.
…… The information specified in Paragraph 72 of Appendix D ("Monitoring Instrument/Equipment Downtime; Override of ACS; and Emissions Exceedances")

BPP's response to CD App.D.72.a. – 72.h for information pertaining to Monitoring Instrument/Equipment Downtime; Override of ACS; and Emissions Exceedances for this reporting period are below.

Downtime of each monitoring instrument for the Covered Flare and the LPG Flare – CD App.D.72.a.
…… BPP shall provide a summary of the following, per Covered Flare and the LPG Flare per calendar quarter…… The total number of hours of downtime of each monitoring instrument/equipment expressed as both an absolute number and a percentage of time the Covered Flare and the LPG Flare that the instrument/equipment monitors is available for operation.

The availability of the equipment required pursuant to App. D, Paragraphs 7 through 9, and 11 through 13, expressed as an absolute number and percentage of time for the third and fourth quarter are listed in Appendix 1.

Identification of the periods of downtime by date, time, cause for downtime > 110 hours per calendar quarter – CD App.D.72.b.
…… BPP shall provide a summary of the following, per Covered Flare and the LPG Flare per calendar quarter…… If the total number of hours of downtime of any monitoring instrument/equipment exceeds 110 hours in any calendar quarter, an identification of the periods of downtime by date, time, cause (including malfunction or maintenance), and, if the cause is asserted to be a Malfunction, the corrective action taken.

The downtime listed for Appendix D.72.a greater than 110 hours is included in Appendix 1. The only downtime greater than 110 hours in any quarter happened in Quarter 4 on the GOHT Flare steam flow meter. The steam flowmeter suffered a total of 290.25 downtime hours in Quarter 4 as a result of a flowmeter malfunction. The original steam flowmeter suffered a malfunction when condensate damaged some of the electronics in the Control Module enclosure, causing the flow readings to go to zero. Because the proper equipment was not immediately available, the damaged electronics were replaced on December 15, 2014 and flow readings were restored. The investigation of the root cause and appropriate corrective actions are ongoing. If additional corrective actions are identified, they will be included in the next semi-annual report.

The VRU Flare Vent Gas temperature analyzer suffered greater than 110 hours of "pegged" data (i.e., temperature analyzer reading at the maximum of the analyzer range), however this time was not counted as downtime as the data was still being recorded in accordance with CD requirements.

Number of hours when the Automatic Control System was overridden – CD App.D.72.c.
…… BPP shall provide a summary of the following, per Covered Flare and the LPG Flare per calendar quarter…… The total number of hours in which BPP overrode the Automatic Control

System expressed as both an absolute number of hours and a percentage of time the Covered Flare and the LPG Flare was available for operation.

A full summary of the Automatic Control System override time for each flare is provided in Appendix 1. The LPG Flare was not overridden for any time, for any reason, during its operation.

Identification of the periods of downtime by date, time, and cause for override time > 110 hours per calendar quarter – CD App.D.72.d.
…… BPP shall provide a summary of the following, per Covered Flare and the LPG Flare per calendar quarter…… If the reason for the override was not one of the exceptions set forth in Paragraphs 31 or 45 or if the total number of hours in which the Automatic Control System was overrode exceeds 110 hours in any calendar quarter, an identification of the periods of override by the date, time, duration, reason for the override, and corrective actions taken

No flare was placed in manual override for greater than 110 hours in the third or fourth quarters of 2014. All manual override events met conditions set forth in Paragraphs 31 or 45.

Number of hours when only Pilot Gas or Purge Gas was vented – CD App.D.72.e.
…… BPP shall provide a summary of the following, per Covered Flare and the LPG Flare per calendar quarter…… The total number of hours in which the only gas or gases being vented was/were Pilot Gas and/or Purge Gas, expressed as both an absolute number of hours and a percentage of time the Covered Flare and/or the LPG Flare was available for operation.

Appendix 1 includes a table listing the total operating time as well as the hours when only pilot and purge were vented to the each flare.

Number of hours of exceedances of the applicable standards during Hours of Applicability – CD App.D.72.f.
…… BPP shall provide a summary of the following, per Covered Flare and the LPG Flare per calendar quarter…… During the Hours of Applicability, the total number of hours of exceedances of the standards expressed as both an absolute number of hours and a percentage of time the Covered Flare and the LPG Flare was available for operation; provided however, that if the exceedance of these standards was less than 110 hours in the calendar quarter and was due to one or more of the exceptions set forth in Paragraph 51, the report shall so note.

The standards in Paragraphs 33.b, 34.a, 34.b, and 36 were not effective during this reporting period. The requirement in Paragraph 45 was not exceeded for more than 110 hours in the third and fourth quarters of 2014.

Identification of each averaging period that exceeded the standard during the Hours of Applicability – CD App.D.72.g.
…… BPP shall provide a summary of the following, per Covered Flare and the LPG Flare per calendar quarter…… During the Hours of Applicability, if the exceedance of the standards was not due to one of the exceptions in Paragraph 51, or if the exceedance was due to one or more of the exceptions in Paragraph 51 but the total number of hours caused by the exceptions in Paragraph 51 was greater than 110, an identification of each averaging period that exceeded the standard, by time

and date; the cause of the exceedance (including startup, shutdown, maintenance, or Malfunction), and if the cause is asserted to be a Malfunction, an explanation and any corrective actions taken.

The standards in Paragraphs 33.b, 34.a, 34.b, and 36 were not effective during this reporting period. The requirements of Paragraph 45 were applicable during the reporting period, but were not exceeded for more than 110 hours in either the third or fourth quarters of 2014.

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Flaring Limitations Exceedances – CD App.D.72.h.
…… BPP shall provide a summary of the following, per Covered Flare and the LPG Flare per calendar quarter…… Flaring Limitations Exceedances

The flaring limitations in Paragraphs 26 and 27 were not in effect during this reporting period.

Additional matters – CD ¶ 98.e.
…… Any additional matters as BPP believes should be brought to the attention of EPA and IDEM

BPP submitted a letter to USEPA on July 15, 2014, discussing issues arising under the Whiting Consent Decree. BPP and EPA are actively working to resolve issues brought to EPA's attention.

Additional items required by the Consent Decree – CD ¶ 98.f.
…… Any additional items required by any other Paragraph of this Consent Decree to be submitted with a semi-annual report.

Other additional items required by the Consent Decree to be submitted for this reporting period, including information from Consent Decree Paragraphs 42(a), 48(c), 52, 67, 69(c)(ii), 75, 91, 100, 101, Appendix B.38(c), Appendix D.3, Appendix D.20, Appendix D.35(a), Appendix D.42(d), Appendix D.43, Appendix D.49(c), Appendix D.57, and Appendix D.73, can be found below.

Fuel Gas Total Sulfur Monitor Location – CD ¶ 42.a.
…… If BPP changes the location of any of [the fuel gas total sulfur] monitors, BPP shall notify EPA and submit a revised Appendix A showing the new locations in the next report required by Part VIII.

BPP was required to install the fuel gas total sulfur analyzers by December 31, 2013. BPP did not make any changes to the location of any analyzer during the period covered by this report.

CEMS Operation and Maintenance Plan – CD ¶ 43.
…… BPP shall develop and submit for the EPA review a comprehensive CEMS Operation and Maintenance Plan ("CEMS O&M Plan" or "Plan") for the Whiting Refinery that is designed to enhance the performance of CEMS components, improve CEMS accuracy and stability, and minimize periods of CEMS downtime.

BPP submitted the first CEMS O&M Plan in accordance with the timeline stated in CD ¶ 43. After updating several sections of the Plan, to account for shutdown equipment and better define the CEMS training program, a revised Plan has been attached in Appendix 5d.

CEMS Root Cause Failure Analysis – CD ¶ 48.c.
……For any CEMS having a downtime greater than 5% of the total time for each of two consecutive calendar quarters, BPP shall conduct a CEMS Root Cause Failure Analysis and develop a corrective action plan to promptly address the findings of the CEMS Root Cause Failure Analysis. …The findings of the CEMS Root Cause Failure Analysis and corrective action plan, including a schedule for implementation, shall be submitted to EPA in a written report included with the first semi-annual report required by Part VIII of the Consent Decree following completion of the Root Cause Failure Analysis.

No CEMS had downtime greater than 5% for two consecutive calendar quarters during the time period of July 1, 2014 to December 31, 2014.

The CO analyzer at Coker 2 F-201 heater appeared to indicate CO emissions for the first half of 2014 that were suspiciously high. An investigation into this matter determined that the periods of high CO concentrations were invalid data due to a non-monitor malfunction related to the configuration of the programmable logic controller (PLC) responsible for the logging and storage of the data from the CO CEMS stack analyzer. Upon further review of the invalid CO data during the 1st and 2nd Quarter of 2014, the Coker 2 F-201 CO analyzer did register greater than 5% downtime during 1st and 2nd Quarter. The Root Cause Failure Analysis (RCFA) for the CEMS is attached in Appendix 4 of this Semiannual Report. For further details, please refer to Appendix 5.c of this Semiannual Report.

Dual Carbon Canister CD ¶ 52.a.i
a. Dual Carbon Canisters/Beds.
i. Except as provided for in sub-paragraph 52.b, by no later than 12 months after the Date of Entry of the Consent Decree, BPP shall install primary and secondary carbon canisters and operate them in series (the "dual-canister" option). BPP may comply with the requirements of the dual canister option required under this sub-paragraph by using a single canister with a "dual carbon bed" if the dual carbon bed configuration allows for breakthrough monitoring between the primary and secondary beds in accordance with this sub-paragraph."

The project to fulfill this requirement was completed by November 5, 2013.

Dual Carbon Canisters – CD ¶ 52.a.ii.
……BPP shall include in its semi-annual report a list of all canisters or beds which BPP has designated as unsafe to monitor during the reporting period.

The unsafe to monitor canisters during the reporting period are provided in Appendix 10.b.

Single Carbon Canisters – CD ¶ 52.b.ii.
…… BPP shall include in its semi-annual report a list of all canisters or beds which BPP has designated as unsafe to monitor during the reporting period.

The unsafe to monitor canisters are identified in Appendix 10.b.

Single Carbon Canister Replacement – CD ¶ 52.b.iv.
…… BPP shall notify EPA of such replacement in its next semi-annual report submitted pursuant to Part VIII of the Consent Decree.

There were no replacements of single carbon canisters in this reporting period.

Alternate Control/Treatment Devices for BWON – CD ¶ 52.c.
…… If BPP elects to use another control technology, BPP shall submit written notification to EPA in its next semi-annual report submitted pursuant to Part VIII of the Consent Decree providing both the location where such other control technology shall be used instead of or in addition to carbon adsorption and a description of the other technology to be used.

BPP did not elect to use an alternative control technology instead of or in addition to carbon adsorption during this reporting period.

SRP O&M Plan Modifications – CD ¶ 67.c.
…… BPP may make reasonable modifications to the SRP O&M Plan submitted under this Paragraph, provided that BPP provides EPA with a copy of the modification in its next semi-annual report submitted pursuant to Part VIII of the Consent Decree.

The SRP O&M Plan was not modified during the reporting period.

SRP Sulfur Storage Tanks – CD ¶ 69.c.
…… For a period of one year commencing from the first use of each molten sulfur storage tank, BPP shall monitor on a continuous basis and report to EPA on a semi-annual basis the duration of all relief valve releases from each molten sulfur storage tank.

No relief valve release from Tk-316 this reporting period.

Note: One year commencing from the first use of each molten sulfur storage tank ended on June 27, 2014 for Tk-315 and on July 12, 2014 for Tk-316.

All reporting requirements have been completed.

FLIR Monitoring Inspections and Corrective Actions – CD ¶ 75.
…… If imaging indicates emissions inconsistent with well-maintained floating roof tanks, seals, fittings, or welds, BPP shall inspect and, if necessary, repair the leaks consistent with the underlying Federal, State or local regulations applicable to the tank(s). BPP will report the results of these inspections and any corrective actions required during the next semi-annual Part VIII report.

Following are the inspection results for the tanks identified in Paragraph 75 with the corresponding corrective actions taken:

Tank	Inspection Date	Inspection Results	Corrective Actions
TK-5052	December 2, 2014.	No leaks observed from the roof support legs, hatches, or rim seals. Leaks from 5 of the 8 vacuum breakers were observed.	The leaking vacuum breakers identified by the FLIR camera were repaired on January 13, 2015.
TK-101	December 4, 2014.	No leaks observed from tank roof and related vent systems	N/A
TK-102	December 4, 2014.	No leaks observed from tank roof and related vent systems	N/A
TK-103	December 4, 2014.	No leaks observed from tank roof and related vent systems	N/A
TK-104	December 4, 2014.	No leaks observed from tank roof and related vent systems	N/A
TK-3559	Not In Service		
TK-3560	Not In Service		
TK-6254	November 14, 2014.	No leaks observed from the tank roof. Emissions observed from the one roof vent.	Adjusted nitrogen purge rate/pressure set point, blower suction, and discharge velocity. Consulted with third party tank expert. Iron sponge reliability improvements and tank operation improvements ongoing.

SEP Implementation Progress – CD ¶ 91.
…… the report required by Paragraph 98.c. for the period in which the SEP is completed shall contain the following information with respect to the SEP ("SEP Completion Report"): a detailed description of the SEP as implemented, a description of any problems encountered in completing the SEP and the solutions thereto, an itemized list of all eligible SEP costs expended, certification that the SEP has been fully implemented pursuant to the provisions of this Decree, and a description of the environmental and public health benefits resulting from implementation of the SEP (with a quantification of the benefits and pollutant reductions, if feasible)
(a) a detailed description of the SEP as implemented;
(b) a description of any problems encountered in completed the SEP and the solutions thereto;
(c) an itemized list of all eligible SEP costs expended;
(d) certification that the SEP has been fully implemented pursuant to the provisions of this Decree; and
(e) a description of the environmental and public health benefits resulting from implementations of the SEP (with a quantification of the benefits and pollutant reductions, if feasible).

The Fence Line Monitoring SEP will be completed after two years of monitoring data has been collected. The SEP will be deemed completed in May 2016.

Emissions limit exceedance for units monitored by CEMS – CD ¶ 100.a.
…… BPP will provide a summary of all exceedances.…. For operating unit emissions limits that are required by this Consent Decree and monitored with CEMS, for each CEMS.

Appendix 5.a and Appendix 5.b include the 3rd and 4th Quarter 2014 CEM Summary Performance Report submitted to IDEM, respectively. These reports include all the information required by CD ¶ 100.a.i. – ¶ 100.a.v.

BP is submitting a revised version of the 1st and 2nd Quarter 2014 CEMS Summary Performance Reports which were included in Appendix 4.a and Appendix 4.b of the Semiannual Report submitted on August 14, 2014 and is included in this Semiannual Report as Appendix 5.c. The reports are being updated as a result of the investigation into the suspiciously high carbon monoxide (CO) readings from the Coker 2 heaters F-201, F-202, and F-203 CEMS. For further detail, please see Appendix 5.c. This appendix includes the 1st and 2nd Quarter 2014 CEMS Summary Performance Reports submitted to IDEM, respectively. These reports include all the information required by CD ¶ 100.a.i. – ¶ 100.a.v.

Emissions limit exceedance for units monitored by stack testing – CD ¶ 100.b.
…… BPP will provide a summary of all exceedances.…. For any exceedance of an emissions limit required by this Consent Decree from an operating unit monitored through stack testing.

There were no emission limit exceedances from units required under the Consent Decree to be monitored by stack testing during this reporting period.

Results of performance testing on both FCCU units – CD ¶ 101.a.
…… BPP shall include in each semi-annual report required by this Part VIII the results of all testing of FCU 500 and FCU 600 required by Paragraph 21 ("FCCU Performance Testing").

The results of the FCCU 500 Performance Testing are included in Appendix 6.a, 6.b and 6.e. The FCCU 600 Performance Testing results from this reporting period are included in Appendix 6.c and 6.d.

Copies of all reports required by NSPS Ja – CD ¶ 101.b.
…… BPP shall include in each semi-annual report copies of all applicable reports required by 40 C.F.R. § 60.108a for the previous 6-month period.

BPP has included all the information required by NSPS Ja in the CEM Summary Performance Reports included in Appendix 5.a and Appendix 5.b of this semi-annual report.

Copies to Citizen-Intervenors of all reports of emission testing– CD ¶ 101.c.
…… Concurrent with submission to EPA, BPP shall submit copies to Citizen-Intervenors of all reports of emissions testing required by this Paragraph.

BPP is submitting copies of emissions testing (Appendices 6.a through 6.e) to Citizen-Intervenors concurrent with the submission of this semi-annual report.

Commercial Unavailability of Low-Leaking Valve or Packing Technology – CD App.B.38(c)
…… BPP shall prepare a written report fully explaining the basis for each claim that a valve or valve packing is not commercially available, to include all relevant documentation and other information supporting the claim. Such report shall also identify the commercially-available valve or packing technology that comes closest to meeting the requirements for a Certified Low-Leaking Valve or Certified Low-Leaking Valve Packing Technology that is selected and installed by BPP pursuant to Paragraph 19 of this Appendix. Such report shall be included in the Semi-Annual Report required by Section VIII of the Consent Decree, for the period in which the valve or valve packing is replaced...

The commercial unavailability of low-leaking valve or packing technology is included in Appendix 7. BPP has identified three (3) valves in hydrocarbon service that are considered commercially unavailable, pursuant to Appendix B Paragraph 20.a.

Minimizing Sweep and Purge Gas Flow – CD App.D.3
…… Based on the results of the survey, by no later than one year after the Date of Entry, BPP shall complete the implementation of all measures necessary to minimize the amount of Sweep Gas and Purge Gas being directed to each Covered Flare. If the implementation of any such measure takes longer than one year after the Date of Entry, BPP shall complete the implementation as soon as practicable and shall provide a schedule for such completion in the first semi-annual report under Section VIII of this Decree that is due after one year after the Date of Entry..

BPP has completed the implementation of all measures necessary to minimize the amount of Sweep Gas and Purge Gas being directed to each Covered Flare. This was detailed in the Semiannual Report which was submitted on February 14, 2014.

Waste Gas Minimization Plan – CD App.D.20.
…… In the first semi-annual report required under Part VIII that is due after June 30, 2017, BPP shall submit a Second Updated WGMP. On an annual basis thereafter until termination of the Decree, BPP shall submit an updated WGMP as part of the applicable semi-annual report...

This reporting requirement was not effective during this reporting period.

Prohibition on Discontinuous Wake Dominated Flow or Requirement for Minimum MFR – CD App.D.35.a
…… By no later than December 31, 2014, for all Covered Flares, BPP shall comply with either Subparagraph 35.b. or 35.c. In the first semi-annual report due after the applicable compliance date, BPP shall identify which compliance option it selects for each Covered Flare.

This reporting requirement was not effective during this reporting period.

Starting January 1, 2015, BPP will comply with the requirements under Subparagraph 35.b, Prohibition on Discontinuous Wake Dominated (DWD) Flow, as opposed to Subparagraph 35.c.

LPG Flare Requirements: Instrumentation and Monitoring Systems – CD App.D.42.d
…… In the semi-annual report required under Paragraph 98 of Part VIII that is the first one due after one year after the Date of Entry of this Consent Decree, provide a detailed description of the installations made in compliance with Subparagraphs 42.a. and 42.b, including the specific models and manufacturers.

BPP has provided the installation descriptions in the previous submittal of the Semiannual Report that was submitted on February 14, 2014.

Waste Gas Minimization for LPG Flare – CD App.D.43
…… In the first semi-annual report due after the installation of the flow meter required pursuant to Subparagraph 42.a and continuing through the semi-annual report due in January of 2015, BPP will provide, for the time period covered by the semi-annual report, the following information: (i) the volumetric flow of Waste Gas, in scfm, on a 30-day rolling average, and the mass flow rate, in pounds per hour, on a 30-day rolling average, vented to the LPG Flare; (ii) the Prevention Measures implemented for the reporting period; and (iii) the Prevention Measures expected to be implemented in the future, together with a schedule for prompt implementation..

The flow information requested by this paragraph is included in Appendix 8. Prevention Measures implemented at the LPG Flare involved the adjustment of the Vent Gas flowmeter range to account for cold ambient temperature, thus increasing stability and accuracy of flow measurements, allowing the ability to minimize at the lower range of the instrumentation.

LPG Flare Requirements: Instrumentation and Monitoring Systems – CD App.D.49.c
…… If as a result of an annual review of the annual average Vent Gas Flow Rate for the LPG Flare, BPP is not required to conduct Passive FTIR Testing, BPP shall report the results of the annual review in the first semi-annual report that is due after the annual review has been completed. If as a result of an annual review, BPP is required to conduct Passive FTIR Testing, BPP shall notify EPA by no later than April 30 of the applicable year of the results of the review and the schedule that it will follow to comply with the requirements in Subparagraphs 48.a and 48.b.

This reporting requirement was not effective during this reporting period.

Submitting the Internal Flaring Incident reports – CD App.D.57
…… In each semi-annual report due under Part VIII of this Consent Decree, BPP shall include copies of each Reportable Flaring Incident report that BPP was required to prepare in compliance with Paragraph 54 during the six month period that the semi-annual report covers …

Event reports addressing the requirements of Paragraphs D.57.a – for one hydrocarbon flaring incident that occurred during this reporting period are contained in Appendix 9.

The RCFA report for one hydrocarbon flaring incident that occurred during this reporting period is included in Appendix 9. This report addresses the requirements of Paragraphs D.57.a.

Submitting the Internal Flaring Incident reports – CD App.D.57.g
…… Stipulated penalties, if any, due …

There were no tail gas incidents during the reporting period.

Submitting the Internal Flaring Incident reports – CD App.D.57.h
…… An analysis of any trends identified by BPP in terms of the number of Incidents, the Root Causes or the types of Corrective Action …

The number of hydrocarbon flaring incidents decreased during the second half of 2014 from the first half of 2014. The one identified event in August, 2014 was a result of an emergency shutdown, so the event could not be linked to any true trends in flare operation.

VOC, SO_2, H_2S, CO_2, methane, and ethane emissions for each Covered Flare and the LPG Flare – CD App.D.73
…… BPP shall provide, for each Covered Flare and the LPG Flare, for the prior calendar year, the amount of emissions of the following compounds (in tons per year): VOCs, SO_2, H_2S, CO_2, methane, and ethane.

This requirement is not due in this reporting period. Consent Decree ¶ 99 specifically states this reporting is due in the semi-annual report to be submitted by August 15 of each calendar year.

Section II: Semi-Annual Benzene Waste NESHAP Report

Semi-Annual Benzene Waste NESHAP Report – CD ¶ 62.
…… BPP shall submit a semi-annual report to EPA that includes the following information for the Whiting Refinery regarding compliance with the Benzene Waste NESHAP requirements of this Section (the "Semi-Annual Benzene Waste NESHAP Report"). Each Semi-Annual Benzene Waste NESHAP Report shall include the following information for the two most recently completed Calendar Quarters (the "reporting period").

Further, more detailed responses for ¶ 62 are given below.

EOL Report CD ¶ 62.a.i (1)
…… BPP shall submit…a list of waste streams sampled at Whiting Refinery pursuant to Paragraph 58.

EOL Report CD ¶ 62.a.i (2)
…… BPP shall submit…the results of the quarterly and annual sampling conducted pursuant to Paragraph 58, including the results of the benzene analysis for each sample.

The table below identifies the waste streams sampled pursuant to Paragraph 58 and the results for those samples. These sampling results include:

1) all "end-of-line" (EOL) samples taken pursuant to CD ¶ 58.a as part of the quarterly samples required under the current EOL Sampling Plan
2) all samples taken pursuant to CD ¶ 58.c that count toward the 6 Mg compliance limit and contain greater than 0.05 Mg/yr of benzene.

Waste Stream**	Sampling Date	Quarterly Benzene (ppm) 58.a	Annual Benzene (ppm) 58.c
East French Drain – Water Phase*+	7/9/2014	0.020	
West French Drain – Water Phase*+	7/9/2014	0.0020J	
Indiana Casper – Water Phase	7/9/2014	0.15	
Indiana Casper – Oil Phase	7/9/2014	8.8	
Lake George – Water Phase	7/9/2014	0.51	
Tank 908 Lift Station - Water Phase*	7/9/2014	0.0083	
J&L Separator – Water Phase	7/9/2014	0.0051	
Marketing Terminal West – Water Phase*+	7/9/2014	0.0059	
DAF Float – Oil phase	7/9/2014	150	
DAF Float – Water phase	7/9/2014	4.5	
DAF Float – Solid phase	7/9/2014	18	
Remediation Groundwater J-141A	7/15/2014		8.1
Remediation Groundwater J-157	7/15/2014		0.44

Waste Stream**	Sampling Date	Quarterly Benzene (ppm) 58.a	Annual Benzene (ppm) 58.c
7 SEP API Sludge – Oil	7/22/2014	51	
7 SEP API Sludge - Solid	9/29/2014	0.48	
Petroleum Contaminated Soil	7/2/2014	0.023	
SPW-Petroleum Contaminated Debris	8/14/2014	<0.0037	
Furnace Refractory Brick	8/18/2014	<0.0037	
SPW-Petroleum Contaminated Debris	8/20/2014	<0.0037	
Benzene Contaminated Soil	8/26/2014	97	
SPW-Petroleum Contaminated Debris	9/5/2014	<0.0037	
Tank 908 Lift Station - Water Phase*	10/8/2014	0.0025	
East French Drain – Water Phase*+	10/8/2014	0.020	
West French Drain – Water Phase*+	10/8/2014	0.0029	
Indiana Casper – Water Phase	10/8/2014	0.13	
Indiana Casper – Oil Phase	10/8/2014	3.1	
Lake George – Water Phase	10/8/2014	0.56	
J&L Separator – Water Phase	10/8/2014	0.07	
Marketing Terminal West – Water Phase*+	10/8/2014	0.0012	
DAF Float – Oil Phase	10/8/2014	59	
DAF Float – Water Phase	10/8/2014	2	
DAF Float – Solid Phase	10/8/2014	14	
Remediation Groundwater J-141A	10/15/2014		2.0
Remediation Groundwater J-157	10/15/2014		0.36
Spent Catalyst (Non-Listed Waste)	10/30/2014	20	
Petroleum Contaminated Soil	10/29/2014	0.015	
Petroleum Contaminated Soil	11/3/2014	3.1	
Petroleum Contaminated Soil	11/5/2014	0.046	
Petroleum Contaminated Soil	11/18/2014	2.3	
Petroleum Contaminated Soil	11/19/2014	<0.019	
Petroleum Contaminated Soil	12/1/2014	<0.0074	
Spent Hydrotreating Catalyst	12/5/2014	0.9	
Spent Catalyst (Non-Listed Waste)	12/10/2014	<0.0037	
Lead Contaminated Soil/Debris	12/15/2014	<0.012	
Lead Contaminated Soil/Debris	12/15/2014	<0.0074	
7 SEP API Sludge – Water Phase	12/17/2014	0.015J	
7 SEP API Sludge – Solid Phase	12/17/2014	0.13J	

* = Denotes “insufficient oil volume available at the time of sampling’
< = Denotes “the reporting value is less than the quantification limit”
+ = Denotes “oil phase in not usually available”
** This table does not include solid wastes that do not contribute to 6BQ.
J = Denotes “not quantifiable”

EOL Report CD ¶ 62.a.i (3)
…… BPP shall submit…the computation of the EOL benzene quantity for each quarter.

The computation of the EOL benzene quantity for each quarter is determined by:

1) Multiplying the concentration of benzene in the waste stream sample by the total quarterly waste quantity for the waste stream. Where there are multiple sample results from any particular waste stream, these results are averaged for the computation. In cases where there is an associated organic phase with a waste stream that is known to exist, and a separate analytical result was not obtainable at the time of sampling, an estimate of the benzene concentration was assumed by a partitioning factor to be either, 100 times the results in the water phase concentration (based on industry rule of thumb), or that average of historic oil phase partitioning from when both water and oil sampling have occurred simultaneously (e.g. Tank 908 lift station).

2) Summing the benzene quantity from each waste stream.

3Q14 EOL Benzene Quantity*

Waste Stream I.D.	Waste Stream Description	Waste Stream Flow (Mg/Qtr)	Benzene Concentration (ppmw)	Benzene Mass (Mg/Qtr)
001A(1)	Tank 908 Lift Station - Oil Phase	27.17	0.423	0.00001
001B	Tank 908 Lift Station - Water Phase	866.32	0.008	0.00001
001C	J&L Separator	14,164.06	0.005	0.00007
002A	Indiana Tank Field - Oil Phase	222.22	8.800	0.00196
002B	Indiana Tank Field - Water Phase	7,778.34	0.150	0.00117
Based on 002A	South Tank Field - Oil Phase	151.11	8.800	0.00133
Based on 002B	South Tank Field - Water Phase	5,289.27	0.150	0.00079
003(2)	SRU T-401 Stripping Tower	0.00	0.000	0.00000
004(3)	Lake George Remediation Groundwater	0.00	0.000	0.00000
005(4)	Tank 5050	0.00	0.000	0.00000
006A	#7Separator API Sludge	3,036.74	28.491	0.08652
006B	AFU (DAF) Flotation Material	8,838.79	62.368	0.49930
007(5)	Tank BT 2 (Controlled in '09)	0.00	0.000	0.00000
008	Waste Containers	34,121.09	2.558	0.08729
009A(6)	East French Drain - Oil Phase	0.00	0.000	0.00000
009B	East French Drain - Water Phase	12,548.26	0.020	0.00025
010A(6)	West French Drain - Oil Phase	42,742.18	0.200	0.00855
010B	West French Drain - Water Phase	0.00	0.000	0.00000
011A(7) (6)	Marketing Terminal - Oil Phase	222.22	0.590	0.00013
011B(7)	Marketing Terminal - Water Phase	7,778.34	0.006	0.00005

Total Uncontrolled Benzene: **0.687**

* This table does not include the benzene quantity of the waste streams sampled pursuant to ¶ 58.c since those samples were not "end of line" samples.
(1) Oil or water phase was not present during sampling. For the oil phase benzene concentration, the water phase concentration was multiplied by a factor of 51. For the water phase benzene concentration, the oil phase was divided by a factor of 51. The conversion factor was based on historic analytical data between 2005 and 2012 at this location where 51x is the historical average ratio encountered from oil analysis.
(2) Equipment was out of service in entire quarter
(3) This source was sampled during this quarter; however, the waste stream is controlled.
(4) Tk5050 was out of service in entire quarter.
(5) Controlled per BWON during quarter.
(6) Oil or water phase was not present during sampling. For the oil phase benzene concentration, the water phase concentration was multiplied by a factor of 100. For the water phase benzene concentration, the oil phase was divided by a factor of 100 (Industry standard).
(7) Sample points 011A and 011B were added to the Plan when the Marketing Terminal was included in the WBU Title V Permit on January 1st 2007.

4Q14 EOL Benzene Quantity*

Waste Stream I.D.	Waste Stream Description	Waste Stream Flow (Mg/Qtr)	Benzene Concentration (ppmw)	Benzene Mass (Mg/Qtr)
001A(1)	Tank 908 Lift Station - Oil Phase	19.14	0.376	0.00001
001B	Tank 908 Lift Station - Water Phase	608.85	0.003	0.00000
001C	J&L Separator	5,651.45	0.070	0.00040
002A	Indiana Tank Field - Oil Phase	1,330.30	3.100	0.00412
002B	Indiana Tank Field - Water Phase	7,898.93	0.130	0.00103
Based on 002A	South Tank Field - Oil Phase	904.60	3.100	0.00280
Based on 002B	South Tank Field - Water Phase	5,371.27	0.130	0.00070
003(2)	SRU T-401 Stripping Tower	0.00	0.000	0.00000
004(3)	Lake George Remediation Groundwater	0.00	0.000	0.00000
005(4)	Tank 5050	0.00	0.000	0.00000
006A	#7Separator API Sludge	261.38	0.020	0.00001
006B	AFU (DAF) Flotation Material	8,838.79	62.368	0.15946
007(5)	Tank BT 2 (Controlled in '09)	0.00	0.000	0.00000
008	Waste Containers	20,014.08	4.091	0.08188
009A(6)	East French Drain - Oil Phase	0.00	0.000	0.00000
009B	East French Drain - Water Phase	10,248.45	0.020	0.00020
010A(6)	West French Drain - Oil Phase	31,653.10	0.290	0.00918
010B	West French Drain - Water Phase	0.00	0.000	0.00000
011A(6) (7)	Marketing Terminal - Oil Phase	1,330.30	0.120	0.00016
011B(7)	Marketing Terminal - Water Phase	7,898.93	0.001	0.00001

Total Uncontrolled Benzene: **0.260**

This table does not include the benzene quantity of the waste streams sampled pursuant to ¶ 58.c since those samples were not "end of line" samples.

(1) Oil or water phase was not present during sampling. For the oil phase benzene concentration, the water phase concentration was multiplied by a factor of 51. For the water phase benzene concentration, the oil phase was divided by a factor of 51. The conversion factor was based on historic analytical data between 2005 and 2012 at this location where 51x is the historical average ratio encountered from oil analysis.
(2) Equipment was out of service in entire quarter
(3) This source was sampled during this quarter; however, the waste stream is controlled.
(4) Tk5050 resumed operation with a floating roof in 4Q14. Tk5050 is considered BWON controlled.
(5) Controlled per BWON during quarter.
(6) Oil or water phase was not present during sampling. For the oil phase benzene concentration, the water phase concentration was multiplied by a factor of 100. For the water phase benzene concentration, the oil phase was divided by a factor of 100 (Industry standard).
(7) Sample points 011A and 011B were added to the Plan when the Marketing Terminal was included in the WBU Title V Permit on January 1st 2007.

EOL Report CD ¶ 62.a.i (4)
…… BPP shall submit…any other related information required under a revised EOL Sampling Plan if submitted pursuant to Paragraph 58.

BPP has submitted a revised EOL sampling plan on February 18, 2014. The report of current reporting period is prepared in accordance with the current version last updated on August 8, 2007. BPP will implement the newest version upon the receipt of EPA's approval pursuant to Paragraph 58.d.

EOL Report CD ¶ 62.a.ii
BPP shall use all sampling results and approved flow calculation methods pursuant to Paragraph 58 to calculate and report a quarterly and a calendar year uncontrolled benzene quantity for the Whiting Refinery against the 6 Mg Option.

BPP has used all sampling results and approved flow calculation methods pursuant to Paragraph 58 to calculate the quarterly and calendar year uncontrolled benzene quantity as follows.

Calendar Year Summary

- Paragraph 58c streams refer to uncontrolled waste streams exceeding 0.05 Mg/yr but not on the EOL sampling plan.
- Paragraph 58a streams refer to uncontrolled waste streams currently on the EOL sampling plan.

Sample Period	Results	
2014 – Annual (¶ 58.c streams)	0.131	Mg/Yr
4Q2014 - EOL (¶ 58.a streams)	0.260	Mg/Qtr
3Q2014 – EOL (¶ 58.a streams)	0.687	Mg/Qtr
2Q2014 – EOL (¶ 58.a streams)	0.118	Mg/Qtr
1Q2014 – EOL (¶ 58.a streams)	0.339	Mg/Qtr
Calendar Year Total	**1.54**	**Mg/yr**

EOL Report CD ¶ 62.a.iii
…… If the quarterly uncontrolled benzene quantity (for any Calendar Quarter during the reporting period) at the Whiting Refinery exceeds 1.5 Mg or the annual uncontrolled benzene quantity exceeds 6 Mg, then BPP shall…conduct a Root Cause Failure Analysis and develop a corrective action plan…

The uncontrolled benzene quantity did not exceed 1.5 Mg for any calendar quarter nor did the annual uncontrolled benzene quantity exceed 6 Mg.

EOL Report CD ¶ 62.a.iv
BPP shall identify all labs used during the quarter to analyze benzene waste samples collected at the Whiting Refinery pursuant to this Section J, and BPP shall provide the date of the most recent audit of each lab.

The following labs were used during the reporting period to analyze benzene waste samples collected at the Whiting Refinery. The dates of most recent audit performed on these labs are also provided as follows.

Lab	Date of Most Recent Audit
Microbac Lab	9/30/2014
Test America Lab – Chicago	6/5/2014

Carbon Canister Report CD ¶ 62.b.i
…… As part of the second Semi-Annual Benzene Waste NESHAP Report required by the Consent Decree, BPP shall submit a project completion report to EPA detailing the actions performed to comply with the requirements of Paragraph 52. BPP shall include a list of all locations within the refinery using the dual-canister option, the installation date of each such dual-canister, and the date that each dual-canister was put into operation.

The carbon canister project completion report was included in Appendix 7 of previous Semiannual Report that was submitted on February 14, 2014.

Carbon Canister Report CD ¶ 62.b.ii
…… As part of each Semi-Annual Benzene Waste NESHAP Report, for all locations at which single carbon canisters are used, BPP shall identify each such location and provide the results of all breakthrough monitoring and carbon canister change-outs that occurred during the reporting period. For each single carbon canister, BPP shall also identify: i) the date(s) and approximate time when breakthrough was first detected; and ii) for each breakthrough event, the date and time when carbon canister change-out occurred. BPP shall also include in each semi-annual report a list of all canisters or beds which BPP has designated as unsafe to monitor during the reporting period.

The following table provides the locations of single carbon canisters during the 3rd and 4th quarters of 2014.

ID	Location	ID	Location
88	LF	94	LF
89	LF	95	LF
90	LF	96	LF
91	LF	97	LF
92	LF	98	LF
93	LF		

The single carbon canister breakthrough monitoring results during the 2nd half-year of 2014 are provided in Appendix 10.a. The dual-bed and single canisters designated as unsafe to monitor during the reporting period is provided in Appendix 10.b.

Audit Reporting CD ¶ 62.c
…… As part of each Semi-Annual Benzene Waste NESHAP Report, BPP shall identify all labs audited pursuant to the requirements of Paragraph 54 during the reporting period, and shall submit the results and the reports regarding any such audits. For each lab audited, BPP shall also provide a description of the methods used in the audit.

BPP audited Microbac Lab on September 30, 2014 and Test America Lab – Chicago on June 5, 2014. The audit report is provided in Appendix.11.a and 11.b, respectively. Please note the Test America Lab audit report was not finalized until 3rd quarter of 2014.

Training Reporting CD ¶ 62.d
…… As part of each Semi-Annual Benzene Waste NESHAP Report, BPP shall identify the employees who received training during the reporting period pursuant to the requirements of Paragraph 56, and shall describe the training these employees received. BPP shall also describe the training scheduled to be performed during the next reporting period.

[CD ¶ 56.a] Waste Stream Sampling
The employees with responsibility to sample benzene waste streams [CD ¶ 56.a] who received training during this reporting period are provided in Appendix 12.a of this report.

Benzene NESHAP Waste Sampling training is scheduled throughout the year by means of computer based training. Each employee takes the training on an annual basis depending upon their initial individual training schedule.

Benzene NESHAP waste sampling training is designed to review sampling procedures that minimize benzene loss during sampling. For example: 1) taking samples with minimum or no head space in sampling vials, 2) immediately cooling samples, 3) preserving samples on ice while waiting and in transport to the laboratory, 4) proper chain-of-custody procedures.

[CD ¶ 56.b] Control Devices
The employees with responsibility to operate control devices used to comply with Benzene Waste Operations NESHAP [CD ¶ 56.b] who received training during this reporting period are provided in Appendix 12.b of this report:

Benzene NESHAP – NSPS QQQ SOP / SOP Refresher computer based training is scheduled throughout the year. Each employee takes the training on an annual basis depending upon their initial individual training schedule.

This course provides brief overview of BWON and NSPS QQQ regulations. It also includes the standard operating procedure for inspecting and operating the waste management units (i.e., drains, cleanouts, manhole covers, conservation vents, and oil-water separator) and the standard operating procedure for inspecting, monitoring, and change out of carbon canisters and flares.

Section III: Appendices

Appendix 1 – Monitoring Instrument/Equipment Downtime and Override of Automatic Control System

Appendix 2 – Averaging Period Exceedances (Placeholder)

Appendix 3 – SRP O&M Plan Update (Placeholder)

Appendix 4 – CEMs Root Cause Failure Analysis

Appendix 5a – 3rd Quarter 2014 CEM Summary Performance Report

Appendix 5b – 4th Quarter 2014 CEM Summary Performance Report

Appendix 5c – 1st Half 2014 CEM Summary Performance Report - Revised

Appendix 5d – CEM QA/QC Plan

Appendix 6a – FCU 500 Performance Testing
June 2014

Appendix 6b – FCU 500 Performance Testing
September 2014

Appendix 6c – FCU 600 Performance Testing
October 2014

Appendix 6d – FCU 600 Performance Testing
October 2014

Appendix 6e – FCU 500 Performance Testing
December 2014

Appendix 7 – Commercial Unavailability

Appendix 8 – Waste Gas Minimization for LPG Flare

Appendix 9 – Flare Incident – 4UF Flare
August 28, 2014

Appendix 10a – 2nd Half 2014 Carbon Canister Report

Appendix 10b – 2nd Half 2014 Unsafe to Monitor Carbon Canister Report

Appendix 11a – Laboratory Audit Report – Microbac

Appendix 11b – Laboratory Audit Report – Test America

Appendix 12a – Benzene Waste NESHAP Waste Sampling Training

Appendix 12b – Benzene Waste NESHAP Control Device Training

Appendix 1 – Monitoring Instrument/Equipment Downtime and Override of Automatic Control System

Appendix 1
App D.72.a - Equipment Availability

Third Quarter Availability

Source	Monitored Parameter	Total Operating Hours	Downtime	
			Hours	Percentage
Meteorological Station	Wind Speed	2,208	0	0.00%
	Ambient Temperature	2,208	0	0.00%
4UF Flare	Vent Gas Flow Meter	2,208	0.02	0.001%
	Vent Gas Temperature	2,208	0	0.00%
	Vent Gas Pressure	2,208	0	0.00%
	Vent Gas Molecular Weight	2,208	0	0.00%
	Total Natural Gas Flow Meter	2,208	0.20	0.01%
	Total Natural Gas Temperature	2,208	0	0.00%
	Total Natural Gas Pressure	2,208	0	0.00%
	Total Steam Flow Meter	2,208	0.07	0.003%
	Total Steam Temperature	2,208	0	0.00%
	Total Steam Pressure	2,208	0	0.00%
	Gas Chromatograph (“GC”)	2,208	0	0.00%
	Video Camera	2,208	0	0.00%
Alky Flare	Vent Gas Flow Meter	2,208	0.10	0.01%
	Vent Gas Temperature	2,208	0.10	0.01%
	Vent Gas Pressure	2,208	0.10	0.01%
	Vent Gas Molecular Weight	2,208	0.10	0.01%
	Total Natural Gas Flow Meter	2,208	0	0.00%
	Total Natural Gas Temperature	2,208	0	0.00%
	Total Natural Gas Pressure	2,208	0	0.00%
	Total Steam Flow Meter	2,208	0	0.00%
	Total Steam Temperature	2,208	0	0.00%
	Total Steam Pressure	2,208	0	0.00%
	Gas Chromatograph (“GC”)	2,208	0	0.00%
	Video Camera	2,208	0	0.00%
DDU Flare	Vent Gas Flow Meter	1,018	0	0.00%
	Vent Gas Temperature	1,018	0	0.00%
	Vent Gas Pressure	1,018	0	0.00%
	Vent Gas Molecular Weight	1,018	0	0.00%
	Total Natural Gas Flow Meter	1,018	0	0.00%
	Total Natural Gas Temperature	1,018	0	0.00%
	Total Natural Gas Pressure	1,018	0	0.00%
	Total Steam Flow Meter	1,018	0	0.00%
	Total Steam Temperature	1,018	0	0.00%
	Total Steam Pressure	1,018	0	0.00%
	Gas Chromatograph (“GC”)	1,018	0	0.00%
	Video Camera	1,018	0	0.00%

Source	Monitored Parameter	Total Operating Hours	Downtime	
			Hours	Percentage
FCU Flare	Vent Gas Flow Meter	1,719	0	0.00%
	Vent Gas Temperature	1,719	0	0.00%
	Vent Gas Pressure	1,719	0	0.00%
	Vent Gas Molecular Weight	1,719	0	0.00%
	Total Natural Gas Flow Meter	1,719	0	0.00%
	Total Natural Gas Temperature	1,719	0	0.00%
	Total Natural Gas Pressure	1,719	0	0.00%
	Total Steam Flow Meter	1,719	0	0.00%
	Total Steam Temperature	1,719	0	0.00%
	Total Steam Pressure	1,719	0	0.00%
	Gas Chromatograph (“GC”)	1,719	0	0.00%
	Video Camera	1,719	0	0.00%
GOHT Flare	Waste Gas Flow Meter	2,208	0	0.00%
	Waste Gas Temperature	2,208	0	0.00%
	Waste Gas Pressure	2,208	0	0.00%
	Waste Gas Molecular Weight	2,208	0.03	0.001%
	Total Natural Gas Flow Meter	2,208	0	0.00%
	Total Natural Gas Temperature	2,208	0	0.00%
	Total Natural Gas Pressure	2,208	0	0.00%
	Total Steam Flow Meter	2,208	0	0.00%
	Total Steam Temperature	2,208	0	0.00%
	Total Steam Pressure	2,208	0	0.00%
	Total Nitrogen Purge Flow Meter	2,208	0	0.00%
	Total Nitrogen Purge Temperature	2,208	0	0.00%
	Total Nitrogen Purge Pressure	2,208	0	0.00%
	Gas Chromatograph (“GC”)	2,208	0	0.00%
	Video Camera	2,208	0	0.00%
South Flare	Waste Gas Flow Meter	2,208	0	0.00%
	Waste Gas Temperature	2,208	0	0.00%
	Waste Gas Pressure	2,208	0	0.00%
	Waste Gas Molecular Weight	2,208	2.0	0.09%
	Total Natural Gas Flow Meter	2,208	0.9	0.04%
	Total Natural Gas Temperature	2,208	0	0.00%
	Total Natural Gas Pressure	2,208	0	0.00%
	Total Steam Flow Meter	2,208	0	0.00%
	Total Steam Temperature	2,208	0	0.00%
	Total Steam Pressure	2,208	0	0.00%
	Total Nitrogen Purge Flow Meter	2,208	0	0.00%
	Total Nitrogen Purge Temperature	2,208	0	0.00%

Source	Monitored Parameter	Total Operating Hours	Downtime	
			Hours	Percentage
	Total Nitrogen Purge Pressure	2,208	0	0.00%
	Gas Chromatograph (“GC”)	2,208	0	0.00%
	Video Camera	2,208	0	0.00%
UIU Flare	Vent Gas Flow Meter	2,208	0	0.00%
	Vent Gas Temperature	2,208	0	0.00%
	Vent Gas Pressure	2,208	0	0.00%
	Vent Gas Molecular Weight	2,208	0	0.00%
	Total Natural Gas Flow Meter	2,208	0	0.00%
	Total Natural Gas Temperature	2,208	0	0.00%
	Total Natural Gas Pressure	2,208	0	0.00%
	Total Steam Flow Meter	2,208	0	0.00%
	Total Steam Temperature	2,208	0	0.00%
	Total Steam Pressure	2,208	0	0.00%
	Gas Chromatograph (“GC”)	2,208	0	0.00%
	Video Camera	2,208	0	0.00%
VRU Flare	Vent Gas Flow Meter	2,208	1.5	0.07%
	Vent Gas Temperature	2,208	0	0.00%
	Vent Gas Pressure	2,208	0	0.00%
	Vent Gas Molecular Weight	2,208	0	0.00%
	Total Natural Gas Flow Meter	2,208	0	0.00%
	Total Natural Gas Temperature	2,208	0	0.00%
	Total Natural Gas Pressure	2,208	0	0.00%
	Total Steam Flow Meter	2,208	0	0.00%
	Total Steam Temperature	2,208	0	0.00%
	Total Steam Pressure	2,208	0	0.00%
	Gas Chromatograph (“GC”)	2,208	0	0.00%
	Video Camera	2,208	0	0.00%
LPG Flare	Vent Gas Flow Meter	2,127	37	1.74%

Fourth Quarter Availability

Source	Monitored Parameter	Total Operating Hours	Downtime	
			Hours	Percentage
Meteorological Station	Wind Speed	2,208	0	0.00%
	Ambient Temperature	2,208	0	0.00%
4UF Flare	Vent Gas Flow Meter	2,208	0.02	0.001%
	Vent Gas Temperature	2,208	0	0.00%
	Vent Gas Pressure	2,208	0	0.00%
	Vent Gas Molecular Weight	2,208	0	0.00%
	Total Natural Gas Flow Meter	2,208	0	0.00%
	Total Natural Gas Temperature	2,208	0	0.00%
	Total Natural Gas Pressure	2,208	0	0.00%
	Total Steam Flow Meter	2,208	0	0.00%
	Total Steam Temperature	2,208	0	0.00%
	Total Steam Pressure	2,208	0	0.00%
	Gas Chromatograph (“GC”)	2,208	0	0.00%
	Video Camera	2,208	0	0.00%
Alky Flare	Vent Gas Flow Meter	2,208	88.8	4.02%
	Vent Gas Temperature	2,208	0	0.00%
	Vent Gas Pressure	2,208	0	0.00%
	Vent Gas Molecular Weight	2,208	0	0.00%
	Total Natural Gas Flow Meter	2,208	0	0.00%
	Total Natural Gas Temperature	2,208	0	0.00%
	Total Natural Gas Pressure	2,208	0	0.00%
	Total Steam Flow Meter	2,208	0	0.00%
	Total Steam Temperature	2,208	0	0.00%
	Total Steam Pressure	2,208	0	0.00%
	Gas Chromatograph (“GC”)	2,208	0	0.00%
	Video Camera	2,208	0	0.00%
DDU Flare	Vent Gas Flow Meter	170.8	0	0.00%
	Vent Gas Temperature	170.8	0	0.00%
	Vent Gas Pressure	170.8	0	0.00%
	Vent Gas Molecular Weight	170.8	0	0.00%
	Total Natural Gas Flow Meter	170.8	0	0.00%
	Total Natural Gas Temperature	170.8	0	0.00%
	Total Natural Gas Pressure	170.8	0	0.00%
	Total Steam Flow Meter	170.8	0	0.00%
	Total Steam Temperature	170.8	0	0.00%
	Total Steam Pressure	170.8	0	0.00%
	Gas Chromatograph (“GC”)	170.8	0	0.00%
	Video Camera	170.8	0	0.00%
FCU Flare	Vent Gas Flow Meter	1,646.6	0	0.00%
	Vent Gas Temperature	1,646.6	0	0.00%

Source	Monitored Parameter	Total Operating Hours	Downtime	
			Hours	Percentage
	Vent Gas Pressure	1,646.6	0	0.00%
	Vent Gas Molecular Weight	1,646.6	0	0.00%
	Total Natural Gas Flow Meter	1,646.6	0	0.00%
	Total Natural Gas Temperature	1,646.6	0	0.00%
	Total Natural Gas Pressure	1,646.6	0	0.00%
	Total Steam Flow Meter	1,646.6	0	0.00%
	Total Steam Temperature	1,646.6	0	0.00%
	Total Steam Pressure	1,646.6	0	0.00%
	Gas Chromatograph ("GC")	1,646.6	0	0.00%
	Video Camera	1,646.6	0	0.00%
GOHT Flare	Waste Gas Flow Meter	2,208	0	0.00%
	Waste Gas Temperature	2,208	0	0.00%
	Waste Gas Pressure	2,208	0	0.00%
	Waste Gas Molecular Weight	2,208	0	0.00%
	Total Natural Gas Flow Meter	2,208	0	0.00%
	Total Natural Gas Temperature	2,208	0	0.00%
	Total Natural Gas Pressure	2,208	0	0.00%
	Total Steam Flow Meter	2,208	290.25	13.14%
	Total Steam Temperature	2,208	0	0.00%
	Total Steam Pressure	2,208	0	0.00%
	Total Nitrogen Purge Flow Meter	2,208	0	0.00%
	Total Nitrogen Purge Temperature	2,208	0	0.00%
	Total Nitrogen Purge Pressure	2,208	0	0.00%
	Gas Chromatograph ("GC")	2,208	0	0.00%
	Video Camera	2,208	0	0.00%
South Flare	Waste Gas Flow Meter	2,208	0	0.00%
	Waste Gas Temperature	2,208	0	0.00%
	Waste Gas Pressure	2,208	0	0.00%
	Waste Gas Molecular Weight	2,208	12.47	5.65%
	Total Natural Gas Flow Meter	2,208	0	0.00%
	Total Natural Gas Temperature	2,208	0	0.00%
	Total Natural Gas Pressure	2,208	0	0.00%
	Total Steam Flow Meter	2,208	0	0.00%
	Total Steam Temperature	2,208	0	0.00%
	Total Steam Pressure	2,208	0	0.00%
	Total Nitrogen Purge Flow Meter	2,208	0	0.00%
	Total Nitrogen Purge Temperature	2,208	0	0.00%
	Total Nitrogen Purge Pressure	2,208	0	0.00%
	Gas Chromatograph ("GC")	2,208	0	0.00%

Source	Monitored Parameter	Total Operating Hours	Downtime	
			Hours	Percentage
	Video Camera	2,208	0	0.00%
UIU Flare	Vent Gas Flow Meter	2,208	0.03	0.002%
	Vent Gas Temperature	2,208	0.03	0.002%
	Vent Gas Pressure	2,208	0.03	0.002%
	Vent Gas Molecular Weight	2,208	0.03	0.002%
	Total Natural Gas Flow Meter	2,208	0	0.00%
	Total Natural Gas Temperature	2,208	0	0.00%
	Total Natural Gas Pressure	2,208	0	0.00%
	Total Steam Flow Meter	2,208	0	0.00%
	Total Steam Temperature	2,208	0	0.00%
	Total Steam Pressure	2,208	0	0.00%
	Gas Chromatograph (“GC”)	2,208	0	0.00%
	Video Camera	2,208	0	0.00%
VRU Flare	Vent Gas Flow Meter	2,208	0	0.00%
	Vent Gas Temperature*	2,208	SEE NOTE*	SEE NOTE*
	Vent Gas Pressure	2,208	0	0.00%
	Vent Gas Molecular Weight	2,208	0	0.00%
	Total Natural Gas Flow Meter	2,208	0	0.00%
	Total Natural Gas Temperature	2,208	0	0.00%
	Total Natural Gas Pressure	2,208	0	0.00%
	Total Steam Flow Meter	2,208	0	0.00%
	Total Steam Temperature	2,208	0	0.00%
	Total Steam Pressure	2,208	0	0.00%
	Gas Chromatograph (“GC”)	2,208	0	0.00%
	Video Camera	2,208	0	0.00%
LPG Flare	Vent Gas Flow Meter	1,979.25	103.17	5.21%

* The temperature sensor on the VRU Flare failed high for 628 hours (28.5% of flare operating time) over a period of a few weeks during the 4th Quarter. However, there were no hot flaring events during doing these periods, and in the absence of such an event, the Vent Gas going to the flare tracks ambient temperature. For this reason, BP believes that the ambient temperature monitoring is sufficient to meet the Consent Decree obligation to “continuously analyze” temperature at the point of flow measurement. BPP used the ambient temperature monitoring to correct the Vent Gas flow to standard conditions.

D.72.c – Flare Summary of Override Hours

Third Quarter

Flare	Total Operating Hours[a]	Override Hours	Percent Override Hours
4UF Flare	2,208	2.43	0.11%
Alky Flare	2,208	1.12	0.05%
DDU Flare	1,018	0.07	.003%
FCU Flare	1,719	5.75	0.33%
GOHT Flare	2,208	0	0.00%
South Flare	2,208	0	0.00%
UIU Flare	2,208	0.15	0.01%
VRU Flare	2,208	31.70	1.44%
LPG Flare	2,127	0	0.00%

Fourth Quarter

Flare	Total Operating Hours[a]	Override Hours	Percent Override Hours
4UF Flare	2,208	1.82	0.08%
Alky Flare	2,208	88.82	4.02%
DDU Flare	170.8	2.65	1.55%
FCU Flare	1,646.6	42.02	2.56%
GOHT Flare	2,208	0.00	0.00%
South Flare	2,208	0.03	0.002%
UIU Flare	2,208	0.12	0.01%
VRU Flare	2,208	1.27	0.06%
LPG Flare	1,979.3	0.00	0.00%

D.72.b – Monitor Instrument/ Equipment Downtime Greater than 110 Hours

Q4 Downtime of GOHT Flare Steam Flow Meter

Incident No.	Start Date	End Date	Duration (hours)	Process Code	Cause	Corrective Actions
1	12/3/14 16:42:00	12/15/14 18:57:00	290.25	1=Flare Event Offline and Control Offline	Flare steam flowmeter malfunction – condensate leak to flowmeter probes caused electronics problems.	No spare electronics immediately available. Like-kind replacement of damaged electronics on 12/15/2014.

App D.72.e – Pilot Gas/Purge Gas Venting

Quarter 3 Summary

Flare	Total Operating Hours	Operating Only on Pilot and/or Purge Gas[1]	
		Hours	Percent
4UF Flare	2,208	0	0
Alky Flare	2,208	0	0
DDU Flare	1,018	0	0
FCU Flare	1,719	0	0
GOHT Flare	2,208	2207.8	99.99%
South Flare	2,208	2206.7	99.94%
UIU Flare	2,208	0	0
VRU Flare	2,208	0	0
LPG Flare	2,127	0	0

Quarter 4 Summary

Flare	Total Operating Hours	Operating Only on Pilot and/or Purge Gas[1]	
		Hours	Percent
4UF Flare	2,208	0	0
Alky Flare	2,208	0	0
DDU Flare	170.8	0	0
FCU Flare	1,646.6	0	0
GOHT Flare	2,208	2207.9	99.995%

South Flare	2,208	2207.1	99.96%
UIU Flare	2,208	0	0
VRU Flare	2,208	0	0
LPG Flare	1,979.3	0	0

[1] The requirements of Paragraphs 33-36 (of Appendix D) were not applicable due to the venting of only Pilot Gas and/or Purge Gas for only the flares with flare gas recovery systems (FGRS) currently installed. At present, BPP only has two flares – South Flare and GOHT Flare – with running FGRS, and is in the process of installing FGRS at the remaining flares per the schedule outlined in App D.25.a.

Appendix 2 – Averaging Period Exceedances (Placeholder)

Appendix 3 – SRP O&M Plan Update (Placeholder)

Appendix 4 – CEMs Root Cause Failure Analysis

Excess CEM Downtime - RCFA Investigation Report and Corrective Action Plan Template

CEMS having a downtime greater than 5% of the total time for each of 2 consecutive calendar quarters.

- CEMS Name: Coker 2 F-201 CO Analyzer
- Quarter 1 with downtime > 5%: 37% (802 hours)
- Quarter 2 with downtime > 5%: 8% (168 hours)

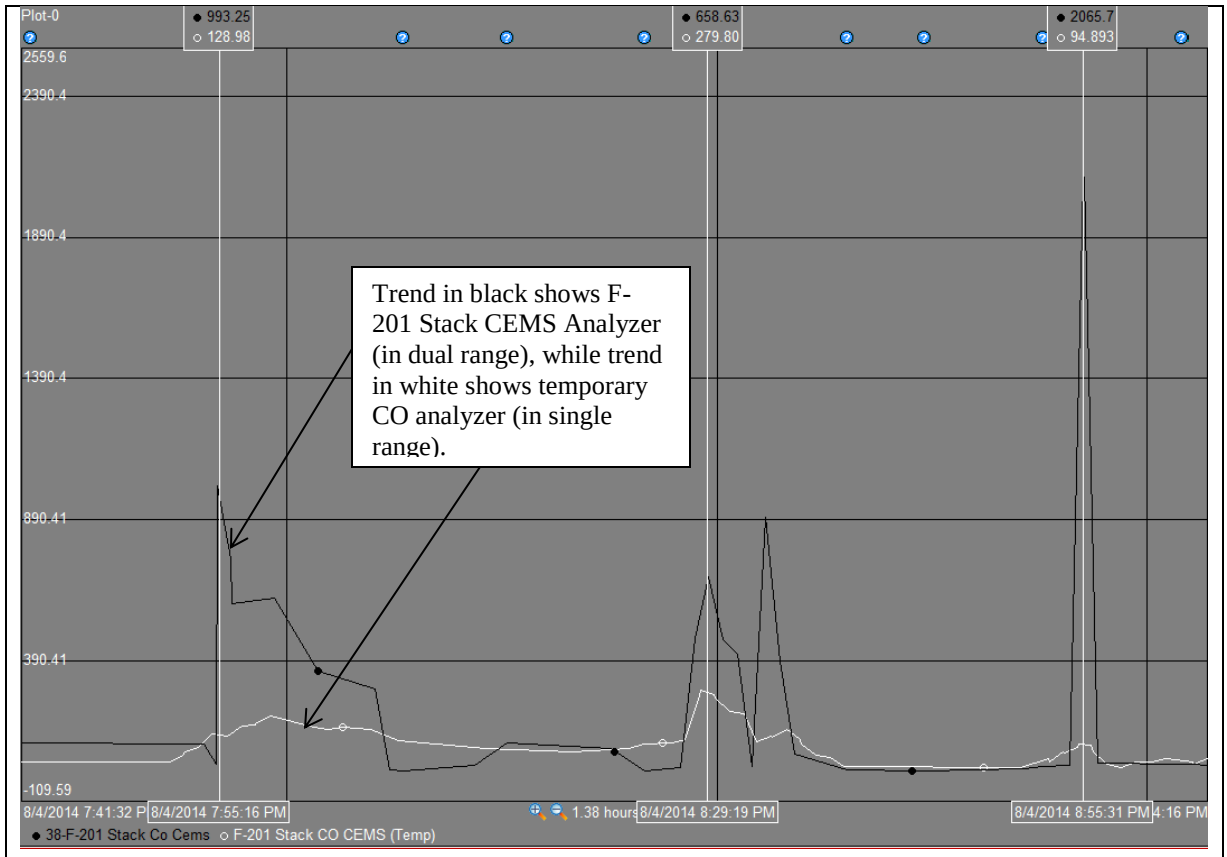
Requirements are spelled out in 2012 Consent Decree Paragraph 48 and 49.

48.a. An identification and detailed analysis setting forth the root causes. (Use additional space as necessary)

The carbon monoxide (CO) analyzer at Coker 2 F-201 heater appeared to indicate CO emissions for the first half of the year that were suspiciously high. An investigation into this matter determined that the periods of high CO concentrations were invalid data due to a non-monitor malfunction related to the configuration of the programmable logic controller (PLC) responsible for the logging and storage of data from the CO CEMS stack analyzer.

The analyzer was installed with a dual range, and when process conditions were maintained at the value triggering analyzer range changes, the analyzer and the PLC were not able to transmit data quickly enough, thus returning values that were inaccurate. In August 2014, this was verified by the connection of another CO stack analyzer, with only one range, in parallel with the CO CEMS analyzer, and running calibration gases through the analyzers at the transition range.

Below is a trend, showing the CO CEMS analyzer (in black) and the parallel CO stack analyzer (in white), and the wide discrepancy at three different points. The CO stack analyzer, programmed with only a single range, shows concentrations much more reflective of process conditions.



48.b. The steps, if any, taken to limit the duration of the CEMS downtime

Operations managed excess oxygen control such that the stack CO concentration was lower than the point at which the analyzer changed ranges. This achieved oxygen control minimized the number of data substitution periods, resulting in a decrease in CEMS downtime.

48.c. An analysis of the measures reasonably available to prevent the root cause(s) for the exceedence from recurring. This analysis shall include an evaluation of possible design, operational, and maintenance measures.

In order to ensure the root cause for the exceedance does not recur, the removal of the split range on the analyzer – moving to a single range CO CEMS – is the best measure to ensure further invalid concentrations is mitigated. An engineering estimate for the highest achievable CO concentration, during startup and shutdown, can be created based on the values observed using the parallel CO analyzer that was used to verify the root cause.

48.c. If an RCFA has been required previously for this CEMs within 12 consecutive calendar quarters, identify the independent third party consulted to review BP's assessment of downtime causes and the date of the review.

An RCFA has not been required previously for this CEMS within the previous 12 consecutive

calendar quarters.

49. Corrective Action Plan

This plan is subject to EPA approval. BP shall begin to implement this corrective action plan by no later than 60-days after submission to EPA, and shall complete the corrective action pursuant to the proposed schedule.

This corrective action plan identifies the reasonably available corrective actions to prevent a recurrence of the root cause(s) identified in the RCFA. The corrective action plan describes any corrective actions already completed or, if not complete, a schedule for their implementation including proposed commencement and completion dates.

Corrective Action	Complete (Yes/No)	If not complete, provide proposed	
		Commencement Date	Completion Date
Install single-range on the CO CEMS on F-201	Yes	10/27/2014	11/19/2014
Install single-range on remaining CO CEMS on Coker 2 (F-202, F-203)	Yes	10/27/2014	12/9/2014

RCFA Completion / Report Approval:

James W Keating		12/18/2014
Investigation Owner		Date

This Root Cause Failure Analysis and Corrective Action Plan shall be submitted to EPA in a written report included with the first semi-annual report required by Part VIII of the Consent Decree following completion of the RCFA.

Appendix 5a – 3rd Quarter 2014 CEM Summary Performance Report

ENVIRONMENTAL CORRESPONDENCE

Document Title: **Third Quarter 2014 CEMS Summary Report**

Document Description: For the period from July 1, 2014 – September 30, 2014

To	Action Required			Signature / Date
James Keating	REVIEW ☒	MAIL ☐	SIGNATURE ☐	JWK 10/28/14
Linda Wilson	REVIEW ☒	MAIL ☐	SIGNATURE ☒	LJW 10-28-14
Gloria Blanco	REVIEW ☒	MAIL ☐	SIGNATURE ☒	
Nick Spencer	REVIEW ☐	MAIL ☐	SIGNATURE ☐	NS 10-28-14

Originator/SME: Rohini Sengupta

Date Prepared and routed for Review: 10/20/2014

Exceedance or Excess Emissions:
YES ☒
NO ☐ _____
See comments below for additional information.

To Whom:
USEPA ☐ BP ☐
IDEM ☒ OTHER ☐
HDEM ☐

Regulated Area:
WATER ☐
AIR ☒
RCRA ☐
OTHER ☐ _____

Nature of the Document:
ROUTINE ☒ PERMIT RENEWAL ☐
CONSENT DECREE ☐ REPORT ☒
SPECIAL ☐ DATA ☐
NEW PERMIT ☐ PLANS ☐
NOTIFICATION ☐

Frequency:
MONTHLY ☐ QUARTERLY ☒
SEMIANNUALLY ☐
ANNUALLY ☐
VARIABLE ☐
OTHER ☐ _____

Mail ORIGINAL ☒
COPIES ☒ Number: 1
Mailing Deadline: 10/30/2014
Special Mailing Instructions: R. Tejuja does not require a copy.
OVERNIGHT ☐ CERTIFIED ☒
REGULAR ☐ OTHER ☐ _____
Mailed By (sign & date): K Santiago 10/29/14
Certified letter tracking Numbers:
INDY- 7010 1060 0001 7187 2708
BCC emailed

Responsible Official Certification:
YES ☐
NO ☒

ACCURACY REVIEW COMPLETED BY:
Data QAQC: ☒ Will Backus
Env. SME: ☒ Rohini Sengupta
Area OE: ☐ _____
☐ _____
☐ _____

COMMENTS: No CEMS had downtime > 5% in 3Q14.

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Document ID WBU-DENV-3G12-46380

BP Products North America Inc.
2815 Indianapolis Blvd.
P O Box 710
Whiting, IN 46394-0710
USA

October 20, 2014

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Dave Cline
Section Chief
Indiana Department of Environmental Management
Compliance Data Section, Office of Air Quality
100 North Senate Avenue
MC 61-53 IGCN 1003
Indianapolis, IN 46204-2251

Dear Mr. Cline:

Re: CEM Summary Performance Report – Third Quarter 2014
BP Products North America Inc. - Whiting Business Unit
Part 70 Operating Permit No. T089-6741-00453

Attached please find the Continuous Emission Monitor (CEM) summary performance reports for the BP Products North America Inc. - Whiting Business Unit (BP Whiting). This report is submitted in accordance with the Indiana Department of Environmental Management (IDEM) Operating Permit No. T089-6741-00453, for Significant Permit Modification (SPM) No. 089-33532-00453, issued on February 4, 2014, for the period beginning on July 1, 2014, through September 30, 2014. It fulfills the reporting requirements contained in 326 IAC 3-5-7 and 40 CFR 60.7(c). BP Whiting has chosen to also include the NO_x CEMS Summary Performance Report for the No. 3 Stanolind Power Station (3SPS), which is subject to 326 IAC 24-3 and the monitoring and reporting requirements in 40 CFR Part 75. See Table 1 for a complete list of permitted emissions units and relevant pollutants monitored by CEMS.

In our CEM Summary Performance Report submittals for 1Q14 and 2Q14, it was noted that the data from the carbon monoxide (CO) CEMS for Coker 2 heaters F-201, F-202, and F-203 appeared to indicate CO emissions for the quarter that were suspiciously high, which was reported as valid data until investigations were complete. After completing the investigation into the data, BP Whiting has determined that there were periods of invalid data that was due to a non-monitor malfunction, related to the configuration of the programmable logic controller (PLC) that is responsible for the logging and storage of the data from the Coker 2 heater CO CEMS. This malfunction has resulted in the downtime that has been reported in this report.

Document ID WBU-DENV-3G12-46380

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Table 1. Emission Units and Relevant Pollutants Monitored by CEMS

Location/Emission Unit	Parameter	Applicable Regulation	Reporting Requirement	Notes
Cat. Feed Hydrotreating Unit (CFHU) Fuel Drum				
- CFHU heater F-801A/B - CFHU heater F-801 C	H_2S in Fuel Gas	§60.107a(a)	326 IAC 3-5-7 and 40 CFR 60.7(c)	
- CFHU heater F-801A/B CFHU heater F-801 C	Total sulfur	Permit Section D.19	326 IAC 3-5-7	CEMS began operation on March 27, 2013.
#4 Ultraformer (4 UF) Fuel Drum				
- 4 UF heater F-1 - 4 UF heater F-2 - 4 UF heater F-3 - 4 UF heater F-4 - 4 UF heater F-5 - 4 UF heater F-6 - 4 UF heater F-7 - 4 UF heater F-8A - 4 UF heater F-8B - Blending Oil Unit (BOU) heater F-401	H_2S in Fuel Gas	§60.107a(a)	326 IAC 3-5-7 and 40 CFR 60.7(c)	
- #4 UF heater F-1 - #4 UF heater F-2 - #4 UF heater F-3 - #4 UF heater F-4 - #4 UF heater F-5 - #4 UF heater F-6 - #4 UF heater F-7 - #4 UF heater F-8A - #4 UF heater F-8B - BOU heater F-401	Total Sulfur	Permit Section D.16 Permit Section D.11	326 IAC 3-5-7	CEMS began operation on March 27, 2013.
DDU Flare	H_2S in Fuel Gas	§60.105(a)(4)	326 IAC 3-5-7 and 40 CFR 60.7(c)	

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Location/Emission Unit	Parameter	Applicable Regulation	Reporting Requirement	Notes
Sulfur Recovery Unit (SRU) Mix Fuel Drum				
- 3SPS Boiler 31 - 3SPS Boiler 32 - 3SPS Boiler 33 - 3SPS Boiler 34 - 3SPS Boiler 36 - No. 11 Pipe Still (11 PS) heater H-1X - 11 PS heater H-2 - 11 PS heater H-3 - No. 11B Coker heater H-101 - No. 11B Coker heater H-102 - No. 11B Coker heater H-103 - No. 11B Coker heater H-104 - 11 PS heater H-200 - 11 PS heater H-300 - Aromatics Recovery Unit (ARU) heater F-200A - ARU heater F-200B - Distillate Desulfurization Unit (DDU) heater WB-301 - DDU heater WB-302 - Hydrogen Unit (HU) heater B-501 for refinery fuel gas - Isomerization Unit (ISOM) heater H-1 - Catalytic Refining Unit (CRU) heater F-101 - CRU heater F-102A	H_2S in Fuel Gas	§60.107a(a)	326 IAC 3-5-7 and 40 CFR 60.7(c)	
- 3SPS Duct Burner 1 - 3SPS Duct Burner 2 - 3SPS Duct Burner 3 - 3SPS Duct Burner 4 - 3SPS Duct Burner 6 - 12 PS heater H-101A - 12 PS heater H-101B - 12 PS heater H-102	H_2S in Fuel Gas	§60.107a(a)	326 IAC 3-5-7 and 40 CFR 60.7(c)	
- #2 Coker heater F-201 - #2 Coker heater F-202 - #2 Coker heater F-203	H_2S in Fuel Gas	§60.107a(a)	326 IAC 3-5-7 and 40 CFR 60.7(c)	Note the #2 Coker heaters F-201, 202, and 203 are labeled H-201, 202, and 203 in the permit.

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Location/Emission Unit	Parameter	Applicable Regulation	Reporting Requirement	Notes
- 11 PS heater H-1X - 11 PS heater H-2 - 11 PS heater H-3 - 11 PS heater H-200 - 11 PS heater H-300	Total Sulfur	Permit Section D.1	326 IAC 3-5-7	Not included in this report because the Total Sulfur CEMS has not yet been installed[1]
- ARU heater F-200A - ARU heater F-200B		Permit Section D.10		
- DDU heater WB-301 - DDD heater WB-302		Permit Section D.18		
- HU heater B-501 for refinery fuel gas		Permit Section D.17		
- 3SPS Boiler 31 - 3SPS Boiler 32 - 3SPS Boiler 33 - 3SPS Boiler 34 - 3SPS Boiler 36		N/A		3SPS Boilers 1, 2, 3, 4, and 6 are not required to be monitored for Total Sulfur.
- 12 PS heater H-101A - 12 PS heater H-101B - 12 PS heater H-102		Permit Section D.3		Unit started up in June 2013
- #2 Coker heater F-201 - #2 Coker heater F-202 - #2 Coker heater F-203		Permit Section D.2		Unit started up November 2013
- GOHT heater F-901A - GOHT heater F-901B		Permit Section D.42		Not included because natural gas-fired
#2 Coker heater F-201	NOx	Permit Section D.2 §60.107a(c)	326 IAC 3-5-7	CEMS began operation on November 6, 2013.
#2 Coker heater F-201	CO	Permit Section D.2	326 IAC 3-5-7	
#2 Coker heater F-202	NOx	Permit Section D.2 §60.107a(c)	326 IAC 3-5-7	CEMS began operation on November 6, 2013.
#2 Coker heater F-202	CO	Permit Section D.2	326 IAC 3-5-7	
#2 Coker heater F-203	NOx	Permit Section D.2 §60.107a(c)	326 IAC 3-5-7	CEMS began operation on November 6, 2013.
#2 Coker heater F-203	CO	Permit Section D.2	326 C 3-5-7	
11A PS Heater H-1X	NOx	Permit Section D.1 §60.107a(c)	326 IAC 3-5-7 And 40 CFR 60.7(c)	CEMS began operation on January 1, 2014.
11C PS Heater H-200	NOx	Permit Section D.1 §60.107a(c)	326 IAC 3-5-7 And 40 CFR 60.7(c)	CEMS began operation on January 1, 2014.
12 PS heater H-101A	NOx	Permit Section D.3 §60.107a(c)	326 IAC 3-5-7	CEMS began operation on June 17, 2013.
12 PS heater H-101A	CO	Permit Section D.3	326 IAC 3-5-7	CEMS began operation on June 17, 2013.
12 PS heater H-101B	NOx	Permit Section D.3 §60.107a(c)	326 IAC 3-5-7	CEMS began operation on June 19, 2013.
12 PS heater H-101B	CO	Permit Section D.3	326 IAC 3-5-7	CEMS began operation on June 19, 2013.
12 PS heater H-102	NOx	Permit Section D.3 §60.107a(c)	326 IAC 3-5-7	CEMS began operation on June 23, 2013.
12 PS heater H-102	CO	Permit Section D.3	326 IAC 3-5-7	CEMS began operation on June 23, 2013.
Distillate Hydrotreating (DHT) Unit heater B-601A	NOx	Permit Section D.37	326 IAC 3-5-7	
DHT Unit heater B-601A	CO	Permit Section D.37	326 IAC 3-5-7	

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Location/Emission Unit	Parameter	Applicable Regulation	Reporting Requirement	Notes
GOHT Flare - Routine or planned non-routine streams	H_2S in Fuel Gas	§60.107a(a)	326 IAC 3-5-7 and 40 CFR 60.7(c)	CEMS began operation on October 4, 2013.
GOHT Flare - Routine or planned non-routine streams	Total Sulfur	Permit Section D.35	326 IAC 3-5-7	CEMS began operation on October 4, 2013.
South Flare - Routine or planned non-routine streams	H_2S in Fuel Gas	§60.107a(a)	326 IAC 3-5-7 and 40 CFR 60.7(c)	CEMS began operation on May 17, 2013.
South Flare - Routine or planned non-routine streams	Total Sulfur	Permit Section D.35	326 IAC 3-5-7	CEMS began operation on May 17, 2013.
SRU Claus Offgas Treater #1 (COT1) Tail Gas Unit A (TGU-A)	CO	Permit Section D.4	326 IAC 3-5-7	CEMS began operation on September 8, 2013.
SRU COT1 TGU-A	SO_2	60.106a(a)(1)	326 IAC 3-5-7 and 40 CFR 60.7(c)	CEMS began operation on September 8, 2013.
SRU COT2 TGU-B	CO	Permit Section D.4	326 IAC 3-5-7	CEMS began operation on November 15, 2013.
SRU COT2 TGU-B	SO_2	60.106a(a)(1)	326 IAC 3-5-7 and 40 CFR 60.7(c)	CEMS began operation on November 15, 2013.
Fluid Catalytic Cracking Unit 500 (FCU-500)	NO_x	Consent Decree 2:12CV207 §60.105a(f)	326 IAC 3-5-7	
FCU-500	CO	§60.105a(h)	326 IAC 3-5-7 and 40 CFR 60.7(c)	
FCU-500	SO_2	Consent Decree 2: 12CV207 §60.105a(g)	326 IAC 3-5-7	
Fluid Catalytic Cracking Unit 600 (FCU-600)	NO_x	Consent Decree 2: 12CV207 §60.105a(f)	326 IAC 3-5-7	
FCU-600	CO	§60.105a(h)	326 IAC 3-5-7 and 40 CFR 60.7(c)	
FCU-600	SO_2	Consent Decree 2: 12CV207 §60.105a(g)	326 IAC 3-5-7	
3SPS Boiler 31	NOx	326 IAC 10-4	326 IAC 3-5-7[2]	
3SPS Boiler 31 and Duct Burner 1 (combined stack)	CO	Permit Section D.24	326 IAC 3-5-7	
3SPS Boiler 32	NOx	326 IAC 10-4	326 IAC 3-5-7[2]	
3SPS Boiler 32 and Duct Burner 2 (combined stack)	CO	Permit Section D.24	326 IAC 3-5-7	
3SPS Boiler 33	NOx	326 IAC 10-4	326 IAC 3-5-7[2]	
3SPS Boiler 33 and Duct Burner 3 (combined stack)	CO	Permit Section D.24	326 IAC 3-5-7	
3SPS Boiler 34	NOx	326 IAC 10-4	326 IAC 3-5-7[2]	
3SPS Boiler 34 and Duct Burner 4 (combined stack)	CO	Permit Section D.24	326 IAC 3-5-7	
3SPS Boiler 36	NOx	326 IAC 10-4	326 IAC 3-5-7[2]	
3SPS Boiler 36 and Duct Burner 6 (combined stack)	CO	Permit Section D.24	326 IAC 3-5-7	

[1] The Total Sulfur CEMS for units existing prior to the Whiting Refinery Modernization (OCC) Project are not required until the completion of the Whiting Refinery Modernization (OCC) Project.

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[2] BP Whiting has chosen to also include the NO_x CEMS Summary Performance Report for the 3SPS, which is subject to 326 IAC 24-3 and the monitoring and reporting requirements in 40 CFR Part 75. The 3SPS boilers are listed as Boiler 1, 2, 3, 4, and 6 in the Title V Permit.

In addition to the units listed in Table 1, BP Whiting is exempt from some continuous monitoring requirements through exemptions to NSPS J promulgated on June 24, 2008, after the operating permit was issued, and is complying with monitoring requirements in Operating Permit No. T089-6741-00453, for SPM No. 089-33532-00453, through approved Alternate Monitoring Plans (AMPs). BP Whiting is also exempt from continuous monitoring requirements through exemptions to NSPS Ja promulgated on December 5, 2013. Emission units and details of the exemptions and approved AMPs are provided below.

- The Chemical Grade Propylene (CGP) and Refinery Grade Propylene (RGP) streams vented during propylene loading are subject to the AMP approved June 17, 2011, that does not require monitoring because of the customer specification for low H_2S concentrations.[1]
- Per 40 CFR 60.105(a)(4)(iv)(B), Polymer Grade Propylene (PGP) stream vented during propylene loading is exempt from the H_2S limits and monitoring requirements because it meets a commercial-grade product specification less than 30 ppmv.[1]
- Per 40 CFR 60.107a(a)(3)(iii), the Hydrogen Unit (HU) heater B-501 is exempt from the H2S concentration limits and monitoring requirements because it combusts a fuel gas stream that is inherently low in sulfur content.
- Per 40 CFR 60.105(a)(4)(iv)(B) and 40 CFR 60.107a(a)(3)(ii), the LPG Flare is exempt from the H_2S limits and monitoring requirements because only commercial grade LPG streams are tied to the flare.
- The two thermal oxidizers (Indiana Tank Farm Thermal Oxidizer & Berry Lake Tank Farm Thermal Oxidizer) are subject to the AMP approved per §60.105(a)(4) on January 9, 2006, requiring hydrogen sulfide (H_2S) grab samples per steps established in the AMP.
- The Marketing Terminal - Vapor Combustion Unit (VCU) is subject to the AMP approved per §60.105(a)(4) on March 22, 2007, that does not require monitoring because there are relatively low H2S concentrations in the stream being loaded.

Attachment A contains the CEMS summary reports.

Attachment B contains the excess emission report and CEMS downtime report per 326 IAC 3-5-7, Permit Condition C.12, and 40 CFR 60.7(c). It should be noted that, pursuant with 40 CFR 60.7(c)(1), conversion factors are not used for any CEMS at BP Whiting.

Attachment C, where applicable, contains the results of the cylinder gas audits.

Attachment D contains any and all flaring root cause failure analyses required during the reporting period.

[1] The CGP, RGP, and PGP vent streams are not combusted at BP Whiting under normal operating scenarios.

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Attachment E contains the complete CEMS summary report, excess emission report, CEMS downtime report, and, where applicable, the results of the cylinder gas audits as provided by Praxair, Inc. for the CEMS currently operating at the New Hydrogen Unit (Section D.43).

If you have any questions or comments about the enclosed information, please contact Rohini Sengupta at (219) 473-2110.

Sincerely,

Linda Wilson

Linda Wilson
Environmental Manager
Health, Safety, Security and Environment

Attachments

cc: Phil Perry - IDEM NW Regional Office (pperry@idem.in.gov)

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CEM Summary Performance Report – Third Quarter 2014
BP Products North America Inc. - Whiting Business
Part 70 Operating Permit No. T089-6741-00453, 326 IAC 3-5-7 and 40 CFR 60.7(c)

October 20, 2014

Bcc: Bill Hughes (Electronic – William.Hughes2@bp.com)
Rohini Sengupta (Electronic – Rohini.Sengupta@bp.com)
Jim Keating (Electronic – James.Keating@bp.com)
Kiranmai Valluri, Praxair (Electronic – Kiranmai_Valluri@Praxair.com)
Ken Comey (Electronic – Kenneth.Comey@bp.com)

Path: I:\ENVIRONMENTAL\Air\A-C\CEM\CEM_Report\2014\3Q14
File: 3Q14 Let.doc

Folder: Quarterly CEM Summary Report
Location: 3G12

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PART 70 OPERATING PERMIT CERTIFICATION

Source Name:	BP Products North America, Inc., Whiting Business Unit
Source Address:	2815 Indianapolis Blvd., Whiting, IN 46394
Mailing Address:	P.O. Box 710, Whiting, Indiana 46394-0710
Permit No.:	T089-6741-00453

This certification shall be included when submitting monitoring, testing reports/results or other documents as required by this permit.
Please check what document is being certified:
☐ Annual Compliance Certification Letter
☐ Test Results (specify)
☒ Report (3rd Quarter 2014 CEM Summary Report per 326 IAC 3-5-7, 40 CFR 60.7(c), 326 IAC 10-4, and 40 CFR Part 75)
☐ Notification (specify)
☐ Affidavit (specify)
☐ Other (specify)

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.	
Signature of Responsible Official:	N.S.
Printed Name:	Nick. Spencer
Title/Position:	Whiting Business Unit Leader
Phone:	(219) 473-3179
Date:	10/28/14.

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Attachment A

CEMS Summary Report per 40 CFR 60.7(c) & (d) and 326 IAC 3-5-7

Including the following:

Location/Emission Unit	Parameter	Notes
CFU Fuel Drum	H_2S	
CFU Fuel Drum	Total Sulfur	No summary report available as the TS CEMS is not subject to an emission limit.
CRU Fuel Drum	H_2S	Permanently removed from service.
CRU Fuel Drum	Total Sulfur	Permanently removed from service.
4UF Fuel Drum	H_2S	
4UF Fuel Drum	Total Sulfur	No summary report available as the TS CEMS is not subject to an emission limit.
#2 Coker Merox Treater Off-Gas	TS	CEMS initial RATA certification occurred on April 16, 2014.
DDU Flare	H_2S	
SRU Mix Fuel Drum	H_2S	
SRU Mix Fuel Drum	Total Sulfur	No summary report available as the TS CEMS is not subject to an emission limit.
#2 Coker heater F-201	NO_X	CEMS initial RATA certification occurred on April 17, 2014.
#2 Coker heater F-201	CO	CEMS initial RATA certification occurred on April 17, 2014.
#2 Coker heater F-202	NO_X	CEMS initial RATA certification occurred on April 18, 2014.
#2 Coker heater F-202	CO	CEMS initial RATA certification occurred on April 18, 2014.
#2 Coker heater F-203	NO_X	CEMS initial RATA certification occurred on April 19, 2014.
#2 Coker heater F-203	CO	CEMS initial RATA certification occurred on April 19, 2014.
11PS heater H-1X	NO_X	CEMS began operation January 1, 2014, in accordance with the applicability date of the heater's limit. Initial certification occurred on November 26, 2013.
11PS heater H-200	NO_X	CEMS began operation January 1, 2014, in accordance with the applicability date of the heater's limit. Initial certification occurred on November 26, 2013.
12 PS heater H-101A	NO_X	
12 PS heater H-101A	CO	
12 PS heater H-101B	NO_X	
12 PS heater H-101B	CO	
12 PS heater H-102	NO_X	
12 PS heater H-102	CO	
DHT heater B-601A	NO_X	
DHT heater B-601A	CO	
GOHT Flare	H_2S	CEMS began operation on October 4, 2013.
GOHT Flare	Total Sulfur	No summary report available as the TS CEMS is not subject to an emission limit.
South Flare	H_2S	CEMS began operation on May 17, 2013.
South Flare	Total Sulfur	No summary report available as the TS CEMS is not subject to an emission limit.
[redacted]	[redacted]	[redacted]

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Location/Emission Unit	Parameter	Notes
COT1	CO	CEMS began operation on September 8, 2013.
COT1	SO_2	CEMS began operation on September 8, 2013.
COT2	CO	CEMS began operation on November 15, 2013.
COT2	SO_2	CEMS began operation on November 15, 2013.
FCU 500	NO_X	7-day rolling average
FCU 500	NO_X	365-day rolling average
FCU 500	CO	
FCU 500	SO_2	7-day rolling average
FCU 500	SO_2	365-day rolling average
FCU 600	NO_X	7-day rolling average
FCU 600	NO_X	365-day rolling average
FCU 600	CO	
FCU 600	SO_2	7-day rolling average
FCU 600	SO_2	365-day rolling average
3SPS Boiler 31[2]	NO_X	
3SPS Boiler 31 and Duct Burner 1[2]	CO	
3SPS Boiler 32[2]	NO_X	
3SPS Boiler 32 and Duct Burner 2[2]	CO	
3SPS Boiler 33[2]	NO_X	
3SPS Boiler 33 and Duct Burner 3[2]	CO	
3SPS Boiler 34[2]	NO_X	
3SPS Boiler 34 and Duct Burner 4[2]	CO	
3SPS Boiler 36[2]	NO_X	
3SPS Boiler 36 and Duct Burner 6[2]	CO	

[1] The Total Sulfur CEMS for units existing prior to the Whiting Refinery Modernization Project (WRMP) are not required until the completion of the WRMP.

[2] The 3SPS Boilers are listed as Boiler 1, 2, 3, 4, and 6 in the Title V Permit.

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Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S
Emission Limitation: 162 ppmvd per 3-hour rolling period
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: CFU

Date of Last CEMS Certification or Audit: 07/29/2014 (CGA)
Total Source Operating Time in Reporting Period: 1625 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
1. CEMS downtime in reporting period due to:	Duration	% Unavailable (1)
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	1	0.05
4.Other Known Causes	20	0.92
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	21	0.96

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	10/20/2014
NAME	SIGNATURE	TITLE	DATE

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Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S
Emission Limitation: 60 ppmvd per 365-day rolling period
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: CFU

Date of Last CEMS Certification or Audit: 07/29/2014 (CGA)
Total Source Operating Time in Reporting Period: 1625 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	1	0.06
4.Other Known Causes	20	1.23
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	21	1.29

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	10/20/14
NAME	SIGNATURE	TITLE	DATE

Document ID WBU-DENV-3G12-46380

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Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: TS Raw - 3 hr
Emission Limitation: 162.0
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: CFU

Date of Last CEMS Certification or Audit: 07/29/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	44	1.99
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	44	1.99

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	10/28/14
NAME	SIGNATURE	TITLE	DATE

Document ID WBU-DENV-3G12-46380

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Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: TS Raw - 365 day
Emission Limitation: 70.0
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: CFU

Date of Last CEMS Certification or Audit: 07/29/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	44	1.99
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	44	1.99

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belieformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	
NAME	SIGNATURE	TITLE	DATE

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S
Emission Limitation: 162 ppmvd per 3-hour rolling period
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: No. 4 Ultraformer

Date of Last CEMS Certification or Audit: 7/21/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	1	0.05
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	1	0.05

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	10/21/14
NAME	SIGNATURE	TITLE	DATE

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S
Emission Limitation: 60 ppmvd per 365-day rolling period
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: No. 4 Ultraformer

Date of Last CEMS Certification or Audit: 7/21/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	1	0.05
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	1	0.05

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	10/21/14
NAME	SIGNATURE	TITLE	DATE

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: TS Raw - 365 day
Emission Limitation: 70.0
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: 4UF

Date of Last CEMS Certification or Audit: 09/4/2014 (RATA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	10/28/14
NAME	SIGNATURE	TITLE	DATE

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: TS Raw - 365 day
Emission Limitation: 70.0
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: 4UF

Date of Last CEMS Certification or Audit: 09/4/2014 (RATA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

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Rohini Sengupta		Environmental Engineer	10/28/14
NAME	SIGNATURE	TITLE	DATE

Document ID WBU-DENV-3G12-46380

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Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: MEROX TS Raw - 3 hr
Emission Limitation: 162.0
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: MEROX

Date of Last CEMS Certification or Audit: 07/16/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	44	1.99
3.Calibration/QA	0	0.00
4.Other Known Causes	13	0.59
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	57	2.58

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	10/25/14
NAME	SIGNATURE	TITLE	DATE

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: MEROX TS Raw - 365 Day
Emission Limitation: 70.0
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: MEROX

Date of Last CEMS Certification or Audit: 07/16/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	44	1.99
3.Calibration/QA	0	0.00
4.Other Known Causes	13	0.59
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	57	2.58

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	10/21/14
NAME	SIGNATURE	TITLE	DATE

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S
Emission Limitation: 162 ppmvd per 3-hour rolling period
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: DDU Flare

Date of Last CEMS Certification or Audit: 07/2/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	2	0.09
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	2	0.09

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	10/21/14
NAME	SIGNATURE	TITLE	DATE

Report Printed on: 04/23/14 09:21:59

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Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S 365 Day
Emission Limitation: 60 ppmvd per 365-day rolling period
Reporting Period Dates: From 07/01/2014 To 09/30/2014

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Sulfur Recovery Unit

Date of Last CEMS Certification or Audit: 09/4/2014 (RATA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	1	0.05
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	1	0.00

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

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Rohini Sengupta		Environmental Engineer	10/20/14
NAME	SIGNATURE	TITLE	DATE

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S
Emission Limitation: 162 ppmvd per 3-hour rolling period
Reporting Period Dates: From 07/01/2014 To 09/30/2014

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Sulfur Recovery Unit

Date of Last CEMS Certification or Audit: 09/4/2014 (RATA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	1	0.05
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	1	0.05

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

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Rohini Sengupta		Environmental Engineer	10/20/14
NAME	SIGNATURE	TITLE	DATE

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: TS Raw - 3 hr
Emission Limitation: 162.0
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Sulfur Recovery Unit

Date of Last CEMS Certification or Audit: 09/4/2014 (RATA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	10/28/14
NAME	SIGNATURE	TITLE	DATE

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: TS Raw - 365 day
Emission Limitation: 70.0
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Sulfur Recovery Unit

Date of Last CEMS Certification or Audit: 09/4/2014 (RATA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	10/28/14
NAME	SIGNATURE	TITLE	DATE

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO
Emission Limitation: 17.3 tons per 12 consecutive month
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater F-201

Date of Last CEMS Certification or Audit: 07/11/2014 (CGA)
Total Source Operating Time in Reporting Period: 2026 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	93	4.59
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	93	4.59

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	10/21/14
NAME	SIGNATURE	TITLE	DATE

Document ID WBU-DENV-3G12-46380

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Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: NOx @ 0% O2 30 Day
Emission Limitation: 60 ppm
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater F-201

Date of Last CEMS Certification or Audit: 07/11/2014 (CGA)
Total Source Operating Time in Reporting Period: 2026 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	1	0.05
4.Other Known Causes	2	0.10
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	3	0.15

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

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Rohini Sengupta		Environmental Engineer	10/21/14
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Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: NOx @ 0% O2 30 Day
Emission Limitation: 60 ppm
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater F-202

Date of Last CEMS Certification or Audit: 07/12/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	4	0.18
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	4	0.18

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

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Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO
Emission Limitation: 17.3 tons per 12 consecutive month
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater F-202

Date of Last CEMS Certification or Audit: 07/12/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

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Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: NOx @ 0% O2 30 Day
Emission Limitation: 60 ppm
Reporting Period Dates: From 07/01/2014 To 09/30/2014

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater F-203

Date of Last CEMS Certification or Audit: 07/13/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

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Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO
Emission Limitation: 17.3 tons per 12 consecutive month
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater F-203

Date of Last CEMS Certification or Audit: 07/13/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

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Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: NOx lb/MMBtu 12-month
Emission Limitation: 0.06 lb/MMBtu
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater H-1X

Date of Last CEMS Certification or Audit: 07/02/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

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Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: NOx lb/MMBtu 12-month
Emission Limitation: 0.05 lb/MMBtu
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater H-200

Date of Last CEMS Certification or Audit: 07/02/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	1	0.05
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	1	0.05

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

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Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO
Emission Limitation: 29.5 tons per 12 consecutive month
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater H-101A

Date of Last CEMS Certification or Audit: 07/10/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	2	0.09
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	2	0.09

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

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Rohini Sengupta		Environmental Engineer	10/21/14
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Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: NOx @ 0% O2 30 Day
Emission Limitation: 60 ppm
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater H-101A

Date of Last CEMS Certification or Audit: 07/10/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	2	0.09
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	2	0.09

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

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Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: NOx @ 0% O2 30 Day
Emission Limitation: 60 ppm
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater H-101B

Date of Last CEMS Certification or Audit: 07/10/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	1	0.05
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	1	0.05

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

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Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO
Emission Limitation: 29.5 tons per 12 consecutive month
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater H-101B

Date of Last CEMS Certification or Audit: 07/10/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	1	0.05
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	1	0.05

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

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Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO
Emission Limitation: 27.5 tons per 12 consecutive month
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater H-102

Date of Last CEMS Certification or Audit: 07/10/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	10/28/14
NAME	SIGNATURE	TITLE	DATE

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: NOx @ 0% O2 30 Day
Emission Limitation: 60 ppm
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater H-102

Date of Last CEMS Certification or Audit: 07/10/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	10/21/14
NAME	SIGNATURE	TITLE	DATE

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: NOX
Emission Limitation: 7.3 tons per 12 consecutive month period
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc. - Whiting Bus
Address: 2815 Indianapolis Blvd, Whiting IN 46307
Process Unit Description: DHT

Date of Last CEMS Certification or Audit: 07/22/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	3	0.14
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	3	0.14

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	10/21/14
NAME	SIGNATURE	TITLE	DATE

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO
Emission Limitation: 7.3 tons per 12 consecutive month period
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc. - Whiting Bus
Address: 2815 Indianapolis Blvd, Whiting IN 46307
Process Unit Description: DHT

Date of Last CEMS Certification or Audit: 07/22/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	3	0.14
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	3	0.14

(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	10/21/14
NAME	SIGNATURE	TITLE	DATE

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S
Emission Limitation: 162 ppmvd per 3-hour rolling period
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: GOHT Flare

Date of Last CEMS Certification or Audit: 07/16/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	4	0.18
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	4	0.18
4.Other Known Causes	3	0.14
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	11	0.50

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	10/20/14
NAME	SIGNATURE	TITLE	DATE

Document ID WBU-DENV-3G12-46380

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Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S
Emission Limitation: 162 ppmvd per 3-hour rolling period
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: South Flare

Date of Last CEMS Certification or Audit: 08/18/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	1	0.05
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	1	0.05

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	10/28/14
NAME	SIGNATURE	TITLE	DATE

Document ID WBU-DENV-3G12-46380

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Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: SO2 @ 0% O2 12-hour
Emission Limitation: 250 ppm
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Tail Gas Unit A

Date of Last CEMS Certification or Audit: 07/9/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	2	0.23
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	1	0.05
4.Other Known Causes	3	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	6	0.27

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	10/20/14
NAME	SIGNATURE	TITLE	DATE

Document ID WBU-DENV-3G12-46380

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Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO per 12 consecutive month
Emission Limitation: 55.0 tons
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Tail Gas Unit A

Date of Last CEMS Certification or Audit: 07/9/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	2	0.23
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	1	0.05
4.Other Known Causes	3	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	6	0.27

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	10/20/14
NAME	SIGNATURE	TITLE	DATE

Document ID WBU-DENV-3G12-46380

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Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: SO2 @ 0% O2 12-hour
Emission Limitation: 250 ppm
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Tail Gas Unit B

Date of Last CEMS Certification or Audit: 07/23/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	29	1.31
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	1	0.05
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	30	1.36

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	10/21/14
NAME	SIGNATURE	TITLE	DATE

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO per 12 consecutive month
Emission Limitation: 55.0 tons
Reporting Period Dates: From 07/01/14 to 09/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Tail Gas Unit B

Date of Last CEMS Certification or Audit: 07/23/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	29	1.33
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	29	1.33
4.Other Known Causes	1	0.05
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	59	2.70

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	10/21/14
NAME	SIGNATURE	TITLE	DATE

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Babcock & Wilcox Power Generation Group NetDAHS©

Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 7/1/2014 00:00 through 9/30/2014 23:59

Pollutant: SO2
Emission Limit: 50 PPM (7-Day Rolling Average)
Date of Latest CEMS Certification or Audit: 09/18/2014 (RATA)

Company Name: BP Products North America, Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: Fluid Catalytic Cracking Unit - 500

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	1.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	4.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	11.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	2.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	16.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.73%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
1 For gases, record all times in hours.
2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHINI SENGUPTA

Signature:

Title: Environmental Engineer

Date: 10/20/14

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 7/1/2014 00:00 through 9/30/2014 23:59

Pollutant: SO2
Emission Limit: 25 ppm (365-Day Rolling Average)
Date of Latest CEMS Certification or Audit: 09/18/2014 (RATA)

Company Name: BP Products North America, Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: Fluid Catalytic Cracking Unit - 500

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	1.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	4.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	11.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	2.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	16.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.73%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
[1] For gases, record all times in hours.
[2] For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
[3] Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHINI SENGUPTA

Signature:

Title: Environmental Engineer

Date: 10/20/14

Document ID WBU-DENV-3G12-46380

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Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 7/1/2014 00:00 through 9/30/2014 23:59

Pollutant: NOx
Emission Limit: 80 ppm (7-Day Rolling Average)
Date of Latest CEMS Certification or Audit: 09/18/2014 (RATA)

Company Name: BP Products North America, Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: Fluid Catalytic Cracking Unit - 500

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	1.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	11.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	12.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.54%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
1 For gases, record all times in hours.
2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHINI SENGUPTA

Signature:

Title: Environmental Engineer

Date: 10/20/14

Document ID WBU-DENV-3G12-46380

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Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 7/1/2014 00:00 through 9/30/2014 23:59

Pollutant: NOx
Emission Limit: 40 ppm (365-Day Rolling Average)
Date of Latest CEMS Certification or Audit: 09/18/2014 (RATA)

Company Name: BP Products North America, Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: Fluid Catalytic Cracking Unit - 500

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	1.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	11.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	12.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.54%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
1 For gases, record all times in hours.
2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHINI SENGUPTA

Signature: [signature]

Title: Environmental Engineer

Date: 10/20/14

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

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Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 7/1/2014 00:00 through 9/30/2014 23:59

Pollutant: CO
Emission Limit: 500 ppm (1 Hour Block Average)
Date of Latest CEMS Certification or Audit: 09/18/2014 (RATA)

Company Name: BP Products North America, Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: Fluid Catalytic Cracking Unit - 500

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	1.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	77.0
e. Unknown Excess Emissions Cause.....	0.0	e. Unknown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	78.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	3.53%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
[1] For gases, record all times in hours.
[2] For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
[3] Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHINI SENGUPTA

Signature:

Title: Environmental Engineer

Date: 10/23/14

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Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 7/1/2014 00:00 through 9/30/2014 23:59

Pollutant: SO2
Emission Limit: 125 ppm (7-Day Rolling Average)
Date of Latest CEMS Certification or Audit: 09/16/2014 (RATA)

Company Name: BP Products North America, Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: Fluid Catalytic Cracking Unit - 600

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	4.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	1.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	5.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.22%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
1 For gases, record all times in hours.
2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHINI SENGUPTA

Signature:

Title: Environmental Engineer

Date: 10/20/14

Document ID WBU-DENV-3G12-46380

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Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 7/1/2014 00:00 through 9/30/2014 23:59

Pollutant: SO2
Emission Limit: 50 ppm (365-Day Rolling Average)
Date of Latest CEMS Certification or Audit: 09/16/2014 (RATA)

Company Name: BP Products North America, Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: Fluid Catalytic Cracking Unit - 600

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	4.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	1.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	5.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.22%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
1 For gases, record all times in hours.
2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHINI SENGUPTA

Signature:

Title: Environmental Engineer

Date: 10/21/14

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Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 7/1/2014 00:00 through 9/30/2014 23:59

Pollutant: NOx
Emission Limit: 40 ppm (7-Day Rolling Average)
Date of Latest CEMS Certification or Audit: 09/16/2014 (RATA)

Company Name: BP Products North America, Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: Fluid Catalytic Cracking Unit - 600

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	1.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	1.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.05%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
1 For gases, record all times in hours.
2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHINI SENGUPTA

Signature:

Title: Environmental Engineer

Date: 10/20/14

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Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 7/1/2014 00:00 through 9/30/2014 23:59

Pollutant: NOx
Emission Limit: 20 ppm (365-day rolling average)
Date of Latest CEMS Certification or Audit: 09/16/2014 (RATA)

Company Name: BP Products North America, Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: Fluid Catalytic Cracking Unit - 600

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	1.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	1.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.05%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
1 For gases, record all times in hours.
2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHINI SENGUPTA

Signature:

Title: Environmental Engineer

Date: 10/20/14

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Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 7/1/2014 00:00 through 9/30/2014 23:59

Pollutant: CO
Emission Limit: 500 ppm (1 Hour Block Average)
Date of Latest CEMS Certification or Audit: 09/16/2014 (RATA)

Company Name: BP Products North America, Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: Fluid Catalytic Cracking Unit - 600

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	9.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	1.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	0.0
3. Excess emission duration (%).....	0.41%	3. CEMS downtime (%).....	0.05%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
1 For gases, record all times in hours.
2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHINI SENGUPTA

Signature: Rohini Sengupta

Title: Environmental Engineer

Date: 10/20/2014

Document ID WBU-DENV-3G12-46380

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Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 7/1/2014 00:00 through 9/30/2014 23:59

Pollutant: NOx
Emission Limit: 0.02 lb/mmBTU (365-day rolling average)
Date of Latest CEMS Certification or Audit: 07/1/2014 (CGA)

Company Name: BP Products North America,Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: 3sps Boiler 31

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	1.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	4.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	0.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.22%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
1 For gases, record all times in hours. For opacity, record all times in minutes.
2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statment(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: RUKINI SENGUPTA

Signature: [signature]

Title: Environmental Engineer

Date: 10/20/14

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

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Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 7/1/2014 00:00 through 9/30/2014 23:59

Pollutant: NOx
Emission Limit: 0.02 lb/mmBTU (365-day rolling average)
Date of Latest CEMS Certification or Audit: 07/02/2014 (CGA)

Company Name: BP Products North America,Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: 3sps Boiler 32

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	1.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	4.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	1.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	6.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.27%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
1 For gases, record all times in hours. For opacity, record all times in minutes.
2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statment(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROUINI SENGUPTA

Signature: [signature]

Title: Environmental Engineer

Date: 10/20/14

Document ID WBU-DENV-3G12-46380

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Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 7/1/2014 00:00 through 9/30/2014 23:59

Pollutant: NOx
Emission Limit: 0.02 lb/mmBTU (365-day rolling average)
Date of Latest CEMS Certification or Audit: 07/02/2014 (CGA)

Company Name: BP Products North America,Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: 3sps Boiler 33

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	5.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	3.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	5.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	13.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.59%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
[1] For gases, record all times in hours. For opacity, record all times in minutes.
[2] For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statment(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHINI SENGUPTA

Signature:

Title: Environmental Engineer

Date: 10/20/14

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Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 7/1/2014 00:00 through 9/30/2014 23:59

Pollutant: NOx
Emission Limit: 0.02 lb/mmBTU (365-day rolling average)
Date of Latest CEMS Certification or Audit: 07/10/2014 (CGA)

Company Name: BP Products North America, Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: 3sps Boiler 34

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary (note 1)		CEMS Downtime Summary (note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	1.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	3.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	4.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.18%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
[1] For gases, record all times in hours. For opacity, record all times in minutes.
[2] For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

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On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHINI SENGUPTA

Signature: Sengupt

Title: Environmental Engineer

Date: 10/20/14

Document ID WBU-DENV-3G12-46380

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Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 7/1/2014 00:00 through 9/30/2014 23:59

Pollutant: NOx
Emission Limit: 0.02 lb/mmBTU (365-day rolling average)
Date of Latest CEMS Certification or Audit: 07/10/2014 (CGA)

Company Name: BP Products North America, Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: 3sps Boiler 36

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary (note 1)		CEMS Downtime Summary (note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	8.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	2.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	10.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.45%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
1 For gases, record all times in hours. For opacity, record all times in minutes.
2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statment(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHINI SENGUPTA

Signature:

Title: Environmental Engineer

Date: 10/20/2014

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Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 7/1/2014 00:00 through 9/30/2014 23:59

Pollutant: CO
Emission Limit: 260.4 tons per 12 consecutive month total

Company Name: BP Products North America, Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: 3sps Boilers 31, 32, 33, 34 & 36

Total source operating time in reporting period: **2208.0 hours per boiler**

Emission Data Summary (note 1)		CEMS Downtime Summary (note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	6.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	8.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	5.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	19.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.86%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
1 For gases, record all times in hours. For opacity, record all times in minutes.
2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statment(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHINI SENGUPTA

Signature: Dgupt

Title: Environmental Engineer

Date: 10/28/2014

Document ID WBU-DENV-3G12-46380

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Attachment B

Excess Emission and CEMS Downtime Report per 325 IAC 3-5-7 and 40 CFR 60.7(c)

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: CFU

Parameter: H2S - 3 hr

Limit: 162

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 28 hours
Total Operating Time in the Reporting Period = 1625 hours

Document ID WBU-DENV-3G12-46380

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Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: CFU

Parameter: H2S - 365 Day Limit: 60

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 1625 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: No. 4 Ultraformer

Parameter: H2S - 365 Day Limit: 60

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: No. 4 Ultraformer

Parameter: H2S - 3 hr Limit: 162

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: MEROX

Parameter: TS Raw - 365 Day

Limit: 162

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: MEROX

Parameter: TS Raw - 3-hr Limit: 162

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: DDU Flare

Parameter: H2S ppmd 3-hr Limit: 162

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Sulfur Recovery Unit

Parameter: H2S - 365 day Limit: 60

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Sulfur Recovery Unit

Parameter: H2S - 3 hr Limit: 162

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	Emission Max	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period								

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

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Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater F-201

Parameter: CO per 12 consecutive month Limit: 17.3 tons

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater F-201

Parameter: NOx @ 0% O2 30-Day Limit: 60

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Document ID WBU-DENV-3G12-46380

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater F-202

Parameter: CO per 12 consecutive month Limit: 17.3 tons

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater F-202

Parameter: NOx @ 0% O2 30-Day Limit: 60

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

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Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater F-203

Parameter: NOx @ 0% O2 30-Day Limit: 60

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

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Document ID WBU-DENV-3G12-46380

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater F-203

Parameter: CO per 12 consecutive month Limit: 17.3 tons

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

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Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-1X

Parameter: NOX 12-Month

Limit: 0.06 lb/MMBtu

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

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Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater H-101A

Parameter: NOX @ 0% O2 30 Day Limit: 60

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater H-101A

Parameter: CO per 12 consecutive month Limit: 29.5 tons

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

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Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater H-101B

Parameter: CO per 12 consecutive month Limit: 29.5 tons

Data in the Reporting Period: 06/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

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Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater H-101B

Parameter: NOx @ 0% O2 30 Day Limit: 60

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

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Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater H-102

Parameter: CO per 12 consecutive month Limit: 27.5 tons

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater H-102

Parameter: NOX @ 0% O2 30 Day Limit: 60

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

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Excess Emissions Report

Facility Name: BP Products North America, Inc. - Whiting Bus

Location: 2815 Indianapolis Blvd, Whiting IN 46307

Source: DHT

Parameter: NOX Tons 12-Month

Limit: 7.3

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Excess Emissions Report

Facility Name: BP Products North America, Inc. - Whiting Bus

Location: 2815 Indianapolis Blvd, Whiting IN 46307

Source: DHT

Parameter: CO Tons 12-Month

Limit: 7.3

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: GOHT Flare

Parameter: H2S ppmd 3-hr Limit: 162

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: South Flare

Parameter: H2S ppmd 3-hr Limit: 162

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

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Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Tail Gas Unit A

Parameter: CO per 12 consecutive month Limit: 55.0 tons

Data in the Reporting Period: 06/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Tail Gas Unit A

Parameter: SO2 @ 0% O2 Limit: 250.0

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Tail Gas Unit B

Parameter: CO per 12 consecutive month Limit: 55.0 tons

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Tail Gas Unit B

Parameter: SO2 @ 0% O2 Limit: 55.0 tons

Data in the Reporting Period: 07/01/14 to 09/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

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Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59

Pollutant: NOx_365BP5 Episode: FCU 500 NOx Excess 365 Day

Incident Start	Incident End	Type	Value	Limit	(%Dev)	Cause of Episode	Corrective Action

No FCU 500 NOx Excess 365 Day during the Report Period

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Document ID WBU-DENV-3G12-46380

Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59

Pollutant: CO_5 Episode: FCU 500 CO Excess

Incident Start	Incident End	Type	Value	Limit	(%Dev)	Cause of Episode	Corrective Action

No FCU 500 CO Excess during the Report Period

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Document ID WBU-DENV-3G12-46380

Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59

Pollutant: NOx_365BP6 Episode: FCU 600 NOx Excess 365 Day

Incident Start	Incident End	Duration Hours	Type	Value	Limit	(%Dev)	Cause of Episode	Corrective Action

No FCU 600 NOx Excess 365 Day during the Report Period

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Document ID WBU-DENV-3G12-46380

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Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59

Pollutant: CO_6 Episode: FCU 600 CO Excess

Incident Start	Incident End	Duration Hours	Value	Cause of Episode	Corrective Action
7/17/14 9:00	7/17/14 23:59	15	2007.4	Loss of power at the controls system, which caused a unit upset.	FCU 600 was shut down and restored.

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Document ID WBU-DENV-3G12-46380

Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59

Pollutant: NOxlbmY_31 Episode: Unit 31 NOx lbmmbtu 365 day Excess

Incident Start	Incident End	Type	Value	Limit	(%Dev)	Cause of Episode	Corrective Action
No Unit 31 NOx lbmmbtu 365 day Excess during the Report Period							

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Document ID WBU-DENV-3G12-46380

Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59

Pollutant: NOxlbmY_32 Episode: Unit 32 NOx lbmmbtu 365 day Excess

Incident Start	Incident End	Type	Value	Limit	(%Dev)	Cause of Episode	Corrective Action

No Unit 32 NOx lbmmbtu 365 day Excess during the Report Period

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Document ID WBU-DENV-3G12-46380

Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59

Pollutant: NOxlbmY_33 Episode: Unit 33 NOx lbmmbtu 365 day Excess

Incident Start	Incident End	Type	Value	Limit	(%Dev)	Cause of Episode	Corrective Action

No Unit 33 NOx lbmmbtu 365 day Excess during the Report Period

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Document ID WBU-DENV-3G12-46380

Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59

Pollutant: NOxlbmY_34 Episode: Unit 34 NOx lbmmbtu 365 day Excess

Incident Start	Incident End	Type	Value	Limit	(%Dev)	Cause of Episode	Corrective Action

No Unit 34 NOx lbmmbtu 365 day Excess during the Report Period

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Document ID WBU-DENV-3G12-46380

Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59

Pollutant: NOxlbmY_36 Episode: Unit 36 NOx lbmmbtu 365 day Excess

Incident Start	Incident End	Type	Value	Limit	(%Dev)	Cause of Episode	Corrective Action

No Unit 36 NOx lbmmbtu 365 day Excess during the Report Period

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Document ID WBU-DENV-3G12-46380

Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59

Pollutant: COTNYR Episode: CO Tons/Year

Incident Start	Incident End	Type	Value	Limit	(%Dev)	Cause of Episode	Corrective Action

SPS 31, 32, 33, 34, 36 No CO Tons/Year during the Report Period

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Document ID WBU-DENV-3G12-46380

Downtime Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: CFU

Parameter: H2S CEMS

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	7/29/2014 23:00	7/29/2014 23:59	1	c. QA Calibration	CGA	CGA
2	8/7/2014 5:00	8/8/2014 0:59	20	d. Other known cause	CFU nitrogen level was lowered. As a safety precaution, the analyzer disabled the heater and valves in order to prevent contamination.	Restored to normal.

Total Downtime in the Reporting Period = 21 hours , Data Availability for this Reporting Period = 99.05 %
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

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Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: CFU

Parameter: TS CEMS

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	7/14/2014 7:00	7/14/2014 8:59	2	d. Other known cause	Preventative Maintenance	Preventative Maintenance
2	8/28/2014 4:00	8/29/2014 21:59	42	d. Other known cause	Analyzer contaminated and failed daily callibration check.	Maintenance on analyzer.

Total Downtime in the Reporting Period = 44 hours , Data Availability for this Reporting Period = 96.67 %
Total Operating Time in the Reporting Period = 1625 hours

Document ID WBU-DENV-3G12-46380

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Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: No. 4 Ultraformer

Parameter: H2S CEMS

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	07/09/14 13:00:39	07/09/14 13:59:39	1	D. Other known cause	Preventative Maintenance	Preventative Maintenance

Total Downtime in the Reporting Period = 1 hours , Data Availability for this Reporting Period = 99.95 %
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: No. 4 Ultraformer

Parameter: TS CEMS

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Downtime Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: MEROX

Parameter: TS Analyzer

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	7/13/2014 5:00	7/14/2014 23:59	43	b. Non monitor equipment malfunction	Coker upset, contaminating analyzer and sample system.	Purged Lines.
2	7/15/2014 23:00	7/15/2014 23:59	1	b. Non monitor equipment malfunction	Purging of lines from previous upset.	Purged Lines.
3	8/5/2014 11:00	8/5/2014 23:59	13	d. Other known cause	Replaced Trigger Pack.	Replaced Trigger Pack.

Total Downtime in the Reporting Period = 57 hours , Data Availability for this Reporting Period = 97.42 %
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

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Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: DDU Flare

Parameter: H2S Analyzer

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	07/23/14 8:00:35	07/23/14 9:59:40	2	d. Other known cause	Power off in order to tie in permanent power.	Power off in order to tie in permanent power.

Total Downtime in the Reporting Period = 2 hours , Data Availability for this Reporting Period = 99.91 %
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: DDU Flare

Parameter: TS Analyzer

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
2	07/23/14 8:00:35	07/23/14 9:59:40	2	d. Other known cause	Power off in order to tie in permanent power.	Power off in order to tie in permanent power.

Total Downtime in the Reporting Period = 4 hours , Data Availability for this Reporting Period = 99.81 %
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Downtime Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: SRU

Parameter: H2S CEMS

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	7/17/2014 1:00	7/17/2014 1:59	1	c. Quality assurance calibrations	CGA	CGA

Total Downtime in the Reporting Period = 1 hour, Data Availability for this Reporting Period = 99.95 %
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Downtime Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: SRU

Parameter: TS CEMS

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Downtime Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater F-201

Parameter: CO CEMS

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	7/1/2014 13:00	7/1/2014 14:59	2	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
2	7/1/2014 16:00	7/1/2014 18:59	3	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
3	7/1/2014 21:00	7/1/2014 23:59	3	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
4	7/2/2014 1:00	7/2/2014 2:59	2	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
5	7/2/2014 8:00	7/2/2014 9:59	2	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
6	7/2/2014 10:00	7/2/2014 12:59	3	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
7	7/11/2014 0:00	7/11/2014 1:59	2	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
8	7/14/2014 9:00	7/14/2014 9:59	1	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
9	7/16/2014 10:00	7/16/2014 10:59	1	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
10	7/17/2014 9:00	7/17/2014 9:59	1	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
11	7/18/2014 16:00	7/18/2014 16:59	1	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
12	7/22/2014 13:00	7/22/2014 13:59	1	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
13	7/23/2014 8:00	7/23/2014 9:59	2	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
14	7/24/2014 13:00	7/24/2014 13:59	1	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
15	7/25/2014 9:00	7/25/2014 9:59	1	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
16	8/4/2014 20:00	8/4/2014 20:59	1	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
17	8/4/2014 22:00	8/4/2014 22:59	1	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
18	8/5/2014 2:00	8/5/2014 20:59	19	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.

Document ID WBU-DENV-3G12-46380

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19	8/6/2014 8:00	8/6/2014 20:59	12	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
20	8/7/2014 4:00	8/7/2014 8:59	5	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
21	8/9/2014 12:00	8/9/2014 12:59	1	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
22	8/12/2014 5:00	8/12/2014 5:59	1	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
23	8/14/2014 15:00	8/14/2014 17:59	3	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
24	8/16/2014 14:00	8/16/2014 14:59	1	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
25	8/21/2014 16:00	8/21/2014 16:59	1	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
26	8/23/2014 17:00	8/23/2014 18:59	2	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
27	8/24/2014 10:00	8/24/2014 14:59	5	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
28	8/24/2014 16:00	8/24/2014 19:59	4	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
29	9/3/2014 13:00	9/3/2014 14:59	2	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
30	9/5/2014 17:00	9/5/2014 17:59	1	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
31	9/16/2014 7:00	9/16/2014 8:59	2	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
32	9/16/2014 10:00	9/16/2014 10:59	1	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
33	9/17/2014 5:00	9/17/2014 6:59	2	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
34	9/18/2014 3:00	9/18/2014 3:59	1	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
35	9/23/2014 0:00	9/23/2014 0:59	1	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.
36	9/30/2014 14:00	9/30/2014 14:59	1	d. Other known causes	CO meter minutely resolution issue.	Data substitution for erroneous CO values.

Total Downtime in the Reporting Period = 93 hours , Data Availability for this Reporting Period = 95.41 %
Total Operating Time in the Reporting Period = 2026 hours

Document ID WBU-DENV-3G12-46380

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Downtime Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater F-201

Parameter: NOX CEMS

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	7/16/2014 9:00	7/16/2014 9:59	1	d. Other known causes	Preventative Maintenance	Preventative Maintenance
2	7/23/2014 8:00	7/23/2014 8:59	1	c. QA Calibration	Single bad reading.	Recalibrated anazlyzer.
3	8/6/2014 7:00	8/6/2014 7:59	1	d. Other known causes	Preventative Maintenance	Preventative Maintenance

Total Downtime in the Reporting Period = 3 hours , Data Availability for this Reporting Period = 99.86 %
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater F-202

Parameter: CO CEMS

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 100.00 %
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater F-202

Parameter: NOX CEMS

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	8/28/2014 4:00	8/28/2014 7:59	4	c. QA Calibration	CGA	CGA

Total Downtime in the Reporting Period = 4 hours , Data Availability for this Reporting Period = 99.81 %
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater F-203

Parameter: CO CEMS

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Document ID WBU-DENV-3G12-46380

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater F-203

Parameter: NOX CEMS

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Document ID WBU-DENV-3G12-46380

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-1X

Parameter: NOX CEMS

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 100.00 %
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

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Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-200

Parameter: NOX CEMS

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	7/2/2014 8:00	7/2/2014 8:59	1	c. QA Calibration	CGA	CGA

Total Downtime in the Reporting Period = 1 hours , Data Availability for this Reporting Period = 99.95 %
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

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Downtime Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater H-101A

Parameter: CO CEMS

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
2	9/13/2014 5:00	9/13/2014 6:59	2	a. Monitor equipment malfunctions	Pump failed.	Corrective Maintenance.

Total Downtime in the Reporting Period = 2 hours , Data Availability for this Reporting Period = 99.91 %
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Downtime Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater H-101A

Parameter: NOX CEMS

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	9/13/2014 5:00	9/13/2014 6:59	2	a. Monitor equipment malfunctions	Pump failed.	Corrective Maintenance.

Total Downtime in the Reporting Period = 2 hours , Data Availability for this Reporting Period = 99.91 %
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Downtime Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater H-101B

Parameter: CO CEMS

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	7/7/2014 15:00	7/7/2014 15:59	1	a. Monitor equipment malfunction	Probe box heater failed, which automatically turns off pump.	Heater returned to normal.

Total Downtime in the Reporting Period = 1 hours , Data Availability for this Reporting Period = 99.95 %
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Downtime Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater H-101B

Parameter: NOX CEMS

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log
1	7/7/2014 15:00	7/7/2014 15:59	1	a. Monitor equipment malfunction	

Total Downtime in the Reporting Period = 1 hours , Data Availability for this Reporting Period = 99.95 %
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-102

Parameter: CO CEMS

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Downtime Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater H-102

Parameter: NOX CEMS

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Document ID WBU-DENV-3G12-46380

Downtime Report

Facility Name: BP Products North America, Inc. - Whiting Bus

Location: 2815 Indianapolis Blvd, Whiting IN 46307

Source: DHT

Parameter: NOx CEMS

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	9/4/2014 8:00	9/4/2014 10:59	3	d. Other known cause	Preventative Maintenance	Preventative Maintenance

Total Downtime in the Reporting Period = 3 hours , Data Availability for this Reporting Period = 99.86 %
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Downtime Report

Facility Name: BP Products North America, Inc. - Whiting Bus

Location: 2815 Indianapolis Blvd, Whiting IN 46307

Source: DHT

Parameter: CO CEMS

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	9/4/2014 8:00	9/4/2014 10:59	3	d. Other known cause	Preventative Maintenance	Preventative Maintenance

Total Downtime in the Reporting Period = 3 hours , Data Availability for this Reporting Period = 99.86 %
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Downtime Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: GOHT Flare

Parameter: H2S Analyzer

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	7/5/2014 5:00	7/5/2014 8:59	4	a. Monitor equipment malfunction	PLC locked up with analyzer in Daily Calc Check sequence.	Restored control of analyzer.
2	7/16/2014 8:00	7/16/2014 10:59	3	c. QA Calibration	CGA	CGA
3	7/18/2014 10:00	7/18/2010 10:59	1	d. Other known cause	Loss of power to shelter.	Power restored.
5	8/12/2014 5:00	8/12/2014 7:59	3	c. QA Calibration	Peak shift out of retention time.	Restored control of analyzer.

Total Downtime in the Reporting Period = 11 hours, Data Availability for this Reporting Period = 99.51 %
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Downtime Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: GOHT Flare

Parameter: TS Analyzer

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	8/12/2014 9:00	8/12/2014 9:59	1	c. QA Calibration	CGA	CGA

Total Downtime in the Reporting Period = 1 hours , Data Availability for this Reporting Period = 99.95 %
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: South Flare

Parameter: H2S Analyzer

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	7/28/14 8:00	7/28/14 8:59	1	c. QA Calibration	CGA	CGA

Total Downtime in the Reporting Period = 1 hours , Data Availability for this Reporting Period = 99.95 %
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Downtime Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: South Flare

Parameter: TS Analyzer

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	8/6/14 8:00	8/6/14 12:59	5	d. Other known cause	Replaced PMT Input Board.	Replaced PMT Input Board.
2	8/6/14 15:00	8/6/14 15:59	1	d. Other known cause	Replaced PMT Input Board.	Replaced PMT Input Board.
3	8/18/14 9:00	8/18/14 9:59	1	c. QA Calibration	CGA	CGA

Total Downtime in the Reporting Period = 7 hours , Data Availability for this Reporting Period = 99.68 %
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

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Downtime Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Tail Gas Unit A

Parameter: CO CEMS

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	7/9/2014 9:00	7/9/2014 9:59	1	c. QA Calibration	Cylinder Gas Audit	Cylinder Gas Audit
2	7/13/2014 0:00	7/13/2014 1:59	2	a. Monitor Equipment Malfunction	Bad storm, tripped breaker for sample line causing pump to shut off.	Reset pump.
3	8/25/2014 10:00	8/25/2014 12:59	3	d. Other known cause	Preventative maintenance.	Preventative maintenance.

Total Downtime in the Reporting Period = 6 hours , Data Availability for this Reporting Period = 99.73 %
Total Operating Time in the Reporting Period = 2202 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Downtime Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Tail Gas Unit A

Parameter: SO2 CEMS

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	7/9/2014 9:00	7/9/2014 9:59	1	c. QA Calibration	Cylinder Gas Audit	Cylinder Gas Audit
2	7/13/2014 0:00	7/13/2014 1:59	2	a. Monitor Equipment Malfunction	Bad storm, tripped breaker for sample line causing pump to shut off.	Reset pump.
3	8/25/2014 10:00	8/25/2014 12:59	3	a. Monitor Equipment Malfunction	Preventative maintenance.	Preventative maintenance.

Total Downtime in the Reporting Period = 6 hours , Data Availability for this Reporting Period = 99.73 %
Total Operating Time in the Reporting Period = 2202 hours

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Downtime Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Tail Gas Unit B

Parameter: SO2 CEMS

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	7/25/14 1:00	7/25/14 1:59	1	d. Other known cause	Preventative Maintenance	Preventative Maintenance
2	8/18/14 5:00	8/19/14 9:59	29	a. Monitor equipment malfunction	Range on analyzer didn't swing back during calibration check.	Switched range manually, and put back in service.

Total Downtime in the Reporting Period = 30 hours , Data Availability for this Reporting Period = 98.64 %
Total Operating Time in the Reporting Period = 2208 hours

Document ID WBU-DENV-3G12-46380

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Downtime Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Tail Gas Unit B

Parameter: CO CEMS

Data in the Reporting Period: 07/01/14 to 09/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	7/25/2014 1:00	7/25/2014 1:59	1	d. Other Known Causes	Preventative Maintenance	Preventative Maintenance
2	8/18/2014 5:00	8/19/2014 9:59	29	a. Monitor equipment malfunction	Range on analyzer didn't swing back during calibration check.	Switched range manually, and put back in service.
3	9/22/2014 5:00	9/23/2014 9:59	29	c. Quality assurance calibration	Range on analyzer didn't swing back during calibration check.	Put analyzer back in low range manually, ran calibration check again and passed.

Total Downtime in the Reporting Period = 59 hours , Data Availability for this Reporting Period = 97.32 %
Total Operating Time in the Reporting Period = 2208 hours

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Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59
Generated: : 9/30/2014 14:13

Pollutant: CO_5 Episode: 500 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
08/27/2014 08:00	08/27/2014 12:59	5	d. Other known cause	Switching data logging service to VIM.
08/27/2014 14:00	08/27/2014 14:59	1	d. Other known cause	Switching data logging service to VIM.
09/05/2014 18:00	09/05/2014 18:59	1	a. Monitor Equipment Malfunction	Analyzer was reading correctly, passed daily calibration checks
09/22/2014 10:00	09/25/2014 08:59	71	d. Other known cause	Manually re-calibrated CO analyzer to correct span.

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 78.0 Hours

0.035326087

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Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59
Generated: : 9/30/2014 14:13

Pollutant: O2_5 Episode: 500 O2 Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
08/27/2014 08:00	08/27/2014 12:59	5	d. Other known cause	Switching data logging service to VIM.
08/27/2014 14:00	08/27/2014 14:59	1	d. Other known cause	Switching data logging service to VIM.
09/05/2014 18:00	09/05/2014 18:59	1	a. Monitor Equipment Malfunction	Analyzer was reading correctly, passed daily calibration checks

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 7.0 Hours

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Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59
Generated: : 9/30/2014 14:13

Pollutant: NOx_5 Episode: 500 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
07/30/2014 05:00	07/30/2014 09:59	5	d. Other known cause	Preventative maintenance
08/27/2014 08:00	08/27/2014 12:59	5	d. Other known cause	Switching data logging service to VIM.
08/27/2014 14:00	08/27/2014 14:59	1	d. Other known cause	Switching data logging service to VIM.
09/05/2014 18:00	09/05/2014 18:59	1	a. Monitor Equipment Malfunction	Analyzer was reading correctly, passed daily calibration checks

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 12.0 Hours

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Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59
Generated: : 9/30/2014 14:13

Pollutant: SO2_5 Episode: 500 SO2 Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
07/20/2014 05:00	07/20/2014 08:59	4	b. Non-monitor Equipment Malfunctions	Single bad reading. Calibrated analyzer.
07/30/2014 05:00	07/30/2014 09:59	5	d. Other known cause	Preventative maintenance
08/27/2014 08:00	08/27/2014 12:59	5	d. Other known cause	Switching data logging service to VIM.
08/27/2014 14:00	08/27/2014 14:59	1	d. Other known cause	Switching data logging service to VIM.
09/05/2014 18:00	09/05/2014 18:59	1	a. Monitor Equipment Malfunction	Analyzer was reading correctly, passed daily calibration checks

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 16.0 Hours

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Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59
Generated: : 9/30/2014 14:13

Pollutant: CO_6 Episode: 600 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
07/15/2014 18:00	07/15/2014 18:59	1	d. Other known cause	Preventative maintenance

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Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59
Generated: : 9/30/2014 14:13

Pollutant: SO2_6 Episode: 600 SO2 Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
07/15/2014 18:00	07/15/2014 18:59	1	d. Other known cause	Preventative maintenance
09/06/2014 05:00	09/06/2014 08:59	4	c. QA Calibration	Calibation gas bottle regulator decreased. Set regulator back to proper pressure and returned to normal.

Total Reported Time: 2208 Hours

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Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59
Generated: : 9/30/2014 14:13

Pollutant: NOx_6 Episode: 600 NOx Analyzer Downtime

Incident Start	Incident End	Duration	Cause of Episode	Corrective Action
07/15/2014 18:00	07/15/2014 18:59	1	d. Other known cause	Preventative maintenance

Total Reported Time: 2208

TOTAL DURATION: 1

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Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59
Generated: : 9/30/2014 14:13

Pollutant: O2_6 Episode: 600 O2 Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
07/15/2014 18:00	07/15/2014 18:59	1	Preventative maintenance	

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Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59

Pollutant: NOx_31 Episode: Unit 31 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
07/01/2014 17:00	07/01/2014 17:59	1	a. Quality assurance calibration	CGA
09/24/2014 05:00	09/24/2014 06:59	2	d. Other known cause	Preventative Maintenance
09/24/2014 07:00	09/24/2014 07:59	1	d. Other known cause	Preventative Maintenance
09/24/2014 08:00	09/24/2014 08:59	1	d. Other known cause	Preventative Maintenance

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 5.0 Hours

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Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59

Pollutant: NOx_32 Episode: Unit 32 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
07/02/2014 09:00	07/02/2013 09:59	1	a. Quality assurance calibration	Cylinder Gas Audit
7/30/2014 5:00	7/30/2014 8:59	4	c. Non-Analyzer Malfunction	Sample pump failure. Fixed pump.
7/31/2014 12:00	7/31/2014	1	d. Other known cause	Preventive Maintenance

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 6.0 Hours

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Document ID WBU-DENV-3G12-46380

Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59

Pollutant: NOx_33 Episode: Unit 33 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
07/02/2014 17:00	07/02/2014 17:59	1	a. Quality assurance calibration	Cylinder Gas Audit
08/23/2014 05:00	08/23/2014 07:59	3	d. Other known cause	Double bad reading, recalibrated.
08/26/2014 07:00	08/26/2014 08:59	2	d. Other known cause	Replaced NOx ozonator bulb
08/29/2014 08:00	08/29/2014 09:59	2	c. Non-Analyzer Malfunction	Exhaust line was plugged and didn't allow analyzers to flow properly. Exhaust lines were cleared.
08/29/2014 11:00	08/29/2014 11:59	1	c. Non-Analyzer Malfunction	Exhaust line was plugged and didn't allow analyzers to flow properly. Exhaust lines were cleared.
09/24/2014 05:00	09/24/2014 06:59	2	a. Monitor Equipment Malfunctions	Multi component analyzer wasn't communicating with NOx Analyzer.
09/24/2014 07:00	09/24/2014 07:59	1	a. Monitor Equipment Malfunctions	Multi component analyzer wasn't communicating with NOx Analyzer.
09/24/2014 08:00	09/24/2014 08:59	1	a. Monitor Equipment Malfunctions	Multi component analyzer wasn't communicating with NOx Analyzer.

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 13.0 Hours

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Document ID WBU-DENV-3G12-46380

Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59

Pollutant: NOx_34 Episode: Unit 34 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
07/09/2014 09:00	07/09/2014 09:59	1	d. Other known cause	Replaced NOx ozonator bulb
07/10/2014 10:00	07/10/2014 10:59	1	a. Quality assurance calibration	Cylinder Gas Audit
7/13/2014 5:00	7/13/2014 6:59	2	d. Other known cause	Range stuck in low prior to calibratio

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 4.0 Hours

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Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59

Pollutant: NOx_36 Episode: Unit 36 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
07/09/2014 16:00	07/09/2014 16:59	1	a. Quality assurance calibration	CGA
07/09/2014 23:00	07/10/2014 00:59	2	d. Other known cause	Replaced NOx ozonator.
07/10/2014 01:00	07/10/2014 01:59	1	a. Quality assurance calibration	CGA
07/29/2014 05:00	07/29/2014 06:59	2	a. Quality assurance calibration	Bad Reading, Re-calibrated.
07/29/2014 07:00	07/29/2014 07:59	1	a. Quality assurance calibration	Re-calibrated
08/20/2014 05:00	08/20/2014 06:59	2	a. Quality assurance calibration	Bad Reading, Re-calibrated.
08/20/2014 07:00	08/20/2014 07:59	1	a. Quality assurance calibration	Re-calibrated

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 10.0 Hours

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Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59

Pollutant: CO_31 Episode: Unit 31 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
07/01/2014 08:00	07/01/2014 09:59	1	c. QA Calibration	CGA

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 1.0 Hours

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Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59

Pollutant: CO_32 Episode: Unit 32 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
07/02/2014 09:00	07/02/2013 09:59	1	a. Quality assurance calibration	Cylinder Gas Audit
7/30/2014 5:00	7/30/2014 8:59	4	c. Non-Analyzer Malfunction	Sample pump failure. Fixed pump.
7/31/2014 12:00	7/31/2014	1	d. Other known cause	Preventive Maintenance

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 6.0 Hours

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Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59

Pollutant: CO_33 Episode: Unit 33 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
07/02/2014 17:00	07/02/2014 17:59	1	a. Quality assurance calibration	Cylinder Gas Audit
08/26/2014 07:00	08/26/2014 08:59	2	d. Other known cause	Replaced NOx ozonator bulb
08/29/2014 08:00	08/29/2014 09:59	2	c. Non-Analyzer Malfunction	Exhaust line was plugged and didn't allow analyzers to flow properly. Exhaust lines were cleared.
08/29/2014 11:00	08/29/2014 11:59	1	c. Non-Analyzer Malfunction	Exhaust line was plugged and didn't allow analyzers to flow properly. Exhaust lines were cleared.

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 6.0 Hours

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Document ID WBU-DENV-3G12-46380

Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59

Pollutant: CO_34 Episode: Unit 34 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
07/09/2014 09:00	07/09/2014 09:59	1	d. Other known cause	Replaced NOx ozonator bulb
07/10/2014 10:00	07/10/2014 10:59	1	a. Quality assurance calibration	Cylinder Gas Audit

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 2.0 Hours

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Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 7/1/2014 00:00 to 9/30/2014 23:59

Pollutant: CO_36 Episode: Unit 36 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
07/09/2014 16:00	07/09/2014 16:59	1	d. Other known cause	Preventative Maintenance
07/09/2014 23:00	07/10/2014 01:59	3	a. Quality assurance calibration	Cylinder Gas Audit

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 4.0 Hours

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Attachment C

Cylinder Gas Audit Results

Including the following:

Location/Emission Unit	Parameter	Notes
CFU Fuel Drum	H_2S	
CFU Fuel Drum	Total Sulfur	
4UF Fuel Drum	H_2S	
4UF Fuel Drum	Total Sulfur	
#2 Coker Merox Treater Off-Gas	TS	
DDU Flare	H_2S	
SRU Mix Fuel Drum	H_2S	Not included in this report because RATA done in this quarter.
SRU Mix Fuel Drum	Total Sulfur	Not included in this report because RATA done in this quarter.
#2 Coker heater F-201	NOX	
#2 Coker heater F-201	CO	
#2 Coker heater F-202	NO_X	
#2 Coker heater F-202	CO	
#2 Coker heater F-203	NO_X	
#2 Coker heater F-203	CO	
11PS heater H-1X	NO_X	
11PS heater H-200	NO_X	
12 PS heater H-101A	NO_X	
12 PS heater H-101A	CO	
12 PS heater H-101B	NO_X	
12 PS heater H-101B	CO	
12 PS heater H-102	NO_X	
12 PS heater H-102	CO	
DHT heater B-601A	NO_X	
DHT heater B-601A	CO	
GOHT Flare	H_2S	
GOHT Flare	Total Sulfur	
South Flare	H_2S	
South Flare	Total Sulfur	
COT1	CO	
COT1	SO_2	
COT2	CO	
COT2	SO_2	
[redacted]	[redacted]	[redacted]
3SPS Boiler 31[2]	NO_X	
3SPS Boiler 31 and Duct Burner 1	CO	
3SPS Boiler 32[2]	NO_X	
3SPS Boiler 32 and Duct Burner 2[2]	CO	

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Location/Emission Unit	Parameter	Notes
3SPS Boiler 33[2]	NO_X	
3SPS Boiler 33 and Duct Burner 3[2]	CO	
3SPS Boiler 34[2]	NO_X	
3SPS Boiler 34 and Duct Burner 4[2]	CO	
3SPS Boiler 36[2]	NO_X	
3SPS Boiler 36 and Duct Burner 6[2]	CO	

[1] The Total Sulfur CEMS for units existing prior to the Whiting Refinery Modernization (OCC) Project are not required until the completion of the Whiting Refinery Modernization (OCC) Project.
[2] The 3SPS Boilers are listed as Boiler 1, 2, 3, 4, and 6 in the Title V Permit.

Document ID WBU-DENV-3G12-46380

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Babcock & Wilcox Power Generation Group NetDAHS® Version 84.0

Linearity Calibration Report
Generated: 7/10/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 7/9/2014
Period End: 7/10/2014
Included Calibrations: **Linearity (40CFR75)**

Range of Analyzers:				Span of Analyzers:			
O2_36	O2	0.00	25.00 %O2	O2_36	O2	0.00	25.00 %O2
NOxLow_36	NOx	0.00	50.00 ppm	NOxLow_36	NOx	0.00	50.00 ppm
NOxHigh_36	NOx	0.0	700.0 ppm	NOxHigh_36	NOx	0.0	700.0 ppm

Date	Time	Channel		Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	%		Bottle ID	Expire Date
07/10/2014	03:04	NOxHigh_36	NOx	LOW	175.300	178.200	2.900	1.7	8.765	5.0	PASS	XC021379B	3/3/2022
07/10/2014	03:04	NOxHigh_36	NOx	MID	391.500	392.500	1.000	0.3	19.575	5.0	PASS	CC332043	3/3/2022
07/10/2014	03:04	NOxHigh_36	NOx	HIGH	636.000	635.700	-0.300	0.0	31.800	5.0	PASS	CC123740	4/8/2022
07/10/2014	02:21	NOxHigh_36	NOx	LOW	175.300	178.100	2.800	1.6	8.765	5.0	PASS	XC021379B	3/3/2022
07/10/2014	02:21	NOxHigh_36	NOx	MID	391.500	392.500	1.000	0.3	19.575	5.0	PASS	CC332043	3/3/2022
07/10/2014	02:21	NOxHigh_36	NOx	HIGH	636.000	636.800	0.800	0.1	31.800	5.0	PASS	CC123740	4/8/2022
07/10/2014	01:29	NOxHigh_36	NOx	LOW	175.300	178.100	2.800	1.6	8.765	5.0	PASS	XC021379B	3/3/2022
07/10/2014	01:29	NOxHigh_36	NOx	MID	391.500	392.800	1.300	0.3	19.575	5.0	PASS	CC332043	3/3/2022
07/10/2014	01:29	NOxHigh_36	NOx	HIGH	636.000	636.700	0.700	0.1	31.800	5.0	PASS	CC123740	4/8/2022
07/10/2014	03:04	NOxLow_36	NOx	LOW	12.510	12.530	0.020	0.0	0.626	5.0	PASS	CC174083	11/8/2014
07/10/2014	03:04	NOxLow_36	NOx	MID	26.150	27.550	1.400	5.4	0.000	5.0	PASS	CC259082	1/21/2017
07/10/2014	03:04	NOxLow_36	NOx	HIGH	44.920	44.910	-0.010	0.0	2.246	5.0	PASS	CC231193	12/14/2016
07/10/2014	02:21	NOxLow_36	NOx	LOW	12.510	12.500	-0.010	0.0	0.626	5.0	PASS	CC174083	11/8/2014
07/10/2014	02:21	NOxLow_36	NOx	MID	26.150	27.570	1.420	5.4	0.000	5.0	PASS	CC259082	1/21/2017
07/10/2014	02:21	NOxLow_36	NOx	HIGH	44.920	45.030	0.110	0.2	2.246	5.0	PASS	CC231193	12/14/2016
07/10/2014	01:29	NOxLow_36	NOx	LOW	12.510	12.450	-0.060	-0.8	0.626	5.0	PASS	CC174083	11/8/2014
07/10/2014	01:29	NOxLow_36	NOx	MID	26.150	27.520	1.370	5.4	0.000	5.0	PASS	CC259082	1/21/2017
07/10/2014	01:29	NOxLow_36	NOx	HIGH	44.920	44.960	0.040	0.0	2.246	5.0	PASS	CC231193	12/14/2016
07/10/2014	03:04	O2_36	O2	LOW	6.270	6.290	0.020	0.0	0.313	5.0	PASS	CC134940	1/23/2015
07/10/2014	03:04	O2_36	O2	MID	13.720	13.780	0.060	0.7	0.686	5.0	PASS	CC349278	5/14/2015
07/10/2014	03:04	O2_36	O2	HIGH	21.120	21.080	-0.040	0.0	1.056	5.0	PASS	CC422749	11/26/2021
07/10/2014	02:21	O2_36	O2	LOW	6.270	6.290	0.020	0.0	0.313	5.0	PASS	CC134940	1/23/2015
07/10/2014	02:21	O2_36	O2	MID	13.720	13.790	0.070	0.7	0.686	5.0	PASS	CC349278	5/14/2015
07/10/2014	02:21	O2_36	O2	HIGH	21.120	21.080	-0.040	0.0	1.056	5.0	PASS	CC422749	11/26/2021
07/10/2014	01:29	O2_36	O2	LOW	6.270	6.290	0.020	0.0	0.313	5.0	PASS	CC134940	1/23/2015
07/10/2014	01:29	O2_36	O2	MID	13.720	13.790	0.070	0.7	0.686	5.0	PASS	CC349278	5/14/2015
07/10/2014	01:29	O2_36	O2	HIGH	21.120	21.080	-0.040	0.0	1.056	5.0	PASS	CC422749	11/26/2021

FAIL = Difference Error > Regulations Allow
TARG = Invalid Target (not within regulatory specs)
RDG = Reading exceeds "Range of Analyzer"
Note: 40CFR75 pass/fail determination is performed after rounding the value of Error%, or Drift, to one decimal place

@ Bottle is within 7 days of expiration
# Bottle has Expired - Must be Replaced

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Document ID WBU-DENV-3G12-46380

Linearity Calibration Report
Generated: 7/10/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 7/9/2014
Period End: 7/10/2014
Included Calibrations: **Linearity (40CFR75)**

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) * 100

		----LOW----		----MID----		----HIGH----	
Channel		Diff Units	Target %	Diff Units	Target %	Diff Units	Target %
NOxHigh_36	NOx	2.833	1.6%	1.100	0.3%	0.400	0.1%
NOxLow_36	NOx	0.017	0.1%	1.397	5.3%	0.047	0.1%
O2_36	O2	0.020	0.3%	0.067	0.5%	0.040	0.2%

Performance Specification

Channel		PASS	FAIL
NOxHigh_36	NOx	<=5.0%	>5.0%
NOxLow_36	NOx	<=5.0%	>5.0%
O2_36	O2	<=5.0%	>5.0%

Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part75 Linearity O2] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity O2] Low = 0.5 %O2, Mid = 0.5 %O2, High = 0.5 %O2

Title:: _____ Signature:: _____ Date: / /

Title:: _____ Signature:: _____ Date: / /

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Document ID WBU-DENV-3G12-46380

Linearity Calibration Report
Generated: 7/2/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 7/2/2014
Period End: 7/2/2014
Included Calibrations: **Linearity (40CFR75)**

Range of Analyzers:

O2_32	O2	0.00	25.00 %O2
COLow_32	CO	0.00	100.00 ppm
COHigh_32	CO	0	5000 ppm
NOxLow_32	NOx	0.00	50.00 ppm
NOxHigh_32	NOx	0.0	700.0 ppm

Span of Analyzers:

O2_32	O2	0.00	25.00 %O2
COLow_32	CO	0.00	100.00 ppm
COHigh_32	CO	0	5000 ppm
NOxLow_32	NOx	0.00	50.00 ppm
NOxHigh_32	NOx	0.0	700.0 ppm

Date	Time	Channel		Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	%		Bottle ID	Expire Date
07/02/2014	10:09	COHigh_32	CO	LOW	1230.000	1209.000	-21.000	- N/A -	- N/A -	- N/A -	- N/A -	sg9142063bal	2/24/2017
07/02/2014	10:09	COHigh_32	CO	MID	2735.000	2567.000	-168.000	- N/A -	- N/A -	- N/A -	- N/A -	CC216465	2/25/2017
07/02/2014	10:09	COHigh_32	CO	HIGH	4512.000	4616.000	104.000	- N/A -	- N/A -	- N/A -	- N/A -	CC360555	12/4/2016
07/02/2014	09:29	COHigh_32	CO	LOW	1230.000	1209.000	-21.000	- N/A -	- N/A -	- N/A -	- N/A -	sg9142063bal	2/24/2017
07/02/2014	09:29	COHigh_32	CO	MID	2735.000	2570.000	-165.000	- N/A -	- N/A -	- N/A -	- N/A -	CC216465	2/25/2017
07/02/2014	09:29	COHigh_32	CO	HIGH	4512.000	4610.000	98.000	- N/A -	- N/A -	- N/A -	- N/A -	CC360555	12/4/2016
07/02/2014	08:49	COHigh_32	CO	LOW	1230.000	1209.000	-21.000	- N/A -	- N/A -	- N/A -	- N/A -	sg9142063bal	2/24/2017
07/02/2014	08:49	COHigh_32	CO	MID	2735.000	2572.000	-163.000	- N/A -	- N/A -	- N/A -	- N/A -	CC216465	2/25/2017
07/02/2014	08:49	COHigh_32	CO	HIGH	4512.000	4612.000	100.000	- N/A -	- N/A -	- N/A -	- N/A -	CC360555	12/4/2016
07/02/2014	10:09	COLow_32	CO	LOW	24.540	25.070	0.530	- N/A -	- N/A -	- N/A -	- N/A -	CC439467	2/14/2022
07/02/2014	10:09	COLow_32	CO	MID	56.000	56.000	0.000	- N/A -	- N/A -	- N/A -	- N/A -	CC107578	5/1/2021
07/02/2014	10:09	COLow_32	CO	HIGH	90.600	90.950	0.350	- N/A -	- N/A -	- N/A -	- N/A -	CC437348	11/26/2021
07/02/2014	09:29	COLow_32	CO	LOW	24.540	25.060	0.520	- N/A -	- N/A -	- N/A -	- N/A -	CC439467	2/14/2022
07/02/2014	09:29	COLow_32	CO	MID	56.000	56.030	0.030	- N/A -	- N/A -	- N/A -	- N/A -	CC107578	5/1/2021
07/02/2014	09:29	COLow_32	CO	HIGH	90.600	90.870	0.270	- N/A -	- N/A -	- N/A -	- N/A -	CC437348	11/26/2021
07/02/2014	08:49	COLow_32	CO	LOW	24.540	24.990	0.450	- N/A -	- N/A -	- N/A -	- N/A -	CC439467	2/14/2022
07/02/2014	08:49	COLow_32	CO	MID	56.000	55.920	-0.080	- N/A -	- N/A -	- N/A -	- N/A -	CC107578	5/1/2021
07/02/2014	08:49	COLow_32	CO	HIGH	90.600	90.870	0.270	- N/A -	- N/A -	- N/A -	- N/A -	CC437348	11/26/2021
07/02/2014	10:09	NOxHigh_32	NOx	LOW	175.500	182.100	6.600	3.8	8.775	5.0	PASS	SG9151432BAL	3/3/2022
07/02/2014	10:09	NOxHigh_32	NOx	MID	391.000	395.300	4.300	1.1	19.550	5.0	PASS	cc417045	3/3/2022
07/02/2014	10:09	NOxHigh_32	NOx	HIGH	632.200	631.600	-0.600	-0.1	31.610	5.0	PASS	CC22137	1/21/2022
07/02/2014	09:29	NOxHigh_32	NOx	LOW	175.500	182.700	7.200	4.1	8.775	5.0	PASS	SG9151432BAL	3/3/2022
07/02/2014	09:29	NOxHigh_32	NOx	MID	391.000	372.300	-18.700	-4.8	19.550	5.0	PASS	cc417045	3/3/2022
07/02/2014	09:29	NOxHigh_32	NOx	HIGH	632.200	631.400	-0.800	-0.1	31.610	5.0	PASS	CC22137	1/21/2022
07/02/2014	08:49	NOxHigh_32	NOx	LOW	175.500	183.600	8.100	4.6	8.775	5.0	PASS	SG9151432BAL	3/3/2022
07/02/2014	08:49	NOxHigh_32	NOx	MID	391.000	373.900	-17.100	-4.4	19.550	5.0	PASS	cc417045	3/3/2022
07/02/2014	08:49	NOxHigh_32	NOx	HIGH	632.200	633.200	1.000	0.2	31.610	5.0	PASS	CC22137	1/21/2022

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Document ID WBU-DENV-3G12-46380

Linearity Calibration Report
Generated: 7/2/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 7/2/2014
Period End: 7/2/2014
Included Calibrations: **Linearity (40CFR75)**

Date	Time	Channel		Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	%		Bottle ID	Expire Date
07/02/2014	10:09	NOxLow_32	NOx	LOW	12.460	12.290	-0.170	-1.6	0.623	5.0	PASS	SG9142063BAL	2/24/2017
07/02/2014	10:09	NOxLow_32	NOx	MID	27.490	26.620	-0.870	-3.3	1.375	5.0	PASS	CC216465	2/25/2017
07/02/2014	10:09	NOxLow_32	NOx	HIGH	44.940	45.200	0.260	0.7	2.247	5.0	PASS	CC360555	12/4/2016
07/02/2014	09:29	NOxLow_32	NOx	LOW	12.460	12.280	-0.180	-1.6	0.623	5.0	PASS	SG9142063BAL	2/24/2017
07/02/2014	09:29	NOxLow_32	NOx	MID	27.490	26.520	-0.970	-3.6	1.375	5.0	PASS	CC216465	2/25/2017
07/02/2014	09:29	NOxLow_32	NOx	HIGH	44.940	45.230	0.290	0.7	2.247	5.0	PASS	CC360555	12/4/2016
07/02/2014	08:49	NOxLow_32	NOx	LOW	12.460	12.240	-0.220	-1.6	0.623	5.0	PASS	SG9142063BAL	2/24/2017
07/02/2014	08:49	NOxLow_32	NOx	MID	27.490	26.620	-0.870	-3.3	1.375	5.0	PASS	CC216465	2/25/2017
07/02/2014	08:49	NOxLow_32	NOx	HIGH	44.940	45.220	0.280	0.7	2.247	5.0	PASS	CC360555	12/4/2016
07/02/2014	10:09	O2_32	O2	LOW	6.200	6.360	0.160	3.2	0.310	5.0	PASS	CC439467	2/14/2022
07/02/2014	10:09	O2_32	O2	MID	13.880	14.040	0.160	1.4	0.694	5.0	PASS	CC107578	5/1/2021
07/02/2014	10:09	O2_32	O2	HIGH	20.970	21.330	0.360	1.9	1.048	5.0	PASS	CC437348	11/26/2021
07/02/2014	09:29	O2_32	O2	LOW	6.200	6.360	0.160	3.2	0.310	5.0	PASS	CC439467	2/14/2022
07/02/2014	09:29	O2_32	O2	MID	13.880	14.040	0.160	1.4	0.694	5.0	PASS	CC107578	5/1/2021
07/02/2014	09:29	O2_32	O2	HIGH	20.970	21.340	0.370	1.9	1.048	5.0	PASS	CC437348	11/26/2021
07/02/2014	08:49	O2_32	O2	LOW	6.200	6.370	0.170	3.2	0.310	5.0	PASS	CC439467	2/14/2022
07/02/2014	08:49	O2_32	O2	MID	13.880	14.040	0.160	1.4	0.694	5.0	PASS	CC107578	5/1/2021
07/02/2014	08:49	O2_32	O2	HIGH	20.970	21.330	0.360	1.9	1.048	5.0	PASS	CC437348	11/26/2021

FAIL = Difference Error > Regulations Allow
TARG = Invalid Target (not within regulatory specs)
RDG = Reading exceeds "Range of Analyzer"
Note: 40CFR75 pass/fail determination is performed after rounding the value of Error%, or Drift, to one decimal place

@ Bottle is within 7 days of expiration
# Bottle has Expired - Must be Replaced

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Document ID WBU-DENV-3G12-46380

Linearity Calibration Report
Generated: 7/2/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 7/2/2014
Period End: 7/2/2014
Included Calibrations: **Linearity (40CFR75)**

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) * 100

Channel		----LOW---- Diff Units	Target %	----MID---- Diff Units	Target %	----HIGH---- Diff Units	Target %
COHigh_32	CO	21.000	- N/A -	165.333	- N/A -	100.667	- N/A -
COLow_32	CO	0.500	- N/A -	0.017	- N/A -	0.297	- N/A -
NOxHigh_32	NOx	7.300	4.2%	10.500	2.7%	0.133	0.0%
NOxLow_32	NOx	0.190	1.5%	0.903	3.3%	0.277	0.6%
O2_32	O2	0.163	2.6%	0.160	1.2%	0.363	1.7%

Performance Specification

Channel		PASS	FAIL
COHigh_32	CO	- N/A -	- N/A -
COLow_32	CO	- N/A -	- N/A -
NOxHigh_32	NOx	<=5.0%	>5.0%
NOxLow_32	NOx	<=5.0%	>5.0%
O2_32	O2	<=5.0%	>5.0%

Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part75 Linearity O2] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity O2] Low = 0.5 %O2, Mid = 0.5 %O2, High = 0.5 %O2

Title:: _____ Signature:: _____ Date: ___/___/___

Title:: _____ Signature:: _____ Date: ___/___/___

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Document ID WBU-DENV-3G12-46380

CGA Calibration Report
Generated: 7/2/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 7/2/2014
Period End: 7/2/2014
Included Calibrations: **CGA (40CFR60)**

Range of Analyzers:				Span of Analyzers:			
O2_32	O2	0.00	25.00 %O2	O2_32	O2	0.00	25.00 %O2
COLow_32	CO	0.00	100.00 ppm	COLow_32	CO	0.00	100.00 ppm
COHigh_32	CO	0	5000 ppm	COHigh_32	CO	0	5000 ppm
NOxLow_32	NOx	0.00	50.00 ppm	NOxLow_32	NOx	0.00	50.00 ppm
NOxHigh_32	NOx	0.0	700.0 ppm	NOxHigh_32	NOx	0.0	700.0 ppm

Date	Time	From 3 Pt.	Channel		Type	Target Units	Actual Units	Diff Units	Error %	CGA Allowable (40CFR60) Units	%		Bottle ID	Expire Date
07/02/2014	10:09	*	COHigh_32	CO	LOW	1230.0	1209.0	-21.0	-1.7	184.5	15.0	PASS	SG9142063BAL	2/24/2017
07/02/2014	10:09	*	COHigh_32	CO	MID	2735.0	2567.0	-168.0	-6.1	410.3	15.0	PASS	CC216465	2/25/2017
07/02/2014	09:29	*	COHigh_32	CO	LOW	1230.0	1209.0	-21.0	-1.7	184.5	15.0	PASS	SG9142063BAL	2/24/2017
07/02/2014	09:29	*	COHigh_32	CO	MID	2735.0	2570.0	-165.0	-6.0	410.3	15.0	PASS	CC216465	2/25/2017
07/02/2014	08:49	*	COHigh_32	CO	LOW	1230.0	1209.0	-21.0	-1.7	184.5	15.0	PASS	SG9142063BAL	2/24/2017
07/02/2014	08:49	*	COHigh_32	CO	MID	2735.0	2572.0	-163.0	-6.0	410.3	15.0	PASS	CC216465	2/25/2017
07/02/2014	10:09	*	COLow_32	CO	LOW	24.5	25.1	0.5	2.2	3.7	15.0	PASS	CC439467	2/14/2022
07/02/2014	10:09	*	COLow_32	CO	MID	56.0	56.0	0.0	0.0	8.4	15.0	PASS	CC107578	5/1/2021
07/02/2014	09:29	*	COLow_32	CO	LOW	24.5	25.1	0.5	2.1	3.7	15.0	PASS	CC439467	2/14/2022
07/02/2014	09:29	*	COLow_32	CO	MID	56.0	56.0	0.0	0.1	8.4	15.0	PASS	CC107578	5/1/2021
07/02/2014	08:49	*	COLow_32	CO	LOW	24.5	25.0	0.4	1.8	3.7	15.0	PASS	CC439467	2/14/2022
07/02/2014	08:49	*	COLow_32	CO	MID	56.0	55.9	-0.1	-0.1	8.4	15.0	PASS	CC107578	5/1/2021
07/02/2014	10:09	*	NOxHigh_32	NOx	LOW	175.5	182.1	6.6	3.8	26.3	15.0	PASS	SG9151432BAL	3/3/2022
07/02/2014	10:09	*	NOxHigh_32	NOx	MID	391.0	395.3	4.3	1.1	58.7	15.0	PASS	CC417045	3/3/2022
07/02/2014	09:29	*	NOxHigh_32	NOx	LOW	175.5	182.7	7.2	4.1	26.3	15.0	PASS	SG9151432BAL	3/3/2022
07/02/2014	09:29	*	NOxHigh_32	NOx	MID	391.0	372.3	-18.7	-4.8	58.7	15.0	PASS	CC417045	3/3/2022
07/02/2014	08:49	*	NOxHigh_32	NOx	LOW	175.5	183.6	8.1	4.6	26.3	15.0	PASS	SG9151432BAL	3/3/2022
07/02/2014	08:49	*	NOxHigh_32	NOx	MID	391.0	373.9	-17.1	-4.4	58.7	15.0	PASS	CC417045	3/3/2022
07/02/2014	10:09	*	NOxLow_32	NOx	LOW	12.5	12.3	-0.2	-1.4	1.9	15.0	PASS	SG9142063BAL	2/24/2017
07/02/2014	10:09	*	NOxLow_32	NOx	MID	27.5	26.6	-0.9	-3.2	4.1	15.0	PASS	CC216465	2/25/2017
07/02/2014	09:29	*	NOxLow_32	NOx	LOW	12.5	12.3	-0.2	-1.4	1.9	15.0	PASS	SG9142063BAL	2/24/2017
07/02/2014	09:29	*	NOxLow_32	NOx	MID	27.5	26.5	-1.0	-3.5	4.1	15.0	PASS	CC216465	2/25/2017
07/02/2014	08:49	*	NOxLow_32	NOx	LOW	12.5	12.2	-0.2	-1.8	1.9	15.0	PASS	SG9142063BAL	2/24/2017
07/02/2014	08:49	*	NOxLow_32	NOx	MID	27.5	26.6	-0.9	-3.2	4.1	15.0	PASS	CC216465	2/25/2017
07/02/2014	10:09	*	O2_32	O2	LOW	6.2	6.4	0.2	2.6	0.9	15.0	PASS	CC439467	2/14/2022
07/02/2014	10:09	*	O2_32	O2	MID	13.9	14.0	0.2	1.2	2.1	15.0	PASS	CC107578	5/1/2021

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Document ID WBU-DENV-3G12-46380

CGA Calibration Report
Generated: 7/2/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 7/2/2014
Period End: 7/2/2014
Included Calibrations: **CGA (40CFR60)**

Date	Time	From 3 Pt.	Channel		Type	Target Units	Actual Units	Diff Units	Error %	CGA Allowable (40CFR60) Units	%		Bottle ID	Expire Date
07/02/2014	09:29	*	O2_32	O2	LOW	6.2	6.4	0.2	2.6	0.9	15.0	PASS	CC439467	2/14/2022
07/02/2014	09:29	*	O2_32	O2	MID	13.9	14.0	0.2	1.2	2.1	15.0	PASS	CC107578	5/1/2021
07/02/2014	08:49	*	O2_32	O2	LOW	6.2	6.4	0.2	2.7	0.9	15.0	PASS	CC439467	2/14/2022
07/02/2014	08:49	*	O2_32	O2	MID	13.9	14.0	0.2	1.2	2.1	15.0	PASS	CC107578	5/1/2021

FAIL = Difference Error > Regulations Allow
TARG = Invalid Target (not within regulatory specs)
RDG = Reading exceeds "Range of Analyzer"
@ Bottle is within 7 days of expiration
# Bottle has Expired - Must be Replaced

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) * 100

Channel		----LOW---- Diff Units	Target %	----MID---- Diff Units	Target %
COHigh_32	CO	21.0	1.7%	165.3	6.0%
COLow_32	CO	0.5	2.0%	0.0	0.0%
NOxHigh_32	NOx	7.3	4.2%	10.5	2.7%
NOxLow_32	NOx	0.2	1.5%	0.9	3.3%
O2_32	O2	0.2	2.6%	0.2	1.2%

Performance Specification

Channel		PASS	FAIL
COHigh_32	CO	<=15.0%	>15.0%
COLow_32	CO	<=15.0%	>15.0%
NOxHigh_32	NOx	<=15.0%	>15.0%
NOxLow_32	NOx	<=15.0%	>15.0%
O2_32	O2	<=15.0%	>15.0%

Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA O2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target

Title:: _____ Signature:: _____ Date: / /

Title:: _____ Signature:: _____ Date: / /

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Document ID WBU-DENV-3G12-46380

Babcock & Wilcox Power Generation Group NetDAHS© Version 84.0

CGA Calibration Report
Generated: 7/10/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 7/10/2014
Period End: 7/10/2014
Included Calibrations: **CGA (40CFR60)**

Range of Analyzers:				Span of Analyzers:			
O2_34	O2	0.00	25.00 %O2	O2_34	O2	0.00	25.00 %O2
COLow_34	CO	0.00	100.00 ppm	COLow_34	CO	0.00	100.00 ppm
COHigh_34	CO	0	5000 ppm	COHigh_34	CO	0	5000 ppm
NOxLow_34	NOx	0.00	50.00 ppm	NOxLow_34	NOx	0.00	50.00 ppm
NOxHigh_34	NOx	0.0	700.0 ppm	NOxHigh_34	NOx	0.0	700.0 ppm

Date	Time	From 3 Pt.	Channel		Type	Target Units	Actual Units	Diff Units	Error %	CGA Allowable (40CFR60) Units	%		Bottle ID	Expire Date
07/10/2014	10:24	*	COHigh_34	CO	LOW	1231.0	1203.0	-28.0	-2.3	184.7	15.0	PASS	CC216462	2/24/2017
07/10/2014	10:24	*	COHigh_34	CO	MID	2749.0	2754.0	5.0	0.2	412.4	15.0	PASS	CC259082	1/21/2017
07/10/2014	09:44	*	COHigh_34	CO	LOW	1231.0	1203.0	-28.0	-2.3	184.7	15.0	PASS	CC216462	2/24/2017
07/10/2014	09:44	*	COHigh_34	CO	MID	2749.0	2753.0	4.0	0.1	412.4	15.0	PASS	CC259082	1/21/2017
07/10/2014	09:05	*	COHigh_34	CO	LOW	1231.0	1201.0	-30.0	-2.4	184.7	15.0	PASS	CC216462	2/24/2017
07/10/2014	09:05	*	COHigh_34	CO	MID	2749.0	2752.0	3.0	0.1	412.4	15.0	PASS	CC259082	1/21/2017
07/10/2014	10:24	*	COLow_34	CO	LOW	24.4	24.8	0.4	1.5	3.7	15.0	PASS	CC439468	2/14/2022
07/10/2014	10:24	*	COLow_34	CO	MID	54.4	54.9	0.4	0.8	8.2	15.0	PASS	CC349278	5/14/2015
07/10/2014	09:44	*	COLow_34	CO	LOW	24.4	24.8	0.4	1.6	3.7	15.0	PASS	CC439468	2/14/2022
07/10/2014	09:44	*	COLow_34	CO	MID	54.4	54.9	0.4	0.8	8.2	15.0	PASS	CC349278	5/14/2015
07/10/2014	09:05	*	COLow_34	CO	LOW	24.4	24.7	0.3	1.2	3.7	15.0	PASS	CC439468	2/14/2022
07/10/2014	09:05	*	COLow_34	CO	MID	54.4	54.8	0.3	0.6	8.2	15.0	PASS	CC349278	5/14/2015
07/10/2014	10:24	*	NOxHigh_34	NOx	LOW	175.3	180.9	5.6	3.2	26.3	15.0	PASS	XC021379B	3/3/2022
07/10/2014	10:24	*	NOxHigh_34	NOx	MID	391.5	397.7	6.2	1.6	58.7	15.0	PASS	CC332043	3/3/2022
07/10/2014	09:44	*	NOxHigh_34	NOx	LOW	175.3	180.9	5.6	3.2	26.3	15.0	PASS	XC021379B	3/3/2022
07/10/2014	09:44	*	NOxHigh_34	NOx	MID	391.5	398.4	6.9	1.8	58.7	15.0	PASS	CC332043	3/3/2022
07/10/2014	09:05	*	NOxHigh_34	NOx	LOW	175.3	181.2	5.9	3.4	26.3	15.0	PASS	XC021379B	3/3/2022
07/10/2014	09:05	*	NOxHigh_34	NOx	MID	391.5	398.4	6.9	1.8	58.7	15.0	PASS	CC332043	3/3/2022
07/10/2014	10:24	*	NOxLow_34	NOx	LOW	12.4	12.3	-0.1	-0.7	1.9	15.0	PASS	CC216462	2/24/2017
07/10/2014	10:24	*	NOxLow_34	NOx	MID	26.1	26.3	0.1	0.4	3.9	15.0	PASS	CC259082	1/21/2017
07/10/2014	09:44	*	NOxLow_34	NOx	LOW	12.4	12.3	-0.1	-0.7	1.9	15.0	PASS	CC216462	2/24/2017
07/10/2014	09:44	*	NOxLow_34	NOx	MID	26.1	26.3	0.1	0.4	3.9	15.0	PASS	CC259082	1/21/2017
07/10/2014	09:05	*	NOxLow_34	NOx	LOW	12.4	12.2	-0.2	-1.2	1.9	15.0	PASS	CC216462	2/24/2017
07/10/2014	09:05	*	NOxLow_34	NOx	MID	26.1	26.3	0.1	0.4	3.9	15.0	PASS	CC259082	1/21/2017
07/10/2014	10:24	*	O2_34	O2	LOW	6.2	6.3	0.1	2.1	0.9	15.0	PASS	CC439468	2/14/2022
07/10/2014	10:24	*	O2_34	O2	MID	13.7	13.9	0.2	1.4	2.1	15.0	PASS	CC349278	5/14/2015

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CGA Calibration Report
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Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 7/10/2014
Period End: 7/10/2014
Included Calibrations: **CGA (40CFR60)**

Date	Time	From 3 Pt.	Channel		Type	Target Units	Actual Units	Diff Units	Error %	CGA Allowable (40CFR60) Units	%		Bottle ID	Expire Date
07/10/2014	09:44	*	O2_34	O2	LOW	6.2	6.3	0.1	1.9	0.9	15.0	PASS	CC439468	2/14/2022
07/10/2014	09:44	*	O2_34	O2	MID	13.7	13.9	0.2	1.4	2.1	15.0	PASS	CC349278	5/14/2015
07/10/2014	09:05	*	O2_34	O2	LOW	6.2	6.3	0.1	2.1	0.9	15.0	PASS	CC439468	2/14/2022
07/10/2014	09:05	*	O2_34	O2	MID	13.7	13.9	0.2	1.4	2.1	15.0	PASS	CC349278	5/14/2015

FAIL = Difference Error > Regulations Allow
TARG = Invalid Target (not within regulatory specs)
RDG = Reading exceeds "Range of Analyzer"
@ Bottle is within 7 days of expiration
# Bottle has Expired - Must be Replaced

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) * 100

Channel		----LOW---- Diff Units	Target %	----MID---- Diff Units	Target %
COHigh_34	CO	28.7	2.3%	4.0	0.1%
COLow_34	CO	0.4	1.4%	0.4	0.7%
NOxHigh_34	NOx	5.7	3.3%	6.7	1.7%
NOxLow_34	NOx	0.1	0.9%	0.1	0.4%
O2_34	O2	0.1	2.0%	0.2	1.4%

Performance Specification

Channel		PASS	FAIL
COHigh_34	CO	<=15.0%	>15.0%
COLow_34	CO	<=15.0%	>15.0%
NOxHigh_34	NOx	<=15.0%	>15.0%
NOxLow_34	NOx	<=15.0%	>15.0%
O2_34	O2	<=15.0%	>15.0%

Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA O2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target

Title:: _____ Signature:: _____ Date: / /

Title:: _____ Signature:: _____ Date: / /

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Document ID WBU-DENV-3G12-46380

Linearity Calibration Report
Generated: 7/10/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 7/10/2014
Period End: 7/10/2014
Included Calibrations: **Linearity (40CFR75)**

Range of Analyzers:				Span of Analyzers:			
O2_34	O2	0.00	25.00 %O2	O2_34	O2	0.00	25.00 %O2
COLow_34	CO	0.00	100.00 ppm	COLow_34	CO	0.00	100.00 ppm
COHigh_34	CO	0	5000 ppm	COHigh_34	CO	0	5000 ppm
NOxLow_34	NOx	0.00	50.00 ppm	NOxLow_34	NOx	0.00	50.00 ppm
NOxHigh_34	NOx	0.0	700.0 ppm	NOxHigh_34	NOx	0.0	700.0 ppm

Date	Time	Channel		Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	%		Bottle ID	Expire Date
07/10/2014	10:24	COHigh_34	CO	LOW	1231.000	1203.000	-28.000	- N/A -	- N/A -	- N/A -	- N/A -	CC216462	2/24/2017
07/10/2014	10:24	COHigh_34	CO	MID	2749.000	2754.000	5.000	- N/A -	- N/A -	- N/A -	- N/A -	CC259082	1/21/2017
07/10/2014	10:24	COHigh_34	CO	HIGH	4553.000	4665.000	112.000	- N/A -	- N/A -	- N/A -	- N/A -	CC240001	1/23/2017
07/10/2014	09:44	COHigh_34	CO	LOW	1231.000	1203.000	-28.000	- N/A -	- N/A -	- N/A -	- N/A -	CC216462	2/24/2017
07/10/2014	09:44	COHigh_34	CO	MID	2749.000	2753.000	4.000	- N/A -	- N/A -	- N/A -	- N/A -	CC259082	1/21/2017
07/10/2014	09:44	COHigh_34	CO	HIGH	4553.000	4664.000	111.000	- N/A -	- N/A -	- N/A -	- N/A -	CC240001	1/23/2017
07/10/2014	09:05	COHigh_34	CO	LOW	1231.000	1201.000	-30.000	- N/A -	- N/A -	- N/A -	- N/A -	CC216462	2/24/2017
07/10/2014	09:05	COHigh_34	CO	MID	2749.000	2752.000	3.000	- N/A -	- N/A -	- N/A -	- N/A -	CC259082	1/21/2017
07/10/2014	09:05	COHigh_34	CO	HIGH	4553.000	4663.000	110.000	- N/A -	- N/A -	- N/A -	- N/A -	CC240001	1/23/2017
07/10/2014	10:24	COLow_34	CO	LOW	24.440	24.810	0.370	- N/A -	- N/A -	- N/A -	- N/A -	CC439468	2/14/2022
07/10/2014	10:24	COLow_34	CO	MID	54.430	54.860	0.430	- N/A -	- N/A -	- N/A -	- N/A -	CC349278	5/14/2015
07/10/2014	10:24	COLow_34	CO	HIGH	90.900	92.150	1.250	- N/A -	- N/A -	- N/A -	- N/A -	CC422749	11/26/2021
07/10/2014	09:44	COLow_34	CO	LOW	24.440	24.840	0.400	- N/A -	- N/A -	- N/A -	- N/A -	CC439468	2/14/2022
07/10/2014	09:44	COLow_34	CO	MID	54.430	54.860	0.430	- N/A -	- N/A -	- N/A -	- N/A -	CC349278	5/14/2015
07/10/2014	09:44	COLow_34	CO	HIGH	90.900	92.150	1.250	- N/A -	- N/A -	- N/A -	- N/A -	CC422749	11/26/2021
07/10/2014	09:05	COLow_34	CO	LOW	24.440	24.730	0.290	- N/A -	- N/A -	- N/A -	- N/A -	CC439468	2/14/2022
07/10/2014	09:05	COLow_34	CO	MID	54.430	54.770	0.340	- N/A -	- N/A -	- N/A -	- N/A -	CC349278	5/14/2015
07/10/2014	09:05	COLow_34	CO	HIGH	90.900	92.050	1.150	- N/A -	- N/A -	- N/A -	- N/A -	CC422749	11/26/2021
07/10/2014	10:24	NOxHigh_34	NOx	LOW	175.300	180.900	5.600	3.2	8.765	5.0	PASS	XC021379B	3/3/2022
07/10/2014	10:24	NOxHigh_34	NOx	MID	391.500	397.700	6.200	1.6	19.575	5.0	PASS	CC332043	3/3/2022
07/10/2014	10:24	NOxHigh_34	NOx	HIGH	636.000	642.700	6.700	1.1	31.800	5.0	PASS	CC123740	4/8/2022
07/10/2014	09:44	NOxHigh_34	NOx	LOW	175.300	180.900	5.600	3.2	8.765	5.0	PASS	XC021379B	3/3/2022
07/10/2014	09:44	NOxHigh_34	NOx	MID	391.500	398.400	6.900	1.8	19.575	5.0	PASS	CC332043	3/3/2022
07/10/2014	09:44	NOxHigh_34	NOx	HIGH	636.000	643.700	7.700	1.2	31.800	5.0	PASS	CC123740	4/8/2022
07/10/2014	09:05	NOxHigh_34	NOx	LOW	175.300	181.200	5.900	3.4	8.765	5.0	PASS	XC021379B	3/3/2022
07/10/2014	09:05	NOxHigh_34	NOx	MID	391.500	398.400	6.900	1.8	19.575	5.0	PASS	CC332043	3/3/2022
07/10/2014	09:05	NOxHigh_34	NOx	HIGH	636.000	644.100	8.100	1.3	31.800	5.0	PASS	CC123740	4/8/2022

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Linearity Calibration Report
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Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 7/10/2014
Period End: 7/10/2014
Included Calibrations: **Linearity (40CFR75)**

Date	Time	Channel		Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	%		Bottle ID	Expire Date
07/10/2014	10:24	NOxLow_34	NOx	LOW	12.350	12.260	-0.090	-0.8	0.618	5.0	PASS	CC216462	2/24/2017
07/10/2014	10:24	NOxLow_34	NOx	MID	26.150	26.250	0.100	0.4	1.308	5.0	PASS	CC259082	1/21/2017
07/10/2014	10:24	NOxLow_34	NOx	HIGH	43.750	43.670	-0.080	-0.2	2.188	5.0	PASS	CC240001	1/23/2017
07/10/2014	09:44	NOxLow_34	NOx	LOW	12.350	12.260	-0.090	-0.8	0.618	5.0	PASS	CC216462	2/24/2017
07/10/2014	09:44	NOxLow_34	NOx	MID	26.150	26.260	0.110	0.4	1.308	5.0	PASS	CC259082	1/21/2017
07/10/2014	09:44	NOxLow_34	NOx	HIGH	43.750	43.650	-0.100	-0.2	2.188	5.0	PASS	CC240001	1/23/2017
07/10/2014	09:05	NOxLow_34	NOx	LOW	12.350	12.200	-0.150	-1.6	0.618	5.0	PASS	CC216462	2/24/2017
07/10/2014	09:05	NOxLow_34	NOx	MID	26.150	26.260	0.110	0.4	1.308	5.0	PASS	CC259082	1/21/2017
07/10/2014	09:05	NOxLow_34	NOx	HIGH	43.750	43.730	-0.020	0.0	2.188	5.0	PASS	CC240001	1/23/2017
07/10/2014	10:24	O2_34	O2	LOW	6.190	6.320	0.130	1.6	0.310	5.0	PASS	CC439468	2/14/2022
07/10/2014	10:24	O2_34	O2	MID	13.720	13.910	0.190	1.5	0.686	5.0	PASS	CC349278	5/14/2015
07/10/2014	10:24	O2_34	O2	HIGH	21.120	21.290	0.170	0.9	1.056	5.0	PASS	CC422749	11/26/2021
07/10/2014	09:44	O2_34	O2	LOW	6.190	6.310	0.120	1.6	0.310	5.0	PASS	CC439468	2/14/2022
07/10/2014	09:44	O2_34	O2	MID	13.720	13.910	0.190	1.5	0.686	5.0	PASS	CC349278	5/14/2015
07/10/2014	09:44	O2_34	O2	HIGH	21.120	21.290	0.170	0.9	1.056	5.0	PASS	CC422749	11/26/2021
07/10/2014	09:05	O2_34	O2	LOW	6.190	6.320	0.130	1.6	0.310	5.0	PASS	CC439468	2/14/2022
07/10/2014	09:05	O2_34	O2	MID	13.720	13.910	0.190	1.5	0.686	5.0	PASS	CC349278	5/14/2015
07/10/2014	09:05	O2_34	O2	HIGH	21.120	21.280	0.160	0.9	1.056	5.0	PASS	CC422749	11/26/2021

FAIL = Difference Error > Regulations Allow
TARG = Invalid Target (not within regulatory specs)
RDG = Reading exceeds "Range of Analyzer"
Note: 40CFR75 pass/fail determination is performed after rounding the value of Error%, or Drift, to one decimal place

@ Bottle is within 7 days of expiration
# Bottle has Expired - Must be Replaced

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City/St: Whiting, IN 46394
Source: stack

Period Start: 7/10/2014
Period End: 7/10/2014
Included Calibrations: **Linearity (40CFR75)**

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) * 100

Channel		----LOW---- Diff Units	Target %	----MID---- Diff Units	Target %	----HIGH---- Diff Units	Target %
COHigh_34	CO	28.667	- N/A -	4.000	- N/A -	111.000	- N/A -
COLow_34	CO	0.353	- N/A -	0.400	- N/A -	1.217	- N/A -
NOxHigh_34	NOx	5.700	3.3%	6.667	1.7%	7.500	1.2%
NOxLow_34	NOx	0.110	0.9%	0.107	0.4%	0.067	0.2%
O2_34	O2	0.127	2.0%	0.190	1.4%	0.167	0.8%

Performance Specification

Channel		PASS	FAIL
COHigh_34	CO	- N/A -	- N/A -
COLow_34	CO	- N/A -	- N/A -
NOxHigh_34	NOx	<=5.0%	>5.0%
NOxLow_34	NOx	<=5.0%	>5.0%
O2_34	O2	<=5.0%	>5.0%

Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part75 Linearity O2] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity O2] Low = 0.5 %O2, Mid = 0.5 %O2, High = 0.5 %O2

Title:: _____ Signature:: _____ Date: ___/___/___

Title:: _____ Signature:: _____ Date: ___/___/___

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Document ID WBU-DENV-3G12-46380

CGA Calibration Report
Generated: 7/10/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 7/9/2014
Period End: 7/10/2014
Included Calibrations: **CGA (40CFR60)**

Range of Analyzers:				Span of Analyzers:			
O2_36	O2	0.00	25.00 %O2	O2_36	O2	0.00	25.00 %O2
COLow_36	CO	0.00	100.00 ppm	COLow_36	CO	0.00	100.00 ppm
COHigh_36	CO	0	5000 ppm	COHigh_36	CO	0	5000 ppm
NOxLow_36	NOx	0.00	50.00 ppm	NOxLow_36	NOx	0.00	50.00 ppm
NOxHigh_36	NOx	0.0	700.0 ppm	NOxHigh_36	NOx	0.0	700.0 ppm

Date	Time	From 3 Pt.	Channel		Type	Target Units	Actual Units	Diff Units	Error %	CGA Allowable (40CFR60) Units	%		Bottle ID	Expire Date
07/10/2014	03:04	*	COHigh_36	CO	LOW	1237.0	1252.0	15.0	1.2	185.6	15.0	PASS	CC174083	11/8/2014
07/10/2014	03:04	*	COHigh_36	CO	MID	2749.0	2754.0	5.0	0.2	412.4	15.0	PASS	CC259082	1/21/2017
07/10/2014	02:21	*	COHigh_36	CO	LOW	1237.0	1252.0	15.0	1.2	185.6	15.0	PASS	CC174083	11/8/2014
07/10/2014	02:21	*	COHigh_36	CO	MID	2749.0	2755.0	6.0	0.2	412.4	15.0	PASS	CC259082	1/21/2017
07/10/2014	01:29	*	COHigh_36	CO	LOW	1237.0	1254.0	17.0	1.4	185.6	15.0	PASS	CC174083	11/8/2014
07/10/2014	01:29	*	COHigh_36	CO	MID	2749.0	2758.0	9.0	0.3	412.4	15.0	PASS	CC259082	1/21/2017
07/10/2014	03:04	*	COLow_36	CO	LOW	24.9	24.8	-0.1	-0.4	3.7	15.0	PASS	CC134940	1/23/2015
07/10/2014	03:04	*	COLow_36	CO	MID	54.4	54.3	-0.1	-0.3	8.2	15.0	PASS	CC349278	5/14/2015
07/10/2014	02:21	*	COLow_36	CO	LOW	24.9	24.7	-0.2	-0.8	3.7	15.0	PASS	CC134940	1/23/2015
07/10/2014	02:21	*	COLow_36	CO	MID	54.4	54.3	-0.2	-0.3	8.2	15.0	PASS	CC349278	5/14/2015
07/10/2014	01:29	*	COLow_36	CO	LOW	24.9	24.8	-0.1	-0.5	3.7	15.0	PASS	CC134940	1/23/2015
07/10/2014	01:29	*	COLow_36	CO	MID	54.4	54.4	-0.1	-0.1	8.2	15.0	PASS	CC349278	5/14/2015
07/10/2014	03:04	*	NOxHigh_36	NOx	LOW	175.3	178.2	2.9	1.7	26.3	15.0	PASS	XC021379B	3/3/2022
07/10/2014	03:04	*	NOxHigh_36	NOx	MID	391.5	392.5	1.0	0.3	58.7	15.0	PASS	CC332043	3/3/2022
07/10/2014	02:21	*	NOxHigh_36	NOx	LOW	175.3	178.1	2.8	1.6	26.3	15.0	PASS	XC021379B	3/3/2022
07/10/2014	02:21	*	NOxHigh_36	NOx	MID	391.5	392.5	1.0	0.3	58.7	15.0	PASS	CC332043	3/3/2022
07/10/2014	01:29	*	NOxHigh_36	NOx	LOW	175.3	178.1	2.8	1.6	26.3	15.0	PASS	XC021379B	3/3/2022
07/10/2014	01:29	*	NOxHigh_36	NOx	MID	391.5	392.8	1.3	0.3	58.7	15.0	PASS	CC332043	3/3/2022
07/10/2014	03:04	*	NOxLow_36	NOx	LOW	12.5	12.5	0.0	0.2	1.9	15.0	PASS	CC174083	11/8/2014
07/10/2014	03:04	*	NOxLow_36	NOx	MID	26.1	27.5	1.4	5.4	3.9	15.0	PASS	CC259082	1/21/2017
07/10/2014	02:21	*	NOxLow_36	NOx	LOW	12.5	12.5	0.0	-0.1	1.9	15.0	PASS	CC174083	11/8/2014
07/10/2014	02:21	*	NOxLow_36	NOx	MID	26.1	27.6	1.4	5.4	3.9	15.0	PASS	CC259082	1/21/2017
07/10/2014	01:29	*	NOxLow_36	NOx	LOW	12.5	12.4	-0.1	-0.5	1.9	15.0	PASS	CC174083	11/8/2014
07/10/2014	01:29	*	NOxLow_36	NOx	MID	26.1	27.5	1.4	5.2	3.9	15.0	PASS	CC259082	1/21/2017
07/10/2014	03:04	*	O2_36	O2	LOW	6.3	6.3	0.0	0.3	0.9	15.0	PASS	CC134940	1/23/2015
07/10/2014	03:04	*	O2_36	O2	MID	13.7	13.8	0.1	0.4	2.1	15.0	PASS	CC349278	5/14/2015

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Document ID WBU-DENV-3G12-46380

CGA Calibration Report
Generated: 7/10/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 7/9/2014
Period End: 7/10/2014
Included Calibrations: **CGA (40CFR60)**

Date	Time	From 3 Pt.	Channel		Type	Target Units	Actual Units	Diff Units	Error %	CGA Allowable (40CFR60) Units	%		Bottle ID	Expire Date
07/10/2014	02:21	*	O2_36	O2	LOW	6.3	6.3	0.0	0.3	0.9	15.0	PASS	CC134940	1/23/2015
07/10/2014	02:21	*	O2_36	O2	MID	13.7	13.8	0.1	0.5	2.1	15.0	PASS	CC349278	5/14/2015
07/10/2014	01:29	*	O2_36	O2	LOW	6.3	6.3	0.0	0.3	0.9	15.0	PASS	CC134940	1/23/2015
07/10/2014	01:29	*	O2_36	O2	MID	13.7	13.8	0.1	0.5	2.1	15.0	PASS	CC349278	5/14/2015

FAIL = Difference Error > Regulations Allow
TARG = Invalid Target (not within regulatory specs)
RDG = Reading exceeds "Range of Analyzer"
@ Bottle is within 7 days of expiration
# Bottle has Expired - Must be Replaced

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) * 100

Channel		----LOW---- Diff Units	Target %	----MID---- Diff Units	Target %
COHigh_36	CO	15.7	1.3%	6.7	0.2%
COLow_36	CO	0.1	0.6%	0.1	0.2%
NOxHigh_36	NOx	2.8	1.6%	1.1	0.3%
NOxLow_36	NOx	0.0	0.1%	1.4	5.3%
O2_36	O2	0.0	0.3%	0.1	0.5%

Performance Specification

Channel		PASS	FAIL
COHigh_36	CO	<=15.0%	>15.0%
COLow_36	CO	<=15.0%	>15.0%
NOxHigh_36	NOx	<=15.0%	>15.0%
NOxLow_36	NOx	<=15.0%	>15.0%
O2_36	O2	<=15.0%	>15.0%

Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA O2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target

Title:: _____ Signature:: _____ Date: / /

Title:: _____ Signature:: _____ Date: / /

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Document ID WBU-DENV-3G12-46380

CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

SFTSLowAuditTestResultsAnalyzerSpan:5000.0ppm

Mfr&Model: THERMOFISHERSCIENTIFIC SerialNumber: SL-07990512

Low-LevelCalibrationGas (20-30%ofSpan) (1000.0ppm-1500.0ppm)	Concentration:	1257.000
	CylinderNo.:	CC416821
	ExpirationDate:	10/09/15
Mid-LevelCalibrationGas (50-60%ofSpan) (2500.0ppm-3000.0ppm)	Concentration:	2667.000
	CylinderNo.:	CC214446
	ExpirationDate:	04/12/16

TestDate: 08/18/14 Tester: DW,MC

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	08:06:04	1229.000	08:11:51	2682.000
Run2	08:53:20	1262.000	08:59:12	2693.000
Run3	09:41:53	1444.000	09:47:45	2707.000
Avg.MonitorResponse		1311.700		2694.000
CalibrationError		4.400		1.000
AbsoluteDifference		54.700		27.000
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

CGATestReport-2014Q3

FacilityName: Location:

H-1XNOxAuditTestResultsAnalyzerSpan:150.00ppm

Mfr&Model: ROSEMOUNT SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (30.00ppm-45.00ppm)	Concentration:	37.63
	CylinderNo.:	SG264463
	ExpirationDate:	10/11/16
Mid-LevelCalibrationGas (50-60%ofSpan) (75.00ppm-90.00ppm)	Concentration:	83.71
	CylinderNo.:	CC13260
	ExpirationDate:	10/03/21

TestDate: 07/02/14 Tester: RamonMarquez

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	11:53:15	34.90	11:56:17	83.00
Run2	12:07:55	34.90	12:10:55	82.90
Run3	12:23:15	34.80	12:26:15	82.90
Avg.MonitorResponse		34.87		82.93
CalibrationError		-7.300		-0.900
AbsoluteDifference		2.76		0.78
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

CGATestReport-2014Q3

FacilityName: Location:

GOHTH2SAuditTestResultsAnalyzerSpan:300.0ppm

Mfr&Model: SiemansMaxumII SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (60.0ppm-90.0ppm)	Concentration:	75.7
	CylinderNo.:	CC240098
	ExpirationDate:	02/22/16
Mid-LevelCalibrationGas (50-60%ofSpan) (150.0ppm-180.0ppm)	Concentration:	159.7
	CylinderNo.:	cc337284
	ExpirationDate:	12/09/16

TestDate: 07/16/14 Tester: cndw

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	13:23:31	77.6	13:36:02	162.8
Run2	13:48:30	77.2	14:00:58	158.5
Run3	14:13:31	78.9	14:25:59	157.8
Avg.MonitorResponse		77.9		159.7
CalibrationError		2.900		0.000
AbsoluteDifference		2.2		0.0
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

CGATestReport-2014Q3

FacilityName: Location:

GOHTTSLowAuditTestResultsAnalyzerSpan:5000.0ppm

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (1000.0ppm-1500.0ppm)	Concentration:	1249.000
	CylinderNo.:	CC419526
	ExpirationDate:	02/26/16
Mid-LevelCalibrationGas (50-60%ofSpan) (2500.0ppm-3000.0ppm)	Concentration:	2746.000
	CylinderNo.:	CC419535
	ExpirationDate:	02/26/16

TestDate: 08/12/14 Tester: AT,CC,MB

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	08:43:15	1319.000	08:53:15	2852.000
Run2	09:27:32	1371.000	09:35:51	2881.000
Run3	10:04:30	1376.000	10:12:52	2877.000
Avg.MonitorResponse		1355.300		2870.000
CalibrationError		8.500		4.500
AbsoluteDifference		106.300		124.000
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

SFTSHighAuditTestResultsAnalyzerSpan:500000ppm

Mfr&Model: THERMOFISHERSCIENTIFIC SerialNumber: SL-07990512

Low-LevelCalibrationGas (20-30%ofSpan) (100000ppm-150000	Concentration:	125000.00
	CylinderNo.:	4149370Y
	ExpirationDate:	03/12/15
Mid-LevelCalibrationGas (50-60%ofSpan) (250000ppm-300000	Concentration:	274900.00
	CylinderNo.:	T112577
	ExpirationDate:	12/24/14

TestDate: 08/18/14 Tester: DW,MC

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	08:21:29	131125.00	08:27:21	274781.00
Run2	09:09:19	131375.00	09:15:08	275031.00
Run3	09:57:52	131625.00	10:03:40	275156.00
Avg.MonitorResponse		131375.00		274989.00
CalibrationError		5.100		0.000
AbsoluteDifference		6375.00		89.00
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration}}{\text{Cal.GasConcentration}} \text{X}100$$

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

CGATestReport-2014Q3

FacilityName: Location:

H-200NOxAuditTestResultsAnalyzerSpan:150.0ppm

Mfr&Model: ROSEMOUNT SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (30.0ppm-45.0ppm)	Concentration:	37.6
	CylinderNo.:	CC401910
	ExpirationDate:	10/11/16
Mid-LevelCalibrationGas (50-60%ofSpan) (75.0ppm-90.0ppm)	Concentration:	84.5
	CylinderNo.:	SG48709
	ExpirationDate:	07/12/21

TestDate: 07/02/14 Tester: RamonMarquez

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	08:36:23	36.8	08:39:23	83.0
Run2	08:50:51	36.8	08:53:51	83.2
Run3	09:06:23	36.9	09:09:23	83.3
Avg.MonitorResponse		36.8		83.2
CalibrationError		-2.100		-1.500
AbsoluteDifference		0.8		1.3
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

CGATestReport-2014Q3

FacilityName: Location:

H-200O2AuditTestResultsAnalyzerSpan:25.00%

Mfr&Model: ROSEMOUNT SerialNumber:

Low-LevelCalibrationGas (4.00%-6.00%)	Concentration:	5.00
	CylinderNo.:	CC273914
	ExpirationDate:	10/07/21
Mid-LevelCalibrationGas (8.00%-12.00%)	Concentration:	10.90
	CylinderNo.:	CC19781
	ExpirationDate:	10/08/21

TestDate: 07/02/14 Tester: RamonMarquez

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	08:30:23	4.99	08:33:23	11.05
Run2	08:44:51	4.99	08:47:51	11.05
Run3	09:00:23	4.99	09:03:23	11.05
Avg.MonitorResponse		4.99		11.05
CalibrationError		-0.200		1.400
AbsoluteDifference		0.01		0.15
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

CGATestReport-2014Q3

FacilityName: Location:

H-1XO2AuditTestResultsAnalyzerSpan:25.000%

Mfr&Model: ROSEMOUNT SerialNumber:

Low-LevelCalibrationGas (4.00%-6.00%)
Concentration: 5.010
CylinderNo.: CC200583
ExpirationDate: 10/07/21

Mid-LevelCalibrationGas (8.00%-12.00%)
Concentration: 11.000
CylinderNo.: CC335321
ExpirationDate: 10/08/21

TestDate: 07/02/14 Tester: RamonMarquez

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	11:47:17	4.980	11:50:17	11.020
Run2	12:01:55	4.980	12:04:57	11.010
Run3	12:17:15	4.980	12:20:15	11.020
Avg.MonitorResponse		4.980		11.017
CalibrationError		-0.600		0.200
AbsoluteDifference		0.030		0.017
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

CGATestReport-2014Q3

FacilityName: Location:

GOHTTSHighAuditTestResultsAnalyzerSpan:500000ppm

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (100000ppm-150000	Concentration:	109900.00
	CylinderNo.:	CC185766
	ExpirationDate:	01/20/15
Mid-LevelCalibrationGas (50-60%ofSpan) (250000ppm-300000	Concentration:	274900.00
	CylinderNo.:	4186132Y
	ExpirationDate:	12/06/14

TestDate: 08/12/14 Tester: AT,CC,MB

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	09:01:35	112469.00	09:11:34	273438.00
Run2	09:42:31	112469.00	09:49:11	271719.00
Run3	10:19:32	113219.00	10:26:12	273188.00
Avg.MonitorResponse		112719.00		272782.00
CalibrationError		2.600		-0.800
AbsoluteDifference		2819.00		2118.00
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration}}{\text{Cal.GasConcentration}} \text{X100}$$

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

TGU-BCOLowAuditTestResultsAnalyzerSpan:100.0ppm

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (20.0ppm-30.0ppm)	Concentration:	25.0
	CylinderNo.:	CC50733
	ExpirationDate:	07/23/21
Mid-LevelCalibrationGas (50-60%ofSpan) (50.0ppm-60.0ppm)	Concentration:	55.7
	CylinderNo.:	CC215795
	ExpirationDate:	07/23/21

TestDate: 07/10/14 Tester: DW,CN

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	09:13:58	22.9	09:18:58	52.8
Run2	09:47:54	23.1	09:52:54	52.9
Run3	10:22:45	23.0	10:27:45	53.0
Avg.MonitorResponse		23.0		52.9
CalibrationError		-8.000		-5.000
AbsoluteDifference		2.0		2.8
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

TGU-BCOHighAuditTestResultsAnalyzerSpan:2500.0ppm

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (500.0ppm-750.0ppm)	Concentration:	629.4
	CylinderNo.:	CC260807
	ExpirationDate:	07/23/21
Mid-LevelCalibrationGas (50-60%ofSpan) (1250.0ppm-1500.0ppm)	Concentration:	1363.0
	CylinderNo.:	CC209206
	ExpirationDate:	07/23/21

TestDate: 07/10/14 Tester: DW,CN

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	09:22:54	602.3	09:26:54	1333.6
Run2	09:56:54	602.3	10:00:54	1334.7
Run3	10:31:45	602.3	10:35:45	1334.5
Avg.MonitorResponse		602.3		1334.3
CalibrationError		-4.300		-2.100
AbsoluteDifference		27.1		28.7
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

TGU-AO2AuditTestResultsAnalyzerSpan:25.00%

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (4.00%-6.00%)	Concentration:	4.99
	CylinderNo.:	CC13807
	ExpirationDate:	07/11/21
Mid-LevelCalibrationGas (8.00%-12.00%)	Concentration:	10.04
	CylinderNo.:	CC409458
	ExpirationDate:	07/15/21

TestDate: 07/09/14 Tester: cn

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	09:50:06	4.97	09:53:06	10.01
Run2	10:22:41	4.96	10:25:41	10.01
Run3	10:54:27	4.97	10:57:27	10.02
Avg.MonitorResponse		4.97		10.01
CalibrationError		-0.400		-0.300
AbsoluteDifference		0.02		0.03
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

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CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

TGU-BO2AuditTestResultsAnalyzerSpan:25.00%

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (4.00%-6.00%)	Concentration:	4.81
	CylinderNo.:	CC245088
	ExpirationDate:	07/11/21
Mid-LevelCalibrationGas (8.00%-12.00%)	Concentration:	10.00
	CylinderNo.:	CC164876
	ExpirationDate:	07/15/21

TestDate: 07/10/14 Tester: DW,CN

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	09:29:54	4.83	09:32:54	10.11
Run2	10:03:58	4.83	10:06:58	10.13
Run3	10:38:45	4.83	10:41:45	10.13
Avg.MonitorResponse		4.83		10.12
CalibrationError		0.400		1.200
AbsoluteDifference		0.02		0.12
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

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CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

TGU-ACOHighAuditTestResultsAnalyzerSpan:2500.0ppm

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (500.0ppm-750.0ppm)	Concentration:	627.9
	CylinderNo.:	CC260700
	ExpirationDate:	07/23/21
Mid-LevelCalibrationGas (50-60%ofSpan) (1250.0ppm-1500.0ppm)	Concentration:	1355.0
	CylinderNo.:	CC274110
	ExpirationDate:	07/23/21

TestDate: 07/09/14 Tester: cn

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	09:43:06	600.8	09:47:06	1321.9
Run2	10:15:42	600.6	10:19:41	1321.7
Run3	10:47:27	600.9	10:51:27	1321.7
Avg.MonitorResponse		600.8		1321.8
CalibrationError		-4.300		-2.500
AbsoluteDifference		27.1		33.2
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

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CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

TGU-ACOLowAuditTestResultsAnalyzerSpan:100.0ppm

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (20.0ppm-30.0ppm)	Concentration:	25.0
	CylinderNo.:	CC15581
	ExpirationDate:	07/23/21
Mid-LevelCalibrationGas (50-60%ofSpan) (50.0ppm-60.0ppm)	Concentration:	55.9
	CylinderNo.:	CC288294
	ExpirationDate:	07/23/21

TestDate: 07/09/14 Tester: cn

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	09:34:06	24.7	09:39:06	54.4
Run2	10:06:46	24.6	10:11:42	54.4
Run3	10:38:25	24.7	10:43:25	54.4
Avg.MonitorResponse		24.7		54.4
CalibrationError		-1.200		-2.700
AbsoluteDifference		0.3		1.5
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

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FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

TGU-ASO2HighAuditTestResultsAnalyzerSpan:3000.0ppm

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (600.0ppm-900.0ppm)	Concentration:	748.0
	CylinderNo.:	CC260700
	ExpirationDate:	07/23/21
Mid-LevelCalibrationGas (50-60%ofSpan) (1500.0ppm-1800.0ppm)	Concentration:	1666.0
	CylinderNo.:	CC274110
	ExpirationDate:	07/23/21

TestDate: 07/09/14 Tester: cn

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	09:43:06	762.6	09:47:06	1698.9
Run2	10:15:42	764.8	10:19:41	1705.9
Run3	10:47:27	767.4	10:51:27	1694.6
Avg.MonitorResponse		764.9		1699.8
CalibrationError		2.300		2.000
AbsoluteDifference		16.9		33.8
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

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CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

TGU-ASO2LowAuditTestResultsAnalyzerSpan:500.0ppm

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (100.0ppm-150.0ppm)	Concentration:	128.6
	CylinderNo.:	CC15581
	ExpirationDate:	07/23/21
Mid-LevelCalibrationGas (50-60%ofSpan) (250.0ppm-300.0ppm)	Concentration:	278.2
	CylinderNo.:	CC288294
	ExpirationDate:	07/23/21

TestDate: 07/09/14 Tester: cn

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	09:34:06	128.6	09:39:06	283.2
Run2	10:06:46	129.0	10:11:42	283.6
Run3	10:38:25	129.0	10:43:25	282.4
Avg.MonitorResponse		128.9		283.1
CalibrationError		0.200		1.800
AbsoluteDifference		0.3		4.9
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

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CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

TGU-BSO2LowAuditTestResultsAnalyzerSpan:500.0ppm

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (100.0ppm-150.0ppm)	Concentration:	128.8
	CylinderNo.:	CC50733
	ExpirationDate:	07/23/21
Mid-LevelCalibrationGas (50-60%ofSpan) (250.0ppm-300.0ppm)	Concentration:	281.3
	CylinderNo.:	CC215795
	ExpirationDate:	07/23/21

TestDate: 07/10/14 Tester: DW,CN

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	09:13:58	125.5	09:18:58	282.9
Run2	09:47:54	124.9	09:52:54	280.6
Run3	10:22:45	127.4	10:27:45	284.2
Avg.MonitorResponse		125.9		282.6
CalibrationError		-2.300		0.500
AbsoluteDifference		2.9		1.3
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

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CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

TGU-BSO2HighAuditTestResultsAnalyzerSpan:3000.0ppm

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (600.0ppm-900.0ppm)	Concentration:	748.0
	CylinderNo.:	CC260807
	ExpirationDate:	07/23/21
Mid-LevelCalibrationGas (50-60%ofSpan) (1500.0ppm-1800.0ppm)	Concentration:	1667.0
	CylinderNo.:	CC209206
	ExpirationDate:	07/23/21

TestDate: 07/10/14 Tester: DW,CN

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	09:22:54	756.2	09:26:54	1682.4
Run2	09:56:54	752.8	10:00:54	1688.1
Run3	10:31:45	756.2	10:35:45	1684.7
Avg.MonitorResponse		755.1		1685.1
CalibrationError		0.900		1.100
AbsoluteDifference		7.1		18.1
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

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CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

TSTSAuditTestResultsAnalyzerSpan:400.0ppm

Mfr&Model: Sola SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (80.0ppm-120.0ppm)	Concentration:	101.3
	CylinderNo.:	CC411655
	ExpirationDate:	02/25/16
Mid-LevelCalibrationGas (50-60%ofSpan) (200.0ppm-240.0ppm)	Concentration:	218.3
	CylinderNo.:	CC431431
	ExpirationDate:	05/08/16

TestDate: 07/16/14 Tester: RR

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	00:10:41	100.5	00:16:13	217.2
Run2	00:25:09	103.4	00:30:42	217.4
Run3	00:39:29	103.5	00:44:57	221.2
Avg.MonitorResponse		102.5		218.6
CalibrationError		1.2		0.1
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentrationX100}}{\text{Cal.GasConcentration}}$$

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CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-202O2AuditTestResultsAnalyzerSpan:25.00%

Low-LevelCalibrationGas (4.00%-6.00%)	Concentration:	5.05
	CylinderNo.:	CC153920
	ExpirationDate:	02/01/21
Mid-LevelCalibrationGas (8.00%-12.00%)	Concentration:	11.00
	CylinderNo.:	SG900888ALB
	ExpirationDate:	01/31/21

TestDate: 07/12/14 Tester: WULITICH

	Low				Mid			
	Time	Monitor Value	Abs Diff	% Error	Time	Monitor Value	Abs Diff	% Error
Run1	09:41:05	5.16	0.11	2.2	09:44:25	11.16	0.16	1.5
Run2	10:11:40	5.14	0.09	1.8	10:15:00	11.18	0.18	1.6
Run3	10:38:33	5.16	0.11	2.2	10:41:53	11.19	0.19	1.7
Avg.MonitorResponse		5.15				11.18		
Reference/Target		5.05				11.00		
AbsoluteDifference			0.10				0.18	
%CalibrationError				2.0				1.6
Performance Specification				15.0%				15.0%
TestStatus	Pass				Pass			

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentrationX100}}{\text{Cal.GasConcentration}}$$

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CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-203O2AuditTestResultsAnalyzerSpan:25.00%

Low-LevelCalibrationGas (4.00%-6.00%)	Concentration:	5.01
	CylinderNo.:	203-O2-low
	ExpirationDate:	10/17/17
Mid-LevelCalibrationGas (8.00%-12.00%)	Concentration:	10.94
	CylinderNo.:	203-O2-mid
	ExpirationDate:	01/01/17

TestDate: 07/13/14 Tester: c.clark

	Low				Mid			
	Time	Monitor Value	Abs Diff	% Error	Time	Monitor Value	Abs Diff	% Error
Run1	15:38:37	4.96	0.05	-1.0	15:41:57	10.95	0.01	0.1
Run2	16:03:26	4.94	0.07	-1.4	16:06:46	10.95	0.01	0.1
Run3	16:31:14	4.94	0.07	-1.4	16:34:34	10.95	0.01	0.1
Avg.MonitorResponse		4.95				10.95		
Reference/Target		5.01				10.94		
AbsoluteDifference			0.06				0.01	
%CalibrationError				-1.2				0.1
Performance Specification				15.0%				15.0%
TestStatus	Pass				Pass			

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentrationX100}}{\text{Cal.GasConcentration}}$$

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CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-202NOxHighAuditTestResultsAnalyzerSpan:150.0ppm

Mfr&Model: Rosemount SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (30.0ppm-45.0ppm)	Concentration:	37.1
	CylinderNo.:	CC364264
	ExpirationDate:	02/27/16
Mid-LevelCalibrationGas (50-60%ofSpan) (75.0ppm-90.0ppm)	Concentration:	81.8
	CylinderNo.:	CC417013
	ExpirationDate:	02/27/21

TestDate: 07/12/14 Tester: WULITICH

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	09:55:25	35.9	09:59:05	78.2
Run2	10:26:04	35.8	10:29:39	78.0
Run3	10:52:53	35.9	10:56:33	78.1
Avg.MonitorResponse		35.9		78.1
CalibrationError		-3.2		-4.5
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

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CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-203NOxHighAuditTestResultsAnalyzerSpan:150.0ppm

Mfr&Model: Rosemount SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (30.0ppm-45.0ppm)	Concentration:	37.1
	CylinderNo.:	cc267047
	ExpirationDate:	02/27/16
Mid-LevelCalibrationGas (50-60%ofSpan) (75.0ppm-90.0ppm)	Concentration:	81.6
	CylinderNo.:	cc403273
	ExpirationDate:	02/27/21

TestDate: 07/13/14 Tester: c.clark

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	15:52:59	37.6	15:56:39	80.4
Run2	16:17:46	37.6	16:21:26	80.5
Run3	16:45:33	37.8	16:49:13	80.2
Avg.MonitorResponse		37.7		80.4
CalibrationError		1.6		-1.5
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

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CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-203COLowAuditTestResultsAnalyzerSpan:100.0ppm

Mfr&Model: Rosemount SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (20.0ppm-30.0ppm)	Concentration:	25.2
	CylinderNo.:	cc21321
	ExpirationDate:	02/01/21
Mid-LevelCalibrationGas (50-60%ofSpan) (50.0ppm-60.0ppm)	Concentration:	55.6
	CylinderNo.:	cc235394
	ExpirationDate:	01/31/21

TestDate: 07/13/14 Tester: c.clark

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	15:38:37	23.5	15:41:57	54.2
Run2	16:03:26	23.3	16:06:46	54.3
Run3	16:31:14	23.4	16:34:34	54.3
Avg.MonitorResponse		23.4		54.3
CalibrationError		-7.1		-2.3
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

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CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-202COLowAuditTestResultsAnalyzerSpan:100.0ppm

Mfr&Model: Rosemount SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (20.0ppm-30.0ppm)	Concentration:	25.1
	CylinderNo.:	CC153920
	ExpirationDate:	02/01/21
Mid-LevelCalibrationGas (50-60%ofSpan) (50.0ppm-60.0ppm)	Concentration:	54.8
	CylinderNo.:	SG900888ALB
	ExpirationDate:	01/31/21

TestDate: 07/12/14 Tester: WULITICH

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	09:41:05	21.5	09:44:25	51.2
Run2	10:11:40	21.3	10:15:00	51.4
Run3	10:38:33	21.6	10:41:53	51.4
Avg.MonitorResponse		21.5		51.3
CalibrationError		-14.3		-6.4
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

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CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-203COHighAuditTestResultsAnalyzerSpan:5000.0ppm

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (1000.0ppm-1500.0ppm)	Concentration:	1241.0
	CylinderNo.:	cc216801
	ExpirationDate:	02/11/16
Mid-LevelCalibrationGas (50-60%ofSpan) (2500.0ppm-3000.0ppm)	Concentration:	2774.0
	CylinderNo.:	cc331310
	ExpirationDate:	02/11/16

TestDate: 07/13/14 Tester: c.clark

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	15:45:37	1213.4	15:49:19	2750.6
Run2	16:10:26	1213.4	16:14:06	2750.9
Run3	16:38:14	1213.1	16:41:54	2750.6
Avg.MonitorResponse		1213.3		2750.7
CalibrationError		-2.2		-0.1
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

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CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-203NOxLowAuditTestResultsAnalyzerSpan:50.0ppm

Mfr&Model: Rosemount SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (10.0ppm-15.0ppm)	Concentration:	12.6
	CylinderNo.:	cc216801
	ExpirationDate:	02/11/16
Mid-LevelCalibrationGas (50-60%ofSpan) (25.0ppm-30.0ppm)	Concentration:	27.3
	CylinderNo.:	cc331310
	ExpirationDate:	02/11/16

TestDate: 07/13/14 Tester: c.clark

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	15:45:37	12.4	15:49:19	27.2
Run2	16:10:26	12.4	16:14:06	27.4
Run3	16:38:14	12.4	16:41:54	27.4
Avg.MonitorResponse		12.4		27.3
CalibrationError		-1.6		0.0
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

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CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-202NOxLowAuditTestResultsAnalyzerSpan:50.0ppm

Mfr&Model: Rosemount SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (10.0ppm-15.0ppm)	Concentration:	12.6
	CylinderNo.:	CC174682
	ExpirationDate:	02/11/16
Mid-LevelCalibrationGas (50-60%ofSpan) (25.0ppm-30.0ppm)	Concentration:	27.7
	CylinderNo.:	CC422138
	ExpirationDate:	09/13/16

TestDate: 07/12/14 Tester: WULITICH

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	09:48:05	11.9	09:51:45	26.3
Run2	10:18:40	12.1	10:22:20	26.2
Run3	10:45:33	12.1	10:49:13	26.3
Avg.MonitorResponse		12.0		26.3
CalibrationError		-4.8		-5.1
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentrationX100}}{\text{Cal.GasConcentration}}$$

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CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-202COHighAuditTestResultsAnalyzerSpan:5000.0ppm

Mfr&Model: Rosemount SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (1000.0ppm-1500.0ppm)	Concentration:	1238.0
	CylinderNo.:	CC174682
	ExpirationDate:	02/11/16
Mid-LevelCalibrationGas (50-60%ofSpan) (2500.0ppm-3000.0ppm)	Concentration:	2778.0
	CylinderNo.:	CC422138
	ExpirationDate:	09/13/16

TestDate: 07/12/14 Tester: WULITICH

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	09:48:05	1220.3	09:51:45	2769.4
Run2	10:18:40	1226.9	10:22:20	2765.0
Run3	10:45:33	1226.9	10:49:13	2769.7
Avg.MonitorResponse		1224.7		2768.0
CalibrationError		-1.1		-0.4
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

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CGATestReport-2014Q3

FacilityName: Location:

DHTNOxAuditTestResultsAnalyzerSpan:100.0ppm

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (20.0ppm-30.0ppm)	Concentration:	24.6
	CylinderNo.:	CC422940
	ExpirationDate:	06/24/17
Mid-LevelCalibrationGas (50-60%ofSpan) (50.0ppm-60.0ppm)	Concentration:	54.6
	CylinderNo.:	CC114328
	ExpirationDate:	07/18/15

TestDate: 07/22/14 Tester: MC

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	01:12:40	24.4	01:15:24	53.6
Run2	01:29:16	24.7	01:31:56	53.8
Run3	01:45:44	24.6	01:48:28	54.1
Avg.MonitorResponse		24.6		53.8
CalibrationError		0.000		-1.500
AbsoluteDifference		0.0		0.8
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

Document ID WBU-DENV-3G12-46380

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CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-201NOxHighAuditTestResultsAnalyzerSpan:150.0ppm

Mfr&Model: Rosemount SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (30.0ppm-45.0ppm)	Concentration:	37.2
	CylinderNo.:	CC166891
	ExpirationDate:	02/27/16
Mid-LevelCalibrationGas (50-60%ofSpan) (75.0ppm-90.0ppm)	Concentration:	81.9
	CylinderNo.:	CC220652
	ExpirationDate:	07/08/21

TestDate: 07/11/14 Tester: WULITICH

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	00:02:58	39.0	00:06:38	84.3
Run2	00:32:44	38.7	00:36:24	84.1
Run3	01:01:19	38.7	01:05:03	83.6
Avg.MonitorResponse		38.8		84.0
CalibrationError		4.3		2.6
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentrationX100}}{\text{Cal.GasConcentration}}$$

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-201O2AuditTestResultsAnalyzerSpan:25.00%

Low-LevelCalibrationGas (4.00%-6.00%)	Concentration:	5.00
	CylinderNo.:	CC165008
	ExpirationDate:	02/01/21
Mid-LevelCalibrationGas (8.00%-12.00%)	Concentration:	10.94
	CylinderNo.:	CC300228
	ExpirationDate:	01/31/21

TestDate: 07/10/14 Tester: wulitich

	Low				Mid			
	Time	Monitor Value	Abs Diff	% Error	Time	Monitor Value	Abs Diff	% Error
Run1	23:48:36	5.01	0.01	0.2	23:51:56	11.05	0.11	1.0
Run2	00:18:28	5.00	0.00	0.0	00:21:48	11.04	0.10	0.9
Run3	00:47:00	5.04	0.04	0.8	00:50:20	11.02	0.08	0.7
Avg.MonitorResponse		5.02				11.04		
Reference/Target		5.00				10.94		
AbsoluteDifference			0.02				0.10	
%CalibrationError				0.4				0.9
Performance Specification				15.0%				15.0%
TestStatus	Pass				Pass			

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentrationX100}}{\text{Cal.GasConcentration}}$$

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

CGATestReport-2014Q3

FacilityName: Location:

DHTO2AuditTestResultsAnalyzerSpan:25.00%

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (4.00%-6.00%)	Concentration:	5.03
	CylinderNo.:	CC200407
	ExpirationDate:	05/09/15
Mid-LevelCalibrationGas (8.00%-12.00%)	Concentration:	11.01
	CylinderNo.:	CC58808
	ExpirationDate:	05/09/15

TestDate: 07/22/14 Tester: MC

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	01:07:16	5.03	01:10:00	11.02
Run2	01:23:48	5.04	01:26:32	11.02
Run3	01:40:20	5.05	01:43:04	11.02
Avg.MonitorResponse		5.04		11.02
CalibrationError		0.200		0.100
AbsoluteDifference		0.01		0.01
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

CGATestReport-2014Q3

FacilityName: Location:

DDUTSLowAuditTestResultsAnalyzerSpan:2000.0ppm

Mfr&Model: SOLA SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (400.00ppm-600.00ppm)	Concentration:	510.500
	CylinderNo.:	cc340514
	ExpirationDate:	01/14/16
Mid-LevelCalibrationGas (50-60%ofSpan) (1000.0ppm-1200.0ppm)	Concentration:	1112.000
	CylinderNo.:	cc337780
	ExpirationDate:	01/20/15

TestDate: 07/02/14 Tester: mb

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	07:40:58	511.000	07:49:18	1045.000
Run2	08:21:00	519.000	08:29:20	1037.000
Run3	09:02:55	514.000	09:11:15	1025.000
Avg.MonitorResponse		514.670		1035.700
CalibrationError		0.800		-6.900
AbsoluteDifference		4.170		76.300
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-201COLowAuditTestResultsAnalyzerSpan:100.0ppm

Mfr&Model: Rosemount SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (20.0ppm-30.0ppm)	Concentration:	25.2
	CylinderNo.:	CC165008
	ExpirationDate:	02/01/21
Mid-LevelCalibrationGas (50-60%ofSpan) (50.0ppm-60.0ppm)	Concentration:	55.5
	CylinderNo.:	CC300228
	ExpirationDate:	01/31/21

TestDate: 07/10/14 Tester: WULITICH

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	23:48:36	24.4	23:51:56	53.7
Run2	00:18:28	24.5	00:21:48	53.4
Run3	00:47:00	24.5	00:50:20	53.6
Avg.MonitorResponse		24.5		53.6
CalibrationError		-2.8		-3.4
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-201COHighAuditTestResultsAnalyzerSpan:5000.0ppm

Mfr&Model: Rosemount SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (1000.0ppm-1500.0ppm)	Concentration:	1237.0
	CylinderNo.:	CC154101
	ExpirationDate:	02/11/16
Mid-LevelCalibrationGas (50-60%ofSpan) (2500.0ppm-3000.0ppm)	Concentration:	2787.0
	CylinderNo.:	CC340356
	ExpirationDate:	02/11/16

TestDate: 07/10/14 Tester: WULITICH

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	23:55:38	1237.8	23:59:18	2763.4
Run2	00:25:28	1233.4	00:29:08	2770.0
Run3	00:54:00	1239.7	00:57:39	2762.5
Avg.MonitorResponse		1237.0		2765.3
CalibrationError		0.0		-0.8
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-201NOxLowAuditTestResultsAnalyzerSpan:50.0ppm

Mfr&Model: Rosemount SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (10.0ppm-15.0ppm)	Concentration:	12.6
	CylinderNo.:	CC154101
	ExpirationDate:	02/11/16
Mid-LevelCalibrationGas (50-60%ofSpan) (25.0ppm-30.0ppm)	Concentration:	27.4
	CylinderNo.:	CC340356
	ExpirationDate:	02/11/16

TestDate: 07/10/14 Tester: WULITICH

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	23:55:38	12.9	23:59:18	28.4
Run2	00:25:28	12.9	00:29:08	28.2
Run3	00:54:00	12.9	00:57:39	28.2
Avg.MonitorResponse		12.9		28.3
CalibrationError		2.4		3.3
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentrationX100}}{\text{Cal.GasConcentration}}$$

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

CGATestReport-2014Q3

FacilityName: Location:

DHTCOHighAuditTestResultsAnalyzerSpan:5000.0ppm

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (1000.0ppm-1500.0ppm)	Concentration:	1249.0
	CylinderNo.:	CC422940
	ExpirationDate:	06/24/17
Mid-LevelCalibrationGas (50-60%ofSpan) (2500.0ppm-3000.0ppm)	Concentration:	2819.0
	CylinderNo.:	CC114328
	ExpirationDate:	07/18/15

TestDate: 07/22/14 Tester: MC

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	01:12:40	1275.9	01:15:24	2842.5
Run2	01:29:16	1276.9	01:31:56	2839.1
Run3	01:45:44	1275.3	01:48:28	2839.1
Avg.MonitorResponse		1276.0		2840.2
CalibrationError		2.200		0.800
AbsoluteDifference		27.0		21.2
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

CGATestReport-2014Q3

FacilityName: Location:

DHTCOLowAuditTestResultsAnalyzerSpan:100.0ppm

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (20.0ppm-30.0ppm)	Concentration:	25.3
	CylinderNo.:	CC200407
	ExpirationDate:	05/09/15
Mid-LevelCalibrationGas (50-60%ofSpan) (50.0ppm-60.0ppm)	Concentration:	54.5
	CylinderNo.:	CC58808
	ExpirationDate:	05/09/15

TestDate: 07/22/14 Tester: MC

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	01:07:16	26.5	01:10:00	54.6
Run2	01:23:48	26.5	01:26:32	54.7
Run3	01:40:20	26.7	01:43:04	54.7
Avg.MonitorResponse		26.6		54.7
CalibrationError		5.100		0.400
AbsoluteDifference		1.3		0.2
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration}}{\text{Cal.GasConcentration}} \text{X100}$$

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

CGATestReport-2014Q3

FacilityName: Location:

DDUTSHighAuditTestResultsAnalyzerSpan:200000ppm

Mfr&Model: SOLA SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (40000ppm-60000ppm)
Concentration: 49999.000
CylinderNo.: sg9160598
ExpirationDate: 01/12/16

Mid-LevelCalibrationGas (50-60%ofSpan) (100000ppm-120000
Concentration: 109900.000
CylinderNo.: cc214373
ExpirationDate: 01/20/15

TestDate: 07/02/14 Tester: mb

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	07:56:00	54013.000	08:02:40	116475.000
Run2	08:35:59	54013.000	08:42:36	116325.000
Run3	09:17:59	54300.000	09:24:35	116475.000
Avg.MonitorResponse		54109.000		116425.000
CalibrationError		8.200		5.900
AbsoluteDifference		4110.000		6525.000
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentrationX100}}{\text{Cal.GasConcentration}}$$

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

CGATestReport-2014Q3

FacilityName: Location:

DDUH2SAuditTestResultsAnalyzerSpan:300.0ppm

Mfr&Model: SIEMENS SerialNumber: 3003875841000606

Low-LevelCalibrationGas (20-30%ofSpan) (60.0ppm-90.0ppm)
Concentration: 75.4
CylinderNo.: CC209525
ExpirationDate: 11/12/16

Mid-LevelCalibrationGas (50-60%ofSpan) (150.0ppm-180.0ppm)
Concentration: 157.7
CylinderNo.: CC430964
ExpirationDate: 05/13/16

TestDate: 07/14/14 Tester: mb

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	07:50:03	78.4	08:02:03	161.6
Run2	08:14:36	78.0	08:26:36	162.3
Run3	08:39:08	77.2	08:51:04	161.6
Avg.MonitorResponse		77.9		161.8
CalibrationError		3.300		2.600
AbsoluteDifference		2.5		4.1
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

CFUH2SAuditTestResultsAnalyzerSpan:300.0ppm

Mfr&Model: SIEMENSMAXUM SerialNumber: 001910

Low-LevelCalibrationGas (20-30%ofSpan) (60.0ppm-90.0ppm)	Concentration:	75.8
	CylinderNo.:	CC408957
	ExpirationDate:	11/12/16
Mid-LevelCalibrationGas (50-60%ofSpan) (150.0ppm-180.0ppm)	Concentration:	162.8
	CylinderNo.:	CC409050
	ExpirationDate:	01/22/17

TestDate: 07/29/14 Tester: WULITICH

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	23:23:35	77.6	23:35:11	165.6
Run2	23:48:27	77.3	00:00:04	166.3
Run3	00:13:20	76.7	00:24:56	173.8
Avg.MonitorResponse		77.2		168.6
CalibrationError		1.8		3.6
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

CFUTSAuditTestResultsAnalyzerSpan:400.0ppm

Mfr&Model: SOLA2 SerialNumber: SL-07070111

Low-LevelCalibrationGas (20-30%ofSpan) (80.0ppm-120.0ppm)
Concentration: 100.4
CylinderNo.: CC409049
ExpirationDate: 08/21/15

Mid-LevelCalibrationGas (50-60%ofSpan) (200.0ppm-240.0ppm)
Concentration: 220.1
CylinderNo.: CC411679
ExpirationDate: 12/10/16

TestDate: 07/30/14 Tester: WULITICH

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	23:20:28	103.8	23:26:20	227.2
Run2	23:39:56	103.4	23:45:44	227.1
Run3	00:00:20	103.4	00:06:09	227.6
Avg.MonitorResponse		103.5		227.3
CalibrationError		3.1		3.3
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Linearity Calibration Report
Generated: 7/9/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 7/1/2014
Period End: 7/2/2014
Included Calibrations: **Linearity (40CFR75)**

Range of Analyzers:

O2_31	O2	0.00	25.00 %O2
COLow_31	CO	0.00	100.00 ppm
COHigh_31	CO	0	5000 ppm
NOxLow_31	NOx	0.00	50.00 ppm
NOxHigh_31	NOx	0.0	700.0 ppm

Span of Analyzers:

O2_31	O2	0.00	25.00 %O2
COLow_31	CO	0.00	100.00 ppm
COHigh_31	CO	0	5000 ppm
NOxLow_31	NOx	0.00	50.00 ppm
NOxHigh_31	NOx	0.0	700.0 ppm

Date	Time	Channel		Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	%		Bottle ID	Expire Date
07/01/2014	20:45	COHigh_31	CO	LOW	1230.000	1218.000	-12.000	- N/A -	- N/A -	- N/A -	- N/A -	SG9142063BAL	2/24/2017
07/01/2014	20:45	COHigh_31	CO	MID	2735.000	2719.000	-16.000	- N/A -	- N/A -	- N/A -	- N/A -	CC216465	5/25/2017
07/01/2014	20:45	COHigh_31	CO	HIGH	4512.000	4498.000	-14.000	- N/A -	- N/A -	- N/A -	- N/A -	CC360555	12/4/2016
07/01/2014	19:48	COHigh_31	CO	LOW	1230.000	1218.000	-12.000	- N/A -	- N/A -	- N/A -	- N/A -	SG9142063BAL	2/24/2017
07/01/2014	19:48	COHigh_31	CO	MID	2735.000	2719.000	-16.000	- N/A -	- N/A -	- N/A -	- N/A -	CC216465	5/25/2017
07/01/2014	19:48	COHigh_31	CO	HIGH	4512.000	4498.000	-14.000	- N/A -	- N/A -	- N/A -	- N/A -	CC360555	12/4/2016
07/01/2014	18:48	COHigh_31	CO	LOW	1230.000	1219.000	-11.000	- N/A -	- N/A -	- N/A -	- N/A -	SG9142063BAL	2/24/2017
07/01/2014	18:48	COHigh_31	CO	MID	2735.000	2718.000	-17.000	- N/A -	- N/A -	- N/A -	- N/A -	CC216465	5/25/2017
07/01/2014	18:48	COHigh_31	CO	HIGH	4512.000	4495.000	-17.000	- N/A -	- N/A -	- N/A -	- N/A -	CC360555	12/4/2016
07/01/2014	17:34	COHigh_31	CO	LOW	1230.000	1219.000	-11.000	- N/A -	- N/A -	- N/A -	- N/A -	SG9142063BAL	2/24/2017
07/01/2014	17:34	COHigh_31	CO	MID	2735.000	2719.000	-16.000	- N/A -	- N/A -	- N/A -	- N/A -	CC216465	5/25/2017
07/01/2014	17:34	COHigh_31	CO	HIGH	4512.000	4494.000	-18.000	- N/A -	- N/A -	- N/A -	- N/A -	CC360555	12/4/2016
07/01/2014	16:47	COHigh_31	CO	LOW	1230.000	1219.000	-11.000	- N/A -	- N/A -	- N/A -	- N/A -	SG9142063BAL	2/24/2017
07/01/2014	16:47	COHigh_31	CO	MID	2735.000	2719.000	-16.000	- N/A -	- N/A -	- N/A -	- N/A -	CC216465	5/25/2017
07/01/2014	16:47	COHigh_31	CO	HIGH	4512.000	4496.000	-16.000	- N/A -	- N/A -	- N/A -	- N/A -	CC360555	12/4/2016
07/01/2014	16:01	COHigh_31	CO	LOW	1230.000	1220.000	-10.000	- N/A -	- N/A -	- N/A -	- N/A -	SG9142063BAL	2/24/2017
07/01/2014	16:01	COHigh_31	CO	MID	2735.000	2721.000	-14.000	- N/A -	- N/A -	- N/A -	- N/A -	CC216465	5/25/2017
07/01/2014	16:01	COHigh_31	CO	HIGH	4512.000	4498.000	-14.000	- N/A -	- N/A -	- N/A -	- N/A -	CC360555	12/4/2016
07/01/2014	20:45	COLow_31	CO	LOW	24.540	25.110	0.570	- N/A -	- N/A -	- N/A -	- N/A -	CC439467	2/14/2022
07/01/2014	20:45	COLow_31	CO	MID	56.000	55.710	-0.290	- N/A -	- N/A -	- N/A -	- N/A -	CC107578	5/1/2021
07/01/2014	20:45	COLow_31	CO	HIGH	90.600	90.720	0.120	- N/A -	- N/A -	- N/A -	- N/A -	CC437348	12/24/2021
07/01/2014	19:48	COLow_31	CO	LOW	24.540	25.160	0.620	- N/A -	- N/A -	- N/A -	- N/A -	CC439467	2/14/2022
07/01/2014	19:48	COLow_31	CO	MID	56.000	55.780	-0.220	- N/A -	- N/A -	- N/A -	- N/A -	CC107578	5/1/2021
07/01/2014	19:48	COLow_31	CO	HIGH	90.600	90.800	0.200	- N/A -	- N/A -	- N/A -	- N/A -	CC437348	12/24/2021
07/01/2014	18:48	COLow_31	CO	LOW	24.540	25.310	0.770	- N/A -	- N/A -	- N/A -	- N/A -	CC439467	2/14/2022
07/01/2014	18:48	COLow_31	CO	MID	56.000	55.900	-0.100	- N/A -	- N/A -	- N/A -	- N/A -	CC107578	5/1/2021
07/01/2014	18:48	COLow_31	CO	HIGH	90.600	90.830	0.230	- N/A -	- N/A -	- N/A -	- N/A -	CC437348	12/24/2021

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Document ID WBU-DENV-3G12-46380

Linearity Calibration Report
Generated: 7/9/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 7/1/2014
Period End: 7/2/2014
Included Calibrations: **Linearity (40CFR75)**

Date	Time	Channel		Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	%		Bottle ID	Expire Date
07/01/2014	17:34	COLow_31	CO	LOW	24.540	25.420	0.880	- N/A -	- N/A -	- N/A -	- N/A -	CC439467	2/14/2022
07/01/2014	17:34	COLow_31	CO	MID	56.000	56.010	0.010	- N/A -	- N/A -	- N/A -	- N/A -	CC107578	5/1/2021
07/01/2014	17:34	COLow_31	CO	HIGH	90.600	90.940	0.340	- N/A -	- N/A -	- N/A -	- N/A -	CC437348	12/24/2021
07/01/2014	16:47	COLow_31	CO	LOW	24.540	25.370	0.830	- N/A -	- N/A -	- N/A -	- N/A -	CC439467	2/14/2022
07/01/2014	16:47	COLow_31	CO	MID	56.000	55.970	-0.030	- N/A -	- N/A -	- N/A -	- N/A -	CC107578	5/1/2021
07/01/2014	16:47	COLow_31	CO	HIGH	90.600	90.990	0.390	- N/A -	- N/A -	- N/A -	- N/A -	CC437348	12/24/2021
07/01/2014	16:01	COLow_31	CO	LOW	24.540	25.420	0.880	- N/A -	- N/A -	- N/A -	- N/A -	CC439467	2/14/2022
07/01/2014	16:01	COLow_31	CO	MID	56.000	56.040	0.040	- N/A -	- N/A -	- N/A -	- N/A -	CC107578	5/1/2021
07/01/2014	16:01	COLow_31	CO	HIGH	90.600	91.080	0.480	- N/A -	- N/A -	- N/A -	- N/A -	CC437348	12/24/2021
07/01/2014	20:45	NOxHigh_31	NOx	LOW	175.500	183.900	8.400	4.8	8.775	5.0	PASS	SG9151432BAL	3/3/2022
07/01/2014	20:45	NOxHigh_31	NOx	MID	391.000	394.600	3.600	0.9	19.550	5.0	PASS	CC417045	3/3/2022
07/01/2014	20:45	NOxHigh_31	NOx	HIGH	632.200	626.600	-5.600	-0.9	31.610	5.0	PASS	CC22137	1/21/2022
07/01/2014	19:48	NOxHigh_31	NOx	LOW	175.500	183.800	8.300	4.7	8.775	5.0	PASS	SG9151432BAL	3/3/2022
07/01/2014	19:48	NOxHigh_31	NOx	MID	391.000	394.700	3.700	0.9	19.550	5.0	PASS	CC417045	3/3/2022
07/01/2014	19:48	NOxHigh_31	NOx	HIGH	632.200	626.500	-5.700	-0.9	31.610	5.0	PASS	CC22137	1/21/2022
07/01/2014	18:48	NOxHigh_31	NOx	LOW	175.500	184.000	8.500	4.8	8.775	5.0	PASS	SG9151432BAL	3/3/2022
07/01/2014	18:48	NOxHigh_31	NOx	MID	391.000	394.800	3.800	1.0	19.550	5.0	PASS	CC417045	3/3/2022
07/01/2014	18:48	NOxHigh_31	NOx	HIGH	632.200	626.400	-5.800	-0.9	31.610	5.0	PASS	CC22137	1/21/2022
07/01/2014	17:34	NOxHigh_31	NOx	LOW	175.500	185.000	9.500	5.4	8.775	5.0	**FAIL**	SG9151432BAL	3/3/2022
07/01/2014	17:34	NOxHigh_31	NOx	MID	391.000	395.100	4.100	1.0	19.550	5.0	PASS	CC417045	3/3/2022
07/01/2014	17:34	NOxHigh_31	NOx	HIGH	632.200	626.900	-5.300	-0.8	31.610	5.0	PASS	CC22137	1/21/2022
07/01/2014	16:47	NOxHigh_31	NOx	LOW	175.500	183.700	8.200	4.7	8.775	5.0	PASS	SG9151432BAL	3/3/2022
07/01/2014	16:47	NOxHigh_31	NOx	MID	391.000	394.800	3.800	1.0	19.550	5.0	PASS	CC417045	3/3/2022
07/01/2014	16:47	NOxHigh_31	NOx	HIGH	632.200	626.200	-6.000	-0.9	31.610	5.0	PASS	CC22137	1/21/2022
07/01/2014	16:01	NOxHigh_31	NOx	LOW	175.500	182.900	7.400	4.2	8.775	5.0	PASS	SG9151432BAL	3/3/2022
07/01/2014	16:01	NOxHigh_31	NOx	MID	391.000	394.700	3.700	0.9	19.550	5.0	PASS	CC417045	3/3/2022
07/01/2014	16:01	NOxHigh_31	NOx	HIGH	632.200	626.800	-5.400	-0.9	31.610	5.0	PASS	CC22137	1/21/2022
07/01/2014	20:45	NOxLow_31	NOx	LOW	12.460	12.130	-0.330	-2.4	0.623	5.0	PASS	SG9142063BAL	2/24/2017
07/01/2014	20:45	NOxLow_31	NOx	MID	27.490	27.780	0.290	1.1	1.375	5.0	PASS	CC216465	5/25/2017
07/01/2014	20:45	NOxLow_31	NOx	HIGH	44.940	44.850	-0.090	-0.2	2.247	5.0	PASS	CC360555	12/4/2016
07/01/2014	19:48	NOxLow_31	NOx	LOW	12.460	12.160	-0.300	-2.4	0.623	5.0	PASS	SG9142063BAL	2/24/2017
07/01/2014	19:48	NOxLow_31	NOx	MID	27.490	27.790	0.300	1.1	1.375	5.0	PASS	CC216465	5/25/2017
07/01/2014	19:48	NOxLow_31	NOx	HIGH	44.940	44.790	-0.150	-0.2	2.247	5.0	PASS	CC360555	12/4/2016
07/01/2014	18:48	NOxLow_31	NOx	LOW	12.460	12.110	-0.350	-3.2	0.623	5.0	PASS	SG9142063BAL	2/24/2017
07/01/2014	18:48	NOxLow_31	NOx	MID	27.490	27.770	0.280	1.1	1.375	5.0	PASS	CC216465	5/25/2017
07/01/2014	18:48	NOxLow_31	NOx	HIGH	44.940	44.800	-0.140	-0.2	2.247	5.0	PASS	CC360555	12/4/2016

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Document ID WBU-DENV-3G12-46380

Linearity Calibration Report
Generated: 7/9/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 7/1/2014
Period End: 7/2/2014
Included Calibrations: **Linearity (40CFR75)**

Date	Time	Channel		Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	%		Bottle ID	Expire Date
07/01/2014	17:34	NOxLow_31	NOx	LOW	12.460	12.130	-0.330	-2.4	0.623	5.0	PASS	SG9142063BAL	2/24/2017
07/01/2014	17:34	NOxLow_31	NOx	MID	27.490	27.770	0.280	1.1	1.375	5.0	PASS	CC216465	5/25/2017
07/01/2014	17:34	NOxLow_31	NOx	HIGH	44.940	44.760	-0.180	-0.4	2.247	5.0	PASS	CC360555	12/4/2016
07/01/2014	16:47	NOxLow_31	NOx	LOW	12.460	12.110	-0.350	-3.2	0.623	5.0	PASS	SG9142063BAL	2/24/2017
07/01/2014	16:47	NOxLow_31	NOx	MID	27.490	27.770	0.280	1.1	1.375	5.0	PASS	CC216465	5/25/2017
07/01/2014	16:47	NOxLow_31	NOx	HIGH	44.940	44.810	-0.130	-0.2	2.247	5.0	PASS	CC360555	12/4/2016
07/01/2014	16:01	NOxLow_31	NOx	LOW	12.460	12.110	-0.350	-3.2	0.623	5.0	PASS	SG9142063BAL	2/24/2017
07/01/2014	16:01	NOxLow_31	NOx	MID	27.490	27.720	0.230	0.7	1.375	5.0	PASS	CC216465	5/25/2017
07/01/2014	16:01	NOxLow_31	NOx	HIGH	44.940	44.750	-0.190	-0.4	2.247	5.0	PASS	CC360555	12/4/2016
07/01/2014	20:45	O2_31	O2	LOW	6.200	6.170	-0.030	0.0	0.310	5.0	PASS	CC439467	2/14/2022
07/01/2014	20:45	O2_31	O2	MID	13.880	13.690	-0.190	-1.4	0.694	5.0	PASS	CC107578	5/1/2021
07/01/2014	20:45	O2_31	O2	HIGH	20.970	20.840	-0.130	-0.5	1.048	5.0	PASS	CC437348	12/24/2021
07/01/2014	19:48	O2_31	O2	LOW	6.200	6.170	-0.030	0.0	0.310	5.0	PASS	CC439467	2/14/2022
07/01/2014	19:48	O2_31	O2	MID	13.880	13.690	-0.190	-1.4	0.694	5.0	PASS	CC107578	5/1/2021
07/01/2014	19:48	O2_31	O2	HIGH	20.970	20.820	-0.150	-0.5	1.048	5.0	PASS	CC437348	12/24/2021
07/01/2014	18:48	O2_31	O2	LOW	6.200	6.170	-0.030	0.0	0.310	5.0	PASS	CC439467	2/14/2022
07/01/2014	18:48	O2_31	O2	MID	13.880	13.680	-0.200	-1.4	0.694	5.0	PASS	CC107578	5/1/2021
07/01/2014	18:48	O2_31	O2	HIGH	20.970	20.820	-0.150	-0.5	1.048	5.0	PASS	CC437348	12/24/2021
07/01/2014	17:34	O2_31	O2	LOW	6.200	6.160	-0.040	0.0	0.310	5.0	PASS	CC439467	2/14/2022
07/01/2014	17:34	O2_31	O2	MID	13.880	13.680	-0.200	-1.4	0.694	5.0	PASS	CC107578	5/1/2021
07/01/2014	17:34	O2_31	O2	HIGH	20.970	20.820	-0.150	-0.5	1.048	5.0	PASS	CC437348	12/24/2021
07/01/2014	16:47	O2_31	O2	LOW	6.200	6.170	-0.030	0.0	0.310	5.0	PASS	CC439467	2/14/2022
07/01/2014	16:47	O2_31	O2	MID	13.880	13.680	-0.200	-1.4	0.694	5.0	PASS	CC107578	5/1/2021
07/01/2014	16:47	O2_31	O2	HIGH	20.970	20.830	-0.140	-0.5	1.048	5.0	PASS	CC437348	12/24/2021
07/01/2014	16:01	O2_31	O2	LOW	6.200	6.170	-0.030	0.0	0.310	5.0	PASS	CC439467	2/14/2022
07/01/2014	16:01	O2_31	O2	MID	13.880	13.690	-0.190	-1.4	0.694	5.0	PASS	CC107578	5/1/2021
07/01/2014	16:01	O2_31	O2	HIGH	20.970	20.840	-0.130	-0.5	1.048	5.0	PASS	CC437348	12/24/2021

FAIL = Difference Error > Regulations Allow
TARG = Invalid Target (not within regulatory specs)
RDG = Reading exceeds "Range of Analyzer"
Note: 40CFR75 pass/fail determination is performed after rounding the value of Error%, or Drift, to one decimal place

● Bottle is within 7 days of expiration
Bottle has Expired - Must be Replaced

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Document ID WBU-DENV-3G12-46380

Linearity Calibration Report
Generated: 7/9/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 7/1/2014
Period End: 7/2/2014
Included Calibrations: **Linearity (40CFR75)**

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) * 100

		----LOW----		----MID----		----HIGH----	
Channel		Diff Units	Target %	Diff Units	Target %	Diff Units	Target %
COHigh_31	CO	11.167	- N/A -	15.833	- N/A -	15.500	- N/A -
COLow_31	CO	0.758	- N/A -	0.098	- N/A -	0.293	- N/A -
NOxHigh_31	NOx	8.383	4.8%	3.783	1.0%	5.633	0.9%
NOxLow_31	NOx	0.335	2.7%	0.277	1.0%	0.147	0.3%
O2_31	O2	0.032	0.5%	0.195	1.4%	0.142	0.7%

Performance Specification

Channel		PASS	FAIL
COHigh_31	CO	- N/A -	- N/A -
COLow_31	CO	- N/A -	- N/A -
NOxHigh_31	NOx	<=5.0%	>5.0%
NOxLow_31	NOx	<=5.0%	>5.0%
O2_31	O2	<=5.0%	>5.0%

Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part75 Linearity O2] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity O2] Low = 0.5 %O2, Mid = 0.5 %O2, High = 0.5 %O2

Title:: _____ Signature:: _____ Date: / /

Title:: _____ Signature:: _____ Date: / /

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Document ID WBU-DENV-3G12-46380

CGA Calibration Report
Generated: 7/9/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 7/1/2014
Period End: 7/2/2014
Included Calibrations: **CGA (40CFR60)**

Range of Analyzers:

O2_31	O2	0.00	25.00 %O2
COLow_31	CO	0.00	100.00 ppm
COHigh_31	CO	0	5000 ppm
NOxLow_31	NOx	0.00	50.00 ppm
NOxHigh_31	NOx	0.0	700.0 ppm

Span of Analyzers:

O2_31	O2	0.00	25.00 %O2
COLow_31	CO	0.00	100.00 ppm
COHigh_31	CO	0	5000 ppm
NOxLow_31	NOx	0.00	50.00 ppm
NOxHigh_31	NOx	0.0	700.0 ppm

Date	Time	From 3 Pt.	Channel		Type	Target Units	Actual Units	Diff Units	Error %	CGA Allowable (40CFR60) Units	%		Bottle ID	Expire Date
07/01/2014	**20:45**	*	**COHigh_31**	CO	LOW	**1230.00**	**1218.00**	**-12.00**	-1.0	184.50	**15.0**	**PASS**	**SG9142063BAL**	**2/24/2017**
07/01/2014	20:45	*	COHigh_31	CO	MID	2735.00	2719.00	-16.00	-0.6	410.25	15.0	PASS	CC216465	5/25/2017
07/01/2014	19:48	*	COHigh_31	CO	LOW	1230.00	1218.00	-12.00	-1.0	184.50	15.0	PASS	SG9142063BAL	2/24/2017
07/01/2014	19:48	*	COHigh_31	CO	MID	2735.00	2719.00	-16.00	-0.6	410.25	15.0	PASS	CC216465	5/25/2017
07/01/2014	18:48	*	COHigh_31	CO	LOW	1230.00	1219.00	-11.00	-0.9	184.50	15.0	PASS	SG9142063BAL	2/24/2017
07/01/2014	18:48	*	COHigh_31	CO	MID	2735.00	2718.00	-17.00	-0.6	410.25	15.0	PASS	CC216465	5/25/2017
07/01/2014	17:34	*	COHigh_31	CO	LOW	1230.00	1219.00	-11.00	-0.9	184.50	15.0	PASS	SG9142063BAL	2/24/2017
07/01/2014	17:34	*	COHigh_31	CO	MID	2735.00	2719.00	-16.00	-0.6	410.25	15.0	PASS	CC216465	5/25/2017
07/01/2014	16:47	*	COHigh_31	CO	LOW	1230.00	1219.00	-11.00	-0.9	184.50	15.0	PASS	SG9142063BAL	2/24/2017
07/01/2014	16:47	*	COHigh_31	CO	MID	2735.00	2719.00	-16.00	-0.6	410.25	15.0	PASS	CC216465	5/25/2017
07/01/2014	16:01	*	COHigh_31	CO	LOW	1230.00	1220.00	-10.00	-0.8	184.50	15.0	PASS	SG9142063BAL	2/24/2017
07/01/2014	16:01	*	COHigh_31	CO	MID	2735.00	2721.00	-14.00	-0.5	410.25	15.0	PASS	CC216465	5/25/2017
07/01/2014	20:45	*	COLow_31	CO	LOW	24.54	25.11	0.57	2.3	3.68	15.0	PASS	CC439467	2/14/2022
07/01/2014	20:45	*	COLow_31	CO	MID	56.00	55.71	-0.29	-0.5	8.40	15.0	PASS	CC107578	5/1/2021
07/01/2014	19:48	*	COLow_31	CO	LOW	24.54	25.16	0.62	2.5	3.68	15.0	PASS	CC439467	2/14/2022
07/01/2014	19:48	*	COLow_31	CO	MID	56.00	55.78	-0.22	-0.4	8.40	15.0	PASS	CC107578	5/1/2021
07/01/2014	18:48	*	COLow_31	CO	LOW	24.54	25.31	0.77	3.1	3.68	15.0	PASS	CC439467	2/14/2022
07/01/2014	18:48	*	COLow_31	CO	MID	56.00	55.90	-0.10	-0.2	8.40	15.0	PASS	CC107578	5/1/2021
07/01/2014	17:34	*	COLow_31	CO	LOW	24.54	25.42	0.88	3.6	3.68	15.0	PASS	CC439467	2/14/2022
07/01/2014	17:34	*	COLow_31	CO	MID	56.00	56.01	0.01	0.0	8.40	15.0	PASS	CC107578	5/1/2021
07/01/2014	16:47	*	COLow_31	CO	LOW	24.54	25.37	0.83	3.4	3.68	15.0	PASS	CC439467	2/14/2022
07/01/2014	16:47	*	COLow_31	CO	MID	56.00	55.97	-0.03	-0.1	8.40	15.0	PASS	CC107578	5/1/2021
07/01/2014	16:01	*	COLow_31	CO	LOW	24.54	25.42	0.88	3.6	3.68	15.0	PASS	CC439467	2/14/2022
07/01/2014	16:01	*	COLow_31	CO	MID	56.00	56.04	0.04	0.1	8.40	15.0	PASS	CC107578	5/1/2021
07/01/2014	20:45	*	NOxHigh_31	NOx	LOW	175.50	183.90	8.40	4.8	26.33	15.0	PASS	SG9151432BAL	3/3/2022
07/01/2014	20:45	*	NOxHigh_31	NOx	MID	391.00	394.60	3.60	0.9	58.65	15.0	PASS	CC417045	3/3/2022

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Document ID WBU-DENV-3G12-46380

CGA Calibration Report
Generated: 7/9/2014

Company: BP Products North America, Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 7/1/2014
Period End: 7/2/2014
Included Calibrations: CGA (40CFR60)

Date	Time	From 3 Pt.	Channel		Type	Target Units	Actual Units	Diff Units	Error %	CGA Allowable (40CFR60) Units	%		Bottle ID	Expire Date
07/01/2014	19:48	*	NOxHigh_31	NOx	LOW	175.50	183.80	8.30	4.7	26.33	15.0	PASS	SG9151432BAL	3/3/2022
07/01/2014	19:48	*	NOxHigh_31	NOx	MID	391.00	394.70	3.70	0.9	58.65	15.0	PASS	CC417045	3/3/2022
07/01/2014	18:48	*	NOxHigh_31	NOx	LOW	175.50	184.00	8.50	4.8	26.33	15.0	PASS	SG9151432BAL	3/3/2022
07/01/2014	18:48	*	NOxHigh_31	NOx	MID	391.00	394.80	3.80	1.0	58.65	15.0	PASS	CC417045	3/3/2022
07/01/2014	17:34	*	NOxHigh_31	NOx	LOW	175.50	185.00	9.50	5.4	26.33	15.0	PASS	SG9151432BAL	3/3/2022
07/01/2014	17:34	*	NOxHigh_31	NOx	MID	391.00	395.10	4.10	1.0	58.65	15.0	PASS	CC417045	3/3/2022
07/01/2014	16:47	*	NOxHigh_31	NOx	LOW	175.50	183.70	8.20	4.7	26.33	15.0	PASS	SG9151432BAL	3/3/2022
07/01/2014	16:47	*	NOxHigh_31	NOx	MID	391.00	394.80	3.80	1.0	58.65	15.0	PASS	CC417045	3/3/2022
07/01/2014	16:01	*	NOxHigh_31	NOx	LOW	175.50	182.90	7.40	4.2	26.33	15.0	PASS	SG9151432BAL	3/3/2022
07/01/2014	16:01	*	NOxHigh_31	NOx	MID	391.00	394.70	3.70	0.9	58.65	15.0	PASS	CC417045	3/3/2022
07/01/2014	20:45	*	NOxLow_31	NOx	LOW	12.46	12.13	-0.33	-2.6	1.87	15.0	PASS	SG9142063BAL	2/24/2017
07/01/2014	20:45	*	NOxLow_31	NOx	MID	27.49	27.78	0.29	1.1	4.12	15.0	PASS	CC216465	5/25/2017
07/01/2014	19:48	*	NOxLow_31	NOx	LOW	12.46	12.16	-0.30	-2.4	1.87	15.0	PASS	SG9142063BAL	2/24/2017
07/01/2014	19:48	*	NOxLow_31	NOx	MID	27.49	27.79	0.30	1.1	4.12	15.0	PASS	CC216465	5/25/2017
07/01/2014	18:48	*	NOxLow_31	NOx	LOW	12.46	12.11	-0.35	-2.8	1.87	15.0	PASS	SG9142063BAL	2/24/2017
07/01/2014	18:48	*	NOxLow_31	NOx	MID	27.49	27.77	0.28	1.0	4.12	15.0	PASS	CC216465	5/25/2017
07/01/2014	17:34	*	NOxLow_31	NOx	LOW	12.46	12.13	-0.33	-2.6	1.87	15.0	PASS	SG9142063BAL	2/24/2017
07/01/2014	17:34	*	NOxLow_31	NOx	MID	27.49	27.77	0.28	1.0	4.12	15.0	PASS	CC216465	5/25/2017
07/01/2014	16:47	*	NOxLow_31	NOx	LOW	12.46	12.11	-0.35	-2.8	1.87	15.0	PASS	SG9142063BAL	2/24/2017
07/01/2014	16:47	*	NOxLow_31	NOx	MID	27.49	27.77	0.28	1.0	4.12	15.0	PASS	CC216465	5/25/2017
07/01/2014	16:01	*	NOxLow_31	NOx	LOW	12.46	12.11	-0.35	-2.8	1.87	15.0	PASS	SG9142063BAL	2/24/2017
07/01/2014	16:01	*	NOxLow_31	NOx	MID	27.49	27.72	0.23	0.8	4.12	15.0	PASS	CC216465	5/25/2017
07/01/2014	20:45	*	O2_31	O2	LOW	6.20	6.17	-0.03	-0.5	0.93	15.0	PASS	CC439467	2/14/2022
07/01/2014	20:45	*	O2_31	O2	MID	13.88	13.69	-0.19	-1.4	2.08	15.0	PASS	CC107578	5/1/2021
07/01/2014	19:48	*	O2_31	O2	LOW	6.20	6.17	-0.03	-0.5	0.93	15.0	PASS	CC439467	2/14/2022
07/01/2014	19:48	*	O2_31	O2	MID	13.88	13.69	-0.19	-1.4	2.08	15.0	PASS	CC107578	5/1/2021
07/01/2014	18:48	*	O2_31	O2	LOW	6.20	6.17	-0.03	-0.5	0.93	15.0	PASS	CC439467	2/14/2022
07/01/2014	18:48	*	O2_31	O2	MID	13.88	13.68	-0.20	-1.4	2.08	15.0	PASS	CC107578	5/1/2021
07/01/2014	17:34	*	O2_31	O2	LOW	6.20	6.16	-0.04	-0.6	0.93	15.0	PASS	CC439467	2/14/2022
07/01/2014	17:34	*	O2_31	O2	MID	13.88	13.68	-0.20	-1.4	2.08	15.0	PASS	CC107578	5/1/2021
07/01/2014	16:47	*	O2_31	O2	LOW	6.20	6.17	-0.03	-0.5	0.93	15.0	PASS	CC439467	2/14/2022
07/01/2014	16:47	*	O2_31	O2	MID	13.88	13.68	-0.20	-1.4	2.08	15.0	PASS	CC107578	5/1/2021
07/01/2014	16:01	*	O2_31	O2	LOW	6.20	6.17	-0.03	-0.5	0.93	15.0	PASS	CC439467	2/14/2022
07/01/2014	16:01	*	O2_31	O2	MID	13.88	13.69	-0.19	-1.4	2.08	15.0	PASS	CC107578	5/1/2021

FAIL = Difference Error > Regulations Allow
TARG = Invalid Target (not within regulatory specs)
RDG = Reading exceeds "Range of Analyzer"
@ Bottle is within 7 days of expiration
$ Bottle has Expired - Must be Replaced

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Document ID WBU-DENV-3G12-46380

CGA Calibration Report
Generated: 7/9/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 7/1/2014
Period End: 7/2/2014
Included Calibrations: **CGA (40CFR60)**

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) * 100

Channel		----LOW---- Diff Units	Target %	----MID---- Diff Units	Target %
COHigh_31	CO	11.17	**0.9%**	**15.83**	**0.6%**
COLow_31	CO	0.76	3.1%	0.10	0.2%
NOxHigh_31	NOx	8.38	4.8%	3.78	1.0%
NOxLow_31	NOx	0.34	2.7%	0.28	1.0%
O2_31	O2	0.03	0.5%	0.20	1.4%

Performance Specification

Channel		PASS	FAIL
COHigh_31	CO	<=15.0%	>15.0%
COLow_31	CO	<=15.0%	>15.0%
NOxHigh_31	NOx	<=15.0%	>15.0%
NOxLow_31	NOx	<=15.0%	>15.0%
O2_31	O2	<=15.0%	>15.0%

Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA O2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target

Title:: _____ Signature:: _____ Date: / /

Title:: _____ Signature:: _____ Date: / /

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Document ID WBU-DENV-3G12-46380

Linearity Calibration Report
Generated: 7/9/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 7/2/2014
Period End: 7/3/2014
Included Calibrations: **Linearity (40CFR75)**

Range of Analyzers:

O2_33	O2	0.00	25.00 %O2
COLow_33	CO	0.00	100.00 ppm
COHigh_33	CO	0	5000 ppm
NOxLow_33	NOx	0.00	50.00 ppm
NOxHigh_33	NOx	0.0	700.0 ppm

Span of Analyzers:

O2_33	O2	0.00	25.00 %O2
COLow_33	CO	0.00	100.00 ppm
COHigh_33	CO	0	5000 ppm
NOxLow_33	NOx	0.00	50.00 ppm
NOxHigh_33	NOx	0.0	700.0 ppm

Date	Time	Channel		Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	%		Bottle ID	Expire Date
07/02/2014	17:33	COHigh_33	CO	LOW	1237.000	1283.000	46.000	- N/A -	- N/A -	- N/A -	- N/A -	CC174083	11/8/2014
07/02/2014	17:33	COHigh_33	CO	MID	2749.000	2761.000	12.000	- N/A -	- N/A -	- N/A -	- N/A -	CC259082	1/21/2017
07/02/2014	17:33	COHigh_33	CO	HIGH	4506.000	4555.000	49.000	- N/A -	- N/A -	- N/A -	- N/A -	CC231193	12/4/2016
07/02/2014	16:48	COHigh_33	CO	LOW	1237.000	1283.000	46.000	- N/A -	- N/A -	- N/A -	- N/A -	CC174083	11/8/2014
07/02/2014	16:48	COHigh_33	CO	MID	2749.000	2761.000	12.000	- N/A -	- N/A -	- N/A -	- N/A -	CC259082	1/21/2017
07/02/2014	16:48	COHigh_33	CO	HIGH	4506.000	4555.000	49.000	- N/A -	- N/A -	- N/A -	- N/A -	CC231193	12/4/2016
07/02/2014	15:56	COHigh_33	CO	LOW	1237.000	1283.000	46.000	- N/A -	- N/A -	- N/A -	- N/A -	CC174083	11/8/2014
07/02/2014	15:56	COHigh_33	CO	MID	2749.000	2761.000	12.000	- N/A -	- N/A -	- N/A -	- N/A -	CC259082	1/21/2017
07/02/2014	15:56	COHigh_33	CO	HIGH	4506.000	4555.000	49.000	- N/A -	- N/A -	- N/A -	- N/A -	CC231193	12/4/2016
07/02/2014	17:33	COLow_33	CO	LOW	24.900	25.550	0.650	- N/A -	- N/A -	- N/A -	- N/A -	CC134940	1/23/2015
07/02/2014	17:33	COLow_33	CO	MID	54.430	54.580	0.150	- N/A -	- N/A -	- N/A -	- N/A -	CC349278	5/14/2015
07/02/2014	17:33	COLow_33	CO	HIGH	90.900	90.240	-0.660	- N/A -	- N/A -	- N/A -	- N/A -	CC422749	11/26/2021
07/02/2014	16:48	COLow_33	CO	LOW	24.900	25.460	0.560	- N/A -	- N/A -	- N/A -	- N/A -	CC134940	1/23/2015
07/02/2014	16:48	COLow_33	CO	MID	54.430	54.620	0.190	- N/A -	- N/A -	- N/A -	- N/A -	CC349278	5/14/2015
07/02/2014	16:48	COLow_33	CO	HIGH	90.900	90.260	-0.640	- N/A -	- N/A -	- N/A -	- N/A -	CC422749	11/26/2021
07/02/2014	15:56	COLow_33	CO	LOW	24.900	25.510	0.610	- N/A -	- N/A -	- N/A -	- N/A -	CC134940	1/23/2015
07/02/2014	15:56	COLow_33	CO	MID	54.430	54.530	0.100	- N/A -	- N/A -	- N/A -	- N/A -	CC349278	5/14/2015
07/02/2014	15:56	COLow_33	CO	HIGH	90.900	90.200	-0.700	- N/A -	- N/A -	- N/A -	- N/A -	CC422749	11/26/2021
07/02/2014	17:33	NOxHigh_33	NOx	LOW	175.300	181.000	5.700	3.3	8.765	5.0	PASS	XC021379B	3/3/2022
07/02/2014	17:33	NOxHigh_33	NOx	MID	391.500	393.300	1.800	0.5	19.575	5.0	PASS	CC332043	3/3/2022
07/02/2014	17:33	NOxHigh_33	NOx	HIGH	643.800	631.000	-12.800	-2.0	32.190	5.0	PASS	CC432873	12/30/2021
07/02/2014	16:48	NOxHigh_33	NOx	LOW	175.300	180.700	5.400	3.1	8.765	5.0	PASS	XC021379B	3/3/2022
07/02/2014	16:48	NOxHigh_33	NOx	MID	391.500	392.600	1.100	0.3	19.575	5.0	PASS	CC332043	3/3/2022
07/02/2014	16:48	NOxHigh_33	NOx	HIGH	643.800	632.500	-11.300	-1.8	32.190	5.0	PASS	CC432873	12/30/2021
07/02/2014	15:56	NOxHigh_33	NOx	LOW	175.300	180.700	5.400	3.1	8.765	5.0	PASS	XC021379B	3/3/2022
07/02/2014	15:56	NOxHigh_33	NOx	MID	391.500	392.800	1.300	0.3	19.575	5.0	PASS	CC332043	3/3/2022
07/02/2014	15:56	NOxHigh_33	NOx	HIGH	643.800	630.100	-13.700	-2.1	32.190	5.0	PASS	CC432873	12/30/2021

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Document ID WBU-DENV-3G12-46380

Linearity Calibration Report
Generated: 7/9/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 7/2/2014
Period End: 7/3/2014
Included Calibrations: **Linearity (40CFR75)**

Date	Time	Channel		Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	%		Bottle ID	Expire Date
07/02/2014	17:33	NOxLow_33	NOx	LOW	12.510	12.280	-0.230	-1.6	0.626	5.0	PASS	CC174083	11/8/2014
07/02/2014	17:33	NOxLow_33	NOx	MID	26.150	27.180	1.030	3.8	1.308	5.0	PASS	CC259082	1/21/2017
07/02/2014	17:33	NOxLow_33	NOx	HIGH	44.930	44.260	-0.670	-1.6	2.247	5.0	PASS	CC231193	12/4/2016
07/02/2014	16:48	NOxLow_33	NOx	LOW	12.510	12.200	-0.310	-2.4	0.626	5.0	PASS	CC174083	11/8/2014
07/02/2014	16:48	NOxLow_33	NOx	MID	26.150	27.140	0.990	3.8	1.308	5.0	PASS	CC259082	1/21/2017
07/02/2014	16:48	NOxLow_33	NOx	HIGH	44.930	44.310	-0.620	-1.3	2.247	5.0	PASS	CC231193	12/4/2016
07/02/2014	15:56	NOxLow_33	NOx	LOW	12.510	12.200	-0.310	-2.4	0.626	5.0	PASS	CC174083	11/8/2014
07/02/2014	15:56	NOxLow_33	NOx	MID	26.150	27.080	0.930	3.4	1.308	5.0	PASS	CC259082	1/21/2017
07/02/2014	15:56	NOxLow_33	NOx	HIGH	44.930	44.160	-0.770	-1.8	2.247	5.0	PASS	CC231193	12/4/2016
07/02/2014	17:33	O2_33	O2	LOW	6.270	6.250	-0.020	0.0	0.313	5.0	PASS	CC134940	1/23/2015
07/02/2014	17:33	O2_33	O2	MID	13.720	13.800	0.080	0.7	0.686	5.0	PASS	CC349278	5/14/2015
07/02/2014	17:33	O2_33	O2	HIGH	21.120	21.130	0.010	0.0	1.056	5.0	PASS	CC422749	11/26/2021
07/02/2014	16:48	O2_33	O2	LOW	6.270	6.250	-0.020	0.0	0.313	5.0	PASS	CC134940	1/23/2015
07/02/2014	16:48	O2_33	O2	MID	13.720	13.800	0.080	0.7	0.686	5.0	PASS	CC349278	5/14/2015
07/02/2014	16:48	O2_33	O2	HIGH	21.120	21.120	0.000	0.0	1.056	5.0	PASS	CC422749	11/26/2021
07/02/2014	15:56	O2_33	O2	LOW	6.270	6.250	-0.020	0.0	0.313	5.0	PASS	CC134940	1/23/2015
07/02/2014	15:56	O2_33	O2	MID	13.720	13.790	0.070	0.7	0.686	5.0	PASS	CC349278	5/14/2015
07/02/2014	15:56	O2_33	O2	HIGH	21.120	21.120	0.000	0.0	1.056	5.0	PASS	CC422749	11/26/2021

FAIL = Difference Error > Regulations Allow
TARG = Invalid Target (not within regulatory specs)
RDG = Reading exceeds "Range of Analyzer"
Note: 40CFR75 pass/fail determination is performed after rounding the value of Error%, or Drift, to one decimal place

● Bottle is within 7 days of expiration
\# Bottle has Expired - Must be Replaced

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Document ID WBU-DENV-3G12-46380

Linearity Calibration Report
Generated: 7/9/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 7/2/2014
Period End: 7/3/2014
Included Calibrations: **Linearity (40CFR75)**

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) * 100

		----LOW----		----MID----		----HIGH----	
Channel		Diff Units	Target %	Diff Units	Target %	Diff Units	Target %
COHigh_33	CO	46.000	- N/A -	12.000	- N/A -	49.000	- N/A -
COLow_33	CO	0.607	- N/A -	0.147	- N/A -	0.667	- N/A -
NOxHigh_33	NOx	5.500	3.1%	1.400	0.4%	12.600	2.0%
NOxLow_33	NOx	0.283	2.3%	0.983	3.8%	0.687	1.5%
O2_33	O2	0.020	0.3%	0.077	0.6%	0.003	0.0%

Performance Specification

Channel		PASS	FAIL
COHigh_33	CO	- N/A -	- N/A -
COLow_33	CO	- N/A -	- N/A -
NOxHigh_33	NOx	<=5.0%	>5.0%
NOxLow_33	NOx	<=5.0%	>5.0%
O2_33	O2	<=5.0%	>5.0%

Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part75 Linearity O2] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity O2] Low = 0.5 %O2, Mid = 0.5 %O2, High = 0.5 %O2

Title:: _____ Signature:: _____ Date: / /

Title:: _____ Signature:: _____ Date: / /

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Document ID WBU-DENV-3G12-46380

CGA Calibration Report
Generated: 7/9/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 7/2/2014
Period End: 7/3/2014
Included Calibrations: **CGA (40CFR60)**

Range of Analyzers:

O2_33	O2	0.00	25.00 %O2
COLow_33	CO	0.00	100.00 ppm
COHigh_33	CO	0	5000 ppm
NOxLow_33	NOx	0.00	50.00 ppm
NOxHigh_33	NOx	0.0	700.0 ppm

Span of Analyzers:

O2_33	O2	0.00	25.00 %O2
COLow_33	CO	0.00	100.00 ppm
COHigh_33	CO	0	5000 ppm
NOxLow_33	NOx	0.00	50.00 ppm
NOxHigh_33	NOx	0.0	700.0 ppm

Date	Time	From 3 Pt.	Channel		Type	Target Units	Actual Units	Diff Units	Error %	CGA Allowable (40CFR60) Units	%		Bottle ID	Expire Date
07/02/2014	**17:33**	*	**COHigh_33**	CO	LOW	1237.00	**1283.00**	**46.00**	**3.7**	**185.55**	**15.0**	PASS	CC174083	**11/8/2014**
07/02/2014	17:33	*	COHigh_33	CO	MID	2749.00	2761.00	12.00	0.4	412.35	15.0	PASS	CC259082	1/21/2017
07/02/2014	16:48	*	COHigh_33	CO	LOW	1237.00	1283.00	46.00	3.7	185.55	15.0	PASS	CC174083	11/8/2014
07/02/2014	16:48	*	COHigh_33	CO	MID	2749.00	2761.00	12.00	0.4	412.35	15.0	PASS	CC259082	1/21/2017
07/02/2014	15:56	*	COHigh_33	CO	LOW	1237.00	1283.00	46.00	3.7	185.55	15.0	PASS	CC174083	11/8/2014
07/02/2014	15:56	*	COHigh_33	CO	MID	2749.00	2761.00	12.00	0.4	412.35	15.0	PASS	CC259082	1/21/2017
07/02/2014	17:33	*	COLow_33	CO	LOW	24.90	25.55	0.65	2.6	3.74	15.0	PASS	CC134940	1/23/2015
07/02/2014	17:33	*	COLow_33	CO	MID	54.43	54.58	0.15	0.3	8.16	15.0	PASS	CC349278	5/14/2015
07/02/2014	16:48	*	COLow_33	CO	LOW	24.90	25.46	0.56	2.2	3.74	15.0	PASS	CC134940	1/23/2015
07/02/2014	16:48	*	COLow_33	CO	MID	54.43	54.62	0.19	0.3	8.16	15.0	PASS	CC349278	5/14/2015
07/02/2014	15:56	*	COLow_33	CO	LOW	24.90	25.51	0.61	2.4	3.74	15.0	PASS	CC134940	1/23/2015
07/02/2014	15:56	*	COLow_33	CO	MID	54.43	54.53	0.10	0.2	8.16	15.0	PASS	CC349278	5/14/2015
07/02/2014	17:33	*	NOxHigh_33	NOx	LOW	175.30	181.00	5.70	3.3	26.30	15.0	PASS	XC021379B	3/3/2022
07/02/2014	17:33	*	NOxHigh_33	NOx	MID	391.50	393.30	1.80	0.5	58.73	15.0	PASS	CC332043	3/3/2022
07/02/2014	16:48	*	NOxHigh_33	NOx	LOW	175.30	180.70	5.40	3.1	26.30	15.0	PASS	XC021379B	3/3/2022
07/02/2014	16:48	*	NOxHigh_33	NOx	MID	391.50	392.60	1.10	0.3	58.73	15.0	PASS	CC332043	3/3/2022
07/02/2014	15:56	*	NOxHigh_33	NOx	LOW	175.30	180.70	5.40	3.1	26.30	15.0	PASS	XC021379B	3/3/2022
07/02/2014	15:56	*	NOxHigh_33	NOx	MID	391.50	392.80	1.30	0.3	58.73	15.0	PASS	CC332043	3/3/2022
07/02/2014	17:33	*	NOxLow_33	NOx	LOW	12.51	12.28	-0.23	-1.8	1.88	15.0	PASS	CC174083	11/8/2014
07/02/2014	17:33	*	NOxLow_33	NOx	MID	26.15	27.18	1.03	3.9	3.92	15.0	PASS	CC259082	1/21/2017
07/02/2014	16:48	*	NOxLow_33	NOx	LOW	12.51	12.20	-0.31	-2.5	1.88	15.0	PASS	CC174083	11/8/2014
07/02/2014	16:48	*	NOxLow_33	NOx	MID	26.15	27.14	0.99	3.8	3.92	15.0	PASS	CC259082	1/21/2017
07/02/2014	15:56	*	NOxLow_33	NOx	LOW	12.51	12.20	-0.31	-2.5	1.88	15.0	PASS	CC174083	11/8/2014
07/02/2014	15:56	*	NOxLow_33	NOx	MID	26.15	27.08	0.93	3.6	3.92	15.0	PASS	CC259082	1/21/2017
07/02/2014	17:33	*	O2_33	O2	LOW	6.27	6.25	-0.02	-0.3	0.94	15.0	PASS	CC134940	1/23/2015
07/02/2014	17:33	*	O2_33	O2	MID	13.72	13.80	0.08	0.6	2.06	15.0	PASS	CC349278	5/14/2015

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CGA Calibration Report
Generated: 7/9/2014

Company: BP Products North America, Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 7/2/2014
Period End: 7/3/2014
Included Calibrations: **CGA (40CFR60)**

Date	Time	From 3 Pt.	Channel		Type	Target Units	Actual Units	Diff Units	Error %	CGA Allowable (40CFR60) Units	%		Bottle ID	Expire Date
07/02/2014	**16:48**	*	**O2_33**	**O2**	**LOW**	**6.27**	**6.25**	**-0.02**	-0.3	0.94	15.0	**PASS**	**CC134940**	**1/23/2015**
07/02/2014	16:48	*	O2_33	O2	MID	13.72	13.80	0.08	0.6	2.06	15.0	PASS	CC349278	5/14/2015
07/02/2014	15:56	*	O2_33	O2	LOW	6.27	6.25	-0.02	-0.3	0.94	15.0	PASS	CC134940	1/23/2015
07/02/2014	15:56	*	O2_33	O2	MID	13.72	13.79	0.07	0.5	2.06	15.0	PASS	CC349278	5/14/2015

FAIL = Difference Error > Regulations Allow
TARG = Invalid Target (not within regulatory specs)
RDG = Reading exceeds "Range of Analyzer"
@ Bottle is within 7 days of expiration
# Bottle has Expired - Must be Replaced

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) * 100

Channel		----LOW---- Diff Units	Target %	----MID---- Diff Units	Target %
COHigh_33	CO	46.00	3.7%	12.00	0.4%
COLow_33	CO	0.61	2.4%	0.15	0.3%
NOxHigh_33	NOx	5.50	3.1%	1.40	0.4%
NOxLow_33	NOx	0.28	2.3%	0.98	3.8%
O2_33	O2	0.02	0.3%	0.08	0.6%

Performance Specification

Channel		PASS	FAIL
COHigh_33	CO	<=15.0%	>15.0%
COLow_33	CO	<=15.0%	>15.0%
NOxHigh_33	NOx	<=15.0%	>15.0%
NOxLow_33	NOx	<=15.0%	>15.0%
O2_33	O2	<=15.0%	>15.0%

Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA O2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target

Title:: _____ Signature:: _____ Date: / /

Title:: _____ Signature:: _____ Date: / /

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Attachment D

NSPS Ja Root Cause Failure Analyses

No NSPS Ja Root Cause Failure Analyses in this quarter.

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Attachment E

New HU CEMS Report

Document ID WBU-DENV-3G12-46380

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PART 70 OPERATING PERMIT
CERTIFICATION

Source Name:	Praxair Inc.
Source Address:	2551 Dickey Road, East Chicago, IN 46312
Mailing Address:	P.O. Box 710, Whiting, Indiana 46394-0710
Permit No.:	T089-6741-00453
	Last updated on February 4, 2014 per SPM 089-33532-00453

Praxair shall include this certification when submitting monitoring, testing reports/results or other documents to BP and requires BP RO certification.
Please check what document is being certified:
☐ Annual Compliance Certification Letter
☐ Test Results (specify)
☒ Report (specify): Quarterly CEMS Report – 3rd Quarter 2014
☐ Notification (specify)
☐ Affidavit (specify)
☐ Other (specify)

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.	
Signature of Responsible Official:	
Printed Name:	Andrew Campbell
Title/Position:	Facility Manager
Phone:	219-378-4854
Date:	10/15/14

Document ID WBU-DENV-3G12-46380

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Praxair Inc
2551 Dickey Rd
East Chicago, IN 46312

October 15, 2014

Ms. Linda Wilson
Environmental Superintendent
BP Products North America Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394-0710

Re: CEM Summary Performance Report – 3rd Quarter 2014

Dear Ms. Wilson,

Please find attached the Continuous Emission Monitor (CEM) summary performance reports for the New Hydrogen Unit owned by Praxair.

This report is submitted in accordance with the Indiana Department of Environmental Management (IDEM) Operating Permit No. T089-6741-00453 Significant Permit Modification (SPM) No. 089-33532-00453 issued on February 4, 2014 and reporting requirements contained in 326 IAC 3-5-7 and 40 CFR 60.7(c). This report covers NOx and CO emissions from SMR 5 (HU-1) and SMR 6 (HU-2) as well as SO2 emissions from the flare (HU Flare) for the period beginning on July 1, 2014 through September 30, 2014.

The CEMS unit on SMR 5 (HU-1) operated with greater than 95% uptime and no excess emissions from this unit during the quarter. Praxair conducted Cylinder Gas Audit (CGA) for CEMS on SMR-5 on September 11, 2014.

The CEMS unit on SMR 6 (HU-2) operated with greater than 95% uptime and no excess emissions from this unit during the quarter. Praxair conducted Cylinder Gas Audit (CGA) for CEMS on SMR-6 on September 11, 2014.

The HU flare SOLA operated with greater than 95% uptime and no excess emissions from this unit during the quarter. Praxair conducted Cylinder Gas Audit (CGA) for Flare SOLA on September 11, 2014.

Monitoring requirements for HU Flare are conducted under an Alternative Monitoring Plan (AMP) approved by USEPA by means of a letter dated June 8, 2010. The AMP allows for the monitoring of total sulfur at the flare in the form of SO2 instead of H2S.

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Praxair Inc
2551 Dickey Rd
East Chicago, IN 46312

Per 40 CFR 60.7(c) and (d) and per 326 IAC 3-5-7 the following reports are attached to this cover letter:

SMR 5 (HU-1)

- NOx @ 0% O2 40 ppm at 30 day rolling average Summary Report
- NOx @ 3% O2 Summary Report
- CO @ 3% O2 Summary Report
- Cylinder Gas Audit Report

SMR 6 (HU-2)

- NOx @ 0% O2 40 ppm at 30 day rolling average Report
- NOx @ 3% O2 Summary Report
- CO @ 3% O2 Summary Report
- Cylinder Gas Audit Report

HU Flare

- SO2 152 ppm Summary Report
- Cylinder Gas Audit Report

If you have any questions or comments about this report or the information contained with it, please contact Kiranmai Valluri at (281) 478-1564.

Sincerely,

Andrew H Campbell
Facility Manager

Document ID WBU-DENV-3G12-46380

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SMR5-HU1 Summary Report

NOx@0% Excess Emission and Monitoring System Performance

Reporting period dates:	July 1, 2014 to September 30, 2014
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	40 ppm@0% O2 30 day average NOx - NSPS Ja
Monitor Manufacturer:	Horiba
Monitor Model No.:	ENDA P-3770
Date of Latest CEMS Certification:	02/04/2014 (RATA)
Process Unit Description:	Hydrogen Reformer
Total Source Operating Time:	2195.7 hours

Emission Data Summary		
1. Duration of excess emissions in reporting period due to:		
a. Startup/shutdown	0.0	hr
b. Control equipment problems	0.0	hr
c. Process problems	0.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total duration of excess emissions.	0.0	hr
3. Percentage total duration of excess emissions of total source operating time.	0.0	%
CEMS Performance Summary		
1. CEMS downtime in reporting due to:		
a. Monitor equipment malfunctions	0.0	hr
b. Non-Monitor equipment malfunctions	0.0	hr
c. Quality assurance calibration	2.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total CEMS Downtime.	2.0	hr
3. Percentage total CEMS Downtime of total source operating time.	0.1	%

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature:

Title: Facility Manager

Date 10/15/2014

Document ID WBU-DENV-3G12-46380

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SMR5-HU1 Summary Report

NOx@3% Excess Emission and Monitoring System Performance

Reporting period dates:	July 1, 2014 to September 30, 2014
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	Sitewide Limit- Title V Permit
Monitor Manufacturer:	Horiba
Monitor Model No.:	ENDA P-3770
Date of Latest CEMS Certification:	02/04/2014 (RATA)
Process Unit Description:	Hydrogen Reformer
Total Source Operating Time:	2195.7 hours

Emission Data Summary		
1. Duration of excess emissions in reporting period due to:		
a. Startup/shutdown	0.0	hr
b. Control equipment problems	0.0	hr
c. Process problems	0.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total duration of excess emissions.	0.0	hr
3. Percentage total duration of excess emissions of total source operating time.	0.0	%
CEMS Performance Summary		
1. CEMS downtime in reporting due to:		
a. Monitor equipment malfunctions	0.0	hr
b. Non-Monitor equipment malfunctions	0.0	hr
c. Quality assurance calibration	2.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total CEMS Downtime.	2.0	hr
3. Percentage total CEMS Downtime of total source operating time.	0.1	%

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature:

Title: Facility Manager

Date 10/15/2014

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

SMR5-HU1 Summary Report

CO@3% Excess Emission and Monitoring System Performance

Reporting period dates:	July 1, 2014 to September 30, 2014
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	Sitewide Limit - Title V Permit
Monitor Manufacturer:	Horiba
Monitor Model No.:	ENDA P-3770
Date of Latest CEMS Certification:	02/04/2014 (RATA)
Process Unit Description:	Hydrogen Reformer
Total Source Operating Time:	2195.7 hours

Emission Data Summary		
1. Duration of excess emissions in reporting period due to:		
a. Startup/shutdown	0.0	hr
b. Control equipment problems	0.0	hr
c. Process problems	0.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total duration of excess emissions.	0.0	hr
3. Percentage total duration of excess emissions of total source operating time.	0.0	%
CEMS Performance Summary		
1. CEMS downtime in reporting due to:		
a. Monitor equipment malfunctions	0.0	hr
b. Non-Monitor equipment malfunctions	0.0	hr
c. Quality assurance calibration	2.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total CEMS Downtime.	2.0	hr
3. Percentage total CEMS Downtime of total source operating time.	0.1	%

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature:

Title: Facility Manager

Date 10/15/2014

Document ID WBU-DENV-3G12-46380

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Reporting period dates:	July 1, 2014 to September 30, 2014
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Monitor Model No.:	ENDA P-3770

SMR5-HU1 Excess Emission Periods: NOx 40ppm@0% 24-Hours

Start Date	Start Time	End Date	End Time	Duration (hr)	Reason	Action Taken
No excess Emissions during the third quarter of 2014						

Total hours 0.00

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Reporting period dates:	July 1, 2014 to September 30, 2014
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Monitor Model No.:	ENDA P-3770

SMR5-HU1 CEMS Downtime-NOx

Date	Start Time	Date	End Time	Duration (hr)	Reason	Action Taken
9/11/2014	9:00	9/11/2014	11:00	2.00	CGA	None

Total hours 2.00

SMR5-HU1 CEMS Downtime-CO

Date	Start Time	Date	End Time	Duration (hr)	Reason	Action Taken
9/11/2014	9:00	9/11/2014	11:00	2.00	CGA	None

Total hours 2

Document ID WBU-DENV-3G12-46380

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SMR6-HU2 Summary Report

NOx@0% Excess Emission and Monitoring System Performance

Reporting period dates:	June 1, 2014 to September 30, 2014
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	40 ppm@0% O2 24-hour NOx - NSPS Ja
Monitor Manufacturer:	Horiba
Monitor Model No.:	ENDA P-3771
Date of Latest CEMS Certification:	05/20/2014 (RATA)
Process Unit Description:	Hydrogen Reformer
Total Source Operating Time:	2205.2 hours

Emission Data Summary		
1. Duration of excess emissions in reporting period due to:		
a. Startup/shutdown	0.0	hr
b. Control equipment problems	0.0	hr
c. Process problems	0.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total duration of excess emissions.	0.0	hr
3. Percentage total duration of excess emissions of total source operating time.	0.0	%
CEMS Performance Summary		
1. CEMS downtime in reporting due to:		
a. Monitor equipment malfunctions	0.0	hr
b. Non-Monitor equipment malfunctions	0.0	hr
c. Quality assurance calibration	2.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total CEMS Downtime.	2.0	hr
3. Percentage total CEMS Downtime of total source operating time.	0.1	%

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature:

Title: Facility Manager

10/15/2014

Document ID WBU-DENV-3G12-46380

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SMR6-HU2 Summary Report

NOx@3% Excess Emission and Monitoring System Performance

Reporting period dates:	June 1, 2014 to September 30, 2014
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	Sitewide Limit - Title V Permit
Monitor Manufacturer:	Horiba
Monitor Model No.:	ENDA P-3771
Date of Latest CEMS Certification:	05/20/2014 (RATA)
Process Unit Description:	Hydrogen Reformer
Total Source Operating Time:	2205.2 hours

Emission Data Summary		
1. Duration of excess emissions in reporting period due to:		
a. Startup/shutdown	0.0	hr
b. Control equipment problems	0.0	hr
c. Process problems	0.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total duration of excess emissions.	0.0	hr
3. Percentage total duration of excess emissions of total source operating time.	0.0	%
CEMS Performance Summary		
1. CEMS downtime in reporting due to:		
a. Monitor equipment malfunctions	0.0	hr
b. Non-Monitor equipment malfunctions	0.0	hr
c. Quality assurance calibration	2.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total CEMS Downtime.	2.0	hr
3. Percentage total CEMS Downtime of total source operating time.	0.1	%

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature:

Title: Facility Manager

10/15/2014

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

SMR6-HU2 Summary Report

CO@3% Excess Emission and Monitoring System Performance

Reporting period dates:	June 1, 2014 to September 30, 2014
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	Sitewide Limit - Title V Permit
Monitor Manufacturer:	Horiba
Monitor Model No.:	ENDA P-3771
Date of Latest CEMS Certification:	05/20/2014 (RATA)
Process Unit Description:	Hydrogen Reformer
Total Source Operating Time:	2205.2 hours

Emission Data Summary		
1. Duration of excess emissions in reporting period due to:		
a. Startup/shutdown	0.0	hr
b. Control equipment problems	0.0	hr
c. Process problems	0.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total duration of excess emissions.	0.0	hr
3. Percentage total duration of excess emissions of total source operating time.	0.0	%
CEMS Performance Summary		
1. CEMS downtime in reporting due to:		
a. Monitor equipment malfunctions	0.0	hr
b. Non-Monitor equipment malfunctions	0.0	hr
c. Quality assurance calibration	2.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total CEMS Downtime.	2.0	hr
3. Percentage total CEMS Downtime of total source operating time.	0.1	%

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature:

Title: Facility Manager

10/15/2014

Document ID WBU-DENV-3G12-46380

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Reporting period dates:	June 1, 2014 to September 30, 2014
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Monitor Model No.:	ENDA P-3771

SMR6-HU2 Excess Emission Periods: NOx 40ppm@0% 24 Hours

Start Date	Start Time	End Date	End Time	Duration (hr)	Reason	Action Taken

There were no excess emission from SMR 6 (HU-2) in third quarter of 2014.

Total hours 0.00

SMR6_HU2 2014_3Q signed SMR6 Ex Emsn

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Reporting period dates:	June 1, 2014 to September 30, 2014
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Monitor Model No.:	ENDA P-3771

SMR6-HU2 CEMS Downtime-NOx

Date	Start Time	Date	End Time	Duration	Reason	Action Taken
9/11/2014	12:00	9/11/2014	14:00	2.0	CGA	None

Total hours 2.0

SMR6-HU2 CEMS Downtime-CO

Date	Start Time	Date	End Time	Duration	Reason	Action Taken
9/11/2014	12:00	9/11/2014	14:00	2.0	CGA	None

Total hours 2.0

Document ID WBU-DENV-3G12-46380

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HU Flare Summary Report

SO2 Excess Emission and Monitoring System Performance

Reporting period dates:	July 1, 2014 to September 30, 2014
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	152 ppm SO2 - NSPS J
Monitor Manufacturer:	Thermo Scientific SOLA II
Monitor Model No.:	SL-06230909
Date of Latest CEMS Certification:	11/19/2013 (RATA)
Process Unit Description:	Hydrogen Unit Flare
Total Source Operating Time:	2208.0 hours

Emission Data Summary		
1. Duration of excess emissions in reporting period due to:		
a. Startup/shutdown	0.0	hr
b. Control equipment problems	0.0	hr
c. Process problems	0.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total duration of excess emissions.	0.0	hr
3. Percentage total duration of excess emissions of total source operating time.	0.0	%
CEMS Performance Summary		
1. CEMS downtime in reporting due to:		
a. Monitor equipment malfunctions	0.0	hr
b. Non-Monitor equipment malfunctions	0.0	hr
c. Quality assurance calibration	0.0	hr
d. Other known causes	1.0	hr
e. Unknown causes	0.0	hr
2. Total CEMS Downtime.	1.0	hr
3. Percentage total CEMS Downtime of total source operating time.	0.0	%

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature:

Title: Facility Manager

10/15/2014

Document ID WBU-DENV-3G12-46380

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Reporting period dates:	July 1, 2014 to September 30, 2014
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Monitor Model No.:	SL-06230909

HU Flare Excess Emission Periods: SO2 152 ppm

Start Date	Start Time	End Date	End Time	Duration (hr)	Reason	Action Taken
No excess emissions during the third quarter of 2014						

Total hours 0.00

HU Flare 2014 3Q signed Flare Ex Emsn

Document ID WBU-DENV-3G12-46380

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Reporting period dates:	July 1, 2014 to September 30, 2014
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Monitor Model No.:	SL-06230909

HU Flare CEMS Downtime-SO2

Start Date	Start Time	End Date	End Time	Duration (hr)	Reason	Action Taken
9/11/2014	14:00	9/11/2014	15:00	1	CGA	None

Total hours 1.0

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CONTINUOUS EMISSIONS MONITORING SYSTEM CYLINDER GAS AUDIT

Performed At The
Praxair, Inc.
HU Flare
Reformer 5 (HU 1)
Reformer 6 (HU 2)
Hydrogen Unit
Whiting, Indiana

Test Dates
September 11, 2014

Report No.
TRC Environmental Corporation Report 202965.5000A

Report Submittal Date
October 15, 2014

TRC Environmental Corporation
7521 Brush Hill Road
Burr Ridge, Illinois 60527
USA

T (312) 533-2042
F (312) 533-2070

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Appendix

Cylinder Gas Audit Data Sheet ..... A

Computer Data ..... B

Audit Gas Certification Sheets C

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CERTIFICATION SHEET

I certify that TRC and its subcontractors (if any) operated in conformance with the requirements of ASTM D 7036-04 during this test project. The validity of any data not generated by TRC or its subcontractors is the responsibility of the organization that provided said data.

TRC Environmental Corporation

David McNulty
Instrumentation Engineer/Manager CEMS Services

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TRC Gas Audit Template Rev 2/1/13

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CONTINUOUS EMISSIONS MONITORING SYSTEM
CYLINDER GAS AUDIT

1.0 INTRODUCTION

A continuous emissions monitoring (CEM) system cylinder gas audit was performed by TRC Environmental Corporation (TRC) on September 11, 2014, at the Hydrogen Unit (HU) Flare, Hydrogen Unit Reformer 5 (HU 1) and Hydrogen Unit Reformer 6 (HU 2) of Praxair, Inc. Whiting facility in Whiting, Indiana. The tests were authorized by Praxair, Inc.

The CEMS system was challenged three times at two audit points and the average responses were used in determining accuracy. All work was performed in accordance with 40 CFR 60, Appendix B, Performance Specification 2, and Appendix F.

1.1 Project Contact Information

Participants		
Test Facility	Praxair, Inc. Praxair Hydrogen Unit Whiting, Indiana 46312	Ms. Kiranmai Valluri Environmental Manager 281-478-1564 (phone) kiranmai_valluri@praxair.com
Air Emissions Testing Body (AETB)	TRC Environmental Corporation 7521 Brush Hill Road Burr Ridge, Illinois 60527	Mr. David McNulty Instrumentation Engineer/Manager CEM Services 312-533-2029 (phone) 312-533-2070 (fax) dmcnulty@trcsolutions.com

The tests were conducted by Mr. David McNulty of TRC.

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2.0 SUMMARY OF RESULTS

AUDIT RESULTS SUMMARY				
Unit No.	Gas Type	Accuracy of CEM Component (%)		Pass (0.00-15.00%) Fail (15.01%->)
		Audit Point 1	Audit Point 2	
HU Flare	SO_2	6.07	3.88	Pass

AUDIT RESULTS SUMMARY				
Unit No.	Gas Type	Accuracy of CEM Component (%)		Pass (0.00-15.00%) Fail (15.01%->)
		Audit Point 1	Audit Point 2	
Reformer 5/HU 1	NO_X Low	-6.77	1.38	Pass
	NO_X High	-2.01	-0.98	Pass
	CO Low	3.33	2.82	Pass
	CO High	0.99	0.34	Pass
	O_2	3.96	2.42	Pass

AUDIT RESULTS SUMMARY				
Unit No.	Gas Type	Accuracy of CEM Component %		Pass (0.00-15.00%) Fail (15.01%->)
		Audit Point 1	Audit Point 2	
Reformer 6/HU 2	NO_X Low	-8.12	0.48	Pass
	NO_X High	-2.55	-1.28	Pass
	CO Low	-0.67	-0.82	Pass
	CO High	0.72	-0.14	Pass
	O_2	-3.83	0.17	Pass

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APPENDIX

Document ID WBU-DENV-3G12-46380

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Appendix A: Cylinder Gas Audit Field Data Sheets

Document ID WBU-DENV-3G12-46380

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Part 60 Cylinder Gas Audit Data Sheet

Period Ending Date:	Third Quarter	Date of Audit:	September 11, 2014
Client:	Praxair	Plant Name:	Praxair Whiting
Unit:	HU Flare	Location:	Whiting IN
Project Number:	202965.5		
Auditor:	David McNulty	Representing:	TRC Environmental

Type: SO_2	Manufacturer: Thermal Environmental	Audit Point 1	Audit Point 2
Model: SOLA II	Serial Number: SL-06230909		
	Full Scale Value: 350 ppm		
** Audit Range (ppm or %):		70-105	175-210
Cylinder ID Number:		CC-97333	XC-019328B
Certification Expiration Date;		30-Jul-22	30-Jul-22
Certification Type;		Protocol 1	Protocol 1
Certified Value		95.5	204.3
CEMS Response 1:		97.2	211.8
CEMS Response 2:		103.4	212.0
CEMS Response 3:		103.3	212.9
Average CEMS Response:		101.300	212.233
Accuracy:		6.07%	3.88%
Absolute Difference:		5.8	7.9

Calculations:

$$A = (C_m - C_a)/C_a \times 100$$

$$A_D = \text{Absolute Value } (C_a - C_m)$$

Where:

A = Accuracy of the CEMS in percent

A_D = Absolute difference between the audit Value and the mean response

C_m = Average CEMs response during audit in units of appropriate concentration

C_a = Certified audit value in units of appropriate concentration

Acceptance Criteria:
The audit passes if the accuracy is ±15 percent of the average audit value, or the absolute difference is ±5 ppm, whichever is greater.

**Audit Point Criteria:

SO_2, NO_X, CO, H_2S

Audit Point 1	20-30% of Full Scale
Audit Point 2	50-60% of Full Scale

O_2

Audit Point 1	4-6%
Audit Point 2	8-12%

CO_2

Audit Point 1	5-8%
Audit Point 2	10-14%

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Part 60 Cylinder Gas Audit Data Sheet

Period Ending Date:	Third Quarter	Date of Audit:	September 11, 2014
Client:	Praxair	Plant Name:	Praxair Whiting
Unit:	SMR5-HU1	Location:	Whiting IN
Project Number:	202965.5		
Auditor:	David McNulty	Representing:	TRC Environmental

Type: NO_X Low Model: ENDA/P	Manufacture: Horiba Serial Number: ENDA/P-3770 Full Scale Value: 20 ppm	Audit Point 1	Audit Point 2
** Audit Range (ppm or %):		4-6 ppm	10-12 ppm
Cylinder ID Number:		CC177329	EB0000706
Certification Expiration Date;		7-May-15	26-Feb-15
Certification Type;		Protocol 1	Protocol 1
Certified Value		4.97	11.08
CEMS Response 1:		4.7	11.3
CEMS Response 2:		4.6	11.2
CEMS Response 3:		4.8	11.2
Average CEMS Response:		4.633	11.233
Accuracy:		-6.77%	1.38%
Absolute Difference:		0.3	0.2

Type: CO Low Model: ENDA/P	Manufacture: Horiba Serial Number: ENDA/P-3770 Full Scale Value: 20 ppm	Audit Point 1	Audit Point 2
** Audit Range (ppm or %):		4-6 ppm	10-12 ppm
Cylinder ID Number:		CC177329	EB0000706
Certification Expiration Date;		7-May-15	26-Feb-15
Certification Type;		Protocol 1	Protocol 1
Certified Value		5.0	10.99
CEMS Response 1:		5.1	11.3
CEMS Response 2:		5.1	11.3
CEMS Response3:		5.3	11.3
Average CEMS Response:		5.167	11.300
Accuracy:		3.33%	2.82%
Absolute Difference:		0.2	0.3

Comments:

Calculations:

$$A = (C_m - C_a)/C_a \times 100$$

$$A_D = \text{Absolute Value } (C_a - C_m)$$

Where:

A = Accuracy of the CEMS in percent

A_D = Absolute difference between the audit Value and the mean response

C_m = Average CEMs response during audit in units of appropriate concentration

C_a = Certified audit value in units of appropriate concentration

Acceptance Criteria:
The audit passes if the accuracy is ±15 percent of the average audit value, or the absolute difference is ±5 ppm, whichever is greater.

**Audit Point Criteria:

SO_2, NO_X, CO, H_2S

Audit Point 1 20-30% of Full Scale
Audit Point 2 50-60% of Full Scale

O_2

Audit Point 1 4-6%
Audit Point 2 8-12%

CO_2

Audit Point 1 5-8%
Audit Point 2 10-14%

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Part 60 Cylinder Gas Audit Data Sheet

Period Ending Date:	Third Quarter	Date of Audit:	September 11, 2014
Client:	Praxair	Plant Name:	Praxair Whiting
Unit:	SMR5-HU1	Location:	Whiting IN
Project Number:	202965.5		
Auditor:	David McNulty	Representing:	TRC Environmental

Type: NO_X High	Manufacture: Horiba	Audit Point 1	Audit Point 2
Model: ENDA/P	Serial Number: ENDA/P-3770		
	Full Scale Value: 200 ppm		
** Audit Range (ppm or %):		40-60	100-120
Cylinder ID Number:		SX47405	SX48605
Certification Expiration Date;		19-Feb-15	15-Feb-19
Certification Type;		Protocol 1	Protocol 1
Certified Value		49.53	110.18
CEMS Response 1:		48.5	109.1
CEMS Response 2:		48.5	109.1
CEMS Response 3:		48.6	109.1
Average CEMS Response:		48.533	109.100
Accuracy:		-2.01%	-0.98%
Absolute Difference:		1.0	1.1

Type: CO High	Manufacture: Horiba	Audit Point 1	Audit Point 2
Model: ENDA/P	Serial Number: ENDA/P-3770		
	Full Scale Value: 100 ppm		
** Audit Range (ppm or %):		20-30	50-60
Cylinder ID Number:		SX47405	SX48605
Certification Expiration Date;		19-Feb-15	15-Feb-19
Certification Type;		Protocol 1	Protocol 1
Certified Value		25.35	55.11
CEMS Response 1:		25.6	55.1
CEMS Response 2:		25.6	55.4
CEMS Response3:		25.6	55.4
Average CEMS Response:		25.600	55.300
Accuracy:		0.99%	0.34%
Absolute Difference:		0.3	0.2

Comments:

Calculations:

$$A = (C_m - C_a)/C_a \times 100$$

$$A_D = \text{Absolute Value } (C_a - C_m)$$

Where:

A = Accuracy of the CEMS in percent

A_D = Absolute difference between the audit Value and the mean response

C_m = Average CEMs response during audit in units of appropriate concentration

C_a = Certified audit value in units of appropriate concentration

Acceptance Criteria:
The audit passes if the accuracy is ±15 percent of the average audit value, or the absolute difference is ±5 ppm, whichever is greater.

**Audit Point Criteria:

SO_2, NO_X, CO, H_2S

Audit Point 1 20-30% of Full Scale
Audit Point 2 50-60% of Full Scale

O_2

Audit Point 1 4-6%
Audit Point 2 8-12%

CO_2

Audit Point 1 5-8%
Audit Point 2 10-14%

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Part 60 Cylinder Gas Audit Data Sheet

Period Ending Date:	Third Quarter	Date of Audit:	September 11, 2014
Client:	Praxair	Plant Name:	Praxair Whiting
Unit:	SMR5-HU1	Location:	Whiting IN
Project Number:	202965.5		
Auditor:	David McNulty	Representing:	TRC Environmental

Type: O_2	Manufacturer: Horiba	Audit Point 1	Audit Point 2
Model: ENDA/P	Serial Number: ENDA/P-3770		
	Full Scale Value: 25%		
** Audit Range (ppm or %):		4-6%	8-12%
Cylinder ID Number:		FL-0000282	EB0000785
Certification Expiration Date;		6-Feb-15	5-Jun-21
Certification Type;		Protocol 1	Protocol 1
Certified Value		5.13	10.057
CEMS Response 1:		5.3	10.3
CEMS Response 2:		5.3	10.3
CEMS Response 3:		5.4	10.3
Average CEMS Response:		5.333	10.300
Accuracy:		3.96%	2.42%
Absolute Difference:		0.2	0.2

Calculations:

$$A = (C_m - C_a)/C_a \times 100$$

$$A_D = \text{Absolute Value } (C_a - C_m)$$

Where:

A = Accuracy of the CEMS in percent

A_D = Absolute difference between the audit Value and the mean response

C_m = Average CEMs response during audit in units of appropriate concentration

C_a = Certified audit value in units of appropriate concentration

Acceptance Criteria:
The audit passes if the accuracy is ±15 percent of the average audit value, or the absolute difference is ±5 ppm, whichever is greater.

**Audit Point Criteria:

SO_2, NO_X, CO, H_2S

Audit Point 1 20-30% of Full Scale

Audit Point 2 50-60% of Full Scale

O_2

Audit Point 1 4-6%

Audit Point 2 8-12%

CO_2

Audit Point 1 5-8%

Audit Point 2 10-14%

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Part 60 Cylinder Gas Audit Data Sheet

Period Ending Date:	Third Quarter	Date of Audit:	September 11, 2014
Client:	Praxair	Plant Name:	Praxair Whiting
Unit:	SMR6-HU2	Location:	Whiting IN
Project Number:	202965.5		
Auditor:	David McNulty	Representing:	TRC Environmental

Type: NO_X Low Model: ENDA/P	Manufacture: Horiba Serial Number: ENDA/P-3771 Full Scale Value: 20 ppm	Audit Point 1	Audit Point 2
** Audit Range (ppm or %):		4-6 ppm	10-12 ppm
Cylinder ID Number:		CC177329	EB0000706
Certification Expiration Date;		7-May-15	26-Feb-15
Certification Type;		Protocol 1	Protocol 1
Certified Value		4.97	11.08
CEMS Response 1:		4.7	11.2
CEMS Response 2:		4.5	11.1
CEMS Response 3:		4.5	11.1
Average CEMS Response:		4.567	11.133
Accuracy:		-8.12%	0.48%
Absolute Difference:		0.4	0.1

Type: CO Low Model: ENDA/P	Manufacture: Horiba Serial Number: ENDA/P-3771 Full Scale Value: 20 ppm	Audit Point 1	Audit Point 2
** Audit Range (ppm or %):		4-6 ppm	10-12 ppm
Cylinder ID Number:		CC177329	EB0000706
Certification Expiration Date;		7-May-15	26-Feb-15
Certification Type;		Protocol 1	Protocol 1
Certified Value		5.0	10.99
CEMS Response 1:		4.9	10.9
CEMS Response 2:		4.9	10.9
CEMS Response3:		5.1	10.9
Average CEMS Response:		4.967	10.900
Accuracy:		-0.67%	-0.82%
Absolute Difference:		0.0	0.1

Comments:

Calculations:

$$A = (C_m - C_a)/C_a \times 100$$

$$A_D = \text{Absolute Value } (C_a - C_m)$$

Where:

A = Accuracy of the CEMS in percent

A_D = Absolute difference between the audit Value and the mean response

C_m = Average CEMs response during audit in units of appropriate concentration

C_a = Certified audit value in units of appropriate concentration

Acceptance Criteria:
The audit passes if the accuracy is ±15 percent of the average audit value, or the absolute difference is ±5 ppm, whichever is greater.

**Audit Point Criteria:

SO_2, NO_X, CO, H_2S

Audit Point 1 20-30% of Full Scale
Audit Point 2 50-60% of Full Scale

O_2

Audit Point 1 4-6%
Audit Point 2 8-12%

CO_2

Audit Point 1 5-8%
Audit Point 2 10-14%

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Part 60 Cylinder Gas Audit Data Sheet

Period Ending Date:	Third Quarter	Date of Audit:	September 11, 2014
Client:	Praxair	Plant Name:	Praxair Whiting
Unit:	SMR6-HU2	Location:	Whiting IN
Project Number:	202965.5		
Auditor:	David McNulty	Representing:	TRC Environmental

Type: NO_X High	Manufacture: Horiba	Audit Point 1	Audit Point 2
Model: ENDA/P	Serial Number: ENDA/P-3771		
	Full Scale Value: 200 ppm		
** Audit Range (ppm or %):		40-60	100-120
Cylinder ID Number:		SX47405	SX48605
Certification Expiration Date;		19-Feb-15	15-Feb-19
Certification Type;		Protocol 1	Protocol 1
Certified Value		49.53	110.18
CEMS Response 1:		48.2	109.1
CEMS Response 2:		48.3	108.5
CEMS Response 3:		48.3	108.7
Average CEMS Response:		48.267	108.767
Accuracy:		-2.55%	-1.28%
Absolute Difference:		1.3	1.4

Type: CO High	Manufacture: Horiba	Audit Point 1	Audit Point 2
Model: ENDA/P	Serial Number: ENDA/P-3771		
	Full Scale Value: 100 ppm		
** Audit Range (ppm or %):		20-30	50-60
Cylinder ID Number:		SX47405	SX48605
Certification Expiration Date;		19-Feb-15	15-Feb-19
Certification Type;		Protocol 1	Protocol 1
Certified Value		25.35	55.11
CEMS Response 1:		25.5	54.9
CEMS Response 2:		25.5	55.1
CEMS REsponse3:		25.6	55.1
Average CEMS Response:		25.533	55.033
Accuracy:		0.72%	-0.14%
Absolute Difference:		0.2	0.1

Comments:

Calculations:

$$A = (C_m - C_a)/C_a \times 100$$

$$A_D = \text{Absolute Value } (C_a - C_m)$$

Where:

A = Accuracy of the CEMS in percent

A_D = Absolute difference between the audit Value and the mean response

C_m = Average CEMs response during audit in units of appropriate concentration

C_a = Certified audit value in units of appropriate concentration

Acceptance Criteria:
The audit passes if the accuracy is ±15 percent of the average audit value, or the absolute difference is ±5 ppm, whichever is greater.

**Audit Point Criteria:

SO_2, NO_X, CO, H_2S

Audit Point 1	20-30% of Full Scale
Audit Point 2	50-60% of Full Scale

O_2

Audit Point 1	4-6%
Audit Point 2	8-12%

CO_2

Audit Point 1	5-8%
Audit Point 2	10-14%

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Part 60 Cylinder Gas Audit Data Sheet

Period Ending Date:	Third Quarter	Date of Audit:	September 11, 2014
Client:	Praxair	Plant Name:	Praxair Whiting
Unit:	SMR6-HU2	Location:	Whiting IN
Project Number:	202965.5		
Auditor:	David McNulty	Representing:	TRC Environmental

Type: O_2	Manufacturer: Horiba	Audit Point 1	Audit Point 2
Model: ENDA/P	Serial Number: ENDA/P-3771		
	Full Scale Value: 25%		
** Audit Range (ppm or %):		4-6%	8-12%
Cylinder ID Number:		FL-0000282	EB0031709
Certification Expiration Date;		6-Feb-15	25-Oct-20
Certification Type;		Protocol 1	Protocol 1
Certified Value		5.13	9.85
CEMS Response 1:		4.9	9.9
CEMS Response 2:		5.0	9.9
CEMS Response 3:		4.9	9.8
Average CEMS Response:		4.933	9.867
Accuracy:		-3.83%	0.17%
Absolute Difference:		0.2	0.0

Calculations:

$$A = (C_m - C_a)/C_a \times 100$$

$$A_D = \text{Absolute Value } (C_a - C_m)$$

Where:

A = Accuracy of the CEMS in percent

A_D = Absolute difference between the audit Value and the mean response

C_m = Average CEMs response during audit in units of appropriate concentration

C_a = Certified audit value in units of appropriate concentration

Acceptance Criteria:
The audit passes if the accuracy is ±15 percent of the average audit value, or the absolute difference is ±5 ppm, whichever is greater.

**Audit Point Criteria:

SO_2, NO_X, CO, H_2S

Audit Point 1	20-30% of Full Scale
Audit Point 2	50-60% of Full Scale

O_2

Audit Point 1	4-6%
Audit Point 2	8-12%

CO_2

Audit Point 1	5-8%
Audit Point 2	10-14%

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Appendix B: Computer Data

Document ID WBU-DENV-3G12-46380

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ONE MINUTE SYSTEM REPORT

COMPANY NAME: Praxair
LOCATION: Whiting, IN
SOURCE: HU Flare
CEMS ID NO.: SL-06230909
DATE CREATED: 09/11/2014 @ 14:45
PERIOD: 09/11/2014 @ 13:55 - 09/11/2014 @ 14:40

ONE MINUTE SUMMARY

DATE MM/DD/YY HH:mm	SO2 (PPM)	
09/11/14 13:55	0.0	
09/11/14 13:56	14.2	
09/11/14 13:57	51.2	
09/11/14 13:58	83.5	
09/11/14 13:59	93.6	
09/11/14 14:00	86.0	Low
09/11/14 14:01	97.2	
09/11/14 14:02	97.6	
09/11/14 14:03	132.5	
09/11/14 14:04	182.0	
09/11/14 14:05	206.8	
09/11/14 14:06	211.6	
09/11/14 14:07	211.8	High
09/11/14 14:08	211.9	
09/11/14 14:09	213.0	
09/11/14 14:10	182.6	
09/11/14 14:11	128.9	
09/11/14 14:12	106.8	
09/11/14 14:13	103.6	Low
09/11/14 14:14	103.4	
09/11/14 14:15	102.8	
09/11/14 14:16	102.5	
09/11/14 14:17	102.6	
09/11/14 14:18	133.1	
09/11/14 14:19	186.0	
09/11/14 14:20	206.7	
09/11/14 14:21	210.4	
09/11/14 14:22	212.0	High
09/11/14 14:23	212.4	
09/11/14 14:24	188.8	
09/11/14 14:25	143.5	
09/11/14 14:26	112.4	
09/11/14 14:27	104.0	
09/11/14 14:28	102.8	Low
09/11/14 14:29	103.3	
09/11/14 14:30	104.6	
09/11/14 14:31	138.4	
09/11/14 14:32	189.4	
09/11/14 14:33	209.8	
09/11/14 14:34	213.3	
09/11/14 14:35	212.9	High
09/11/14 14:36	212.9	
09/11/14 14:37	214.2	
09/11/14 14:38	214.1	
09/11/14 14:39	201.1	
09/11/14 14:40	121.7	

REPORT SUMMARY

	SO2 (PPM)
AVG:	134.2

NOTE: THE REPORT SUMMARY RESULTS ABOVE INCLUDE VALID DATA ONLY

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ONE MINUTE SYSTEM REPORT

COMPANY NAME: Praxair
LOCATION: Whiting, IN
SOURCE: SMR5-HU1
CEMS ID NO.: P-3770
DATE CREATED: 09/11/2014 @ 10:45
PERIOD: 09/11/2014 @ 10:20 - 09/11/2014 @ 10:43

ONE MINUTE SUMMARY

DATE MM/DD/YY HH:mm	NOx-L (PPM)-MC	CO-L (PPM)-MC	
09/11/14 10:20	4.9-00	5.1-00	
09/11/14 10:21	4.7-00	5.1-00	Low
09/11/14 10:22	5.4-00	7.4-00	
09/11/14 10:23	8.0-00	8.4-00	
09/11/14 10:24	9.5-00	11.1-00	
09/11/14 10:25	11.7-00	11.4-00	
09/11/14 10:26	11.3-00	11.3-00	
09/11/14 10:27	11.3-00	11.0-00	
09/11/14 10:28	10.9-00	4.1-00	
09/11/14 10:29	6.1-00	4.8-00	
09/11/14 10:30	4.6-00	5.0-00	
09/11/14 10:31	4.6-00	5.1-00	Low
09/11/14 10:32	4.8-00	5.4-00	
09/11/14 10:33	8.9-00	10.2-00	
09/11/14 10:34	11.2-00	11.3-00	
09/11/14 10:35	11.2-00	11.3-00	High
09/11/14 10:36	11.2-00	11.1-00	
09/11/14 10:37	7.1-00	6.2-00	
09/11/14 10:38	4.6-00	5.1-00	
09/11/14 10:39	4.6-00	5.1-00	
09/11/14 10:40	4.6-00	5.3-00	Low
09/11/14 10:41	8.7-00	10.2-00	
09/11/14 10:42	11.2-00	11.3-00	
09/11/14 10:43	11.2-00	11.3-00	High

REPORT SUMMARY

	NOx-L (PPM)	CO-L (PPM)
AVG:	8.0	8.1
TOTAL:	1.921E2	1.936E2

NOTE: THE REPORT SUMMARY RESULTS ABOVE INCLUDE VALID DATA ONLY

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ONE MINUTE SYSTEM REPORT

COMPANY NAME: Praxair
LOCATION: Whiting, IN
SOURCE: SMR5-HU1
CEMS ID NO.: P-3770
DATE CREATED: 09/11/2014 @ 09:55
PERIOD: 09/11/2014 @ 09:29 - 09/11/2014 @ 09:55

ONE MINUTE SUMMARY

DATE MM/DD/YY HH:mm	NOx (PPM)	CO (PPM)	
09/11/14 09:29	31.2	36.5	
09/11/14 09:30	47.9	25.4	
09/11/14 09:31	48.3	25.5	
09/11/14 09:32	48.5	25.6	Low
09/11/14 09:33	48.5	24.0	
09/11/14 09:34	129.6	13.5	
09/11/14 09:35	114.3	52.8	
09/11/14 09:36	109.3	54.8	
09/11/14 09:37	109.1	55.1	High
09/11/14 09:38	106.2	46.4	
09/11/14 09:39	49.0	25.6	
09/11/14 09:40	48.5	25.6	Low
09/11/14 09:41	48.5	25.6	
09/11/14 09:42	57.3	38.1	
09/11/14 09:43	108.3	55.2	
09/11/14 09:44	108.9	55.4	
09/11/14 09:45	109.1	55.4	High
09/11/14 09:46	103.1	44.4	
09/11/14 09:47	49.0	25.6	
09/11/14 09:48	48.6	25.6	Low
09/11/14 09:49	48.6	25.7	
09/11/14 09:50	59.0	39.2	
09/11/14 09:51	108.6	55.4	
09/11/14 09:52	108.9	55.5	
09/11/14 09:53	109.1	55.4	High
09/11/14 09:54	108.0	43.8	
09/11/14 09:55	MISS		

Document ID WBU-DENV-3G12-46380

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ONE MINUTE SYSTEM REPORT

COMPANY NAME: Praxair
LOCATION: Whiting, IN
SOURCE: SMR5-HU1
CEMS ID NO.: P-3770
DATE CREATED: 09/11/2014 @ 09:30
PERIOD: 09/11/2014 @ 09:02 - 09/11/2014 @ 09:29

ONE MINUTE SUMMARY

DATE MM/DD/YY HH:mm	O2 (%)	
09/11/14 09:02	3.0	
09/11/14 09:03	0.9	
09/11/14 09:04	5.1	
09/11/14 09:05	5.3	
09/11/14 09:06	5.3	Low
09/11/14 09:07	8.8	
09/11/14 09:08	13.4	
09/11/14 09:09	10.4	
09/11/14 09:10	10.3	High
09/11/14 09:11	10.3	
09/11/14 09:12	9.8	
09/11/14 09:13	5.3	
09/11/14 09:14	5.3	Low
09/11/14 09:15	5.4	
09/11/14 09:16	6.2	
09/11/14 09:17	10.2	
09/11/14 09:18	10.2	
09/11/14 09:19	10.3	High
09/11/14 09:20	10.2	
09/11/14 09:21	5.4	
09/11/14 09:22	5.3	
09/11/14 09:23	5.3	Low
09/11/14 09:24	5.4	
09/11/14 09:25	8.9	
09/11/14 09:26	10.3	
09/11/14 09:27	10.3	High
09/11/14 09:28	10.2	
09/11/14 09:29	0.2	

Document ID WBU-DENV-3G12-46380

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ONE MINUTE SYSTEM REPORT

COMPANY NAME: Praxair
LOCATION: Whiting, IN
SOURCE: SMR6-HU2
CEMS ID NO.: P-3771
DATE CREATED: 09/11/2014 @ 13:17
PERIOD: 09/11/2014 @ 12:49 - 09/11/2014 @ 13:16

ONE MINUTE SUMMARY

DATE MM/DD/YY HH:mm	NOX-L (PPM)	CO-L (PPM)	
09/11/14 12:49	10.1	3.6	
09/11/14 12:50	10.1	9.9	
09/11/14 12:51	5.9	12.2	
09/11/14 12:52	5.8	4.9	
09/11/14 12:53	4.8	4.9	
09/11/14 12:54	4.7	4.9	Low
09/11/14 12:55	6.2	9.1	
09/11/14 12:56	7.4	9.2	
09/11/14 12:57	12.2	11.0	
09/11/14 12:58	11.2	10.9	
09/11/14 12:59	11.2	10.9	High
09/11/14 13:00	11.0	10.5	
09/11/14 13:01	6.5	5.6	
09/11/14 13:02	4.6	4.9	
09/11/14 13:03	4.5	4.9	Low
09/11/14 13:04	4.5	5.2	
09/11/14 13:05	9.0	9.9	
09/11/14 13:06	11.1	10.9	
09/11/14 13:07	11.1	10.9	High
09/11/14 13:08	11.1	10.6	
09/11/14 13:09	6.7	5.8	
09/11/14 13:10	4.6	4.9	
09/11/14 13:11	4.5	4.9	
09/11/14 13:12	4.5	5.1	Low
09/11/14 13:13	8.5	9.7	
09/11/14 13:14	11.0	10.9	
09/11/14 13:15	11.1	10.9	Hi-up
09/11/14 13:16	11.1	10.9	

REPORT SUMMARY

	NOX-L (PPM)	CO-L (PPM)

NOTE: THE REPORT SUMMARY RESULTS ABOVE INCLUDE VALID DATA ONLY

Document ID WBU-DENV-3G12-46380

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ONE MINUTE SYSTEM REPORT

COMPANY NAME: Praxair
LOCATION: Whiting, IN
SOURCE: SMR6-HU2
CEMS ID NO.: P-3771
DATE CREATED: 09/11/2014 @ 12:19
PERIOD: 09/11/2014 @ 11:52 - 09/11/2014 @ 12:17

ONE MINUTE SUMMARY

DATE MM/DD/YY HH:MM	NOx (PPM)	CO (PPM)	
09/11/14 11:52	39.7	25.1	
09/11/14 11:53	47.7	25.5	
09/11/14 11:54	48.1	25.5	
09/11/14 11:55	48.2	25.5	Low
09/11/14 11:56	48.2	25.6	
09/11/14 11:57	76.2	58.4	
09/11/14 11:58	116.1	49.2	
09/11/14 11:59	109.3	34.7	
09/11/14 12:00	109.1	54.9	High
09/11/14 12:01	103.8	44.4	
09/11/14 12:02	48.6	25.6	
09/11/14 12:03	48.2	25.6	
09/11/14 12:04	48.3	25.5	Low
09/11/14 12:05	98.5	54.9	
09/11/14 12:06	108.6	55.2	
09/11/14 12:07	108.5	55.1	High
09/11/14 12:08	108.7	55.1	
09/11/14 12:09	100.8	42.8	
09/11/14 12:10	48.7	25.6	
09/11/14 12:11	48.3	25.6	Low
09/11/14 12:12	48.4	25.5	
09/11/14 12:13	58.5	39.1	
09/11/14 12:14	108.2	55.1	
09/11/14 12:15	108.7	55.0	
09/11/14 12:16	108.7	55.1	High
09/11/14 12:17	108.6	55.0	

REPORT SUMMARY

	NOx (PPM)	CO (PPM)

NOTE: THE REPORT SUMMARY RESULTS ABOVE INCLUDE INVALID DATA

Document ID WBU-DENV-3G12-46380

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ONE MINUTE SYSTEM REPORT

COMPANY NAME: Praxair
LOCATION: Whiting, IN
SOURCE: SMR6-HU2
CEMS ID NO.: P-3771
DATE CREATED: 09/11/2014 @ 11:52
PERIOD: 09/11/2014 @ 11:27 - 09/11/2014 @ 11:51

ONE MINUTE SUMMARY

DATE MM/DD/YY HH:mm	O2 (%)	
09/11/14 11:27	4.8	
09/11/14 11:28	4.9	
09/11/14 11:29	4.9	Low
09/11/14 11:30	8.2	
09/11/14 11:31	16.3	
09/11/14 11:32	10.1	
09/11/14 11:33	9.9	High
09/11/14 11:34	9.9	
09/11/14 11:35	9.2	
09/11/14 11:36	4.9	
09/11/14 11:37	5.0	Low
09/11/14 11:38	5.0	
09/11/14 11:39	5.5	
09/11/14 11:40	9.8	
09/11/14 11:41	9.9	High
09/11/14 11:42	9.8	
09/11/14 11:43	9.7	
09/11/14 11:44	5.0	
09/11/14 11:45	4.9	
09/11/14 11:46	4.9	Low
09/11/14 11:47	5.5	
09/11/14 11:48	9.8	
09/11/14 11:49	9.8	High
09/11/14 11:50	9.8	
09/11/14 11:51	9.0	

REPORT SUMMARY

	O2 (%)

NOTE: THE REPORT SUMMARY RESULTS ABOVE INCLUDE INVALID DATA

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Appendix C: Audit Gas Certification Sheets

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MATHESON TRI•GAS
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CERTIFICATE OF ANALYSIS - EPA PROTOCOL MIXTURE

1650 ENTERPRISE PKWY
TWINSBURG, OHIO 44087
215-648-4000

Customer: GE ENERGY
Cylinder Number: XC-019382B
Cylinder pressure: 2000 psig
Last Analysis date: 5/24/2012
Expiration Date: 5/24/14

Protocol:	Reference #	Lot #
G1	601119	109-96-27813

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 150 PSIG

REPLICATE RESPONSES

Component : Sulfur Dioxide
Certified Conc: 204.3 ppm ± 1% rel

Date: 5/17/2012	Date: 5/24/2012
203.6 PPM	204.5 PPM
203.5 PPM	204.6 PPM
205.1 PPM	204.5 PPM

BALANCE GAS: Nitrogen

REFERENCE STANDARDS
Component: Sulfur Dioxide
SRM #: SRM-1661a
Sample #: 94-H-12
Cylinder #: FF-27998
Concentration: 490.9 ppm

CERTIFICATION INSTRUMENTS
Component: Sulfur Dioxide
Make/Model: Nicolet 550
Serial Number: ACN-9402192
Measurement Principle: FTIR
Last Calibration: 5/3/2012

Notes: T171484

This certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards September 1997, using procedure G1 and/or G2.
U.S. EPA Vendor ID No.:D42012, PGVP Participation Date: 04/12/11 PGVP Renewal Date 01/01/13

Analyst SIGNATURE ON FILE Date 5/25/2012

Document ID WBU-DENV-3G12-46380

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1700 Scepter Rd
Waverly, TN 37185
931-296-3357

Certificate of Analysis - EPA Protocol Mixtures

Customer: GE Energy

Customer PO #:

Protocol:	Reference #:	Lot#:
G1	650320	109-96-27812

Cylinder Number: CC97333

Cylinder Pressure: 1500 psig

Last Analysis Date: 7/29/2014

Expiration Date: 7/30/2022

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 100 PSIG

Component: Sulfur Dioxide

Certified Conc: 95.5 ppm +/- 0.4 ppm ABS

REPLICATE RESPONSES

Date: 7/22/2014	Date: 7/29/2014
92.4	92.9
92.7	92.3
92.2	92.8

BALANCE GAS: Nitrogen

REFERENCE STANDARDS:

Component: Sulfur Dioxide
Reference Standard: PRM
Cylinder #: D249823
Concentration: 248.7 ppm
Exp Date: 1/13/2017
NIST Sample #: VSL PRIMARY

CERTIFICATION INSTRUMENTS

Component: Sulfur Dioxide
Make/Model: Antaris IGS
Serial Number: AKS1000151
Measurement Principle: FTIR
Last Calibration: 7/21/2014

Notes: **RECERTIFICATION**

The certification was performed according to EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards May 2012, using procedure G1 and/or G2. U.S EPA Vendor ID Number: D62014, PGVP Participation Date: 01/01/14, PGVP Renewal Date: 01/01/15

Analyst: Roman Khidekel

Date: 7/30/2014

Document ID WBU-DENV-3G12-46380

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MATHESON TRI•GAS

ask. . .The Gas Professionals™ **Certificate of Analysis - EPA Protocol Mixtures**

1650 Enterprise Parkway
Twinsburg, Ohio 44087
215-648-4000

Customer: GE ENERGY MANAGEMENT SVCS INC
Cylinder Number: FL-0000282
Cylinder pressure: 2000 psig
Last Analysis date: 2/6/2012
Expiration Date: 2/6/15

Protocol:	Reference #	Lot #
G1	592091	109-26-07001

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 150 PSIG

REPLICATE RESPONSES

	Date: 2/6/2012	Date:
Component : Oxygen	5.13%	
Certified Conc: 5.13% ± 1% REL	5.13%	
	5.13%	

BALANCE GAS: Nitrogen

REFERENCE STANDARDS

Component: Oxygen
SRM #: SRM-2658a
Sample #: 72-D-40
Cylinder #: CAL-016840
Concentration: 9.918%

CERTIFICATION INSTRUMENTS

Component: Oxygen
Make/Model: Rosemount 755
Serial Number: 2002832
Measurement Principle: Paramagnetic
Last Calibration: 1/27/2012

Notes: T168024

This certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards September 1997, using procedure G1 and/or G2.

U.S. EPA Vendor ID No.: D42012 PGVP Participation Date: 4/12/11 PGVP Renewal Date: 1/01/13

Analyst Philip D. Mat. Date 2/7/2012

Document ID WBU-DENV-3G12-46380

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1700 Scepter Rd
Waverly, TN 37185
931-296-3357

Certificate of Analysis - EPA Protocol Mixtures

Customer: GE STOCK

		Protocol:	Reference #:	Lot#:
Cylinder Number:	EB0031709	G1	T179174-1	9302604220
Cylinder Pressure:	1900psig			
Last Analysis Date:	10/25/2012			
Expiration Date:	10/25/2020			

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 100 Psig

REPLICATE RESPONSES

Date: 10/25/2012

Component: Oxygen

9.85
9.85
9.86

Certified Conc: 9.85% +/- 1% REL

BALANCE GAS: Nitrogen

REFERENCE STANDARDS:

Component: Oxygen
Reference Standard: SRM
Cylinder #: CAL015431
Concentration: 20.72%
Exp. Date: 1/1/2016

CERTIFICATION INSTRUMENTS

Component: Oxygen
Make/Model: Horiba MPA-510
Serial Number: PGDF4TKM
Measurement Principle: Paramagnetic
Last Calibration: 10/8/2012

Notes: **Acid rain CEM Meets Federal Register Specification Title 40 CFR 72.2 Total Oxides of Nitrogen <0.1ppm Carbon Dioxide <1.0ppm Carbon Monoxide<0.5ppm Sulfur Dioxide<0.1ppm THC<0.1ppm Water<1.0ppm**

This Certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards September 1997, using procedure G1 and/or G2. The certification expiration date and minimum usable service pressure is assigned using the May 2012 revision of the EPA Traceability Protocol document.

U.S. EPA Vendor ID No.: D52012 PGVP Participation Date: 01/01/12 PGVP Renewal Date: 12/31/12

Analyst: La'Shawn Grissom

Date: 1/9/2013

Document ID WBU-DENV-3G12-46380

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1700 Scepter Rd
Waverly, TN 37185
931-296-3357

Certificate of Analysis - EPA Protocol Mixtures

Customer: TRC ENVIRONMENTAL CORP.

Customer PO#: STOCK

Protocol:	Reference #:	Lot#:
G1	T184057-02	9303605558

Cylinder Number: EB0000785
Cylinder Pressure: 1900psig
Last Analysis Date: 6/4/2013
Expiration Date: 6/5/2021

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 100 PSIG

				REPLICATE RESPONSES
				Date: 6/4/2013
Component:	Oxygen			10.050
				10.059
Certified Conc:	10.057%	+/- 0.013%	ABS	10.062

BALANCE GAS: Nitrogen

REFERENCE STANDARDS:

Component: Oxygen
Reference Standard: SRM
Cylinder #: CAL015431
Concentration: 20.72%
Exp Date: 1/1/2016
NIST Sample # 71-D-12

CERTIFICATION INSTRUMENTS

Component: Oxygen
Make/Model: Horiba MPA-510
Serial Number: U1LSAGS6
Measurement Principle: Paramagnetic
Last Calibration: 6/4/2013

Notes: **Meets Federal Register Specifications Title 40 CFR 72.2**
Total Oxides of Nitrogen <0.1ppm Carbon Dioxide <1.0ppm
Carbon Monoxide <0.5ppm Sulfur Dioxide <0.1ppm THC <0.1
Water <1.0ppm

This Certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards May 2012, using procedure G1 and/or G2.

U.S. EPA Vendor ID No.: D62013 PGVP Participation Date: 01/01/13: PGVP Renewal Date: 01/01/14

Julie Higgins

Analyst: Julie Higgins

Date: 6/6/2013

Document ID WBU-DENV-3G12-46380

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1700 Scepter Rd
Waverly, TN 37185
931-296-3357

Certificate of Analysis - EPA Protocol Mixtures

Customer: TRC ENVIRONMENTAL CORP.
7521 BRUSH HILL RD
BURR RIDGE, IL 60527

Customer PO#: GEE292

		Protocol:	Reference #:	Lot#:
Cylinder Number:	CC177329	G1	626623-01	8303605309
Cylinder Pressure:	1900psig			
Last Analysis Date:	5/7/2013			
Expiration Date:	5/7/2015			

[redacted]

REPLICATE RESPONSES

Component:	Carbon Monoxide			Date:	5/7/2013		
					5.01		
Certified Conc:	5.00ppm	+/- 0.54%	REL		5.00		
					5.00		
Component:	Nitric Oxide			Date:	4/29/2013	Date:	5/6/2013
					4.96		4.95
Certified Conc:	4.97ppm	+/- 1.25%	REL		4.97		4.98
					4.98		4.97
NOx:	5.5ppm	Reference Only					

BALANCE GAS: Nitrogen

REFERENCE STANDARDS:

Component:	Carbon Monoxide	Component:	Nitric Oxide
Reference Standard:	GMIS	Reference Standard:	NTRM
Cylinder #:	ND22576	Cylinder #:	AN11101
Concentration:	9.34ppm	Concentration:	18.98ppm
Exp. Date:	7/10/2014	Exp. Date:	6/17/2017

CERTIFICATION INSTRUMENTS

Component:	Carbon Monoxide	Component:	Nitric Oxide
Make/Model:	Thermo 48i-TLE	Make/Model:	Horiba CLA-510S
Serial Number:	903034427	Serial Number:	FRJ8FDME
Measurement Principle:	NDIR	Measurement Principle:	Chemi
Last Calibration:	5/7/2013	Last Calibration:	4/11/2013

Notes: Carbon Monoxide GMIS CERTIFIED USING SRM STANDARD.
CYLINDER# FF30774

This Certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards September 1997, using procedure G1 and/or G2. The certification expiration date and minimum usable service pressure using the May 2012 revision of the EPA Traceability Protocol document.
U.S. EPA Vendor ID No.: D62013 PGVP Participation Date: 01/01/13: PGVP Renewal Date: 12/31/13

Analyst: Julie Higgins
Julie Higgins

Date: 5/8/2013

Document ID WBU-DENV-3G12-46380

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1700 Scepter Rd
Waverly, TN 37185
931-296-3357

Certificate of Analysis - EPA Protocol Mixtures

Customer: GE Energy Management SVCS Inc

Customer PO#:

		Protocol:	Reference #:	Lot#:
Cylinder Number:	EB0000706	G1	T180909-5	9303604675
Cylinder Pressure:	1900 psig			
Last Analysis Date:	2/26/2013			
Expiration Date:	2/26/2015			

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 100 PSIG

Component: Carbon Monoxide

Certified Conc: 10.99 ppm +/- 1% REL

Component: Nitric Oxide

Certified Conc: 11.08 ppm +/- 1% REL

NOx: 11.79 ppm Reference Only

BALANCE GAS: Nitrogen

REPLICATE RESPONSES

Date: 2/12/2013	Date: 2/19/2013	Date: 2/26/2013
10.97	11.18	11.11
11.03	11.19	10.99
10.92	11.02	10.96

REFERENCE STANDARDS:

Component:	Carbon Monoxide	Component:	Nitric Oxide
Reference Standard:	SRM	Reference Standard:	NTRM
Cylinder #:	CAL017991	Cylinder #:	ND43269
Concentration:	98.85 ppm	Concentration:	98.17 ppm
Exp. Date:	1/2/2017	Exp. Date:	9/20/2015

CERTIFICATION INSTRUMENTS

Component:	Carbon Monoxide	Component:	Nitric Oxide
Make/Model:	Horiba VIA-510	Make/Model:	Antaris IGS
Serial Number:	RL77Y00G	Serial Number:	AKS1000151
Measurement Principle:	NDIR	Measurement Principle:	FTIR
Last Calibration:	1/23/2013	Last Calibration:	2/7/2013

Notes:

This Certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards September 1997, using procedure G1 and/or G2. The certification expiration date and minimum usable service pressure using the May 2012 revision of the EPA Traceability Protocol document.
U.S. EPA Vendor ID No.: D62013 PGVP Participation Date: 01/01/13: PGVP Renewal Date: 12/31/13

Analyst: Roman Khidekel

Date: 2/27/2013

Document ID WBU-DENV-3G12-46380

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1700 Scepter Rd
Waverly, TN 37185
931-296-3357

Certificate of Analysis - EPA Protocol Mixtures

Customer: GE ENERGY MANAGEMENT SVCS INC. Customer PO#:

		Protocol:	Reference #:	Lot#:
Cylinder Number:	SX47405	G1	622600	9303604676
Cylinder Pressure:	1900 PSIG			
Last Analysis Date:	2/19/2013			
Expiration Date:	2/19/2015			

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 100 PSIG

REPLICATE RESPONSES

Component:	Carbon Monoxide	Date:	2/12/2013		
			25.34		
Certified Conc:	25.35 PPM +/- 1% REL		25.34		
			25.37		
Component:	Nitric Oxide	Date:	2/12/2013	Date:	2/19/2013
			49.41		49.72
Certified Conc:	49.53 PPM +/- 1% REL		49.42		49.57
			49.42		49.63
NOx:	50.47 PPM Reference Only				

BALANCE GAS: Nitrogen

REFERENCE STANDARDS:

Component:	Carbon Monoxide	Component:	Nitric Oxide
Reference Standard:	GMIS	Reference Standard:	NTRM
Cylinder #:	SX51243	Cylinder #:	ND43269
Concentration:	207.73 PPM	Concentration:	98.17PPM
Exp. Date:	10/10/2014	Exp. Date:	9/20/2015

CERTIFICATION INSTRUMENTS

Component:	Carbon Monoxide	Component:	Nitric Oxide
Make/Model:	ANTARIS IGS	Make/Model:	ANTARIS IGS
Serial Number:	AKS1000151	Serial Number:	AKS1000151
Measurement Principle:	FTIR	Measurement Principle:	FTIR
Last Calibration:	1/14/2013	Last Calibration:	2/7/2013

Notes:

This Certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards September 1997, using procedure G1 and/or G2. The certification expiration date and minimum usable service pressure using the May 2012 revision of the EPA Traceability Protocol document.
U.S. EPA Vendor ID No.: D62013 PGVP Participation Date: 01/01/13: PGVP Renewal Date: 12/31/13

Analyst: Taylor Wallace Date: 2/19/2013

Document ID WBU-DENV-3G12-46380

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1700 Scepter Rd
Waverly, TN 37185
931-296-3357

Certificate of Analysis - EPA Protocol Mixtures

Customer: GE ENERGY MANAGEMENT SERVICES INC Customer PO#:

		Protocol:	Reference #:	Lot#:
Cylinder Number:	SX48605	G1	622600	9303604677
Cylinder Pressure:	1900 PSIG			
Last Analysis Date:	2/19/2013			
Expiration Date:	2/19/2015			

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 100 PSIG

REPLICATE RESPONSES

Component:	Carbon Monoxide	Date:	2/12/2013		
			55.06		
Certified Conc:	55.11 PPM +/- 1% REL		55.09		
			55.19		
Component:	Nitric Oxide	Date:	2/12/2013	Date:	2/19/2013
			110.19		110.64
Certified Conc:	110.18 PPM +/- 1% REL		109.59		110.20
			110.35		110.13
NOx:	111.46 PPM Reference Only				

BALANCE GAS: Nitrogen

REFERENCE STANDARDS:

Component:	Carbon Monoxide	Component:	Nitric Oxide
Reference Standard:	GMIS	Reference Standard:	NTRM
Cylinder #:	SX51243	Cylinder #:	ND43269
Concentration:	207.73%	Concentration:	98.17PPM
Exp. Date:	10/10/2014	Exp. Date:	9/20/2015

CERTIFICATION INSTRUMENTS

Component:	Carbon Monoxide	Component:	Nitric Oxide
Make/Model:	ANTARIS IGS	Make/Model:	ANTARIS IGS
Serial Number:	AKS1000151	Serial Number:	AKS1000151
Measurement Principle:	FTIR	Measurement Principle:	FTIR
Last Calibration:	1/14/2013	Last Calibration:	2/7/2013

Notes:

This Certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards September 1997, using procedure G1 and/or G2. The certification expiration date and minimum usable service pressure using the May 2012 revision of the EPA Traceability Protocol document.

U.S. EPA Vendor ID No.: D62013 PGVP Participation Date: 01/01/13: PGVP Renewal Date: 12/31/13

Analyst: Taylor Wallace Date: 2/19/2013

Document ID WBU-DENV-3G12-46380

Uncontrolled Document. Valid Only at Time of Printing/Download: 01/16/2015

Appendix 5b – 4th Quarter 2014 CEM Summary Performance Report

BP Products North America Inc.
2815 Indianapolis Blvd.
P O Box 710
Whiting, IN 46394-0710
USA

January 21, 2014

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Dave Cline
Section Chief
Indiana Department of Environmental Management
Compliance Data Section, Office of Air Quality
100 North Senate Avenue
MC 61-53 IGCN 1003
Indianapolis, IN 46204-2251

Dear Mr. Cline:

Re: CEM Summary Performance Report – Fourth Quarter 2014
BP Products North America Inc. - Whiting Business Unit
Part 70 Operating Permit No. T089-6741-00453

Attached please find the Continuous Emission Monitor (CEM) summary performance reports for the BP Products North America Inc. - Whiting Business Unit (BP Whiting). This report is submitted in accordance with the Indiana Department of Environmental Management (IDEM) Operating Permit No. T089-6741-00453, for Significant Permit Modification (SPM) No. 089-33532-00453, issued on February 4, 2014, for the period beginning on October 1, 2014, through December 31, 2014. It fulfills the reporting requirements contained in 326 IAC 3-5-7 and 40 CFR 60.7(c). BP Whiting has chosen to also include the NO_x CEMS Summary Performance Report for the No. 3 Stanolind Power Station (3SPS), which is subject to 326 IAC 24-3 and the monitoring and reporting requirements in 40 CFR Part 75. See Table 1 for a complete list of permitted emissions units and relevant pollutants monitored by CEMS.

Table 1. Emission Units and Relevant Pollutants Monitored by CEMS

Location/Emission Unit	Parameter	Applicable Regulation	Reporting Requirement	Notes
Cat. Feed Hydrotreating Unit (CFHU) Fuel Drum				
- CFHU heater F-801A/B - CFHU heater F-801 C	H_2S in Fuel Gas	§60.107a(a)	326 IAC 3-5-7 and 40 CFR 60.7(c)	
- CFHU heater F-801A/B CFHU heater F-801 C	Total sulfur	Permit Section D.19	326 IAC 3-5-7	CEMS began operation on March 27, 2013.
#4 Ultraformer (4 UF) Fuel Drum				

Location/Emission Unit	Parameter	Applicable Regulation	Reporting Requirement	Notes
- 4 UF heater F-1 - 4 UF heater F-2 - 4 UF heater F-3 - 4 UF heater F-4 - 4 UF heater F-5 - 4 UF heater F-6 - 4 UF heater F-7 - 4 UF heater F-8A - 4 UF heater F-8B - Blending Oil Unit (BOU) heater F-401	H_2S in Fuel Gas	§60.107a(a)	326 IAC 3-5-7 and 40 CFR 60.7(c)	
- #4 UF heater F-1 - #4 UF heater F-2 - #4 UF heater F-3 - #4 UF heater F-4 - #4 UF heater F-5 - #4 UF heater F-6 - #4 UF heater F-7 - #4 UF heater F-8A - #4 UF heater F-8B - BOU heater F-401	Total Sulfur	Permit Section D.16 Permit Section D.11	326 IAC 3-5-7	CEMS began operation on March 27, 2013.
DDU Flare	H_2S in Fuel Gas	§60.105(a)(4)	326 IAC 3-5-7 and 40 CFR 60.7(c)	

Location/Emission Unit	Parameter	Applicable Regulation	Reporting Requirement	Notes
Sulfur Recovery Unit (SRU) Mix Fuel Drum				
- 3SPS Boiler 31 - 3SPS Boiler 32 - 3SPS Boiler 33 - 3SPS Boiler 34 - 3SPS Boiler 36 - No. 11 Pipe Still (11 PS) heater H-1X - 11 PS heater H-2 - 11 PS heater H-3 - No. 11B Coker heater H-101 - No. 11B Coker heater H-102 - No. 11B Coker heater H-103 - No. 11B Coker heater H-104 - 11 PS heater H-200 - 11 PS heater H-300 - Aromatics Recovery Unit (ARU) heater F-200A - ARU heater F-200B - Distillate Desulfurization Unit (DDU) heater WB-301 - DDU heater WB-302 - Hydrogen Unit (HU) heater B-501 for refinery fuel gas - Isomerization Unit (ISOM) heater H-1 - Catalytic Refining Unit (CRU) heater F-101 - CRU heater F-102A	H_2S in Fuel Gas	§60.107a(a)	326 IAC 3-5-7 and 40 CFR 60.7(c)	
- 3SPS Duct Burner 1 - 3SPS Duct Burner 2 - 3SPS Duct Burner 3 - 3SPS Duct Burner 4 - 3SPS Duct Burner 6 - 12 PS heater H-101A - 12 PS heater H-101B - 12 PS heater H-102	H_2S in Fuel Gas	§60.107a(a)	326 IAC 3-5-7 and 40 CFR 60.7(c)	
- #2 Coker heater F-201 - #2 Coker heater F-202 - #2 Coker heater F-203	H_2S in Fuel Gas	§60.107a(a)	326 IAC 3-5-7 and 40 CFR 60.7(c)	Note the #2 Coker heaters F-201, 202, and 203 are labeled H-201, 202, and 203 in the permit.

Location/Emission Unit	Parameter	Applicable Regulation	Reporting Requirement	Notes
- 11 PS heater H-1X - 11 PS heater H-2 - 11 PS heater H-3 - 11 PS heater H-200 - 11 PS heater H-300	Total Sulfur	Permit Section D.1	326 IAC 3-5-7	Not included in this report because the Total Sulfur CEMS has not yet been installed[1]
- ARU heater F-200A - ARU heater F-200B		Permit Section D.10		
- DDU heater WB-301 - DDD heater WB-302		Permit Section D.18		
- HU heater B-501 for refinery fuel gas		Permit Section D.17		
- 3SPS Boiler 31 - 3SPS Boiler 32 - 3SPS Boiler 33 - 3SPS Boiler 34 - 3SPS Boiler 36		N/A		3SPS Boilers 1, 2, 3, 4, and 6 are not required to be monitored for Total Sulfur.
- 12 PS heater H-101A - 12 PS heater H-101B - 12 PS heater H-102		Permit Section D.3		Unit started up in June 2013
- #2 Coker heater F-201 - #2 Coker heater F-202 - #2 Coker heater F-203		Permit Section D.2		Unit started up November 2013
- GOHT heater F-901A - GOHT heater F-901B		Permit Section D.42		Not included because natural gas-fired
#2 Coker heater F-201	NOx	Permit Section D.2 §60.107a(c)	326 IAC 3-5-7	CEMS began operation on November 6, 2013.
#2 Coker heater F-201	CO	Permit Section D.2	326 IAC 3-5-7	
#2 Coker heater F-202	NOx	Permit Section D.2 §60.107a(c)	326 IAC 3-5-7	CEMS began operation on November 6, 2013.
#2 Coker heater F-202	CO	Permit Section D.2	326 IAC 3-5-7	
#2 Coker heater F-203	NOx	Permit Section D.2 §60.107a(c)	326 IAC 3-5-7	CEMS began operation on November 6, 2013.
#2 Coker heater F-203	CO	Permit Section D.2	326 IAC 3-5-7	
11A PS Heater H-1X	NOx	Permit Section D.1 §60.107a(c)	326 IAC 3-5-7 And 40 CFR 60.7(c)	CEMS began operation on January 1, 2014.
11C PS Heater H-200	NOx	Permit Section D.1 §60.107a(c)	326 IAC 3-5-7 And 40 CFR 60.7(c)	CEMS began operation on January 1, 2014.
12 PS heater H-101A	NOx	Permit Section D.3 §60.107a(c)	326 IAC 3-5-7	CEMS began operation on June 17, 2013.
12 PS heater H-101A	CO	Permit Section D.3	326 IAC 3-5-7	CEMS began operation on June 17, 2013.
12 PS heater H-101B	NOx	Permit Section D.3 §60.107a(c)	326 IAC 3-5-7	CEMS began operation on June 19, 2013.
12 PS heater H-101B	CO	Permit Section D.3	326 IAC 3-5-7	CEMS began operation on June 19, 2013.
12 PS heater H-102	NOx	Permit Section D.3 §60.107a(c)	326 IAC 3-5-7	CEMS began operation on June 23, 2013.
12 PS heater H-102	CO	Permit Section D.3	326 IAC 3-5-7	CEMS began operation on June 23, 2013.
Distillate Hydrotreating (DHT) Unit heater B-601A	NOx	Permit Section D.37	326 IAC 3-5-7	
DHT Unit heater B-601A	CO	Permit Section D.37	326 IAC 3-5-7	

Location/Emission Unit	Parameter	Applicable Regulation	Reporting Requirement	Notes
GOHT Flare - Routine or planned non-routine streams	H_2S in Fuel Gas	§60.107a(a)	326 IAC 3-5-7 and 40 CFR 60.7(c)	CEMS began operation on October 4, 2013.
GOHT Flare - Routine or planned non-routine streams	Total Sulfur	Permit Section D.35	326 IAC 3-5-7	CEMS began operation on October 4, 2013.
South Flare - Routine or planned non-routine streams	H_2S in Fuel Gas	§60.107a(a)	326 IAC 3-5-7 and 40 CFR 60.7(c)	CEMS began operation on May 17, 2013.
South Flare - Routine or planned non-routine streams	Total Sulfur	Permit Section D.35	326 IAC 3-5-7	CEMS began operation on May 17, 2013.
SRU Claus Offgas Treater #1 (COT1) Tail Gas Unit A (TGU-A)	CO	Permit Section D.4	326 IAC 3-5-7	CEMS began operation on September 8, 2013.
SRU COT1 TGU-A	SO_2	60.106a(a)(1)	326 IAC 3-5-7 and 40 CFR 60.7(c)	CEMS began operation on September 8, 2013.
SRU COT2 TGU-B	CO	Permit Section D.4	326 IAC 3-5-7	CEMS began operation on November 15, 2013.
SRU COT2 TGU-B	SO_2	60.106a(a)(1)	326 IAC 3-5-7 and 40 CFR 60.7(c)	CEMS began operation on November 15, 2013.
Fluid Catalytic Cracking Unit 500 (FCU-500)	NO_x	Consent Decree 2:12CV207 §60.105a(f)	326 IAC 3-5-7	
FCU-500	CO	§60.105a(h)	326 IAC 3-5-7 and 40 CFR 60.7(c)	
FCU-500	SO_2	Consent Decree 2: 12CV207 §60.105a(g)	326 IAC 3-5-7	
Fluid Catalytic Cracking Unit 600 (FCU-600)	NO_x	Consent Decree 2: 12CV207 §60.105a(f)	326 IAC 3-5-7	
FCU-600	CO	§60.105a(h)	326 IAC 3-5-7 and 40 CFR 60.7(c)	
FCU-600	SO_2	Consent Decree 2: 12CV207 §60.105a(g)	326 IAC 3-5-7	
3SPS Boiler 31	NOx	326 IAC 10-4	326 IAC 3-5-7[2]	
3SPS Boiler 31 and Duct Burner 1 (combined stack)	CO	Permit Section D.24	326 IAC 3-5-7	
3SPS Boiler 32	NOx	326 IAC 10-4	326 IAC 3-5-7[2]	
3SPS Boiler 32 and Duct Burner 2 (combined stack)	CO	Permit Section D.24	326 IAC 3-5-7	
3SPS Boiler 33	NOx	326 IAC 10-4	326 IAC 3-5-7[2]	
3SPS Boiler 33 and Duct Burner 3 (combined stack)	CO	Permit Section D.24	326 IAC 3-5-7	
3SPS Boiler 34	NOx	326 IAC 10-4	326 IAC 3-5-7[2]	
3SPS Boiler 34 and Duct Burner 4 (combined stack)	CO	Permit Section D.24	326 IAC 3-5-7	
3SPS Boiler 36	NOx	326 IAC 10-4	326 IAC 3-5-7[2]	
3SPS Boiler 36 and Duct Burner 6 (combined stack)	CO	Permit Section D.24	326 IAC 3-5-7	

[1] The Total Sulfur CEMS for units existing prior to the Whiting Refinery Modernization (OCC) Project are not required until the completion of the Whiting Refinery Modernization (OCC) Project.

[2] BP Whiting has chosen to also include the NO_x CEMS Summary Performance Report for the 3SPS, which is subject to 326 IAC 24-3 and the monitoring and reporting requirements in 40 CFR Part 75. The 3SPS boilers are listed as Boiler 1, 2, 3, 4, and 6 in the Title V Permit.

In addition to the units listed in Table 1, BP Whiting is exempt from some continuous monitoring requirements through exemptions to NSPS J promulgated on June 24, 2008, after the operating permit was issued, and is complying with monitoring requirements in Operating Permit No. T089-6741-00453, for SPM No. 089-33532-00453, through approved Alternate Monitoring Plans (AMPs). BP Whiting is also exempt from continuous monitoring requirements through exemptions to NSPS Ja promulgated on December 5, 2013. Emission units and details of the exemptions and approved AMPs are provided below.

- The Chemical Grade Propylene (CGP) and Refinery Grade Propylene (RGP) streams vented during propylene loading are subject to the AMP approved June 17, 2011, that does not require monitoring because of the customer specification for low H_2S concentrations.[1]
- Per 40 CFR 60.105(a)(4)(iv)(B), Polymer Grade Propylene (PGP) stream vented during propylene loading is exempt from the H_2S limits and monitoring requirements because it meets a commercial-grade product specification less than 30 ppmv.[1]
- Per 40 CFR 60.107a(a)(3)(iii), the Hydrogen Unit (HU) heater B-501 is exempt from the H2S concentration limits and monitoring requirements because it combusts a fuel gas stream that is inherently low in sulfur content.
- Per 40 CFR 60.105(a)(4)(iv)(B) and 40 CFR 60.107a(a)(3)(ii), the LPG Flare is exempt from the H_2S limits and monitoring requirements because only commercial grade LPG streams are tied to the flare.
- The two thermal oxidizers (Indiana Tank Farm Thermal Oxidizer & Berry Lake Tank Farm Thermal Oxidizer) are subject to the AMP approved per §60.105(a)(4) on January 9, 2006, requiring hydrogen sulfide (H_2S) grab samples per steps established in the AMP.
- The Marketing Terminal - Vapor Combustion Unit (VCU) is subject to the AMP approved per §60.105(a)(4) on March 22, 2007, that does not require monitoring because there are relatively low H2S concentrations in the stream being loaded.

Attachment A contains the CEMS summary reports.

Attachment B contains the excess emission report and CEMS downtime report per 326 IAC 3-5-7, Permit Condition C.12, and 40 CFR 60.7(c). It should be noted that, pursuant with 40 CFR 60.7(c)(1), conversion factors are not used for any CEMS at BP Whiting.

Attachment C, where applicable, contains the results of the cylinder gas audits.

Attachment D contains any and all flaring root cause failure analyses required during the reporting period.

[1] The CGP, RGP, and PGP vent streams are not combusted at BP Whiting under normal operating scenarios.

Attachment E contains the complete CEMS summary report, excess emission report, CEMS downtime report, and, where applicable, the results of the cylinder gas audits as provided by Praxair, Inc. for the CEMS currently operating at the New Hydrogen Unit (Section D.43).

If you have any questions or comments about the enclosed information, please contact Rohini Sengupta at (219) 473-2110.

Sincerely,

Linda Wilson

Linda Wilson
Environmental Manager
Health, Safety, Security and Environment

Attachments

cc: Kevin Sokolowski - IDEM NW Regional Office (ksokolow@idem.in.gov)

PART 70 OPERATING PERMIT CERTIFICATION

Source Name:	BP Products North America, Inc., Whiting Business Unit
Source Address:	2815 Indianapolis Blvd., Whiting, IN 46394
Mailing Address:	P.O. Box 710, Whiting, Indiana 46394-0710
Permit No.:	T089-6741-00453

This certification shall be included when submitting monitoring, testing reports/results or other documents as required by this permit.
Please check what document is being certified:
☐ Annual Compliance Certification Letter
☐ Test Results (specify)
☒ Report (4th Quarter 2014 CEM Summary Report per 326 IAC 3-5-7, 40 CFR 60.7(c), 326 IAC 10-4, and 40 CFR Part 75)
☐ Notification (specify)
☐ Affidavit (specify)
☐ Other (specify)

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.	
Signature of Responsible Official:	
Printed Name:	Jorge Lanza
Title/Position:	Whiting Refinery Manager
Phone:	(219) 473-3179
Date:	

Attachment A

CEMS Summary Report per 40 CFR 60.7(c) & (d) and 326 IAC 3-5-7

Including the following:

Location/Emission Unit	Parameter	Notes
CFU Fuel Drum	H_2S	
CFU Fuel Drum	Total Sulfur	Limit will be met by first compliance period beginning 7/1/2015
4UF Fuel Drum	H_2S	
4UF Fuel Drum	Total Sulfur	Limit will be met by first compliance period beginning 7/1/2015
#2 Coker Merox Treater Off-Gas	TS	
DDU Flare	H_2S	
SRU Mix Fuel Drum	H_2S	
SRU Mix Fuel Drum	Total Sulfur	Limit will be met by first compliance period beginning 7/1/2015
#2 Coker heater F-201	NO_X	
#2 Coker heater F-201	CO	
#2 Coker heater F-202	NO_X	
#2 Coker heater F-202	CO	
#2 Coker heater F-203	NO_X	
#2 Coker heater F-203	CO	
11PS heater H-1X	NO_X	
11PS heater H-200	NO_X	
12 PS heater H-101A	NO_X	
12 PS heater H-101A	CO	
12 PS heater H-101B	NO_X	
12 PS heater H-101B	CO	
12 PS heater H-102	NO_X	
12 PS heater H-102	CO	
DHT heater B-601A	NO_X	
DHT heater B-601A	CO	
GOHT Flare	H_2S	
GOHT Flare	Total Sulfur	No summary report available as the TS CEMS is not subject to an emission limit.
South Flare	H_2S	
South Flare	Total Sulfur	No summary report available as the TS CEMS is not subject to an emission limit.
COT1	CO	
COT1	SO_2	
COT2	CO	
COT2	SO_2	
FCU 500	NO_X	7-day rolling average
FCU 500	NO_X	365-day rolling average
FCU 500	CO	
FCU 500	SO_2	7-day rolling average
FCU 500	SO_2	365-day rolling average
FCU 600	NO_X	7-day rolling average
FCU 600	NO_X	365-day rolling average
FCU 600	CO	
FCU 600	SO_2	7-day rolling average
FCU 600	SO_2	365-day rolling average
3SPS Boiler 31*	NO_X	
3SPS Boiler 31 and Duct Burner 1*	CO	
3SPS Boiler 32*	NO_X	

Location/Emission Unit	Parameter	Notes
3SPS Boiler 32 and Duct Burner 2*	CO	
3SPS Boiler 33*	NO_X	
3SPS Boiler 33 and Duct Burner 3*	CO	
3SPS Boiler 34*	NO_X	
3SPS Boiler 34 and Duct Burner 4*	CO	
3SPS Boiler 36*	NO_X	
3SPS Boiler 36 and Duct Burner 6*	CO	

* The 3SPS Boilers are listed as Boiler 1, 2, 3, 4, and 6 in the Title V Permit.

Attachment B

Excess Emission and CEMS Downtime Report per 325 IAC 3-5-7 and 40 CFR 60.7(c)

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S
Emission Limitation: 162 ppmvd per 3-hour rolling period
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: CFU

Date of Last CEMS Certification or Audit: 10/16/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	3	0.14
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	3	0.14

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	4	0.18
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	4	0.18

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/26/2015
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S
Emission Limitation: 60 ppmvd per 365-day rolling period
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: CFU

Date of Last CEMS Certification or Audit: 10/16/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/15
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: TS Raw - 3 hr
Emission Limitation: 162.0
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: CFU

Date of Last CEMS Certification or Audit: 10/16/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary - Limit will be met by first compliance period beginning 7/1/2015

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/15
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: TS Raw - 365 day
Emission Limitation: 70.0
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: 4UF

Date of Last CEMS Certification or Audit: 10/16/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	1	0.05
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	1	0.05

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary - Limit will be met by first compliance period beginning 7/1/2015

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/26/2015
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S
Emission Limitation: 162 ppmvd per 3-hour rolling period
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: No. 4 Ultraformer

Date of Last CEMS Certification or Audit: 10/16/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	9	0.41
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	2	0.09
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	11	0.50

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	2	0.09
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	2	0.09

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/2015
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S
Emission Limitation: 60 ppmvd per 365-day rolling period
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: No. 4 Ultraformer

Date of Last CEMS Certification or Audit: 10/16/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	9	0.41
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	2	0.09
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	11	0.50

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/2015
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: TS Raw - 3 hr
Emission Limitation: 162.0
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: 4UF

Date of Last CEMS Certification or Audit: 10/16/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	1	0.05
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	1	0.05

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary - Limit will be met by first compliance period beginning 7/1/2015

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/15
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: TS Raw - 365 day
Emission Limitation: 70.0
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: 4UF

Date of Last CEMS Certification or Audit: 10/16/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	1	0.05
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	1	0.05

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary - Limit will be met by first compliance period beginning 7/1/2015

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/15
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: MEROX TS Raw - 3 hr
Emission Limitation: 162.0
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: MEROX

Date of Last CEMS Certification or Audit: 10/22/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	5	0.23
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	1	0.05
4.Other Known Causes	33	1.49
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	39	1.76

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/15
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: MEROX TS Raw - 365 Day
Emission Limitation: 70.0
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: MEROX

Date of Last CEMS Certification or Audit: 10/22/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	5	0.23
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	1	0.05
4.Other Known Causes	33	1.49
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	39	1.76

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary - Limit will be met by first compliance period beginning 7/1/2015

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/15
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S
Emission Limitation: 162 ppmvd per 3-hour rolling period
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: DDU Flare

Date of Last CEMS Certification or Audit: 10/29/2014 (CGA)
Total Source Operating Time in Reporting Period: 170 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	3	1.76
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	3	1.76

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/15
NAME	SIGNATURE	TITLE	DATE

Report Printed on: 04/23/14 09:21:59

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S 365 Day
Emission Limitation: 60 ppmvd per 365-day rolling period
Reporting Period Dates: From 10/01/2014 To 12/31/2014

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Sulfur Recovery Unit

Date of Last CEMS Certification or Audit: 10/29/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	5	0.23
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	5	0.23

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/15
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: TS Raw - 3 hr
Emission Limitation: 162.0
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Sulfur Recovery Unit

Date of Last CEMS Certification or Audit: 10/22/2014 (RATA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary - Limit will be met by first compliance period beginning 7/1/2015

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/15
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: TS Raw - 365 day
Emission Limitation: 70.0
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Sulfur Recovery Unit

Date of Last CEMS Certification or Audit: 10/22/2014 (RATA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary - Limit will be met by first compliance period beginning 7/1/2015

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/15
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: NOx @ 0% O2 30 Day
Emission Limitation: 60 ppm
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater F-201

Date of Last CEMS Certification or Audit: 10/16/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	1	0.05
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	1	0.05

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/2015
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO
Emission Limitation: 17.3 tons per 12 consecutive month
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater F-201

Date of Last CEMS Certification or Audit: 10/16/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	1	0.05
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	1	0.05

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/2015
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: NOx @ 0% O2 30 Day
Emission Limitation: 60 ppm
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater F-202

Date of Last CEMS Certification or Audit: 10/17/2014 (CGA)
Total Source Operating Time in Reporting Period: 1798 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	7	0.39
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	7	0.39

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/15
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO
Emission Limitation: 17.3 tons per 12 consecutive month
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater F-202

Date of Last CEMS Certification or Audit: 10/17/2014 (CGA)
Total Source Operating Time in Reporting Period: 1798 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	5	0.28
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	5	0.28

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/15
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: NOx @ 0% O2 30 Day
Emission Limitation: 60 ppm
Reporting Period Dates: From 10/01/2014 To 12/31/2014

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater F-203

Date of Last CEMS Certification or Audit: 10/17/2014 (CGA)
Total Source Operating Time in Reporting Period: 1989 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/15
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO
Emission Limitation: 17.3 tons per 12 consecutive month
Reporting Period Dates: From 10/01/2014 To 12/31/2014

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater F-203

Date of Last CEMS Certification or Audit: 10/17/2014 (CGA)
Total Source Operating Time in Reporting Period: 1989 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/15
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: NOx lb/MMBtu 12-month
Emission Limitation: 0.06 lb/MMBtu
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater H-1X

Date of Last CEMS Certification or Audit: 12/02/2014 (RATA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/15
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: NOx @ 0% O2 30-Day
Emission Limitation: 40 ppm during natural draft operation, 60 ppm during forced draft operation
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater H-200

Date of Last CEMS Certification or Audit: 12/03/2014 (RATA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	144	6.52
5.Unknown Causes	0	0.00
2. Total duration of excess emissions	144	6.52

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/26/2015
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: NOx lb/MMBtu 12-month
Emission Limitation: 0.05 lb/MMBtu
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater H-200

Date of Last CEMS Certification or Audit: 12/03/2014 (RATA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/15
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: NOx @ 0% O2 30 Day
Emission Limitation: 60 ppm
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater H-101A

Date of Last CEMS Certification or Audit: 12/05/2014 (RATA)
Total Source Operating Time in Reporting Period: 2204 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	5	0.23
3.Calibration/QA	1	0.05
4.Other Known Causes	1	0.05
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	7	0.32

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/2015
NAME	SIGNATURE	TITLE	DATE

Report Printed on: 04/23/14 06:48:49

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO
Emission Limitation: 29.5 tons per 12 consecutive month
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater H-101A

Date of Last CEMS Certification or Audit: 12/05/2014 (RATA)
Total Source Operating Time in Reporting Period: 2204 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	5	0.23
3.Calibration/QA	1	0.05
4.Other Known Causes	1	0.05
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	7	0.32

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/15
NAME	SIGNATURE	TITLE	DATE

Report Printed on: 04/23/14 06:48:52

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: NOx @ 0% O2 30 Day
Emission Limitation: 60 ppm
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater H-101B

Date of Last CEMS Certification or Audit: 12/08/2014 (RATA)
Total Source Operating Time in Reporting Period: 2207 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	2	0.09
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	2	0.09

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/15
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO
Emission Limitation: 29.5 tons per 12 consecutive month
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater H-101B

Date of Last CEMS Certification or Audit: 12/08/2014 (RATA)
Total Source Operating Time in Reporting Period: 2207 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	1	0.05
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	1	0.05

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/27/2015
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: NOx @ 0% O2 30 Day
Emission Limitation: 60 ppm
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater H-101B

Date of Last CEMS Certification or Audit: 12/08/2014 (RATA)
Total Source Operating Time in Reporting Period: 2207 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	2	0.09
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	2	0.09

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/27/2015
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO
Emission Limitation: 27.5 tons per 12 consecutive month
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater H-102

Date of Last CEMS Certification or Audit: 12/09/2014 (RATA)
Total Source Operating Time in Reporting Period: 2207 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	1	0.05
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	1	0.05

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/26/2015
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: NOX
Emission Limitation: 7.3 tons per 12 consecutive month period
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc. - Whiting Bus
Address: 2815 Indianapolis Blvd, Whiting IN 46307
Process Unit Description: DHT

Date of Last CEMS Certification or Audit: 10/27/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/2015
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO
Emission Limitation: 7.3 tons per 12 consecutive month period
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc. - Whiting Bus
Address: 2815 Indianapolis Blvd, Whiting IN 46307
Process Unit Description: DHT

Date of Last CEMS Certification or Audit: 10/27/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/2015
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S
Emission Limitation: 162 ppmvd per 3-hour rolling period
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: GOHT Flare

Date of Last CEMS Certification or Audit: 12/18/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	1	0.05
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	1	0.05

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/15
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: H2S
Emission Limitation: 162 ppmvd per 3-hour rolling period
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: South Flare

Date of Last CEMS Certification or Audit: 10/29/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	2	0.09
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	2	0.09

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/15
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO per 12 consecutive month
Emission Limitation: 55.0 tons
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Tail Gas Unit A

Date of Last CEMS Certification or Audit: 10/03/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/2015
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: SO2 @ 0% O2 12-hour
Emission Limitation: 250 ppm
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Tail Gas Unit A

Date of Last CEMS Certification or Audit: 10/03/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	0	0.00

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/15
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO per 12 consecutive month
Emission Limitation: 55.0 tons
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Tail Gas Unit B

Date of Last CEMS Certification or Audit: 10/28/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	5	0.23
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	5	0.23

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/15
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: SO2 @ 0% O2 12-hour
Emission Limitation: 250 ppm
Reporting Period Dates: From 10/01/14 to 12/31/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Tail Gas Unit B

Date of Last CEMS Certification or Audit: 10/28/2014 (CGA)
Total Source Operating Time in Reporting Period: 2208 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	0	0.00
3.Calibration/QA	0	0.00
4.Other Known Causes	5	0.23
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	5	0.23

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	1/19/2015
NAME	SIGNATURE	TITLE	DATE

Babcock & Wilcox Power Generation Group NetDAHS©

Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 10/1/2014 00:00 through 12/31/2014 23:59

Pollutant: NOx
Emission Limit: 80 ppm (7-Day Rolling Average)
Date of Latest CEMS Certification or Audit: 12/10/2014 (CGA)

Company Name: BP Products North America, Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: Fluid Catalytic Cracking Unit - 500

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	1.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	4.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	5.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.23%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
1 For gases, record all times in hours.
2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHINI SENGUPTA

Signature:

Title: Environmental Engineer

Date: 1/19/2015

Babcock & Wilcox Power Generation Group NetDAHS©

Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 10/1/2014 00:00 through 12/31/2014 23:59

Pollutant: NOx
Emission Limit: 40 ppm (365-Day Rolling Average)
Date of Latest CEMS Certification or Audit: 12/10/2014 (CGA)

Company Name: BP Products North America, Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: Fluid Catalytic Cracking Unit - 500

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	1.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	4.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	5.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.23%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
1 For gases, record all times in hours.
2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHINI SENGUPTA

Signature:

Title: Environmental Engineer

Date: 1/19/2015

Babcock & Wilcox Power Generation Group NetDAHS©

Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 10/1/2014 00:00 through 12/31/2014 23:59

Pollutant: CO
Emission Limit: 500 ppm (1 Hour Block Average)
Date of Latest CEMS Certification or Audit: 12/10/2014 (CGA)

Company Name: BP Products North America, Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: Fluid Catalytic Cracking Unit - 500

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	1.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	4.0
e. Unknown Excess Emissions Cause.....	0.0	e. Unknown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	5.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.23%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
[1] For gases, record all times in hours.
[2] For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
[3] Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHINI SENGUPTA

Signature:

Title: Environmental Engineer

Date: 1/19/2015

Babcock & Wilcox Power Generation Group NetDAHS©

Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 10/1/2014 00:00 through 12/31/2014 23:59

Pollutant: SO2
Emission Limit: 50 PPM (7-Day Rolling Average)
Date of Latest CEMS Certification or Audit: 12/10/2014 (CGA)

Company Name: BP Products North America, Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: Fluid Catalytic Cracking Unit - 500

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	1.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	4.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	5.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.23%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
1 For gases, record all times in hours.
2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: RATNI SENGUPTA

Signature:

Title: Environmental Engineer

Date: 1/19/2015

Babcock & Wilcox Power Generation Group NetDAHS©

Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 10/1/2014 00:00 through 12/31/2014 23:59

Pollutant: SO2
Emission Limit: 25 ppm (365-Day Rolling Average)
Date of Latest CEMS Certification or Audit: 12/10/2014 (CGA)

Company Name: BP Products North America, Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: Fluid Catalytic Cracking Unit - 500

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	1.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	4.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	5.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.23%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
[1] For gases, record all times in hours.
[2] For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
[3] Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHINI SENGUPTA
Signature: RSgupt
Title: Environmental Engineer
Date: 1/19/2015

Babcock & Wilcox Power Generation Group NetDAHS©

Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 10/1/2014 00:00 through 12/31/2014 23:59

Pollutant: NOx
Emission Limit: 40 ppm (7-Day Rolling Average)
Date of Latest CEMS Certification or Audit: 12/11/2014 (CGA)

Company Name: BP Products North America, Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: Fluid Catalytic Cracking Unit - 600

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	11.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	4.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	15.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.68%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
1 For gases, record all times in hours.
2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHINI SENGUPTA

Signature:

Title: Environmental Engineer

Date: 1/19/2015

Babcock & Wilcox Power Generation Group NetDAHS©

Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 10/1/2014 00:00 through 12/31/2014 23:59

Pollutant: NOx
Emission Limit: 20 ppm (365-day rolling average)
Date of Latest CEMS Certification or Audit: 12/11/2014 (CGA)

Company Name: BP Products North America, Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: Fluid Catalytic Cracking Unit - 600

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	11.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	4.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	15.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.68%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
1 For gases, record all times in hours.
2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: RATNI SENGUPTA

Signature:

Title: Environmental Engineer

Date: 1/19/2015

Babcock & Wilcox Power Generation Group NetDAHS©

Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 10/1/2014 00:00 through 12/31/2014 23:59

Pollutant: CO
Emission Limit: 500 ppm (1 Hour Block Average)
Date of Latest CEMS Certification or Audit: 12/11/2014 (CGA)

Company Name: BP Products North America, Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: Fluid Catalytic Cracking Unit - 600

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	1.0	c. Quality Assurance.....	2.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	3.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	1.0	2. Total duration of CEMS downtime.....	5.0
3. Excess emission duration (%).....	0.05%	3. CEMS downtime (%).....	0.23%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
1 For gases, record all times in hours.
2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
3 Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHINI SENGUPTA

Signature:

Title: Environmental Engineer

Date: 1/26/2015

Babcock & Wilcox Power Generation Group NetDAHS©

Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 10/1/2014 00:00 through 12/31/2014 23:59

Pollutant: SO2
Emission Limit: 125 ppm (7-Day Rolling Average)
Date of Latest CEMS Certification or Audit: 12/11/2014 (CGA)

Company Name: BP Products North America, Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: Fluid Catalytic Cracking Unit - 600

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	2.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	4.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	6.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.27%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
[1] For gases, record all times in hours.
[2] For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
[3] Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHINI SENGUPTA
Signature:
Title: Environmental Engineer
Date: 1/19/2015

Babcock & Wilcox Power Generation Group NetDAHS©

Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 10/1/2014 00:00 through 12/31/2014 23:59

Pollutant: SO2
Emission Limit: 50 ppm (365-Day Rolling Average)
Date of Latest CEMS Certification or Audit: 12/11/2014 (CGA)

Company Name: BP Products North America, Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: Fluid Catalytic Cracking Unit - 600

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	2.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	4.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	6.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.27%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
[1] For gases, record all times in hours.
[2] For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.
[3] Total CEMS Downtime excludes quality assurance calibration time.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief.

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHINI SENGUPTA

Signature: [signature]

Title: Environmental Engineer

Date: 1/26/2015

Babcock & Wilcox Power Generation Group NetDAHS©

Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 10/1/2014 00:00 through 12/31/2014 23:59

Pollutant: CO
Emission Limit: 260.4 tons per 12 consecutive month total

Company Name: BP Products North America,Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: 3sps Boilers 31, 32, 33, 34 & 36

Total source operating time in reporting period: **2208.0 hours per boiler**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	3.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	2.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	20.0
e. Unknown Excess Emissions Cause.....	0.0	e. Unknown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	25.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	1.13%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
[1] For gases, record all times in hours. For opacity, record all times in minutes.
[2] For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statment(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHINI SENGUPTA

Signature: Rohini

Title: Environmental Engineer

Date: 1/19/2015

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Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 10/1/2014 00:00 through 12/31/2014 23:59

Pollutant: NOx
Emission Limit: 0.02 lb/mmBTU (365-day rolling average)
Date of Latest CEMS Certification or Audit: 10/1/2014 (CGA)

Company Name: BP Products North America,Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: 3sps Boiler 31

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	1.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	12.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	12.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.54%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
1 For gases, record all times in hours. For opacity, record all times in minutes.
2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statement(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHINI SENGUPTA

Signature: [signature]

Title: Environmental Engineer

Date: 1/19/2015

Babcock & Wilcox Power Generation Group NetDAHS©

Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 10/1/2014 00:00 through 12/31/2014 23:59

Pollutant: NOx
Emission Limit: 0.02 lb/mmBTU (365-day rolling average)
Date of Latest CEMS Certification or Audit: 10/02/2014 (CGA)

Company Name: BP Products North America,Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: 3sps Boiler 32

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	1.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	1.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.05%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
1 For gases, record all times in hours. For opacity, record all times in minutes.
2 For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statement(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHINI SENGUPTA

Signature: [signature]

Title: Environmental Engineer

Date: 1/19/2015

Babcock & Wilcox Power Generation Group NetDAHS©

Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 10/1/2014 00:00 through 12/31/2014 23:59

Pollutant: NOx
Emission Limit: 0.02 lb/mmBTU (365-day rolling average)
Date of Latest CEMS Certification or Audit: 10/02/2014 (CGA)

Company Name: BP Products North America,Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: 3sps Boiler 33

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	0.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	0.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.00%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
[1] For gases, record all times in hours. For opacity, record all times in minutes.
[2] For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statement(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHINI SENGUPTA

Signature: [signature]

Title: Environmental Engineer

Date: 1/19/2015

Babcock & Wilcox Power Generation Group NetDAHS©

Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 10/1/2014 00:00 through 12/31/2014 23:59

Pollutant: NOx
Emission Limit: 0.02 lb/mmBTU (365-day rolling average)
Date of Latest CEMS Certification or Audit: 10/02/2014 (CGA)

Company Name: BP Products North America,Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: 3sps Boiler 34

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	3.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	0.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	6.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	9.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.41%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
[1] For gases, record all times in hours. For opacity, record all times in minutes.
[2] For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statement(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHIN SENGUPTA

Signature:

Title: Environmental Engineer

Date: 1/19/2015

Babcock & Wilcox Power Generation Group NetDAHS©

Indiana Department of Environmental Management
Office of Air Quality

Summary Report
Excess Emission and Monitoring System Performance
Version 43.0

Reporting dates 10/1/2014 00:00 through 12/31/2014 23:59

Pollutant: NOx
Emission Limit: 0.02 lb/mmBTU (365-day rolling average)
Date of Latest CEMS Certification or Audit: 10/15/2014

Company Name: BP Products North America,Inc.
Address: 2815 Indianapolis Blvd. Whiting, IN 46394
Unit Description: 3sps Boiler 36

Total source operating time in reporting period: **2208.0 hours**

Emission Data Summary(note 1)		CEMS Downtime Summary(note 1)	
1. Duration of excess emissions in period due to:		1. Duration of CEMS downtime in period due to:	
a. Start Up/Shut Down.....	0.0	a. Monitoring Equipment Malfunction.....	0.0
b. Control Equipment Failure.....	0.0	b. Non-Monitoring Equipment Malfunction...	0.0
c. Process Problems.....	0.0	c. Quality Assurance.....	1.0
d. Other Known Excess Emissions Cause.....	0.0	d. Other Known Monitor Downtime Cause.....	2.0
e. UnKnown Excess Emissions Cause.....	0.0	e. UnKnown Monitor Downtime Cause.....	0.0
2. Total duration of excess emission.....	0.0	2. Total duration of CEMS downtime.....	3.0
3. Excess emission duration (%).....	0.00%	3. CEMS downtime (%).....	0.14%

Total source operating time in reporting period: = Time in the Report Period minus the Process Down Episode Time.

Note(s):
[1] For gases, record all times in hours. For opacity, record all times in minutes.
[2] For the reporting period: If the total duration of excess emissions is 1% or greater of the total operating time or the total CEMS downtime is 5% or greater of the total operating time, both this summary report and the excess emissions report described in 40CFR60.7(c) shall be submitted.

I have personally examined and am familiar with the information submitted in this document and all attachments and certify (based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information) that the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that any false statement(s) made in this document or its attachments may be punishable as a criminal offense."

On a separate page, describe any changes since last quarter in CEMS, process or controls.

Name: ROHINI SENGUPTA

Signature: [signature]

Title: Environmental Engineer

Date: 1/19/2015

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: CFU

Parameter: H2S CEMS

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	11/18/14 05:00:39	11/18/14 06:59:39	2	a. Monitor equipment malfunction	Went into fault during last run on the daily validation check and stayed on fault until acknowledged.	Passed calibration check.
2	12/22/14 05:00:39	12/22/14 05:59:39	1	a. Monitor equipment malfunction	Went into fault during last run on the daily validation check and stayed on fault until acknowledged.	Passed calibration check.

Total Downtime in the Reporting Period = 3 hours , Data Availability for this Reporting Period = 99.86 %
Total Operating Time in the Reporting Period = 2208 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: CFU

Parameter: TS CEMS

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 0 %
Total Operating Time in the Reporting Period = 2208 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: No. 4 Ultraformer

Parameter: H2S CEMS

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	10/16/2014 11:00	10/16/2014 12:59	2	c. QA Calibration	Cylinder Gas Audit	Cylinder Gas Audit
2	10/16/2014 23:00	10/16/2014 0:59	2	a. Monitor Equipment Malfunction	Fault generated at analyzer.	Analyzer passed morning cal check.
3	10/27/2014 19:00	10/27/2014 19:59	1	a. Monitor Equipment Malfunction	Fault generated due to NAU freezing up.	Analyzer passed morning cal check.
4	11/21/2014 5:00	11/21/2014 8:59	4	a. Monitor Equipment Malfunction	NAU froze and held the outputs from the analyzer	Maitnenance tech restarted the unit.
5	12/10/2014 3:00	12/10/2014 5:00	2	a. Monitor Equipment Malfunction	Unknown monitoring equipment malfunction	Next calibration check passed

Total Downtime in the Reporting Period = 11 hours , Data Availability for this Reporting Period = 99.5 %
Total Operating Time in the Reporting Period = 2208 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: No. 4 Ultraformer

Parameter: TS CEMS

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	10/30/2014 13:00	10/30/2014 13:59	1	b. Non-monitor malfunction	Process unit upset led to high analyzer reading which recorded a fault.	Corrected unit operation.

Total Duration in the Reporting Period = 1 hours
Total Operating Time in the Reporting Period = 2208 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: MEROX

Parameter: TS Analyzer

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	10/22/2014 9:00	10/22/2014 9:59	1	c. QA Calibration	Cylinder Gas Audit	Cylinder Gas Audit
2	10/23/2014 4:00	10/23/2014 8:59	5	a. Monitor Equipment Malfunction	Nitrogen bottle for zero gas was shut off.	Analyzer passed morning cal check.
3	12/18/2014 5:00	12/18/2014 9:59	5	d. Other Known Causes	Unit upset caused liquid to be sent to analyzer and sample conditioning causing problems.	Blew down sample lines and conditioning system. Rebuilt the analyzer.
4	12/18/2014 15:00	12/19/2014 18:59:00	28	d. Other Known Causes	Unit upset caused liquid to be sent to analyzer and sample conditioning causing problems.	Blew down sample lines and conditioning system. Rebuilt the analyzer.

Total Downtime in the Reporting Period = 39 hours , Data Availability for this Reporting Period = 98.23 %
Total Operating Time in the Reporting Period = 2208 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: DDU Flare

Parameter: H2S Analyzer

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 100 %
Total Operating Time in the Reporting Period = 170 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: DDU Flare

Parameter: TS Analyzer

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 100 %
Total Operating Time in the Reporting Period = 170 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: SRU

Parameter: H2S CEMS

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	11/18/2014 10:00	11/18/2014 15:00	5	d. Other Known Causes	Single bad reading.	Return to normal state after troubleshooting.

Total Downtime in the Reporting Period = 5 hour, Data Availability for this Reporting Period = 99.77 %
Total Operating Time in the Reporting Period = 2208 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: SRU

Parameter: TS CEMS

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater F-201

Parameter: NOX CEMS

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	12/12/2014 20:00	12/12/2014 20:59	1	d. Other known causes	Preventative Maintenance	Preventative Maintenance

Total Downtime in the Reporting Period = 1 hour , Data Availability for this Reporting Period = 99.95 %
Total Operating Time in the Reporting Period = 2208 hours

Downtime Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater F-201

Parameter: CO CEMS

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	12/12/2014 20:00	12/12/2014 20:59	1	d. Other known causes	Preventative Maintenance	Preventative Maintenance

Total Downtime in the Reporting Period = 1 hours , Data Availability for this Reporting Period = 99.95 %
Total Operating Time in the Reporting Period = 2208 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater F-202

Parameter: NOX CEMS

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	10/16/2014 23:00	10/17/2014 0:59	2	c. QA Calibration	Cylinder Gas Audit	Cylinder Gas Audit
2	12/4/2014 10:00	12/4/2014 14:59	5	c. QA Calibration	Conducted range change with VIM on CO. Changed dual range to single range. Checked cal checks, CGAs, and operation.	Conducted range change with VIM on CO. Changed dual range to single range. Checked cal checks, CGAs, and operation.

Total Downtime in the Reporting Period = 7 hours , Data Availability for this Reporting Period = 99.61 %
Total Operating Time in the Reporting Period = 1798 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater F-202

Parameter: CO CEMS

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	12/4/2014 10:00	12/4/2014 14:59	5	c. QA Calibration	Conducted range change with VIM on CO. Changed dual range to single range. Checked cal checks, CGAs, and operation.	Conducted range change with VIM on CO. Changed dual range to single range. Checked cal checks, CGAs, and operation.

Total Downtime in the Reporting Period = 5 hours , Data Availability for this Reporting Period = 99.72 %
Total Operating Time in the Reporting Period = 1798 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater F-203

Parameter: NOX CEMS

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 100 %
Total Operating Time in the Reporting Period = 1989 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater F-203

Parameter: CO CEMS

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 100 %
Total Operating Time in the Reporting Period = 1989 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-1X

Parameter: NOX CEMS

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 100.00 %
Total Operating Time in the Reporting Period = 2208 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-200

Parameter: NOX CEMS

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
No Incidents found in this Reporting Period						

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 100 %
Total Operating Time in the Reporting Period = 2208 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-101A

Parameter: NOX CEMS

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	10/1/2014 8:00	10/1/2014 8:59	1	c. QA Calibration	Cylinder Gas Audit	Cylinder Gas Audit
1	10/31/2014 9:00	10/31/2014 13:59	5	b. Non monitor malfunction	Bad wind storm caused loss of communication and upset on unit.	Settled out and passed morning cal check.
3	12/23/2014 17:00	12/23/2014 17:00	1	d. Other Known Downtime	Preventataive Maintenance	Preventataive Maintenance

Total Downtime in the Reporting Period = 7 hours , Data Availability for this Reporting Period = 99.7%
Total Operating Time in the Reporting Period = 2204 hours

Downtime Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater H-101A

Parameter: CO CEMS

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	10/1/2014 8:00	10/1/2014 8:59	1	c. QA Calibration	Cylinder Gas Audit	Cylinder Gas Audit
2	10/31/2014 9:00	10/31/2014 13:59:00 AM	5	b. Non monitor malfunction	Bad wind storm caused loss of communication and upset on unit.	Settled out and passed morning cal check.
3	12/23/2014 17:00	12/23/2014 17:00	1	d. Other Known Downtime	Preventataive Maintenance	Preventataive Maintenance

Total Downtime in the Reporting Period = 7 hours , Data Availability for this Reporting Period = 99.68%
Total Operating Time in the Reporting Period = 2204 hours

Downtime Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater H-101B

Parameter: NOX CEMS

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	11/18/2014 5:00	11/18/2014 6:59	2	d. Monitor Equipment Malfunctions	Probe box temperature alarm. The pump was shut off to protect the analyzers.	The pump restarts once an appropriate temperature is reached.

Total Downtime in the Reporting Period = 2 hours , Data Availability for this Reporting Period = 99.91 %
Total Operating Time in the Reporting Period = 2207 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-101B

Parameter: CO CEMS

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	11/18/2014 2:00	11/18/2014 2:59	1	d. Monitor Equipment Malfunctions	Probe box temperature alarm. The pump was shut off to protect the analyzers.	The pump restarts once an appropriate temperature is reached.

Total Downtime in the Reporting Period = 1 hour , Data Availability for this Reporting Period = 99.95 %
Total Operating Time in the Reporting Period = 2207 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-102

Parameter: NOX CEMS

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	10/2/2014 8:00	10/2/2014 8:59	1	c. QA Calibration	Cylinder Gas Audit	Cylinder Gas Audit

Total Downtime in the Reporting Period = 1 hour , Data Availability for this Reporting Period = 99.95 %
Total Operating Time in the Reporting Period = 2207 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-102

Parameter: CO CEMS

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	10/2/2014 8:00	10/2/2014 8:59	1	c. QA Calibration	Cylinder Gas Audit	Cylinder Gas Audit

Total Downtime in the Reporting Period = 1 hour , Data Availability for this Reporting Period = 99.95 %
Total Operating Time in the Reporting Period = 2207 hours

Downtime Report

Facility Name: BP Products North America, Inc. - Whiting Bus

Location: 2815 Indianapolis Blvd, Whiting IN 46307

Source: DHT

Parameter: NOx CEMS

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 100 %
Total Operating Time in the Reporting Period = 2208 hours

Downtime Report

Facility Name: BP Products North America, Inc. - Whiting Bus

Location: 2815 Indianapolis Blvd, Whiting IN 46307

Source: DHT

Parameter: CO CEMS

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 100 %
Total Operating Time in the Reporting Period = 2208 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: GOHT Flare

Parameter: H2S Analyzer

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	12/18/2014 9:00	12/18/2014 9:59	1	c. QA Calibration	Cylinder Gas Audit	Cylinder Gas Audit

Total Downtime in the Reporting Period = 1 hours, Data Availability for this Reporting Period = 99.95 %
Total Operating Time in the Reporting Period = 2208 hours

Downtime Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: GOHT Flare

Parameter: TS Analyzer

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	10/30/2014 10:00	10/30/2014 10:59	1	c. QA Calibration	Cylinder Gas Audit	Cylinder Gas Audit

Total Downtime in the Reporting Period = 1 hours , Data Availability for this Reporting Period = 99.95 %
Total Operating Time in the Reporting Period = 2208 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: South Flare

Parameter: H2S Analyzer

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	10/29/14 8:00	10/29/14 9:59	2	c. QA Calibration	Cylinder Gas Audit	Cylinder Gas Audit

Total Downtime in the Reporting Period = 2 hours , Data Availability for this Reporting Period = 99.91 %
Total Operating Time in the Reporting Period = 2208 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: South Flare

Parameter: TS Analyzer

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	12/16/14 14:00	12/16/14 14:59	1	c. Calibration/QA	Cylinder Gas Audit	Cylinder Gas Audit
2	12/16/14 16:00	12/16/14 17:59	2	c. Calibration/QA	Cylinder Gas Audit	Cylinder Gas Audit
3	12/16/14 19:00	12/16/14 19:59	1	c. Calibration/QA	Cylinder Gas Audit	Cylinder Gas Audit
4	12/26/14 3:00	12/26/14 3:59	1	d. Other Known Causes	Process Upset	Analyzer self corrected issue.

Total Downtime in the Reporting Period = 5 hours , Data Availability for this Reporting Period = 99.77 %
Total Operating Time in the Reporting Period = 2208 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Tail Gas Unit A

Parameter: CO CEMS

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 100 %
Total Operating Time in the Reporting Period = 2208 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Tail Gas Unit A

Parameter: SO2 CEMS

Data in the Reporting Period: 10/01/14 to 10/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action

Total Downtime in the Reporting Period = 0 hours , Data Availability for this Reporting Period = 100 %
Total Operating Time in the Reporting Period = 2208 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Tail Gas Unit B

Parameter: CO CEMS

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	12/02/14 05:00	12/02/14 09:59	5	d. Other Known Causes	Double bad due to zero gas bottle being replaced, but not opened.	Zero gas bottle opened.

Total Downtime in the Reporting Period = 5 hours , Data Availability for this Reporting Period = 99.77 %
Total Operating Time in the Reporting Period = 2208 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Tail Gas Unit B

Parameter: SO2 CEMS

Data in the Reporting Period: 10/01/14 to 12/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
1	12/02/14 05:00	12/02/14 09:59	5	d. Other Known Causes	Double bad due to zero gas bottle being replaced, but not opened.	Zero gas bottle opened.

Total Downtime in the Reporting Period = 5 hours , Data Availability for this Reporting Period = 99.77 %
Total Operating Time in the Reporting Period = 2208 hours

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Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59

Pollutant: NOx_5 Episode: 500 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
10/07/2014 11:00	10/07/2014 11:59	1	d. Other known cause	Single bad reading, passed daily calibration checks
10/08/2014 10:00	10/08/2014 10:59	1	d. Other known cause	Preventative maintenance.
12/22/2014 08:00	12/22/2014 08:59	1	c. Calibration/QA	Calibrating system
12/23/2014 08:00	12/23/2014 08:59	1	d. Other known cause	Preventative maintenance.
12/30/2014 09:00	12/30/2014 09:59	1	d. Other known cause	Preventative maintenance.

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 5.0 Hours

Babcock & Wilcox Power Generation Group NetDAHS©

Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59

Pollutant: CO_5 Episode: 500 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
10/07/2014 11:00	10/07/2014 11:59	1	d. Other known cause	Single bad reading, passed daily calibration checks
10/08/2014 10:00	10/08/2014 10:59	1	d. Other known cause	Preventative maintenance.
12/22/2014 08:00	12/22/2014 08:59	1	c. Calibration/QA	Calibrating system
12/23/2014 08:00	12/23/2014 08:59	1	d. Other known cause	Preventative maintenance.
12/30/2014 09:00	12/30/2014 09:59	1	d. Other known cause	Preventative maintenance.

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 5.0 Hours

Babcock & Wilcox Power Generation Group NetDAHS©

Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59

Pollutant: SO2_5 Episode: 500 SO2 Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
10/07/2014 11:00	10/07/2014 11:59	1	d. Other known cause	Single bad reading, passed daily calibration checks
10/08/2014 10:00	10/08/2014 10:59	1	d. Other known cause	Preventative maintenance.
12/22/2014 08:00	12/22/2014 08:59	1	c. Calibration/QA	Single bad reading, calibrated system
12/23/2014 08:00	12/23/2014 08:59	1	d. Other known cause	Preventative maintenance.
12/30/2014 09:00	12/30/2014 09:59	1	d. Other known cause	Preventative maintenance.

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 5.0 Hours

Babcock & Wilcox Power Generation Group NetDAHS©

Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59

Pollutant: NOx_6 Episode: 600 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
11/06/2014 10:00	11/06/2014 10:59	1	d. Other Known Causes	Preventative Maintenance
12/04/2014 05:00	12/04/2014 09:59	5	c. Calibration/QA	Double bad reading, calibrated system
12/06/2014 05:00	12/06/2014 10:59	6	c. Calibration/QA	Double bad reading, replaced the bulb and converter. Calibrated system.
12/12/2014 05:00	12/12/2014 07:59	3	d. Other Known Causes	Low pressure on system due to sample line plugging. Blew back line and probe.

Total Reported Time: 2208 Hours

TOTAL DURATION: 15 Hours

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Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59

Pollutant: CO_6 Episode: 600 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
11/06/2014 10:00	11/06/2014 10:59	1	d. Other Known Causes	Preventative Maintenance
12/04/2014 09:00	12/04/2014 09:59	1	c. Calibration/QA	Calibrating system
12/06/2014 10:00	12/06/2014 10:59	1	c. Calibration/QA	Calibrating system
12/12/2014 05:00	12/12/2014 06:59	2	d. Other Known Causes	Low pressure on system due to sample line plugging. Blew back line and probe.

Total Reported Time: 2208 Hours

TOTAL DURATION: 5 Hours

Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59

Pollutant: SO2_6 Episode: 600 SO2 Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
11/06/2014 10:00	11/06/2014 10:59	1	d. Other Known Causes	Preventative Maintenance
12/04/2014 09:00	12/04/2014 09:59	1	c. Calibration/QA	Calibrating system
12/06/2014 10:00	12/06/2014 10:59	1	c. Calibration/QA	Calibrating system
12/12/2014 05:00	12/12/2014 07:59	3	d. Other Known Causes	Low pressure on system due to sample line plugging. Blew back line and probe.

Total Reported Time: 2208 Hours

TOTAL DURATION: 6 Hours

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Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59

Pollutant: NOx_31 Episode: Unit 31 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
10/15/2014 16:00	10/15/2014 17:59	2	d. Other known cause	Preventative Maintenance
11/12/2014 09:00	11/12/2014 18:59	10	d. Other known cause	Calibrated analyzer and removed from maintenance mode.

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 12.0 Hours

Babcock & Wilcox Power Generation Group NetDAHS©

Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59

Pollutant: CO_31 Episode: Unit 31 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
10/15/2014 16:00	10/15/2014 17:59	2	d. Other known cause	Preventative Maintenance
11/12/2014 09:00	11/12/2014 18:59	10	d. Other known cause	Calibrated analyzer and removed from maintenance mode.

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 12.0 Hours

Babcock & Wilcox Power Generation Group NetDAHS©

Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59

Pollutant: NOx_32 Episode: Unit 32 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
10/02/2014 09:00	10/02/2014 09:59	1	a. Quality assurance calibration	Cylinder Gas Audit

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 1.0 Hours

Babcock & Wilcox Power Generation Group NetDAHS©

Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59

Pollutant: CO_32 Episode: Unit 32 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
10/02/2014 09:00	10/02/2014 09:59	1	c. Quality assurance calibration	Cylinder Gas Audit

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 1.0 Hours

Babcock & Wilcox Power Generation Group NetDAHS©

Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59

Pollutant: NOx_33 Episode: Unit 33 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 0.0 Hours

Babcock & Wilcox Power Generation Group NetDAHS©

Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59

Pollutant: CO_33 Episode: Unit 33 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 0.0 Hours

Babcock & Wilcox Power Generation Group NetDAHS©

Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59

Pollutant: NOx_34 Episode: Unit 34 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
10/02/2014 12:00	10/02/2014 17:59	6	d. Other known cause	Preventative maintenance
10/08/2014 05:00	10/08/2014 07:59	3	a. Monitor Equipment Malfunction	Recalibrated anazlyer and ran cal check.

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 9.0 Hours

Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59

Pollutant: CO_34 Episode: Unit 34 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
10/02/2014 12:00	10/02/2014 17:59	6	d. Other known cause	Preventative maintenance
10/08/2014 05:00	10/08/2014 07:59	3	a. Monitor Equipment Malfunction	Recalibrated anazlyer and ran cal check.

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 9.0 Hours

Babcock & Wilcox Power Generation Group NetDAHS©

Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59

Pollutant: NOx_36 Episode: Unit 36 NOx Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
10/08/2014 23:00	10/09/2014 00:59	2	d. Other known cause	Preventative maintenance.
10/15/2014 09:00	10/15/2014 09:59	1	a. Quality assurance calibration	Cylinder Gas Audit

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 3.0 Hours

Babcock & Wilcox Power Generation Group NetDAHS©

Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59

Pollutant: CO_36 Episode: Unit 36 CO Analyzer Downtime

Incident Start	Incident End	Duration Hours	Cause of Episode	Corrective Action
10/08/2014 23:00	10/09/2014 00:59	2	d. Other known cause	Preventative maintenance.
10/15/2014 09:00	10/15/2014 09:59	1	c. Quality assurance calibration	Cylinder Gas Audit

Total Reported Time: 2208.0 Hours

TOTAL DURATION: 3.0 Hours

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: CFU

Parameter: H2S - 3 hr

Limit: 162

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
1	10/1/2014 13:00	10/1/2014 16:59	4	232	c. Process Problems	Due to an upset at the Sulfur Recovery Unit (SRU), a high H2S concentration stream was sent to the Cat Feed Hydrotreating Unit (CFU) fuel gas system.	The SRU returned to normal operations, resulting in the stabilization of both the CFU fuel gas system.

Total Duration in the Reporting Period = 4 hours
Total Operating Time in the Reporting Period = 2208 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: CFU

Parameter: H2S - 365 Day

Limit: 60

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: No. 4 Ultraformer

Parameter: H2S - 3 hr

Limit: 162

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
1	10/1/2014 14:00	10/1/2014 15:59	2	179	c. Process Problems	Due to an upset at the Sulfur Recovery Unit (SRU), a high H2S concentration stream was sent to the No. 4 Ultraformer (4UF).	The SRU returned to normal operations, resulting in the stabilization of both the 4UF fuel gas system.

Total Duration in the Reporting Period = 2 hours
Total Operating Time in the Reporting Period = 2208 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: No. 4 Ultraformer

Parameter: H2S - 365 Day

Limit: 60

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: MEROX

Parameter: TS Raw - 3-hr

Limit: 162

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: MEROX

Parameter: TS Raw - 365 Day

Limit: 162

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: DDU Flare

Parameter: H2S ppmd 3-hr

Limit: 162

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
1	10/4/2014 13:00	10/4/2014 15:59	3	176.8	c. Process Problems	A relief valve at the Distillate Desulfurization Unit (DDU) released a high H2S concentration stream, which was sent to the DDU Flare.	The relief valve was isolated, ending the high H2S release to the flare.

Total Duration in the Reporting Period = 3 hours
Total Operating Time in the Reporting Period = 170 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Sulfur Recovery Unit

Parameter: H2S - 3 hr Limit: 162

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	Emission Max	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period								

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Sulfur Recovery Unit

Parameter: H2S - 365 day

Limit: 60

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater F-201

Parameter: NOx @ 0% O2 30-Day

Limit: 60

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater F-201

Parameter: CO per 12 consecutive month

Limit: 17.3 tons

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater F-202

Parameter: NOx @ 0% O2 30-Day

Limit: 60

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 1798 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater F-202

Parameter: CO per 12 consecutive month

Limit: 17.3 tons

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 1798 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater F-203

Parameter: NOx @ 0% O2 30-Day Limit: 60

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 1989 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater F-203

Parameter: CO per 12 consecutive month Limit: 17.3 tons

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 1989 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-1X

Parameter: NOX 12-Month

Limit: 0.06 lb/MMBtu

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-200

Parameter: NOx @ 0% O2 30-Day

Limit: 40 ppm during natural draft operation, 60 ppm during forced draft operation

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
1	11/12/2014 0:00	11/17/2014 23:59	144	41 ppm	d. Other Known Causes	No. 11 Pipe Still (11PS) heater H-200 was in excess of its 30-day average 40 ppmv limit under natural draft.	NOx control was managed such that the 30-day average returned below the limit.

Total Duration in the Reporting Period = 144 hours
Total Operating Time in the Reporting Period = 2208 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-200

Parameter: NOX 12-Month

Limit: 0.05 lb/MMBtu

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-101A

Parameter: NOX @ 0% O2 30 Day

Limit: 60

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period =2204 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-101A

Parameter: CO per 12 consecutive month

Limit: 29.5 tons

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-101B

Parameter: NOx @ 0% O2 30 Day

Limit: 60

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2207 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-101B

Parameter: CO per 12 consecutive month

Limit: 29.5 tons

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2207 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-102

Parameter: NOX @ 0% O2 30 Day

Limit: 60

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater H-102

Parameter: CO per 12 consecutive month

Limit: 27.5 tons

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2207.5 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc. - Whiting Bus

Location: 2815 Indianapolis Blvd, Whiting IN 46307

Source: DHT

Parameter: NOX Tons 12-Month

Limit: 7.3

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 406 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc. - Whiting Bus

Location: 2815 Indianapolis Blvd, Whiting IN 46307

Source: DHT

Parameter: CO Tons 12-Month

Limit: 7.3

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 406 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: GOHT Flare

Parameter: H2S ppmd 3-hr

Limit: 162

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: South Flare

Parameter: H2S ppmd 3-hr

Limit: 162

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Tail Gas Unit A

Parameter: CO per 12 consecutive month

Limit: 55.0 tons

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Tail Gas Unit A

Parameter: SO2 @ 0% O2

Limit: 250.0

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Tail Gas Unit B

Parameter: CO per 12 consecutive month

Limit: 55.0 tons

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Tail Gas Unit B

Parameter: SO2 @ 0% O2

Limit: 55.0 tons

Data in the Reporting Period: 10/01/14 to 12/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2208 hours

Babcock & Wilcox Power Generation Group NetDAHS©

Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59

Pollutant: NOx_7DyBP5 Episode: FCU 500 NOx Excess 7 Day

Incident Start	Incident End	Type	Value	Limit	(%Dev)	Cause of Episode	Corrective Action

No FCU 500 NOx Excess 7 Day during the Report Period

Babcock & Wilcox Power Generation Group NetDAHS©

Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59

Pollutant: NOx_365BP5 Episode: FCU 500 NOx Excess 365 Day

Incident Start	Incident End	Type	Value	Limit	(%Dev)	Cause of Episode	Corrective Action

No FCU 500 NOx Excess 365 Day during the Report Period

Babcock & Wilcox Power Generation Group NetDAHS©

Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59

Pollutant: CO_5 Episode: FCU 500 CO Excess

Incident Start	Incident End	Type	Value	Limit	(%Dev)	Cause of Episode	Corrective Action

No FCU 500 CO Excess during the Report Period

Babcock & Wilcox Power Generation Group NetDAHS©

Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59

Pollutant: SO2_7DyBP5 Episode: FCU 500 SO2 Excess 7 Day

Incident Start	Incident End	Type	Value	Limit	(%Dev)	Cause of Episode	Corrective Action

No FCU 500 SO2 Excess 7 Day during the Report Period

Babcock & Wilcox Power Generation Group NetDAHS©

Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59

Pollutant: SO2_365BP5 Episode: FCU 500 SO2 Excess 365 Day

Incident Start	Incident End	Type	Value	Limit	(%Dev)	Cause of Episode	Corrective Action

No FCU 500 SO2 Excess 365 Day during the Report Period

Babcock & Wilcox Power Generation Group NetDAHS©

Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59

Pollutant: NOx_7DyBP6 Episode: FCU 600 NOx Excess 7 Day

Incident Start	Incident End	Duration Hours	Type	Value	Limit	(%Dev)	Cause of Episode	Corrective Action

No FCU 600 NOx Excess 7 Day during the Report Period

Babcock & Wilcox Power Generation Group NetDAHS©

Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59

Pollutant: NOx_365BP6 Episode: FCU 600 NOx Excess 365 Day

Incident Start	Incident End	Duration Hours	Type	Value	Limit	(%Dev)	Cause of Episode	Corrective Action

No FCU 600 NOx Excess 365 Day during the Report Period

Babcock & Wilcox Power Generation Group NetDAHS©

Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59

Pollutant: CO_6 Episode: FCU 600 CO Excess

Incident Start	Incident End	Deviation Hours	Value	Cause of Episode	Corrective Action
10/07/2014 05:00	10/07/2014 05:59	1.0	680.1	Loss of regeneration bed temperature.	Regeneration bed temperature was returned to proper levels.

Babcock & Wilcox Power Generation Group NetDAHS©

Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59

Pollutant: SO2_7DyBP6 Episode: FCU 600 SO2 Excess 7 Day

Incident Start	Incident End	Duration Hours	Type	Value	Limit	(%Dev)	Cause of Episode	Corrective Action

No FCU 600 SO2 Excess 7 Day during the Report Period

Babcock & Wilcox Power Generation Group NetDAHS©

Episode List Report

BP Products North America, Inc
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59

Pollutant: SO2_365BP6 Episode: FCU 600 SO2 Excess 365 Day

Incident Start	Incident End	Duration Hours	Type	Value	Limit	(%Dev)	Cause of Episode	Corrective Action

No FCU 600 SO2 Excess 365 Day during the Report Period

Babcock & Wilcox Power Generation Group NetDAHS©

Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59
Generated: : 1/13/2015 10:00

Pollutant: NOxlbmY_31 Episode: Unit 31 NOx lbmmbtu 365 day Excess

Incident Start	Incident End	Type	Value	Limit	(%Dev)	Cause of Episode	Corrective Action

No Unit 31 NOx lbmmbtu 365 day Excess during the Report Period

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Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59
Generated: : 1/13/2015 10:00

Pollutant: NOxlbmY_32 Episode: Unit 32 NOx lbmmbtu 365 day Excess

Incident Start	Incident End	Type	Value	Limit	(%Dev)	Cause of Episode	Corrective Action

No Unit 32 NOx lbmmbtu 365 day Excess during the Report Period

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Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59
Generated: : 1/13/2015 10:00

Pollutant: NOxlbmY_33 Episode: Unit 33 NOx lbmmbtu 365 day Excess

Incident Start	Incident End	Type	Value	Limit	(%Dev)	Cause of Episode	Corrective Action

No Unit 33 NOx lbmmbtu 365 day Excess during the Report Period

Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59
Generated: : 1/13/2015 10:00

Pollutant: NOxlbmY_34 Episode: Unit 34 NOx lbmmbtu 365 day Excess

Incident Start	Incident End	Type	Value	Limit	(%Dev)	Cause of Episode	Corrective Action

No Unit 34 NOx lbmmbtu 365 day Excess during the Report Period

Babcock & Wilcox Power Generation Group NetDAHS©

Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59
Generated: : 1/13/2015 10:00

Pollutant: NOxlbmY_36 Episode: Unit 36 NOx lbmmbtu 365 day Excess

Incident Start	Incident End	Type	Value	Limit	(%Dev)	Cause of Episode	Corrective Action

No Unit 36 NOx lbmmbtu 365 day Excess during the Report Period

Babcock & Wilcox Power Generation Group NetDAHS©

Episode List Report

BP Products North America,Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394
from 10/1/2014 00:00 to 12/31/2014 23:59
Generated: : 1/13/2015 09:54

Pollutant: COTNYR Episode: CO Tons/Year

Incident Start	Incident End	Type	Value	Limit	(%Dev)	Cause of Episode	Corrective Action

No CO Tons/Year during the Report Period

Attachment C

Cylinder Gas Audit Results

Including the following:

Location/Emission Unit	Parameter	Notes
CFU Fuel Drum	H_2S	
CFU Fuel Drum	Total Sulfur	
4UF Fuel Drum	H_2S	
4UF Fuel Drum	Total Sulfur	
#2 Coker Merox Treater Off-Gas	TS	
DDU Flare	H_2S	
SRU Mix Fuel Drum	H2S	
SRU Mix Fuel Drum	Total Sulfur	
#2 Coker heater F-201	NOX	
#2 Coker heater F-201	CO	
#2 Coker heater F-202	NO_X	
#2 Coker heater F-202	CO	
#2 Coker heater F-203	NO_X	
#2 Coker heater F-203	CO	
11PS heater H-1X	NO_X	Not included in this report because RATA done in this quarter.
11PS heater H-200	NO_X	Not included in this report because RATA done in this quarter.
12 PS heater H-101A	NO_X	Not included in this report because RATA done in this quarter.
12 PS heater H-101A	CO	Not included in this report because RATA done in this quarter.
12 PS heater H-101B	NO_X	Not included in this report because RATA done in this quarter.
12 PS heater H-101B	CO	Not included in this report because RATA done in this quarter.
12 PS heater H-102	NO_X	Not included in this report because RATA done in this quarter.
12 PS heater H-102	CO	Not included in this report because RATA done in this quarter.
DHT heater B-601A	NO_X	
DHT heater B-601A	CO	
GOHT Flare	H_2S	
GOHT Flare	Total Sulfur	
South Flare	H_2S	
South Flare	Total Sulfur	
COT1	CO	
COT1	SO_2	
COT2	CO	
COT2	SO_2	
FCU 500	NO_X	
FCU 500	CO	
FCU 500	SO_2	
FCU 600	NO_X	
FCU 600	CO	
FCU 600	SO_2	
3SPS Boiler 31*	NO_X	
3SPS Boiler 31 and Duct Burner 1*	CO	
3SPS Boiler 32*	NO_X	
3SPS Boiler 32 and Duct Burner 2*	CO	

Location/Emission Unit	Parameter	Notes
3SPS Boiler 33*	NO_X	
3SPS Boiler 33 and Duct Burner 3*	CO	
3SPS Boiler 34*	NO_X	
3SPS Boiler 34 and Duct Burner 4*	CO	
3SPS Boiler 36*	NO_X	
3SPS Boiler 36 and Duct Burner 6*	CO	

*The 3SPS Boilers are listed as Boiler 1, 2, 3, 4, and 6 in the Title V Permit.

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

CFUTSAuditTestResultsAnalyzerSpan:400.0ppm

Mfr&Model: SOLA2 SerialNumber: SL-07070111

Low-LevelCalibrationGas (20-30%ofSpan) (80.0ppm-120.0ppm)	Concentration:	100.4
	CylinderNo.:	CC409049
	ExpirationDate:	08/21/15
Mid-LevelCalibrationGas (50-60%ofSpan) (200.0ppm-240.0ppm)	Concentration:	219.9
	CylinderNo.:	CC267147
	ExpirationDate:	12/11/16

TestDate: 10/16/14 Tester: M.Crizer

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	12:03:34	96.4	12:09:25	210.0
Run2	12:20:21	95.6	12:26:07	207.6
Run3	12:36:43	95.3	12:42:31	208.4
Avg.MonitorResponse		95.8		208.7
CalibrationError		-4.6		-5.1
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

CFUH2SAuditTestResultsAnalyzerSpan:300.0ppm

Mfr&Model: SIEMENSMAXUM SerialNumber: 001910

Low-LevelCalibrationGas (20-30%ofSpan) (60.0ppm-90.0ppm)	Concentration:	75.8
	CylinderNo.:	CC408957
	ExpirationDate:	11/12/16
Mid-LevelCalibrationGas (50-60%ofSpan) (150.0ppm-180.0ppm)	Concentration:	161.0
	CylinderNo.:	CC189757
	ExpirationDate:	06/11/17

TestDate: 10/16/14 Tester: M.Crizer

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	08:35:46	78.4	08:47:22	169.2
Run2	09:00:38	77.7	09:12:14	167.9
Run3	09:25:30	77.5	09:37:06	169.0
Avg.MonitorResponse		77.9		168.7
CalibrationError		2.8		4.8
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

4UFH2SAuditTestResultsAnalyzerSpan:300.0ppm

Mfr&Model: SIEMENS SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (60.0ppm-90.0ppm)	Concentration:	74.7
	CylinderNo.:	CC221584
	ExpirationDate:	08/04/17
Mid-LevelCalibrationGas (50-60%ofSpan) (150.0ppm-180.0ppm)	Concentration:	160.1
	CylinderNo.:	CC443481
	ExpirationDate:	01/20/17

TestDate: 10/16/14 Tester: wulitich

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	11:40:52	81.7	11:52:28	175.1
Run2	12:05:40	83.0	12:17:16	172.2
Run3	12:30:32	83.5	12:42:07	168.9
Avg.MonitorResponse		82.7		172.1
CalibrationError		10.7		7.5
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentrationX100}}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: Location:

4UFH2SAuditTestResultsAnalyzerSpan:300.0ppm

Mfr&Model: SiemansMaxumII SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (60.0ppm-90.0ppm)	Concentration:	76.2
	CylinderNo.:	CC159221
	ExpirationDate:	11/12/16
Mid-LevelCalibrationGas (50-60%ofSpan) (150.0ppm-180.0ppm)	Concentration:	162.1
	CylinderNo.:	CC352164
	ExpirationDate:	10/22/16

TestDate: 12/23/14 Tester:

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	13:02:49	75.2	13:14:49	176.7
Run2	13:27:21	74.5	13:39:20	158.4
Run3	13:51:48	73.9	14:03:47	154.9
Avg.MonitorResponse		74.5		163.3
CalibrationError		-2.200		0.700
AbsoluteDifference		1.7		1.2
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: Location:

4UFTSLowAuditTestResultsAnalyzerSpan:500.00ppm

Mfr&Model: THERMOSOLAII SerialNumber: 08351012

Low-LevelCalibrationGas (20-30%ofSpan) (100.00ppm-150.00ppm)	Concentration:	128.300
	CylinderNo.:	CC315966
	ExpirationDate:	07/16/16
Mid-LevelCalibrationGas (50-60%ofSpan) (250.00ppm-300.00ppm)	Concentration:	276.600
	CylinderNo.:	CC416795
	ExpirationDate:	07/10/16

TestDate: 12/23/14 Tester: At

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	13:07:13	109.000	13:13:53	254.000
Run2	13:57:16	113.000	14:03:55	252.000
Run3	14:50:18	115.000	14:56:57	253.000
Avg.MonitorResponse		112.330		253.000
CalibrationError		-12.400		-8.500
AbsoluteDifference		15.970		23.600
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: Location:

4UFTSHighAuditTestResultsAnalyzerSpan:50000ppm

Mfr&Model: THERMOSOLAII SerialNumber: 08351012

Low-LevelCalibrationGas (20-30%ofSpan) (10000ppm-15000ppm)	Concentration:	12530.00
	CylinderNo.:	CC215354
	ExpirationDate:	07/17/15
Mid-LevelCalibrationGas (50-60%ofSpan) (25000ppm-30000ppm)	Concentration:	27480.00
	CylinderNo.:	CC97790
	ExpirationDate:	01/17/15

TestDate: 12/23/14 Tester: At

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	13:20:33	11590.00	13:27:13	26120.00
Run2	14:10:35	11800.00	14:17:15	26450.00
Run3	15:03:37	11970.00	15:10:17	26470.00
Avg.MonitorResponse		11787.00		26347.00
CalibrationError		-5.900		-4.100
AbsoluteDifference		743.00		1133.00
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: Location:

4UFTSHighAuditTestResultsAnalyzerSpan:50000ppm

Mfr&Model: THERMOSOLAII SerialNumber: 08351012

Low-LevelCalibrationGas (20-30%ofSpan) (10000ppm-15000ppm)	Concentration:	12530.00
	CylinderNo.:	CC215354
	ExpirationDate:	07/17/15
Mid-LevelCalibrationGas (50-60%ofSpan) (25000ppm-30000ppm)	Concentration:	27480.00
	CylinderNo.:	CC97790
	ExpirationDate:	01/17/15

TestDate: 12/23/14 Tester: At

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	13:20:33	11590.00	13:27:13	26120.00
Run2	14:10:35	11800.00	14:17:15	26450.00
Run3	15:03:37	11970.00	15:10:17	26470.00
Avg.MonitorResponse		11787.00		26347.00
CalibrationError		-5.900		-4.100
AbsoluteDifference		743.00		1133.00
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration}}{\text{Cal.GasConcentration}} \times 100$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

4UFTSAuditTestResultsAnalyzerSpan:400.0ppm

Mfr&Model: SOLA2 SerialNumber: SL07070111

Low-LevelCalibrationGas (20-30%ofSpan) (80.0ppm-120.0ppm)
Concentration: 100.8
CylinderNo.: CC268194
ExpirationDate: 08/04/16

Mid-LevelCalibrationGas (50-60%ofSpan) (200.0ppm-240.0ppm)
Concentration: 222.1
CylinderNo.: CC266689
ExpirationDate: 12/10/16

TestDate: 10/16/14 Tester: wulitich

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	08:15:26	109.0	08:20:54	231.0
Run2	08:35:38	109.0	08:41:06	232.6
Run3	08:54:18	110.0	08:59:50	230.8
Avg.MonitorResponse		109.3		231.5
CalibrationError		8.4		4.2
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentrationX100}}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

TSTSAuditTestResultsAnalyzerSpan:400.0ppm

Mfr&Model: Sola SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (80.0ppm-120.0ppm)	Concentration:	101.3
	CylinderNo.:	CC411655
	ExpirationDate:	02/25/16
Mid-LevelCalibrationGas (50-60%ofSpan) (200.0ppm-240.0ppm)	Concentration:	219.4
	CylinderNo.:	CC219927
	ExpirationDate:	11/26/16

TestDate: 10/22/14 Tester: M.Crizer

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	09:16:27	103.9	09:21:55	225.6
Run2	09:31:38	101.8	09:37:06	214.0
Run3	09:46:55	102.5	09:52:27	224.8
Avg.MonitorResponse		102.7		221.5
CalibrationError		1.4		1.0
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: Location:

DDUH2SAuditTestResultsAnalyzerSpan:300.0ppm

Mfr&Model: SIEMENS SerialNumber: 3003875841000606

Low-LevelCalibrationGas (20-30%ofSpan) (60.0ppm-90.0ppm)
Concentration: 75.4
CylinderNo.: CC209525
ExpirationDate: 11/12/16

Mid-LevelCalibrationGas (50-60%ofSpan) (150.0ppm-180.0ppm)
Concentration: 157.7
CylinderNo.: CC430964
ExpirationDate: 05/13/16

TestDate: 10/29/14 Tester: AB/JW

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	23:38:42	78.1	23:50:42	163.8
Run2	00:02:58	78.0	00:14:15	162.3
Run3	00:26:45	77.2	00:38:44	161.6
Avg.MonitorResponse		77.8		162.6
CalibrationError		3.200		3.100
AbsoluteDifference		2.4		4.9
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

SRUTSAuditTestResultsAnalyzerSpan:400.0ppm

Mfr&Model: Solall SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (80.0ppm-120.0ppm)	Concentration:	102.3
	CylinderNo.:	CC330101
	ExpirationDate:	02/25/16
Mid-LevelCalibrationGas (50-60%ofSpan) (200.0ppm-240.0ppm)	Concentration:	219.1
	CylinderNo.:	CC209283
	ExpirationDate:	12/11/16

TestDate: 10/22/14 Tester: wulitich

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	18:58:53	102.2	19:03:53	214.8
Run2	19:15:53	102.0	19:20:53	217.1
Run3	19:31:58	102.6	19:36:58	216.6
Avg.MonitorResponse		102.3		216.2
CalibrationError		0.000		-1.300
AbsoluteDifference		0.0		2.9
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

SRUH2SAuditTestResultsAnalyzerSpan:300.0ppm

Mfr&Model: SiemansMaxum SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (60.0ppm-90.0ppm)	Concentration:	76.3
	CylinderNo.:	CC282088
	ExpirationDate:	06/24/16
Mid-LevelCalibrationGas (50-60%ofSpan) (150.0ppm-180.0ppm)	Concentration:	161.5
	CylinderNo.:	CC431011
	ExpirationDate:	06/11/17

TestDate: 10/29/14 Tester: wulitich

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	00:48:14	73.5	01:00:14	159.8
Run2	01:12:38	72.2	01:24:38	161.8
Run3	01:37:02	71.2	01:49:02	160.8
Avg.MonitorResponse		72.3		160.8
CalibrationError		-5.200		-0.400
AbsoluteDifference		4.0		0.7
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-201NOxLowAuditTestResultsAnalyzerSpan:50.0ppm

Mfr&Model: Rosemount SerialNumber:

Low-LevelCalibrationGas	Concentration:	12.6
(20-30%ofSpan)	CylinderNo.:	CC154101
(10.0ppm-15.0ppm)	ExpirationDate:	02/11/16
Mid-LevelCalibrationGas	Concentration:	27.4
(50-60%ofSpan)	CylinderNo.:	CC340356
(25.0ppm-30.0ppm)	ExpirationDate:	02/11/16

TestDate: 10/16/14 Tester: Tuttle

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	01:03:50	12.5	01:07:30	27.5
Run2	01:30:37	12.4	01:34:13	27.5
Run3	01:55:34	12.6	01:59:14	27.4
Avg.MonitorResponse		12.5		27.5
CalibrationError		-0.8		0.4
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentrationX100}}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-201NOxHighAuditTestResultsAnalyzerSpan:150.0ppm

Mfr&Model: Rosemount SerialNumber:

Low-LevelCalibrationGas	Concentration:	37.2
(20-30%ofSpan)	CylinderNo.:	CC166891
(30.0ppm-45.0ppm)	ExpirationDate:	02/27/16
Mid-LevelCalibrationGas	Concentration:	81.9
(50-60%ofSpan)	CylinderNo.:	CC220652
(75.0ppm-90.0ppm)	ExpirationDate:	07/08/21

TestDate: 10/16/14 Tester: Tuttle

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	01:11:10	37.7	01:14:50	82.0
Run2	01:37:55	37.8	01:41:35	81.9
Run3	02:02:54	37.6	02:06:34	82.0
Avg.MonitorResponse		37.7		82.0
CalibrationError		1.3		0.1
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-201COLowAuditTestResultsAnalyzerSpan:100.0ppm

Mfr&Model: Rosemount SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (20.0ppm-30.0ppm)	Concentration:	25.2
	CylinderNo.:	CC165008
	ExpirationDate:	02/01/21
Mid-LevelCalibrationGas (50-60%ofSpan) (50.0ppm-60.0ppm)	Concentration:	55.5
	CylinderNo.:	CC300228
	ExpirationDate:	01/31/21

TestDate: 10/16/14 Tester: Tuttle

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	00:56:50	28.0	01:00:10	56.8
Run2	01:23:37	28.2	01:26:57	56.9
Run3	01:48:34	28.4	01:51:54	57.0
Avg.MonitorResponse		28.2		56.9
CalibrationError		11.9		2.5
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-201COHighAuditTestResultsAnalyzerSpan:5000.0ppm

Mfr&Model: Rosemount SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (1000.0ppm-1500.0ppm)	Concentration:	1237.0
	CylinderNo.:	CC154101
	ExpirationDate:	02/11/16
Mid-LevelCalibrationGas (50-60%ofSpan) (2500.0ppm-3000.0ppm)	Concentration:	2787.0
	CylinderNo.:	CC340356
	ExpirationDate:	02/11/16

TestDate: 10/16/14 Tester: Tuttle

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	01:03:50	1236.6	01:07:30	2798.8
Run2	01:30:37	1236.2	01:34:13	2796.9
Run3	01:55:34	1236.2	01:59:14	2799.1
Avg.MonitorResponse		1236.3		2798.3
CalibrationError		-0.1		0.4
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-201O2AuditTestResultsAnalyzerSpan:25.00%

Low-LevelCalibrationGas (4.00%-6.00%)	Concentration:	5.00
	CylinderNo.:	CC165008
	ExpirationDate:	02/01/21
Mid-LevelCalibrationGas (8.00%-12.00%)	Concentration:	10.94
	CylinderNo.:	CC300228
	ExpirationDate:	01/31/21

TestDate: 10/16/14 Tester: Tuttle

	Low				Mid			
	Time	Monitor Value	Abs Diff	% Error	Time	Monitor Value	Abs Diff	% Error
Run1	00:56:50	5.00	0.00	0.0	01:00:10	11.01	0.07	0.6
Run2	01:23:37	5.03	0.03	0.6	01:26:57	11.01	0.07	0.6
Run3	01:48:34	5.03	0.03	0.6	01:51:54	11.03	0.09	0.8
Avg.MonitorResponse		5.02				11.02		
Reference/Target		5.00				10.94		
AbsoluteDifference			0.02				0.08	
%CalibrationError				0.4				0.7
Performance Specification				15.0%				15.0%
TestStatus	Pass				Pass			

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentrationX100}}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-202NOxLowAuditTestResultsAnalyzerSpan:50.0ppm

Mfr&Model: Rosemount SerialNumber:

Low-LevelCalibrationGas	Concentration:	12.6
(20-30%ofSpan)	CylinderNo.:	CC174682
(10.0ppm-15.0ppm)	ExpirationDate:	02/11/16
Mid-LevelCalibrationGas	Concentration:	27.7
(50-60%ofSpan)	CylinderNo.:	CC422138
(25.0ppm-30.0ppm)	ExpirationDate:	09/13/16

TestDate: 10/17/14 Tester: Tuttle

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	00:16:26	13.0	00:20:06	28.4
Run2	00:42:21	13.0	00:45:57	28.5
Run3	01:23:40	13.0	01:27:21	28.6
Avg.MonitorResponse		13.0		28.5
CalibrationError		3.2		2.9
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-202NOxHighAuditTestResultsAnalyzerSpan:150.0ppm

Mfr&Model: Rosemount SerialNumber:

Low-LevelCalibrationGas	Concentration:	37.1
(20-30%ofSpan)	CylinderNo.:	CC364264
(30.0ppm-45.0ppm)	ExpirationDate:	02/27/16
Mid-LevelCalibrationGas	Concentration:	81.8
(50-60%ofSpan)	CylinderNo.:	CC417013
(75.0ppm-90.0ppm)	ExpirationDate:	02/27/21

TestDate: 10/17/14 Tester: Tuttle

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	00:23:46	38.9	00:27:25	83.4
Run2	00:49:37	38.9	00:53:17	83.1
Run3	01:31:01	38.9	01:34:41	83.1
Avg.MonitorResponse		38.9		83.2
CalibrationError		4.9		1.7
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentrationX100}}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-202COLowAuditTestResultsAnalyzerSpan:100.0ppm

Mfr&Model: Rosemount SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (20.0ppm-30.0ppm)	Concentration:	25.1
	CylinderNo.:	CC153920
	ExpirationDate:	02/01/21
Mid-LevelCalibrationGas (50-60%ofSpan) (50.0ppm-60.0ppm)	Concentration:	54.8
	CylinderNo.:	SG900888ALB
	ExpirationDate:	01/31/21

TestDate: 10/17/14 Tester: Tuttle

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	00:09:21	24.8	00:12:45	55.3
Run2	00:35:21	25.1	00:38:41	55.3
Run3	01:16:40	24.5	01:20:00	55.1
Avg.MonitorResponse		24.8		55.2
CalibrationError		-1.2		0.7
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-202COHighAuditTestResultsAnalyzerSpan:5000.0ppm

Mfr&Model: Rosemount SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (1000.0ppm-1500.0ppm)	Concentration:	1238.0
	CylinderNo.:	CC174682
	ExpirationDate:	02/11/16
Mid-LevelCalibrationGas (50-60%ofSpan) (2500.0ppm-3000.0ppm)	Concentration:	2778.0
	CylinderNo.:	CC422138
	ExpirationDate:	09/13/16

TestDate: 10/17/14 Tester: Tuttle

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	00:16:26	1217.2	00:20:06	2731.9
Run2	00:42:21	1207.8	00:45:57	2731.6
Run3	01:23:40	1213.1	01:27:21	2732.2
Avg.MonitorResponse		1212.7		2731.9
CalibrationError		-2.0		-1.7
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-202O2AuditTestResultsAnalyzerSpan:25.00%

Low-LevelCalibrationGas (4.00%-6.00%)	Concentration:	5.05
	CylinderNo.:	CC153920
	ExpirationDate:	02/01/21
Mid-LevelCalibrationGas (8.00%-12.00%)	Concentration:	11.00
	CylinderNo.:	SG900888ALB
	ExpirationDate:	01/31/21

TestDate: 10/17/14 Tester: Tuttle

	Low				Mid			
	Time	Monitor Value	Abs Diff	% Error	Time	Monitor Value	Abs Diff	% Error
Run1	00:09:21	5.03	0.02	-0.4	00:12:45	11.00	0.00	0.0
Run2	00:35:21	5.02	0.03	-0.6	00:38:41	11.02	0.02	0.2
Run3	01:16:40	5.00	0.05	-1.0	01:20:00	10.98	0.02	-0.2
Avg.MonitorResponse		5.02				11.00		
Reference/Target		5.05				11.00		
AbsoluteDifference			0.03				0.00	
%CalibrationError				-0.6				0.0
Performance Specification				15.0%				15.0%
TestStatus	Pass				Pass			

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentrationX100}}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-203NOxLowAuditTestResultsAnalyzerSpan:50.0ppm

Mfr&Model: Rosemount SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (10.0ppm-15.0ppm)	Concentration:	12.6
	CylinderNo.:	cc216801
	ExpirationDate:	02/11/16
Mid-LevelCalibrationGas (50-60%ofSpan) (25.0ppm-30.0ppm)	Concentration:	27.3
	CylinderNo.:	cc331310
	ExpirationDate:	02/11/16

TestDate: 10/17/14 Tester: Tuttle

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	02:30:08	12.7	02:33:48	28.3
Run2	02:56:19	13.0	02:59:59	28.4
Run3	03:22:32	13.0	03:26:12	28.6
Avg.MonitorResponse		12.9		28.4
CalibrationError		2.4		4.0
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentrationX100}}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-203NOxHighAuditTestResultsAnalyzerSpan:150.0ppm

Mfr&Model: Rosemount SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (30.0ppm-45.0ppm)	Concentration:	37.1
	CylinderNo.:	cc267047
	ExpirationDate:	02/27/16
Mid-LevelCalibrationGas (50-60%ofSpan) (75.0ppm-90.0ppm)	Concentration:	83.6
	CylinderNo.:	CC73825
	ExpirationDate:	01/29/22

TestDate: 10/17/14 Tester: Tuttle

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	02:37:28	39.0	02:41:08	86.7
Run2	03:03:41	39.0	03:07:21	86.6
Run3	03:29:52	39.2	03:33:32	87.1
Avg.MonitorResponse		39.1		86.8
CalibrationError		5.4		3.8
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-203COLowAuditTestResultsAnalyzerSpan:100.0ppm

Mfr&Model: Rosemount SerialNumber:

Low-LevelCalibrationGas	Concentration:	25.2
(20-30%ofSpan)	CylinderNo.:	cc21321
(20.0ppm-30.0ppm)	ExpirationDate:	02/01/21
Mid-LevelCalibrationGas	Concentration:	55.6
(50-60%ofSpan)	CylinderNo.:	cc235394
(50.0ppm-60.0ppm)	ExpirationDate:	01/31/21

TestDate: 10/17/14 Tester: Tuttle

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	02:23:09	25.3	02:26:29	56.3
Run2	02:49:19	25.2	02:52:39	56.5
Run3	03:15:33	25.3	03:18:52	56.7
Avg.MonitorResponse		25.3		56.5
CalibrationError		0.4		1.6
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentrationX100}}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-203COHighAuditTestResultsAnalyzerSpan:5000.0ppm

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (1000.0ppm-1500.0ppm)	Concentration:	1241.0
	CylinderNo.:	cc216801
	ExpirationDate:	02/11/16
Mid-LevelCalibrationGas (50-60%ofSpan) (2500.0ppm-3000.0ppm)	Concentration:	2774.0
	CylinderNo.:	cc331310
	ExpirationDate:	02/11/16

TestDate: 10/17/14 Tester:

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	02:30:08	1203.1	02:33:48	2713.1
Run2	02:56:19	1203.8	02:59:59	2713.1
Run3	03:22:32	1203.8	03:26:12	2713.4
Avg.MonitorResponse		1203.6		2713.2
CalibrationError		-3.0		-2.2
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentrationX100}}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhtingRefinery

F-203O2AuditTestResultsAnalyzerSpan:25.00%

Low-LevelCalibrationGas (4.00%-6.00%)	Concentration:	5.01
	CylinderNo.:	203-O2-low
	ExpirationDate:	10/17/17
Mid-LevelCalibrationGas (8.00%-12.00%)	Concentration:	10.94
	CylinderNo.:	203-O2-mid
	ExpirationDate:	01/01/17

TestDate: 10/17/14 Tester: Tuttle

	Low				Mid			
	Time	Monitor Value	Abs Diff	% Error	Time	Monitor Value	Abs Diff	% Error
Run1	02:23:09	5.02	0.01	0.2	02:26:29	10.99	0.05	0.5
Run2	02:49:19	4.99	0.02	-0.4	02:52:39	11.00	0.06	0.5
Run3	03:15:33	5.00	0.01	-0.2	03:18:52	11.00	0.06	0.5
Avg.MonitorResponse		5.00				11.00		
Reference/Target		5.01				10.94		
AbsoluteDifference			0.01				0.06	
%CalibrationError				-0.2				0.5
Performance Specification				15.0%				15.0%
TestStatus	Pass				Pass			

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentrationX100}}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: Location:

DHTNOxAuditTestResultsAnalyzerSpan:100.0ppm

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas	Concentration:	24.6
(20-30%ofSpan)	CylinderNo.:	CC422940
(20.0ppm-30.0ppm)	ExpirationDate:	06/24/17
Mid-LevelCalibrationGas	Concentration:	54.6
(50-60%ofSpan)	CylinderNo.:	CC114328
(50.0ppm-60.0ppm)	ExpirationDate:	07/18/15

TestDate: 10/27/14 Tester: AlTuttle

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	15:18:09	24.9	15:20:49	54.4
Run2	15:34:01	25.1	15:36:40	54.7
Run3	15:48:32	25.0	15:51:16	54.8
Avg.MonitorResponse		25.0		54.6
CalibrationError		1.600		0.000
AbsoluteDifference		0.4		0.0
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentrationX100}}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: Location:

DHTCOLowAuditTestResultsAnalyzerSpan:100.0ppm

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (20.0ppm-30.0ppm)	Concentration:	25.3
	CylinderNo.:	CC200407
	ExpirationDate:	05/09/15
Mid-LevelCalibrationGas (50-60%ofSpan) (50.0ppm-60.0ppm)	Concentration:	54.5
	CylinderNo.:	CC58808
	ExpirationDate:	05/09/15

TestDate: 10/27/14 Tester: AlTuttle

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	15:12:41	24.4	15:15:25	53.1
Run2	15:28:33	25.9	15:31:17	53.5
Run3	15:43:08	26.2	15:45:48	53.6
Avg.MonitorResponse		25.5		53.4
CalibrationError		0.800		-2.000
AbsoluteDifference		0.2		1.1
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentrationX100}}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: Location:

DHTCOHighAuditTestResultsAnalyzerSpan:5000.0ppm

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (1000.0ppm-1500.0ppm)	Concentration:	1249.0
	CylinderNo.:	CC422940
	ExpirationDate:	06/24/17
Mid-LevelCalibrationGas (50-60%ofSpan) (2500.0ppm-3000.0ppm)	Concentration:	2819.0
	CylinderNo.:	CC114328
	ExpirationDate:	07/18/15

TestDate: 10/27/14 Tester: MC

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	15:18:09	1255.6	15:20:49	2782.5
Run2	15:34:01	1255.9	15:36:40	2786.6
Run3	15:48:32	1256.6	15:51:16	2784.4
Avg.MonitorResponse		1256.0		2784.5
CalibrationError		0.600		-1.200
AbsoluteDifference		7.0		34.5
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: Location:

DHTO2AuditTestResultsAnalyzerSpan:25.00%

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (4.00%-6.00%)	Concentration:	5.03
	CylinderNo.:	CC200407
	ExpirationDate:	05/09/15
Mid-LevelCalibrationGas (8.00%-12.00%)	Concentration:	11.01
	CylinderNo.:	CC58808
	ExpirationDate:	05/09/15

TestDate: 10/27/14 Tester: AlTuttle

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	15:12:41	5.02	15:15:25	10.89
Run2	15:28:33	5.00	15:31:17	10.87
Run3	15:43:08	5.00	15:45:48	10.88
Avg.MonitorResponse		5.01		10.88
CalibrationError		-0.400		-1.200
AbsoluteDifference		0.02		0.13
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: Location:

GOHTH2SAuditTestResultsAnalyzerSpan:300.0ppm

Mfr&Model: SiemansMaxumII SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (60.0ppm-90.0ppm)	Concentration:	75.7
	CylinderNo.:	CC240098
	ExpirationDate:	02/22/16
Mid-LevelCalibrationGas (50-60%ofSpan) (150.0ppm-180.0ppm)	Concentration:	159.7
	CylinderNo.:	CC337284
	ExpirationDate:	12/09/16

TestDate: 12/18/14 Tester: wulitich

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	09:00:49	72.3	09:13:18	152.5
Run2	09:25:49	74.0	09:38:16	156.4
Run3	09:50:50	75.3	10:03:17	158.2
Avg.MonitorResponse		73.9		155.7
CalibrationError		-2.400		-2.500
AbsoluteDifference		1.8		4.0
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

SFH2SAuditTestResultsAnalyzerSpan:300.0ppm

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (60.0ppm-90.0ppm)	Concentration:	75.7
	CylinderNo.:	CC411623
	ExpirationDate:	09/04/16
Mid-LevelCalibrationGas (50-60%ofSpan) (150.0ppm-180.0ppm)	Concentration:	163.7
	CylinderNo.:	CC405401
	ExpirationDate:	01/22/17

TestDate: 10/29/14 Tester: DW

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	08:13:09	80.0	08:25:05	158.0
Run2	08:37:06	74.4	08:49:06	156.5
Run3	09:01:10	75.3	09:13:05	156.0
Avg.MonitorResponse		76.6		156.8
CalibrationError		1.200		-4.200
AbsoluteDifference		0.9		6.9
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

TGU-ACOLowAuditTestResultsAnalyzerSpan:100.0ppm

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (20.0ppm-30.0ppm)	Concentration:	25.0
	CylinderNo.:	CC15581
	ExpirationDate:	07/23/21
Mid-LevelCalibrationGas (50-60%ofSpan) (50.0ppm-60.0ppm)	Concentration:	55.9
	CylinderNo.:	CC288294
	ExpirationDate:	07/23/21

TestDate: 10/03/14 Tester: DW

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	00:47:27	23.6	00:52:27	53.0
Run2	01:21:23	23.6	01:26:23	53.0
Run3	01:54:26	23.6	01:59:26	53.0
Avg.MonitorResponse		23.6		53.0
CalibrationError		-5.600		-5.200
AbsoluteDifference		1.4		2.9
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentrationX100}}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

TGU-ACOHighAuditTestResultsAnalyzerSpan:2500.0ppm

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas	Concentration:	628.0
(20-30%ofSpan)	CylinderNo.:	CC260700
(500.0ppm-750.0ppm)	ExpirationDate:	07/23/21
Mid-LevelCalibrationGas	Concentration:	1355.0
(50-60%ofSpan)	CylinderNo.:	CC274110
(1250.0ppm-1500.0ppm)	ExpirationDate:	07/23/21

TestDate: 10/03/14 Tester: DW

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	00:56:27	591.1	01:00:27	1299.8
Run2	01:30:23	590.9	01:34:22	1298.9
Run3	02:03:26	590.0	02:07:26	1298.0
Avg.MonitorResponse		590.7		1298.9
CalibrationError		-5.900		-4.100
AbsoluteDifference		37.3		56.1
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentrationX100}}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

TGU-ASO2HighAuditTestResultsAnalyzerSpan:3000.0ppm

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (600.0ppm-900.0ppm)	Concentration:	748.0
	CylinderNo.:	CC260700
	ExpirationDate:	07/23/21
Mid-LevelCalibrationGas (50-60%ofSpan) (1500.0ppm-1800.0ppm)	Concentration:	1666.0
	CylinderNo.:	CC274110
	ExpirationDate:	07/23/21

TestDate: 10/03/14 Tester: dw

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	00:56:27	758.1	01:00:27	1693.1
Run2	01:30:23	757.9	01:34:22	1692.2
Run3	02:03:26	759.2	02:07:26	1693.3
Avg.MonitorResponse		758.4		1692.9
CalibrationError		1.400		1.600
AbsoluteDifference		10.4		26.9
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentrationX100}}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

TGU-ASO2LowAuditTestResultsAnalyzerSpan:500.0ppm

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (100.0ppm-150.0ppm)	Concentration:	128.6
	CylinderNo.:	CC15581
	ExpirationDate:	07/23/21
Mid-LevelCalibrationGas (50-60%ofSpan) (250.0ppm-300.0ppm)	Concentration:	278.2
	CylinderNo.:	CC288294
	ExpirationDate:	07/23/21

TestDate: 10/03/14 Tester: dw

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	00:47:27	125.2	00:52:27	277.8
Run2	01:21:23	126.3	01:26:23	281.2
Run3	01:54:26	126.0	01:59:26	279.0
Avg.MonitorResponse		125.8		279.3
CalibrationError		-2.200		0.400
AbsoluteDifference		2.8		1.1
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

TGU-AO2AuditTestResultsAnalyzerSpan:25.00%

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (4.00%-6.00%)	Concentration:	4.99
	CylinderNo.:	CC13807
	ExpirationDate:	07/11/21
Mid-LevelCalibrationGas (8.00%-12.00%)	Concentration:	10.04
	CylinderNo.:	CC409458
	ExpirationDate:	07/15/21

TestDate: 10/03/14 Tester: DW

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	01:03:27	4.92	01:06:27	9.90
Run2	01:37:22	4.92	01:40:22	9.89
Run3	02:10:26	4.91	02:13:26	9.89
Avg.MonitorResponse		4.92		9.89
CalibrationError		-1.400		-1.500
AbsoluteDifference		0.07		0.15
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

TGU-BCOLowAuditTestResultsAnalyzerSpan:100.0ppm

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (20.0ppm-30.0ppm)	Concentration:	25.0
	CylinderNo.:	CC50733
	ExpirationDate:	07/23/21
Mid-LevelCalibrationGas (50-60%ofSpan) (50.0ppm-60.0ppm)	Concentration:	55.7
	CylinderNo.:	CC215795
	ExpirationDate:	07/23/21

TestDate: 10/28/14 Tester: wulitich

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	00:41:32	21.9	00:46:32	51.2
Run2	01:15:51	21.8	01:20:51	51.1
Run3	01:49:15	21.8	01:54:18	51.1
Avg.MonitorResponse		21.8		51.1
CalibrationError		-12.800		-8.300
AbsoluteDifference		3.2		4.6
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

TGU-BCOHighAuditTestResultsAnalyzerSpan:2500.0ppm

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (500.0ppm-750.0ppm)	Concentration:	629.4
	CylinderNo.:	CC260807
	ExpirationDate:	07/23/21
Mid-LevelCalibrationGas (50-60%ofSpan) (1250.0ppm-1500.0ppm)	Concentration:	1363.0
	CylinderNo.:	CC209206
	ExpirationDate:	07/23/21

TestDate: 10/28/14 Tester: wulitich

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	00:50:32	589.8	00:54:31	1305.0
Run2	01:24:51	589.8	01:28:51	1305.0
Run3	01:58:18	589.8	02:02:18	1305.0
Avg.MonitorResponse		589.8		1305.0
CalibrationError		-6.300		-4.300
AbsoluteDifference		39.6		58.0
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration}}{\text{Cal.GasConcentration}} \times 100$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

TGU-BSO2LowAuditTestResultsAnalyzerSpan:500.0ppm

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas	Concentration:	128.8
(20-30%ofSpan)	CylinderNo.:	CC50733
(100.0ppm-150.0ppm)	ExpirationDate:	07/23/21
Mid-LevelCalibrationGas	Concentration:	281.3
(50-60%ofSpan)	CylinderNo.:	CC215795
(250.0ppm-300.0ppm)	ExpirationDate:	07/23/21

TestDate: 10/28/14 Tester: wulitich

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	00:41:32	125.3	00:46:32	278.7
Run2	01:15:51	125.1	01:20:51	279.1
Run3	01:49:15	125.5	01:54:18	278.9
Avg.MonitorResponse		125.3		278.9
CalibrationError		-2.700		-0.900
AbsoluteDifference		3.5		2.4
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentrationX100}}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q3

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

TGU-BSO2HighAuditTestResultsAnalyzerSpan:3000.0ppm

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (600.0ppm-900.0ppm)	Concentration:	748.0
	CylinderNo.:	CC260807
	ExpirationDate:	07/23/21
Mid-LevelCalibrationGas (50-60%ofSpan) (1500.0ppm-1800.0ppm)	Concentration:	1667.0
	CylinderNo.:	CC209206
	ExpirationDate:	07/23/21

TestDate: 07/10/14 Tester: DW,CN

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	09:22:54	756.2	09:26:54	1682.4
Run2	09:56:54	752.8	10:00:54	1688.1
Run3	10:31:45	756.2	10:35:45	1684.7
Avg.MonitorResponse		755.1		1685.1
CalibrationError		0.900		1.100
AbsoluteDifference		7.1		18.1
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

TGU-BO2AuditTestResultsAnalyzerSpan:25.00%

Mfr&Model: SerialNumber:

Low-LevelCalibrationGas (4.00%-6.00%)	Concentration:	4.81
	CylinderNo.:	CC245088
	ExpirationDate:	07/11/21
Mid-LevelCalibrationGas (8.00%-12.00%)	Concentration:	10.03
	CylinderNo.:	CC164876
	ExpirationDate:	07/15/21

TestDate: 10/28/14 Tester: wulitich

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	00:57:31	4.75	01:00:31	9.95
Run2	01:31:51	4.75	01:34:51	9.95
Run3	02:05:18	4.74	02:08:18	9.93
Avg.MonitorResponse		4.75		9.94
CalibrationError		-1.200		-0.900
AbsoluteDifference		0.06		0.09
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

FCU500NOxAuditTestResultsAnalyzerSpan:120.0ppm

Mfr&Model: RosemountMLT/CLD SerialNumber:

Low-LevelCalibrationGas	Concentration:	30.0
(20-30%ofSpan)	CylinderNo.:	CC360535
(24.0ppm-36.0ppm)	ExpirationDate:	04/15/16
Mid-LevelCalibrationGas	Concentration:	66.1
(50-60%ofSpan)	CylinderNo.:	CC350976
(60.0ppm-72.0ppm)	ExpirationDate:	04/15/16

TestDate: 12/10/14 Tester: wulitich

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	02:52:42	33.1	02:58:42	67.5
Run2	03:29:41	33.0	03:35:41	67.5
Run3	04:13:32	33.1	04:19:33	67.6
Avg.MonitorResponse		33.1		67.5
CalibrationError		10.300		2.100
AbsoluteDifference		3.1		1.4
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

FCU500COAuditTestResultsAnalyzerSpan:1000.0ppm

Mfr&Model: RosemountMLT/CLD SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (200.0ppm-300.0ppm)	Concentration:	251.6
	CylinderNo.:	XC005499B
	ExpirationDate:	05/14/15
Mid-LevelCalibrationGas (50-60%ofSpan) (500.0ppm-600.0ppm)	Concentration:	555.1
	CylinderNo.:	CC182925
	ExpirationDate:	05/14/15

TestDate: 12/10/14 Tester: wulitich

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	02:39:38	262.8	02:42:37	565.4
Run2	03:16:37	263.1	03:19:37	565.1
Run3	04:00:29	262.8	04:03:28	564.7
Avg.MonitorResponse		262.9		565.1
CalibrationError		4.500		1.800
AbsoluteDifference		11.3		10.0
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration}}{\text{Cal.GasConcentration}} \times 100$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

FCU500CO2AuditTestResultsAnalyzerSpan:30.00%

Mfr&Model: RosemountMLT/CLD SerialNumber:

Low-LevelCalibrationGas (5.00%-8.00%)
Concentration: 7.44
CylinderNo.: CC360535
ExpirationDate: 04/15/16

Mid-LevelCalibrationGas (10.00%-14.00%)
Concentration: 16.42
CylinderNo.: CC350976
ExpirationDate: 04/15/16

TestDate: 12/10/14 Tester: wulitich

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	02:52:42	6.62	02:58:42	15.97
Run2	03:29:41	6.62	03:35:41	15.98
Run3	04:13:32	6.61	04:19:33	16.00
Avg.MonitorResponse		6.62		15.98
CalibrationError		-11.000		-2.700
AbsoluteDifference		0.82		0.44
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

FCU500SO2AuditTestResultsAnalyzerSpan:100.0ppm

Mfr&Model: RosemountMLT/CLD SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (20.0ppm-30.0ppm)	Concentration:	24.0
	CylinderNo.:	CC360535
	ExpirationDate:	04/15/16
Mid-LevelCalibrationGas (50-60%ofSpan) (50.0ppm-60.0ppm)	Concentration:	56.6
	CylinderNo.:	CC350976
	ExpirationDate:	04/15/16

TestDate: 12/10/14 Tester: wulitich

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	02:52:42	26.5	02:58:42	58.7
Run2	03:29:41	26.3	03:35:41	59.2
Run3	04:13:32	25.4	04:19:33	57.9
Avg.MonitorResponse		26.1		58.6
CalibrationError		8.800		3.500
AbsoluteDifference		2.1		2.0
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

FCU500O2AuditTestResultsAnalyzerSpan:10.00%

Mfr&Model: RosemountMLT/CLD SerialNumber:

Low-LevelCalibrationGas (4.00%-6.00%)
Concentration: 5.02
CylinderNo.: XC005499B
ExpirationDate: 05/14/15

Mid-LevelCalibrationGas (8.00%-12.00%)
Concentration: 9.04
CylinderNo.: CC182925
ExpirationDate: 05/14/15

TestDate: 12/10/14 Tester: wulitich

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	02:39:38	5.07	02:42:37	9.18
Run2	03:16:37	5.08	03:19:37	9.17
Run3	04:00:29	5.08	04:03:28	9.17
Avg.MonitorResponse		5.08		9.17
CalibrationError		1.200		1.400
AbsoluteDifference		0.06		0.13
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

FCU600NOxAuditTestResultsAnalyzerSpan:80.0ppm

Mfr&Model: ROSEMOUNT SerialNumber:

Low-LevelCalibrationGas	Concentration:	19.5
(20-30%ofSpan)	CylinderNo.:	CC206521
(16.0ppm-24.0ppm)	ExpirationDate:	04/16/16
Mid-LevelCalibrationGas	Concentration:	43.9
(50-60%ofSpan)	CylinderNo.:	CC179076
(40.0ppm-48.0ppm)	ExpirationDate:	04/15/16

TestDate: 12/11/14 Tester: wulitich

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	01:43:17	17.2	01:47:17	39.6
Run2	02:18:09	17.2	02:22:09	39.7
Run3	02:57:17	17.2	03:01:17	39.7
Avg.MonitorResponse		17.2		39.7
CalibrationError		-11.800		-9.600
AbsoluteDifference		2.3		4.2
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

FCU600COAuditTestResultsAnalyzerSpan:1000.0ppm

Mfr&Model: ROSEMOUNT SerialNumber:

Low-LevelCalibrationGas (20-30%ofSpan) (200.0ppm-300.0ppm)	Concentration:	247.9
	CylinderNo.:	CC124749
	ExpirationDate:	11/03/22
Mid-LevelCalibrationGas (50-60%ofSpan) (500.0ppm-600.0ppm)	Concentration:	555.0
	CylinderNo.:	CC287097
	ExpirationDate:	05/14/15

TestDate: 12/11/14 Tester: wulitich

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	01:33:13	256.0	01:36:13	572.1
Run2	02:08:05	256.0	02:11:05	572.0
Run3	02:46:21	256.4	02:49:21	572.4
Avg.MonitorResponse		256.1		572.2
CalibrationError		3.300		3.100
AbsoluteDifference		8.2		17.2
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

FCU600SO2AuditTestResultsAnalyzerSpan:100.0ppm

Mfr&Model: ROSEMOUNT SerialNumber:

Low-LevelCalibrationGas	Concentration:	24.8
(20-30%ofSpan)	CylinderNo.:	CC206521
(20.0ppm-30.0ppm)	ExpirationDate:	04/16/16
Mid-LevelCalibrationGas	Concentration:	56.6
(50-60%ofSpan)	CylinderNo.:	CC179076
(50.0ppm-60.0ppm)	ExpirationDate:	04/15/16

TestDate: 12/11/14 Tester: wulitich

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	01:43:17	23.3	01:47:17	54.7
Run2	02:18:09	23.0	02:22:09	54.6
Run3	02:57:17	23.1	03:01:17	54.7
Avg.MonitorResponse		23.1		54.7
CalibrationError		-6.900		-3.400
AbsoluteDifference		1.7		1.9
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse} - \text{Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

FCU600CO2AuditTestResultsAnalyzerSpan:30.00%

Mfr&Model: ROSEMOUNT SerialNumber:

Low-LevelCalibrationGas (5.00%-8.00%)
Concentration: 7.53
CylinderNo.: CC206521
ExpirationDate: 04/16/16

Mid-LevelCalibrationGas (10.00%-14.00%)
Concentration: 16.41
CylinderNo.: CC179076
ExpirationDate: 04/15/16

TestDate: 12/11/14 Tester: wulitich

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	01:43:17	6.54	01:47:17	15.69
Run2	02:18:09	6.54	02:22:09	15.69
Run3	02:57:17	6.54	03:01:17	15.68
Avg.MonitorResponse		6.54		15.69
CalibrationError		-13.100		-4.400
AbsoluteDifference		0.99		0.72
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

CGATestReport-2014Q4

FacilityName: BPProductsNorthAmerica,Inc. Location: WhitingRefinery

FCU600O2AuditTestResultsAnalyzerSpan:10.00%

Mfr&Model: ROSEMOUNT SerialNumber:

Low-LevelCalibrationGas (4.00%-6.00%)
Concentration: 4.94
CylinderNo.: CC124749
ExpirationDate: 11/03/22

Mid-LevelCalibrationGas (8.00%-12.00%)
Concentration: 8.98
CylinderNo.: CC287097
ExpirationDate: 05/14/15

TestDate: 12/11/14 Tester: wulitich

	Low		Mid	
	Time	Monitor Value	Time	Monitor Value
Run1	01:33:13	5.19	01:36:13	9.33
Run2	02:08:05	5.19	02:11:05	9.32
Run3	02:46:21	5.19	02:49:21	9.32
Avg.MonitorResponse		5.19		9.32
CalibrationError		5.100		3.800
AbsoluteDifference		0.25		0.34
TestStatus		Pass		Pass

$$\text{CalibrationError} = \frac{\text{Avg.MonitorResponse-Cal.GasConcentration} \times 100}{\text{Cal.GasConcentration}}$$

Babcock & Wilcox Power Generation Group NetDAHS©

Version 84.0

CGA Calibration Report
Generated: 10/1/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/1/2014
Period End: 10/1/2014
Included Calibrations: **CGA (40CFR60)**

Range of Analyzers:				Span of Analyzers:			
O2_31	O2	0.00	25.00 %O2	O2_31	O2	0.00	25.00 %O2
COLow_31	CO	0.00	100.00 ppm	COLow_31	CO	0.00	100.00 ppm
COHigh_31	CO	0	5000 ppm	COHigh_31	CO	0	5000 ppm
NOxLow_31	NOx	0.00	50.00 ppm	NOxLow_31	NOx	0.00	50.00 ppm
NOxHigh_31	NOx	0.0	700.0 ppm	NOxHigh_31	NOx	0.0	700.0 ppm

Date	Time	From 3 Pt.	Channel		Type	Target Units	Actual Units	Diff Units	Error %	CGA Allowable (40CFR60) Units	%		Bottle ID	Expire Date
10/01/2014	02:13	*	COHigh_31	CO	LOW	1230.0	1211.0	-19.0	-1.5	184.5	15.0	PASS	SG9142063BAL	2/24/2017
10/01/2014	02:13	*	COHigh_31	CO	MID	2735.0	2704.0	-31.0	-1.1	410.3	15.0	PASS	CC216465	5/25/2017
10/01/2014	01:33	*	COHigh_31	CO	LOW	1230.0	1211.0	-19.0	-1.5	184.5	15.0	PASS	SG9142063BAL	2/24/2017
10/01/2014	01:33	*	COHigh_31	CO	MID	2735.0	2704.0	-31.0	-1.1	410.3	15.0	PASS	CC216465	5/25/2017
10/01/2014	00:25	*	COHigh_31	CO	LOW	1230.0	1211.0	-19.0	-1.5	184.5	15.0	PASS	SG9142063BAL	2/24/2017
10/01/2014	00:25	*	COHigh_31	CO	MID	2735.0	2706.0	-29.0	-1.1	410.3	15.0	PASS	CC216465	5/25/2017
10/01/2014	02:13	*	COLow_31	CO	LOW	24.5	23.7	-0.8	-3.3	3.7	15.0	PASS	CC439467	2/14/2022
10/01/2014	02:13	*	COLow_31	CO	MID	56.0	53.1	-2.9	-5.2	8.4	15.0	PASS	CC107578	5/1/2021
10/01/2014	01:33	*	COLow_31	CO	LOW	24.5	23.6	-0.9	-3.7	3.7	15.0	PASS	CC439467	2/14/2022
10/01/2014	01:33	*	COLow_31	CO	MID	56.0	53.0	-3.0	-5.4	8.4	15.0	PASS	CC107578	5/1/2021
10/01/2014	00:25	*	COLow_31	CO	LOW	24.5	23.6	-0.9	-3.8	3.7	15.0	PASS	CC439467	2/14/2022
10/01/2014	00:25	*	COLow_31	CO	MID	56.0	53.0	-3.0	-5.4	8.4	15.0	PASS	CC107578	5/1/2021
10/01/2014	02:13	*	NOxHigh_31	NOx	LOW	175.5	184.2	8.7	5.0	26.3	15.0	PASS	SG9151432BAL	3/3/2022
10/01/2014	02:13	*	NOxHigh_31	NOx	MID	391.0	395.6	4.6	1.2	58.7	15.0	PASS	CC417045	3/3/2022
10/01/2014	01:33	*	NOxHigh_31	NOx	LOW	175.5	184.1	8.6	4.9	26.3	15.0	PASS	SG9151432BAL	3/3/2022
10/01/2014	01:33	*	NOxHigh_31	NOx	MID	391.0	395.6	4.6	1.2	58.7	15.0	PASS	CC417045	3/3/2022
10/01/2014	00:25	*	NOxHigh_31	NOx	LOW	175.5	183.9	8.4	4.8	26.3	15.0	PASS	SG9151432BAL	3/3/2022
10/01/2014	00:25	*	NOxHigh_31	NOx	MID	391.0	395.9	4.9	1.3	58.7	15.0	PASS	CC417045	3/3/2022
10/01/2014	02:13	*	NOxLow_31	NOx	LOW	12.5	11.8	-0.7	-5.4	1.9	15.0	PASS	SG9142063BAL	2/24/2017
10/01/2014	02:13	*	NOxLow_31	NOx	MID	27.5	26.9	-0.6	-2.2	4.1	15.0	PASS	CC216465	5/25/2017
10/01/2014	01:33	*	NOxLow_31	NOx	LOW	12.5	11.8	-0.7	-5.7	1.9	15.0	PASS	SG9142063BAL	2/24/2017
10/01/2014	01:33	*	NOxLow_31	NOx	MID	27.5	26.9	-0.6	-2.3	4.1	15.0	PASS	CC216465	5/25/2017
10/01/2014	00:25	*	NOxLow_31	NOx	LOW	12.5	11.7	-0.7	-5.9	1.9	15.0	PASS	SG9142063BAL	2/24/2017
10/01/2014	00:25	*	NOxLow_31	NOx	MID	27.5	26.9	-0.6	-2.3	4.1	15.0	PASS	CC216465	5/25/2017
10/01/2014	02:13	*	O2_31	O2	LOW	6.2	6.2	0.0	0.6	0.9	15.0	PASS	CC439467	2/14/2022
10/01/2014	02:13	*	O2_31	O2	MID	13.9	13.8	0.0	-0.3	2.1	15.0	PASS	CC107578	5/1/2021

CGA Calibration Report
Generated: 10/1/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/1/2014
Period End: 10/1/2014
Included Calibrations: **CGA (40CFR60)**

Date	Time	From 3 Pt.	Channel		Type	Target Units	Actual Units	Diff Units	Error %	CGA Allowable (40CFR60) Units	%		Bottle ID	Expire Date
10/01/2014	01:33	*	O2_31	O2	LOW	6.2	6.3	0.1	0.8	0.9	15.0	PASS	CC439467	2/14/2022
10/01/2014	01:33	*	O2_31	O2	MID	13.9	13.8	0.0	-0.3	2.1	15.0	PASS	CC107578	5/1/2021
10/01/2014	00:25	*	O2_31	O2	LOW	6.2	6.3	0.1	0.8	0.9	15.0	PASS	CC439467	2/14/2022
10/01/2014	00:25	*	O2_31	O2	MID	13.9	13.9	0.0	-0.2	2.1	15.0	PASS	CC107578	5/1/2021

FAIL = Difference Error > Regulations Allow
TARG = Invalid Target (not within regulatory specs)
RDG = Reading exceeds "Range of Analyzer"
@ Bottle is within 7 days of expiration
# Bottle has Expired - Must be Replaced

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) * 100

Channel		----LOW---- Diff Units	Target %	----MID---- Diff Units	Target %
COHigh_31	CO	19.0	1.5%	30.3	1.1%
COLow_31	CO	0.9	3.6%	3.0	5.3%
NOxHigh_31	NOx	8.6	4.9%	4.7	1.2%
NOxLow_31	NOx	0.7	5.7%	0.6	2.2%
O2_31	O2	0.0	0.8%	0.0	0.3%

Performance Specification

Channel		PASS	FAIL
COHigh_31	CO	<=15.0%	>15.0%
COLow_31	CO	<=15.0%	>15.0%
NOxHigh_31	NOx	<=15.0%	>15.0%
NOxLow_31	NOx	<=15.0%	>15.0%
O2_31	O2	<=15.0%	>15.0%

Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA O2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target

Title:: _____ Signature:: _____ Date: / /

Title:: _____ Signature:: _____ Date: / /

Babcock & Wilcox Power Generation Group NetDAHS©

Version 84.0

Linearity Calibration Report
Generated: 10/1/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/1/2014
Period End: 10/1/2014
Included Calibrations: **Linearity (40CFR75)**

Range of Analyzers:

O2_31	O2	0.00	25.00 %O2
COLow_31	CO	0.00	100.00 ppm
COHigh_31	CO	0	5000 ppm
NOxLow_31	NOx	0.00	50.00 ppm
NOxHigh_31	NOx	0.0	700.0 ppm

Span of Analyzers:

O2_31	O2	0.00	25.00 %O2
COLow_31	CO	0.00	100.00 ppm
COHigh_31	CO	0	5000 ppm
NOxLow_31	NOx	0.00	50.00 ppm
NOxHigh_31	NOx	0.0	700.0 ppm

Date	Time	Channel		Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	%		Bottle ID	Expire Date
10/01/2014	02:13	COHigh_31	CO	LOW	1230.000	1211.000	-19.000	- N/A -	- N/A -	- N/A -	- N/A -	SG9142063BAL	2/24/2017
10/01/2014	02:13	COHigh_31	CO	MID	2735.000	2704.000	-31.000	- N/A -	- N/A -	- N/A -	- N/A -	CC216465	5/25/2017
10/01/2014	02:13	COHigh_31	CO	HIGH	4585.000	4549.000	-36.000	- N/A -	- N/A -	- N/A -	- N/A -	CC326244	12/30/2016
10/01/2014	01:33	COHigh_31	CO	LOW	1230.000	1211.000	-19.000	- N/A -	- N/A -	- N/A -	- N/A -	SG9142063BAL	2/24/2017
10/01/2014	01:33	COHigh_31	CO	MID	2735.000	2704.000	-31.000	- N/A -	- N/A -	- N/A -	- N/A -	CC216465	5/25/2017
10/01/2014	01:33	COHigh_31	CO	HIGH	4585.000	4548.000	-37.000	- N/A -	- N/A -	- N/A -	- N/A -	CC326244	12/30/2016
10/01/2014	00:25	COHigh_31	CO	LOW	1230.000	1211.000	-19.000	- N/A -	- N/A -	- N/A -	- N/A -	SG9142063BAL	2/24/2017
10/01/2014	00:25	COHigh_31	CO	MID	2735.000	2706.000	-29.000	- N/A -	- N/A -	- N/A -	- N/A -	CC216465	5/25/2017
10/01/2014	00:25	COHigh_31	CO	HIGH	4585.000	4553.000	-32.000	- N/A -	- N/A -	- N/A -	- N/A -	CC326244	12/30/2016
10/01/2014	02:13	COLow_31	CO	LOW	24.540	23.720	-0.820	- N/A -	- N/A -	- N/A -	- N/A -	CC439467	2/14/2022
10/01/2014	02:13	COLow_31	CO	MID	56.000	53.090	-2.910	- N/A -	- N/A -	- N/A -	- N/A -	CC107578	5/1/2021
10/01/2014	02:13	COLow_31	CO	HIGH	90.600	86.280	-4.320	- N/A -	- N/A -	- N/A -	- N/A -	CC437348	12/24/2021
10/01/2014	01:33	COLow_31	CO	LOW	24.540	23.620	-0.920	- N/A -	- N/A -	- N/A -	- N/A -	CC439467	2/14/2022
10/01/2014	01:33	COLow_31	CO	MID	56.000	52.970	-3.030	- N/A -	- N/A -	- N/A -	- N/A -	CC107578	5/1/2021
10/01/2014	01:33	COLow_31	CO	HIGH	90.600	86.140	-4.460	- N/A -	- N/A -	- N/A -	- N/A -	CC437348	12/24/2021
10/01/2014	00:25	COLow_31	CO	LOW	24.540	23.600	-0.940	- N/A -	- N/A -	- N/A -	- N/A -	CC439467	2/14/2022
10/01/2014	00:25	COLow_31	CO	MID	56.000	52.980	-3.020	- N/A -	- N/A -	- N/A -	- N/A -	CC107578	5/1/2021
10/01/2014	00:25	COLow_31	CO	HIGH	90.600	86.140	-4.460	- N/A -	- N/A -	- N/A -	- N/A -	CC437348	12/24/2021
10/01/2014	02:13	NOxHigh_31	NOx	LOW	175.500	184.200	8.700	5.0	8.775	5.0	PASS	SG9151432BAL	3/3/2022
10/01/2014	02:13	NOxHigh_31	NOx	MID	391.000	395.600	4.600	1.2	19.550	5.0	PASS	CC417045	3/3/2022
10/01/2014	02:13	NOxHigh_31	NOx	HIGH	632.400	624.900	-7.500	-1.2	31.620	5.0	PASS	SG9137976BAL	4/8/2022
10/01/2014	01:33	NOxHigh_31	NOx	LOW	175.500	184.100	8.600	4.9	8.775	5.0	PASS	SG9151432BAL	3/3/2022
10/01/2014	01:33	NOxHigh_31	NOx	MID	391.000	395.600	4.600	1.2	19.550	5.0	PASS	CC417045	3/3/2022
10/01/2014	01:33	NOxHigh_31	NOx	HIGH	632.400	625.000	-7.400	-1.2	31.620	5.0	PASS	SG9137976BAL	4/8/2022
10/01/2014	00:25	NOxHigh_31	NOx	LOW	175.500	183.900	8.400	4.8	8.775	5.0	PASS	SG9151432BAL	3/3/2022
10/01/2014	00:25	NOxHigh_31	NOx	MID	391.000	395.900	4.900	1.3	19.550	5.0	PASS	CC417045	3/3/2022
10/01/2014	00:25	NOxHigh_31	NOx	HIGH	632.400	624.900	-7.500	-1.2	31.620	5.0	PASS	SG9137976BAL	4/8/2022

Linearity Calibration Report
Generated: 10/1/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/1/2014
Period End: 10/1/2014
Included Calibrations: **Linearity (40CFR75)**

Date	Time	Channel		Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	%		Bottle ID	Expire Date
10/01/2014	02:13	NOxLow_31	NOx	LOW	12.460	11.790	-0.670	-5.6	0.000	5.0	PASS	SG9142063BAL	2/24/2017
10/01/2014	02:13	NOxLow_31	NOx	MID	27.490	26.890	-0.600	-2.2	1.375	5.0	PASS	CC216465	5/25/2017
10/01/2014	02:13	NOxLow_31	NOx	HIGH	44.080	43.340	-0.740	-1.6	2.204	5.0	PASS	CC326244	12/30/2016
10/01/2014	01:33	NOxLow_31	NOx	LOW	12.460	11.750	-0.710	-5.6	0.000	5.0	PASS	SG9142063BAL	2/24/2017
10/01/2014	01:33	NOxLow_31	NOx	MID	27.490	26.860	-0.630	-2.2	1.375	5.0	PASS	CC216465	5/25/2017
10/01/2014	01:33	NOxLow_31	NOx	HIGH	44.080	43.340	-0.740	-1.6	2.204	5.0	PASS	CC326244	12/30/2016
10/01/2014	00:25	NOxLow_31	NOx	LOW	12.460	11.720	-0.740	-5.6	0.000	5.0	PASS	SG9142063BAL	2/24/2017
10/01/2014	00:25	NOxLow_31	NOx	MID	27.490	26.870	-0.620	-2.2	1.375	5.0	PASS	CC216465	5/25/2017
10/01/2014	00:25	NOxLow_31	NOx	HIGH	44.080	43.270	-0.810	-1.8	2.204	5.0	PASS	CC326244	12/30/2016
10/01/2014	02:13	O2_31	O2	LOW	6.200	6.240	0.040	0.0	0.310	5.0	PASS	CC439467	2/14/2022
10/01/2014	02:13	O2_31	O2	MID	13.880	13.840	-0.040	0.0	0.694	5.0	PASS	CC107578	5/1/2021
10/01/2014	02:13	O2_31	O2	HIGH	20.970	21.030	0.060	0.5	1.048	5.0	PASS	CC437348	12/24/2021
10/01/2014	01:33	O2_31	O2	LOW	6.200	6.250	0.050	1.6	0.310	5.0	PASS	CC439467	2/14/2022
10/01/2014	01:33	O2_31	O2	MID	13.880	13.840	-0.040	0.0	0.694	5.0	PASS	CC107578	5/1/2021
10/01/2014	01:33	O2_31	O2	HIGH	20.970	21.030	0.060	0.5	1.048	5.0	PASS	CC437348	12/24/2021
10/01/2014	00:25	O2_31	O2	LOW	6.200	6.250	0.050	1.6	0.310	5.0	PASS	CC439467	2/14/2022
10/01/2014	00:25	O2_31	O2	MID	13.880	13.850	-0.030	0.0	0.694	5.0	PASS	CC107578	5/1/2021
10/01/2014	00:25	O2_31	O2	HIGH	20.970	21.030	0.060	0.5	1.048	5.0	PASS	CC437348	12/24/2021

FAIL = Difference Error > Regulations Allow
TARG = Invalid Target (not within regulatory specs)
RDG = Reading exceeds "Range of Analyzer"
Note: 40CFR75 pass/fail determination is performed after rounding the value of Error%, or Drift, to one decimal place

@ Bottle is within 7 days of expiration
# Bottle has Expired - Must be Replaced

Linearity Calibration Report
Generated: 10/1/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/1/2014
Period End: 10/1/2014
Included Calibrations: **Linearity (40CFR75)**

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) * 100

		----LOW----		----MID----		----HIGH----	
Channel		Diff Units	Target %	Diff Units	Target %	Diff Units	Target %
COHigh_31	CO	19.000	- N/A -	30.333	- N/A -	35.000	- N/A -
COLow_31	CO	0.893	- N/A -	2.987	- N/A -	4.413	- N/A -
NOxHigh_31	NOx	8.567	4.9%	4.700	1.2%	7.467	1.2%
NOxLow_31	NOx	0.707	5.7%	0.617	2.2%	0.763	1.7%
O2_31	O2	0.047	0.8%	0.037	0.3%	0.060	0.3%

Performance Specification

Channel		PASS	FAIL
COHigh_31	CO	- N/A -	- N/A -
COLow_31	CO	- N/A -	- N/A -
NOxHigh_31	NOx	<=5.0%	>5.0%
NOxLow_31	NOx	<=5.0%	>5.0%
O2_31	O2	<=5.0%	>5.0%

Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part75 Linearity O2] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity O2] Low = 0.5 %O2, Mid = 0.5 %O2, High = 0.5 %O2

Title:: Signature:: Date: / /

Title:: Signature:: Date: / /

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Version 84.0

CGA Calibration Report
Generated: 10/15/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/2/2014
Period End: 10/2/2014
Included Calibrations: **CGA (40CFR60)**

Range of Analyzers:

O2_32	O2	0.00	25.00 %O2
COLow_32	CO	0.00	100.00 ppm
COHigh_32	CO	0	5000 ppm
NOxLow_32	NOx	0.00	50.00 ppm
NOxHigh_32	NOx	0.0	700.0 ppm

Span of Analyzers:

O2_32	O2	0.00	25.00 %O2
COLow_32	CO	0.00	100.00 ppm
COHigh_32	CO	0	5000 ppm
NOxLow_32	NOx	0.00	50.00 ppm
NOxHigh_32	NOx	0.0	700.0 ppm

Date	Time	From 3 Pt.	Channel		Type	Target Units	Actual Units	Diff Units	Error %	CGA Allowable (40CFR60) Units	%		Bottle ID	Expire Date
10/02/2014	09:24	*	COHigh_32	CO	LOW	1230.0	1186.0	-44.0	-3.6	184.5	15.0	PASS	SG9142063BAL	2/14/2017
10/02/2014	09:24	*	COHigh_32	CO	MID	2735.0	2669.0	-66.0	-2.4	410.3	15.0	PASS	CC216465	2/25/2017
10/02/2014	08:43	*	COHigh_32	CO	LOW	1230.0	1186.0	-44.0	-3.6	184.5	15.0	PASS	SG9142063BAL	2/14/2017
10/02/2014	08:43	*	COHigh_32	CO	MID	2735.0	2685.0	-50.0	-1.8	410.3	15.0	PASS	CC216465	2/25/2017
10/02/2014	08:02	*	COHigh_32	CO	LOW	1230.0	1186.0	-44.0	-3.6	184.5	15.0	PASS	SG9142063BAL	2/14/2017
10/02/2014	08:02	*	COHigh_32	CO	MID	2735.0	2685.0	-50.0	-1.8	410.3	15.0	PASS	CC216465	2/25/2017
10/02/2014	07:16	*	COHigh_32	CO	LOW	1230.0	1186.0	-44.0	-3.6	184.5	15.0	PASS	SG9142063BAL	2/14/2017
10/02/2014	07:16	*	COHigh_32	CO	MID	2735.0	2685.0	-50.0	-1.8	410.3	15.0	PASS	CC216465	2/25/2017
10/02/2014	09:24	*	COLow_32	CO	LOW	24.5	24.6	0.1	0.4	3.7	15.0	PASS	CC439467	2/14/2022
10/02/2014	09:24	*	COLow_32	CO	MID	56.0	53.8	-2.2	-3.9	8.4	15.0	PASS	CC107578	5/1/2021
10/02/2014	08:43	*	COLow_32	CO	LOW	24.5	24.7	0.2	0.7	3.7	15.0	PASS	CC439467	2/14/2022
10/02/2014	08:43	*	COLow_32	CO	MID	56.0	53.9	-2.1	-3.7	8.4	15.0	PASS	CC107578	5/1/2021
10/02/2014	08:02	*	COLow_32	CO	LOW	24.5	24.6	0.0	0.2	3.7	15.0	PASS	CC439467	2/14/2022
10/02/2014	08:02	*	COLow_32	CO	MID	56.0	53.9	-2.1	-3.8	8.4	15.0	PASS	CC107578	5/1/2021
10/02/2014	07:16	*	COLow_32	CO	LOW	24.5	24.5	0.0	-0.1	3.7	15.0	PASS	CC439467	2/14/2022
10/02/2014	07:16	*	COLow_32	CO	MID	56.0	53.8	-2.2	-3.9	8.4	15.0	PASS	CC107578	5/1/2021
10/02/2014	09:24	*	NOxHigh_32	NOx	LOW	175.5	183.0	7.5	4.3	26.3	15.0	PASS	SG9151432BAL	3/3/2022
10/02/2014	09:24	*	NOxHigh_32	NOx	MID	391.0	397.4	6.4	1.6	58.7	15.0	PASS	CC417045	3/3/2022
10/02/2014	08:43	*	NOxHigh_32	NOx	LOW	175.5	183.1	7.6	4.3	26.3	15.0	PASS	SG9151432BAL	3/3/2022
10/02/2014	08:43	*	NOxHigh_32	NOx	MID	391.0	397.2	6.2	1.6	58.7	15.0	PASS	CC417045	3/3/2022
10/02/2014	08:02	*	NOxHigh_32	NOx	LOW	175.5	183.2	7.7	4.4	26.3	15.0	PASS	SG9151432BAL	3/3/2022
10/02/2014	08:02	*	NOxHigh_32	NOx	MID	391.0	397.5	6.5	1.7	58.7	15.0	PASS	CC417045	3/3/2022
10/02/2014	07:16	*	NOxHigh_32	NOx	LOW	175.5	183.2	7.7	4.4	26.3	15.0	PASS	SG9151432BAL	3/3/2022
10/02/2014	07:16	*	NOxHigh_32	NOx	MID	391.0	397.1	6.1	1.6	58.7	15.0	PASS	CC417045	3/3/2022
10/02/2014	09:24	*	NOxLow_32	NOx	LOW	12.5	12.1	-0.4	-3.0	1.9	15.0	PASS	SG9142063BAL	2/14/2017
10/02/2014	09:24	*	NOxLow_32	NOx	MID	27.5	27.2	-0.3	-1.0	4.1	15.0	PASS	CC216465	2/25/2017

CGA Calibration Report
Generated: 10/15/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/2/2014
Period End: 10/2/2014
Included Calibrations: **CGA (40CFR60)**

Date	Time	From 3 Pt.	Channel		Type	Target Units	Actual Units	Diff Units	Error %	CGA Allowable (40CFR60) Units	%		Bottle ID	Expire Date
10/02/2014	08:43	*	NOxLow_32	NOx	LOW	12.5	12.1	-0.4	-3.2	1.9	15.0	PASS	SG9142063BAL	2/14/2017
10/02/2014	08:43	*	NOxLow_32	NOx	MID	27.5	27.4	-0.1	-0.5	4.1	15.0	PASS	CC216465	2/25/2017
10/02/2014	08:02	*	NOxLow_32	NOx	LOW	12.5	12.1	-0.4	-3.1	1.9	15.0	PASS	SG9142063BAL	2/14/2017
10/02/2014	08:02	*	NOxLow_32	NOx	MID	27.5	27.4	-0.1	-0.5	4.1	15.0	PASS	CC216465	2/25/2017
10/02/2014	07:16	*	NOxLow_32	NOx	LOW	12.5	12.0	-0.5	-4.0	1.9	15.0	PASS	SG9142063BAL	2/14/2017
10/02/2014	07:16	*	NOxLow_32	NOx	MID	27.5	27.3	-0.2	-0.8	4.1	15.0	PASS	CC216465	2/25/2017
10/02/2014	09:24	*	O2_32	O2	LOW	6.2	6.3	0.1	1.1	0.9	15.0	PASS	CC439467	2/14/2022
10/02/2014	09:24	*	O2_32	O2	MID	13.9	13.8	-0.1	-0.5	2.1	15.0	PASS	CC107578	5/1/2021
10/02/2014	08:43	*	O2_32	O2	LOW	6.2	6.3	0.1	1.3	0.9	15.0	PASS	CC439467	2/14/2022
10/02/2014	08:43	*	O2_32	O2	MID	13.9	13.8	-0.1	-0.5	2.1	15.0	PASS	CC107578	5/1/2021
10/02/2014	08:02	*	O2_32	O2	LOW	6.2	6.3	0.1	1.3	0.9	15.0	PASS	CC439467	2/14/2022
10/02/2014	08:02	*	O2_32	O2	MID	13.9	13.8	-0.1	-0.4	2.1	15.0	PASS	CC107578	5/1/2021
10/02/2014	07:16	*	O2_32	O2	LOW	6.2	6.3	0.1	1.5	0.9	15.0	PASS	CC439467	2/14/2022
10/02/2014	07:16	*	O2_32	O2	MID	13.9	13.8	-0.1	-0.4	2.1	15.0	PASS	CC107578	5/1/2021

FAIL = Difference Error > Regulations Allow
TARG = Invalid Target (not within regulatory specs)
RDG = Reading exceeds "Range of Analyzer"
@ Bottle is within 7 days of expiration
# Bottle has Expired - Must be Replaced

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) * 100

Channel		----LOW---- Diff Units	Target %	----MID---- Diff Units	Target %
COHigh_32	CO	44.0	3.6%	54.0	2.0%
COLow_32	CO	0.1	0.3%	2.1	3.8%
NOxHigh_32	NOx	7.6	4.3%	6.3	1.6%
NOxLow_32	NOx	0.4	3.3%	0.2	0.7%
O2_32	O2	0.1	1.3%	0.1	0.5%

CGA Calibration Report
Generated: 10/15/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/2/2014
Period End: 10/2/2014
Included Calibrations: **CGA (40CFR60)**

Channel		Performance Specification PASS	FAIL
COHigh_32	CO	<=15.0%	>15.0%
COLow_32	CO	<=15.0%	>15.0%
NOxHigh_32	NOx	<=15.0%	>15.0%
NOxLow_32	NOx	<=15.0%	>15.0%
O2_32	O2	<=15.0%	>15.0%

Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA O2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target

Title:: _____ Signature:: _____ Date: / /

Title:: _____ Signature:: _____ Date: / /

Babcock & Wilcox Power Generation Group NetDAHS©

Version 84.0

Linearity Calibration Report
Generated: 10/15/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/2/2014
Period End: 10/2/2014
Included Calibrations: **Linearity (40CFR75)**

Range of Analyzers:

O2_32	O2	0.00	25.00 %O2
COLow_32	CO	0.00	100.00 ppm
COHigh_32	CO	0	5000 ppm
NOxLow_32	NOx	0.00	50.00 ppm
NOxHigh_32	NOx	0.0	700.0 ppm

Span of Analyzers:

O2_32	O2	0.00	25.00 %O2
COLow_32	CO	0.00	100.00 ppm
COHigh_32	CO	0	5000 ppm
NOxLow_32	NOx	0.00	50.00 ppm
NOxHigh_32	NOx	0.0	700.0 ppm

Date	Time	Channel		Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	%		Bottle ID	Expire Date
10/02/2014	09:24	COHigh_32	CO	LOW	1230.000	1186.000	-44.000	- N/A -	- N/A -	- N/A -	- N/A -	SG9142063BAL	2/14/2017
10/02/2014	09:24	COHigh_32	CO	MID	2735.000	2669.000	-66.000	- N/A -	- N/A -	- N/A -	- N/A -	CC216465	2/25/2017
10/02/2014	09:24	COHigh_32	CO	HIGH	4585.000	4575.000	-10.000	- N/A -	- N/A -	- N/A -	- N/A -	CC326244	12/30/2016
10/02/2014	08:43	COHigh_32	CO	LOW	1230.000	1186.000	-44.000	- N/A -	- N/A -	- N/A -	- N/A -	SG9142063BAL	2/14/2017
10/02/2014	08:43	COHigh_32	CO	MID	2735.000	2685.000	-50.000	- N/A -	- N/A -	- N/A -	- N/A -	CC216465	2/25/2017
10/02/2014	08:43	COHigh_32	CO	HIGH	4585.000	4573.000	-12.000	- N/A -	- N/A -	- N/A -	- N/A -	CC326244	12/30/2016
10/02/2014	08:02	COHigh_32	CO	LOW	1230.000	1186.000	-44.000	- N/A -	- N/A -	- N/A -	- N/A -	SG9142063BAL	2/14/2017
10/02/2014	08:02	COHigh_32	CO	MID	2735.000	2685.000	-50.000	- N/A -	- N/A -	- N/A -	- N/A -	CC216465	2/25/2017
10/02/2014	08:02	COHigh_32	CO	HIGH	4585.000	4572.000	-13.000	- N/A -	- N/A -	- N/A -	- N/A -	CC326244	12/30/2016
10/02/2014	07:16	COHigh_32	CO	LOW	1230.000	1186.000	-44.000	- N/A -	- N/A -	- N/A -	- N/A -	SG9142063BAL	2/14/2017
10/02/2014	07:16	COHigh_32	CO	MID	2735.000	2685.000	-50.000	- N/A -	- N/A -	- N/A -	- N/A -	CC216465	2/25/2017
10/02/2014	07:16	COHigh_32	CO	HIGH	4585.000	4571.000	-14.000	- N/A -	- N/A -	- N/A -	- N/A -	CC326244	12/30/2016
10/02/2014	09:24	COLow_32	CO	LOW	24.540	24.630	0.090	- N/A -	- N/A -	- N/A -	- N/A -	CC439467	2/14/2022
10/02/2014	09:24	COLow_32	CO	MID	56.000	53.830	-2.170	- N/A -	- N/A -	- N/A -	- N/A -	CC107578	5/1/2021
10/02/2014	09:24	COLow_32	CO	HIGH	90.200	86.460	-3.740	- N/A -	- N/A -	- N/A -	- N/A -	CC140828	1/23/2022
10/02/2014	08:43	COLow_32	CO	LOW	24.540	24.710	0.170	- N/A -	- N/A -	- N/A -	- N/A -	CC439467	2/14/2022
10/02/2014	08:43	COLow_32	CO	MID	56.000	53.930	-2.070	- N/A -	- N/A -	- N/A -	- N/A -	CC107578	5/1/2021
10/02/2014	08:43	COLow_32	CO	HIGH	90.200	86.590	-3.610	- N/A -	- N/A -	- N/A -	- N/A -	CC140828	1/23/2022
10/02/2014	08:02	COLow_32	CO	LOW	24.540	24.580	0.040	- N/A -	- N/A -	- N/A -	- N/A -	CC439467	2/14/2022
10/02/2014	08:02	COLow_32	CO	MID	56.000	53.870	-2.130	- N/A -	- N/A -	- N/A -	- N/A -	CC107578	5/1/2021
10/02/2014	08:02	COLow_32	CO	HIGH	90.200	86.500	-3.700	- N/A -	- N/A -	- N/A -	- N/A -	CC140828	1/23/2022
10/02/2014	07:16	COLow_32	CO	LOW	24.540	24.510	-0.030	- N/A -	- N/A -	- N/A -	- N/A -	CC439467	2/14/2022
10/02/2014	07:16	COLow_32	CO	MID	56.000	53.790	-2.210	- N/A -	- N/A -	- N/A -	- N/A -	CC107578	5/1/2021
10/02/2014	07:16	COLow_32	CO	HIGH	90.200	86.460	-3.740	- N/A -	- N/A -	- N/A -	- N/A -	CC140828	1/23/2022
10/02/2014	09:24	NOxHigh_32	NOx	LOW	175.500	183.000	7.500	4.3	8.775	5.0	PASS	SG9151432BAL	3/3/2022
10/02/2014	09:24	NOxHigh_32	NOx	MID	391.000	397.400	6.400	1.6	19.550	5.0	PASS	CC417045	3/3/2022
10/02/2014	09:24	NOxHigh_32	NOx	HIGH	628.500	627.000	-1.500	-0.2	31.425	5.0	PASS	CC60478	8/5/2022

Linearity Calibration Report
Generated: 10/15/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/2/2014
Period End: 10/2/2014
Included Calibrations: **Linearity (40CFR75)**

Date	Time	Channel		Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	%		Bottle ID	Expire Date
10/02/2014	08:43	NOxHigh_32	NOx	LOW	175.500	183.100	7.600	4.3	8.775	5.0	PASS	SG9151432BAL	3/3/2022
10/02/2014	08:43	NOxHigh_32	NOx	MID	391.000	397.200	6.200	1.6	19.550	5.0	PASS	CC417045	3/3/2022
10/02/2014	08:43	NOxHigh_32	NOx	HIGH	628.500	627.900	-0.600	-0.1	31.425	5.0	PASS	CC60478	8/5/2022
10/02/2014	08:02	NOxHigh_32	NOx	LOW	175.500	183.200	7.700	4.4	8.775	5.0	PASS	SG9151432BAL	3/3/2022
10/02/2014	08:02	NOxHigh_32	NOx	MID	391.000	397.500	6.500	1.7	19.550	5.0	PASS	CC417045	3/3/2022
10/02/2014	08:02	NOxHigh_32	NOx	HIGH	628.500	626.900	-1.600	-0.3	31.425	5.0	PASS	CC60478	8/5/2022
10/02/2014	07:16	NOxHigh_32	NOx	LOW	175.500	183.200	7.700	4.4	8.775	5.0	PASS	SG9151432BAL	3/3/2022
10/02/2014	07:16	NOxHigh_32	NOx	MID	391.000	397.100	6.100	1.6	19.550	5.0	PASS	CC417045	3/3/2022
10/02/2014	07:16	NOxHigh_32	NOx	HIGH	628.500	627.600	-0.900	-0.1	31.425	5.0	PASS	CC60478	8/5/2022
10/02/2014	09:24	NOxLow_32	NOx	LOW	12.460	12.090	-0.370	-3.2	0.623	5.0	PASS	SG9142063BAL	2/14/2017
10/02/2014	09:24	NOxLow_32	NOx	MID	27.490	27.220	-0.270	-1.1	1.375	5.0	PASS	CC216465	2/25/2017
10/02/2014	09:24	NOxLow_32	NOx	HIGH	44.080	44.120	0.040	0.0	2.204	5.0	PASS	CC326244	12/30/2016
10/02/2014	08:43	NOxLow_32	NOx	LOW	12.460	12.060	-0.400	-3.2	0.623	5.0	PASS	SG9142063BAL	2/14/2017
10/02/2014	08:43	NOxLow_32	NOx	MID	27.490	27.350	-0.140	-0.4	1.375	5.0	PASS	CC216465	2/25/2017
10/02/2014	08:43	NOxLow_32	NOx	HIGH	44.080	44.170	0.090	0.2	2.204	5.0	PASS	CC326244	12/30/2016
10/02/2014	08:02	NOxLow_32	NOx	LOW	12.460	12.070	-0.390	-3.2	0.623	5.0	PASS	SG9142063BAL	2/14/2017
10/02/2014	08:02	NOxLow_32	NOx	MID	27.490	27.350	-0.140	-0.4	1.375	5.0	PASS	CC216465	2/25/2017
10/02/2014	08:02	NOxLow_32	NOx	HIGH	44.080	44.160	0.080	0.2	2.204	5.0	PASS	CC326244	12/30/2016
10/02/2014	07:16	NOxLow_32	NOx	LOW	12.460	11.960	-0.500	-4.0	0.623	5.0	PASS	SG9142063BAL	2/14/2017
10/02/2014	07:16	NOxLow_32	NOx	MID	27.490	27.280	-0.210	-0.7	1.375	5.0	PASS	CC216465	2/25/2017
10/02/2014	07:16	NOxLow_32	NOx	HIGH	44.080	44.110	0.030	0.0	2.204	5.0	PASS	CC326244	12/30/2016
10/02/2014	09:24	O2_32	O2	LOW	6.200	6.270	0.070	1.6	0.310	5.0	PASS	CC439467	2/14/2022
10/02/2014	09:24	O2_32	O2	MID	13.880	13.810	-0.070	-0.7	0.694	5.0	PASS	CC107578	5/1/2021
10/02/2014	09:24	O2_32	O2	HIGH	21.000	20.930	-0.070	-0.5	1.050	5.0	PASS	CC140828	1/23/2022
10/02/2014	08:43	O2_32	O2	LOW	6.200	6.280	0.080	1.6	0.310	5.0	PASS	CC439467	2/14/2022
10/02/2014	08:43	O2_32	O2	MID	13.880	13.810	-0.070	-0.7	0.694	5.0	PASS	CC107578	5/1/2021
10/02/2014	08:43	O2_32	O2	HIGH	21.000	20.930	-0.070	-0.5	1.050	5.0	PASS	CC140828	1/23/2022
10/02/2014	08:02	O2_32	O2	LOW	6.200	6.280	0.080	1.6	0.310	5.0	PASS	CC439467	2/14/2022
10/02/2014	08:02	O2_32	O2	MID	13.880	13.820	-0.060	-0.7	0.694	5.0	PASS	CC107578	5/1/2021
10/02/2014	08:02	O2_32	O2	HIGH	21.000	20.920	-0.080	-0.5	1.050	5.0	PASS	CC140828	1/23/2022
10/02/2014	07:16	O2_32	O2	LOW	6.200	6.290	0.090	1.6	0.310	5.0	PASS	CC439467	2/14/2022
10/02/2014	07:16	O2_32	O2	MID	13.880	13.820	-0.060	-0.7	0.694	5.0	PASS	CC107578	5/1/2021
10/02/2014	07:16	O2_32	O2	HIGH	21.000	20.930	-0.070	-0.5	1.050	5.0	PASS	CC140828	1/23/2022

FAIL = Difference Error > Regulations Allow
TARG = Invalid Target (not within regulatory specs)
RDG = Reading exceeds "Range of Analyzer"
Note: 40CFR75 pass/fail determination is performed after rounding the value of Error%, or Drift, to one decimal place

@ Bottle is within 7 days of expiration
# Bottle has Expired - Must be Replaced

Linearity Calibration Report
Generated: 10/15/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/2/2014
Period End: 10/2/2014
Included Calibrations: **Linearity (40CFR75)**

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) * 100

		----LOW----		----MID----		----HIGH----	
Channel		Diff Units	Target %	Diff Units	Target %	Diff Units	Target %
COHigh_32	CO	44.000	- N/A -	54.000	- N/A -	12.250	- N/A -
COLow_32	CO	0.067	- N/A -	2.145	- N/A -	3.698	- N/A -
NOxHigh_32	NOx	7.625	4.3%	6.300	1.6%	1.150	0.2%
NOxLow_32	NOx	0.415	3.3%	0.190	0.7%	0.060	0.1%
O2_32	O2	0.080	1.3%	0.065	0.5%	0.073	0.3%

Performance Specification

Channel		PASS	FAIL
COHigh_32	CO	- N/A -	- N/A -
COLow_32	CO	- N/A -	- N/A -
NOxHigh_32	NOx	<=5.0%	>5.0%
NOxLow_32	NOx	<=5.0%	>5.0%
O2_32	O2	<=5.0%	>5.0%

Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part75 Linearity O2] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity O2] Low = 0.5 %O2, Mid = 0.5 %O2, High = 0.5 %O2

Title:: _____ Signature:: _____ Date: / /

Title:: _____ Signature:: _____ Date: / /

Babcock & Wilcox Power Generation Group NetDAHS©

Version 84.0

CGA Calibration Report
Generated: 10/2/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/2/2014
Period End: 10/2/2014
Included Calibrations: **CGA (40CFR60)**

Range of Analyzers:				Span of Analyzers:			
O2_33	O2	0.00	25.00 %O2	O2_33	O2	0.00	25.00 %O2
COLow_33	CO	0.00	100.00 ppm	COLow_33	CO	0.00	100.00 ppm
COHigh_33	CO	0	5000 ppm	COHigh_33	CO	0	5000 ppm
NOxLow_33	NOx	0.00	50.00 ppm	NOxLow_33	NOx	0.00	50.00 ppm
NOxHigh_33	NOx	0.0	700.0 ppm	NOxHigh_33	NOx	0.0	700.0 ppm

Date	Time	From 3 Pt.	Channel		Type	Target Units	Actual Units	Diff Units	Error %	CGA Allowable (40CFR60) Units	%		Bottle ID	Expire Date
10/02/2014	01:24	*	COHigh_33	CO	LOW	1231.0	1250.0	19.0	1.5	184.7	15.0	PASS	CC216462	2/24/2017
10/02/2014	01:24	*	COHigh_33	CO	MID	2749.0	2747.0	-2.0	-0.1	412.4	15.0	PASS	CC259082	1/21/2017
10/02/2014	00:46	*	COHigh_33	CO	LOW	1231.0	1250.0	19.0	1.5	184.7	15.0	PASS	CC216462	2/24/2017
10/02/2014	00:46	*	COHigh_33	CO	MID	2749.0	2747.0	-2.0	-0.1	412.4	15.0	PASS	CC259082	1/21/2017
10/02/2014	00:06	*	COHigh_33	CO	LOW	1231.0	1250.0	19.0	1.5	184.7	15.0	PASS	CC216462	2/24/2017
10/02/2014	00:06	*	COHigh_33	CO	MID	2749.0	2749.0	0.0	0.0	412.4	15.0	PASS	CC259082	1/21/2017
10/02/2014	01:24	*	COLow_33	CO	LOW	24.4	25.8	1.4	5.6	3.7	15.0	PASS	CC439468	2/14/2022
10/02/2014	01:24	*	COLow_33	CO	MID	54.4	55.4	1.0	1.8	8.2	15.0	PASS	CC349278	5/14/2015
10/02/2014	00:46	*	COLow_33	CO	LOW	24.4	25.8	1.4	5.5	3.7	15.0	PASS	CC439468	2/14/2022
10/02/2014	00:46	*	COLow_33	CO	MID	54.4	55.4	1.0	1.7	8.2	15.0	PASS	CC349278	5/14/2015
10/02/2014	00:06	*	COLow_33	CO	LOW	24.4	25.7	1.3	5.2	3.7	15.0	PASS	CC439468	2/14/2022
10/02/2014	00:06	*	COLow_33	CO	MID	54.4	55.3	0.9	1.6	8.2	15.0	PASS	CC349278	5/14/2015
10/02/2014	01:24	*	NOxHigh_33	NOx	LOW	175.3	181.9	6.6	3.8	26.3	15.0	PASS	XC021379B	3/3/2022
10/02/2014	01:24	*	NOxHigh_33	NOx	MID	391.5	399.2	7.7	2.0	58.7	15.0	PASS	CC332043	3/3/2022
10/02/2014	00:46	*	NOxHigh_33	NOx	LOW	175.3	181.9	6.6	3.8	26.3	15.0	PASS	XC021379B	3/3/2022
10/02/2014	00:46	*	NOxHigh_33	NOx	MID	391.5	398.9	7.4	1.9	58.7	15.0	PASS	CC332043	3/3/2022
10/02/2014	00:06	*	NOxHigh_33	NOx	LOW	175.3	182.0	6.7	3.8	26.3	15.0	PASS	XC021379B	3/3/2022
10/02/2014	00:06	*	NOxHigh_33	NOx	MID	391.5	398.6	7.1	1.8	58.7	15.0	PASS	CC332043	3/3/2022
10/02/2014	01:24	*	NOxLow_33	NOx	LOW	12.4	12.9	0.6	4.6	1.9	15.0	PASS	CC216462	2/24/2017
10/02/2014	01:24	*	NOxLow_33	NOx	MID	26.1	27.8	1.6	6.2	3.9	15.0	PASS	CC259082	1/21/2017
10/02/2014	00:46	*	NOxLow_33	NOx	LOW	12.4	12.9	0.6	4.8	1.9	15.0	PASS	CC216462	2/24/2017
10/02/2014	00:46	*	NOxLow_33	NOx	MID	26.1	27.8	1.7	6.3	3.9	15.0	PASS	CC259082	1/21/2017
10/02/2014	00:06	*	NOxLow_33	NOx	LOW	12.4	12.9	0.5	4.5	1.9	15.0	PASS	CC216462	2/24/2017
10/02/2014	00:06	*	NOxLow_33	NOx	MID	26.1	27.8	1.6	6.2	3.9	15.0	PASS	CC259082	1/21/2017
10/02/2014	01:24	*	O2_33	O2	LOW	6.2	6.2	0.0	0.8	0.9	15.0	PASS	CC439468	2/14/2022
10/02/2014	01:24	*	O2_33	O2	MID	13.7	13.8	0.1	0.9	2.1	15.0	PASS	CC349278	5/14/2015

CGA Calibration Report
Generated: 10/2/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/2/2014
Period End: 10/2/2014
Included Calibrations: **CGA (40CFR60)**

Date	Time	From 3 Pt.	Channel		Type	Target Units	Actual Units	Diff Units	Error %	CGA Allowable (40CFR60) Units	%		Bottle ID	Expire Date
10/02/2014	00:46	*	O2_33	O2	LOW	6.2	6.3	0.1	1.0	0.9	15.0	PASS	CC439468	2/14/2022
10/02/2014	00:46	*	O2_33	O2	MID	13.7	13.8	0.1	0.9	2.1	15.0	PASS	CC349278	5/14/2015
10/02/2014	00:06	*	O2_33	O2	LOW	6.2	6.3	0.1	1.0	0.9	15.0	PASS	CC439468	2/14/2022
10/02/2014	00:06	*	O2_33	O2	MID	13.7	13.8	0.1	0.9	2.1	15.0	PASS	CC349278	5/14/2015

FAIL = Difference Error > Regulations Allow
TARG = Invalid Target (not within regulatory specs)
RDG = Reading exceeds "Range of Analyzer"
@ Bottle is within 7 days of expiration
# Bottle has Expired - Must be Replaced

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) * 100

Channel		----LOW---- Diff Units	Target %	----MID---- Diff Units	Target %
COHigh_33	CO	19.0	1.5%	1.3	0.0%
COLow_33	CO	1.3	5.4%	0.9	1.7%
NOxHigh_33	NOx	6.6	3.8%	7.4	1.9%
NOxLow_33	NOx	0.6	4.6%	1.6	6.3%
O2_33	O2	0.1	0.9%	0.1	0.9%

Performance Specification

Channel		PASS	FAIL
COHigh_33	CO	<=15.0%	>15.0%
COLow_33	CO	<=15.0%	>15.0%
NOxHigh_33	NOx	<=15.0%	>15.0%
NOxLow_33	NOx	<=15.0%	>15.0%
O2_33	O2	<=15.0%	>15.0%

Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA O2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target

Title:: _____ Signature:: _____ Date: / /

Title:: _____ Signature:: _____ Date: / /

Babcock & Wilcox Power Generation Group NetDAHS© Version 84.0

Linearity Calibration Report
Generated: 10/2/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/2/2014
Period End: 10/2/2014
Included Calibrations: **Linearity (40CFR75)**

Range of Analyzers:				Span of Analyzers:			
O2_33	O2	0.00	25.00 %O2	O2_33	O2	0.00	25.00 %O2
COLow_33	CO	0.00	100.00 ppm	COLow_33	CO	0.00	100.00 ppm
COHigh_33	CO	0	5000 ppm	COHigh_33	CO	0	5000 ppm
NOxLow_33	NOx	0.00	50.00 ppm	NOxLow_33	NOx	0.00	50.00 ppm
NOxHigh_33	NOx	0.0	700.0 ppm	NOxHigh_33	NOx	0.0	700.0 ppm

Date	Time	Channel		Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	%		Bottle ID	Expire Date
10/02/2014	01:24	COHigh_33	CO	LOW	1231.000	1250.000	19.000	- N/A -	- N/A -	- N/A -	- N/A -	CC216462	2/24/2017
10/02/2014	01:24	COHigh_33	CO	MID	2749.000	2747.000	-2.000	- N/A -	- N/A -	- N/A -	- N/A -	CC259082	1/21/2017
10/02/2014	01:24	COHigh_33	CO	HIGH	4506.000	4553.000	47.000	- N/A -	- N/A -	- N/A -	- N/A -	CC231193	12/4/2016
10/02/2014	00:46	COHigh_33	CO	LOW	1231.000	1250.000	19.000	- N/A -	- N/A -	- N/A -	- N/A -	CC216462	2/24/2017
10/02/2014	00:46	COHigh_33	CO	MID	2749.000	2747.000	-2.000	- N/A -	- N/A -	- N/A -	- N/A -	CC259082	1/21/2017
10/02/2014	00:46	COHigh_33	CO	HIGH	4506.000	4553.000	47.000	- N/A -	- N/A -	- N/A -	- N/A -	CC231193	12/4/2016
10/02/2014	00:06	COHigh_33	CO	LOW	1231.000	1250.000	19.000	- N/A -	- N/A -	- N/A -	- N/A -	CC216462	2/24/2017
10/02/2014	00:06	COHigh_33	CO	MID	2749.000	2749.000	0.000	- N/A -	- N/A -	- N/A -	- N/A -	CC259082	1/21/2017
10/02/2014	00:06	COHigh_33	CO	HIGH	4506.000	4553.000	47.000	- N/A -	- N/A -	- N/A -	- N/A -	CC231193	12/4/2016
10/02/2014	01:24	COLow_33	CO	LOW	24.440	25.800	1.360	- N/A -	- N/A -	- N/A -	- N/A -	CC439468	2/14/2022
10/02/2014	01:24	COLow_33	CO	MID	54.430	55.420	0.990	- N/A -	- N/A -	- N/A -	- N/A -	CC349278	5/14/2015
10/02/2014	01:24	COLow_33	CO	HIGH	90.640	91.100	0.460	- N/A -	- N/A -	- N/A -	- N/A -	CC151722	1/23/2022
10/02/2014	00:46	COLow_33	CO	LOW	24.440	25.790	1.350	- N/A -	- N/A -	- N/A -	- N/A -	CC439468	2/14/2022
10/02/2014	00:46	COLow_33	CO	MID	54.430	55.380	0.950	- N/A -	- N/A -	- N/A -	- N/A -	CC349278	5/14/2015
10/02/2014	00:46	COLow_33	CO	HIGH	90.640	91.110	0.470	- N/A -	- N/A -	- N/A -	- N/A -	CC151722	1/23/2022
10/02/2014	00:06	COLow_33	CO	LOW	24.440	25.720	1.280	- N/A -	- N/A -	- N/A -	- N/A -	CC439468	2/14/2022
10/02/2014	00:06	COLow_33	CO	MID	54.430	55.320	0.890	- N/A -	- N/A -	- N/A -	- N/A -	CC349278	5/14/2015
10/02/2014	00:06	COLow_33	CO	HIGH	90.640	91.060	0.420	- N/A -	- N/A -	- N/A -	- N/A -	CC151722	1/23/2022
10/02/2014	01:24	NOxHigh_33	NOx	LOW	175.300	181.900	6.600	3.8	8.765	5.0	PASS	XC021379B	3/3/2022
10/02/2014	01:24	NOxHigh_33	NOx	MID	391.500	399.200	7.700	2.0	19.575	5.0	PASS	CC332043	3/3/2022
10/02/2014	01:24	NOxHigh_33	NOx	HIGH	633.300	645.600	12.300	1.9	31.665	5.0	PASS	SG9111379BAL	4/8/2022
10/02/2014	00:46	NOxHigh_33	NOx	LOW	175.300	181.900	6.600	3.8	8.765	5.0	PASS	XC021379B	3/3/2022
10/02/2014	00:46	NOxHigh_33	NOx	MID	391.500	398.900	7.400	1.9	19.575	5.0	PASS	CC332043	3/3/2022
10/02/2014	00:46	NOxHigh_33	NOx	HIGH	633.300	646.300	13.000	2.1	31.665	5.0	PASS	SG9111379BAL	4/8/2022
10/02/2014	00:06	NOxHigh_33	NOx	LOW	175.300	182.000	6.700	3.8	8.765	5.0	PASS	XC021379B	3/3/2022
10/02/2014	00:06	NOxHigh_33	NOx	MID	391.500	398.600	7.100	1.8	19.575	5.0	PASS	CC332043	3/3/2022
10/02/2014	00:06	NOxHigh_33	NOx	HIGH	633.300	645.600	12.300	1.9	31.665	5.0	PASS	SG9111379BAL	4/8/2022

Linearity Calibration Report
Generated: 10/2/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/2/2014
Period End: 10/2/2014
Included Calibrations: **Linearity (40CFR75)**

Date	Time	Channel		Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	%		Bottle ID	Expire Date
10/02/2014	01:24	NOxLow_33	NOx	LOW	12.350	12.920	0.570	4.9	0.618	5.0	PASS	CC216462	2/24/2017
10/02/2014	01:24	NOxLow_33	NOx	MID	26.150	27.780	1.630	6.1	0.000	5.0	PASS	CC259082	1/21/2017
10/02/2014	01:24	NOxLow_33	NOx	HIGH	44.930	45.560	0.630	1.3	2.247	5.0	PASS	CC231193	12/4/2016
10/02/2014	00:46	NOxLow_33	NOx	LOW	12.350	12.940	0.590	4.9	0.618	5.0	PASS	CC216462	2/24/2017
10/02/2014	00:46	NOxLow_33	NOx	MID	26.150	27.810	1.660	6.5	0.000	5.0	PASS	CC259082	1/21/2017
10/02/2014	00:46	NOxLow_33	NOx	HIGH	44.930	45.680	0.750	1.8	2.247	5.0	PASS	CC231193	12/4/2016
10/02/2014	00:06	NOxLow_33	NOx	LOW	12.350	12.900	0.550	4.0	0.618	5.0	PASS	CC216462	2/24/2017
10/02/2014	00:06	NOxLow_33	NOx	MID	26.150	27.780	1.630	6.1	0.000	5.0	PASS	CC259082	1/21/2017
10/02/2014	00:06	NOxLow_33	NOx	HIGH	44.930	45.680	0.750	1.8	2.247	5.0	PASS	CC231193	12/4/2016
10/02/2014	01:24	O2_33	O2	LOW	6.190	6.240	0.050	0.0	0.310	5.0	PASS	CC439468	2/14/2022
10/02/2014	01:24	O2_33	O2	MID	13.720	13.840	0.120	0.7	0.686	5.0	PASS	CC349278	5/14/2015
10/02/2014	01:24	O2_33	O2	HIGH	21.100	21.190	0.090	0.5	1.055	5.0	PASS	CC151722	1/23/2022
10/02/2014	00:46	O2_33	O2	LOW	6.190	6.250	0.060	1.6	0.310	5.0	PASS	CC439468	2/14/2022
10/02/2014	00:46	O2_33	O2	MID	13.720	13.840	0.120	0.7	0.686	5.0	PASS	CC349278	5/14/2015
10/02/2014	00:46	O2_33	O2	HIGH	21.100	21.190	0.090	0.5	1.055	5.0	PASS	CC151722	1/23/2022
10/02/2014	00:06	O2_33	O2	LOW	6.190	6.250	0.060	1.6	0.310	5.0	PASS	CC439468	2/14/2022
10/02/2014	00:06	O2_33	O2	MID	13.720	13.840	0.120	0.7	0.686	5.0	PASS	CC349278	5/14/2015
10/02/2014	00:06	O2_33	O2	HIGH	21.100	21.180	0.080	0.5	1.055	5.0	PASS	CC151722	1/23/2022

FAIL = Difference Error > Regulations Allow
TARG = Invalid Target (not within regulatory specs)
RDG = Reading exceeds "Range of Analyzer"
Note: 40CFR75 pass/fail determination is performed after rounding the value of Error%, or Drift, to one decimal place

@ Bottle is within 7 days of expiration
# Bottle has Expired - Must be Replaced

Linearity Calibration Report
Generated: 10/2/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/2/2014
Period End: 10/2/2014
Included Calibrations: **Linearity (40CFR75)**

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) * 100

		----LOW----		----MID----		----HIGH----	
Channel		Diff Units	Target %	Diff Units	Target %	Diff Units	Target %
COHigh_33	CO	19.000	- N/A -	1.333	- N/A -	47.000	- N/A -
COLow_33	CO	1.330	- N/A -	0.943	- N/A -	0.450	- N/A -
NOxHigh_33	NOx	6.633	3.8%	7.400	1.9%	12.533	2.0%
NOxLow_33	NOx	0.570	4.6%	1.640	6.3%	0.710	1.6%
O2_33	O2	0.057	0.9%	0.120	0.9%	0.087	0.4%

Performance Specification

Channel		PASS	FAIL
COHigh_33	CO	- N/A -	- N/A -
COLow_33	CO	- N/A -	- N/A -
NOxHigh_33	NOx	<=5.0%	>5.0%
NOxLow_33	NOx	<=5.0%	>5.0%
O2_33	O2	<=5.0%	>5.0%

Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part75 Linearity O2] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity O2] Low = 0.5 %O2, Mid = 0.5 %O2, High = 0.5 %O2

Title:: _____ Signature:: _____ Date: / /

Title:: _____ Signature:: _____ Date: / /

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Version 84.0

CGA Calibration Report
Generated: 10/15/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/2/2014
Period End: 10/2/2014
Included Calibrations: **CGA (40CFR60)**

Range of Analyzers:

O2_34	O2	0.00	25.00 %O2
COLow_34	CO	0.00	100.00 ppm
COHigh_34	CO	0	5000 ppm
NOxLow_34	NOx	0.00	50.00 ppm
NOxHigh_34	NOx	0.0	700.0 ppm

Span of Analyzers:

O2_34	O2	0.00	25.00 %O2
COLow_34	CO	0.00	100.00 ppm
COHigh_34	CO	0	5000 ppm
NOxLow_34	NOx	0.00	50.00 ppm
NOxHigh_34	NOx	0.0	700.0 ppm

Date	Time	From 3 Pt.	Channel		Type	Target Units	Actual Units	Diff Units	Error %	CGA Allowable (40CFR60) Units	%		Bottle ID	Expire Date
10/02/2014	18:58	*	COHigh_34	CO	LOW	1231.0	1178.0	-53.0	-4.3	184.7	15.0	PASS	CC174083	11/8/2014
10/02/2014	18:58	*	COHigh_34	CO	MID	2749.0	2688.0	-61.0	-2.2	412.4	15.0	PASS	CC259082	1/21/2017
10/02/2014	18:14	*	COHigh_34	CO	LOW	1231.0	1178.0	-53.0	-4.3	184.7	15.0	PASS	CC174083	11/8/2014
10/02/2014	18:14	*	COHigh_34	CO	MID	2749.0	2689.0	-60.0	-2.2	412.4	15.0	PASS	CC259082	1/21/2017
10/02/2014	17:30	*	COHigh_34	CO	LOW	1231.0	1180.0	-51.0	-4.1	184.7	15.0	PASS	CC174083	11/8/2014
10/02/2014	17:30	*	COHigh_34	CO	MID	2749.0	2693.0	-56.0	-2.0	412.4	15.0	PASS	CC259082	1/21/2017
10/02/2014	12:40	*	COHigh_34	CO	LOW	1231.0	1182.0	-49.0	-4.0	184.7	15.0	PASS	CC174083	11/8/2014
10/02/2014	12:40	*	COHigh_34	CO	MID	2749.0	2698.0	-51.0	-1.9	412.4	15.0	PASS	CC259082	1/21/2017
10/02/2014	11:56	*	COHigh_34	CO	LOW	1231.0	1182.0	-49.0	-4.0	184.7	15.0	PASS	CC174083	11/8/2014
10/02/2014	11:56	*	COHigh_34	CO	MID	2749.0	2698.0	-51.0	-1.9	412.4	15.0	PASS	CC259082	1/21/2017
10/02/2014	18:58	*	COLow_34	CO	LOW	24.4	24.4	0.0	0.0	3.7	15.0	PASS	CC439468	2/14/2022
10/02/2014	18:58	*	COLow_34	CO	MID	54.4	54.0	-0.4	-0.8	8.2	15.0	PASS	CC349278	5/14/2015
10/02/2014	18:14	*	COLow_34	CO	LOW	24.4	24.4	0.0	0.0	3.7	15.0	PASS	CC439468	2/14/2022
10/02/2014	18:14	*	COLow_34	CO	MID	54.4	54.0	-0.4	-0.8	8.2	15.0	PASS	CC349278	5/14/2015
10/02/2014	17:30	*	COLow_34	CO	LOW	24.4	24.5	0.1	0.4	3.7	15.0	PASS	CC439468	2/14/2022
10/02/2014	17:30	*	COLow_34	CO	MID	54.4	54.1	-0.3	-0.6	8.2	15.0	PASS	CC349278	5/14/2015
10/02/2014	12:40	*	COLow_34	CO	LOW	24.4	24.6	0.1	0.5	3.7	15.0	PASS	CC439468	2/14/2022
10/02/2014	12:40	*	COLow_34	CO	MID	54.4	54.2	-0.3	-0.5	8.2	15.0	PASS	CC349278	5/14/2015
10/02/2014	11:56	*	COLow_34	CO	LOW	24.4	24.5	0.1	0.3	3.7	15.0	PASS	CC439468	2/14/2022
10/02/2014	11:56	*	COLow_34	CO	MID	54.4	54.2	-0.3	-0.5	8.2	15.0	PASS	CC349278	5/14/2015
10/02/2014	18:58	*	NOxHigh_34	NOx	LOW	175.3	177.5	2.2	1.3	26.3	15.0	PASS	XC021379B	3/3/2022
10/02/2014	18:58	*	NOxHigh_34	NOx	MID	391.5	390.6	-0.9	-0.2	58.7	15.0	PASS	CC332043	3/3/2022
10/02/2014	18:14	*	NOxHigh_34	NOx	LOW	175.3	177.4	2.1	1.2	26.3	15.0	PASS	XC021379B	3/3/2022
10/02/2014	18:14	*	NOxHigh_34	NOx	MID	391.5	390.8	-0.7	-0.2	58.7	15.0	PASS	CC332043	3/3/2022
10/02/2014	17:30	*	NOxHigh_34	NOx	LOW	175.3	177.7	2.4	1.4	26.3	15.0	PASS	XC021379B	3/3/2022
10/02/2014	17:30	*	NOxHigh_34	NOx	MID	391.5	390.8	-0.7	-0.2	58.7	15.0	PASS	CC332043	3/3/2022

Babcock & Wilcox Power Generation Group NetDAHS©

CGA Calibration Report
Generated: 10/15/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/2/2014
Period End: 10/2/2014
Included Calibrations: **CGA (40CFR60)**

Date	Time	From 3 Pt.	Channel		Type	Target Units	Actual Units	Diff Units	Error %	CGA Allowable (40CFR60) Units	%		Bottle ID	Expire Date
10/02/2014	12:40	*	NOxHigh_34	NOx	LOW	175.3	185.2	9.9	5.6	26.3	15.0	PASS	XC021379B	3/3/2022
10/02/2014	12:40	*	NOxHigh_34	NOx	MID	391.5	399.5	8.0	2.0	58.7	15.0	PASS	CC332043	3/3/2022
10/02/2014	11:56	*	NOxHigh_34	NOx	LOW	175.3	185.2	9.9	5.6	26.3	15.0	PASS	XC021379B	3/3/2022
10/02/2014	11:56	*	NOxHigh_34	NOx	MID	391.5	399.5	8.0	2.0	58.7	15.0	PASS	CC332043	3/3/2022
10/02/2014	18:58	*	NOxLow_34	NOx	LOW	12.4	12.7	0.3	2.8	1.9	15.0	PASS	CC174083	11/8/2014
10/02/2014	18:58	*	NOxLow_34	NOx	MID	26.1	27.1	1.0	3.7	3.9	15.0	PASS	CC259082	1/21/2017
10/02/2014	18:14	*	NOxLow_34	NOx	LOW	12.4	12.7	0.3	2.6	1.9	15.0	PASS	CC174083	11/8/2014
10/02/2014	18:14	*	NOxLow_34	NOx	MID	26.1	27.2	1.0	3.9	3.9	15.0	PASS	CC259082	1/21/2017
10/02/2014	17:30	*	NOxLow_34	NOx	LOW	12.4	12.7	0.3	2.8	1.9	15.0	PASS	CC174083	11/8/2014
10/02/2014	17:30	*	NOxLow_34	NOx	MID	26.1	27.1	1.0	3.8	3.9	15.0	PASS	CC259082	1/21/2017
10/02/2014	12:40	*	NOxLow_34	NOx	LOW	12.4	12.8	0.4	3.4	1.9	15.0	PASS	CC174083	11/8/2014
10/02/2014	12:40	*	NOxLow_34	NOx	MID	26.1	27.3	1.2	4.5	3.9	15.0	PASS	CC259082	1/21/2017
10/02/2014	11:56	*	NOxLow_34	NOx	LOW	12.4	12.8	0.4	3.4	1.9	15.0	PASS	CC174083	11/8/2014
10/02/2014	11:56	*	NOxLow_34	NOx	MID	26.1	27.3	1.2	4.6	3.9	15.0	PASS	CC259082	1/21/2017
10/02/2014	18:58	*	O2_34	O2	LOW	6.2	6.3	0.1	1.3	0.9	15.0	PASS	CC439468	2/14/2022
10/02/2014	18:58	*	O2_34	O2	MID	13.7	13.8	0.1	0.5	2.1	15.0	PASS	CC349278	5/14/2015
10/02/2014	18:14	*	O2_34	O2	LOW	6.2	6.3	0.1	1.3	0.9	15.0	PASS	CC439468	2/14/2022
10/02/2014	18:14	*	O2_34	O2	MID	13.7	13.8	0.1	0.6	2.1	15.0	PASS	CC349278	5/14/2015
10/02/2014	17:30	*	O2_34	O2	LOW	6.2	6.3	0.1	1.5	0.9	15.0	PASS	CC439468	2/14/2022
10/02/2014	17:30	*	O2_34	O2	MID	13.7	13.8	0.1	0.7	2.1	15.0	PASS	CC349278	5/14/2015
10/02/2014	12:40	*	O2_34	O2	LOW	6.2	6.3	0.1	1.6	0.9	15.0	PASS	CC439468	2/14/2022
10/02/2014	12:40	*	O2_34	O2	MID	13.7	13.8	0.1	0.8	2.1	15.0	PASS	CC349278	5/14/2015
10/02/2014	11:56	*	O2_34	O2	LOW	6.2	6.3	0.1	1.6	0.9	15.0	PASS	CC439468	2/14/2022
10/02/2014	11:56	*	O2_34	O2	MID	13.7	13.8	0.1	0.9	2.1	15.0	PASS	CC349278	5/14/2015

FAIL = Difference Error > Regulations Allow
TARG = Invalid Target (not within regulatory specs)
RDG = Reading exceeds "Range of Analyzer"
@ Bottle is within 7 days of expiration
# Bottle has Expired - Must be Replaced

CGA Calibration Report
Generated: 10/15/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/2/2014
Period End: 10/2/2014
Included Calibrations: **CGA (40CFR60)**

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) * 100

		----LOW----		----MID----	
Channel		Diff Units	Target %	Diff Units	Target %
COHigh_34	CO	51.0	4.1%	55.8	2.0%
COLow_34	CO	0.1	0.2%	0.3	0.6%
NOxHigh_34	NOx	5.3	3.0%	2.7	0.7%
NOxLow_34	NOx	0.4	3.0%	1.1	4.1%
O2_34	O2	0.1	1.5%	0.1	0.7%

Performance Specification

Channel		PASS	FAIL
COHigh_34	CO	<=15.0%	>15.0%
COLow_34	CO	<=15.0%	>15.0%
NOxHigh_34	NOx	<=15.0%	>15.0%
NOxLow_34	NOx	<=15.0%	>15.0%
O2_34	O2	<=15.0%	>15.0%

Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA O2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target

Title:: _____ Signature:: _____ Date: / /

Title:: _____ Signature:: _____ Date: / /

Babcock & Wilcox Power Generation Group NetDAHS©

Version 84.0

Linearity Calibration Report
Generated: 10/15/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/2/2014
Period End: 10/2/2014
Included Calibrations: **Linearity (40CFR75)**

Range of Analyzers:

O2_34	O2	0.00	25.00 %O2
COLow_34	CO	0.00	100.00 ppm
COHigh_34	CO	0	5000 ppm
NOxLow_34	NOx	0.00	50.00 ppm
NOxHigh_34	NOx	0.0	700.0 ppm

Span of Analyzers:

O2_34	O2	0.00	25.00 %O2
COLow_34	CO	0.00	100.00 ppm
COHigh_34	CO	0	5000 ppm
NOxLow_34	NOx	0.00	50.00 ppm
NOxHigh_34	NOx	0.0	700.0 ppm

Date	Time	Channel		Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	%		Bottle ID	Expire Date
10/02/2014	18:58	COHigh_34	CO	LOW	1231.000	1178.000	-53.000	- N/A -	- N/A -	- N/A -	- N/A -	CC174083	11/8/2014
10/02/2014	18:58	COHigh_34	CO	MID	2749.000	2688.000	-61.000	- N/A -	- N/A -	- N/A -	- N/A -	CC259082	1/21/2017
10/02/2014	18:58	COHigh_34	CO	HIGH	4517.000	4519.000	2.000	- N/A -	- N/A -	- N/A -	- N/A -	SG9170670BAL	8/8/2017
10/02/2014	18:14	COHigh_34	CO	LOW	1231.000	1178.000	-53.000	- N/A -	- N/A -	- N/A -	- N/A -	CC174083	11/8/2014
10/02/2014	18:14	COHigh_34	CO	MID	2749.000	2689.000	-60.000	- N/A -	- N/A -	- N/A -	- N/A -	CC259082	1/21/2017
10/02/2014	18:14	COHigh_34	CO	HIGH	4517.000	4519.000	2.000	- N/A -	- N/A -	- N/A -	- N/A -	SG9170670BAL	8/8/2017
10/02/2014	17:30	COHigh_34	CO	LOW	1231.000	1180.000	-51.000	- N/A -	- N/A -	- N/A -	- N/A -	CC174083	11/8/2014
10/02/2014	17:30	COHigh_34	CO	MID	2749.000	2693.000	-56.000	- N/A -	- N/A -	- N/A -	- N/A -	CC259082	1/21/2017
10/02/2014	17:30	COHigh_34	CO	HIGH	4517.000	4528.000	11.000	- N/A -	- N/A -	- N/A -	- N/A -	SG9170670BAL	8/8/2017
10/02/2014	12:40	COHigh_34	CO	LOW	1231.000	1182.000	-49.000	- N/A -	- N/A -	- N/A -	- N/A -	CC174083	11/8/2014
10/02/2014	12:40	COHigh_34	CO	MID	2749.000	2698.000	-51.000	- N/A -	- N/A -	- N/A -	- N/A -	CC259082	1/21/2017
10/02/2014	12:40	COHigh_34	CO	HIGH	4517.000	4536.000	19.000	- N/A -	- N/A -	- N/A -	- N/A -	SG9170670BAL	8/8/2017
10/02/2014	11:56	COHigh_34	CO	LOW	1231.000	1182.000	-49.000	- N/A -	- N/A -	- N/A -	- N/A -	CC174083	11/8/2014
10/02/2014	11:56	COHigh_34	CO	MID	2749.000	2698.000	-51.000	- N/A -	- N/A -	- N/A -	- N/A -	CC259082	1/21/2017
10/02/2014	11:56	COHigh_34	CO	HIGH	4517.000	4540.000	23.000	- N/A -	- N/A -	- N/A -	- N/A -	SG9170670BAL	8/8/2017
10/02/2014	18:58	COLow_34	CO	LOW	24.440	24.440	0.000	- N/A -	- N/A -	- N/A -	- N/A -	CC439468	2/14/2022
10/02/2014	18:58	COLow_34	CO	MID	54.430	54.020	-0.410	- N/A -	- N/A -	- N/A -	- N/A -	CC349278	5/14/2015
10/02/2014	18:58	COLow_34	CO	HIGH	90.320	90.230	-0.090	- N/A -	- N/A -	- N/A -	- N/A -	CC432741	1/23/2022
10/02/2014	18:14	COLow_34	CO	LOW	24.440	24.440	0.000	- N/A -	- N/A -	- N/A -	- N/A -	CC439468	2/14/2022
10/02/2014	18:14	COLow_34	CO	MID	54.430	54.020	-0.410	- N/A -	- N/A -	- N/A -	- N/A -	CC349278	5/14/2015
10/02/2014	18:14	COLow_34	CO	HIGH	90.320	90.270	-0.050	- N/A -	- N/A -	- N/A -	- N/A -	CC432741	1/23/2022
10/02/2014	17:30	COLow_34	CO	LOW	24.440	24.530	0.090	- N/A -	- N/A -	- N/A -	- N/A -	CC439468	2/14/2022
10/02/2014	17:30	COLow_34	CO	MID	54.430	54.130	-0.300	- N/A -	- N/A -	- N/A -	- N/A -	CC349278	5/14/2015
10/02/2014	17:30	COLow_34	CO	HIGH	90.320	90.430	0.110	- N/A -	- N/A -	- N/A -	- N/A -	CC432741	1/23/2022
10/02/2014	12:40	COLow_34	CO	LOW	24.440	24.560	0.120	- N/A -	- N/A -	- N/A -	- N/A -	CC439468	2/14/2022
10/02/2014	12:40	COLow_34	CO	MID	54.430	54.160	-0.270	- N/A -	- N/A -	- N/A -	- N/A -	CC349278	5/14/2015
10/02/2014	12:40	COLow_34	CO	HIGH	90.320	90.510	0.190	- N/A -	- N/A -	- N/A -	- N/A -	CC432741	1/23/2022

Linearity Calibration Report
Generated: 10/15/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/2/2014
Period End: 10/2/2014
Included Calibrations: **Linearity (40CFR75)**

Date	Time	Channel		Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	%		Bottle ID	Expire Date
10/02/2014	11:56	COLow_34	CO	LOW	24.440	24.510	0.070	- N/A -	- N/A -	- N/A -	- N/A -	CC439468	2/14/2022
10/02/2014	11:56	COLow_34	CO	MID	54.430	54.150	-0.280	- N/A -	- N/A -	- N/A -	- N/A -	CC349278	5/14/2015
10/02/2014	11:56	COLow_34	CO	HIGH	90.320	90.630	0.310	- N/A -	- N/A -	- N/A -	- N/A -	CC432741	1/23/2022
10/02/2014	18:58	NOxHigh_34	NOx	LOW	175.300	177.500	2.200	1.3	8.765	5.0	PASS	XC021379B	3/3/2022
10/02/2014	18:58	NOxHigh_34	NOx	MID	391.500	390.600	-0.900	-0.2	19.575	5.0	PASS	CC332043	3/3/2022
10/02/2014	18:58	NOxHigh_34	NOx	HIGH	635.100	636.000	0.900	0.1	31.755	5.0	PASS	CC2447	8/5/2022
10/02/2014	18:14	NOxHigh_34	NOx	LOW	175.300	177.400	2.100	1.2	8.765	5.0	PASS	XC021379B	3/3/2022
10/02/2014	18:14	NOxHigh_34	NOx	MID	391.500	390.800	-0.700	-0.2	19.575	5.0	PASS	CC332043	3/3/2022
10/02/2014	18:14	NOxHigh_34	NOx	HIGH	635.100	636.300	1.200	0.2	31.755	5.0	PASS	CC2447	8/5/2022
10/02/2014	17:30	NOxHigh_34	NOx	LOW	175.300	177.700	2.400	1.4	8.765	5.0	PASS	XC021379B	3/3/2022
10/02/2014	17:30	NOxHigh_34	NOx	MID	391.500	390.800	-0.700	-0.2	19.575	5.0	PASS	CC332043	3/3/2022
10/02/2014	17:30	NOxHigh_34	NOx	HIGH	635.100	636.100	1.000	0.2	31.755	5.0	PASS	CC2447	8/5/2022
10/02/2014	12:40	NOxHigh_34	NOx	LOW	175.300	185.200	9.900	5.6	8.765	5.0	**FAIL**	XC021379B	3/3/2022
10/02/2014	12:40	NOxHigh_34	NOx	MID	391.500	399.500	8.000	2.0	19.575	5.0	PASS	CC332043	3/3/2022
10/02/2014	12:40	NOxHigh_34	NOx	HIGH	635.100	629.300	-5.800	-0.9	31.755	5.0	PASS	CC2447	8/5/2022
10/02/2014	11:56	NOxHigh_34	NOx	LOW	175.300	185.200	9.900	5.6	8.765	5.0	**FAIL**	XC021379B	3/3/2022
10/02/2014	11:56	NOxHigh_34	NOx	MID	391.500	399.500	8.000	2.0	19.575	5.0	PASS	CC332043	3/3/2022
10/02/2014	11:56	NOxHigh_34	NOx	HIGH	635.100	629.600	-5.500	-0.9	31.755	5.0	PASS	CC2447	8/5/2022
10/02/2014	18:58	NOxLow_34	NOx	LOW	12.350	12.690	0.340	2.4	0.618	5.0	PASS	CC174083	11/8/2014
10/02/2014	18:58	NOxLow_34	NOx	MID	26.150	27.130	0.980	3.8	1.308	5.0	PASS	CC259082	1/21/2017
10/02/2014	18:58	NOxLow_34	NOx	HIGH	44.590	44.590	0.000	0.0	2.230	5.0	PASS	SG9170670BAL	8/8/2017
10/02/2014	18:14	NOxLow_34	NOx	LOW	12.350	12.670	0.320	2.4	0.618	5.0	PASS	CC174083	11/8/2014
10/02/2014	18:14	NOxLow_34	NOx	MID	26.150	27.160	1.010	3.8	1.308	5.0	PASS	CC259082	1/21/2017
10/02/2014	18:14	NOxLow_34	NOx	HIGH	44.590	44.580	-0.010	0.0	2.230	5.0	PASS	SG9170670BAL	8/8/2017
10/02/2014	17:30	NOxLow_34	NOx	LOW	12.350	12.690	0.340	2.4	0.618	5.0	PASS	CC174083	11/8/2014
10/02/2014	17:30	NOxLow_34	NOx	MID	26.150	27.150	1.000	3.8	1.308	5.0	PASS	CC259082	1/21/2017
10/02/2014	17:30	NOxLow_34	NOx	HIGH	44.590	44.650	0.060	0.2	2.230	5.0	PASS	SG9170670BAL	8/8/2017
10/02/2014	12:40	NOxLow_34	NOx	LOW	12.350	12.770	0.420	3.2	0.618	5.0	PASS	CC174083	11/8/2014
10/02/2014	12:40	NOxLow_34	NOx	MID	26.150	27.320	1.170	4.6	1.308	5.0	PASS	CC259082	1/21/2017
10/02/2014	12:40	NOxLow_34	NOx	HIGH	44.590	44.700	0.110	0.2	2.230	5.0	PASS	SG9170670BAL	8/8/2017
10/02/2014	11:56	NOxLow_34	NOx	LOW	12.350	12.770	0.420	3.2	0.618	5.0	PASS	CC174083	11/8/2014
10/02/2014	11:56	NOxLow_34	NOx	MID	26.150	27.340	1.190	4.6	1.308	5.0	PASS	CC259082	1/21/2017
10/02/2014	11:56	NOxLow_34	NOx	HIGH	44.590	44.750	0.160	0.4	2.230	5.0	PASS	SG9170670BAL	8/8/2017
10/02/2014	18:58	O2_34	O2	LOW	6.190	6.270	0.080	1.6	0.310	5.0	PASS	CC439468	2/14/2022
10/02/2014	18:58	O2_34	O2	MID	13.720	13.790	0.070	0.7	0.686	5.0	PASS	CC349278	5/14/2015
10/02/2014	18:58	O2_34	O2	HIGH	20.980	21.060	0.080	0.5	1.049	5.0	PASS	CC432741	1/23/2022

Linearity Calibration Report
Generated: 10/15/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/2/2014
Period End: 10/2/2014
Included Calibrations: **Linearity (40CFR75)**

Date	Time	Channel		Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	%		Bottle ID	Expire Date
10/02/2014	18:14	O2_34	O2	LOW	6.190	6.270	0.080	1.6	0.310	5.0	PASS	CC439468	2/14/2022
10/02/2014	18:14	O2_34	O2	MID	13.720	13.800	0.080	0.7	0.686	5.0	PASS	CC349278	5/14/2015
10/02/2014	18:14	O2_34	O2	HIGH	20.980	21.070	0.090	0.5	1.049	5.0	PASS	CC432741	1/23/2022
10/02/2014	17:30	O2_34	O2	LOW	6.190	6.280	0.090	1.6	0.310	5.0	PASS	CC439468	2/14/2022
10/02/2014	17:30	O2_34	O2	MID	13.720	13.810	0.090	0.7	0.686	5.0	PASS	CC349278	5/14/2015
10/02/2014	17:30	O2_34	O2	HIGH	20.980	21.100	0.120	0.5	1.049	5.0	PASS	CC432741	1/23/2022
10/02/2014	12:40	O2_34	O2	LOW	6.190	6.290	0.100	1.6	0.310	5.0	PASS	CC439468	2/14/2022
10/02/2014	12:40	O2_34	O2	MID	13.720	13.830	0.110	0.7	0.686	5.0	PASS	CC349278	5/14/2015
10/02/2014	12:40	O2_34	O2	HIGH	20.980	21.130	0.150	0.5	1.049	5.0	PASS	CC432741	1/23/2022
10/02/2014	11:56	O2_34	O2	LOW	6.190	6.290	0.100	1.6	0.310	5.0	PASS	CC439468	2/14/2022
10/02/2014	11:56	O2_34	O2	MID	13.720	13.840	0.120	0.7	0.686	5.0	PASS	CC349278	5/14/2015
10/02/2014	11:56	O2_34	O2	HIGH	20.980	21.150	0.170	1.0	1.049	5.0	PASS	CC432741	1/23/2022

FAIL = Difference Error > Regulations Allow
TARG = Invalid Target (not within regulatory specs)
RDG = Reading exceeds "Range of Analyzer"
Note: 40CFR75 pass/fail determination is performed after rounding the value of Error%, or Drift, to one decimal place

@ Bottle is within 7 days of expiration
\# Bottle has Expired - Must be Replaced

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) * 100

Channel		----LOW---- Diff Units	Target %	----MID---- Diff Units	Target %	----HIGH---- Diff Units	Target %
COHigh_34	CO	51.000	- N/A -	55.800	- N/A -	11.400	- N/A -
COLow_34	CO	0.056	- N/A -	0.334	- N/A -	0.094	- N/A -
NOxHigh_34	NOx	5.300	3.0%	2.740	0.7%	1.640	0.3%
NOxLow_34	NOx	0.368	3.0%	1.070	4.1%	0.064	0.1%
O2_34	O2	0.090	1.5%	0.094	0.7%	0.122	0.6%

Linearity Calibration Report
Generated: 10/15/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/2/2014
Period End: 10/2/2014
Included Calibrations: **Linearity (40CFR75)**

Channel		Performance Specification PASS	FAIL
COHigh_34	CO	- N/A -	- N/A -
COLow_34	CO	- N/A -	- N/A -
NOxHigh_34	NOx	<=5.0%	>5.0%
NOxLow_34	NOx	<=5.0%	>5.0%
O2_34	O2	<=5.0%	>5.0%

Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part75 Linearity O2] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity O2] Low = 0.5 %O2, Mid = 0.5 %O2, High = 0.5 %O2

Title:: _____ Signature:: _____ Date: / /

Title:: _____ Signature:: _____ Date: / /

Babcock & Wilcox Power Generation Group NetDAHS©

Version 84.0

CGA Calibration Report
Generated: 10/15/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/15/2014
Period End: 10/15/2014
Included Calibrations: **CGA (40CFR60)**

Range of Analyzers:				Span of Analyzers:			
O2_36	O2	0.00	25.00 %O2	O2_36	O2	0.00	25.00 %O2
COLow_36	CO	0.00	100.00 ppm	COLow_36	CO	0.00	100.00 ppm
COHigh_36	CO	0	5000 ppm	COHigh_36	CO	0	5000 ppm
NOxLow_36	NOx	0.00	50.00 ppm	NOxLow_36	NOx	0.00	50.00 ppm
NOxHigh_36	NOx	0.0	700.0 ppm	NOxHigh_36	NOx	0.0	700.0 ppm

Date	Time	From 3 Pt.	Channel		Type	Target Units	Actual Units	Diff Units	Error %	CGA Allowable (40CFR60) Units	%		Bottle ID	Expire Date
10/15/2014	11:02	*	COHigh_36	CO	LOW	1231.0	1208.0	-23.0	-1.9	184.7	15.0	PASS	CC216462	2/14/2017
10/15/2014	11:02	*	COHigh_36	CO	MID	2749.0	2708.0	-41.0	-1.5	412.4	15.0	PASS	CC259082	1/21/2017
10/15/2014	10:21	*	COHigh_36	CO	LOW	1231.0	1207.0	-24.0	-1.9	184.7	15.0	PASS	CC216462	2/14/2017
10/15/2014	10:21	*	COHigh_36	CO	MID	2749.0	2706.0	-43.0	-1.6	412.4	15.0	PASS	CC259082	1/21/2017
10/15/2014	09:39	*	COHigh_36	CO	LOW	1231.0	1207.0	-24.0	-1.9	184.7	15.0	PASS	CC216462	2/14/2017
10/15/2014	09:39	*	COHigh_36	CO	MID	2749.0	2706.0	-43.0	-1.6	412.4	15.0	PASS	CC259082	1/21/2017
10/15/2014	11:02	*	COLow_36	CO	LOW	24.4	25.1	0.6	2.5	3.7	15.0	PASS	CC439468	2/14/2022
10/15/2014	11:02	*	COLow_36	CO	MID	54.4	54.6	0.2	0.3	8.2	15.0	PASS	CC349278	5/14/2015
10/15/2014	10:21	*	COLow_36	CO	LOW	24.4	25.0	0.5	2.3	3.7	15.0	PASS	CC439468	2/14/2022
10/15/2014	10:21	*	COLow_36	CO	MID	54.4	54.5	0.1	0.2	8.2	15.0	PASS	CC349278	5/14/2015
10/15/2014	09:39	*	COLow_36	CO	LOW	24.4	25.1	0.7	2.7	3.7	15.0	PASS	CC439468	2/14/2022
10/15/2014	09:39	*	COLow_36	CO	MID	54.4	54.5	0.0	0.1	8.2	15.0	PASS	CC349278	5/14/2015
10/15/2014	11:02	*	NOxHigh_36	NOx	LOW	175.3	182.9	7.6	4.3	26.3	15.0	PASS	XC021379B	3/3/2022
10/15/2014	11:02	*	NOxHigh_36	NOx	MID	391.5	396.8	5.3	1.4	58.7	15.0	PASS	CC332043	3/3/2022
10/15/2014	10:21	*	NOxHigh_36	NOx	LOW	175.3	182.9	7.6	4.3	26.3	15.0	PASS	XC021379B	3/3/2022
10/15/2014	10:21	*	NOxHigh_36	NOx	MID	391.5	396.7	5.2	1.3	58.7	15.0	PASS	CC332043	3/3/2022
10/15/2014	09:39	*	NOxHigh_36	NOx	LOW	175.3	183.2	7.9	4.5	26.3	15.0	PASS	XC021379B	3/3/2022
10/15/2014	09:39	*	NOxHigh_36	NOx	MID	391.5	396.7	5.2	1.3	58.7	15.0	PASS	CC332043	3/3/2022
10/15/2014	11:02	*	NOxLow_36	NOx	LOW	12.4	13.0	0.7	5.4	1.9	15.0	PASS	CC216462	2/14/2017
10/15/2014	11:02	*	NOxLow_36	NOx	MID	26.1	27.7	1.6	6.0	3.9	15.0	PASS	CC259082	1/21/2017
10/15/2014	10:21	*	NOxLow_36	NOx	LOW	12.4	13.0	0.7	5.4	1.9	15.0	PASS	CC216462	2/14/2017
10/15/2014	10:21	*	NOxLow_36	NOx	MID	26.1	27.7	1.6	6.1	3.9	15.0	PASS	CC259082	1/21/2017
10/15/2014	09:39	*	NOxLow_36	NOx	LOW	12.4	13.0	0.7	5.4	1.9	15.0	PASS	CC216462	2/14/2017
10/15/2014	09:39	*	NOxLow_36	NOx	MID	26.1	27.7	1.6	6.1	3.9	15.0	PASS	CC259082	1/21/2017
10/15/2014	11:02	*	O2_36	O2	LOW	6.2	6.2	0.0	0.5	0.9	15.0	PASS	CC439468	2/14/2022
10/15/2014	11:02	*	O2_36	O2	MID	13.7	13.6	-0.1	-0.5	2.1	15.0	PASS	CC349278	5/14/2015

CGA Calibration Report
Generated: 10/15/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/15/2014
Period End: 10/15/2014
Included Calibrations: **CGA (40CFR60)**

Date	Time	From 3 Pt.	Channel		Type	Target Units	Actual Units	Diff Units	Error %	CGA Allowable (40CFR60) Units	%		Bottle ID	Expire Date
10/15/2014	10:21	*	O2_36	O2	LOW	6.2	6.2	0.0	0.5	0.9	15.0	PASS	CC439468	2/14/2022
10/15/2014	10:21	*	O2_36	O2	MID	13.7	13.6	-0.1	-0.5	2.1	15.0	PASS	CC349278	5/14/2015
10/15/2014	09:39	*	O2_36	O2	LOW	6.2	6.2	0.0	0.3	0.9	15.0	PASS	CC439468	2/14/2022
10/15/2014	09:39	*	O2_36	O2	MID	13.7	13.6	-0.1	-0.5	2.1	15.0	PASS	CC349278	5/14/2015

FAIL = Difference Error > Regulations Allow
TARG = Invalid Target (not within regulatory specs)
RDG = Reading exceeds "Range of Analyzer"
@ Bottle is within 7 days of expiration
# Bottle has Expired - Must be Replaced

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) * 100

Channel		----LOW---- Diff Units	Target %	----MID---- Diff Units	Target %
COHigh_36	CO	23.7	1.9%	42.3	1.5%
COLow_36	CO	0.6	2.5%	0.1	0.2%
NOxHigh_36	NOx	7.7	4.4%	5.2	1.3%
NOxLow_36	NOx	0.7	5.4%	1.6	6.0%
O2_36	O2	0.0	0.4%	0.1	0.5%

Performance Specification

Channel		PASS	FAIL
COHigh_36	CO	<=15.0%	>15.0%
COLow_36	CO	<=15.0%	>15.0%
NOxHigh_36	NOx	<=15.0%	>15.0%
NOxLow_36	NOx	<=15.0%	>15.0%
O2_36	O2	<=15.0%	>15.0%

Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA CO] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA CO] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA NOx] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target
AltPerf: [Part60 CGA NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part60 CGA O2] Low = 15.0 %Target, Mid = 15.0 %Target, High = 15.0 %Target

Title:: Signature:: Date: / /

Title:: Signature:: Date: / /

Babcock & Wilcox Power Generation Group NetDAHS©

Version 84.0

Linearity Calibration Report
Generated: 10/15/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/15/2014
Period End: 10/15/2014
Included Calibrations: **Linearity (40CFR75)**

Range of Analyzers:				Span of Analyzers:			
O2_36	O2	0.00	25.00 %O2	O2_36	O2	0.00	25.00 %O2
COLow_36	CO	0.00	100.00 ppm	COLow_36	CO	0.00	100.00 ppm
COHigh_36	CO	0	5000 ppm	COHigh_36	CO	0	5000 ppm
NOxLow_36	NOx	0.00	50.00 ppm	NOxLow_36	NOx	0.00	50.00 ppm
NOxHigh_36	NOx	0.0	700.0 ppm	NOxHigh_36	NOx	0.0	700.0 ppm

Date	Time	Channel		Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	%		Bottle ID	Expire Date
10/15/2014	11:02	COHigh_36	CO	LOW	1231.000	1208.000	-23.000	- N/A -	- N/A -	- N/A -	- N/A -	CC216462	2/14/2017
10/15/2014	11:02	COHigh_36	CO	MID	2749.000	2708.000	-41.000	- N/A -	- N/A -	- N/A -	- N/A -	CC259082	1/21/2017
10/15/2014	11:02	COHigh_36	CO	HIGH	4532.000	4516.000	-16.000	- N/A -	- N/A -	- N/A -	- N/A -	CC165169	5/23/2017
10/15/2014	10:21	COHigh_36	CO	LOW	1231.000	1207.000	-24.000	- N/A -	- N/A -	- N/A -	- N/A -	CC216462	2/14/2017
10/15/2014	10:21	COHigh_36	CO	MID	2749.000	2706.000	-43.000	- N/A -	- N/A -	- N/A -	- N/A -	CC259082	1/21/2017
10/15/2014	10:21	COHigh_36	CO	HIGH	4532.000	4515.000	-17.000	- N/A -	- N/A -	- N/A -	- N/A -	CC165169	5/23/2017
10/15/2014	09:39	COHigh_36	CO	LOW	1231.000	1207.000	-24.000	- N/A -	- N/A -	- N/A -	- N/A -	CC216462	2/14/2017
10/15/2014	09:39	COHigh_36	CO	MID	2749.000	2706.000	-43.000	- N/A -	- N/A -	- N/A -	- N/A -	CC259082	1/21/2017
10/15/2014	09:39	COHigh_36	CO	HIGH	4532.000	4513.000	-19.000	- N/A -	- N/A -	- N/A -	- N/A -	CC165169	5/23/2017
10/15/2014	11:02	COLow_36	CO	LOW	24.440	25.060	0.620	- N/A -	- N/A -	- N/A -	- N/A -	CC439468	2/14/2022
10/15/2014	11:02	COLow_36	CO	MID	54.430	54.600	0.170	- N/A -	- N/A -	- N/A -	- N/A -	CC349278	5/14/2015
10/15/2014	11:02	COLow_36	CO	HIGH	90.510	90.760	0.250	- N/A -	- N/A -	- N/A -	- N/A -	CC40110	6/6/2022
10/15/2014	10:21	COLow_36	CO	LOW	24.440	24.990	0.550	- N/A -	- N/A -	- N/A -	- N/A -	CC439468	2/14/2022
10/15/2014	10:21	COLow_36	CO	MID	54.430	54.550	0.120	- N/A -	- N/A -	- N/A -	- N/A -	CC349278	5/14/2015
10/15/2014	10:21	COLow_36	CO	HIGH	90.510	90.720	0.210	- N/A -	- N/A -	- N/A -	- N/A -	CC40110	6/6/2022
10/15/2014	09:39	COLow_36	CO	LOW	24.440	25.100	0.660	- N/A -	- N/A -	- N/A -	- N/A -	CC439468	2/14/2022
10/15/2014	09:39	COLow_36	CO	MID	54.430	54.480	0.050	- N/A -	- N/A -	- N/A -	- N/A -	CC349278	5/14/2015
10/15/2014	09:39	COLow_36	CO	HIGH	90.510	90.670	0.160	- N/A -	- N/A -	- N/A -	- N/A -	CC40110	6/6/2022
10/15/2014	11:02	NOxHigh_36	NOx	LOW	175.300	182.900	7.600	4.3	8.765	5.0	PASS	XC021379B	3/3/2022
10/15/2014	11:02	NOxHigh_36	NOx	MID	391.500	396.800	5.300	1.4	19.575	5.0	PASS	CC332043	3/3/2022
10/15/2014	11:02	NOxHigh_36	NOx	HIGH	635.100	633.700	-1.400	-0.2	31.755	5.0	PASS	CC2447	8/5/2022
10/15/2014	10:21	NOxHigh_36	NOx	LOW	175.300	182.900	7.600	4.3	8.765	5.0	PASS	XC021379B	3/3/2022
10/15/2014	10:21	NOxHigh_36	NOx	MID	391.500	396.700	5.200	1.3	19.575	5.0	PASS	CC332043	3/3/2022
10/15/2014	10:21	NOxHigh_36	NOx	HIGH	635.100	635.000	-0.100	0.0	31.755	5.0	PASS	CC2447	8/5/2022
10/15/2014	09:39	NOxHigh_36	NOx	LOW	175.300	183.200	7.900	4.5	8.765	5.0	PASS	XC021379B	3/3/2022
10/15/2014	09:39	NOxHigh_36	NOx	MID	391.500	396.700	5.200	1.3	19.575	5.0	PASS	CC332043	3/3/2022
10/15/2014	09:39	NOxHigh_36	NOx	HIGH	635.100	634.400	-0.700	-0.1	31.755	5.0	PASS	CC2447	8/5/2022

Linearity Calibration Report
Generated: 10/15/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/15/2014
Period End: 10/15/2014
Included Calibrations: **Linearity (40CFR75)**

Date	Time	Channel		Type	Target Units	Actual Units	Diff Units	Error %	Linearity Allowable (40CFR75) Units	%		Bottle ID	Expire Date
10/15/2014	11:02	NOxLow_36	NOx	LOW	12.350	13.020	0.670	5.7	0.000	5.0	PASS	CC216462	2/14/2017
10/15/2014	11:02	NOxLow_36	NOx	MID	26.150	27.710	1.560	6.1	0.000	5.0	PASS	CC259082	1/21/2017
10/15/2014	11:02	NOxLow_36	NOx	HIGH	45.000	45.130	0.130	0.2	2.250	5.0	PASS	CC165169	5/23/2017
10/15/2014	10:21	NOxLow_36	NOx	LOW	12.350	13.020	0.670	5.7	0.000	5.0	PASS	CC216462	2/14/2017
10/15/2014	10:21	NOxLow_36	NOx	MID	26.150	27.740	1.590	6.1	0.000	5.0	PASS	CC259082	1/21/2017
10/15/2014	10:21	NOxLow_36	NOx	HIGH	45.000	45.170	0.170	0.4	2.250	5.0	PASS	CC165169	5/23/2017
10/15/2014	09:39	NOxLow_36	NOx	LOW	12.350	13.020	0.670	5.7	0.000	5.0	PASS	CC216462	2/14/2017
10/15/2014	09:39	NOxLow_36	NOx	MID	26.150	27.740	1.590	6.1	0.000	5.0	PASS	CC259082	1/21/2017
10/15/2014	09:39	NOxLow_36	NOx	HIGH	45.000	45.220	0.220	0.4	2.250	5.0	PASS	CC165169	5/23/2017
10/15/2014	11:02	O2_36	O2	LOW	6.190	6.220	0.030	0.0	0.310	5.0	PASS	CC439468	2/14/2022
10/15/2014	11:02	O2_36	O2	MID	13.720	13.650	-0.070	-0.7	0.686	5.0	PASS	CC349278	5/14/2015
10/15/2014	11:02	O2_36	O2	HIGH	20.950	20.860	-0.090	-0.5	1.048	5.0	PASS	CC40110	6/6/2022
10/15/2014	10:21	O2_36	O2	LOW	6.190	6.220	0.030	0.0	0.310	5.0	PASS	CC439468	2/14/2022
10/15/2014	10:21	O2_36	O2	MID	13.720	13.650	-0.070	-0.7	0.686	5.0	PASS	CC349278	5/14/2015
10/15/2014	10:21	O2_36	O2	HIGH	20.950	20.860	-0.090	-0.5	1.048	5.0	PASS	CC40110	6/6/2022
10/15/2014	09:39	O2_36	O2	LOW	6.190	6.210	0.020	0.0	0.310	5.0	PASS	CC439468	2/14/2022
10/15/2014	09:39	O2_36	O2	MID	13.720	13.650	-0.070	-0.7	0.686	5.0	PASS	CC349278	5/14/2015
10/15/2014	09:39	O2_36	O2	HIGH	20.950	20.850	-0.100	-0.5	1.048	5.0	PASS	CC40110	6/6/2022

FAIL = Difference Error > Regulations Allow
TARG = Invalid Target (not within regulatory specs)
RDG = Reading exceeds "Range of Analyzer"
Note: 40CFR75 pass/fail determination is performed after rounding the value of Error%, or Drift, to one decimal place

@ Bottle is within 7 days of expiration
# Bottle has Expired - Must be Replaced

Linearity Calibration Report
Generated: 10/15/2014

Company: BP Products North America,Inc.
Plant: 2815 Indianapolis Blvd.
City/St: Whiting, IN 46394
Source: stack

Period Start: 10/15/2014
Period End: 10/15/2014
Included Calibrations: **Linearity (40CFR75)**

Absolute Average DIFF and Absolute(Target - Average Reading)/Target) * 100

		----LOW----		----MID----		----HIGH----	
Channel		Diff Units	Target %	Diff Units	Target %	Diff Units	Target %
COHigh_36	CO	23.667	- N/A -	42.333	- N/A -	17.333	- N/A -
COLow_36	CO	0.610	- N/A -	0.113	- N/A -	0.207	- N/A -
NOxHigh_36	NOx	7.700	4.4%	5.233	1.3%	0.733	0.1%
NOxLow_36	NOx	0.670	5.4%	1.580	6.0%	0.173	0.4%
O2_36	O2	0.027	0.4%	0.070	0.5%	0.093	0.4%

Performance Specification

Channel		PASS	FAIL
COHigh_36	CO	- N/A -	- N/A -
COLow_36	CO	- N/A -	- N/A -
NOxHigh_36	NOx	<=5.0%	>5.0%
NOxLow_36	NOx	<=5.0%	>5.0%
O2_36	O2	<=5.0%	>5.0%

Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part75 Linearity NOx] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity NOx] Low = 5 ppm, Mid = 5 ppm, High = 5 ppm
Perf: [Part75 Linearity O2] Low = 5.0 %Target, Mid = 5.0 %Target, High = 5.0 %Target
AltPerf: [Part75 Linearity O2] Low = 0.5 %O2, Mid = 0.5 %O2, High = 0.5 %O2

Title:: _____ Signature:: _____ Date: / /

Title:: _____ Signature:: _____ Date: / /

Attachment D

NSPS Ja Root Cause Failure Analyses

An event requiring an NSPS Ja Root Cause Failure Analysis (RCFA) occurred at the South Flare on December 26, 2014. The RCFA is ongoing and will be completed within 45 days of the event as required by 40 CFR 60.103a(d).

Attachment E

New HU CEMS Report

PART 70 OPERATING PERMIT
CERTIFICATION

Source Name:	Praxair Inc.
Source Address:	2551 Dickey Road, East Chicago, IN 46312
Mailing Address:	P.O. Box 710, Whiting, Indiana 46394-0710
Permit No.:	T089-6741-00453
	Last updated on February 4, 2014 per SPM 089-33532-00453

Praxair shall include this certification when submitting monitoring, testing reports/results or other documents to BP and requires BP RO certification.
Please check what document is being certified:
☐ Annual Compliance Certification Letter
☐ Test Results (specify)
☒ Report (specify): Quarterly CEMS Report – 4th Quarter 2014
☐ Notification (specify)
☐ Affidavit (specify)
☐ Other (specify)

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.	
Signature of Responsible Official:	
Printed Name:	Andrew Campbell
Title/Position:	Facility Manager
Phone:	219-378-4854
Date:	1/13/15

Praxair Inc
2551 Dickey Rd
East Chicago, IN 46312

January 13, 2015

Ms. Linda Wilson
Environmental Superintendent
BP Products North America Inc.
2815 Indianapolis Blvd.
Whiting, IN 46394-0710

Re: CEM Summary Performance Report – 4th Quarter 2014

Dear Ms. Wilson,

Please find attached the Continuous Emission Monitor (CEM) summary performance reports for the New Hydrogen Unit owned by Praxair.

This report is submitted in accordance with the Indiana Department of Environmental Management (IDEM) Operating Permit No. T089-6741-00453 Significant Permit Modification (SPM) No. 089-33532-00453 issued on February 4, 2014 and reporting requirements contained in 326 IAC 3-5-7 and 40 CFR 60.7(c). This report covers NOx and CO emissions from SMR 5 (HU-1) and SMR 6 (HU-2) as well as SO2 emissions from the flare (HU Flare) for the period beginning on October 1, 2014 through December 31, 2014.

The CEMS unit on SMR 5 (HU-1) operated with greater than 95% uptime and no excess emissions from this unit during the quarter. Praxair conducted Cylinder Gas Audit (CGA) for CEMS on SMR-5 on November 25, 2014.

The CEMS unit on SMR 6 (HU-2) operated with greater than 95% uptime and no excess emissions from this unit during the quarter. Praxair conducted Cylinder Gas Audit (CGA) for CEMS on SMR-6 on November 25, 2014.

The HU flare SOLA operated with greater than 90% uptime and no excess emissions from this unit during the quarter. Praxair did not vent any process gas to the flare (no upset, maintenance, start up and shutdown activities) during the flare SOLA down time. Praxair monitored the purge gas going to flare by using draeger tubes and emissions are within the limits. Praxair conducted Relative Accuracy Test Audit (RATA) for Flare SOLA on November 25, 2014.

Monitoring requirements for HU Flare are conducted under an Alternative Monitoring Plan (AMP) approved by USEPA by means of a letter dated June 8, 2010. The AMP allows for the monitoring of total sulfur at the flare in the form of SO2 instead of H2S.

Praxair Inc
2551 Dickey Rd
East Chicago, IN 46312

Per 40 CFR 60.7(c) and (d) and per 326 IAC 3-5-7 the following reports are attached to this cover letter:

SMR 5 (HU-1)

- NOx @ 0% O2 40 ppm at 30 day rolling average Summary Report
- NOx @ 3% O2 Summary Report
- CO @ 3% O2 Summary Report
- Cylinder Gas Audit Report

SMR 6 (HU-2)

- NOx @ 0% O2 40 ppm at 30 day rolling average Report
- NOx @ 3% O2 Summary Report
- CO @ 3% O2 Summary Report
- Cylinder Gas Audit Report

HU Flare

- SO2 152 ppm Summary Report

If you have any questions or comments about this report or the information contained with it, please contact Kiranmai Valluri at (281) 478-1564.

Sincerely,

Andrew Campbell
Facility Manager

SMR5-HU1 Summary Report

NOx@0% Excess Emission and Monitoring System Performance

Reporting period dates:	October 1, 2014 to December 31, 2014
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	40 ppm@0% O2 30 day average NOx - NSPS Ja
Monitor Manufacturer:	Horiba
Monitor Model No.:	ENDA P-3770
Date of Latest CEMS Certification:	02/04/2014 (RATA)
Process Unit Description:	Hydrogen Reformer
Total Source Operating Time:	2208.0 hours

Emission Data Summary		
1. Duration of excess emissions in reporting period due to:		
a. Startup/shutdown	0.0	hr
b. Control equipment problems	0.0	hr
c. Process problems	0.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total duration of excess emissions.	0.0	hr
3. Percentage total duration of excess emissions of total source operating time.	0.0	%
CEMS Performance Summary		
1. CEMS downtime in reporting due to:		
a. Monitor equipment malfunctions	0.0	hr
b. Non-Monitor equipment malfunctions	0.0	hr
c. Quality assurance calibration	2.0	hr
d. Other known causes	23.0	hr
e. Unknown causes	0.0	hr
2. Total CEMS Downtime.	25.0	hr
3. Percentage total CEMS Downtime of total source operating time.	1.1	%

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature:

Title: Facility Manager

Date 1/8/2015

SMR5-HU1 Summary Report

NOx@3% Excess Emission and Monitoring System Performance

Reporting period dates:	October 1, 2014 to December 31, 2014
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	Sitewide Limit- Title V Permit
Monitor Manufacturer:	Horiba
Monitor Model No.:	ENDA P-3770
Date of Latest CEMS Certification:	02/04/2014 (RATA)
Process Unit Description:	Hydrogen Reformer
Total Source Operating Time:	2208.0 hours

Emission Data Summary		
1. Duration of excess emissions in reporting period due to:		
a. Startup/shutdown	0.0	hr
b. Control equipment problems	0.0	hr
c. Process problems	0.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total duration of excess emissions.	0.0	hr
3. Percentage total duration of excess emissions of total source operating time.	0.0	%
CEMS Performance Summary		
1. CEMS downtime in reporting due to:		
a. Monitor equipment malfunctions	0.0	hr
b. Non-Monitor equipment malfunctions	0.0	hr
c. Quality assurance calibration	2.0	hr
d. Other known causes	23.0	hr
e. Unknown causes	0.0	hr
2. Total CEMS Downtime.	25.0	hr
3. Percentage total CEMS Downtime of total source operating time.	1.1	%

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature:

Title: Facility Manager

Date 1/8/2015

SMR5-HU1 Summary Report

CO@3% Excess Emission and Monitoring System Performance

Reporting period dates:	October 1, 2014 to December 31, 2014
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	Sitewide Limit - Title V Permit
Monitor Manufacturer:	Horiba
Monitor Model No.:	ENDA P-3770
Date of Latest CEMS Certification:	02/04/2014 (RATA)
Process Unit Description:	Hydrogen Reformer
Total Source Operating Time:	2208.0 hours

Emission Data Summary		
1. Duration of excess emissions in reporting period due to:		
a. Startup/shutdown	0.0	hr
b. Control equipment problems	0.0	hr
c. Process problems	0.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total duration of excess emissions.	0.0	hr
3. Percentage total duration of excess emissions of total source operating time.	0.0	%
CEMS Performance Summary		
1. CEMS downtime in reporting due to:		
a. Monitor equipment malfunctions	0.0	hr
b. Non-Monitor equipment malfunctions	0.0	hr
c. Quality assurance calibration	2.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total CEMS Downtime.	2.0	hr
3. Percentage total CEMS Downtime of total source operating time.	0.1	%

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature:

Title: Facility Manager

Date 1/8/2015

Reporting period dates:	October 1, 2014 to December 31, 2014
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Monitor Model No.:	ENDA P-3770

SMR5-HU1 CEMS Downtime-NOx

Date	Start Time	Date	End Time	Duration (hr)	Reason	Action Taken
11/25/2014	9:00	9/11/2014	11:00	2.00	CGA	None
11/25/2014	11:00	9/11/2014	10:00	23.00	After CGA, testing company did not return the CEMS to normal position	Corrected the problem and recalibrated

Total hours **25.00**

SMR5-HU1 CEMS Downtime-CO

Date	Start Time	Date	End Time	Duration (hr)	Reason	Action Taken
11/25/2014	9:00	9/11/2014	11:00	2.00	CGA	None

Total hours **2**

Reporting period dates:	October 1, 2014 to December 31, 2014
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Monitor Model No.:	ENDA P-3770

SMR5-HU1 Excess Emission Periods: NOx 40ppm@0% 24-Hours

Start Date	Start Time	End Date	End Time	Duration (hr)	Reason	Action Taken
No excess Emissions during the fourth quarter of 2014						

Total hours **0.00**

SMR6-HU2 Summary Report

NOx@0% Excess Emission and Monitoring System Performance

Reporting period dates:	October 1, 2014 to December 31, 2014
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	40 ppm@0% O2 24-hour NOx - NSPS Ja
Monitor Manufacturer:	Horiba
Monitor Model No.:	ENDA P-3771
Date of Latest CEMS Certification:	05/20/2014 (RATA)
Process Unit Description:	Hydrogen Reformer
Total Source Operating Time:	2205.2 hours

Emission Data Summary		
1. Duration of excess emissions in reporting period due to:		
a. Startup/shutdown	0.0	hr
b. Control equipment problems	0.0	hr
c. Process problems	0.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total duration of excess emissions.	0.0	hr
3. Percentage total duration of excess emissions of total source operating time.	0.0	%
CEMS Performance Summary		
1. CEMS downtime in reporting due to:		
a. Monitor equipment malfunctions	0.0	hr
b. Non-Monitor equipment malfunctions	0.0	hr
c. Quality assurance calibration	3.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	2.0	hr
2. Total CEMS Downtime.	5.0	hr
3. Percentage total CEMS Downtime of total source operating time.	0.2	%

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature:

Title: Facility Manager

1/8/2015

SMR6-HU2 Summary Report

NOx@3% Excess Emission and Monitoring System Performance

Reporting period dates:	October 1, 2014 to December 31, 2014
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	Sitewide Limit - Title V Permit
Monitor Manufacturer:	Horiba
Monitor Model No.:	ENDA P-3771
Date of Latest CEMS Certification:	05/20/2014 (RATA)
Process Unit Description:	Hydrogen Reformer
Total Source Operating Time:	2205.2 hours

Emission Data Summary		
1. Duration of excess emissions in reporting period due to:		
a. Startup/shutdown	0.0	hr
b. Control equipment problems	0.0	hr
c. Process problems	0.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total duration of excess emissions.	0.0	hr
3. Percentage total duration of excess emissions of total source operating time.	0.0	%
CEMS Performance Summary		
1. CEMS downtime in reporting due to:		
a. Monitor equipment malfunctions	0.0	hr
b. Non-Monitor equipment malfunctions	0.0	hr
c. Quality assurance calibration	3.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	2.0	hr
2. Total CEMS Downtime.	5.0	hr
3. Percentage total CEMS Downtime of total source operating time.	0.2	%

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature:

Title: Facility Manager

1/8/2015

SMR6-HU2 Summary Report

CO@3% Excess Emission and Monitoring System Performance

Reporting period dates:	October 1, 2014 to December 31, 2014
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	Sitewide Limit - Title V Permit
Monitor Manufacturer:	Horiba
Monitor Model No.:	ENDA P-3771
Date of Latest CEMS Certification:	05/20/2014 (RATA)
Process Unit Description:	Hydrogen Reformer
Total Source Operating Time:	2205.2 hours

Emission Data Summary		
1. Duration of excess emissions in reporting period due to:		
a. Startup/shutdown	0.0	hr
b. Control equipment problems	0.0	hr
c. Process problems	0.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total duration of excess emissions.	0.0	hr
3. Percentage total duration of excess emissions of total source operating time.	0.0	%
CEMS Performance Summary		
1. CEMS downtime in reporting due to:		
a. Monitor equipment malfunctions	0.0	hr
b. Non-Monitor equipment malfunctions	0.0	hr
c. Quality assurance calibration	3.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	2.0	hr
2. Total CEMS Downtime.	5.0	hr
3. Percentage total CEMS Downtime of total source operating time.	0.2	%

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature: _____

Title: Facility Manager

1/8/2015

Reporting period dates:	October 1, 2014 to December 31, 2014
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Monitor Model No.:	ENDA P-3771

SMR6-HU2 Excess Emission Periods: NOx 40ppm@0% 24-Hours

Start Date	Start Time	End Date	End Time	Duration (hr)	Reason	Action Taken

There were no excess emission from SMR 6 (HU-2) in fourth quarter of 2014.

Total hours 0.00

Reporting period dates:	October 1, 2014 to December 31, 2014
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Monitor Model No.:	ENDA P-3771

SMR6-HU2 CEMS Downtime-NOx

Date	Start Time	Date	End Time	Duration	Reason	Action Taken
11/25/2014	11:00	11/25/2014	14:00	3.0	CGA	None
12/23/2014	8:00	12/23/2014	10:00	2.0	Unknown	None

Total hours **5.0**

SMR6-HU2 CEMS Downtime-CO

Date	Start Time	Date	End Time	Duration	Reason	Action Taken
11/25/2014	11:00	11/25/2014	14:00	3.0	CGA	None
12/23/2014	8:00	12/23/2014	10:00	2.0	Unknown	None

Total hours **5.0**

HU Flare Summary Report

SO2 Excess Emission and Monitoring System Performance

Reporting period dates:	October 1, 2014 to December 31, 2014
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Emission Limitation:	152 ppm SO2 - NSPS J
Monitor Manufacturer:	Thermo Scientific SOLA II
Monitor Model No.:	SL-06230909
Date of Latest CEMS Certification:	11/25/2014 (RATA)
Process Unit Description:	Hydrogen Unit Flare
Total Source Operating Time:	2208.0 hours

Emission Data Summary		
1. Duration of excess emissions in reporting period due to:		
a. Startup/shutdown	0.0	hr
b. Control equipment problems	0.0	hr
c. Process problems	0.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	0.0	hr
2. Total duration of excess emissions.	0.0	hr
3. Percentage total duration of excess emissions of total source operating time.	0.0	%
CEMS Performance Summary		
1. CEMS downtime in reporting due to:		
a. Monitor equipment malfunctions	0.0	hr
b. Non-Monitor equipment malfunctions	0.0	hr
c. Quality assurance calibration	0.0	hr
d. Other known causes	0.0	hr
e. Unknown causes	185.0	hr
2. Total CEMS Downtime.	185.0	hr
3. Percentage total CEMS Downtime of total source operating time.	8.4	%

I certify that the information contained in this report is true accurate and complete

Name: Andrew Campbell

Signature:

Title: Facility Manager

1/8/2015

Reporting period dates:	October 1, 2014 to December 31, 2014
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Monitor Model No.:	SL-06230909

HU Flare Excess Emission Periods: SO2 152 ppm

Start Date	Start Time	End Date	End Time	Duration (hr)	Reason	Action Taken
No excess emissions during the fourth quarter of 2014						

Total hours **0.00**

Reporting period dates:	October 1, 2014 to December 31, 2014
Company:	Praxair, Inc.
Address:	2551 Dickey Road, East Chicago, IN
Monitor Model No.:	SL-06230909

HU Flare CEMS Downtime-SO2

Start Date	Start Time	End Date	End Time	Duration (hr)	Reason	Action Taken
10/18/2014	6:31	10/19/2014	12:08	30	4x failure on October 19, 2014	Corrected the poblem and recalibrated. No process is going to flare this time.
12/2/2014	6:31	12/8/2014	15:15	155	4x failure on 12/3/2014	Corrected the poblem and recalibrated. No process gas is going to flare this time.

Total hours 185.0

CONTINUOUS EMISSIONS MONITORING SYSTEM CYLINDER GAS AUDIT

Performed At The
Praxair, Inc.
Reformer 5 (HU 1)
Reformer 6 (HU 2)
Hydrogen Unit
Whiting, Indiana

Test Date
November 25, 2014

Report No.
TRC Environmental Corporation Report 202965.6000A

Report Submittal Date
December 17, 2014

TRC Environmental Corporation
7521 Brush Hill Road
Burr Ridge, Illinois 60527
USA

T (312) 533-2042
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CERTIFICATION SHEET

I certify that TRC and its subcontractors (if any) operated in conformance with the requirements of ASTM D 7036-04 during this test project. The validity of any data not generated by TRC or its subcontractors is the responsibility of the organization that provided said data.

TRC Environmental Corporation

David McNulty
Instrumentation Engineer/Manager CEMS Services

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TRC Gas Audit Template Rev 2/1/13

CONTINUOUS EMISSIONS MONITORING SYSTEM CYLINDER GAS AUDIT

1.0 INTRODUCTION

A continuous emissions monitoring (CEM) system cylinder gas audit was performed by TRC Environmental Corporation (TRC) on November 25, 2014, at the Hydrogen Unit Reformer 5 (HU 1) and Hydrogen Unit Reformer 6 (HU 2) of Praxair, Inc. Whiting facility in Whiting, Indiana. The tests were authorized by Praxair, Inc.

The CEMS system was challenged three times at two audit points and the average responses were used in determining accuracy. All work was performed in accordance with 40 CFR 60, Appendix B, Performance Specification 2, and Appendix F.

1.1 Project Contact Information

Participants		
Test Facility	Praxair, Inc. Praxair Hydrogen Unit Whiting, Indiana 46312	Ms. Kiranmai Valluri Environmental Manager 281-478-1564 (phone) kiranmai_valluri@praxair.com
Air Emissions Testing Body (AETB)	TRC Environmental Corporation 7521 Brush Hill Road Burr Ridge, Illinois 60527	Mr. David McNulty Instrumentation Engineer/Manager CEM Services 312-533-2029 (phone) 312-533-2070 (fax) dmcnulty@trcsolutions.com

The tests were conducted by Mr. David McNulty of TRC.

2.0 SUMMARY OF RESULTS

AUDIT RESULTS SUMMARY				
Unit No.	Gas Type	Accuracy of CEM Component (%)		Pass (0.00-15.00%) Fail (15.01%->)
		Audit Point 1	Audit Point 2	
Reformer 5/HU 1	NO_X Low	-4.76	4.09	Pass
	NO_X High	1.76	3.07	Pass
	CO Low	-2.00	-0.21	Pass
	CO High	0.33	0.04	Pass
	O_2	2.66	-0.24	Pass

AUDIT RESULTS SUMMARY				
Unit No.	Gas Type	Accuracy of CEM Component %		Pass (0.00-15.00%) Fail (15.01%->)
		Audit Point 1	Audit Point 2	
Reformer 6/HU 2	NO_X Low	-6.77	3.19	Pass
	NO_X High	1.08	2.44	Pass
	CO Low	-2.00	-0.21	Pass
	CO High	2.04	1.25	Pass
	O_2	-4.48	0.17	Pass

APPENDIX

Appendix A: Cylinder Gas Audit Field Data Sheets

Part 60 Cylinder Gas Audit Data Sheet

Period Ending Date:	Fourth Quarter	Date of Audit:	November 25, 2014
Client:	Praxair	Plant Name:	Praxair Whiting
Unit:	SMR5-HU1	Location:	Whiting IN
Project Number:	202965.6		
Auditor:	David McNulty	Representing:	TRC Environmental

Type: NOX Low	Manufacture: Horiba	Audit Point 1	Audit Point 2
Model: ENDA/P	Serial Number: ENDA/P-3770		
	Full Scale Value: 20 ppm		
** Audit Range (ppm or %):		4-6 ppm	10-12 ppm
Cylinder ID Number:		CC177329	EB0000706
Certification Expiration Date;		7-May-15	26-Feb-15
Certification Type;		Protocol 1	Protocol 1
Certified Value		4.97	11.08
CEMS Response 1:		4.8	11.6
CEMS Response 2:		4.7	11.5
CEMS Response 3:		4.7	11.5
Average CEMS Response:		4.7	11.5
Accuracy:		-4.76%	4.09%
Absolute Difference:		0.2	0.5

Type: CO Low	Manufacture: Horiba	Audit Point 1	Audit Point 2
Model: ENDA/P	Serial Number: ENDA/P-3770		
	Full Scale Value: 20 ppm		
** Audit Range (ppm or %):		4-6 ppm	10-12 ppm
Cylinder ID Number:		CC177329	EB0000706
Certification Expiration Date;		7-May-15	26-Feb-15
Certification Type;		Protocol 1	Protocol 1
Certified Value		5.00	10.99
CEMS Response 1:		4.9	11.0
CEMS Response 2:		4.9	11.0
CEMS Response3:		4.9	10.9
Average CEMS Response:		4.9	11.0
Accuracy:		-2.00%	-0.21%
Absolute Difference:		0.1	0.0

Comments:

Calculations:

$$A = (C_m - C_a)/C_a \times 100$$

$$A_D = \text{Absolute Value } (C_a - C_m)$$

Where:

A = Accuracy of the CEMS in percent

A_D = Absolute difference between the Audit Value and the mean response

C_m = Average CEMs response during audit in units of appropriate concentration

C_a = Certified audit value in units of appropriate concentration

Acceptance Criteria:
The audit passes if the accuracy is ±15 percent of the average audit value, or the absolute difference is ±5 ppm, whichever is greater.

**Audit Point Criteria:

SO_2, NO_X, CO, H_2S

Audit Point 1	20-30% of Full Scale
Audit Point 2	50-60% of Full Scale

O_2

Audit Point 1	4-6%
Audit Point 2	8-12%

CO_2

Audit Point 1	5-8%
Audit Point 2	10-14%

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Part 60 Cylinder Gas Audit Data Sheet

Period Ending Date:	Fourth Quarter	Date of Audit:	November 25, 2014
Client:	Praxair	Plant Name:	Praxair Whiting
Unit:	SMR5-HU1	Location:	Whiting IN
Project Number:	202965.6		
Auditor:	David McNulty	Representing:	TRC Environmental

Type: NO_X High	Manufacture: Horiba	Audit Point 1	Audit Point 2
Model: ENDA/P	Serial Number: ENDA/P-3770		
	Full Scale Value: 200 ppm		
** Audit Range (ppm or %):		40-60	100-120
Cylinder ID Number:		SX47405	SX48605
Certification Expiration Date;		19-Feb-15	15-Feb-19
Certification Type;		Protocol 1	Protocol 1
Certified Value		49.53	110.18
CEMS Response 1:		50.3	113.4
CEMS Response 2:		50.5	113.7
CEMS Response 3:		50.4	113.6
Average CEMS Response:		50.4	113.6
Accuracy:		1.76%	3.07%
Absolute Difference:		0.9	3.4

Type: CO High	Manufacture: Horiba	Audit Point 1	Audit Point 2
Model: ENDA/P	Serial Number: ENDA/P-3770		
	Full Scale Value: 100 ppm		
** Audit Range (ppm or %):		20-30	50-60
Cylinder ID Number:		SX47405	SX48605
Certification Expiration Date;		19-Feb-15	15-Feb-19
Certification Type;		Protocol 1	Protocol 1
Certified Value		25.35	55.11
CEMS Response 1:		25.3	55.0
CEMS Response 2:		25.5	55.2
CEMS Response3:		25.5	55.2
Average CEMS Response:		25.4	55.1
Accuracy:		0.33%	0.04%
Absolute Difference:		0.1	0.0

Comments:

Calculations:

$$A = (C_m - C_a)/C_a \times 100$$

$$A_D = \text{Absolute Value } (C_a - C_m)$$

Where:

A = Accuracy of the CEMS in percent

A_D = Absolute difference between the Audit Value and the mean response

C_m = Average CEMs response during audit in units of appropriate concentration

C_a = Certified audit value in units of appropriate concentration

Acceptance Criteria:
The audit passes if the accuracy is ±15 percent of the average audit value, or the absolute difference is ±5 ppm, whichever is greater.

**Audit Point Criteria:

SO_2, NO_X, CO, H_2S

Audit Point 1	20-30% of Full Scale
Audit Point 2	50-60% of Full Scale

O_2

Audit Point 1	4-6%
Audit Point 2	8-12%

CO_2

Audit Point 1	5-8%
Audit Point 2	10-14%

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Part 60 Cylinder Gas Audit Data Sheet

Period Ending Date:	Fourth Quarter	Date of Audit:	November 25, 2014
Client:	Praxair	Plant Name:	Praxair Whiting
Unit:	SMR5-HU1	Location:	Whiting IN
Project Number:	202965.6		
Auditor:	David McNulty	Representing:	TRC Environmental

Type: O_2	Manufacturer: Horiba	Audit Point 1	Audit Point 2
Model: ENDA/P	Serial Number: ENDA/P-3770		
	Full Scale Value: 25%		
** Audit Range (ppm or %):		4-6%	8-12%
Cylinder ID Number:		FL-0000282	EB0000785
Certification Expiration Date;		6-Feb-15	5-Jun-21
Certification Type;		Protocol 1	Protocol 1
Certified Value		5.13	10.057
CEMS Response 1:		5.3	9.8
CEMS Response 2:		5.3	10.2
CEMS Response 3:		5.2	10.1
Average CEMS Response:		5.3	10.0
Accuracy:		2.66%	-0.24%
Absolute Difference:		0.1	0.0

Comments:

Calculations:

$$A = (C_m - C_a)/C_a \times 100$$

$$A_D = \text{Absolute Value } (C_a - C_m)$$

Where:

A = Accuracy of the CEMS in percent

A_D = Absolute difference between the Audit Value and the mean response

C_m = Average CEMs response during audit in units of appropriate concentration

C_a = Certified audit value in units of appropriate concentration

Acceptance Criteria:
The audit passes if the accuracy is ±15 percent of the average audit value, or the absolute difference is ±5 ppm, whichever is greater.

**Audit Point Criteria:

SO_2, NO_X, CO, H_2S

Audit Point 1 20-30% of Full Scale

Audit Point 2 50-60% of Full Scale

O_2

Audit Point 1 4-6%

Audit Point 2 8-12%

CO_2

Audit Point 1 5-8%

Audit Point 2 10-14%

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Part 60 Cylinder Gas Audit Data Sheet

Period Ending Date:	Fourth Quarter	Date of Audit:	November 25, 2014
Client:	Praxair	Plant Name:	Praxair Whiting
Unit:	SMR6-HU2	Location:	Whiting IN
Project Number:	202965.6		
Auditor:	David McNulty	Representing:	TRC Environmental

Type: NOX Low	Manufacture: Horiba	Audit Point 1	Audit Point 2
Model: ENDA/P	Serial Number: ENDA/P-3771		
	Full Scale Value: 20 ppm		
** Audit Range (ppm or %):		4-6 ppm	10-12 ppm
Cylinder ID Number:		CC177329	EB0000706
Certification Expiration Date;		7-May-15	26-Feb-15
Certification Type;		Protocol 1	Protocol 1
Certified Value		4.97	11.08
CEMS Response 1:		4.7	11.4
CEMS Response 2:		4.6	11.4
CEMS Response 3:		4.6	11.5
Average CEMS Response:		4.6	11.4
Accuracy:		-6.77%	3.19%
Absolute Difference:		0.3	0.4

Type: CO Low	Manufacture: Horiba	Audit Point 1	Audit Point 2
Model: ENDA/P	Serial Number: ENDA/P-3771		
	Full Scale Value: 20 ppm		
** Audit Range (ppm or %):		4-6 ppm	10-12 ppm
Cylinder ID Number:		CC177329	EB0000706
Certification Expiration Date;		7-May-15	26-Feb-15
Certification Type;		Protocol 1	Protocol 1
Certified Value		5.00	10.99
CEMS Response 1:		4.9	10.7
CEMS Response 2:		4.9	11.1
CEMS Response3:		4.9	11.1
Average CEMS Response:		4.9	11.0
Accuracy:		-2.00%	-0.21%
Absolute Difference:		0.1	0.0

Comments:

Calculations:

$$A = (C_m - C_a)/C_a \times 100$$

$$A_D = \text{Absolute Value } (C_a - C_m)$$

Where:

A = Accuracy of the CEMS in percent

A_D = Absolute difference between the Audit Value and the mean response

C_m = Average CEMs response during audit in units of appropriate concentration

C_a = Certified audit value in units of appropriate concentration

Acceptance Criteria:
The audit passes if the accuracy is ±15 percent of the average audit value, or the absolute difference is ±5 ppm, whichever is greater.

**Audit Point Criteria:

SO_2, NO_X, CO, H_2S

Audit Point 1	20-30% of Full Scale
Audit Point 2	50-60% of Full Scale

O_2

Audit Point 1	4-6%
Audit Point 2	8-12%

CO_2

Audit Point 1	5-8%
Audit Point 2	10-14%

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Part 60 Cylinder Gas Audit Data Sheet

Period Ending Date:	Fourth Quarter	Date of Audit:	November 25, 2014
Client:	Praxair	Plant Name:	Praxair Whiting
Unit:	SMR6-HU2	Location:	Whiting IN
Project Number:	202965.6		
Auditor:	David McNulty	Representing:	TRC Environmental

Type: NO_X High	Manufacture: Horiba	Audit Point 1	Audit Point 2
Model: ENDA/P	Serial Number: ENDA/P-3771		
	Full Scale Value: 200 ppm		
** Audit Range (ppm or %):		40-60	100-120
Cylinder ID Number:		SX47405	SX48605
Certification Expiration Date;		19-Feb-15	15-Feb-19
Certification Type;		Protocol 1	Protocol 1
Certified Value		49.53	110.18
CEMS Response 1:		50.0	112.7
CEMS Response 2:		50.0	112.9
CEMS Response 3:		50.2	113.0
Average CEMS Response:		50.1	112.9
Accuracy:		1.08%	2.44%
Absolute Difference:		0.5	2.7

Type: CO High	Manufacture: Horiba	Audit Point 1	Audit Point 2
Model: ENDA/P	Serial Number: ENDA/P-3771		
	Full Scale Value: 100 ppm		
** Audit Range (ppm or %):		20-30	50-60
Cylinder ID Number:		SX47405	SX48605
Certification Expiration Date;		19-Feb-15	15-Feb-19
Certification Type;		Protocol 1	Protocol 1
Certified Value		25.35	55.11
CEMS Response 1:		25.9	55.7
CEMS Response 2:		25.8	55.9
CEMS Response3:		25.9	55.8
Average CEMS Response:		25.9	55.8
Accuracy:		2.04%	1.25%
Absolute Difference:		0.5	0.7

Comments:

Calculations:

$$A = (C_m - C_a)/C_a \times 100$$

$$A_D = \text{Absolute Value } (C_a - C_m)$$

Where:

A = Accuracy of the CEMS in percent

A_D = Absolute difference between the Audit Value and the mean response

C_m = Average CEMs response during audit in units of appropriate concentration

C_a = Certified audit value in units of appropriate concentration

Acceptance Criteria:
The audit passes if the accuracy is ±15 percent of the average audit value, or the absolute difference is ±5 ppm, whichever is greater.

**Audit Point Criteria:

SO_2, NO_X, CO, H_2S

Audit Point 1 20-30% of Full Scale
Audit Point 2 50-60% of Full Scale

O_2

Audit Point 1 4-6%
Audit Point 2 8-12%

CO_2

Audit Point 1 5-8%
Audit Point 2 10-14%

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Part 60 Cylinder Gas Audit Data Sheet

Period Ending Date:	Fourth Quarter	Date of Audit:	November 25, 2014
Client:	Praxair	Plant Name:	Praxair Whiting
Unit:	SMR6-HU2	Location:	Whiting IN
Project Number:	202965.6		
Auditor:	David McNulty	Representing:	TRC Environmental

Type: O_2	Manufacturer: Horiba	Audit Point 1	Audit Point 2
Model: ENDA/P	Serial Number: ENDA/P-3771		
	Full Scale Value: 25%		
** Audit Range (ppm or %):		4-6%	8-12%
Cylinder ID Number:		FL-0000282	EB0031709
Certification Expiration Date;		6-Feb-15	25-Oct-20
Certification Type;		Protocol 1	Protocol 1
Certified Value		5.13	9.85
CEMS Response 1:		4.9	9.9
CEMS Response 2:		4.9	9.9
CEMS Response 3:		4.9	9.8
Average CEMS Response:		4.9	9.9
Accuracy:		-4.48%	0.17%
Absolute Difference:		0.2	0.0

Comments:

Calculations:

$$A = (C_m - C_a)/C_a \times 100$$

$$A_D = \text{Absolute Value } (C_a - C_m)$$

Where:

A = Accuracy of the CEMS in percent

A_D = Absolute difference between the Audit Value and the mean response

C_m = Average CEMs response during audit in units of appropriate concentration

C_a = Certified audit value in units of appropriate concentration

Acceptance Criteria:
The audit passes if the accuracy is ±15 percent of the average audit value, or the absolute difference is ±5 ppm, whichever is greater.

**Audit Point Criteria:

SO_2, NO_X, CO, H_2S

Audit Point 1 20-30% of Full Scale

Audit Point 2 50-60% of Full Scale

O_2

Audit Point 1 4-6%

Audit Point 2 8-12%

CO_2

Audit Point 1 5-8%

Audit Point 2 10-14%

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Appendix B: Computer Data

ONE MINUTE SYSTEM REPORT

COMPANY NAME: Praxair
LOCATION: Whiting, IN
SOURCE: SMR5-HU1
CEMS ID NO.: P-3770
DATE CREATED: 11/25/2014 @ 11:04
PERIOD: 11/25/2014 @ 10:35 - 11/25/2014 @ 11:03

ONE MINUTE SUMMARY

DATE MM/DD/YY HH:mm	NOx-L (PPM)-MC	CO-L (PPM)-MC
11/25/14 10:35	11.2-00	5.8-00
11/25/14 10:36	5.8-00	11.3-00
11/25/14 10:37	5.5-00	5.1-00
11/25/14 10:38	4.9-00	5.0-00
11/25/14 10:39	4.8-00	4.9-00
11/25/14 10:40	6.3-00	7.8-00
11/25/14 10:41	6.4-00	8.6-00
11/25/14 10:42	12.3-00	11.0-00
11/25/14 10:43	11.7-00	11.0-00
11/25/14 10:44	11.6-00	11.0-00
11/25/14 10:45	11.5-00	9.9-00
11/25/14 10:46	9.6-00	3.7-00
11/25/14 10:47	5.1-00	4.8-00
11/25/14 10:48	4.7-00	4.9-00
11/25/14 10:49	4.8-00	5.3-00
11/25/14 10:50	9.3-00	10.1-00
11/25/14 10:51	11.4-00	10.9-00
11/25/14 10:52	11.5-00	11.0-00
11/25/14 10:53	11.5-00	11.0-00
11/25/14 10:54	8.8-00	7.3-00
11/25/14 10:55	4.7-00	5.0-00
11/25/14 10:56	4.7-00	4.9-00
11/25/14 10:57	4.6-00	4.9-00
11/25/14 10:58	4.9-00	5.6-00
11/25/14 10:59	10.0-00	10.4-00
11/25/14 11:00	11.5-00	10.9-00
11/25/14 11:01	11.4-00	11.0-00
11/25/14 11:02	11.5-00	10.9-00
11/25/14 11:03	11.5-00	10.7-00

REPORT SUMMARY

	NOx-L (PPM)	CO-L (PPM)
AVG:	8.4	8.1
TOTAL:	2.435E2	2.347E2

NOTE: THE REPORT SUMMARY RESULTS ABOVE INCLUDE VALID DATA ONLY

ONE MINUTE SYSTEM REPORT

COMPANY NAME: Praxair
LOCATION: Whiting, IN
SOURCE: SMR5-HU1
CEMS ID NO.: P-3770
DATE CREATED: 11/25/2014 @ 10:08
PERIOD: 11/25/2014 @ 09:41 - 11/25/2014 @ 10:08

ONE MINUTE SUMMARY

DATE MM/DD/YY HH:mm	NOx (PPM)	CO (PPM)	
11/25/14 09:41	0.7	0.7	
11/25/14 09:42	157.8	90.8	
11/25/14 09:43	49.5	25.3	
11/25/14 09:44	50.2	25.3	
11/25/14 09:45	50.3	25.3	Low1
11/25/14 09:46	93.1	31.4	
11/25/14 09:47	113.8	54.5	
11/25/14 09:48	113.7	54.8	
11/25/14 09:49	113.4	55.0	High1
11/25/14 09:50	107.7	44.2	
11/25/14 09:51	50.9	25.5	
11/25/14 09:52	50.5	25.4	
11/25/14 09:53	50.5	25.5	Low2
11/25/14 09:54	59.7	38.0	
11/25/14 09:55	113.0	55.1	
11/25/14 09:56	113.3	55.0	
11/25/14 09:57	113.7	55.2	High2
11/25/14 09:58	102.4	41.5	
11/25/14 09:59	50.7	25.4	
11/25/14 10:00	50.5	25.5	
11/25/14 10:01	50.4	25.5	Low3
11/25/14 10:02	44.6	43.5	
11/25/14 10:03	6.2	70.2	
11/25/14 10:04	106.8	55.1	
11/25/14 10:05	113.5	55.1	
11/25/14 10:06	113.6	55.2	High3
11/25/14 10:07	113.6	55.1	
11/25/14 10:08	MISS		

ONE MINUTE SYSTEM REPORT

COMPANY NAME: Praxair
LOCATION: Whiting, IN
SOURCE: SMR5-HU1
CEMS ID NO.: P-3770
DATE CREATED: 11/25/2014 @ 09:42
PERIOD: 11/25/2014 @ 09:18 - 11/25/2014 @ 09:41

ONE MINUTE SUMMARY

DATE MM/DD/YY HH:mm	O2 (%)	
11/25/14 09:18	1.2	
11/25/14 09:19	5.0	
11/25/14 09:20	5.5	
11/25/14 09:21	5.3	Low1
11/25/14 09:22	5.3	
11/25/14 09:23	11.9	
11/25/14 09:24	13.2	
11/25/14 09:25	10.5	
11/25/14 09:26	9.8	High 1
11/25/14 09:27	9.7	
11/25/14 09:28	6.4	
11/25/14 09:29	5.5	
11/25/14 09:30	5.3	Low2
11/25/14 09:31	6.3	
11/25/14 09:32	10.1	
11/25/14 09:33	10.2	High 2
11/25/14 09:34	10.1	
11/25/14 09:35	5.4	
11/25/14 09:36	5.2	
11/25/14 09:37	5.2	Low3
11/25/14 09:38	7.3	
11/25/14 09:39	10.0	
11/25/14 09:40	10.1	High3
11/25/14 09:41	10.1	

ONE MINUTE SYSTEM REPORT

COMPANY NAME: Praxair
LOCATION: Whiting, IN
SOURCE: SMR6-HU2
CEMS ID NO.: P-3771
DATE CREATED: 11/25/2014 @ 13:48
PERIOD: 11/25/2014 @ 13:22 - 11/25/2014 @ 13:47

ONE MINUTE SUMMARY

DATE MM/DD/YY HH:mm	NOx-L (PPM)	CO-L (PPM)
11/25/14 13:22	10.8	3.4
11/25/14 13:23	7.2	14.7
11/25/14 13:24	7.4	5.9
11/25/14 13:25	5.0	4.9
11/25/14 13:26	4.7	4.9
11/25/14 13:27	5.7	7.6
11/25/14 13:28	7.2	8.2
11/25/14 13:29	10.9	11.3
11/25/14 13:30	11.6	11.1
11/25/14 13:31	11.4	10.7
11/25/14 13:32	6.5	5.7
11/25/14 13:33	4.6	5.0
11/25/14 13:34	4.6	4.9
11/25/14 13:35	6.6	8.1
11/25/14 13:36	11.5	11.1
11/25/14 13:37	11.4	11.1
11/25/14 13:38	11.5	11.0
11/25/14 13:39	7.7	6.5
11/25/14 13:40	4.6	5.0
11/25/14 13:41	4.6	4.9
11/25/14 13:42	4.6	4.9
11/25/14 13:43	4.5	5.2
11/25/14 13:44	9.2	10.1
11/25/14 13:45	11.4	11.1
11/25/14 13:46	11.5	11.1
11/25/14 13:47	11.5	11.1

REPORT SUMMARY

NOx-L (PPM)	CO-L (PPM)

NOTE: THE REPORT SUMMARY RESULTS ABOVE INCLUDE VALID DATA ONLY

ONE MINUTE SYSTEM REPORT

COMPANY NAME: Praxair
LOCATION: Whiting, IN
SOURCE: SMR6-HU2
CEMS ID NO.: P-3771
DATE CREATED: 11/25/2014 @ 12:55
PERIOD: 11/25/2014 @ 12:13 - 11/25/2014 @ 12:50

ONE MINUTE SUMMARY

DATE MM/DD/YY HH:mm	NOx (PPM)	CO (PPM)
11/25/14 12:13	0.0	0.0
11/25/14 12:14	0.0	0.0
11/25/14 12:15	0.0	0.0
11/25/14 12:16	170.1	98.4
11/25/14 12:17	49.4	25.8
11/25/14 12:18	49.7	25.8
11/25/14 12:19	50.0	25.9
11/25/14 12:20	84.8	10.4
11/25/14 12:21	131.6	49.3
11/25/14 12:22	113.4	55.4
11/25/14 12:23	113.3	55.7
11/25/14 12:24	112.7	55.7
11/25/14 12:25	111.2	47.8
11/25/14 12:26	50.4	25.9
11/25/14 12:27	50.2	25.9
11/25/14 12:28	50.2	25.9
11/25/14 12:29	50.0	25.8
11/25/14 12:30	50.2	25.9
11/25/14 12:31	50.2	25.9
11/25/14 12:32	48.1	31.9
11/25/14 12:33	112.3	55.7
11/25/14 12:34	113.1	55.9
11/25/14 12:35	113.0	55.9
11/25/14 12:36	112.9	55.9
11/25/14 12:37	113.1	55.8
11/25/14 12:38	110.5	46.9
11/25/14 12:39	50.6	25.9
11/25/14 12:40	50.2	25.9
11/25/14 12:41	50.2	25.9
11/25/14 12:42	50.2	25.9
11/25/14 12:43	50.2	25.9
11/25/14 12:44	50.2	25.9
11/25/14 12:45	54.1	35.2
11/25/14 12:46	112.7	55.9
11/25/14 12:47	113.0	55.8
11/25/14 12:48	113.2	56.0
11/25/14 12:49	78.1	30.2
11/25/14 12:50	50.3	25.9

ONE MINUTE SYSTEM REPORT

COMPANY NAME: Praxair
LOCATION: Whiting, IN
SOURCE: SMR6-HU2
CEMS ID NO.: P-3771
DATE CREATED: 11/25/2014 @ 12:14
PERIOD: 11/25/2014 @ 11:52 - 11/25/2014 @ 12:13

ONE MINUTE SUMMARY

DATE MM/DD/YY HH:mm	O2 (%)
11/25/14 11:52	1.8
11/25/14 11:53	4.0
11/25/14 11:54	4.7
11/25/14 11:55	4.9
11/25/14 11:56	4.9
11/25/14 11:57	12.3
11/25/14 11:58	10.0
11/25/14 11:59	9.9
11/25/14 12:00	9.5
11/25/14 12:01	4.9
11/25/14 12:02	4.9
11/25/14 12:03	5.0
11/25/14 12:04	8.9
11/25/14 12:05	9.9
11/25/14 12:06	9.9
11/25/14 12:07	9.0
11/25/14 12:08	5.0
11/25/14 12:09	4.9
11/25/14 12:10	5.0
11/25/14 12:11	5.0
11/25/14 12:12	9.8
11/25/14 12:13	9.8

REPORT SUMMARY

	O2 (%)

NOTE: THE REPORT SUMMARY RESULTS ABOVE INCLUDE INVALID DATA

Appendix C: Audit Gas Certification Sheets

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1700 Scepter Rd
Waverly, TN 37185
931-296-3357

Certificate of Analysis - EPA Protocol Mixtures

Customer: TRC ENVIRONMENTAL CORP.
7521 BRUSH HILL RD
BURR RIDGE, IL 60527

Customer PO#: GEE292

		Protocol:	Reference #:	Lot#:
Cylinder Number:	CC177329	G1	626623-01	9303605309

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 100 PSIG

Cylinder Pressure: 1900psig

Last Analysis Date: 5/7/2013

Expiration Date: 5/7/2015

REPLICATE RESPONSES

Component:	Carbon Monoxide			Date:	5/7/2013		
					5.01		
Certified Conc:	5.00ppm	+/- 0.54%	REL		5.00		
					5.00		
Component:	Nitric Oxide			Date:	4/29/2013	Date:	5/6/2013
					4.96		4.95
Certified Conc:	4.97ppm	+/- 1.25%	REL		4.97		4.98
					4.98		4.97
NOx:	5.5ppm	Reference Only					

BALANCE GAS: Nitrogen

REFERENCE STANDARDS:

Component:	Carbon Monoxide	Component:	Nitric Oxide
Reference Standard:	GMIS	Reference Standard:	NTRM
Cylinder #:	ND22576	Cylinder #:	AN11101
Concentration:	9.34ppm	Concentration:	18.98ppm
Exp. Date:	7/10/2014	Exp. Date:	6/17/2017

CERTIFICATION INSTRUMENTS

Component:	Carbon Monoxide	Component:	Nitric Oxide
Make/Model:	Thermo 48i-TLE	Make/Model:	Horiba CLA-510S
Serial Number:	903034427	Serial Number:	FRJ8FDME
Measurement Principle:	NDIR	Measurement Principle:	Chemi
Last Calibration:	5/7/2013	Last Calibration:	4/11/2013

Notes: **Carbon Monoxide GMIS CERTIFIED USING SRM STANDARD. CYLINDER# FF30774**

This Certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards September 1997, using procedure G1 and/or G2. The certification expiration date and minimum usable service pressure using the May 2012 revision of the EPA Traceability Protocol document.
U.S. EPA Vendor ID No.: D62013 PGVP Participation Date: 01/01/13: PGVP Renewal Date: 12/31/13

Analyst: Julie Higgins
Julie Higgins

Date: 5/8/2013

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1700 Scepter Rd
Waverly, TN 37185
931-296-3357

Certificate of Analysis - EPA Protocol Mixtures

Customer: GE Energy Management SVCS Inc

Customer PO#:

		Protocol:	Reference #:	Lot#:
Cylinder Number:	EB0000706	G1	T180909-5	9303604675
Cylinder Pressure:	1900 psig			
Last Analysis Date:	2/26/2013			
Expiration Date:	2/26/2015			

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 100 PSIG

REPLICATE RESPONSES

Component:	Carbon Monoxide			Date:	2/12/2013	
					10.97	
Certified Conc:	10.99 ppm	+/-	1% REL		11.03	
					10.92	
Component:	Nitric Oxide			Date:	2/19/2013	Date: 2/26/2013
					11.18	11.11
Certified Conc:	11.08 ppm	+/-	1% REL		11.19	10.99
					11.02	10.96
NOx:	11.79 ppm	Reference Only				

BALANCE GAS: Nitrogen

REFERENCE STANDARDS:

Component:	Carbon Monoxide	Component:	Nitric Oxide
Reference Standard:	SRM	Reference Standard:	NTRM
Cylinder #:	CAL017991	Cylinder #:	ND43269
Concentration:	98.85 ppm	Concentration:	98.17 ppm
Exp. Date:	1/2/2017	Exp. Date:	9/20/2015

CERTIFICATION INSTRUMENTS

Component:	Carbon Monoxide	Component:	Nitric Oxide
Make/Model:	Horiba VIA-510	Make/Model:	Antaris IGS
Serial Number:	RL77Y00G	Serial Number:	AKS1000151
Measurement Principle:	NDIR	Measurement Principle:	FTIR
Last Calibration:	1/23/2013	Last Calibration:	2/7/2013

Notes:

This Certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards September 1997, using procedure G1 and/or G2. The certification expiration date and minimum usable service pressure using the May 2012 revision of the EPA Traceability Protocol document.
U.S. EPA Vendor ID No.: D62013 PGVP Participation Date: 01/01/13: PGVP Renewal Date: 12/31/13

Analyst: Roman Khidekel

Date: 2/27/2013

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1700 Scepter Rd
Waverly, TN 37185
931-296-3357

Certificate of Analysis - EPA Protocol Mixtures

Customer: GE ENERGY MANAGEMENT SVCS INC. Customer PO#:

		Protocol:	Reference #:	Lot#:
Cylinder Number:	SX47405	G1	622600	9303604676
Cylinder Pressure:	1900 PSIG			
Last Analysis Date:	2/19/2013			
Expiration Date:	2/19/2015			

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 100 PSIG

REPLICATE RESPONSES

Component:	Carbon Monoxide	Date:	2/12/2013		
			25.34		
Certified Conc:	25.35 PPM +/- 1% REL		25.34		
			25.37		
Component:	Nitric Oxide	Date:	2/12/2013	Date:	2/19/2013
			49.41		49.72
Certified Conc:	49.53 PPM +/- 1% REL		49.42		49.57
			49.42		49.63
NOx:	50.47 PPM Reference Only				

BALANCE GAS: Nitrogen

REFERENCE STANDARDS:

Component:	Carbon Monoxide	Component:	Nitric Oxide
Reference Standard:	GMIS	Reference Standard:	NTRM
Cylinder #:	SX51243	Cylinder #:	ND43269
Concentration:	207.73 PPM	Concentration:	98.17PPM
Exp. Date:	10/10/2014	Exp. Date:	9/20/2015

CERTIFICATION INSTRUMENTS

Component:	Carbon Monoxide	Component:	Nitric Oxide
Make/Model:	ANTARIS IGS	Make/Model:	ANTARIS IGS
Serial Number:	AKS1000151	Serial Number:	AKS1000151
Measurement Principle:	FTIR	Measurement Principle:	FTIR
Last Calibration:	1/14/2013	Last Calibration:	2/7/2013

Notes:

This Certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards September 1997, using procedure G1 and/or G2. The certification expiration date and minimum usable service pressure using the May 2012 revision of the EPA Traceability Protocol document.
U.S. EPA Vendor ID No.: D62013 PGVP Participation Date: 01/01/13: PGVP Renewal Date: 12/31/13

Analyst: Taylor Wallace Date: 2/19/2013

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1700 Scepter Rd
Waverly, TN 37185
931-296-3357

Certificate of Analysis - EPA Protocol Mixtures

Customer: GE ENERGY MANAGEMENT SERVICES INC Customer PO#:

		Protocol:	Reference #:	Lot#:
Cylinder Number:	SX48605	G1	622600	9303604677
Cylinder Pressure:	1900 PSIG			
Last Analysis Date:	2/19/2013			
Expiration Date:	2/19/2015			

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 100 PSIG

REPLICATE RESPONSES

Component:	Carbon Monoxide	Date:	2/12/2013		
			55.06		
Certified Conc:	55.11 PPM +/- 1% REL		55.09		
			55.19		
Component:	Nitric Oxide	Date:	2/12/2013	Date:	2/19/2013
			110.19		110.64
Certified Conc:	110.18 PPM +/- 1% REL		109.59		110.20
			110.35		110.13
NOx:	111.46 PPM Reference Only				

BALANCE GAS: Nitrogen

REFERENCE STANDARDS:

Component:	Carbon Monoxide	Component:	Nitric Oxide
Reference Standard:	GMIS	Reference Standard:	NTRM
Cylinder #:	SX51243	Cylinder #:	ND43269
Concentration:	207.73%	Concentration:	98.17PPM
Exp. Date:	10/10/2014	Exp. Date:	9/20/2015

CERTIFICATION INSTRUMENTS

Component:	Carbon Monoxide	Component:	Nitric Oxide
Make/Model:	ANTARIS IGS	Make/Model:	ANTARIS IGS
Serial Number:	AKS1000151	Serial Number:	AKS1000151
Measurement Principle:	FTIR	Measurement Principle:	FTIR
Last Calibration:	1/14/2013	Last Calibration:	2/7/2013

Notes:

This Certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards September 1997, using procedure G1 and/or G2. The certification expiration date and minimum usable service pressure using the May 2012 revision of the EPA Traceability Protocol document.
U.S. EPA Vendor ID No.: D62013 PGVP Participation Date: 01/01/13: PGVP Renewal Date: 12/31/13

Analyst: Taylor Wallace Date: 2/19/2013

MATHESON TRI•GAS

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1650 Enterprise Parkway
Twinsburg, Ohio 44087
215-648-4000

Certificate of Analysis - EPA Protocol Mixtures

Customer: GE ENERGY MANAGEMENT SVCS INC
Cylinder Number: FL-0000282
Cylinder pressure: 2000 psig
Last Analysis date: 2/6/2012
Expiration Date: 2/6/15

Protocol:	Reference #	Lot #
G1	592091	109-26-07001

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 150 PSIG

REPLICATE RESPONSES

	Date: 2/6/2012	Date:
Component : Oxygen	5.13%	
Certified Conc: 5.13% ± 1% REL	5.13%	
	5.13%	

BALANCE GAS: Nitrogen

REFERENCE STANDARDS

Component: Oxygen
SRM #: SRM-2658a
Sample #: 72-D-40
Cylinder #: CAL-016840
Concentration: 9.918%

CERTIFICATION INSTRUMENTS

Component: Oxygen
Make/Model: Rosemount 755
Serial Number: 2002832
Measurement Principle: Paramagnetic
Last Calibration: 1/27/2012

Notes: T168024

This certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards September 1997, using procedure G1 and/or G2.

U.S. EPA Vendor ID No.: D42012 PGVP Participation Date: 4/12/11 PGVP Renewal Date: 1/01/13

Analyst Philip D. Mont. Date 2/7/2012

MATHESON
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1700 Scepter Rd
Waverly, TN 37185
931-296-3357

Certificate of Analysis - EPA Protocol Mixtures

Customer: TRC ENVIRONMENTAL CORP.

Customer PO#: STOCK

Protocol:	Reference #:	Lot#:
G1	T184057-02	9303605558

Cylinder Number: EB0000785

Cylinder Pressure: 1900psig

Last Analysis Date: 6/4/2013

Expiration Date: 6/5/2021

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 100 PSIG

				REPLICATE RESPONSES
				Date: 6/4/2013
Component:	Oxygen			10.050
				10.059
Certified Conc:	10.057%	+/- 0.013%	ABS	10.062

BALANCE GAS: Nitrogen

REFERENCE STANDARDS:

Component:	Oxygen
Reference Standard:	SRM
Cylinder #:	CAL015431
Concentration:	20.72%
Exp Date:	1/1/2016
NIST Sample #	71-D-12

CERTIFICATION INSTRUMENTS

Component:	Oxygen
Make/Model:	Horiba MPA-510
Serial Number:	U1LSAGS6
Measurement Principle:	Paramagnetic
Last Calibration:	6/4/2013

Notes: **Meets Federal Register Specifications Title 40 CFR 72.2**
Total Oxides of Nitrogen <0.1ppm Carbon Dioxide <1.0ppm
Carbon Monoxide <0.5ppm Sulfur Dioxide <0.1ppm THC <0.1
Water <1.0ppm

This Certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards May 2012, using procedure G1 and/or G2.

U.S. EPA Vendor ID No.: D62013 PGVP Participation Date: 01/01/13: PGVP Renewal Date: 01/01/14

Julie Higgins

Analyst: Julie Higgins

Date: 6/6/2013

MATHESON
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1700 Scepter Rd
Waverly, TN 37185
931-296-3357

Certificate of Analysis - EPA Protocol Mixtures

Customer: GE STOCK

		Protocol:	Reference #:	Lot#:
Cylinder Number:	EB0031709	G1	T179174-1	9302604220
Cylinder Pressure:	1900psig			
Last Analysis Date:	10/25/2012			
Expiration Date:	10/25/2020			

DO NOT USE THIS CYLINDER WHEN THE PRESSURE FALLS BELOW 100 PSIG

				REPLICATE RESPONSES
			Date:	10/25/2012
Component:	Oxygen			9.85
				9.85
Certified Conc:	9.85%	+/-	1% REL	9.86

BALANCE GAS: Nitrogen

REFERENCE STANDARDS:

Component: Oxygen
Reference Standard: SRM
Cylinder #: CAL015431
Concentration: 20.72%
Exp. Date: 1/1/2016

CERTIFICATION INSTRUMENTS

Component: Oxygen
Make/Model: Horiba MPA-510
Serial Number: PGDF4TKM
Measurement Principle: Paramagnetic
Last Calibration: 10/8/2012

Notes: **Acid rain CEM Meets Federal Register Specification Title 40 CFR 72.2 Total Oxides of Nitrogen <0.1ppm Carbon Dioxide <1.0ppm Carbon Monoxide<0.5ppm Sulfur Dioxide<0.1ppm THC<0.1ppm Water<1.0ppm**

This Certification was performed according to EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards September 1997, using procedure G1 and/or G2. The certification expiration date and minimum usable service pressure is assigned using the May 2012 revision of the EPA Traceability Protocol document.

U.S. EPA Vendor ID No.: D52012 PGVP Participation Date: 01/01/12 PGVP Renewal Date: 12/31/12

Analyst: La'Shawn Grissom
La'Shawn Grissom

Date: 1/9/2013

Appendix 5c – 1st Half 2014 CEM Summary Performance Report - Revised

BP Products North America Inc.
2815 Indianapolis Blvd.
P O Box 710
Whiting, IN 46394-0710
USA

December 18, 2014

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

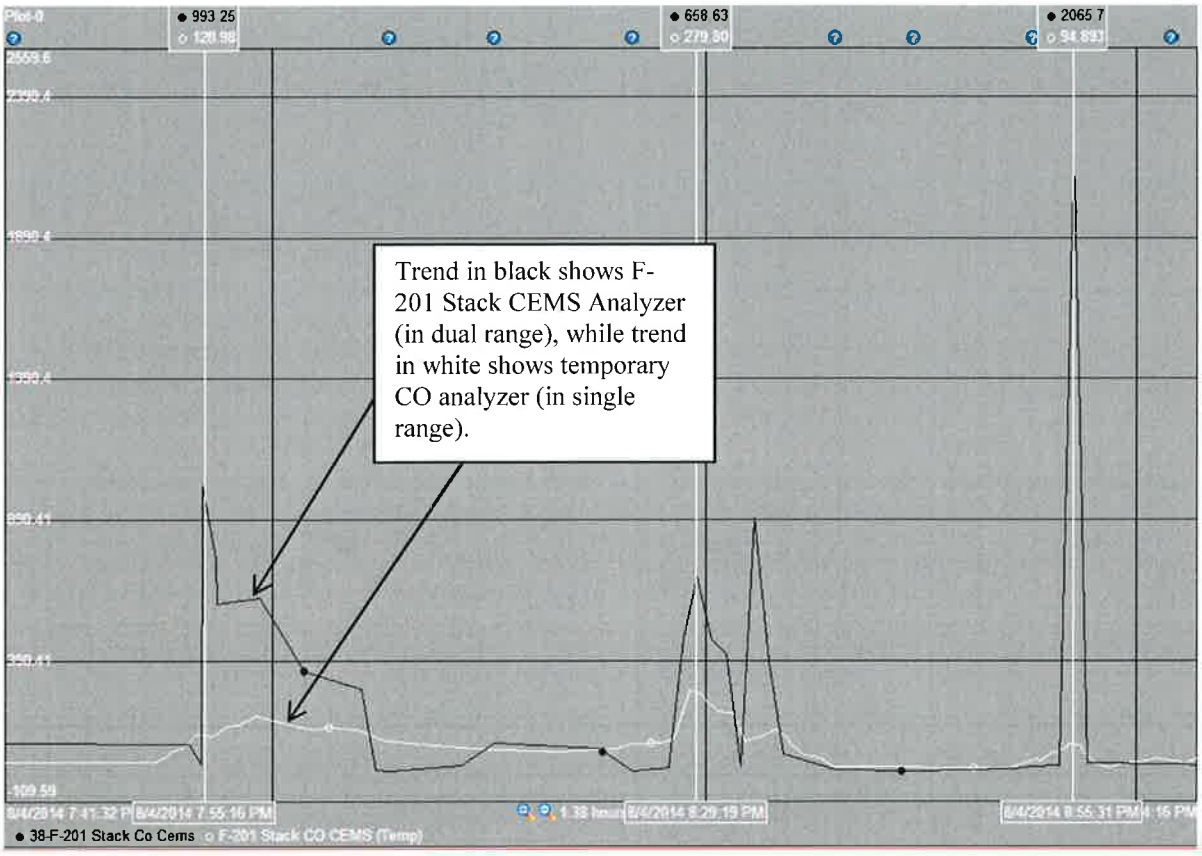
Mr. Dave Cline
Section Chief
Indiana Department of Environmental Management
Compliance Data Section, Office of Air Quality
100 North Senate Avenue
MC 61-53 IGCN 1003
Indianapolis, IN 46204-2251

Dear Mr. Cline:

Re: CEM Summary Performance Report Resubmittal – First and Second Quarter 2014
BP Products North America Inc. - Whiting Business Unit
Part 70 Operating Permit No. T089-6741-00453

In our Continuous Emissions Monitor (CEM) Summary Performance Report submittals for 1Q14 and 2Q14, we noted that the data from the carbon monoxide (CO) CEMs for Coker 2 heaters F-201, F-202, and F-203 appeared to indicate CO emissions for the quarter were suspiciously high, which we have confirmed to be false. We also reported that until the investigations were complete, we were reporting the data as valid. We have completed the investigation into the data. This report provides the results of the investigation and updates the CEM performance report for those sources for 1Q and 2Q.

The investigation determined that there were periods of invalid data due to a non-monitor malfunction related to the configuration of the programmable logic controller (PLC) responsible for the logging and storage of data from the CO CEMS analyzers on the heater stacks. The analyzers were installed as dual range, and when process conditions were maintained at the value triggering analyzer range changes, the analyzers and the PLC were not able to transmit data quickly enough, thus returning values that were inaccurate. This was verified by the connection of another CO analyzer, with only one range, in parallel with the compliance analyzer on F-201 heater starting in August 2014. This was further verified by running calibration gases through the analyzers at the transition range. See below trend for discrepancies between the values read from the stack CEMS analyzer (dual range) and the values read from the temporary CO analyzer (single range) during a test with the transition range calibration gases.



Once the root cause of the erroneous CO values was determined, an approach of data substitution was implemented for the affected data in order to estimate the total CO emitted from the heaters.. The substitution methodology used the most conservative achievable CO concentration as identified from the highest reading recorded by the CO analyzer. Any period of time this substitution was made was evaluated as an hour where the CEMS was unavailable, and thus contributed to analyzer downtime.

Attachment A contains the updated F-201, F-202, and F-203 CEMS summary reports.

Attachment B contains the updated F-201, F-202, and F-203 excess emission reports and CEMS downtime reports per 326 IAC 3-5-7, Permit Condition C.12, and 40 CFR 60.7(c). These have been updated to reflect the data substitution and associated analyzer downtime methodology

If you have any questions or comments about the enclosed information, please contact Rohini Sengupta at (219) 473-2110.

Sincerely,

Linda Wilson

Linda Wilson
Environmental Manager
Health, Safety, Security and Environment

PART 70 OPERATING PERMIT CERTIFICATION

Source Name:	BP Products North America, Inc., Whiting Business Unit
Source Address:	2815 Indianapolis Blvd., Whiting, IN 46394
Mailing Address:	P.O. Box 710, Whiting, Indiana 46394-0710
Permit No.:	T089-6741-00453

This certification shall be included when submitting monitoring, testing reports/results or other documents as required by this permit.
Please check what document is being certified:
☐ Annual Compliance Certification Letter
☐ Test Results (specify)
☒ Report (1st Half 2014 CEM Summary Report Resubmittal per 326 IAC 3-5-7, 40 CFR 60.7(c), 326 IAC 10-4, and 40 CFR Part 75)
☐ Notification (specify)
☐ Affidavit (specify)
☐ Other (specify)

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.	
Signature of Responsible Official:	
Printed Name:	Jorge Lanza
Title/Position:	Whiting Business Unit Leader
Phone:	(219) 473-3179
Date:	

Attachment A

CEMS Summary Report Resubmittal per 40 CFR 60.7(c) & (d) and 326 IAC 3-5-7

Including the following:

Location/Emission Unit	Parameter	Notes
#2 Coker heater F-201	CO	CEMS initial RATA certification occurred on April 17, 2014.
#2 Coker heater F-202	CO	CEMS initial RATA certification occurred on April 18, 2014.
#2 Coker heater F-203	CO	CEMS initial RATA certification occurred on April 19, 2014.

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO
Emission Limitation: 17.3 tons per 12 consecutive month
Reporting Period Dates: From 01/01/2014 To 03/31/2014

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater F-201

Date of Last CEMS Certification or Audit: N/A
Total Source Operating Time in Reporting Period: 2160 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	802	37.13
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	1	0.05
2. Total CEMS Downtime	803	37.18

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Specialist	
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO
Emission Limitation: 17.3 tons per 12 consecutive month
Reporting Period Dates: From 04/01/14 to 06/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater F-201

Date of Last CEMS Certification or Audit: 04/17/2014 (RATA)
Total Source Operating Time in Reporting Period: 2184 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	168	7.69
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	168	7.69

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and belieformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	
NAME	SIGNATURE	TITLE	DATE

Report Printed on: 04/23/14 08:26:09

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO
Emission Limitation: 17.3 tons per 12 consecutive month
Reporting Period Dates: From 01/01/2014 To 03/31/2014

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater F-202

Date of Last CEMS Certification or Audit: N/A
Total Source Operating Time in Reporting Period: 2160 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	264	12.22
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	264	12.22

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Specialist	
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO
Emission Limitation: 17.3 tons per 12 consecutive month
Reporting Period Dates: From 04/01/14 to 06/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater F-202

Date of Last CEMS Certification or Audit: 04/18/2014 (RATA)
Total Source Operating Time in Reporting Period: 2184 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	9	0.41
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	9	0.41

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	
NAME	SIGNATURE	TITLE	DATE

Report Printed on: 04/23/14 08:27:03

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO
Emission Limitation: 17.3 tons per 12 consecutive month
Reporting Period Dates: From 01/01/2014 To 03/31/2014

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater F-203

Date of Last CEMS Certification or Audit: N/A
Total Source Operating Time in Reporting Period: 2160 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	286	13.24
3.Calibration/QA	0	0.00
4.Other Known Causes	8	0.37
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	294	13.61

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary		
	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Specialist	
NAME	SIGNATURE	TITLE	DATE

Continuous Emission Monitor Quarterly Report Summary
Gaseous and Opacity Excess Emission and Monitoring System Performance

Pollutant: CO
Emission Limitation: 17.3 tons per 12 consecutive month
Reporting Period Dates: From 04/01/14 to 06/30/14

Company Name: BP Products North America, Inc.
Address: Whiting Refinery
Process Unit Description: Heater F-203

Date of Last CEMS Certification or Audit: 04/19/2014 (RATA)
Total Source Operating Time in Reporting Period: 2184 hours

CEMS Performance Summary	Total CEMS Downtimes including exemptions	
	Duration	% Unavailable (1)
1. CEMS downtime in reporting period due to:		
1.Monitor Equipment Malfunctions	0	0.00
2.Non-Monitor CEMS Equipment Malfunction	6	0.27
3.Calibration/QA	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total CEMS Downtime	6	0.27

Durations in hours
(1) % Unavailable is calculated by the following formula:
% Unavailable = CEMS Downtime during Source Operating Time/ Source Operating Time x 100

Emission Data Summary

	Duration	% Excess Emissions(2)
1. Duration of excess emissions in reporting period due to:		
1.Startup/Shutdown	0	0.00
2.Control Equip Problems	0	0.00
3.Process Problems	0	0.00
4.Other Known Causes	0	0.00
5.Unknown Causes	0	0.00
2. Total duration ofexcess emissions	0	0.00

Durations in hours
(2) % Excess Emissions is calculated by the following formulas:
% Excess Emissions = Total Duration of Excess Emissions/ Source Operating Time x 100

For the reporting period: If the total duration of excess emission is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater ofthe total operating time, both the summary report form and the excess emission report described in 60.7(c) shall be submitted.

Total CEMS downtime excludes quality assurance calibration time.

On a separate page, describe any changes since last reporting period in CMS, process or controls.

I certify, based on information and beliefformed after reasonable inquiry, the statements and information in this report are true, accurate, and complete.

Rohini Sengupta		Environmental Engineer	
NAME	SIGNATURE	TITLE	DATE

Report Printed on: 04/23/14 08:27:45

Attachment B

Excess Emission and CEMS Downtime Report Resubmittal per 325 IAC 3-5-7 and 40 CFR 60.7(c)

Including the following:

Location/Emission Unit	Parameter	Notes
#2 Coker heater F-201	CO	CEMS initial RATA certification occurred on April 17, 2014.
#2 Coker heater F-202	CO	CEMS initial RATA certification occurred on April 18, 2014.
#2 Coker heater F-203	CO	CEMS initial RATA certification occurred on April 19, 2014.

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater F-201

Parameter: CO per 12 consecutive month

Limit: 17.3 tons

Data in the Reporting Period: 01/01/14 to 03/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2160 hours
Report Printed on: 10/21/2014

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater F-202

Parameter: CO per 12 consecutive month Limit: 17.3 tons

Data in the Reporting Period: 01/01/14 to 03/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2160 hours
Report Printed on: 10/21/2014

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater F-203

Parameter: CO per 12 consecutive month Limit: 17.3 tons

Data in the Reporting Period: 01/01/14 to 03/31/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2160 hours
Report Printed on: 10/21/2014

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater F-201

Parameter: CO per 12 consecutive month Limit: 17.3 tons

Data in the Reporting Period: 04/01/14 to 06/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2184 hours
Report Printed on: 10/21/2014

Excess Emissions Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater F-202

Parameter: CO per 12 consecutive month

Limit: 17.3 tons

Data in the Reporting Period: 04/01/14 to 06/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2184 hours
Report Printed on: 10/21/2014

Excess Emissions Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater F-203

Parameter: CO per 12 consecutive month Limit: 17.3 tons

Data in the Reporting Period: 04/01/14 to 06/30/14

Inc No.	Start Date	End Date	Duration (hours)	Emission Reading	EPA Category	Reason for Incident	Corrective Action
No Incidents found in this Reporting Period							

Total Duration in the Reporting Period = 0 hours
Total Operating Time in the Reporting Period = 2184 hours
Report Printed on: 07/24/14

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater F-202

Parameter: CO CEMS

Data in the Reporting Period: 01/01/14 to 03/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
	1/1/2014 0:00	1/31/2014 23:59	20	b. Non-monitor malfunction	Periods of invalid data due to a non-monitor malfunction	Substitution methodology using most conservative achievable CO concentration.
	2/1/2014 0:00	2/28/2014 23:59	208	b. Non-monitor malfunction	Periods of invalid data due to a non-monitor malfunction	Substitution methodology using most conservative achievable CO concentration.
	3/1/2014 0:00	3/31/2014 23:59	36	b. Non-monitor malfunction	Periods of invalid data due to a non-monitor malfunction	Substitution methodology using most conservative achievable CO concentration.

Total Downtime in the Reporting Period = 264 hours , Data Availability for this Reporting Period = 87.78 %
Total Operating Time in the Reporting Period = 2160 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater F-202

Parameter: CO CEMS

Data in the Reporting Period: 04/01/14 to 06/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
	4/1/2014 0:00	4/30/2014 23:59	2	b. Non-monitor malfunction	Periods of invalid data due to a non-monitor malfunction	Substitution methodology using most conservative achievable CO concentration.
	5/1/2014 0:00	5/31/2014 23:59	6	b. Non-monitor malfunction	Periods of invalid data due to a non-monitor malfunction	Substitution methodology using most conservative achievable CO concentration.
	6/1/2014 0:00	6/30/2014 23:59	1	b. Non-monitor malfunction	Periods of invalid data due to a non-monitor malfunction	Substitution methodology using most conservative achievable CO concentration.

Total Downtime in the Reporting Period = 9 hours , Data Availability for this Reporting Period = 99.59 %
Total Operating Time in the Reporting Period = 2184 hours

Downtime Report

Facility Name: BP Products North America, Inc. Location: Whiting Refinery

Source: Heater F-201

Parameter: CO CEMS

Data in the Reporting Period: 01/01/14 to 01/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
	1/1/2014 0:00	1/31/2014 23:59	285	b. Non-monitor malfunction	CO analyzer PLC configuration issue.	Periods of invalid data due to a non-monitor malfunction
	2/1/2014 0:00	2/28/2014 23:59	331	b. Non-monitor malfunction	CO analyzer PLC configuration issue.	Periods of invalid data due to a non-monitor malfunction
	3/1/2014 0:00	3/31/2014 23:59	186	b. Non-monitor malfunction	CO analyzer PLC configuration issue.	Periods of invalid data due to a non-monitor malfunction

Total Downtime in the Reporting Period = 802 hours , Data Availability for this Reporting Period = 62.90 %
Total Operating Time in the Reporting Period = 2160 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater F-201

Parameter: CO CEMS

Data in the Reporting Period: 01/01/14 to 01/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
	1/1/2014 0:00	1/31/2014 23:59	285	b. Non-monitor malfunction	Periods of invalid data due to a non-monitor malfunction	Substitution methodology using most conservative achievable CO concentration.
	2/1/2014 0:00	2/28/2014 23:59	331	b. Non-monitor malfunction	Periods of invalid data due to a non-monitor malfunction	Substitution methodology using most conservative achievable CO concentration.
	3/1/2014 0:00	3/31/2014 23:59	186	b. Non-monitor malfunction	Periods of invalid data due to a non-monitor malfunction	Substitution methodology using most conservative achievable CO concentration.

Total Downtime in the Reporting Period = 802 hours , Data Availability for this Reporting Period = 62.90 %
Total Operating Time in the Reporting Period = 2160 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater F-201

Parameter: CO CEMS

Data in the Reporting Period: 04/01/14 to 06/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
	4/1/2014 0:00	4/30/2014 23:59	146	b. Non-monitor malfunction	Periods of invalid data due to a non-monitor malfunction	Substitution methodology using most conservative achievable CO concentration.
	5/1/2014 0:00	5/31/2014 23:59	11	b. Non-monitor malfunction	Periods of invalid data due to a non-monitor malfunction	Substitution methodology using most conservative achievable CO concentration.
	6/1/2014 0:00	6/30/2014 23:59	11	b. Non-monitor malfunction	Periods of invalid data due to a non-monitor malfunction	Substitution methodology using most conservative achievable CO concentration.

Total Downtime in the Reporting Period = 168 hours , Data Availability for this Reporting Period = 92.31 %
Total Operating Time in the Reporting Period = 2184 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater F-203

Parameter: CO CEMS

Data in the Reporting Period: 01/01/14 to 03/31/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
	1/1/2014 0:00	1/31/2014 23:59	76	b. Non-monitor malfunction	Periods of invalid data due to a non-monitor malfunction	Substitution methodology using most conservative
	2/1/2014 0:00	2/28/2014 23:59	144	b. Non-monitor malfunction	Periods of invalid data due to a non-monitor malfunction	Substitution methodology using most conservative achievable CO concentration.
	3/1/2014 0:00	3/31/2014 23:59	61	b. Non-monitor malfunction	Periods of invalid data due to a non-monitor malfunction	Substitution methodology using most conservative achievable CO concentration.

Total Downtime in the Reporting Period = 281 hours , Data Availability for this Reporting Period = 86.99 %
Total Operating Time in the Reporting Period = 2160 hours

Downtime Report

Facility Name: BP Products North America, Inc.

Location: Whiting Refinery

Source: Heater F-203

Parameter: CO CEMS

Data in the Reporting Period: 04/01/14 to 06/30/14

Incid. No.	Start Date	End Date	Duration (hours)	Reason (Monitoring Code) EPA Downtime Category	Process Log	Corrective Action
	4/1/2014 0:00	4/30/2014 23:59	1	b. Non-monitor malfunction	Periods of invalid data due to a non-monitor malfunction	Substitution methodology using most conservative achievable CO concentration.
	5/1/2014 0:00	5/31/2014 23:59	1	b. Non-monitor malfunction	Periods of invalid data due to a non-monitor malfunction	Substitution methodology using most conservative achievable CO concentration.
	6/1/2014 0:00	6/30/2014 23:59	3	b. Non-monitor malfunction	Periods of invalid data due to a non-monitor malfunction	Substitution methodology using most conservative achievable CO concentration.

Total Downtime in the Reporting Period = 5 hours , Data Availability for this Reporting Period = 99.77 %
Total Operating Time in the Reporting Period = 2184 hours

Appendix 5d – CEM QA/QC Plan

CONTINUOUS EMISSION MONITORING SYSTEM QUALITY ASSURANCE/QUALITY CONTROL OPERATIONS AND MAINTENANCE PLAN

BP Products North America Inc.
Whiting Business Unit
Whiting, Indiana

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1.0 PROJECT DESCRIPTION

Continuous Emission Monitoring Systems (CEMS) have been installed at BP Products North America Inc. - Whiting Business Unit (WBU) according to US EPA 40 CFR Parts 60, 63, the 2012 Consent Decree (Civil No. 2:12 CV 207), Indiana Department of Environmental Management (IDEM) and the Office of Air Management (OAM) requirements, and the WBU Air Operating Permit (AOP), T089-6741-00453. IDEM requires that all CEMS that are used to monitor compliance with applicable emission standards on a continuous basis adhere to regulations contained in 40 CFR 60 Subpart A, Appendix B, and Appendix F. All CEMS covered by this plan are those identified by the WBU as subject to the aforementioned regulations and consent decree. Unless otherwise specified within this document, devices for making the following measurements are not considered CEMS and are not within the scope of this manual.

- Stack gas flow
- Fuel gas and natural gas flow
- Process gas and liquid and steam flow
- Flare header flow
- Temperature
- Pressure
- pH
- Opacity
- Power related values (e.g. amperes, voltage, resistance)
- Btu (heat content) for flares and fuel gas
- Thermocouples and other sensors intended to monitor pilot operation on flares
- Compliance Assurance Monitoring equipment required exclusively by Section C.11 of IDEM Permit T089-6741-00453
- NO_X CEMS subject exclusively to requirements of 40 CFR Part 75 (e.g., No. 3 Stanolind Power Station Boilers)
- CEMS associated with the hydrogen unit heaters operated by Praxair.

This Quality Assurance/Quality Control Operations and Maintenance (QA/QC O&M) Manual applies to the following list of CEMS at the Whiting Business Unit:

TABLE 1.1 Emission Limits and Applicable Regulations for Sources with CEMS

Unit	Emission Limit	Applicable Regulations
SRU Mix Drum	162 ppm H_2S (3-hour rolling) 60 ppm H_2S (365-day rolling)	40 CFR, Subparts A and Ja
	70 ppm TS as H_2S (12-month rolling)	2012 Consent Decree (V.H.41 & 42) (Compliance date December 31, 2013)

TABLE 1.1 Emission Limits and Applicable Regulations for Sources with CEMS (continued)

Unit	Emission Limit	Applicable Regulations
4UF Mix Drum	162 ppm H_2S (3-hour rolling) 60 ppm H_2S (365-day rolling)	40 CFR, Subparts A and Ja
	70 ppm TS as H_2S (12-month rolling)	2012 Consent Decree (V.H.41 & 42) (Compliance date December 31, 2013)
CFU Mix Drum	162 ppm H_2S (3-hour rolling) 60 ppm H_2S (365-day rolling)	40 CFR, Subparts A and Ja
	70 ppm TS as H_2S (12-month rolling)	2012 Consent Decree (V.H.41 & 42) (Compliance date December 31, 2013)
DDU Flare	162 ppm H_2S (3-hour rolling)	40 CFR, Subparts A and Ja
South Flare	162 ppm H_2S (3-hour rolling)	40 CFR, Subparts A and Ja
GOHT Flare	162 ppm H_2S (3-hour rolling)	40 CFR, Subparts A and Ja
VRU Flare	162 ppm H_2S (3-hour rolling)	40 CFR 60 Subparts A and Ja after December 31, 2015
Alky Flare		
FCU Flare		
UIU Flare	162 ppm H_2S (3-hour rolling)	40 CFR 60 Subparts A and Ja after December 31, 2016
4UF Flare		
FCU 500	80 ppm NO_X @ 0% O_2 (7-day rolling) 35 ppm NO_X @ 0% O_2 (365-day rolling)	40 CFR 60, Subparts A and Ja 2012 Consent Decree (V.A.12.b) (See Note 1 for SSM related emissions)
FCU 600	40 ppm NO_X @ 0% O_2 (7-day rolling) 10 ppm NO_X @ 0% O_2 (365-day rolling)	
FCU 500	50 ppm SO_2 @ 0% O_2 (7-day rolling) 10 ppm SO_2 @ 0% O_2 (365-day rolling)	40 CFR 60, Subparts A and Ja 2012 Consent Decree (V.B.15.b) (See Note 1 for SSM related emissions)
FCU 600		
FCU 500	500 ppm CO @ 0% O_2 (1-hr avg.)	40 CFR 60, Subparts A and Ja 2012 Consent Decree (V.D.25 & 26)
FCU 600		
DHT B-601A	7.3 tpy NO_X (12-month rolling avg.)	2012 Consent Decree (V.F.34.a) AOP D.37.3(a)(1)
	7.3 tpy CO (12-month rolling avg.)	AOP D.37.3(a)(2)
11A H-1X	0.06 lb NO_X/MMBtu	2012 Consent Decree (V.F.31.b) (effective 12/31/2013)
	0.166 lb NO_X/MMBtu	AOP D.1.2(b)(3)
11A H-200	0.05 lb NO_X/MMBtu	2012 Consent Decree (V.F.34.a)
	0.2745 lb NO_X/MMBtu	AOP D.1.2(b)(3) (effective only prior to startup of Low NOx Burners)
4UF F-2	0.04 lb NO_X/MMBtu (12-month rolling avg.)	2012 Consent Decree (V.F.31.b) (effective 12/31/2016)
	0.210 lb NO_X/MMBtu	AOP D.16.3(a)

TABLE 1.1 Emission Limits and Applicable Regulations for Sources with CEMS (continued)

Unit	Emission Limit	Applicable Regulations
4UF F-3	0.04 lb NO_X/MMBtu (12-month rolling avg.)	2012 Consent Decree (V.F.31.b) (effective 12/31/2016)
	0.240 lb NO_X/MMBtu	AOP D.16.3(a)
12PS H-101A	77.7 tpy NOx(12-month rolling)	2012 Consent Decree (V.F.34.a)
	60 ppmdv NO_X @ 0% O2 (30-day rolling avg.) –or– 0.060 lb NO_X/MMBtu (30-day rolling avg.)	40 CFR, Subparts A and Ja (AOP D.3.4)
12PS H-101B	77.7 tpy NO_X (12-month rolling)	2012 Consent Decree (V.F.34.a)
	60 ppmdv NO_X @ 0% O2 (30-day rolling avg.) –or– 0.060 lb NO_X/MMBtu (30-day rolling avg.)	40 CFR, Subparts A and Ja (AOP D.3.4)
12PS H-102	72.5 tpy NOx (12-month rolling)	2012 Consent Decree (V.F.34.a)
	60 ppmdv NO_X @ 0% O2 (30-day rolling avg.) –or– 0.060 lb NO_X/MMBtu (30-day rolling avg.)	40 CFR, Subparts A and Ja (AOP D.3.4)
Coker F-201	18.2 tpy NO_X (12-month rolling)	2012 Consent Decree (V.F.34.a)
	60 ppmdv NO_X @ 0% O2 (30-day rolling avg.) –or– 0.060 lb NO_X/MMBtu (30-day rolling avg.)	40 CFR, Subparts A and Ja (AOP D.2.5)
Coker F-202	18.2 tpy NO_X (12-month rolling)	2012 Consent Decree (V.F.34.a)
	60 ppmdv NO_X @ 0% O2 (30-day rolling avg.) –or– 0.060 lb NO_X/MMBtu (30-day rolling avg.)	40 CFR, Subparts A and Ja (AOP D.2.5)
Coker F-203	18.2 tpy NO_X (12-month rolling)	2012 Consent Decree (V.F.34.a)
	60 ppmdv NO_X @ 0% O2 (30-day rolling avg.) –or– 0.060 lb NO_X/MMBtu (30-day rolling avg.)	40 CFR, Subparts A and Ja (AOP D.2.5)
SRC TGU-A & COT 2	194.8 tons SO_2 per 12-consecutive months	2012 Consent Decree (V.L.66.a)
	250 ppm SO_2 @ 0% O_2 (12-hr rolling avg.)	40 CFR, Subparts A and Ja (Note 8)
	55 tons CO per 12-consecutive months	AOP D.4.4(c)(6)

TABLE 1.1 Emission Limits and Applicable Regulations for Sources with CEMS (continued)

Unit	Emission Limit	Applicable Regulations
Boilers 31, 32, 33, 34, 36 (3SPS 1,2,3,4,6)	260.4 tons CO per 12-consecutive months	AOP D.24.4 (a)(4)
	17.3 tons NO_X per 12-consecutive months	AOP D.24.4 (b)(1)
FCU 500	O_2 monitoring only	Note 2
FCU 600	O_2 monitoring only	Note 2
DHT B-601A	O_2 monitoring only	Note 2
SRC TGU-A	O_2 monitoring only	Note 2
SRC TGU-B	O_2 monitoring only	Note 2
11A H-1X	O_2 monitoring only	Note 2
11A H-200	O_2 monitoring only	Note 2
4UF F-2	O_2 monitoring only	Note 2
4UF F-3	O_2 monitoring only	Note 2
12PS H-101A	O_2 monitoring only	Note 2
12PS H-101B	O_2 monitoring only	Note 2
12PS H-102	O_2 monitoring only	Note 2
Coker F-201	O_2 monitoring only	Note 2
Coker F-202	O_2 monitoring only	Note 2
Coker F-203	O_2 monitoring only	Note 2
DHT B-601A	O_2 monitoring only	Note 2
Boiler 31 (3SPS 1)	O_2 monitoring only	Note 2
Boiler 32 (3SPS 2)	O_2 monitoring only	Note 2
Boiler 33 (3SPS 3)	O_2 monitoring only	Note 2
Boiler 34 (3SPS 4)	O_2 monitoring only	Note 2
Boiler 36 (3SPS 6)	O_2 monitoring only	Note 2

Note 1. NOx emissions during periods of Startup, Shutdown, or Malfunction shall not be used in determining compliance with the 7-day rolling average emission limit, provided that during such periods BPP implements good air pollution control practices as required by 40 C.F.R. § 60.11(d) to minimize NO_X and SO_2 emissions. NO_X and SO_2 emissions during periods of Startup, Shutdown, or Malfunction shall be used in determining compliance with the 365-day rolling average emission limit.

Note 2. Oxygen analyzers are part of the CEMS (System) for NO_X and SO_2 and are not considered an independent CEMS. Oxygen diluent monitors associated with the CO and NO_X analyzers for the 3 SPS Boilers 31, 32, 33, 34, and 36 will comply with the 40 CFR Part 75 quality assurance requirements with the NO_X analyzers. These analyzers are included in the E1407 40 CFR Part 75 QA QC Plan.

Note 4. Boilers 31, 32, 33, 34, and 36 at 3SPS are denoted as Boilers 1, 2, 3, 4, and 6 in the Title V permit. Boilers 31, 32, 33, 34, and 36 at 3SPS have an annual mass limit set by the Title V Operating Permit issued by IDEM (SPM089-24588-00453, issued on June 16, 2008). No ppm limit is set for Boilers 31, 32, 33, 34, and 36.

Note 5. Relative Accuracy Test Audits (RATAs) are only performed on the Low Span of each CEM.

Note 6 A CEMS operating in accordance with method 15A (40 CFR 60 Appendix A) mathematically calculates the expected SO_2 concentration using the existing TRS measurements in equation 15-2 of Method 15. This monitoring method has been found to be consistent with the provisions on NSPS Subpart J in an alternative Monitoring Plan (AMP) approved by EPA Region 5 on August 30, 2006.

Note 7 Analyzers for determining Btu content of fuel gas use an analytical method that complies with the requirements of ASTM D 1827-94. EPA Reference Method 19, section 12.3.2 is followed to calculate the volume of combustion components per unit of heat content in units of dry scf/MMBtu (F-Factors).

Note 8 Compliance with emission limits effective no later than 60 days after achieving the maximum production rate at which the unit will be operated, or 180 days after initial startup, whichever comes first.

1.1 Consent Decree Description

The 2012 Consent Decree (Civil No. 2:12 CV 207) requires several items be addressed as part of a CEMS Operations and Maintenance Plan (O&M Plan). To insure all consent decree requirements are addressed by this Plan, the following table lists those paragraphs of the decree that correspond to sections of this plan. The contents of the QA/QC O&M Plan are specifically stipulated by paragraphs 44 through 46.

Consent Decree Paragraph	CEMS QA/QC O&M Plan Section
44	4.1
45	4.2 and 4.3
46(a)	4.5
46(b)	4.2, 4.3, and 4.5
46(c)	4.5, 4.6, and 4.7

2.0 QA/QC O&M INTRODUCTION

The QA/QC O&M Plan is the basis for assessing and maintaining the quality of the CEMS data. This QA/QC O&M Plan has been prepared for the all WBU employees with CEMS program responsibility. These CEMS described in this manual are used for measurement of Hydrogen Sulfide (H_2S) in refinery fuel gas, Total Reduced Sulfur (TRS) in fuel gas and other selected emission points, Nitric Oxides (NO_X) emissions, Sulfur Dioxide (SO_2) emissions, Carbon Monoxide (CO) emissions, and Oxygen (O_2) for dilution correction.

The CEMS were installed to comply with the specific requirements of operating permits, Consent Decree requirements, and/or federal regulations. All documents used to develop this quality assurance plan are listed in Section 7, References.

Praxair maintains a QA/QC O&M Plan for the CEMS associated with the New Hydrogen (New HU) unit heaters (HU-1 and HU-2) which Praxair operates which is not part of this Plan.

2.1 Quality Assurance (QA) and Quality Control (QC)—Definition And Function

QA, QC and O&M are independent but interrelated functions. QC can be defined as the series of activities performed to provide quality data. QA can be defined as the system of activities to provide assurance that the QC is performing adequately. O&M includes routine activities undertaken by CEMS technicians that relate to assuring monitoring proceeds in an uninterrupted manner.

A QA/QC O&M Plan has three functions:

(1) QA – The assessment of the quality of the data (accuracy and precision)
(2) QC – Activities that maintain or improve data quality.
(3) O&M – Routine activities that preserve CEMS equipment operation including prevent equipment failure.

These functions form a control loop. When accuracy or precision is unacceptable, QC must increase until the quality of the data is acceptable. When system downtime is experienced, data quality is usually impacted first.

QC and O&M functions are usually a series of frequent internal checks, such as system inspections, periodic calibrations, and routine maintenance. QA involves fewer frequent external checks on data quality. These external checks may include independent system audits, third party sample and analysis for accuracy and precision, comparison to know calibration standards or inter-laboratory audits. This QA/QC O&M Plan encompasses QA, QC and O&M functions and whenever possible are identified which of these functions is fulfilled by the specific activity.

2.2 Quality Assurance Policy, Goal, and Objective

It is the policy of BP to efficiently operate and maintain its facilities and CEMS in accordance with good operating practices and all applicable local, state and federal environmental regulations. BP is committed to collecting all necessary data to demonstrate that its operations are in compliance with its operating permit and consent decree. BP is also committed to operate all environmental monitoring systems are operating within acceptable limits.

The goal of this QA/QC O&M program designed to assure high operational reliability and to provide emission data of known and acceptable quality and quantity to support the operation of the air pollution

control equipment and the demonstration of compliance with the following air pollution emission and monitoring regulations:

Applicable Regulations and Requirements

- 40 CFR Part 60, Subparts A, J, and Ja
- 40 CFR Part 60, Appendix B, Performance Specifications 2, 3, 4, 5 and 7
- 40 CFR Part 60, Appendix F
- Indiana Rule 326 IAC 3 and 12
- BP Consent Decrees (specific citations for the CDs)
- Part 70 Operating Permit (Permit No. T089-6741-00453) last modified under Significant Permit Modification (SPM No. 089-31849-00453), issued on December 20, 2012
- 40 CFR 63, Subparts A and UUU

BP recognizes that the reliability and acceptability of CEMS data depends on completion of all activities stipulated in a well-defined QA/QC O&M Plan. Accordingly, the objective of this QA/QC O&M Plan is to define those activities necessary to guarantee that CEMS data quality is maintained at acceptable levels. The Plan also provides the framework for carrying out QA/QC O&M activities by addressing items such as documentation, corrective actions, and preventive maintenance activities.

This Plan also describes the necessary support services and activities, such as manual source test, data reduction, and report preparation, which are required to maintain data quality.

Quality data is assured through routine preventive maintenance, daily calibration checks and quarterly audits. It is noted that all QA/QC O&M activities may not be discussed in detail within this Plan. Those activities not fully discussed may include, but are not limited to, instrument maintenance manuals, plant operating procedures, and plant internal procedures for procurement and inventory control. These procedures are referenced is this QA/QC O&M Plan and may be updated as the CEMS program develops through operational experience.

2.3 Distribution and Document Control

This document is maintained in accordance with the BP Whiting Environmental Management System (EMS) EP445 for document control. The current version is also accessible through the WBU Environmental web page.

This document is reviewed on an annual basis and updated by the Environmental Department as necessary. Changes to the document content are summarized in the annual review. After annual review and changes are complete, WBU may elect to submit the amended plan to EPA.

3.0 DESCRIPTION AND LOCATION OF CEMS EQUIPMENT

3.1 Equipment Location

The location of all CEMS covered within this document is included below in Table 3.1.

TABLE 3.1 LOCATION OF CEM EQUIPMENT

Location	Designator	Sampling Location Height (relative to grade)	Line / Stack Diameter
H_2S in Refinery Fuel Gas			
SRU Mix Drum	Outlet of D-391	32 ft.	30 in.
4UF Mix Drum	Outlet of D-9	28 ft.	18 in.
CFU Mix Drum	Outlet of D-807	20 ft.	6 in.
H_2S in Flare Gas			
DDU Flare	F-315	20 ft.	18 in.
South Flare	D-102	60 ft.	72 in.
GOHT Flare	D-947	60 ft.	60 in.
VRU Flare	Flare Stack	45 ft.	24 in.
Alky Flare	Flare Stack	56 ft.	30 in.
FCU Flare	Flare Stack	33 ft.	20 in.
UIU Flare	Flare Stack	36 ft.	30 in.
4UF Flare	Flare Stack	38 ft.	30 in.
TRS			
SRU Mix Drum	Outlet of D-391	32 ft.	30 in.
4UF Mix Drum	Outlet of D-9	28 ft.	18 in.
CFU Mix Drum	Outlet of D-807	20 ft.	6 in.
Merox	Outlet of D-444	30 ft.	2 in.
DDU Flare	F-315	20 ft.	18 in.
South Flare	D-102	64 ft.	72 in.
GOHT Flare	D-947	60 ft.	60 in.
VRU Flare	Flare Stack	45 ft.	24 in.
Alky Flare	Flare Stack	56 ft.	30 in.
FCU Flare	Flare Stack	33 ft.	20 in.
UIU Flare	Flare Stack	36 ft.	30 in.
4UF Flare	Flare Stack	38 ft.	30 in.
NO_x			
FCU-500	B-250 Exhaust Stack	85.5 ft.	9 ft.
FCU-600	S-701 Exhaust Stack	64 ft.	8 ft.
DHT B-601A	B-601A Exhaust Stack	107.7 ft.	5.5 ft.
11A H-1X	H-1X Exhaust Stack	163.2 ft.	10 ft.
11C H-200	H-200 Exhaust Stack	246.2 ft.	10 ft.
4UF F-2	To Be Installed in 2016		

Location	Designator	Sampling Location Height (relative to grade)	Line / Stack Diameter
4UF F-3	To Be Installed in 2016		
12PS H-101A	H-101A Exhaust Stack	267 ft.	13.3 ft.
12PS H-101B	H-101B Exhaust Stack	267 ft.	13.3 ft.
12PS H-102	H-102 Exhaust Stack	267 ft.	14.3 ft.
Coker F-201	F-201 Exhaust Stack	167 ft.	9 ft., 2 in.
Coker F-202	F-202 Exhaust Stack	167 ft.	9 ft., 2 in.
Coker F-203	F-203 Exhaust Stack	167 ft.	9 ft., 2 in.
SO_2			
FCU-500	B-250 Exhaust Stack	85.5 ft.	9 ft.
FCU-600	S-701 Exhaust Stack	64 ft.	8 ft.
SRC TGU-A	F-606 Exhaust Stack	48 ft.	6ft., 2 in
SRC TGU-B	F-626 Exhaust Stack	48 ft.	6ft., 2 in
O_2			
FCU-500	B-250 Exhaust Stack	85.5 ft.	9 ft.
FCU-600	S-701 Exhaust Stack	64 ft.	8 ft.
DHT B-601A	B-601A Exhaust Stack	147.2 ft.	5.5 ft.
SRC TGU-A	F-606 Exhaust Stack	48 ft.	6ft., 2 in.
SRC TGU-B	F-626 Exhaust Stack	48 ft.	6ft., 2 in.
11A H-1X	H-1X Exhaust Stack	163.2 ft.	10 ft.
11A H-200	H-200 Exhaust Stack	246.2 ft.	10 ft.
4UF F-2	To Be Installed in 2016		
4UF F-3	To Be Installed in 2016		
12PS H-101A	H-101A Exhaust Stack	267 ft.	13.3 ft.
12PS H-101B	H-101B Exhaust Stack	267 ft.	13.3 ft.
12PS H-102	H-102 Exhaust Stack	267 ft.	14.3 ft.
Coker F-201	F-201 Exhaust Stack	167 ft.	9 ft., 2 in.
Coker F-202	F-202 Exhaust Stack	167 ft.	9 ft., 2 in.
Coker F-203	F-203 Exhaust Stack	167 ft.	9 ft., 2 in.
DHT B-601A	B-601A Exhaust Stack	107.7 ft.	5.5 ft.
CO			
FCU-500	B-250 Exhaust Stack	85.5 ft.	9 ft.
FCU-600	S-701 Exhaust Stack	64 ft.	8 ft.
DHT B-601A	B-601A Exhaust Stack	107.7 ft.	5.5 ft.
Boiler 31 (SPS 1)	Boiler 31 Exhaust Stack	156.7 ft.	8.3 ft.
Boiler 32 (SPS 2)	Boiler 32 Exhaust Stack	156.7 ft.	8.3 ft.
Boiler 33 (SPS-3)	Boiler 33 Exhaust Stack	156.7 ft.	8.3 ft.
Boiler 34 (SPS-4_	Boiler 34 Exhaust Stack	156.7 ft.	8.3 ft.

Location	Designator	Sampling Location Height (relative to grade)	Line / Stack Diameter
Boiler 36 (SPS-6)	Boiler 36 Exhaust Stack	156.7 ft.	8.3 ft.
SRC TGU-A	F-606 Exhaust Stack	48 ft.	6ft., 2 in.
SRC TGU-B	F-626 Exhaust Stack	48 ft.	6ft., 2 in.
12PS H-101A	H-101A Exhaust Stack	267 ft.	13.3 ft.
12PS H-101B	H-101B Exhaust Stack	267 ft.	13.3 ft.
12PS H-102	H-102 Exhaust Stack	267 ft.	14.3 ft.
Coker F-201	F-201 Exhaust Stack	167 ft.	9 ft., 2 in.
Coker F-202	F-202 Exhaust Stack	167 ft.	9 ft., 2 in.
Coker F-203	F-203 Exhaust Stack	167 ft.	9 ft., 2 in.

3.2 Continuous Emission Monitoring System

The model and serial number of all CEMS covered within this document is included below in Table 3.2.

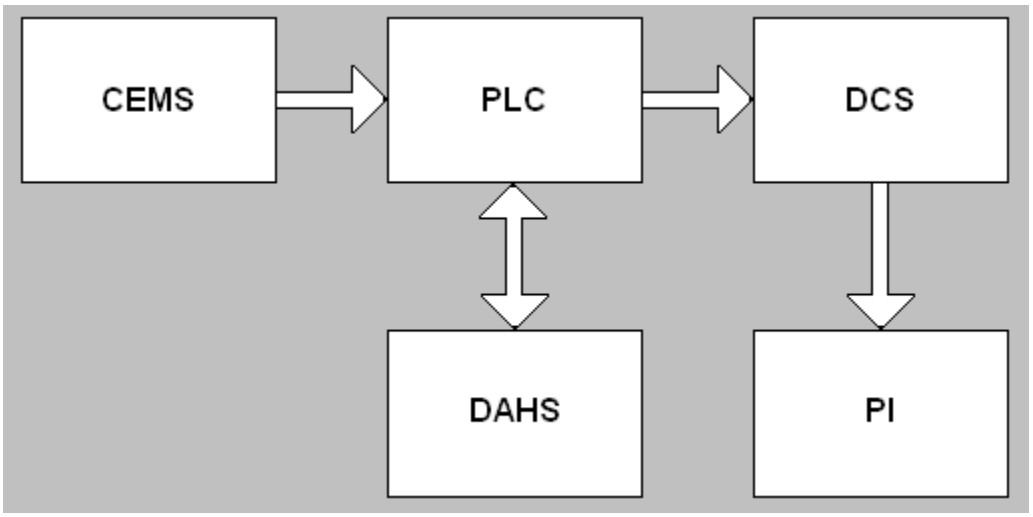
TABLE 3.2 CEM MODEL AND SERIAL NUMBER INFORMATION

Location	Pollutant	Model	Serial Number
SRU Mix Drum	H_2S	Siemens Maxum II	002510
	Total Sulfur	Thermo Fisher SOLA II	SL-07690112
4UF Mix Drum	H_2S	Siemens Maxum II	000010
	Total Sulfur	Thermo Fisher SOLA II	SL-07070111
CFU Mix Drum	H_2S	Siemens Maxum II	001910
	Total Sulfur	Thermo Fisher SOLA II	SL-07700112
Merox	Total Sulfur	Thermo Fisher SOLA II	SL-06910910
DDU Flare	H_2S	Siemens Maxum II	000606
	Total Sulfur	Thermo Fisher SOLA II	SL-08310912
South Flare	H_2S	Siemens Maxum II	000020
	Total Sulfur	Thermo Fisher SOLA II	SL-07990512
GOHT Flare	H_2S	Siemens Maxum II	000010
	Total Sulfur	Thermo Fisher SOLA II	SL-08000512
VRU Flare	H_2S	Siemens Maxum II	009400
	Total Sulfur	Thermo Fisher SOLA II	SL-08330912
Alky Flare	H_2S	Siemens Maxum II	000406
	Total Sulfur	Thermo Fisher SOLA II	SL-08341012
FCU Flare	H_2S	Siemens Maxum II	001061
	Total Sulfur	Thermo Fisher SOLA II	SL-83320912
UIU Flare	H_2S	Siemens Maxum II	003068
	Total Sulfur	Thermo Fisher SOLA II	SL-08361012
4UF Flare	H_2S	Siemens Maxum II	000506

Location	Pollutant	Model	Serial Number
	Total Sulfur	Thermo Fisher SOLA II	SL-08351012
FCU-500	NO_X	Rosemont NOX CLD	U1005675
	SO_2	Rosemont MLT 3	400661479254
	CO/O_2	Rosemont MLT	45061458974
FCU-600	NO_X	Rosemont NOX CLD	U1005674
	SO_2	Rosemont MLT 3	400661479253
	CO/O_2	Rosemont MLT	45061458973
DHT B-601A	NO_X	Rosemont NOX CLD	6001102642836
	CO/O_2	Rosemont MLT	3001002642836
11A H-1X	NO_X	Rosemont NOX CLD	6005303662701
	O_2	Rosemont MLT	3005303663657
11C H-200	NO_X	Rosemont NOX CLD	6006303662703
	O_2	Rosemont MLT	3005303663658
4UF F-2	NO_X	To Be Installed in 2016	To Be Installed in 2016
4UF F-3	NO_X	To Be Installed in 2016	To Be Installed in 2016
12PS H-101A	NO_X	Rosemont NOX CLD	600602659426
	CO/O_2	Rosemount MLT	3006002659423
12PS H-101B	NO_X	Rosemont NOX CLD	600602659428
	CO/O_2	Rosemount MLT	3010002772211
12PS H-102	NO_X	Rosemont NOX CLD	600602659427
	CO/O_2	Rosemount MLT	3006002659424
Coker F-201	NO_X	Rosemont NOX CLD	2772212
	CO/O_2	Rosemount MLT	2772209
Coker F-202	NO_X	Rosemont NOX CLD	2772214
	CO/O_2	Rosemount MLT	2772210
Coker F-203	NO_X	Rosemont NOX CLD	2772216
	CO/O_2	Rosemount MLT	2772211
Boiler 31 (3SPS 1)	CO	Rosemont MLT	3012902511680
Boiler 32 (3SPS 2)	CO	Rosemont MLT	30053726654
Boiler 33 (3SPS-3)	CO	Rosemont MLT	3012902511682
Boiler 34 (3SPS-4)	CO	Rosemont MLT	3012902511681
Boiler 36 (3SPS-6)	CO	Rosemont MLT	3012902511684
SRC TGU-A	SO_2	Rosemont MLT 3	4005002648872
	CO	Rosemont MLT 3	4005002648872
SRC TGU-B	SO_2	Rosemont MLT 3	4005002648873
	CO	Rosemont MLT 3	4005002648873

3.3 Continuous Emission Monitoring System

A simplified block diagram of the continuous monitoring system showing the flow of information is shown in figure below.



Where:

CEMS = Continuous Monitoring System
PLC = Programmable Logic Controller
DCS = Digital Control System
DAHS= Data Acquisition and Handling System
PI = Process Information (Data historian)

3.3.1 Analyzers

Stack or sample gas is collected from the source and transported through heated sample lines to the analyzers for measurement. The excess sample is exhausted to the atmosphere in a safe location or to a flare relief valve header.

3.3.1.1 NO_X

The Chemiluminescence Analyzer Module is based on Chemiluminescence reaction that occurs when nitric oxide (NO) reacts with ozone (O_3) to produce nitrogen dioxide (NO_2) and oxygen (O_2). As NO and O_3 mix in the reaction chamber, the intensity of the emitted red light is measured by a photodiode and is proportional to the concentration of NO in the original gas sample.

To measure NO_X ($NO+NO_2$), any NO_2 in the sample is reduced to NO through a heated metallic converter (at 95% efficiency). Any NO initially present in the sample passes through this converter stage unchanged. The converted sample gas is then introduced into the reaction cell by continuously passing through a heated bed of vitreous carbon.

The photodiode generates a DC current proportional to the NO concentration. The current is amplified, conditioned and expressed on the network as the Primary Variable.

3.3.1.2 SO_2

The measuring effect is derived from absorption of ultraviolet radiation from a glow-discharge lamp used as radiation a source. The gas-specific wavelengths of the absorption bands characterize the type of gas while the strength of the absorption gives a measurement of the concentration of the component measured. Due to a rotation chopper wheel, the radiation intensities coming from measuring and reference side of the analysis cell produce periodically changing signals in the detector.

The detector signal amplitude thus alternates between concentration dependent and concentration independent values. The difference between the two is proportional to the concentration of the absorbing gas component.

A second filter cell is installed after the analysis cell. The photo detector, which follows, converts the pulsating radiation intensities from measuring and reference side of the analysis cell into electrical voltages.

A glow-discharge lamp needs a specific and as constant as possible temperature, the UV lamp is built into a temperature-controlled section of the optical bench.

3.3.1.3 O_2

The determination of O_2 concentration is based on the paramagnetic principle (magneto mechanic principle).

Two nitrogen-filled quartz spheres are arranged in a “dumbbell” configuration and suspended free to rotate on a thin platinum ribbon in a cell.

A small mirror that reflects a light beam coming from a light source to a photo detector is mounted on this ribbon. A strong permanent magnet especially shaped to produce a strong highly inhomogeneous magnetic field inside the analysis cell, is mounted outside the wall.

When oxygen molecules enter the cell, their paramagnetism will cause them to be drawn towards the region of greatest magnetic field strength. The O_2 molecules thus exert different forces, which produce torque acting on the sphere arrangement, and the suspended “dumbbell.” Along with the mirror mounted on its suspension ribbon, will be angularly rotated away from the equilibrium position.

The mirror then will deflect an incident light beam onto the photo detector which itself produces an electric voltage. The electrical signal is amplified and fed back to a conducting coil at the “dumbbell,” forcing the suspended spheres back to the equilibrium position. The current required to generate the restoring torque to return the “dumbbell” to its equilibrium position is a direct measure of the O_2 concentration in the gas mixture.

3.3.1.4 H_2S

The Siemens Maxum II at the DDU Flare, 4UF, and CFU fuel gas CEMS and the flare stacks use gas chromatographic separation of H_2S from other components in flare gas with a thermal conductivity (TCD). The Siemens Applied Automation Advanced Plus analyzer at the SRU Mix Drum uses a gas chromatographic separation of H_2S from other components in fuel gas and selective detection by a flame photometric detector (FPD).

Following auto-injection of the sample from a continuous sample loop, the analysis is completed every few minutes.

3.3.1.5 TRS

To determine the total sulfur content of flare header gas and refinery fuel gas streams all volatile sulfur compounds (i.e. H2S, COS, CS2, mercaptans, and organically bound sulfur), samples of the process gases are extracted from the process stream and transported to the CEMS using heated transfer lines. An automated sample injection valve is used to introduce the sample gas into the CEMS. An air carrier gas is used to deliver the sample from the injection valve to the air bath oven. The air bath oven provides the necessary heat to ensure all components of the process gas remain vaporized. The hydrocarbon/air mixture next enters the mixing chamber where additional air is added. Upon exiting the mixing chamber, the sample is fully combusted to CO2, H2O and SO2 in the 1100°C Pyrolyzer section.

The mixture of pyrolyzed sample gas and air then enters a measurement cell where the sample is irradiated with ultraviolet light. Irradiation of SO2 with a specific wavelength of ultraviolet forms an electronically excited form of SO2. When the SO2 returns to its ground state, emission (fluorescence) of light at a slightly different wavelength occurs. A photomultiplier tube (PMT) measures the intensity of the resulting fluorescence. The intensity of the emitted light is directly proportional to the total sulfur content of the sample. This step of the analysis is termed Pulsed Ultraviolet Fluorescence.

3.3.1.6 CO

The CO analyzer module uses the IR absorption method of measurement. The gas specific wavelengths of the absorption bands characterize the type of gas while the strength of the absorption gives a measure of the concentration of the component measured. The detector signal amplitude thus alternates between concentration dependent and concentration independent values. The difference between the two is a reliable measure of the concentration of the absorbing component. The electronics evaluate the signals and convert them into the corresponding display format.

In order to analyze refinery fuel gas for this array of potential components, the GC used at whiting Business Unit consists of several chromatographic columns. These columns require separate thermal conductivity detectors to accurately detect the wide range of concentrations present.

3.3.2 DAHS

Each CEMS has an independent PLC, which processes analog signals from the analyzers. The DAHS performs all necessary calculations, and controls system calibration. This DAHS interfaces with the plant's computer system where the data is stored in the DCS. DAHS can trend data and compile it for reporting.

In the event of a failure within the DAHS system, the DCS & PI provide backup for emissions data trending and reporting.

TABLE 3.2 DAHS SERVER CONFIGURATION

Unit	DAHS Server	DCS Tag Name
H_2S in Refinery Fuel Gas		

Unit	DAHS Server	DCS Tag Name
SRU Mix Drum	BP1WHIAP012	A43903
4UF Mix Drum	WI4UFCEM001	A21120
CFU Mix Drum	WI4UFCEM001	A23720
H_2S in Flare Gas		
DDU Flare	BP1WHIAP011	A25502
South Flare	WHI12PCEM802	A33632
GOHT Flare	WHIGOHCEM371	A29720A
VRU Flare	WIREFCEM001	A01906
Alky Flare	WISRCCEM569	A46173
FCU Flare	WIREFCEM001	A09603
UIU Flare	WIREFCEM001	A13903
4UF Flare	WIREFCEM001	A21903
TRS or TS		
SRU Mix Drum	WISRCCEM569	A43415WS
4UF Mix Drum	WI4UFCEM001	A21121
CFU Mix Drum	WI4UFCEM001	A23721
DDU Flare	WIGOHCEM371	A25509A/B
South Flare	WHI12PCEM802	A33633A/B
GOHT Flare	WHIGOHCEM371	A29720BL/BH
VRU Flare	WIREFCEM001	A01907A/B
Alky Flare	WISRCCEM569	A46174A/B
FCU Flare	WIREFCEM001	A09604A/B
UIU Flare	WIREFCEM001	A13904A/B
4UF Flare	WIREFCEM001	A21904A/B
NO_X		
FCU500	BP1WHIAP010	A05660A
FCU600	BP1WHIAP010	A06660A
DHT B-601A	WIDHTCEM001	A26109
11A H-1X	WHIGOHCEM371	A51222
11A H-200	WHIGOHCEM371	A52222
4UF F-2	To Be Installed in 2016	
4UF F-3	To Be Installed in 2016	
12PS H-101A	WI12PCEM802	A32200B
12PS H-101B	WI12PCEM802	A32235B
12PS H-102	WI12PCEM802	A32600B
Coker F-201	WICKRCEM835	A38205B
Coker F-202	WICKRCEM835	A38405B
Coker F-203	WICKRCEM835	A38605B
Boiler 31 (3SPS 1)	BP1WHIAP026	A93192NX

Unit	DAHS Server	DCS Tag Name
Boiler 32 (3SPS 2)	BP1WHIAP026	A93192NX
Boiler 33 (3SPS 3)	BP1WHIAP026	A93192NX
Boiler 34 (3SPS 4)	BP1WHIAP026	A93192NX
Boiler 36 (3SPS 6)	BP1WHIAP026	A93192NX
SO_2		
FCU500	BP1WHIAP010	A05660B
FCU600	BP1WHIAP010	A06660B
SRC TGU-A	WISRCCEM569	A49025C
SRC TGU-B	WISRCCEM569	A49225C
O_2		
FCU500	BP1WHIAP010	A05660d
FCU600	BP1WHIAP010	A06660d
DHT B-601A	WIDHTDEM001	A26108
SRC TGU-A	WISRCCEM569	A49025A
SRC TGU-B	WISRCCEM569	A49225A
11A H-1X	WHIGOHCEM371	A51221
11A H-200	WHIGOHCEM371	A52221
4UF F-2	To Be Installed in 2016	
4UF F-3	To Be Installed in 2016	
12PS H-101A	WI12PCEM802	A32200A
12PS H-101B	WI12PCEM802	A32235A
12PS H-102	WI12PCEM802	A32600A
Coker F-201	WICKRCEM835	A38205A
Coker F-202	WICKRCEM835	A38405A
Coker F-203	WICKRCEM835	A38605A
DHT- B-601 A	WIDHTCEM001	A26108
Boiler 31 (3SPS 1)	BP1WHIAP026	A93103C
Boiler 32 (3SPS 2)	BP1WHIAP026	A93203C
Boiler 33 (3SPS 3)	BP1WHIAP026	A93303C
Boiler 34 (3SPS 4)	BP1WHIAP026	A93403C
Boiler 36 (3SPS 6)	BP1WHIAP026	A93603C
CO		
FCU500	BP1WHIAP010	A05660C
FCU600	BP1WHIAP010	A06660C
DHT B-601A	WIDHTDEM001	A26107A/B
Boiler 31 (3SPS 1)	BP1WHIAP026	A93192CO
Boiler 32 (3SPS 2)	BP1WHIAP026	A93292CO
Boiler 33 (3SPS 3)	BP1WHIAP026	A93392CO
Boiler 34 (3SPS 4)	BP1WHIAP026	A93492CO

Unit	DAHS Server	DCS Tag Name
Boiler 36 (3SPS 6)	BP1WHIAP026	A93692CO
SRC TGU-A	WISRCCEM569	A49025B
SRC TGU-B	WISRCCEM569	A49225B
12PS H-101A	WI12PCEM802	A32200C
12PS H-101B	WI12PCEM802	A32235C
12PS H-102	WI12PCEM802	A32600C
Coker F-201	WICKRCEM835	A38205C
Coker F-202	WICKRCEM835	A38405C
Coker F-203	WICKRCEM835	A38605C

4.0 QUALITY CONTROL/QUALITY ASSURANCE ACTIVITIES

Several quality control and quality assurance activities are performed to ensure that monitor operation and maintenance is adequate and appropriate to maintain data accuracy. The most important of these is training described below in Section 4.1. Properly trained personnel perform insure proper monitor operation and high reliability through regular quality control, routine quality assurance, and maintenance activities. Each activity set is outlined below in Tables 4.1 and 4.2, and described in further detail in Sections 4.2 and 4.3 below.

4.1 Personnel Training

The scope of the personnel training program is provided for all personnel with responsibilities related to CEMS operation, data collection and calculations, including contractors or non-BP employees, required to respond to alarms or to inspect or work on the equipment.

BP employees are assigned training requirements through Learning Management System, a database program. All training is scheduled through and maintained by the Interactive Learning and Development Center (ILDC) with the Learning Management System. Records of such training are maintained by the Training Department.

BP employees assigned as Environmental Department Supervisor, CEMS subject Matter Expert, and to the Analyzer Group receive annual training in the requirements of the CEMS QA/QC O&M manual. In addition to training, these employees also have access to the complete current manual through Documentum.

TABLE 4.1 – CEMS TRAINING ACTIVITIES

Training Activity	Training Applicability	Frequency of Re-training
Introduction to Whiting CEMS Program & CEMS QA/QC O&M Manual	All Analyzer Group, Environmental Manager, and CEMS SME	Annually
Manufacturers Training (Siemens)	Analyzer Supervisor and Technicians	Once every 3 years
Manufacturers Training (Thermo Process instruments)		Once every 3 years
Manufacturers Training (Rosemont)		Once every 3 years
Manufacturers Training (NetDAHS)		Annually
Manufacturers Training (VIM Technology)		Annually
On-the-job Training	Newly Assigned Tech	As needed

4.1.1 QA/QC O&M Manual Training Scope

All employees performing preventive maintenance, repairs, or replacement of any parts or components of any CEMS within the scope of this manual will receive training in the contents and requirements set out in this manual will receive initial training within 30 days of assignment to perform any of the above tasks. Annual refresher training in the QA/QC O&M manual contents and requirements is provided to all employees in the CEMS/Analyzer department either in person or via Computer Based Training (CBT).

The scope of the training will include:

- QA/QC O&M Introduction
- Overview of CEMS Equipment and location
- Relative Accuracy Test Audit (RATA)
- Cylinder Gas Audit (CGA)
- Data Recording and Reporting
- Preventive Maintenance and Unit Shutdowns
- Repair Program
- Location and Procedures of Spare Parts Inventory

4.1.2 Manufacturer Training Scope

Analyzer Technicians and Supervisers will receive refresher training on the CEMS manufacturer type every three years. Training on other critical CEMS elements (e.g. chillers, PLC, DAHS) is provided annually to Analyzer Technicians and Supervisers. This training is required to be provided by a competent individual, such as the manufacturer, the site Analyzer Subject Matter Expert, or via CBT.

The scope of the training will include:

- Principles of detection or operation
- Normal operation of the product
- Recommendations for preventive maintenance and spare parts
- Known failure modes
- Troubleshooting procedures
- Other manufacturer support available

Manufacturers/Vendors that provide training include the following:

- Thermo-Scientific
- Siemens
- Rosemont
- Babcock & Wilcox
- VIM Technology

4.1.3 On-the-job Training Scope

All technicians newly assigned to the Analyzer Group will be work in tandem with and fully qualified analyzer technician until the new technician is found to meet the minimum training and knowledge requirements for an analyzer technician. The Analyzer Supervisor determines the qualification level of the new technicians using the following evidence:

- Observations in the field by supervisors and fully qualified technicians
- Previous job experience directly related to CEMS
- Recommendations from experienced technicians assigned to train the new technician
- Satisfactory completion of Learning Management System scheduled training

Newly assigned CEMS technicians may only perform unsupervised work on CEMS after demonstrating competence in all of the following:

- Principles of operation of the CEMS
- CEMS QA/QC O&M Plan
- Daily calibration drift test procedures
- Analyzer calibration procedures
- Preventive maintenance procedures for the CEMS
- Common failure modes for the analyzers, heated sample lines, sample conditioning systems
- PLC controllers, DAHS

4.1.4 Bench Top Training Exercise Scope

In order to update analyzer technicians on new learnings from recent maintenance work on CEMS, new manufacturer recommendations, changes in CEMS QA/QC O&M requirements, or other important new information the analyzer supervisor holds training exercises. The exercises are generally informal and may not be scheduled in advance through Learning Management System

TABLE 4.2 - QUALITY ASSURANCE / QUALITY CONTROL ACTIVITIES

Quality Activity	Frequency
Initial Quality Control Activities	
Seven-Day Calibration Drift Test	Once following installation of new CEMS (for a 7-day period)
Relative Accuracy Test Audit (RATA)	Once following installation of new CEMS
Response Time Test	Once following installation of new CEMS
Calibration Error Test	Once following installation of new CEMS
Routine Quality Assurance Activities	
Calibration Drift Test (Daily Cal)	Daily
Cylinder Gas Audit (CGA)	No more than 3 consecutive quarters
Relative Accuracy Test Audit (RATA)	At least once every 4 calendar quarters (except for CEMS for flares required by NSPS Subpart Ja, where a CGA is allowed to be substituted for a RATA under 40 CFR 60.104a(e)(1)(ii) for TRS and 60.104a(e)(2)(ii)for H_2S)

4.2 Initial Quality Control (QC) Activities

These activities are performed to ensure that monitor operation and maintenance is adequate and appropriate to maintain data accuracy and generally occur immediately after installation of a new CEMS or after the necessity to recertify a CEMS. These activities are completed in addition to the strict installation verification procedures established by the vendor, which include initial start-up, debugging, and inspection of the systems to ensure proper operation. In addition, a complete set of Operations and maintenance manuals for all components of the system are maintained by the Analyzer Department. These manuals provide complete descriptions of the system including theory, installation, operation, and maintenance. The procedures are individually described in further detail below.

4.2.1 Initial Seven-Day Calibration Drift Test Procedure

The initial QC activity is the seven-day calibration drift test. Regulations require that each CEMS, upon initial installation, perform a one-time, seven-day calibration drift test without performing maintenance,

repair, or adjustment to ensure the accuracy of the analyzer. Calibration drift refers to the difference between the CEMS output reading and the reference value (supplied by cylinder gas) after a period of operation during which no unscheduled maintenance, repair, or adjustment takes place. The CEMS must demonstrate a calibration drift less than the applicable standard included in Table 4.3 below.

TABLE 4.3 - SEVEN-DAY CALIBRATION DRIFT TEST ALLOWANCES

Pollutant	Allowable Drift	Days Required within Allowable Limit	Regulatory Citation
H_2S	5.0% of Span	Six (6)	Part 60, Appendix B Specification 7, Section 6.2
TRS	5.0% of Span	Six (6)	Part 60, Appendix B Specification 5, Section 13.1
NO_X	2.5% of Span	Seven (7)	Part 60, Appendix B Specification 2, Section 13.1
CO	5.0% of Span	Seven (7)	Part 60, Appendix B Specification 4, Section 13.1
SO_2	2.5% of Span	Seven (7)	Part 60, Appendix B Specification 2, Section 13.1
O_2	0.5% O_2	Seven (7)	Part 60, Appendix B Specification 3, Section 13.1

4.2.2 Initial Relative Accuracy Test Audit (RATA)

A RATA will be conducted on a CEMS upon initial installation in accordance with Appendix B and Appendix F (40 CFR Part 60) using the appropriate U.S. EPA reference methods. If the results exceed acceptable criteria in Table 4.4, then the Analyzer Department will take corrective action immediately. After the system has been repaired, the RATA will be repeated. This testing will continue until the CEMS passes the RATA.

TABLE 4.4 – INITIAL RATA TEST ALLOWABLE CRITERIA

Pollutant	Acceptable Criteria (+ / -)	Regulatory Citation
H_2S	10% of Applicable Standard - or - 20% of Reference Method	Part 60, Appendix B Specification 7, Section 6.3
TRS	10% of Applicable Standard - or - 20% of Reference Method	Part 60, Appendix B Specification 5, Section 13.2
NO_X	10% of Applicable Standard(1) - or - 20% of Reference Method(2)	Part 60, Appendix B Specification 2, Section 13.2
CO(3)	5% of Applicable Standard - or - 10% of Reference Method Value	Part 60, Appendix B Specification 4, Section 13.2
SO_2	10% of Applicable Standard(1) - or - 20% of Reference Method(2)	Part 60, Appendix B Specification 2, Section 13.2

Pollutant	Acceptable Criteria (+ / -)	Regulatory Citation
O_2	1.0% O_2	Part 60, Appendix B Specification 3, Section 13.2

(1) Applicable when average emissions during test are less than 50 percent of the emission standard
(2) Applicable when average emissions during test are greater than 50 percent of the emission standard
(3) Consult requirements of Performance Specification 4A if CO concentration range of CEMS is ≤200 ppm

Applicable Standard refers to the specific emission limit contained in the current Title V Operating Permit for each source at which the pollutant is being monitored. The Applicable Standard is different for each unit, source, and pollutant. For more information, refer to the Title V Operating Permit. Reference Method refers to the reading by an independent CEMS that is provided by a stack testing contractor company.

For CO, there is a special calculation that can be performed to satisfy the RATA. The RATA can be satisfied if the absolute average difference between the Reference Method and CEMS reading, plus the 2.5% confidence coefficient, is less than 5 ppmv.

RATA for CEMS H_2S and TRS installed on flares required by NSPS Subpart Ja are not performed. CGA is allowed to be substituted for a RATA under 40 CFR 60.104a(e)(1)(ii) for TRS and 60.104a(e)(2)(ii)for H_2S).

4.2.3 Response Time and Initial Calibration Error Tests

Upon initial installation a calibration error and response time test are required for CO and O_2 analyzers. The acceptable criteria for each test and pollutant are included below in Table 4.5.

TABLE 4.5 - RESPONSE TIME AND CALIBRATION ERROR ALLOWABLE CRITERIA

Pollutant	Allowable Drift	Regulatory Citation
CO (<200 ppm)	Must reach 95% of final stable reading in 1.5 minutes	Part 60, Appendix B Specification 4A, Section 13.3
O_2	Less than two (2) minutes	Part 60, Appendix B Specification 4B, Section 4.5
CO	Less than 5.0% of Span	Part 60, Appendix B Specification 4B, Section 4.4
O_2	Less than 0.5% of Span	Part 60, Appendix B Specification 4B, Section 4.4

4.2.4 Initial Performance Testing Requirements of 40 CFR 60.8(a)

As discussed in the introduction to this manual, the initial performance testing requirements of 40 CFR 60.8(a) for monitoring equipment used for opacity, Btu on flare gas, temperature, flow and other parameters are not within the scope of this manual since the Consent Decree exempts specific sources from the testing requirements of this section.

4.3 Routine Quality Assurance (QA) Activities

These activities are performed to ensure that the CEMS provides accurate and reliable data during their continual operation. These procedures compare the measured values obtained from the CEMS to values obtained by EPA Reference Method or known value testing. The results of these tests provide verification of the continued comparability of the CEM data to data collected and compared to outside references. The procedures for these tests are published in Appendix A, B, and F (40 CFR Part 60). The procedures are individually described in further detail below.

4.3.1 Daily Calibration Drift Test Procedure

Each CEMS must perform a daily calibration drift test and must demonstrate a calibration drift less than twice the allowable drift (per 40 CFR Part 60, Appendix F, Section 4.1), otherwise it is considered "Out of Control." Calibration drift refers to the difference between the CEMS output reading and the reference value (supplied by cylinder gas). The calibration drift involves challenging the CEMS with zero (low level) and span (high level) calibration gases to verify the accuracy of the analyzer per 40 CFR Part 60.13(d)(1). Low-level calibration gases must be 0-20% of the span and the high-level calibration gases must be 50-100% of the span. The Span Values and Daily Calibration Drift ranges for the applicable CEMS are included in Table 4.5 and the Out of Control Limits are included in Table 4.6.

TABLE 4.6 CALIBRATION GAS CONCENTRATIONS

Unit	Span	Daily Calibration Drift Check			
		Low Level		High Level	
		0%	20%	50%	100%
H2S (Refinery Fuel Gas/Flare Gas)					
SRU Mix Drum 4UF Mix Drum CFU Mix Drum DDU Flare South Flare GOHT Flare VRU Flare Alky Flare FCU Flare UIU Flare 4UF Flare	300 ppm	0 ppm	60 ppm	150 ppm	300 ppm

TABLE 4.6 CALIBRATION GAS CONCENTRATIONS (continued)

Unit	Span	Daily Calibration Drift Check			
		Low Level		High Level	
		0%	20%	50%	100%
TRS					
SRU Mix Drum 4UF Mix Drum CFU Mix Drum Merox	400 ppm	0 ppm	80 ppm	200 ppm	400 ppm
DDU Flare VRU Flare FCU Flare	20 mol%	0 ppm	2000 ppm	10 mol%	20 mol%
Alky Flare UIU Flare 4UF Flare	5 mol%	0 ppm	500 ppm	2.5 mol%	5 mol%
South Flare GOHT Flare	50 mol%	0 ppm	5000 ppm	25 mol%	50 mol%
NO_X					
FCU 500	120 ppm	0 ppm	32 ppm	60 ppm	120 ppm
FCU 600	80 ppm	0 ppm	16 ppm	40 ppm	80 ppm
DHT B-601A	100 ppm	0 ppm	20 ppm	50 ppm	100 ppm
11A H-1X	150 ppm	0 ppm	30 ppm	75 ppm	150 ppm
11A H-200	150 ppm	0 ppm	30 ppm	75 ppm	150 ppm
4UF F-2	TBD	0 ppm	TBD	TBD	TBD
4UF F-3	TBD	0 ppm	TBD	TBD	TBD
12PS H-101A	150 ppm	0 ppm	30 ppm	75 ppm	150 ppm
12PS H-101B	150 ppm	0 ppm	30 ppm	75 ppm	150 ppm
12PS H-102	150 ppm	0 ppm	30 ppm	75 ppm	150 ppm
Coker F-201 Low Range Coker F-202 Low Range Coker F-203 Low Range	50 ppm	0 ppm	10 ppm	25 ppm	50 ppm
Coker F-201 High Range Coker F-202 High Range Coker F-203 High Range	150 ppm	0 ppm	30 ppm	75 ppm	150 ppm

TABLE 4.6 CALIBRATION GAS CONCENTRATIONS (continued)

Unit	Span	Daily Calibration Drift Check			
		Low Level		High Level	
		0%	20%	50%	100%
SO_2					
FCU 500	100 ppm	0 ppm	10 ppm	50 ppm	100 ppm
FCU 600	100 ppm	0 ppm	10 ppm	50 ppm	100 ppm
SRC TGU-A Low Range SRC TGU-B Low Range	500 ppm	0 ppm	100 ppm	250 ppm	500 ppm
SRC TGU-A High Range SRC TGU-B High Range	3,000 ppm	0 ppm	600 ppm	1,500 ppm	3,000 ppm
O_2					
FCU 500 FCU 600	10.0% O_2	0.0% O_2	2.0% O_2	5.0% O_2	10.0% O_2
DHT B-601A SRC TGU-A SRC TGU-B 11A H-1X 11A H-200 4UF F-2 4UF F-3 12PS H-101A 12PS H-101B 12PS H-102 Coker F-201 Coker F-202 Coker F-203 Boiler 31 (3SPS 1) Boiler 32 (3SPS 2) Boiler 33 (3SPS 3) Boiler 34 (3SPS 4) Boiler 36 (3SPS 6)	25.0% O_2	0.0% O_2	5.0% O_2	12.5% O_2	25.0% O_2

TABLE 4.6 CALIBRATION GAS CONCENTRATIONS (continued)

Unit	Span	Daily Calibration Drift Check			
		Low Level		High Level	
		0%	20%	50%	100%
CO					
FCU 500 FCU 600	1,000 ppm	0 ppm	200 ppm	500 ppm	1,000 ppm
Coker F-201 Coker F-202 Coker F-203	500 ppm	0 ppm	100 ppm	250 ppm	500 ppm
DHT B-601A Low Range Boiler 31 Low Range Boiler 32 Low Range Boiler 33 Low Range Boiler 34 Low Range Boiler 36 Low Range SRC TGU-A Low Range SRC TGU-B Low Range 12PS H-101A Low Range 12PS H-101B Low Range 12PS H-102 Low Range	100 ppm	0 ppm	20 ppm	50 ppm	100 ppm
DHT B-601A High Range Boiler 31 High Range Boiler 32 High Range Boiler 33 High Range Boiler 34 High Range Boiler 36 High Range 12PS H-101A High Range 12PS H-101B High Range 12PS H-102 High Range	5,000 ppm	0 ppm	1,000 ppm	2,500 ppm	5,000 ppm
SRC TGU-A High Range SRC TGU-B High Range	2,500 ppm	0 ppm	500 ppm	1,250 ppm	2,500 ppm

TABLE 4.7 ALLOWABLE CALIBRATION DRIFT

Unit	Allowable Drift (AD)	Out of Control Limits	
		2 X AD for 5 days (Single Bad)	4 X AD for 1 day (Double Bad)
H2S (Refinery Fuel Gas/Flare Gas)			
SRU Mix Drum 4UF Mix Drum CFU Mix Drum DDU Flare South Flare GOHT Flare VRU Flare Alky Flare FCU Flare UIU Flare 4UF Flare	5.0%	30 ppm	60 ppm

TABLE 4.7 ALLOWABLE CALIBRATION DRIFT (continued)

Unit	Allowable Drift (AD)	Out of Control Limits	
		2 X AD for 5 days (Single Bad)	4 X AD for 1 day (Double Bad)
TRS			
SRU Mix Drum 4UF Mix Drum CFU Mix Drum Merox DDU Flare South Flare GOHT Flare VRU Flare Alky Flare FCU Flare UIU Flare 4UF Flare	5.0%	40 ppm	80 ppm
NOx			
FCU-500	2.5%	8 ppm	16 ppm
FCU-600		4 ppm	8 ppm
DHT B-601A		5 ppm	10 ppm
11A H-1X		7.5 ppm	15 ppm
11A H-200		7.5 ppm	15 ppm
4UF F-2		TBD	TBD
4UF F-3		TBD	TBD
12PS H-101A		7.5 ppm	15 ppm
12PS H-101B		7.5 ppm	15 ppm
12PS H-102		7.5 ppm	15 ppm
Coker F-201 Low Range Coker F-202 Low Range Coker F-203 Low Range		2.5 ppm	5 ppm
Coker F-201 High Range Coker F-202 High Range Coker F-203 High Range		7.5 ppm	15 ppm

TABLE 4.7 ALLOWABLE CALIBRATION DRIFT (continued)

Unit	Allowable Drift (AD)	Out of Control Limits	
		2 X AD for 5 days (Single Bad)	4 X AD for 1 day (Double Bad)
SO_2			
FCU-500	2.5%	5 ppm	10 ppm
FCU-600		12.5 ppm	25 ppm
SRC TGU-A Low Range SRC TGU-B Low Range		25 ppm	50 ppm
SRC TGU-A High Range SRC TGU-B High Range		150 ppm	300 ppm
O_2			
FCU-500 FCU-600 DHT B-601A SRC TGU-A SRC TGU-B 11A H-1X 11A H-200 4UF F-2 4UF F-3 12PS H-101A 12PS H-101B 12PS H-102 Coker F-201 Coker F-202 Coker F-203 Boiler 31 (3SPS 1) Boiler 32 (3SPS 2) Boiler 33 (3SPS 3) Boiler 34 (3SPS 4) Boiler 36 (3SPS 6)	0.5% O_2	1.0% O_2	2.0% O_2

TABLE 4.7 ALLOWABLE CALIBRATION DRIFT (continued)

Unit	Allowable Drift (AD)	Out of Control Limits	
		2 X AD for 5 days (Single Bad)	4 X AD for 1 day (Double Bad)
CO			
FCU-500 FCU-600	5%	100 ppm	200 ppm
DHT B-601A Low Range Boiler 31 Low Range Boiler 32 Low Range Boiler 33 Low Range Boiler 34 Low Range Boiler 36 Low Range SRC TGU-A Low Range SRC TGU-B Low Range 12PS H-101A Low Range 12PS H-101B Low Range 12PS H-102 Low Range Coker F-201 Low Range Coker F-202 Low Range Coker F-203 Low Range		10 ppm	20 ppm
DHT High Range Boiler 31 High Range Boiler 32 High Range Boiler 33 High Range Boiler 34 High Range Boiler 36 High Range 12PS H-101A Low Range 12PS H-101B Low Range 12PS H-102 Low Range Coker F-201 Low Range Coker F-202 Low Range Coker F-203 Low Range		500 ppm	1000 ppm
SRC TGU-A High Range SRC TGU-B High Range		250 ppm	500 ppm

Daily calibration standards are a way to determine when the CEMS is considered "Out of Control." The beginning of the Out of Control period is the time corresponding to the completion of the fifth, consecutive, daily calibration drift in excess of twice the applicable standard or the time corresponding to the completion of any daily calibration drift in excess of four times the allowable drift. If daily calibration drift exceeds four times the allowable drift, then data from the analyzer back to the last good calibration is deemed invalid. This Out of Control period is considered CEMS downtime. The end of the Out of Control period is the time corresponding to the completion of the calibration drift check following corrective action that results in the calibration drift at both the zero (or low) and high-level measurement point being within the corresponding allowable calibration drift limit. Correction for excessive drift may consist of any adjustments or activities that the Analyzer Tech deem necessary to correct an observed drift. These

activities typically consist of routine checks and adjustments of calibration gas flow rates and pressures, verification of the status of monitor-specific auxiliary monitoring parameters, and adjustment of zero and/or span potentiometers. All maintenance activities and adjustments are to be recorded in the analyzer technician's log-book, the event-logger in DAHS, or the web (http://onerefining-us.bpweb.bp.com/sites/wh2/organization/maintenancereliability/centralmaintenance/instrumentation/Pages/logbook.aspx).

The Board Operators will receive an alarm notifying them of an Out of Control Calibration "OOC - Part 60".

4.3.2 Relative Accuracy Test Audit (RATA)

A RATA will be conducted at least every 4 calendar quarters on each CEMS. RATA must be performed at least 60 days after the previous CGA. These tests will be conducted in accordance with Appendix B and Appendix F (40 CFR 60) using the appropriate U.S. EPA reference methods. If at least one (1) of the acceptable criteria is met for a given pollutant, then the CEMS has passed the RATA. If the results exceed all of the acceptable criteria in Table 4.7 for a given pollutant, then the system is "Out of Control" and all data will be considered invalid. The Analyzer Department will take immediate corrective action until the system passes the RATA. Please note that for the NOX CEMS F-2 (4UF), F-3 (4UF), H-1X (11PS), H-200 (11PS), and fuel gas total sulfur analyzers, the consent decree allows WBU the option to conduct RATAs once every three (3) years. Nevertheless, it is the WBU's expectation that RATAs will be conducted at these CEMS on an annual basis.

TABLE 4.8 - RATA TEST ALLOWABLE CRITERIA

Pollutant	Acceptable Criteria (+ / -)	Regulatory Citation
H_2S	10% of Applicable Standard - or - 20% of Reference Method	Part 60, Appendix B Specification 7, Section 6.3
TRS	10% of Applicable Standard - or - 20% of Reference Method	Part 60, Appendix B Specification 5, Section 13.2
NO_X	10% of Applicable Standard(1) - or - 20% of Reference Method(2)	Part 60, Appendix B Specification 2, Section 13.2
CO(3)	5% of Applicable standard - or - 10% of Reference Method	Part 60, Appendix B Specification 4, Section 13.2
SO_2	10% of Applicable Standard(1) - or - 20% of Reference Method(2)	Part 60, Appendix B Specification 2, Section 13.2
O_2	1.0% O_2	Part 60, Appendix B Specification 3, Section 13.2

(1) Applicable when average emissions during test are less than 50 percent of the emission standard
(2) Applicable when average emissions during test are greater than 50 percent of the emission standard
(3) Consult requirements of Performance Specification 4A if CO concentration range of CEMS is ≤200 ppm

4.3.2.1 Data Reduction and Analysis

The results of the manual Reference Methods are calculated according to procedures included in Appendix A (40 CFR Part 60). Each test run is calculated individually, and these results are used with the CEMS data to calculate relative accuracy.

4.3.2.2 Relative Accuracy Calculations

The calculation procedure for relative accuracy is as found in Appendix B, Performance Specification 2, 3, 4, 5, and 7 (40 CFR Part 60). In this procedure, the results of the Reference Method testing are compared to the CEM data, in matching units.

For each test run, compute the difference between the Reference Method results and the corresponding CEMS results with the following equation from Appendix B, Performance Specification 2, Section 12.0, Equation 2-6 (40 CFR Part 60):

$$RA = \frac{\left[\left|\bar{d}\right| + \left|CC\right|\right]}{\overline{RM}} \times 100 \qquad Eq.\ 2\text{-}6$$

Where:

d = Absolute value of the mean differences

$$\bar{d} = \frac{1}{n}\sum_{i=1}^{n} d_i \qquad \text{Eq. 2-3}$$

CC = Absolute value of the confidence coefficient

$$CC = t_{0.975}\frac{S_d}{\sqrt{n}} \qquad Eq.\ 2\text{-}5$$

RM = Average Reference Method value. In cases where the average emissions for the test are less than 50 percent of the applicable standard, substitute the emission standard value in the denominator of Eq. 2-6 in place of RM. In all other cases, use RM.

4.3.2.3 Reporting

The RATA report must be submitted within 45 days of completion RATA to the regulatory agency (326 IAC 3-5-3(3)). The RATA report should, at a minimum, include the following criteria:

- Description of the audit and the purpose thereof
- Date of the audit and the unit tested
- Model and serial numbers for the CEMS tested
- Description of the results with example calculations
- Description of corrective actions, if any, conducted to allow the CEMS to pass
- Results of repeat audits, if required

4.3.3 Cylinder Gas Audit (CGA)

CGAs are conducted for no longer than three consecutive quarters. RATAs are conducted during the fourth quarter. The CGA's shall be conducted even if the unit is down during the calendar quarter. These audits are conducted in accordance with 40 CFR 60, Appendix F. The CEMS is challenged with two known concentrations of US EPA Protocol 1 gas in the ranges list in the following table. The CEMS is challenged three times at each audit point. If the results (the average of the three) from either or both audit points exceed 15% then the system is "OUT OF CONTROL" and all data following completion of the CGA will be considered invalid. Corrective action will be taken immediately by the Analyzer Department. After the system has been repaired the CGA will be repeated. The "OUT OF CONTROL" period ends when all audit points meet the <15% accuracy requirement.

In the CGA, the CEM is challenged dynamically through all sampling and analysis systems. Low and mid-range audit gases are introduced in lieu of the normal calibration gases. The audit data is retrieved from the DAHS Historian system.

The normal concentration range of audit gases are shown in Table 4.8. Audit data and observations, including concentrations of gases actually used during the audit, are recorded on the CGA audit sheet as shown in the attachment to this document.

Besides this SOP, the following documents are reference materials, which, as necessary, should be reviewed before performing the CGA:

- DAHS Operation and Maintenance Manual
- 40 CFR Part 60, Appendix F

TABLE 4.9 CALIBRATION GASES FOR CGA

Unit	Span	Calibration Gas for CGA			
		Low Level (20% to 30% of Span)		High Level (50% to 60% of Span)	
H2S (Refinery Fuel Gas/Flare Gas)					
SRU Mix Drum 4UF Mix Drum CFU Mix Drum DDU Flare South Flare GOHT Flare VRU Flare Alky Flare FCU Flare UIU Flare 4UF Flare	300 ppm	60 ppm	90 ppm	150 ppm	180 ppm
TRS					
SRU Mix Drum 4UF Mix Drum CFU Mix Drum Merox DDU Flare	400 ppm	80 ppm	120 ppm	200 ppm	240 ppm

Unit	Span	Calibration Gas for CGA			
		Low Level (20% to 30% of Span)		High Level (50% to 60% of Span)	
South Flare GOHT Flare VRU Flare Alky Flare FCU Flare UIU Flare 4UF Flare					

TABLE 4.10 CALIBRATION GASES FOR CGA

Unit	Span	Calibration Gas for CGA			
		Low Level (20% to 30% of Span)		High Level (50% to 60% of Span)	
NO_X					
FCU600	80 ppm	16 ppm	24 ppm	40 ppm	48 ppm
FCU500	160 ppm	32 ppm	48 ppm	80 ppm	96 ppm
DHT B-601A	100 ppm	20 ppm	30 ppm	50 ppm	60 ppm
11A H-1X	150 ppm	30 ppm	45 ppm	75 ppm	90 ppm
11A H-200	150 ppm	30 ppm	45 ppm	75 ppm	90 ppm
4UF F-2	TBD	TBD	TBD	TBD	TBD
4UF F-3	TBD	TBD	TBD	TBD	TBD
12PS H-101A	150 ppm	30 ppm	45 ppm	75 ppm	90 ppm
12PS H-101B	150 ppm	30 ppm	45 ppm	75 ppm	90 ppm
12PS H-102	150 ppm	30 ppm	45 ppm	75 ppm	90 ppm
Coker F-201 Low Range Coker F-202 Low Range Coker F-203 Low Range	50 ppm	10 ppm	15 ppm	25 ppm	30 ppm
Coker F-201 High Range Coker F-202 High Range Coker F-203 High Range	150 ppm	30 ppm	45 ppm	75 ppm	90 ppm
SO_2					
FCU 500	100 ppm	20 ppm	30 ppm	50 ppm	60 ppm
FCU 600	250 ppm	50 ppm	75 ppm	125 ppm	150 ppm
SRC TGU-A SRC TGU-B	500 ppm	100 ppm	150 ppm	250 ppm	300 ppm
SRC TGU-A SRC TGU-B	3,000 ppm	600 ppm	900 ppm	1,500 ppm	1,800 ppm
O_2					
FCU 500 FCU 600	10%	4%	6%	8%	10%
SRU Inc.	20%	4%	6%	8%	12%

Unit	Span	Calibration Gas for CGA			
		Low Level (20% to 30% of Span)		High Level (50% to 60% of Span)	
DHT B-601A	25%	4%	6%	8%	12%
SRC TGU-A	25%	4%	6%	8%	12%
SRC TGU-B	25%	4%	6%	8%	12%
11A H-1X	25%	4%	6%	8%	12%
11A H-200	25%	4%	6%	8%	12%
4UF F-2	25%	4%	6%	8%	12%
4UF F-3	25%	4%	6%	8%	12%
12PS H-101A	25%	4%	6%	8%	12%
12PS H-101B	25%	4%	6%	8%	12%
12PS H-102	25%	4%	6%	8%	12%
Coker F-201	25%	4%	6%	8%	12%
Coker F-202	25%	4%	6%	8%	12%
Coker F-203	25%	4%	6%	8%	12%
Boiler 31 (3SPS 1)	25%	4%	6%	8%	12%
Boiler 32 (3SPS 2)	25%	4%	6%	8%	12%
Boiler 33 (3SPS 3)	25%	4%	6%	8%	12%
Boiler 34 (3SPS 4)	25%	4%	6%	8%	12%
Boiler 36 (3SPS 6)	25%	4%	6%	8%	12%
CO					
FCU 500 FCU 600	1,000 ppm	200 ppm	300 ppm	500 ppm	600 ppm
DHT B-601A Boiler 31 (3SPS 1) Boiler 32 (3SPS 2) Boiler 33 (3SPS 3) Boiler 34 (3SPS 4) Boiler 36 (3SPS 6) SRC TGU-A SRC TGU-B 12PS H-101A 12PS H-101B 12PS H-102 Coker F-201 Coker F-202 Coker F-203	100 ppm	20 ppm	30 ppm	50 ppm	60 ppm
Boiler 31 (3SPS 1) Boiler 32 (3SPS 2) Boiler 33 (3SPS 3) Boiler 34 (3SPS 4) Boiler 36 (3SPS 6) 12PS H-101A 12PS H-101B 12PS H-102	5,000 ppm	1,000 ppm	1,500 ppm	2,500 ppm	3,000 ppm

Unit	Span	Calibration Gas for CGA			
		Low Level (20% to 30% of Span)		High Level (50% to 60% of Span)	
Coker F-201 Coker F-202 Coker F-203					
SRC TGU-A SRC TGU-B	2,500 ppm	500 ppm	750 ppm	1,250 ppm	1,500 ppm

4.3.3.1 Cylinder Gas Audit Procedure

GCA must be performed for each CEMS once during each calendar quarter when a RATA is not performed. CGA must be performed at least 60 days after the previous CGA or RATA.

For each system to be audited, record the appropriate audit cylinder serial numbers on the data sheet and ensure the information if properly entered in the "Cal Gas Bottle Detail" of the DAHS, certified gas concentrations, and the dates of analysis. Check the expiration date of the cylinder gas to make certain it is not expired. If the expiration date has been exceeded, replace the cylinder gas with another cylinder with a current date. The following steps should be performed:

1. Notify operations that the audit is ready to begin and to disregard the CEMS calibration alarms.
2. Initiate a Zero and Span check of the CEMS by manually switching gases on. Upon completion disconnect the daily calibration gas and connect the appropriate audit gas cylinders.
3. Initiate with all concentrations—low and mid values, for three non-consecutive runs (low-mid, low-mid, and low-mid).
4. Disconnect the audit cylinders and reconnect to normal operation (alarm conditions).
5. Advise operations that the audit is complete. Record completion in the CEMS log.

4.3.3.2 Data Reduction and Analysis Procedure

1. Calculate the percent difference (% diff) for each value as follows:

$$\text{Relative Accuracy} = \frac{C_m - C_a}{C_a} * 100\%$$

Where: A = Accuracy of the CEMS, percent
Cm = Average CEMS response during audit
Ca = Cylinder gas concentration

2. Verify that the relative accuracy does not exceed 15% (or applicable limit) for any audit point.
3. Add any remarks relating to the audit on the data sheet.

If any audit value exceeds the acceptable limits, initiate immediate appropriate corrective actions. Upon completion of the necessary corrective actions, the CGA must be repeated. The results of the original audit, corrective actions, and any repeat audits must all be reported.

4.3.3.3 Reporting

A report of the results from each CGA is prepared for inclusion in the current Quarterly Emission Report. The CGA report includes the following criteria (40 CFR 60, Appendix F):

I. Results
- give the date of the audit and a brief description of the results
- present the results of repeat audits, if required

II. Supporting Data
- Include the CGA Audit Data, Calibration Report, and any other supporting data (i.e., vendor's gas cylinder certification reports).

4.4 Data Recording and Reporting

Data collected as part of the auditing of the CEMS falls into two categories:
- Routine data from the normal operation of the CEMS; and
- Data generated as a function of the audit.

The Environmental Department checks both audit and routine emissions data from a regulatory viewpoint while the Analyzer Department checks this data for technical accuracy. The Environmental Department submits all required reports to IDEM.

4.5 Preventive Maintenance and Unit Shutdowns

All maintenance of the CEMS can be classified into one of two areas:

- Routine preventive maintenance: A regularly scheduled set of activities designed to prevent downtime before it occurs.
- Non-routine preventive maintenance: A set of activities also designed to prevent downtime, but the need for it cannot be predicted, so it is done on an as-needed basis. An example of non-routine preventive maintenance is maintenance performed on CEMS prior to an occurrence of excessive drift thereby reducing CEMS downtime.

The preventive maintenance program for the CEMS is based on the vendor's recommended procedures. As experience dictates, these procedures may be modified to be more appropriate for the installation. All routine preventive maintenance is scheduled and performed in a timely manner by the Analyzer Department. See matrix in Table 4.6 below for scheduled maintenance activities, which are maintained in the analyzer department's SOPs.

A Daily System Check is a general appraisal of system operating parameters. Any discrepancies will be repaired by an Analyzer Tech.

TABLE 4.11 Part 60 Preventive Maintenance Matrix

Activity	Monthly	Quarterly	Semi-Annual	Annual
Check probe hardware for integrity of fittings/connections		X		
Check sample line connection at the probe		X		
Perform leak check on the sample line		X		

Activity	Monthly	Quarterly	Semi-Annual	Annual
Check operation of blow-back solenoids		X		
Rebuild Sample Pump			X	
Replace peristaltic pump tubing			X	
Leak Test Analyzers				X
Measure CLD converter efficiency				X
Check MLT and CLD analyzer internal voltages				X
Inspect CLD reaction chamber and sapphire windows / clean if necessary				X
Inspect the MLT sample cells as clean as necessary				X
Clean sample dryer heat exchangers				X
Flush sample line				X
Fuel Gas CEM GC's				
Backup AMD files and Methods for the Analyzer	X			
Check detector sensitivity degradation using Chromatogram data / rebuild FPD detector if needed	X			
Check and record PMT tube Bias voltage	X			
Leak Test TGU GC sample line		X		
Check calibration solenoids, ARV, SSO and air operated valves in sample conditioner		X		
Replace filter at sample tap.			X	
Inspect Heated Vaporizing Regulator at sample tap. Rebuild if necessary			X	
Check all cabinet heaters at probe boxes and sample conditioners			X	
Check probe box for leaks.			X	
Rebuild Sample and Column valves				X

4.6 CEMS Startup & Shutdowns

The analyzer can be shutdown only after the unit optimization engineer has confirmed with the analyzer supervisor or environmental engineer that the unit has been blinded (no flow going to the unit) and no combustion or process gaseous emissions are being vented from tanks, pilots, etc. Please note, only the "optimization engineer" can determine that the unit has been totally blinded and that the analyzer can be taken out of service.

For analyzer shutdown/startup - the unit shutdown/startup procedure will notify the analyzer supervisor that the analyzer should be put in service.

4.7 Repair Program

The CEMS shall be maintained by the Analyzer Department. System faults are monitored by both Board Operators Department and Analyzer Department.

I. After learning the CEMS is non-operational during normal business hours (7 am to 5 pm, Monday – Friday) the following individuals must be notified:

Analyzer Tech Supervisor should be notified immediately to assess and correct the problem.

Environmental Engineer will be notified of situation to document and contact the appropriate IDEM personnel, as necessary.
Environmental Superintendent should be notified as soon as possible depending on his/her required involvement.

II. After learning the CEMS is non-operational during non-business hours (5 pm to 7 am, Monday – Friday, and all day on Saturday, Sunday and holidays)
The Call Out Procedure in Appendix A should be followed.

In all cases of malfunction of any of the components of a CEMS a record must be made of the times and reasons of the breakdown and efforts made to correct the problem. In addition, were it is practical, supplemental or intermittent monitoring of the parameter(s) which are indicative of normal operation of the monitored source should be implemented at intervals of at least once an hour until the CEMS is back in operation.

4.8 Response to CEMS Breakdowns

For purposes of this manual, a CEMS breakdown occurs any time a CEMS is malfunctioning or is otherwise off-line and not monitoring emission for more than 24 consecutive hours. During these periods, alternative monitoring activities are required for some CEMS.

Whenever an H_2S CEMS is or will be down for more than twenty-four hours Draeger tube sampling of the fuel gas once during each clock hour until the primary CEMS or a backup CEMS is brought online. The results of each Draeger tube measurement must be recorded. The records will be maintained by the Environmental Department.

Whenever the SO_2 CEMS on the FCU 500 or FCU 600 is or will be down for more than twenty-four hours, the following parametric monitoring must be recorded at least once per day until the CEMS is restored to operation:

- Unit feed rate,
- Feed sulfur analysis
- SOx additive injection

Whenever the NOx CEMS on the FCU 500 or FCU 600 is or will be down for more than twenty-four hours, the following parametric monitoring must be recorded at least once per day until the CEMS is restored to operation:

- Unit feed rate,
- Ammonia injection rates and
- Regenerator bed temperature

Whenever the CO CEMS on the FCU 500 or FCU 600 is or will be down for more than twenty-four hours, the following parametric monitoring must be recorded at least once per day until the CEMS is restored to operation:

- Unit feed rate,
- Percent excess oxygen as measured by the regenerator process analyzer
- Regenerator bed temperature

4.9 Root Cause Failure Analysis and Corrective Action Program

If any CEMS has a quarterly downtime greater than 5% for two consecutive quarters, a Root Cause Failure Analysis (RCFA) must be conducted. A team to conduct the RCFA will consist of representatives from the following functions:

- Analyzer Maintenance,
- Analyzer Engineer,
- CEMS Regulatory Specialist,
- RCFA Specialist,
- Manufacturer'/Vendor's Representative (optional), and
- Other Technical Specialists as necessary (optional).

At a minimum, the RCFA must include:

- Evaluation of possible design, operational and maintenance measures causing or contributing to downtime,
- Detailed analysis of all causes of CEMS downtime, and
- Steps already taken to minimize CEMS downtime.

Upon identifying the root cause(s) for the excessive downtime, the team will develop a Corrective Action Plan (CAP). The plan will include a description of the each action taken or planned. Projected dates will be established for initiating and completing each corrective action.

When completed, the RCFA and CAP will be submitted to EPA and IDEM with the next semi-annual Consent Decree report (due on either February 15 or August 15).

4.10 CEMS Program Assessments by Third Parties

A third party independent assessment must be performed whenever any CEMS experiences greater than 5% downtime in two consecutive calendar quarters, and when any CEMS experiences greater than 5% in two of the preceding 12 quarters.

The Whiting CEMS SME or RCFA team may also request a third party CEMS program assessment at any time. The scope of the assessment is established by the CEMS SME or RCFA team, but must, at a minimum include all CEMS with greater than 5% downtime.

4.11 Spare Parts Inventory

The Analyzer Technician Supervisor in responsible for maintaining a spare parts inventory adequate to meet the normal operating requirements. The spare parts lists (one for each CEMS) is maintained in SAP or in a spreadsheet managed by the Analyzer Technician Supervisor. The spare parts inventory is segregated by manufacturer and function in a series of five cabinets.

Cabinets B, D and K are dedicated to housing over 200 different electronic components, valves and other hardware supporting operation and maintenance of the Siemens gas chromatographs used for continuous monitoring.

Cabinets E and F contain nearly 400 different electronics and hardware items to support Ametek analyzers for monitoring of SRU sources, Rosemont NOx analyzers, Siemens Optichrom and Maxum gas chromatographs, and chillers and scrubbers used in sample conditioning.

Inclusion of analyzer spare parts inventory depend initially on the recommendations of the manufacturer of the device, However, the quantity maintained in inventory is adjusted based on periodic reviews of

analyzer failures and maintenance records. In addition, spare part available on-site, emergency parts are available through analyzer manufacturers and their local representatives on a next day basis using either an existing contractual agreement with the local vendor or by request for expedited delivery of a replacement parts from the manufacturer.

5.0 DOCUMENTATION AND REPORTS

The documentation of QA/QC O&M data and the information is an integral part of this QA Plan. This section describes the reports and other records that provide adequate documentation of QA/QC O&M activities. The two primary means of documentation are:

- Data Acquisition and Handling System (DAHS)
- Manually prepared QA/QC O&M forms, logs and reports

The following subsections describe the DAHS and its uses in QA/QC O&M documentation. During QA audits, the DAHS will be operated to collect data in a normal fashion, but will print all instantaneous engineering units for a real time, hard copy of tested values.

Each of the following types of documentation is described in subsequent subsections:

- Averaging Reports
- Alarm Reports
- Quarterly Reports
- Root-Cause Failure Analysis (RCFA) and Corrective Action Reports

A number of written QA/QC O&M reports are also needed to provide supporting documentation of the continued operation of the CEMS in an acceptable manner.

All reports are used to notify individuals of problems related to operation of the CEMS. Compilation of these reports is intended to assist in identifying the need for remedial maintenance, training, or supply action, as well as the need to revise operating procedures for this QA/QC O&M Plan.

5.1 DAHS

The DAHS is automated system that records both pollutant and diluent data for subsequent calculations and report preparation. The DAHS is used not only to document QA/QC O&M data and information, but it also serves as the CEMS data acquisition and processing system. Reports prepared by the system include alarm, calibration, and routine emission reports. The analyzers are connected to the plant DAHS system through each CEMS independent PLC system.

5.2 Emission Measurement Data Processing

Each analyzer sends a 4-20 mA signal to the PLC located in the CEMS Shelter.
From there on it will go to the plant DCS and the DAHS server.
The servers are equipped with dual redundant hard drives and manual tape back-ups.
The manual tape back-ups will be performed by the IT Department on a routine basis.

5.3 DAHS Reports

5.3.1 Current (Averaging) Reports

All data is maintained in the DAHS historian with instant retrieval of at least two years.

5.3.2 Alarm Reports

All alarms are recorded by the DAHS Historian and can be reviewed upon command.

5.3.3 Quarterly Reports

Quarterly reports are created using the DAHS historian consistent with 40 CFR 60.7(d). Reports sent to IDEM include excessive emissions reports and totals for calibration, maintenance and down time.

5.4 Maintenance Record

The record is maintained through the Analyzer Tech. The Analyzer Tech enters a description of the preventative or remedial action performed on the CEMS. These entries are kept in the maintenance logbooks and DAHS. This record also documents the use of spare parts, and its periodic review by the Analyzer Supervisor provides information about spare parts usage.

5.5 Audit Reports

Each audit discussed in Section 6 of this plan is documented in a report. The Environmental Department will maintain all submittals to regulatory agencies in the environmental filing system. The Analyzer Supervisor will keep all supporting data on file in the Analyzer Supervisors office. These audits serve as verification of the accuracy of the emissions data in the quarterly report.

5.6 CEMS RCFA and Corrective Action Reports and External Checks

External checks of the overall CEMS program will be performed within six months after startup of all CD or WRMP required CEMS. The external check of the overall CEMS program will be performed by an external consultant or specialist identified by WBU. The scope of the external check will include the contents of this manual, the Consent Decree, and the requirements of 40 CFR 60.13, and appendices B and F of 40 CFR 60.

For any CEMS having a downtime greater than five percent of the total time for each of two consecutive calendar quarters, a CEMS RCFA will be conducted and a corrective action plan will be developed to promptly address the findings of the RCFA. The CEMS RCFA must include the following elements, at a minimum:

- Identification and detailed analysis setting forth the root cause of the downtime.
- Steps, if any, taken to limit the duration of the CEMS downtime.
- Analysis of the measures reasonably available to prevent the root cause(s) of the CEMS downtime from recurring (e.g., design, operational, and maintenance measures).

The Corrective Action Plan must include a description of any corrective actions already completed or, if not complete, a schedule for their implementation including proposed commencement and completion dates.

For any CEMS for which a CEMS RCFA is required twice within 12 consecutive calendar quarters, an independent third party (retained by BP) will provide an external check of CEMS downtime, which may include recommendations for additional corrective actions and modifications to this Plan. The findings of the CEMS RCFA and corrective action plan, including a schedule for implementation, must be submitted to U.S. EPA in a written report included with the first semi-annual report required by the Consent Decree following completion of the CEMS RCFA.

6.0 REFERENCES

- 40 CFR 60, Subpart A, J and Ja
- 40 CFR 60, Appendix A, B & F
- 40 CFR 63, Subpart A and UUU
- Indiana Rule 326 IAC 3
- Indiana Rule 326 IAC 12
- Part 70 Operating Permit (Permit No. T089-6741-00453) last modified under Significant Permit Modification (SPM) No. 089 25488 00453 issued on June 16, 2008
- Consent Decree
- Manufacturer's Manuals

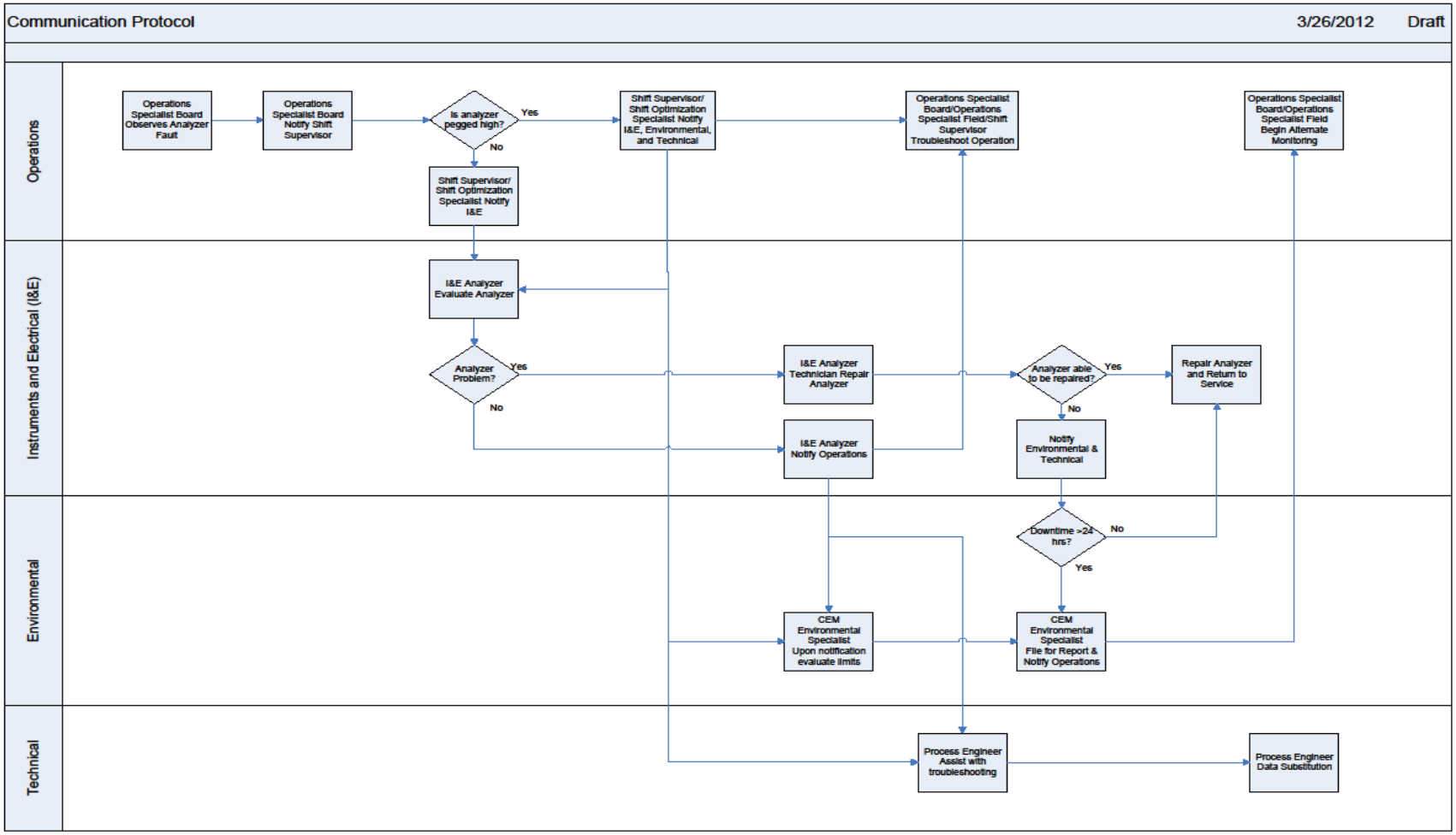
7.0 REVISION HISTORY

Revision Level	Change(s)	Author	Date
1-16	As noted in previous revision history.		
17	Updated to provide information required under our 2012 Consent Decree, which included the following updates. Added Section 4.1 to address personnel training provisions. Update Section 4.7 to address provisions for obtaining spare parts on an emergency basis. Updated Sections 4.2 through 4.6 to address inconsistencies and mistakes with information provided and make the tables in these Sections easier to understand. Update Section 3.2.1.5 to include special considerations for the TRS analyzer. Added Appendix A for the Call Out Procedure and include procedure in Plan.	Brandon Mik	9/7/2012
18	Updated to incorporate requirements of the 2012 Consent Decree (Civil No. 2:12 CV 207), Section I (Paragraphs 43, 44, 45, 46, 47, 48 and 49). Added Appendix B - Spare Parts Lists, Appendix C – Methods of Emission Calculations and Reporting, and Appendix D - Rolling Average Calculations for CEMS Measurements.	Brandon Mik	4/30/2013
19	Updated to incorporate myriad of new CEMS installed since the last revision.	Brandon Mik	1/7/2014
20	Removed references of shut down equipment, accounted for analyzer range changes, and update to Training section.	Rohini Sengupta	2/9/2015

Approved by:

Date:

Appendix A – Call out Procedure



Appendix B - Spare Parts Inventory – Cabinet B

MANUFACTURER	Symbol #	PART #	DESCRIPTION	IN STOCK
SIEMENS		1901667-001	COMPACT FLASH TYPE 1 64 BYTE	3
SIEMENS		1291000-006	1/4FNPT X 1/4M ISO SST SS4-A-4RS	2
SIEMENS		2021823-002	CABLE PECM-2 TO SOL VALVE 500 mm smc	1
SIEMENS		2021823-001	CABLE PECM-2 TO SOL VALVE 1000 mm smc	2
SIEMENS		1672102-001	SVCM SHORT CABLE TO ORIG SVCM CTRL.BD	2
SIEMENS		1672101-001	GASKET FOR MOUNTING SOL (SMC) -SVCM	4
SIEMENS		1672100-100	VALVE GAS SOLENOID	1
SIEMENS		2022021-001	SOL VALVE REPLACEMENT KIT (SMC)	1
SIEMENS		1672009-006	VALVE GAS SOLENOID (PARKER)	1
SIEMENS		1901692-001	CABLE ,IDE 19" FOR COMPACT FLASH	2
SIEMENS		2021278-001	CABLE HI. VOLTAGE DPM2/OEFT/1	2
SIEMENS		2017596-001	CABLE HEATER TO SENSOR MODULE	6
SIEMENS		2021275-001	CABLE ELECTROMETER SIG SMA/DPM2/OEFT2	2
SIEMENS		2017911-001	CABLE FID DET. PERSONALITY MOD.TO OEFT	2
SIEMENS		2017959-001	HEATER TERM. PLUG	1
SIEMENS		2020910-001	PCBA ,OEFT ADAPTER	2
SIEMENS		2017519-804	2 EA.AI/AO/DI/DO BOARD	3
SIEMENS		2020165-001	EPC COMPLETE MODULE,MAN +SEALS	3
SIEMENS		2017519-803	4 EA. DO/DI BOARD	3
SIEMENS		2021726-002	I2C CONT BRD.TO MNT.CF MEM ON SYSCON	2
SIEMENS		2021277-001	CABLE HI VOLT DPM2/OEFT2	2
SIEMENS		2021276-001	CABLE IGNITION DPM GLOW PLUG	2
SIEMENS		202092-001	FEED TRU FLEX CABLE (PCBA)	2
SIEMENS		1901381-001	CABLE FLEX LAMIN. 30 COND.6IN SHIELDED	2
SIEMENS		201756-001	CABLE I2C DPM #1	1
SIEMENS		2020126-701	FPD QUARTZ INSERT/O RING	1
SIEMENS		1270002-009	CONVERTER,MEDIA INT.PC,10BASET/FO	2
SIEMENS		2017929-003	SPACER,HEX M4 THREAD	1
SIEMENS		2017929-004	SPACER,HEX 8/32 THREAD	1
SIEMENS		1700280-001	CONN,22PIN ANALOG/DIGITAL I/O PCB	3

Appendix B - Spare Parts Inventory – Cabinet B

MANUFACTURER	Symbol #	PART #	DESCRIPTION	IN STOCK
SIEMENS		H24970	HEATER CARTRIDGE FOR METANIZER	1
SIEMENS		2021784-001	PECM-2 WITH TEMP +SVCM CTRL.TOP BOARD	1
SIEMENS		2021963-002	SNECON VER4 WITHOUT CAGE MINI COAX,TP	1
SIEMENS		A5E02829199001	SNECON5 WITH LEGACY 10BASE2 INT BUS MINI	1
SIEMENS		2020169-001	TCD ELEMENT WITH SCREWS ORIG MAXUM	1
SIEMENS		2021796-001	BASE DPM WITH SHIELD/CONN BOARD	2
SIEMENS		2020176-001	TCD-2 THERM BEAD KIT MAXII	
SIEMENS		2021328-001	DPM MEZZ FOR FPD, 100na SINGLE RANGE	1
SIEMENS		2021328-002	DPM MEZZ FOR FID 100na/1000na dual hi range	1
SIEMENS		2021328-003	DPM MEZZ FOR FPD 100na single range .18HZ	
SIEMENS		2021284-002	AIR BATH ASSEMBLY LO PWR (650 WATT)	2
SIEMENS		202128-701	FPD COLUMN INLET .38ID WITH WASHER	1
SIEMENS		202128-702	FPD COLUMN INLET .25ID WITH WASHER	1
SIEMENS		2021347-004	FID 302AFLAME ARRESTOR 205 X.38 ID	
SIEMENS		2021347-006	FID 302AFLAME ARRESTOR 205 X.38 ID SULF	
SIEMENS		1622005-001	PROBE (RTD) BARE ELM. 100 OHM 1/8" OD	1
SIEMENS		2021388-004	RES TUBE ASSEMBLY FPD H2	1
SIEMENS		2021388-005	RES TUBE ASSEMBLY FPD AIR	1
SIEMENS		2020125-701	FPD IGN REPAIR KIT	1
SIEMENS		2020376-701	SOLID STATE RELAY KIT MAXII	
SIEMENS		2020379-701	2 CELL FILAMENT DET REPAIR KIT MAX II	1

Appendix B - Spare Parts Inventory – Cabinet E

VENDOR AND/OR (CODE)	MANUFACTURER	Symbol #	PART #	DESCRIPTION	IN STOCK
	AA/SIEMANS		2000103-002	ANALYZER RELAY BOARD ASSEMBLY	1
	AA/SIEMANS		2000176-003	FILAMENT DETECTOR AMPLIFIER BOARD	1
	AA/SIEMANS		2000133-001	ADVANCE POWER SUPPLY 115VAC/+5VDC	2
	AA/SIEMANS		2000240-001	ADVANCE POWER SUPPLY ,CABLE+BRACKET	2
	AA/SIEMANS		B05218	2100/ADVANCE THERMISTORS,DUAL RNGE TCD	1
	AA/SIEMANS		B05207	SAMPLE AIR HEATER TEMP CONTROL BRD.	2
	AA/SIEMANS				
	AA/SIEMANS		1241001-001	LOW VOL. FILAMENTS MATCHED PAIR 22OHMS	3
	AA/SIEMANS		C94020	MODEL 20 VLV. DIAPHRAGM CUSION NOMEX	5
	AA/SIEMANS		D60900	MODEL 20 VLV. TEFLON SEAL DISC 1.25OD	5
	AA/SIEMANS		V16055	MODEL 11 SAMPLE VALVE PLUNGER	5
	AA/SIEMANS		F09200	FILTER ELEMENT .5 MICRON COPOLYMER	7
	AA/SIEMANS				
	AA/SIEMANS		F09230	FILTER SUPPORT PAD 10 MICRON POLYPROP	7
	AA/SIEMANS		1487008-004	ACB-2 3.5V LITIUM BATTERY	3
	AA/SIEMANS		1481006-001	POWER SUPPLY SWITCHER 90-132 VAC	3
	AA/SIEMANS		V16040	MODEL 11,20 SILC O RING SIZE 133	5
	AA/SIEMANS		G83500	GLOW PLUG LOW FOR FID	3
	AA/SIEMANS		V16052	MODEL 11 BALLS SST 5/32 4.0MM DIA	5
	AA/SIEMANS		P56705	MODEL 11 SAMPLE VALVE PLUNGER HI PRESS	5
	AA/SIEMANS		O34024	MODEL 11 SV SILICONE O RING 24 1/ 1/8IDX1/16	5
	AA/SIEMANS				
	AA/SIEMANS				
	AA/SIEMANS		S52000	MODEL 11 COMPRESSION SPRING	5
	AA/SIEMANS		T28006	30K THERM BEADS DOUBLE DIPPED PAIR H2	3
	AA/SIEMANS		B02378	TEFLON BUSHING INSERT T/C DETECTORS	3
	AA/SIEMANS		D40000	MODEL 11 SAMP VLV DACRON CUSHION	5
	AA/SIEMANS		V16308	VALVE MODEL X SEAL DIAPHRAM	5

Appendix B - Spare Parts Inventory – Cabinet E

VENDOR AND/OR (CODE)	MANUFACTURER	Symbol #	PART #	DESCRIPTION	IN STOCK
	AA/SIEMANS		W10000	MODEL 11 WASHER SPRING SST .190	5
	AA/SIEMANS		V16038	MODEL11,20 SILICONE ORING SIZE 10 .24ID	5
	AA/SIEMANS				
	AA/SIEMANS		O39006	VITON ORING 1/8IDX1/16OD	3
	AA/SIEMANS		1542100-003	100K THERMISTOR BEADS DOUBLE DIPPED	3
	AA/SIEMANS		2020169-001	TCD ELEMENT MAXUM I	1
	AA/SIEMANS		2021016-002	2 CELL GOLD PLATED FILAMENT BOARD	1
	AA/SIEMANS		1531000-003	FID VITON O-RING .35,SENSOR COVER	3
	AA/SIEMANS		1605000-007	PRESS SWITCH 1.0 N/C	1

Appendix B – Spare Parts Inventory – Cabinet F

VENDOR AND/OR (CODE)	MANUFACTURER	Symbol #	PART #	DESCRIPTION	IN STOCK
	ROSEMOUNT		CH000068	SIO O2 ANALOG OUTPUT BOARD MLT	1
	ROSEMOUNT		CH000099	MLT ACUO2, MICROPROCESSOR BOARD	1
	ROSEMOUNT		655245	DRVR BD. COMP ANA CABLE	2
	ROSEMOUNT		655249	J5 COMP ANA BD/SIG BD CABLE	1
	ROSEMOUNT		655620	DRIVER BOARD	1
	ROSEMOUNT		655263	SOLENOID VALVE CLD	4
	ROSEMOUNT		632784	GLASS TUBE CONN. CLD	14
	ROSEMOUNT		655250	NOX/NO CONV.	1
	ROSEMOUNT		655227	NOX/NO CONVERTER TUBE	2
	ROSEMOUNT		655228	NOX/NO CONV.HEATER JACKET	1
	ROSEMOUNT		655282	NOX/NO CONV. TEMP SENSOR	1
	ROSEMOUNT		659658	CAPILLARY ,SAMPLE 200CC/ MIN	
	ROSEMOUNT		903906	CLD POWER CONN.	8
	ROSEMOUNT		903033	CABLE ASSEMBLY 24.CONDUCTOR	2
	ROSEMOUNT		903035-V1	CLD COM BOARD CABLES	1
	ROSEMOUNT		903034-V1	CLD COM BOARD CABLES	1
	ROSEMOUNT		903032-V1	CLD COM BOARD CABLES	1
	ROSEMOUNT		655216	DETECTOR THERMISTOR	1
	ROSEMOUNT		656898	GASKET	3
	ROSEMOUNT		854540	O-RING	3
	ROSEMOUNT		660408	TUBE EXHAUST	1
	ROSEMOUNT		656897	GASKET RETAINER	3
	UNIVERSAL		1150-0059	100 OHM RTD	1
	BALDWIN		1CBC-004	BALDWIN TEMP .CONT.BOARD	2
	DAYTON		1 EHV4	24VDC RELAY	2
	POTTER BRUMFIED		KHU17D11	24VDC RELAY	1

Appendix B – Spare Parts Inventory – Cabinet F

VENDOR AND/OR (CODE)	MANUFACTURER	Symbol #	PART #	DESCRIPTION	IN STOCK
	MAGNECRAFT		KHS-17A11-120	782XDXH10 120VAC RELAY	4
	MAGNECRAFT		KHS-17D11-24	782XDXH10-24VDC RELAY	3
	AB		700DC-R020Z24	700DC TYPE R 24VDC RELAY	1
	WATLOW		DA10-24C0-0000	SOLID STATE POWER CONTROL	9
	CRYDOM		D2450	SOLID STATE RELAY	4
	CRYDOM		D2440	SOLID STATE RELAY	1
	SQUARE D		QO2401021	PLUG ON CIRCUIT BREAKER 40AMP	2
	SQUARE D		QO2301021	PPLUG ON CIRCUIT BREAKER 30AMP	3
	SQUARE D		QO230EPD	CIRCUIT BREAKER	2
	FERRAZ SHAWMUT		A25Z5-2	PROBE BOX FUSES 5 AMP	5
	LOVE		16111	TEMP CONTROLLER	1
	WATLOW		96B0-CDAA-00RG	TEMP. CONTROLLER	8
	SOLA		SDNS-24-100P	SOLA 24VDC POWER SUPPLY	2
	GE		IC693PWR321AA	GE PLC (NEW PHSE) DAHS	2
	SENSOR TECH		655253	OZONE PRESS SENSOR 0-15PSI	1
	SENSOR TECH		655254	OZONE PRESS SENSOR 0-30	3
	ROSEMOUNT		657716	PWR SUPPLY ASSEMBLY OZANATOR	1
	ROSEMOUNT		655215	PRESS SWITCH ASSEMBLY 8 PSI	1
	McMILLAN		902931	SENSOR FLO GAS	1
	ROSEMOUNT		844420	NGA COMP CARD	1
	ROSEMOUNT		CH000070	MLT ANALOG OUT PUT CARD	1
	ROSEMOUNT		CH000071	MLT SIAO2 ANALOG OUTPUT EXT	1
	ROSEMOUNT		4846B48G02	SAMPLE PROBE RTD ASSEMBY	4
	KIP/INC		1A68529HO1	24VDC SOL.NEW DHT/3SPS	2
	PETER PAUL		2220999NSGH	24VDC ISOLATION SOL.DHT/SPS CEM	2
	ASCO		4955-0142	24VDC BLOWBACK SOL	2

Appendix B – Spare Parts Inventory – Cabinet F

VENDOR AND/OR (CODE)	MANUFACTURER	Symbol #	PART #	DESCRIPTION	IN STOCK
	ASCO		JJP8262G230	SAMPLE BOX SOLENOID FCU CEM	3
	KIP/INC		357064	SAMPLE SYS. SOLENOID CEM	2
	AIR DIMENSIONS		AO3012	HEATER CARTRIDGE 75W 115VAC	8
	WATLOW		3014-0066	PROBE BOX HEATER NEW 3SPS CEM	1
	AIR DIMENSIONS		8010-0001	HEAT PASTE	2
	GALTEK		203-3414-415	GALTEK SOL. 1/4 3 WAY 115VAC	1
	WATLOW		254655	WATLOW PROBE HEATERS	4
	UNIVERSAL		4980-0328	2-MICRON WOVEN SS 9"FILTER	2
	ROSEMOUNT		1A68507H01	.5 MICRON HASTELLOY FILTER	4
	ROSEMOUNT		1A68507H02	.5 MICRON 316SS	4
	ROSEMOUNT		1A68507H03	50 MICRON FILTER 316L SS (SRU INC)	2
	ROSEMOUNT		4843B34H01	SAMPLE PROBE FILT. CAP	2
	AIR DIMENSIONS		A19005	SCREW/HEAD BASE	24
	AIR DIMENSIONS		A190017A	PROBE HEAD BOLTS /WASH 5/16	50
	AIR DIMENSIONS		4843B30H02	COVER GASKET	9
	AIR DIMENSIONS		4843B30H03	FILTER GASKET	8
	AIR DIMENSIONS		4846B11H01	PROBE THUMB SCREWS	2
	AIR DIMENSIONS		A20200	PUMP HEAD THERMOSTAT	3
	AIR DIMENSIONS		11005	VAC PUMP REBUILD KIT	12
	AIR DIMENSIONS		11006	TEFLON VITON VAC PUMP REBLD KIT	1
	AIR DIMENSIONS		11011	3 PLY TEFLON VAC PUMP RBLD KIT	6
	AIR DIMENSIONS		11305	TEFLON EDPM VAC PUMP RBLD KIT	3
	AIR DIMENSIONS		A06302	PUMP FAN BLADE	1
	AIR DIMENSIONS		19044	VALOX SPACER	2
	AIR DIMENSIONS		7001	PUMP DISC	6
	AIR DIMENSIONS		19006	VALVE SCREWS	2
	AIR DIMENSIONS		19015	PLATE SCREWS	4
	WATLOW		SGA1J5JY3	120VAC 250W CABINET HEATER	1

Appendix B – Spare Parts Inventory – Cabinet F

VENDOR AND/OR (CODE)	MANUFACTURER	Symbol #	PART #	DESCRIPTION	IN STOCK
	WATLOW		SGA1J6AY3	120VAC 300W CABINET HEATER	

Appendix B - Spare Parts Inventory – Cabinet K

MANUFACTURER	Symbol #	PART #	DESCRIPTION	IN STOCK
AA/SIEMENS		1622100-001	FID THERMOCOUPLE 1.875"	2
AA/SIEMENS		1622100-002	FPD FLAME OUT THERMOCOUPLE 2.875"	7
AA/SIEMENS		P85100	PROBE OVER TEMP AND SHUT DOWN	1
AA/SIEMENS		A75050	ASPIRATOR,AIRVAC,HAVR HSS SS	1
AA/SIEMENS	F04736	2000736-001	FPD BURNER TIP(2000736-001)	7
AA/SIEMENS	O39015	2000736-001	FPD VITON O-RING SIZE 15 9/16id x 1/16	40
AA/SIEMENS		1531000-003	FID VITON O-RING SIZE .35 2.239id x.070dia	2
AA/SIEMENS	O39008	20000736-001	FPD VITON O-RING SIZE .008 3/16 X1/16	20
AA/SIEMENS		2000785-001	FPD IGNITION NAIL	2
AA/SIEMENS	F04738	2000736-001	FPD BARRIER TUBE	2
AA/SIEMENS	O39006	20000470-001/B02310	VITON O-RING SIZE 6 1/8 ID X1/4 OD X 1/16	20
AA/SIEMENS		2020912-001	MEMORY EXP MODULE 8 Mbytes Sram +Flash	1
AA/SIEMENS		1226015-707	MEMORY MODULE 32Mbytes Dynamic Ram	3
AA/SIEMENS		2021835-001	MEMORY EXP MODULE 16 Mbytes PSRAM	1
AA/SIEMENS		R60550	TEMP. CONTROL RELAY 280VAC	1
AA/SIEMENS		F37759	SNUBBER FITTING 1/4MxF SST FLAME ARREST	7
AA/SIEMENS		SS-100-1-BT	SWAGELOK FID THERMOCOUPLE FITTING	10
AA/SIEMENS		F65701	FTG FERRULE BACK 1/16 TEFLON	4
AA/SIEMENS		1481011-005	POWER SUPPLY 24 VOLT 25 WATT 1.1 AMP	3
AA/SIEMENS		2000117-005	FPD DETECTOR BOARD GAIN .1	1
AA/SIEMENS		B05223	FPD BIAS BOARD	1
AA/SIEMENS		2020146-001	PECM TO SSR CABLE AND CONNECTOR KIT	1
AA/SIEMENS		T82750	FPD PHOTO-MULTIPLER TUBE	1
AA/SIEMENS		2015546-001	MODEL 11 Sample Valve Cap LDV EXT. LOOP	1
AA/SIEMENS		2015547-004	MDL 11 SAMPLE VALVE CAP LDV INT LOOP 5ul	
AA/SIEMENS		6ft	1/8 in silcostl 1.5% ov225 h3p04 60/80 carbopack	2
AA/SIEMENS		9ft	1/8 in silcostl 1.5% ov225 h3p04 60/80 carbopack	2
AA/SIEMENS		COL1526	COLUMN MOLE SIEVE 5A 110/120	

Appendix B - Spare Parts Inventory – Cabinet K

MANUFACTURER	Symbol #	PART #	DESCRIPTION	IN STOCK
AA/SIEMENS		P32500	FPD PHOTO MULTIPLER TUBE ASSEMBLY	1
AA/SIEMENS		2020129-701	FPD LIGHT PIPE ASSEMBLY WITH O-RING	1
AA/SIEMENS		5006067	WATLOW PMT HEATER PAD	2
AA/SIEMENS		2000116-001	DIGITAL OUTPUT BOARD 115V (DO)	1
AA/SIEMENS		2000118-001	ISOLATED ANALOG OUTPUT BOARD	1
AA/SIEMENS		2000100-001	ANALOG OUTPUT BOARD	1
AA/SIEMENS		2017585	PCBA ADVANCE PLUS SNE ADAPTER	1
AA/SIEMENS		1682002-001	INTERCONNECT CABLE ACB/AMB J6	1
AA/SIEMENS		1682002-003	INTERCONNECT CABLE ACB/AMB J7 22"	1
AA/SIEMANS		H34110	HEATER ELEC 120WATT 120VAC	2
SWAGELOK		S10444	SAMPLE PROBE 3/8" SS	1
AA/SIEMANS		2020167-001	HEATER ELEMENT VERS.1	1
AA/SIEMANS		R40525	PRESS REG 60 -120 1/8" NPT	1
AA/SIEMANS		MBD005	ADVANCE PLUS SOLENOIDS,MAN	1
AA/SIEMANS		1622002-001	PROBR OVEN CONTROL RTD 1/8"	1
AA/SIEMANS		2013716-001	TEMP PROBE TUBE ASSEMBLY	1
AA/SIEMANS		2013713-001	PTGC TRANSFER TUBE	1
WHITEY		V82081	1/4" 3 WAY BALL VALVE SS	1
WHITEY		V82052	1/8" 3 WAY BALL VALVE SS	1
AA/SIEMANS		H27805	120VAC CAB HEATER	1
AA/SIEMANS		CSG-3321-316-H2-LB-ST	VERSA 3 WAY VALVE	1
AA/SIEMANS		MBD005	ADV. + SOL, AND MANIFLODS	3
PARKER		14R118FD	PARKER REG 1/4 IN PORTS	6
PARKER		14R118FC	PARKER REG 1/8 IN PORTS	6
ARROW		R162-S8	ARROW REG	1
SWAGELOK		SS-91K-T2B1V-OR-C	O-RING KIT	1
SWAGELOK		SS-91K-T2B3V-OR-C	O-RING KIT	1
SWAGELOK		SS-92F2-A-0	SAMPLE SHUTOFF VALVE	1
SWAGELOK		SS-TT2B3V1F2-C	1/8 IN 3WAY MANIFOLD	1

Appendix B - Spare Parts Inventory – Cabinet K

MANUFACTURER	Symbol #	PART #	DESCRIPTION	IN STOCK
SWAGELOK		SS-1K-T2B1VF2-C	1/8IN VALVE MODULE	1
SWAGELOK		SS-1K-T2B3VF2-C	1/8 IN VALVE MODULE	1
ASCO		302759	ASCO SOL REBUILD KIT	3
ASCO		238714-106-D	ASCO 24VDC SOLENOID COILS	1
AA/SIEMANS		2017585-001	ADVANCE PLUS SNE TO OPT ADAPTER	1
ASCO		A224384	SAMPLE BOX SOLENOID	2

Appendix B - Spare Parts Inventory – Cabinet D

CEMS Type	VENDOR AND/OR (CODE)	MANUFACTURER	Symbol #	PART #	DESCRIPTION	IN STOCK
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		1622100-001	FID THERMOCOUPLE 1.875"	2
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		1622100-002	FPD FLAME OUT THERMOCOUPLE 2.875"	7
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		P85100	PROBE OVER TEMP AND SHUT DOWN	1
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		A75050	ASPIRATOR,AIRVAC,HAVR HSS SS	1
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS	F04736	2000736-001	FPD BURNER TIP(2000736-001)	7
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS	O39015	2000736-001	FPD VITON O-RING SIZE 15 9/16id x 1/16	40
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		1531000-003	FID VITON O-RING SIZE .35 2.239id x.070dia	2
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS	O39008	20000736-001	FPD VITON O-RING SIZE .008 3/16 X1/16	20
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		2000785-001	FPD IGNITION NAIL	2
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS	F04738	2000736-001	FPD BARRIER TUBE	2
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS	O39006	20000470-001/B02310	VITON O-RING SIZE 6 1/8 ID X1/4 OD X 1/16	20
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		2020912-001	MEMORY EXP MODULE 8 Mbytes Sram +Flash	1
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		1226015-707	MEMORY MODULE 32Mbytes Dynamic Ram	3
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		2021835-001	MEMORY EXP MODULE 16 Mbytes PSRAM	1
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		R60550	TEMP. CONTROL RELAY 280VAC	1
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		F37759	SNUBBER FITTING 1/4MxF SST FLAME ARREST	7
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		SS-100-1-BT	SWAGELOK FID THERMOCOUPLE FITTING	10
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		F65701	FTG FERRULE BACK 1/16 TEFLON	4
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		1481011-005	POWER SUPPLY 24 VOLT 25 WATT 1.1 AMP	3
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		2000117-005	FPD DETECTOR BOARD GAIN .1	1
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		B05223	FPD BIAS BOARD	1
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		2020146-001	PECM TO SSR CABLE AND CONNECTOR KIT	1
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		T82750	FPD PHOTO-MULTIPLER TUBE	1
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		2015546-001	MODEL 11 Sample Valve Cap LDV EXT. LOOP	1
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		2015547-004	MDL 11 SAMPLE VALVE CAP LDV INT LOOP 5ul	
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		6ft	1/8 in silcostl 1.5% ov225 h3p04 60/80 carbopack	2
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		9ft	1/8 in silcostl 1.5% ov225 h3p04 60/80 carbopack	2
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		COL1526	COLUMN MOLE SIEVE 5A 110/120	
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		P32500	FPD PHOTO MULTIPLER TUBE ASSEMBLY	1
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		2020129-701	FPD LIGHT PIPE ASSEMBLY WITH O-RING	1
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		5006067	WATLOW PMT HEATER PAD	2
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		2000116-001	DIGITAL OUTPUT BOARD 115V (DO)	1

Appendix B - Spare Parts Inventory – Cabinet D

CEMS Type	VENDOR AND/OR (CODE)	MANUFACTURER	Symbol #	PART #	DESCRIPTION	IN STOCK
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		2000118-001	ISOLATED ANALOG OUTPUT BOARD	1
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		2000100-001	ANALOG OUTPUT BOARD	1
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		2017585	PCBA ADVANCE PLUS SNE ADAPTER	1
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		1682002-001	INTERCONNECT CABLE ACB/AMB J6	1
ADVANCE PLUS DRAWERS 1+2		AA/SIEMENS		1682002-003	INTERCONNECT CABLE ACB/AMB J7 22”	1
ADVANCE PLUS DRAWERS 1+2						
ADVANCE PLUS DRAWERS 1+2					DRAWER #2	
ADVANCE PLUS DRAWERS 1+2		AA/SIEMANS		H34110	HEATER ELEC 120WATT 120VAC	2
ADVANCE PLUS DRAWERS 1+2		SWAGELOK		S10444	SAMPLE PROBE 3/8” SS	1
ADVANCE PLUS DRAWERS 1+2		AA/SIEMANS		2020167-001	HEATER ELEMENT VERS.1	1
ADVANCE PLUS DRAWERS 1+2		AA/SIEMANS		R40525	PRESS REG 60 -120 1/8” NPT	1
ADVANCE PLUS DRAWERS 1+2		AA/SIEMANS		MBD005	ADVANCE PLUS SOLENOIDS,MAN	1
ADVANCE PLUS DRAWERS 1+2		AA/SIEMANS		1622002-001	PROBR OVEN CONTROL RTD 1/8”	1
ADVANCE PLUS DRAWERS 1+2		AA/SIEMANS		2013716-001	TEMP PROBE TUBE ASSEMBLY	1
ADVANCE PLUS DRAWERS 1+2		AA/SIEMANS		2013713-001	PTGC TRANSFER TUBE	1
ADVANCE PLUS DRAWERS 1+2		WHITEY		V82081	¼” 3 WAY BALL VALVE SS	1
ADVANCE PLUS DRAWERS 1+2		WHITEY		V82052	1/8” 3 WAY BALL VALVE SS	1
ADVANCE PLUS DRAWERS 1+2		AA/SIEMANS		H27805	120VAC CAB HEATER	1
ADVANCE PLUS DRAWERS 1+2		AA/SIEMANS		CSG-3321-316-H2-LB-ST	VERSA 3 WAY VALVE	1
ADVANCE PLUS DRAWERS 1+2		AA/SIEMANS		MBD005	ADV. + SOL, AND MANIFLODS	3
ADVANCE PLUS DRAWERS 1+2		PARKER		14R118FD	PARKER REG ¼ IN PORTS	6
ADVANCE PLUS DRAWERS 1+2		PARKER		14R118FC	PARKER REG 1/8 IN PORTS	6
ADVANCE PLUS DRAWERS 1+2		ARROW		R162-S8	ARROW REG	1
ADVANCE PLUS DRAWERS 1+2		SWAGELOK		SS-91K-T2B1V-OR-C	O-RING KIT	1
ADVANCE PLUS DRAWERS 1+2		SWAGELOK		SS-91K-T2B3V-OR-C	O-RING KIT	1
ADVANCE PLUS DRAWERS 1+2		SWAGELOK		SS-92F2-A-0	SAMPLE SHUTOFF VALVE	1
ADVANCE PLUS DRAWERS 1+2		SWAGELOK		SS-TT2B3V1F2-C	1/8 IN 3WAY MANIFOLD	1
ADVANCE PLUS DRAWERS 1+2		SWAGELOK		SS-1K-T2B1VF2-C	1/8IN VALVE MODULE	1
ADVANCE PLUS DRAWERS 1+2		SWAGELOK		SS-1K-T2B3VF2-C	1/8 IN VALVE MODULE	1
ADVANCE PLUS DRAWERS 1+2		ASCO		302759	ASCO SOL REBUILD KIT	3
ADVANCE PLUS DRAWERS 1+2		ASCO		238714-106-D	ASCO 24VDC SOLENOID COILS	1
ADVANCE PLUS DRAWERS 1+2		AA/SIEMANS		2017585-001	ADVANCE PLUS SNE TO OPT ADAPTER	1

ADVANCE PLUS DRAWERS 1+2		ASCO		A224384	SAMPLE BOX SOLENOID	2

Appendix B - Spare Parts Inventory – Cabinet D

CEMS Type	VENDOR AND/OR (CODE)	MANUFACTURER	Symbol #	PART #	DESCRIPTION	IN STOCK
2 AMETEK CEM'S	AFFILIATED STEAM & EQPT. CO.	ASCO	SRU-AMETEK	EF8340G1	SOLENOID VALVE, 24/DC, SS	2
2 AMETEK CEM'S	AFFILIATED STEAM & EQPT. CO.	ASCO	SRU-AMETEK	EV8327G42	SOLENOID VALVE, 24/DC, SS	3
2 AMETEK CEM'S	AFFILIATED STEAM & EQPT. CO.	ASCO	SRU-AMETEK	8262G220	SOLENOID VALVE, 24/DC, SS	1
2 AMETEK CEM'S	AFFILIATED STEAM & EQPT. CO.	ASCO	SRU-AMETEK	ZAS302757	ASCO SOLENOID VALVE REBUILD KIT	3
2 AMETEK CEM'S						
2 AMETEK CEM'S	AMETEK	ITT--CONOFLOW	?	GFH60XTKEX1F	REGULATOR, 300 PSI IN, 0-60 PSI OUT	1
2 AMETEK CEM'S	AMETEK	XXX	?	299950001	.N .REPLACEMENT 466 MEMBRANE FILTR	2
2 AMETEK CEM'S	AMETEK	THERMOX	440-41222	71063SE	CELL,6",1/4",CERAMIC,& O-RING	2
2 AMETEK CEM'S	AMETEK	THERMOX	440-41651	70724KE	CELL HOUSING	2
2 AMETEK CEM'S						
2 AMETEK CEM'S	AMETEK 880	XXX	TAIL GAS	200880001	SOURCE LAMP	
2 AMETEK CEM'S	AMETEK 880	XXX	TAIL GAS	880118901	C ASSY. LAMP POWER SUPPLY TRIGGER	1
2 AMETEK CEM'S	AMETEK 880	XXX	TAIL GAS	880063901	WP PAD 880 DEMISTER	4
2 AMETEK CEM'S	AMETEK 880	XXX	TAIL GAS	A880019901	DEMISTER ASSY.	
2 AMETEK CEM'S	AMETEK 880	XXX	TAIL GAS	880129001	.WP.CROSS 316SST, TEFLON PAD STOPPER	
2 AMETEK CEM'S	AMETEK 880	XXX	TAIL GAS	265858008	12 VOLT DC ADAPTER	1
2 AMETEK CEM'S						
2 AMETEK CEM'S	AMETEK 4000	XXX	440-41102	257801000	LAMP HOUSING WINDOW, QUARTZ	3
MAXUM 1+2		SIEMENS		1901667-001	COMPACT FLASH TYPE 1 64 BYTE	
MAXUM 1+2		SIEMENS		1291000-006	1/4FNPT X 1/4M ISO SST SS4-A-4RS	7
						7 PIECES
						1
						2
						1
						2
						-
						3
						2

Appendix B - Spare Parts Inventory – Cabinet D

CEMS Type	VENDOR AND/OR (CODE)	MANUFACTURER	Symbol #	PART #	DESCRIPTION	IN STOCK
MAXUM 1+2		SIEMENS		2021823-002	CABLE PECM-2 TO SOL VALVE 500 mm smc	1
MAXUM 1+2		SIEMENS		2021823-001	CABLE PECM-2 TO SOL VALVE 1000 mm smc	2
MAXUM 1+2		SIEMENS		1672102-001	SVCM SHORT CABLE TO ORIG SVCM CTRL.BD	2
MAXUM 1+2		SIEMENS		1672101-001	GASKET FOR MOUNTING SOL (SMC) -SVCM	4
MAXUM 1+2		SIEMENS		1672100-100	VALVE GAS SOLENOID	1
MAXUM 1+2		SIEMENS		2022021-001	SOL VALVE REPLACEMENT KIT (SMC)	1
MAXUM 1+2		SIEMENS		1672009-006	VALVE GAS SOLENOID (PARKER)	1
MAXUM 1+2		SIEMENS		1901692-001	CABLE ,IDE 19" FOR COMPACT FLASH	2
MAXUM 1+2		SIEMENS		2021278-001	CABLE HI. VOLTAGE DPM2/OEFT/1	2
MAXUM 1+2		SIEMENS		2017596-001	CABLE HEATER TO SENSOR MODULE	6
MAXUM 1+2		SIEMENS		2021275-001	CABLE ELECTROMETER SIG SMA/DPM2/OEFT2	2
MAXUM 1+2		SIEMENS		2017911-001	CABLE FID DET. PERSONALITY MOD.TO OEFT	2
MAXUM 1+2		SIEMENS		2017959-001	HEATER TERM. PLUG	1
MAXUM 1+2		SIEMENS		2020910-001	PCBA ,OEFT ADAPTER	2
MAXUM 1+2		SIEMENS		2017519-804	2 EA.AI/AO/DI/DO BOARD	3
MAXUM 1+2		SIEMENS		2020165-001	EPC COMPLETE MODULE,MAN +SEALS	3
MAXUM 1+2		SIEMENS		2017519-803	4 EA. DO/DI BOARD	3
MAXUM 1+2		SIEMENS		2021726-002	I2C CONT BRD.TO MNT.CF MEM ON SYSCON	2
MAXUM 1+2		SIEMENS		2021277-001	CABLE HI VOLT DPM2/OEFT2	2
MAXUM 1+2		SIEMENS		2021276-001	CABLE IGNITION DPM GLOW PLUG	2
MAXUM 1+2		SIEMENS		202092-001	FEED TRU FLEX CABLE (PCBA)	2
MAXUM 1+2		SIEMENS		1901381-001	CABLE FLEX LAMIN. 30 COND.6IN SHIELDED	2
MAXUM 1+2		SIEMENS		201756-001	CABLE I2C DPM #1	1
MAXUM 1+2		SIEMENS		2020126-701	FPD QUARTZ INSERT/O RING	1
MAXUM 1+2		SIEMENS		1270002-009	CONVERTER,MEDIA INT.PC,10BASET/FO	2
MAXUM 1+2		SIEMENS		2017929-003	SPACER,HEX M4 THREAD	1
MAXUM 1+2		SIEMENS		2017929-004	SPACER,HEX 8/32 THREAD	1
MAXUM 1+2		SIEMENS		1700280-001	CONN,22PIN ANALOG/DIGITAL I/O PCB	3
MAXUM 1+2		SIEMENS		H24970	HEATER CARTRIDGE FOR METANIZER	1
MAXUM 1+2		SIEMENS		2021784-001	PECM-2 WITH TEMP +SVCM CTRL.TOP BOARD	1
MAXUM 1+2		SIEMENS		2021963-002	SNECON VER4 WITHOUT CAGE MINI COAX,TP	1
MAXUM 1+2		SIEMENS		A5E02829199001	SNECON5 WITH LEGACY 10BASE2 INT BUS MINI	1

Appendix B - Spare Parts Inventory – Cabinet D

CEMS Type	VENDOR AND/OR (CODE)	MANUFACTURER	Symbol #	PART #	DESCRIPTION	IN STOCK
MAXUM 1+2		SIEMENS		2020169-001	TCD ELEMENT WITH SCREWS ORIG MAXUM	1
MAXUM 1+2		SIEMENS		2021796-001	BASE DPM WITH SHIELD/CONN BOARD	2
MAXUM 1+2		SIEMENS		2020176-001	TCD-2 THERM BEAD KIT MAXII	
MAXUM 1+2		SIEMENS		2021328-001	DPM MEZZ FOR FPD, 100na SINGLE RANGE	1
MAXUM 1+2		SIEMENS		2021328-002	DPM MEZZ FOR FID 100na/1000na dual hi range	1
MAXUM 1+2		SIEMENS		2021328-003	DPM MEZZ FOR FPD 100na single range .18HZ	
MAXUM 1+2		SIEMENS		2021284-002	AIR BATH ASSEMBLY LO PWR (650 WATT)	2
MAXUM 1+2		SIEMENS		202128-701	FPD COLUMN INLET .38ID WITH WASHER	1
MAXUM 1+2		SIEMENS		202128-702	FPD COLUMN INLET .25ID WITH WASHER	1
MAXUM 1+2		SIEMENS		2021347-004	FID 302AFLAME ARRESTOR 205 X.38 ID	
MAXUM 1+2		SIEMENS		2021347-006	FID 302AFLAME ARRESTOR 205 X.38 ID SULF	
MAXUM 1+2		SIEMENS		1622005-001	PROBE (RTD) BARE ELM. 100 OHM 1/8" OD	1
MAXUM 1+2		SIEMENS		2021388-004	RES TUBE ASSEMBLY FPD H2	1
MAXUM 1+2		SIEMENS		2021388-005	RES TUBE ASSEMBLY FPD AIR	1
MAXUM 1+2		SIEMENS		2020125-701	FPD IGN REPAIR KIT	1
MAXUM 1+2		SIEMENS		2020376-701	SOLID STATE RELAY KIT MAXII	
MAXUM 1+2		SIEMENS		2020379-701	2 CELL FILAMENT DET REPAIR KIT MAX II	1
OPTICHROM		AA/SIEMANS		2000103-002	ANALYZER RELAY BOARD ASSEMBLY	1
OPTICHROM		AA/SIEMANS		2000176-003	FILAMENT DETECTOR AMPLIFIER BOARD	1
OPTICHROM		AA/SIEMANS		2000133-001	ADVANCE POWER SUPPLY 115VAC/+5VDC	2
OPTICHROM		AA/SIEMANS		2000240-001	ADVANCE POWER SUPPLY ,CABLE+BRACKET	2
OPTICHROM		AA/SIEMANS		B05218	2100/ADVANCE THERMISTORS,DUAL RNGE TCD	1
OPTICHROM		AA/SIEMANS		B05207	SAMPLE AIR HEATER TEMP CONTROL BRD.	2
OPTICHROM		AA/SIEMANS				
OPTICHROM		AA/SIEMANS		1241001-001	LOW VOL. FILAMENTS MATCHED PAIR 22OHMS	3
OPTICHROM		AA/SIEMANS		C94020	MODEL 20 VLV. DIAPHRAGM CUSION NOMEX	5
OPTICHROM		AA/SIEMANS		D60900	MODEL 20 VLV. TEFLON SEAL DISC 1.25OD	5
OPTICHROM		AA/SIEMANS		V16055	MODEL 11 SAMPLE VALVE PLUNGER	5
OPTICHROM		AA/SIEMANS		F09200	FILTER ELEMENT .5 MICRON COPOLYMER	7
OPTICHROM		AA/SIEMANS				
OPTICHROM		AA/SIEMANS		F09230	FILTER SUPPORT PAD 10 MICRON POLYPROP	7
OPTICHROM		AA/SIEMANS		1487008-004	ACB-2 3.5V LITIUM BATTERY	3

Appendix B - Spare Parts Inventory – Cabinet D

CEMS Type	VENDOR AND/OR (CODE)	MANUFACTURER	Symbol #	PART #	DESCRIPTION	IN STOCK
OPTICHROM		AA/SIEMANS		1481006-001	POWER SUPPLY SWITCHER 90-132 VAC	3
OPTICHROM		AA/SIEMANS		V16040	MODEL 11,20 SILC O RING SIZE 133	5
OPTICHROM		AA/SIEMANS		G83500	GLOW PLUG LOW FOR FID	3
OPTICHROM		AA/SIEMANS		V16052	MODEL 11 BALLS SST 5/32 4.0MM DIA	5
OPTICHROM		AA/SIEMANS		P56705	MODEL 11 SAMPLE VALVE PLUNGER HI PRESS	5
OPTICHROM		AA/SIEMANS		O34024	MODEL 11 SV SILICONE O RING 24 1/ 1/8IDX1/16	5
OPTICHROM		AA/SIEMANS				
OPTICHROM		AA/SIEMANS				
OPTICHROM		AA/SIEMANS		S52000	MODEL 11 COMPRESSION SPRING	5
OPTICHROM		AA/SIEMANS		T28006	30K THERM BEADS DOUBLE DIPPED PAIR H2	3
OPTICHROM		AA/SIEMANS		B02378	TEFLON BUSHING INSERT T/C DETECTORS	3
OPTICHROM		AA/SIEMANS		D40000	MODEL 11 SAMP VLV DACRON CUSHION	5
OPTICHROM		AA/SIEMANS		V16308	VALVE MODEL X SEAL DIAPHRAM	5
OPTICHROM		AA/SIEMANS		W10000	MODEL 11 WASHER SPRING SST .190	5
OPTICHROM		AA/SIEMANS		V16038	MODEL11,20 SILICONE ORING SIZE 10 .24ID	5
OPTICHROM		AA/SIEMANS				
OPTICHROM		AA/SIEMANS		O39006	VITON ORING 1/8IDX1/16OD	3
OPTICHROM		AA/SIEMANS		1542100-003	100K THERMISTOR BEADS DOUBLE DIPPED	3
OPTICHROM		AA/SIEMANS		2020169-001	TCD ELEMENT MAXUM I	1
OPTICHROM		AA/SIEMANS		2021016-002	2 CELL GOLD PLATED FILAMENT BOARD	1
OPTICHROM		AA/SIEMANS		1531000-003	FID VITON O-RING .35,SENSOR COVER	3
OPTICHROM		AA/SIEMANS		1605000-007	PRESS SWITCH 1.0 N/C	1
ROSEMOUNT CHIPS, CEM'S 5	ROSEMOUNT/EMERSON	XXX	XXX	90000070	BRONZE CHIPS; (240 GR)	6
ROSEMOUNT CHIPS, CEM'S 5	ROSEMOUNT/EMERSON	XXX	XXX	90000072	ZINC CHIPS; (200 GR)	4
ROSEMOUNT CHIPS, CEM'S 5	PERMA PURE	XXX	XXX	AS-200-8-EB	AMMONIA SCRUBBING MEDIA (SADDLES)	1
ROSEMOUNT CHIPS, CEM'S 5	PERMA PURE	XXX	XXX	AS-200-8-E	AMMONIA SCRUBBING MEDIA (PART B)	1
ROSEMOUNT CHIPS, CEM'S 5	HOLTHAUS MEDICAL	XXX	XXX	90002047	FILTER COTTON 500GR,DIN 61640	1
ROSEMOUNT CHIPS, CEM'S 5	PERMA PURE LLC	XXX	XXX	AS-200-3	AMMONIA SCRUBBER O-RINGS	12
ROSEMOUNT CHIPS, CEM'S 5	PERMA PURE	XXX	XXX	AS-200-02-04	AMMONIA SCRUBBER CHAMBER	3
ROSEMOUNT CHIPS, CEM'S 5	PERMA PURE	XXX	XXX		ACID SCRUBBERS	4
ROSEMOUNT CHIPS, CEM'S 5	PERMA PURE	XXX	XXX		AMMONIA SCRUBBERS	3
ROSEMOUNT SAMPLE SYSTEM		A+ CORPORATION		90-507CFS-5	AVENGER SERIES 90 FILTER ELEMENT. BOX OF 5.	9

Appendix B - Spare Parts Inventory – Cabinet D

CEMS Type	VENDOR AND/OR (CODE)	MANUFACTURER	Symbol #	PART #	DESCRIPTION	IN STOCK
ROSEMOUNT SAMPLE SYSTEM		PARKER FILTRATION		A914A-BX	COMPRESSED AIR FILTER AND HOUSING	5
ROSEMOUNT SAMPLE SYSTEM		M&C PRODUCTS		03F3005	FILTER CLF-5/W	4
ROSEMOUNT SAMPLE SYSTEM		BROOKS		1350EM2BCJF1A	0-3700 SCCM AIR FLOW METER	6
ROSEMOUNT SAMPLE SYSTEM		M&C		90F0006	F-2K FILTER ELEMENT	11
ROSEMOUNT SAMPLE SYSTEM		BROOKS		1350EL2DCKE1A	0-12000 SCCM AIR FLOW METER	2
ROSEMOUNT SAMPLE SYSTEM		A+ CORPORATION		91-3/2-0-007CFS-SS	AVENGER SERIES 91 FILTER ELEMENT	1
ROSEMOUNT SAMPLE SYSTEM		KIP INC.		2X361B	1/8 ORIFACE 24VDC SOLENOIDS AND BLOCK	1
ROSEMOUNT SAMPLE SYSTEM		PROTECTOSEAL CO.		796H	SHELTER FLAME ARRESTOR	1
ROSEMOUNT SAMPLE SYSTEM		SWAGELOK		KCB1DOD2D5P20000	0-25 PSIG INLET PSIG REGULATOR	1
ROSEMOUNT SAMPLE SYSTEM		SWAGELOK		KCB1DOA2A5P20000	0-25 PSIG INLET PSIG REGULATOR	1
ROSEMOUNT SAMPLE SYSTEM		KENMAC		KCH1A0132F5PEO	100W/130-300 DEG F HEATED REGULATOR.	1
ROSEMOUNT SAMPLE SYSTEM		KIP		1A68157H05	24VDC INDIVIDUAL SOLENOIDS	4
ROSEMOUNT SAMPLE SYSTEM		UNIVERSAL ANALYZER		5110-0012	KYNAR RETAINER	3
ROSEMOUNT SAMPLE SYSTEM		OMEGA		PSW-521	0-30 PSIG PRESSURE SWITCH	1
ROSEMOUNT SAMPLE SYSTEM	M&C PRODUCTS	ROSEMOUNT		BV-2TF	ROSEMOUNT F1 FILTER + HOUSING	3
ROSEMOUNT SAMPLE SYSTEM	M&C PRODUCTS	ROSEMOUNT		CLFS-5WS/PVDF	ROSEMOUNT FILTER + HOUSING	2
ROSEMOUNT SAMPLE SYSTEM	M&C PRODUCTS	ROSEMOUNT		90F3530	CLF-5/W FILTER REBUILD KIT	4
ROSEMOUNT SAMPLE SYSTEM		KIP INC		1A68529H01	24 VDC SOLENOID 3 way	
ROSEMOUNT SAMPLE SYSTEM		ROSEMOUNT		1A99914H03	VISIBLE FILTER W/MOISTURE SENSOR COMPLETE	
ROSEMOUNT SAMPLE SYSTEM		CONTROL AIR		TYPE 300	TYPE 300 PRESSURE REGULATOR 0-60 PSIG MAX PRESS 250	
6 ROSEMOUNT CEM'S		ROSEMOUNT		2-3-0700-028 REV G	CPU BOARD	1
6 ROSEMOUNT CEM'S		ROSEMOUNT		2-3-2350-041	ADC BOARD 16 BIT	1
6 ROSEMOUNT CEM'S		ROSEMOUNT		2-3-580-002	PREAMPLIFIER BOARD	1
6 ROSEMOUNT CEM'S		ROSEMOUNT		2-3-0700-010	FIELD TERMINATION BOARD	1
6 ROSEMOUNT CEM'S		ROSEMOUNT		2-3-0700-005	DRIVER I/O BOARD	1
6 ROSEMOUNT CEM'S		ROSEMOUNT		2-3-0700-007	ANALOG OUTPUT BOARD	1
6 ROSEMOUNT CEM'S		ROSEMOUNT		2-3-0700-004	MULTIFUNCTION BOARD	1
6 ROSEMOUNT CEM'S		ROSEMOUNT		902460	POWER SUPPLY	1
6 ROSEMOUNT CEM'S		ROSEMOUNT		2-4-0700-152	SOLENOID VALVE	1
6 ROSEMOUNT CEM'S		ROSEMOUNT		2-4-0700-187	REPAIR KIT 6- PORT VALVE	8
6 ROSEMOUNT CEM'S		ROSEMOUNT		2-4-0700-171	REPAIR KIT 10- PORT VALVE	1

Appendix B - Spare Parts Inventory – Cabinet D

CEMS Type	VENDOR AND/OR (CODE)	MANUFACTURER	Symbol #	PART #	DESCRIPTION	IN STOCK
6 ROSEMOUNT CEM'S		ROSEMOUNT		2-4-9500-084	CARRIER GAS REGULATOR (MASONELIAN)	1
6 ROSEMOUNT CEM'S		ROSEMOUNT		2-3-0520-101	COLUMN SET 4 MIN BTU	1
6 ROSEMOUNT CEM'S		ROSEMOUNT		2-6-1611-083	THERMISTOR SET 8K WITH SEALS	2
6 ROSEMOUNT CEM'S		ROSEMOUNT		2-3-0500-391	TEFLON THERMISTOR SEALS	1PKG
6 ROSEMOUNT CEM'S		ROSEMOUNT			6 PORT SAMPLE VALVE	2
6 ROSEMOUNT CEM'S		ROSEMOUNT		3-0500-425	COLUMNS C3=	1 SET
6 ROSEMOUNT CEM'S		ROSEMOUNT		101-506	GENIE REPAIR KIT (A+ CORP.)	1
6 ROSEMOUNT CEM'S		VERSA		E5SM-3201-23-H2--LB-ST-XX-D024	DDU CEM FLARE SAMPLE COND SOLENOID	3
6 ROSEMOUNT CEM'S		ROSEMOUNT		2-3-0700-022	FRONT DISPLAY BOARD	1
6 ROSEMOUNT CEM'S		WINSYSTEMS		PCM-FPVGA-16-1M	VIDEO UPGRADE CARD MODEL700 GC	2
6 ROSEMOUNT CEM'S		PARKER\PNEUTRONICS		4-0700-152	24VDC SOLENOIDS	7
6 ROSEMOUNT CEM'S		A+ CORP		4-4500-394	MEMBRANE REPLACEMENT KIT	12
6 ROSEMOUNT CEM'S		ROSEMOUNT		4-0700-280	10 PT.VALVE DIAPHRAM KIT	1
6 ROSEMOUNT CEM'S		ROSEMOUNT		5141386	RESTRICTOR TUBING	1
6 ROSEMOUNT CEM'S		BENDIX	440-40852	3615344-1	400 OHMS RTD	1
6 ROSEMOUNT CEM'S		ROSEMOUNT		3-0500-375	COLUMNS H2S AND C3=	2 SETS
6 ROSEMOUNT CEM'S		ROSEMOUNT		3-0500-391	THERMISTOR SEALS	20
6 ROSEMOUNT CEM'S		BROOKS		1350EZ192	0-10 SCCM AIR (SAMPLE FLOW DDU CEM)	1
6 ROSEMOUNT CEM'S		BROOKS		1350EZ191	1-1000 CC/MIN (BYPASS FLOW DDU CEM)	
CHILLER+SCRUBBER		PERMA PURE		AS-200-08-EB	PART A CERAMIC SADDLES (2 LITER) AMMONIA SCRUBBING MEDIA	2
CHILLER+SCRUBBER		PERMA PURE		AS -200-8-EB	PART B ACTIVE MEDIA (1LITER) AMMONIA SCRUBBING MEDIA	2
CHILLER+SCRUBBER		MASTERFLEX		07017-20	PUMP HEAD -SHT SHAFT STD	9
CHILLER+SCRUBBER		MASTERFLEX		07015-20	PUMP HEAD -SHT SHAFT STD	2
CHILLER+SCRUBBER		UNIVERSAL ANALYZER		1A99914H19	PERISTALLIC PUMP,2 HEADS 115 VAC 2 HEADS	3
CHILLER+SCRUBBER		BARANT CO.		D-2504-2	PERISTALLIC PUMP MOTOR	2
CHILLER+SCRUBBER		MASTERFLEX		07013-08	PERISTALLIC PUMP HEAD MOUNTING HARDWARE	1
CHILLER+SCRUBBER		MASTERFLEX		7017-20	PERISTALLIC PUMP HEADS	6
CHILLER+SCRUBBER		UNIVERSAL ANALYZERS		3016-0002	PELTIER ELEMENTS	1

Appendix B - Spare Parts Inventory – Cabinet D

CEMS Type	VENDOR AND/OR (CODE)	MANUFACTURER	Symbol #	PART #	DESCRIPTION	IN STOCK
CHILLER+SCRUBBER		UNIVERSAL ANALYZERS		3016-0016	PELTIER ELEMENTS	2
CHILLER+SCRUBBER		UNIVERSAL ANALYZERS		5200-0030	HEAT EXCHANGER - GLASS/KYNAR, 10 IN	1
CHILLER+SCRUBBER		UNIVERSAL		5200-K01F	FREEZER IMPINGER KYNAR/KYNAR PAK 10 IN	4
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		CH000068	SIO O2 ANALOG OUTPUT BOARD MLT	1
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		CH000099	MLT ACUO2, MICROPROCESSOR BOARD	1
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		655245	DRVR BD. COMP ANA CABLE	2
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		655249	J5 COMP ANA BD/SIG BD CABLE	1
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		655620	DRIVER BOARD	1
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		655263	SOLENOID VALVE CLD	4
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		632784	GLASS TUBE CONN. CLD	14
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		655250	NOX/NO CONV.	1
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		655227	NOX/NO CONVERTER TUBE	2
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		655228	NOX/NO CONV.HEATER JACKET	1
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		655282	NOX/NO CONV. TEMP SENSOR	1
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		659658	CAPILLARY ,SAMPLE 200CC/ MIN	
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		903906	CLD POWER CONN.	8
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		903033	CABLE ASSEMBLY 24.CONDUCTOR	2
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		903035-V1	CLD COM BOARD CABLES	1
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		903034-V1	CLD COM BOARD CABLES	1
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		903032-V1	CLD COM BOARD CABLES	1
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		655216	DETECTOR THERMISTOR	1
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		656898	GASKET	3
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		854540	O-RING	3
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		660408	TUBE EXHAUST	1
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		656897	GASKET RETAINER	3
ROSEMOUNT CEM CLD -MLT		UNIVERSAL		1150-0059	100 OHM RTD	1
ROSEMOUNT CEM CLD -MLT		BALDWIN		1CBC-004	BALDWIN TEMP .CONT.BOARD	2
ROSEMOUNT CEM CLD -MLT		DAYTON		1 EHV4	24VDC RELAY	2
ROSEMOUNT CEM CLD -MLT		POTTER BRUMFIED		KHU17D11	24VDC RELAY	1
ROSEMOUNT CEM CLD -MLT		MAGNECRAFT		KHS-17A11-120	782XDXH10 120VAC RELAY	4
ROSEMOUNT CEM CLD -MLT		MAGNECRAFT		KHS-17D11-24	782XDXH10-24VDC RELAY	3

Appendix B - Spare Parts Inventory – Cabinet D

CEMS Type	VENDOR AND/OR (CODE)	MANUFACTURER	Symbol #	PART #	DESCRIPTION	IN STOCK
ROSEMOUNT CEM CLD -MLT		AB		700DC-R020Z24	700DC TYPE R 24VDC RELAY	1
ROSEMOUNT CEM CLD -MLT		WATLOW		DA10-24C0-0000	SOLID STATE POWER CONTROL	9
ROSEMOUNT CEM CLD -MLT		CRYDOM		D2450	SOLID STATE RELAY	4
ROSEMOUNT CEM CLD -MLT		CRYDOM		D2440	SOLID STATE RELAY	1
ROSEMOUNT CEM CLD -MLT		SQUARE D		QO2401021	PLUG ON CIRCUIT BREAKER 40AMP	2
ROSEMOUNT CEM CLD -MLT		SQUARE D		QO2301021	PPLUG ON CIRCUIT BREAKER 30AMP	3
ROSEMOUNT CEM CLD -MLT		SQUARE D		QO230EPD	CIRCUIT BREAKER	2
ROSEMOUNT CEM CLD -MLT		FERRAZ SHAWMUT		A25Z5-2	PROBE BOX FUSES 5 AMP	5
ROSEMOUNT CEM CLD -MLT		LOVE		16111	TEMP CONTROLLER	1
ROSEMOUNT CEM CLD -MLT		WATLOW		96B0-CDAA-00RG	TEMP. CONTROLLER	8
ROSEMOUNT CEM CLD -MLT		SOLA		SDNS-24-100P	SOLA 24VDC POWER SUPPLY	2
ROSEMOUNT CEM CLD -MLT		GE		IC693PWR321AA	GE PLC (NEW PHSE) DAHS	2
ROSEMOUNT CEM CLD -MLT		SENSOR TECH		655253	OZONE PRESS SENSOR 0-15PSI	1
ROSEMOUNT CEM CLD -MLT		SENSOR TECH		655254	OZONE PRESS SENSOR 0-30	3
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		657716	PWR SUPPLY ASSEMBLY OZANATOR	1
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		655215	PRESS SWITCH ASSEMBLY 8 PSI	1
ROSEMOUNT CEM CLD -MLT		McMILLAN		902931	SENSOR FLO GAS	1
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		844420	NGA COMP CARD	1
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		CH000070	MLT ANALOG OUT PUT CARD	1
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		CH000071	MLT SIAO2 ANALOG OUTPUT EXT	1
ROSEMOUNT CEM CLD -MLT						
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		4846B48G02	SAMPLE PROBE RTD ASSEMBY	4
ROSEMOUNT CEM CLD -MLT		KIP/INC		1A68529HO1	24VDC SOL.NEW DHT/3SPS	2
ROSEMOUNT CEM CLD -MLT		PETER PAUL		2220999NSGH	24VDC ISOLATION SOL.DHT/SPS CEM	2
ROSEMOUNT CEM CLD -MLT		ASCO		4955-0142	24VDC BLOWBACK SOL	2
ROSEMOUNT CEM CLD -MLT		ASCO		JJP8262G230	SAMPLE BOX SOLENOID FCU CEM	3
ROSEMOUNT CEM CLD -MLT		KIP/INC		357064	SAMPLE SYS. SOLENOID CEM	2
ROSEMOUNT CEM CLD -MLT		AIR DIMENSIONS		AO3012	HEATER CARTRIDGE 75W 115VAC	8
ROSEMOUNT CEM CLD -MLT		WATLOW		3014-0066	PROBE BOX HEATER NEW 3SPS CEM	1
ROSEMOUNT CEM CLD -MLT		AIR DIMENSIONS		8010-0001	HEAT PASTE	2
ROSEMOUNT CEM CLD -MLT		GALTEK		203-3414-415	GALTEK SOL. 1/4 3 WAY 115VAC	1
ROSEMOUNT CEM CLD -MLT		WATLOW		254655	WATLOW PROBE HEATERS	4

Appendix B - Spare Parts Inventory – Cabinet D

CEMS Type	VENDOR AND/OR (CODE)	MANUFACTURER	Symbol #	PART #	DESCRIPTION	IN STOCK
ROSEMOUNT CEM CLD -MLT		UNIVERSAL		4980-0328	2-MICRON WOVEN SS 9"FILTER	2
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		1A68507H01	.5 MICRON HASTELLOY FILTER	4
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		1A68507H02	.5 MICRON 316SS	4
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		1A68507H03	50 MICRON FILTER 316L SS (SRU INC)	2
ROSEMOUNT CEM CLD -MLT		ROSEMOUNT		4843B34H01	SAMPLE PROBE FILT. CAP	2
ROSEMOUNT CEM CLD -MLT		AIR DIMENSIONS		A19005	SCREW/HEAD BASE	24
ROSEMOUNT CEM CLD -MLT		AIR DIMENSIONS		A190017A	PROBE HEAD BOLTS /WASH 5/16	50
ROSEMOUNT CEM CLD -MLT		AIR DIMENSIONS		4843B30H02	COVER GASKET	9
ROSEMOUNT CEM CLD -MLT		AIR DIMENSIONS		4843B30H03	FILTER GASKET	8
ROSEMOUNT CEM CLD -MLT		AIR DIMENSIONS		4846B11H01	PROBE THUMB SCREWS	2
ROSEMOUNT CEM CLD -MLT		AIR DIMENSIONS		A20200	PUMP HEAD THERMOSTAT	3
ROSEMOUNT CEM CLD -MLT		AIR DIMENSIONS		11005	VAC PUMP REBUILD KIT	12
ROSEMOUNT CEM CLD -MLT		AIR DIMENSIONS		11006	TEFLON VITON VAC PUMP REBLD KIT	1
ROSEMOUNT CEM CLD -MLT		AIR DIMENSIONS		11011	3 PLY TEFLON VAC PUMP RBLD KIT	6
ROSEMOUNT CEM CLD -MLT		AIR DIMENSIONS		11305	TEFLON EDPM VAC PUMP RBLD KIT	3
ROSEMOUNT CEM CLD -MLT		AIR DIMENSIONS		A06302	PUMP FAN BLADE	1
ROSEMOUNT CEM CLD -MLT		AIR DIMENSIONS		19044	VALOX SPACER	2
ROSEMOUNT CEM CLD -MLT		AIR DIMENSIONS		7001	PUMP DISC	6
ROSEMOUNT CEM CLD -MLT		AIR DIMENSIONS		19006	VALVE SCREWS	2
ROSEMOUNT CEM CLD -MLT		AIR DIMENSIONS		19015	PLATE SCREWS	4
ROSEMOUNT CEM CLD -MLT		WATLOW		SGA1J5JY3	120VAC 250W CABINET HEATER	1
ROSEMOUNT CEM CLD -MLT		WATLOW		SGA1J6AY3	120VAC 300W CABINET HEATER	
ROSEMOUNT CEM CLD -MLT		SOLA		SDN-10-24-100P	SOLA 24VDC POWER SUPPLY 10 AMP	2

Appendix C – Methods of Emission Calculation and Reporting

This appendix is intended to meet the requirements of 40 CRF 60 Appendix F, section 3, item 4 that the methods of calculating emissions, and reporting emission data for specific averaging periods be documented.

C-1 – Calculating Mass per Unit Volume (lb/dscf) from Measured CEMS Concentrations

$$\text{Conc.(lb/dscf)} = \frac{\text{Conc.(ppm)}\ (\text{MW})}{(1\text{ x }10^{-6}\text{ moles poll./total mole})\,(0.03531\text{ dscf/liter})\,(22.414\text{ liters / g - mole})\,(453.6\text{ g / lb})\left[\frac{527.7^{o}\text{R}}{491.7^{o}\text{R}}\right]} \quad \text{(equation C - 1)}$$

Where:

Conc. (ppm) = Pollutant concentration of the stack gas as measured by an pollutant CEMS
MW = molecular weight of the pollutant being measured:
SO_2 = 64.06
NO_2 = 46.01
CO =28.0

C-2 – Calculating Stack Flow Rate for Combustion Sources

Calculation of stack flow rate for combustion sources is based on the methods contained in EPA Reference Method 19. The method uses the composition of the fuel gas to compute the volume of combustion byproducts from stoichiometric combustion of the fuel gas with air per MMBtu of the fuel gas. The first step in the calculation process is to obtain the composition of the fuel gas. This should include all hydrocarbons, hydrogen, hydrogen sulfide, and fixed gases (N2, O2, CO2, CO).

$$\text{Fuel Gas Molecular Weight} = \text{MW(fg)} = \sum^{i}(\text{Ci})(MWi) \quad \text{(equation C - 2)}$$

Where:

Ci = decimal concentration of component (i) in the fuel gas
MWi = molecular weight of component (i) in the fuel gas

$$\text{Carbon Atomic Weight of Fuel Gas} = \text{MWc} = \sum^{i}(\text{Ci})(12)(\text{Ni}) \quad \text{(equation C - 3)}$$

Where:

Ci = decimal concentration of component (i) in the fuel gas
Ni = number of carbon atoms in component (i) in the fuel gas

$$\text{Hydrogen Atomic Weight of Fuel Gas} = \text{MWh} = \sum^{i}(\text{Ci})(1)(\text{Ni}) \quad \text{(equation C - 4)}$$

Where:

Ci = decimal concentration of component (i) in the fuel gas
Ni = number of hydrogen atoms in component (i) in the fuel gas

$$\text{Oxygen Atomic Weight of Fuel Gas} = \text{MWo} = \sum^{i}(\text{Ci})(1)(\text{Ni}) \quad \text{(equation C - 5)}$$

Where:

Ci = decimal concentration of component (i) in the fuel gas
Ni = number of oxygen atoms in component (i) in the fuel gas

$$\text{Nitrogen Atomic Weight of Fuel Gas} = MWn = \sum^{i} (Ci)(1)(Ni) \qquad \text{(equation C - 6)}$$

Where:
Ci = decimal concentration of component (i) in the fuel gas
Ni = number of nitrogen atoms in component (i) in the fuel gas

$$\text{Sulfur Atomic Weight of Fuel Gas} = MWs = \sum^{i} (Ci)(1)(Ni) \qquad \text{(equation C - 7)}$$

Where:
Ci = decimal concentration of component (i) in the fuel gas
Ni = number of sulfur atoms in component (i) in the fuel gas

Gross Heating Value (@ 68°F) = GCV

$$GCV = \frac{(FHC) \times (SMV)}{(MW_{fg})} \qquad \text{(equation C - 8)}$$

Where:
SMV = 385.3 dscf/lb-mole = Specific molar volume at 68°F
FHC = Fuel gas heat content as measured by gas chromatography (Btu/dscf)
MW_{fg} = Molecular weight of fuel gas (lb/lb-mole)

Calculation

$$Fd = \frac{(K)\left\{\left[(Khd)\left(\frac{MWh}{MWfg}\right)(100)\right] + \left[(Kc)\left(\frac{MWc}{MWfg}\right)(100)\right] - \left[(Ko)\left(\frac{MWo}{MWfg}\right)(100)\right] + \left[(Kn)\left(\frac{MWn}{MWfg}\right)(100)\right] + \left[(Ks)\left(\frac{MWs}{MWfg}\right)(100)\right]\right\}}{GCV} \qquad \text{(equation C - 9)}$$

Where:
Fd = dry standard cubic feet of stack gas produced per million Btu of fuel gas consumed by a combustion source
K = 1,000,000
Khd = (3.64 scf/lb)/%
Kc = (1.53 scf/lb)/%
Ko = (0.46 scf/lb)/%
Kn = (0.14 scf/lb)/%
Ks = (0.57 scf/lb)/%
GCV = Gross calorific value of fuel gas (Btu/lb)

Stack Flow Rate (dscf/min) (@68°F)

$$Q_{std} = [(F_d)(FHC)(\text{Fuel Flow})] \qquad \text{(equation C - 10)}$$

Where:
Q_{std} = (dscf/min) = Volumetric stack rate (@ 0% excess O2)
F_d = (dscf/MMBtu) = dry standard cubic feet of stack gas produced per million Btu of fuel gas consumed by a combustion source
Fuel Flow = (dscf/min) = Flow rate of fuel gas
FHC = Fuel gas heat content as measured by gas chromatography (Btu/dscf)

C-3 – Calculating Mass Emission Rate (lb/hr)

$$\text{Em. Rate (lb/hr)} = (Q_{std})(\text{Conc.(lb/dscf)})(60\ \text{min./hr}) \qquad \text{(equation C-11)}$$

Where:

Q_{std} = (dscf/min) = Volumetric stack rate (@ 0% excess O2)
Conc. (lb/dscf) = See section C-1 for details

C-4 – Calculating Mass Emission Rate (lb/MMBtu)

$$\text{Em. Rate (lb/MMBtu)} = (F_d)(\text{Conc.(lb/dscf)})\left[\frac{20.9\ \%\ O_2}{(20.9\ \%\ O_2 - \text{Stack}\ \%\ O_2)}\right] \qquad \text{(equation C-12)}$$

Where:

F_d = (dscf/MMBtu) = dry standard cubic feet of stack gas produced per million Btu of fuel gas consumed by a combustion source
Conc. (lb/dscf) = See section C-1 for details
Stack % O_2 = Measured oxygen concentration in the stack

C-5 – Calculating Mass Emission Rate (tons/year)

$$\text{Em. Rate (tons/year)} = \frac{(Q_{std})(\text{Conc.(lb/dscf)})(60\ \text{min./hr})(8760\ \text{hr/yr})}{2000\ \text{lb/ton}} \qquad \text{(equation C-13)}$$

Where:

Q_{std} = (dscf/min) = Volumetric stack rate (@ 0% excess O2)
Conc. (lb/dscf) = See section C-1 for details

C-6 – Calculating ppm Concentrations at a Fixed Oxygen Concentration

$$\text{Conc (ppm) (corrected)} = [\text{Conc. (ppm)(measured)}]\left[\frac{(20.9\ \%\ O_2 - \text{Std}\ \%\ O_2)}{(20.9\ \%\ O_2 - \text{Stack}\ \%\ O_2)}\right] \qquad \text{(equation C-14)}$$

Where:

Conc. (ppm) (corrected) = Concentration (in ppm) of the pollutant corrected for the standard oxygen contrition
Conc. (ppm) (corrected) = Measured concentration (in ppm) of the pollutant
Std % O_2 = Oxygen concentration specified by permit or regulation to be used for reporting a pollutant concentration

C-7 – Calculating Milligrams per Cubic Meter Concentrations from ppm Concentrations

$$\text{Conc.}\,(\text{mg/m}^3) = \left[\frac{\text{Conc.}\,(\text{ppm})\,(\text{MW})\,(1000\ \text{liters/m}^3)\ \text{x}\ (1000\ \text{mg/g})}{(1{,}000{,}000\ \text{mole poll./total mole})\ \text{x}\ \ (22.414\ \text{liters / g-mole})\ (453.6\ \text{g / lb})\left[\frac{527.7^{o}\text{R}}{491.7^{o}\text{R}}\right]}\right] \quad \text{(equation C-15)}$$

Where:

MW = molecular weight of the pollutant being measured:

SO_2 = 64.06

NO_2 = 46.01

CO =28.0

Appendix D – Rolling Average Calculations for CEMS Measurements

3-Hour Rolling Average calculations are the average CEMS reading of each valid clock hour and the two preceding clock hours

7-Day Rolling Average Calculations are performed in a two-step process. Treat as "valid", any calendar day for which there is any valid hour of data (i.e. even one valid hour). Calculate the rolling average as the average of all valid hourly data in the 7- calendar day period . Skip days on which there is no valid data as described in step 3 below.

STEP 1 – Calculate a calendar day average for each 24 hour day starting with the 12:00 am – 12:59 am hour and ending with the 11:0 pm – 11:59 pm hour.

STEP 2 – Calculate the 7 day rolling average by averaging the most recently completed daily average and the 6 preceding daily averages into a 7-day rolling average. The 7-day rolling average is only updated at 12:00 am when a new daily average is calculated.

STEP 3 - If any days in the 7-day period has no valid hours of CEMS data, no daily average is calculated. When 7-day averages are calculated for periods when one or more days have no valid hours, sum the daily averages for each valid day and divide by the number of valid days in the 7-day period.

30-Day Rolling Average Calculations are performed in a two-step process. Treat as "valid", any calendar day for which there is any valid hour of data (i.e. even one valid hour). Calculate the rolling average as the average of all valid hourly data in the 30- calendar day period . Skip days on which there is no valid data as described in step 3 below.

STEP 1 – Calculate a calendar day average for each 24 hour day starting with the 12:00 am – 12:59 am hour and ending with the 11:0 pm – 11:59 pm hour.

STEP 2 – Calculate the 30 day rolling average by averaging the most recently completed daily average and the 6 preceding daily averages into a 30-day rolling average. The 30-day rolling average is only updated at 12:00 am when a new daily average is calculated.

STEP 3 - If any days in the 30-day period has no valid hours of CEMS data, no daily average is calculated. When 30-day averages are calculated for periods when one or more days have no valid hours, sum the daily averages for each valid day and divide by the number of valid days in the 30-day period.

365-Day Rolling Average Calculations are performed in a two-step process. Treat as "valid", any calendar day for which there is any valid hour of data (i.e. even one valid hour). Calculate the rolling average as the average of all valid hourly data in the 365-calendar day period . Skip days on which there is no valid data .

STEP 1 – Calculate a calendar day average for each 24 hour day starting with the 12:00 am – 12:59 am hour and ending with the 11:0 pm – 11:59 pm hour.

STEP 2 – Calculate the 365-day rolling average by averaging the most recently completed daily average and the 6 preceding daily averages into a 7-day rolling average. The 365-day rolling average is only updated at 12:00 am when a new daily average is calculated.

STEP 3 - If any days in the 365-day period has no valid hours of CEMS data, no daily average is calculated. When 365-day averages are calculated for periods when one or more days have no valid hours, sum the daily averages for each valid day and divide by the number of valid days in the 365-day period.

Appendix 6a – FCU 500 Performance Testing June 2014

TEST REPORT

COMPLIANCE EMISSION TEST
NSPS, SUBPART Ja
FLUIDIZED CATALYTIC CRACKING UNIT 500

BP PRODUCTS NORTH AMERICA, INC.
WHITING, INDIANA

PREPARED FOR:

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REPORT CERTIFICATION

STATEMENT OF CONFORMANCE AND TEST REPORT CERTIFICATION

I certify, to the best of my knowledge, that this test program was conducted in a manner conforming to the criteria set forth in ASTM D7036-04: Standard Practice for Competence of Air Emission Testing Bodies, and that project management and supervision of all project related activities were performed by qualified individuals as defined by this practice.

I further certify that this test report and all attachments were prepared under my direction or supervision in accordance with the ARI Environmental, Inc. quality management system designed to ensure that qualified personnel gathered and evaluated the test information submitted. Based on my inquiry of the person or persons who performed the sampling and analysis relating to this performance test, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate and complete.

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ARI Environmental, Inc.

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SECTIONONE Introduction and Summary

ARI Environmental, Inc. (ARI) was retained by BP Products North America, Inc. (BP) to conduct a particulate matter (PM) compliance emission test on the Fluidized Catalytic Cracking Unit (FCCU) 500 stack at their refinery located in Whiting, Indiana. Testing was conducted on June 17, 2014.

Three 60-minute test runs were conducted on the FCCU 500 stack to determine the concentration and emission rate of filterable nonsulfate PM. The emission test was performed to fulfill the testing requirements of the New Source Performance Standards (NSPS), Subpart Ja.

Sampling and analysis methodologies followed the procedural requirements as detailed in the Code of Federal Regulations, Title 40, Part 60 (40 CFR 60), Appendix A, USEPA Methods 1, 2, 3, 4 and 5F; and the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods.

Mr. Dan Jorgenson of BP coordinated the test and monitored process conditions. Testing was conducted by Messrs. Alex Hildreth and Brett Tussing of ARI.

This report summarizes the test procedures and results of the emission test. Included as appendices is complete documentation of all calculation summaries, field data, analytical data, calibration data, process data and test program qualifications.

The test results are summarized in Table 1-1.

TABLE 1-1. SUMMARY OF FCCU 500 STACK NONSULFATE PM TEST RESULTS

TEST RUN NO.	:	5F-1	5F-2	5F-3	
TEST DATE	:	6/17/14	6/17/14	6/17/14	
TEST TIME	:	14:53-15:58	16:35-17:40	18:10-19:15	Average
Nonsulfate Filterable PM					
Concentration					
grains/dscf		0.0295	0.0310	0.0313	0.0306
mg/dscm		67.518	70.905	71.722	70.048
Emission rate					
lb/hr		43.61	46.47	47.02	45.70
lb/1,000 lb coke burn		0.711	0.756	0.768	0.745

SECTIONTWO Testing and Analytical Procedures

2.1 OVERVIEW

ARI conducted a compliance emission test on the FCCU 500 stack at the BP refinery located in Whiting, Indiana.

Three 60-minute test runs were conducted on June 17, 2014 to determine the concentration and emission rate of filterable nonsulfate PM.

2.2 METHODOLOGY

Testing procedures and sampling methodologies were conducted following the procedural requirements as detailed in 40 CFR 60, Appendix A, USEPA Methods 1, 2, 3, 4 and 5F; and the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods.

2.2.1 Sampling Locations (USEPA Method 1)

The sampling point locations used for the determination of gas velocity and volume flow rate were determined following the procedural requirements as detailed in USEPA Method 1. Sampling was conducted in the FCCU 500 stack using the two (2) sampling ports provided in the 108-inch diameter stack. The sample ports are located approximately 1,368 inches downstream and 720 inches upstream from the nearest flow disturbances. Twelve (12) traverse points were used to sample the cross-sectional area of the stack.

A cyclonic flow check was conducted to demonstrate that cyclonic flow conditions did not exist at the sampling location.

2.2.2 Flue Gas Volumetric Flow Rate (USEPA Method 2)

Gas velocity and volumetric flow rate were determined following USEPA Method 2. Velocity head measurements were performed using a Type-S pitot tube and Dwyer inclined 0 to 10-in. water manometer. Temperature measurements were conducted using a Chromel-Alumel thermocouple connected to a digital direct read-out potentiometer.

2.2.3 Molecular Weight (USEPA Method 3)

The stack gas oxygen (O_2) and carbon dioxide (CO_2) concentrations were determined following USEPA Method 3 procedures. During each test run, an integrated bag sample of the exhaust gas was collected. An Orsat combustion analyzer was used to determine the O_2 and CO_2 concentrations of each collected bag. The nitrogen (N_2) content was calculated as the difference.

2.2.4 Flue Gas Moisture Content (USEPA Method 4)

The stack gas moisture content was determined following USEPA Method 4. This method was performed in conjunction with the USEPA Method 5F procedures described in Subsection 2.2.5.

2.2.5 *Nonsulfate Particulate Matter Determination (USEPA Method 5F)*

Nonsulfate PM sampling was conducted in accordance with USEPA Method 5F using an Apex Instruments, Inc. sampling train.

2.2.5.1 Sampling Apparatus

The PM sampling train met design specifications established by the USEPA. Assembled by ARI personnel, it consisted of the following:

Nozzle – Stainless steel, with sharp, tapered leading edge.

Probe – Stainless steel with a heating system capable of maintaining a probe exit temperature of 320°F ±25°F.

Pitot Tube - Type-S attached to probe for monitoring stack gas velocity.

Filter Holder - Borosilicate glass filter holder with a 4-in. Teflon frit filter support and a silicone rubber gasket. The holder design provided a positive seal against leakage from the outside or around the filter. The filter holder was heated to 320°F ±25°F during sampling.

Draft Gauge – Inclined manometer with a readability of 0.01-in. H_2O in the 0 to 1-in. range and 0.1-in. H_2O in the 1 to 10-in. range.

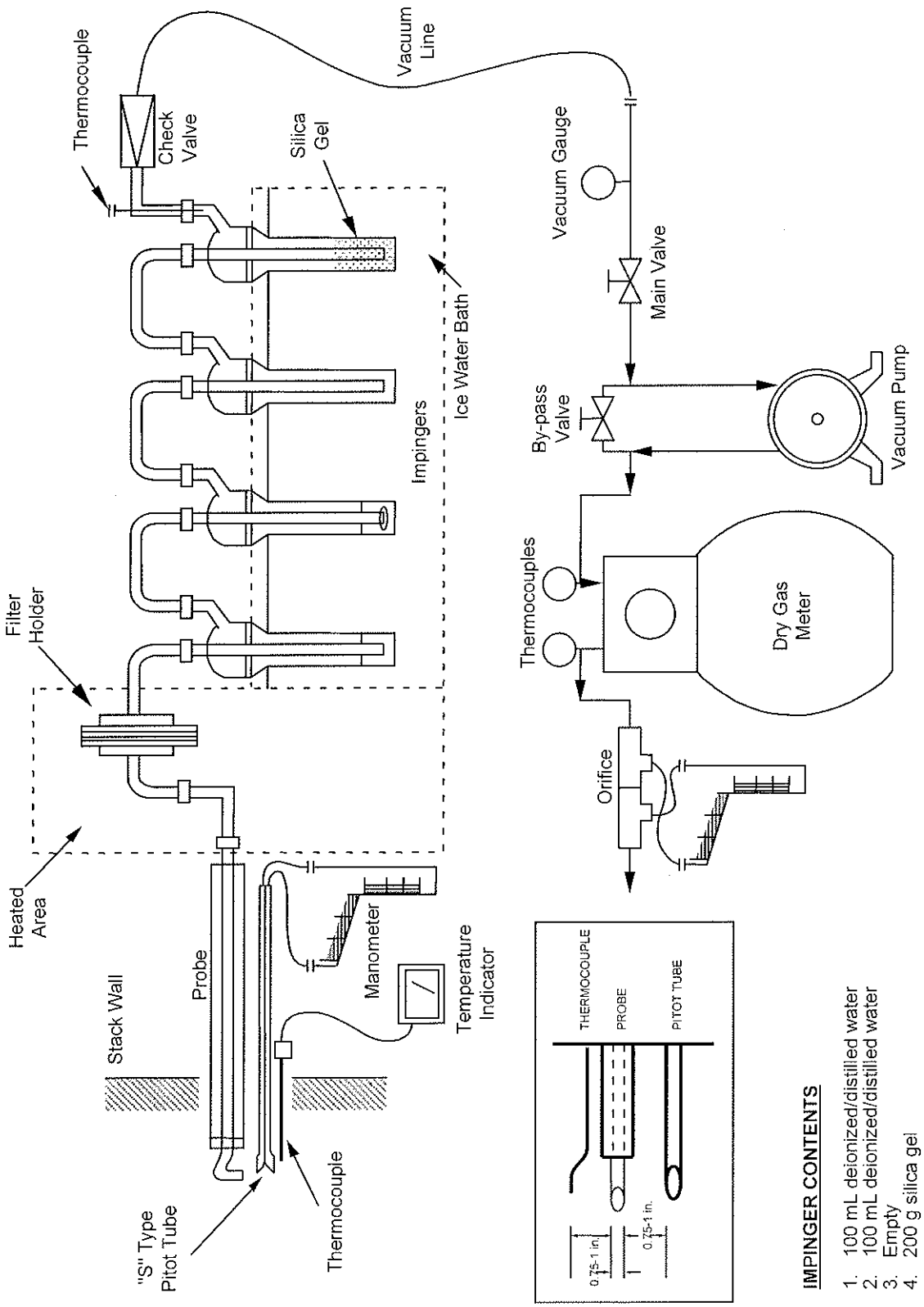
Impingers – Four (4) impingers connected in series with glass ball joints. The first, third and fourth impingers were of the Greenburg-Smith design, but modified by replacing the standard tip with a ½-in. i.d. glass tube extending to within ½-in. of the bottom of the impinger flask. The second impinger was of the Greenburg-Smith design with a standard tip.

Metering System - Apex Model 522. Vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 5°F, dry gas meter with ±2 percent accuracy and related equipment as required to maintain an isokinetic sampling rate and to determine sample volume.

Barometer - Mercury barometer capable of measuring atmospheric pressure to within ±0.1-in. Hg.

2.2.5.2 Sampling Procedures

After the sampling site and minimum number of traverse points were selected, the stack pressure, temperature, moisture and range of velocity differential pressure (ΔP) were measured according to procedures described in USEPA Methods 1 through 4. For the sampling train, the first and second impingers initially contained 100 milliliters (mL) of deionized/distilled water. The third impinger was initially empty. The fourth impinger contained 200 grams of silica gel. The train was set up with the probe and filter holder as shown in Figure 2-1.



IMPINGER CONTENTS

1. 100 mL deionized/distilled water
2. 100 mL deionized/distilled water
3. Empty
4. 200 g silica gel

FIGURE 2-1. USEPA METHOD 5F NONSULFATE PARTICULATE MATTER SAMPLING TRAIN

The sampling train was leak-checked at the sampling site by plugging the inlet to the nozzle and pulling a vacuum of 15-in. Hg. Leak rates of less than 0.02 ft^3/min at a vacuum of 15-in. Hg are considered acceptable. At the completion of each test run, the sampling train was leak-checked by the same procedure. Both pre and post-test leak checks of the pitot tube were made for each test run. Ice was placed around the impingers to keep the temperature of the gases leaving the last impinger at less than 68°F.

During sampling, stack gas and sampling train data were recorded at specified intervals. Isokinetic sampling rates were set throughout the sampling period with the aid of a programmable calculator.

2.2.5.3 Sample Recovery Procedures

After sampling was completed and the final leak checks performed, the filter and probe (front-half) were disconnected from the impinger train. The sample fractions were recovered as follows:

Container 1 - The filter holder was sealed.

Container 2 - Loose PM and deionized/distilled water washings from all sample-exposed surfaces prior to the filter were placed in a glass jar, sealed and labeled. PM was removed from the probe liner, nozzle and fitting with the aid of a brush and deionized/ distilled water rinsing. The liquid level was marked after the container was sealed.

Container 3 - A minimum of 200 mL of deionized/distilled water was taken for the blank analysis. The blank was obtained and treated in a similar manner as the contents of Container 2.

The contents of impingers 1 through 3 were measured for volume and then discarded. The contents of the fourth impinger (silica gel) were placed in a polyethylene bottle for subsequent weighing to the nearest gram.

2.2.5.4 Analytical Procedures

The analytical procedures followed those described in USEPA Method 5F.

The filter from Container 1 was cut into small pieces and placed in a 125 mL Erlenmeyer flask equipped with an air condenser. The sample container was rinsed with water and placed into the same flask as the filter pieces. The contents of the flask were refluxed on a hot plate for 6 to 8 hours. The solution was then cooled and transferred to a 500 mL volumetric flask. The contents of Container 2 (probe rinse) were placed in the 500 mL volumetric flask with the filter solution. The contents were then diluted to exactly 500 mL with water.

The sample was allowed to settle, and then a pipette was used to deliver 5 mL of the solution into a 50 mL volumetric flask. The aliquot was diluted to exactly 50 mL with water. The final solution was analyzed in duplicate by ion chromatography for sulfate content (SO_4^{-2}). The duplicate samples agreed within 5% of their mean and were compared to a 5-point standard calibration curve.

After the sulfate analysis, the remaining contents of the volumetric flask were transferred to a tared 250 mL beaker. The flask was carefully rinsed with water to make sure that all PM was transferred to the tared beaker. The beaker was transferred to an oven and heated to 105°C until approximately 100 mL of solution remained. The beaker was allowed to cool, after which five (5) drops of phenolphthalein indicator were added. Concentrated ammonium hydroxide was added until the solution turned pink. The sample was returned to the oven and evaporated to dryness at 105°C. The sample was then cooled, placed in a desiccator and subsequently weighed to a constant weight.

The term "constant weight" means a difference of no more than 0.5 mg or 1 percent of the total weight less tare weight, whichever is greater between two consecutive readings, with no less than 6 hours of desiccation between weighings.

SECTIONTHREE Process Description

The FCCU 500, constructed in 1945 and identified as Unit ID 230, is rated at 115,000 barrels per day. This unit converts hydrocarbons that boil above 500°F into lower molecular weight products, which include gasoline and LPG. The cracking takes place as the gas oil and catalyst stream mix in the reactor. This process results in the catalyst being coated with coke, which is subsequently burned off in a regenerator.

The process data summary is presented in Table 3-1.

TABLE 3-1. FCCU 500 PROCESS AND STACK CEMS DATA SUMMARY

TEST RUN NO. :	5F-1	5F-2	5F-3	Average
FCCU Regenerator Coke Burn, lb/hr	61,327	61,505	61,191	61,341
ESP Total Primary Power, KW	84	83	83	83
ESP Total Secondary Current, Amps	2,638	2,640	2,639	2,639
SO_2, ppm @ 0% O_2	2	2	2	2
NO_x, ppm @ 0% O_2	35	34	34	34

SECTIONFOUR Test Results

The test results are presented in Table 4-1.

The calculation summaries, field data, analytical data, calibration data, process data and test program qualifications are included in the appendices.

TABLE 4-1. FCCU 500 STACK NONSULFATE PM EMISSION TEST RESULTS

TEST RUN NO. :	5F-1	5F-2	5F-3	
TEST DATE :	6/17/2014	6/17/2014	6/17/2014	
TEST TIME :	14:53-15:58	16:35-17:40	18:10-19:15	Average
Stack Gas Parameters				
Temperature, °F	656.6	656.8	656.8	656.7
Velocity, av. ft/sec	130.0	129.9	129.9	129.9
Volumetric flow, acfm	496,335	495,761	495,945	496,013
Volumetric flow, scfm	227,401	227,097	227,181	227,226
Volumetric flow, scfh	13,644,034	13,625,834	13,630,876	13,633,581
Volumetric flow, dscfm	172,419	174,936	175,013	174,123
Volumetric flow, dscfh	10,345,145	10,496,147	10,500,798	10,447,363
Mass flow, Mlb/hr db	836.7	849.7	849.3	845.2
Moisture, av. % vol	24.2	23.0	23.0	23.4
Molecular weight, lb/lb-mole db	31.16	31.19	31.16	31.17
Carbon Dioxide, av. % vol	19.0	19.2	19.0	19.1
Oxygen, av. % vol	3.1	2.9	3.0	3.0
Particulate Sample				
Time, min.	60.0	60.0	60.0	60.0
Volume, dscf	38.172	39.118	39.051	38.780
Filterable nonsulfate PM, mg	72.98	78.54	79.31	76.94
Isokinetic ratio, %	97.7	98.6	98.4	98.2
Nonsulfate Filterable PM				
Concentration				
grains/dscf	0.0295	0.0310	0.0313	0.0306
mg/dscm	67.518	70.905	71.722	70.048
lb/dscf x 10^{-6}	4.216	4.427	4.478	4.374
Emission rate				
lb/hr	43.61	46.47	47.02	45.70
lb/1,000 lb coke burn	0.711	0.756	0.768	0.745

APPENDIX A Calculation Summaries

USEPA Method 2
Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client:	BP
Location:	Whiting, IN
Source:	FCCU 500 Exhaust
Date:	6/17/2014
Run #:	5F-1

Data Input

Carbon Dioxide (CO_2):	19.0	**%**
Oxygen (O_2):	3.1	**%**
Nitrogen (N_2):	77.9	**%**
Fractional Moisture Content (B_{wo})	0.2418	**dimensionless**
Stack Temperature (T_s):	656.6	**°F**
Pitot Coefficient (C_p):	0.84	**dimensionless**
Average square root of ΔP	1.5432	**inches H_2O**
Barometric Pressure (P_{bar}):	29.10	**inches Hg**
Static Pressure (S_t)	-1.50	**inches H_2O**
Stack diameter:	108.00	**inches H_2O**
Stack area (A_s):	63.6172	**ft^2**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$ = **31.158 lb/lb-mole**

Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws})$$ = **27.976 lb/lb-mole**

Absolute stack gas pressure:

$$P_s = P_{bar} + \left(\frac{S_t}{13.6}\right)$$ = **28.990 inches H_2O**

Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}}$$ = **130.031 feet/second**

Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60$$ = **496,335 acfm**

Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right]$$ = **227,401 scfm**

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right] \times 60$$ = **13,644,034 scfh**

Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo})$$ = **172,419 dscfm**

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60$$ = **10,345,145 dscfh**

USEPA Method 4
Moisture Determination Sample Calculations

Client:	BP
Location:	Whiting, IN
Source:	FCCU 500 Exhaust
Date:	6/17/2014
Run #:	5F-1

Data Input:

Volume metered (V_m):	42.388	**ft^3**
Meter calibration coefficient (Y_d):	0.989	**dimensionless**
Barometric pressure (P_{bar}):	29.10	**inches Hg**
Meter sample rate (ΔH):	1.63	**inches H_2O**
Meter inlet/outlet temperature (T_m):	106.3	**°F**
Volume of moisture collected (V_{lc}):	258.6	**milliliters**
Stack Temperature (T_s):	656.6	**°F**
Static Pressure (St):	-1.5	**inches H_2O**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Volume of sample, dry basis:

$$Vm_{std} = V_m \times Y_d \times \left(\frac{528.0°R}{29.92"Hg}\right) \times \left(\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460}\right)$$ = **38.172 dscf**

Volume of water vapor in sample:

$$Vw_{std} = \frac{0.04707 ft^3}{ml} \times V_{lc}$$ = **12.172 scf**

Fractional moisture content of stack gas:

$$B_{wo} = \frac{Vw_{std}}{(Vm_{std} + Vw_{std})}$$ = **0.2418 B_{wo}**

Percent Moisture:

$$\%moisture = B_{wo} \times 100$$ = **24.18 %**

Fractional moisture content of stack gas at saturated conditions:

$$T_{s(°K)} = ((T_s - 32) * 0.5556) + 273$$ = **620.0 °Kelvin**

$$P_{s(mmHg)} = \left(P_{bar} + \frac{S_t}{13.6}\right) \times 25.401$$ = **739.17 mm Hg**

$$B_{wos} = \frac{\sqrt{\left(10^{\left(A - \left(\frac{B}{(T_{s(°K)} - C)}\right)\right)}\right)}}{P_{s(mmHg)}}$$

where:
A= 8.361
B=1893.5
C=27.65

= **197.6126 B_{wo}**

Percent moisture at saturated conditions:

$$\%moisture_{saturated} = B_{wos} \times 100$$ = **100.00 %**

Percent moisture used for emissions calculations:

= **24.18 %**

USEPA Method 5F (Non-Sulfate PM)
Particulate Calculation Summary

Client:	BP
Location:	Whiting, IN
Source:	FCCU 500 Exhaust
Date:	6/17/2014
Run #:	5F-1

Data Input

Barometric pressure (P_{bar}):	29.10	**inches Hg**	**Particulate Weight:**	
Stack pressure (P_s):	28.99	**inches Hg Abs.**	**Filterable:**	72.98 **milligrams**
Test length (θ):	60.0	**minutes**		
Sample nozzle diameter (D_n):	0.2100	**inches**		
Sample nozzle area (A_n):	0.000241	**ft^3**		
Stack temperature (T_s):	656.6	**°F**		
Volume metered (Vm_{std}):	38.172	**ft^3**		
Stack gas velocity (V_s):	130.031	**feet/second**	**Coke Burn Rate:**	61,327 **lb/hr**
Stack gas volumetric flow (Q_{std}):	10,345,145	**dsct/hour**		
Fractional Moisture content (B_{wo}):	0.2418	**%**		

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Percent Isokinetic:

$$\%\text{Isokinetic} = \frac{0.0945 \times Vm_{std} \times (T_s + 460)}{P_s \times V_s \times \theta \times A_n \times (1 - B_{wo})}$$

= **97.7 % isokinetic**

Method 5-F Particulate Concentration:

$$C_s = \frac{\left(\frac{0.01543\text{grains}}{\text{mg}} \times M_n\right)}{V_{mstd}}$$

= **0.0295 gr/dscf**

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315\,ft^3}{m^3}$$

= **67.5183 mg/dscm**

$$C^1{}_s = \frac{\left(\frac{2.205 \times 10^{-6}\text{lb}}{\text{mg}} \times M_n\right)}{V_{mstd}}$$

= **4.216 x 10^{-6} lb/dscf**

Method 5-F Particulate Emission Rate:

$$E_p = C^1{}_s \times Q_{std}$$

= **43.612 lb/hr**

$$pmr_{lb/1000lb\,cokeburn} = \frac{(E_p)(1000)}{(R_c)}$$

= **0.7111 lb/1000lb coke burn**

USEPA Method 2
Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client: BP
Location: Whiting, IN
Source: FCCU 500 Exhaust
Date: 6/17/2014
Run #: 5F-2

Data Input

Carbon Dioxide (CO_2):	19.2	**%**
Oxygen (O_2):	2.9	**%**
Nitrogen (N_2):	77.9	**%**
Fractional Moisture Content (B_{wo})	0.2297	**dimensionless**
Stack Temperature (T_s):	656.8	**°F**
Pitot Coefficient (C_p):	0.84	**dimensionless**
Average square root of ΔP	1.5463	**inches H_2O**
Barometric Pressure (P_{bar}):	29.10	**inches Hg**
Static Pressure (S_t)	-1.50	**inches H_2O**
Stack diameter:	108.00	**inches H_2O**
Stack area (A_s):	63.6172	**ft^2**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$ = **31.188 lb/lb-mole**

Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws})$$ = **28.159 lb/lb-mole**

Absolute stack gas pressure:

$$P_s = P_{bar} + \left(\frac{S_t}{13.6}\right)$$ = **28.990 inches H_2O**

Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}}$$ = **129.881 feet/second**

Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60$$ = **495,761 acfm**

Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right]$$ = **227,097 scfm**

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right] \times 60$$ = **13,625,834 scfh**

Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo})$$ = **174,936 dscfm**

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60$$ = **10,496,147 dscfh**

USEPA Method 4
Moisture Determination Sample Calculations

Client:	BP
Location:	Whiting, IN
Source:	FCCU 500 Exhaust
Date:	6/17/2014
Run #:	5F-2

Data Input:

Volume metered (V_m):	43.546	**ft^3**
Meter calibration coefficient (Y_d):	0.989	**dimensionless**
Barometric pressure (P_{bar}):	29.10	**inches Hg**
Meter sample rate (ΔH):	1.63	**inches H_2O**
Meter inlet/outlet temperature (T_m):	107.7	**°F**
Volume of moisture collected (V_{lc}):	247.8	**milliliters**
Stack Temperature (T_s):	656.8	**°F**
Static Pressure (St):	-1.5	**inches H_2O**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Volume of sample, dry basis:

$$Vm_{std} = V_m \times Y_d \times \left(\frac{528.0°R}{29.92"Hg}\right) \times \left(\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460}\right)$$ = **39.118 dscf**

Volume of water vapor in sample:

$$Vw_{std} = \frac{0.04707 ft^3}{ml} \times V_{lc}$$ = **11.664 scf**

Fractional moisture content of stack gas:

$$B_{wo} = \frac{Vw_{std}}{(Vm_{std} + Vw_{std})}$$ = **0.2297 B_{wo}**

Percent Moisture:

$$\%moisture = B_{wo} \times 100$$ = **22.97 %**

Fractional moisture content of stack gas at saturated conditions:

$$T_{s(°K)} = ((T_s - 32) * 0.5556) + 273$$ = **620.1 °Kelvin**

$$P_{s(mmHg)} = \left(P_{bar} + \frac{S_t}{13.6}\right) \times 25.401$$ = **739.17 mm Hg**

$$B_{wos} = \frac{\sqrt{\left(10^{\left(A - \left(\frac{B}{(T_{s(°K)} - C)}\right)\right)}\right)}}{P_{s(mmHg)}}$$

where:
A= 8.361
B=1893.5
C=27.65

= **197.8856 B_{wo}**

Percent moisture at saturated conditions:

$$\%moisture_{saturated} = B_{wos} \times 100$$ = **100.00 %**

Percent moisture used for emissions calculations:

= **22.97 %**

USEPA Method 5F (Non-Sulfate PM)
Particulate Calculation Summary

Client:	BP
Location:	Whiting, IN
Source:	FCCU 500 Exhaust
Date:	6/17/2014
Run #:	5F-2

Data Input

Barometric pressure (P_{bar}):	29.10	**inches Hg**	**Particulate Weight:**	
Stack pressure (P_s):	28.99	**Inches Hg Abs.**	**Filterable:**	78.54 **milligrams**
Test length (θ):	60.0	**minutes**		
Sample nozzle diameter (D_n):	0.2100	**inches**		
Sample nozzle area (A_n):	0.000241	**ft^3**		
Stack temperature (T_s):	656.8	**°F**		
Volume metered (Vm_{std}):	39.118	**ft^3**		
Stack gas velocity (V_s):	129.881	**feet/second**	**Coke Burn Rate:**	61,505 **lb/hr**
Stack gas volumetric flow (Q_{std}):	10,496,147	**dscf/hour**		
Fractional Moisture content (B_{wo}):	0.2297	**%**		

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Percent Isokinetic:

$$\%\text{Isokinetic} = \frac{0.0945 \times Vm_{std} \times (T_s + 460)}{P_s \times V_s \times \theta \times A_n \times (1 - B_{wo})}$$

= **98.6 % isokinetic**

Method 5-F Particulate Concentration:

$$C_s = \frac{\left(\frac{0.01543\,\text{grains}}{\text{mg}} \times M_n\right)}{V_{mstd}}$$

= **0.0310 gr/dscf**

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315\,ft^3}{m^3}$$

= **70.9048 mg/dscm**

$$C^1{}_s = \frac{\left(\frac{2.205 \times 10^{-6}\,\text{lb}}{\text{mg}} \times M_n\right)}{V_{mstd}}$$

= **4.427 x 10^{-6} lb/dscf**

Method 5-F Particulate Emission Rate:

$$E_p = C^1{}_s \times Q_{std}$$

= **46.468 lb/hr**

$$pmr_{lb/1000lb\,coke\,burn} = \frac{(E_p)(1000)}{(R_c)}$$

= **0.7555 lb/1000lb coke burn**

USEPA Method 2
Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client:	BP
Location:	Whiting, IN
Source:	FCCU 500 Exhaust
Date:	6/17/2014
Run #:	5F-3

Data Input

Carbon Dioxide (CO_2):	19.0	**%**
Oxygen (O_2):	3.0	**%**
Nitrogen (N_2):	78.0	**%**
Fractional Moisture Content (B_{wo})	0.2296	**dimensionless**
Stack Temperature (T_s):	656.8	**°F**
Pitot Coefficient (C_p):	0.84	**dimensionless**
Average square root of ΔP	1.5463	**inches H_2O**
Barometric Pressure (P_{bar}):	29.10	**inches Hg**
Static Pressure (S_t)	-1.50	**inches H_2O**
Stack diameter:	108.00	**inches H_2O**
Stack area (A_s):	63.6172	**ft^2**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$ = **31.160 lb/lb-mole**

Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws})$$ = **28.138 lb/lb-mole**

Absolute stack gas pressure:

$$P_s = P_{bar} + \left(\frac{S_t}{13.6}\right)$$ = **28.990 inches H_2O**

Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}}$$ = **129.929 feet/second**

Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60$$ = **495,945 acfm**

Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right]$$ = **227,181 scfm**

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right] \times 60$$ = **13,630,876 scfh**

Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo})$$ = **175,013 dscfm**

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60$$ = **10,500,798 dscfh**

USEPA Method 4
Moisture Determination Sample Calculations

Client:	BP
Location:	Whiting, IN
Source:	FCCU 500 Exhaust
Date:	6/17/2014
Run #:	5F-3

Data Input:

Volume metered (V_m):	44.265	**ft^3**
Meter calibration coefficient (Y_d):	0.989	**dimensionless**
Barometric pressure (P_{bar}):	29.10	**inches Hg**
Meter sample rate (ΔH):	1.66	**inches H_2O**
Meter inlet/outlet temperature (T_m):	118.1	**°F**
Volume of moisture collected (V_{lc}):	247.3	**milliliters**
Stack Temperature (T_s):	656.8	**°F**
Static Pressure (St):	-1.5	**inches H_2O**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Volume of sample, dry basis:

$$Vm_{std} = V_m \times Y_d \times \left(\frac{528.0°R}{29.92"Hg}\right) \times \left(\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460}\right)$$ = **39.051 dscf**

Volume of water vapor in sample:

$$Vw_{std} = \frac{0.04707 ft^3}{ml} \times V_{lc}$$ = **11.640 scf**

Fractional moisture content of stack gas:

$$B_{wo} = \frac{Vw_{std}}{(Vm_{std} + Vw_{std})}$$ = **0.2296 B_{wo}**

Percent Moisture:

$$\%moisture = B_{wo} \times 100$$ = **22.96 %**

Fractional moisture content of stack gas at saturated conditions:

$$T_{s(°K)} = ((T_s - 32) * 0.5556) + 273$$ = **620.1 °Kelvin**

$$P_{s(mmHg)} = \left(P_{bar} + \frac{S_t}{13.6}\right) \times 25.401$$ = **739.17 mm Hg**

$$B_{wos} = \frac{\sqrt{\left(10^{\left(A - \left(\frac{B}{(T_{s(°K)} - C)}\right)\right)}\right)}}{P_{s(mmHg)}}$$

where:
A= 8.361
B=1893.5
C=27.65

= **197.8856 B_{wo}**

Percent moisture at saturated conditions:

$$\%moisture_{saturated} = B_{wos} \times 100$$ = **100.00 %**

Percent moisture used for emissions calculations:

= **22.96 %**

USEPA Method 5F (Non-Sulfate PM)
Particulate Calculation Summary

Client:	BP
Location:	Whiting, IN
Source:	FCCU 500 Exhaust
Date:	6/17/2014
Run #:	5F-3

Data Input

Barometric pressure (P_{bar}):	29.10	**inches Hg**	**Particulate Weight:**	
Stack pressure (P_s):	28.99	**Inches Hg Abs.**	**Filterable:**	79.31 **milligrams**
Test length (θ):	60.0	**minutes**		
Sample nozzle diameter (D_n):	0.2100	**inches**		
Sample nozzle area (A_n):	0.000241	**ft^3**		
Stack temperature (T_s):	656.8	**°F**		
Volume metered (Vm_{std}):	39.051	**ft^3**		
Stack gas velocity (V_s):	129.929	**feet/second**	**Coke Burn Rate:**	61,191 **lb/hr**
Stack gas volumetric flow (Q_{std}):	10,500,798	**dscf/hour**		
Fractional Moisture content (B_{wo}):	0.2296	**%**		

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Percent Isokinetic:

$$\%Isokinetic = \frac{0.0945 \times Vm_{std} \times (T_s + 460)}{P_s \times V_s \times \theta \times A_n \times (1 - B_{wo})}$$

= **98.4 % isokinetic**

Method 5-F Particulate Concentration:

$$C_s = \frac{\left(\frac{0.01543 grains}{mg} \times M_n\right)}{V_{mstd}}$$

= **0.0313 gr/dscf**

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 ft^3}{m^3}$$

= **71.7219 mg/dscm**

$$C^1{}_s = \frac{\left(\frac{2.205 \times 10^{-6} lb}{mg} \times M_n\right)}{V_{mstd}}$$

= **4.478 x 10^{-6} lb/dscf**

Method 5-F Particulate Emission Rate:

$$E_p = C^1{}_s \times Q_{std}$$

= **47.024 lb/hr**

$$pmr_{lb/1000lb\,coke\,burn} = \frac{(E_p)(1000)}{(R_c)}$$

= **0.7685 lb/1000lb coke burn**

APPENDIX B

Field Data

TRAVERSE POINT LOCATIONS FOR CIRCULAR AND RECTANGULAR STACKS AND DUCTS

Facility BP Whiting
Date 6-17-14
Sampling Location FCC 500 Exhaust
Inside of Far Wall to
Outside of Port (Distance C) 114.5 in.
Inside of Near Wall to
Outside of Port (Distance D) 6.5 in
Stack ID (Distance C- Distance D) 108 in.
Port Distance Downstream From Disturbance (B) 13.68 in.
Port Distance Upstream From Disturbance (A) 720 in.
Equivalent Diameters Downstream From Disturbance (B) 12.67 (≥ 2.0)
Equivalent Diameters Upstream From Disturbance (A) 6.67 (≥ 0.5)
Number of Ports Used 2 Traverse Points / Port 6

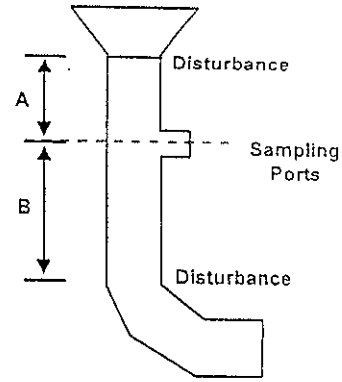
Note: Sketch Stack/Ports/Control Device on Back of Form

Equivalent Diameters Downstream From Disturbance (B) = 12.67
[Distance B / Stack ID]

Equivalent Diameters Upstream From Disturbance (A) = 6.67
[Distance A / Stack ID]

Equivalent Diameter For a Square or Rectangular Stack = N/A
[(2 x L x W) / (L + W)]

Port ID 6 in. (for monorail bracket specs.)
Port Length Outside of Stack 4 in. (for monorail bracket specs.)



1	2	3	4	5	6
Port Traverse Point Number	Fractional % of Stack I.D. (trac. %)	Stack I.D. (inches)	Product of Columns 2 and 3 (inches)	Port Depth (inches)	Traverse Point Location From Outside of Port (Sum of 4 and 5 in inches)
1	0.044	108	4.75	6.5	11.25
2	0.146		15.77		22.27
3	0.296		31.97		38.47
4	0.704		76.03		82.53
5	0.854		92.23		98.73
6	0.956		103.25		109.75
7					
8					
9					
10					
11					
12					

For Stacks / Ducts ≤ 24 inches ID – No traverse point shall be located less than 0.5 inches from stack wall

For Stacks / Ducts > 24 inches ID – No traverse point shall be located less than 1.0 inches from stack wall

QA/QC Check:
Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓

Method 1 Calculator Signature/Date [signature] 6-17-14

Field Supervisor Signature/Date [signature] 6-17-14

LOCATION OF TRAVERSE POINTS IN CIRCULAR STACKS

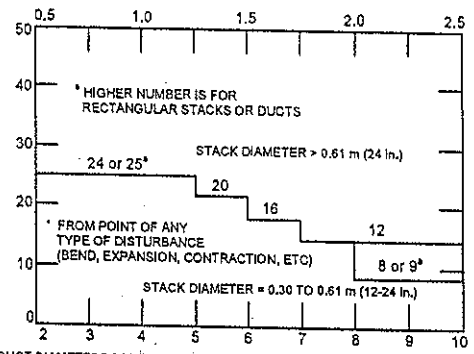
Pts	4	6	8	10	12
1	6.7	4.4	3.2	2.6	2.1
2	25.0	14.6	10.5	8.2	6.7
3	75.0	29.6	19.4	14.6	11.8
4	93.3	70.4	32.3	22.6	17.7
5		85.4	67.7	34.2	25.0
6		95.6	80.6	65.8	35.6
7			89.5	77.4	64.4
8			96.8	85.4	75.0
9				91.8	82.3
10				97.4	88.2
11					93.3
12					97.9

LOCATION OF TRAVERSE POINTS IN RECTANGULAR STACKS
CEMS*

Pts	2	3	4	5	6	7	8	9
1	25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6
2	75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7
3		83.3	62.5	50.0	41.7	35.7	31.3	27.8
4			87.5	70.0	58.3	50.0	43.8	38.9
5				90.0	75.0	64.3	56.3	50.0
6					91.7	78.6	68.8	61.1
7						92.9	81.3	72.2
8							93.8	83.3
9								94.4

*3 point CEMS RATA traverse point locations (valid for rectangular and round stacks)

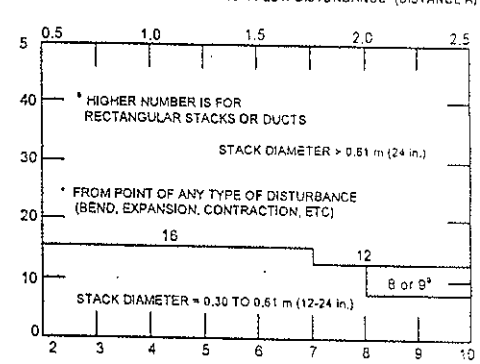
DUCT DIAMETERS UPSTREAM FROM FLOW DISTURBANCE* (DISTANCE A)



DUCT DIAMETERS DOWNSTREAM FROM FLOW DISTURBANCE* (DISTANCE B)

MINIMUM NUMBER OF TRAVERSE POINTS
ISOKINETIC TESTING

DUCT DIAMETERS UPSTREAM FROM FLOW DISTURBANCE* (DISTANCE A)



DUCT DIAMETERS DOWNSTREAM FROM FLOW DISTURBANCE* (DISTANCE B)

MINIMUM NUMBER OF TRAVERSE POINTS
FOR VELOCITY (NON-ISOKINETIC) TRAVERSES

Form FDF 4000.00

VELOCITY TRAVERSE AND CYCLONIC FLOW VERIFICATION

PLANT: BP Whiting
DATE: 6-16-14
LOCATION: Whiting, IN
SOURCE: FCC 500
STACK ID: 108
PROBE #/TC #: 735
BAROMETRIC PRESSURE, in. Hg: 29.05
OPERATORS: WAH, BJ

SCHEMATIC OF TRAVERSE POINT LAYOUT

RUN NO. Prelim cyclonic
STATIC, in. H_2O —
START: 1310 STOP: 1320
PRE-TEST: +/-05 POST-TEST: +/-05

TRAVERSE POINT NUMBER	VELOCITY HEAD, ΔP (in. H_2O)	STACK TEMP. (°F)	YAW ANGLE (°)
1			8
2			7
3			3
4			3
5			4
6			5
1			7
2			8
3			4
4			5
5			2
6			7
AVERAGE			4.20

RUN NO. _____
STATIC, in. H_2O _____
START: _____ STOP: _____
PRE-TEST: _____ POST-TEST: _____

TRAVERSE POINT NUMBER	VELOCITY HEAD, ΔP (in. H_2O)	STACK TEMP. (°F)	YAW ANGLE (°)
AVERAGE			

Form FDF 4005.00

FIELD DATA

PLANT	BP whiting	AMBIENT TEMPERATURE	100	PROBE HEATER SETTING	320
DATE	6-17-14	BAROMETRIC PRESSURE	29.1	HEATER BOX SETTING	320
LOCATION	Whiting IN	ASSUMED MOISTURE, %	25	METER $H_@$	1.95
OPERATOR	BT	PROBE LENGTH, in.	~~108~~ 120	C_p FACTOR	0.84
STACK NO.	FCCU 900	NOZZLE DIAMETER, in.	0.260	Y_d FACTOR	0.989
RUN NO.	~~5C~~ 5F-1	STACK DIAMETER, in.	108	PITOT NO.	735
SAMPLE BOX NO.	A9E12	MINUTES PER POINT	5		
METER BOX NO.	601612	NUMBER OF POINTS	12		
START TIME	1453	NUMBER OF PORTS	2		

WEIGHT OF PARTICULATE, mg		
Filter No.	55555	
Sample		
Final wt		
Tare wt		
Wt. gain	881.	
TOTAL		mg

CROSS SECTION

CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (Θ) min.	STATIC PRESSURE (in. H_2O)	STACK TEMP (T_S) °F	VELOCITY HEAD (ΔP_S)	VELOCITY HEAD (ΔP_S)	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O ACTUAL	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O DESIRED	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP AT DRY GAS METER INLET (Tm_{in}) °F	GAS SAMPLE TEMP AT DRY GAS METER OUTLET (Tm_{out}) °F	FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
1453	1	0	-1.5	656	–	2.5	1.7	1.68	557.055	105	–	321	320	–	65	5
1458	2	5		656		2.4	1.6	1.61	560.75	106		335	322		63	4
1503	3	10		657		2.5	1.7	1.69	564.38	105		336	322		64	5
1508	4	15		657		2.5	1.7	1.69	568.08	106		320	320		65	4
1513	5	20		657		2.3	1.6	1.56	571.78	107		314	323		65	4
1518	6	25		657		2.3	1.6	1.56	575.39	107		310	323		65	4
1523/1528	1	30		657		2.4	1.6	1.62	578.88	107		305	322		65	4
1533	2	35		657		2.6	1.8	1.76	582.50	107		304	320		63	4
1538	3	40		656		2.4	1.6	1.63	586.28	106		307	321		64	3
1543	4	45		656		2.3	1.6	1.57	589.90	106		321	325		65	4
1548	5	50		656		2.3	1.6	1.57	593.46	108		330	325		65	4
1553	6	55		657		2.1	1.4	1.43	597.03	107		329	325		66	4
1558		60							599.443							
AVERAGE	12	60 min	-1.5	656.6	–	1.5432	~~1.63~~ 1.53		42.388	106.33	–	—	—	–	768	~~4~~ 5

✓ by WAH 6-19-14

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g) #1	#2	#3	#4	#5	SILICA GEL WEIGHT g
FINAL 306	~~155~~	~~144~~ 144	0			208.6
INITIAL	100	100	0	50		200
LIQUID COLLECTED 206	~~306~~	~~144~~ 44	0			~~5.6~~
TOTAL LIQUID COLLECTED (specify ml or g)						258.6

ORSAT DATA	TIME	CO_2	O_2
TRIAL 1		19.0	3.1
TRIAL 2		19.0	3.1
TRIAL 3		19.0	3.1
Average		19.0	3.1

LEAK CHECK	
SYSTEM PRE:	00.000 CFM@15"Hg
POST:	00.000 CFM@15"Hg
PITOT PRE:	+/- OK @>3"H_2O
POST:	+/- OK @>3"H_2O

Form FDF 4003.00

FIELD DATA

PLANT	BP Whiting	AMBIENT TEMPERATURE	100	PROBE HEATER SETTING	320
DATE	6-19-14	BAROMETRIC PRESSURE	29.1	HEATER BOX SETTING	320
LOCATION	Whiting IN	ASSUMED MOISTURE, %	25	METER $H_@$	1.95
OPERATOR	BT	PROBE LENGTH, in.	~~104~~ 120	C_p FACTOR	0.84
STACK NO.	FCCU 500	NOZZLE DIAMETER, in.	0.210	Y_d FACTOR	0.989
RUN NO.	5F-2	STACK DIAMETER, in.	108	PITOT NO.	735
SAMPLE BOX NO.	APEX	MINUTES PER POINT	5		
METER BOX NO.	601012	NUMBER OF POINTS	12		
START TIME	1635	NUMBER OF PORTS	2		

WEIGHT OF PARTICULATE, mg		
Filter No.	15554	
Sample		
Final wt		
Tare wt		
Wt. gain	845.0	
TOTAL		mg

CROSS SECTION

CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (Θ) min.	STATIC PRESSURE (in. H_2O)	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP_s)	VELOCITY HEAD (ΔP_s)	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O ACTUAL	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O DESIRED	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP AT DRY GAS METER INLET (Tm_{in}) °F	GAS SAMPLE TEMP AT DRY GAS METER OUTLET (Tm_{out}) °F	FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
1635	1	0	-1.5	657	–	2.5	1.7	1.71	599.913	103	–	310	321	–	64	4
1640	2	5		657		2.4	1.6	1.64	603.63	104		308	321		64	4
1645	3	10		656		2.3	1.6	1.57	607.27	104		305	323		65	4
1650	4	15		657		2.3	1.6	1.56	610.83	105		315	320		65	4
1655	5	20		657		2.4	1.6	1.63	614.37	105		330	320		65	4
1700	6	25		657		2.5	1.7	1.70	618.00	107		309	321		63	~~4~~ 5
1705/1710	1	30		657		2.4	1.6	1.63	621.71	107		311	322		63	5
1715	2	35		657		2.4	1.6	1.63	625.34	109		309	325		65	5
1720	3	40		656		2.5	1.7	1.71	628.98	110		325	324		65	5
1725	4	45		657		2.4	1.6	1.64	632.71	110		338	324		66	5
1730	5	50		657		2.3	1.6	1.55	636.37	114		335	323		66	5
1735	6	55		657		2.3	1.6	1.58	639.97	114		337	322		66	5
1740		60							643.459							
AVERAGE	12	60 min	-1.5	656.8	–	1.5465	~~1.6250~~ 1.63	—	43.540	107.7	–	—	—	–	768	max 5

✓ by WAH 6-19-14

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g) #1	#2	#3	#4	#5	SILICA GEL WEIGHT g
FINAL	280 ~~180~~	~~56~~ 156	0			211.8
INITIAL	100	100	0	56		200
LIQUID COLLECTED	180 ~~240~~	~~156~~ 56	0			11.8
TOTAL LIQUID COLLECTED (specify ml or g)						247.8

ORSAT DATA	TIME	CO_2	O_2
TRIAL 1		19.2	2.9
TRIAL 2		19.2	2.9
TRIAL 3		19.2	2.9
Average		19.2	2.9

LEAK CHECK		
SYSTEM PRE:	00.000	CFM@15"Hg
POST:	00.000	CFM@15"Hg
PITOT PRE:	+/- ok	@>3"H_2O
POST:	+/- ok	@>3"H_2O

Form FDF 4003.00

FIELD DATA

ARI ENVIRONMENTAL INC.

PLANT	BP whiting	AMBIENT TEMPERATURE	100	PROBE HEATER SETTING	320
DATE	6-17-14	BAROMETRIC PRESSURE	29.1	HEATER BOX SETTING	320
LOCATION	Whiting IN	ASSUMED MOISTURE, %	25	METER $H_@$	1.95
OPERATOR	BT	PROBE LENGTH, in.	~~104~~ 120	C_p FACTOR	0.84
STACK NO.	FCCU 500	NOZZLE DIAMETER, in.	0.210	Y_d FACTOR	0.989
RUN NO.	5F-3	STACK DIAMETER, in.	108	PITOT NO.	735
SAMPLE BOX NO.	APEX	MINUTES PER POINT	5		
METER BOX NO.	6011012	NUMBER OF POINTS	12		
START TIME	1810	NUMBER OF PORTS	2		

WEIGHT OF PARTICULATE, mg		
Filter No.	65552	
Sample		
Final wt.		
Tare wt.	8823	
Wt. gain		
TOTAL		mg

CROSS SECTION

CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (Θ) min.	STATIC PRESSURE (in. H_2O)	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP_s)	VELOCITY HEAD (ΔP_s)	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O ACTUAL	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O DESIRED	GAS SAMPLE VOLUME (Vm) ft³	GAS SAMPLE TEMP AT DRY GAS METER INLET (Tm_{in}) °F	GAS SAMPLE TEMP AT DRY GAS METER OUTLET (Tm_{out}) °F	FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
1810	1	0	-1.5	657	–	2.5	1.7	1.72	643.912	114	–	325	320	–	62	7
1815	2	5		657		2.4	1.6	1.65	647.67	116		315	321		63	7
1820	3	10		657		2.5	1.7	1.73	651.36	116		323	321		64	7
1825	4	15		656		2.3	1.6	1.59	655.13	118		330	322		65	7
1830	5	20		656		2.3	1.6	1.59	658.75	118		329	322		65	7
1835	6	25		657		2.4	1.7	1.66	662.37	118		329	321		66	7
1840/1845	1	30		657		2.3	1.6	1.59	666.06	119		309	320		64	7
1850	2	35		657		2.4	1.7	1.66	669.68	119		312	320		64	7
1855	3	40		657		2.4	1.7	1.66	673.37	119		315	322		65	7
1900	4	45		657		2.5	1.7	1.73	677.06	120		320	323		65	7
1905	5	50		657		2.4	1.7	1.66	680.83	120		321	323		66	7
1910	6	55		657		2.3	1.6	1.59	684.53	120		322	323		66	7
1915		60							688.177							
AVERAGE	12	60	-1.5	656.8	–	TDP= 1.5463	Average ~~1.6583~~ 1.66	–	44.265	118.1	–	–	–	–	768	7

✓ by WAH 6-19-14

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g) #1	#2	#3	#4	#5	SILICA GEL WEIGHT g
FINAL	275	160	0			212.3
INITIAL	100	100	0	SG		200
LIQUID COLLECTED	175	60	0			12.3
TOTAL LIQUID COLLECTED (specify ml or g)						247.3

ORSAT DATA	TIME	CO_2	O_2
TRIAL 1		19	3
TRIAL 2		19	3
TRIAL 3		19	3
Average		19	3

LEAK CHECK	
SYSTEM PRE:	80.000K CFM@15"Hg
POST:	50.000K CFM@15"Hg
PITOT PRE:	+/-OK @>3"H_2O
POST:	+/-OK @>3"H_2O

Form FDF 4003.00

ARI ENVIRONMENTAL INC.

SAMPLING NOZZLE INSPECTION AND MEASUREMENT

Date: 6-17-14

Nozzle ID: 0.210

Nozzle Type: Stainless steel

Inspected By: WAH

Nozzle Clean: (Y) / N

Nozzle Undamaged: (Y) / N

Absent of Nicks or Dents: (Y) / N

Leading Edge Sharp: (Y) / N

Nozzle Diameter			ΔD	D_{avg}
D_1 (inches)	D_2 (inches)	D_3 (inches)	(inches)	(inches)
0.210	0.210	0.209	0.001 ~~0.0~~ ~~0.2095~~	~~0.2095~~ 0.2097

where:

$D_{1,2,3}$ = three different nozzle diameter measurements , (inches) ; each diameter must be measured to within 0.001 inches

ΔD = maximum difference between any two diameters, (inches) ; $\Delta D \leq 0.004$ inches

D_{avg} = average of D_1, D_2, and D_3, (inches)

√ by WAH 6-19-14

Form FDF 4004.00

APPENDIX C

Analytical Data

ANALYTICAL REPORT

Client: BP

Sampling Location: Whiting, IN

Sampling Date(s): 6/17/14

Lab Project Number: 08-655

COC Numbers(s): W02429

Analysis Date(s): 6/20 – 6/25/14

Analytical Method: USEPA Method 5F

Prepared For:
ARI Environmental, Inc.
951 Old Rand Road, Unit 106
Wauconda, IL 60084
Project Mgr: Steve Flaherty
Phone: 847-487-1580 ext. 117
Fax: 847-487-1587
E-mail: sflaherty@arienv.com

Prepared By:
ARI Environmental, Inc.
951 Old Rand Road, Unit 106
Wauconda, IL 60084
Eric Vogt, Lab Manager
Phone: 847-487-1580 ext.116
Fax: 847-487-1587
E-mail: evogt@arienv.com

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- The results and interpretations expressed in this report represent the best judgment of ARI Environmental, Inc.
- This report shall not be reproduced, except in full, without the expressed written approval of ARI Environmental, Inc.

State of Texas TCEQ/NELAP Certificate ID: T104704428-13-5
State of Louisiana LDEQ/LELAP Certificate ID: 02010
State of New Jersey NJDEP Certification ID: IL007

Project Narrative

Sample Receipt and Acceptance Quality Assurance:

Nine (9) samples were received in good condition and were logged in at the ARI laboratory located in Wauconda, IL on 6/19/14. All sample receipt acceptance criteria were met as documented in the Sample Receipt Checklist included in this report.

Analytical Quality Assurance:

Analysis of samples met the procedural requirements and QA/QC criteria set forth in the TNI Standard, applicable reference methods and standard operating procedures and, where applicable, the project test plan.

Data Interpretation and Comments:

There were no deviations from the test methods and no non-standard conditions that may affect the quality of the test results. Test results reported under this project number apply only to the samples as received and identified on the chain-of-custody document(s) included in this report.

Scope of Accreditation:

All test methods and analytes were analyzed under ARI's current scope of accreditation under TCEQ/NELAP.

Laboratory Contact Information:

If you have any questions regarding these test results, please contact Mr. Eric Vogt, Laboratory Manager, at 847-487-1580 ext.116 or by e-mail at evogt@arienv.com.

Reviewed and Approved by:

Eric Vogt

Signature: Laboratory Manager

6/26/14

Date

951 Old Rand Road # 106
Wauconda, IL 60084

Texas NELAP ID: T 104704428-13-5

ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting
Whiting, IN
FCCU 500

Lab Project #: 08-655
Project Manager: Steve Flaherty
Received: 6/19/2014
Reported: 6/26/2014

Sample ID: 5F-1 Probe Wash
Lab Sample #: 13391
Date Sampled: 06/17/2014
Field #: 44058

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Sample ID: 5F-1 Filter
Lab Sample #: 13392
Date Sampled: 06/17/2014
Field #: 55555

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	USEPA Method 5F	Joel Ruggaber	06/26/2014	73.00	mg	
Sulfate	USEPA Method 5F	Joel Ruggaber	06/26/2014	1029.3	ug	

Sample ID: 5F-2 Probe Wash
Lab Sample #: 13393
Date Sampled: 06/17/2014
Field #: 44059

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Sample ID: 5F-2 Filter
Lab Sample #: 13394
Date Sampled: 06/17/2014
Field #: 55554

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	USEPA Method 5F	Joel Ruggaber	06/26/2014	78.50	mg	
Sulfate	USEPA Method 5F	Joel Ruggaber	06/26/2014	879.6	ug	

Sample ID: 5F-3 Probe Wash
Lab Sample #: 13395
Date Sampled: 06/17/2014
Field #: 44060

951 Old Rand Road # 106
Wauconda, IL 60084

Texas NELAP ID: T 104704428-13-5

ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting
Whiting, IN
FCCU 500

Lab Project #: 08-655
Project Manager: Steve Flaherty
Received: 6/19/2014
Reported: 6/26/2014

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Sample ID: 5F-3 Filter
Lab Sample #: 13396
Date Sampled: 06/17/2014
Field #: 55552

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	USEPA Method 5F	Joel Ruggaber	06/26/2014	79.30	mg	
Sulfate	USEPA Method 5F	Joel Ruggaber	06/26/2014	717.4	ug	

Sample ID: DI Blank
Lab Sample #: 13397
Date Sampled: 06/17/2014
Field #: 44061

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Sample ID: Filter Blank
Lab Sample #: 13398
Date Sampled: 06/17/2014
Field #: 55548

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	USEPA Method 5F	Joel Ruggaber	06/26/2014	3.70	mg	
Sulfate	USEPA Method 5F	Joel Ruggaber	06/26/2014	<89.8	ug	

Sample ID: Trip Blank
Lab Sample #: 13399
Date Sampled: 06/17/2014
Field #: 55551

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Notes: UA - Not a NELAC accredited analyte under this method.

951 Old Rand Road # 106

Wauconda, IL 60084

Texas NELAP ID: T 104704428-13-5

ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting
Whiting, IN
FCCU 500

Lab Project #: 08-655
Project Manager: Steve Flaherty
Received: 6/19/2014
Reported: 6/26/2014

NA - Sample not tested for this analyte.
D - Value calculated from dilution.
J - Value less than the low standard but above the Limit of Detection (LOD).
L - Sample leaked before receipt.
H - Value greater than the high standard.

ANALYTICAL SUMMARY

CLIENT: BP
LOCATION: Whiting, IN
SOURCE: FCCU 500
SAMPLE DATE: 6/17/2014
ANALYSIS: Particulates
METHOD: USEPA Method 5F

ANALYST: J. Ruggaber
DATE OF COMPLETION: 6/26/2014
TEMPLATE CONTROL ID: USEPA-M5F-PARTIC-TEMPLATE-61T-REV3
PROJECT NUMBER: 08-655

Ammonium Sulfate and Particulate Weight

Identification		LIMS Number	Tare	WT1	WT2	WT 1 - WT 2 (mg)	Particulate (mg)	Blank Corrected Total Partic. (mg)
5F-1	FILTER	13392	881.4	118095.1	118095.2	-0.1	78.1	74.40
	BEAKER	13391	117135.6					
5F-2	FILTER	13394	885.0	110494.2	110494.4	-0.2	83.5	79.75
	BEAKER	13392	109525.8					
5F-3	FILTER	13396	882.3	113524.3	113524.4	-0.1	84.1	80.30
	BEAKER	13393	112558.0					
DI Water Blank	BEAKER	13397	112993.6	113884.0	113884.1	-0.1	3.7	-
Filter Blank	FILTER	13398	886.7					

Identification		Volume (mL)	Tare	WT1	WT2	WT 1 - WT 2 (mg)	Condensate (mg)	Target Weight (mg)	% Accuracy	Pass/Fail
LCS	QC	100	114137.0	114236.3	114236.5	0.2	99.4	100.3	99.1	Pass

Sample Concentration Calculations (Ammonium Sulfate Weight)

Identification	Analysis 1 (area counts)	Analysis 2 (area counts)	Average (area counts)	Deviation (%)	Diluted SO_4 Conc. (µg/ml)	Dilution Factor	Sample Volume (mls)	SO_4 mass (µg)	$(NH_4)_2SO_4$ mass (mg)	Corrected for Blank (mg)
5F-1	0.0165	0.0165	0.0165	0.00	0.21	10	500	1029.33	1.42	1.42
5F-2	0.0141	0.0141	0.0141	0.00	0.18	10	500	879.61	1.21	1.21
5F-3	0.0118	0.0112	0.0115	2.61	0.14	10	500	717.41	0.99	0.99
Field Blank	<0.0014	<0.0014	<0.0014	0.00	<0.02	10	500	<89.83	<0.12	-
Lab DI Water Blank	<0.0014	<0.0014	<0.0014	0.00	<0.02	-	-	-	-	-

ID	Analysis 1 (area counts)	Analysis 2 (area counts)	Average (area counts)	Deviation (%)	Actual Conc. (µg/ml)	Spike Conc. (µg/ml)	Theo. Spike Conc. (µg/ml)	R (%)	Pass/Fail
spike 1	0.0230	0.0236	0.023	-1.29	**0.29**	0.11	0.10	105.4	Pass
spike 2	0.0232	0.0226	0.023	1.31	**0.29**	0.10	0.10	100.4	Pass

spike prep: 9 mL of 5F-1 + 1 mL of 1 ppm std

CLIENT: BP
LOCATION: Whiting, IN
SOURCE: FCCU 500
SAMPLE DATE: 6/17/2014
ANALYSIS: Particulates
METHOD: USEPA Method 5F

ANALYST: J. Ruggaber
DATE OF COMPLETION: 6/26/2014
TEMPLATE CONTROL ID: USEPA-M5F-PARTIC-TEMPLATE-61T-REV3
PROJECT NUMBER: 08-655

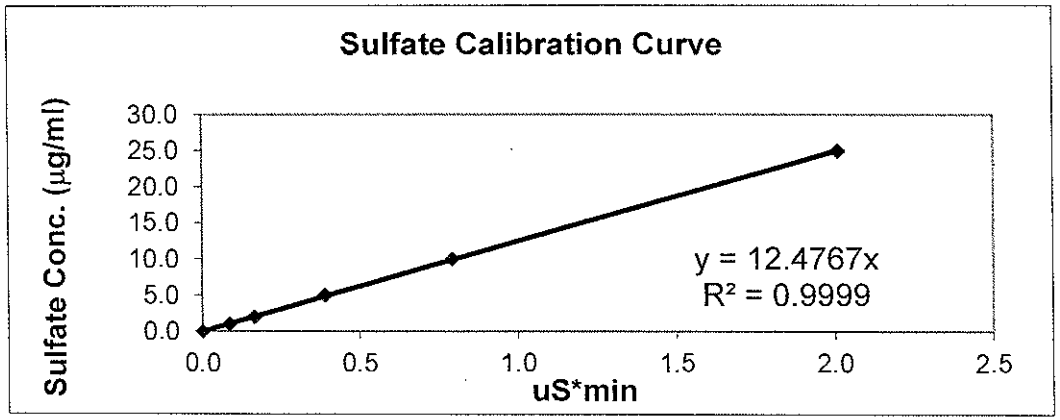
Non-Sulfate Particulate Weight

Identification	Total Partic (mg)	Mass NH_4SO4 (mg)	Corrected Partic (mg)
Run 1	74.40	1.42	72.98
Run 2	79.75	1.21	78.54
Run 3	80.30	0.99	79.31

Std. (µg/ml)	Pre Cal (µS*min)	Post Cal (µS*min)	Average (µS*min)	Deviation (%)		Conc (µg/ml)	Peak Area	RE	Cal Conc	% Dif
0.0	0.00	0.00	0.00	0.00		1.0	0.085	0.085	1.0	4.83
1.0	0.085	0.085	0.085	-0.41		2.0	0.165	0.082	2.0	1.89
2.0	0.168	0.162	0.165	1.67		5.0	0.389	0.078	4.8	-3.94
5.0	0.383	0.394	0.389	-1.45		10.0	0.793	0.079	9.8	-2.05
10.0	0.815	0.771	0.793	2.75		25.0	2.009	0.080	24.8	-0.72
25.0	1.994	2.024	2.009	-0.73		mean RF------>	0.0809			
					2nd std	5.0	0.3972	N/A	5.0	-0.98

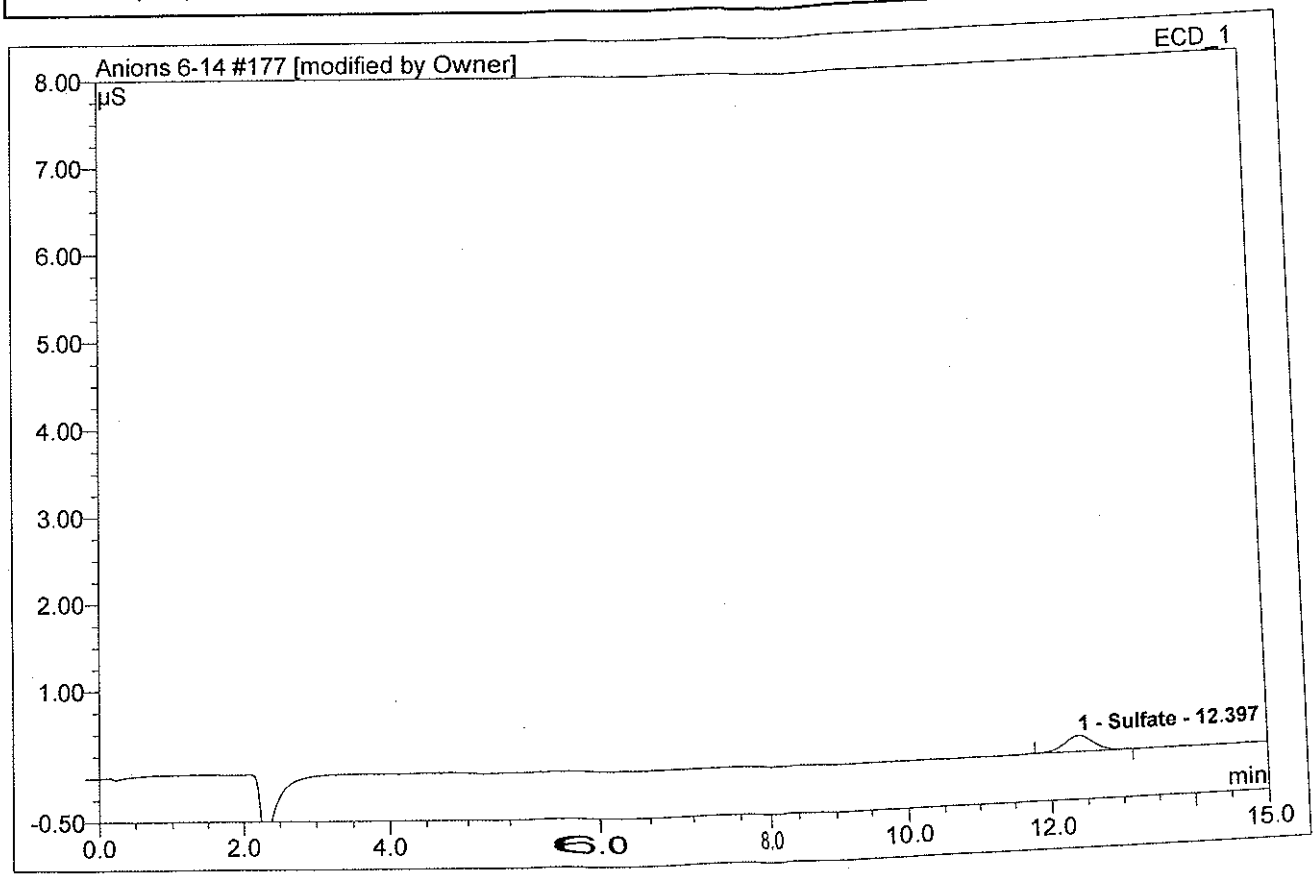
CCVs

Conc. (µg/ml)	Inj. #	Peak Area	% Diff	Pass/Fail
5.0	199	0.3951	1.63	Pass



177 1.0 ppm sulfate 6-19-14

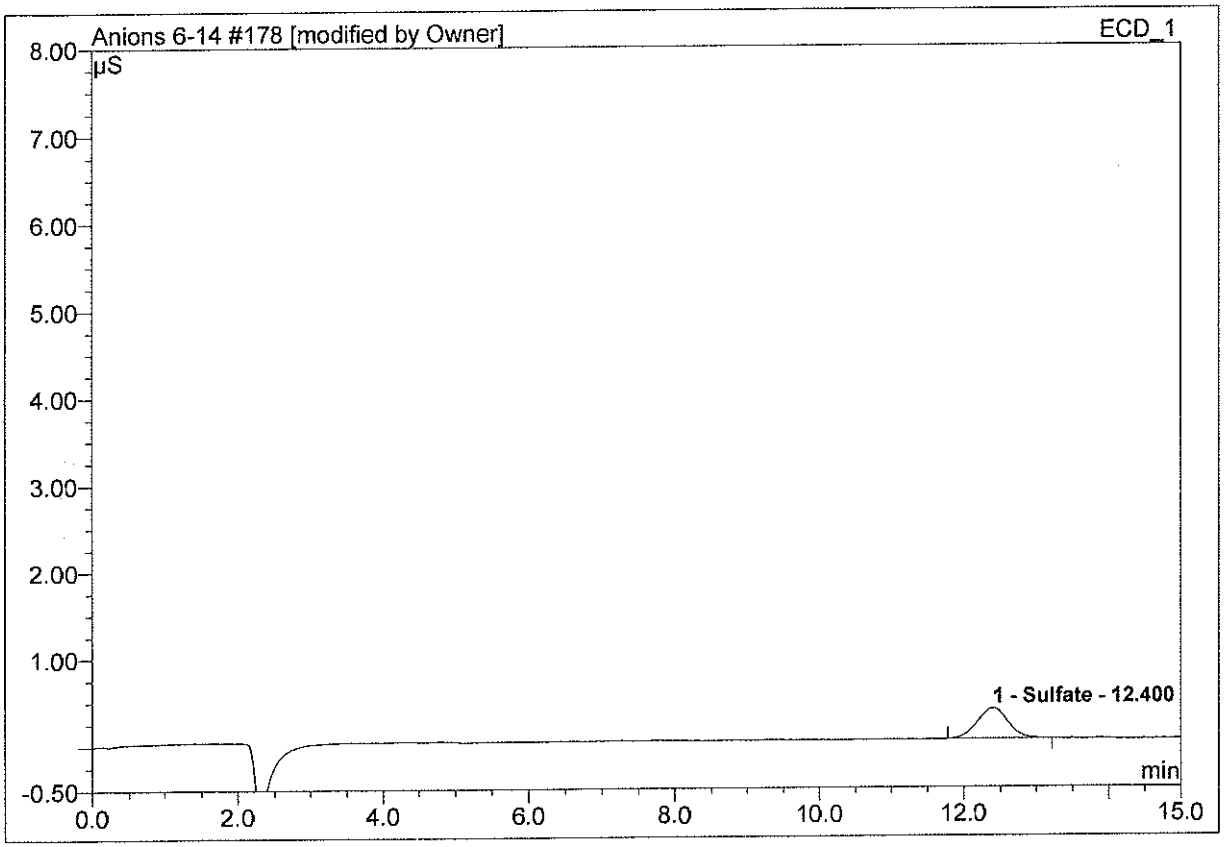
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**158**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/23/2014 15:08**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.40	Sulfate	0.181	0.0845

178 2.0 ppm sulfate 6-19-14

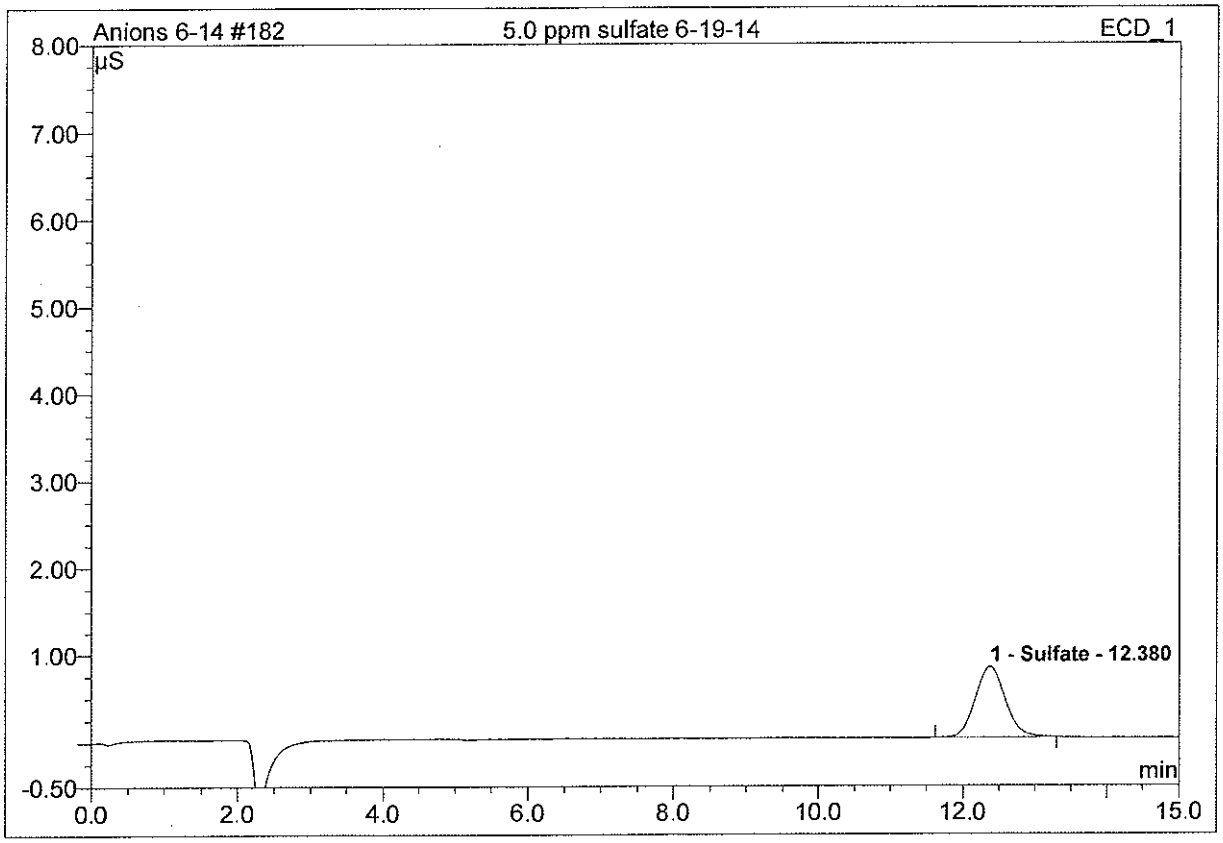
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**159**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/23/2014 15:25**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.40	Sulfate	0.345	0.1677

182 5.0 ppm sulfate 6-19-14

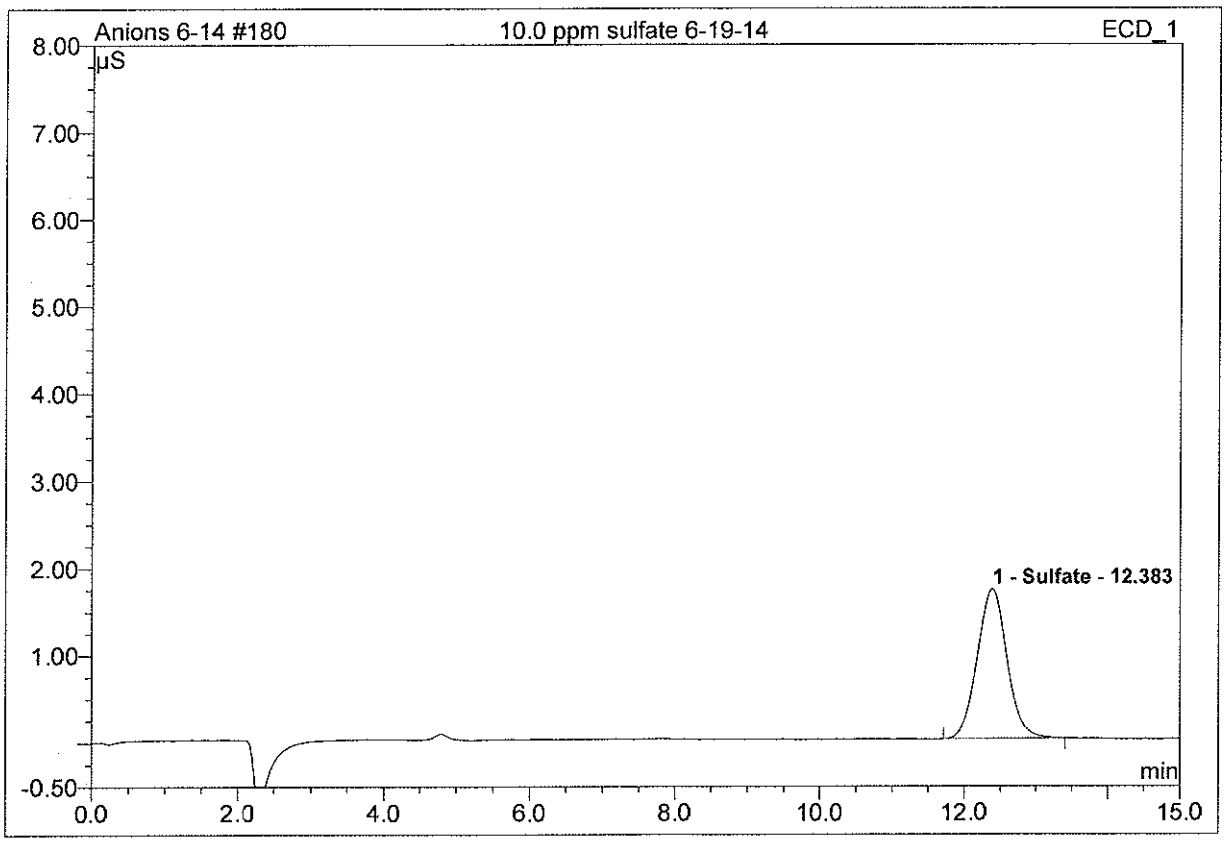
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**163**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/23/2014 16:38**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.38	Sulfate	0.805	0.3831

180 10.0 ppm sulfate 6-19-14

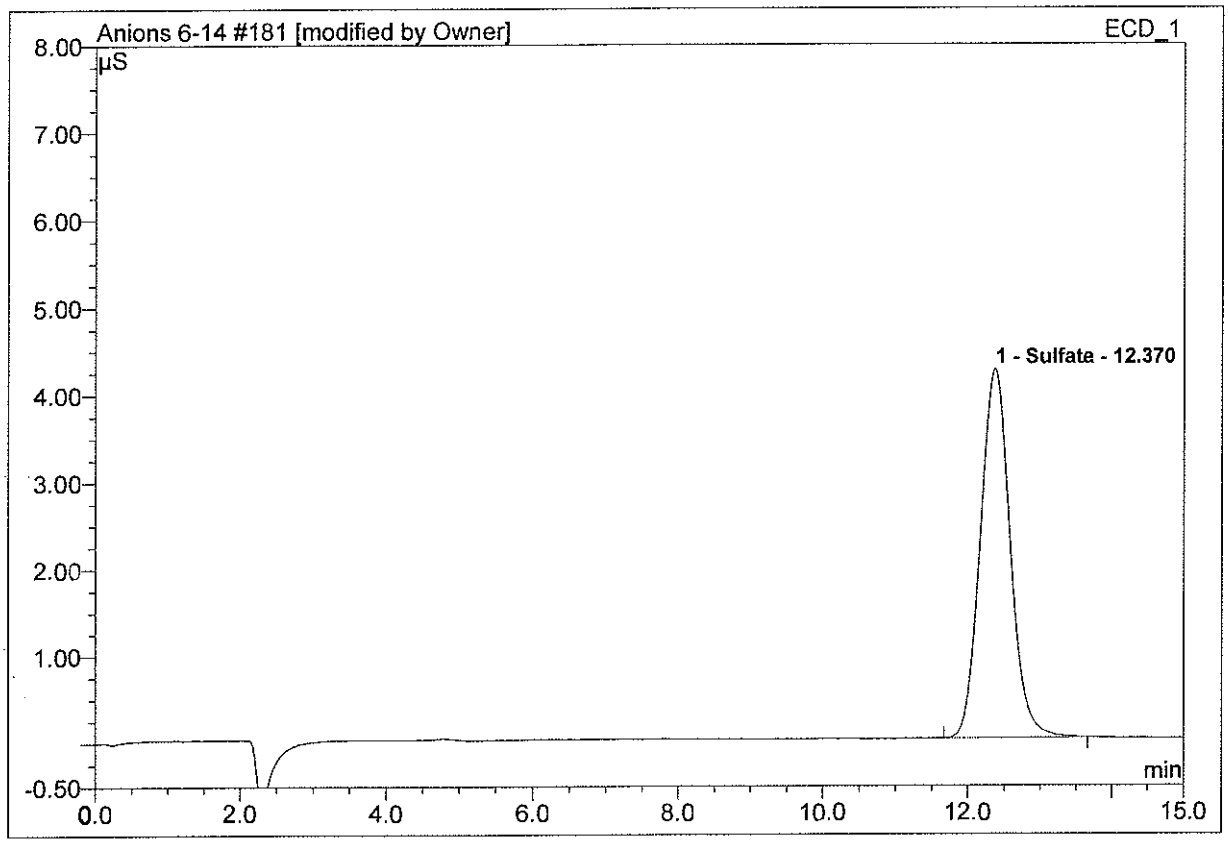
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**161**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/23/2014 15:59**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.38	Sulfate	1.715	0.8146

181 25.0 ppm sulfate 6-12-14

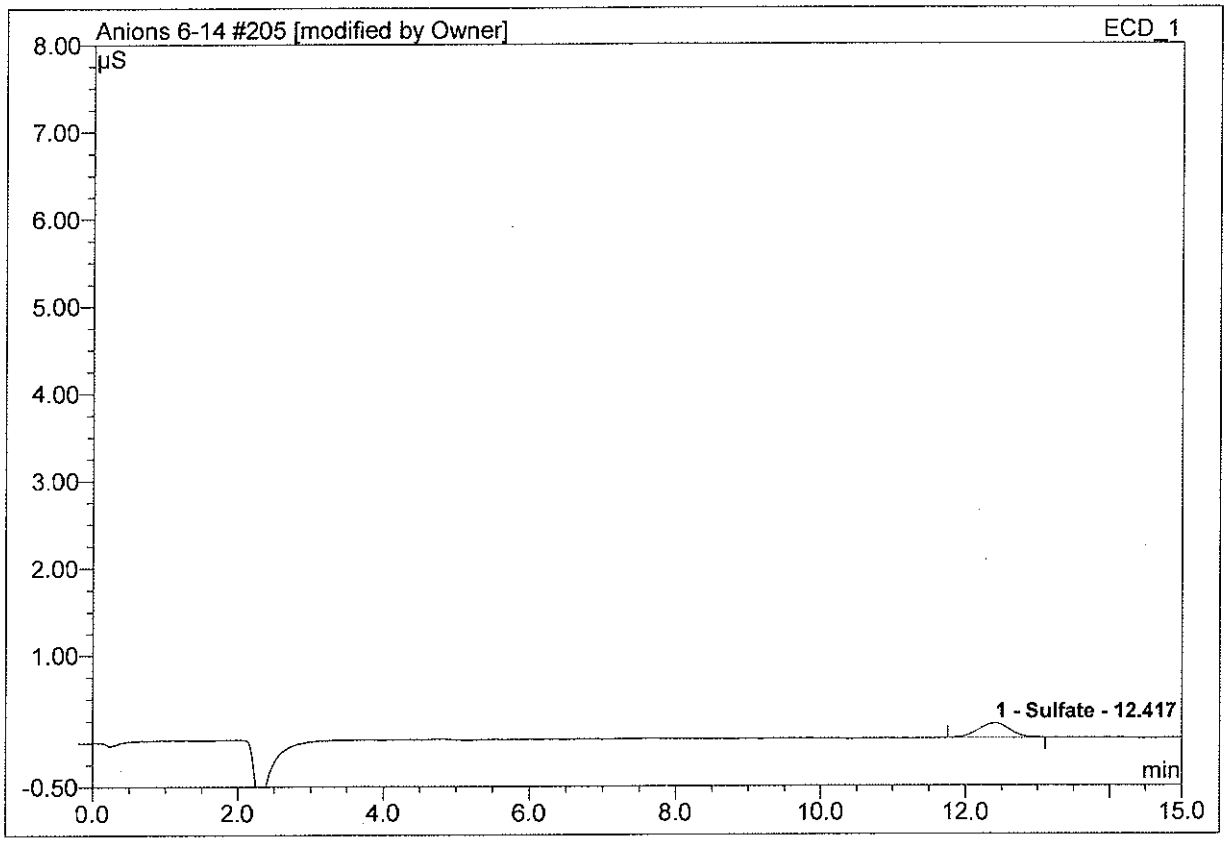
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**162**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/23/2014 16:16**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.37	Sulfate	4.238	1.9942

205 1.0 ppm sulfate 6-19-14

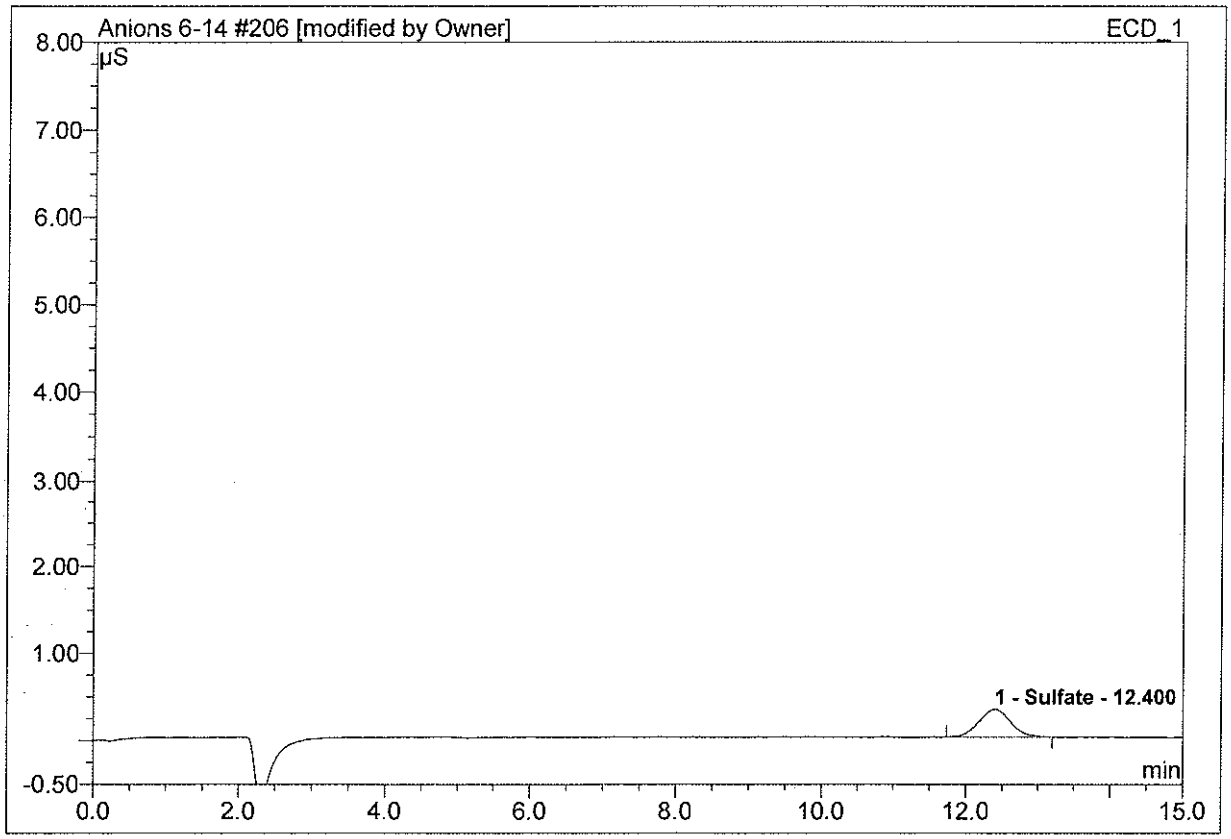
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**186**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/24/2014 10:41**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.42	Sulfate	0.167	0.0852

206 2.0 ppm sulfate 6-19-14

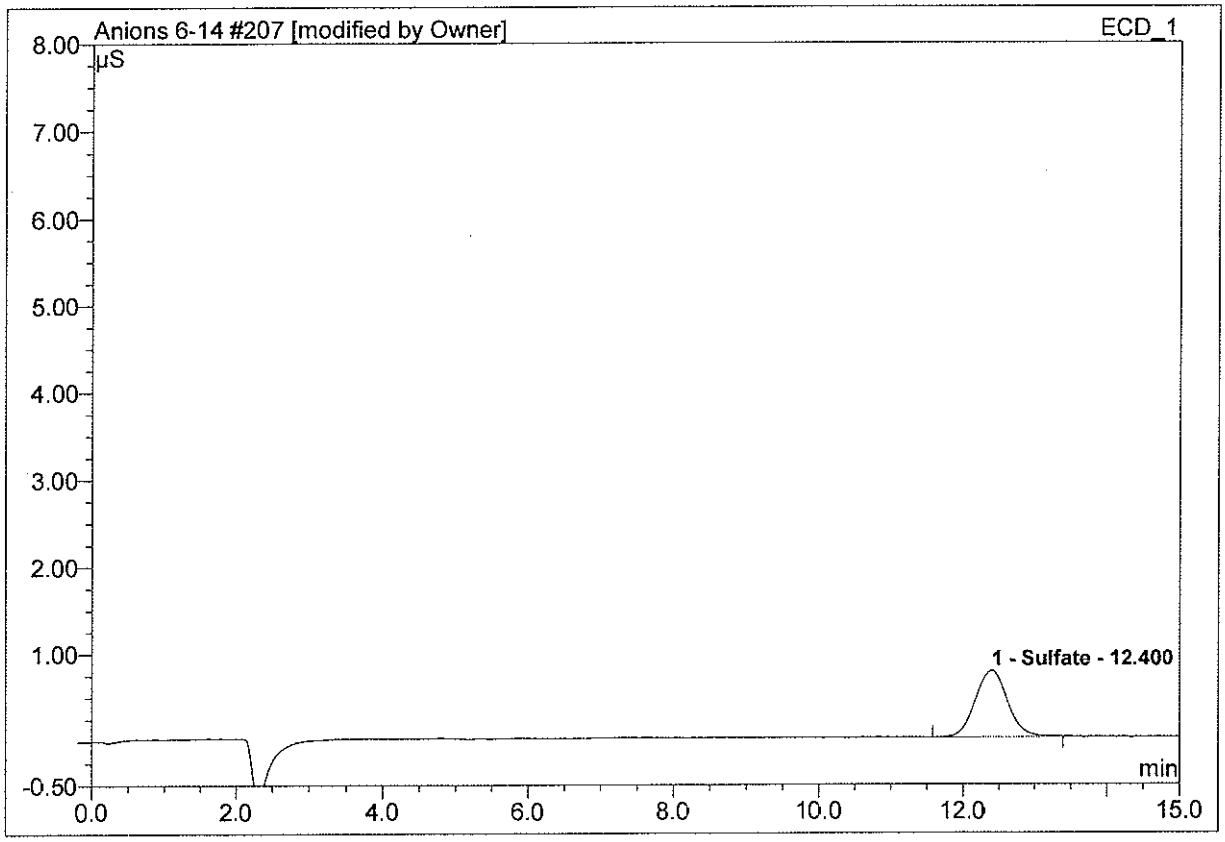
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**187**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/24/2014 10:58**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.40	Sulfate	0.318	0.1622

207 5.0 ppm sulfate 6-19-14

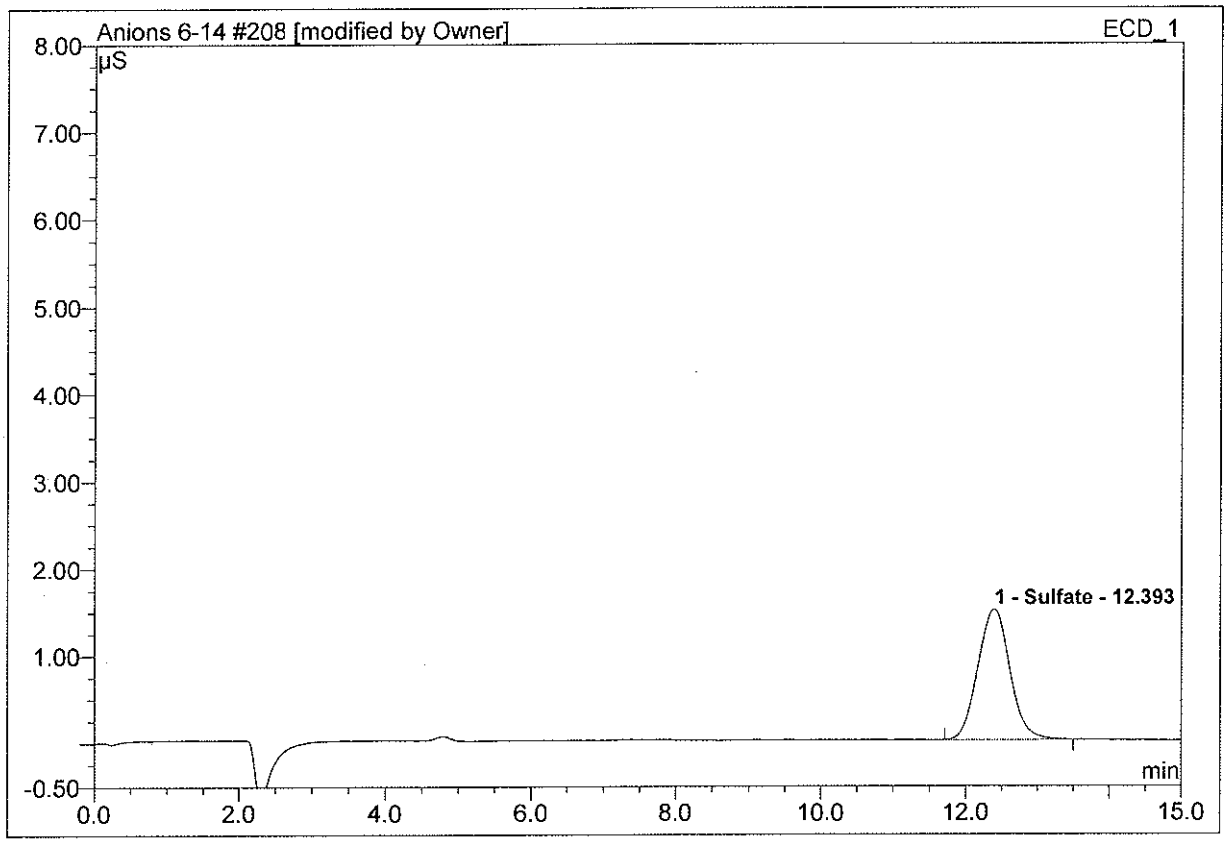
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**188**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/24/2014 11:15**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.40	Sulfate	0.759	0.3944

208 10.0 ppm sulfate 6-19-14

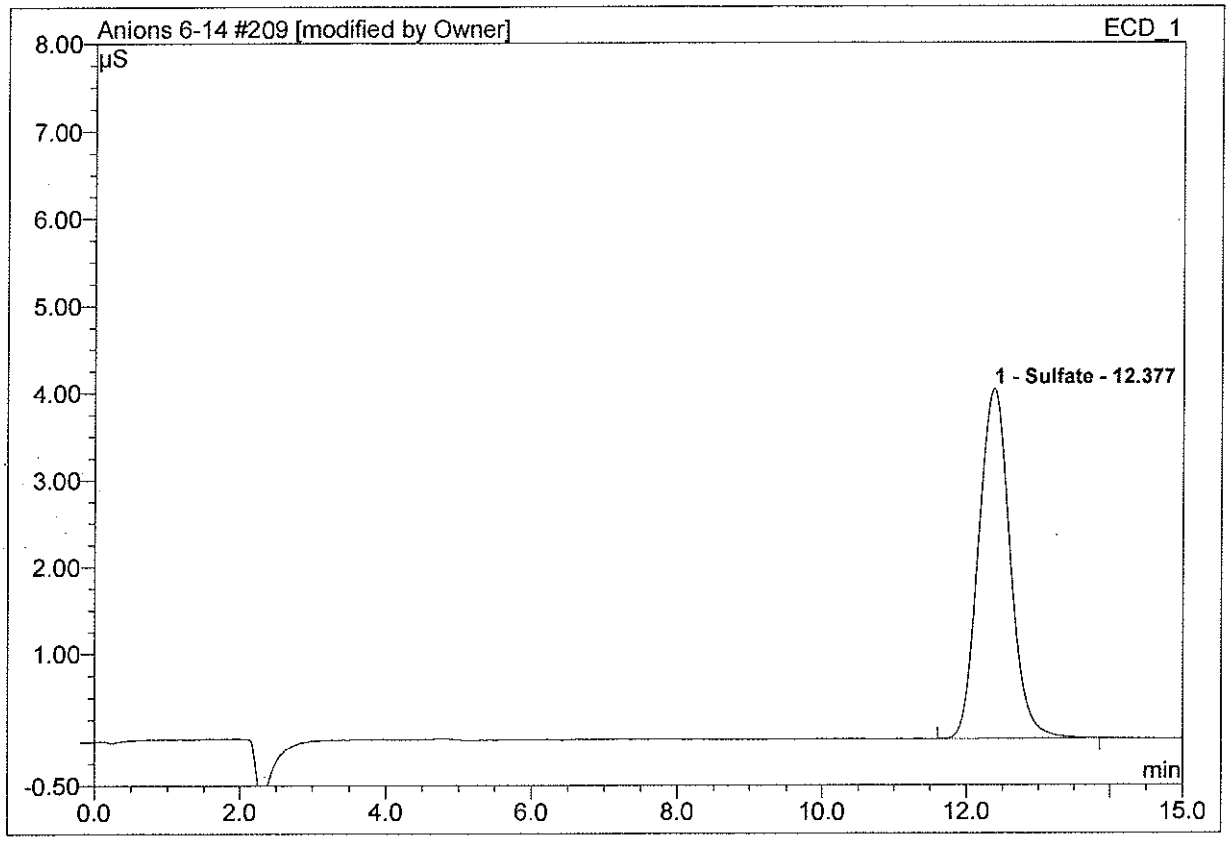
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**189**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/24/2014 11:32**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.39	Sulfate	1.495	0.7710

209 25.0 ppm sulfate 6-12-14

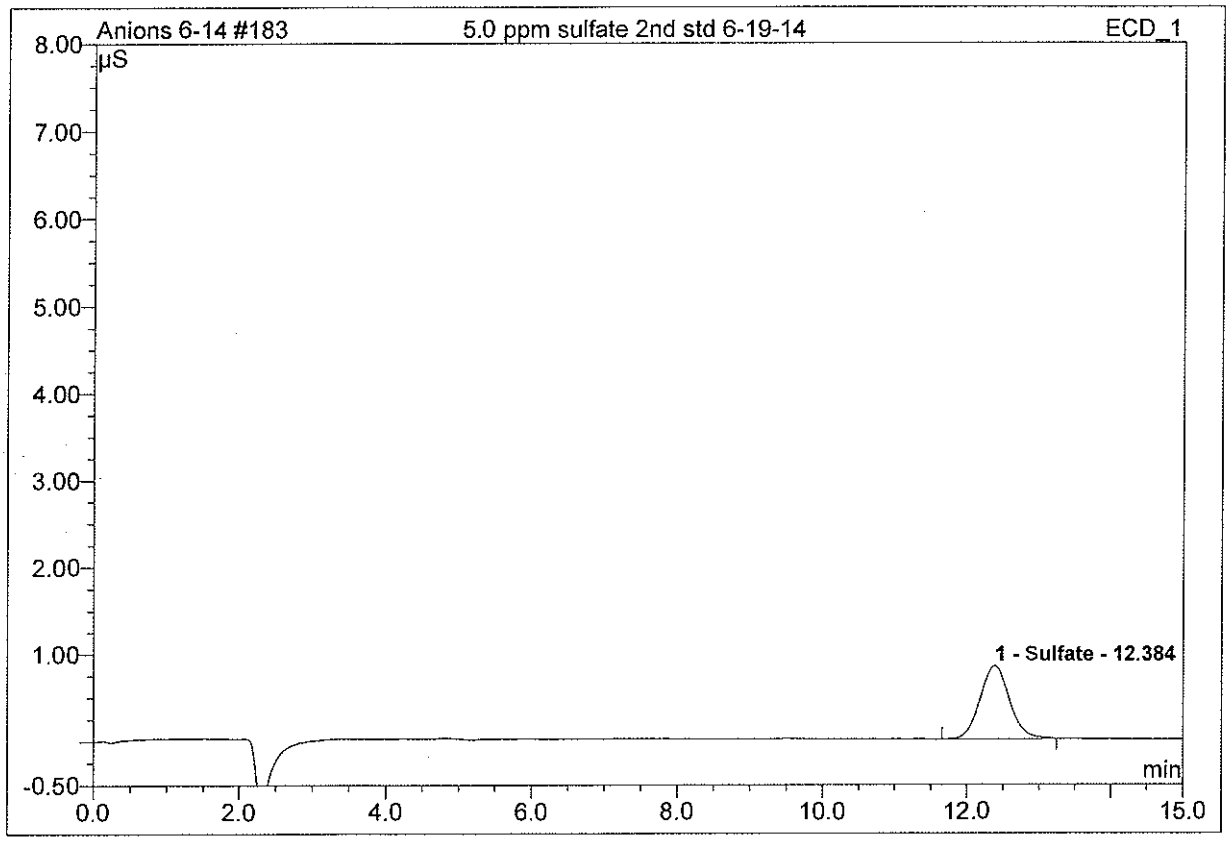
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**190**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/24/2014 11:50**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.38	Sulfate	4.008	2.0236

183 5.0 ppm sulfate 2nd std 6-19-14

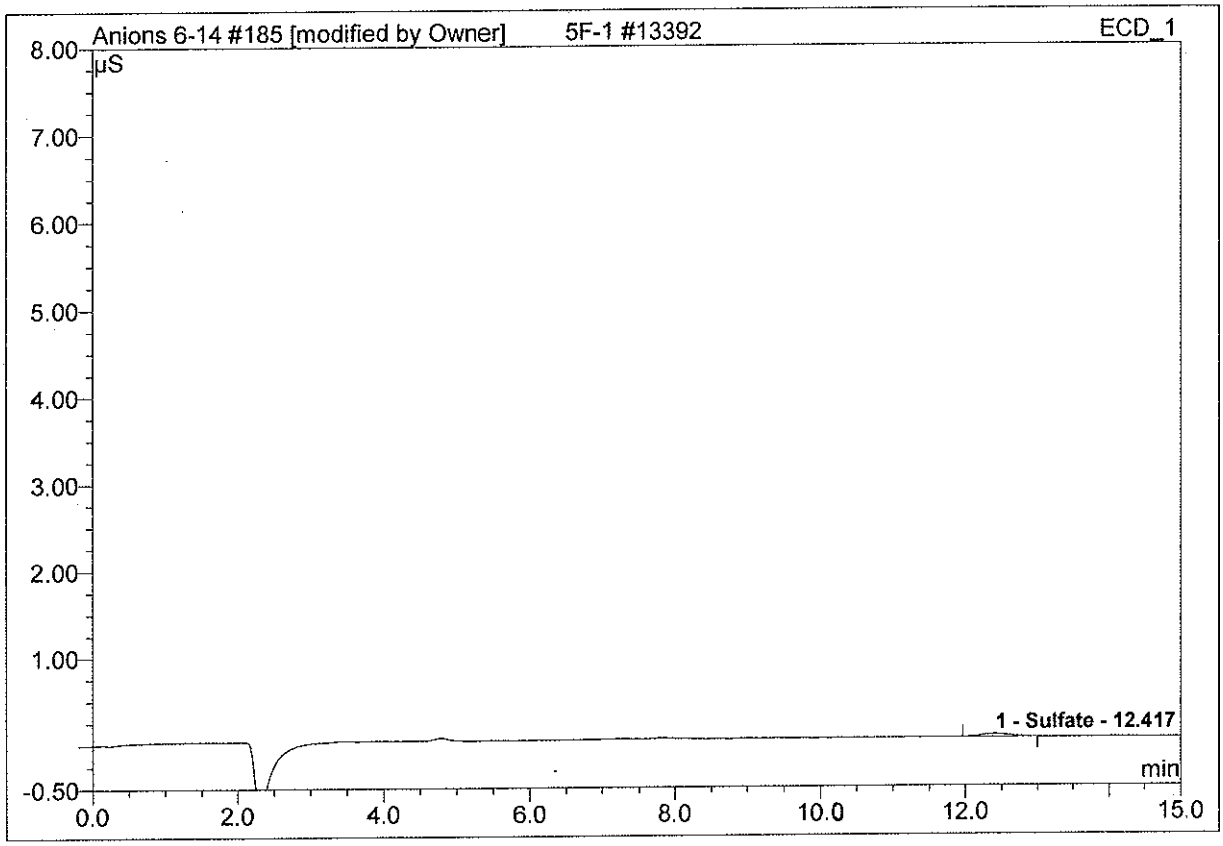
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**164**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/23/2014 16:55**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.38	Sulfate	0.838	0.3972

185 5F-1 #13392

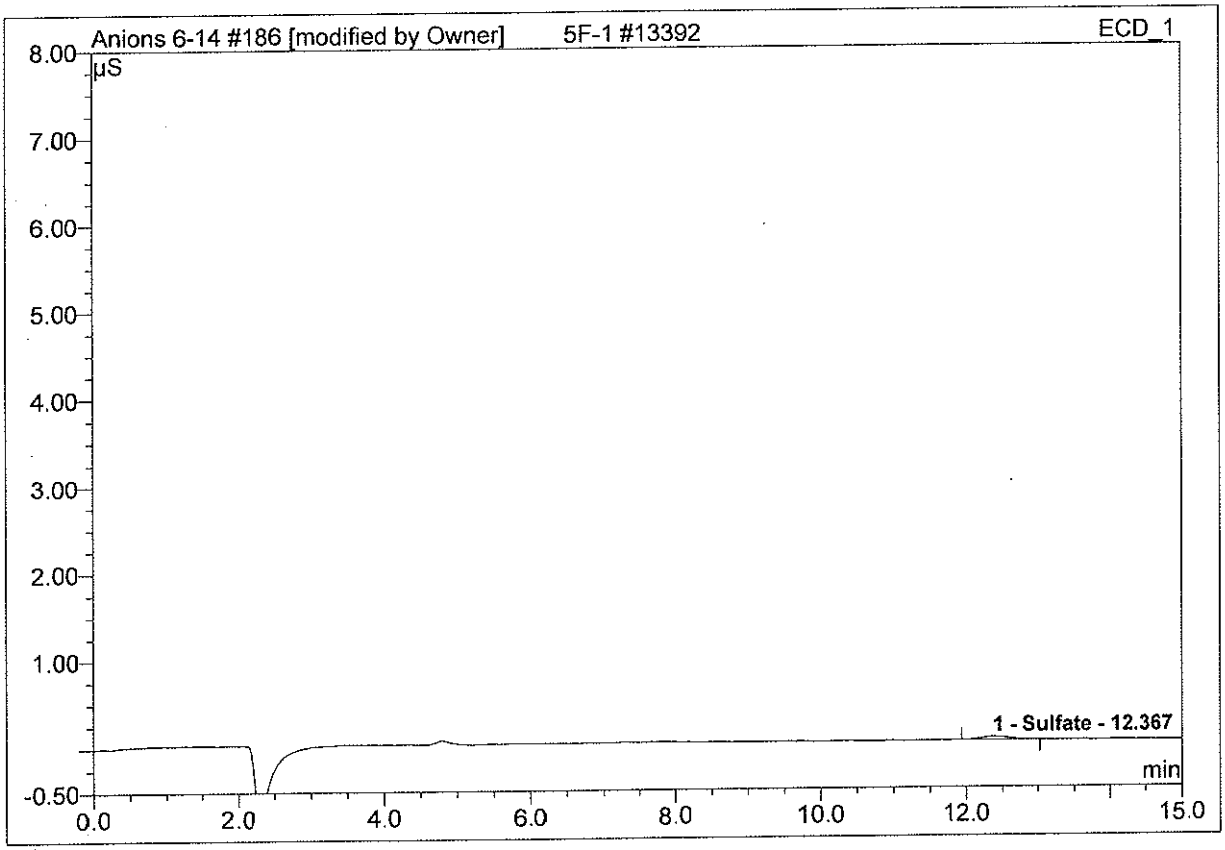
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**166**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/23/2014 17:30**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.42	Sulfate	0.035	0.0165

186 5F-1 #13392

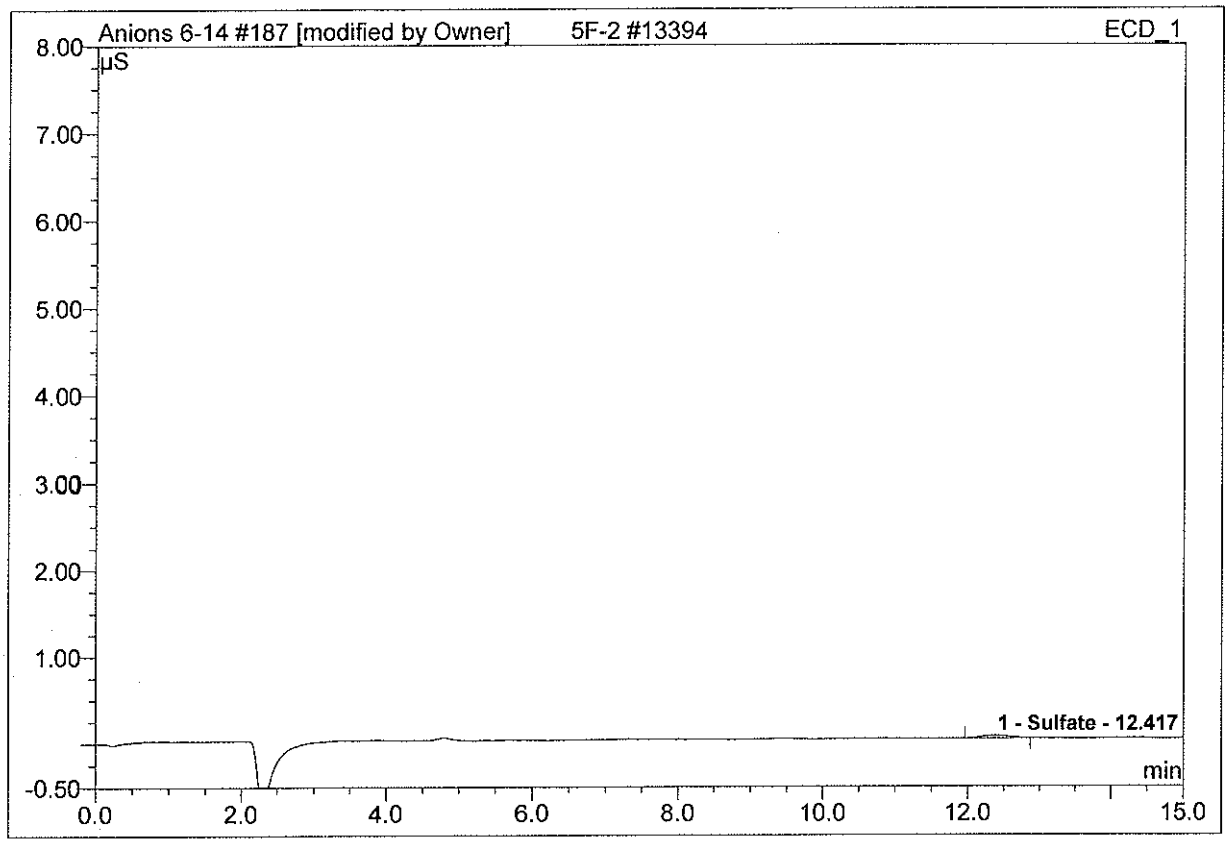
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**167**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/23/2014 17:47**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.37	Sulfate	0.035	0.0165

187 5F-2 #13394

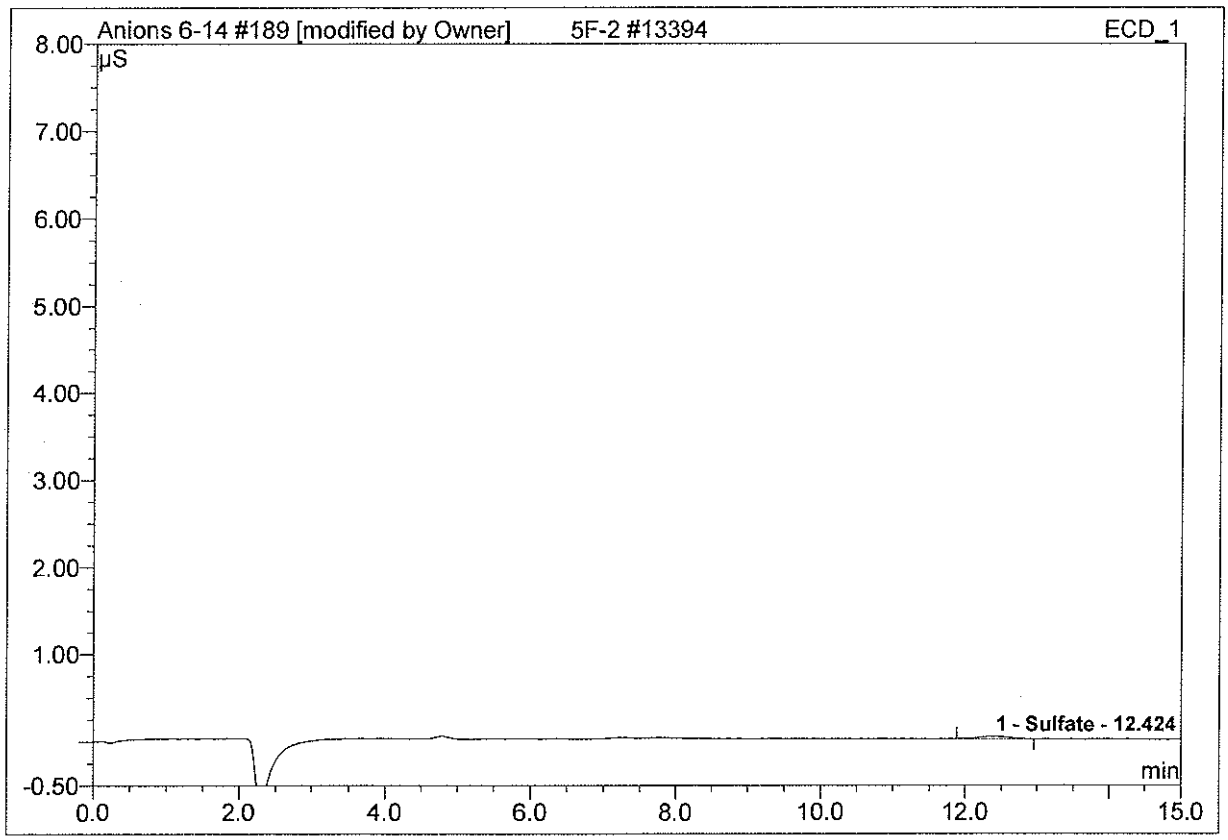
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**168**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/23/2014 18:04**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.42	Sulfate	0.031	0.0141

189 5F-2 #13394

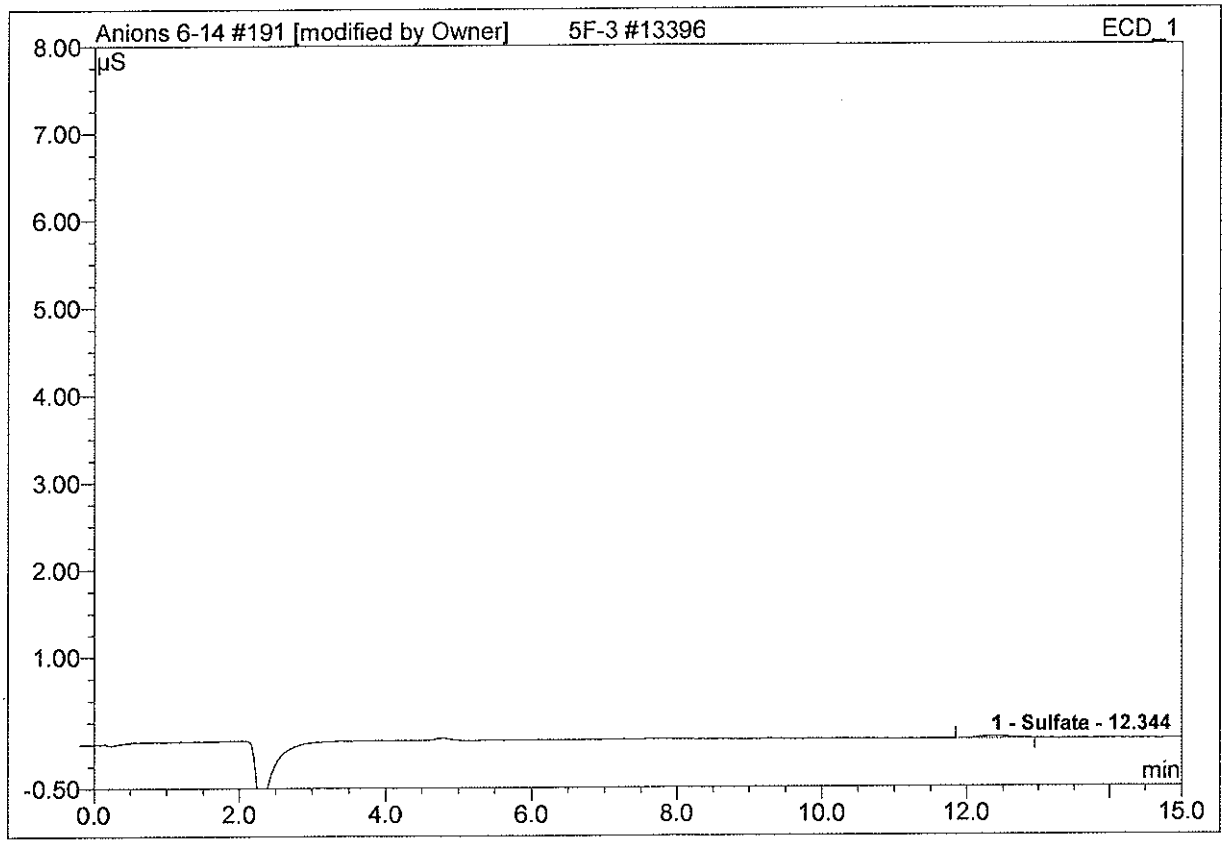
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**170**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/23/2014 18:38**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.42	Sulfate	0.027	0.0141

191 5F-3 #13396

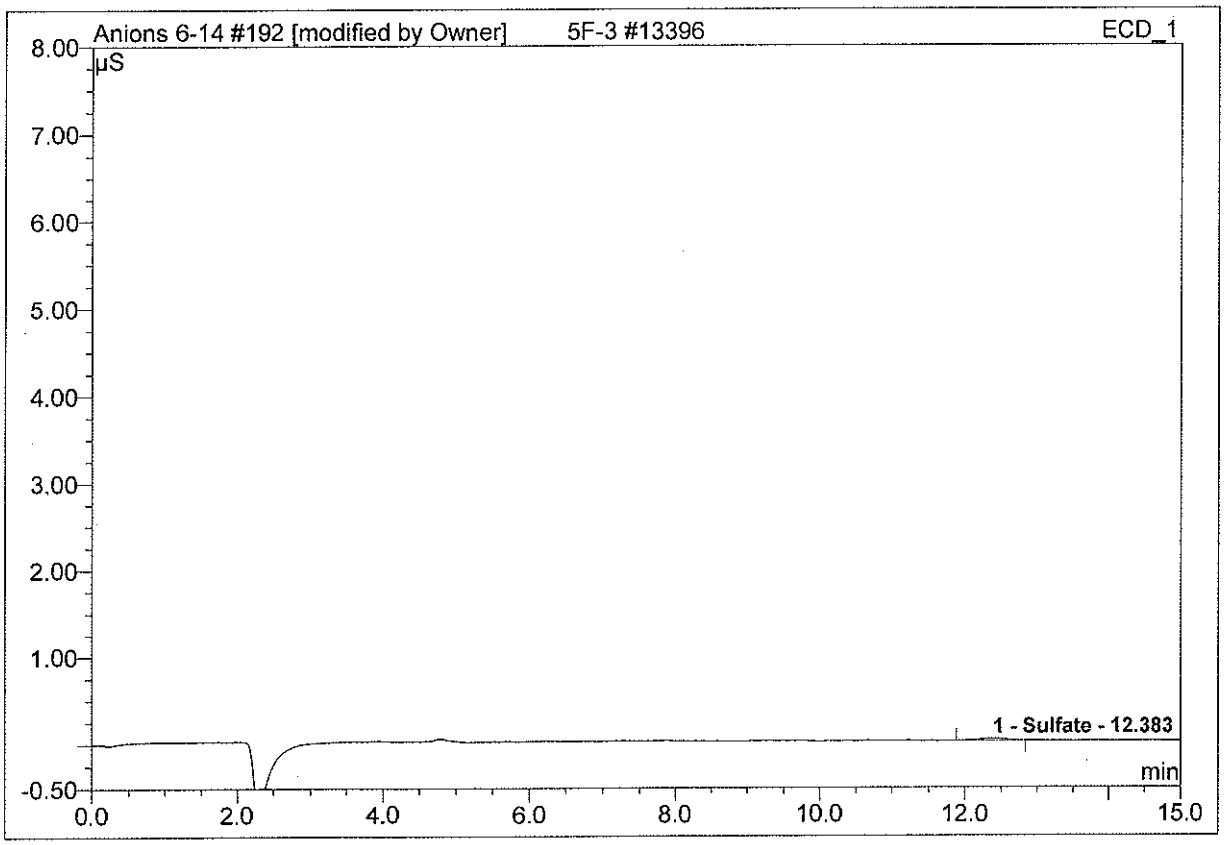
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**172**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/23/2014 19:12**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.34	Sulfate	0.024	0.0118

192 5F-3 #13396

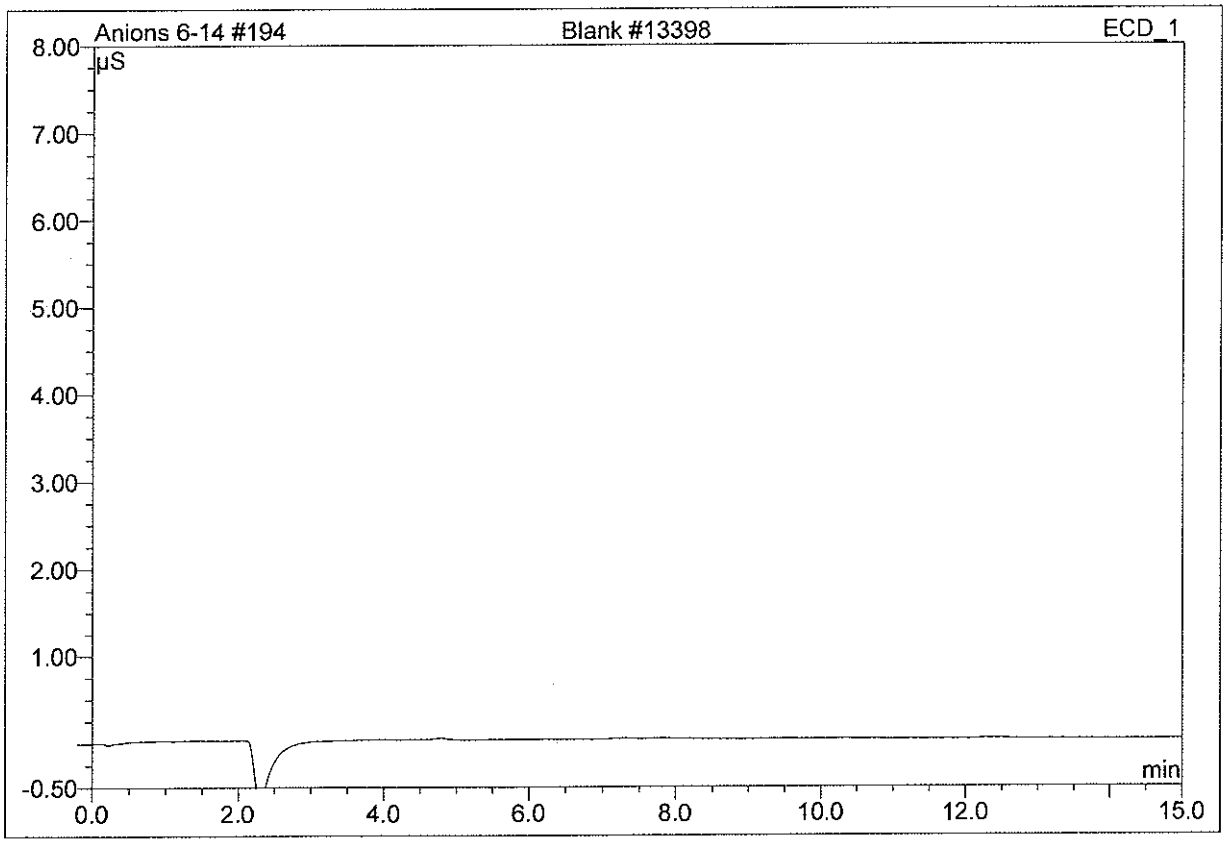
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**173**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/23/2014 19:29**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.38	Sulfate	0.024	0.0112

194 Blank #13398

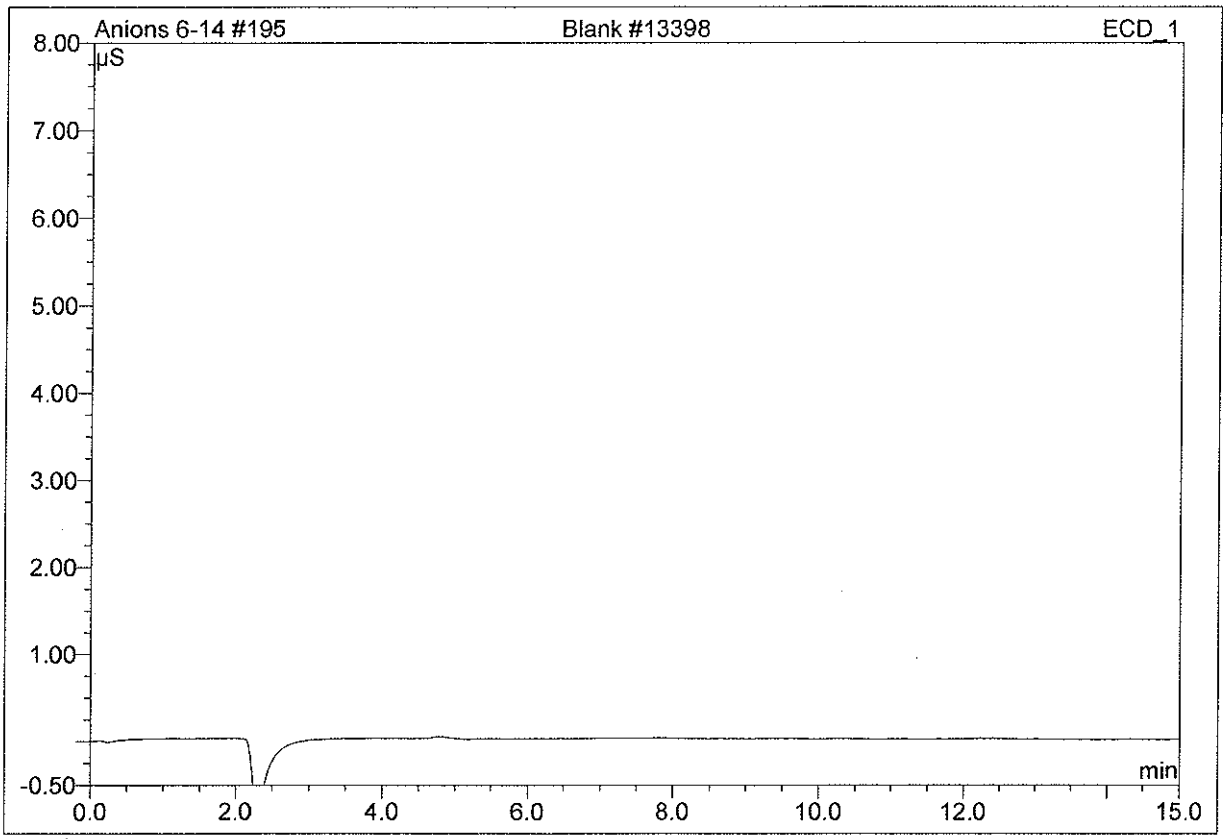
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**175**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/23/2014 20:04**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min

195 Blank #13398

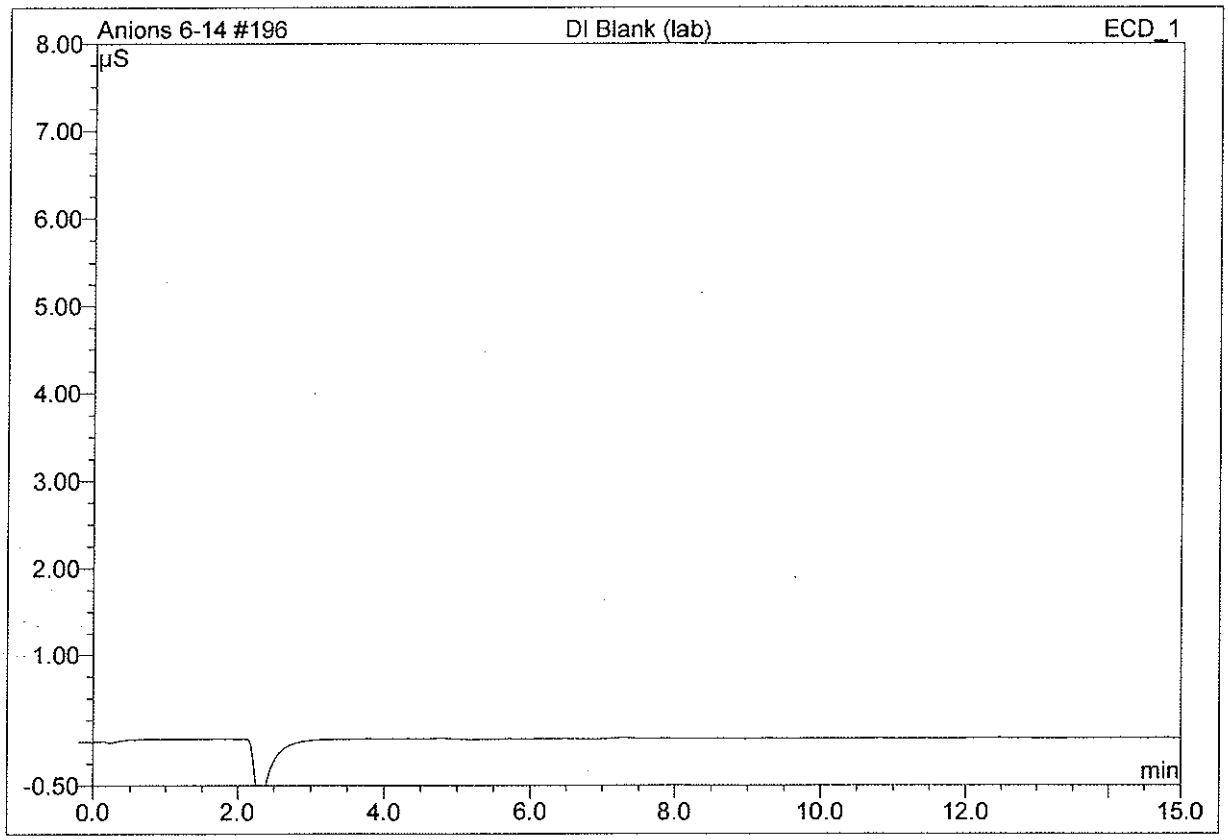
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**176**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/23/2014 20:21**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min

196 DI Blank (lab)

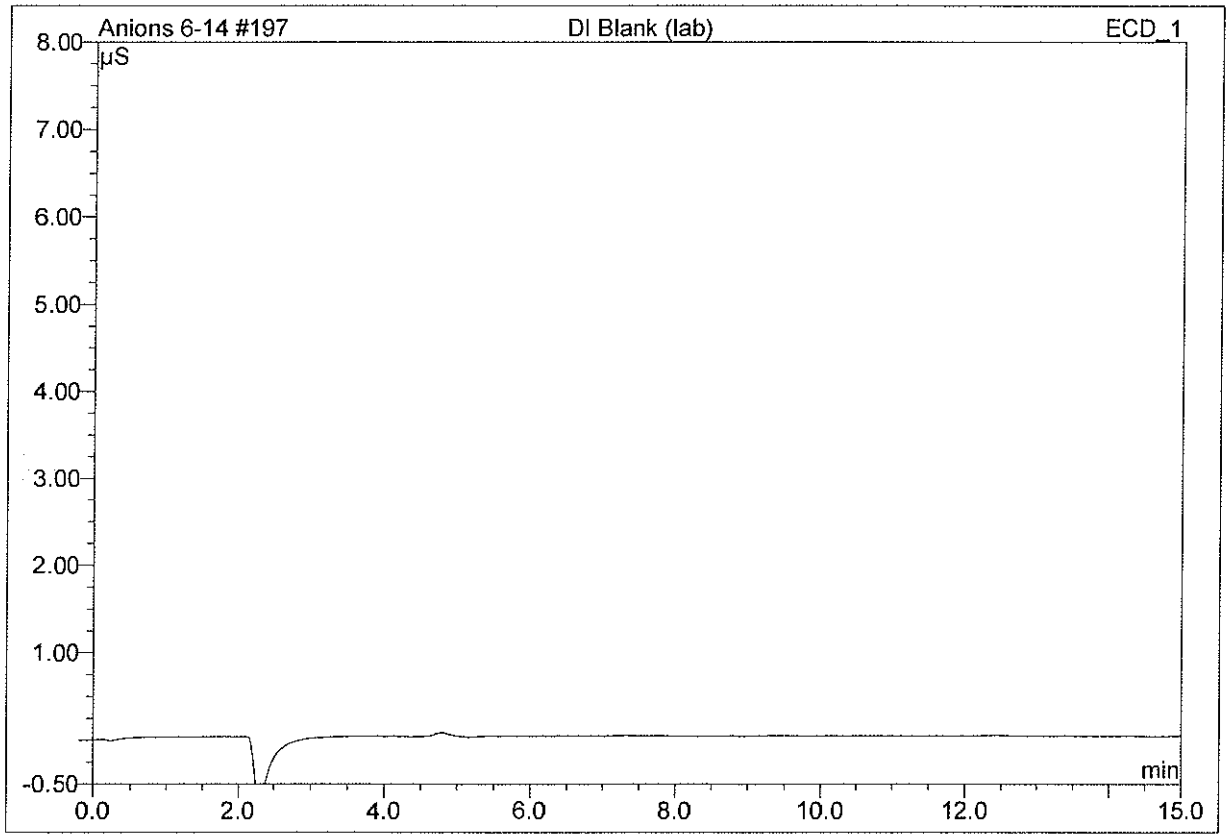
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**177**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/23/2014 20:38**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min

197 DI Blank (lab)

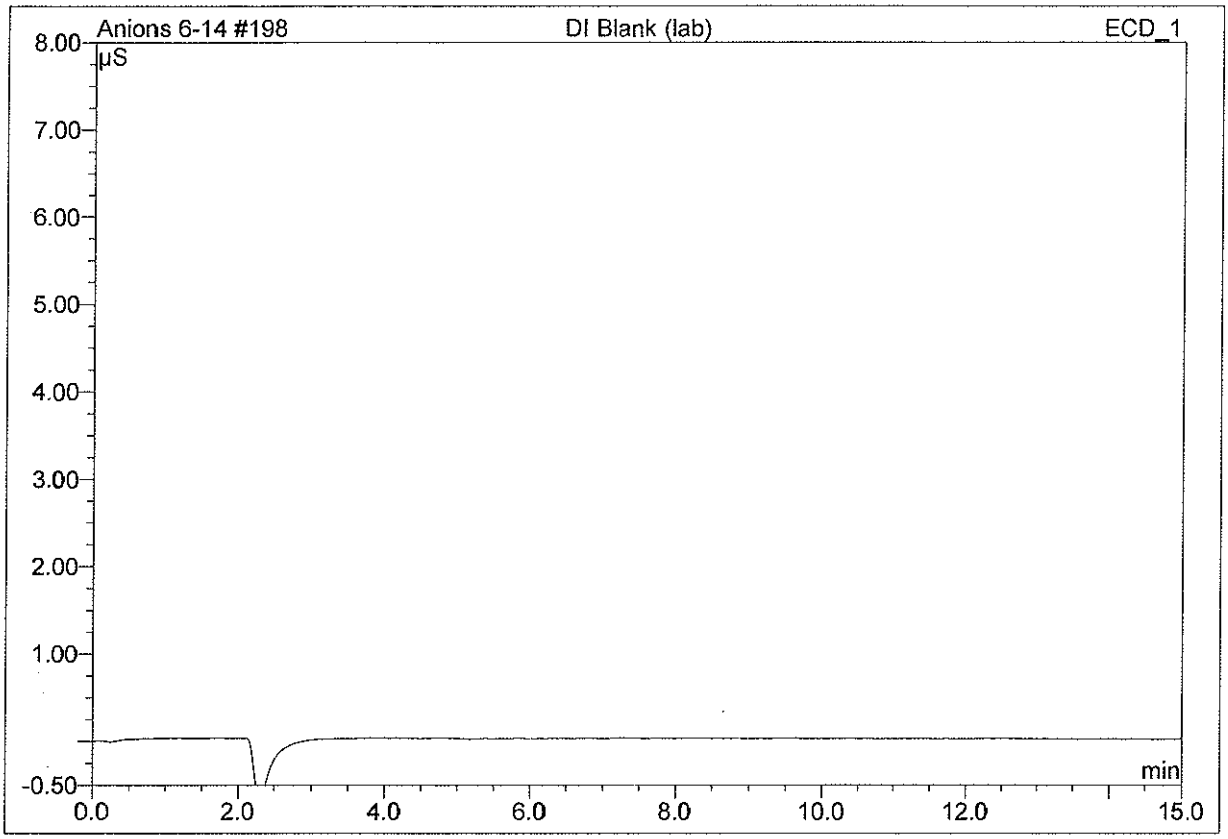
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**178**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/23/2014 20:55**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min

198 DI Blank (lab)

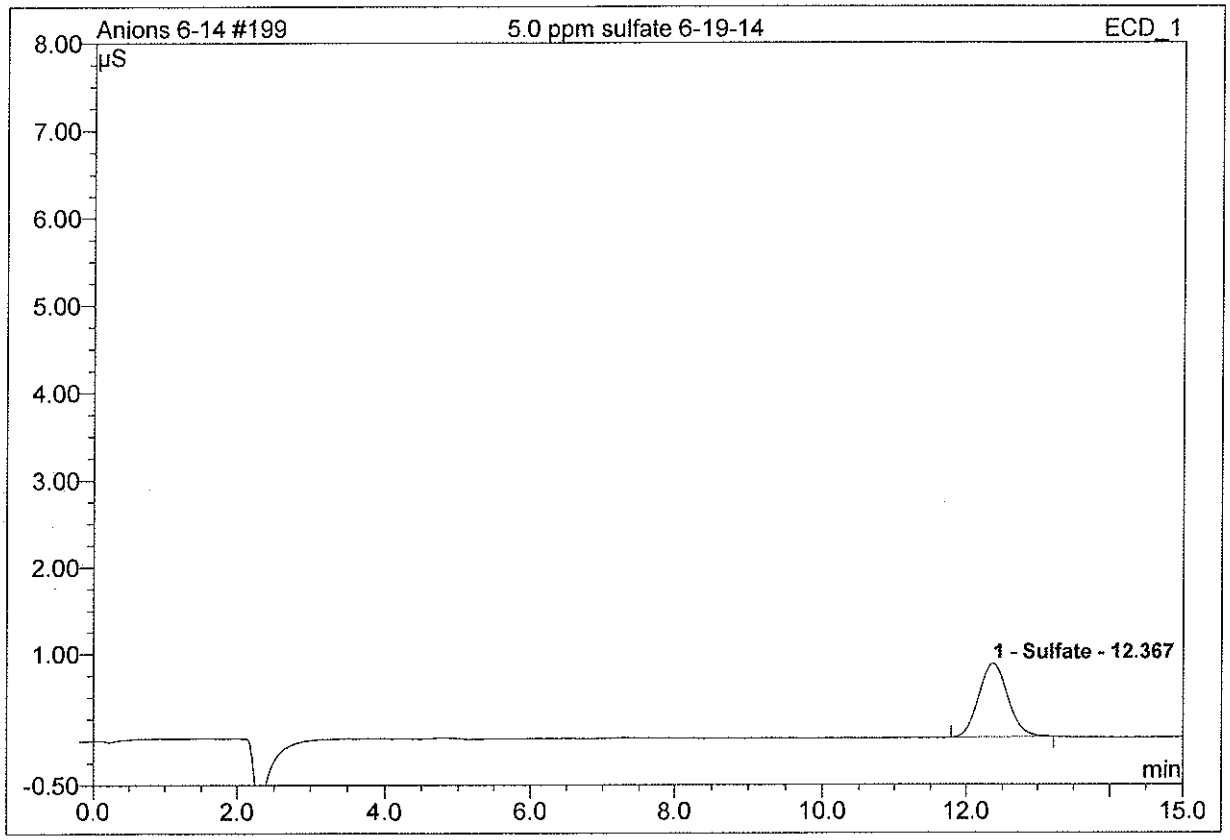
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**179**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/23/2014 21:12**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min

199 5.0 ppm sulfate 6-19-14

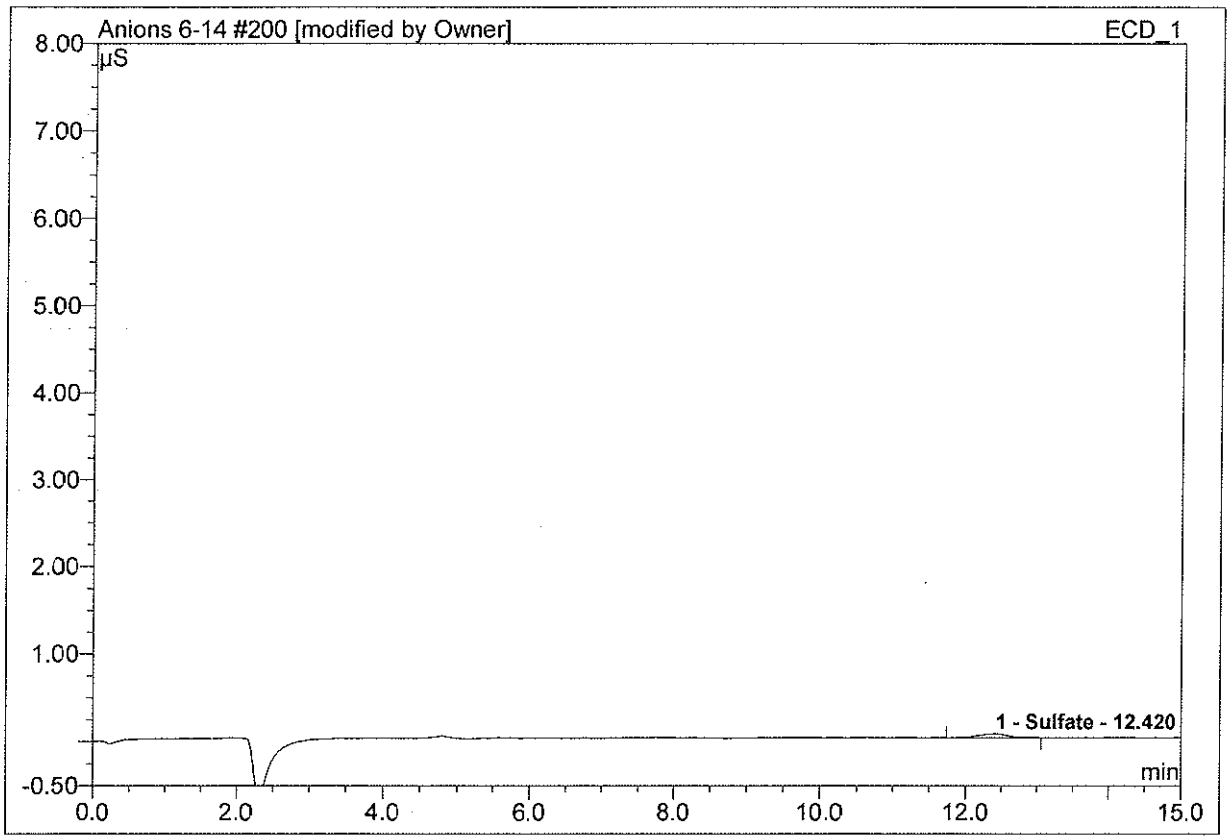
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**180**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/23/2014 21:29**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.37	Sulfate	0.844	0.3951

200 5F-1 #13392 spike-1

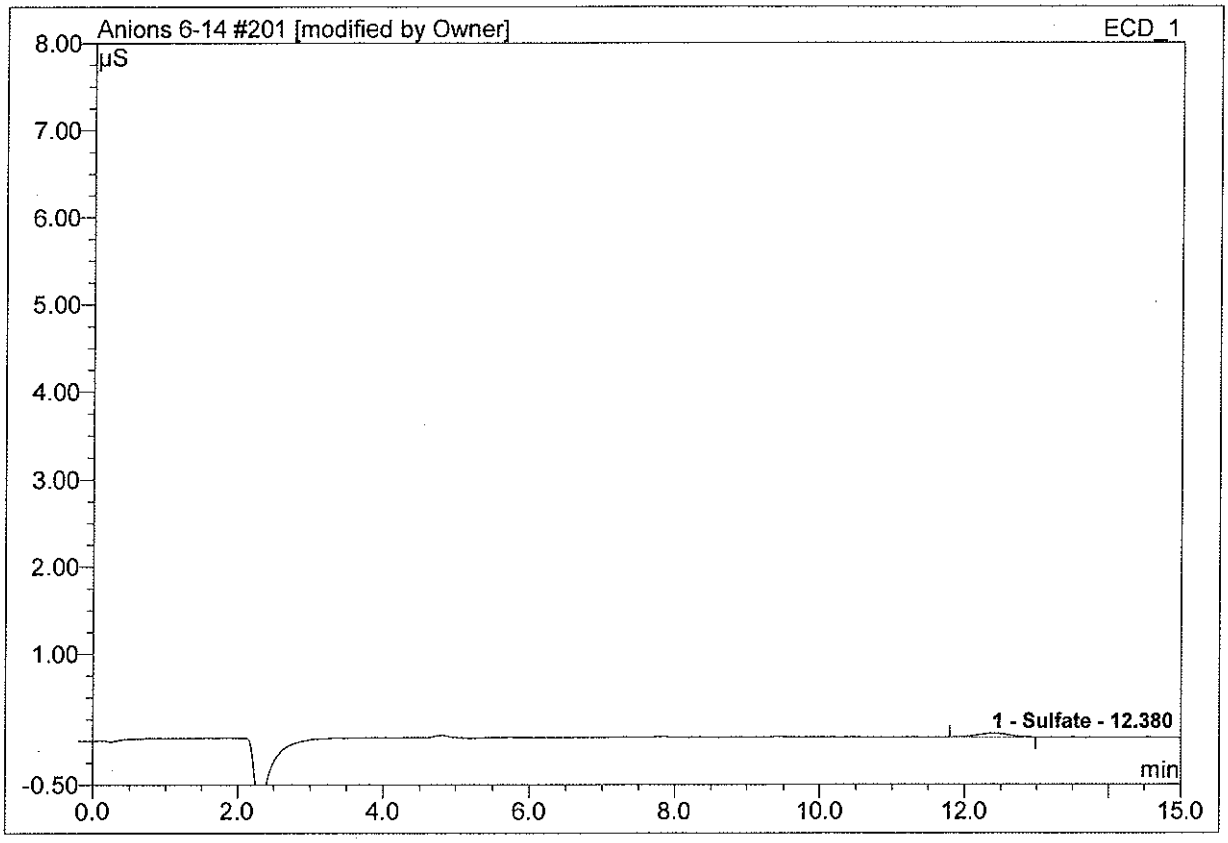
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**181**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/24/2014 9:13**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.42	Sulfate	0.044	0.0230

201 5F-1 #13392 spike-1

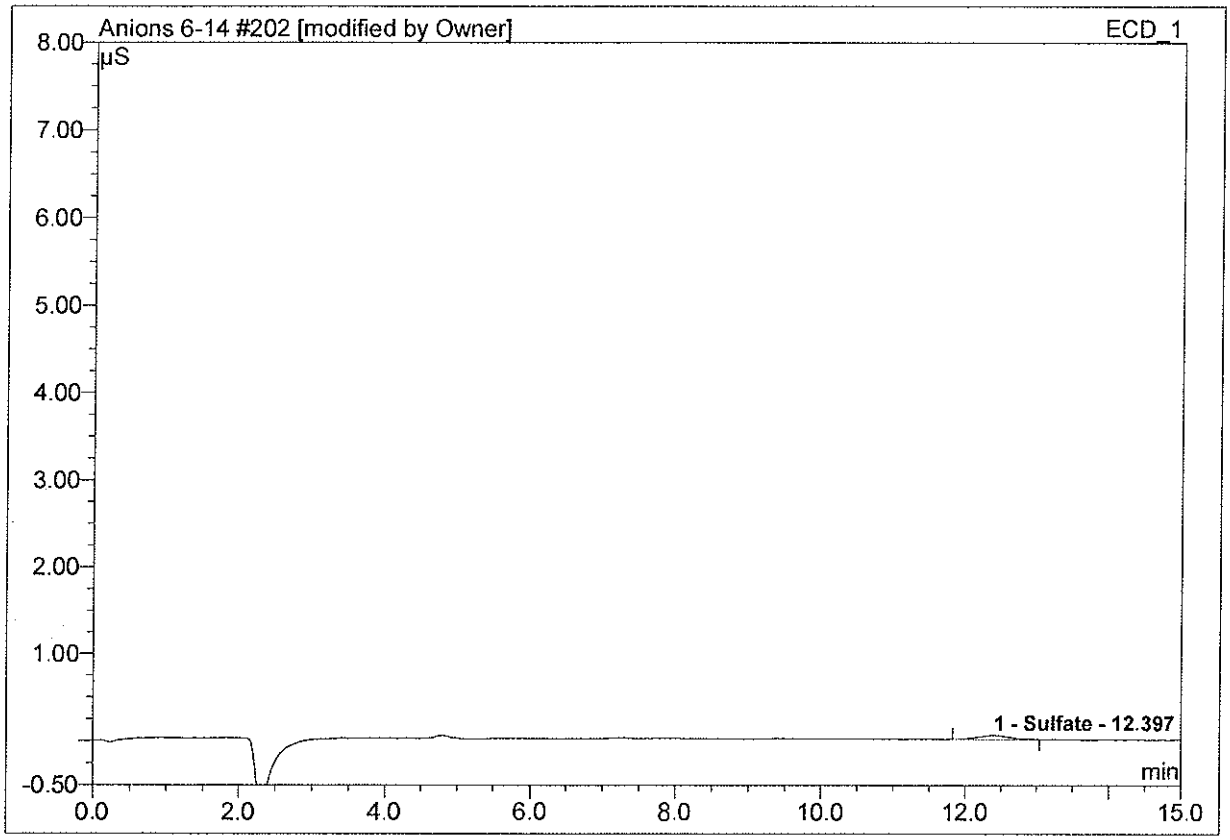
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**182**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/24/2014 9:30**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.38	Sulfate	0.046	0.0236

202 5F-1 #13392 spike-2

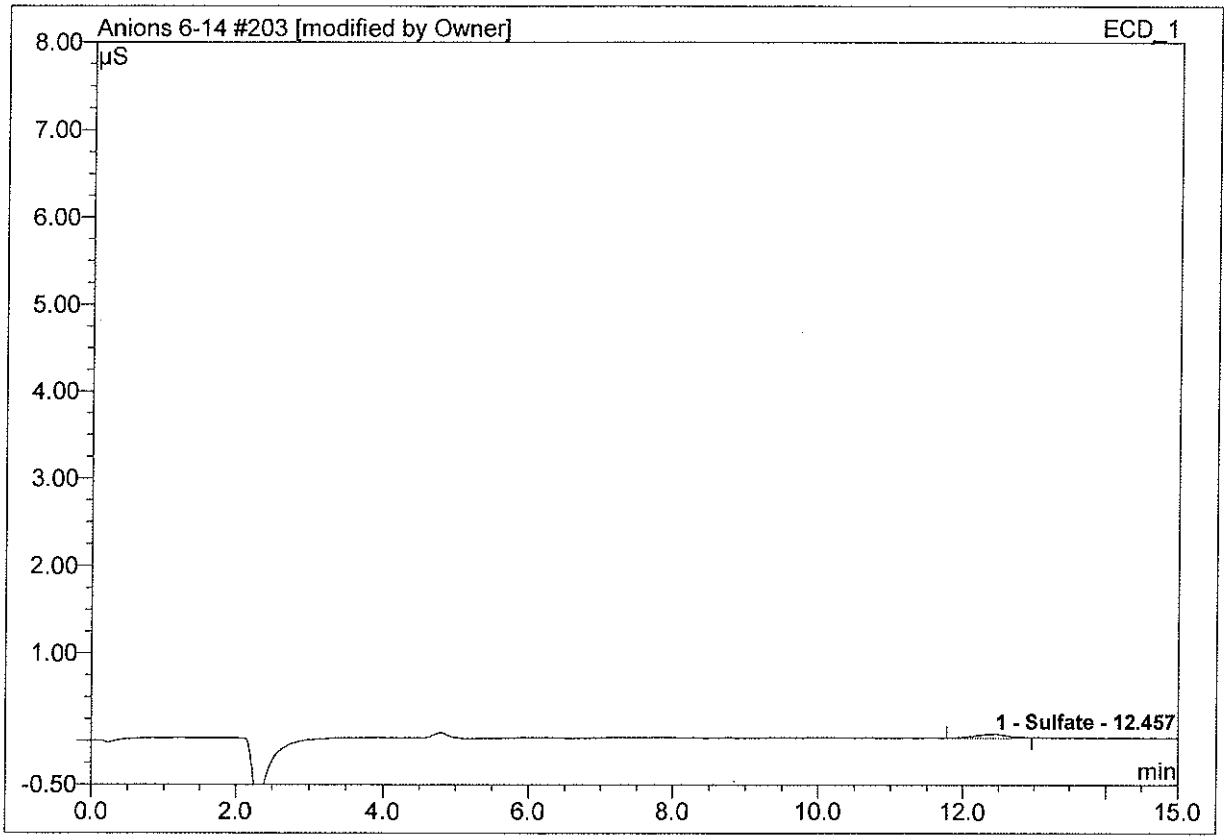
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**183**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/24/2014 9:47**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.40	Sulfate	0.045	0.0232

203 5F-1 #13392 spike-2

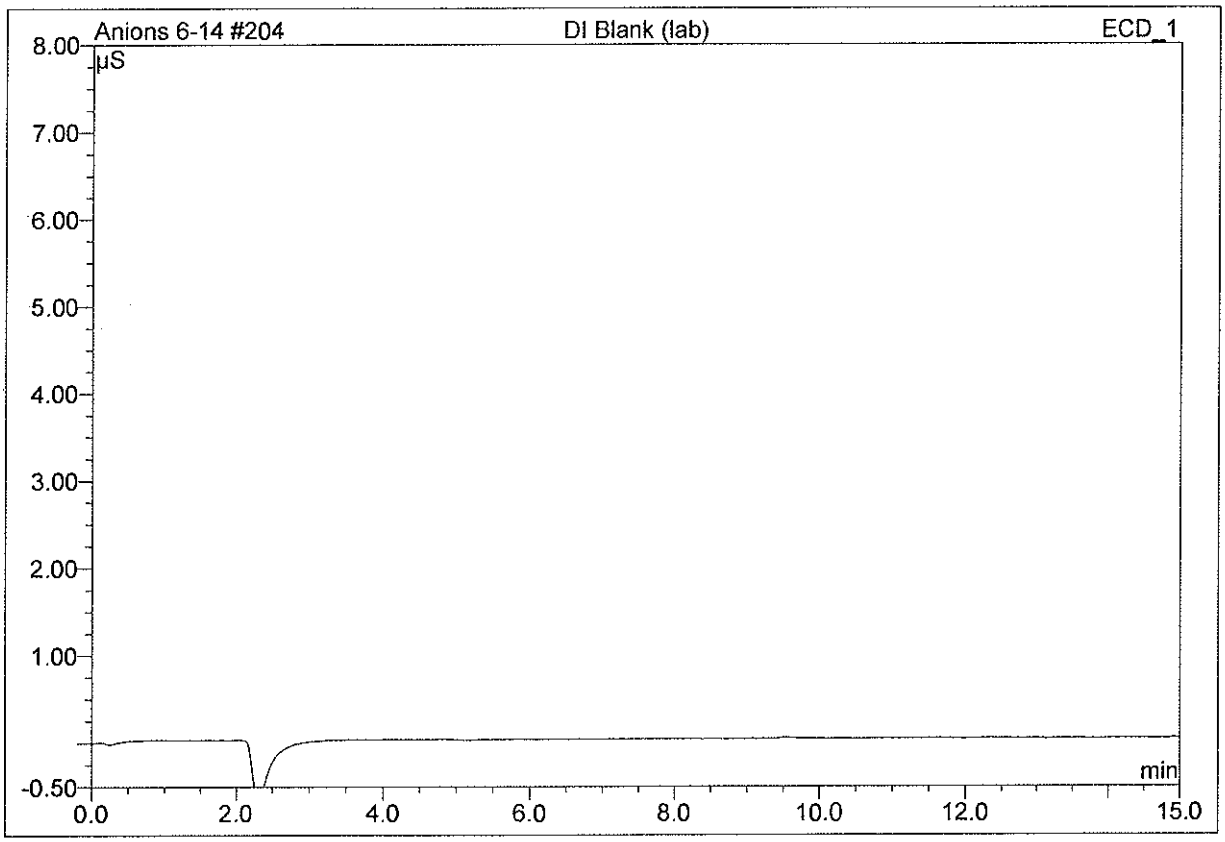
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**184**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/24/2014 10:04**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.46	Sulfate	0.043	0.0226

204 DI Blank (lab)

Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**185**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**6/24/2014 10:24**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min

USEPA METHOD 5F TASK SCHEDULE

Client: BP Whiting

Location: Whiting, IN

Project Manager: S. Flaherty

Date Sampled: 6/17/14

Lab Project #: 08-655

Spreadsheet Template ID: USEPA-M5F-Partic-Template-61T-REV3

Analyst: J. Ruggaber

Eluent

Sodium Carbonate (Na_2CO3) manufacturer and lot: Fisher, Lot 095351

Batch Number	Amount weighed/2L	Date/Time Prepared
1	1.6966 g	6/23/14, 10:02
2	g	
3	g	

Sodium Bicarbonate ($NaHCO_3$) manufacturer and lot: Fisher, Lot 110567

Batch Number	Amount weighed/2L	Date/Time Prepared
1	0.1687 g	6/23/14, 10:02
2	g	
3	g	

Reagents

Phenolphthalein Solution: WL-LOG#4-Log-037A page 46

Ammonium Hydroxide: 0.0992 N, lot SHBC0698V, Fluka

Standard Identification

1)1.0 ppm sulfate 6-19-14

2)2.0 ppm sulfate 6-19-14

3)5.0 ppm sulfate 6-19-14

4)10.0 ppm sulfate 6-19-14

5) 25.0 ppm sulfate 6-12-14

Secondary standard solution 5.0 ppm sulfate 6-19-14

DATE/TIME	EQUIPMENT	TASK
N/A	N/A	If not already performed in the field, remove the filter from the filter holder and place into a Petri dish.
6/20/14	N/A	Cut the filter into small pieces, and transfer to a 250 mL beaker.
6/20/14	N/A	Rinse the Petri dish with water, and transfer the wash to the beaker. Add additional water to approximately 75 mL.
6/20/14, 10:00 – 16:45	N/A	Reflux on a hot plate for 6-8 hours.
6/20/14 – 6/23/14	N/A	Cool the flasks, and transfer contents, including particulate and filter pieces, to a 500 mL (or 1000 mL, if needed) volumetric flask.
6/23/14	N/A	Add the probe wash (with rinse) to the volumetric flask. Dilute to volume with water. Repeat for all samples and blanks.
6/23/14	N/A	After solids settle, volumetrically dilute 5 mL to 50 mL with water. Save for sulfate analysis.
6/20/14 16:30	Desiccator #1	Place labeled beakers in desiccator (store 24 hrs).
6/23/14 12:02	Balance #1	Weigh conditioned beakers and record tares.
6/23/14 – 6/24/14	Oven #1	Evaporate the contents of the volumetric flasks (and rinses) in tared beakers using a 105 °C oven to about 100 mL.
6/24/14	N/A	Remove the beakers from the oven and cool.
6/24/14	N/A	Add approximately 5 drops of phenolphthalein to each beaker. Add concentrated ammonium hydroxide dropwise until the solution turns pink.
6/24/14	Oven #1	Return the beakers to the oven and evaporate to dryness.
6/24/14 16:32	Desiccator #1	Place beakers in desiccator (store min. 24 hours)

ARI ENVIRONMENTAL INC.

Sample Receipt Checklist

Client Name: BP Whiting

Site Location: Whiting, IN

ARI Project Manager: Steve Flaherty

Sample Collection Date(s): 6/17/14

Chain-of-Custody Number(s): W02429

Chain-of-Custody Form(s):

Custody release signatures, dates, and times present:	Yes
Preservation code noted:	Yes
Project information clearly identfied:	Yes
Sample information clearly identified:	Yes
Analysis request clearly identified:	Yes
Report tier level noted:	Yes

Sample Containers:

Quantity of samples match number on the COC	Yes
Container label ID numbers and descriptions match COC	Yes
All containers received in good condition	Yes
Liquid levels at marked heights on containers	Yes
All container labels are legible	Yes
All sample IDs are unique	Yes
Samples received in correct container type	Yes
Samples received within the required holding time	Yes
Samples received under the required preservation code	Yes

Non-Conformances and/or Corrective Actions Applied:

All criteria for sample acceptance met.

Samples Received by: Joel Ruggaber _____ signature

Date and Time received: 6/19/14 11:18

Form LF0002

ARI ENVIRONMENTAL, INC.

Chain of Custody Record Number: W02429

Lab Project No. (Lab use only)	Client Name	Client Location
08-655	BP whiting	whiting, IN
ARI Proposal Number	ARI Test Plan Number	ARI Project Manager
		SF
ARI Sampler Initials	Laboratory (Wauconda or Pasadena)	Subcontracted Laboratory (if applicable)
WAH, BT		N/A
Engineering or Compliance Test Samples		

Label Number	Sample Date	Time of Collection[2]	Sample Identification	Number of Containers	Container Type (Petri, Bottle, Bag, Tube, Summa, Bomb)	Preservation Code	Analysis Request[1]: Method 5F				Comments
44058	6-17-14	—	5F-1 Probe wash	1	1000 N	1	X				
55554			5F-1 Filter	1	Petri	1	X				
44059			5F-2 Probe wash	1	1000 N	1	X				
55553			5F-2 Filter	1	Petri	1	X				
44060			5F-3 Probe wash	1	1000 N	1	X				
55552			5F-3 Filter	1	Petri	1	X				
44061			DI Blank	1	1000 N	1	X				
55548			Filter Blank	1	Petri	1	X				
55551	↓		Trip Blank	1	Petri	1	X				

Preservation Code
1 = Ambient Temp.
2 = 4°C (Ice Packs)
3 = Dry Ice
4 = Other (Noted)

Special Instructions:	(1) Relinquished By: WAH	(2) Relinquished By	(3) Relinquished By	SHIPMENT:
	(1) Date / Time: 6-18-14 1100	(2) Date / Time	(3) Date / Time	Hand Carry
Date test results needed: 6-27-14	(1) Company: ARI	(2) Company	(3) Company	FedEx
Reporting level: Engineering Compliance	(1) Received By:	(2) Received By	(3) Received By	UPS
Route results through: SF	(1) Date / Time: 6/18/14 11:18	(2) Date / Time	(3) Date / Time	Custody Seal Applied
Project manager signature:	(1) Company: ARI	(2) Company	(3) Company	Yes No

1 – Analysis request must be confirmed by project manager signature 2 – End time only and applicable to samples requiring specific holding time limits and/or bag spike recovery determination

Form LF0001

APPENDIX D

Calibration Data

APEX INSTRUMENTS METHOD 5 PRE-TEST CONSOLE CALIBRATION
USING CALIBRATED CRITICAL ORIFICES
5-POINT ENGLISH UNITS

Meter Console Information	
Console Model Number	MC522
Console Serial Number	6011012
DGM Model Number	MS4
DGM Serial Number	DGM 1510080

Calibration Conditions			
Date	Time	16-Dec-13	4:00
Barometric Pressure		29.4	in Hg
Theoretical Critical Vacuum[1]		13.9	in Hg
Calibration Technician		B. Crane	

Factors/Conversions		
Std Temp	528	°R
Std Press	29.92	in Hg
K_1	17.647	°R/in Hg

[1]For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.

[2]The Critical Orifice Coefficient, K', must be entered in English units, $(ft^3 \cdot °R^{1/2})/(in.Hg \cdot min)$.

Calibration Data

Run Time	Metering Console					Critical Orifice				
Elapsed	DGM Orifice ΔH	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final	Serial Number	Coefficient	Amb Temp Initial	Amb Temp Final	Actual Vacuum
(θ)	(P_{ov})	(V_{mi})	(V_{mf})	(t_{mi})	(t_{mf})		K'	(t_{amb})	(t_{amb})	
min	in H_2O	cubic feet	cubic feet	°F	°F		see above2	°F	°F	in Hg
11.0	2.0	84.900	93.480	78	79	OX63	0.5894	75	76	19
10.0	3.4	94.800	105.120	79	81	OX73	0.7770	76	76	16
11.0	1.1	38.900	45.380	76	76	OX55	0.4440	76	76	21
15.0	0.7	46.500	53.370	77	77	OX48	0.3439	76	75	22
17.0	0.3	53.800	58.970	77	77	OX40	0.2298	75	75	23

Results

Standardized Data				Dry Gas Meter				
				Calibration Factor		Flowrate	ΔH @	
Dry Gas Meter		Critical Orifice		Value	Variation	Std & Corr	0.75 SCFM	Variation
(V_{mstd})	(Q_{mstd})	(Vcr_{std})	(Q_{crstd})	(Y)	(ΔY)	$(Q_{mstd/crstd})$	(ΔH@)	(ΔΔH@)
cubic feet	cfm	cubic feet	cfm			cfm	in H2O	
8.316	0.756	8.245	0.750	0.991	0.003	0.750	1.952	0.002
10.010	1.001	9.877	0.988	0.987	-0.002	0.988	1.919	-0.030
6.296	0.572	6.208	0.564	0.986	-0.003	0.564	1.894	-0.056
6.656	0.444	6.560	0.437	0.986	-0.003	0.437	1.942	-0.008
5.004	0.294	4.971	0.292	0.993	0.005	0.292	2.041	0.092
CAL-MASTERMETER-WORKBOOK-203T-REV1				0.989	Y Average		1.950	ΔH@ Average

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR Title 40, Part 60, Appendix A-3, Method 5, 16.2.3

Signature [signature] Date 12-16-13

ARI Environmental, Inc.
Gas Meter Thermometer Calibration Data Form
Pre -Test

Meter Box: 6011012
Calibrator: B.Crane
Date: 12/16/2013
Barometric: 29.43
Ambient Temp: 74
Reference Thermometer: Altek Thermocouple Source CAL-MASTERMETER-WORKBOOK-203T-REV1

Reference Temperature Altek	Thermometer Temperature Inlet	Difference (%) mean Inlet	Thermometer Temperature Oulet	Difference (%) mean Oulet	Thermometer Temperature Probe	Difference (%) mean Probe
0	NA		0	0.00	0	0.00
100			97	-0.54	99	-0.18
200			200	0.00	201	0.15
300			299	-0.13	301	0.13
400			396	-0.47	398	-0.23
500			497	-0.31	498	-0.21

Temperature Altek	Temperature Filter	(%) mean Filter	Temperature Exit	(%) mean Exit	Temperature Aux	(%) mean Aux
0	0	0.00	0	0.00	0	0.00
100	98	-0.36	97	-0.54	97	-0.54
200	201	0.15	201	0.15	200	0.00
300	300	0.00	300	0.00	299	-0.13
400	397	-0.35	397	-0.35	396	-0.47
500	498	-0.21	497	-0.31	497	-0.31

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
0	0	0.00
200	200	0.00
400	396	-0.47
600	600	0.00
800	801	0.08
1000	1001	0.07

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
1200	1199	-0.06
1400	1398	-0.11
1600	1600	0.00
1800	1798	-0.09

Revised 10/03

APEX INSTRUMENTS METHOD 5 POST-TEST CONSOLE CALIBRATION
USING CALIBRATED CRITICAL ORIFICES
3-POINT ENGLISH UNITS

Meter Console Information	
Console Model Number	MC522
Console Serial Number	6011012
DGM Model Number	MS-4
DGM Serial Number	1510080.00

Calibration Conditions			
Date	Time	20-Jun-14	11:00
Barometric Pressure		29.3	in Hg
Theoretical Critical Vacuum[1]		13.8	in Hg
Calibration Technician		B. Crane	

Factors/Conversions		
Std Temp	528	°R
Std Press	29.92	in Hg
K_1	17.647	oR/in Hg

[1]For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.

[2]The Critical Orifice Coefficient, K', must be entered in English units, $(ft^3 * °R^{1/2})/(in.Hg*min)$.

Calibration Data

Run Time	Metering Console					Critical Orifice				
Elapsed	DGM Orifice ΔH	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final	Serial Number	Coefficient	Amb Temp Initial	Amb Temp Final	Actual Vacuum
(Θ)	(P_m)	(V_{mi})	(V_{mf})	(t_{mi})	(t_{mf})		K'	(t_{amb})	(t_{amb})	
min	in H_2O	cubic feet	cubic feet	°F	°F		see above2	°F	°F	in Hg
10.0	1.9	717.500	725.170	73	74	OX63	0.5881	71	71	18
10.0	1.9	725.170	732.820	74	74	OX63	0.5881	71	73	18
10.0	1.9	732.820	740.460	74	74	OX63	0.5881	73	74	18

Results

Standardized Data				Dry Gas Meter				
				Calibration Factor		Flowrate	ΔH @	
Dry Gas Meter		Critical Orifice		Value	Variation	Std & Corr	0.75 SCFM	Variation
($V_{m(std)}$)	($Q_{m(std)}$)	($Vcr_{(std)}$)	($Q_{cr(std)}$)	(Y)	(ΔY)	($Q_{m(std)(corr)}$)	(ΔH@)	(ΔΔH@)
cubic feet	cfm	cubic feet	cfm			cfm	in H2O	
7.456	0.746	7.465	0.746	1.001	-0.002	0.746	1.875	-0.003
7.430	0.743	7.458	0.746	1.004	0.001	0.746	1.877	-0.001
7.420	0.742	7.447	0.745	1.004	0.001	0.745	1.882	0.004
Pretest Gamma	0.989	% Deviation	1.4	1.003	Y Average		1.878	ΔH@ Average

CAL-MASTERMETER-WORKBOOK-203T-REV1

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR Title 40, Part 60, Appendix A-3, Method 5, 16.2.3

Signature B. Crane Date 6-20-14

ARI Environmental, Inc.
Gas Meter Thermometer Calibration Data Form
Post-Test

Meter Box: 6011012
Calibrator: B. Crane
Date: 6/20/2014
Barometric: 29.25
Ambient Temp: 75
Reference Thermometer: Altek Thermocouple Source CAL-MASTERMETER-WORKBOOK-203T-REV1

Reference Temperature Altek	Thermometer Temperature Inlet	Difference (%) mean Inlet	Thermometer Temperature Oulet	Difference (%) mean Oulet	Thermometer Temperature Probe	Difference (%) mean Probe
0	NA		-1	-0.22	-2	-0.43
100			97	-0.54	97	-0.54
200			199	-0.15	199	-0.15
300			299	-0.13	299	-0.13
400			395	-0.58	395	-0.58
500			497	-0.31	496	-0.42

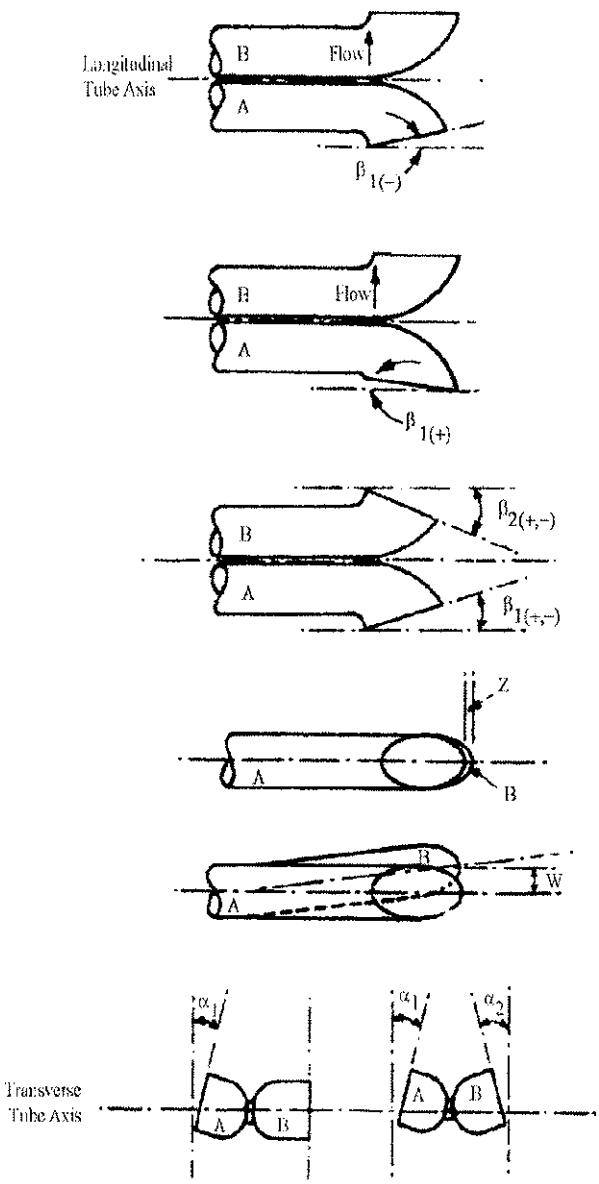
Reference Temperature Altek	Thermometer Temperature Filter	Difference (%) mean Filter	Thermometer Temperature Exit	Difference (%) mean Exit	Thermometer Temperature Aux	Difference (%) mean Aux
0	1	0.22	-1	-0.22	-2	-0.43
100	99	-0.18	97	-0.54	97	-0.54
200	202	0.30	199	-0.15	199	-0.15
300	301	0.13	300	0.00	299	-0.13
400	398	-0.23	396	-0.47	395	-0.58
500	499	-0.10	497	-0.31	496	-0.42

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
0	0	0.00
200	200	0.00
400	396	-0.47
600	600	0.00
800	801	0.08
1000	1001	0.07

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
1200	1198	-0.12
1400	1397	-0.16
1600	1600	0.00
1800	1797	-0.13

Pitot Tube Inspection Data

Client Name: _____



Pre-Sample Date: 5/10/2014		Post-Sample Date: 6/23/2014
Y	**level?**	Y
N	**obstructions?**	N
N	**damaged?**	N
0	**$-10° < \alpha_1 < +10°$**	0
1	**$-10° < \alpha_2 < +10°$**	0
1	**$-5° < \beta_1 < +5°$**	1
0	**$-5° < \beta_2 < +5°$**	0
2	**γ**	0
0	**θ**	0
0.720	**A**	0.74
0.360	**$0.2625 < P_A < 0.375$**	0.370
0.360	**$0.2625 < P_B < 0.375$**	0.370
0.250	**$0.1875 \leq D_t \leq 0.375$**	0.250
0.025	**$A \tan \gamma < 0.125"$**	0.000
0.00000	**$A \tan \theta < 0.03125"$**	0.00000
TRUE	**$P_A = P_B$ +/- 0.063**	TRUE
PASS	**PASS/FAIL**	PASS

Comments: 9' effective length M5 probe.

Pitot tube/probe number 735 meets or exceeds all specifications and criteria and/or applicable design features (per 40CFR60 Appendix A; Method 2) and is heareby assigned a pitot tube calibration factor of 0.84.

Signature: _____

Date: 6-23-14

ARI Environmental Inc.
Thermocouple Calibration Data Form

Calibrator: B. Crane
Thermocouple ID. 735

	pretest	posttest
Date:	5/10/2014	6/23/2014
Barometric:	29.22	29.14

Reference Thermometer = Mercury in glass

	Reference Point Number	Source	Reference Thermometer Temperature	Meter Readout Temperature	Difference (%)
Pre-Test	T.C	Ice Water			0.00
		Ambient	76.9	77.1	-0.04
		Heat Source			0.00
Post-Test	T.C	Ice Water	32.4	32.2	0.04
		Ambient	80.5	78.7	0.33
		Heat Source	296.7	296.0	0.09

a (temp. diff.) = (ref.temp + 460) - (Thermo. temp. + 460) / (ref. temp. +460) x 100

Where $-1.5 < a < 1.5$

CAL-SPITOT-WORKBOOK-200T-REV1

APPENDIX E

Process Data

MAIN BODY OF REPORT Process Data Summary Tables

NSPS-Ja

Run	5F-1	5F-2	5F - 3	Test Average
Start time	6/17/2014 14:53	6/17/2014 16:35	6/17/2014 18:10	
End time	6/17/2014 15:58	6/17/2014 17:40	6/17/2014 19:15	
Soot Blowing				
FCCU Regenerator Coke Burn, lb/hr	61327	61505	61191	61341
ESP Total Primary Power, KW	84	83	83	83
ESP Total Secondary Current, Amps	2638	2640	2639	2639
SO2, ppm @ 0%O2	2	2	2	2
NOx, ppm @ 0%O2	35	34	34	34

APPENDIX Additional Process Data Summary - BP CONFIDENTIAL BUSINESS INFORMATION

NSPS-Ja

Run	5F-1	5F-2	5F - 3	Test Average
Ammonia Flow to ESP, lb/hr	149	150	151	150
SO2 Additive Rate, PPD	100	100	100	100
Ammonia Slip (Calc), ppm	7.09	7.07	7.17	7.11
Regenerator Plenum Outlet Temperature, F	1366	1363	1361	1363
Average ESP Inlet Temperature, F	674	674	674	674
Total Feed Rate, BPD	105	105	105	105

APPENDIX F Test Program Qualifications

Test Program Qualifications

ARI Environmental's offices in Wauconda, Illinois; Newport, Delaware and Pasadena, Texas specialize in conducting stack emission, fugitive leak detection, ambient air and in-plant OSHA type testing for industrial clients.

ARI is organized so that its facilities and resources meet the requirements of ASTM D7036, Standard Practice for Competence of Air Emission Testing Bodies. ARI's laboratories in Wauconda, Illinois and Pasadena, Texas hold NELAP primary accreditation with the Texas Commission on Environmental Quality (Certificate No. T104704428-13-5), NELAP accreditation with the New Jersey Department of Environmental Protection (Certificate No. IL007), and NELAP/State accreditation with the Louisiana Department of Environmental Quality (Certificate No. 02010). ARI is also registered with the Pennsylvania Laboratory Accreditation Program (Registration No. 68-05220).

During the past 30 years, ARI personnel have conducted over 5,000 separate stack emission tests for a variety of industrial clients throughout North America for the determination of degree of source compliance and to yield emissions data and control equipment performance data for in-house engineering purposes.

ARI presently has over 80 trained personnel for conducting source emission sampling, fugitive leak detection monitoring, ambient air monitoring and OSHA sampling programs. All test programs are supervised and conducted by onsite Qualified Individuals (QI) and/or Qualified Source Testing Individuals (QSTI) pursuant to ASTM D7036.

The key personnel involved in the test program were as follows:

Steven Flaherty
Mr. Flaherty is a Senior Project Manager with ARI. His 14 years of experience includes emission compliance and CEM certification testing for a wide variety of industries including petrochemical, steel mills, electric utilities, cement plants, asphalt plants and general manufacturing plants. Mr. Flaherty is presently certified as a QSTI by the Source Evaluation Society (SES) pursuant to the requirements of ASTM D7036-04.

W. Alex Hildreth
Mr. Hildreth is a field technician specializing in sampling equipment preparation, maintenance and calibration, equipment setup, field sampling, sample recovery and post-test equipment clean up. Mr. Hildreth has 2 years of experience in conducting various source emission test programs. Mr. Hildreth is presently certified as a QI by the SES pursuant to the requirements of ASTM D7036-04.

Brett Tussing
Mr. Tussing is a field technician specializing in sampling equipment preparation, maintenance and calibration, equipment setup, field sampling, sample recovery and post-test equipment clean up.

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

STEVEN M. FLAHERTY

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS

ISSUED THIS 26TH DAY OF NOVEMBER 2013 AND EFFECTIVE UNTIL NOVEMBER 25TH, 2018

Peter R. Westlin, QSTI/QSTQ Review Board

C. David Bagwell, QSTI/QSTQ Review Board

Peter S. Pakalnis, QSTI/QSTQ Review Board

Karen D. Kajiya-Mills , QSTI/QSTQ Review Board

LeRoy Owens, QSTI/QSTQ Review Board

Glenn C. England, QSTI/QSTQ Review Board

APPLICATION NO. 2008-237

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

STEVEN M. FLAHERTY

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GASEOUS POLLUTANTS SOURCE SAMPLING METHODS

ISSUED THIS 26TH DAY OF NOVEMBER 2013 AND EFFECTIVE UNTIL NOVEMBER 25TH, 2018

Peter R. Westlin, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Karen O. Kajiya-Mills , QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2008-237

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

STEVEN M. FLAHERTY

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS

ISSUED THIS 26TH DAY OF NOVEMBER 2013 AND EFFECTIVE UNTIL NOVEMBER 25TH, 2018

Peter R. Westlin, QSTI/QSTQ Review Board

C. David Bagwell, QSTI/QSTQ Review Board

Peter S. Pakalnis, QSTI/QSTQ Review Board

Karen D. Kajiya-Mills, QSTI/QSTQ Review Board

LeRoy Owens, QSTI/QSTQ Review Board

Glenn C. England, QSTI/QSTQ Review Board

APPLICATION NO. 2008-237

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

STEVEN M. FLAHERTY

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

HAZARDOUS METALS MEASUREMENT SAMPLING METHODS

ISSUED THIS 18TH DAY OF OCTOBER 2011 AND EFFECTIVE UNTIL OCTOBER 17TH , 2016

Peter R. Westlin, QSTI/QSTQ Review Board

C. David Bagwell, QSTI/QSTQ Review Board

Peter S. Pakalnis, QSTI/QSTQ Review Board

Karen Q. Kajiya-Mills , QSTI/QSTQ Review Board

LeRoy Owens, QSTI/QSTQ Review Board

Glenn C. England, QSTI/QSTQ Review Board

APPLICATION NO. 2008-237

Appendix 6b – FCU 500 Performance Testing
September 2014

TEST REPORT

COMPLIANCE EMISSION TEST
CONSENT DECREE
FLUIDIZED CATALYTIC CRACKING UNIT 500

BP PRODUCTS NORTH AMERICA, INC.
WHITING, INDIANA

PREPARED FOR:

BP PRODUCTS NORTH AMERICA, INC.
Whiting Refinery
2918 Indianapolis Blvd.
Whiting, Indiana 46394
Phone: 219.473.2110
E-mail: rohini.sengupta@bp.com
Attention: Ms. Rohini Sengupta
Environmental Specialist

cc: Mr. Dave Fashimpaur
Mr. Mark Huthmaker
Ms. Cheryl Joyal
Mr. Sean O'Connell
Mr. Dave Ringwald

ARI Project No. 566-140 Revision 1
BP Purchase Order No. 3000319830
Test Dates: September 18 and 19, 2014
Report Issuance Date: _____

ARI Environmental, Inc.
951 Old Rand Road, Unit 106
Wauconda, Illinois 50084
Phone: 847.487.1580 Ext. 117
Fax: 847.487.1587
E-mail: sflaherty@arienv.com
Steve Flaherty
Senior Project Manager
Source Testing Division

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Appendix C	Analytical Data
Appendix D	Calibration Data
Appendix E	Process Data
Appendix F	Test Program Qualifications

REPORT CERTIFICATION

STATEMENT OF CONFORMANCE AND TEST REPORT CERTIFICATION

I certify, to the best of my knowledge, that this test program was conducted in a manner conforming to the criteria set forth in ASTM D7036-04: Standard Practice for Competence of Air Emission Testing Bodies, and that project management and supervision of all project related activities were performed by qualified individuals as defined by this practice.

I further certify that this test report and all attachments were prepared under my direction or supervision in accordance with the ARI Environmental, Inc. quality management system designed to ensure that qualified personnel gathered and evaluated the test information submitted. Based on my inquiry of the person or persons who performed the sampling and analysis relating to this performance test, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate and complete.

_____

Steve Flaherty, QSTI
Senior Project Manager, Source Testing Division
ARI Environmental, Inc.

_____

Hank Taylor, QI
Quality Assurance Manager
ARI Environmental, Inc.

SECTIONONE Introduction and Summary

ARI Environmental, Inc. (ARI) was retained by BP Products North America, Inc. (BP) to conduct a particulate matter (PM) compliance emission test on the Fluidized Catalytic Cracking Unit (FCCU) 500 stack at their refinery located in Whiting, Indiana. Testing was conducted on September 18 and 19, 2014.

Four approximately 120-minute test runs were conducted on the FCCU 500 stack to determine the concentrations and emission rates of total PM and PM under 10 microns (PM_{10}), including condensable PM (CPM). The emission test was performed to fulfill the testing requirements of BP's Consent Decree.

Sampling and analysis methodologies followed the procedural requirements as detailed in the Code of Federal Regulations, Title 40, Part 60 (40 CFR 60), Appendix A, USEPA Methods 1, 2, 3 and 4; 40 CFR 51, Appendix M, USEPA Methods 201A and 202; and the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods.

Ms. Rohini Sengupta of BP coordinated the test and monitored process conditions. Testing was conducted by Messrs. Steve Flaherty, Jayce Best, Richard Gluth and Jonathon Phillips of ARI.

This report summarizes the test procedures and results of the emission test. Included as appendices is complete documentation of all calculation summaries, field data, analytical data, calibration data, process data and test program qualifications.

The test results are summarized in Table 1-1.

TABLE 1-1. SUMMARY OF FCCU 500 STACK PM_{10} AND TOTAL PM TEST RESULTS

TEST RUN NO. :	1 - 500	2 - 500	3 - 500	4 - 500	
TEST DATE :	9/18/2014	9/18/2014	9/18/2014	9/19/2014	
TEST TIME :	11:30 - 13:46	15:30 - 17:36	18:40 - 20:44	09:07 - 11:11	Average
Filterable PM_{10}					
Concentration					
grains/dscf	0.0154	0.0168	0.0141	0.0174	0.0159
mg/dscm	35.318	38.379	32.169	39.857	36.431
Emission rate					
lb/hr	24.406	25.582	21.917	26.985	24.722
lb/1,000 lb coke burn	0.471	0.493	0.422	0.526	0.478
Condensable PM_{10}					
Concentration					
grains/dscf	0.0103	0.0074	0.0112	0.0099	0.0097
mg/dscm	23.641	16.902	25.526	22.729	22.199
Emission rate					
lb/hr	16.337	11.266	17.391	15.388	15.095
lb/1,000 lb coke burn	0.316	0.217	0.335	0.300	0.292
Total PM_{10}					
Concentration					
grains/dscf	0.0258	0.0242	0.0252	0.0273	0.0256
mg/dscm	58.959	55.281	57.694	62.586	58.630
Emission rate					
lb/hr	40.743	36.847	39.307	42.373	39.818
lb/1,000 lb coke burn	0.787	0.710	0.756	0.826	0.770
Filterable $>PM_{10}$					
Concentration					
grains/dscf	0.0036	0.0032	0.0034	0.0022	0.0031
mg/dscm	8.159	7.336	7.691	5.027	7.053
Emission rate					
lb/hr	5.639	4.890	5.240	3.403	4.793
lb/1,000 lb coke burn	0.109	0.094	0.101	0.066	0.093
Total PM (PM_{10} + $>PM_{10}$)					
Concentration					
grains/dscf	0.0293	0.0274	0.0286	0.0295	0.0287
mg/dscm	67.118	62.617	65.386	67.612	65.683
Emission rate					
lb/hr	46.381	41.737	44.547	45.776	44.611
lb/1,000 lb coke burn	0.896	0.804	0.857	0.892	0.862

SECTIONTWO Testing and Analytical Procedures

2.1 OVERVIEW

ARI conducted a compliance emission test on the FCCU 500 stack at the BP refinery located in Whiting, Indiana. Testing was conducted on September 18 and 19, 2014.

Four approximately 120-minute test runs were conducted on the FCCU 500 stack to determine the concentrations and emission rates of total PM and PM_{10}, including CPM.

2.2 METHODOLOGY

Testing procedures and sampling methodologies were conducted following the procedural requirements as detailed in 40 CFR 60, Appendix A, USEPA Methods 1, 2, 3 and 4; 40 CFR 51, Appendix M, USEPA Methods 201A and 202; and the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods.

2.2.1 Sampling Locations (USEPA Method 1)

The sampling point locations used for the determination of gas velocity and volume flow rate were determined following the procedural requirements as detailed in USEPA Method 1. Sampling was conducted in the FCCU 500 stack using the two sampling ports provided in the 108-inch diameter stack. The sample ports are located approximately 1,368 inches downstream and 720 inches upstream from the nearest flow disturbances. Twelve traverse points were used to sample the cross-sectional area of the stack.

A cyclonic flow check has been conducted to demonstrate that cyclonic flow conditions do not exist at the sampling location.

2.2.2 Flue Gas Volumetric Flow Rate (USEPA Method 2)

Gas velocity and volumetric flow rate were determined following USEPA Method 2. Velocity head measurements were performed using a Type-S pitot tube and Dwyer inclined 0 to 10-in. inclined oil gauge manometer. Temperature measurements were conducted using a Chromel-Alumel thermocouple connected to a digital direct read-out potentiometer.

2.2.3 Molecular Weight (USEPA Method 3)

The stack gas oxygen (O_2) and carbon dioxide (CO_2) concentrations were determined following USEPA Method 3 procedures. During each test run, an integrated bag sample of the exhaust gas was collected. An Orsat combustion gas analyzer was used to determine the O_2 and CO_2 concentrations of each collected bag. The nitrogen (N_2) content was calculated as the difference.

2.2.4 Flue Gas Moisture Content (USEPA Method 4)

The stack gas moisture content was determined following USEPA Method 4. This method was performed in conjunction with the USEPA Methods 201A and 202 procedures described in Subsection 2.2.5.

2.2.5 Total PM, PM_{10} and CPM (USEPA Methods 201A and 202)

Sampling was conducted in accordance with USEPA Methods 201A and 202 using an Apex Instruments, Inc. PM sampling train (see Figure 2-1). The back-half impinger catch was analyzed for CPM in accordance with USEPA Method 202 procedures. The front half was analyzed for filterable PM_{10} and $>PM_{10}$ to allow for calculation of total filterable PM in accordance with USEPA Method 201A procedures.

PM_{10} was determined using the procedures of USEPA Method 201A. Sampling was conducted at a constant rate in order to achieve the 10 microns cut-rate of the cyclone separator. Dwell times at each sample point were calculated based on the stack gas velocity and gas meter temperature. Although USEPA Method 201A has an acceptable isokinetic range of 80 - 120%, this test targeted the more stringent isokinetic range of 90 - 110% to allow for the calculation of total PM following the procedural requirements of the method. Total PM was calculated as the total filterable PM plus CPM.

2.2.5.1 Sampling Apparatus

Assembled by ARI personnel, the sampling train consisted of the following:

Cyclone Separator - Apex Instruments, 316 stainless steel design - 10 micron cut-rate.

Cyclone Nozzle - Stainless steel - integrated with cyclone, sized to attain PM_{10} cut-rate.

Probe - Stainless steel with a heating system capable of maintaining a probe exit temperature of 248°F.

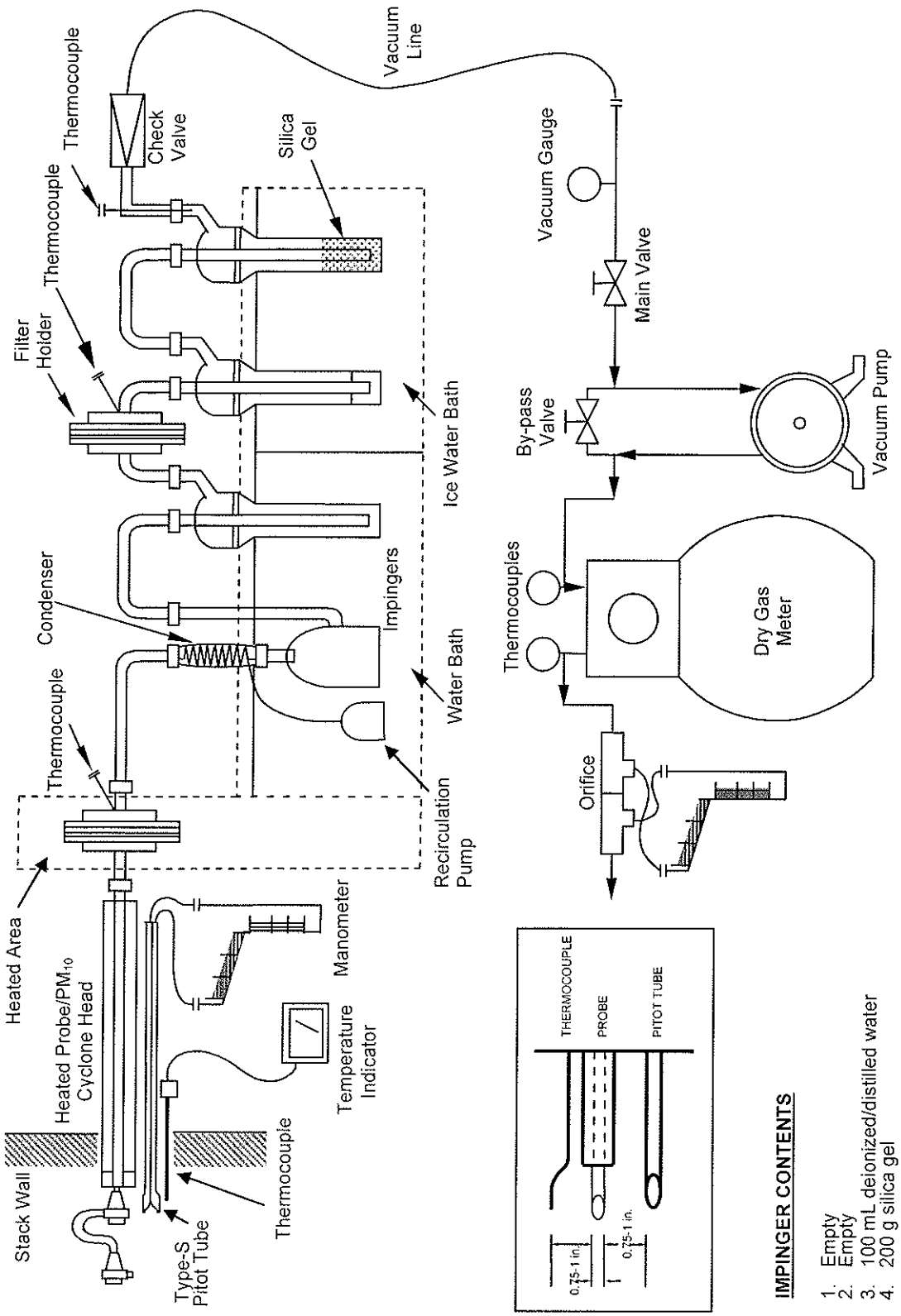
Pitot Tube - Type-S, attached to probe for monitoring stack gas velocity.

Heated Filter Holder - Borosilicate glass filter holder with a 4-in. Teflon frit filter support and a silicone rubber gasket. The holder design provided a positive seal against leakage from the outside or around the filter. The filter holder was heated to 248°F ±25°F during sampling. A thermocouple was placed in the back half of the filter support in direct contact with the sample stream. A quartz fiber filter that met the requirements of USEPA Method 5 was used.

Ambient Filter Holder - Unheated borosilicate glass filter with a 4-in. Teflon frit filter support, Teflon filter and a silicone rubber gasket. A thermocouple was placed in the back half of the filter holder to measure sample gas temperature by direct contact with the sample stream. Temperature was maintained between 65 and 85°F. A Teflon filter disc was placed in the filter holder.

Draft Gauge - Inclined manometer with a readability of 0.01-in. H_2O in the 0 to 1-in. range and 0.1-in. H_2O in the 0 to 10-in. range.

Condenser - Glass, coil type with compatible fittings.



IMPINGER CONTENTS

1. Empty
2. Empty
3. 100 mL deionized/distilled water
4. 200 g silica gel

FIGURE 2-1. USEPA METHODS 201A/202 PARTICULATE MATTER SAMPLING TRAIN

Impingers - Four impingers connected in series with glass ball joints. The first impinger was a USEPA Method 23 type condenser with a condensate drop-out. The second, third and fourth impingers were of the Greenburg-Smith design, but modified by replacing the standard tip with a ½-in. i.d. glass tube extending to within ½-in. of the bottom of the impinger flask. The second and third impingers were connected using the ambient filter holder.

Metering System - Apex Model 522. Vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 5°F, dry gas meter with ±2 percent accuracy and related equipment as required to maintain an isokinetic sampling rate and to determine sample volume.

Barometer - Mercury barometer capable of measuring atmospheric pressure to within ±0.1-in. Hg.

2.2.5.2 Sampling Procedures

After the minimum number of traverse points was selected, the stack pressure, temperature, moisture and range of velocity differential pressure (ΔP) were measured according to procedures described in USEPA Methods 1 through 4. For the sampling train, the first and second impingers were initially empty. The third impinger contained 100 milliliters (mL) of deionized/distilled (DI) water. The fourth impinger contained 200 grams of silica gel.

The impingers were placed in a container that had two compartments. The first two impingers were placed in the first compartment, and the third and fourth impingers were placed in the second compartment. The first compartment contained water that was circulated through the condenser to reduce the sample gas to between 65 and 85°F at the exit of the ambient filter. The second compartment contained ice water to reduce the sample gas to ≤68°F upon exiting the last impinger. Both temperatures were recorded at each traverse point interval throughout each test run.

The sampling train was leak-checked at the sampling site by plugging the inlet to the nozzle and pulling a vacuum of 15-in. Hg. Leak rates of less than 0.02 ft^3/min at a vacuum of 15-in. Hg are considered acceptable. At the completion of each test run, the sampling train was again leak-checked by the same procedure. Both pre and post-test leak checks of the pitot tube were made for each test run. Ice was placed around the impingers to keep the temperature of the gases leaving the last impinger at less than 68°F.

During sampling, stack gas and sampling train data were recorded at specified intervals. Isokinetic sampling rates were set throughout the sampling period with the aid of a programmable calculator.

2.2.5.3 Sample Recovery Procedures

After sampling was completed, a post-test nitrogen purge was conducted with the impingers still on ice at a rate ≥14 liters per minute for 60 minutes. Before the purge step began, the short stem of the first impinger was replaced with a long stem that was within ½-inch of the bottom of the impinger. If the stem did not extend below the water level in the impinger by at least 1 cm, a measured amount of degassed DI water was added to adjust the level.

Method 201A

The sample fractions were recovered as follows:

Container 1 - The filter was removed from the holder and placed in a petri dish.

Container 2 - The >PM_{10} was acetone rinsed from the cyclone cup, the internal surface of the nozzle and the outside surface of the downcomer line. The 250 mL glass container with Teflon-lined lid was sealed, and the liquid level was marked.

Container 3 - The ≤PM_{10} filterable PM was acetone rinsed from the cyclone exit tube and internal surfaces of the PM_{10} cyclone assembly, probe liner and sample exposed surfaces prior to the filter. The 250 mL glass container with Teflon-lined lid was sealed, and the liquid level was marked.

Container 4 - 150 mL of acetone was taken for blank analysis. The blank was obtained and treated in a similar manner as the contents of Container 2.

Method 202 (Including Field Recovery Blank Train)

The sample fractions were recovered as follows:

Container 1 - The contents from the first two impingers were placed into a glass container. The impingers (including the short stem), connecting glassware and front half of the ambient filter holder were quantitatively rinsed twice with DI water, and the rinse was added to this container. The liquid level was marked after the container was sealed.

Container 2 - The first two impingers (including the short stem), connecting glassware and front half of the ambient filter holder were rinsed with acetone, followed by two rinses with hexane, and placed in a glass container. The liquid level was marked after the container was sealed.

Container 3 - The ambient filter was removed and placed in a petri dish.

Containers 4 & 5 - 150 mL of DI water and hexane were taken for blank analysis. The blanks were obtained and treated in a similar manner as the contents of Containers 1 and 2.

The contents of the third impinger were weighed and discarded. The contents of the fourth impinger (silica gel) were weighed to the nearest gram.

2.2.5.4 Analytical Procedures

Method 201A

The analytical procedures followed those described in USEPA Method 201A.

Container 1 - The filter and any loose PM were transferred from the sample container to a tared glass weighing dish, dried at 105°C for 2 to 3 hours and placed in a desiccator for 24 hours. The filter was weighed to a constant weight. The results were reported to the nearest 0.1 mg.

Containers 2 & 3 - The acetone washings were transferred to a tared beaker and evaporated to dryness at ambient temperature and pressure. The contents were then placed in a desiccator for 24 hours and weighed to a constant weight to the nearest 0.1 mg.

Container 4 - The acetone blank was transferred to a tared beaker, evaporated to dryness at ambient temperature and pressure in a fume hood, placed in a desiccator for 24 hours and weighed to a constant weight to the nearest 0.1 mg.

Method 202 (Including Field Recovery Blank Train)

The analytical procedures followed those described in USEPA Method 202.

Container 1 - The liquid in this container was measured volumetrically and placed into a separatory funnel. Approximately 30 mL of hexane was added, mixed well and the lower organic phase drained off. This procedure was repeated twice, leaving a small amount of the organic/hexane phase in the separatory funnel each time to yield approximately 90 mL of organic extract. This organic extract was combined with Container 2. The aqueous fraction from Container 1 was transferred to a tared Teflon beaker liner, evaporated in an oven at 105°C to no less than 10 mL and allowed to air dry at ambient temperature. If a dried constant weight could not be achieved, the residue was redissolved in 100 mL of water and titrated with 0.1N ammonium hydroxide to a pH of 7.0. The aqueous phase was then evaporated in an oven at 105°C to approximately 10 mL, evaporated to dryness in a fume hood at ambient temperature and pressure, placed in a desiccator for 24 hours and weighed to a constant weight to the nearest 0.1 mg. The gain in mass represents the inorganic PM collected in the sampling train back half.

Container 2 - The contents of this container were combined with the organic extract from Container 1, placed in a tared Teflon beaker liner, evaporated to dryness at ambient temperature and pressure in a fume hood, placed in a desiccator for 24 hours and weighed to a constant weight to the nearest 0.1 mg. The gain in mass represents the organic PM collected in the sampling train back half.

Container 3 - The ambient filter was folded in quarters and placed into a 50 mL extraction tube. Sufficient DI water was used to cover the filter. The extraction tube was placed in a sonication bath, and the water soluble material was extracted for a minimum of 2 minutes. The aqueous extract was combined with the contents of Container 1. This step was completed a total of three times. After completion of the aqueous extraction, the filter was covered with a sufficient amount of hexane. The extraction tube was then placed in a sonication bath, and the organic material was extracted for a minimum of 2

minutes. The organic extract was combined with the contents of Container 2. This step was completed a total of three times. The procedures for Container 3 were completed prior to any procedures for Containers 1 and 2.

Container 4 - The water blank was transferred to a tared Teflon beaker liner and evaporated to approximately 10 mL in an oven at 105°C. It was then evaporated to dryness at ambient temperature and pressure in a fume hood, placed in a desiccator for 24 hours and weighed to a constant weight to the nearest 0.1 mg.

Container 5 - The hexane blank was transferred to a tared Teflon beaker liner, evaporated to dryness at ambient temperature and pressure in a fume hood, placed in a desiccator for 24 hours and weighed to a constant weight to the nearest 0.1 mg.

The term "constant weight" means a difference of no more than 0.5 mg or 1 percent of the total weight less tare weight, whichever is greater between two consecutive readings, with no less than 6 hours of desiccation between weighings.

SECTIONTHREE Process Description

The FCCU 500, constructed in 1945 and identified as Unit ID 230, is rated at 115,000 barrels per day. This unit converts hydrocarbons that boil above 500°F into lower molecular weight products, which include gasoline and LPG. The cracking takes place as the gas oil and catalyst stream mix in the reactor. This process results in the catalyst being coated with coke, which is subsequently burned off in a regenerator.

The process data summary is presented in Table 3-1.

TABLE 3-1. FCCU 500 PROCESS AND STACK CEMS DATA SUMMARY

TEST RUN NO. :	1 - 500	2 - 500	3 - 500	4 - 500	Average
Total Feed Rate, BPD	88	88	88	88	88
FCCU Regenerator Coke Burn, lb/hr	51,771	51,933	51,976	51,329	51,752
Ammonia Flow to ESP, lb/hr	135	135	135	134	135
ESP Total Primary Power, KW	125	126	125	126	126
ESP Total Secondary Current, Amps	4,231	4,234	4,231	4,234	4,233
SO_2, ppm @ 0% O_2	6	6	6	6	6
NO_x, ppm @ 0% O_2	25	26	25	25	25
SO_2 Additive Rate, PPD	400	400	400	450	412
Ammonia Slip (Measured), ppm	7.00	7.01	7.01	7.08	7.02
Regenerator Plenum Outlet Temperature, °F	1,294	1,292	1,291	1,292	1,292
Average ESP Inlet Temperature, °F	668	669	670	669	669

SECTIONFOUR Test Results

The test results are presented in Table 4-1.

The calculation summaries, field data, analytical data, calibration data, process data and test program qualifications are included in the appendices.

DISCUSSION

During formal review of the analytical test data, it was noted the deionized water used during field recovery of the Method 202 CPM samples exhibited an unusually high blank level for inorganic residue. A high inorganic CPM mass was also noted for the Method 202 recovery blank train analytical results. Subsequently, an investigation was initiated to determine the root cause of the high blank values.

Results of the investigation indicated the laboratory deionized water system had malfunctioned, and the reagent water used during the field recovery of the Method 202 train samples was contaminated and exhibited a high residue concentration. As a result of using this water during field testing, the stack sample inorganic CPM mass values reported by the laboratory are biased high by 14.3 mg. Therefore, the emission rates reported in Table 1-1 and Table 3-1 overstate the actual emission rates of condensable PM_{10} and total PM/PM_{10} for all four test runs.

TABLE 4-1. FCCU 500 STACK PM_{10} AND TOTAL PM TEST RESULTS

TEST RUN NO. :	1 - 500	2 - 500	3 - 500	4 - 500	
TEST DATE :	9/18/2014	9/18/2014	9/18/2014	9/19/2014	
TEST TIME :	11:30 - 13:46	15:30 - 17:36	18:40 - 20:44	09:07 - 11:11	Average
Stack Gas Parameters					
Temperature, °F	640.3	647.1	644.7	638.7	642.7
Velocity, av. ft/sec	131.2	131.4	130.5	129.9	130.7
Volumetric flow, acfm	500,605	501,748	498,144	495,735	499,058
Volumetric flow, scfm	236,887	235,970	234,784	235,264	235,726
Volumetric flow, scfh	14,213,248	14,158,205	14,087,045	14,115,858	14,143,589
Volumetric flow, dscfm	184,460	177,923	181,860	180,723	181,242
Volumetric flow, dscfh	11,067,612	10,675,373	10,911,621	10,843,400	10,874,502
Mass flow, Mlb/hr db	891.1	859.2	878.2	872.4	875.2
Moisture, av. % vol.	22.1	24.6	22.5	23.2	23.1
Molecular weight, lb/lb-mole db	31.0	31.0	31.0	31.0	31.0
CO_2, av. % vol.	18.6	18.5	18.5	18.4	18.5
O_2, av. % vol.	1.1	1.2	1.2	1.3	1.2
Particulate Sample					
Time, min.	130.15	118.15	117.35	117.00	120.66
Volume, dscf	38.736	36.632	36.732	38.711	37.703
>PM_{10}, mg	8.95	7.61	8.00	5.51	7.52
Filterable PM_{10}, mg	38.7	39.8	33.5	43.7	38.9
Condensable PM_{10}, mg	25.93	17.53	26.55	24.91	23.73
Total PM_{10}, mg	64.7	57.3	60.0	68.6	62.7
Isokinetic ratio, %	101.8	95.4	93.0	100.2	97.6
D_{50} cutpoint, µm	10.58	10.03	10.17	9.72	10.12
Filterable PM_{10}					
Concentration					
grains/dscf	0.0154	0.0168	0.0141	0.0174	0.0159
$x10^{-6}$ lb/dscf	2.205	2.396	2.009	2.489	2.275
mg/dscm	35.318	38.379	32.169	39.857	36.431
Emission rate					
lb/hr	24.406	25.582	21.917	26.985	24.722
lb/1,000 lb coke burn	0.471	0.493	0.422	0.526	0.478
Condensable PM_{10}					
Concentration					
grains/dscf	0.0103	0.0074	0.0112	0.0099	0.0097
$x10^{-6}$ lb/dscf	1.476	1.055	1.594	1.419	1.386
mg/dscm	23.641	16.902	25.526	22.729	22.199
Emission rate					
lb/hr	16.337	11.266	17.391	15.388	15.095
lb/1,000 lb coke burn	0.316	0.217	0.335	0.300	0.292

TABLE 4-1 (CONTINUED). FCCU 500 STACK PM_{10} AND TOTAL PM TEST RESULTS

TEST RUN NO. :	1 - 500	2 - 500	3 - 500	4 - 500	
TEST DATE :	9/18/2014	9/18/2014	9/18/2014	9/19/2014	
TEST TIME :	11:30 - 13:46	15:30 - 17:36	18:40 - 20:44	09:07 - 11:11	Average
Total PM_{10}					
Concentration					
grains/dscf	0.0258	0.0242	0.0252	0.0273	0.0256
$x10^{-6}$ lb/dscf	3.681	3.452	3.602	3.908	3.661
mg/dscm	58.959	55.281	57.694	62.586	58.630
Emission rate					
lb/hr	40.743	36.847	39.307	42.373	39.818
lb/1,000 lb coke burn	0.787	0.710	0.756	0.826	0.770
Filterable >PM_{10}					
Concentration					
grains/dscf	0.0036	0.0032	0.0034	0.0022	0.0031
$x10^{-6}$ lb/dscf	0.509	0.458	0.480	0.314	0.440
mg/dscm	8.159	7.336	7.691	5.027	7.053
Emission rate					
lb/hr	5.639	4.890	5.240	3.403	4.793
lb/1,000 lb coke burn	0.109	0.094	0.101	0.066	0.093
Total PM (PM_{10} + >PM_{10})					
Concentration					
grains/dscf	0.0293	0.0274	0.0286	0.0295	0.0287
$x10^{-6}$ lb/dscf	4.191	3.910	4.083	4.222	4.101
mg/dscm	67.118	62.617	65.386	67.612	65.683
Emission rate					
lb/hr	46.381	41.737	44.547	45.776	44.611
lb/1,000 lb coke burn	0.896	0.804	0.857	0.892	0.862

APPENDIX A

Calculation Summaries

USEPA Method 4
Moisture Determination Sample Calculations

Client: BP
Location: Whiting, IN
Source: FCCU 500
Date: 9/18/2014
Run #: 1 - 500

Data Input:

Volume metered (V_m):	41.784	**ft^3**
Meter calibration coefficient (Y_d):	1.007	**dimensionless**
Barometric pressure (P_{bar}):	29.60	**inches Hg**
Meter sample rate (ΔH):	0.36	**inches H_2O**
Meter inlet/outlet temperature (T_m):	107.9	**°F**
Volume of moisture collected (V_{lc}):	233.9	**milliliters**
Stack Temperature (T_s):	640.3	**°F**
Static Pressure (St):	-1.3	**inches H_2O**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Volume of sample, dry basis:

$$Vm_{std} = V_m \times Y_d \times \left(\frac{528.0^{o}R}{29.92"Hg}\right) \times \left(\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460}\right)$$ = **38.736 dscf**

Volume of water vapor in sample:

$$Vw_{std} = \frac{0.04707ft^3}{ml} \times V_{lc}$$ = **11.010 scf**

Fractional moisture content of stack gas:

$$B_{wo} = \frac{Vw_{std}}{(Vm_{std} + Vw_{std})}$$ = **0.2213 B_{wo}**

Percent Moisture:

$$\%moisture = B_{wo} \times 100$$ = **22.13 %**

Fractional moisture content of stack gas at saturated conditions:

$$T_{s(^{o}K)} = ((T_s - 32) * 0.5556) + 273$$ = **611.0 °Kelvin**

$$P_{s(mmHg)} = \left(P_{bar} + \frac{S_t}{13.6}\right) \times 25.401$$ = **751.87 mm Hg**

$$B_{wos} = \frac{\sqrt{\left(10^{\left(A - \left(\frac{B}{(T_{s(^{o}K)} - C)}\right)\right)}\right)}}{P_{s(mmHg)}}$$

where:
A= 8.361
B=1893.5
C=27.65

= **173.30**

Percent moisture at saturated conditions:

$$\%moisture_{saturated} = B_{wos} \times 100$$ = **100.00 %**

Percent moisture used for emissions calculations:

= **22.13 %**

USEPA Method 2
Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client:	BP
Location:	Whiting, IN
Source:	FCCU 500
Date:	9/18/2014
Run #:	1 - 500

Data Input

Carbon Dioxide (CO_2):	18.6	**%**
Oxygen (O_2):	1.1	**%**
Nitrogen (N_2):	80.3	**%**
Fractional Moisture Content (B_{wo})	0.2213	
Stack Temperature (T_s):	640.3	**°F**
Pitot Coefficient (C_p):	0.84	**dimensionless**
Average square root of ΔP	1.5864	**inches H_2O**
Barometric Pressure (P_{bar}):	29.60	**inches Hg**
Static Pressure (S_t)	-1.30	**inches H_2O**
Stack diameter:	108.00	**inches H_2O**
Stack area (A_s):	63.6172	**ft^2**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$ = **31.020 lb/lb-mole**

Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws})$$ = **28.138 lb/lb-mole**

Absolute stack gas pressure:

$$P_s = P_{bar} + \left(\frac{S_t}{13.6}\right)$$ = **29.504 inches H_2O**

Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}}$$ = **131.150 feet/second**

Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60$$ = **500,605 acfm**

Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right]$$ = **236,887 scfm**

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right] \times 60$$ = **14,213,248 scfh**

Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo})$$ = **184,460 dscfm**

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60$$ = **11,067,612 dscfh**

USEPA Method 201A PM_{10} Emissions
D_{50} Cutpoint Calculation Summary

Client:	BP
Location:	Whiting, IN
Source:	FCCU 500
Date:	9/18/2014
Run #:	1 - 500

Data Input

Stack temperature (T_s):	640.3	**°F**
Fractional Moisture content (B_{ws}):	0.2213	**%**
Oxygen (O_2):	1.1	**%**
Stack pressure (P_s):	29.50	**Inches Hg Abs.**
Volume metered (Vm_{std}):	38.736	**dscf**
Volume of water vapor (Vw_{std}):	11.010	**scf**
Molecular weight of gas, wet basis (M_s):	28.138	**lb/lb-mole**
Test length (θ):	130.15	**minutes**
D_p:	10.0	**microns**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Stack gas viscosity:

$$\mu = -150.3162 + \left(13.4622 \times \sqrt{(T_s + 460)}\right) + \left(3.86153 \times 10^{6} \times (T_s + 460)^{-2}\right) + \left(0.591123 \times (\%O_{2,wet})\right) - (91.9723 \times B_{ws}) + \left(1.51761 \times 10^{-5} \times B_{ws} \times (T_s + 460)^{2}\right)$$

= **283.64 micropoise**

Sample flow rate @ standard conditions:

$$Q_{sSt} = \frac{V_{mstd}}{\theta}$$

= **0.298 dscfm**

Sample flow rate through PM_{10} cyclone:

$$Q_s = \frac{29.92}{528} \times Q_{sSt} \times \left(\frac{1}{(1 - B_{ws})}\right) \times \left(\frac{[T_s + 460]}{P_s}\right)$$

= **0.808 cfm**

Calculated Reynolds Number

$$N_{re} = 8.64 \times 10^{5} \times \left(\frac{P_s \times M_s}{(T_s + 460)}\right) \times \left(\frac{Q_s}{\mu}\right)$$

= **1856**

Cunningham Correction Factor

$$C = 1 + 0.0057193 \times \left(\frac{\mu}{P_s \times D_p}\right) \times \left(\left(\frac{[T_s + 460]}{M_s}\right)^{0.50}\right)$$

= **1.0344**

D_{50} cutpoint (for Cyclone I):

$$D_{50} = \left(0.15625 \times \left(\frac{[T_s + 460]}{(M_s \times P_s)}\right)^{0.2091}\right) \times \left(\frac{\mu}{Q_s}\right)^{.7091}$$

= **10.578 µm**

ARI Environmental Inc.
USEPA Method 202
Condensible Particulate Calculation Summary

COMPANY: BP
LOCATION: Whiting, IN
SOURCE: FCCU 500
TEST DATE: 9/18/14
RUN NUMBER: 1 - 500

Data Input:

V_m:	41.784	ft^3	Q_s:	184,460	dscfm
γ FACTOR:	1.007		T_s:	640.3	°F
P_{bar}:	29.60	in.Hg	Runtime:	130.15	minutes
ΔH:	0.36	$in.H_2O$	V_s:	131.150	ft/sec
T_m:	107.9	°F	P_s:	29.50	in.Hg
V_{lc}:	233.9	mL	Noz. diam:	0.136	inches
N:	0.0992		m_{ib}:	19.60	mg
V_t:	0.10	mL	m_{ob}:	6.15	mg
m_r:	25.30	mg			
m_o:	2.80	mg			

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Volume of sample at standard conditions:

$$V_{mstd} = \left(\frac{528}{29.92}\right) \times V_m \times \gamma \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}\right] = 38.736 \text{ dscf}$$

Mass of ammonia correction:

$$m_c = 17.03 \times V_T \times N = 0.17 \text{ mg}$$

Mass of the field blank:

$$m_{fb} = m_{ib} + m_{ob} = 2.00 \text{ mg @ max allowable}$$

2.00 mg @ max allowable

Mass of inorganic condensible PM:

$$m_i = m_r - m_c = 25.13 \text{ mg}$$

Total mass of condensible PM:

$$m_{cpm} = m_i + m_o - m_{fb} = 25.93 \text{ mg}$$

@ max. blank

USEPA Method 201A PM_{10} Emissions
Particulate Calculation Summary

Client:	BP
Location:	Whiting, IN
Source:	FCCU 500
Date:	9/18/2014
Run #:	1 - 500

Data Input

Barometric pressure (P_{bar}):	29.60	**inches Hg**	**Particulate Weight:**	
Stack pressure (P_s):	29.50	**Inches Hg Abs.**	**<PM10 (Filterable)**	28.70 **milligrams**
Test length (θ):	130.15	**minutes**	**>PM10 (Cyclone Catch)**	8.95 **milligrams**
Sample nozzle diameter (D_n):	0.1360	**inches**		
Sample nozzle area (A_n):	0.000101	**ft^3**	**<PM10 (Probe Wash)**	10.04 **milligrams**
Stack temperature (T_s):	640.3	**°F**	**Total PM_{10} front half:**	38.74 **milligrams**
Volume metered (Vm_{std}):	38.736	**ft^3**		
Stack gas velocity (V_s):	131.150	**feet/second**	**Total PM front half**	47.69 **milligrams**
Stack gas volumetric flow (Q_{std}):	11,067,612	**dscf/hour**	**Total corrected PM_{10} back half:**	25.93 **milligrams**
Fractional moisture content (B_{wo}):	0.2213			
Coke Burn Rate (R_c):	51,771	**lb/hr**	**Total PM_{10} weight (M_n):**	64.67 **milligrams**
			Total PM weight (M_n):	73.62 **milligrams (>PM_{10} + PM_{10})**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Percent Isokinetic:

$$\%Isokinetic = \frac{0.0945 \times Vm_{std} \times (T_s + 460)}{P_s \times V_s \times \theta \times A_n \times (1 - B_{wo})}$$

= **101.8 % isokinetic**

PM_{10} and Total Particulate emission rate (lb/dscf):

$$C_s = \frac{\left(\frac{0.01543 grains}{mg} \times M_n\right)}{V_{mstd}}$$

= **0.0293 total PM gr/dscf**
= **0.0036 >PM_{10} gr/dscf**
= **0.0154 filterable PM_{10} gr/dscf**
= **0.0103 condensible PM_{10} gr/dscf**
= **0.0258 PM_{10} gr/dscf**

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 ft^3}{m^3}$$

= **67.118 total PM mg/dscm**
= **8.159 >PM_{10} mg/dscm**
= **35.318 filterable PM_{10} mg/dscm**
= **23.641 condensible PM_{10} mg/dscm**
= **58.959 PM_{10} mg/dscm**

$$E_p = \frac{\left(\frac{2.205 \times 10^{-6} lb}{mg} \times M_n\right)}{V_{mstd}}$$

= **4.191 x 10^{-8} total PM lb/dscf**
= **0.509 x 10^{-6} >PM_{10} lb/dscf**
= **2.205 x 10^{-6} filterable PM_{10} lb/dscf**
= **1.476 x 10^{-6} condensible PM_{10} lb/dscf**
= **3.681 x 10^{-6} PM_{10} lb/dscf**

PM_{10} and Total Particulate emission rate (lb/hr):

$$E_p = C'_s \times Q_{std}$$

= **46.381 total PM lb/hr**
= **5.639 >PM_{10} lb/hr**
= **24.406 filterable PM_{10} lb/hr**
= **16.337 condensible PM_{10} lb/hr**
= **40.743 PM_{10} lb/hr**

$$pmr_{lb/1000lb\,coke\,burn} = \frac{(E_p)(1000)}{(R_c)}$$

= **0.896 total PM lb/1000lb coke burn**
= **0.109 >PM_{10} lb/1000lb coke burn**
= **0.471 filterable PM_{10} lb/1000lb coke burn**
= **0.316 condensible PM_{10} lb/1000 coke burn**
= **0.787 PM_{10} lb/1000 coke burn**

USEPA Method 4
Moisture Determination Sample Calculations

Client: BP
Location: Whiting, IN
Source: FCCU 500
Date: 9/18/2014
Run #: 2 - 500

Data Input:

Volume metered (V_m):	39.980	**ft^3**
Meter calibration coefficient (Y_d):	1.007	**dimensionless**
Barometric pressure (P_{bar}):	29.60	**inches Hg**
Meter sample rate (ΔH):	0.36	**inches H_2O**
Meter inlet/outlet temperature (T_m):	114.6	**°F**
Volume of moisture collected (V_{lc}):	253.9	**milliliters**
Stack Temperature (T_s):	647.1	**°F**
Static Pressure (St):	-1.3	**inches H_2O**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Volume of sample, dry basis:

$$Vm_{std} = V_m \times Y_d \times \left(\frac{528.0°R}{29.92"Hg}\right) \times \left(\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460}\right)$$ = **36.632 dscf**

Volume of water vapor in sample:

$$Vw_{std} = \frac{0.04707 ft^3}{ml} \times V_{lc}$$ = **11.951 scf**

Fractional moisture content of stack gas:

$$B_{wo} = \frac{Vw_{std}}{(Vm_{std} + Vw_{std})}$$ = **0.2460 B_{wo}**

Percent Moisture:

$$\%moisture = B_{wo} \times 100$$ = **24.60 %**

Fractional moisture content of stack gas at saturated conditions:

$$T_{s(°K)} = ((T_s - 32) * 0.5556) + 273$$ = **614.7 °Kelvin**

$$P_{s(mmHg)} = \left(P_{bar} + \frac{S_l}{13.6}\right) \times 25.401$$ = **751.87 mm Hg**

$$B_{wos} = \frac{\sqrt{\left(10^{\left(A - \left(\frac{B}{(T_{s(K)} - C)}\right)\right)}\right)}}{P_{s(mmHg)}}$$

where:
A= 8.361
B=1893.5
C=27.65

= **181.84**

Percent moisture at saturated conditions:

$$\%moisture_{saturated} = B_{wos} \times 100$$ = **100.00 %**

Percent moisture used for emissions calculations:

= **24.60 %**

USEPA Method 2
Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client: BP
Location: Whiting, IN
Source: FCCU 500
Date: 9/18/2014
Run #: 2 - 500

Data Input

Carbon Dioxide (CO_2):	18.5	**%**
Oxygen (O_2):	1.2	**%**
Nitrogen (N_2):	80.3	**%**
Fractional Moisture Content (B_{wo})	0.2460	
Stack Temperature (T_s):	647.1	**°F**
Pitot Coefficient (C_p):	0.84	**dimensionless**
Average square root of ΔP	1.5758	**inches H_2O**
Barometric Pressure (P_{bar}):	29.60	**inches Hg**
Static Pressure (S_t)	-1.30	**inches H_2O**
Stack diameter:	108.00	**inches H_2O**
Stack area (A_s):	63.6172	**ft^2**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$ = **31.008 lb/lb-mole**

Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws})$$ = **27.808 lb/lb-mole**

Absolute stack gas pressure:

$$P_s = P_{bar} + \left(\frac{S_t}{13.6}\right)$$ = **29.504 inches H_2O**

Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}}$$ = **131.450 feet/second**

Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60$$ = **501,748 acfm**

Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right]$$ = **235,970 scfm**

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right] \times 60$$ = **14,158,205 scfh**

Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo})$$ = **177,923 dscfm**

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60$$ = **10,675,373 dscfh**

USEPA Method 201A PM_{10} Emissions
D_{50} Cutpoint Calculation Summary

Client:	BP
Location:	Whiting, IN
Source:	FCCU 500
Date:	9/18/2014
Run #:	2 - 500

Data Input

Stack temperature (T_s):	647.1	**°F**
Fractional Moisture content (B_{ws}):	0.2460	**%**
Oxygen (O_2):	1.2	**%**
Stack pressure (P_s):	29.50	**Inches Hg Abs.**
Volume metered (Vm_{std}):	36.632	**dscf**
Volume of water vapor (Vw_{std}):	11.951	**scf**
Molecular weight of gas, wet basis (M_s):	27.808	**lb/lb-mole**
Test length (θ):	118.15	**minutes**
D_p:	10.0	**microns**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Stack gas viscosity;

$$\mu = -150.3162 + \left(13.4622 \times \sqrt{(T_s + 460)}\right) + \left(3.86153 \times 10^{6} \times (T_s + 460)^{-2}\right) + \left(0.591123 \times (\%O_{2,\,wet})\right) - (91.9723 \times B_{ws}) + \left(1.51761 \times 10^{-5} \times B_{ws} \times (T_s + 460)^{2}\right)$$

= **283.2 micropoise**

Sample flow rate @ standard conditions:

$$Q_{sSt} = \frac{V_{mstd}}{\theta}$$

= **0.310 dscfm**

Sample flow rate through PM_{10} cyclone:

$$Q_s = \frac{29.92}{528} \times Q_{sSt} \times \left(\frac{1}{(1 - B_{ws})}\right) \times \left(\frac{[T_s + 460]}{P_s}\right)$$

= **0.874 cfm**

Calculated Reynolds Number

$$N_{re} = 8.64 \times 10^{5} \times \left(\frac{P_s \times M_s}{(T_s + 460)}\right) \times \left(\frac{Q_s}{\mu}\right)$$

= **1976**

Cunningham Correction Factor

$$C = 1 + 0.0057193 \times \left(\frac{\mu}{P_s \times D_p}\right) \times \left(\left(\frac{[T_s + 460]}{M_s}\right)^{0.50}\right)$$

= **1.035**

D_{50} cutpoint (for Cyclone i):

$$D_{50} = \left(0.15625 \times \left(\frac{[T_s + 460]}{(M_s \times P_s)}\right)^{0.2091}\right) \times \left(\frac{\mu}{Q_s}\right)^{.7091}$$

= **10.028 µm**

ARI Environmental Inc.
USEPA Method 202
Condensible Particulate Calculation Summary

COMPANY: BP
LOCATION: Whiting, IN
SOURCE: FCCU 500
TEST DATE: 9/18/14
RUN NUMBER: 2 - 500

Data Input:

V_m:	39.980	ft^3	Q_s:	177,923	dscfm
γ FACTOR:	1.007		T_s:	647.1	°F
P_{bar}:	29.60	in.Hg	Runtime:	118.15	minutes
ΔH:	0.36	$in.H_2O$	V_s:	131.450	ft/sec
T_m:	114.6	°F	P_s:	29.50	in.Hg
V_{lc}:	253.9	mL	Noz. diam:	0.146	inches
N:	0.0992		m_{ib}:	19.60	mg
V_t:	0.07	mL	m_{ob}:	6.15	mg
m_r:	17.20	mg			
m_o:	2.45	mg			

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Volume of sample at standard conditions:

$$V_{mstd} = \left(\frac{528}{29.92}\right) \times V_m \times \gamma \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}\right] = 36.632 \text{ dscf}$$

Mass of ammonia correction:

$$m_c = 17.03 \times V_T \times N = 0.12 \text{ mg}$$

Mass of the field blank:

$$m_{fb} = m_{ib} + m_{ob} = 2.00 \text{ mg @ max allowable}$$

2.00 mg @ max allowable

Mass of inorganic condensible PM:

$$m_i = m_r - m_c = 17.08 \text{ mg}$$

Total mass of condensible PM:

$$m_{cpm} = m_i + m_o - m_{fb} = 17.53 \text{ mg}$$

@ max. blank

USEPA Method 201A PM10 Emissions
Particulate Calculation Summary

Client: BP
Location: Whiting, IN
Source: FCCU 500
Date: 9/18/2014
Run #: 2 - 500

Data Input

Barometric pressure (P_{bar}):	29.60	inches Hg	Particulate Weight:	
Stack pressure (P_s):	29.50	inches Hg Abs.	<PM10 (Filterable)	33.45 milligrams
Test length (θ):	118.15	minutes	>PM10 (Cyclone Catch)	7.61 milligrams
Sample nozzle diameter (D_n):	0.1460	inches		
Sample nozzle area (A_n):	0.000116	ft^3	<PM10 (Probe Wash)	6.36 milligrams
Stack temperature (T_s):	647.1	°F	Total PM_{10} front half:	39.81 milligrams
Volume metered (Vm_{std}):	36.632	ft^3		
Stack gas velocity (V_s):	131.450	feet/second	Total PM front half	47.42 milligrams
Stack gas volumetric flow (Q_{std}):	10,675,373	dscf/hour	Total corrected PM_{10} back half:	17.53 milligrams
Fractional Moisture content (B_{wo}):	0.2460			
Coke Burn Rate (R_c):	51,933	lb/hr	Total PM_{10} weight (M_n):	57.34 milligrams
			Total PM weight (M_n):	64.95 milligrams (>PM_{10} + PM_{10})

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Percent Isokinetic:

$$\%Isokinetic = \frac{0.0945 \times Vm_{std} \times (T_s + 460)}{P_s \times V_s \times \theta \times A_n \times (1 - B_{wo})}$$

= 95.4 % isokinetic

PM_{10} and Total Particulate emission rate (lb/dscf):

$$C_s = \frac{\left(\frac{0.01543 grains}{mg} \times M_n\right)}{V_{mstd}}$$

= 0.0274 total PM gr/dscf
= 0.0032 >PM_{10} gr/dscf
= 0.0168 filterable PM_{10} gr/dscf
= 0.0074 condensible PM_{10} gr/dscf
= 0.0242 PM_{10} gr/dscf

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 ft^3}{m^3}$$

= 62.617 total PM mg/dscm
= 7.336 >PM_{10} mg/dscm
= 38.379 filterable PM_{10} mg/dscm
= 16.902 condensible PM_{10} mg/dscm
= 55.281 PM_{10} mg/dscm

$$E_p = \frac{\left(\frac{2.205 \times 10^{-6} lb}{mg} \times M_n\right)}{V_{mstd}}$$

= 3.910 x 10^{-6} total PM lb/dscf
= 0.458 x 10^{-6} >PM_{10} lb/dscf
= 2.396 x 10^{-6} filterable PM_{10} lb/dscf
= 1.055 x 10^{-6} condensible PM_{10} lb/dscf
= 3.452 x 10^{-6} PM_{10} lb/dscf

PM_{10} and Total Particulate emission rate (lb/hr):

$$E_p = C^1_s \times Q_{std}$$

= 41.737 total PM lb/hr
= 4.890 >PM_{10} lb/hr
= 25.582 filterable PM_{10} lb/hr
= 11.266 condensible PM_{10} lb/hr
= 36.847 PM_{10} lb/hr

$$pmr_{lb/1000lb\,coke\,burn} = \frac{(E_p)(1000)}{(R_c)}$$

= 0.804 total PM lb/1000lb coke burn
= 0.094 >PM_{10} lb/1000lb coke burn
= 0.493 filterable PM_{10} lb/1000lb coke burn
= 0.217 condensible PM_{10} lb/1000 coke burn
= 0.710 PM_{10} lb/1000 coke burn

USEPA Method 4
Moisture Determination Sample Calculations

Client:	BP
Location:	Whiting, IN
Source:	FCCU 500
Date:	9/18/2014
Run #:	3 - 500

Data Input:

Volume metered (V_m):	40.036	**ft^3**
Meter calibration coefficient (Y_d):	1.007	**dimensionless**
Barometric pressure (P_{bar}):	29.60	**inches Hg**
Meter sample rate (ΔH):	0.34	**inches H_2O**
Meter inlet/outlet temperature (T_m):	113.8	**°F**
Volume of moisture collected (V_{lc}):	227.1	**milliliters**
Stack Temperature (T_s):	644.7	**°F**
Static Pressure (St):	-1.3	**inches H_2O**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Volume of sample, dry basis:

$$Vm_{std} = V_m \times Y_d \times \left(\frac{528.0°R}{29.92"Hg}\right) \times \left(\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460}\right) = \mathbf{36.732\ dscf}$$

Volume of water vapor in sample:

$$Vw_{std} = \frac{0.04707 ft^3}{ml} \times V_{lc} = \mathbf{10.690\ scf}$$

Fractional moisture content of stack gas:

$$B_{wo} = \frac{Vw_{std}}{(Vm_{std} + Vw_{std})} = \mathbf{0.2254\ B_{wo}}$$

Percent Moisture:

$$\%moisture = B_{wo} \times 100 = \mathbf{22.54\ \%}$$

Fractional moisture content of stack gas at saturated conditions:

$$T_{s(°K)} = ((T_s - 32) * 0.5556) + 273 = \mathbf{613.4\ °Kelvin}$$

$$P_{s(mmHg)} = \left(P_{bar} + \frac{S_t}{13.6}\right) \times 25.401 = \mathbf{751.87\ mm\ Hg}$$

$$B_{wos} = \frac{\sqrt{\left(10^{\left(A - \left(\frac{B}{(T_{s(°K)} - C)}\right)\right)}\right)}}{P_{s(mmHg)}} = \mathbf{178.79}$$

where:
A= 8.361
B=1893.5
C=27.65

Percent moisture at saturated conditions:

$$\%moisture_{saturated} = B_{wos} \times 100 = \mathbf{100.00\ \%}$$

Percent moisture used for emissions calculations:

$$= \mathbf{22.54\ \%}$$

USEPA Method 2
Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client: BP
Location: Whiting, IN
Source: FCCU 500
Date: 9/18/2014
Run #: 3 - 500

Data Input

Carbon Dioxide (CO_2):	18.5	**%**
Oxygen (O_2):	1.2	**%**
Nitrogen (N_2):	80.3	**%**
Fractional Moisture Content (B_{wo})	0.2254	
Stack Temperature (T_s):	644.7	**°F**
Pitot Coefficient (C_p):	0.84	**dimensionless**
Average square root of ΔP	1.5737	**inches H_2O**
Barometric Pressure (P_{bar}):	29.60	**inches Hg**
Static Pressure (S_t)	-1.30	**inches H_2O**
Stack diameter:	108.00	**inches H_2O**
Stack area (A_s):	63.6172	**ft^2**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$ = **31.008 lb/lb-mole**

Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws})$$ = **28.076 lb/lb-mole**

Absolute stack gas pressure:

$$P_s = P_{bar} + \left(\frac{S_t}{13.6}\right)$$ = **29.504 inches H_2O**

Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}}$$ = **130.506 feet/second**

Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60$$ = **498,144 acfm**

Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right]$$ = **234,784 scfm**

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right] \times 60$$ = **14,087,045 scfh**

Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo})$$ = **181,860 dscfm**

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60$$ = **10,911,621 dscfh**

USEPA Method 201A PM_{10} Emissions
D_{50} Cutpoint Calculation Summary

Client:	BP
Location:	Whiting, IN
Source:	FCCU 500
Date:	9/18/2014
Run #:	3 - 500

Data Input

Stack temperature (T_s):	644.7	**°F**
Fractional Moisture content (B_{ws}):	0.2254	**%**
Oxygen (O_2):	1.2	**%**
Stack pressure (P_s):	29.50	**Inches Hg Abs.**
Volume metered (Vm_{std}):	36.732	**dscf**
Volume of water vapor (Vw_{std}):	10.690	**scf**
Molecular weight of gas, wet basis (M_s):	28.076	**lb/lb-mole**
Test length (θ):	117.35	**minutes**
D_p:	10.0	**microns**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Stack gas viscosity:

$$\mu = -150.3162 + \left(13.4622 \times \sqrt{(T_s + 460)}\right) + \left(3.86153 \times 10^{6} \times (T_s + 460)^{-2}\right) + \left(0.591123 \times (\%O_{2,\,wet})\right) - (91.9723 \times B_{ws}) + \left(1.51761 \times 10^{-5} \times B_{ws} \times (T_s + 460)^{2}\right)$$

= **284.3 micropoise**

Sample flow rate @ standard conditions:

$$Q_{sSt} = \frac{V_{mstd}}{\theta}$$

= **0.313 dscfm**

Sample flow rate through PM_{10} cyclone:

$$Q_s = \frac{29.92}{528} \times Q_{sSt} \times \left(\frac{1}{(1 - B_{ws})}\right) \times \left(\frac{[T_s + 460]}{P_s}\right)$$

= **0.857 cfm**

Calculated Reynolds Number

$$N_{re} = 8.64 \times 10^{5} \times \left(\frac{P_s \times M_s}{(T_s + 460)}\right) \times \left(\frac{Q_s}{\mu}\right)$$

= **1954**

Cunningham Correction Factor

$$C = 1 + 0.0057193 \times \left(\frac{\mu}{P_s \times D_p}\right) \times \left(\left(\frac{[T_s + 460]}{M_s}\right)^{0.50}\right)$$

= **1.035**

D_{50} cutpoint (for Cyclone I):

$$D_{50} = \left(0.15625 \times \left(\frac{[T_s + 460]}{(M_s \times P_s)}\right)^{0.2091}\right) \times \left(\frac{\mu}{Q_s}\right)^{.7091}$$

= **10.169 µm**

ARI Environmental Inc.
USEPA Method 202
Condensible Particulate Calculation Summary

COMPANY: BP
LOCATION: Whiting, IN
SOURCE: FCCU 500
TEST DATE: 9/18/14
RUN NUMBER: 3 - 500

Data Input:

V_m:	40.036	ft^3	Q_s:	181,860	dscfm
γ FACTOR:	1.007		T_s:	644.7	°F
P_{bar}:	29.60	in.Hg	Runtime:	117.35	minutes
ΔH:	0.34	in.H_2O	V_s:	130.506	ft/sec
T_m:	113.8	°F	P_s:	29.50	in.Hg
V_{lc}:	227.1	mL	Noz. diam:	0.147	inches
N:	0.0992		m_{ib}:	19.60	mg
V_t:	0.00	mL	m_{ob}:	6.15	mg
m_r:	25.65	mg			
m_o:	2.90	mg			

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Volume of sample at standard conditions:

$$V_{mstd} = \left(\frac{528}{29.92}\right) \times V_m \times \gamma \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}\right] = 36.732 \text{ dscf}$$

Mass of ammonia correction:

$$m_c = 17.03 \times V_T \times N = 0.00 \text{ mg}$$

Mass of the field blank:

$$m_{fb} = m_{ib} + m_{ob} = 2.00 \text{ mg @ max allowable}$$

2.00 mg @ max allowable

Mass of inorganic condensible PM:

$$m_i = m_r - m_c = 25.65 \text{ mg}$$

Total mass of condensible PM:

$$m_{cpm} = m_i + m_o - m_{fb} = 26.55 \text{ mg}$$

@ max. blank

USEPA Method 201A PM10 Emissions
Particulate Calculation Summary

Client:	BP
Location:	Whiting, IN
Source:	FCCU 500
Date:	9/18/2014
Run #:	3 - 500

Data Input

Barometric pressure (P_{bar}):	29.60	inches Hg	**Particulate Weight:**	
Stack pressure (P_s):	29.50	inches Hg Abs.	<PM10 (Filterable)	26.50 milligrams
Test length (θ):	117.35	minutes	>PM10 (Cyclone Catch)	8.00 milligrams
Sample nozzle diameter (D_n):	0.1470	inches		
Sample nozzle area (A_n):	0.000118	ft^2	<PM10 (Probe Wash)	4.96 milligrams
Stack temperature (T_s):	644.7	°F	Total PM_{10} front half:	33.46 milligrams
Volume metered (Vm_{std}):	36.732	ft^3		
Stack gas velocity (V_s):	130.506	feet/second	Total PM front half	41.46 milligrams
Stack gas volumetric flow (Q_{std}):	10,911,621	dscf/hour	Total corrected PM_{10} back half:	26.55 milligrams
Fractional Moisture content (B_{wo}):	0.2254			
Coke Burn Rate (R_c):	51,976	lb/hr	Total PM_{10} weight (M_n):	60.01 milligrams
			Total PM weight (M_n):	68.01 milligrams (>PM_{10} + PM_{10})

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Percent Isokinetic:

$$\%isokinetic = \frac{0.0945 \times Vm_{std} \times (T_s + 460)}{P_s \times V_s \times \theta \times A_n \times (1 - B_{wo})}$$

= 93.0 % isokinetic

PM_{10} and Total Particulate emission rate (lb/dscf):

$$C_s = \frac{\left(\frac{0.01543 grains}{mg} \times M_n\right)}{V_{mstd}}$$

= 0.0286 total PM gr/dscf
= 0.0034 >PM_{10} gr/dscf
= 0.0141 filterable PM_{10} gr/dscf
= 0.0112 condensible PM_{10} gr/dscf
= 0.0252 PM_{10} gr/dscf

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 ft^3}{m^3}$$

= 65.386 total PM mg/dscm
= 7.691 >PM_{10} mg/dscm
= 32.169 filterable PM_{10} mg/dscm
= 25.526 condensible PM_{10} mg/dscm
= 57.694 PM_{10} mg/dscm

$$E_p = \frac{\left(\frac{2.205 \times 10^{-6} lb}{mg} \times M_n\right)}{V_{mstd}}$$

= 4.083 x 10^{-6} total PM lb/dscf
= 0.480 x 10^{-6} >PM_{10} lb/dscf
= 2.009 x 10^{-6} filterable PM_{10} lb/dscf
= 1.594 x 10^{-6} condensible PM_{10} lb/dscf
= 3.602 x 10^{-6} PM_{10} lb/dscf

PM_{10} and Total Particulate emission rate (lb/hr):

$$E_p = C_s \times Q_{std}$$

= 44.547 total PM lb/hr
= 5.240 >PM_{10} lb/hr
= 21.917 filterable PM_{10} lb/hr
= 17.391 condensible PM_{10} lb/hr
= 39.307 PM_{10} lb/hr

$$pmr_{lb/1000lb\,coke\,burn} = \frac{(E_p)(1000)}{(R_c)}$$

= 0.857 total PM lb/1000lb coke burn
= 0.101 >PM_{10} lb/1000lb coke burn
= 0.422 filterable PM_{10} lb/1000lb coke burn
= 0.335 condensible PM_{10} lb/1000 coke burn
= 0.756 PM_{10} lb/1000 coke burn

USEPA Method 4
Moisture Determination Sample Calculations

Client: BP
Location: Whiting, IN
Source: FCCU 500
Date: 9/19/2014
Run #: 4 - 500

Data Input:

Volume metered (V_m):	41.695	**ft^3**
Meter calibration coefficient (Y_d):	1.007	**dimensionless**
Barometric pressure (P_{bar}):	29.65	**inches Hg**
Meter sample rate (ΔH):	0.35	**inches H_2O**
Meter inlet/outlet temperature (T_m):	108.0	**°F**
Volume of moisture collected (V_{lc}):	248.2	**milliliters**
Stack Temperature (T_s):	638.7	**°F**
Static Pressure (St):	-1.4	**inches H_2O**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Volume of sample, dry basis:

$$Vm_{std} = V_m \times Y_d \times \left(\frac{528.0^{o}R}{29.92"Hg}\right) \times \left(\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460}\right) = \mathbf{38.711\ dscf}$$

Volume of water vapor in sample:

$$Vw_{std} = \frac{0.04707ft^3}{ml} \times V_{lc} = \mathbf{11.683\ scf}$$

Fractional moisture content of stack gas:

$$B_{wo} = \frac{Vw_{std}}{(Vm_{std} + Vw_{std})} = \mathbf{0.2318\ B_{wo}}$$

Percent Moisture:

$$\%moisture = B_{wo} \times 100 = \mathbf{23.18\ \%}$$

Fractional moisture content of stack gas at saturated conditions:

$$T_{s(^{o}K)} = ((T_s - 32) * 0.5556) + 273 = \mathbf{610.1\ ^{o}Kelvin}$$

$$P_{s(mmHg)} = \left(P_{bar} + \frac{S_t}{13.6}\right) \times 25.401 = \mathbf{753.14\ mm\ Hg}$$

$$B_{wos} = \frac{\sqrt{\left(10^{\left(A - \left(\frac{B}{(T_{s(^{o}K)} - C)}\right)\right)}\right)}}{P_{s(mmHg)}} = \mathbf{171.04}$$

where:
A= 8.361
B=1893.5
C=27.65

Percent moisture at saturated conditions:

$$\%moisture_{saturated} = B_{wos} \times 100 = \mathbf{100.00\ \%}$$

Percent moisture used for emissions calculations:

$$= \mathbf{23.18\ \%}$$

USEPA Method 2
Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client: BP
Location: Whiting, IN
Source: FCCU 500
Date: 9/19/2014
Run #: 4 - 500

Data Input

Carbon Dioxide (CO_2):	18.4	**%**
Oxygen (O_2):	1.3	**%**
Nitrogen (N_2):	80.3	**%**
Fractional Moisture Content (B_{wo})	0.2318	
Stack Temperature (T_s):	638.7	**°F**
Pitot Coefficient (C_p):	0.84	**dimensionless**
Average square root of ΔP	1.5689	**inches H_2O**
Barometric Pressure (P_{bar}):	29.65	**inches Hg**
Static Pressure (S_t)	-1.40	**inches H_2O**
Stack diameter:	108.00	**inches H_2O**
Stack area (A_s):	63.6172	**ft^2**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$ = **30.996 lb/lb-mole**

Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws})$$ = **27.983 lb/lb-mole**

Absolute stack gas pressure:

$$P_s = P_{bar} + \left(\frac{S_t}{13.6}\right)$$ = **29.547 inches H_2O**

Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}}$$ = **129.875 feet/second**

Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60$$ = **495,735 acfm**

Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right]$$ = **235,264 scfm**

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right] \times 60$$ = **14,115,858 scfh**

Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo})$$ = **180,723 dscfm**

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60$$ = **10,843,400 dscfh**

USEPA Method 201A PM_{10} Emissions
D_{50} Cutpoint Calculation Summary

Client:	BP
Location:	Whiting, IN
Source:	FCCU 500
Date:	9/19/2014
Run #:	4 - 500

Data Input

Stack temperature (T_s):	638.7	**°F**
Fractional Moisture content (B_{ws}):	0.2318	**%**
Oxygen (O_2):	1.3	**%**
Stack pressure (P_s):	29.55	**Inches Hg Abs.**
Volume metered (Vm_{std}):	38.711	**dscf**
Volume of water vapor (Vw_{std}):	11.683	**scf**
Molecular weight of gas, wet basis (M_s):	27.983	**lb/lb-mole**
Test length (θ):	117.00	**minutes**
D_p:	10.0	**microns**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Stack gas viscosity:

$$\mu = -150.3162 + \left(13.4622 \times \sqrt{(T_s+460)}\right) + \left(3.86153\text{x}10^{6} \times (T_s+460)^{-2}\right) + \left(0.591123 \times (\%O_{2,\,wet})\right) - (91.9723 \times B_{ws}) + \left(1.51761\text{x}10^{-5} \times B_{ws} \times (T_s+460)^{2}\right)$$

= **282.6 micropoise**

Sample flow rate @ standard conditions:

$$Q_{sSt} = \frac{V_{metd}}{\theta}$$

= **0.331 dscfm**

Sample flow rate through PM_{10} cyclone:

$$Q_s = \frac{29.92}{528} \times Q_{sSt} \times \left(\frac{1}{(1-B_{ws})}\right) \times \left(\frac{[T_s+460]}{P_s}\right)$$

= **0.908 cfm**

Calculated Reynolds Number

$$N_{re} = 8.64 \times 10^{5} \times \left(\frac{P_s \times M_s}{(T_s+460)}\right) \times \left(\frac{Q_s}{\mu}\right)$$

= **2088**

Cunningham Correction Factor

$$C = 1 + 0.0057193 \times \left(\frac{\mu}{P_s \times D_p}\right) \times \left(\left(\frac{[T_s+460]}{M_s}\right)^{0.50}\right)$$

= **1.034**

D_{50} cutpoint (for Cyclone I):

$$D_{50} = \left(0.15625 \times \left(\frac{[T_s+460]}{(M_s \times P_s)}\right)^{0.2091}\right) \times \left(\frac{\mu}{Q_s}\right)^{.7091}$$

= **9.720 µm**

ARI Environmental Inc.
USEPA Method 202
Condensible Particulate Calculation Summary

COMPANY: BP
LOCATION: Whiting, IN
SOURCE: FCCU 500
TEST DATE: 9/19/14
RUN NUMBER: 4 - 500

Data Input:

V_m:	41.695	ft^3	Q_s:	180,723	dscfm
γ FACTOR:	1.007		T_s:	638.7	°F
P_{bar}:	29.65	in.Hg	Runtime:	117.00	minutes
ΔH:	0.35	in.H_2O	V_s:	129.875	ft/sec
T_m:	108	°F	P_s:	29.55	in.Hg
V_{tc}:	248.2	mL	Noz. diam:	0.146	inches
N:	0.0992		m_{ib}:	19.60	mg
V_t:	0.08	mL	m_{ob}:	6.15	mg
m_r:	21.95	mg			
m_o:	5.10	mg			

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Volume of sample at standard conditions:

$$V_{mstd} = \left(\frac{528}{29.92}\right) \times V_m \times \gamma \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}\right] = 38.711 \text{ dscf}$$

Mass of ammonia correction:

$$m_c = 17.03 \times V_T \times N = 0.14 \text{ mg}$$

Mass of the field blank:

$$m_{fb} = m_{ib} + m_{ob} = 2.00 \text{ mg @ max allowable}$$

2.00 mg @ max allowable

Mass of inorganic condensible PM:

$$m_i = m_r - m_c = 21.81 \text{ mg}$$

Total mass of condensible PM:

$$m_{cpm} = m_i + m_o - m_{fb} = 24.91 \text{ mg}$$

@ max. blank

USEPA Method 201A PM10 Emissions
Particulate Calculation Summary

Client:	BP
Location:	Whiting, IN
Source:	FCCU 500
Date:	9/19/2014
Run #:	4 - 500

Data Input

Barometric pressure (P_{bar}):	29.65	**inches Hg**	**Particulate Weight:**	
Stack pressure (P_s):	29.55	**inches Hg Abs.**	**<PM10 (Filterable)**	31.60 **milligrams**
Test length (θ):	117.00	**minutes**	**>PM10 (Cyclone Catch)**	5.51 **milligrams**
Sample nozzle diameter (D_n):	0.1460	**inches**		
Sample nozzle area (A_n):	0.000116	**ft^2**	**<PM10 (Probe Wash)**	12.09 **milligrams**
Stack temperature (T_s):	638.7	**°F**	**Total PM_{10} front half:**	43.69 **milligrams**
Volume metered (Vm_{std}):	38.711	**ft^3**		
Stack gas velocity (V_s):	129.875	**feet/second**	**Total PM front half**	49.20 **milligrams**
Stack gas volumetric flow (Q_{std}):	10,643,400	**dscf/hour**	**Total corrected PM_{10} back half:**	24.91 **milligrams**
Fractional Moisture content (B_{wo}):	0.2318			
Coke Burn Rate (R_c):	51,329	**lb/hr**	**Total PM_{10} weight (M_n):**	**68.60 milligrams**
			Total PM weight (M_n):	**74.11 milligrams (>PM_{10} + PM_{10})**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Percent Isokinetic:

$$\%\text{Isokinetic} = \frac{0.0945 \times Vm_{std} \times (T_s + 460)}{P_s \times V_s \times \theta \times A_n \times (1 - B_{wo})}$$

= **100.2 % isokinetic**

PM_{10} and Total Particulate emission rate (lb/dscf):

$$C_s = \frac{\left(\frac{0.01543\,\text{grains}}{\text{mg}} \times M_n\right)}{V_{mstd}}$$

= **0.0295 total PM gr/dscf**
= **0.0022 >PM_{10} gr/dscf**
= **0.0174 filterable PM_{10} gr/dscf**
= **0.0099 condensible PM_{10} gr/dscf**
= **0.0273 PM_{10} gr/dscf**

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315\,ft^3}{m^3}$$

= **67.612 total PM mg/dscm**
= **5.027 >PM_{10} mg/dscm**
= **39.857 filterable PM_{10} mg/dscm**
= **22.729 condensible PM_{10} mg/dscm**
= **62.586 PM_{10} mg/dscm**

$$E_p = \frac{\left(\frac{2.205 \times 10^{-6}\,\text{lb}}{\text{mg}} \times M_n\right)}{V_{mstd}}$$

= **4.222 x 10^{-6} total PM lb/dscf**
= **0.314 x 10^{-6} >PM_{10} lb/dscf**
= **2.489 x 10^{-6} filterable PM_{10} lb/dscf**
= **1.419 x 10^{-6} condensible PM_{10} lb/dscf**
= **3.908 x 10^{-6} PM_{10} lb/dscf**

PM_{10} and Total Particulate emission rate (lb/hr):

$$E_p = C'_s \times Q_{std}$$

= **45.776 total PM lb/hr**
= **3.403 >PM_{10} lb/hr**
= **26.985 filterable PM_{10} lb/hr**
= **15.388 condensible PM_{10} lb/hr**
= **42.373 PM_{10} lb/hr**

$$pmr_{lb/1000lb\,coke\,burn} = \frac{(E_p)(1000)}{(R_c)}$$

= **0.892 total PM lb/1000lb coke burn**
= **0.066 >PM_{10} lb/1000lb coke burn**
= **0.526 filterable PM_{10} lb/1000lb coke burn**
= **0.300 condensible PM_{10} lb/1000 coke burn**
= **0.826 PM_{10} lb/1000 coke burn**

APPENDIX B

Field Data

TRAVERSE POINT LOCATIONS FOR CIRCULAR AND RECTANGULAR STACKS AND DUCTS

Facility BP-Whiting
Date 9-17-14
Sampling Location FCC 500 exhaust
Inside of Far Wall to
Outside of Port (Distance C) 114.5 in.
Inside of Near Wall to
Outside of Port (Distance D) 6.5 in
Stack ID (Distance C- Distance D) 108 in.
Port Distance Downstream From Disturbance (B) 1368 in.
Port Distance Upstream From Disturbance (A) 720 in.
Equivalent Diameters Downstream From Disturbance (B) 12.67 (≥ 2.0)
Equivalent Diameters Upstream From Disturbance (A) 6.67 (≥ 0.5)
Number of Ports Used 2 Traverse Points / Port 6

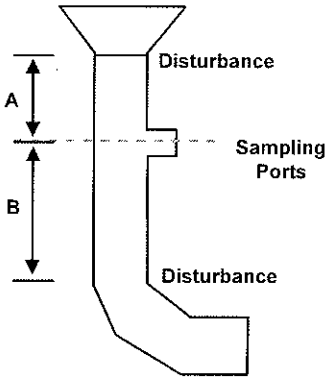
Note: Sketch Stack/Ports/Control Device on Back of Form

Equivalent Diameters Downstream From Disturbance (B) =
[Distance B / Stack ID]

Equivalent Diameters Upstream From Disturbance (A) =
[Distance A / Stack ID]

Equivalent Diameter For a Square or Rectangular Stack =
[(2 x L x W) / (L + W)]

Port ID 6 in. (for monorail bracket specs.)
Port Length Outside of Stack 4 in. (for monorail bracket specs.)



1	2	3	4	5	6
Port Traverse Point Number	Fractional % of Stack I.D. (frac. %)	Stack I.D. (inches)	Product of Columns 2 and 3 (inches)	Port Depth (inches)	Traverse Point Location From Outside of Port (Sum of 4 and 5 in inches)
1	0.044	108	~~6.5475~~	6.5	11.25
2	0.146		15.77		22.27
3	0.296		31.97		38.47
4	0.704		76.03		82.53
5	0.854		92.23		98.73
6	0.956		103.25		109.75
7					
8					
9					
10					
11					
12					

For Stacks / Ducts ≤ 24 inches ID – No traverse point shall be located less than 0.5 inches from stack wall

For Stacks / Ducts > 24 inches ID – No traverse point shall be located less than 1.0 inches from stack wall

QA/QC Check:
Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓

Method 1 Calculator Signature/Date 9-17-14

Field Supervisor Signature/Date 9/18/14

LOCATION OF TRAVERSE POINTS IN CIRCULAR STACKS

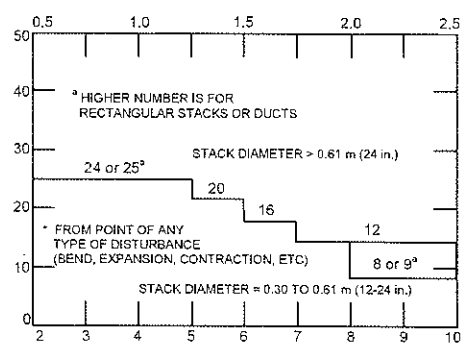
Pts	4	6	8	10	12
1	6.7	4.4	3.2	2.6	2.1
2	25.0	14.6	10.5	8.2	6.7
3	75.0	29.6	19.4	14.6	11.8
4	93.3	70.4	32.3	22.6	17.7
5		85.4	67.7	34.2	25.0
6		95.6	80.6	65.8	35.6
7			89.5	77.4	64.4
8			96.8	85.4	75.0
9				91.8	82.3
10				97.4	88.2
11					93.3
12					97.9

LOCATION OF TRAVERSE POINTS IN RECTANGULAR STACKS
CEMS *

Pts	2	3	4	5	6	7	8	9
1	25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6
2	75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7
3		83.3	62.5	50.0	41.7	35.7	31.3	27.8
4			87.5	70.0	58.3	50.0	43.8	38.9
5				90.0	75.0	64.3	56.3	50.0
6					91.7	78.6	68.8	61.1
7						92.9	81.3	72.2
8							93.8	83.3
9								94.4

*3 point CEMS RATA traverse point locations (valid for rectangular and round stacks)

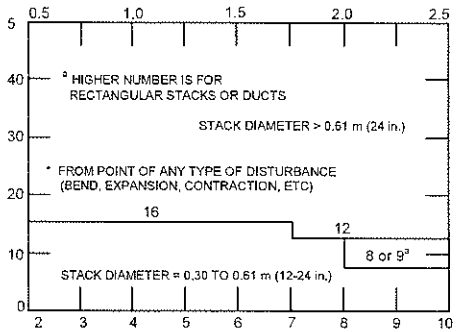
DUCT DIAMETERS UPSTREAM FROM FLOW DISTURBANCE* (DISTANCE A)



DUCT DIAMETERS DOWNSTREAM FROM FLOW DISTURBANCE* (DISTANCE B)

MINIMUM NUMBER OF TRAVERSE POINTS
ISOKINETIC TESTING

DUCT DIAMETERS UPSTREAM FROM FLOW DISTURBANCE* (DISTANCE A)



DUCT DIAMETERS DOWNSTREAM FROM FLOW DISTURBANCE* (DISTANCE B)

MINIMUM NUMBER OF TRAVERSE POINTS
FOR VELOCITY (NON-ISOKINETIC) TRAVERSES

Form FDF 4000.00

ARI ENVIRONMENTAL INC.

VELOCITY TRAVERSE AND CYCLONIC FLOW VERIFICATION

PLANT: BP Whiting
DATE: 2-13-13
LOCATION: Whiting, IN
SOURCE: FCU 600
STACK ID: 108
PROBE #/TC #: 354
BAROMETRIC PRESSURE, in. Hg: 29.20
OPERATORS: WAH

RUN NO. Prelim
STATIC, in. H_2O ~1.4
START: 0811 STOP: 0815
PRE-TEST: +/-05 POST-TEST: +/-05

	TRAVERSE POINT NUMBER	VELOCITY HEAD, ΔP (in. H_2O)	STACK TEMP. (°F)	YAW ANGLE (°)
	6	2.5	637	13
	5	3.0	637	9
NW	4	3.1	637	5
	3	3.2	637	6
	2	3.3	637	8
	1	3.0	637	10
	6	2.7	637	9
	5	3.0	637	6
SW	4	3.0	637	3
	3	3.3	637	0
	2	3.1	637	1
	1	2.9	637	4
	AVERAGE	~~0.4400~~ 1.7332	637.0	<20°

RUN NO. _____
STATIC, in. H_2O _____
START: _____ STOP: _____
PRE-TEST: _____ POST-TEST: _____

SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD, ΔP (in. H_2O)	STACK TEMP. (°F)	YAW ANGLE (°)
AVERAGE			

Form FDF 4005.00

ARI ENVIRONMENTAL INC.

SAMPLING NOZZLE INSPECTION AND MEASUREMENT

Date: 9/18/14

Nozzle ID: PM_{10}

Nozzle Type: SS # PM_{10} # 2 & #1

Inspected By: S. Flaherty

Nozzle Clean: (Y) / N

Nozzle Undamaged: (Y) / N

Absent of Nicks or Dents: (Y) / N

Leading Edge Sharp: (Y) / N

Nozzle Diameter					
D_1 (inches)	D_2 (inches)	D_3 (inches)	ΔD (inches)	D_{avg} (inches)	
0.147	0.147	0.147	0.000	0.147	✓ JB
0.146	0.145	0.146	0.001	0.146	✓ JB
0.135	0.136	0.137	0.002	0.136	✓ JB

where:

$D_{1,2,3}$ = three different nozzle diameter measurements , (inches) ; each diameter must be measured to within 0.001 inches

ΔD = maximum difference between any two diameters, (inches) ; $\Delta D \leq 0.004$ inches

D_{avg} = average of D_1, D_2, and D_3, (inches)

Form FDF 4004.00

B-4

FIELD DATA

PLANT	BP Whiting	AMBIENT TEMPERATURE	62	PROBE HEATER SETTING	250
DATE	9-18-14	BAROMETRIC PRESSURE	29.60	HEATER BOX SETTING	250
LOCATION	FCC 500 exhaust	ASSUMED MOISTURE, %	24	METER $H_@$	1.79
OPERATOR	JB	PROBE LENGTH, in.	120	C_p FACTOR	0.84
STACK NO.	FCU 500	NOZZLE DIAMETER, in.	0.136	Y_d FACTOR	1.007
RUN NO.	500-1	STACK DIAMETER, in.	108	PITOT NO.	731
SAMPLE BOX NO.	–	MINUTES PER POINT	–		
METER BOX NO	6112609	NUMBER OF POINTS	6		
START TIME	11:30	NUMBER OF PORTS	2		

WEIGHT OF PARTICULATE, mg		
Filter No.	55593	
Sample		
Final wt		
Tare wt	855.6	
Wt. gain		
TOTAL		mg

CROSS SECTION

CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (Θ) min.	STATIC PRESSURE (in. H_2O)	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP_s)	VELOCITY HEAD $\sqrt{(\Delta P_s)}$	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m) ft^3	GAS SAMPLE TEMP AT DRY GAS METER INLET ($T_{m_{in}}$) °F	OUTLET ($T_{m_{out}}$) °F	FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
11:30	A 1	9m46s	-1.3	611	2.0	1.41	0.36		704.753	92	91	245	250	66	54	4
11:39	2	10m56s		645	2.5	1.58	0.36		708.07	102	92	252	252	66	54	4
11:50	3	11m8s		646	2.6	1.61	0.36		712.24	112	95	249	249	67	57	4
12:02	4	11m21s		646	2.7	1.64	0.36		715.51	118	100	252	250	68	60	4
12:13	5	11m21s		646	2.7	1.64	0.36		718.93	121	100	248	251	69	62	4
12:24	6	11m46s		646	2.9	1.7	0.36		722.57	123	100	243	248	70	64	4
12:36/12:41	B 1	9m31s		609	1.9	1.37	0.36		726.15	120	100	245	252	67	59	4
12:51	2	10m55s		642	2.5	1.58	0.36		730.42	123	101	243	254	65	58	4
13:02	3	11m8s		649	2.6	1.61	0.36		734.71	123	101	240	251	66	56	4
13:13	4	11m21s		649	2.7	1.64	0.36		737.42	123	102	247	249	67	56	4
13:24	5	11m21s		648	2.7	1.64	0.36		740.18	123	102	255	249	70	61	4
13:35	6	10m55s		646	2.5	1.58	0.36		743.27	123	102	256	251	71	64	4
13:46									746.537	~~124~~	~~103~~ JB					
				✓ JB.							✓ JB					
				640.33		1.5864				107.88						
AVERAGE		130m9s		~~623.6~~		~~1.5833~~ JB	0.36		41.784	~~103.83~~ JB					~~≤~~ 68	MAX = 4

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g) #1	#2	#3	#4	#5	SILICA GEL WEIGHT g
FINAL						
INITIAL						
LIQUID COLLECTED						
TOTAL LIQUID COLLECTED (specify ml or g)						

ORSAT DATA	TIME	CO_2	O_2
TRIAL 1	1410	18.6	1.1
TRIAL 2	1415	18.6	1.1
TRIAL 3	1420	18.6	1.1
Average		18.6	1.1

LEAK CHECK		
SYSTEM PRE:	✓	CFM@15"Hg
POST:	✓	CFM@15"Hg
PITOT PRE:	✓	@ > 3" H_2O
POST:	✓	@ > 3" H_2O

Form FDF 4003.00

IMPINGER RECOVERY DATA SHEET

Company:	bP	Date Set-up:	9/17/14
Location:	Whiting IN	Test Date:	9/18/14
Source:	FCU 500	Date Recovered:	9/18/14
Run No.:	1-500	USEPA Method:	201A/202
		Corresponding Filter Wgt:	855.6
		Filter Container No:	55593

Measurement Method: Weight or Volume

Impinger No.	Impinger Contents	Initial wt/vol g/mL	Final wt/vol g/mL	Difference wt/vol g/mL	Sample Container No.
1	KO	356.3	565.1		
2	Empty	596.9	600.8		
3	~100ml DI	696.0	702.2		
4	SG	843.2	858.2		
5					
6					

FORM FDF 4007.00

6 24

FIELD DATA

PLANT	BP Whiting	AMBIENT TEMPERATURE	62	PROBE HEATER SETTING	250
DATE	9-18-14	BAROMETRIC PRESSURE	29.60	HEATER BOX SETTING	250
LOCATION	FCC 500 Exhaust	ASSUMED MOISTURE, %	24%	METER $H_@$	1.79
OPERATOR	JB	PROBE LENGTH, in.	120	C_p FACTOR	0.84
STACK NO.		NOZZLE DIAMETER, in.	0.146	Y_d FACTOR	1.007
RUN NO.	500-2	STACK DIAMETER, in.	108	PITOT NO.	731
SAMPLE BOX NO.		MINUTES PER POINT			
METER BOX NO.	611209	NUMBER OF POINTS	6		
START TIME	15:30	NUMBER OF PORTS	2		

WEIGHT OF PARTICULATE, mg	
Filter No.	55592
Sample	
Final wt	
Tare wt	852.1
Wt. gain	
TOTAL	mg

CROSS SECTION

CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (Θ) min.	STATIC PRESSURE (in. H_2O)	STACK TEMP (T_s) 'F	VELOCITY HEAD (ΔP_s)	$\sqrt{\Delta P_s}$	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP AT DRY GAS METER INLET (Tm_{in}) 'F	OUTLET (Tm_{out}) 'F	FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP. 'F	LAST IMPINGER OUTLET TEMP. 'F	PUMP VACUUM (in. Hg)
15:30	A 1	8m53s	-1.3	650	2.0	1.41	0.36		748.315	113	103	240	248	66	59	4
15:38	2	9m32s		649	2.3	1.51	0.36		751.52	125	104	242	249	66	60	4
15:48	3	10m8s		650	2.6	1.61	0.36		754.39	125	104	243	248	66	60	4
15:59	4	10m30s		650	2.8	1.67	0.36		758.27	125	105	243	249	66	60	4
16:09	5	10m20s		649	2.7	1.64	0.36		762.58	125	105	255	251	73	67	4
16:19	6	9m56s		647	2.5	1.58	0.36		765.41	125	105	260	254	71	66	4
16:29/16:35	B 1	8m40s		640	1.9	1.38	0.36		768.55	125	106	262	255	70	58	4
16:42	2	9m44s		636	2.4	1.55	0.36		771.63	125	106	260	249	67	57	4
16:52	3	10m20s		648	2.7	1.64	0.36		774.76	125	106	254	251	67	57	4
17:03	4	10m31s		650	2.8	1.67	0.36		778.21	125	106	250	249	67	60	4
17:14	5	10m20s		649	2.7	1.64	0.36		781.76	125	106	246	248	71	61	4
17:25	6	9m56s	✓	647	2.5	1.58	0.36		785.13	125	106	260	253	73	65	4
17:36							✓		788.295							
						✓ JB										
				✓ JB		1.5758			✓ JB		✓ JB					
AVERAGE		118:09		647.1		~~1.5755~~ JB	0.36		39.980		114.6				≤68	MAX = 4

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g) #1	#2	#3	#4	#5	SILICA GEL WEIGHT g
FINAL						
INITIAL						
LIQUID COLLECTED						
TOTAL LIQUID COLLECTED (specify ml or g)						

ORSAT DATA	TIME	CO_2	O_2
TRIAL 1	1800	18.5	1.2
TRIAL 2	1805	18.5	1.2
TRIAL 3	1810	18.5	1.2
Average		18.5	1.2

LEAK CHECK		
SYSTEM PRE:	✓	CFM@15"Hg
POST:	✓	CFM@15"Hg
PITOT PRE:	✓	@>3"H_2O
POST:	✓	@>3"H_2O

Form FDF 4003.00

ARI ENVIRONMENTAL INC.

IMPINGER RECOVERY DATA SHEET

Company:	BP	Date Set-up:	9/18/14
Location:	Whiting IN	Test Date:	9/18/14
Source:	FCU 500	Date Recovered:	9/18/14
Run No.:	Z-500	USEPA Method:	201A/202
		Corresponding Filter Wgt:	352.1
		Filter Container No:	55592

Measurement Method: Weight or Volume

Impinger No.	Impinger Contents	Initial wt/vol g/mL	Final wt/vol g/mL	Difference wt/vol g/mL	Sample Container No.
1	KO	378.5	609.2 ~~609.2~~ SMF	230.7	
2	Empty	604.9	607.2	2.3	
3	~100ml DI	699.8	709.8	10.0	
4	SG	764.7	775.6	10.9	
5					
6					

FORM FDF 4007.00

ARI ENVIRONMENTAL INC.

1.29

FIELD DATA

B-8

PLANT	BP Whiting	AMBIENT TEMPERATURE	62	PROBE HEATER SETTING	250		
DATE	9-18-14	BAROMETRIC PRESSURE	29.66	HEATER BOX SETTING	250		
LOCATION	FCC 500 Exhaust	ASSUMED MOISTURE, %	24%	METER $H_@$	1.79		
OPERATOR	JB	PROBE LENGTH, in.	120	C_p FACTOR	0.84		
STACK NO.	FCU 500	NOZZLE DIAMETER, in.	0.147	Y_d FACTOR	1.007		
RUN NO.	500-3	STACK DIAMETER, in.	108	PITOT NO.	731		
SAMPLE BOX NO.		MINUTES PER POINT	–				
METER BOX NO.	611209	NUMBER OF POINTS	6				
START TIME	18:40	NUMBER OF PORTS	2				

WEIGHT OF PARTICULATE, mg		
Filter No.	555995	
Sample		
Final wt		
Tare wt	952.3	
Wt. gain		
TOTAL		mg

CROSS SECTION

CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (Θ) min.	STATIC PRESSURE (in. H_2O)	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP_s)	$\sqrt{\Delta P_s}$	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP AT DRY GAS METER INLET (Tm_{in}) °F	OUTLET (Tm_{out}) °F	FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
18:40	A 1	8m53s	-1.3	620	2.0	1.41	0.34		788.695	105	103	240	245	66	58	4
18:48	2	9m56s		633	2.5	1.58			791.51	124	104	246	249	66	57	4
18:58	3	10m20s		650	2.7	1.64			794.65	125	104	252	253	66	57	4
19:08	4	10m31s		650	2.8	1.67			799.24	125	105	253	249	67	58	4
19:18	5	10m20s		650	2.7	1.64			801.76	125	105	254	249	67	62	4
19:29	6	9m44s		649	2.4	1.55			805.08	125	106	255	252	68	65	4
1945 / 19:39	B 1	8m53s		640	2.0	1.41			808.33	124	106	248	244	69	61	4
19:54	2	9m44s		646	2.4	1.55			811.27	124	106	247	244	67	60	4
20:04	3	10m8s		650	2.6	1.61			814.20	124	106	250	251	67	60	4
20:14	4	10m20s		650	2.7	1.64			817.56	124	105	254	252	68	60	4
20:24	5	10m8s		650	2.6	1.61			820.88	123	105	256	255	69	61	4
20:34	6	9m44s		648	2.4	1.55			824.48	123	105	257	255	72	65	4
20:44									828.731							
						✓ JB.										
				✓ JB.		1.5737			✓ JB.	✓ JB						
AVERAGE		117:21 m s		644.7		~~1.5717~~ JB			40.036	113.79		~~250.04~~			≤68	MAX = 4

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g) #1	#2	#3	#4	#5	SILICA GEL WEIGHT g
FINAL						
INITIAL						
LIQUID COLLECTED						
TOTAL LIQUID COLLECTED (specify ml or g)						

ORSAT DATA	TIME	CO_2	O_2
TRIAL 1	2110	18.5	1.1
TRIAL 2	2115	18.5	1.3
TRIAL 3	2120	18.5	1.2
Average		18.5	1.2

LEAK CHECK		
SYSTEM PRE:	✓	CFM@15"Hg
POST:	✓	CFM@15"Hg
PITOT PRE:	✓	@ > 3"H_2O
POST:	✓	@ > 3"H_2O

Form FDF 4003.00

ARI ENVIRONMENTAL INC.

IMPINGER RECOVERY DATA SHEET

Company:	BP	Date Set-up:	9/18/14
Location:	Whiting IN	Test Date:	9/18/14
Source:	FCU 500	Date Recovered:	9/19/14
Run No.:	3-500	USEPA Method:	201A/202
		Corresponding Filter Wgt:	852.3
		Filter Container No:	55595

Measurement Method: Weight or Volume

Impinger No.	Impinger Contents	Initial wt/vol g/mL	Final wt/vol g/mL	Difference wt/vol g/mL	Sample Container No.
1	KO	357.2	564.8		
2	Empty	599.1	603.7		
3	~700 ml DI	702.2	~~603~~ 711.2		
4	SG	858.2	864.1		
5					
6					

FORM FDF 4007.00

FIELD DATA

PLANT	BP Whiting	AMBIENT TEMPERATURE	59	PROBE HEATER SETTING	250
DATE	9-19-14	BAROMETRIC PRESSURE	29.65	HEATER BOX SETTING	250
LOCATION	FCC 500 Exhaust	ASSUMED MOISTURE, %	23	METER $H_@$	1.79
OPERATOR	JB.	PROBE LENGTH, in.	120	C_p FACTOR	0.84
STACK NO.	FCU 500	NOZZLE DIAMETER, in.	0.146	Y_d FACTOR	1.007
RUN NO.	500-4	STACK DIAMETER, in.	108	PITOT NO.	731
SAMPLE BOX NO.	-	MINUTES PER POINT	-		
METER BOX NO.	611209	NUMBER OF POINTS	6		
START TIME	0907	NUMBER OF PORTS	2		

WEIGHT OF PARTICULATE, mg	
Filter No.	556066
Sample Total Wt.	
Tare Wt.	854.1
Weight	
TOTAL	mg

CROSS SECTION

CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (θ) min.	STATIC PRESSURE (in. H_2O)	STACK TEMP. (T_s) °F	VELOCITY HEAD (ΔP_s)	VELOCITY HEAD ($\sqrt{\Delta P_s}$)	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m) ft³	GAS SAMPLE TEMP AT DRY GAS METER INLET ($T_{m_{in}}$) °F	OUTLET ($T_{m_{out}}$) °F	FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
9:07	A 1	8m53s	-1.4	590	2.0	1.41	0.35		828.320	108	90	260	246	67	60	4
9:16	2	9m56s		626	2.5	1.58	0.35		831.45	117	91	255	249	66	64	4
9:26	3	10m8s		650	2.6	1.61	0.35		834.69	118	93	256	251	66	65	4
9:36	4	10m20s		650	2.7	1.64	0.35		838.15	119	95	256	253	67	65	4
9:46	5	10m20s		649	2.7	1.64	0.35		841.70	120	96	251	251	67	64	4
9:56	6	9m44s		647	2.4	1.55	0.35		845.22	120	97	255	258	73	61	4
10:06/10:11	B 1	9m7s		622	2.1	1.45	0.35		848.33	121	98	245	247	66	59	4
10:21	2	9m44s		636	2.4	1.55	0.35		851.52	121	99	243	249	66	59	4
10:31	3	10m8s		648	2.6	1.61	0.35		855.46	122	99	245	250	67	58	4
10:41	4	10m20s		649	2.7	1.64	0.35		859.16	122	100	249	251	68	59	4
10:51	5	10m8s		649	2.6	1.61	0.35		863.53	123	100	253	256	69	60	4
11:01	6	9m32s		648	2.3	1.51	0.35		867.86	123	101	256	254	72	62	4
11:11									870.015							
						✓ JB										
				✓ JB.		1.5689			✓ JB.	✓ JB.						
AVERAGE		117m0s		638.7		~~1.3667~~	JB 0.35		41.6950	108.04					≤68	MAX = 4

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g) #1	#2	#3	#4	#5	SILICA GEL WEIGHT g
FINAL						
INITIAL						
LIQUID COLLECTED						
TOTAL LIQUID COLLECTED (specify ml or g)						

ORSAT DATA	TIME	CO_2	O_2
TRIAL 1	1145	18.7	1.3
TRIAL 2	1150	18.7	1.3
TRIAL 3	1200	18.7	1.3
Average		18.7	1.3

LEAK CHECK		
SYSTEM PRE:	0.00	CFM@15"Hg
POST:	0.00	CFM@15"Hg
PITOT PRE:	0.00	@ > 3" H_2O
POST:	0.00	@ > 3" H_2O

Form FDF 4003.00

IMPINGER RECOVERY DATA SHEET

Company:	BP	Date Set-up:	9/18/14
Location:	Whiting IN	Test Date:	9/19/14
Source:	FCU 500	Date Recovered:	9/19/14
Run No.:	4-500	USEPA Method:	201A/202
		Corresponding Filter Wgt:	854.1
		Filter Container No:	55606

Measurement Method: Weight or Volume

Impinger No.	Impinger Contents	Initial wt/vol g/mL	Final wt/vol g/mL	Difference wt/vol g/mL	Sample Container No.
1	KO	379.6	606.5		
2	MT	606.8	608.5		
3	100ml DI	709.9	717.8		
4	SG	775.6	787.3		
5					
6					

FORM FDF 4007.00

APPENDIX C

Analytical Data

ANALYTICAL REPORT

Client: BP

Sampling Location: Whiting, IN

Sampling Date(s): 9/18 – 9/19/14

Lab Project Number: 08-672

COC Numbers(s): W01047 – W01049

Analysis Date(s): 9/19 – 9/30/14

Analytical Method: USEPA Method 201A & USEPA Method 202

Prepared For:
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State of Texas TCEQ/NELAP Certificate ID: T104704428-13-5
State of Louisiana LDEQ/LELAP Certificate ID: 02010
State of New Jersey NJDEP Certification ID: IL007

Project Narrative

Sample Receipt and Acceptance Quality Assurance:

Thirty-one (31) samples were received in good condition and were logged in at the ARI laboratory located in Wauconda, IL on 9/19/14. All sample receipt acceptance criteria were met as documented in the Sample Receipt Checklist included in this report.

Analytical Quality Assurance:

Analysis of samples met the procedural requirements and QA/QC criteria set forth in the TNI Standard, applicable reference methods and standard operating procedures and, where applicable, the project test plan.

Data Interpretation and Comments:

There were no deviations from the test methods and no non-standard conditions that may affect the quality of the test results. Test results reported under this project number apply only to the samples as received and identified on the chain-of-custody document(s) included in this report.

Scope of Accreditation:

All test methods and analytes were analyzed under ARI's current scope of accreditation under TCEQ/NELAP.

Laboratory Contact Information:

If you have any questions regarding these test results, please contact Mr. Eric Vogt, Laboratory Manager, at 847-487-1580 ext.116 or by e-mail at evogt@arienv.com.

Reviewed and Approved by:

Signature: Laboratory Manager

Date 10/1/14

ANALYTICAL SUMMARY

CLIENT: BP Whiting
LOCATION: Whiting, IN
SOURCE: FCU 500
SAMPLE DATE: 9/18/14 - 9/19/14
ANALYSIS: Particulates
METHOD: USEPA Methods 201A/202

Analyst: J. Ruggaber
Date of Completion: 9/30/2014
Template Control ID: USEPA-M201/202-PARTIC-TEMPLATE-62T-REV3
Project Number: 08-672

Identification	LIMS Number	Solvent Mass (g)	Tare	WT1	WT2	WT 1 - WT 2 (mg)	% difference	Particulate (mg)	Blank Corrected Particulate (mg)
Run 1 Filter	13662	-	855.6	884.2	884.4	-0.20	N/A	28.70	28.70
Run 1 >PM10	13639	91.7	114515.3	114524.7	114524.6	0.10	N/A	9.35	8.95
Run 1 <PM10	13643	150.0	111683.1	111693.7	111693.9	-0.20	N/A	10.70	10.04
Run 2 Filter	13663	-	852.1	885.7	885.4	0.30	N/A	33.45	33.45
Run 2 >PM10	13640	99.3	116513.4	116521.3	116521.6	-0.30	N/A	8.05	7.61
Run 2 <PM10	13644	146.1	115818.7	115825.7	115825.7	0.00	N/A	7.00	6.36
Run 3 Filter	13664	-	852.3	880.9	880.7	0.20	N/A	28.50	28.50
Run 3 >PM10	13641	79.9	115233.2	115241.7	115241.4	0.30	N/A	8.35	8.00
Run 3 <PM10	13645	146.0	109951.0	109956.5	109956.7	-0.20	N/A	5.60	4.96
Run 4 Filter	13665	-	854.1	885.8	885.6	0.20	N/A	31.60	31.60
Run 4 >PM10	13642	111.5	114186.0	114191.9	114192.1	-0.20	N/A	6.00	5.51
Run 4 <PM10	13646	184.1	113889.7	113902.7	113902.5	0.20	N/A	12.90	12.09
Filter Blank	13666	-	848.8	849.5	849.5	0.00	N/A	0.70	
Acetone Blank	13637	148.3	4091.0	4091.8	4091.5	0.30	N/A	0.65	-

M202 Organic Rinse

Identification	LIMS Number	Tare	WT1	WT2	WT 1 - WT 2 (mg)	% difference	Organic CPM (mg)
Run 1	13651	4045.9	4048.9	4048.5	0.40	N/A	2.80
Run 2	13652	4075.1	4077.5	4077.6	-0.10	N/A	2.45
Run 3	13653	4066.8	4069.7	4069.7	0.00	N/A	2.90
Run 4	13654	4100.7	4105.7	4105.9	-0.20	N/A	5.10
Train Blank	13661	4111.6	4117.7	4117.8	-0.10	N/A	6.15
Acetone Blank	13637	4091.0	4091.8	4091.5	0.30	N/A	0.65
Hexane Blank	13638	4097.7	4098.8	4098.5	0.30	N/A	0.95

C-4

CLIENT: BP Whiting
LOCATION: Whiting, IN
SOURCE: FCU 500
SAMPLE DATE: 9/18/14 - 9/19/14
ANALYSIS: Particulates
METHOD: USEPA Methods 201A/202

Analyst: J. Ruggaber
Date of Completion: 9/30/2014
Template Control ID: USEPA-M201/202-PARTIC-TEMPLATE-62T-REV3
Project Number: 08-672

M202 Imp Contents

Identification	LIMS Number	mL of NH_4OH added*	Tare	WT1	WT2	WT 1 - WT 2 (mg)	% difference	Inorganic CPM (mg)**
Run 1	13647	0.10	4179.7	4205.1	4204.9	0.20	N/A	25.30
Run 2	13648	0.07	4128.1	4145.4	4145.2	0.20	N/A	17.20
Run 3	13649	0.00	4117.2	4143.0	4142.7	0.30	N/A	25.65
Run 4	13650	0.08	4068.2	4090.3	4090.0	0.30	N/A	21.95
Train Blank	13660	0.00	4102.9	4122.3	4122.7	-0.40	N/A	19.60
DI Water Blank	13636	-	4121.4	4132.1	4132.1	0.00	N/A	10.70

Ammonium Hydroxide Conc = 0.0992
*Samples with 0.00 as the mL of NH_4OH added were already basic
**Not Corrected for Ammonium Hydroxide titration

Identification		Volume (mL)	Tare	WT1	WT2	WT 1 - WT 2 (mg)	Condensate (mg)	Target Weight (mg)	Accuracy	Pass/Fail
LCS	QC	100	119412.7	119513.2	119513.2	0.00	100.50	100.18	100.3	Pass

951 Old Rand Road # 106
Wauconda, IL 60084

Texas NELAP ID: T 104704428-13-5

ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting
Whiting, IN
FCU 500

Lab Project #: 08-672
Project Manager: Steve Flaherty
Received: 9/19/2014
Reported: 10/1/2014

Sample ID: DI H2O Blank
Lab Sample #: 13636
Date Sampled: 09/18/2014
Field #: 51679

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Inorganic Residue	USEPA Method 202	Joel Ruggaber	09/30/2014	10.70	mg	

Sample ID: Acetone Reagent Blank (202)
Lab Sample #: 13637
Date Sampled: 09/18/2014
Field #: 51680

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	09/30/2014	0.65	mg	
Organic Residue	USEPA Method 202	Joel Ruggaber	09/30/2014	0.65	mg	

Sample ID: Hexane Reagent Blank
Lab Sample #: 13638
Date Sampled: 09/18/2014
Field #: 51681

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Organic Residue	USEPA Method 202	Joel Ruggaber	09/30/2014	0.95	mg	

Sample ID: Run 1 >PM10 Catch
Lab Sample #: 13639
Date Sampled: 09/18/2014
Field #: 49658

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	09/30/2014	8.95	mg	

Sample ID: Run 2 >PM10 Catch
Lab Sample #: 13640
Date Sampled: 09/18/2014
Field #: 49659

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

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Wauconda, IL 60084

Texas NELAP ID: T 104704428-13-5

ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting
Whiting, IN
FCU 500

Lab Project #: 08-672
Project Manager: Steve Flaherty
Received: 9/19/2014
Reported: 10/1/2014

Particulate	Method 201A	Joel Ruggaber	09/30/2014	7.61	mg

Sample ID: Run 3 >PM10 Catch
Lab Sample #: 13641
Date Sampled: 09/18/2014
Field #: 49660

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	09/30/2014	8.00	mg	

Sample ID: Run 4 >PM10 Catch
Lab Sample #: 13642
Date Sampled: 09/19/2014
Field #: 49661

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	09/30/2014	5.51	mg	

Sample ID: Run 1 < PM10
Lab Sample #: 13643
Date Sampled: 09/18/2014
Field #: 49662

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	09/30/2014	10.04	mg	

Sample ID: Run 2 < PM10
Lab Sample #: 13644
Date Sampled: 09/18/2014
Field #: 48712

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	09/30/2014	6.36	mg	

Sample ID: Run 3 < PM10
Lab Sample #: 13645
Date Sampled: 09/18/2014
Field #: 48713

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

951 Old Rand Road # 106
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Texas NELAP ID: T 104704428-13-5

ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting
Whiting, IN
FCU 500

Lab Project #: 08-672
Project Manager: Steve Flaherty
Received: 9/19/2014
Reported: 10/1/2014

Particulate	Method 201A	Joel Ruggaber	09/30/2014	4.96	mg

Sample ID: Run 4 < PM10
Lab Sample #: 13646
Date Sampled: 09/19/2014
Field #: 48714

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	09/30/2014	12.09	mg	

Sample ID: Run 1 Imp Catch
Lab Sample #: 13647
Date Sampled: 09/18/2014
Field #: 48715

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Inorganic Residue	USEPA Method 202	Joel Ruggaber	09/30/2014	25.30	mg	

Sample ID: Run 2 Imp Catch
Lab Sample #: 13648
Date Sampled: 09/18/2014
Field #: 48716

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Inorganic Residue	USEPA Method 202	Joel Ruggaber	09/30/2014	17.20	mg	

Sample ID: Run 3 Imp Catch
Lab Sample #: 13649
Date Sampled: 09/18/2014
Field #: 48717

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Inorganic Residue	USEPA Method 202	Joel Ruggaber	09/30/2014	25.65	mg	

Sample ID: Run 4 Imp Catch
Lab Sample #: 13650
Date Sampled: 09/19/2014
Field #: 48718

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

951 Old Rand Road # 106
Wauconda, IL 60084

Texas NELAP ID: T 104704428-13-5

ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting
Whiting, IN
FCU 500

Lab Project #: 08-672
Project Manager: Steve Flaherty
Received: 9/19/2014
Reported: 10/1/2014

Inorganic Residue	USEPA Method 202	Joel Ruggaber	09/30/2014	21.95	mg

Sample ID: Run 1 Organic Rinse
Lab Sample #: 13651
Date Sampled: 09/18/2014
Field #: 48719

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Organic Residue	USEPA Method 202	Joel Ruggaber	09/30/2014	2.80	mg	

Sample ID: Run 2 Organic Rinse
Lab Sample #: 13652
Date Sampled: 09/18/2014
Field #: 48720

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Organic Residue	USEPA Method 202	Joel Ruggaber	09/30/2014	2.45	mg	

Sample ID: Run 3 Organic Rinse
Lab Sample #: 13653
Date Sampled: 09/18/2014
Field #: 48721

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Organic Residue	USEPA Method 202	Joel Ruggaber	09/30/2014	2.90	mg	

Sample ID: Run 4 Organic Rinse
Lab Sample #: 13654
Date Sampled: 09/19/2014
Field #: 48722

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Organic Residue	USEPA Method 202	Joel Ruggaber	09/30/2014	5.10	mg	

Sample ID: Run 1 CPM Filter
Lab Sample #: 13655
Date Sampled: 09/18/2014
Field #: 48729

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

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Wauconda, IL 60084

Texas NELAP ID: T 104704428-13-5

ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting
Whiting, IN
FCU 500

Lab Project #: 08-672
Project Manager: Steve Flaherty
Received: 9/19/2014
Reported: 10/1/2014

Sample ID: Run 2 CPM Filter
Lab Sample #: 13656
Date Sampled: 09/18/2014
Field #: 48730

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Sample ID: Run 3 CPM Filter
Lab Sample #: 13657
Date Sampled: 09/18/2014
Field #: 48731

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Sample ID: Run 4 CPM Filter
Lab Sample #: 13658
Date Sampled: 09/19/2014
Field #: 48732

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Sample ID: Train Blank CPM Filter
Lab Sample #: 13659
Date Sampled: 09/18/2014
Field #: 48725

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Sample ID: Train Blank DI Rinse
Lab Sample #: 13660
Date Sampled: 09/18/2014
Field #: 48723

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

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Texas NELAP ID: T 104704428-13-5

ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting
Whiting, IN
FCU 500

Lab Project #: 08-672
Project Manager: Steve Flaherty
Received: 9/19/2014
Reported: 10/1/2014

Inorganic Residue	USEPA Method 202	Joel Ruggaber	09/30/2014	19.60	mg

Sample ID: Train Blank Organic Rinse
Lab Sample #: 13661
Date Sampled: 09/18/2014
Field #: 48724

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Organic Residue	USEPA Method 202	Joel Ruggaber	09/30/2014	6.15	mg	

Sample ID: Run 1 Filter
Lab Sample #: 13662
Date Sampled: 09/18/2014
Field #: 55593

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	09/30/2014	28.70	mg	

Sample ID: Run 2 Filter
Lab Sample #: 13663
Date Sampled: 09/18/2014
Field #: 55592

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	09/30/2014	33.45	mg	

Sample ID: Run 3 Filter
Lab Sample #: 13664
Date Sampled: 09/18/2014
Field #: 55595

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	09/30/2014	28.50	mg	

Sample ID: Run 4 Filter
Lab Sample #: 13665
Date Sampled: 09/19/2014
Field #: 55606

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

951 Old Rand Road # 106

Wauconda, IL 60084

Texas NELAP ID: T 104704428-13-5

ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting
Whiting, IN
FCU 500

Lab Project #: 08-672
Project Manager: Steve Flaherty
Received: 9/19/2014
Reported: 10/1/2014

Particulate	Method 201A	Joel Ruggaber	09/30/2014	31.60	mg

Sample ID: **Filter Blank**
Lab Sample #: **13666**

Date Sampled: 09/19/2014
Field #: 55596

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	09/30/2014	0.70	mg	

Notes: UA - Not a NELAC accredited analyte under this method.
NA - Sample not tested for this analyte.
D - Value calculated from dilution.
J - Value less than the low standard but above the Limit of Detection (LOD).
L - Sample leaked before receipt.
H - Value greater than the high standard.

USEPA METHOD 201A TASK SCHEDULE

Client: BP Whiting

Location: Whiting, IN

Project Manager: S. Flaherty

Date Sampled: 9/18 – 9/19/14

Lab Project #: 08-672

Spreadsheet Template ID: USEPA-M201/202-PARTIC-TEMPLATE-62T-REV3

Analyst: J. Ruggaber

DATE	TIME	EQUIPMENT	TASK
9/19/14	16:00	Desiccator #1	Place labeled beakers in dessicator (store 24 hrs)
9/23/14	9:20	Oven #2	Heat filters in oven at 105 °C (approximately 2 hours)
9/23/14	11:25	Desiccator #1	Place filters in dessicator (store min. 24 hours)
9/22/14	9:53	Balance #1	Weigh conditioned beakers and record tares
9/22/14 – 9/23/14	-	-	Dry down probe washes and/or cyclone separator fractions and blanks in tared beakers in the hood.
9/22/14 – 9/26/14	-	Oven #2	In a tared beaker, dry down 100 mL of the LCS solution in an oven at 110 °C.
9/23/14	9:10	Desiccator #1	Place beakers in dessicator (store min. 24 hours)
9/29/14	9:57	Balance #1	Beaker weighing #1
9/30/14	9:26	Balance #1	Beaker weighing #2 (min. 6 hrs after weighing #1)
-	-	-	Beaker weighing #3 (min. 6 hrs after weighing #2)
-	-	-	Beaker weighing #4 (min. 6 hrs after weighing #3)
9/29/14	10:21	Balance #1	Filter weighing #1 (min. 24 hrs in dessicator)
9/30/14	9:51	Balance #1	Filter weighing #2 (min. 6 hrs after weighing #1)
-	-	-	Filter weighing #3 (min. 6 hrs after weighing #2)
-	-	-	Filter weighing #4 (min. 6 hrs after weighing #3)
10/1/14	-	-	Prepare report
			Report QA review
			Report distribution

LCS Sodium Chloride Solution:

USEPA METHOD 202 TASK SCHEDULE

Client: BP Whiting

Location: Whiting, IN

Project Manager: S. Flaherty

Date Sampled: 9/18 – 9/19/14

Lab Project #: 08-672

Spreadsheet Template ID: USEPA-M201/202-PARTIC-TEMPLATE-62T-REV3

Analyst: J. Ruggaber

Reagent Information

Hexane Lot #13040459, Tedia

Phenolphthalein Solution (if needed): WL-Log#4-Log-037A:46

0.1 N Ammonium Hydroxide Lot # (if needed): 0.0992 N, Lot SHBC0698V, Sigma

Sodium Chloride Solution: 1.0018 g/L NaCl in DI water, WL-Log#2-Log-009A:182

DATE	TIME	EQUIPMENT	TASK
9/19/14	16:00	Desiccator # 1	Label beakers for hexane rinse, imp samples, and LCS sample. Place beakers in desiccator (store 24 hrs).
9/22/14	10:04	Balance #1	Weigh conditioned beakers and record tares.
9/22/14	-	-	Sonicate filter in water for at least two minutes. Add the water to the imp contents. Repeat 2 more times.
9/22/14	-	-	Sonicate filter in hexane for at least two minutes. Add the hexane to the hexane sample contents. Repeat 2 more times.
9/22/14	-	-	Extract the imp contents with 30 mL of hexane 3 times. Collect all hexane extractions in the labeled and tared hexane beaker. Add the hexane sample to the hexane extractions.
9/22/14	-	-	Drain the water phase into the labeled and tared beaker.
9/22/14 – 9/23/14	-	-	Evaporate hexane beakers to dryness in a fume hood.
9/23/14	-	-	Transfer 100 mL of the sodium chloride solution into the tared LCS beaker.

9/22/14 – 9/25/14		-	Place the water phase beakers and LCS sample in an oven or hot plate and evaporate to not less than 10 mL. Allow to evaporate to dryness in a fume hood at room temperature.
9/23/14	14:08	Desiccator #1	Place hexane beakers in desiccator (store min. 24 hours)
		See Next Section	Place aqueous beakers in desiccator (store min. 24 hours)
9/29/14	10:06	Balance #1	Hexane beaker weighing #1
9/30/14	9:36	Balance #1	Hexane beaker weighing #2 (min. 6 hrs after weighing #1)
9/30/14	15:50	Balance #1	Hexane beaker weighing #3 (min. 6 hrs after weighing #2)
N/A	N/A	N/A	Hexane beaker weighing #4 (min. 6 hrs after weighing #3)
		See Next Section	Water Phase and LCS beaker weighing #1
-	-	-	Water Phase and LCS beaker weighing #2 (min. 6 hrs after weighing #1)
-	-	-	Water Phase and LCS beaker weighing #3 (min. 6 hrs after weighing #2)
-	-	-	Water Phase and LCS beaker weighing #4 (min. 6 hrs after weighing #3)
If Water Phase Beakers achieve constant weight, skip this section			
9/25/14	-	-	Redissolve the residue from water phases in 100 mL of DI water. Add approximately 5 drops of phenolphthalein.
9/25/14	-	-	Titrate with 0.1 N ammonium hydroxide. Record the amount of ammonium hydroxide used.
9/25/14 – 9/26/14	-	-	Return the water phase beakers to the oven or hot plate and evaporate to not less than 10 mL. Allow to evaporate to dryness in a fume hood at room temperature.
9/26/14	8:39	Desiccator #1	Place beakers in desiccator (store min. 24 hours)
9/29/14	10:15	Balance #1	Water Phase beaker weighing #1
9/30/14	9:28	Balance #1	Water Phase beaker weighing #2 (min. 6 hrs after weighing #1)
9/30/14	15:50	Balance #1	Water Phase beaker weighing #3 (min. 6 hrs after weighing #2)
N/A	N/A	N/A	Water Phase beaker weighing #4 (min. 6 hrs after weighing #3)
End Section			
10/1/14	-	-	Prepare report
			Report QA review
			Report distribution

Sample Receipt Checklist

Client Name:	BP
Site Location:	Whiting, IN
ARI Project Manager:	Steve Flaherty
Sample Collection Date(s):	9/18/14 - 9/19/14
Chain-of-Custody Number(s):	W01047 - W01049

Chain-of-Custody Form(s):

Custody release signatures, dates, and times present:	Yes
Preservation code noted:	Yes
Project information clearly identfied:	Yes
Sample information clearly identified:	Yes
Analysis request clearly identified:	Yes
Report tier level noted:	Yes

Sample Containers:

Quantity of samples match number on the COC	Yes
Container label ID numbers and descriptions match COC	Yes
All containers received in good condition	Yes
Liquid levels at marked heights on containers	Yes
All container labels are legible	Yes
All sample IDs are unique	Yes
Samples received in correct container type	Yes
Samples received within the required holding time	Yes
Samples received under the required preservation code	Yes

Non-Conformances and/or Corrective Actions Applied:

All criteria for sample acceptance met.

Samples Received by: Joel Ruggaber

signature

Date and Time received: 9/19/14 16:47

Form LF0002

ARI ENVIRONMENTAL, INC.

Chain of Custody Record Number: W01047

Lab Project No. (Lab use only)	Client Name	Client Location
09-672	BP	Whiting, IN
ARI Proposal Number	**ARI Test Plan Number**	**ARI Project Manager**
12313	NA	S. Flaherty
ARI Sampler Initials	**Laboratory (Wauconda or Pasadena)**	**Subcontracted Laboratory (if applicable)**
SF, IP, JB, RGH	Wauconda	NA
Engineering or Compliance Test Samples		
Compliance		

Label Number	Sample Date (2014)	Time of Collection[2]	Sample Identification	Number of Containers	Container Type (Petri, Bottle, Bag, Tube, Summa, Bomb)	Preservation Code	Analysis Request[1]: USEPA M201A	Analysis Request[1]: USEPA M202	Analysis Request[1]:	Analysis Request[1]:	Comments
51679	9/18		DI H_2O Blank	1	500W	1		X			
51680	9/18		Acetone Reagent Blank	1	250W	1		X			
51681	9/18		Hexane Reagent Blank	1	250W	1		X			
49658	9/18		Run 1 - > PM_{10} Catch	1	250W	1	X				
49659	9/18		Run 2 -	1	250W	1	X				
49660	9/18		Run 3 -	1	250W	1	X				
49661	9/19		Run 4 -	1	250W	1	X				
~~49662 48712~~	~~9/18~~										
~~49663 48713~~											
~~49664 48714~~											
49662	9/18		Run 1 - PW & PM_{10}	1	250W	1	X				
48712	9/18		2 -	1	250W	1	X				
48713	9/18		3 -	1	250W	1	X				
48714	9/19		4 -	1	250W	1	X				

Preservation Code
1 = Ambient Temp.
2 = 4°C (Ice Packs)
3 = Dry Ice
4 = Other (Noted)

Special Instructions:

Date test results needed: 10-10-14

Reporting level: Engineering (Compliance)

Route results through: S. Flaherty

Project manager signature:

(1) Relinquished By	(2) Relinquished By	(3) Relinquished By
(1) Date / Time: 9/19 4:10	(2) Date / Time	(3) Date / Time
(1) Company: ARI	(2) Company	(3) Company
(1) Received By	(2) Received By	(3) Received By
(1) Date / Time: 9/19/14 16:47	(2) Date / Time	(3) Date / Time
(1) Company: ARI	(2) Company	(3) Company

SHIPMENT: (Hand Carry) FedEx UPS

Custody Seal Applied: Yes (No)

1 – Analysis request must be confirmed by project manager signature

2 – End time only and applicable to samples requiring specific holding time limits and/or bag spike recovery determination

Form LF0001

ARI ENVIRONMENTAL, INC.

Chain of Custody Record Number: W01048

Lab Project No. (Lab use only)	Client Name	Client Location
08-672	BP	Whiting IN
ARI Proposal Number	**ARI Test Plan Number**	**ARI Project Manager**
12313	NA	STEVE FLAHERTY
ARI Sampler Initials	**Laboratory (Wauconda or Pasadena)**	**Subcontracted Laboratory (if applicable)**
SF, RG, JP, JB	Wauconda	NA

Engineering or Compliance Test Samples

Label Number	Sample Date (2/4)	Time of Collection[2]	Sample Identification	Number of Containers	Container Type (Petri, Bottle, Bag, Tube, Summa, Bomb)	Preservation Code		USEPA M202			Comments
48715	9/18		Run 1 - Imp Catch + DI Rinses	1	500N	1		X			
48716	9/18		2-	1	500N	1		X			
48717	9/18		3-	1	500N	1		X			
48718	9/19		4-	1	500N	1		X			
48719	9/18		Run 1 - Organic Rinses	1	250A	1		X			
48720	9/18		2-	1	250A	1		X			
48721	9/18		3-	1	250A	1		X			
48722	9/19		4-	1	250A	1		X			
48729	9/18		Run 1 - CPM Filter	1	250A	1		X			
48730	9/18		2-	1	250A	1		X			
48731	9/18		3-	1	250A	1		X			
48732	9/19		4-	1	250A	1		X			
48725	9/18		Train Blank - CPM Filter	1	250A	1		X			
48723	9/18		Train Blank - DI Rinses	1	500N	1		X			
48724	9/18		Train Blank - Organic Rinses	1	250A	1		X			

Special Instructions:

Date test results needed: 10-10-14

Reporting level: Engineering (Compliance)

Route results through: S. FLAHERTY

Project manager signature:

(1) Relinquished By	(2) Relinquished By	(3) Relinquished By
(1) Date / Time: 9/19 4:10	(2) Date / Time	(3) Date / Time
(1) Company: ARI	(2) Company	(3) Company
(1) Received By	(2) Received By	(3) Received By
(1) Date / Time: 9/19/14 16:47	(2) Date / Time	(3) Date / Time
(1) Company: ARI	(2) Company	(3) Company

SHIPMENT: (Hand Carry) FedEx UPS

Custody Seal Applied: Yes (No)

1 – Analysis request must be confirmed by project manager signature

2 – End time only and applicable to samples requiring specific holding time limits and/or bag spike recovery determination

Form LF0001

ARI ENVIRONMENTAL, INC.

Chain of Custody Record Number: W01049

Lab Project No. (Lab use only)	Client Name	Client Location
08-672	BP	Whiting, IN
ARI Proposal Number	**ARI Test Plan Number**	**ARI Project Manager**
12313	NA	S Flaherty
ARI Sampler Initials	**Laboratory (Wauconda or Pasadena)**	**Subcontracted Laboratory (if applicable)**
SF, JB, JP, RG	Wau	NA
Engineering or Compliance Test Samples		
Compliance		

Label Number	Sample Date	Time of Collection[2]	Sample Identification	Number of Containers	Container Type (Petri, Bottle, Bag, Tube, Summa, Bomb)	Preservation Code	Analysis Request[1]: USEPA M2014				Preservation Code: 1 = Ambient Temp. 2 = 4°C (Ice Packs) 3 = Dry Ice 4 = Other (Noted)	Comments
55593	9/18		Run 1 - Filter	1	Petri	1	X					
55592	9/18		2 -	1	Petri	1	X					
55595	9/18		3 -	1	Petri	1	X					
55606	9/19		4 -	1	Petri	1	X					
55596	9/19		M5 Style Filter - BLANK	1	Petri	1	X					

Special Instructions:

Date test results needed: 10-10-14

Reporting level: Engineering Compliance

Route results through: S. Flaherty

Project manager signature:

(1) Relinquished By	(2) Relinquished By	(3) Relinquished By
(1) Date / Time: 9/19 / 4:10	(2) Date / Time	(3) Date / Time
(1) Company: ARI	(2) Company	(3) Company
(1) Received By	(2) Received By	(3) Received By
(1) Date / Time: 9/19/14 16:47	(2) Date / Time	(3) Date / Time
(1) Company: ARI	(2) Company	(3) Company

SHIPMENT: Hand Carry / FedEx / UPS

Custody Seal Applied: Yes / No

1 – Analysis request must be confirmed by project manager signature

2 – End time only and applicable to samples requiring specific holding time limits and/or bag spike recovery determination

Form LF0001

APPENDIX D

Calibration Data

APEX INSTRUMENTS METHOD 5 PRE-TEST CONSOLE CALIBRATION
USING CALIBRATED CRITICAL ORIFICES
5-POINT ENGLISH UNITS

Meter Console Information	
Console Model Number	MC522
Console Serial Number	611209
DGM Model Number	MS4
DGM Serial Number	DGM 971631

Calibration Conditions			
Date	Time	12-Nov-13	6:00
Barometric Pressure		30.0	in Hg
Theoretical Critical Vacuum[1]		14.2	in Hg
Calibration Technician		B. Crane	

Factors/Conversions		
Std Temp	528	°R
Std Press	29.92	in Hg
K_1	17.647	oR/in Hg

[1]For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.

[2]The Critical Orifice Coefficient, K', must be entered in English units, $(ft^3 \cdot {}^oR^{1/2})/(in.Hg \cdot min)$.

Calibration Data

Run Time	Metering Console					Critical Orifice				
Elapsed	DGM Orifice ΔH	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final	Serial Number	Coefficient	Amb Temp Initial	Amb Temp Final	Actual Vacuum
(Θ)	(P_m)	(V_{mi})	(V_{mf})	(t_{mi})	(t_{mf})		K'	(t_{amb})	(t_{amb})	
min	in H_2O	cubic feet	cubic feet	°F	°F		see above2	°F	°F	in Hg
10.0	3.2	438.000	448.120	77	78	OX73	0.7770	74	74	14
12.0	1.8	427.700	436.930	76	77	OX63	0.5894	74	73	16
10.0	1.1	448.800	454.610	78	78	OX55	0.4440	74	73	17
16.0	0.7	456.800	463.990	78	77	OX48	0.3439	74	73	18
17.0	0.3	485.700	470.780	77	76	OX40	0.2298	73	73	20

Results

Standardized Data				Dry Gas Meter				
				Calibration Factor		Flowrate	ΔH @	
Dry Gas Meter		Critical Orifice		Value	Variation	Std & Corr	0.75 SCFM	Variation
$(V_{std(m)})$	$(Q_{std(m)})$	$(Vcr_{(std)})$	$(Q_{std(cr)})$	(Y)	(ΔY)	$(Q_{std(corr)})$	(ΔH@)	(ΔΔH@)
cubic feet	cfm	cubic feet	cfm			cfm	in H2O	
10.039	1.004	10.080	1.008	1.004	-0.003	1.008	1.772	-0.020
9.142	0.762	9.180	0.765	1.004	-0.003	0.765	1.722	-0.070
5.729	0.573	5.763	0.576	1.006	-0.001	0.576	1.843	0.051
7.088	0.443	7.142	0.446	1.008	0.001	0.446	1.813	0.021
5.013	0.295	5.073	0.298	1.012	0.005	0.298	1.810	0.018
CAL-MASTERMETER-WORKBOOK-203T-REV1				1.007	Y Average		1.792	ΔH@ Average

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR Title 40, Part 60, Appendix A-3, Method 5, 16.2.3

Signature: B. Crane

Date: 11·12·13

ARI Environmental, Inc.
Gas Meter Thermometer Calibration Data Form
Pre -Test

Meter Box: 611209
Calibrator: B. Crane
Date: 11/12/2013
Barometric: 29.98
Ambient Temp: 74
Reference Thermometer: Altek Thermocouple Source CAL-MASTERMETER-WORKBOOK-203T-REV1

Reference Temperature Altek	Thermometer Temperature Inlet	Difference (%) mean Inlet	Thermometer Temperature Oulet	Difference (%) mean Oulet	Thermometer Temperature Probe	Difference (%) mean Probe
0	1	0.22	1	0.22	0	0.00
100	98	-0.36	98	-0.36	98	-0.36
200	201	0.15	201	0.15	201	0.15
300	300	0.00	300	0.00	300	0.00
400	398	-0.23	398	-0.23	397	-0.35
500	497	-0.31	497	-0.31	497	-0.31

Temperature Altek	Temperature Filter	(%) mean Filter	Temperature Exit	(%) mean Exit	Temperature Aux	(%) mean Aux
0	1	0.22	1	0.22	1	0.22
100	98	-0.36	98	-0.36	98	-0.36
200	202	0.30	202	0.30	202	0.30
300	300	0.00	300	0.00	300	0.00
400	398	-0.23	398	-0.23	398	-0.23
500	497	-0.31	497	-0.31	498	-0.21

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
0	0	0.00
200	201	0.15
400	397	-0.35
600	600	0.00
800	801	0.08
1000	1001	0.07

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
1200	1199	-0.06
1400	1397	-0.16
1600	1601	0.05
1800	1798	-0.09

Revised 10/03

APEX INSTRUMENTS METHOD 5 POST-TEST CONSOLE CALIBRATION
USING CALIBRATED CRITICAL ORIFICES
3-POINT ENGLISH UNITS

Meter Console Information	
Console Model Number	MC522
Console Serial Number	611209
DGM Model Number	MS-4
DGM Serial Number	971831.00

Calibration Conditions			
Date	Time	8-Oct-14	2:00
Barometric Pressure		29.3	in Hg
Theoretical Critical Vacuum[1]		13.8	in Hg
Calibration Technician		B. Crane	

Factors/Conversions		
Std Temp	528	°R
Std Press	29.92	in Hg
K_1	17.647	oR/in Hg

[1]For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.

[2]The Critical Orifice Coefficient, K', must be entered in English units, $(ft^3 \cdot {}^oR^{1/2})/(in.Hg \cdot min)$.

Calibration Data

Run Time	Metering Console					Critical Orifice				
Elapsed	DGM Orifice ΔH	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final	Serial Number	Coefficient	Amb Temp Initial	Amb Temp Final	Actual Vacuum
(Θ)	(P_m)	(V_{mi})	(V_{mf})	(t_{mi})	(t_{mf})		K'	(t_{amb})	(t_{amb})	
min	in H_2O	cubic feet	cubic feet	°F	°F		see above2	°F	°F	in Hg
10.0	1.8	911.340	919.050	72	74	OX63	0.5881	77	76	19
10.0	1.8	919.050	926.720	74	75	OX63	0.5881	76	78	19
10.0	1.8	926.720	934.400	75	77	OX63	0.5881	78	78	19

Results

Standardized Data				Dry Gas Meter				
				Calibration Factor		Flowrate	ΔH @	
Dry Gas Meter		Critical Orifice		Value	Variation	Std & Corr	0.75 SCFM	Variation
($V_{m(std)}$)	($Q_{m(std)}$)	($Vcr_{(std)}$)	($Q_{cr(std)}$)	(Y)	(ΔY)	($Q_{m(std)(corr)}$)	(ΔH@)	(ΔΔH@)
cubic feet	cfm	cubic feet	cfm			cfm	in H2O	
7.516	0.752	7.442	0.744	0.990	-0.005	0.744	1.792	0.003
7.456	0.746	7.438	0.744	0.998	0.002	0.744	1.788	-0.001
7.445	0.744	7.431	0.743	0.998	0.003	0.743	1.787	-0.002
Pretest Gamma	1.007	% Deviation	1.2	0.995	Y Average		1.789	ΔH@ Average

CAL-MASTERMETER-WORKBOOK-203T-REV1

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR Title 40, Part 60, Appendix A-3, Method 5, 16.2.3

Signature B. Crane Date 10-8-14

ARI Environmental, Inc.
Gas Meter Thermometer Calibration Data Form
Post-Test

Meter Box: 611209
Calibrator: B. Crane
Date: 10/8/2014
Barometric: 29.31
Ambient Temp: 74
Reference Thermometer: Altek Thermocouple Source CAL-MASTERMETER-WORKBOOK-203T-REV1

Reference Temperature Altek	Thermometer Temperature Inlet	Difference (%) mean Inlet	Thermometer Temperature Oulet	Difference (%) mean Oulet	Thermometer Temperature Probe	Difference (%) mean Probe
0	0	0.00	0	0.00	0	0.00
100	98	-0.36	98	-0.36	98	-0.36
200	200	0.00	200	0.00	200	0.00
300	300	0.00	300	0.00	300	0.00
400	397	-0.35	397	-0.35	397	-0.35
500	498	-0.21	498	-0.21	498	-0.21

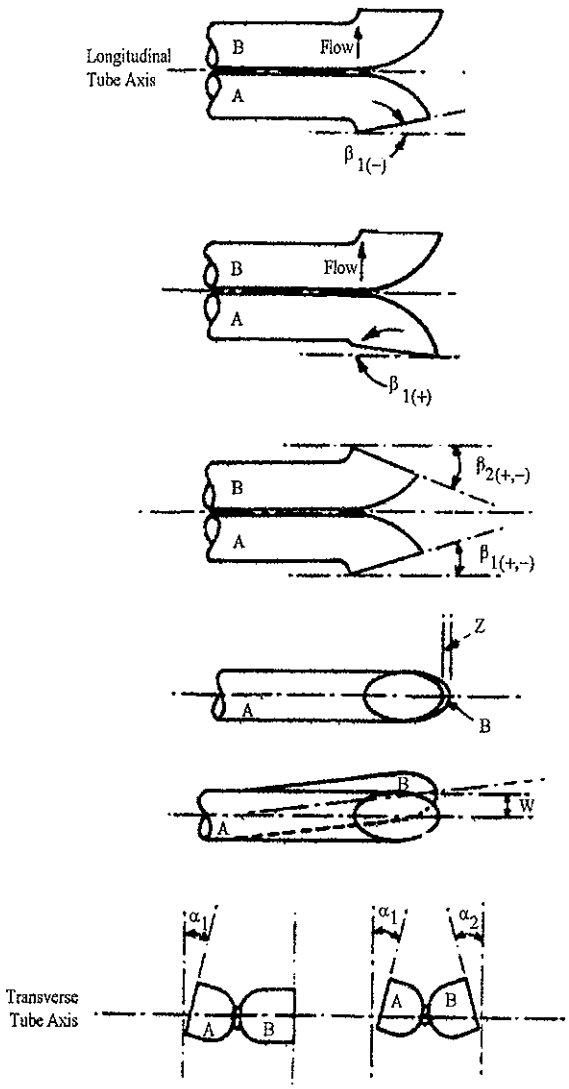
Reference Temperature Altek	Thermometer Temperature Filter	Difference (%) mean Filter	Thermometer Temperature Exit	Difference (%) mean Exit	Thermometer Temperature Aux	Difference (%) mean Aux
0	0	0.00	0	0.00	0	0.00
100	98	-0.36	98	-0.36	98	-0.36
200	200	0.00	200	0.00	200	0.00
300	300	0.00	300	0.00	300	0.00
400	396	-0.47	397	-0.35	397	-0.35
500	498	-0.21	498	-0.21	498	-0.21

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
0	0	0.00
200	200	0.00
400	397	-0.35
600	600	0.00
800	801	0.08
1000	1000	0.00

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
1200	1199	-0.06
1400	1397	-0.16
1600	1601	0.05
1800	1799	-0.04

Pitot Tube Inspection Data

Client Name: _____



Pre-Sample Date: 4/1/2014		Post-Sample Date: 10/15/2014
Y	level?	Y
N	obstructions?	N
N	damaged?	N
1	$-10° < \alpha_1 < +10°$	0
0	$-10° < \alpha_2 < +10°$	0
1	$-5° < \beta_1 < +5°$	1
2	$-5° < \beta_2 < +5°$	0
2	γ	2
1	θ	0
0.920	A	0.94
0.460	$0.39375 < P_A < 0.5625$	0.470
0.460	$0.39375 < P_B < 0.5625$	0.470
0.375	$0.1875 \leq D_t \leq 0.375$	0.375
0.032	$A \tan \gamma < 0.125"$	0.033
0.01606	$A \tan \theta < 0.03125"$	0.00000
TRUE	$P_A = P_B$ +/- 0.063	TRUE
PASS	PASS/FAIL	PASS

Comments: 10' effective length M5 probe.

Pitot tube/probe number 731 meets or exceeds all specifications and criteria and/or applicable design features (per 40CFR60 Appendix A; Method 2) and is heareby assigned a pitot tube calibration factor of 0.84.

Signature: _____

Date: 10·15·14

ARI Environmental Inc.
Thermocouple Calibration Data Form

Calibrator: B. Crane
Thermocouple ID. 731

	pretest	posttest
Date:	4/1/2014	10/15/2014
Barometric:	29.20	29.05

Reference Thermometer = Mercury in glass

	Reference Point Number	Source	Reference Thermometer Temperature	Meter Readout Temperature	Difference (%)
Pre-Test	T.C	Ice Water			0.00
		Ambient	62.8	62.9	-0.02
		Heat Source			0.00
Post-Test	T.C	Ice Water	32.4	32.4	0.00
		Ambient	73.6	72.9	0.13
		Heat Source	297.1	297.4	-0.04

a (temp. diff.) = (ref.temp + 460) - (Thermo. temp. + 460) / (ref. temp. +460) x 100

Where $-1.5 < a < 1.5$

APPENDIX E

Process Data

BP-Whiting Operational Data
FCU 500 Consent Decree Test

Consent Decree	Concent Decree				
Run	Test #1	Test #2	Test #3	Test #4	Test average
Start time	9/18/2014 11:30	9/18/2014 15:30	9/18/2014 18:40	9/19/2014 9:07	
End time	9/18/2014 13:46	9/18/2014 17:36	9/18/2014 20:44	9/19/2014 11:11	
Soot Blowing					
Total Feed Rate, BPD	88	88	88	88	88
FCCU Regenerator Coke Burn, lb/hr	51771	51933	51976	51329	51752
Ammonia Flow to ESP, lb/hr	135	135	135	134	135
ESP Total Primary Power, KW	125	126	125	126	126
ESP Total Secondary Current, Amps	4231	4234	4231	4234	4233
SO2, ppm @ 0%O2	6	6	6	6	6
NOx, ppm @ 0%O3	25	26	25	25	25
SO2 Additive Rate, PPD	400	400	400	450	412
Ammonia Slip (Calc), ppm	7.00	7.01	7.01	7.08	7.02
Regenerator Plenum Outlet Temperature, F	1294	1292	1291	1292	1292
Average ESP Inlet Temperature, F	668	669	670	669	669

APPENDIXF Test Program Qualifications

Test Program Qualifications

ARI Environmental's offices in Wauconda, Illinois; Newport, Delaware and Pasadena, Texas specialize in conducting stack emission, fugitive leak detection, ambient air and in-plant OSHA type testing for industrial clients.

ARI is organized so that its facilities and resources meet the requirements of ASTM D7036, Standard Practice for Competence of Air Emission Testing Bodies. ARI's laboratories in Wauconda, Illinois and Pasadena, Texas hold NELAP primary accreditation with the Texas Commission on Environmental Quality (Certificate No. T104704428-13-5), NELAP accreditation with the New Jersey Department of Environmental Protection (Certificate No. IL007), and NELAP/State accreditation with the Louisiana Department of Environmental Quality (Certificate No. 02010). ARI is also registered with the Pennsylvania Laboratory Accreditation Program (Registration No. 68-05220).

During the past 30 years, ARI personnel have conducted over 5,000 separate stack emission tests for a variety of industrial clients throughout North America for the determination of degree of source compliance and to yield emissions data and control equipment performance data for in-house engineering purposes.

ARI presently has over 80 trained personnel for conducting source emission sampling, fugitive leak detection monitoring, ambient air monitoring and OSHA sampling programs. All test programs are supervised and conducted by onsite Qualified Individuals (QI) and/or Qualified Source Testing Individuals (QSTI) pursuant to ASTM D7036.

The key personnel involved in the test program were as follows:

Steven Flaherty
Mr. Flaherty is a Senior Project Manager with ARI. His 14 years of experience includes emission compliance and CEM certification testing for a wide variety of industries including petrochemical, steel mills, electric utilities, cement plants, asphalt plants and general manufacturing plants. Mr. Flaherty is presently certified as a QSTI by the Source Evaluation Society (SES) pursuant to the requirements of ASTM D7036-04.

Jayce Best
Mr. Best is a field technician specializing in sampling equipment preparation, maintenance and calibration, equipment setup, field sampling, sample recovery and post-test equipment clean up.

Jonathon Phillips
Mr. Phillips is a field technician specializing in sampling equipment preparation, maintenance and calibration, equipment setup, field sampling, sample recovery and post-test equipment clean up.

Richard Gluth III
Mr. Gluth is a field technician specializing in sampling equipment preparation, maintenance and calibration, equipment setup, field sampling, sample recovery and post-test equipment clean up.

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

STEVEN M. FLAHERTY

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS

ISSUED THIS 26TH DAY OF NOVEMBER 2013 AND EFFECTIVE UNTIL NOVEMBER 25TH, 2018

Peter R. Westlin, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2008-237

SOURCE EVALUATION SOCIETY

SES

Qualified Source Testing Individual

LET IT BE KNOWN THAT

STEVEN M. FLAHERTY

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GASEOUS POLLUTANTS SOURCE SAMPLING METHODS

ISSUED THIS 26TH DAY OF NOVEMBER 2013 AND EFFECTIVE UNTIL NOVEMBER 25TH, 2018

Peter R. Westlin, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2008-237

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

STEVEN M. FLAHERTY

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS

ISSUED THIS 26TH DAY OF NOVEMBER 2013 AND EFFECTIVE UNTIL NOVEMBER 25TH, 2018

Peter R. Westlin, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2008-237

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

STEVEN M. FLAHERTY

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

HAZARDOUS METALS MEASUREMENT SAMPLING METHODS

ISSUED THIS 18TH DAY OF OCTOBER 2011 AND EFFECTIVE UNTIL OCTOBER 17TH , 2016

Peter R. Westlin, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2008-237

Appendix 6c – FCU 600 Performance Testing
October 2014

TEST REPORT

COMPLIANCE EMISSION TEST
NSPS, SUBPART Ja
FLUIDIZED CATALYTIC CRACKING UNIT 600

BP PRODUCTS NORTH AMERICA, INC.
WHITING, INDIANA

PREPARED FOR:

BP PRODUCTS NORTH AMERICA, INC.
Whiting Refinery
2918 Indianapolis Blvd.
Whiting, Indiana 46394
Phone: 219.473.2110
E-mail: rohini.sengupta@bp.com
Attention: Ms. Rohini Sengupta
Environmental Specialist

cc: Mr. Dave Fashimpaur
Mr. Mark Huthmaker
Ms. Cheryl Joyal
Mr. Sean O'Connell
Mr. Dave Ringwald

ARI Environmental, Inc.
951 Old Rand Road, Unit 106
Wauconda, Illinois 50084
Phone: 847.487.1580 Ext. 117
Fax: 847.487.1587
E-mail: sflaherty@arienv.com
Steve Flaherty
Senior Project Manager
Source Testing Division

ARI Project No. 566-144
BP Purchase Order No. 3000319830
Test Dates: October 23 and 24, 2014
Report Issuance Date: January 6, 2015

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Appendix D	Calibration Data
Appendix E	Process Data
Appendix F	Test Program Qualifications

REPORT CERTIFICATION

STATEMENT OF CONFORMANCE AND TEST REPORT CERTIFICATION

I certify, to the best of my knowledge, that this test program was conducted in a manner conforming to the criteria set forth in ASTM D7036-04: Standard Practice for Competence of Air Emission Testing Bodies, and that project management and supervision of all project related activities were performed by qualified individuals as defined by this practice.

I further certify that this test report and all attachments were prepared under my direction or supervision in accordance with the ARI Environmental, Inc. quality management system designed to ensure that qualified personnel gathered and evaluated the test information submitted. Based on my inquiry of the person or persons who performed the sampling and analysis relating to this performance test, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate and complete.

Steve Flaherty, QSTI
Senior Project Manager, Source Testing Division
ARI Environmental, Inc.

Hank Taylor, QI
Quality Assurance Manager, Source Testing Division
ARI Environmental, Inc.

SECTIONONE Introduction and Summary

ARI Environmental, Inc. (ARI) was retained by BP Products North America, Inc. (BP) to conduct a particulate matter (PM) compliance emission test on the Fluidized Catalytic Cracking Unit (FCCU) 600 stack at their refinery located in Whiting, Indiana. Testing was conducted on October 23 and 24, 2014.

Three 60-minute test runs were conducted on the FCCU 600 stack to determine the concentration and emission rate of filterable nonsulfate PM. The emission test was performed to fulfill the testing requirements of the New Source Performance Standards (NSPS), Subpart Ja.

Sampling and analysis methodologies followed the procedural requirements as detailed in the Code of Federal Regulations, Title 40, Part 60 (40 CFR 60), Appendix A, USEPA Methods 1, 2, 3, 4 and 5F; and the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods.

Ms. Rohini Sengupta of BP coordinated the test and monitored process conditions. Testing was conducted by Messrs. Steve Flaherty, Alex Hildreth, Brett O'Leary and Jonathon Phillips of ARI.

This report summarizes the test procedures and results of the emission test. Included as appendices is complete documentation of all calculation summaries, field data, analytical data, calibration data, process data and test program qualifications.

The test results are summarized in Table 1-1.

TABLE 1-1. SUMMARY OF FCCU 600 STACK NONSULFATE PM TEST RESULTS

TEST RUN NO. :	1-5F*	2-5F	4-5F	
TEST DATE :	10/23/14	10/23/14	10/24/14	
TEST TIME :	09:40-10:47	15:20-16:25	11:15-12:19	Average
Nonsulfate Filterable PM				
Concentration				
grains/dscf	0.0210	0.0265	0.0267	0.0247
mg/dscm	48.066	60.579	61.007	56.551
Emission rate (as measured)				
lb/hr	23.27	28.71	28.42	26.80
lb/1,000 lb coke burn	0.544	0.665	0.695	0.635
Prorated soot blow emission rate				
lb/hr				27.68
lb/1,000 lb coke burn				0.657

*A soot blow was conducted during Run No. 1-5F.

SECTIONTWO Testing and Analytical Procedures

2.1 OVERVIEW

ARI conducted a compliance emission test on the FCCU 600 stack at the BP refinery located in Whiting, Indiana.

Three 60-minute test runs were conducted on October 23 and 24, 2014 to determine the concentration and emission rate of filterable nonsulfate PM.

2.2 METHODOLOGY

Testing procedures and sampling methodologies were conducted following the procedural requirements as detailed in 40 CFR 60, Appendix A, USEPA Methods 1, 2, 3, 4 and 5F; and the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods.

2.2.1 Sampling Locations (USEPA Method 1)

The sampling point locations used for the determination of gas velocity and volume flow rate were determined following the procedural requirements as detailed in USEPA Method 1. Sampling was conducted at the FCCU 600 stack in the two sampling ports provided in the 96-inch diameter duct. The sampling ports are located 936 inches downstream and approximately 480 inches upstream from the nearest flow disturbances. Twelve traverse points were used to sample the cross-sectional area of the stack.

A cyclonic flow check was conducted to demonstrate that cyclonic flow conditions did not exist at the sampling location.

2.2.2 Flue Gas Volumetric Flow Rate (USEPA Method 2)

Gas velocity and volumetric flow rate were determined following USEPA Method 2. Velocity head measurements were performed using a Type-S pitot tube and Dwyer inclined 0 to 10-in. water manometer. Temperature measurements were conducted using a chromel-alumel thermocouple connected to a digital direct read-out potentiometer.

2.2.3 Molecular Weight (USEPA Method 3)

The stack gas oxygen (O_2) and carbon dioxide (CO_2) concentrations were determined following USEPA Method 3 procedures. During each test run, an integrated bag sample of the exhaust gas was collected. An Orsat combustion analyzer was used to determine the O_2 and CO_2 concentrations of each collected bag. The nitrogen (N_2) content was calculated as the difference.

2.2.4 Flue Gas Moisture Content (USEPA Method 4)

The stack gas moisture content was determined following USEPA Method 4. This method was performed in conjunction with the USEPA Method 5F procedures described in Subsection 2.2.5.

2.2.5 Nonsulfate Particulate Matter Determination (USEPA Method 5F)

Nonsulfate PM sampling was conducted in accordance with USEPA Method 5F using an Apex Instruments, Inc. sampling train.

2.2.5.1 Sampling Apparatus

The PM sampling train met design specifications established by the USEPA. Assembled by ARI personnel, it consisted of the following:

Nozzle – Stainless steel, with sharp, tapered leading edge.

Probe – Stainless steel with a heating system capable of maintaining a probe exit temperature of 320°F ±25°F.

Pitot Tube - Type-S attached to probe for monitoring stack gas velocity.

Filter Holder - Borosilicate glass filter holder with a 4-in. Teflon frit filter support and a silicone rubber gasket. The holder design provided a positive seal against leakage from the outside or around the filter. The filter holder was heated to 320°F ±25°F during sampling.

Draft Gauge – Inclined manometer with a readability of 0.01-in. H_2O in the 0 to 1-in. range and 0.1-in. H_2O in the 1 to 10-in. range.

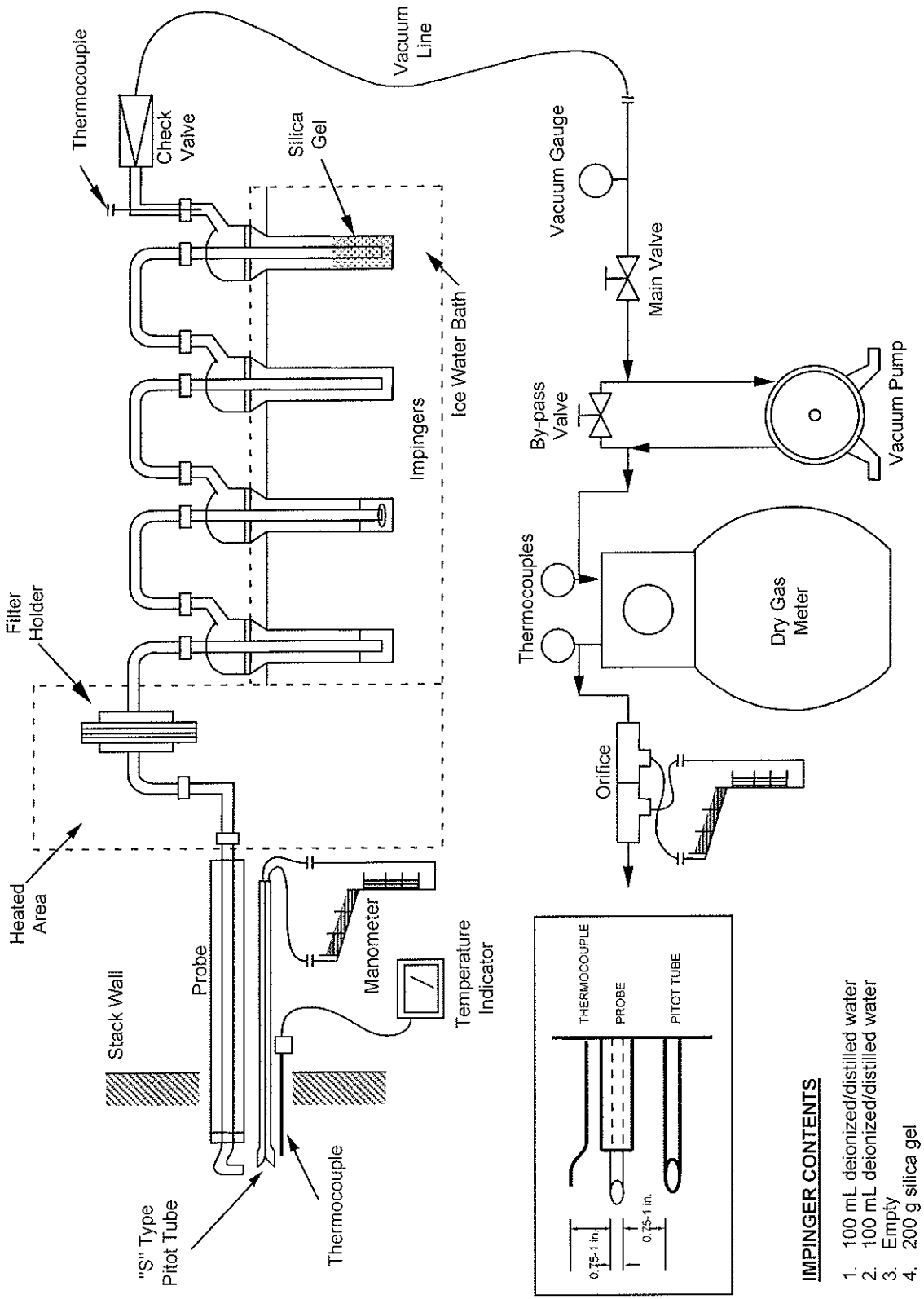
Impingers – Four impingers connected in series with glass ball joints. The first, third and fourth impingers were of the Greenburg-Smith design, but modified by replacing the standard tip with a ½-in. i.d. glass tube extending to within ½-in. of the bottom of the impinger flask. The second impinger was of the Greenburg-Smith design with a standard tip.

Metering System - Apex Model 522. Vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 5°F, dry gas meter with ±2 percent accuracy and related equipment as required to maintain an isokinetic sampling rate and to determine sample volume.

Barometer - Mercury barometer capable of measuring atmospheric pressure to within ±0.1-in. Hg.

2.2.5.2 Sampling Procedures

After the sampling site and minimum number of traverse points were selected, the stack pressure, temperature, moisture and range of velocity differential pressure (ΔP) were measured according to procedures described in USEPA Methods 1 through 4. The sampling train was set up with the probe and filter holder as shown in Figure 2-1. The first and second impingers initially contained 100 milliliters (mL) of deionized/distilled water. The third impinger was initially empty. The fourth impinger contained 200 grams of silica gel.



IMPINGER CONTENTS

1. 100 mL deionized/distilled water
2. 100 mL deionized/distilled water
3. Empty
4. 200 g silica gel

FIGURE 2-1. USEPA METHOD 5F NONSULFATE PARTICULATE MATTER SAMPLING TRAIN

The sampling train was leak-checked at the sampling site by plugging the inlet to the nozzle and pulling a vacuum of 15-in. Hg. Leak rates of less than 0.02 ft^3/min. at a vacuum of 15-in. Hg are considered acceptable. At the completion of each test run, the sampling train was leak-checked by the same procedure. Both pre and post-test leak checks of the pitot tube were made for each test run. Ice was placed around the impingers to keep the temperature of the gases leaving the last impinger at less than 68°F.

During sampling, stack gas and sampling train data were recorded at specified intervals. Isokinetic sampling rates were set throughout the sampling period with the aid of a programmable calculator.

2.2.5.3 Sample Recovery Procedures

After sampling was completed and the final leak checks performed, the filter and probe (front-half) were disconnected from the impinger train. The sample fractions were recovered as follows:

Container 1 - The filter holder was sealed.

Container 2 - Loose PM and deionized/distilled water washings from all sample-exposed surfaces prior to the filter were placed in a glass jar, sealed and labeled. PM was removed from the probe liner, nozzle and fitting with the aid of a brush and deionized/ distilled water rinsing. The liquid level was marked after the container was sealed.

Container 3 - A minimum of 200 mL of deionized/distilled water was taken for the blank analysis. The blank was obtained and treated in a similar manner as the contents of Container 2.

The contents of impingers 1 through 3 were measured for volume and then discarded. The contents of the fourth impinger (silica gel) were placed in a polyethylene bottle for subsequent weighing to the nearest gram.

2.2.5.4 Analytical Procedures

The analytical procedures followed those described in USEPA Method 5F.

The filter from Container 1 was cut into small pieces and placed in a 125 mL Erlenmeyer flask equipped with an air condenser. The sample container was rinsed with water and placed into the same flask as the filter pieces. The contents of the flask were refluxed on a hot plate for 6 to 8 hours. The solution was then cooled and transferred to a 500 mL volumetric flask. The contents of Container 2 (probe rinse) were placed in the 500 mL volumetric flask with the filter solution. The contents were then diluted to exactly 500 mL with water.

The sample was allowed to settle, and then a pipette was used to deliver 5 mL of the solution into a 50 mL volumetric flask. The aliquot was diluted to exactly 50 mL with water. The final solution was analyzed in duplicate by ion chromatography for sulfate content (SO_4^{-2}). The duplicate samples agreed within 5% of their mean and were compared to a 5-point standard calibration curve.

After the sulfate analysis, the remaining contents of the volumetric flask were transferred to a tared 250 mL beaker. The flask was carefully rinsed with water to make sure that all PM was transferred to the tared beaker. The beaker was transferred to an oven and heated to 105°C until approximately 100 mL of solution remained. The beaker was allowed to cool, after which five drops of phenolphthalein indicator were added. Concentrated ammonium hydroxide was added until the solution turned pink. The sample was returned to the oven and evaporated to dryness at 105°C. The sample was then cooled, placed in a desiccator and subsequently weighed to a constant weight.

The term "constant weight" means a difference of no more than 0.5 mg or 1 percent of the total weight less tare weight, whichever is greater between two consecutive readings, with no less than 6 hours of desiccation between weighings.

2.3 PARTICULATE MATTER EMISSION RATE CALCULATION PROCEDURE

Representative averaging of emission rates accommodated a 6-minute soot blowing cycle during the first test run. The following equation (excerpted from the memo to all USEPA regions from E. Reich dated March 6, 1979) was used for calculations:

$$E_{pave} = E_{sbr}\left(\frac{(A + B)S}{AR}\right) + E_{nosb}\left(\frac{R - S}{R} - \frac{BS}{AR}\right)$$

Where:

E_{pave} = Average E for daily operating time
E_{sbr} = Average E of sample(s) containing soot blowing
E_{nosb} = Average E of sample(s) with no soot blowing
A = Hours of soot blowing during sample run
B = Hours not soot blowing during sample run
R = Average hours of operating per 24 hours
S = Average hours of soot blowing per 24 hours

SECTIONTHREE Process Description

The FCCU 600, constructed in 1946, is identified as Unit ID 240 and rated at 80,000 barrels per day. This facility converts hydrocarbons that boil above 500°F into lower molecular weight products, which include gasoline and LPG. The cracking takes place as the gas oil and catalyst stream mix in the reactor. This process results in the catalyst being coated with coke, which is subsequently burned off in a regenerator.

The process data summary is presented in Table 3-1.

TABLE 3-1. FCCU 600 PROCESS AND STACK CEMS DATA SUMMARY

TEST RUN NO. :	1-5F	2-5F	4-5F	Average
FCCU Regenerator Coke Burn, lb/hr	42,745	43,194	40,870	42,270
ESP Total Primary Power, KW	57.5	56.7	57.7	57.3
ESP Total Secondary Current, Amps	2,482	2,567	2,640	2,563
SO_2, ppm @ 0% O_2	1.7	1.6	1.0	1.4
NO_x, ppm @ 0% O_2	4.3	10.4	8.0	7.6

SECTIONFOUR Test Results

The test results are presented in Table 4-1.

The calculation summaries, field data, analytical data, calibration data, process data and test program qualifications are included in the appendices.

DISCUSSION

Four PM test runs were conducted. The third test run was voided due to a process upset and associated unit evacuation alarm during the test run. An additional test run was conducted, and the results for Test Run Nos. 1-5F, 2-5F and 4-5F are included in the results table.

TABLE 4-1. FCCU 600 STACK NONSULFATE PM EMISSION TEST RESULTS

TEST RUN NO. :	1-5F*	2-5F	4-5F	
TEST DATE :	10/23/2014	10/23/2014	10/24/2014	
TEST TIME :	09:40 - 10:47	15:20 - 16:25	11:15-12:19	Average
Stack Gas Parameters				
Temperature, °F	614.8	621.0	619.6	618.5
Velocity, av. ft/sec	103.5	102.5	104.2	103.4
Volumetric flow, acfm	312,249	309,271	314,231	311,917
Volumetric flow, scfm	152,431	149,627	150,955	151,004
Volumetric flow, scfh	9,145,859	8,977,638	9,057,310	9,060,269
Volumetric flow, dscfm	129,227	126,510	124,353	126,696
Volumetric flow, dscfh	7,753,602	7,590,576	7,461,182	7,601,787
Mass flow, Mlb/hr db	625.5	612.3	598.7	612.2
Moisture, av. % vol	15.2	15.5	17.6	16.1
Molecular weight, lb/lb-mole db	31.08	31.08	30.92	31.02
Carbon Dioxide, av. % vol	18.8	18.7	17.6	18.4
Oxygen, av. % vol	1.8	2.1	2.5	2.1
Particulate Sample				
Time, min.	60.0	60.0	60.0	60.0
Volume, dscf	47.316	46.520	45.788	46.541
Filterable nonsulfate PM, mg	64.40	79.80	79.10	74.43
Isokinetic ratio, %	101.9	102.3	102.5	102.2
Nonsulfate Filterable PM				
Concentration				
grains/dscf	0.0210	0.0265	0.0267	0.0247
mg/dscm	48.066	60.579	61.007	56.551
lb/dscf x 10^{-6}	3.001	3.782	3.809	3.531
Emission rate (as measured)				
lb/hr	23.27	28.71	28.42	26.80
lb/1,000 lb coke burn	0.544	0.665	0.695	0.635
Prorated soot blow emission rate				
lb/hr				27.68
lb/1,000 lb coke burn				0.657

*A soot blow was conducted during Run No. 1-5F.

APPENDIX A

Calculation Summaries

USEPA Method 4
Moisture Determination Sample Calculations

Client: BP
Location: Whiting, IN
Source: FCCU 600 Exhaust
Date: 10/23/2014
Run #: 1 - 5F

Data Input:

Volume metered (V_m):	46.900	**ft^3**
Meter calibration coefficient (Y_d):	0.994	**dimensionless**
Barometric pressure (P_{bar}):	29.80	**inches Hg**
Meter sample rate (ΔH):	1.93	**inches H_2O**
Meter inlet/outlet temperature (T_m):	60.6	**°F**
Volume of moisture collected (V_{lc}):	180.5	**milliliters**
Stack Temperature (T_s):	614.8	**°F**
Static Pressure (St):	-0.9	**inches H_2O**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Volume of sample, dry basis:

$$Vm_{std} = V_m \times Y_d \times \left(\frac{528.0°R}{29.92"Hg}\right) \times \left(\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460}\right)$$ = **47.316 dscf**

Volume of water vapor in sample:

$$Vw_{std} = \frac{0.04707 ft^3}{ml} \times V_{lc}$$ = **8.496 scf**

Fractional moisture content of stack gas:

$$B_{wo} = \frac{Vw_{std}}{(Vm_{std} + Vw_{std})}$$ = **0.1522 B_{wo}**

Percent Moisture:

$$\%moisture = B_{wo} \times 100$$ = **15.22 %**

Fractional moisture content of stack gas at saturated conditions:

$$T_{s(°K)} = ((T_s - 32) * 0.5556) + 273$$ = **596.8 °Kelvin**

$$P_{s(mmHg)} = \left(P_{bar} + \frac{S_t}{13.6}\right) \times 25.401$$ = **756.95 mm Hg**

$$B_{wos} = \frac{\sqrt{\left(10^{\left(A - \left(\frac{B}{(T_{s(°K)} - C)}\right)\right)}\right)}}{P_{s(mmHg)}}$$

where:
A= 8.361
B=1893.5
C=27.65

= **1.0000**

Percent moisture at saturated conditions:

$$\%moisture_{saturated} = B_{wos} \times 100$$ = **100.00 %**

Percent moisture used for emissions calculations:

= **15.22 %**

USEPA Method 2
Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client: BP
Location: Whiting, IN
Source: FCCU 600 Exhaust
Date: 10/23/2014
Run #: 1 - 5F

Data Input

Carbon Dioxide (CO_2):	18.8	**%**
Oxygen (O_2):	1.8	**%**
Nitrogen (N_2):	79.4	**%**
Fractional Moisture Content (B_{wo})	0.1522	**dimensionless**
Stack Temperature (T_s):	614.8	**°F**
Pitot Coefficient (C_p):	0.84	**dimensionless**
Average square root of ΔP	1.2933	**inches H_2O**
Barometric Pressure (P_{bar}):	29.80	**inches Hg**
Static Pressure (S_t)	-0.92	**inches H_2O**
Stack diameter:	96.00	**inches H_2O**
Stack area (A_s):	50.2655	**ft^2**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$ = **31.080 lb/lb-mole**

Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws})$$ = **29.089 lb/lb-mole**

Absolute stack gas pressure:

$$P_s = P_{bar} + \left(\frac{S_t}{13.6}\right)$$ = **29.732 inches H_2O**

Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}}$$ = **103.533 feet/second**

Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60$$ = **312,249 acfm**

Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right]$$ = **152,431 scfm**

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right] \times 60$$ = **9,145,859 scfh**

Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo})$$ = **129,227 dscfm**

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60$$ = **7,753,602 dscfh**

USEPA Method 5F (Non-Sulfate PM)
Particulate Calculation Summary

Client:	BP
Location:	Whiting, IN
Source:	FCCU 600 Exhaust
Date:	10/23/2014
Run #:	1 - 5F

Data Input

Barometric pressure (P_{bar}):	29.80	**inches Hg**	**Particulate Weight:**	
Stack pressure (P_s):	29.73	**Inches Hg Abs.**	**Filterable:**	64.40 **milligrams**
Test length (θ):	60.0	**minutes**		
Sample nozzle diameter (D_n):	0.2350	**inches**		
Sample nozzle area (A_n):	0.000301	**ft^3**		
Stack temperature (T_s):	614.8	**°F**		
Volume metered (Vm_{std}):	47.316	**ft^3**		
Stack gas velocity (V_s):	103.533	**feet/second**	**Coke Burn Rate:**	42,745 **lb/hr**
Stack gas volumetric flow (Q_{std}):	7,753,602	**dscf/hour**		
Fractional Moisture content (B_{wo}):	0.1522	**%**		

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Percent Isokinetic:

$$\%\text{Isokinetic} = \frac{0.0945 \times Vm_{std} \times (T_s + 460)}{P_s \times V_s \times \theta \times A_n \times (1 - B_{wo})}$$

= **101.9 % isokinetic**

Method 5-F Particulate Concentration:

$$C_s = \frac{\left(\frac{0.01543\text{grains}}{\text{mg}} \times M_n\right)}{V_{mstd}}$$

= **0.0210 gr/dscf**

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315\,ft^3}{m^3}$$

= **48.0662 mg/dscm**

$$C^1{}_s = \frac{\left(\frac{2.205 \times 10^{-6}\,\text{lb}}{\text{mg}} \times M_n\right)}{V_{mstd}}$$

= **3.001×10^{-6} lb/dscf**

Method 5-F Particulate Emission Rate:

$$E_p = C^1{}_s \times Q_{std}$$

= **23.270 lb/hr**

$$pmr_{lb/1000lbcokeburn} = \frac{(E_p)(1000)}{(R_c)}$$

= **0.5444 lb/1000lb coke burn**

USEPA Method 4
Moisture Determination Sample Calculations

Client:	BP
Location:	Whiting, IN
Source:	FCCU 600 Exhaust
Date:	10/23/2014
Run #:	2 - 5F

Data Input:

Volume metered (V_m):	47.410	**ft^3**
Meter calibration coefficient (Y_d):	0.994	**dimensionless**
Barometric pressure (P_{bar}):	29.71	**inches Hg**
Meter sample rate (ΔH):	1.89	**inches H_2O**
Meter inlet/outlet temperature (T_m):	73.6	**°F**
Volume of moisture collected (V_{lc}):	180.6	**milliliters**
Stack Temperature (T_s):	621.0	**°F**
Static Pressure (St):	-1.0	**inches H_2O**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Volume of sample, dry basis:

$$Vm_{std} = V_m \times Y_d \times \left(\frac{528.0°R}{29.92"Hg}\right) \times \left(\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460}\right) = \mathbf{46.520\ dscf}$$

Volume of water vapor in sample:

$$Vw_{std} = \frac{0.04707 ft^3}{ml} \times V_{lc} = \mathbf{8.501\ scf}$$

Fractional moisture content of stack gas:

$$B_{wo} = \frac{Vw_{std}}{(Vm_{std} + Vw_{std})} = \mathbf{0.1545\ B_{wo}}$$

Percent Moisture:

$$\%moisture = B_{wo} \times 100 = \mathbf{15.45\ \%}$$

Fractional moisture content of stack gas at saturated conditions:

$$T_{s(°K)} = ((T_s - 32) * 0.5556) + 273 = \mathbf{600.2\ °Kelvin}$$

$$P_{s(mmHg)} = \left(P_{bar} + \frac{S_t}{13.6}\right) \times 25.401 = \mathbf{754.66\ mm\ Hg}$$

$$B_{wos} = \frac{\sqrt{\left(10^{\left(A - \left(\frac{B}{(T_{s(°K)} - C)}\right)\right)}\right)}}{P_{s(mmHg)}} = \mathbf{1.0000}$$

where:
A= 8.361
B=1893.5
C=27.65

Percent moisture at saturated conditions:

$$\%moisture_{saturated} = B_{wos} \times 100 = \mathbf{100.00\ \%}$$

Percent moisture used for emissions calculations:

$$= \mathbf{15.45\ \%}$$

USEPA Method 2
Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client: BP
Location: Whiting, IN
Source: FCCU 600 Exhaust
Date: 10/23/2014
Run #: 2 - 5F

Data Input

Carbon Dioxide (CO_2):	18.7	**%**
Oxygen (O_2):	2.1	**%**
Nitrogen (N_2):	79.2	**%**
Fractional Moisture Content (B_{wo})	0.1545	**dimensionless**
Stack Temperature (T_s):	621.0	**°F**
Pitot Coefficient (C_p):	0.84	**dimensionless**
Average square root of ΔP	1.2745	**inches H_2O**
Barometric Pressure (P_{bar}):	29.71	**inches Hg**
Static Pressure (S_t)	-1.00	**inches H_2O**
Stack diameter:	96.00	**inches H_2O**
Stack area (A_s):	50.2655	**ft^2**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$ = **31.076 lb/lb-mole**

Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws})$$ = **29.056 lb/lb-mole**

Absolute stack gas pressure:

$$P_s = P_{bar} + \left(\frac{S_t}{13.6}\right)$$ = **29.636 inches H_2O**

Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}}$$ = **102.546 feet/second**

Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60$$ = **309,271 acfm**

Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right]$$ = **149,627 scfm**

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right] \times 60$$ = **8,977,638 scfh**

Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo})$$ = **126,510 dscfm**

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60$$ = **7,590,576 dscfh**

USEPA Method 5F (Non-Sulfate PM)
Particulate Calculation Summary

Client: BP
Location: Whiting, IN
Source: FCCU 600 Exhaust
Date: 10/23/2014
Run #: 2 - 5F

Data Input

Barometric pressure (P_{bar}):	29.71	**inches Hg**	**Particulate Weight:**	
Stack pressure (P_s):	29.64	**Inches Hg Abs.**	**Filterable:**	79.80 **milligrams**
Test length (θ):	60.0	**minutes**		
Sample nozzle diameter (D_n):	0.2350	**inches**		
Sample nozzle area (A_n):	0.000301	**ft^3**		
Stack temperature (T_s):	621.0	**°F**		
Volume metered (Vm_{std}):	46.520	**ft^3**		
Stack gas velocity (V_s):	102.546	**feet/second**	**Coke Burn Rate:**	43,194 **lb/hr**
Stack gas volumetric flow (Q_{std}):	7,590,576	**dscf/hour**		
Fractional Moisture content (B_{wo}):	0.1545	**%**		

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Percent Isokinetic:

$$\%\text{Isokinetic} = \frac{0.0945 \times Vm_{std} \times (T_s + 460)}{P_s \times V_s \times \theta \times A_n \times (1 - B_{wo})}$$

= **102.3 % isokinetic**

Method 5-F Particulate Concentration:

$$C_s = \frac{\left(\frac{0.01543\,\text{grains}}{\text{mg}} \times M_n\right)}{V_{mstd}}$$

= **0.0265 gr/dscf**

$$C_s = \frac{M_n}{V_{msld}} \times \frac{35.315\,ft^3}{m^3}$$

= **60.5789 mg/dscm**

$$C^1{}_s = \frac{\left(\frac{2.205 \times 10^{-6}\,\text{lb}}{\text{mg}} \times M_n\right)}{V_{mstd}}$$

= **3.782×10^{-6} lb/dscf**

Method 5-F Particulate Emission Rate:

$$E_p = C^1{}_s \times Q_{std}$$

= **28.711 lb/hr**

$$pmr_{lb/1000lbcokeburn} = \frac{(E_p)(1000)}{(R_c)}$$

= **0.6647 lb/1000lb coke burn**

USEPA Method 4
Moisture Determination Sample Calculations

Client: BP
Location: Whiting, IN
Source: FCCU 600 Exhaust
Date: 10/24/2014
Run #: 4-5F

Data Input:

Volume metered (V_m):	47.520	**ft^3**
Meter calibration coefficient (Y_d):	0.994	**dimensionless**
Barometric pressure (P_{bar}):	29.46	**inches Hg**
Meter sample rate (ΔH):	1.94	**inches H_2O**
Meter inlet/outlet temperature (T_m):	78.9	**°F**
Volume of moisture collected (V_{lc}):	208.1	**milliliters**
Stack Temperature (T_s):	619.6	**°F**
Static Pressure (St):	-1.0	**inches H_2O**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Volume of sample, dry basis:

$$Vm_{std} = V_m \times Y_d \times \left(\frac{528.0^{o}R}{29.92"Hg}\right) \times \left(\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460}\right)$$ = **45.788 dscf**

Volume of water vapor in sample:

$$Vw_{std} = \frac{0.04707ft^3}{ml} \times V_{lc}$$ = **9.795 scf**

Fractional moisture content of stack gas:

$$B_{wo} = \frac{Vw_{std}}{(Vm_{std} + Vw_{std})}$$ = **0.1762 B_{wo}**

Percent Moisture:

$$\%moisture = B_{wo} \times 100$$ = **17.62 %**

Fractional moisture content of stack gas at saturated conditions:

$$T_{s(^{o}K)} = ((T_s - 32) * 0.5556) + 273$$ = **599.5 °Kelvin**

$$P_{s(mmHg)} = \left(P_{bar} + \frac{S_t}{13.6}\right) \times 25.401$$ = **748.31 mm Hg**

$$B_{wos} = \frac{\sqrt{\left(10^{\left(A - \left(\frac{B}{(T_{s(^{o}K)} - C)}\right)\right)}\right)}}{P_{s(mmHg)}}$$

where:
A= 8.361
B=1893.5
C=27.65

= **1.0000**

Percent moisture at saturated conditions:

$$\%moisture_{saturated} = B_{wos} \times 100$$ = **100.00 %**

Percent moisture used for emissions calculations:

= **17.62 %**

USEPA Method 2
Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client: BP
Location: Whiting, IN
Source: FCCU 600 Exhaust
Date: 10/24/2014
Run #: 4-5F

Data Input

Carbon Dioxide (CO_2):	17.6	**%**
Oxygen (O_2):	2.5	**%**
Nitrogen (N_2):	79.9	**%**
Fractional Moisture Content (B_{wo})	0.1762	**dimensionless**
Stack Temperature (T_s):	619.6	**°F**
Pitot Coefficient (C_p):	0.84	**dimensionless**
Average square root of ΔP	1.2811	**inches H_2O**
Barometric Pressure (P_{bar}):	29.46	**inches Hg**
Static Pressure (S_t)	-0.96	**inches H_2O**
Stack diameter:	96.00	**inches H_2O**
Stack area (A_s):	50.2655	**ft^2**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$ = **30.916 lb/lb-mole**

Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws})$$ = **28.640 lb/lb-mole**

Absolute stack gas pressure:

$$P_s = P_{bar} + \left(\frac{S_t}{13.6}\right)$$ = **29.389 inches H_2O**

Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}}$$ = **104.190 feet/second**

Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60$$ = **314,231 acfm**

Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right]$$ = **150,955 scfm**

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right] \times 60$$ = **9,057,310 scfh**

Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo})$$ = **124,353 dscfm**

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60$$ = **7,461,182 dscfh**

USEPA Method 5F (Non-Sulfate PM)
Particulate Calculation Summary

Client: BP
Location: Whiting, IN
Source: FCCU 600 Exhaust
Date: 10/24/2014
Run #: 4-5F

Data Input

Barometric pressure (P_{bar}):	29.46	**inches Hg**	**Particulate Weight:**	
Stack pressure (P_s):	29.39	**Inches Hg Abs.**	**Filterable:**	79.1 **milligrams**
Test length (θ):	60.0	**minutes**		
Sample nozzle diameter (D_n):	0.2350	**inches**		
Sample nozzle area (A_n):	0.000301	**ft^3**		
Stack temperature (T_s):	619.6	**°F**		
Volume metered (Vm_{std}):	45.788	**ft^3**		
Stack gas velocity (V_s):	104.190	**feet/second**	**Coke Burn Rate:**	40,870 **lb/hr**
Stack gas volumetric flow (Q_{std}):	7,461,182	**dscf/hour**		
Fractional Moisture content (B_{wo}):	0.1762	**%**		

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Percent Isokinetic:

$$\%\text{Isokinetic} = \frac{0.0945 \times Vm_{std} \times (T_s + 460)}{P_s \times V_s \times \theta \times A_n \times (1 - B_{wo})}$$ = **102.5 % isokinetic**

Method 5-F Particulate Concentration:

$$C_s = \frac{\left(\frac{0.01543\,\text{grains}}{\text{mg}} \times M_n\right)}{V_{mstd}}$$ = **0.0267 gr/dscf**

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315\,ft^3}{m^3}$$ = **61.0070 mg/dscm**

$$C^1{}_s = \frac{\left(\frac{2.205 \times 10^{-6}\,\text{lb}}{\text{mg}} \times M_n\right)}{V_{mstd}}$$ = **3.809 x 10^{-6} lb/dscf**

Method 5-F Particulate Emission Rate:

$$E_p = C^1{}_s \times Q_{std}$$ = **28.421 lb/hr**

$$pmr_{lb/1000lb\,cokeburn} = \frac{(E_p)(1000)}{(R_c)}$$ = **0.6954 lb/1000lb coke burn**

PARTICULATE EMISSIONS PRORATION PROCEDURES

(Excerpted from memo to all US. EPA Regions from E. Reich dated March 6, 1979):

Client: BP
Location: Whiting, IN
Source: FCCU 600 Exhaust
Date: 10/23/2014
Run #: 1 - 5F

The representative average emissions must be calculated by the following generalized equation (instead of simple averaging as outlined in 40 CFR 60.8(f)):

$$E_{pave} = E_{sbr}\left(\frac{(A+B)S}{AR}\right) + E_{nosb}\left(\frac{R-S}{R} - \frac{BS}{AR}\right)$$

Where:

E_{pave}	=	average E for daily operating time
E_{sbr}	=	average E of sample(s) containing soot blowing
E_{nosb}	=	average E of sample(s) with no soot blowing
A	=	hours of soot blowing during sample(s)
B	=	hours not blowing during sample(s) containing soot blowing
R	=	average hours of operating per 24 hours
S	=	average hours of sootblowing per 24 hours

Test and Sootblowing Data:

Run	1 - 5F			
Date	10/23/2014			
Run time	09:40 - 10:47			
Soot blow time	10:18 - 10:24			
Soot blow duration	6	**minutes**		
Average E of sample(s) containing soot blowing, (E_{sbr}):	23.270	**total lb/hr**	0.5444	**lb/1000lb coke burn**
Average E of sample(s) with no soot blowing, (E_{nosb}):	28.566	**total lb/hr**	0.6800	**lb/1000lb coke burn**
Hours of soot blowing during sample(s), (A):	0.100	**hours**		
Hours not blowing soot during sample(s) containing soot blowing, (B):	0.900	**hours**		
Average hours of operating per 24 hours, (R):	24.000	**hours**		
Average hours of soot blowing per 24 hours, (S):	0.40	**hours**		

Test Program Pro-rated Results:

Filterable Nonsulfate PM Emissions: = **27.683 average lb/hr**
= **0.6574 average lb/1000lb coke burn**

APPENDIX B

Field Data

TRAVERSE POINT LOCATIONS FOR CIRCULAR AND RECTANGULAR STACKS AND DUCTS

ARI ENVIRONMENTAL INC.

Facility BP
Date 10/22/14
Sampling Location FCCU 600
Inside of Far Wall to Outside of Port (Distance C) 118.75 in.
Inside of Near Wall to Outside of Port (Distance D) 22.75 in
Stack ID (Distance C- Distance D) 96 in.
Port Distance Downstream From Disturbance (B) 936 in.
Port Distance Upstream From Disturbance (A) ~480 in.
Equivalent Diameters Downstream From Disturbance (B) 9.75 (≥ 2.0)
Equivalent Diameters Upstream From Disturbance (A) 5 (≥ 0.5)
Number of Ports Used 2 Traverse Points / Port 6

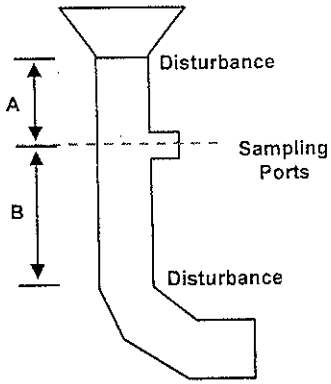
Note: Sketch Stack/Ports/Control Device on Back of Form

Equivalent Diameters Downstream From Disturbance (B) = [Distance B / Stack ID]

Equivalent Diameters Upstream From Disturbance (A) = [Distance A / Stack ID]

Equivalent Diameter For a Square or Rectangular Stack = [(2 x L x W) / (L + W)]

Port ID 5 in. (for monorail bracket specs.)
Port Length Outside of Stack _____ in. (for monorail bracket specs.)



1	2	3	4	5	6
Port Traverse Point Number	Fractional % of Stack I.D. (frac. %)	Stack I.D. (inches)	Product of Columns 2 and 3 (inches)	Port Depth (inches)	Traverse Point Location From Outside of Port (Sum of 4 and 5 in inches)
1	.044	96	4.22	22.75	26.97
2	.146		14.01		36.76
3	.296		28.41		51.16
4	.704		67.58		70.33
5	.854		81.98		104.73
6	.956		91.77		114.52
7					
8					
9					
10					
11					
12					

For Stacks / Ducts ≤ 24 inches ID – No traverse point shall be located less than 0.5 inches from stack wall

For Stacks / Ducts > 24 inches ID – No traverse point shall be located less than 1.0 inches from stack wall

QA/QC Check:
Completeness [signature] Legibility [signature] Accuracy [signature] Specifications [signature]

Method 1 Calculator Signature/Date 10/22/14 / [signature]

Field Supervisor Signature/Date [signature] 10/22/14

LOCATION OF TRAVERSE POINTS IN CIRCULAR STACKS

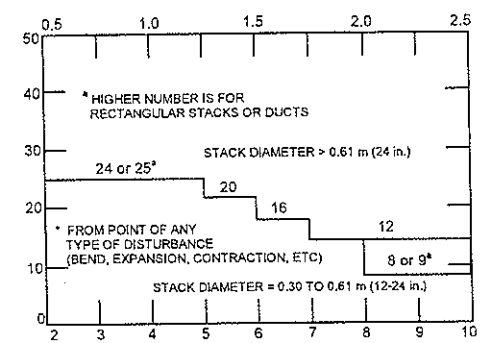
Pts	4	6	8	10	12
1	6.7	4.4	3.2	2.6	2.1
2	25.0	14.6	10.5	8.2	6.7
3	75.0	29.6	19.4	14.6	11.8
4	93.3	70.4	32.3	22.6	17.7
5		85.4	67.7	34.2	25.0
6		95.6	80.6	65.8	35.6
7			89.5	77.4	64.4
8			96.6	85.4	75.0
9				91.8	82.3
10				97.4	88.2
11					93.3
12					97.9

LOCATION OF TRAVERSE POINTS IN RECTANGULAR STACKS
CEMS*

Pts	2	3	4	5	6	7	8	9
1	25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6
2	75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7
3		83.3	62.5	50.0	41.7	35.7	31.3	27.8
4			87.5	70.0	58.3	50.0	43.8	38.9
5				90.0	75.0	64.3	56.3	50.0
6					91.7	78.6	68.8	61.1
7						92.9	81.3	72.2
8							93.8	83.3
9								94.4

*3 point CEMS RATA traverse point locations (valid for rectangular and round stacks)

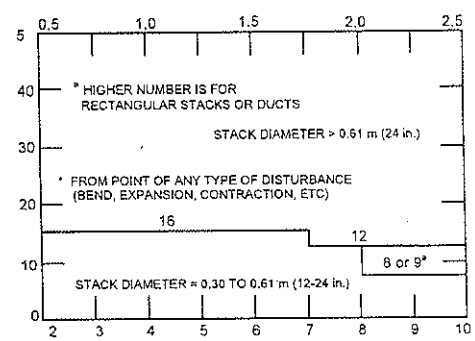
DUCT DIAMETERS UPSTREAM FROM FLOW DISTURBANCE* (DISTANCE A)



DUCT DIAMETERS DOWNSTREAM FROM FLOW DISTURBANCE* (DISTANCE B)

MINIMUM NUMBER OF TRAVERSE POINTS
ISOKINETIC TESTING

DUCT DIAMETERS UPSTREAM FROM FLOW DISTURBANCE* (DISTANCE A)



DUCT DIAMETERS DOWNSTREAM FROM FLOW DISTURBANCE* (DISTANCE B)

MINIMUM NUMBER OF TRAVERSE POINTS
FOR VELOCITY (NON-ISOKINETIC) TRAVERSES

Form FDF 4000.00

ARI ENVIRONMENTAL INC.

SAMPLING NOZZLE INSPECTION AND MEASUREMENT

Date: 10/22/14

Nozzle ID: M5

Nozzle Type: ~ 1/4"

Inspected By: S. Flaherty

Nozzle Clean: Y / N

Nozzle Undamaged: Y / N

Absent of Nicks or Dents: Y / N

Leading Edge Sharp: Y / N

Nozzle Diameter				
D_1 (inches)	D_2 (inches)	D_3 (inches)	ΔD (inches)	D_{avg} (inches)
0.235	0.236	0.234	0.002	0.235

where:

$D_{1,2,3}$ = three different nozzle diameter measurements , (inches) ; each diameter must be measured to within 0.001 inches

ΔD = maximum difference between any two diameters, (inches) ; $\Delta D \leq 0.004$ inches

D_{avg} = average of D_1, D_2, and D_3, (inches)

Form FDF 4004.00

ARI ENVIRONMENTAL INC.

VELOCITY TRAVERSE AND CYCLONIC FLOW VERIFICATION

PLANT: BP Whiting
DATE: 10-22-14
LOCATION: Whiting, IN
SOURCE: FCC 600
STACK ID: 97.0
PROBE #/TC #: 731
BAROMETRIC PRESSURE, in. Hg: 29.56
OPERATORS: WAH, JP

SCHEMATIC OF TRAVERSE POINT LAYOUT

RUN NO. _____
STATIC, in. H_2O _____
START: _____ STOP: _____
PRE-TEST: +/-05 POST-TEST: +/-05

TRAVERSE POINT NUMBER	VELOCITY HEAD, ΔP (in. H_2O)	STACK TEMP. (°F)	YAW ANGLE (°)
1			10
2			8
3			7
4			3
5			4
6			5
1			7
2			8
3			3
4			2
5			6
6			11
AVERAGE			520

RUN NO. _____
STATIC, in. H_2O _____
START: _____ STOP: _____
PRE-TEST: _____ POST-TEST: _____

TRAVERSE POINT NUMBER	VELOCITY HEAD, ΔP (in. H_2O)	STACK TEMP. (°F)	YAW ANGLE (°)
AVERAGE			

Form FDF 400S-00

FIELD DATA

B-4

PLANT	BP Whiting	AMBIENT TEMPERATURE	31	PROBE HEATER SETTING	320
DATE	10-23-14	BAROMETRIC PRESSURE	29.80	HEATER BOX SETTING	320
LOCATION	Whiting, IN	ASSUMED MOISTURE, %	15	METER $H_@$	1.72
OPERATOR	WAH	PROBE LENGTH, in.	120	C_p FACTOR	0.84
STACK NO.	FCC 600	NOZZLE DIAMETER, in.	0.235	Y_d FACTOR	0.994
RUN NO.	~~MS-1~~ 5F-1	STACK DIAMETER, in.	96.0	PITOT NO.	731
SAMPLE BOX NO.	Apex	MINUTES PER POINT	5		
METER BOX NO.	96/001	NUMBER OF POINTS	6		
START TIME	0940	NUMBER OF PORTS	2		

WEIGHT OF PARTICULATE, mg		
Filter No.		
Sample		
Final wt.		
Tare wt.		
Wt. gain		
TOTAL		mg

CROSS SECTION

CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (Θ) min.	STATIC PRESSURE (in. H_2O)	STACK TEMP (T_S) °F	VELOCITY HEAD (ΔP_g)	VELOCITY HEAD (ΔP_s)	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP AT DRY GAS METER INLET (Tm_{in}) °F	OUTLET (Tm_{out}) °F	FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
0940	1	0	-0.92	600	1.5		1.7	1.65	911.096	—	55	318	320	—	49	1
0945	2	5		598	1.5		1.7	1.65	914.44		56	320	320		49	1
0950	3	10		619	1.8		2.2	2.16	917.96		58	335	318		54	1
0955	4	15		624	1.8		2.1	2.06	921.84		59	325	315		54	1
1000	5	20		624	1.8		2.1	2.06	925.83		60	308	320		60	2
1005/1010	6	25		624	1.7		2.0	1.94	930.43		62	322	320		65	2
1017	1	30		606	1.6	1.8	~~1.6~~ 1.6	1.83	934.13		62	308	320		56	2
1022	2	35		603	1.6	1.8	1.6	1.83	938.43		63	310	310		55	2
1027	3	40		619	1.8		2.1	2.06	942.11		62	315	320		56	2
1032	4	45		624	1.8		2.1	2.06	946.67		63	313	318		56	2
1037	5	50		620	1.7		1.9	1.94	950.02		64	310	316		58	2
1042	6	55		616	1.5		1.7	1.72	954.03		64	308	314		57	2
1047		60							958.900							
				✓		✓	✓		✓		✓					
AVERAGE	12	60	-0.92	614.8	—	1.2933	1.93	—	46.900	—	60.6	—	—	—	568	MAX 2

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g) #1	#2	#3	#4	#5	SILICA GEL WEIGHT g
FINAL	252	15	0			213.5
INITIAL	100	100	0	56		209
LIQUID COLLECTED	152	15	0			13.5
TOTAL LIQUID COLLECTED (specify ml or g)						180.5

ORSAT DATA	TIME	CO_2	O_2
TRIAL 1	1130	18.8	1.8
TRIAL 2	1135	18.8	1.8
TRIAL 3	1140	18.8	1.8
Average		18.8	1.8

LEAK CHECK		
SYSTEM PRE:	0.000	CFM@15"Hg
POST:	0.000	CFM@15"Hg
PITOT PRE:	+-0.4	@ > 3"H_2O
POST:	+-0.4	@ > 3"H_2O

Form FDF 4003.00

FIELD DATA

PLANT	BP Whiting	AMBIENT TEMPERATURE	70	PROBE HEATER SETTING	320
DATE	10-23-14	BAROMETRIC PRESSURE	29.71	HEATER BOX SETTING	320
LOCATION	Whiting, IN	ASSUMED MOISTURE, %	15	METER $H_@$	1.72
OPERATOR	WAH	PROBE LENGTH, in.	120	C_p FACTOR	0.84
STACK NO.	ECC 600	NOZZLE DIAMETER, in.	0.235	Y_d FACTOR	0.9971
RUN NO.	SF-2	STACK DIAMETER, in.	~~47~~ 96.0	PITOT NO.	731
SAMPLE BOX NO.	Apex	MINUTES PER POINT	5		
METER BOX NO.	901601	NUMBER OF POINTS	12		
START TIME	1520	NUMBER OF PORTS	2		

WEIGHT OF PARTICULATE, mg		
Filter No.		
Sample		
Final wt		
Tare wt		
Wt. gain		
TOTAL		mg

CROSS SECTION

CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (Θ) min.	STATIC PRESSURE (in. H_2O)	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP_s)	VELOCITY HEAD (ΔP_s)	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O ACTUAL	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O DESIRED	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP AT DRY GAS METER INLET (Tm_{in}) °F	GAS SAMPLE TEMP AT DRY GAS METER OUTLET (Tm_{out}) °F	FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
1520	1	0	-1.0	607	1.5	—	1.7	1.72	960.390	—	72	310	302	—	61	1
1525	2	5		619	1.6		1.8	1.83	964.42		72	312	304		58	1
1530	3	10		619	1.6		1.8	1.83	968.08		73	313	305		62	1
1535	4	15		625	1.7		1.9	1.94	971.84		73	313	305		59	1
1540	5	20		625	1.6		1.9	1.87	975.33		73	315	305		58	1
1545/1550	6	25		625	1.7		2.0	1.98	979.59		74	315	309		57	1
1555	1	30		606	1.6		1.9	1.87	983.86		73	308	315		58	1
1600	2	35		625	1.7		2.0	1.98	987.63		73	307	315		57	1
1605	3	40		625	1.6		1.9	1.87	991.87		74	307	315		57	1
1610	4	45		626	1.7		2.0	1.98	994.78		74	308	315		57	1
1615	5	50		625	1.6		1.9	1.87	998.93		75	310	315		58	1
1620	6	55		625	1.6		~~1.5~~ 1.9	1.87	1003.23		77	311	315		59	1
1625		60							1007.860							
				✓	✓		✓		✓		✓					
AVERAGE	12	60	-1.0	621.0	1.2745	—	1.89	—	47.410		73.6	—	—	—	65	max 1

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g) #1	#2	#3	#4	#5	SILICA GEL WEIGHT g
FINAL	230	136	0			214.6
INITIAL	100	100	0	56		200.0
LIQUID COLLECTED	130	36	0			14.6
TOTAL LIQUID COLLECTED (specify ml or g)						180.6

ORSAT DATA	TIME	CO_2	O_2
TRIAL 1	1640	18.7	2.1
TRIAL 2	1645	18.7	2.1
TRIAL 3	1650	18.7	2.1
Average		18.7	2.1

LEAK CHECK		
SYSTEM PRE:	0.000	CFM@15"Hg
POST:	0.000	CFM@15"Hg
PITOT PRE:	ok	@>3"H_2O
POST:	ok	@>3"H_2O

Form FDF 4003.00

ARI ENVIRONMENTAL INC.

B-6

FIELD DATA

PLANT	BP Whiting	AMBIENT TEMPERATURE	65	PROBE HEATER SETTING	320
DATE	10-23-14	BAROMETRIC PRESSURE	29.46	HEATER BOX SETTING	320
LOCATION	Whiting, IN	ASSUMED MOISTURE, %	15	METER H@	1.72
OPERATOR	WAK	PROBE LENGTH, in.	120	C_p FACTOR	0.84
STACK NO.	FCC 600	NOZZLE DIAMETER, in.	0.235	Y_d FACTOR	0.994
RUN NO.	SF-3	STACK DIAMETER, in.	970	PITOT NO.	731
SAMPLE BOX NO.	Apex	MINUTES PER POINT	5		
METER BOX NO.	901001	NUMBER OF POINTS	12		
START TIME	1705	NUMBER OF PORTS	2		

WEIGHT OF PARTICULATE, mg		
Filter No.		
Sample		
Final wt		
Tare wt		
Wt. gain		
	TOTAL	mg

CROSS SECTION

CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (Θ) min.	STATIC PRESSURE (in. H_2O)	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP_s)	VELOCITY HEAD (ΔP_s)	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (Vm) ft³	GAS SAMPLE TEMP AT DRY GAS METER INLET (Tm_{in}) °F	OUTLET (Tm_{out}) °F	FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
1705	1	0	-1.1	604	1.6	—	1.9	1.87	8.185	—				—		
1710	2	5		605	1.5		1.8	1.75	12.06		70	303	305		56	4
1715	3	10		620	1.6		1.9	1.87	15.70		70	304	305		52	4
1720	4	15		626	1.7		2.0	1.98	19.34		71	304	305		54	4
1725	5	20		626	1.7		2.0	1.98	23.49		72	305	308		56	5
1730 / 1735	6	25		627	1.7		2.0	1.98	27.63		73	311	315		58	5
17:40	1	30		605	1.5		1.8	1.75	31.81		73	313	314		60	5
17:45	2	35		621	1.7		2.0	1.98	35.65		73	305	308		58	5
17:50	3	40		626	1.7		2.0	1.98	39.44		73	306	310		59	4
17:55	4	45		626	1.6		1.4	1.86	43.32		74	321	325		58	4
18:00	5	50		620	1.7		2.0	1.98	47.42		73	328	330		60	5
18:05	6	55		620	1.6		1.9	1.87	52.38		74	307	315		65	5
18:10		60							56.830		73	309			64	5
				√	√ 1.2777 ~~1.2770~~		√		√		√					
AVERAGE				620.2	~~1.278~~		1.93		48.745		72.3					

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g) #1	#2	#3	#4	#5	SILICA GEL WEIGHT g
FINAL	232	130	Ø			
INITIAL	100	100	0	56		2004
LIQUID COLLECTED	132	130	Ø			
TOTAL LIQUID COLLECTED (specify ml or g)						

ORSAT DATA	TIME	CO_2	O_2
TRIAL 1			
TRIAL 2			
TRIAL 3			
Average			

LEAK CHECK

SYSTEM PRE: 0.000 CFM@15"Hg

POST: 0.000 CFM@15"Hg

PITOT PRE: +/-0K @ > 3"H_2O

POST: +/-0K @ > 3"H_2O

Form FDF 4003.00

FIELD DATA

PLANT	GP	AMBIENT TEMPERATURE	68	PROBE HEATER SETTING	320
DATE	10/29/14	BAROMETRIC PRESSURE	29.46	HEATER BOX SETTING	320
LOCATION	FW 600	ASSUMED MOISTURE, %	15	METER $H_@$	1.72
OPERATOR	JP/AH	PROBE LENGTH, in.	120	C_p FACTOR	0.84
STACK NO.	FW 600	NOZZLE DIAMETER, in.	.235	Y_d FACTOR	.994
RUN NO.	#5F-4	STACK DIAMETER, in.	96	PITOT NO.	731
SAMPLE BOX NO.	Box	MINUTES PER POINT	5		
METER BOX NO.	90001	NUMBER OF POINTS	12		
START TIME	1115	NUMBER OF PORTS	2		

WEIGHT OF PARTICULATE, mg		
Filter No.		
Sample		
Final wt.		
Tare wt.		
Wt. gain		
TOTAL		mg

CROSS SECTION

CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (Θ) min.	STATIC PRESSURE (in. H_2O)	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP_s)	VELOCITY HEAD (ΔP_s)	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O ACTUAL	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O DESIRED	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP AT DRY GAS METER INLET (Tm_{in}) °F	GAS SAMPLE TEMP AT DRY GAS METER OUTLET (Tm_{out}) °F	FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
11:15	1	0	-0.96	609	1.7		2.0	1.98	56.755		73	302	310		63	1
	2	5		611	1.6		1.9	1.87	60.61		77	305	312		52	1
	3	10		623	1.6		1.9	1.87	64.41		77	306	313		52	1
	4	15		624	1.7		2.0	1.98	68.23		77	310	315		54	1
	5	20		623	1.6		1.9	1.87	72.26		80	309	310		52	1
	6	25		624	1.6		1.9	1.87	76.54		80	286	298		56	1
11:49	1	30		611	1.6		1.9	1.87	80.52		80	289	305		61	1
	2	35		618	1.7		2.0	1.98	84.64		80	290	286		53	1
	3	40		619	1.7		2.0	1.98	88.67		80	288	288		57	1
	4	45		623	1.7		2.0	1.98	92.61		81	295	300		59	1
	5	50		623	1.6		1.9	1.98	96.51		81	312	320		59	1
	6	55		623	1.6		1.9	1.98	100.38		81	321	330		62	1
12:19		60							104.265							
									✓		✓					
				✓	✓		✓		47.520							
AVERAGE		60	-0.96	619.6	1.28		1.94		~~47.615~~		78.9				<68	

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g) #1	#2	#3	#4	#5	SILICA GEL WEIGHT g
FINAL	240	155	0			213.1
INITIAL	100	100	0	96		200
LIQUID COLLECTED	140	55	0			13.1
TOTAL LIQUID COLLECTED (specify ml or g)						208.1

ORSAT DATA	TIME	CO_2	O_2
TRIAL 1	1245	17.6	2.5
TRIAL 2	1250	17.6	2.5
TRIAL 3	1255	17.6	2.5
Average		17.6	2.5

LEAK CHECK	
SYSTEM PRE:	0.00 CFM@15"Hg
POST:	0.000 CFM@15"Hg
PITOT PRE:	+/- ok @ > 3" H_2O
POST:	+/- ok @ > 3" H_2O

Form FDF 4003.00

APPENDIX C

Analytical Data

ANALYTICAL REPORT

Client: BP

Sampling Location: Whiting, IN

Sampling Date(s): 10/23 – 10/24/14

Lab Project Number: 08-687

COC Numbers(s): 7011

Analysis Date(s): 11/3 – 11/15/14

Analytical Method: USEPA Method 5F

Prepared For:
ARI Environmental, Inc.
951 Old Rand Road, Unit 106
Wauconda, IL 60084
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State of Texas TCEQ/NELAP Certificate ID: T104704428-13-5
State of Louisiana LDEQ/LELAP Certificate ID: 02010
State of New Jersey NJDEP Certification ID: IL007

Project Narrative

Sample Receipt and Acceptance Quality Assurance:

Ten (10) samples were received in good condition and were logged in at the ARI laboratory located in Wauconda, IL on 10/27/14. All sample receipt acceptance criteria were met as documented in the Sample Receipt Checklist included in this report.

Analytical Quality Assurance:

Analysis of samples met the procedural requirements and QA/QC criteria set forth in the TNI Standard, applicable reference methods and standard operating procedures and, where applicable, the project test plan.

Data Interpretation and Comments:

There were no deviations from the test methods and no non-standard conditions that may affect the quality of the test results. Test results reported under this project number apply only to the samples as received and identified on the chain-of-custody document(s) included in this report.

Scope of Accreditation:

All test methods and analytes were analyzed under ARI's current scope of accreditation under TCEQ/NELAP.

Laboratory Contact Information:

If you have any questions regarding these test results, please contact Mr. Eric Vogt, Laboratory Manager, at 847-487-1580 ext.116 or by e-mail at evogt@arienv.com.

Reviewed and Approved by:

Signature: Laboratory Manager

11/17/14
Date

ANALYTICAL SUMMARY

CLIENT: BP
LOCATION: Whiting, IN
SOURCE: 600 Stack
SAMPLE DATE: 10/23/2014 - 10/24/2014
ANALYSIS: Particulates
METHOD: USEPA Method 5F

ANALYST: J. Ruggaber
DATE OF COMPLETION: 11/17/2014
TEMPLATE CONTROL ID: USEPA-M5F-PARTIC-TEMPLATE-61T-REV3
PROJECT NUMBER: 08-686

Identification		LIMS Number	Tare	WT1	WT2	WT 1 - WT 2 (mg)	Particulate (mg)	Blank Corrected Total Partic. (mg)
Run 1	FILTER	13923	854.8	109594.3	109594.2	0.1	68.4	64.55
	BEAKER	13924	108671.0					
Run 2	FILTER	13925	851.9	116942.7	116942.3	0.4	83.9	80.00
	BEAKER	13926	116006.7					
Run 3	FILTER	13927	855.6	114755.9	114755.7	0.2	300.8	296.90
	BEAKER	13928	113599.4					
Run 4	FILTER	13929	857.2	115780.2	115779.8	0.4	83.1	79.20
	BEAKER	13940	114839.7					
Acetone Blank	BEAKER	13932	110600.5	111456.0	111455.8	0.2	3.9	-
Filter Blank	FILTER	13931	851.5					

Sample Concentration Calculations

Identification	Analysis 1 (area counts)	Analysis 2 (area counts)	Average (area counts)	Deviation (%)	Diluted SO_4 Conc. (µg/ml)	Dilution Factor	Sample Volume (mls)	SO_4 mass (µg)	Corrected for Aliquot (mg)	$(NH_4)_2SO_4$ mass (mg)	Corrected for Blank (mg)
5F-1	0.0230	0.0227	0.0229	0.66	0.27	10	50	135.35	0.14	0.19	0.19
5F-2	0.0182	0.0184	0.0183	-0.55	0.22	10	50	108.39	0.11	0.15	0.15
5F-3	0.0298	0.0294	0.0296	0.68	0.35	10	50	175.33	0.18	0.24	0.24
5F-4	0.0161	0.0155	0.0158	1.90	0.19	10	50	93.59	0.09	0.13	0.13
Field Blank	<0.0015	<0.0015	<0.0015	0.00	<0.02	10	50	<8.88	<0.009	<0.012	-
Lab DI Water Blank	<0.0015	<0.0015	<0.0015	0.00	<0.02	-	-	-	-	-	-

ID	Analysis 1 (area counts)	Analysis 2 (area counts)	Average (area counts)	Deviation (%)	Actual Conc. (µg/ml)	Spike Conc. (µg/ml)	Theo. Spike Conc. (µg/ml)	R (%)	Pass/Fail
spike 1	0.0432	0.0412	0.042	2.37	**0.50**	0.18	0.20	92.2	Pass
spike 2	0.0442	0.0415	0.043	3.15	**0.51**	0.19	0.20	96.0	Pass

spike prep: 9 mL of 5F-3 + 1 mL of 2 ppm std

C-4

CLIENT: BP
LOCATION: Whiting, IN
SOURCE: 600 Stack
SAMPLE DATE: 10/23/2014 - 10/24/2014
ANALYSIS: Particulates
METHOD: USEPA Method 5F

ANALYST: J. Ruggaber
DATE OF COMPLETION: 11/17/2014
TEMPLATE CONTROL ID: USEPA-M5F-PARTIC-TEMPLATE-61T-REV3
PROJECT NUMBER: 08-686

Non-Sulfate Particulate Weight

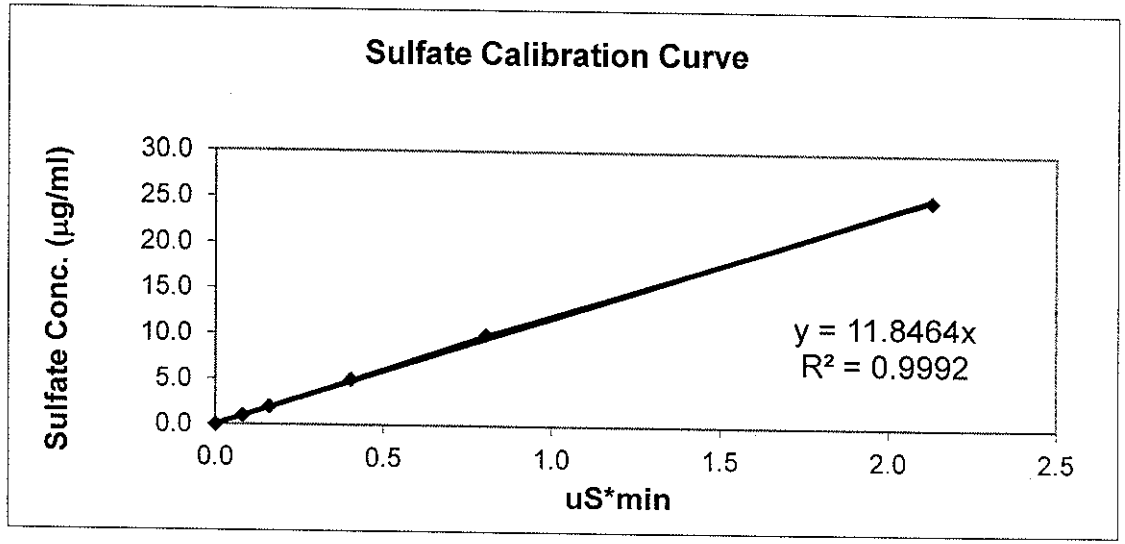
Identification	Total Partic (mg)	Mass NH_4SO4 (mg)	Corrected Partic (mg)
Run 1	64.6	0.19	64.4
Run 2	80.0	0.15	79.8
Run 3	296.9	0.24	296.7
Run 4	79.2	0.13	79.1

Std. (µg/ml)	Pre Cal (µS*min)	Post Cal (µS*min)	Average (µS*min)	Deviation (%)
0.0	0.00	0.00	0.00	0.00
1.0	0.079	0.082	0.080	-1.49
2.0	0.163	0.158	0.160	1.71
5.0	0.404	0.401	0.403	0.37
10.0	0.815	0.794	0.804	1.29
25.0	2.131	2.129	2.130	0.04

	Conc (µg/ml)	Peak Area	RE	Cal Conc	% Dif
	1.0	0.080	0.080	1.0	-1.17
	2.0	0.160	0.080	2.0	-1.44
	5.0	0.403	0.081	5.0	-0.99
	10.0	0.804	0.080	9.9	-1.13
	25.0	2.130	0.085	26.2	4.73
	mean RF-----	0.0813			
2nd std	5.0	0.4017	N/A	4.8	-4.92

CCVs

Conc. (µg/ml)	Inj. #	Peak Area	% Diff	Pass/Fail
5.0	114	0.3940	-2.16	Pass



951 Old Rand Road # 106
Wauconda, IL 60084

ARI ENVIRONMENTAL ANALYTICAL REPORT

Texas NELAP ID: T 104704428-13-5

BP-Whiting
Whiting, IN
600 Stack

Lab Project #: 08-686
Project Manager: Steve Flaherty
Received: 10/27/2014
Reported: 11/17/2014

Sample ID: Run 1-5F Filter
Lab Sample #: 13923
Date Sampled: 10/23/2014
Field #: 55691

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	USEPA Method 5F	Joel Ruggaber	11/17/2014	64.40	mg	
Sulfate	USEPA Method 5F	Joel Ruggaber	11/17/2014	135.4	ug	J

Sample ID: Run 1-5F Probe Wash
Lab Sample #: 13924
Date Sampled: 10/23/2014
Field #: 76380

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Sample ID: Run 2-5F Filter
Lab Sample #: 13925
Date Sampled: 10/23/2014
Field #: 55687

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	USEPA Method 5F	Joel Ruggaber	11/17/2014	79.80	mg	
Sulfate	USEPA Method 5F	Joel Ruggaber	11/17/2014	108.4	ug	J

Sample ID: Run 2-5F Probe Wash
Lab Sample #: 13926
Date Sampled: 10/23/2014
Field #: 76381

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Sample ID: Run 3-5F Filter
Lab Sample #: 13927
Date Sampled: 10/23/2014
Field #: 55692

951 Old Rand Road # 106
Wauconda, IL 60084

Texas NELAP ID: T 104704428-13-5

ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting
Whiting, IN
600 Stack

Lab Project #: 08-686
Project Manager: Steve Flaherty
Received: 10/27/2014
Reported: 11/17/2014

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	USEPA Method 5F	Joel Ruggaber	11/17/2014	296.70	mg	
Sulfate	USEPA Method 5F	Joel Ruggaber	11/17/2014	175.3	ug	J

Sample ID: Run 3-5F Probe Wash
Lab Sample #: 13928
Date Sampled: 10/23/2014
Field #: 76382

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Sample ID: Run 4-5F Filter
Lab Sample #: 13929
Date Sampled: 10/24/2014
Field #: 55693

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	USEPA Method 5F	Joel Ruggaber	11/17/2014	79.10	mg	
Sulfate	USEPA Method 5F	Joel Ruggaber	11/17/2014	93.6	ug	J

Sample ID: Run 4-5F Probe Wash
Lab Sample #: 13930
Date Sampled: 10/24/2014
Field #: 76383

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Sample ID: Blank 5F Filter
Lab Sample #: 13931
Date Sampled: 10/24/2014
Field #: 55688

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	USEPA Method 5F	Joel Ruggaber	11/17/2014	3.90	mg	
Sulfate	USEPA Method 5F	Joel Ruggaber	11/17/2014	<8.9	ug	

951 Old Rand Road # 106

Wauconda, IL 60084

Texas NELAP ID: T 104704428-13-5

ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting
Whiting, IN
600 Stack

Lab Project #: 08-686
Project Manager: Steve Flaherty
Received: 10/27/2014
Reported: 11/17/2014

Sample ID: Blank Probe Wash
Lab Sample #: 13932

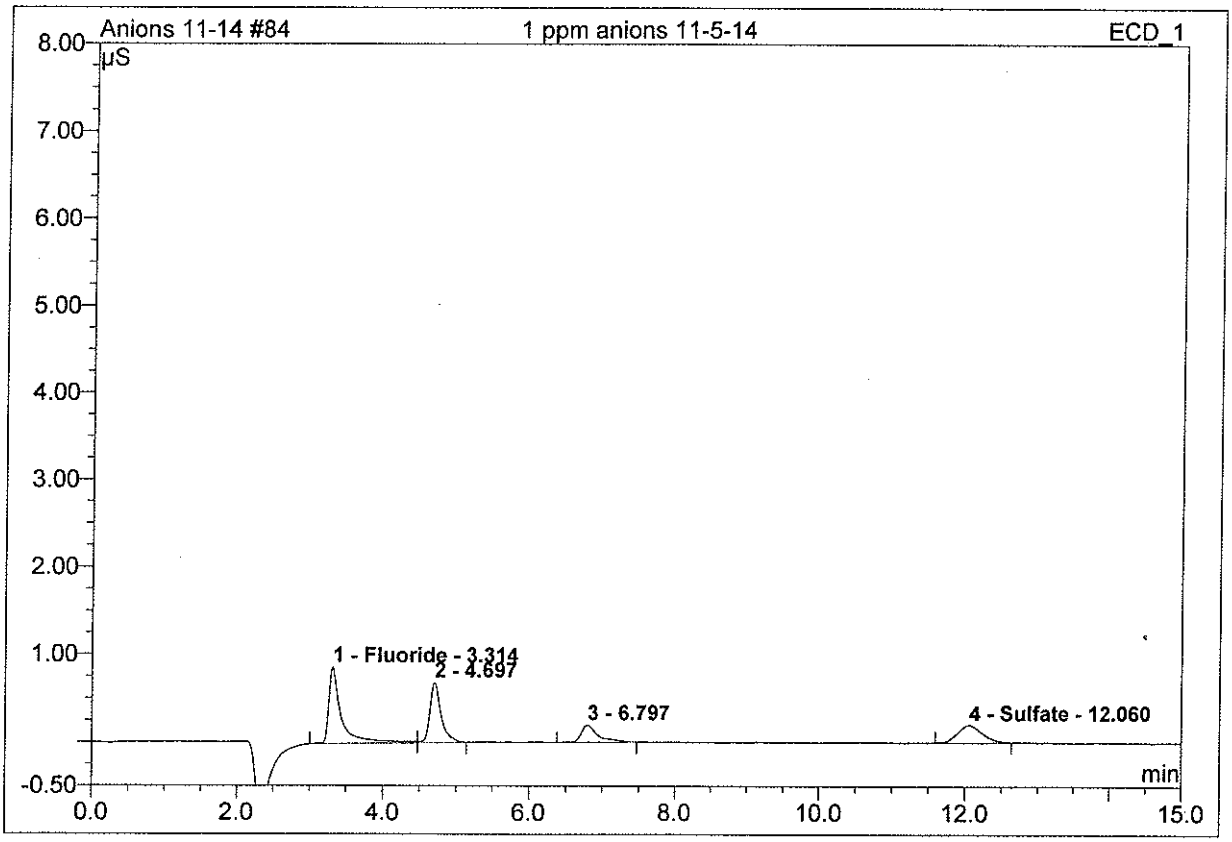
Date Sampled: 10/24/2014
Field #: 76384

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Notes: UA - Not a NELAC accredited analyte under this method.
NA - Sample not tested for this analyte.
D - Value calculated from dilution.
J - Value less than the low standard but above the Limit of Detection (LOD).
L - Sample leaked before receipt.
H - Value greater than the high standard.

84 1 ppm anions 11-5-14

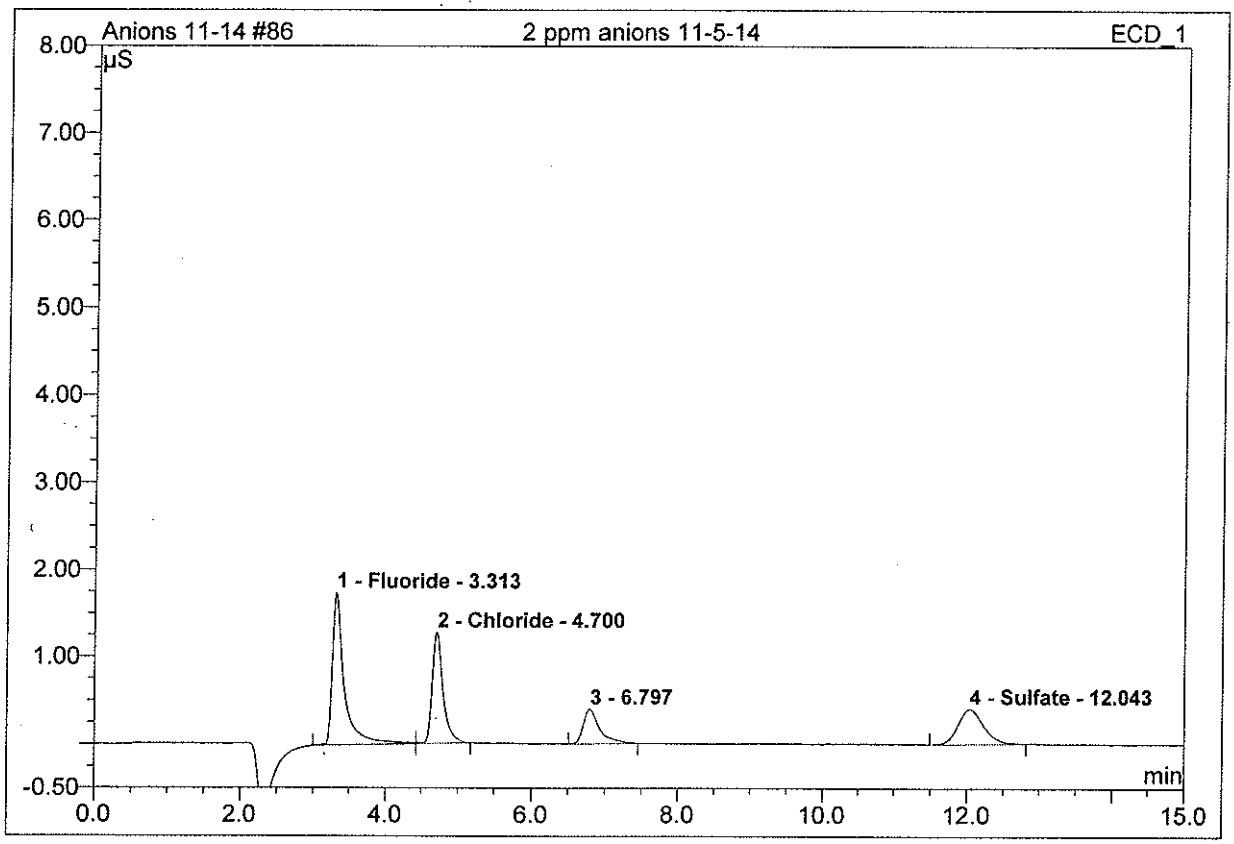
Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**84**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/14/2014 20:31**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	3.31	Fluoride	0.875	0.1807
4	12.06	Sulfate	0.199	0.0792

86 2 ppm anions 11-5-14

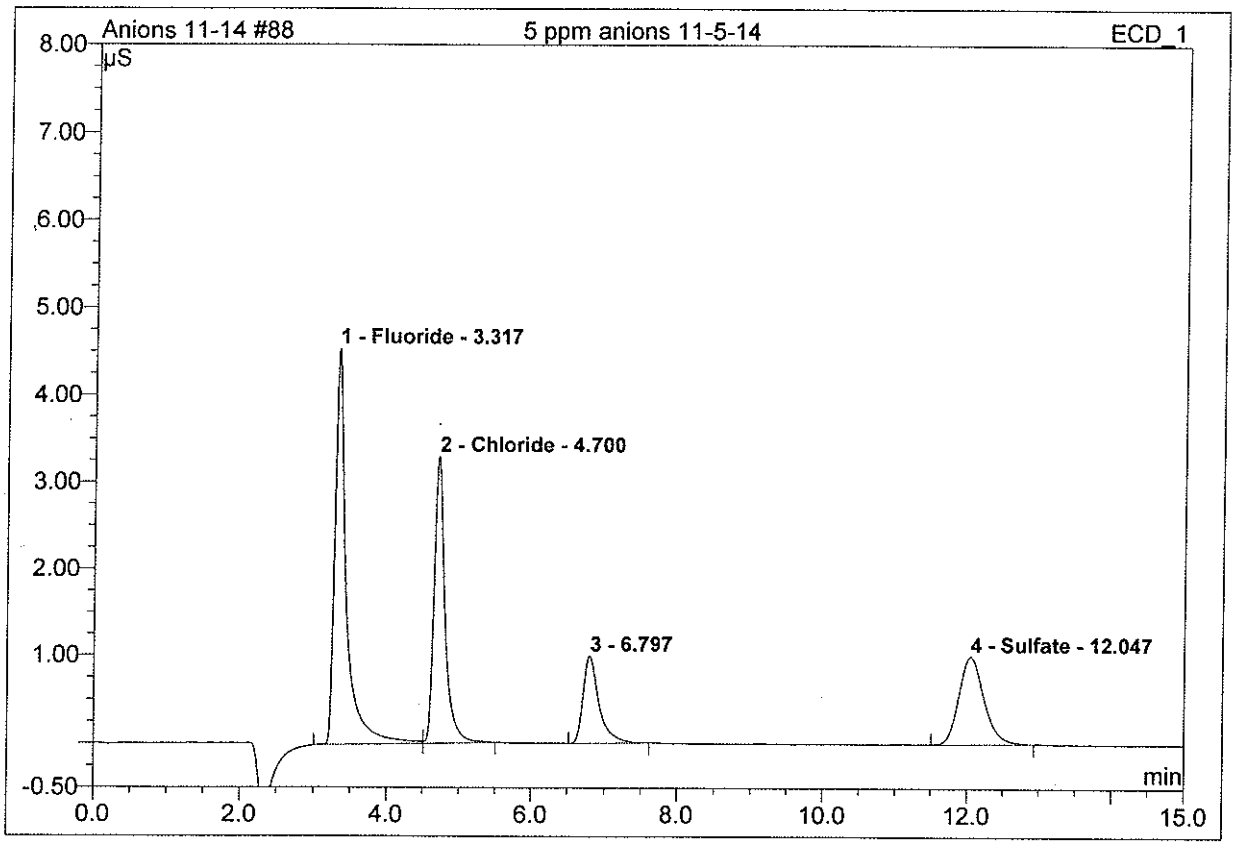
Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**86**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/14/2014 21:07**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	3.31	Fluoride	1.748	0.3343
2	4.70	Chloride	1.274	0.2198
4	12.04	Sulfate	0.400	0.1631

88 5 ppm anions 11-5-14

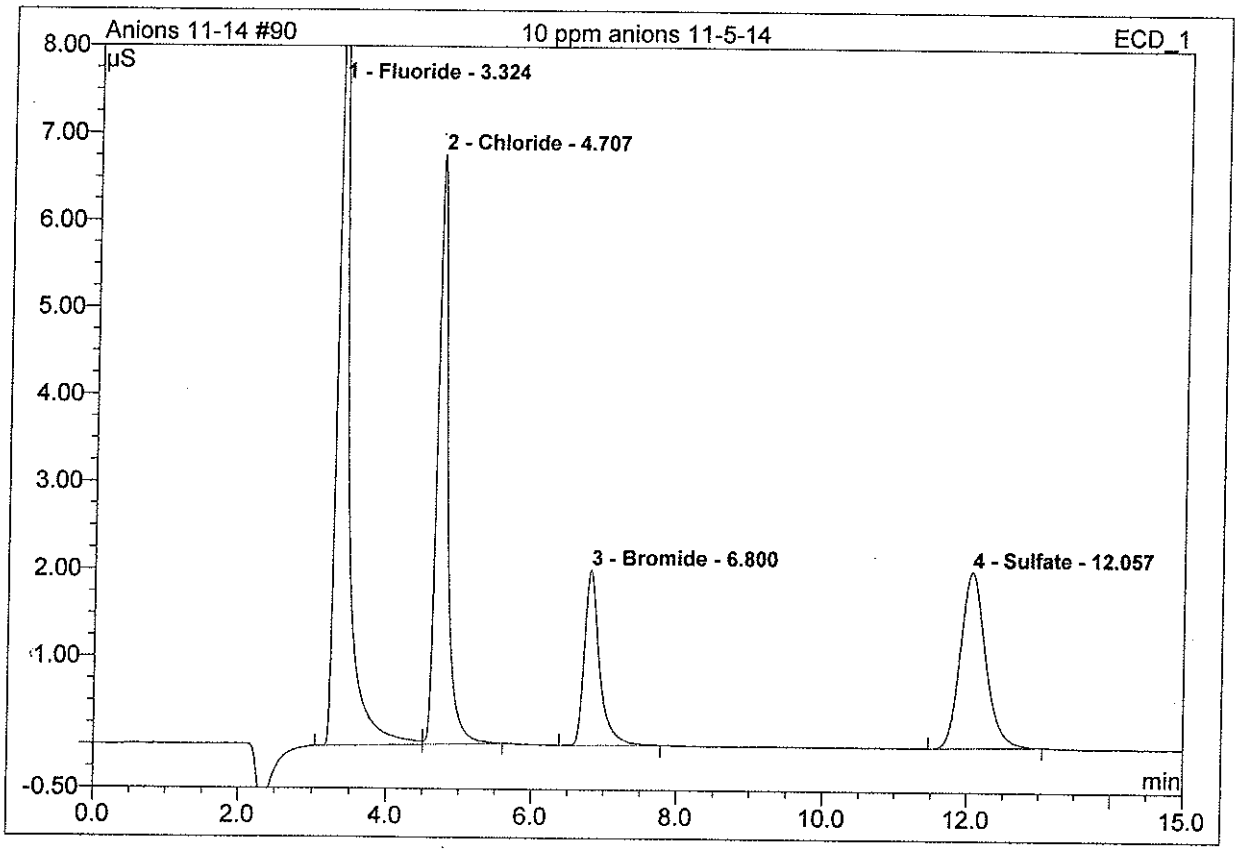
Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**88**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/14/2014 21:43**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	3.32	Fluoride	4.549	0.8412
2	4.70	Chloride	3.291	0.5744
4	12.05	Sulfate	0.999	0.4042

90 10 ppm anions 11-5-14

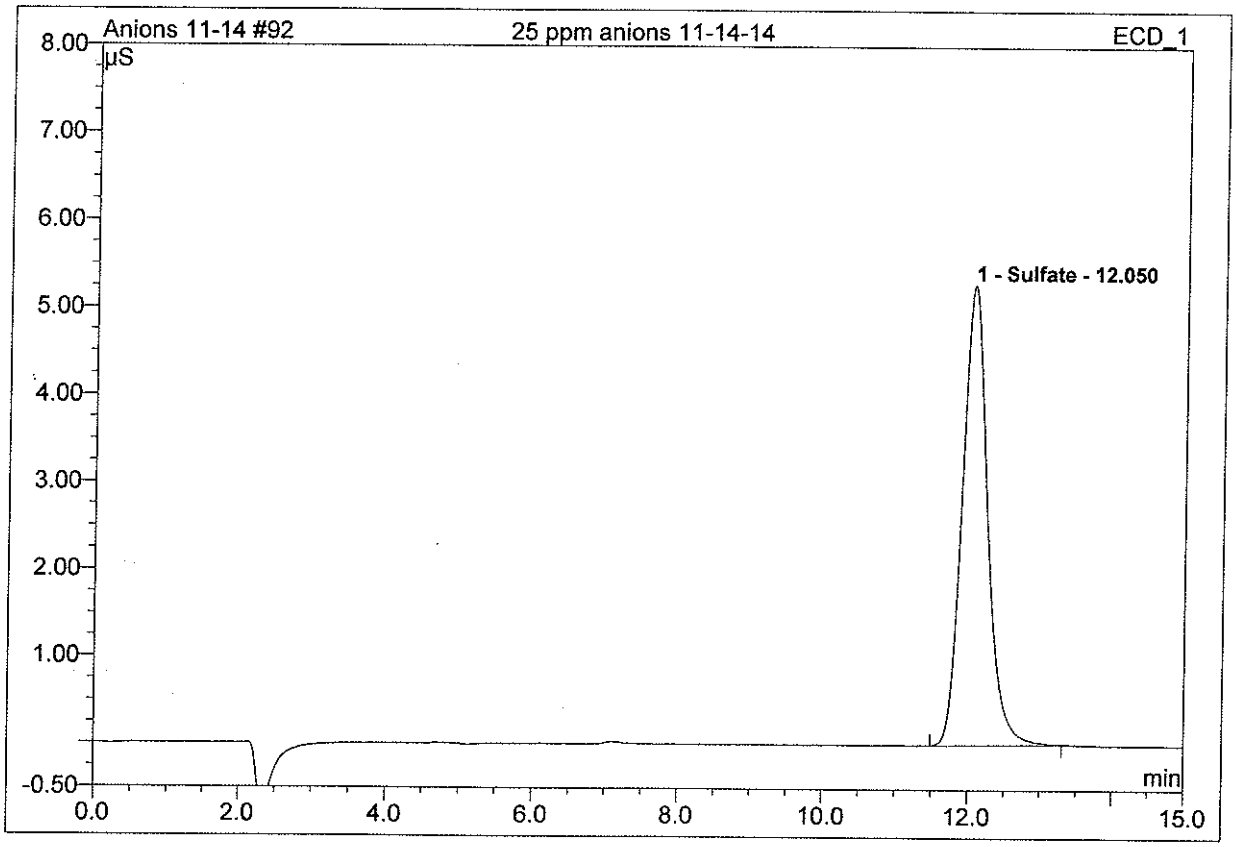
Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**90**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/14/2014 22:19**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	3.32	Fluoride	9.458	1.6906
2	4.71	Chloride	6.759	1.1650
3	6.80	Bromide	2.008	0.4946
4	12.06	Sulfate	2.014	0.8147

92 25 ppm anions 11-14-14

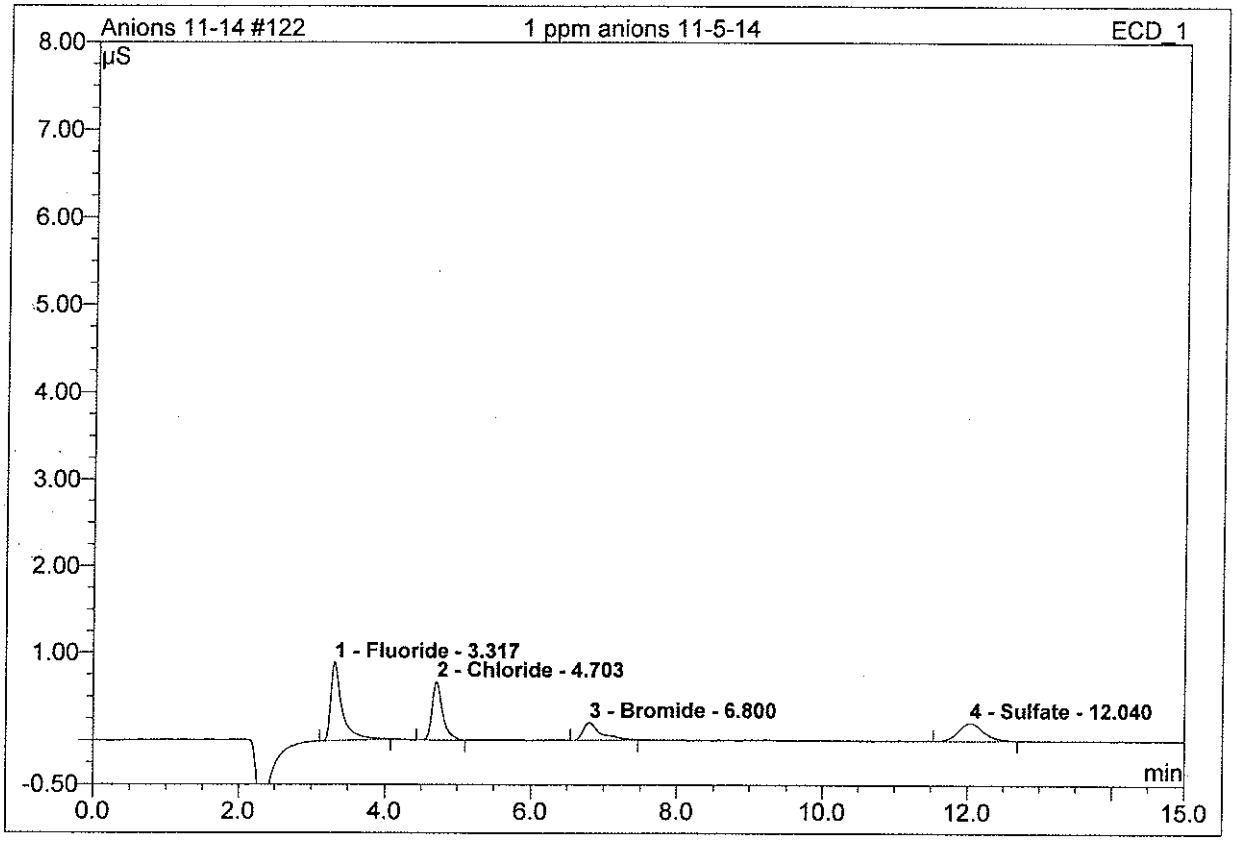
Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**92**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/14/2014 22:55**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.05	Sulfate	5.270	2.1307

122 1 ppm anions 11-5-14

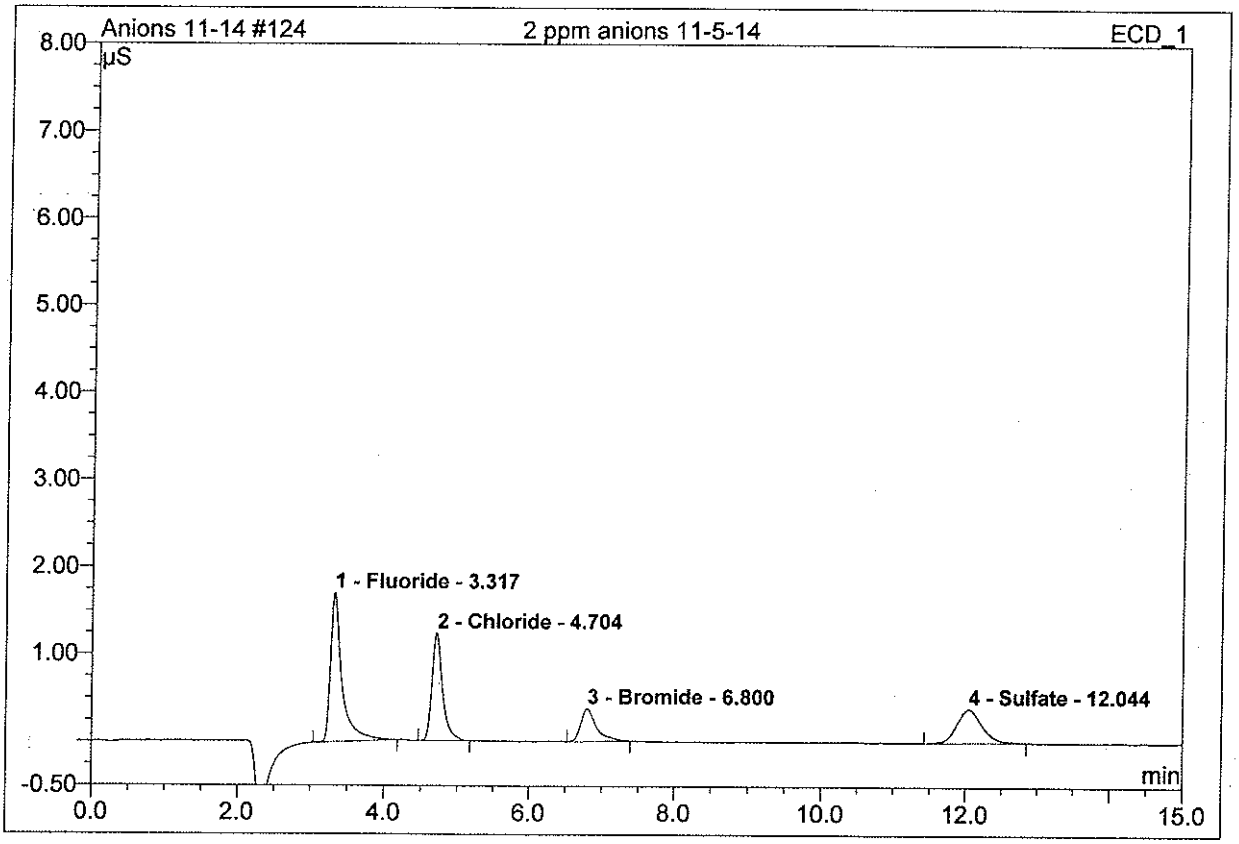
Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**122**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/15/2014 7:59**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	3.32	Fluoride	0.896	0.1594
2	4.70	Chloride	0.663	0.1124
3	6.80	Bromide	0.199	0.0562
4	12.04	Sulfate	0.203	0.0816

124 2 ppm anions 11-5-14

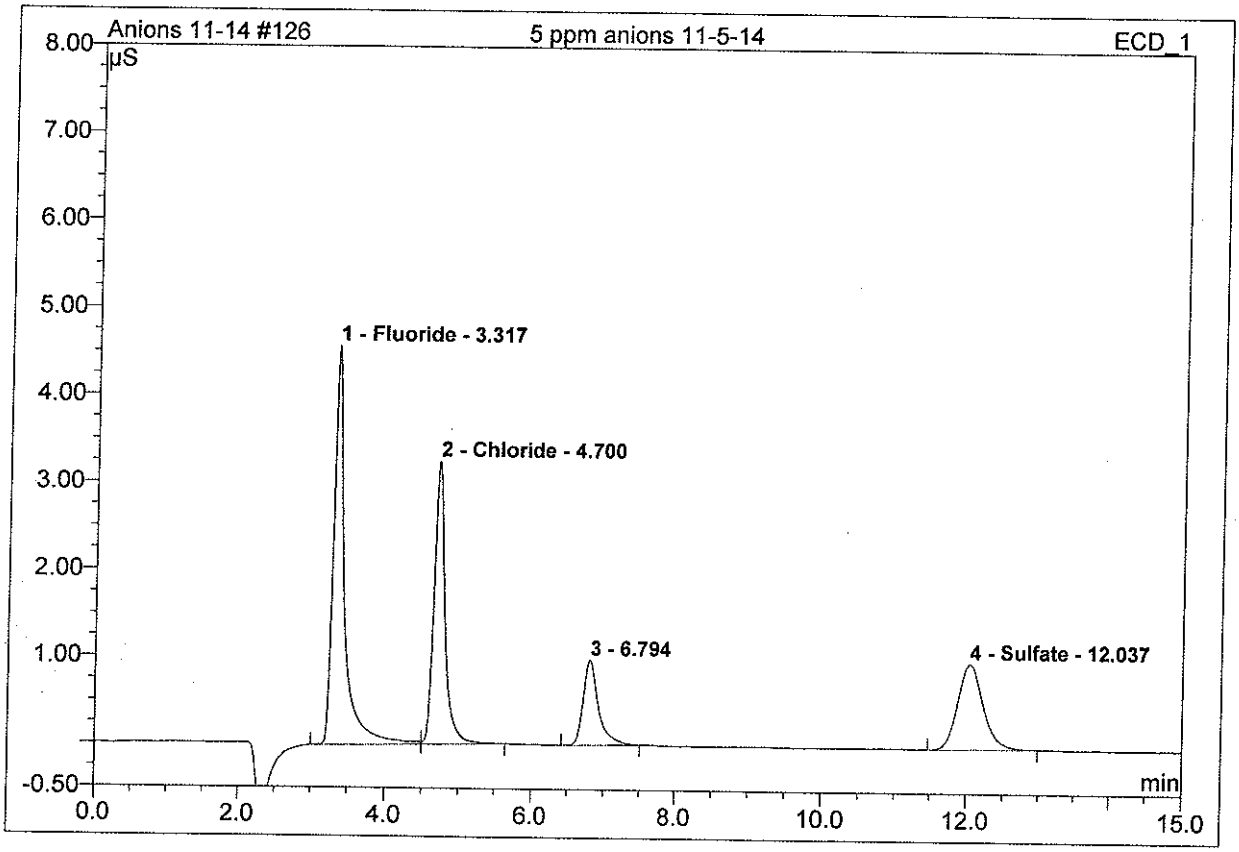
Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**124**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/15/2014 8:35**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	3.32	Fluoride	1.707	0.3051
2	4.70	Chloride	1.229	0.2093
3	6.80	Bromide	0.373	0.0937
4	12.04	Sulfate	0.385	0.1576

126 5 ppm anions 11-5-14

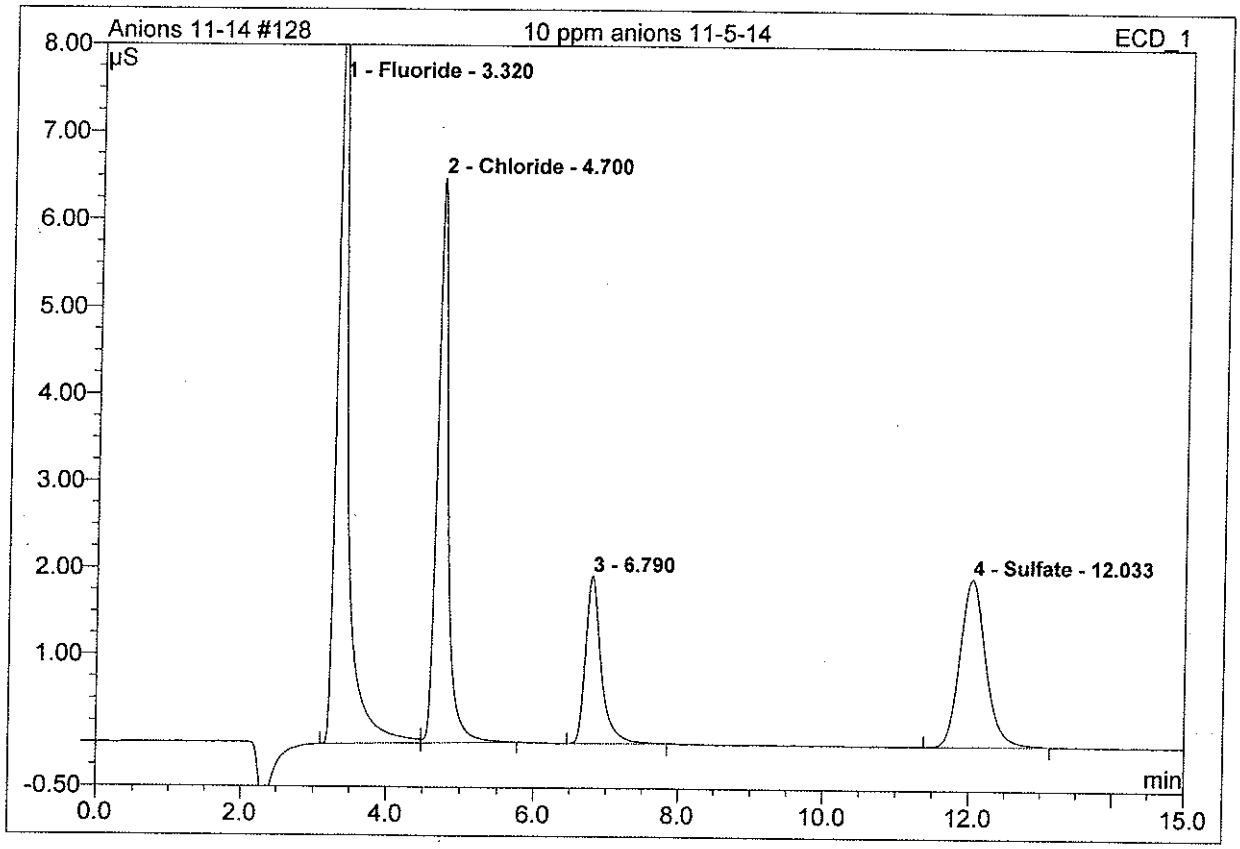
Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**126**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/15/2014 9:11**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	3.32	Fluoride	4.579	0.8279
2	4.70	Chloride	3.247	0.5668
4	12.04	Sulfate	0.983	0.4012

128 10 ppm anions 11-5-14

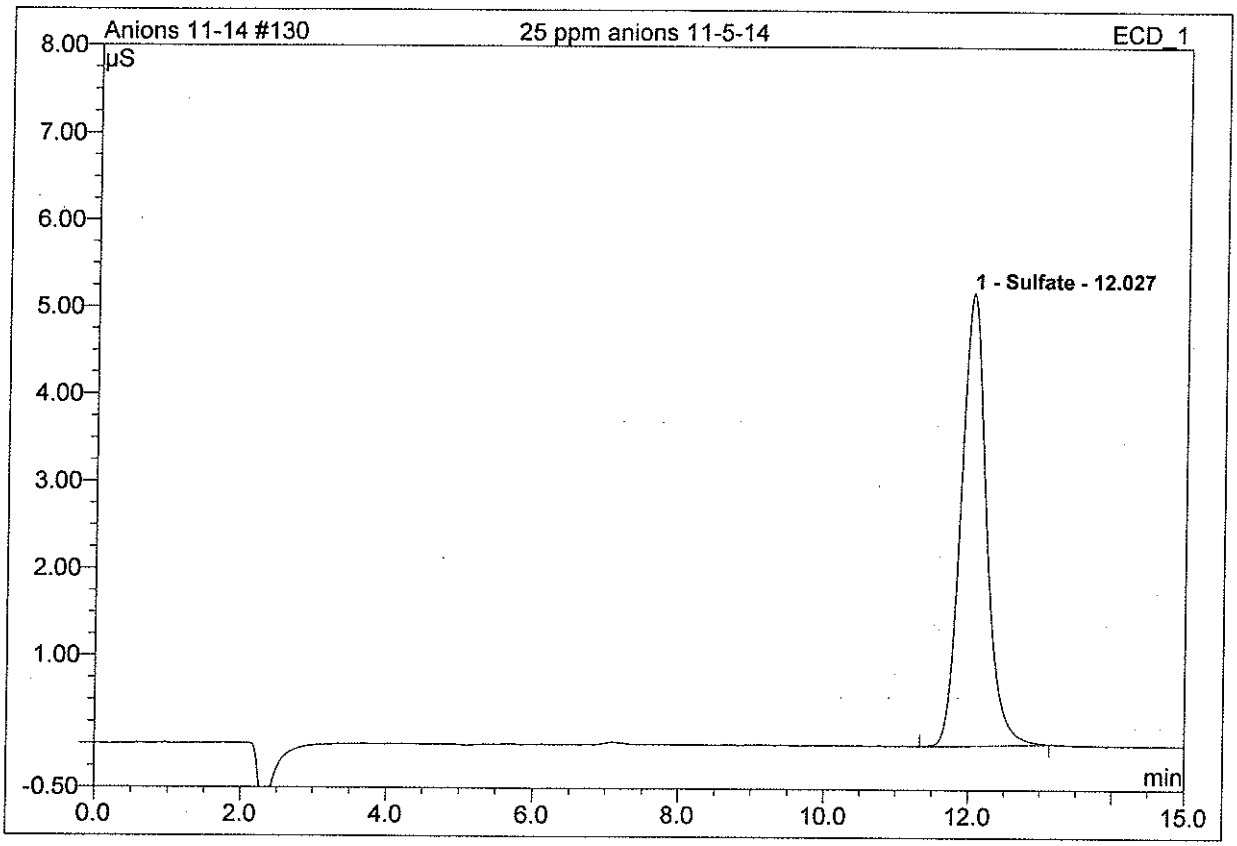
Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**128**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/15/2014 9:47**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	3.32	Fluoride	9.246	1.6266
2	4.70	Chloride	6.481	1.1301
4	12.03	Sulfate	1.919	0.7939

130 25 ppm anions 11-5-14

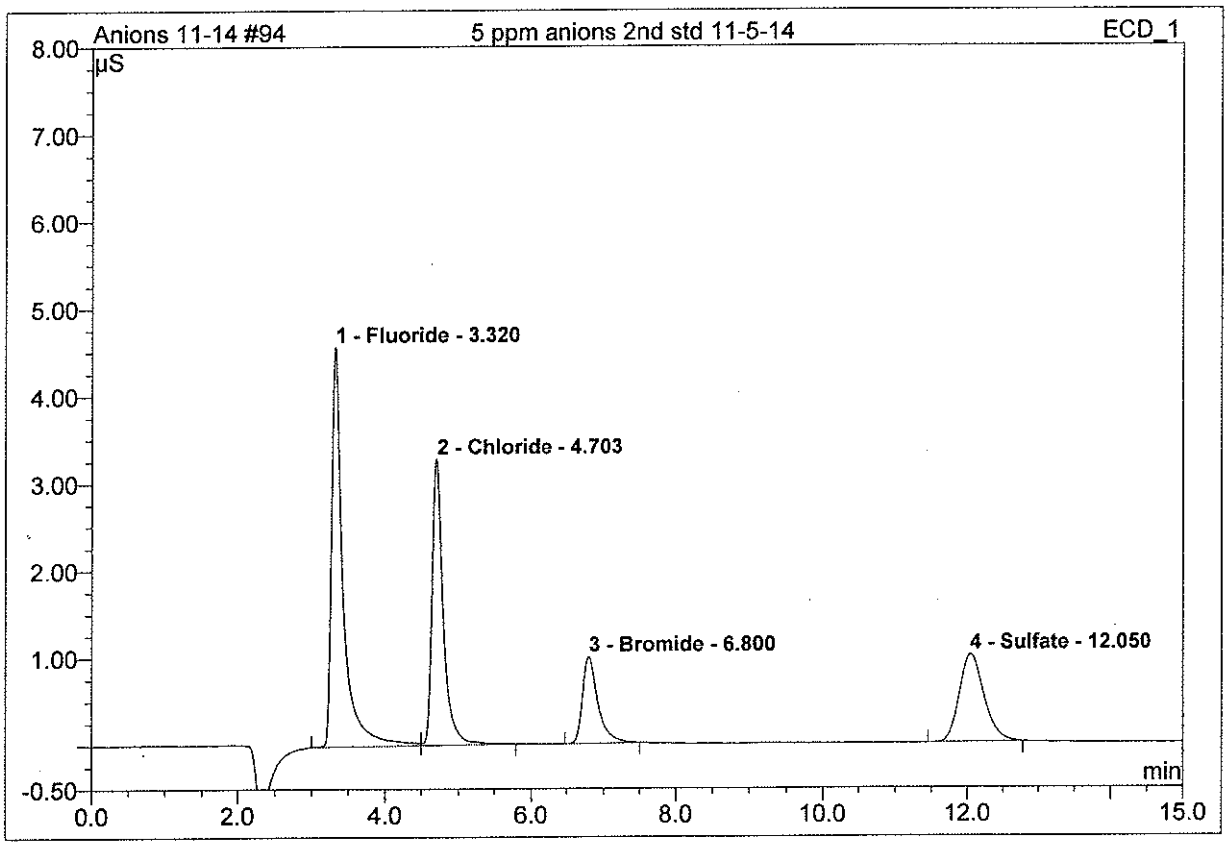
Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**130**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/15/2014 10:23**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.03	Sulfate	5.182	2.1290

94 5 ppm anions 2nd std 11-5-14

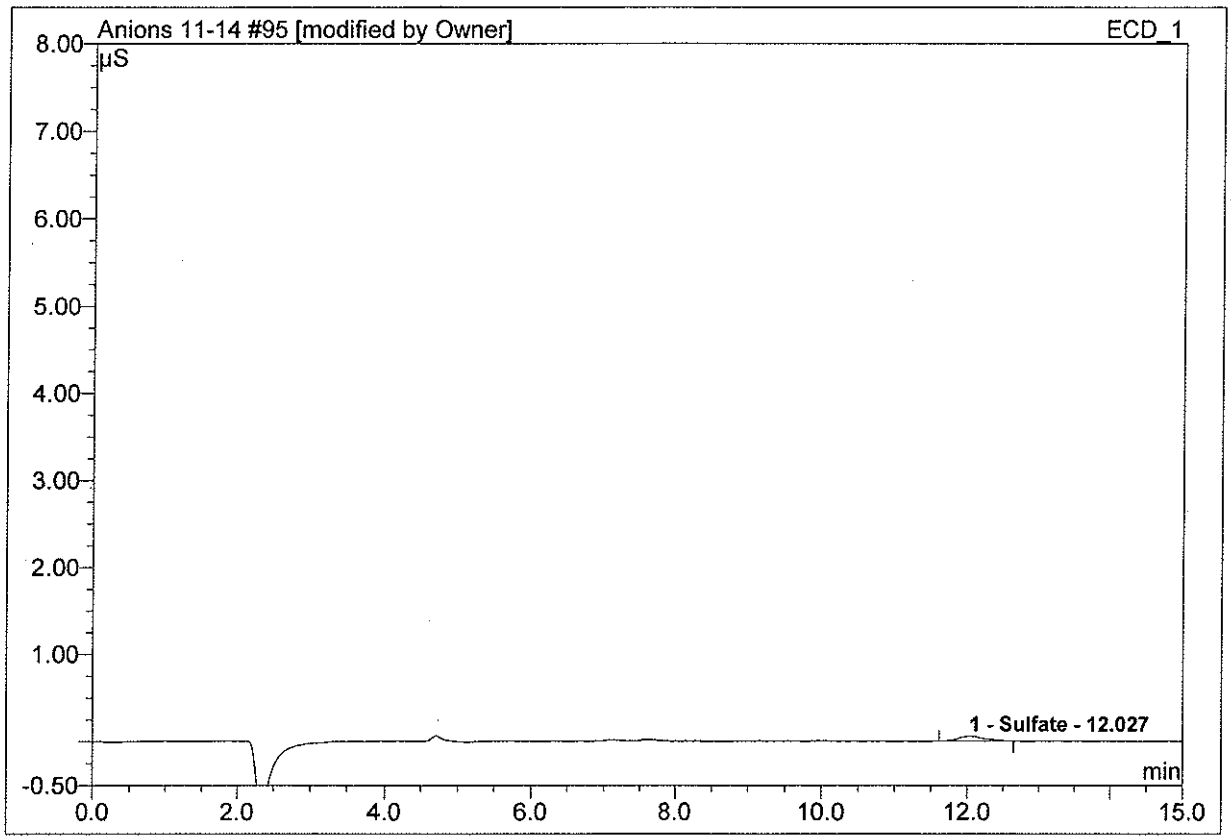
Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**94**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/14/2014 23:32**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	3.32	Fluoride	4.573	0.8440
2	4.70	Chloride	3.275	0.5767
3	6.80	Bromide	0.993	0.2424
4	12.05	Sulfate	1.003	0.4017

95 5F-1 #13923/13924

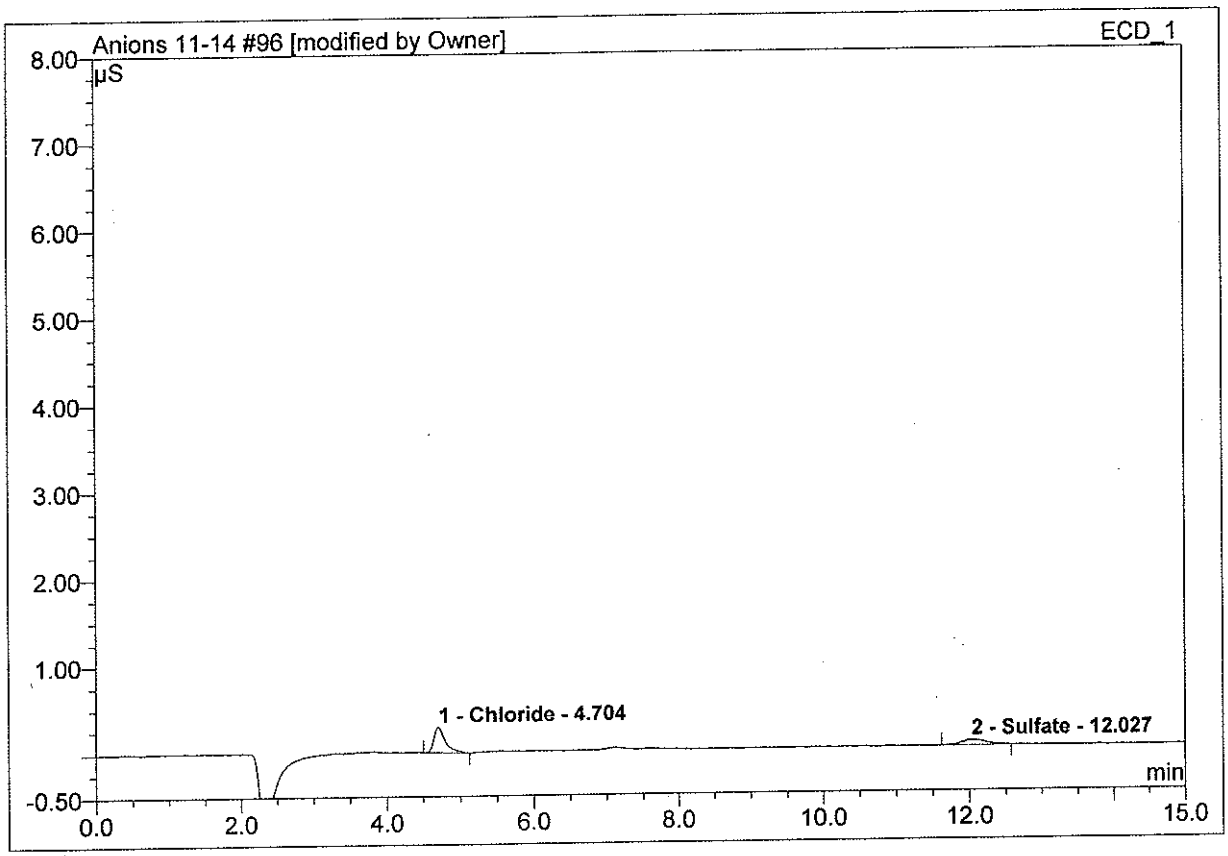
Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**95**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/14/2014 23:50**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.03	Sulfate	0.056	0.0230

96 5F-1 #13923/13924

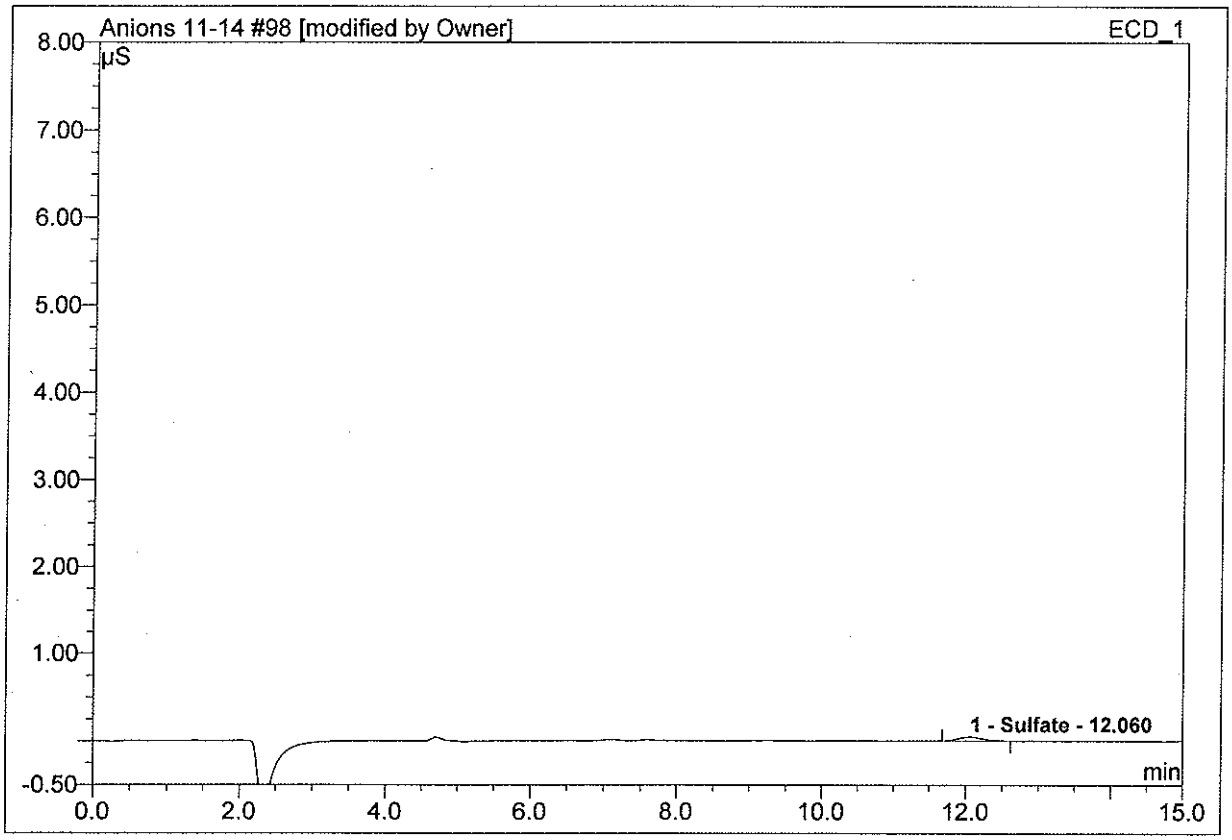
Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**96**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/15/2014 0:08**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	4.70	Chloride	0.285	0.0513
2	12.03	Sulfate	0.060	0.0227

98 5F-2 #13925/13926

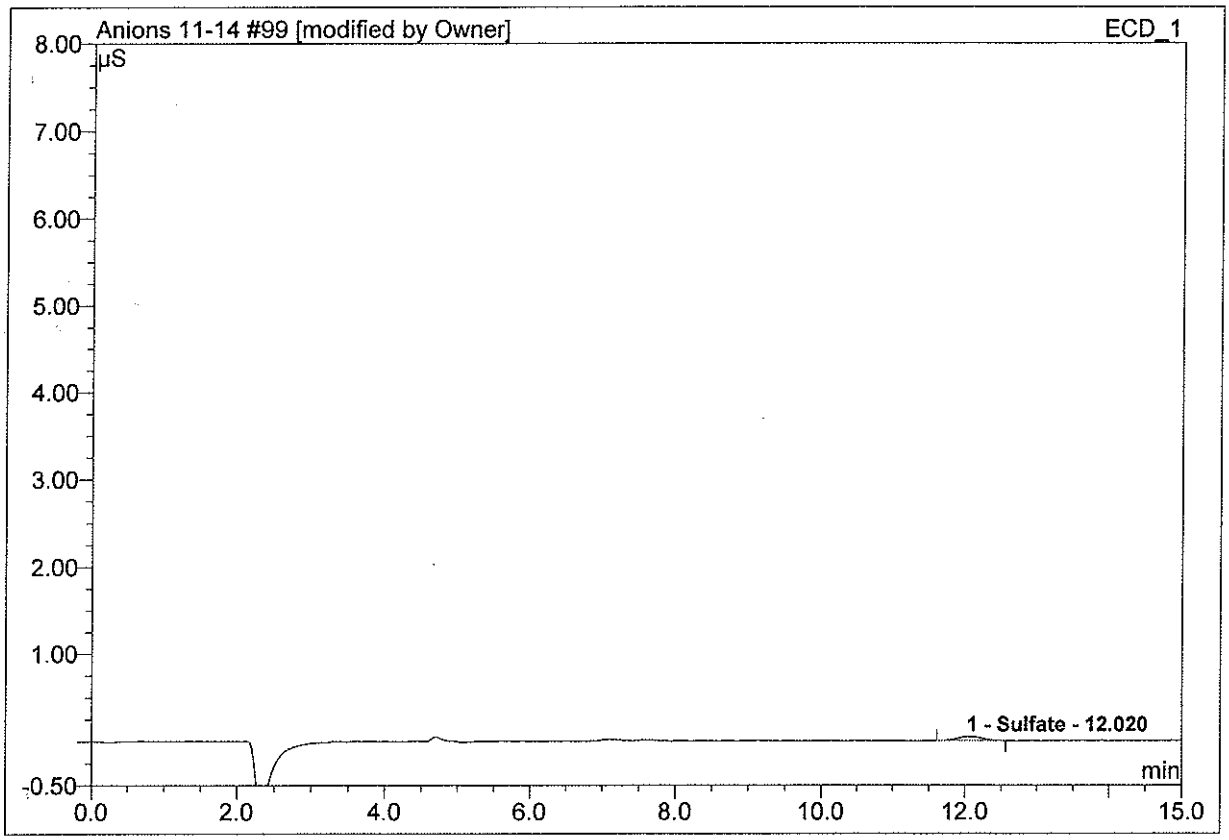
Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**98**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/15/2014 0:44**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.06	Sulfate	0.046	0.0182

99 5F-2 #13925/13926

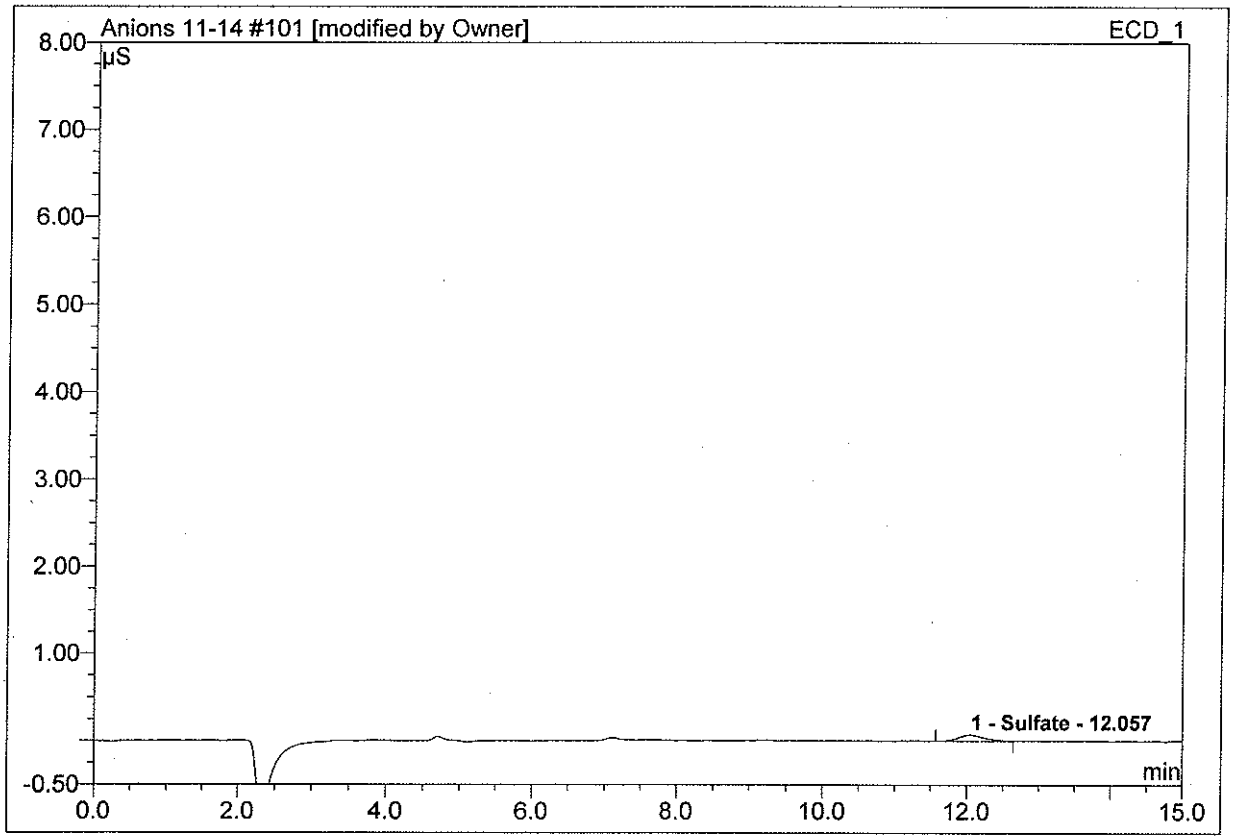
Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**99**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/15/2014 1:02**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.02	Sulfate	0.046	0.0184

101 5F-3 #13927/13928

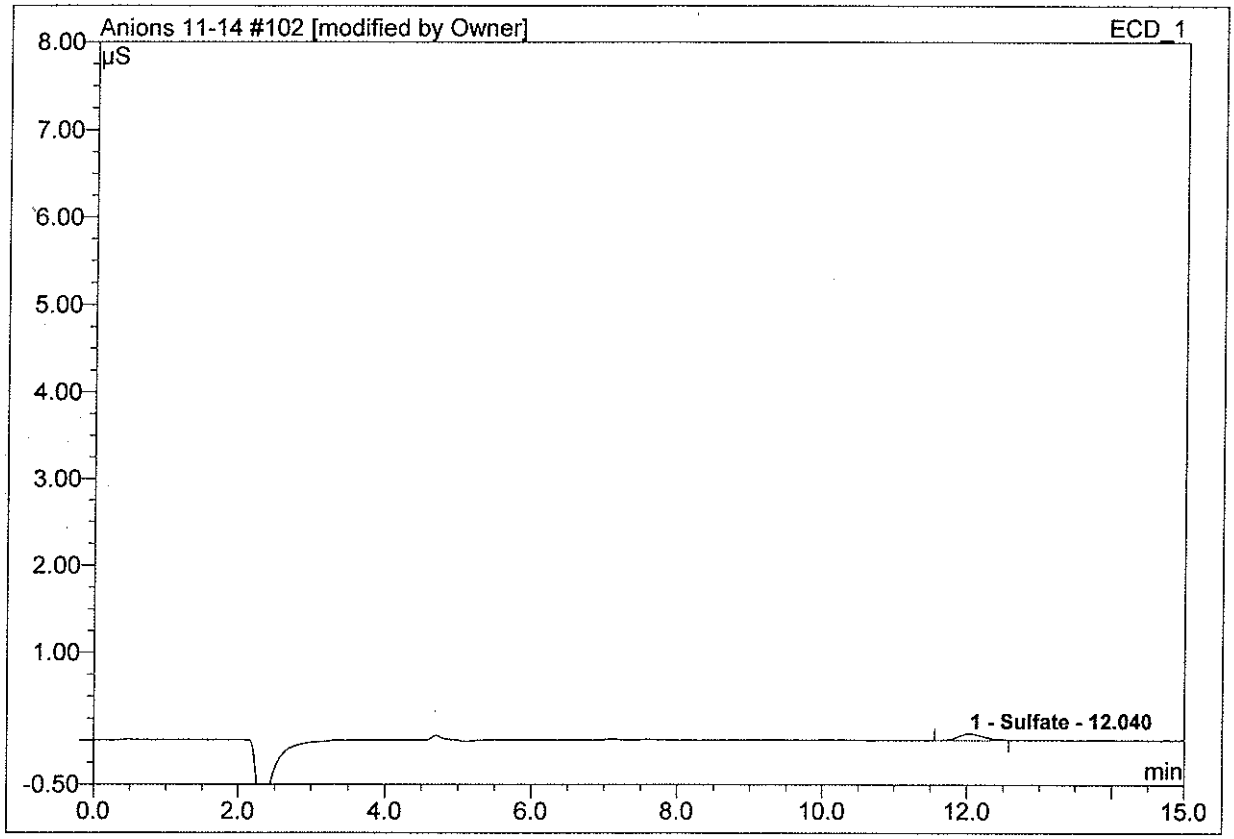
Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**101**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/15/2014 1:38**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.06	Sulfate	0.073	0.0298

102 5F-3 #13927/13928

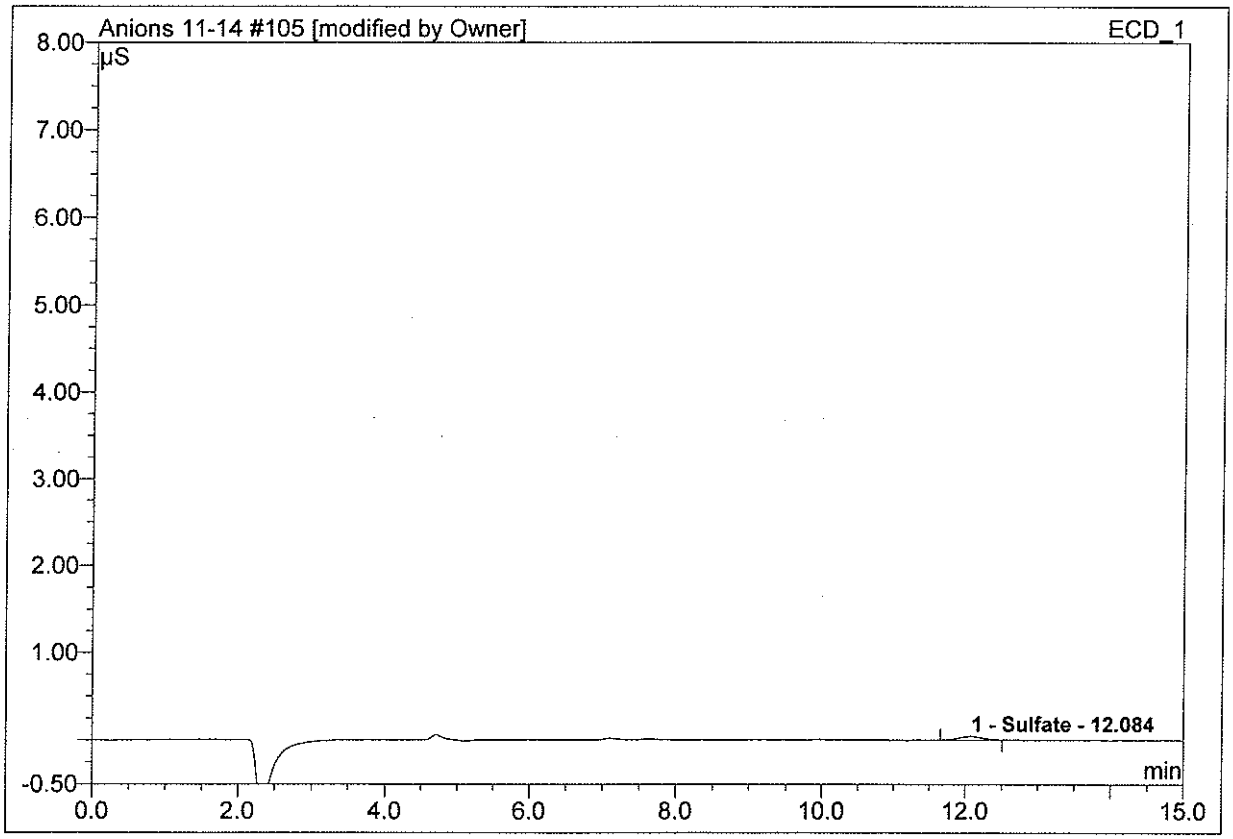
Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**102**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/15/2014 1:56**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.04	Sulfate	0.074	0.0294

105 5F-4 #13929/13930

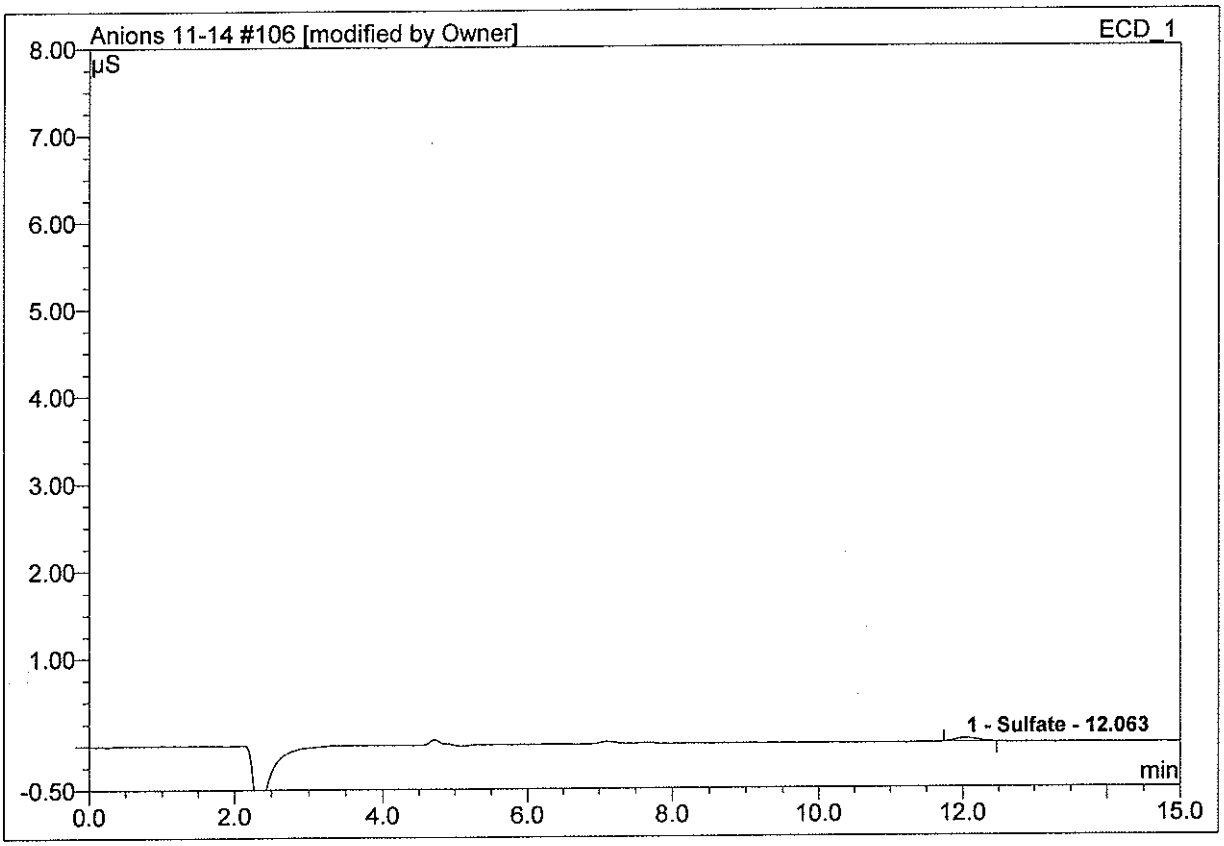
Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**105**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/15/2014 2:51**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.08	Sulfate	0.042	0.0161

106 5F-4 #13929/13930

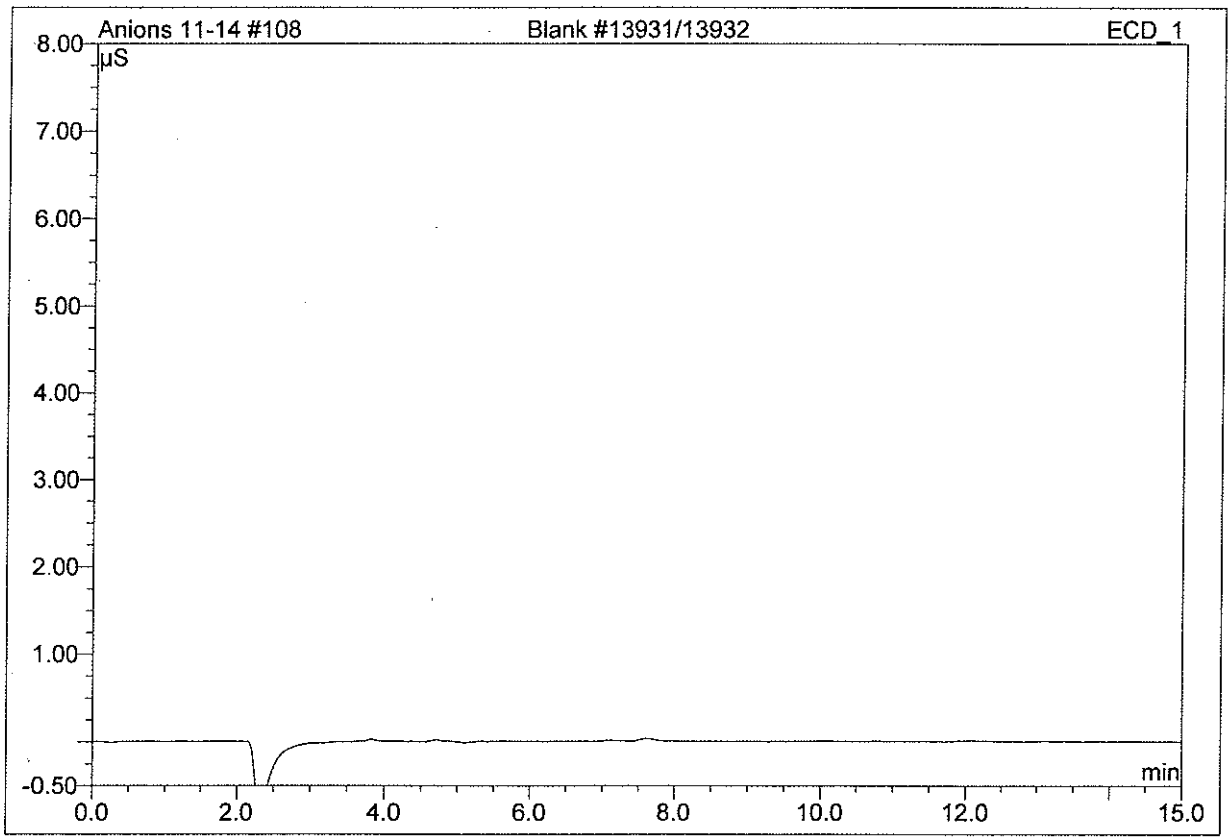
Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**106**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/15/2014 3:09**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.06	Sulfate	0.043	0.0155

108 Blank #13931/13932

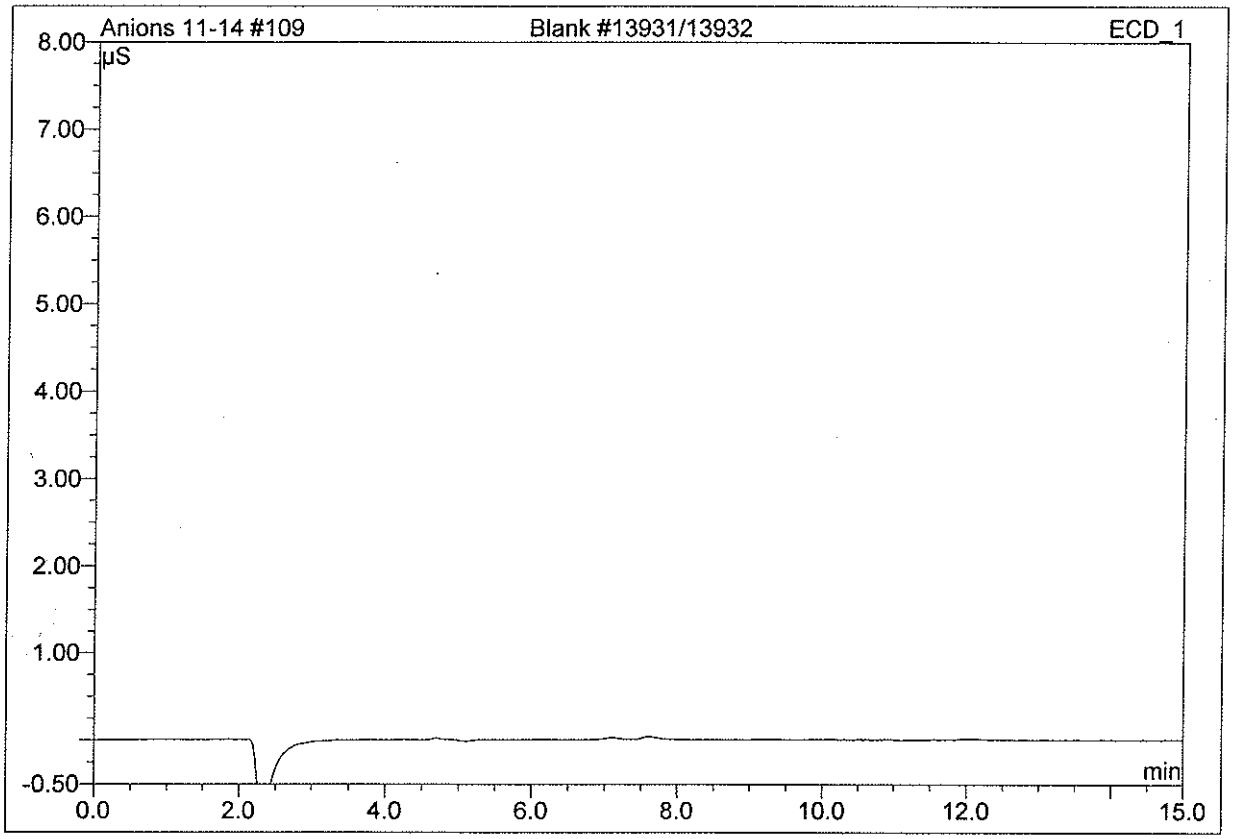
Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**108**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/15/2014 3:45**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min

109 Blank #13931/13932

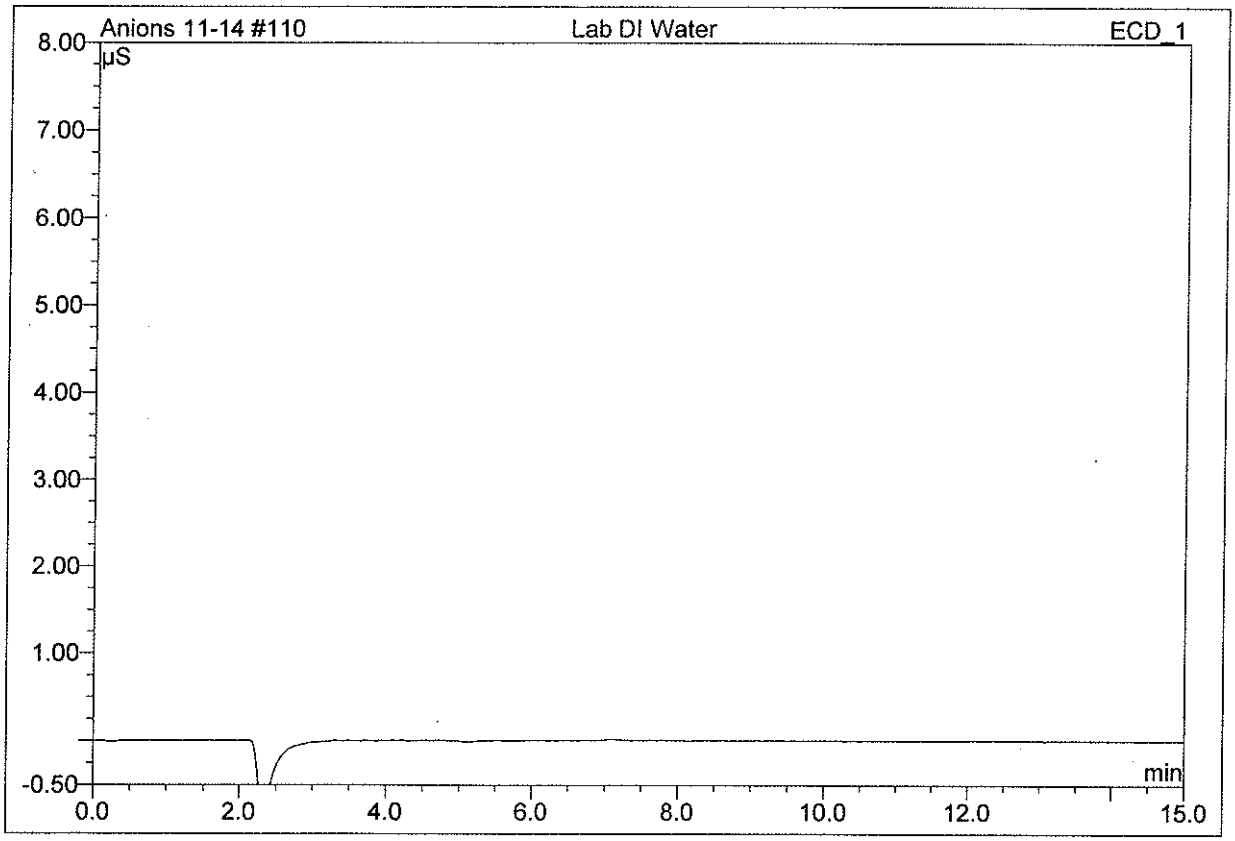
Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**109**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/15/2014 4:03**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min

110 Lab DI Water

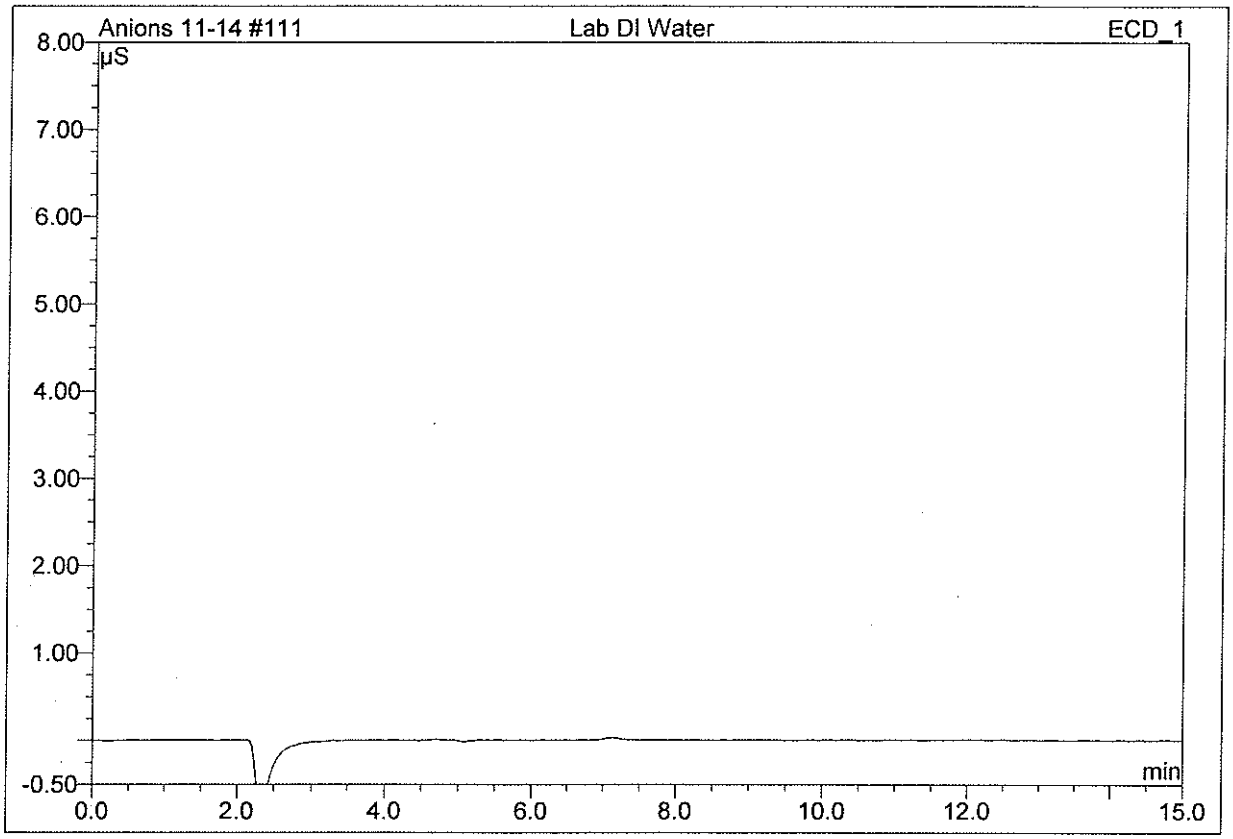
Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**110**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/15/2014 4:21**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min

111 Lab DI Water

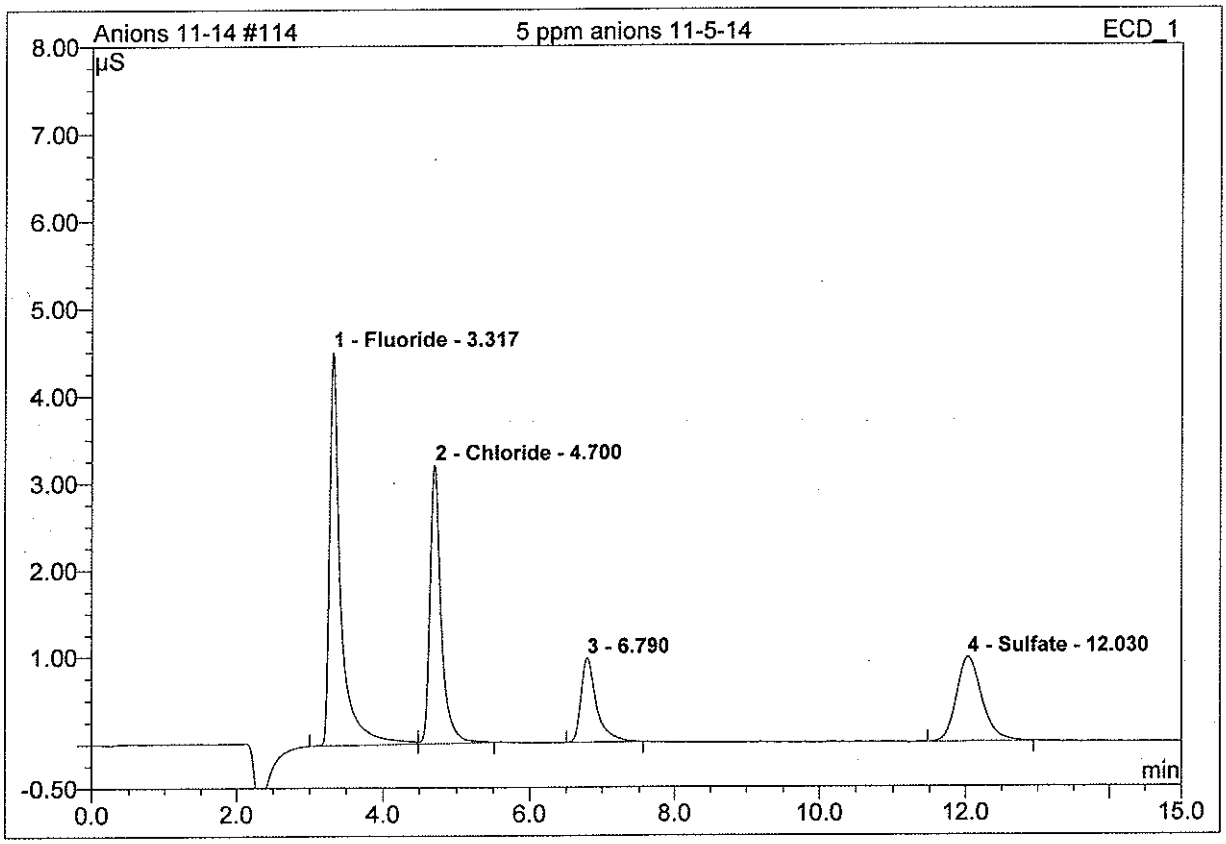
Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**111**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/15/2014 4:39**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min

114 5 ppm anions 11-5-14

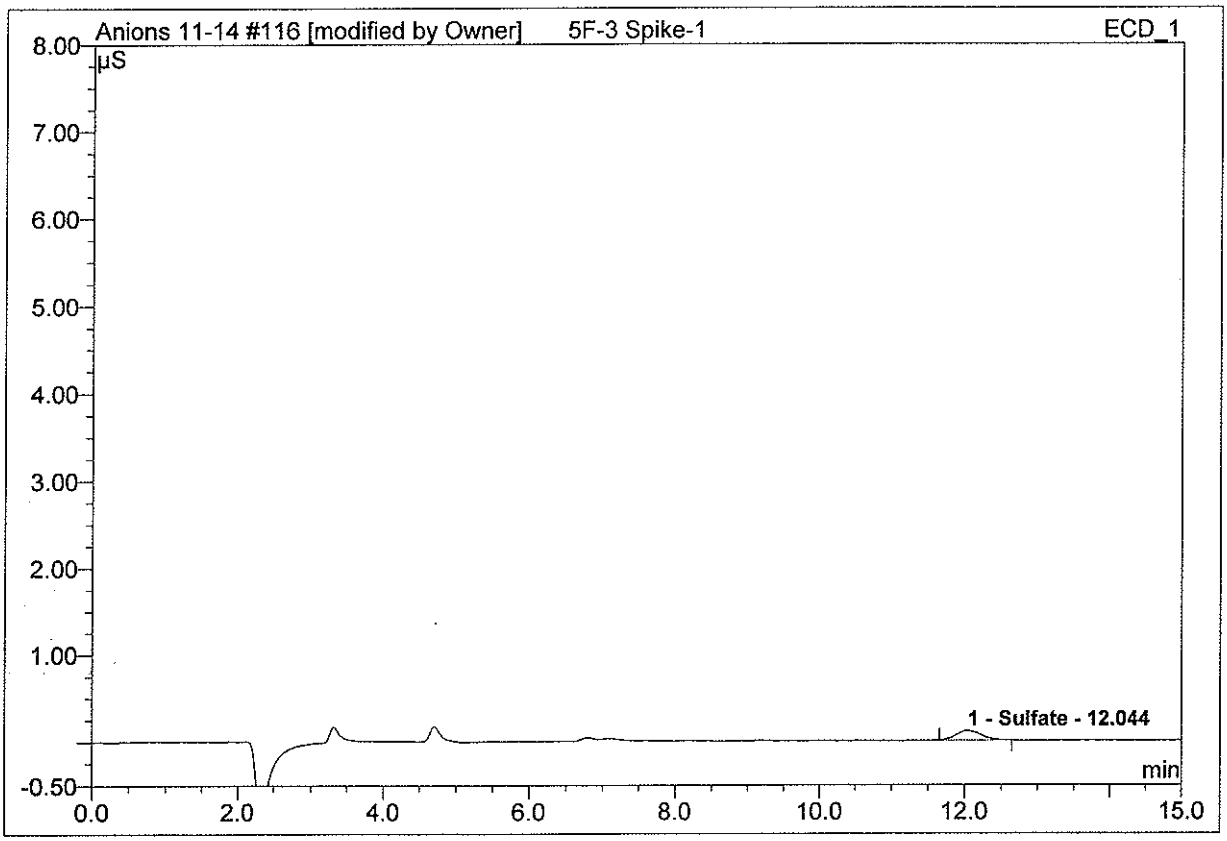
Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**114**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/15/2014 5:34**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	3.32	Fluoride	4.515	0.8160
2	4.70	Chloride	3.195	0.5534
4	12.03	Sulfate	0.966	0.3940

116 5F-3 Spike-1

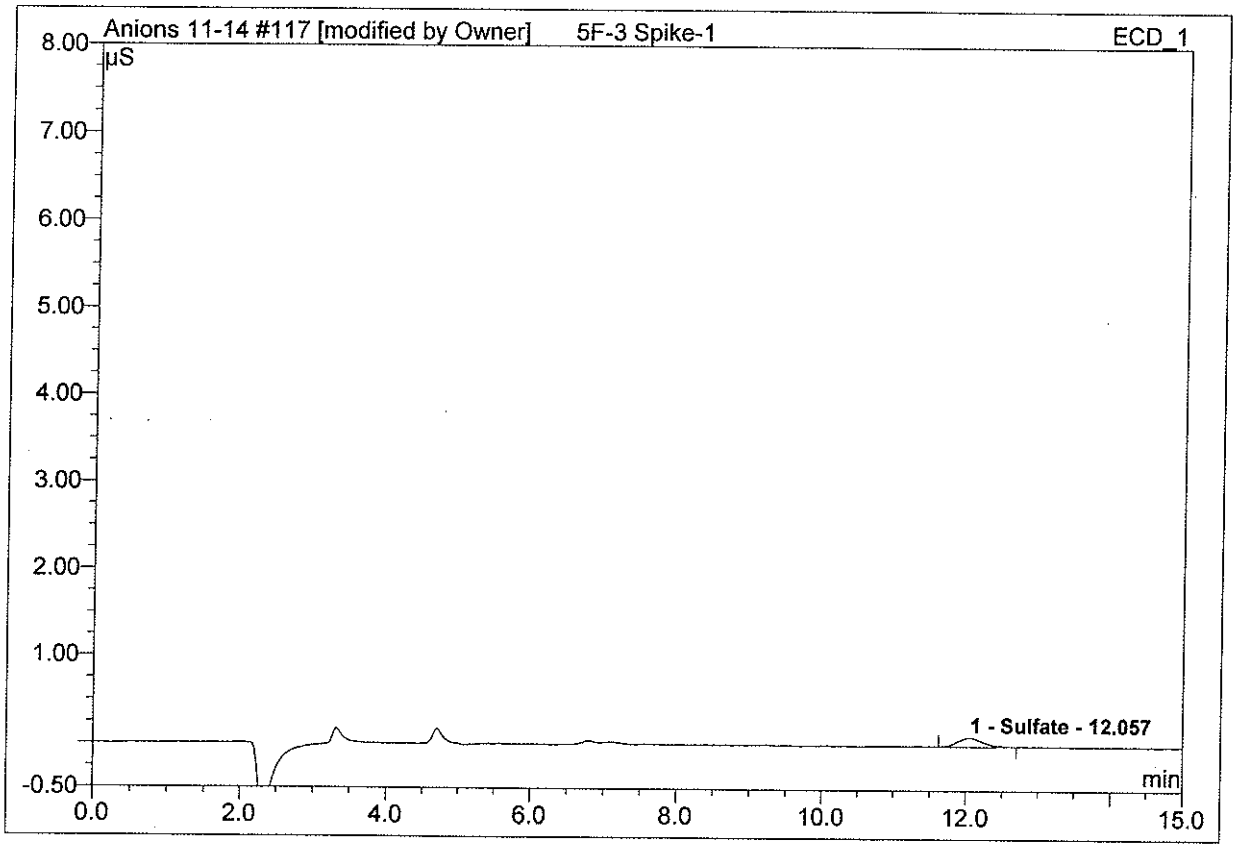
Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**116**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/15/2014 6:10**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.04	Sulfate	0.108	0.0432

117 5F-3 Spike-1

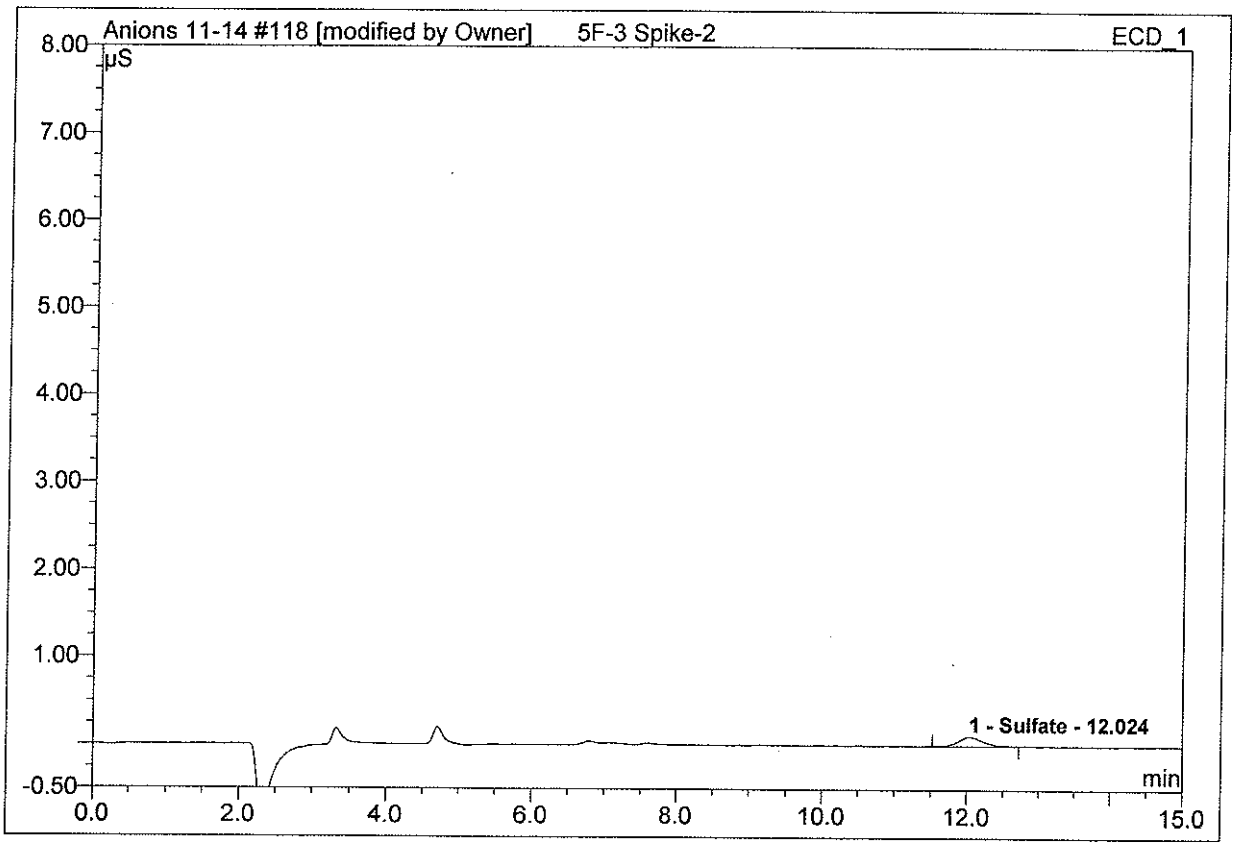
Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**117**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/15/2014 6:28**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.06	Sulfate	0.102	0.0412

118 5F-3 Spike-2

Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**118**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/15/2014 6:46**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**

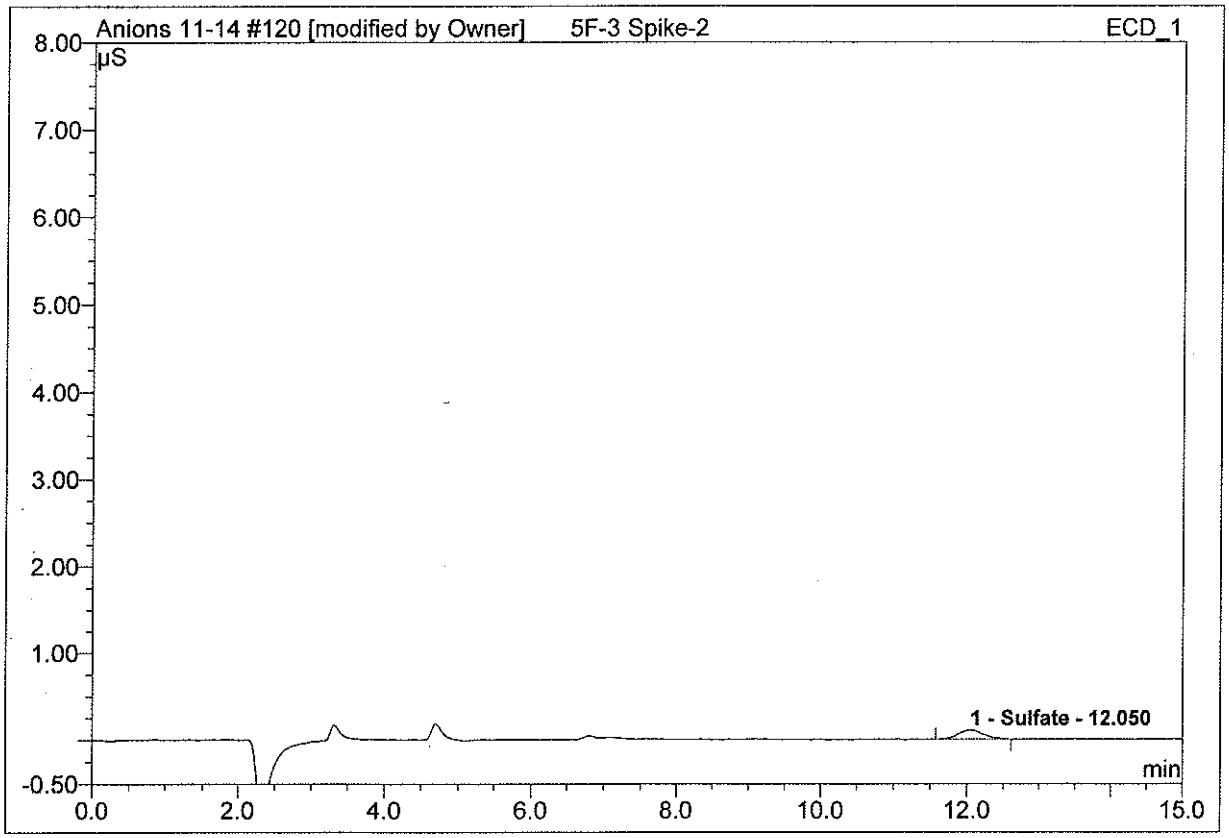


No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.02	Sulfate	0.109	0.0442

Chromeleon (c) Dionex 1996-2001
Version 6.80 SR11 Build 3161 (184582)

120 5F-3 Spike-2

Client	**BP**	*Injection Volume:*	**20.0**
Vial Number:	**120**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**11/15/2014 7:22**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	12.05	Sulfate	0.103	0.0415

USEPA METHOD 5F TASK SCHEDULE

Client: BP Whiting

Location: Whiting, IN

Project Manager: S. Flaherty

Date Sampled: 10/23/14

Lab Project #: 08-687

Spreadsheet Template ID: USEPA-M5F-Partic-Template-61T-REV3

Analyst: J. Ruggaber

Eluent

Sodium Carbonate (Na_2CO_3) manufacturer and lot: Fisher, Lot 095351

Batch Number	Amount weighed/2L	Date/Time Prepared
1	1.6960 g	11/14/14, 12:59
2	g	
3	g	

Sodium Bicarbonate ($NaHCO_3$) manufacturer and lot: Fisher, Lot 110567

Batch Number	Amount weighed/2L	Date/Time Prepared
1	0.1683 g	11/14/14, 12:59
2	g	
3	g	

Reagents

Phenolphthalein Solution: WL-LOG#4-Log-037A page 46

Ammonium Hydroxide: 0.0992 N, lot SHBC0698V, Fluka

Standard Identification

1)1.0 ppm anions 11-5-14

2)2.0 ppm anions 11-5-14

3)5.0 ppm anions 11-5-14

4)10.0 ppm anions 11-5-14

5) 25.0 ppm SO4 11-14-14

Secondary standard solution 5.0 ppm anions 11-5-14

DATE/TIME	EQUIPMENT	TASK
N/A	N/A	If not already performed in the field, remove the filter from the filter holder and place into a Petri dish.
11/3/14	N/A	Cut the filter into small pieces, and transfer to a 250 mL beaker.
11/3/14	N/A	Rinse the Petri dish with water, and transfer the wash to the beaker. Add additional water to approximately 75 mL.
11/3/14, 10:00 – 16:45	N/A	Reflux on a hot plate for 6-8 hours.
11/3/14 – 11/4/14	N/A	Cool the flasks, and transfer contents, including particulate and filter pieces, to a 500 mL (or 1000 mL, if needed) volumetric flask.
11/4/14	N/A	Add the probe wash (with rinse) to the volumetric flask. Dilute to volume with water. Repeat for all samples and blanks.
11/4/14	N/A	After solids settle, volumetrically dilute 5 mL to 50 mL with water. Save for sulfate analysis.
11/3/14 9:14	Desiccator #1	Place labeled beakers in desiccator (store 24 hrs).
11/5/14 14:58	Balance #1	Weigh conditioned beakers and record tares.
11/5/14 – 11/6/14	Oven #1	Evaporate the contents of the volumetric flasks (and rinses) in tared beakers using a 105 ˚C oven to about 100 mL.
11/6/14	N/A	Remove the beakers from the oven and cool.
11/6/14	N/A	Add approximately 5 drops of phenolphthalein to each beaker. Add concentrated ammonium hydroxide dropwise until the solution turns pink.
11/7/14	Oven #1	Return the beakers to the oven and evaporate to dryness.
11/7/14 11:10	Desiccator #1	Place beakers in desiccator (store min. 24 hours)

Sample Receipt Checklist

Client Name: BP

Site Location: Whiting, IN

ARI Project Manager: Steve Flaherty

Sample Collection Date(s): 10/23 - 10/24/14

Chain-of-Custody Number(s): 7011

Chain-of-Custody Form(s):

Custody release signatures, dates, and times present:	Yes
Preservation code noted:	Yes
Project information clearly identified:	Yes
Sample information clearly identified:	Yes
Analysis request clearly identified:	Yes
Report tier level noted:	Yes

Sample Containers:

Quantity of samples match number on the COC	Yes
Container label ID numbers and descriptions match COC	Yes
All containers received in good condition	Yes
Liquid levels at marked heights on containers	Yes
All container labels are legible	Yes
All sample IDs are unique	Yes
Samples received in correct container type	Yes
Samples received within the required holding time	Yes
Samples received under the required preservation code	Yes

Non-Conformances and/or Corrective Actions Applied:

All sample receipt acceptance criteria met.

Samples Received by: Eric Vogt

signature

Date and Time received: 10/27/14, 9:30

Form LF0002

ARI ENVIRONMENTAL, INC.

951 N. Old Rand Rd, Unit 106
Wauconda, Illinois 60084

Chain of Custody Record 7011

1710 Preston Rd., Unit C
Pasadena, Texas 77503

LAB USE ONLY: 08-687

Lab Project No.:
Client Name: BP
Location: Whiting, IN
ARI Project Manager: Steve Flaherty
ARI Sampler Initials: SF, WAH, BO, JP
Analysis Location (Wauconda or Pasadena): Wauconda
Engineering or Compliance Test Samples: Compliance

Preservation Code: 1 = Ambient Temp. 2 = 4°C (Ice Packs) 3 = Dry Ice 4 = Other (Noted)

Sample No.	Date Collected	Sample ID	Number of Containers	Container Type (Petri, Bottle, Bag, Tube, Summa, Bomb)	Preservation Code	Analysis Request: USEPA MSF				Comments
55691	10/23/14	1-5F Filter	1	Petri	1	x				
76380	10/23/14	1-5F PW	1	Bottle	1	x				
55687	10/23/14	2-5F Filter	1	Petri	1	x				
76381	10/23/14	2-5F PW	1	Bottle	1	x				
55692	10/23/14	3-5F Filter	1	Petri	1	x				
76382	10/23/14	3-5F PW	1	Bottle	1	x				
55693	10/24/14	4-5F Filter	1	Petri	1	x				
76383	10/24/14	4-5F PW	1	Bottle	1	x				
55688	10/23/14	Blank 5F Filter	1	Petri	1	x				
76384	10/23/14	Blank DI water	1	Bottle	1	x				

Special Instructions / Comments:

	(1) Relinquished By	(2) Relinquished By	(3) Relinquished By	SHIPMENT:
	BO	WAH		HAND CARRY
	(1) Date / Time: 10-24-14 2:30pm	(2) Date / Time: 10-24-14 4:30pm	(3) Date / Time	FEDX
	(1) Company: ARI	(2) Company: ARI	(3) Company	UPS
Requested Analysis Completion Date: 11/7/14	(1) Received By: WAH	(2) Received By: [illegible]	(3) Received By	Custody Seal Applied
Report Level: Tier I: Engineering; Tier II: Compliance; Tier III: QAPP	(1) Date / Time: 10-24-14 2:30pm	(2) Date / Time: 10/27/14 9:30	(3) Date / Time	Yes / No
Route Results Through: Steve Flaherty	(1) Company: ARI	(2) Company: ARI	(3) Company	

Form LF0001

APPENDIX D

Calibration Data

APEX INSTRUMENTS METHOD 5 POST-TEST CONSOLE CALIBRATION
USING CALIBRATED CRITICAL ORIFICES
3-POINT ENGLISH UNITS

Meter Console Information	
Console Model Number	MC522
Console Serial Number	901001
DGM Model Number	MS-4
DGM Serial Number	317423.00

Calibration Conditions			
Date	Time	28-Oct-14	10:30
Barometric Pressure		29.1	in Hg
Theoretical Critical Vacuum[1]		13.7	in Hg
Calibration Technician		B. Crane	

Factors/Conversions		
Std Temp	528	°R
Std Press	29.92	in Hg
K_1	17.647	oR/in Hg

[1]For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.

[2]The Critical Orifice Coefficient, K', must be entered in English units, $(ft^3 \cdot {}^oR^{1/2})/(in.Hg \cdot min)$.

Calibration Data

Run Time	Metering Console					Critical Orifice				
Elapsed	DGM Orifice ΔH	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final	Serial Number	Coefficient	Amb Temp Initial	Amb Temp Final	Actual Vacuum
(Θ)	(P_m)	(V_{mi})	(V_{mf})	(t_{mi})	(t_{mf})		K'	(t_{amb})	(t_{amb})	
min	in H_2O	cubic feet	cubic feet	°F	°F		see above2	°F	°F	in Hg
13.0	1.8	129.600	139.430	75	77	OX63	0.5881	78	78	16
11.0	1.8	139.430	147.780	77	78	OX63	0.5881	78	79	16
10.0	1.8	147.780	155.370	78	78	OX63	0.5881	79	80	16

Results

Standardized Data				Dry Gas Meter				
				Calibration Factor		Flowrate	ΔH @	
Dry Gas Meter		Critical Orifice		Value	Variation	Std & Corr	0.75 SCFM	Variation
($V_{m(std)}$)	($Q_{m(std)}$)	($Vcr_{(std)}$)	($Q_{cr(std)}$)	(Y)	(ΔY)	($Q_{m(std)(corr)}$)	(ΔH@)	(ΔΔH@)
cubic feet	cfm	cubic feet	cfm			cfm	in H2O	
9.470	0.728	9.602	0.739	1.014	0.001	0.739	1.798	0.002
8.022	0.729	8.121	0.738	1.012	-0.001	0.738	1.794	-0.002
7.285	0.729	7.376	0.738	1.012	0.000	0.738	1.796	0.000
Pretest Gamma	0.994	% Deviation	1.9	1.013	Y Average		1.796	ΔH@ Average

CAL-MASTERMETER-WORKBOOK-203T-REV1

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR Title 40, Part 60, Appendix A-3, Method 5, 16.2.3

Signature B Crane Date 10-28-14

ARI Environmental, Inc.
Gas Meter Thermometer Calibration Data Form
Post-Test

Meter Box: 901001
Calibrator: B. Crane
Date: 10/28/2014
Barometric: 29.13
Ambient Temp: 77
Reference Thermometer: Altek Thermocouple Source CAL-MASTERMETER-WORKBOOK-203T-REV1

Reference Temperature Altek	Thermometer Temperature Inlet	Difference (%) mean Inlet	Thermometer Temperature Oulet	Difference (%) mean Oulet	Thermometer Temperature Probe	Difference (%) mean Probe
0	NA		1	0.22	1	0.22
100			100	0.00	100	0.00
200			202	0.30	202	0.30
300			302	0.26	302	0.26
400			398	-0.23	398	-0.23
500			499	-0.10	499	-0.10

Reference Temperature Altek	Thermometer Temperature Filter	Difference (%) mean Filter	Thermometer Temperature Exit	Difference (%) mean Exit	Thermometer Temperature Aux	Difference (%) mean Aux
0	1	0.22	2	0.43	2	0.43
100	100	0.00	101	0.18	101	0.18
200	202	0.30	202	0.30	202	0.30
300	302	0.26	302	0.26	302	0.26
400	398	-0.23	398	-0.23	398	-0.23
500	499	-0.10	499	-0.10	500	0.00

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
0	1	0.22
200	202	0.30
400	398	-0.23
600	601	0.09
800	802	0.16
1000	1001	0.07

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
1200	1199	-0.06
1400	1396	-0.22
1600	1599	-0.05
1800	1797	-0.13

Revised 10/03

APEX INSTRUMENTS METHOD 5 PRE-TEST CONSOLE CALIBRATION
USING CALIBRATED CRITICAL ORIFICES
5-POINT ENGLISH UNITS

Meter Console Information	
Console Model Number	MC522
Console Serial Number	901001
DGM Model Number	MS4
DGM Serial Number	DGM 317423

Calibration Conditions			
Date	Time	21-Nov-13	5:00
Barometric Pressure		29.4	in Hg
Theoretical Critical Vacuum[1]		13.9	in Hg
Calibration Technician		B. Crane	

Factors/Conversions		
Std Temp	528	°R
Std Press	29.92	in Hg
K_1	17.647	cR/in Hg

[1]For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.

[2]The Critical Orifice Coefficient, K', must be entered in English units, $(ft^3 \cdot °R^{1/2})/(in.Hg \cdot min)$.

Calibration Data

Run Time	Metering Console					Critical Orifice				
Elapsed	DGM Orifice ΔH	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final	Serial Number	Coefficient	Amb Temp Initial	Amb Temp Final	Actual Vacuum
(Θ)	(P_m)	(V_{mi})	(V_{mf})	(t_{fi})	(t_{ff})		K'	(t_{amb})	(t_{amb})	
min	in H_2O	cubic feet	cubic feet	°F	°F		see above2	°F	°F	in Hg
10.0	1.8	142.550	150.250	74	74	OX63	0.5894	74	75	18
10.0	3.2	161.100	171.300	74	74	OX73	0.7770	75	75	16
11.0	1.0	174.500	180.930	74	74	OX55	0.4440	75	75	20
12.0	0.6	189.300	194.720	75	74	OX48	0.3439	75	75	21
18.0	0.3	196.300	201.740	75	75	OX40	0.2298	73	74	23

Results

Standardized Data				Dry Gas Meter				
				Calibration Factor		Flowrate	ΔH @	
Dry Gas Meter		Critical Orifice		Value	Variation	Std & Corr	0.75 SCFM	Variation
(V_{mstd})	(Q_{mstd})	(Vcr_{std})	(Q_{crstd})	(Y)	(ΔY)	($Q_{mstdcorr}$)	(ΔH@)	(ΔΔH@)
cubic feet	cfm	cubic feet	cfm			cfm	in H2O	
7.525	0.753	7.505	0.751	0.997	0.003	0.751	1.765	0.047
10.003	1.000	9.890	0.989	0.989	-0.005	0.989	1.821	0.102
6.271	0.570	6.216	0.565	0.991	-0.003	0.565	1.723	0.005
5.276	0.440	5.253	0.438	0.996	0.002	0.438	1.690	-0.029
5.286	0.294	5.272	0.293	0.997	0.003	0.293	1.595	-0.124
				0.994	Y Average		1.719	ΔH@ Average

CAL-MASTERMETER-WORKBOOK-203T-REV1

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR Title 40, Part 60, Appendix A-3, Method 5, 16.2.3

Signature B. Crane Date 11-21-13

ARI Environmental, Inc.
Gas Meter Thermometer Calibration Data Form
Pre -Test

Meter Box: 901001
Calibrator: B. Crane
Date: 11/21/2013
Barometric: 29.44
Ambient Temp: 74
Reference Thermometer: Altek Thermocouple Source CAL-MASTERMETER-WORKBOOK-203T-REV1

Reference Temperature Altek	Thermometer Temperature Inlet	Difference (%) mean Inlet	Thermometer Temperature Oulet	Difference (%) mean Oulet	Thermometer Temperature Probe	Difference (%) mean Probe
0	NA		0	0.00	0	0.00
100			96	-0.71	96	-0.71
200			200	0.00	200	0.00
300			298	-0.26	298	-0.26
400			396	-0.47	396	-0.47
500			496	-0.42	495	-0.52

Temperature Altek	Temperature Filter	(%) mean Filter	Temperature Exit	(%) mean Exit	Temperature Aux	(%) mean Aux
0	-1	-0.22	-1	-0.22	-1	-0.22
100	96	-0.71	96	-0.71	96	-0.71
200	199	-0.15	199	-0.15	199	-0.15
300	298	-0.26	298	-0.26	298	-0.26
400	396	-0.47	396	-0.47	396	-0.47
500	495	-0.52	496	-0.42	496	-0.42

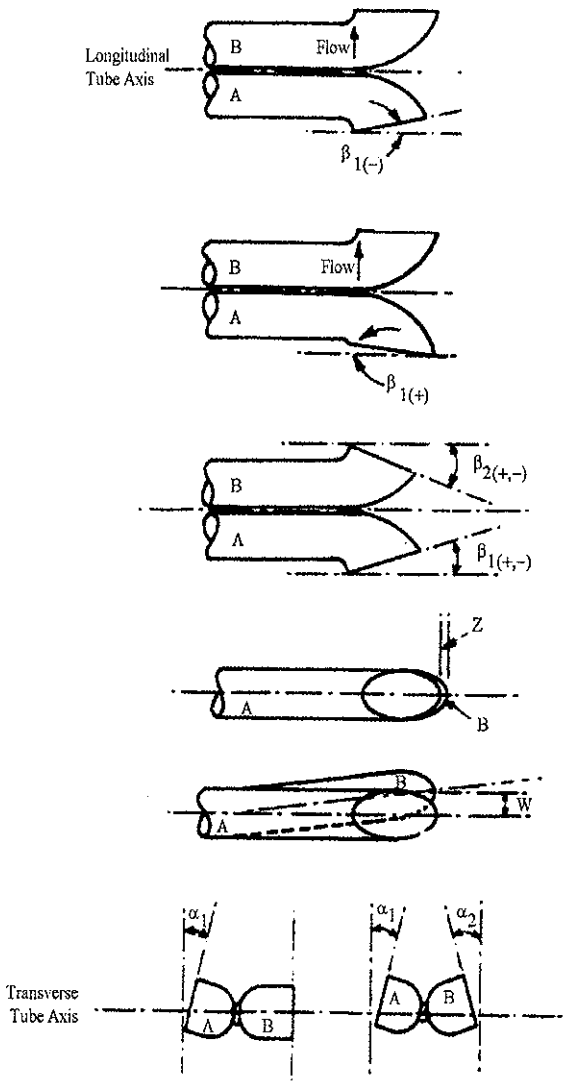
Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
0	-1	-0.22
200	199	-0.15
400	396	-0.47
600	598	-0.19
800	800	0.00
1000	999	-0.07

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
1200	1197	-0.18
1400	1395	-0.27
1600	1597	-0.15
1800	1795	-0.22

Revised 10/03

Pitot Tube Inspection Data

Client Name: _____



Pre-Sample Date: 4/12/2014		Post-Sample Date: 11/1/2014
Y	level?	Y
N	obstructions?	N
N	damaged?	N
1	$-10° < \alpha_1 < +10°$	1
0	$-10° < \alpha_2 < +10°$	0
1	$-5° < \beta_1 < +5°$	0
2	$-5° < \beta_2 < +5°$	1
2	γ	0
1	θ	0
0.920	A	0.93
0.460	$0.39375 < P_A < 0.5625$	0.465
0.460	$0.39375 < P_B < 0.5625$	0.465
0.375	$0.1875 \leq D_t \leq 0.375$	0.375
0.032	$A \tan \gamma < 0.125"$	0.000
0.01606	$A \tan \theta < 0.03125"$	0.00000
TRUE	$P_A = P_B$ +/- 0.063	TRUE
PASS	PASS/FAIL	PASS

Comments: 10' effective length M5 probe.

Pitot tube/probe number 731 meets or exceeds all specifications and criteria and/or applicable design features (per 40CFR60 Appendix A; Method 2) and is heareby assigned a pitot tube calibration factor of 0.84.

Signature: _____

Date: 11.1.14

ARI Environmental Inc.
Thermocouple Calibration Data Form

Calibrator: B. Crane
Thermocouple ID. 731

	pretest	posttest
Date:	4/1/2014	11/1/2014
Barometric:	29.20	29.67

Reference Thermometer = Mercury in glass

	Reference Point Number	Source	Reference Thermometer Temperature	Meter Readout Temperature	Difference (%)
Pre-Test	T.C	Ice Water			0.00
		Ambient	62.8	62.9	-0.02
		Heat Source			0.00
Post-Test	T.C	Ice Water	32.3	32.1	0.04
		Ambient	66.3	65.7	0.11
		Heat Source	295.8	293.6	0.29

a (temp. diff.) = (ref.temp + 460) - (Thermo. temp. + 460) / (ref. temp. +460) x 100

Where $-1.5 < a < 1.5$

APPENDIX E

Process Data

Process Data Summary Tables

Run		5F-1	5F-2	5F - 4	Test Average
Start time End time Soot Blowing		10/23/2014 9:40 10/23/2014 10:47 X	10/23/2014 15:20 10/23/2014 16:25	10/24/2014 11:15 10/24/2014 12:19	3 RUNS
FCCU Regenerator Coke Burn, lb/hr	C06MACK	42745	43194	40870	42270
ESP Total Primary Power, KW	C08101KW	57.5	56.7	57.7	57.3
ESP Total Secondary Current, Amps	C08101SA	2482	2567	2640	2563
SO2, ppm @ 0%O2	C06660B	1.7	1.6	1.0	1
NOx, ppm @ 0%O2	C06660A	4.3	10.4	8.0	8

APPENDIX F

Test Program Qualifications

Test Program Qualifications

ARI Environmental's offices in Wauconda, Illinois; Newport, Delaware and Pasadena, Texas specialize in conducting stack emission, fugitive leak detection, ambient air and in-plant OSHA type testing for industrial clients.

ARI is organized so that its facilities and resources meet the requirements of ASTM D7036, Standard Practice for Competence of Air Emission Testing Bodies. ARI's laboratories in Wauconda, Illinois and Pasadena, Texas hold NELAP primary accreditation with the Texas Commission on Environmental Quality (Certificate No. T104704428-13-5), NELAP accreditation with the New Jersey Department of Environmental Protection (Certificate No. IL007), and NELAP/State accreditation with the Louisiana Department of Environmental Quality (Certificate No. 02010). ARI is also registered with the Pennsylvania Laboratory Accreditation Program (Registration No. 68-05220).

During the past 30 years, ARI personnel have conducted over 5,000 separate stack emission tests for a variety of industrial clients throughout North America for the determination of degree of source compliance and to yield emissions data and control equipment performance data for in-house engineering purposes.

ARI presently has over 80 trained personnel for conducting source emission sampling, fugitive leak detection monitoring, ambient air monitoring and OSHA sampling programs. All test programs are supervised and conducted by onsite Qualified Individuals (QI) and/or Qualified Source Testing Individuals (QSTI) pursuant to ASTM D7036.

The key personnel involved in the test program were as follows:

Steven Flaherty
Mr. Flaherty is a Senior Project Manager with ARI. His 14 years of experience includes emission compliance and CEM certification testing for a wide variety of industries including petrochemical, steel mills, electric utilities, cement plants, asphalt plants and general manufacturing plants. Mr. Flaherty is presently certified as a QSTI by the Source Evaluation Society (SES) pursuant to the requirements of ASTM D7036-04.

W. Alex Hildreth
Mr. Hildreth is a field scientist specializing in sampling equipment preparation, maintenance and calibration, equipment setup, field sampling, sample recovery and post-test equipment clean up. Mr. Hildreth has 2 years of experience in conducting various source emission test programs. Mr. Hildreth is presently certified as a QI by the SES pursuant to the requirements of ASTM D7036-04.

Brett O'Leary
Mr. O'Leary is a field technician specializing in sampling equipment preparation, maintenance and calibration, equipment setup, field sampling, sample recovery and post-test equipment clean up.

Jonathon Phillips
Mr. Phillips is a field technician specializing in sampling equipment preparation, maintenance and calibration, equipment setup, field sampling, sample recovery and post-test equipment clean up.

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

STEVEN M. FLAHERTY

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS

ISSUED THIS 26TH DAY OF NOVEMBER 2013 AND EFFECTIVE UNTIL NOVEMBER 25TH, 2018

Peter R. Westlin, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2008-237

SOURCE EVALUATION SOCIETY

SES

Qualified Source Testing Individual

LET IT BE KNOWN THAT

STEVEN M. FLAHERTY

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GASEOUS POLLUTANTS SOURCE SAMPLING METHODS

ISSUED THIS 26TH DAY OF NOVEMBER 2013 AND EFFECTIVE UNTIL NOVEMBER 25TH, 2018

Peter R. Westlin, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2008-237

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

STEVEN M. FLAHERTY

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS

ISSUED THIS 26TH DAY OF NOVEMBER 2013 AND EFFECTIVE UNTIL NOVEMBER 25TH, 2018

Peter R. Westlin, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2008-237

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

STEVEN M. FLAHERTY

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

HAZARDOUS METALS MEASUREMENT SAMPLING METHODS

ISSUED THIS 18TH DAY OF OCTOBER 2011 AND EFFECTIVE UNTIL OCTOBER 17TH , 2016

Peter R. Westlin, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2008-237

Appendix 6d – FCU 600 Performance Testing
October 2014

TEST REPORT

COMPLIANCE EMISSION TEST
CONSENT DECREE
FLUIDIZED CATALYTIC CRACKING UNIT 600

BP PRODUCTS NORTH AMERICA, INC.
WHITING, INDIANA

PREPARED FOR:

BP PRODUCTS NORTH AMERICA, INC.
Whiting Refinery
2918 Indianapolis Blvd.
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Environmental Specialist

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Mr. Mark Huthmaker
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Source Testing Division

ARI Project No. 566-143
BP Purchase Order No. 3000319830
Test Dates: October 29 and 30, 2014
Report Issuance Date: January 6, 2015

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REPORT CERTIFICATION

STATEMENT OF CONFORMANCE AND TEST REPORT CERTIFICATION

I certify, to the best of my knowledge, that this test program was conducted in a manner conforming to the criteria set forth in ASTM D7036-04: Standard Practice for Competence of Air Emission Testing Bodies, and that project management and supervision of all project related activities were performed by qualified individuals as defined by this practice.

I further certify that this test report and all attachments were prepared under my direction or supervision in accordance with the ARI Environmental, Inc. quality management system designed to ensure that qualified personnel gathered and evaluated the test information submitted. Based on my inquiry of the person or persons who performed the sampling and analysis relating to this performance test, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate and complete.

Steve Flaherty, QSTI
Senior Project Manager, Source Testing Division
ARI Environmental, Inc.

Hank Taylor, QI
Quality Assurance Manager, Source Testing Division
ARI Environmental, Inc.

SECTIONONE Introduction and Summary

ARI Environmental, Inc. (ARI) was retained by BP Products North America, Inc. (BP) to conduct a particulate matter (PM) compliance emission test on the Fluidized Catalytic Cracking Unit (FCCU) 600 stack at their refinery located in Whiting, Indiana. Testing was conducted on October 29 and 30, 2014.

Four approximately 120-minute test runs were conducted on the FCCU 600 stack to determine the concentrations and emission rates of total PM and PM under 10 microns (PM_{10}), including condensable PM (CPM). The emission test was performed to fulfill the testing requirements of BP's Consent Decree.

Sampling and analysis methodologies followed the procedural requirements as detailed in the Code of Federal Regulations, Title 40, Part 60 (40 CFR 60), Appendix A, USEPA Methods 1, 2, 3 and 4; 40 CFR 51, Appendix M, USEPA Methods 201A and 202; and the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods.

Ms. Rohini Sengupta of BP coordinated the test and monitored process conditions. Testing was conducted by Messrs. Steve Flaherty, Alex Hildreth, Brett O'Leary and Jonathon Phillips of ARI.

This report summarizes the test procedures and results of the emission test. Included as appendices is complete documentation of all calculation summaries, field data, analytical data, calibration data, process data and test program qualifications.

The test results are summarized in Table 1-1.

TABLE 1-1. SUMMARY OF FCCU 600 STACK PM_{10} AND TOTAL PM TEST RESULTS

TEST RUN NO. :	1-PM	2-PM*	3-PM	4-PM	
TEST DATE :	10/29/2014	10/29/2014	10/29/2014	10/30/2014	
TEST TIME :	10:10 - 12:25	13:20 - 15:30	16:35 - 18:40	12:30 -14:41	Average
Filterable PM_{10}					
Concentration					
grains/dscf	0.0188	0.0189	0.0180	0.0217	0.0193
mg/dscm	42.994	43.209	41.287	49.567	44.264
Emission rate (as measured)					
lb/hr	21.477	22.004	20.280	25.159	22.230
lb/1,000 lb coke burn	0.553	0.565	0.522	0.625	0.566
Prorated soot blow emission rate					
lb/hr					22.205
lb/1,000 lb coke burn					0.566
Condensable PM_{10}					
Concentration					
grains/dscf	0.0016	0.0031	0.0092	0.0018	0.0039
mg/dscm	3.749	7.209	21.082	4.064	9.026
Emission rate (as measured)					
lb/hr	1.873	3.671	10.355	2.063	4.490
lb/1,000 lb coke burn	0.048	0.094	0.266	0.051	0.115
Prorated soot blow emission rate					
lb/hr					4.399
lb/1,000 lb coke burn					0.113
Total PM_{10}					
Concentration					
grains/dscf	0.0204	0.0220	0.0273	0.0234	0.0233
mg/dscm	46.743	50.418	62.369	53.631	53.290
Emission rate (as measured)					
lb/hr	23.349	25.675	30.635	27.222	26.720
lb/1,000 lb coke burn	0.601	0.659	0.788	0.677	0.681
Prorated soot blow emission rate					
lb/hr					26.604
lb/1,000 lb coke burn					0.679
Filterable >PM_{10}					
Concentration					
grains/dscf	0.0044	0.0071	0.0039	0.0047	0.0050
mg/dscm	9.973	16.214	9.039	10.686	11.478
Emission rate (as measured)					
lb/hr	4.982	8.257	4.440	5.424	5.776
lb/1,000 lb coke burn	0.128	0.212	0.114	0.135	0.147
Prorated soot blow emission rate					
lb/hr					6.051
lb/1,000 lb coke burn					0.155
Total PM (PM_{10} + >PM_{10})					
Concentration					
grains/dscf	0.0248	0.0291	0.0312	0.0281	0.0283
mg/dscm	56.716	66.633	71.408	64.317	64.768
Emission rate (as measured)					
lb/hr	28.331	33.932	35.074	32.646	32.496
lb/1,000 lb coke burn	0.730	0.871	0.902	0.811	0.829
Prorated soot blow emission rate					
lb/hr					32.655
lb/1,000 lb coke burn					0.833

*A soot blow was conducted during Run No. 2-PM.

SECTIONTWO Testing and Analytical Procedures

2.1 OVERVIEW

ARI conducted a compliance emission test on the FCCU 600 stack at the BP refinery located in Whiting, Indiana. Testing was conducted on October 29 and 30, 2014.

Four approximately 120-minute test runs were conducted on the FCCU 600 stack to determine the concentrations and emission rates of total PM and PM_{10}, including CPM.

2.2 METHODOLOGY

Testing procedures and sampling methodologies were conducted following the procedural requirements as detailed in 40 CFR 60, Appendix A, USEPA Methods 1, 2, 3 and 4; 40 CFR 51, Appendix M, USEPA Methods 201A and 202; and the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods.

2.2.1 Sampling Locations (USEPA Method 1)

The sampling point locations used for the determination of gas velocity and volume flow rate were determined following the procedural requirements as detailed in USEPA Method 1. Sampling was conducted at the FCCU 600 stack in the two sampling ports provided in the 96-inch diameter duct. The sampling ports are located 936 inches downstream and approximately 480 inches upstream from the nearest flow disturbances. Twelve traverse points were used to sample the cross-sectional area of the stack.

A cyclonic flow check was conducted to demonstrate that cyclonic flow conditions did not exist at the sampling location.

2.2.2 Flue Gas Volumetric Flow Rate (USEPA Method 2)

Gas velocity and volumetric flow rate were determined following USEPA Method 2. Velocity head measurements were performed using a Type-S pitot tube and Dwyer inclined 0 to 10-in. water manometer. Temperature measurements were conducted using a chromel-alumel thermocouple connected to a digital direct read-out potentiometer.

2.2.3 Molecular Weight (USEPA Method 3)

The stack gas oxygen (O_2) and carbon dioxide (CO_2) concentrations were determined following USEPA Method 3 procedures. During each test run, an integrated bag sample of the exhaust gas was collected. An Orsat combustion gas analyzer was used to determine the O_2 and CO_2 concentrations of each collected bag. The nitrogen (N_2) content was calculated as the difference.

2.2.4 Flue Gas Moisture Content (USEPA Method 4)

The stack gas moisture content was determined following USEPA Method 4. This method was performed in conjunction with the USEPA Methods 201A and 202 procedures described in Subsection 2.2.5.

2.2.5 Total PM, PM_{10} and CPM (USEPA Methods 201A and 202)

Sampling was conducted in accordance with USEPA Methods 201A and 202 using an Apex Instruments, Inc. PM sampling train (see Figure 2-1). The back-half impinger catch was analyzed for CPM in accordance with USEPA Method 202 procedures. The front half was analyzed for filterable PM_{10} and $>PM_{10}$ to allow for calculation of total filterable PM in accordance with USEPA Method 201A procedures.

PM_{10} was determined using the procedures of USEPA Method 201A. Sampling was conducted at a constant rate in order to achieve the 10 microns cut-rate of the cyclone separator. Dwell times at each sample point were calculated based on the stack gas velocity and gas meter temperature. Although USEPA Method 201A has an acceptable isokinetic range of 80 - 120%, this test targeted the more stringent isokinetic range of 90 - 110% to allow for the calculation of total PM following the procedural requirements of the method. Total PM was calculated as the total filterable PM plus CPM.

2.2.5.1 Sampling Apparatus

Assembled by ARI personnel, the sampling train consisted of the following:

Cyclone Separator - Apex Instruments, 316 stainless steel design - 10 micron cut-rate.

Cyclone Nozzle - Stainless steel - integrated with cyclone, sized to attain PM_{10} cut-rate.

Probe - Stainless steel with a heating system capable of maintaining a probe exit temperature of 248°F.

Pitot Tube - Type-S, attached to probe for monitoring stack gas velocity.

Heated Filter Holder - Borosilicate glass filter with a 4-in. Teflon frit filter support and a silicone rubber gasket. The holder design provided a positive seal against leakage from the outside or around the filter. The filter holder was heated to 248°F ±25°F during sampling. A thermocouple was placed in the back half of the filter support in direct contact with the sample stream. A quartz fiber filter that met the requirements of USEPA Method 5 was used.

Ambient Filter Holder - Unheated borosilicate glass filter with a 4-in. Teflon frit filter support, Teflon filter and a silicone rubber gasket. A thermocouple was placed in the back half of the filter holder to measure sample gas temperature by direct contact with the sample stream. Temperature was maintained between 65 and 85°F. A Teflon filter disc was placed in the filter holder.

Draft Gauge - Inclined manometer with a readability of 0.01-in. H_2O in the 0 to 1-in. range and 0.1-in. H_2O in the 1 to 10-in. range.

Condenser - Glass, coil type with compatible fittings.

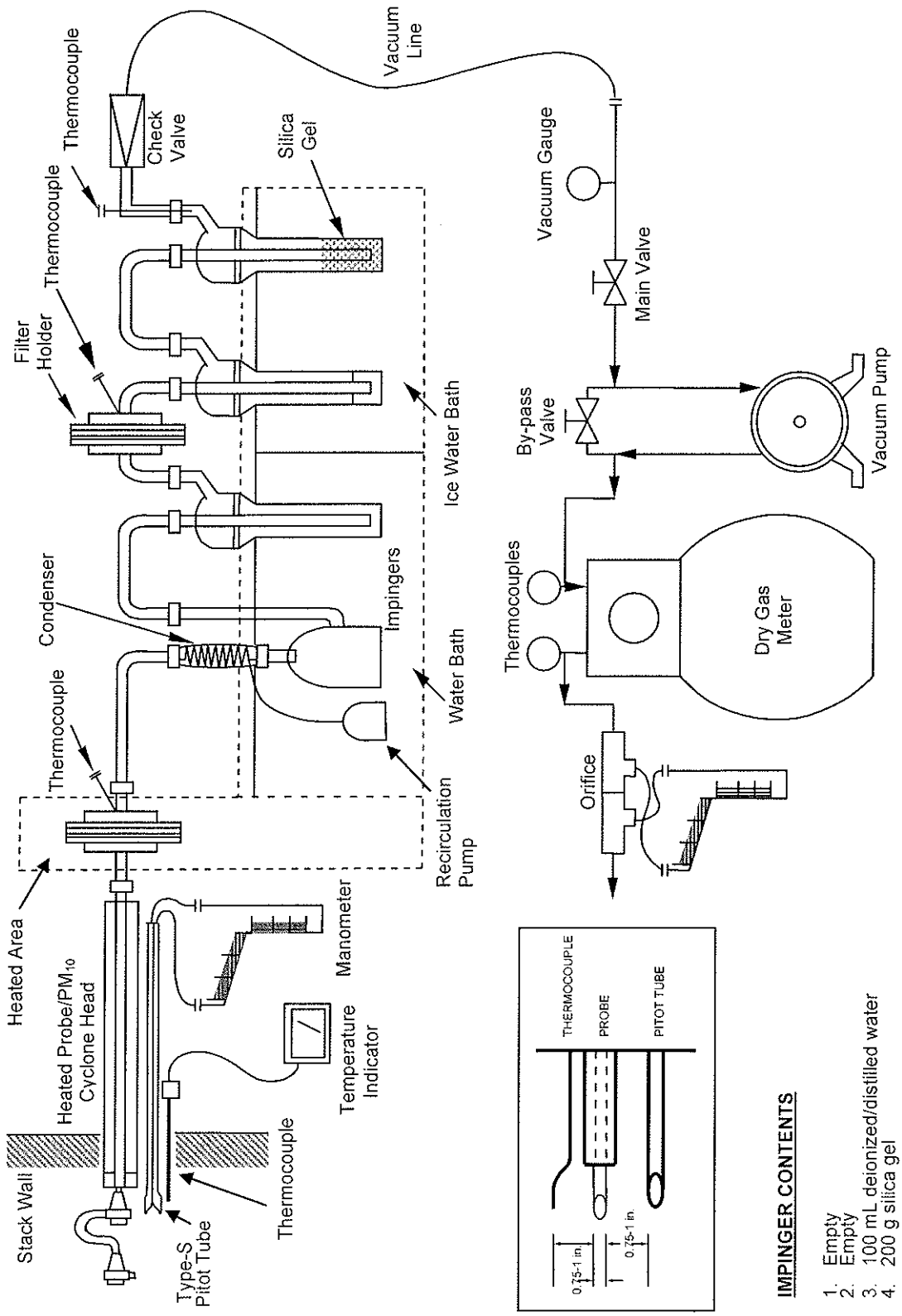


FIGURE 2-1. USEPA METHODS 201A/202 PARTICULATE MATTER SAMPLING TRAIN

Impingers - Four (4) impingers connected in series with glass ball joints. The first impinger was a Method 23 type condenser with a condensate drop-out. The second, third and fourth impingers were of the Greenburg-Smith design, but modified by replacing the standard tip with a ½-in. i.d. glass tube extending to within ½-in. of the bottom of the impinger flask. The second and third impingers were connected using the ambient filter holder.

Metering System - Apex Model 522. Vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 5°F, dry gas meter with ±2 percent accuracy and related equipment as required to maintain an isokinetic sampling rate and to determine sample volume.

Barometer - Mercury barometer capable of measuring atmospheric pressure to within ±0.1-in. Hg.

2.2.5.2 Sampling Procedures

After the minimum number of traverse points was selected, the stack pressure, temperature, moisture and range of velocity differential pressure (ΔP) were measured according to procedures described in USEPA Methods 1 through 4. For the sampling train, the first and second impingers were initially empty. The third impinger contained 100 milliliters (mL) of deionized/distilled (DI) water. The fourth impinger contained 200 grams of silica gel.

The impingers were placed in a container that had two compartments. The first two impingers were placed in the first compartment, and the third and fourth impingers were placed in the second compartment. The first compartment contained water that was circulated through the condenser to reduce the sample gas to between 65 and 85°F at the exit of the ambient filter. The second compartment contained ice water to reduce the sample gas to ≤68°F upon exiting the last impinger. Both temperatures were recorded at each traverse point interval throughout each test run.

The sampling train was leak-checked at the sampling site by plugging the inlet to the nozzle and pulling a vacuum of 15-in. Hg. Leak rates of less than 0.02 ft^3/min. at a vacuum of 15-in. Hg are considered acceptable. At the completion of each test run, the sampling train was again leak-checked by the same procedure. Both pre and post-test leak checks of the pitot tube were made for each test run. Ice was placed around the impingers to keep the temperature of the gases leaving the last impinger at less than 68°F.

During sampling, stack gas and sampling train data were recorded at specified intervals. Isokinetic sampling rates were set throughout the sampling period with the aid of a programmable calculator.

2.2.5.3 Sample Recovery Procedures

After sampling was completed, a post-test nitrogen purge was conducted with the impingers still on ice at a rate ≥14 liters per minute for 60 minutes. Before the purge step began, the short stem of the first impinger was replaced with a long stem that was within ½-inch of the bottom of the impinger. If the stem did not extend below the water level in the impinger by at least 1 cm, a measured amount of degassed DI water was added to adjust the level.

Method 201A

The sample fractions were recovered as follows:

Container 1 - The filter was removed from the holder and placed in a petri dish.

Container 2 - The >PM_{10} was acetone rinsed from the cyclone cup, the internal surface of the nozzle and the outside surface of the downcomer line. The 250 mL glass container with Teflon-lined lid was sealed, and the liquid level was marked.

Container 3 - The ≤PM_{10} filterable PM was acetone rinsed from the cyclone exit tube and internal surfaces of the PM_{10} cyclone assembly, probe liner and sample exposed surfaces prior to the filter. The 250 mL glass container with Teflon-lined lid was sealed, and the liquid level was marked.

Container 4 - 150 mL of acetone was taken for blank analysis. The blank was obtained and treated in a similar manner as the contents of Container 2.

Method 202 (Including Field Recovery Blank Train)

The sample fractions were recovered as follows:

Container 1 - The contents from the first two impingers were placed into a glass container. The impingers (including the short stem), connecting glassware and front half of the ambient filter holder were quantitatively rinsed twice with DI water, and the rinse was added to this container. The liquid level was marked after the container was sealed.

Container 2 - The first two impingers (including the short stem), connecting glassware and front half of the ambient filter holder were rinsed with acetone, followed by two rinses with hexane, and placed in a glass container. The liquid level was marked after the container was sealed.

Container 3 - The ambient filter was removed and placed in a petri dish.

Containers 4 & 5 - 150 mL of DI water and hexane were taken for blank analysis. The blanks were obtained and treated in a similar manner as the contents of Containers 1 and 2.

The contents of the third impinger were weighed and discarded. The contents of the fourth impinger (silica gel) were weighed to the nearest gram.

2.2.5.4 Analytical Procedures

Method 201A

The analytical procedures followed those described in USEPA Method 201A.

Container 1 - The filter and any loose PM were transferred from the sample container to a tared glass weighing dish, dried at 105°C for 2 to 3 hours and placed in a desiccator for 24 hours. The filter was weighed to a constant weight. The results were reported to the nearest 0.1 mg.

Containers 2 & 3 - The acetone washings were transferred to a tared beaker and evaporated to dryness at ambient temperature and pressure. The contents were then placed in a desiccator for 24 hours and weighed to a constant weight to the nearest 0.1 mg.

Container 4 - The acetone blank was transferred to a tared beaker, evaporated to dryness at ambient temperature and pressure in a fume hood, placed in a desiccator for 24 hours and weighed to a constant weight to the nearest 0.1 mg.

Method 202 (Including Field Recovery Blank Train)

The analytical procedures followed those described in USEPA Method 202.

Container 1 - The liquid in this container was measured volumetrically and placed into a separatory funnel. Approximately 30 mL of hexane was added, mixed well and the lower organic phase drained off. This procedure was repeated twice, leaving a small amount of the organic/hexane phase in the separatory funnel each time to yield approximately 90 mL of organic extract. This organic extract was combined with Container 2. The aqueous fraction from Container 1 was transferred to a tared Teflon beaker liner, evaporated in an oven at 105°C to no less than 10 mL and allowed to air dry at ambient temperature. If a dried constant weight could not be achieved, the residue was redissolved in 100 mL of water and titrated with 0.1N ammonium hydroxide to a pH of 7.0. The aqueous phase was then evaporated in an oven at 105°C to approximately 10 mL, evaporated to dryness in a fume hood at ambient temperature and pressure, placed in a desiccator for 24 hours and weighed to a constant weight to the nearest 0.1 mg. The gain in mass represents the inorganic PM collected in the sampling train back half.

Container 2 - The contents of this container were combined with the organic extract from Container 1, placed in a tared Teflon beaker liner, evaporated to dryness at ambient temperature and pressure in a fume hood, placed in a desiccator for 24 hours and weighed to a constant weight to the nearest 0.1 mg. The gain in mass represents the organic PM collected in the sampling train back half.

Container 3 - The ambient filter was folded in quarters and placed into a 50 mL extraction tube. Sufficient DI water was used to cover the filter. The extraction tube was placed in a sonication bath, and the water soluble material was extracted for a minimum of 2 minutes. The aqueous extract was combined with the contents of Container 1. This step was completed a total of three times. After completion of the aqueous extraction, the filter was covered with a sufficient amount of hexane. The extraction tube was then placed in a sonication bath, and the organic material was extracted for a minimum of 2 minutes. The organic extract was combined with the contents of Container 2. This step was completed a total of three times. The procedures for Container 3 were completed prior to any procedures for Containers 1 and 2.

Container 4 - The water blank was transferred to a tared Teflon beaker liner and evaporated to approximately 10 mL in an oven at 105°C. It was then evaporated to dryness at ambient temperature and pressure in a fume hood, placed in a desiccator for 24 hours and weighed to a constant weight to the nearest 0.1 mg.

Container 5 - The hexane blank was transferred to a tared Teflon beaker liner, evaporated to dryness at ambient temperature and pressure in a fume hood, placed in a desiccator for 24 hours and weighed to a constant weight to the nearest 0.1 mg.

The term "constant weight" means a difference of no more than 0.5 mg or 1 percent of the total weight less tare weight, whichever is greater between two consecutive readings, with no less than 6 hours of desiccation between weighings.

2.3 PARTICULATE MATTER EMISSION RATE PRORATION PROCEDURES

Representative averaging of emission rates accommodated a 6-minute soot blowing cycle during the second test run. The following equation (excerpted from the memo to all USEPA regions from E. Reich dated March 6, 1979) was used for calculations:

$$E_{pave} = E_{sbr}\left(\frac{(A + B)S}{AR}\right) + E_{nosb}\left(\frac{R - S}{R} - \frac{BS}{AR}\right)$$

where:

E_{pave} = Average E for daily operating time
E_{sbr} = Average E of sample(s) containing soot blowing
E_{nosb} = Average E of sample(s) with no soot blowing
A = Hours of soot blowing during sample(s)
B = Hours not blowing during sample(s) containing soot blowing
R = Average hours of operating per 24 hours
S = Average hours of soot blowing per 24 hours

SECTIONTHREE Process Description

The FCCU 600, constructed in 1946, is identified as Unit ID 240 and rated at 80,000 barrels per day. This facility converts hydrocarbons that boil above 500°F into lower molecular weight products, which include gasoline and LPG. The cracking takes place as the gas oil and catalyst stream mix in the reactor. This process results in the catalyst being coated with coke, which is subsequently burned off in a regenerator.

The process data summary is presented in Table 3-1.

TABLE 3-1. FCCU 600 STACK PROCESS AND STACK CEMS DATA SUMMARY

TEST RUN NO. :	1-PM	2-PM	3-PM	4-PM	Average
Total Feed Rate, MBPD	59.9	60.0	60.0	62.0	60.5
FCCU Regenerator Coke Burn, lb/hr	38,824	38,946	38,887	40,239	39,224
Ammonia Flow to ESP, lb/hr	45	47	45	45	45
ESP Total Primary Power, KW	85	82	84	75	82
ESP Total Secondary Current, Amps	3,726	3,569	3,685	3,265	3,561
SO_2, ppm @ 0% O_2	2	2	1	2	2
NO_x, ppm @ 0% O_2	8	7	9	8	8
SO_2 Additive Rate, PPD	100	100	100	96	99
Ammonia Slip (Calc.), ppm	No Data	No Data	No Data	No Data	No Data
Regenerator Plenum Outlet Temperature, °F	1,066	1,066	1,066	1,066	1,066
Average ESP Inlet Temperature, °F	666	665	668	675	669

SECTIONFOUR Test Results

The test results are presented in Table 4-1.

The calculation summaries, field data, analytical data, calibration data, process data and test program qualifications are included in the appendices.

TABLE 4-1. FCCU 600 STACK PM_{10} AND TOTAL PM TEST RESULTS

TEST RUN NO. :	1-PM	2-PM*	3-PM	4-PM	
TEST DATE :	10/29/2014	10/29/2014	10/29/2014	10/30/2014	
TEST TIME :	10:10 - 12:25	13:20 - 15:30	16:35 - 18:40	12:30 - 14:41	Average
Stack Gas Parameters					
Temperature, °F	601.5	601.6	601.8	614.0	604.7
Velocity, av. ft/sec	106.2	105.4	104.2	107.8	105.9
Volumetric flow, acfm	320,360	317,819	314,201	325,093	319,368
Volumetric flow, scfm	157,200	155,780	153,769	157,826	156,144
Volumetric flow, scfh	9,432,028	9,346,824	9,226,132	9,469,588	9,368,643
Volumetric flow, dscfm	133,339	135,933	131,112	135,489	133,968
Volumetric flow, dscfh	8,000,345	8,155,981	7,866,693	8,129,366	8,038,096
Mass flow, Mlb/hr db	637.0	653.9	626.8	647.3	641.3
Moisture, av. % vol.	15.2	12.7	14.7	14.2	14.2
Molecular weight, lb/lb-mole db	30.7	30.9	30.7	30.7	30.7
CO_2, av. % vol.	16.2	16.1	16.3	16.2	16.2
O_2, av. % vol.	2.1	2.2	2.2	2.1	2.2
Particulate Sample					
Time, min.	119.96	119.98	117.67	121.64	119.81
Volume, dscf	42.137	40.620	37.507	38.830	39.773
>PM_{10}, mg	11.90	18.65	9.60	11.75	12.98
Filterable PM_{10}, mg	51.30	49.70	43.85	54.50	49.84
Condensable PM_{10}, mg	4.47	8.29	22.39	4.47	9.91
Total PM_{10}, mg	55.77	57.99	66.24	58.97	59.74
Isokinetic ratio, %	109.4	106.3	101.0	100.5	104.3
D_{50} cutpoint, μm	10.07	10.56	10.82	10.90	10.59
Filterable PM_{10}					
Concentration					
grains/dscf	0.0188	0.0189	0.0180	0.0217	0.0193
x 10^{-6} lb/dscf	2.684	2.698	2.578	3.095	2.764
mg/dscm	42.994	43.209	41.287	49.567	44.264
Emission rate (as measured)					
lb/hr	21.477	22.004	20.280	25.159	22.230
lb/1,000 lb coke burn	0.553	0.565	0.522	0.625	0.566
Prorated soot blow emission rate					
lb/hr					22.205
lb/1,000 lb coke burn					0.566
Condensable PM_{10}					
Concentration					
grains/dscf	0.0016	0.0031	0.0092	0.0018	0.0039
x 10^{-6} lb/dscf	0.234	0.450	1.316	0.254	0.564
mg/dscm	3.749	7.209	21.082	4.064	9.026
Emission rate (as measured)					
lb/hr	1.873	3.671	10.355	2.063	4.490
lb/1,000 lb coke burn	0.048	0.094	0.266	0.051	0.115
Prorated soot blow emission rate					
lb/hr					4.399
lb/1,000 lb coke burn					0.113

*A soot blow was conducted during Run No. 2-PM.

TABLE 4-1 (CONTINUED). FCCU 600 STACK PM_{10} AND TOTAL PM TEST RESULTS

TEST RUN NO. :	1-PM	2-PM*	3-PM	4-PM	
TEST DATE :	10/29/2014	10/29/2014	10/29/2014	10/30/2014	
TEST TIME :	10:10 - 12:25	13:20 - 15:30	16:35 - 18:40	12:30 -14:41	Average
Total PM_{10}					
Concentration					
grains/dscf	0.0204	0.0220	0.0273	0.0234	0.0233
x 10^{-6} lb/dscf	2.919	3.148	3.894	3.349	3.327
mg/dscm	46.743	50.418	62.369	53.631	53.290
Emission rate (as measured)					
lb/hr	23.349	25.675	30.635	27.222	26.720
lb/1,000 lb coke burn	0.601	0.659	0.788	0.677	0.681
Prorated soot blow emission rate					
lb/hr					26.604
lb/1,000 lb coke burn					0.679
Filterable >PM_{10}					
Concentration					
grains/dscf	0.0044	0.0071	0.0039	0.0047	0.0050
x 10^{-6} lb/dscf	0.623	1.012	0.564	0.667	0.717
mg/dscm	9.973	16.214	9.039	10.686	11.478
Emission rate (as measured)					
lb/hr	4.982	8.257	4.440	5.424	5.776
lb/1,000 lb coke burn	0.128	0.212	0.114	0.135	0.147
Prorated soot blow emission rate					
lb/hr					6.051
lb/1,000 lb coke burn					0.155
Total PM (PM_{10} + >PM_{10})					
Concentration					
grains/dscf	0.0248	0.0291	0.0312	0.0281	0.0283
x 10^{-6} lb/dscf	3.541	4.160	4.459	4.016	4.044
mg/dscm	56.716	66.633	71.408	64.317	64.768
Emission rate (as measured)					
lb/hr	28.331	33.932	35.074	32.646	32.496
lb/1,000 lb coke burn	0.730	0.871	0.902	0.811	0.829
Prorated soot blow emission rate					
lb/hr					32.655
lb/1,000 lb coke burn					0.833

*A soot blow was conducted during Run No. 2-PM.

APPENDIX A

Calculation Summaries

USEPA Method 4
Moisture Determination Sample Calculations

Client:	BP
Location:	Whiting, In
Source:	FCCU 600
Date:	10/29/2014
Run #:	1 - PM

Data Input:

Volume metered (V_m):	41.462	**ft^3**
Meter calibration coefficient (Y_d):	0.990	**dimensionless**
Barometric pressure (P_{bar}):	29.59	**inches Hg**
Meter sample rate (ΔH):	0.50	**inches H_2O**
Meter inlet/outlet temperature (T_m):	49.3	**°F**
Volume of moisture collected (V_{lc}):	160.2	**milliliters**
Stack Temperature (T_s):	601.5	**°F**
Static Pressure (St):	-1.0	**inches H_2O**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Volume of sample, dry basis:

$$Vm_{std} = V_m \times Y_d \times \left(\frac{528.0°R}{29.92"Hg}\right) \times \left(\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460}\right)$$ = **42.137 dscf**

Volume of water vapor in sample:

$$Vw_{std} = \frac{0.04707 ft^3}{ml} \times V_{lc}$$ = **7.541 scf**

Fractional moisture content of stack gas:

$$B_{wo} = \frac{Vw_{std}}{(Vm_{std} + Vw_{std})}$$ = **0.1518 B_{wo}**

Percent Moisture:

$$\%moisture = B_{wo} \times 100$$ = **15.18 %**

Fractional moisture content of stack gas at saturated conditions:

$$T_{s(°K)} = ((T_s - 32) * 0.5556) + 273$$ = **589.4 °Kelvin**

$$P_{s(mmHg)} = \left(P_{bar} + \frac{S_t}{13.6}\right) \times 25.401$$ = **751.62 mm Hg**

$$B_{wos} = \frac{\sqrt{\left(10^{\left(A - \left(\frac{B}{(T_{s(°K)} - C)}\right)\right)}\right)}}{P_{s(mmHg)}}$$

where:
A= 6.361
B=1893.5
C=27.65

= **130.13**

Percent moisture at saturated conditions:

$$\%moisture_{saturated} = B_{wos} \times 100$$ = **100.00 %**

Percent moisture used for emissions calculations:

= **15.18 %**

USEPA Method 2
Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client:	BP
Location:	Whiting, In
Source:	FCCU 600
Date:	10/29/2014
Run #:	1 - PM

Data Input

Carbon Dioxide (CO_2):	16.2	**%**
Oxygen (O_2):	2.1	**%**
Nitrogen (N_2):	81.7	**%**
Fractional Moisture Content (B_{wo})	0.1518	
Stack Temperature (T_s):	601.5	**°F**
Pitot Coefficient (C_p):	0.84	**dimensionless**
Average square root of ΔP	1.3226	**inches H_2O**
Barometric Pressure (P_{bar}):	29.59	**inches Hg**
Static Pressure (S_t)	-1.00	**inches H_2O**
Stack diameter:	96.00	**inches H_2O**
Stack area (A_s):	50.2655	**ft^2**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$ = **30.676 lb/lb-mole**

Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws})$$ = **28.752 lb/lb-mole**

Absolute stack gas pressure:

$$P_s = P_{bar} + \left(\frac{S_t}{13.6}\right)$$ = **29.516 inches H_2O**

Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}}$$ = **106.223 feet/second**

Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60$$ = **320,360 acfm**

Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right]$$ = **157,200 scfm**

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right] \times 60$$ = **9,432,028 scfh**

Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo})$$ = **133,339 dscfm**

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60$$ = **8,000,345 dscfh**

USEPA Method 201A PM_{10} Emissions
D_{50} Cutpoint Calculation Summary

Client:	BP
Location:	Whiting, In
Source:	FCCU 600
Date:	10/29/2014
Run #:	1 - PM

Data Input

Stack temperature (T_s):	601.5	**°F**
Fractional Moisture content (B_{ws}):	0.1518	**%**
Oxygen (O_2):	2.1	**%**
Stack pressure (P_s):	29.52	**Inches Hg Abs.**
Volume metered (Vm_{std}):	42.137	**dscf**
Volume of water vapor (Vw_{std}):	7.541	**scf**
Molecular weight of gas, wet basis (M_s):	28.752	**lb/lb-mole**
Test length (θ):	119.96	**minutes**
D_p:	10.0	**microns**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Stack gas viscosity:

$$\mu = -150.3162 + \left(13.4622 \times \sqrt{(T_s + 460)}\right) + \left(3.86153 \times 10^{6} \times (T_s + 460)^{-2}\right) + \left(0.591123 \times (\%O_{2,wet})\right) - (91.9723 \times B_{ws}) + \left(1.51761 \times 10^{-5} \times B_{ws} \times (T_s + 460)^{2}\right)$$

= **281.41 micropoise**

Sample flow rate @ standard conditions:

$$Q_{sSt} = \frac{V_{mstd}}{\theta}$$

= **0.351 dscfm**

Sample flow rate through PM_{10} cyclone:

$$Q_s = \frac{29.92}{528} \times Q_{sSt} \times \left(\frac{1}{(1 - B_{ws})}\right) \times \left(\frac{[T_s + 460]}{P_s}\right)$$

= **0.844 cfm**

Calculated Reynolds Number

$$N_{re} = 8.64 \times 10^{5} \times \left(\frac{P_s \times M_s}{(T_s + 460)}\right) \times \left(\frac{Q_s}{\mu}\right)$$

= **2072**

Cunningham Correction Factor

$$C = 1 + 0.0057193 \times \left(\frac{\mu}{P_s \times D_p}\right) \times \left(\left(\frac{[T_s + 460]}{M_s}\right)^{0.50}\right)$$

= **1.0331**

D_{50} cutpoint (for Cyclone I):

$$D_{50} = \left(0.15625 \times \left(\frac{[T_s + 460]}{(M_s \times P_s)}\right)^{0.2091}\right) \times \left(\frac{\mu}{Q_s}\right)^{.7091}$$

= **10.074 µm**

ARI Environmental Inc.
USEPA Method 202
Condensible Particulate Calculation Summary

COMPANY: BP
LOCATION: Whiting, In
SOURCE: FCCU 600
TEST DATE: 10/29/14
RUN NUMBER: 1 - PM

Data Input:

V_m:	41.462	ft^3	Q_s:	133,339	dscfm
γ FACTOR:	0.99		T_s:	601.5	°F
P_{bar}:	29.59	in.Hg	Runtime:	119.96	minutes
ΔH:	0.50	in.H_2O	V_s:	106.223	ft/sec
T_m:	49.3	°F	P_s:	29.52	in.Hg
V_{lc}:	160.2	mL	Noz. diam:	0.149	inches
N:	0.0992		m_{ib}:	1.00	mg
V_t:	0.46	mL	m_{ob}:	1.30	mg
m_r:	5.25	mg			
m_o:	2.00	mg			

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Volume of sample at standard conditions:

$$V_{mstd} = \left(\frac{528}{29.92}\right) \times V_m \times \gamma \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}\right] = 42.137 \text{ dscf}$$

Mass of ammonia correction:

$$m_c = 17.03 \times V_T \times N = 0.78 \text{ mg}$$

Mass of the field blank:

$$m_{fb} = m_{ib} + m_{ob} = 2.00 \text{ mg @ max allowable}$$

2.00 mg @ max allowable

Mass of inorganic condensible PM:

$$m_i = m_r - m_c = 4.47 \text{ mg}$$

Total mass of condensible PM:

$$m_{cpm} = m_i + m_o - m_{fb} = 4.47 \text{ mg @ max. blank}$$

USEPA Method 201A PM_{10} Emissions
Particulate Calculation Summary

Client: BP
Location: Whiting, In
Source: FCCU 600
Date: 10/29/2014
Run #: 1 - PM

Data Input

Barometric pressure (P_{bar}):	29.59	**inches Hg**	**Particulate Weight:**		
Stack pressure (P_s):	29.52	**Inches Hg Abs.**	**<PM10 (Filterable)**	43.60	**milligrams**
Test length (θ):	119.96	**minutes**	**>PM10 (Cyclone Catch)**	11.90	**milligrams**
Sample nozzle diameter (D_n):	0.1490	**inches**			
Sample nozzle area (A_n):	0.000121	**ft^3**	**<PM10 (Probe Wash)**	7.70	**milligrams**
Stack temperature (T_s):	601.5	**°F**	**Total PM_{10} front half:**	51.30	**milligrams**
Volume metered (Vm_{std}):	42.137	**ft^3**			
Stack gas velocity (V_s):	106.223	**feet/second**	**Total PM front half**	63.20	**milligrams**
Stack gas volumetric flow (Q_{std}):	8,000,345	**dscf/hour**	**Total corrected PM_{10} back half:**	4.47	**milligrams**
Fractional moisture content (B_{wo}):	0.1518				
Coke Burn Rate (R_c):	38,824	**lb/hr**	**Total PM_{10} weight (M_n):**	55.77	**milligrams**
			Total PM weight (M_n):	67.67	**milligrams (>PM_{10} + PM_{10})**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Percent Isokinetic:

$$\%Isokinetic = \frac{0.0945 \times Vm_{std} \times (T_s + 460)}{P_s \times V_s \times \theta \times A_n \times (1 - B_{wo})}$$

= **109.4 % isokinetic**

PM_{10} and Total Particulate emission rate (lb/dscf):

$$C_s = \frac{\left(\frac{0.01543 grains}{mg} \times M_n\right)}{V_{mstd}}$$

= **0.0248 total PM gr/dscf**
= **0.0044 >PM_{10} gr/dscf**
= **0.0188 filterable PM_{10} gr/dscf**
= **0.0016 condensible PM_{10} gr/dscf**
= **0.0204 PM_{10} gr/dscf**

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 ft^3}{m^3}$$

= **56.716 total PM mg/dscm**
= **9.973 >PM_{10} mg/dscm**
= **42.994 filterable PM_{10} mg/dscm**
= **3.749 condensible PM_{10} mg/dscm**
= **46.743 PM_{10} mg/dscm**

$$E_p = \frac{\left(\frac{2.205 \times 10^{-6} lb}{mg} \times M_n\right)}{V_{mstd}}$$

= **3.541 x 10^{-6} total PM lb/dscf**
= **0.623 x 10^{-6} >PM_{10} lb/dscf**
= **2.684 x 10^{-6} filterable PM_{10} lb/dscf**
= **0.234 x 10^{-6} condensible PM_{10} lb/dscf**
= **2.919 x 10^{-6} PM_{10} lb/dscf**

PM_{10} and Total Particulate emission rate (lb/hr):

$$E_p = C'_s \times Q_{std}$$

= **28.331 total PM lb/hr**
= **4.982 >PM_{10} lb/hr**
= **21.477 filterable PM_{10} lb/hr**
= **1.873 condensible PM_{10} lb/hr**
= **23.349 PM_{10} lb/hr**

$$pmr_{lb/1000lbcokeburn} = \frac{(E_p)(1000)}{(R_c)}$$

= **0.730 total PM lb/1000lb coke burn**
= **0.128 >PM_{10} lb/1000lb coke burn**
= **0.553 filterable PM_{10} lb/1000lb coke burn**
= **0.048 condensible PM_{10} lb/1000 coke burn**
= **0.601 PM_{10} lb/1000 coke burn**

USEPA Method 4
Moisture Determination Sample Calculations

Client:	BP
Location:	Whiting, In
Source:	FCCU 600
Date:	10/29/2014
Run #:	2 - PM

Data Input:

Volume metered (V_m):	40.292	**ft^3**
Meter calibration coefficient (Y_d):	0.990	**dimensionless**
Barometric pressure (P_{bar}):	29.56	**inches Hg**
Meter sample rate (ΔH):	0.50	**inches H_2O**
Meter inlet/outlet temperature (T_m):	52.9	**°F**
Volume of moisture collected (V_{lc}):	126.0	**milliliters**
Stack Temperature (T_s):	601.6	**°F**
Static Pressure (St):	-1.0	**inches H_2O**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Volume of sample, dry basis:

$$Vm_{std} = V_m \times Y_d \times \left(\frac{528.0°R}{29.92"Hg}\right) \times \left(\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460}\right) = \mathbf{40.620\ dscf}$$

Volume of water vapor in sample:

$$Vw_{std} = \frac{0.04707ft^3}{ml} \times V_{lc} = \mathbf{5.931\ scf}$$

Fractional moisture content of stack gas:

$$B_{wo} = \frac{Vw_{std}}{(Vm_{std} + Vw_{std})} = \mathbf{0.1274\ B_{wo}}$$

Percent Moisture:

$$\%moisture = B_{wo} \times 100 = \mathbf{12.74\ \%}$$

Fractional moisture content of stack gas at saturated conditions:

$$T_{s(°K)} = ((T_s - 32) * 0.5556) + 273 = \mathbf{589.5\ °Kelvin}$$

$$P_{s(mmHg)} = \left(P_{bar} + \frac{S_t}{13.6}\right) \times 25.401 = \mathbf{750.85\ mm\ Hg}$$

$$B_{wos} = \frac{\sqrt{\left(10^{\left(A - \left(\frac{B}{(T_{s(°K)} - C)}\right)\right)}\right)}}{P_{s(mmHg)}} = \mathbf{130.36}$$

where:
A= 8.361
B=1893.5
C=27.65

Percent moisture at saturated conditions:

$$\%moisture_{saturated} = B_{wos} \times 100 = \mathbf{100.00\ \%}$$

Percent moisture used for emissions calculations:

$$= \mathbf{12.74\ \%}$$

USEPA Method 2
Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client:	BP
Location:	Whiting, In
Source:	FCCU 600
Date:	10/29/2014
Run #:	2 - PM

Data Input

Carbon Dioxide (CO_2):	16.1	**%**
Oxygen (O_2):	2.2	**%**
Nitrogen (N_2):	82.5	**%**
Fractional Moisture Content (B_{wo})	0.1274	
Stack Temperature (T_s):	601.6	**°F**
Pitot Coefficient (C_p):	0.84	**dimensionless**
Average square root of ΔP	1.3226	**inches H_2O**
Barometric Pressure (P_{bar}):	29.56	**inches Hg**
Static Pressure (S_t)	-1.00	**inches H_2O**
Stack diameter:	96.00	**inches H_2O**
Stack area (A_s):	50.2655	**ft^2**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$ = **30.888 lb/lb-mole**

Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws})$$ = **29.246 lb/lb-mole**

Absolute stack gas pressure:

$$P_s = P_{bar} + \left(\frac{S_t}{13.6}\right)$$ = **29.486 inches H_2O**

Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}}$$ = **105.380 feet/second**

Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60$$ = **317,819 acfm**

Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right]$$ = **155,780 scfm**

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right] \times 60$$ = **9,346,824 scfh**

Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo})$$ = **135,933 dscfm**

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60$$ = **8,155,981 dscfh**

USEPA Method 201A PM_{10} Emissions
D_{50} Cutpoint Calculation Summary

Client:	BP
Location:	Whiting, In
Source:	FCCU 600
Date:	10/29/2014
Run #:	2 - PM

Data Input

Stack temperature (T_s):	601.6	°F
Fractional Moisture content (B_{ws}):	0.1274	%
Oxygen (O_2):	2.2	%
Stack pressure (P_s):	29.49	**Inches Hg Abs.**
Volume metered (Vm_{std}):	40.620	**dscf**
Volume of water vapor (Vw_{std}):	5.931	**scf**
Molecular weight of gas, wet basis (M_s):	29.246	**lb/lb-mole**
Test length (θ):	119.98	**minutes**
D_p:	10.0	**microns**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Stack gas viscosity:

$$\mu = -150.3162 + \left(13.4622 \times \sqrt{(T_s+460)}\right) + \left(3.86153 \times 10^{6} \times (T_s+460)^{-2}\right) + \left(0.591123 \times (\%O_{2,\,wet})\right) - (91.9723 \times B_{ws}) + \left(1.51761 \times 10^{-5} \times B_{ws} \times (T_s+460)^{2}\right)$$

= **283.3 micropoise**

Sample flow rate @ standard conditions:

$$Q_{sSt} = \frac{V_{mstd}}{\theta}$$

= **0.339 dscfm**

Sample flow rate through PM_{10} cyclone:

$$Q_s = \frac{29.92}{528} \times Q_{sSt} \times \left(\frac{1}{(1-B_{ws})}\right) \times \left(\frac{[T_s+460]}{P_s}\right)$$

= **0.792 cfm**

Calculated Reynolds Number

$$N_{re} = 8.64 \times 10^{5} \times \left(\frac{P_s \times M_s}{(T_s+460)}\right) \times \left(\frac{Q_s}{\mu}\right)$$

= **1961**

Cunningham Correction Factor

$$C = 1 + 0.0057193 \times \left(\frac{\mu}{P_s \times D_p}\right) \times \left(\left(\frac{[T_s+460]}{M_s}\right)^{0.50}\right)$$

= **1.033**

D_{50} cutpoint (for Cyclone I):

$$D_{50} = \left(0.15625 \times \left(\frac{[T_s+460]}{(M_s \times P_s)}\right)^{0.2091}\right) \times \left(\frac{\mu}{Q_s}\right)^{.7091}$$

= **10.559 µm**

ARI Environmental Inc.
USEPA Method 202
Condensible Particulate Calculation Summary

COMPANY: BP
LOCATION: Whiting, In
SOURCE: FCCU 600
TEST DATE: 10/29/14
RUN NUMBER: 2 - PM

Data Input:

V_m:	40.292	ft^3	Q_s:	135,933	dscfm
γ FACTOR:	0.99		T_s:	601.6	°F
P_{bar}:	29.56	in.Hg	Runtime:	119.98	minutes
ΔH:	0.50	$in.H_2O$	V_s:	105.380	ft/sec
T_m:	52.9	°F	P_s:	29.49	in.Hg
V_{lc}:	126	mL	Noz. diam:	0.147	inches
N:	0.0992		m_{ib}:	1.00	mg
V_t:	1.84	mL	m_{ob}:	1.30	mg
m_r:	11.50	mg			
m_o:	1.90	mg			

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Volume of sample at standard conditions:

$$V_{mstd} = \left(\frac{528}{29.92}\right) \times V_m \times \gamma \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}\right] = 40.620 \text{ dscf}$$

Mass of ammonia correction:

$$m_c = 17.03 \times V_T \times N = 3.11 \text{ mg}$$

Mass of the field blank:

$$m_{fb} = m_{ib} + m_{ob} = 2.00 \text{ mg @ max allowable}$$

2.00 mg @ max allowable

Mass of inorganic condensible PM:

$$m_i = m_r - m_c = 8.39 \text{ mg}$$

Total mass of condensible PM:

$$m_{cpm} = m_i + m_o - m_{fb} = 8.29 \text{ mg}$$

@ max. blank

USEPA Method 201A PM10 Emissions
Particulate Calculation Summary

Client:	BP
Location:	Whiting, In
Source:	FCCU 600
Date:	10/29/2014
Run #:	2 - PM

Data Input

Barometric pressure (P_{bar}):	29.56	**inches Hg**	**Particulate Weight:**		
Stack pressure (P_s):	29.49	**inches Hg Abs.**	**<PM10 (Filterable)**	42.65	**milligrams**
Test length (θ):	119.98	**minutes**	**>PM10 (Cyclone Catch)**	18.65	**milligrams**
Sample nozzle diameter (D_n):	0.1470	**inches**			
Sample nozzle area (A_n):	0.000118	**ft^3**	**<PM10 (Probe Wash)**	7.05	**milligrams**
Stack temperature (T_s):	601.6	**°F**	**Total PM_{10} front half:**	49.70	**milligrams**
Volume metered (Vm_{std}):	40.620	**ft^3**			
Stack gas velocity (V_s):	105.380	**feet/second**	**Total PM front half**	66.35	**milligrams**
Stack gas volumetric flow (Q_{std}):	8,155,981	**dscf/hour**	**Total corrected PM_{10} back half:**	8.29	**milligrams**
Fractional Moisture content (B_{wo}):	0.1274				
Coke Burn Rate (R_c):	38,946	**lb/hr**	**Total PM_{10} weight (M_n):**	57.99	**milligrams**
			Total PM weight (M_n):	76.64	**milligrams (>PM_{10} + PM_{10})**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Percent Isokinetic:

$$\%Isokinetic = \frac{0.0945 \times Vm_{std} \times (T_s + 460)}{P_s \times V_s \times \theta \times A_n \times (1 - B_{wo})}$$

= **106.3 % isokinetic**

PM_{10} and Total Particulate emission rate (lb/dscf):

$$C_s = \frac{\left(\frac{0.01543 grains}{mg} \times M_n\right)}{V_{mstd}}$$

= **0.0291 total PM gr/dscf**
= **0.0071 >PM_{10} gr/dscf**
= **0.0189 filterable PM_{10} gr/dscf**
= **0.0031 condensible PM_{10} gr/dscf**
= **0.0220 PM_{10} gr/dscf**

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 ft^3}{m^3}$$

= **66.633 total PM mg/dscm**
= **16.214 >PM_{10} mg/dscm**
= **43.209 filterable PM_{10} mg/dscm**
= **7.209 condensible PM_{10} mg/dscm**
= **50.418 PM_{10} mg/dscm**

$$E_p = \frac{\left(\frac{2.205 \times 10^{-6} lb}{mg} \times M_n\right)}{V_{mstd}}$$

= **4.160 x 10^{-6} total PM lb/dscf**
= **1.012 x 10^{-6} >PM_{10} lb/dscf**
= **2.698 x 10^{-6} filterable PM_{10} lb/dscf**
= **0.450 x 10^{-6} condensible PM_{10} lb/dscf**
= **3.148 x 10^{-6} PM_{10} lb/dscf**

PM_{10} and Total Particulate emission rate (lb/hr):

$$E_p = C^1_s \times Q_{std}$$

= **33.932 total PM lb/hr**
= **8.257 >PM_{10} lb/hr**
= **22.004 filterable PM_{10} lb/hr**
= **3.671 condensible PM_{10} lb/hr**
= **25.675 PM_{10} lb/hr**

$$pmr_{lb/1000lb\,coke\,burn} = \frac{(E_p)(1000)}{(R_c)}$$

= **0.871 total PM lb/1000lb coke burn**
= **0.212 >PM_{10} lb/1000lb coke burn**
= **0.565 filterable PM_{10} lb/1000lb coke burn**
= **0.094 condensible PM_{10} lb/1000 coke burn**
= **0.659 PM_{10} lb/1000 coke burn**

USEPA Method 4
Moisture Determination Sample Calculations

Client:	BP
Location:	Whiting, In
Source:	FCCU 600
Date:	10/29/2014
Run #:	3 - PM

Data Input:

Volume metered (V_m):	37.320	**ft^3**
Meter calibration coefficient (Y_d):	0.990	**dimensionless**
Barometric pressure (P_{bar}):	29.52	**inches Hg**
Meter sample rate (ΔH):	0.50	**inches H_2O**
Meter inlet/outlet temperature (T_m):	53.8	**°F**
Volume of moisture collected (V_{lc}):	137.7	**milliliters**
Stack Temperature (T_s):	601.8	**°F**
Static Pressure (St):	-1.0	**inches H_2O**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Volume of sample, dry basis:

$$Vm_{std} = V_m \times Y_d \times \left(\frac{528.0°R}{29.92"Hg}\right) \times \left(\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460}\right) = \mathbf{37.507\ dscf}$$

Volume of water vapor in sample:

$$Vw_{std} = \frac{0.04707 ft^3}{ml} \times V_{lc} = \mathbf{6.482\ scf}$$

Fractional moisture content of stack gas:

$$B_{wo} = \frac{Vw_{std}}{(Vm_{std} + Vw_{std})} = \mathbf{0.1473\ B_{wo}}$$

Percent Moisture:

$$\%moisture = B_{wo} \times 100 = \mathbf{14.73\ \%}$$

Fractional moisture content of stack gas at saturated conditions:

$$T_{s(°K)} = ((T_s - 32) * 0.5556) + 273 = \mathbf{589.6\ °Kelvin}$$

$$P_{s(mmHg)} = \left(P_{bar} + \frac{S_t}{13.6}\right) \times 25.401 = \mathbf{749.84\ mm\ Hg}$$

$$B_{wos} = \frac{\sqrt{\left(10^{\left(A - \left(\frac{B}{(T_{s(°K)} - C)}\right)\right)}\right)}}{P_{s(mmHg)}} = \mathbf{130.74}$$

where:
A= 8.361
B=1893.5
C=27.65

Percent moisture at saturated conditions:

$$\%moisture_{saturated} = B_{wos} \times 100 = \mathbf{100.00\ \%}$$

Percent moisture used for emissions calculations:

$$= \mathbf{14.73\ \%}$$

USEPA Method 2
Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client:	BP
Location:	Whiting, In
Source:	FCCU 600
Date:	10/29/2014
Run #:	3 - PM

Data Input

Carbon Dioxide (CO_2):	16.3	%
Oxygen (O_2):	2.2	%
Nitrogen (N_2):	81.5	%
Fractional Moisture Content (B_{wo})	0.1473	
Stack Temperature (T_s):	601.8	°F
Pitot Coefficient (C_p):	0.84	dimensionless
Average square root of ΔP	1.2971	inches H_2O
Barometric Pressure (P_{bar}):	29.52	inches Hg
Static Pressure (S_t)	-1.00	inches H_2O
Stack diameter:	96.00	inches H_2O
Stack area (A_s):	50.2655	ft^2

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$ = **30.696 lb/lb-mole**

Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws})$$ = **28.825 lb/lb-mole**

Absolute stack gas pressure:

$$P_s = P_{bar} + \left(\frac{S_t}{13.6}\right)$$ = **29.446 inches H_2O**

Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}}$$ = **104.180 feet/second**

Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60$$ = **314,201 acfm**

Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right]$$ = **153,769 scfm**

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right] \times 60$$ = **9,226,132 scfh**

Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo})$$ = **131,112 dscfm**

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60$$ = **7,866,693 dscfh**

USEPA Method 201A PM_{10} Emissions
D_{50} Cutpoint Calculation Summary

Client:	BP
Location:	Whiting, In
Source:	FCCU 600
Date:	10/29/2014
Run #:	3 - PM

Data Input

Stack temperature (T_s):	601.8	**°F**
Fractional Moisture content (B_{ws}):	0.1473	**%**
Oxygen (O_2):	2.2	**%**
Stack pressure (P_s):	29.45	**inches Hg Abs.**
Volume metered (Vm_{std}):	37.507	**dscf**
Volume of water vapor (Vw_{std}):	6.482	**scf**
Molecular weight of gas, wet basis (M_s):	28.825	**lb/lb-mole**
Test length (θ):	117.67	**minutes**
D_p:	10.0	**microns**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Stack gas viscosity:

$$\mu = -150.3162 + \left(13.4622 \times \sqrt{(T_s+460)}\right) + \left(3.86153\text{x}10^{6} \times (T_s+460)^{-2}\right) + \left(0.591123 \times (\%O_{2,\,wet})\right) - (91.9723 \times B_{ws}) + \left(1.51761\text{x}10^{-5} \times B_{ws} \times (T_s+460)^{2}\right)$$

= **281.9 micropoise**

Sample flow rate @ standard conditions:

$$Q_{sSt} = \frac{V_{mstd}}{\theta}$$

= **0.319 dscfm**

Sample flow rate through PM_{10} cyclone:

$$Q_s = \frac{29.92}{528} \times Q_{sSt} \times \left(\frac{1}{(1-B_{ws})}\right) \times \left(\frac{[T_s+460]}{P_s}\right)$$

= **0.764 cfm**

Calculated Reynolds Number

$$N_{re} = 8.64 \times 10^{5} \times \left(\frac{P_s \times M_s}{(T_s+460)}\right) \times \left(\frac{Q_s}{\mu}\right)$$

= **1872**

Cunningham Correction Factor

$$C = 1 + 0.0057193 \times \left(\frac{\mu}{P_s \times D_p}\right) \times \left(\left(\frac{[T_s+460]}{M_s}\right)^{0.50}\right)$$

= **1.033**

D_{50} cutpoint (for Cyclone I):

$$D_{50} = \left(0.15625 \times \left(\frac{[T_s+460]}{(M_s \times P_s)}\right)^{0.2091}\right) \times \left(\frac{\mu}{Q_s}\right)^{.7091}$$

= **10.825 μm**

ARI Environmental Inc.
USEPA Method 202
Condensible Particulate Calculation Summary

COMPANY: BP
LOCATION: Whiting, In
SOURCE: FCCU 600
TEST DATE: 10/29/14
RUN NUMBER: 3 - PM

Data Input:

V_m:	37.320	ft^3	Q_s:	131,112	dscfm
γ FACTOR:	0.99		T_s:	601.8	°F
P_{bar}:	29.52	in.Hg	Runtime:	117.67	minutes
ΔH:	0.50	$in.H_2O$	V_s:	104.180	ft/sec
T_m:	53.8	°F	P_s:	29.45	in.Hg
V_{lc}:	137.7	mL	Noz. diam:	0.149	inches
N:	0.0992		m_{ib}:	1.00	mg
V_t:	1.90	mL	m_{ob}:	1.30	mg
m_r:	13.80	mg			
m_o:	2.10	mg			

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Volume of sample at standard conditions:

$$V_{mstd} = \left(\frac{528}{29.92}\right) \times V_m \times \gamma \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}\right] = 37.507 \text{ dscf}$$

Mass of ammonia correction:

$$m_c = 17.03 \times V_T \times N = 3.21 \text{ mg}$$

Mass of the field blank:

$$m_{fb} = m_{ib} + m_{ob} = 2.00 \text{ mg @ max allowable}$$

2.00 mg @ max allowable

Mass of inorganic condensible PM:

$$m_i = m_r - m_c = 10.59 \text{ mg}$$

Total mass of condensible PM:

$$m_{cpm} = m_i + m_o - m_{fb} = 22.39 \text{ mg}$$

@ max. blank

USEPA Method 201A PM10 Emissions
Particulate Calculation Summary

Client: BP
Location: Whiting, In
Source: FCCU 600
Date: 10/29/2014
Run #: 3 - PM

Data Input

Barometric pressure (P_{bar}):	29.52	inches Hg	Particulate Weight:		
Stack pressure (P_s):	29.45	Inches Hg Abs.	<PM10 (Filterable)	39.50	milligrams
Test length (θ):	117.67	minutes	>PM10 (Cyclone Catch)	9.60	milligrams
Sample nozzle diameter (D_n):	0.1490	inches			
Sample nozzle area (A_n):	0.000121	ft^3	<PM10 (Probe Wash)	4.35	milligrams
Stack temperature (T_s):	601.8	°F	Total PM_{10} front half:	43.85	milligrams
Volume metered (Vm_{std}):	37.507	ft^3			
Stack gas velocity (V_s):	104.180	feet/second	Total PM front half	53.45	milligrams
Stack gas volumetric flow (Q_{std}):	7,866,693	dscf/hour	Total corrected PM_{10} back half:	22.39	milligrams
Fractional Moisture content (B_{wo}):	0.1473				
Coke Burn Rate (R_c):	38,887	lb/hr	Total PM_{10} weight (M_n):	66.24	milligrams
			Total PM weight (M_n):	75.84	milligrams (>PM_{10} + PM_{10})

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Percent Isokinetic:

$$\%Isokinetic = \frac{0.0945 \times Vm_{std} \times (T_s + 460)}{P_s \times V_s \times \theta \times A_n \times (1 - B_{wo})}$$

= 101.0 % isokinetic

PM_{10} and Total Particulate emission rate (lb/dscf):

$$C_s = \frac{\left(\frac{0.01543 grains}{mg} \times M_n\right)}{V_{mstd}}$$

= 0.0312 total PM gr/dscf
= 0.0039 >PM_{10} gr/dscf
= 0.0180 filterable PM_{10} gr/dscf
= 0.0092 condensible PM_{10} gr/dscf
= 0.0273 PM_{10} gr/dscf

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 ft^3}{m^3}$$

= 71.408 total PM mg/dscm
= 9.039 >PM_{10} mg/dscm
= 41.287 filterable PM_{10} mg/dscm
= 21.082 condensible PM_{10} mg/dscm
= 62.369 PM_{10} mg/dscm

$$E_p = \frac{\left(\frac{2.205 \times 10^{-6} lb}{mg} \times M_n\right)}{V_{mstd}}$$

= 4.459 x 10^{-6} total PM lb/dscf
= 0.564 x 10^{-6} >PM_{10} lb/dscf
= 2.578 x 10^{-6} filterable PM_{10} lb/dscf
= 1.316 x 10^{-6} condensible PM_{10} lb/dscf
= 3.894 x 10^{-6} PM_{10} lb/dscf

PM_{10} and Total Particulate emission rate (lb/hr):

$$E_p = C'_s \times Q_{std}$$

= 35.074 total PM lb/hr
= 4.440 >PM_{10} lb/hr
= 20.280 filterable PM_{10} lb/hr
= 10.355 condensible PM_{10} lb/hr
= 30.635 PM_{10} lb/hr

$$pmr_{lb/1000/bcokeburn} = \frac{(E_p)(1000)}{(R_c)}$$

= 0.902 total PM lb/1000lb coke burn
= 0.114 >PM_{10} lb/1000lb coke burn
= 0.522 filterable PM_{10} lb/1000lb coke burn
= 0.266 condensible PM_{10} lb/1000 coke burn
= 0.788 PM_{10} lb/1000 coke burn

USEPA Method 4
Moisture Determination Sample Calculations

Client:	BP
Location:	Whiting, In
Source:	FCCU 600
Date:	10/30/2014
Run #:	4 - PM

Data Input:

Volume metered (V_m):	39.720	**ft^3**
Meter calibration coefficient (Y_d):	0.990	**dimensionless**
Barometric pressure (P_{bar}):	29.62	**inches Hg**
Meter sample rate (ΔH):	0.50	**inches H_2O**
Meter inlet/outlet temperature (T_m):	70.0	**°F**
Volume of moisture collected (V_{lc}):	136.0	**milliliters**
Stack Temperature (T_s):	614.0	**°F**
Static Pressure (St):	-1.0	**inches H_2O**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Volume of sample, dry basis:

$$Vm_{std} = V_m \times Y_d \times \left(\frac{528.0°R}{29.92"Hg}\right) \times \left(\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460}\right) = \mathbf{38.830\ dscf}$$

Volume of water vapor in sample:

$$Vw_{std} = \frac{0.04707 ft^3}{ml} \times V_{lc} = \mathbf{6.402\ scf}$$

Fractional moisture content of stack gas:

$$B_{wo} = \frac{Vw_{std}}{(Vm_{std} + Vw_{std})} = \mathbf{0.1415\ B_{wo}}$$

Percent Moisture:

$$\%moisture = B_{wo} \times 100 = \mathbf{14.15\ \%}$$

Fractional moisture content of stack gas at saturated conditions:

$$T_{s(°K)} = ((T_s - 32) * 0.5556) + 273 = \mathbf{596.4\ °Kelvin}$$

$$P_{s(mmHg)} = \left(P_{bar} + \frac{S_t}{13.6}\right) \times 25.401 = \mathbf{752.38\ mm\ Hg}$$

$$B_{wos} = \frac{\sqrt{\left(10^{\left(A - \left(\frac{B}{(T_{s(°K)} - C)}\right)\right)}\right)}}{P_{s(mmHg)}} = \mathbf{142.92}$$

where:
A= 8.361
B=1893.5
C=27.65

Percent moisture at saturated conditions:

$$\%moisture_{saturated} = B_{wos} \times 100 = \mathbf{100.00\ \%}$$

Percent moisture used for emissions calculations:

$$= \mathbf{14.15\ \%}$$

USEPA Method 2
Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client:	BP
Location:	Whiting, In
Source:	FCCU 600
Date:	10/30/2014
Run #:	4 - PM

Data Input

Carbon Dioxide (CO_2):	16.2	%
Oxygen (O_2):	2.1	%
Nitrogen (N_2):	81.7	%
Fractional Moisture Content (B_{wo})	0.1415	
Stack Temperature (T_s):	614.0	°F
Pitot Coefficient (C_p):	0.84	dimensionless
Average square root of ΔP	1.3380	inches H_2O
Barometric Pressure (P_{bar}):	29.62	inches Hg
Static Pressure (S_t)	-1.00	inches H_2O
Stack diameter:	96.00	inches H_2O
Stack area (A_s):	50.2655	ft^2

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$ = **30.676 lb/lb-mole**

Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws})$$ = **28.882 lb/lb-mole**

Absolute stack gas pressure:

$$P_s = P_{bar} + \left(\frac{S_t}{13.6}\right)$$ = **29.546 inches H_2O**

Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}}$$ = **107.792 feet/second**

Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60$$ = **325,093 acfm**

Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right]$$ = **157,826 scfm**

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right] \times 60$$ = **9,469,588 scfh**

Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo})$$ = **135,489 dscfm**

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60$$ = **8,129,366 dscfh**

USEPA Method 201A PM_{10} Emissions
D_{50} Cutpoint Calculation Summary

Client:	BP
Location:	Whiting, In
Source:	FCCU 600
Date:	10/30/2014
Run #:	12:30 -14:41

Data Input

Stack temperature (T_s):	614.0	**°F**
Fractional Moisture content (B_{ws}):	0.1415	**%**
Oxygen (O_2):	2.1	**%**
Stack pressure (P_s):	29.55	**Inches Hg Abs.**
Volume metered (Vm_{std}):	38.830	**dscf**
Volume of water vapor (Vw_{std}):	6.402	**scf**
Molecular weight of gas, wet basis (M_s):	28.882	**lb/lb-mole**
Test length (θ):	121.64	**minutes**
D_p:	10.0	**microns**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Stack gas viscosity:

$$\mu = -150.3162 + \left(13.4622 \times \sqrt{(T_s + 460)}\right) + \left(3.86153 \times 10^{6} \times (T_s + 460)^{-2}\right) + \left(0.591123 \times (\%O_{2,wet})\right) - (91.9723 \times B_{ws}) + \left(1.51761 \times 10^{-5} \times B_{ws} \times (T_s + 460)^{2}\right)$$

= **284.7 micropoise**

Sample flow rate @ standard conditions:

$$Q_{sSt} = \frac{V_{mstd}}{\theta}$$

= **0.319 dscfm**

Sample flow rate through PM_{10} cyclone:

$$Q_s = \frac{29.92}{528} \times Q_{sSt} \times \left(\frac{1}{(1 - B_{ws})}\right) \times \left(\frac{[T_s + 460]}{P_s}\right)$$

= **0.766 cfm**

Calculated Reynolds Number

$$N_{re} = 8.64 \times 10^{5} \times \left(\frac{P_s \times M_s}{(T_s + 460)}\right) \times \left(\frac{Q_s}{\mu}\right)$$

= **1847**

Cunningham Correction Factor

$$C = 1 + 0.0057193 \times \left(\frac{\mu}{P_s \times D_p}\right) \times \left(\left(\frac{[T_s + 460]}{M_s}\right)^{0.50}\right)$$

= **1.034**

D_{50} cutpoint (for Cyclone I):

$$D_{50} = \left(0.15625 \times \left(\frac{[T_s + 460]}{(M_s \times P_s)}\right)^{0.2091}\right) \times \left(\frac{\mu}{Q_s}\right)^{.7091}$$

= **10.896 µm**

ARI Environmental Inc.
USEPA Method 202
Condensible Particulate Calculation Summary

COMPANY: BP
LOCATION: Whiting, In
SOURCE: FCCU 600
TEST DATE: 10/30/14
RUN NUMBER: 4 - PM

Data Input:

V_m:	39.720	ft^3	Q_s:	135,489	dscfm
γ FACTOR:	0.99		T_s:	614.0	°F
P_{bar}:	29.62	in.Hg	Runtime:	121.64	minutes
ΔH:	0.50	$in.H_2O$	V_s:	107.792	ft/sec
T_m:	70	°F	P_s:	29.55	in.Hg
V_{lc}:	136	mL	Noz. diam:	0.147	inches
N:	0.0992		m_{ib}:	1.00	mg
V_t:	0.67	mL	m_{ob}:	1.30	mg
m_r:	6.50	mg			
m_o:	1.10	mg			

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Volume of sample at standard conditions:

$$V_{mstd} = \left(\frac{528}{29.92}\right) \times V_m \times \gamma \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}\right] = 38.830 \text{ dscf}$$

Mass of ammonia correction:

$$m_c = 17.03 \times V_T \times N = 1.13 \text{ mg}$$

Mass of the field blank:

$$m_{fb} = m_{ib} + m_{ob} = 2.00 \text{ mg @ max allowable}$$

2.00 mg @ max allowable

Mass of inorganic condensible PM:

$$m_i = m_r - m_c = 5.37 \text{ mg}$$

Total mass of condensible PM:

$$m_{cpm} = m_i + m_o - m_{fb} = 4.47 \text{ mg}$$

@ max. blank

USEPA Method 201A PM10 Emissions
Particulate Calculation Summary

Client:	BP
Location:	Whiting, In
Source:	FCCU 600
Date:	10/30/2014
Run #:	PM10 - 4

Data Input

Barometric pressure (P_{bar}):	29.62	**inches Hg**	**Particulate Weight:**	
Stack pressure (P_s):	29.55	**Inches Hg Abs.**	**<PM10 (Filterable)**	45.00 **milligrams**
Test length (θ):	121.64	**minutes**	**>PM10 (Cyclone Catch)**	11.75 **milligrams**
Sample nozzle diameter (D_n):	0.1470	**inches**		
Sample nozzle area (A_n):	0.000118	**ft^3**	**<PM10 (Probe Wash)**	9.50 **milligrams**
Stack temperature (T_s):	614.0	**°F**	**Total PM_{10} front half:**	54.50 **milligrams**
Volume metered (Vm_{std}):	38.830	**ft^3**		
Stack gas velocity (V_s):	107.792	**feet/second**	**Total PM front half**	66.25 **milligrams**
Stack gas volumetric flow (Q_{std}):	8,129,366	**dscf/hour**	**Total corrected PM_{10} back half:**	4.47 **milligrams**
Fractional Moisture content (B_{wo}):	0.1415			
Coke Burn Rate (R_c):	40,239	**lb/hr**	**Total PM_{10} weight (M_n):**	58.97 **milligrams**
			Total PM weight (M_n):	70.72 **milligrams (>PM_{10} + PM_{10})**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Percent Isokinetic:

$$\%Isokinetic = \frac{0.0945 \times Vm_{std} \times (T_s + 460)}{P_s \times V_s \times \theta \times A_n \times (1 - B_{wo})}$$

= **100.5 % isokinetic**

PM_{10} and Total Particulate emission rate (lb/dscf):

$$C_s = \frac{\left(\frac{0.01543 grains}{mg} \times M_n\right)}{V_{mstd}}$$

= **0.0281 total PM gr/dscf**
= **0.0047 >PM_{10} gr/dscf**
= **0.0217 filterable PM_{10} gr/dscf**
= **0.0018 condensible PM_{10} gr/dscf**
= **0.0234 PM_{10} gr/dscf**

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 ft^3}{m^3}$$

= **64.317 total PM mg/dscm**
= **10.686 >PM_{10} mg/dscm**
= **49.567 filterable PM_{10} mg/dscm**
= **4.064 condensible PM_{10} mg/dscm**
= **53.631 PM_{10} mg/dscm**

$$E_p = \frac{\left(\frac{2.205 \times 10^{-6} lb}{mg} \times M_n\right)}{V_{mstd}}$$

= **4.016 x 10^{-6} total PM lb/dscf**
= **0.667 x 10^{-6} >PM_{10} lb/dscf**
= **3.095 x 10^{-6} filterable PM_{10} lb/dscf**
= **0.254 x 10^{-6} condensible PM_{10} lb/dscf**
= **3.349 x 10^{-6} PM_{10} lb/dscf**

PM_{10} and Total Particulate emission rate (lb/hr):

$$E_p = C'_s \times Q_{std}$$

= **32.646 total PM lb/hr**
= **5.424 >PM_{10} lb/hr**
= **25.159 filterable PM_{10} lb/hr**
= **2.063 condensible PM_{10} lb/hr**
= **27.222 PM_{10} lb/hr**

$$pmr_{lb/1000lb\,coke\,burn} = \frac{(E_p)(1000)}{(R_c)}$$

= **0.811 total PM lb/1000lb coke burn**
= **0.135 >PM_{10} lb/1000lb coke burn**
= **0.625 filterable PM_{10} lb/1000lb coke burn**
= **0.051 condensible PM_{10} lb/1000 coke burn**
= **0.677 PM_{10} lb/1000 coke burn**

PARTICULATE EMISSIONS PRORATION PROCEDURES

(Excerpted from memo to all US. EPA Regions from E. Reich dated March 6, 1979):

Client: BP
Location: Whiting, In
Source: FCCU 600
Date: 10/29/2014
Run #: 2 - PM

The representative average emissions must be calculated by the following generalized equation (instead of simple averaging as outlined in 40 CFR 60.8(f)):

$$E_{pave} = E_{sbr}\left(\frac{(A+B)S}{AR}\right) + E_{nosb}\left(\frac{R-S}{R} - \frac{BS}{AR}\right)$$

Where:

E_{pave}	=	average E for daily operating time
E_{sbr}	=	average E of sample(s) containing soot blowing
E_{nosb}	=	average E of sample(s) with no soot blowing
A	=	hours of soot blowing during sample(s)
B	=	hours not blowing during sample(s) containing soot blowing
R	=	average hours of operating per 24 hours
S	=	average hours of sootblowing per 24 hours

Test and Sootblowing Data:

Run	2 - PM			
Date	10/29/2014			
Run Clock Time	13:20 - 15:30			
Total Sample Run Time	2.00	hours		
Soot Blow Time	13:35 - 13:41			
Soot Blow Duration	6	**minutes**		
Average E of sample(s) containing soot blowing, (E_{sbr}):	22.004	**total lb/hr**	0.5650	**lb/1000lb coke burn**
Average E of sample(s) with no soot blowing, (E_{nosb}):	22.305	**total lb/hr**	0.5666	**lb/1000lb coke burn**
Hours of soot blowing during sample(s), (A):	0.100	**hours**		
Hours not soot blowing during sample run (B):	1.900	**hours**		
Average hours of operating per 24 hours, (R):	24.00	**hours**		
Average hours of soot blowing per 24 hours, (S):	0.40	**hours**		

Test Program Pro-rated Results:

Filterable PM10 Emissions: = **22.205 average lb/hr**
= **0.5661 average lb/1000lb coke burn**

PARTICULATE EMISSIONS PRORATION PROCEDURES

(Excerpted from memo to all US. EPA Regions from E. Reich dated March 6, 1979):

Client: BP
Location: Whiting, In
Source: FCCU 600
Date: 10/29/2014
Run #: 2 - PM

The representative average emissions must be calculated by the following generalized equation (instead of simple averaging as outlined in 40 CFR 60.8(f)):

$$E_{pave} = E_{sbr}\left(\frac{(A+B)S}{AR}\right) + E_{nosb}\left(\frac{R-S}{R} - \frac{BS}{AR}\right)$$

Where:

E_{pave}	=	average E for daily operating time
E_{sbr}	=	average E of sample(s) containing soot blowing
E_{nosb}	=	average E of sample(s) with no soot blowing
A	=	hours of soot blowing during sample(s)
B	=	hours not blowing during sample(s) containing soot blowing
R	=	average hours of operating per 24 hours
S	=	average hours of sootblowing per 24 hours

Test and Sootblowing Data:

Run	2 - PM			
Date	10/29/2014			
Run Clock Time	13:20 - 15:30			
Total Sample Run Time	2.00	hours		
Soot Blow Time	13:35 - 13:41			
Soot Blow Duration	6	**minutes**		
Average E of sample(s) containing soot blowing, (E_{sbr}):	3.671	**total lb/hr**	0.0943	**lb/1000lb coke burn**
Average E of sample(s) with no soot blowing, (E_{nosb}):	4.763	**total lb/hr**	0.1219	**lb/1000lb coke burn**
Hours of soot blowing during sample(s), (A):	0.100	**hours**		
Hours not soot blowing during sample run (B):	1.900	**hours**		
Average hours of operating per 24 hours, (R):	24.00	**hours**		
Average hours of soot blowing per 24 hours, (S):	0.40	**hours**		

Test Program Pro-rated Results:

Total Condensible PM Emissions: = **4.399 average lb/hr**
= **0.1127 average lb/1000lb coke burn**

PARTICULATE EMISSIONS PRORATION PROCEDURES

(Excerpted from memo to all US. EPA Regions from E. Reich dated March 6, 1979):

Client: BP
Location: Whiting, In
Source: FCCU 600
Date: 10/29/2014
Run #: 2 - PM

The representative average emissions must be calculated by the following generalized equation (instead of simple averaging as outlined in 40 CFR 60.8(f)):

$$E_{pave} = E_{sbr}\left(\frac{(A+B)S}{AR}\right) + E_{nosb}\left(\frac{R-S}{R} - \frac{BS}{AR}\right)$$

Where:

E_{pave}	=	average E for daily operating time
E_{sbr}	=	average E of sample(s) containing soot blowing
E_{nosb}	=	average E of sample(s) with no soot blowing
A	=	hours of soot blowing during sample(s)
B	=	hours not blowing during sample(s) containing soot blowing
R	=	average hours of operating per 24 hours
S	=	average hours of sootblowing per 24 hours

Test and Sootblowing Data:

Run	2 - PM			
Date	10/29/2014			
Run Clock Time	13:20 - 15:30			
Total Sample Run Time	2.00	hours		
Soot Blow Time	13:35 - 13:41			
Soot Blow Duration	6	**minutes**		
Average E of sample(s) containing soot blowing, (E_{sbr}):	25.675	**total lb/hr**	0.6593	**lb/1000lb coke burn**
Average E of sample(s) with no soot blowing, (E_{nosb}):	27.069	**total lb/hr**	0.6886	**lb/1000lb coke burn**
Hours of soot blowing during sample(s), (A):	0.100	**hours**		
Hours not soot blowing during sample run (B):	1.900	**hours**		
Average hours of operating per 24 hours, (R):	24.00	**hours**		
Average hours of soot blowing per 24 hours, (S):	0.40	**hours**		

Test Program Pro-rated Results:

PM_{10} Emissions: = **26.604 average lb/hr**
= **0.6788 average lb/1000lb coke burn**

PARTICULATE EMISSIONS PRORATION PROCEDURES

(Excerpted from memo to all US. EPA Regions from E. Reich dated March 6, 1979):

Client: BP
Location: Whiting, In
Source: FCCU 600
Date: 10/29/2014
Run #: 2 - PM

The representative average emissions must be calculated by the following generalized equation (instead of simple averaging as outlined in 40 CFR 60.8(f)):

$$E_{pave} = E_{sbr}\left(\frac{(A+B)S}{AR}\right) + E_{nosb}\left(\frac{R-S}{R} - \frac{BS}{AR}\right)$$

Where:

E_{pave}	=	average E for daily operating time
E_{sbr}	=	average E of sample(s) containing soot blowing
E_{nosb}	=	average E of sample(s) with no soot blowing
A	=	hours of soot blowing during sample(s)
B	=	hours not blowing during sample(s) containing soot blowing
R	=	average hours of operating per 24 hours
S	=	average hours of sootblowing per 24 hours

Test and Walnut Blasting Data:

Run	2 - PM			
Date	10/29/2014			
Run Clock Time	13:20 - 15:30			
Total Sample Run Time	2.00	hours		
Soot Blow Time	13:35 - 13:41			
Soot Blow Duration	6	**minutes**		
Average E of sample(s) containing soot blowing, (E_{sbr}):	8.257	**total lb/hr**	0.2120	**lb/1000lb coke burn**
Average E of sample(s) with no soot blowing, (E_{nosb}):	4.949	**total lb/hr**	0.1258	**lb/1000lb coke burn**
Hours of soot blowing during sample(s), (A):	0.100	**hours**		
Hours not soot blowing during sample run (B):	1.900	**hours**		
Average hours of operating per 24 hours, (R):	24.00	**hours**		
Average hours of soot blowing per 24 hours, (S):	0.40	**hours**		

Test Program Pro-rated Results:

Filterable >PM10 Emissions: = **6.051 average lb/hr**
= **0.1545 average lb/1000lb coke burn**

PARTICULATE EMISSIONS PRORATION PROCEDURES

(Excerpted from memo to all US. EPA Regions from E. Reich dated March 6, 1979):

Client: BP
Location: Whiting, In
Source: FCCU 600
Date: 10/29/2014
Run #: 2 - PM

The representative average emissions must be calculated by the following generalized equation (instead of simple averaging as outlined in 40 CFR 60.8(f)):

$$E_{pave} = E_{sbr}\left(\frac{(A+B)S}{AR}\right) + E_{nosb}\left(\frac{R-S}{R} - \frac{BS}{AR}\right)$$

Where:

E_{pave}	=	average E for daily operating time
E_{sbr}	=	average E of sample(s) containing soot blowing
E_{nosb}	=	average E of sample(s) with no soot blowing
A	=	hours of soot blowing during sample(s)
B	=	hours not blowing during sample(s) containing soot blowing
R	=	average hours of operating per 24 hours
S	=	average hours of sootblowing per 24 hours

Test and Sootblowing Data:

Run	2 - PM			
Date	10/29/2014			
Run Clock Time	13:20 - 15:30			
Total Sample Run Time	2.00	hours		
Soot Blow Time	13:35 - 13:41			
Soot Blow Duration	6	**minutes**		
Average E of sample(s) containing soot blowing, (E_{sbr}):	33.932	**total lb/hr**	0.8713	**lb/1000lb coke burn**
Average E of sample(s) with no soot blowing, (E_{nosb}):	32.017	**total lb/hr**	0.8143	**lb/1000lb coke burn**
Hours of soot blowing during sample(s), (A):	0.100	**hours**		
Hours not soot blowing during sample run (B):	1.900	**hours**		
Average hours of operating per 24 hours, (R):	24.00	**hours**		
Average hours of soot blowing per 24 hours, (S):	0.40	**hours**		

Test Program Pro-rated Results:

Total PM Emissions: = **32.655 average lb/hr**
= **0.8333 average lb/1000lb coke burn**

APPENDIX B

Field Data

TRAVERSE POINT LOCATIONS FOR CIRCULAR AND RECTANGULAR STACKS AND DUCTS

Facility BP
Date 10/22/14
Sampling Location FCCU 600
Inside of Far Wall to Outside of Port (Distance C) 118.75 in.
Inside of Near Wall to Outside of Port (Distance D) 22.75 in
Stack ID (Distance C- Distance D) 96 in.
Port Distance Downstream From Disturbance (B) 936 in.
Port Distance Upstream From Disturbance (A) ~480 in.
Equivalent Diameters Downstream From Disturbance (B) 9.75 (≥ 2.0)
Equivalent Diameters Upstream From Disturbance (A) 5 (≥ 0.5)
Number of Ports Used 2 Traverse Points / Port 6

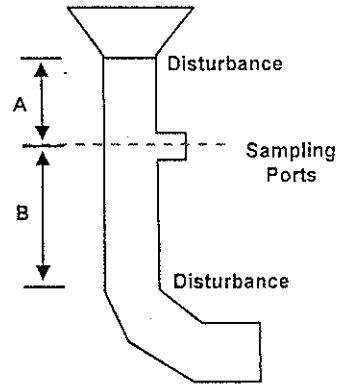
Note: Sketch Stack/Ports/Control Device on Back of Form

Equivalent Diameters Downstream From Disturbance (B) = [Distance B / Stack ID]

Equivalent Diameters Upstream From Disturbance (A) = [Distance A / Stack ID]

Equivalent Diameter For a Square or Rectangular Stack = [(2 x L x W) / (L + W)]

Port ID 5 in. (for monorail bracket specs.)
Port Length Outside of Stack _____ in. (for monorail bracket specs.)



1	2	3	4	5	6
Port Traverse Point Number	Fractional % of Stack I.D. (frac. %)	Stack I.D. (inches)	Product of Columns 2 and 3 (inches)	Port Depth (inches)	Traverse Point Location From Outside of Port (Sum of 4 and 5 in inches)
1	.044	96	4.22	22.75	26.97
2	.146		14.01		36.76
3	.296		28.41		51.16
4	.704		67.58		70.33
5	.854		81.98		104.73
6	.956		91.77		114.52
7					
8					
9					
10					
11					
12					

For Stacks / Ducts ≤ 24 inches ID – No traverse point shall be located less than 0.5 inches from stack wall

For Stacks / Ducts > 24 inches ID – No traverse point shall be located less than 1.0 inches from stack wall

QA/QC Check:
Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓

Method 1 Calculator Signature/Date 10/22/14 / [signature]

Field Supervisor Signature/Date [signature] 10/22/14

LOCATION OF TRAVERSE POINTS IN CIRCULAR STACKS

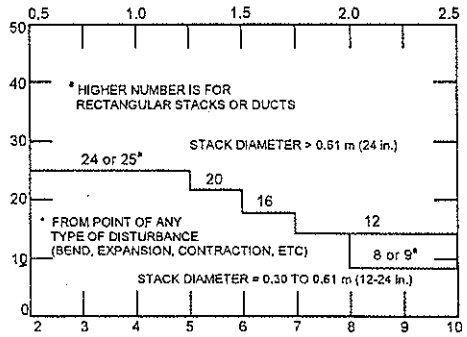
Pts	4	6	8	10	12
1	6.7	4.4	3.2	2.6	2.1
2	25.0	14.6	10.5	8.2	6.7
3	75.0	29.6	19.4	14.6	11.8
4	93.3	70.4	32.3	22.6	17.7
5		85.4	67.7	34.2	25.0
6		95.6	80.6	65.8	35.6
7			89.5	77.4	64.4
8			96.8	85.4	75.0
9				91.8	82.3
10				97.4	88.2
11					93.3
12					97.9

LOCATION OF TRAVERSE POINTS IN RECTANGULAR STACKS
CEMS*

Pts	2	3	4	5	6	7	8	9
1	25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6
2	75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7
3		83.3	62.5	50.0	41.7	35.7	31.3	27.8
4			87.5	70.0	58.3	50.0	43.8	38.9
5				90.0	75.0	64.3	56.3	50.0
6					91.7	78.6	68.8	61.1
7						92.9	81.3	72.2
8							93.8	83.3
9								94.4

*3 point CEMS RATA traverse point locations (valid for rectangular and round stacks)

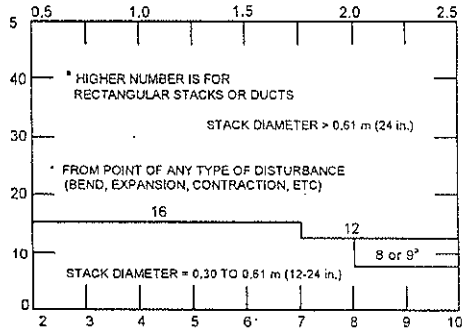
DUCT DIAMETERS UPSTREAM FROM FLOW DISTURBANCE* (DISTANCE A)



DUCT DIAMETERS DOWNSTREAM FROM FLOW DISTURBANCE* (DISTANCE B)

MINIMUM NUMBER OF TRAVERSE POINTS
ISOKINETIC TESTING

DUCT DIAMETERS UPSTREAM FROM FLOW DISTURBANCE* (DISTANCE A)



DUCT DIAMETERS DOWNSTREAM FROM FLOW DISTURBANCE* (DISTANCE B)

MINIMUM NUMBER OF TRAVERSE POINTS
FOR VELOCITY (NON-ISOKINETIC) TRAVERSES

Form FDF 4000.00

ARI ENVIRONMENTAL INC.

SAMPLING NOZZLE INSPECTION AND MEASUREMENT

Date: 10/29/14

Nozzle ID: #2

Nozzle Type: S.S. PM_{10}

Inspected By: S. Flaherty

Nozzle Clean: (Y) / N

Nozzle Undamaged: (Y) / N

Absent of Nicks or Dents: (Y) / N (New)

Leading Edge Sharp: (Y) / N

	Nozzle Diameter				
	D_1 (inches)	D_2 (inches)	D_3 (inches)	ΔD (inches)	D_{avg} (inches)
Set A	0.148	0.149	0.149	0.001	0.149
Set B	0.147	0.148	0.147	0.001	0.147

where:

$D_{1,2,3}$ = three different nozzle diameter measurements , (inches) ; each diameter must be measured to within 0.001 inches

ΔD = maximum difference between any two diameters, (inches) ; $\Delta D \leq 0.004$ inches

D_{avg} = average of D_1, D_2, and D_3, (inches)

Form FDF 4004.00

VELOCITY TRAVERSE AND CYCLONIC FLOW VERIFICATION

PLANT: BP Whiting
DATE: 10-29-14
LOCATION: Whiting, IN
SOURCE: FCC 600
STACK ID: 97.0
PROBE #/TC #: 731
BAROMETRIC PRESSURE, in. Hg: 29.68
OPERATORS: WAH, JP

SCHEMATIC OF TRAVERSE POINT LAYOUT

RUN NO. Cyclonic
STATIC, in. H_2O _____
START: _____ STOP: _____
PRE-TEST: +/-0.5 POST-TEST: +/-0.5

TRAVERSE POINT NUMBER	VELOCITY HEAD, ΔP (in. H_2O)	STACK TEMP. (°F)	YAW ANGLE (°)
1			9
2			7
3			2
4			0
5			4
6			1
1			5
2			3
3			1
4			0
5			1
6			4
AVERAGE			2.0°

RUN NO. _____
STATIC, in. H_2O _____
START: _____ STOP: _____
PRE-TEST: _____ POST-TEST: _____

TRAVERSE POINT NUMBER	VELOCITY HEAD, ΔP (in. H_2O)	STACK TEMP. (°F)	YAW ANGLE (°)
AVERAGE			

Form FDF 4005-00

1-PM ~~PM10 202-1~~ 1-PM

PM-10

K = 7.56

FIELD DATA

B-4

PLANT	BP whiting	AMBIENT TEMPERATURE	44	PROBE HEATER SETTING	250
DATE	10-29-14	BAROMETRIC PRESSURE	27.84	HEATER BOX SETTING	250
LOCATION	~~FCC 600~~ whiting	ASSUMED MOISTURE, %	15	METER $H_@$	1.92
OPERATOR	WAH/JP	PROBE LENGTH, in.	120	C_p FACTOR	0.84
STACK NO.	FCC 600	NOZZLE DIAMETER, in.	0.149	Y_d FACTOR	0.990
RUN NO.	~~PM 202-1~~ 1-PM	STACK DIAMETER, in.	97.0	PITOT NO.	73
SAMPLE BOX NO.	A98X	MINUTES PER POINT	Variable		
METER BOX NO.	~~0308024~~	NUMBER OF POINTS	12		
START TIME	1010	NUMBER OF PORTS	2		

WEIGHT OF PARTICULATE, mg		
Filter No.		
Sample		
Final wt		
Tare wt		
Wt. gain		
TOTAL		mg

CROSS SECTION

Bowell Time	CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (Θ) min.	STATIC PRESSURE (in. H_2O)	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP_s)	VELOCITY HEAD (ΔP_s)	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP AT DRY GAS METER INLET (Tm_{in}) °F	OUTLET (Tm_{out}) °F	FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
9:52	1010	1	0	-1.0	582	1.7	—	0.50	0.50	439.220	—	48	240	252	67	44	1
10:08		2	9.86		598	1.8		0.50	0.50	442.93		48	250	252	68	42	1
10:08		3	20.00		601	1.8		0.50	0.50	446.58		48	252	253	68	42	1
10:08		4	30.14		605	1.8		.50	.50	450.17		49	256	251	67	42	1
10:08		5	~~40.14~~	40.28	606	1.8		.50	.50	453.98		49	251	251	68	42	1
10:08		6	~~50.28~~	50.42	606	1.6		.50	.50	456.90		49	245	258	67	43	1
9:31	11:21	1	~~54.44~~	59.98	591	1.7		.50	.50	460.23		50	240	243	67	44	1
10:08	11:25	2	~~64.51~~	69.84	606	1.6		.50	.50	463.71		51	245	248	67	45	1
10:08		3	~~74.54~~	79.98	605	1.8		.50	.50	467.12		51	268	251	67	47	1
10:08	10:08	4	~~84.60~~	90.12	605	1.8		.50	.50	470.58		50	259	258	69	46	1
10:08	10:08	5	~~100.13~~	100.26	606	1.8		.50	.50	474.16		49	265	257	68	45	1
9:33		6	~~110.23~~	110.40	607	1.6		.50	.50	477.42		49	~~26~~ 260	255	67	45	1
1225			~~119.50~~	119.96						480.682							
					√												
					601.5	√		√		√		√					
AVERAGE	12	119.96	-1.0	~~601.66~~	1.3226	—		0.50	—	441.412	—	49.250					

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g) #1	#2	#3	#4	#5	SILICA GEL WEIGHT g
FINAL						
INITIAL						
LIQUID COLLECTED						
TOTAL LIQUID COLLECTED (specify ml or g)						

ORSAT DATA	TIME	CO_2	O_2
TRIAL 1	1300	16.2	2.1
TRIAL 2	1305	16.2	2.1
TRIAL 3	1310	16.2	2.1
Average		16.2	2.1

LEAK CHECK		
SYSTEM PRE:	0.000	CFM@15"Hg
POST:	0.000	CFM@15"Hg
PITOT PRE:	H-ok	@>3"H_2O
POST:	H-ok	@>3"H_2O

Form FDF 4003.00

ARI ENVIRONMENTAL INC.

IMPINGER RECOVERY DATA SHEET

Company:	BP	Date Set-up:	10/27/14
Location:	Whiting, IN	Test Date:	10/29/14
Source:	600 stack	Date Recovered:	10/29/14
Run No.:	1-PM	USEPA Method:	201A/202
		Corresponding Filter Wgt:	846.8
		Filter Container No:	55579

Measurement Method: Weight or Volume

Impinger No.	Impinger Contents	Initial wt/vol g/mL	Final wt/vol g/mL	Difference wt/vol g/mL	Sample Container No.
1	KO	380.3	507.1	126.8	
2	MT	609.8	627.2	17.4	
3	~100 mL DI	731.8	737.7	5.9	
4	SG	802.2	812.3	10.1	
5					
6					

Total = 160.2

FORM FDF 4007.00

ARI ENVIRONMENTAL INC.

2-PM

9.83
0.16

FIELD DATA

$5_1 = 7.56$

20

~~2.87~~

1.29

B-6

PLANT	BP Whiting	AMBIENT TEMPERATURE	50	PROBE HEATER SETTING	250		
DATE	10-29-14	BAROMETRIC PRESSURE	29.56	HEATER BOX SETTING	250		
LOCATION	Whiting, IN	ASSUMED MOISTURE, %	15	METER $H_@$	1.92		
OPERATOR	WAH	PROBE LENGTH, in.	120	C_p FACTOR	0.84		
STACK NO.	FCC 600	NOZZLE DIAMETER, in.	0.147	Y_d FACTOR	0.990		
RUN NO.	2-PM ~~10-202-2~~	STACK DIAMETER, in.	97.0	PITOT NO.	731		
SAMPLE BOX NO.	Apex	MINUTES PER POINT	variable				
METER BOX NO.	~~[illegible]~~	NUMBER OF POINTS	12				
START TIME	1320	NUMBER OF PORTS	2				

WEIGHT OF PARTICULATE, mg		
Filter No.		
Sample		
Final wt.		
Tare wt.		
Wt. gain		
TOTAL		mg

CROSS SECTION

Dwell Time	CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (Θ) min.	STATIC PRESSURE (in. H_2O)	STACK TEMP (T_S) °F	VELOCITY HEAD (ΔP_S)	VELOCITY HEAD (ΔP_S)	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O ACTUAL	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O DESIRED	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP AT DRY GAS METER INLET (Tm_{in}) °F	GAS SAMPLE TEMP AT DRY GAS METER OUTLET (Tm_{out}) °F	FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
9:52	13:20	1	0	-1.0	590	1.7	—	0.50	0.50	481.078	—	51	252	252	67	48	1
10:08		2	9.46		604	1.8		0.50	0.50	484.35		53	256	252	67	47	1
10:08		3	20.00		608	1.8		0.50	0.50	487.78		52	260	252	67	47	1
10:08		4	30.14		606	1.8		0.50	0.50	491.07		52	262	252	68	47	1
10:08		5	40.28		605	1.8		0.50	0.50	494.44		52	258	252	68	47	1
9:33		6	50.42		603	1.6		0.50	0.50	497.65		53	253	251	68	47	1
9:51	1430	1	59.98		590	1.7		0.50	0.50	500.91		53	250	250	68	48	1
9:51		2	69.84		591	1.7		0.50	0.50	504.36		53	246	251	68	48	1
10:08		3	79.70		604	1.8		0.50	0.50	507.48	—	53	244	253	69	48	1
9:52		4	89.84		605	1.7		0.50	0.50	510.32		53	244	253	69	49	1
10:08		5	99.70		606	1.6		.50	.50	514.06		55	246	254	70	49	1
10:08		6	109.84		607	1.8		0.50	0.50	517.62		56	248	255	70	50	1
	1520		119.98							521.370							
					✓	✓		✓		✓		✓					
AVERAGE		12	119.98	-1.0	601.6	1.3226	—	0.50	—	40.292	—	52.9	—	—	—	48	max 1

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g) #1	#2	#3	#4	#5	SILICA GEL WEIGHT g
FINAL						
INITIAL						
LIQUID COLLECTED						
TOTAL LIQUID COLLECTED (specify ml or g)						

ORSAT DATA	TIME	CO_2	O_2
TRIAL 1	1550	16.1	2.2
TRIAL 2	1555	16.1	2.2
TRIAL 3	1600	16.1	2.2
Average		16.1	2.2

LEAK CHECK	
SYSTEM PRE:	0.000 CFM@15"Hg
POST:	0.000 CFM@15"Hg
PITOT PRE:	+/- 0% @ > 3"H_2O
POST:	+/- 0% @ > 3"H_2O

Form FDF 4003.00

IMPINGER RECOVERY DATA SHEET

Company:	BP	Date Set-up:	10/29/14
Location:	Whiting, IN	Test Date:	10/29/14
Source:	600 Stack	Date Recovered:	10/29/14
Run No.:	2-PM	USEPA Method:	201A/202
		Corresponding Filter Wgt:	854.7
		Filter Container No:	55690

Measurement Method: Weight or Volume

Impinger No.	Impinger Contents	Initial wt/vol g/mL	Final wt/vol g/mL	Difference wt/vol g/mL	Sample Container No.
1	KO	~~395.2~~ 370.6 (547)	460.8	90.2	
2	MT	552.4	573.3	20.9	
3	~100mL DI	700.7	704.4	3.7	
4	SG	825.6	836.8	11.2	
5					
6					

Total = 126.0

FORM FDF 4007.00

3 - PM-10

FIELD DATA

$b_1 = 7.56$

PLANT	BP Whiting	AMBIENT TEMPERATURE	51	PROBE HEATER SETTING	250
DATE	10-29-14	BAROMETRIC PRESSURE	29.52	HEATER BOX SETTING	250
LOCATION	Whiting, IN	ASSUMED MOISTURE, %	15	METER $H_@$	1.92
OPERATOR	WAH	PROBE LENGTH, in.	120	C_p FACTOR	0.84
STACK NO.	FCC600	NOZZLE DIAMETER, in.	0.149	Y_d FACTOR	0.990
RUN NO.	PM-10 ~~202-3~~	STACK DIAMETER, in.	97.0	PITOT NO.	731
SAMPLE BOX NO.	Apex	MINUTES PER POINT	variable		
METER BOX NO.	808024	NUMBER OF POINTS	12		
START TIME	1635	NUMBER OF PORTS	2		

WEIGHT OF PARTICULATE, mg		
Filter No.		
Sample		
Final wt		
Tare wt		
Wt. gain		
TOTAL		mg

CROSS SECTION

Dwell Time	CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (Θ) min.	STATIC PRESSURE (in. H_2O)	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP_s)	VELOCITY HEAD (ΔP_s)	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O ACTUAL	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O DESIRED	GAS SAMPLE VOLUME (Vm) ft³	GAS SAMPLE TEMP AT DRY GAS METER INLET (Tm_{in}) °F	GAS SAMPLE TEMP AT DRY GAS METER OUTLET (Tm_{out}) °F	FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
9:34	1635	1	0	-1.0	588	1.6	—	0.50	0.50	523.630	—	51	240	253	66	47	1
9:52		2	9.56		589	1.7		0.50	0.50	526.68		52	243	251	66	47	1
9:34		3	19.42		606	1.6		.50	.50	529.70		53	248	255	67	47	1
9:52		4	28.98		607	1.7		.50	.50	532.81		54	249	251	67	48	1
9:52		5	38.84		605	1.7		.50	.50	535.90		54	262	253	68	48	1
9:34	~~1735~~ 1800	6	48.64		600	1.6		0.50	0.50	539.28		54	262	253	68	48	1
9:34	~~1~~ 1740	1	58.26		595	1.6		0.50	0.50	542.32		54	263	243	68	48	1
10:08	1750	2	67.82		602	1.8		0.50	0.50	544.87		54	263	243	68	47	1
10:08	~~1755~~ 1800	3	77.96		607	1.8		0.50	0.50	548.03		55	263	244	68	49	1
9:52	1810	4	88.10		608	1.7		0.50	0.50	551.43		55	260	244	67	47	1
10:08	1820	5	97.96		608	1.8		0.50	0.50	554.41		55	258	244	67	48	1
9:34	1830	6	108.10		607	1.6		0.50	0.50	557.77		55	255	244	66	49	1
	1840		117.67							560.950							
					✓	✓		✓		✓		✓					
AVERAGE		12	117.67	-1.0	601.8	1.2971	—	0.50	—	37.320	—	53.8	—	—	—	468	Max 1

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g) #1	#2	#3	#4	#5	SILICA GEL WEIGHT g
FINAL						
INITIAL						
LIQUID COLLECTED						
TOTAL LIQUID COLLECTED (specify ml or g)						

ORSAT DATA	TIME	CO_2	O_2
TRIAL 1	1900	16.3	2.2
TRIAL 2	1905	16.3	2.2
TRIAL 3	1910	16.3	2.2
Average		16.3	2.2

LEAK CHECK		
SYSTEM PRE:	0.000	CFM@15"Hg
POST:	0.000	CFM@15"Hg
PITOT PRE:	+/- 0.05	@ > 3"H_2O
POST:	+/- 0.05	@ > 3"H_2O

Form FDF 4003

ARI ENVIRONMENTAL INC.

IMPINGER RECOVERY DATA SHEET

Company:	BP	Date Set-up:	10/29/14
Location:	Whiting, IN	Test Date:	10/29/14
Source:	600 Stack	Date Recovered:	10/30/14
Run No.:	3-PM	USEPA Method:	201A/202
		Corresponding Filter Wgt:	854.3
		Filter Container No:	55689
		Purged:	10/29/14 19:30-20:30

Measurement Method: Weight or Volume

Impinger No.	Impinger Contents	Initial wt/vol g/mL	Final wt/vol g/mL	Difference wt/vol g/mL	Sample Container No.
1	KO	380.7	487.8	107.1	
2	MT	611.5	628.1	16.6	
3	~100mL DI	708.2	712.6	4.4	
4	SG	801.7	811.3	9.6	
5					
6					

Total = 137.7

FORM FDF 4007.00

PM-10 $K_1 = 7.56$

FIELD DATA

PLANT	BP whiting	AMBIENT TEMPERATURE	~~70~~ 55	PROBE HEATER SETTING	250
DATE	10-30-~~15~~14	BAROMETRIC PRESSURE	29.62	HEATER BOX SETTING	250
LOCATION	Whiting, IN	ASSUMED MOISTURE, %	15	METER $H_@$	1.92
OPERATOR	WAH	PROBE LENGTH, in.	120	C_p FACTOR	0.84
STACK NO.	FCC 600	NOZZLE DIAMETER, in.	0.147	Y_d FACTOR	0.990
RUN NO.	4 - PM ~~10-20-14~~	STACK DIAMETER, in.	47.0	PITOT NO.	731
SAMPLE BOX NO.	APEX	MINUTES PER POINT	Variable		
METER BOX NO	808624	NUMBER OF POINTS	12		
START TIME	1230	NUMBER OF PORTS	2		

WEIGHT OF PARTICULATE, mg		
Filter No.		
Sample		
Final wt.		
Tare wt.		
Wt. gain		
TOTAL		mg

CROSS SECTION

Dwell Time	CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (Θ) min.	STATIC PRESSURE (in. H_2O)	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP_s)	VELOCITY HEAD (ΔP_s)	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP AT DRY GAS METER INLET (Tm_{in}) °F	OUTLET (Tm_{out}) °F	FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
9:52	1230	1	0	-1.0	603	1.7	—	0.50	0.50	561.230	—	68	235	244	66	54	1
10:08	1240	2	9.86		606	1.8		0.50	0.50	564.60		68	261	244	66	53	1
10:08	1250	3	20.00		617	1.8		0.50	0.50	567.90		68	248	244	68	49	1
10:08	1300	4	30.14		617	1.8		0.50	0.50	570.73		68	240	244	67	48	1
10:08	1310	5	40.28		618	1.8		0.50	0.50	573.77		68	238	257	67	49	1
9:34	1320/1330	6	50.42		617	1.6		0.50	0.50	577.13		67	230	260	67	49	1
9:52	1340	1	59.98		613	1.7		0.50	0.50	580.28		68	238	260	68	49	1
10:08	1350	2	70.12		606	1.8		0.50	0.50	583.54		70	~~279~~ 273	259	67	52	1
10:41	1400	3	80.26		616	2.0		.50	.50	586.89		73	256	260	67	53	1
10:25	1410	4	90.95		618	1.9		.50	.50	590.23		72	265	260	72	52	1
10:25	1420	5	101.37		618	1.9		.50	.50	593.67		75	234	260	74	53	1
~~10:25~~	1430	6	111.79		617	1.7		.50	.50	597.03		75	245	260	68	54	1
9:52	1434		~~122.31~~ 121.64							600.950							
AVERAGE					614.0	1.3380		0.50		~~38.920~~ 39.720		70.0					

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g) #1	#2	#3	#4	#5	SILICA GEL WEIGHT g
FINAL						
INITIAL						
LIQUID COLLECTED						
TOTAL LIQUID COLLECTED (specify ml or g)						

ORSAT DATA	TIME	CO_2	O_2
TRIAL 1	1500	16.2	2.1
TRIAL 2	1510	16.2	2.1
TRIAL 3	1515	16.2	2.1
Average		16.2	2.1

LEAK CHECK	
SYSTEM PRE:	0.000 CFM@15"Hg
POST:	0.000 CFM@15"Hg
PITOT PRE:	+/- 0.4/0.4 @ > 3"H_2O
POST:	+/- 0.4/0.4 @ > 3"H_2O

Form FDF 4003.00

ARI ENVIRONMENTAL INC.

IMPINGER RECOVERY DATA SHEET

Company:	BP	Date Set-up:	10/29/14
Location:	Whiting, IN	Test Date:	10/30/14
Source:	600 Stack	Date Recovered:	10/30/14
Run No.:	4-PM	USEPA Method:	201A/202
		Corresponding Filter Wgt:	852.9
		Filter Container No:	55600

Measurement Method: Weight or Volume

Impinger No.	Impinger Contents	Initial wt/vol g/mL	Final wt/vol g/mL	Difference wt/vol g/mL	Sample Container No.
1	KO	354.6	444.6	90.0	
2	MT	609.6	636.4	26.8	
3	~100mL DI	698.3	708.9	10.6	
4	SG	842.4	851.0	8.6	
5					
6			Total	136.0	

FORM FDF 4007.00

APPENDIX C

Analytical Data

ANALYTICAL REPORT

Client: BP

Sampling Location: Whiting, IN

Sampling Date(s): 10/29 – 10/30/14

Lab Project Number: 08-688

COC Numbers(s): W01042, W02470 & W01115

Analysis Date(s): 11/7 – 11/13/14

Analytical Method: USEPA Method 201A & USEPA Method 202

Prepared For:
ARI Environmental, Inc.
951 Old Rand Road, Unit 106
Wauconda, IL 60084
Project Mgr: Steve Flaherty
Phone: 847-487-1580 ext. 117
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Prepared By:
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State of Texas TCEQ/NELAP Certificate ID: T104704428-13-5
State of Louisiana LDEQ/LELAP Certificate ID: 02010
State of New Jersey NJDEP Certification ID: IL007

Project Narrative

Sample Receipt and Acceptance Quality Assurance:

Twenty (32) samples were received in good condition and were logged in at the ARI laboratory located in Wauconda, IL on 10/30/14. All sample receipt acceptance criteria were met as documented in the Sample Receipt Checklist included in this report.

Analytical Quality Assurance:

Analysis of samples met the procedural requirements and QA/QC criteria set forth in the TNI Standard, applicable reference methods and standard operating procedures and, where applicable, the project test plan.

Data Interpretation and Comments:

There were no deviations from the test methods and no non-standard conditions that may affect the quality of the test results. Test results reported under this project number apply only to the samples as received and identified on the chain-of-custody document(s) included in this report.

Scope of Accreditation:

All test methods and analytes were analyzed under ARI's current scope of accreditation under TCEQ/NELAP.

Laboratory Contact Information:

If you have any questions regarding these test results, please contact Mr. Eric Vogt, Laboratory Manager, at 847-487-1580 ext.116 or by e-mail at evogt@arienv.com.

Reviewed and Approved by:

Signature: Laboratory Manager

11/17/14
Date

ANALYTICAL SUMMARY

CLIENT: BP Whiting
LOCATION: Whiting, IN
SOURCE: FCU 600
SAMPLE DATE: 10/29/14 - 10/30/14
ANALYSIS: Particulates
METHOD: USEPA Methods 201A/202

Analyst: J. Ruggaber
Date of Completion: 11/14/2014
Template Control ID: USEPA-M201/202-PARTIC-TEMPLATE-62T-REV3
Project Number: 08-688

Identification	LIMS Number	Solvent Mass (g)	Tare	WT1	WT2	WT 1 - WT 2 (mg)	% difference	Particulate (mg)	Blank Corrected Particulate (mg)
Run 1 Filter	13955	-	846.8	890.4	890.4	0.00	N/A	43.60	43.60
Run 1 >PM10	13961	65.6	101991.5	102003.5	102003.3	0.20	N/A	11.90	11.90
Run 1 <PM10	13956	189.3	106378.5	106386.4	106386.0	0.40	N/A	7.70	7.70
Run 2 Filter	13960	-	854.7	897.3	897.4	-0.10	N/A	42.65	42.65
Run 2 >PM10	13966	97.3	101623.0	101641.8	101641.5	0.30	N/A	18.65	18.65
Run 2 <PM10	13962	196.9	96823.9	96831.0	96830.9	0.10	N/A	7.05	7.05
Run 3 Filter	13967	-	854.3	893.8	893.8	0.00	N/A	39.50	39.50
Run 3 >PM10	13972	89.5	106800.5	106810.1	106810.1	0.00	N/A	9.60	9.60
Run 3 <PM10	13968	176.5	100003.7	100008.1	100008.0	0.10	N/A	4.35	4.35
Run 4 Filter	13973	-	852.9	897.8	898.0	-0.20	N/A	45.00	45.00
Run 4 >PM10	13978	73.6	118456.2	118467.9	118468.0	-0.10	N/A	11.75	11.75
Run 4 <PM10	13974	178.9	95484.3	95494.0	95493.6	0.40	N/A	9.50	9.50
Acetone Blank	13986	176.5	97455.6	97455.7	97455.6	0.10	N/A	<0.10	-

M202 Organic Rinse

Identification	LIMS Number	Tare	WT1	WT2	WT 1 - WT 2 (mg)	% difference	Organic CPM (mg)
Run 1	13958	3973.5	3975.5	3975.5	0.00	N/A	2.00
Run 2	13964	4002.0	4004.1	4003.7	0.40	N/A	1.90
Run 3	13970	3925.9	3928.2	3927.8	0.40	N/A	2.10
Run 4	13976	3951.9	3953.1	3952.9	0.20	N/A	1.10
Train Blank	13984	3828.0	3829.4	3829.2	0.20	N/A	1.30
Acetone Blank	13979	3833.6	3833.9	3833.7	0.20	N/A	0.20
Hexane Blank	13980	3899.7	3900.0	3899.9	0.10	N/A	0.25

CLIENT: BP Whiting
LOCATION: Whiting, IN
SOURCE: FCU 600
SAMPLE DATE: 10/29/14 - 10/30/14
ANALYSIS: Particulates
METHOD: USEPA Methods 201A/202

Analyst: J. Ruggaber
Date of Completion: 11/14/2014
Template Control ID: USEPA-M201/202-PARTIC-TEMPLATE-62T-REV3
Project Number: 08-688

M202 Imp Contents

Identification	LIMS Number	mL of NH_4OH added	Tare	WT1	WT2	WT 1 - WT 2 (mg)	% difference	Inorganic CPM (mg)*
Run 1	13957	0.46	3885.4	3890.5	3890.8	-0.30	N/A	5.25
Run 2	13963	1.84	4022.3	4034.0	4033.6	0.40	N/A	11.50
Run 3	13969	1.90	4064.2	4078.2	4077.8	0.40	N/A	13.80
Run 4	13975	0.67	3998.1	4004.7	4004.5	0.20	N/A	6.50
Train Blank	13983	0.10	3964.9	3965.9	3965.9	0.00	N/A	1.00
DI Water Blank	13981	-	3913.3	3913.2	3913.1	0.10	N/A	<0.10

Ammonium Hydroxide Conc = 0.0992
*Not Corrected for Ammonium Hydroxide titration

Identification		Volume (mL)	Tare	WT1	WT2	WT 1 - WT 2 (mg)	Condensate (mg)	Target Weight (mg)	Accuracy	Pass/Fail
LCS	QC	100	117331.7	117431.9	117431.5	0.40	100.00	100.06	99.9	Pass

951 Old Rand Road # 106
Wauconda, IL 60084

Texas NELAP ID: T 104704428-13-5

ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting
Whiting, IN
600 Stack

Lab Project #: 08-688
Project Manager: Steve Flaherty
Received: 10/31/2014
Reported: 11/17/2014

Sample ID: Run 1-PM Filter
Lab Sample #: 13955
Date Sampled: 10/29/2014
Field #: 55579

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	11/14/2014	43.60	mg	

Sample ID: Run 1-PM Probe Wash
Lab Sample #: 13956
Date Sampled: 10/29/2014
Field #: 76386

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	11/14/2014	7.70	mg	

Sample ID: Run 1-PM Imp Catch
Lab Sample #: 13957
Date Sampled: 10/29/2014
Field #: 76387

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Inorganic Residue	USEPA Method 202	Joel Ruggaber	11/14/2014	5.25	mg	

Sample ID: Run 1-PM Organic Rinses
Lab Sample #: 13958
Date Sampled: 10/29/2014
Field #: 76388

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Organic Residue	USEPA Method 202	Joel Ruggaber	11/14/2014	2.00	mg	

Sample ID: Run 1-PM CPM Filter
Lab Sample #: 13959
Date Sampled: 10/29/2014
Field #: 76389

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

951 Old Rand Road # 106
Wauconda, IL 60084

Texas NELAP ID: T 104704428-13-5

ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting
Whiting, IN
600 Stack

Lab Project #: 08-688
Project Manager: Steve Flaherty
Received: 10/31/2014
Reported: 11/17/2014

Sample ID: Run 2-PM Filter
Lab Sample #: 13960
Date Sampled: 10/29/2014
Field #: 55690

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	11/14/2014	42.65	mg	

Sample ID: Run 1-PM >PM10 Catch
Lab Sample #: 13961
Date Sampled: 10/29/2014
Field #: 76390

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	11/14/2014	11.90	mg	

Sample ID: Run 2-PM Probe Wash
Lab Sample #: 13962
Date Sampled: 10/29/2014
Field #: 76391

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	11/14/2014	7.05	mg	

Sample ID: Run 2-PM Imp Catch
Lab Sample #: 13963
Date Sampled: 10/29/2014
Field #: 76392

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Inorganic Residue	USEPA Method 202	Joel Ruggaber	11/14/2014	11.50	mg	

Sample ID: Run 2-PM Organic Rinses
Lab Sample #: 13964
Date Sampled: 10/29/2014
Field #: 76393

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Organic Residue	USEPA Method 202	Joel Ruggaber	11/14/2014	1.90	mg	

951 Old Rand Road # 106
Wauconda, IL 60084

Texas NELAP ID: T 104704428-13-5

ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting
Whiting, IN
600 Stack

Lab Project #: 08-688
Project Manager: Steve Flaherty
Received: 10/31/2014
Reported: 11/17/2014

Sample ID: Run 2-PM CPM Filter
Lab Sample #: 13965
Date Sampled: 10/29/2014
Field #: 76394

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Sample ID: Run 2-PM >PM10 Catch
Lab Sample #: 13966
Date Sampled: 10/29/2014
Field #: 76395

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	11/14/2014	18.65	mg	

Sample ID: Run 3-PM Filter
Lab Sample #: 13967
Date Sampled: 10/29/2014
Field #: 55689

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	11/14/2014	39.50	mg	

Sample ID: Run 3-PM Probe Wash
Lab Sample #: 13968
Date Sampled: 10/29/2014
Field #: 76396

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	11/14/2014	4.35	mg	

Sample ID: Run 3-PM Imp Catch
Lab Sample #: 13969
Date Sampled: 10/29/2014
Field #: 76397

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Inorganic Residue	USEPA Method 202	Joel Ruggaber	11/14/2014	13.80	mg	

951 Old Rand Road # 106

Wauconda, IL 60084

Texas NELAP ID: T 104704428-13-5

ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting
Whiting, IN
600 Stack

Lab Project #: 08-688
Project Manager: Steve Flaherty
Received: 10/31/2014
Reported: 11/17/2014

Sample ID: Run 3-PM Organic Rinses
Lab Sample #: 13970
Date Sampled: 10/29/2014
Field #: 76398

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Organic Residue	USEPA Method 202	Joel Ruggaber	11/14/2014	2.10	mg	

Sample ID: Run 3-PM CPM Filter
Lab Sample #: 13971
Date Sampled: 10/29/2014
Field #: 76399

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Sample ID: Run 3-PM >PM10 Catch
Lab Sample #: 13972
Date Sampled: 10/29/2014
Field #: 76400

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	11/14/2014	9.60	mg	

Sample ID: Run 4-PM Filter
Lab Sample #: 13973
Date Sampled: 10/30/2014
Field #: 55600

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	11/14/2014	45.00	mg	

Sample ID: Run 4-PM Probe Wash
Lab Sample #: 13974
Date Sampled: 10/30/2014
Field #: 76401

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	11/14/2014	9.50	mg	

951 Old Rand Road # 106
Wauconda, IL 60084

Texas NELAP ID: T 104704428-13-5

ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting
Whiting, IN
600 Stack

Lab Project #: 08-688
Project Manager: Steve Flaherty
Received: 10/31/2014
Reported: 11/17/2014

Sample ID: Run 4-PM Imp Catch
Lab Sample #: 13975
Date Sampled: 10/30/2014
Field #: 76402

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Inorganic Residue	USEPA Method 202	Joel Ruggaber	11/14/2014	6.50	mg	

Sample ID: Run 4-PM Organic Rinses
Lab Sample #: 13976
Date Sampled: 10/30/2014
Field #: 76403

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Organic Residue	USEPA Method 202	Joel Ruggaber	11/14/2014	1.10	mg	

Sample ID: Run 4-PM CPM Filter
Lab Sample #: 13977
Date Sampled: 10/30/2014
Field #: 76404

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Sample ID: Run 4-PM >PM10 Catch
Lab Sample #: 13978
Date Sampled: 10/30/2014
Field #: 76405

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber		11.75	mg	

Sample ID: Field Reagent Blank - Acetone
Lab Sample #: 13979
Date Sampled: 10/29/2014
Field #: 76406

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Organic Residue	USEPA Method 202	Joel Ruggaber	11/14/2014	0.20	mg	

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Wauconda, IL 60084

Texas NELAP ID: T 104704428-13-5

ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting
Whiting, IN
600 Stack

Lab Project #: 08-688
Project Manager: Steve Flaherty
Received: 10/31/2014
Reported: 11/17/2014

Sample ID: Field Reagent Blank - Hexane
Lab Sample #: 13980
Date Sampled: 10/29/2014
Field #: 76407

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Organic Residue	USEPA Method 202	Joel Ruggaber	11/14/2014	0.25	mg	

Sample ID: Field Reagent Blank - DI Water
Lab Sample #: 13981
Date Sampled: 10/29/2014
Field #: 76408

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Inorganic Residue	USEPA Method 202	Joel Ruggaber	11/14/2014	<0.10	mg	

Sample ID: Field Reagent Blank - CPM Filter
Lab Sample #: 13982
Date Sampled: 10/29/2014
Field #: 76409

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Sample ID: Train Blank Imp Catch
Lab Sample #: 13983
Date Sampled: 10/29/2014
Field #: 76410

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Inorganic Residue	USEPA Method 202	Joel Ruggaber	11/14/2014	1.00	mg	

Sample ID: Train Blank Organic Rinses
Lab Sample #: 13984
Date Sampled: 10/29/2014
Field #: 76411

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Organic Residue	USEPA Method 202	Joel Ruggaber	11/14/2014	1.30	mg	

951 Old Rand Road # 106

Wauconda, IL 60084

Texas NELAP ID: T 104704428-13-5

ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting
Whiting, IN
600 Stack

Lab Project #: 08-688
Project Manager: Steve Flaherty
Received: 10/31/2014
Reported: 11/17/2014

Sample ID: Train Blank CPM Filter
Lab Sample #: 13985
Date Sampled: 10/29/2014
Field #: 76412

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Sample ID: Train Blank Probe Wash
Lab Sample #: 13986
Date Sampled: 10/29/2014
Field #: 76413

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	Method 201A	Joel Ruggaber	11/14/2014	<0.10	mg	

Notes: UA - Not a NELAC accredited analyte under this method.
NA - Sample not tested for this analyte.
D - Value calculated from dilution.
J - Value less than the low standard but above the Limit of Detection (LOD).
L - Sample leaked before receipt.
H - Value greater than the high standard.

USEPA METHOD 201A TASK SCHEDULE

Client: BP Whiting

Location: Whiting, IN

Project Manager: S. Flaherty

Date Sampled: 10/29/14 – 10/30/14

Lab Project #: 08-688

Spreadsheet Template ID: USEPA-M201/202-PARTIC-TEMPLATE-62T-REV3

Analyst: J. Ruggaber

DATE	TIME	EQUIPMENT	TASK
11/7/14	16:00	Desiccator #1	Place labeled beakers in dessicator (store 24 hrs)
11/11/14	10:40	Oven #2	Heat filters in oven at 105 ˚C (approximately 2 hours)
11/11/14	13:02	Desiccator #1	Place filters in dessicator (store min. 24 hours)
11/10/14	10:06	Balance #1	Weigh conditioned beakers and record tares
11/10/14 – 11/11/14	-	-	Dry down probe washes and/or cyclone separator fractions and blanks in tared beakers in the hood.
11/10/14 – 11/11/14	-	Oven #2	In a tared beaker, dry down 100 mL of the LCS solution in an oven at 110 ˚C.
11/11/14	9:01	Desiccator #1	Place beakers in dessicator (store min. 24 hours)
11/13/14	9:26	Balance #1	Beaker weighing #1
11/13/14	16:02	Balance #1	Beaker weighing #2 (min. 6 hrs after weighing #1)
-	-	-	Beaker weighing #3 (min. 6 hrs after weighing #2)
-	-	-	Beaker weighing #4 (min. 6 hrs after weighing #3)
11/13/14	10:22	Balance #1	Filter weighing #1 (min. 24 hrs in dessicator)
11/13/14	16:33	Balance #1	Filter weighing #2 (min. 6 hrs after weighing #1)
-	-	-	Filter weighing #3 (min. 6 hrs after weighing #2)
-	-	-	Filter weighing #4 (min. 6 hrs after weighing #3)
11/17/14	-	-	Prepare report
			Report QA review
			Report distribution

LCS Sodium Chloride Solution:

USEPA METHOD 202 TASK SCHEDULE

Client: BP Whiting

Location: Whiting, IN

Project Manager: S. Flaherty

Date Sampled: 10/29/14 – 10/30/14

Lab Project #: 08-688

Spreadsheet Template ID: USEPA-M201/202-PARTIC-TEMPLATE-62T-REV3

Analyst: J. Ruggaber

Reagent Information

Hexane Lot #14050547, Tedia

Phenolphthalein Solution (if needed): WL-Log#4-Log-037A:46

0.1 N Ammonium Hydroxide Lot # (if needed): 0.0992 N, Lot SHBC0698V, Sigma

Sodium Chloride Solution: 1.0006 g/L NaCl in DI water, WL-Log#5-Log-037A:135

DATE	TIME	EQUIPMENT	TASK
11/7/14	16:00	Desiccator # 2	Label beakers for hexane rinse, imp samples, and LCS sample. Place beakers in desiccator (store 24 hrs).
11/10/14	10:23	Balance #1	Weigh conditioned beakers and record tares.
11/10/14	-	-	Sonicate filter in water for at least two minutes. Add the water to the imp contents. Repeat 2 more times.
11/10/14	-	-	Sonicate filter in hexane for at least two minutes. Add the hexane to the hexane sample contents. Repeat 2 more times.
11/10/14	-	-	Extract the imp contents with 30 mL of hexane 3 times. Collect all hexane extractions in the labeled and tared hexane beaker. Add the hexane sample to the hexane extractions.
11/10/14	-	-	Drain the water phase into the labeled and tared beaker.
11/10/14 – 11/11/14	-	-	Evaporate hexane beakers to dryness in a fume hood.
11/11/14	-	-	Transfer 100 mL of the sodium chloride solution into the tared LCS beaker.

11/10/14 – 11/11/14	-	Oven #1	Place the water phase beakers and LCS sample in an oven or hot plate and evaporate to not less than 10 mL. Allow to evaporate to dryness in a fume hood at room temperature.
11/11/14	14:10	Desiccator #2	Place hexane beakers in desiccator (store min. 24 hours)
		See next section	Place aqueous beakers in desiccator (store min. 24 hours)
11/13/14	9:28	Balance #1	Hexane beaker weighing #1
11/13/14	16:08	Balance #1	Hexane beaker weighing #2 (min. 6 hrs after weighing #1)
N/A	N/A	N/A	Hexane beaker weighing #3 (min. 6 hrs after weighing #2)
N/A	N/A	N/A	Hexane beaker weighing #4 (min. 6 hrs after weighing #3)
		See next section	Water Phase and LCS beaker weighing #1
N/A	N/A	N/A	Water Phase and LCS beaker weighing #2 (min. 6 hrs after weighing #1)
N/A	N/A	N/A	Water Phase and LCS beaker weighing #3 (min. 6 hrs after weighing #2)
N/A	N/A	N/A	Water Phase and LCS beaker weighing #4 (min. 6 hrs after weighing #3)
If Water Phase Beakers achieve constant weight, skip this section			
11/11/14	-	-	Redissolve the residue from water phases in 100 mL of DI water. Add approximately 5 drops of phenolphthalein.
11/11/14	-	-	Titrate with 0.1 N ammonium hydroxide. Record the amount of ammonium hydroxide used.
11/11/14	-	-	Return the water phase beakers to the oven or hot plate and evaporate to not less than 10 mL. Allow to evaporate to dryness in a fume hood at room temperature.
11/11/14	14:15	Desiccator #2	Place beakers in desiccator (store min. 24 hours)
11/13/14	9:55	Balance #1	Water Phase beaker weighing #1
11/13/14	16:23	Balance #1	Water Phase beaker weighing #2 (min. 6 hrs after weighing #1)
N/A	N/A	N/A	Water Phase beaker weighing #3 (min. 6 hrs after weighing #2)
N/A	N/A	N/A	Water Phase beaker weighing #4 (min. 6 hrs after weighing #3)
End Section			
11/17/14	-	-	Prepare report
			Report QA review
			Report distribution

ARI ENVIRONMENTAL INC.

Sample Receipt Checklist

Client Name: BP

Site Location: Whiting, IN

ARI Project Manager: Steve Flaherty

Sample Collection Date(s): 10/29 - 10/30/14

Chain-of-Custody Number(s): W01042, W02470 & W01115

Chain-of-Custody Form(s):

Custody release signatures, dates, and times present:	Yes
Preservation code noted:	Yes
Project information clearly identified:	Yes
Sample information clearly identified:	Yes
Analysis request clearly identified:	Yes
Report tier level noted:	Yes

Sample Containers:

Quantity of samples match number on the COC	Yes
Container label ID numbers and descriptions match COC	Yes
All containers received in good condition	Yes
Liquid levels at marked heights on containers	Yes
All container labels are legible	Yes
All sample IDs are unique	Yes
Samples received in correct container type	Yes
Samples received within the required holding time	Yes
Samples received under the required preservation code	Yes

Non-Conformances and/or Corrective Actions Applied:

All sample receipt acceptance criteria met.

Samples Received by: Eric Vogt

signature

Date and Time received: 11/3/14, 9:00

Form LF0002

ARI ENVIRONMENTAL, INC.

Chain of Custody Record Number: W01042

Lab Project No. (Lab use only)	Client Name	Client Location
08-688	BP	Whiting, IN
ARI Proposal Number	**ARI Test Plan Number**	**ARI Project Manager**
43313	NA	Steve Flaherty
ARI Sampler Initials	**Laboratory (Wauconda or Pasadena)**	**Subcontracted Laboratory (if applicable)**
SF, WAH, BO, JP	Wauconda	NA
Engineering or Compliance Test Samples		
Compliance		

Label Number	Sample Date	Time of Collection[2]	Sample Identification	Number of Containers	Container Type (Petri, Bottle, Bag, Tube, Summa, Bomb)	Preservation Code	Analysis Request[1]: USEPA 201A	Analysis Request[1]: USEPA 202	Analysis Request[1]:	Analysis Request[1]:	Comments
55579	10/29/14		1-PM Filter	1	Petri	1	x				
76386	10/29/14		1-PM PW	1	Bottle	1	x				
76387	10/29/14		1-PM Imp Catch & DI Rinse	1	Bottle	1		x			
76388	10/29/14		1-PM Organic Rinses	1	Bottle	1		x			
76389	10/29/14		1-PM CPM Filter	1	Bottle	1		x			
76390	10/29/14		1-PM >PM10 Catch	1	Bottle	1	x				
55690	10/29/14		2-PM Filter	1	Petri	1	x				
76391	10/29/14		2-PM PW	1	Bottle	1	x				
76392	10/29/14		2-PM Imp Catch & DI Rinse	1	Bottle	1		x			
76393	10/29/14		2-PM Organic Rinses	1	Bottle	1		x			
76394	10/29/14		2-PM CPM Filter	1	Bottle	1		x			
76395	10/29/14		2-PM >PM10 Catch	1	Bottle	1	x				
55689	10/29/14		3-PM Filter	1	Petri	1	x				
76396	10/29/14		3-PM PW	1	Bottle	1	x				
76397	10/29/14		3-PM Imp Catch & DI Rinse	1	Bottle	1		x			

Preservation Code
1 = Ambient Temp.
2 = 4°C (Ice Packs)
3 = Dry Ice
4 = Other (Noted)

Special Instructions:

Date test results needed: 11-14-14

Reporting level: Engineering (Compliance)

Route results through: Steve Flaherty

Project manager signature:

(1) Relinquished By	(2) Relinquished By	(3) Relinquished By
(1) Date / Time: 10-30-14 2000	(2) Date / Time	(3) Date / Time
(1) Company: ARI	(2) Company	(3) Company
(1) Received By	(2) Received By	(3) Received By
(1) Date / Time: 11/3/14 9:00	(2) Date / Time	(3) Date / Time
(1) Company: ARI	(2) Company	(3) Company

SHIPMENT: (Hand Carry) FedEx UPS

Custody Seal Applied: Yes (No)

1 – Analysis request must be confirmed by project manager signature

2 – End time only and applicable to samples requiring specific holding time limits and/or bag spike recovery determination

Form LF0001

ARI ENVIRONMENTAL, INC.

Chain of Custody Record Number: W02470

Lab Project No. (Lab use only)	Client Name	Client Location
08-688	BP	Whiting, IN
ARI Proposal Number	**ARI Test Plan Number**	**ARI Project Manager**
43313	NA	Steve Flaherty
ARI Sampler Initials	**Laboratory (Wauconda or Pasadena)**	**Subcontracted Laboratory (if applicable)**
SF, WAH, BO, JP	Wauconda	NA

Engineering or Compliance Test Samples: Compliance

Label Number	Sample Date	Time of Collection[2]	Sample Identification	Number of Containers	Container Type (Petri, Bottle, Bag, Tube, Summa, Bomb)	Preservation Code	Analysis Request[1]: USEPA 201A	Analysis Request[1]: USEPA 202	Analysis Request[1]:	Analysis Request[1]:	Comments
76398	10/29/14		3-PM Organic Rinses	1	Bottle	1		x			
76399	10/29/14		3-PM CPM Filter	1	Bottle	1		x			
76400	10/29/14		3-PM >PM_{10} Catch	1	Bottle	1	x				
55600	10/30/14		4-PM Filter	1	Petri	1	x				
76401	10/30/14		4-PM PW	1	Bottle	1	x				
76402	10/30/14		4-PM Imp Catch & DI Rinse	1	Bottle	1		x			
76403	10/30/14		4-PM Organic Rinses	1	Bottle	1		x			
76404	10/30/14		4-PM CPM Filter	1	Bottle	1		x			
76405	10/29/14		4-PM >PM_{10} Catch	1	Bottle	1	x				
76406	10/29/14	~~10/29/14~~ 30	Field Reagent Blank Acetone	1	Bottle	1		x			
76407	10/29/14	~~10/29/14~~ 30	Field Reagent Blank Hexane	1	Bottle	1		x			
76408	10/29/14		Field Reagent Blank DI Water	1	Bottle	1		x			
76409	10/29/14		CPM Filter Blank	1	Bottle	1		x			
76410	10/29/14		Train Blank Imp Catch & DI Rinse	1	Bottle	1		x			
76411	10/29/14		Train Blank Organic Rinses	1	Bottle	1		x			

Preservation Code: 1 = Ambient Temp. 2 = 4°C (Ice Packs) 3 = Dry Ice 4 = Other (Noted)

Special Instructions:

Date test results needed: 11-14-14

Reporting level: Engineering (Compliance)

Route results through: Steve Flaherty

Project manager signature:

(1) Relinquished By	(2) Relinquished By	(3) Relinquished By
(1) Date / Time: 10-30-14 2000	(2) Date / Time	(3) Date / Time
(1) Company: ARI	(2) Company	(3) Company
(1) Received By	(2) Received By	(3) Received By
(1) Date / Time: 11/3/14 9:00	(2) Date / Time	(3) Date / Time
(1) Company: ARI	(2) Company	(3) Company

SHIPMENT: (Hand Carry) FedEx UPS

Custody Seal Applied: Yes (No)

1 – Analysis request must be confirmed by project manager signature 2 – End time only and applicable to samples requiring specific holding time limits and/or bag spike recovery determination

Form LF0001

ARI ENVIRONMENTAL, INC.

Chain of Custody Record Number: W01115

Lab Project No. (Lab use only)	Client Name	Client Location
08-688	BP	Whiting, IN
ARI Proposal Number	**ARI Test Plan Number**	**ARI Project Manager**
43313	NA	Steve Flaherty
ARI Sampler Initials	**Laboratory (Wauconda or Pasadena)**	**Subcontracted Laboratory (if applicable)**
SF, WAH, BO, JP	Wauconda	NA
Engineering or Compliance Test Samples		
Compliance		

Label Number	Sample Date	Time of Collection[2]	Sample Identification	Number of Containers	Container Type (Petri, Bottle, Bag, Tube, Summa, Bomb)	Preservation Code	Analysis Request[1]: USEPA 201A	USEPA 202			Comments
76412	10/29/14		Train Blank CPM Filter	1	Bottle	1		X			
76413	10/29/14		Train Blank PW Blank	1	Bottle	1	X				

Preservation Code
1 = Ambient Temp.
2 = 4°C (Ice Packs)
3 = Dry Ice
4 = Other (Noted)

Special Instructions:

Date test results needed: 11-14-14

Reporting level: Engineering 11-14-14 Compliance

Route results through: Steve Flaherty

Project manager signature:

(1) Relinquished By	(2) Relinquished By	(3) Relinquished By
(1) Date / Time: 10-30-14 2000	(2) Date / Time	(3) Date / Time
(1) Company: ARI	(2) Company	(3) Company
(1) Received By	(2) Received By	(3) Received By
(1) Date / Time: 11/3/14 9:00	(2) Date / Time	(3) Date / Time
(1) Company: ARI	(2) Company	(3) Company

SHIPMENT: ~~Hand Carry~~ FedEx UPS

Custody Seal Applied: Yes No[1]

1 – Analysis request must be confirmed by project manager signature

2 – End time only and applicable to samples requiring specific holding time limits and/or bag spike recovery determination

Form LF0001

APPENDIX D

Calibration Data

APEX INSTRUMENTS METHOD 5 PRE-TEST CONSOLE CALIBRATION
USING CALIBRATED CRITICAL ORIFICES
5-POINT ENGLISH UNITS

Meter Console Information	
Console Model Number	MC522
Console Serial Number	808024
DGM Model Number	MS4
DGM Serial Number	5-Dec-12

Calibration Conditions			
Date	Time	12-Aug-14	2:30
Barometric Pressure		29.2	in Hg
Theoretical Critical Vacuum[1]		13.8	in Hg
Calibration Technician		B.Crane	

Factors/Conversions		
Std Temp	528	°R
Std Press	29.92	in Hg
K_1	17.647	oR/in Hg

[1]For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.

[2]The Critical Orifice Coefficient, K', must be entered in English units, $(ft^3 \cdot °R^{1/2})/(in.Hg \cdot min)$.

Calibration Data

Run Time	Metering Console					Critical Orifice				
Elapsed	DGM Orifice ΔH	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final	Serial Number	Coefficient	Amb Temp Initial	Amb Temp Final	Actual Vacuum
(θ)	(P_{m})	(V_{mi})	(V_{mf})	(t_{mi})	(t_{mf})		K'	(t_{amb})	(t_{amb})	
min	in H_2O	cubic feet	cubic feet	°F	°F		see above2	°F	°F	in Hg
10.0	1.9	887.600	895.380	78	78	OX63	0.5881	75	76	18
10.0	3.3	903.810	914.140	78	79	OX73	0.7801	77	78	15
10.0	1.1	919.200	925.120	79	79	OX55	0.4459	79	76	19
12.0	0.7	929.900	935.410	79	78	OX48	0.3461	76	77	20
23.0	0.3	941.550	948.600	78	78	OX40	0.2316	79	75	21

Results

Standardized Data				Dry Gas Meter				
Dry Gas Meter		Critical Orifice		Calibration Factor		Flowrate	ΔH @	
$(V_{m(std)})$	$(Q_{m(std)})$	$(Vcr_{(std)})$	$(Q_{cr(std)})$	Value (Y)	Variation (ΔY)	Std & Corr $(Q_{m(std)(corr)})$	0.75 SCFM (ΔH@)	Variation (ΔΔH@)
cubic feet	cfm	cubic feet	cfm			cfm	in H2O	
7.487	0.749	7.421	0.742	0.991	0.001	0.742	1.878	-0.041
9.967	0.997	9.825	0.983	0.986	-0.004	0.983	1.872	-0.047
5.675	0.568	5.616	0.562	0.990	-0.001	0.562	1.887	-0.032
5.282	0.440	5.236	0.436	0.991	0.001	0.436	1.931	0.011
6.758	0.294	6.712	0.292	0.993	0.003	0.292	2.029	0.110
				0.990	Y Average		1.920	ΔH@ Average

CAL-MASTERMETER-WORKBOOK-203T-REV1

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR Title 40, Part 60, Appendix A-3, Method 5, 16.2.3

Signature: B. Crane

Date 8-12-14

ARI Environmental, Inc.
Gas Meter Thermometer Calibration Data Form
Pre -Test

Meter Box: 808024
Calibrator: B. Crane
Date: 8/12/2014
Barometric: 29.2
Ambient Temp: 75
Reference Thermometer: Altek Thermocouple Source CAL-MASTERMETER-WORKBOOK-203T-REV1

Reference Temperature Altek	Thermometer Temperature Inlet	Difference (%) mean Inlet	Thermometer Temperature Oulet	Difference (%) mean Oulet	Thermometer Temperature Probe	Difference (%) mean Probe
0	NA		1	0.22	1	0.22
100			100	0.00	100	0.00
200			202	0.30	202	0.30
300			301	0.13	302	0.26
400			398	-0.23	398	-0.23
500			498	-0.21	499	-0.10

Temperature Altek	Temperature Filter	(%) mean Filter	Temperature Exit	(%) mean Exit	Temperature Aux	(%) mean Aux
0	1	0.22	1	0.22	1	0.22
100	100	0.00	100	0.00	100	0.00
200	202	0.30	202	0.30	202	0.30
300	301	0.13	302	0.26	302	0.26
400	398	-0.23	398	-0.23	398	-0.23
500	499	-0.10	499	-0.10	499	-0.10

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
0	1	0.22
200	202	0.30
400	398	-0.23
600	601	0.09
800	802	0.16
1000	1001	0.07

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
1200	1199	-0.06
1400	1397	-0.16
1600	1600	0.00
1800	1798	-0.09

Revised 10/03

APEX INSTRUMENTS METHOD 5 POST-TEST CONSOLE CALIBRATION
USING CALIBRATED CRITICAL ORIFICES
3-POINT ENGLISH UNITS

Meter Console Information	
Console Model Number	MC522
Console Serial Number	808024
DGM Model Number	MS-4
DGM Serial Number	1502218.00

Calibration Conditions			
Date	Time	14-Nov-14	4:00
Barometric Pressure		29.6	in Hg
Theoretical Critical Vacuum[1]		14.0	in Hg
Calibration Technician		B. Crane	

Factors/Conversions		
Std Temp	528	°R
Std Press	29.92	in Hg
K_1	17.647	oR/in Hg

[1]For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.

[2]The Critical Orifice Coefficient, K', must be entered in English units, $(ft^{3*o}R^{1/2})/(in.Hg*min)$.

Calibration Data

Run Time	Metering Console					Critical Orifice				
Elapsed	DGM Orifice ΔH	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final	Serial Number	Coefficient	Amb Temp Initial	Amb Temp Final	Actual Vacuum
(Θ)	(P_m)	(V_{mi})	(V_{mf})	(t_{mi})	(t_{mf})		K'	(t_{amb})	(t_{amb})	
min	in H_2O	cubic feet	cubic feet	°F	°F		see above2	°F	°F	in Hg
13.0	1.9	14.600	24.550	63	68	OX63	0.5881	73	75	17
10.0	1.9	24.550	32.250	68	71	OX63	0.5881	75	76	17
10.0	1.9	32.250	39.990	71	73	OX63	0.5881	76	76	17

Results

Standardized Data				Dry Gas Meter				
Dry Gas Meter		Critical Orifice		Calibration Factor		Flowrate	ΔH @	
($V_{m(std)}$)	($Q_{m(std)}$)	($Vcr_{(std)}$)	($Q_{cr(std)}$)	Value (Y)	Variation (ΔY)	Std & Corr ($Q_{m(std)(corr)}$)	0.75 SCFM (ΔH@)	Variation (ΔΔH@)
cubic feet	cfm	cubic feet	cfm			cfm	in H2O	
9.950	0.765	9.806	0.754	0.986	0.000	0.754	1.889	0.008
7.642	0.764	7.533	0.753	0.986	0.000	0.753	1.880	-0.001
7.646	0.765	7.529	0.753	0.985	-0.001	0.753	1.873	-0.008
Pretest Gamma	0.990	% Deviation	0.5	0.985	Y Average		1.880	ΔH@ Average

CAL-MASTERMETER-WORKBOOK-203T-REV1

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR Title 40, Part 60, Appendix A-3, Method 5, 16.2.3

Signature B. Crane Date 11-14-14

ARI Environmental, Inc.
Gas Meter Thermometer Calibration Data Form
Post-Test

Meter Box: 808024
Calibrator: B. Crane
Date: 11/14/2014
Barometric: 29.64
Ambient Temp: 74
Reference Thermometer: Altek Thermocouple Source CAL-MASTERMETER-WORKBOOK-203T-REV1

Reference Temperature Altek	Thermometer Temperature Inlet	Difference (%) mean Inlet	Thermometer Temperature Oulet	Difference (%) mean Oulet	Thermometer Temperature Probe	Difference (%) mean Probe
0	NA		0	0.00	0	0.00
100			99	-0.18	99	-0.18
200			201	0.15	201	0.15
300			301	0.13	301	0.13
400			398	-0.23	398	-0.23
500			499	-0.10	499	-0.10

Reference Temperature Altek	Thermometer Temperature Filter	Difference (%) mean Filter	Thermometer Temperature Exit	Difference (%) mean Exit	Thermometer Temperature Aux	Difference (%) mean Aux
0	0	0.00	0	0.00	0	0.00
100	99	-0.18	99	-0.18	99	-0.18
200	201	0.15	201	0.15	201	0.15
300	301	0.13	301	0.13	302	0.26
400	398	-0.23	398	-0.23	398	-0.23
500	499	-0.10	498	-0.21	499	-0.10

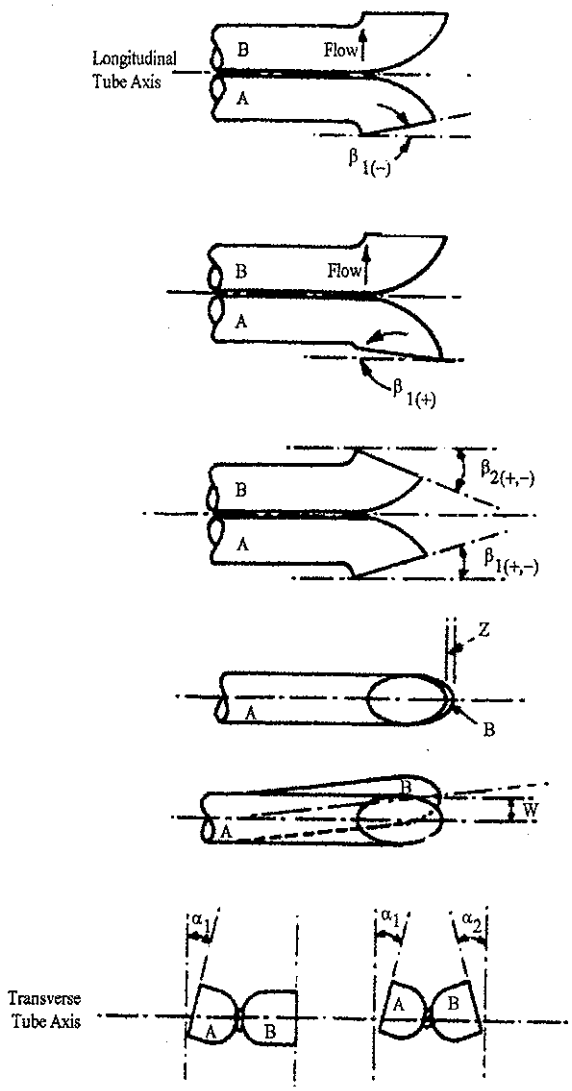
Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
0	0	0.00
200	201	0.15
400	398	-0.23
600	601	0.09
800	803	0.24
1000	1002	0.14

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
1200	1200	0.00
1400	1399	-0.05
1600	1603	0.15
1800	1801	0.04

Revised 10/03

Pitot Tube Inspection Data

Client Name: _____



Pre-Sample Date: 4/12/2014		Post-Sample Date: 11/1/2014
Y	level?	Y
N	obstructions?	N
N	damaged?	N
1	$-10° < \alpha_1 < +10°$	1
0	$-10° < \alpha_2 < +10°$	0
1	$-5° < \beta_1 < +5°$	0
2	$-5° < \beta_2 < +5°$	1
2	γ	0
1	θ	0
0.920	A	0.93
0.460	$0.39375 < P_A < 0.5625$	0.465
0.460	$0.39375 < P_B < 0.5625$	0.465
0.375	$0.1875 \leq D_t \leq 0.375$	0.375
0.032	$A \tan \gamma < 0.125"$	0.000
0.01606	$A \tan \theta < 0.03125"$	0.00000
TRUE	$P_A = P_B$ +/- 0.063	TRUE
PASS	PASS/FAIL	PASS

Comments: 10' effective length M5 probe.

Pitot tube/probe number 731 meets or exceeds all specifications and criteria and/or applicable design features (per 40CFR60 Appendix A; Method 2) and is heareby assigned a pitot tube calibration factor of 0.84.

Signature: A Crane

Date: 11·1·14

ARI Environmental Inc.
Thermocouple Calibration Data Form

Calibrator: B. Crane
Thermocouple ID. 731

	pretest	posttest
Date:	4/1/2014	11/1/2014
Barometric:	29.20	29.67

Reference Thermometer = Mercury in glass

	Reference Point Number	Source	Reference Thermometer Temperature	Meter Readout Temperature	Difference (%)
Pre-Test	T.C	Ice Water			0.00
		Ambient	62.8	62.9	-0.02
		Heat Source			0.00
Post-Test	T.C	Ice Water	32.3	32.1	0.04
		Ambient	66.3	65.7	0.11
		Heat Source	295.8	293.6	0.29

a (temp. diff.) = (ref.temp + 460) - (Thermo. temp. + 460) / (ref. temp. +460) x 100

Where $-1.5 < a < 1.5$

APPENDIX E

Process Data

Process Data Summary Tables

Run	Tag	Concent Decree				
		Test #1	Test #2	Test #3	Test #4	Test average
Start time		10/29/2014 10:10	10/29/2014 13:20	10/29/2014 16:35	10/30/2014 12:30	
End time		10/29/2014 12:25	10/29/2014 15:30	10/29/2014 18:40	10/30/2014 14:41	
Soot Blowing (mark with X)						
Total Feed Rate, BPD	C060008	59.9	60.0	60.0	62.0	60.5
FCCU Regenerator Coke Burn, lb/hr	C06MACK	38824	38946	38887	40239	39224
Ammonia Flow to ESP, lb/hr	F06898	45	47	45	45	45
ESP Total Primary Power, KW	C08101KW	85	82	84	75	82
ESP Total Secondary Current, Amps	C08101SA	3726	3569	3685	3265	3561
SO2, ppm @ 0%O2	C06660B	2	2	1	2	2
NOx, ppm @ 0%O3	C06660A	8	7	9	8	8
SO2 Additive Rate, PPD	H06901A	100	100	100	96	99
Ammonia Slip (Calc), ppm	C06660	No Data	No Data	No Data	No Data	No Data
Regenerator Plenum Outlet Temperature, F	T06801	1066	1066	1066	1066	1066
FCU 600 ESP Temperature - K-701A	T08006	659	657	660	667	661
FCU 600 ESP Temperature - K-701B	T08007	674	673	676	683	676
Average ESP Inlet Temperature, F		666	665	668	675	669
Ammonia Flow to SCR, lb/hr	F06894	42	39	39	45	41
Total Ammonia Flow , lb/hr		87	85	84	91	87

APPENDIX F Test Program Qualifications

Test Program Qualifications

ARI Environmental's offices in Wauconda, Illinois; Newport, Delaware and Pasadena, Texas specialize in conducting stack emission, fugitive leak detection, ambient air and in-plant OSHA type testing for industrial clients.

ARI is organized so that its facilities and resources meet the requirements of ASTM D7036, Standard Practice for Competence of Air Emission Testing Bodies. ARI's laboratories in Wauconda, Illinois and Pasadena, Texas hold NELAP primary accreditation with the Texas Commission on Environmental Quality (Certificate No. T104704428-13-5), NELAP accreditation with the New Jersey Department of Environmental Protection (Certificate No. IL007), and NELAP/State accreditation with the Louisiana Department of Environmental Quality (Certificate No. 02010). ARI is also registered with the Pennsylvania Laboratory Accreditation Program (Registration No. 68-05220).

During the past 30 years, ARI personnel have conducted over 5,000 separate stack emission tests for a variety of industrial clients throughout North America for the determination of degree of source compliance and to yield emissions data and control equipment performance data for in-house engineering purposes.

ARI presently has over 80 trained personnel for conducting source emission sampling, fugitive leak detection monitoring, ambient air monitoring and OSHA sampling programs. All test programs are supervised and conducted by onsite Qualified Individuals (QI) and/or Qualified Source Testing Individuals (QSTI) pursuant to ASTM D7036.

The key personnel involved in the test program were as follows:

Steven Flaherty
Mr. Flaherty is a Senior Project Manager with ARI. His 14 years of experience includes emission compliance and CEM certification testing for a wide variety of industries including petrochemical, steel mills, electric utilities, cement plants, asphalt plants and general manufacturing plants. Mr. Flaherty is presently certified as a QSTI by the Source Evaluation Society (SES) pursuant to the requirements of ASTM D7036-04.

W. Alex Hildreth
Mr. Hildreth is a field scientist specializing in sampling equipment preparation, maintenance and calibration, equipment setup, field sampling, sample recovery and post-test equipment clean up. Mr. Hildreth has 2 years of experience in conducting various source emission test programs. Mr. Hildreth is presently certified as a QI by the SES pursuant to the requirements of ASTM D7036-04.

Brett O'Leary
Mr. O'Leary is a field technician specializing in sampling equipment preparation, maintenance and calibration, equipment setup, field sampling, sample recovery and post-test equipment clean up.

Jonathon Phillips
Mr. Phillips is a field technician specializing in sampling equipment preparation, maintenance and calibration, equipment setup, field sampling, sample recovery and post-test equipment clean up.

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

STEVEN M. FLAHERTY

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS

ISSUED THIS 26TH DAY OF NOVEMBER 2013 AND EFFECTIVE UNTIL NOVEMBER 25TH, 2018

Peter R. Westlin, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2008-237

SOURCE EVALUATION SOCIETY

SES

Qualified Source Testing Individual

LET IT BE KNOWN THAT

STEVEN M. FLAHERTY

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GASEOUS POLLUTANTS SOURCE SAMPLING METHODS

ISSUED THIS 26TH DAY OF NOVEMBER 2013 AND EFFECTIVE UNTIL NOVEMBER 25TH, 2018

Peter R. Westlin, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2008-237

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

STEVEN M. FLAHERTY

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS

ISSUED THIS 26TH DAY OF NOVEMBER 2013 AND EFFECTIVE UNTIL NOVEMBER 25TH, 2018

Peter R. Westlin, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Karen D. Kajiya-Mills, QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2008-237

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

STEVEN M. FLAHERTY

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

HAZARDOUS METALS MEASUREMENT SAMPLING METHODS

ISSUED THIS 18TH DAY OF OCTOBER 2011 AND EFFECTIVE UNTIL OCTOBER 17TH , 2016

Peter R. Westlin, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2008-237

Appendix 6e – FCU 500 Performance Testing
December 2014

TEST REPORT

COMPLIANCE EMISSION TEST
NSPS, SUBPART Ja
FLUIDIZED CATALYTIC CRACKING UNIT 500

BP PRODUCTS NORTH AMERICA, INC.
WHITING, INDIANA

PREPARED FOR:

BP PRODUCTS NORTH AMERICA, INC.
Whiting Refinery
2918 Indianapolis Blvd.
Whiting, Indiana 46394
Phone: 219.473.2110
E-mail: rohini.sengupta@bp.com
Attention: Ms. Rohini Sengupta
Environmental Specialist

cc: Mr. Dave Fashimpaur
Mr. Mark Huthmaker
Ms. Cheryl Joyal
Mr. Sean O'Connell
Mr. Dave Ringwald

ARI Environmental, Inc.
951 Old Rand Road, Unit 106
Wauconda, Illinois 50084
Phone: 847.487.1580 Ext. 117
Fax: 847.487.1587
E-mail: sflaherty@arienv.com
Steve Flaherty
Senior Project Manager
Source Testing Division

ARI Project No. 566-146
BP Purchase Order No. 3000319830
Test Date: December 10, 2014
Report Issuance Date: January 13, 2015

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Appendix C	Analytical Data
Appendix D	Calibration Data
Appendix E	Process Data
Appendix F	Test Program Qualifications

REPORT CERTIFICATION

STATEMENT OF CONFORMANCE AND TEST REPORT CERTIFICATION

I certify, to the best of my knowledge, that this test program was conducted in a manner conforming to the criteria set forth in ASTM D7036-04: Standard Practice for Competence of Air Emission Testing Bodies, and that project management and supervision of all project related activities were performed by qualified individuals as defined by this practice.

I further certify that this test report and all attachments were prepared under my direction or supervision in accordance with the ARI Environmental, Inc. quality management system designed to ensure that qualified personnel gathered and evaluated the test information submitted. Based on my inquiry of the person or persons who performed the sampling and analysis relating to this performance test, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate and complete.

Steve Flaherty, QSTI
Senior Project Manager, Source Testing Division
ARI Environmental, Inc.

Hank Taylor, QI
Quality Assurance Manager, Source Testing Division
ARI Environmental, Inc.

SECTIONONE Introduction and Summary

ARI Environmental, Inc. (ARI) was retained by BP Products North America, Inc. (BP) to conduct a particulate matter (PM) compliance emission test on the Fluidized Catalytic Cracking Unit (FCCU) 500 stack at their refinery located in Whiting, Indiana. Testing was conducted on December 10, 2014.

Three 60-minute test runs were conducted on the FCCU 500 stack to determine the concentration and emission rate of filterable nonsulfate PM. The emission test was performed to fulfill the testing requirements of the New Source Performance Standards (NSPS), Subpart Ja.

Sampling and analysis methodologies followed the procedural requirements as detailed in the Code of Federal Regulations, Title 40, Part 60 (40 CFR 60), Appendix A, USEPA Methods 1, 2, 3, 4 and 5F; and the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods.

Ms. Rohini Sengupta of BP coordinated the test and monitored process conditions. Testing was conducted by Messrs. Steve Flaherty, Brett O'Leary and Jonathon Phillips of ARI.

This report summarizes the test procedures and results of the emission test. Included as appendices is complete documentation of all calculation summaries, field data, analytical data, calibration data, process data and test program qualifications.

The test results are summarized in Table 1-1.

TABLE 1-1. SUMMARY OF FCCU 500 STACK NONSULFATE PM TEST RESULTS

TEST RUN NO.	:	5F-1	5F-2	5F-3	
TEST DATE	:	12/10/2014	12/10/2014	12/10/2014	
TEST TIME	:	13:33-14:40	15:30-16:37	17:10-18:16	Average
Nonsulfate Filterable PM					
Concentration					
grains/dscf		0.0277	0.0322	0.0374	0.0324
mg/dscm		63.454	73.611	85.645	74.237
Emission rate					
lb/hr		43.90	50.58	59.64	51.37
lb/1,000 lb coke burn		0.741	0.854	1.008	0.868

SECTIONTWO Testing and Analytical Procedures

2.1 OVERVIEW

ARI conducted a compliance emission test on the FCCU 500 stack at the BP refinery located in Whiting, Indiana.

Three 60-minute test runs were conducted on December 10, 2014 to determine the concentration and emission rate of filterable nonsulfate PM.

2.2 METHODOLOGY

Testing procedures and sampling methodologies were conducted following the procedural requirements as detailed in 40 CFR 60, Appendix A, USEPA Methods 1, 2, 3, 4 and 5F; and the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods.

2.2.1 Sampling Locations (USEPA Method 1)

The sampling point locations used for the determination of gas velocity and volume flow rate were determined following the procedural requirements as detailed in USEPA Method 1. Sampling was conducted in the FCCU 500 stack using the two (2) sampling ports provided in the 108-inch diameter stack. The sample ports are located approximately 1,368 inches downstream and 720 inches upstream from the nearest flow disturbances. Twelve (12) traverse points were used to sample the cross-sectional area of the stack.

A cyclonic flow check has been conducted to demonstrate that cyclonic flow conditions do not exist at the sampling location.

2.2.2 Flue Gas Volumetric Flow Rate (USEPA Method 2)

Gas velocity and volumetric flow rate were determined following USEPA Method 2. Velocity head measurements were performed using a Type-S pitot tube and Dwyer inclined 0 to 10-in. water manometer. Temperature measurements were conducted using a chromel-alumel thermocouple connected to a digital direct read-out potentiometer.

2.2.3 Molecular Weight (USEPA Method 3)

The stack gas oxygen (O_2) and carbon dioxide (CO_2) concentrations were determined following USEPA Method 3 procedures. During each test run, an integrated bag sample of the exhaust gas was collected. An Orsat combustion analyzer was used to determine the O_2 and CO_2 concentrations of each collected bag. The nitrogen (N_2) content was calculated as the difference.

2.2.4 Flue Gas Moisture Content (USEPA Method 4)

The stack gas moisture content was determined following USEPA Method 4. This method was performed in conjunction with the USEPA Method 5F procedures described in Subsection 2.2.5.

2.2.5 Nonsulfate Particulate Matter Determination (USEPA Method 5F)

Nonsulfate PM sampling was conducted in accordance with USEPA Method 5F using an Apex Instruments, Inc. sampling train.

2.2.5.1 Sampling Apparatus

The PM sampling train met design specifications established by the USEPA. Assembled by ARI personnel, it consisted of the following:

Nozzle – Stainless steel, with sharp, tapered leading edge.

Probe – Stainless steel with a heating system capable of maintaining a probe exit temperature of 320°F ±25°F.

Pitot Tube - Type-S attached to probe for monitoring stack gas velocity.

Filter Holder - Borosilicate glass filter holder with a 4-in. Teflon frit filter support and a silicone rubber gasket. The holder design provided a positive seal against leakage from the outside or around the filter. The filter holder was heated to 320°F ±25°F during sampling.

Draft Gauge – Inclined manometer with a readability of 0.01-in. H_2O in the 0 to 1-in. range and 0.1-in. H_2O in the 1 to 10-in. range.

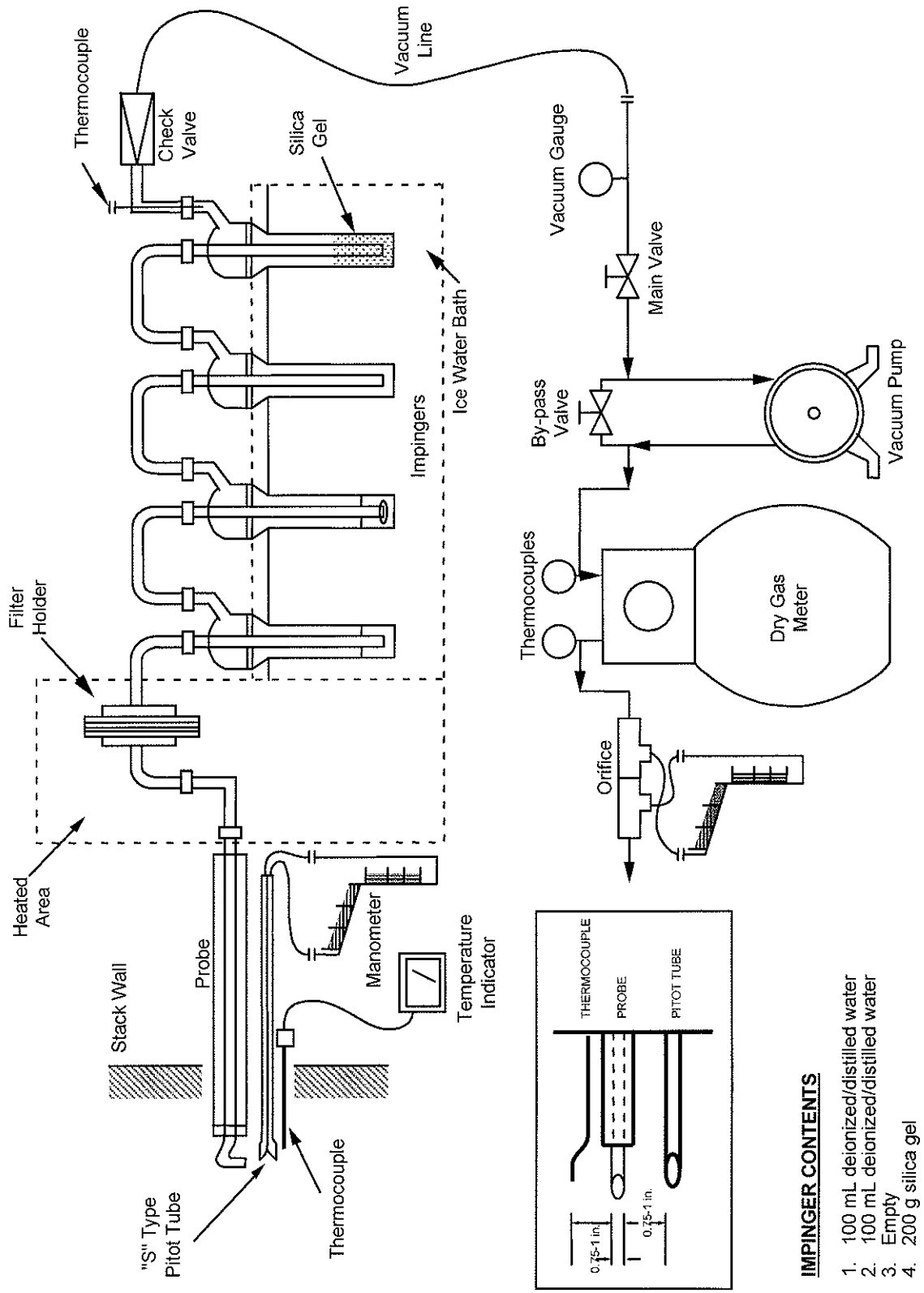
Impingers – Four impingers connected in series with glass ball joints. The first, third and fourth impingers were of the Greenburg-Smith design, but modified by replacing the standard tip with a ½-in. i.d. glass tube extending to within ½-in. of the bottom of the impinger flask. The second impinger was of the Greenburg-Smith design with a standard tip.

Metering System - Apex Model 522. Vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 5°F, dry gas meter with ±2 percent accuracy and related equipment as required to maintain an isokinetic sampling rate and to determine sample volume.

Barometer - Mercury barometer capable of measuring atmospheric pressure to within ±0.1-in. Hg.

2.2.5.2 Sampling Procedures

After the sampling site and minimum number of traverse points were selected, the stack pressure, temperature, moisture and range of velocity differential pressure (ΔP) were measured according to procedures described in USEPA Methods 1 through 4. The sampling train was set up with the probe and filter holder as shown in Figure 2-1. The first and second impingers initially contained 100 milliliters (mL) of deionized/distilled water. The third impinger was initially empty. The fourth impinger contained 200 grams of silica gel.



IMPINGER CONTENTS

1. 100 mL deionized/distilled water
2. 100 mL deionized/distilled water
3. Empty
4. 200 g silica gel

FIGURE 2-1. USEPA METHOD 5F NONSULFATE PARTICULATE MATTER SAMPLING TRAIN

The sampling train was leak-checked at the sampling site by plugging the inlet to the nozzle and pulling a vacuum of 15-in. Hg. Leak rates of less than 0.02 ft^3/min. at a vacuum of 15-in. Hg are considered acceptable. At the completion of each test run, the sampling train was leak-checked by the same procedure. Both pre and post-test leak checks of the pitot tube were made for each test run. Ice was placed around the impingers to keep the temperature of the gases leaving the last impinger at less than 68°F.

During sampling, stack gas and sampling train data were recorded at specified intervals. Isokinetic sampling rates were set throughout the sampling period with the aid of a programmable calculator.

2.2.5.3 Sample Recovery Procedures

After sampling was completed and the final leak checks performed, the filter and probe (front-half) were disconnected from the impinger train. The sample fractions were recovered as follows:

Container 1 - The filter holder was sealed.

Container 2 - Loose PM and deionized/distilled water washings from all sample-exposed surfaces prior to the filter were placed in a glass jar, sealed and labeled. PM was removed from the probe liner, nozzle and fitting with the aid of a brush and deionized/ distilled water rinsing. The liquid level was marked after the container was sealed.

Container 3 - A minimum of 200 mL of deionized/distilled water was taken for the blank analysis. The blank was obtained and treated in a similar manner as the contents of Container 2.

The contents of impingers 1 through 3 were measured for volume and then discarded. The contents of the fourth impinger (silica gel) were placed in a polyethylene bottle for subsequent weighing to the nearest gram.

2.2.5.4 Analytical Procedures

The analytical procedures followed those described in USEPA Method 5F.

The filter from Container 1 was cut into small pieces and placed in a 125 mL Erlenmeyer flask equipped with an air condenser. The sample container was rinsed with water and placed into the same flask as the filter pieces. The contents of the flask were refluxed on a hot plate for 6 to 8 hours. The solution was then cooled and transferred to a 500 mL volumetric flask. The contents of Container 2 (probe rinse) were placed in the 500 mL volumetric flask with the filter solution. The contents were then diluted to exactly 500 mL with water.

The sample was allowed to settle, and then a pipette was used to deliver 5 mL of the solution into a 50 mL volumetric flask. The aliquot was diluted to exactly 50 mL with water. The final solution was analyzed in duplicate by ion chromatography for sulfate content (SO_4^{-2}). The duplicate samples agreed within 5% of their mean and were compared to a 5-point standard calibration curve.

After the sulfate analysis, the remaining contents of the volumetric flask were transferred to a tared 250 mL beaker. The flask was carefully rinsed with water to make sure that all PM was transferred to the tared beaker. The beaker was transferred to an oven and heated to 105°C until approximately 100 mL of solution remained. The beaker was allowed to cool, after which five drops of phenolphthalein indicator were added. Concentrated ammonium hydroxide was added until the solution turned pink. The sample was returned to the oven and evaporated to dryness at 105°C. The sample was then cooled, placed in a desiccator and subsequently weighed to a constant weight.

The term "constant weight" means a difference of no more than 0.5 mg or 1 percent of the total weight less tare weight, whichever is greater between two consecutive readings, with no less than 6 hours of desiccation between weighings.

SECTIONTHREE Process Description

The FCCU 500, constructed in 1945 and identified as Unit ID 230, is rated at 115,000 barrels per day. This unit converts hydrocarbons that boil above 500°F into lower molecular weight products, which include gasoline and LPG. The cracking takes place as the gas oil and catalyst stream mix in the reactor. This process results in the catalyst being coated with coke, which is subsequently burned off in a regenerator.

The process data summary is presented in Table 3-1.

TABLE 3-1. FCCU 500 PROCESS AND STACK CEMS DATA SUMMARY

TEST RUN NO. :	5F-1	5F-2	5F-3	Average
FCCU Regenerator Coke Burn, lb/hr	59,288	59,242	59,151	59,227
ESP Total Primary Power, KW	82	82	82	82
ESP Total Secondary Current, milliAmps	2,917	2,917	2,919	2,918
SO_2, ppm @ 0% O_2	5.4	5.6	5.4	5.5
NO_x, ppm @ 0% O_2	27	27	27	27

SECTIONFOUR Test Results

The test results are presented in Table 4-1.

The calculation summaries, field data, analytical data, calibration data, process data and test program qualifications are included in the appendices.

TABLE 4-1. FCCU 500 STACK NONSULFATE PM EMISSION TEST RESULTS

TEST RUN NO. :	5F-1	5F-2	5F-3	
TEST DATE :	12/10/2014	12/10/2014	12/10/2014	
TEST TIME :	13:33 - 14:40	15:30 - 16:37	17:10 - 18:16	Average
Stack Gas Parameters				
Temperature, °F	653.9	654.6	654.0	654.2
Velocity, av. ft/sec	134.5	131.9	134.0	133.4
Volumetric flow, acfm	513,220	503,537	511,331	509,363
Volumetric flow, scfm	238,493	233,846	237,594	236,644
Volumetric flow, scfh	14,309,574	14,030,763	14,255,611	14,198,649
Volumetric flow, dscfm	184,684	183,415	185,886	184,662
Volumetric flow, dscfh	11,081,065	11,004,908	11,153,183	11,079,719
Mass flow, Mlb/hr db	884.9	879.9	891.1	885.3
Moisture, av. % vol	22.6	21.6	21.8	22.0
Molecular weight, lb/lb-mole db	30.76	30.80	30.78	30.78
Carbon Dioxide, av. % vol	16.7	17.0	16.8	16.8
Oxygen, av. % vol	2.3	2.1	2.3	2.2
Particulate Sample				
Time, min.	60.0	60.0	60.0	60.0
Volume, dscf	42.409	43.705	43.049	43.054
Filterable nonsulfate PM, mg	76.20	91.10	104.40	90.57
Isokinetic ratio, %	101.3	105.1	102.1	102.8
Nonsulfate Filterable PM				
Concentration				
grains/dscf	0.0277	0.0322	0.0374	0.0324
mg/dscm	63.454	73.611	85.645	74.237
lb/dscf x 10^{-6}	3.962	4.596	5.347	4.635
Emission rate				
lb/hr	43.90	50.58	59.64	51.37
lb/1,000 lb coke burn	0.741	0.854	1.008	0.868

APPENDIX A Calculation Summaries

USEPA Method 4
Moisture Determination Sample Calculations

Client:	BP
Location:	Whiting, IN
Source:	FCCU 500 Exhaust
Date:	12/10/2014
Run #:	5F-1

Data Input:

Volume metered (V_m):	42.338	**ft^3**
Meter calibration coefficient (Y_d):	0.996	**dimensionless**
Barometric pressure (P_{bar}):	29.45	**inches Hg**
Meter sample rate (ΔH):	1.81	**inches H_2O**
Meter inlet/outlet temperature (T_m):	59.1	**°F**
Volume of moisture collected (V_{lc}):	262.5	**milliliters**
Stack Temperature (T_s):	653.9	**°F**
Static Pressure (St):	-1.6	**inches H_2O**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Volume of sample, dry basis:

$$Vm_{std} = V_m \times Y_d \times \left(\frac{528.0°R}{29.92"Hg}\right) \times \left(\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460}\right) = \mathbf{42.409\ dscf}$$

Volume of water vapor in sample:

$$Vw_{std} = \frac{0.04707 ft^3}{ml} \times V_{lc} = \mathbf{12.356\ scf}$$

Fractional moisture content of stack gas:

$$B_{wo} = \frac{Vw_{std}}{(Vm_{std} + Vw_{std})} = \mathbf{0.2256\ B_{wo}}$$

Percent Moisture:

$$\%moisture = B_{wo} \times 100 = \mathbf{22.56\ \%}$$

Fractional moisture content of stack gas at saturated conditions:

$$T_{s(°K)} = ((T_s - 32) * 0.5556) + 273 = \mathbf{618.5\ °Kelvin}$$

$$P_{s(mmHg)} = \left(P_{bar} + \frac{S_t}{13.6}\right) \times 25.401 = \mathbf{748.06\ mm\ Hg}$$

$$B_{wos} = \frac{\sqrt{\left(10^{\left(A - \left(\frac{B}{(T_{s(°K)} - C)}\right)\right)}\right)}}{P_{s(mmHg)}} = \mathbf{1.0000\ B_{wo}}$$

where:
A= 8.361
B=1893.5
C=27.65

Percent moisture at saturated conditions:

$$\%moisture_{saturated} = B_{wos} \times 100 = \mathbf{100.00\ \%}$$

Percent moisture used for emissions calculations:

$$= \mathbf{22.56\ \%}$$

USEPA Method 2
Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client: BP
Location: Whiting, IN
Source: FCCU 500 Exhaust
Date: 12/10/2014
Run #: 5F-1

Data Input

Carbon Dioxide (CO_2):	16.7	**%**
Oxygen (O_2):	2.3	**%**
Nitrogen (N_2):	81.0	**%**
Fractional Moisture Content (B_{wo})	0.2256	**dimensionless**
Stack Temperature (T_s):	653.9	**°F**
Pitot Coefficient (C_p):	0.84	**dimensionless**
Average square root of ΔP	1.6044	**inches H_2O**
Barometric Pressure (P_{bar}):	29.45	**inches Hg**
Static Pressure (S_t)	-1.60	**inches H_2O**
Stack diameter:	108.00	**inches H_2O**
Stack area (A_s):	63.6172	**ft^2**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$ = **30.764 lb/lb-mole**

Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws})$$ = **27.884 lb/lb-mole**

Absolute stack gas pressure:

$$P_s = P_{bar} + \left(\frac{S_t}{13.6}\right)$$ = **29.332 inches H_2O**

Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}}$$ = **134.455 feet/second**

Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60$$ = **513,220 acfm**

Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right]$$ = **238,493 scfm**

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right] \times 60$$ = **14,309,574 scfh**

Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo})$$ = **184,684 dscfm**

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60$$ = **11,081,065 dscfh**

USEPA Method 5F (Non-Sulfate PM)
Particulate Calculation Summary

Client:	BP
Location:	Whiting, IN
Source:	FCCU 500 Exhaust
Date:	12/10/2014
Run #:	5F-1

Data Input

Barometric pressure (P_{bar}):	29.45	**inches Hg**	**Particulate Weight:**	
Stack pressure (P_s):	29.33	**Inches Hg Abs.**	**Filterable:**	76.20 **milligrams**
Test length (θ):	60.0	**minutes**		
Sample nozzle diameter (D_n):	0.2100	**inches**		
Sample nozzle area (A_n):	0.000241	**ft^3**		
Stack temperature (T_s):	653.9	**°F**		
Volume metered (Vm_{std}):	42.409	**ft^3**		
Stack gas velocity (V_s):	134.455	**feet/second**	**Coke Burn Rate:**	59,288 **lb/hr**
Stack gas volumetric flow (Q_{std}):	11,081,065	**dscf/hour**		
Fractional Moisture content (B_{wo}):	0.2256	**%**		

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Percent Isokinetic:

$$\%\text{Isokinetic} = \frac{0.0945 \times Vm_{std} \times (T_s + 460)}{P_s \times V_s \times \theta \times A_n \times (1 - B_{wo})}$$

= **101.3 % isokinetic**

Method 5-F Particulate Concentration:

$$C_s = \frac{\left(\frac{0.01543\,\text{grains}}{\text{mg}} \times M_n\right)}{V_{mstd}}$$

= **0.0277 gr/dscf**

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315\,ft^3}{m^3}$$

= **63.4543 mg/dscm**

$$C^1{}_s = \frac{\left(\frac{2.205 \times 10^{-6}\,\text{lb}}{\text{mg}} \times M_n\right)}{V_{mstd}}$$

= **3.962×10^{-6} lb/dscf**

Method 5-F Particulate Emission Rate:

$$E_p = C^1{}_s \times Q_{std}$$

= **43.903 lb/hr**

$$pmr_{lb/1000lbcokeburn} = \frac{(E_p)(1000)}{(R_c)}$$

= **0.7405 lb/1000lb coke burn**

USEPA Method 4
Moisture Determination Sample Calculations

Client: BP
Location: Whiting, IN
Source: FCCU 500 Exhaust
Date: 12/10/2014
Run #: 5F-2

Data Input:

Volume metered (V_m):	43.542	**ft^3**
Meter calibration coefficient (Y_d):	0.996	**dimensionless**
Barometric pressure (P_{bar}):	29.45	**inches Hg**
Meter sample rate (ΔH):	1.87	**inches H_2O**
Meter inlet/outlet temperature (T_m):	58.1	**°F**
Volume of moisture collected (V_{lc}):	255.3	**milliliters**
Stack Temperature (T_s):	654.6	**°F**
Static Pressure (St):	-1.6	**inches H_2O**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Volume of sample, dry basis:

$$Vm_{std} = V_m \times Y_d \times \left(\frac{528.0°R}{29.92"Hg}\right) \times \left(\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460}\right)$$ = **43.705 dscf**

Volume of water vapor in sample:

$$Vw_{std} = \frac{0.04707 ft^3}{ml} \times V_{lc}$$ = **12.017 scf**

Fractional moisture content of stack gas:

$$B_{wo} = \frac{Vw_{std}}{(Vm_{std} + Vw_{std})}$$ = **0.2157 B_{wo}**

Percent Moisture:

$$\%moisture = B_{wo} \times 100$$ = **21.57 %**

Fractional moisture content of stack gas at saturated conditions:

$$T_{s(°K)} = ((T_s - 32) * 0.5556) + 273$$ = **618.9 °Kelvin**

$$P_{s(mmHg)} = \left(P_{bar} + \frac{S_t}{13.6}\right) \times 25.401$$ = **748.06 mm Hg**

$$B_{wos} = \frac{\sqrt{\left(10^{\left(A - \left(\frac{B}{(T_{s(°K)} - C)}\right)\right)}\right)}}{P_{s(mmHg)}}$$

where:
A= 8.361
B=1893.5
C=27.65

= **1.0000 B_{wo}**

Percent moisture at saturated conditions:

$$\%moisture_{saturated} = B_{wos} \times 100$$ = **100.00 %**

Percent moisture used for emissions calculations:

= **21.57 %**

USEPA Method 2
Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client: BP
Location: Whiting, IN
Source: FCCU 500 Exhaust
Date: 12/10/2014
Run #: 5F-2

Data Input

Carbon Dioxide (CO_2):	17.0	**%**
Oxygen (O_2):	2.1	**%**
Nitrogen (N_2):	80.9	**%**
Fractional Moisture Content (B_{wo})	0.2157	**dimensionless**
Stack Temperature (T_s):	654.6	**°F**
Pitot Coefficient (C_p):	0.84	**dimensionless**
Average square root of ΔP	1.5781	**inches H_2O**
Barometric Pressure (P_{bar}):	29.45	**inches Hg**
Static Pressure (S_t)	-1.60	**inches H_2O**
Stack diameter:	108.00	**inches H_2O**
Stack area (A_s):	63.6172	**ft^2**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$ = **30.804 lb/lb-mole**

Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws})$$ = **28.043 lb/lb-mole**

Absolute stack gas pressure:

$$P_s = P_{bar} + \left(\frac{S_t}{13.6}\right)$$ = **29.332 inches H_2O**

Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}}$$ = **131.918 feet/second**

Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60$$ = **503,537 acfm**

Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right]$$ = **233,846 scfm**

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right] \times 60$$ = **14,030,763 scfh**

Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo})$$ = **183,415 dscfm**

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60$$ = **11,004,908 dscfh**

USEPA Method 5F (Non-Sulfate PM)
Particulate Calculation Summary

Client: BP
Location: Whiting, IN
Source: FCCU 500 Exhaust
Date: 12/10/2014
Run #: 5F-2

Data Input

Barometric pressure (P_{bar}):	29.45	**inches Hg**	**Particulate Weight:**	
Stack pressure (P_s):	29.33	**Inches Hg Abs.**	**Filterable:**	91.10 **milligrams**
Test length (θ):	60.0	**minutes**		
Sample nozzle diameter (D_n):	0.2100	**inches**		
Sample nozzle area (A_n):	0.000241	**ft^3**		
Stack temperature (T_s):	654.6	**°F**		
Volume metered (Vm_{std}):	43.705	**ft^3**		
Stack gas velocity (V_s):	131.918	**feet/second**	**Coke Burn Rate:**	59,242 **lb/hr**
Stack gas volumetric flow (Q_{std}):	11,004,908	**dscf/hour**		
Fractional Moisture content (B_{wo}):	0.2157	**%**		

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Percent Isokinetic:

$$\%Isokinetic = \frac{0.0945 \times Vm_{std} \times (T_s + 460)}{P_s \times V_s \times \theta \times A_n \times (1 - B_{wo})}$$ = **105.1 % isokinetic**

Method 5-F Particulate Concentration:

$$C_s = \frac{\left(\frac{0.01543 grains}{mg} \times M_n\right)}{V_{mstd}}$$ = **0.0322 gr/dscf**

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315 ft^3}{m^3}$$ = **73.6113 mg/dscm**

$$C'_s = \frac{\left(\frac{2.205 \times 10^{-6} lb}{mg} \times M_n\right)}{V_{mstd}}$$ = **4.596 x 10^{-6} lb/dscf**

Method 5-F Particulate Emission Rate:

$$E_p = C'_s \times Q_{std}$$ = **50.580 lb/hr**

$$pmr_{lb/1000lb\,coke\,burn} = \frac{(E_p)(1000)}{(R_c)}$$ = **0.8538 lb/1000lb coke burn**

USEPA Method 4
Moisture Determination Sample Calculations

Client: BP
Location: Whiting, IN
Source: FCCU 500 Exhaust
Date: 12/10/2014
Run #: 5F-3

Data Input:

Volume metered (V_m):	42.954	**ft^3**
Meter calibration coefficient (Y_d):	0.996	**dimensionless**
Barometric pressure (P_{bar}):	29.45	**inches Hg**
Meter sample rate (ΔH):	1.87	**inches H_2O**
Meter inlet/outlet temperature (T_m):	58.9	**°F**
Volume of moisture collected (V_{lc}):	254.4	**milliliters**
Stack Temperature (T_s):	654.0	**°F**
Static Pressure (St):	-1.6	**inches H_2O**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Volume of sample, dry basis:

$$Vm_{std} = V_m \times Y_d \times \left(\frac{528.0°R}{29.92"Hg}\right) \times \left(\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m + 460}\right) = \mathbf{43.049\ dscf}$$

Volume of water vapor in sample:

$$Vw_{std} = \frac{0.04707 ft^3}{ml} \times V_{lc} = \mathbf{11.975\ scf}$$

Fractional moisture content of stack gas:

$$B_{wo} = \frac{Vw_{std}}{(Vm_{std} + Vw_{std})} = \mathbf{0.2176\ B_{wo}}$$

Percent Moisture:

$$\%moisture = B_{wo} \times 100 = \mathbf{21.76\ \%}$$

Fractional moisture content of stack gas at saturated conditions:

$$T_{s(°K)} = ((T_s - 32) * 0.5556) + 273 = \mathbf{618.6\ °Kelvin}$$

$$P_{s(mmHg)} = \left(P_{bar} + \frac{S_t}{13.6}\right) \times 25.401 = \mathbf{748.06\ mm\ Hg}$$

$$B_{wos} = \frac{\sqrt{\left(10^{\left(A - \left(\frac{B}{(T_{s(°K)} - C)}\right)\right)}\right)}}{P_{s(mmHg)}} = \mathbf{1.0000\ B_{wo}}$$

where:
A= 8.361
B=1893.5
C=27.65

Percent moisture at saturated conditions:

$$\%moisture_{saturated} = B_{wos} \times 100 = \mathbf{100.00\ \%}$$

Percent moisture used for emissions calculations:

$$= \mathbf{21.76\ \%}$$

USEPA Method 2
Volumetric Flow Rate Sample Calculations (Circular Ducts)

Client: BP
Location: Whiting, IN
Source: FCCU 500 Exhaust
Date: 12/10/2014
Run #: 5F-3

Data Input

Carbon Dioxide (CO_2):	16.8	**%**
Oxygen (O_2):	2.3	**%**
Nitrogen (N_2):	80.9	**%**
Fractional Moisture Content (B_{wo})	0.2176	**dimensionless**
Stack Temperature (T_s):	654.0	**°F**
Pitot Coefficient (C_p):	0.84	**dimensionless**
Average square root of ΔP	1.6017	**inches H_2O**
Barometric Pressure (P_{bar}):	29.45	**inches Hg**
Static Pressure (S_t)	-1.60	**inches H_2O**
Stack diameter:	108.00	**inches H_2O**
Stack area (A_s):	63.6172	**ft^2**

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Dry molecular weight of stack gas:

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$ = **30.780 lb/lb-mole**

Molecular weight of stack gas, wet basis:

$$M_s = (M_d \times (1 - B_{ws})) + (18 \times B_{ws})$$ = **27.999 lb/lb-mole**

Absolute stack gas pressure:

$$P_s = P_{bar} + \left(\frac{S_t}{13.6}\right)$$ = **29.332 inches H_2O**

Stack gas velocity:

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{(T_s + 460)}{(P_s \times M_s)}}$$ = **133.960 feet/second**

Stack gas volumetric flow rate:

$$Q_a = A_s \times V_s \times 60$$ = **511,331 acfm**

Stack gas volumetric flow rate, wet basis:

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right]$$ = **237,594 scfm**

$$Q_{sw} = Q_a \times \left[\left(\frac{528°R}{29.92in.Hg}\right) \times \left(\frac{P_s}{T_s + 460}\right)\right] \times 60$$ = **14,255,611 scfh**

Stack gas volumetric flow rate, dry basis:

$$Q_{std} = Q_{sw} \times (1 - B_{wo})$$ = **185,886 dscfm**

$$Q_{std} = Q_{sw} \times (1 - B_{wo}) \times 60$$ = **11,153,183 dscfh**

USEPA Method 5F (Non-Sulfate PM)
Particulate Calculation Summary

Client: BP
Location: Whiting, IN
Source: FCCU 500 Exhaust
Date: 12/10/2014
Run #: 5F-3

Data Input

Barometric pressure (P_{bar}):	29.45	**inches Hg**	**Particulate Weight:**	
Stack pressure (P_s):	29.33	**Inches Hg Abs.**	**Filterable:**	104.4 **milligrams**
Test length (θ):	60.0	**minutes**		
Sample nozzle diameter (D_n):	0.2100	**inches**		
Sample nozzle area (A_n):	0.000241	**ft^3**		
Stack temperature (T_s):	654.0	**°F**		
Volume metered (Vm_{std}):	43.049	**ft^3**		
Stack gas velocity (V_s):	133.960	**feet/second**	**Coke Burn Rate:**	59,151 **lb/hr**
Stack gas volumetric flow (Q_{std}):	11,153,183	**dscf/hour**		
Fractional Moisture content (B_{wo}):	0.2176	**%**		

Sample calculations @ standard conditions (29.92 inches Hg, 68.0 °F):

Percent Isokinetic:

$$\%\text{Isokinetic} = \frac{0.0945 \times Vm_{std} \times (T_s + 460)}{P_s \times V_s \times \theta \times A_n \times (1 - B_{wo})}$$

= **102.1 % isokinetic**

Method 5-F Particulate Concentration:

$$C_s = \frac{\left(\frac{0.01543\,\text{grains}}{\text{mg}} \times M_n\right)}{V_{mstd}}$$

= **0.0374 gr/dscf**

$$C_s = \frac{M_n}{V_{mstd}} \times \frac{35.315\,ft^3}{m^3}$$

= **85.6449 mg/dscm**

$$C^1{}_s = \frac{\left(\frac{2.205 \times 10^{-6}\,\text{lb}}{\text{mg}} \times M_n\right)}{V_{mstd}}$$

= **5.347 x 10^{-6} lb/dscf**

Method 5-F Particulate Emission Rate:

$$E_p = C^1{}_s \times Q_{std}$$

= **59.642 lb/hr**

$$pmr_{lb/1000lbcokeburn} = \frac{(E_p)(1000)}{(R_c)}$$

= **1.0083 lb/1000lb coke burn**

APPENDIX B

Field Data

TRAVERSE POINT LOCATIONS FOR CIRCULAR AND RECTANGULAR STACKS AND DUCTS

ARI ENVIRONMENTAL INC.

Facility BP Whiting
Date 12/9/14
Sampling Location 500 Stack
Inside of Far Wall to
Outside of Port (Distance C) 114.5 in.
Inside of Near Wall to
Outside of Port (Distance D) 6.5 in
Stack ID (Distance C- Distance D) 108 in.
Port Distance Downstream From Disturbance (B) 1368 in.
Port Distance Upstream From Disturbance (A) 720 in.
Equivalent Diameters Downstream From Disturbance (B) 12.67 (≥ 2.0)
Equivalent Diameters Upstream From Disturbance (A) 6.67 (≥ 0.5)
Number of Ports Used 2 Traverse Points / Port 12

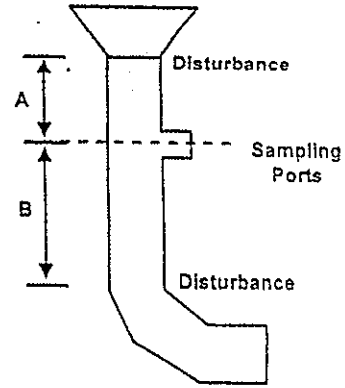
Note: Sketch Stack/Ports/Control Device on Back of Form

Equivalent Diameters Downstream From Disturbance (B) = [Distance B / Stack ID]

Equivalent Diameters Upstream From Disturbance (A) = [Distance A / Stack ID]

Equivalent Diameter For a Square or Rectangular Stack = [(2 x L x W) / (L + W)]

Port ID _____ in. (for monorail bracket specs.)
Port Length Outside of Stack _____ in. (for monorail bracket specs.)



1	2	3	4	5	6
Port Traverse Point Number	Fractional % of Stack I.D. (frac. %)	Stack I.D. (inches)	Product of Columns 2 and 3 (inches)	Port Depth (inches)	Traverse Point Location From Outside of Port (Sum of 4 and 5 in inches)
1	0.044	108	4.75	6.5	11.25
2	0.145	↓	15.77	↓	22.27
3	0.296	↓	31.97	↓	38.47
4	0.704	↓	26.03	↓	82.53
5	0.854	↓	92.23	↓	98.73
6	0.956	↓	103.25	↓	109.75
7					
8					
9					
10					
11					
12					

For Stacks / Ducts ≤ 24 inches ID – No traverse point shall be located less than 0.5 inches from stack wall

For Stacks / Ducts > 24 inches ID – No traverse point shall be located less than 1.0 inches from stack wall

QA/QC Check:
Completeness _____ Legibility _____ Accuracy _____ Specifications _____

Method 1 Calculator Signature/Date Brett O'J 12/9/14

Field Supervisor Signature/Date _____

B-1

LOCATION OF TRAVERSE POINTS IN CIRCULAR STACKS

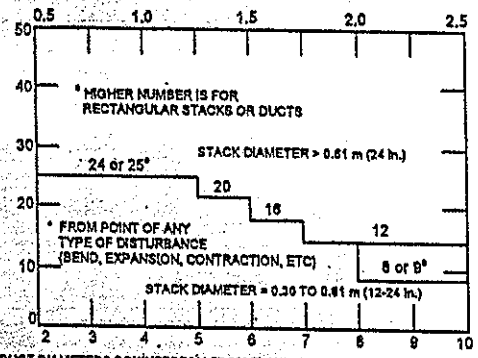
Pts	4	6	8	10	12
1	6.7	4.4	3.2	2.6	2.1
2	25.0	14.6	10.5	8.2	6.7
3	75.0	29.6	19.4	14.6	11.8
4	93.3	70.4	32.3	22.6	17.7
5		85.4	67.7	34.2	25.0
6		95.6	80.6	65.8	35.6
7			89.6	77.4	64.4
8			96.8	85.4	75.0
9				91.8	82.3
10				97.4	88.2
11					93.3
12					97.9

LOCATION OF TRAVERSE POINTS IN RECTANGULAR STACKS CEMS*

Pts	2	3	4	5	6	7	8	9
1	25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6
2	75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7
3		83.3	62.5	50.0	41.7	35.7	31.3	27.8
4			87.5	70.0	58.3	50.0	43.8	38.9
5				90.0	75.0	64.3	56.3	50.0
6					91.7	78.6	68.8	61.1
7						92.9	81.3	72.2
8							93.8	83.3
9								94.4

*3 point CEMS RATA traverse point locations (valid for rectangular and round stacks)

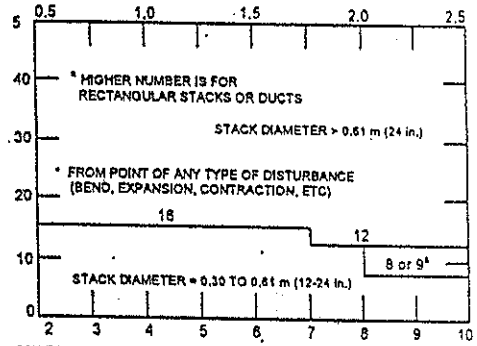
DUCT DIAMETERS UPSTREAM FROM FLOW DISTURBANCE* (DISTANCE A)



DUCT DIAMETERS DOWNSTREAM FROM FLOW DISTURBANCE* (DISTANCE B)

MINIMUM NUMBER OF TRAVERSE POINTS ISOKINETIC TESTING

DUCT DIAMETERS UPSTREAM FROM FLOW DISTURBANCE* (DISTANCE A)



DUCT DIAMETERS DOWNSTREAM FROM FLOW DISTURBANCE* (DISTANCE B)

MINIMUM NUMBER OF TRAVERSE POINTS FOR VELOCITY (NON-ISOKINETIC) TRAVERSES

Form FDF 4000.00

ARI ENVIRONMENTAL INC.

SAMPLING NOZZLE INSPECTION AND MEASUREMENT

Date: 12/9/14

Nozzle ID: 0.210

Nozzle Type: Steel

Inspected By: Brett O'Leary

Nozzle Clean: (Y) / N

Nozzle Undamaged: (Y) / N

Absent of Nicks or Dents: (Y) / N

Leading Edge Sharp: (Y) / N

Nozzle Diameter				
D_1 (inches)	D_2 (inches)	D_3 (inches)	ΔD (inches)	D_{avg} (inches)
0.211	0.210	0.209	0.002	0.210

where:

$D_{1,2,3}$ = three different nozzle diameter measurements , (inches) ; each diameter must be measured to within 0.001 inches

ΔD = maximum difference between any two diameters, (inches) ; $\Delta D \leq 0.004$ inches

D_{avg} = average of D_1, D_2, and D_3, (inches)

Form FDF 4004.00

FIELD DATA

ARI ENVIRONMENTAL INC.

PLANT	BP	AMBIENT TEMPERATURE	35°	PROBE HEATER SETTING	320
DATE	12/10/14	BAROMETRIC PRESSURE	29.45	HEATER BOX SETTING	320
LOCATION	Whiting, IN	ASSUMED MOISTURE, %	23	METER $H_@$	2.05
OPERATOR	BO, JD	PROBE LENGTH, in.	120	C_p FACTOR	0.84
STACK NO.	BOO Stack	NOZZLE DIAMETER, in.	0.210	Y_d FACTOR	0.996
RUN NO.	1	STACK DIAMETER, in.	108	PITOT NO.	731
SAMPLE BOX NO.	N/A	MINUTES PER POINT	5		
METER BOX NO.	503001	NUMBER OF POINTS	12		
START TIME	1333	NUMBER OF PORTS	~~Be~~ 2		

WEIGHT OF PARTICULATE, mg		
Filter No.	54440	
Sample		
Final wt		
Tare wt		
Wt. gain		
TOTAL		mg

CROSS SECTION

CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (Θ) min.	STATIC PRESSURE (in. H_2O)	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP_s)	VELOCITY HEAD (ΔP_s)	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O ACTUAL	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O DESIRED	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP AT DRY GAS METER INLET (Tm_{in}) °F	GAS SAMPLE TEMP AT DRY GAS METER OUTLET (Tm_{out}) °F	FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
1333	1	0	-1.6	652		2.6	1.8	1.83	763.347		54	315	307	N/A	58	1
1338	2	5		653		2.7	1.9	1.89	766.89		57	319	324		56	1
1343	3	10		653		2.7	1.9	1.89	770.51		58	303	305		56	1
1348	4	15		654		2.6	1.8	1.83	774.14		58	310	301		60	1
1353	5	20		654		2.5	1.8	1.75	777.69		59	309	310		59	1
1358	6	25		654		2.4	1.7	1.68	781.16		59	307	305		59	1
1403/1410	1	30		654		2.5	1.8	1.75	784.58		60	311	304		60	1
1415	2	35		654		2.6	1.8	1.83	788.06		60	306	300		63	1
1420	3	40		654		2.7	1.9	1.89	791.61		61	303	309		64	1
1425	4	45		655		2.6	1.8	1.83	795.16		61	310	305		65	1
1430	5	50		655		2.6	1.8	1.83	798.71		61	311	315		60	1
1435	6	55		655		2.4	1.7	1.68	802.26		61	309	307		58	1
1440	END	60							805.685							
				✓		✓	✓		✓		✓					
AVERAGE	12 pts	60 mins	-1.6	653.9		1.6044	1.81		42.338		59.1				≤68	max 1

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g) #1	#2	#3	#4	#5	SILICA GEL WEIGHT g
FINAL	258	170	20			214.5
INITIAL	100	100	0	56		200
LIQUID COLLECTED	158	70	20			14.5
TOTAL LIQUID COLLECTED (specify ml or g)						262.5

ORSAT DATA	TIME	CO_2	O_2
TRIAL 1	1510	16.7	2.4
TRIAL 2	1520	16.7	2.2
TRIAL 3	1525	16.8	2.3
Average		16.7	2.3

LEAK CHECK		
SYSTEM PRE:	0.000	CFM@15"Hg
POST:	0.000	CFM@15"Hg
PITOT PRE:	+/- OK	@>3"H_2O
POST:	+/- OK	@>3"H_2O

Form FDF 4003.00

FIELD DATA

PLANT	BP	AMBIENT TEMPERATURE	38	PROBE HEATER SETTING	320
DATE	12/10/14	BAROMETRIC PRESSURE	29.45	HEATER BOX SETTING	320
LOCATION	Whiting, IN	ASSUMED MOISTURE, %	23	METER $H_@$	2.05
OPERATOR	BO, JP	PROBE LENGTH, in.	120	C_p FACTOR	0.84
STACK NO.	500 Stack	NOZZLE DIAMETER, in.	0.210	Y_d FACTOR	0.9996
RUN NO.	2	STACK DIAMETER, in.	108	PITOT NO.	731
SAMPLE BOX NO.	N/A	MINUTES PER POINT	5		
METER BOX NO.	503001	NUMBER OF POINTS	12		
START TIME	1530	NUMBER OF PORTS	2		

WEIGHT OF PARTICULATE, mg		
Filter No.	55733	
Sample		
Final wt		
Tare wt		
Wt. gain		
TOTAL		mg

CROSS SECTION

CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (Θ) min.	STATIC PRESSURE (in. H_2O)	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP_s)	VELOCITY HEAD (ΔP_s)	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O ACTUAL	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O DESIRED	GAS SAMPLE VOLUME (Vm) ft^3	GAS SAMPLE TEMP AT DRY GAS METER INLET (Tm_{in}) °F	GAS SAMPLE TEMP AT DRY GAS METER OUTLET (Tm_{out}) °F	FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
1530	1	0	-1.6	653		2.5	1.8	1.76	806.457		55	310	316	N/A	43	2
1535	2	5		652		2.6	1.8	1.82	809.93		56	316	320		44	1
1540	3	10		654		2.6	1.8	1.82	813.35		57	317	319		45	2
1545	4	15		655		2.7	1.9	1.89	816.50		56	318	320		47	3
1550	5	20		655		2.3	1.6	1.61	819.95		57	317	319		49	2
1555	6	25		660		2.3	1.6	1.61	823.72		59	316	317		50	3
1600/1607	1	30		653		2.5	1.8	1.76	827.75		58	316	317		51	3
1612	2	35		654		2.5	2	2.06	831.09		58	315	318		50	3
1617	3	40		655		2.6	~~1.82~~ 1	~~1.82~~ 1.06	834.871		60	317	311		51	3
1622	4	45		656		2.5	2	2.06	838.41		60	319	307		51	3
1627	5	50		654		2.4	2	1.98	842.15		61	312	316		51	4
1632	6	55		654		2.4	2	1.98	846.05		60	315	300		55	4
1637	END	60		~~655~~ 30		2			849.999		~~61~~ 30	~~317~~	~~318~~	✓	~~55~~	~~1~~
				✓		✓	✓		✓		✓					
AVERAGE	12 pts	60 mins	-1.6	654.6		1.5781	1.87		43.542		58.1				≤68	max 4

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g) #1	#2	#3	#4	#5	SILICA GEL WEIGHT g
FINAL	250	180	10			215.3
INITIAL	100	100	Ø	56		200
LIQUID COLLECTED	150	80	10			15.3
TOTAL LIQUID COLLECTED (specify ml or g)						255.3

ORSAT DATA	TIME	CO_2	O_2
TRIAL 1	1700	17.0	2.1
TRIAL 2	1705	17.0	2.1
TRIAL 3	1710	17.0	2.1
Average		17.0	2.1

LEAK CHECK		
SYSTEM PRE:	0.000	CFM@15"Hg
POST:	0.000	CFM@15"Hg
PITOT PRE:	+/- OK	@>3"H_2O
POST:	+/- OK	@>3"H_2O

Form FDF 4003.00

FIELD DATA

PLANT	BP	AMBIENT TEMPERATURE	30	PROBE HEATER SETTING	320
DATE	12/10/14	BAROMETRIC PRESSURE	29.45	HEATER BOX SETTING	320
LOCATION	Whiting, IN	ASSUMED MOISTURE, %	23	METER $H_@$	2.05
OPERATOR	BO	PROBE LENGTH, in.	130	C_p FACTOR	0.84
STACK NO.	500	NOZZLE DIAMETER, in.	0.210	Y_d FACTOR	0.996
RUN NO.	3	STACK DIAMETER, in.	108	PITOT NO.	731
SAMPLE BOX NO.	N/A	MINUTES PER POINT	5		
METER BOX NO.	503C9	NUMBER OF POINTS	12		
START TIME	1710	NUMBER OF PORTS	2		

WEIGHT OF PARTICULATE, mg		
Filter No.	75870	
Sample		
Final wt		
Tare wt		
Wt. gain		
TOTAL		mg

CROSS SECTION

CLOCK TIME (Hrs)	TRAVERSE POINT NUMBER	SAMPLING TIME (Θ) min.	STATIC PRESSURE (in. H_2O)	STACK TEMP (T_s) °F	VELOCITY HEAD (ΔP_s)	VELOCITY HEAD (ΔP_s)	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O ACTUAL	PRESSURE DIFFERENTIAL ACROSS METER ORIFICE (ΔH) in. H_2O DESIRED	GAS SAMPLE VOLUME (V_m) ft^3	GAS SAMPLE TEMP AT DRY GAS METER INLET (Tm_{in}) °F	GAS SAMPLE TEMP AT DRY GAS METER OUTLET (Tm_{out}) °F	FILTER EXIT GAS TEMP. °F	PROBE TEMP °F	AUXILIARY TEMP. °F	LAST IMPINGER OUTLET TEMP. °F	PUMP VACUUM (in. Hg)
1710	1	0	-1.6	653		2.5	1.8	1.75	850.140		56	320	325	N/A	45	1
1715	2	5		653		2.6	1.9	1.88	853.62		56	315	317		44	1
1720	3	10		654		2.7	2.0	1.96	857.23		57	307	310		46	2
1725	4	15		654		2.7	2.0	1.96	860.91		58	312	321		47	2
1730	5	20		655		2.5	1.8	1.81	864.58		59	315	305		49	2
1735	6	25		654		2.4	1.7	1.74	868.12		59	310	311		49	2
1740/1746	1	30		653		2.4	1.7	1.74	871.58		60	318	307		49	2
1751	2	35		653		2.6	1.9	1.88	875.05		60	305	311		49	2
1756	3	40		655		2.7	2.0	1.96	878.66		60	302	312		50	2
1801	4	45		655		2.7	2.0	1.96	882.33		60	316	319		52	2
1806	5	50		655		2.6	1.9	1.88	886.01		61	322	325		53	2
1811	6	55		654		2.4	1.7	1.74	889.62		61	328	321		55	2
1816	END	60							893.094							
			✓	✓		✓	✓		✓		✓					
							1.87									
AVERAGE	12 Pts	60 Mins	-1.6	654.0		1.6017	~~1.86~~		42.954		58.9				≤68	max 2

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g) #1	#2	#3	#4	#5	SILICA GEL WEIGHT g
FINAL	260	166	~~210~~			~~228~~ 218 JP ~~229~~ 238
INITIAL	100	100	0	56		200
LIQUID COLLECTED	160	66				16.4
TOTAL LIQUID COLLECTED (specify ml or g)		10				254.4

JP ~~229~~ ~~139~~ 238

ORSAT DATA	TIME	CO_2	O_2
TRIAL 1	1900	16.8	2.3
TRIAL 2	1905	16.8	2.3
TRIAL 3	1910	16.8	2.3
Average		16.8	2.3

LEAK CHECK	
SYSTEM PRE:	0.000 CFM@15"Hg
POST:	0.000 CFM@15"Hg
PITOT PRE:	+/- OK @>3"H_2O
POST:	+/- OK @>3"H_2O

Form FDF 4003.00

ARI ENVIRONMENTAL INC.

VELOCITY TRAVERSE AND CYCLONIC FLOW VERIFICATION

PLANT Bp Whiting
DATE 2-13-13
LOCATION Whiting, IN
SOURCE FCU 600
STACK ID 108
PROBE #/TC # 354
BAROMETRIC PRESSURE, in. Hg 29.20
OPERATORS WAH

SCHEMATIC OF TRAVERSE POINT LAYOUT

RUN NO. Prelim
STATIC, in. H_2O -1.4
START: 0811 STOP: 0815
PRE-TEST: +/-05 POST-TEST: +/-05

	TRAVERSE POINT NUMBER	VELOCITY HEAD, ΔP (in. H_2O)	STACK TEMP. (°F)	YAW ANGLE (°)
	6	2.5	637	13
	5	3.0	637	9
NW	4	3.1	637	5
	3	3.2	637	5
	2	3.3	637	8
	1	3.0	637	10
	6	2.7	637	9
	5	3.0	637	6
SW	4	3.0	637	3
	3	3.3	637	0
	2	3.1	637	1
	1	2.9	637	4
	AVERAGE	~~0.4400~~ 1.7332	637.0	<20°

RUN NO. _____
STATIC, in. H_2O _____
START: _____ STOP: _____
PRE-TEST: _____ POST-TEST: _____

TRAVERSE POINT NUMBER	VELOCITY HEAD, ΔP (in. H_2O)	STACK TEMP. (°F)	YAW ANGLE (°)
AVERAGE			

Form EDF 4005.00

APPENDIX C

Analytical Data

ANALYTICAL REPORT

Client: BP

Sampling Location: Whiting, IN

Sampling Date(s): 12/10/14

Lab Project Number: 08-700

COC Numbers(s): W01179

Analysis Date(s): 12/12 – 12/19/14

Analytical Method: USEPA Method 5F

Prepared For:
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State of Texas TCEQ/NELAP Certificate ID: T104704428-13-5
State of Louisiana LDEQ/LELAP Certificate ID: 02010
State of New Jersey NJDEP Certification ID: IL007

Project Narrative

Sample Receipt and Acceptance Quality Assurance:

Eight (8) samples were received in good condition and were logged in at the ARI laboratory located in Wauconda, IL on 12/11/14. All sample receipt acceptance criteria were met as documented in the Sample Receipt Checklist included in this report.

Analytical Quality Assurance:

Analysis of samples met the procedural requirements and QA/QC criteria set forth in the TNI Standard, applicable reference methods and standard operating procedures and, where applicable, the project test plan.

Data Interpretation and Comments:

There were no deviations from the test methods and no non-standard conditions that may affect the quality of the test results. Test results reported under this project number apply only to the samples as received and identified on the chain-of-custody document(s) included in this report.

Scope of Accreditation:

All test methods and analytes were analyzed under ARI's current scope of accreditation under TCEQ/NELAP.

Laboratory Contact Information:

If you have any questions regarding these test results, please contact Mr. Eric Vogt, Laboratory Manager, at 847-487-1580 ext.116 or by e-mail at evogt@arienv.com.

Reviewed and Approved by:

Signature: Laboratory Manager

12/22/14
Date

ANALYTICAL SUMMARY

CLIENT: BP Whiting
LOCATION: Whiting, IN
SOURCE: 500 Stack
SAMPLE DATE: 12/10/2014
ANALYSIS: Particulates
METHOD: USEPA Method 5F

ANALYST: J. Ruggaber
DATE OF COMPLETION: 12/19/2014
TEMPLATE CONTROL ID: USEPA-M5F-PARTIC-TEMPLATE-61T-REV3
PROJECT NUMBER: 08-700

Identification		LIMS Number	Tare	WT1	WT2	WT 1 - WT 2 (mg)	Particulate (mg)	Blank Corrected Total Partic. (mg)
Run 1	FILTER	14283	880.3	110138.6	110138.2	0.4	78.9	76.40
	BEAKER	14284	109179.2					
Run 2	FILTER	14285	819.2	114854.6	114854.7	-0.1	93.8	91.25
	BEAKER	14286	113941.7					
Run 3	FILTER	14287	822.1	115049.7	115049.7	0.0	107.1	104.60
	BEAKER	14288	114120.5					
Acetone Blank	BEAKER	14290	815.6	109116.2	109116.0	0.2	2.5	-
Filter Blank	FILTER	14289	108298					

Identification		Volume (mL)	Tare	WT1	WT2	WT 1 - WT 2 (mg)	Condensate (mg)	Target Weight (mg)	% Accuracy	Pass/Fail
LCS	QC	100	107791.9	107891.9	107891.7	-0.2	99.9	100.05	99.9	Pass

Sample Concentration Calculations

Identification	Analysis 1 (area counts)	Analysis 2 (area counts)	Average (area counts)	Deviation (%)	Diluted SO_4 Conc. (µg/ml)	Dilution Factor	Sample Volume (mls)	SO_4 mass (µg)	Corrected for Aliquot (mg)	$(NH_4)_2SO_4$ mass (mg)	Corrected for Blank (mg)
M5F Run 1 #14283	0.0206	0.0204	0.0205	0.49	0.25	10	50	127.31	0.13	0.18	0.18
M5F Run 2 #14285	0.0181	0.0180	0.0181	0.28	0.22	10	50	112.10	0.11	0.16	0.16
M5F Run 3 #14287	0.0187	0.0183	0.0185	1.08	0.23	10	50	114.89	0.12	0.16	0.16
Field Blank #14289	<0.0014	<0.0014	<0.0014	0.00	<0.02	10	50	<8.69	<0.01	<0.01	-
Lab DI Water Blank	<0.0014	<0.0014	<0.0014	0.00	<0.02	-	-	-	-	-	-

ID	Analysis 1 (area counts)	Analysis 2 (area counts)	Average (area counts)	Deviation (%)	Actual Conc. (µg/ml)	Spike Conc. (µg/ml)	Theo. Spike Conc. (µg/ml)	R (%)	Pass/Fail
spike 1	0.0257	0.0265	0.026	-1.53	**0.32**	0.095	0.100	95.0	Pass
spike 2	0.0266	0.0272	0.027	-1.12	**0.33**	0.105	0.100	105.0	Pass

spike prep: 9 mL of M5F Run 1 + 1 mL of 1 ppm std

CLIENT: BP Whiting
LOCATION: Whiting, IN
SOURCE: 500 Stack
SAMPLE DATE: 12/10/2014
ANALYSIS: Particulates
METHOD: USEPA Method 5F

ANALYST: J. Ruggaber
DATE OF COMPLETION: 12/19/2014
TEMPLATE CONTROL ID: USEPA-M5F-PARTIC-TEMPLATE-61T-REV3
PROJECT NUMBER: 08-700

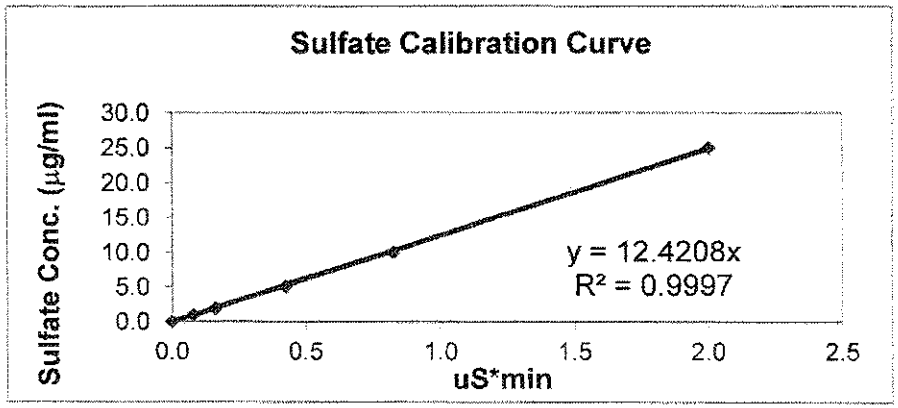
Non-Sulfate Particulate Weight

Identification	Total Partic (mg)	Mass NH_4SO4 (mg)	Corrected Partic (mg)
Run 1	76.4	0.18	76.2
Run 2	91.3	0.16	91.1
Run 3	104.6	0.16	104.4

Std. (µg/ml)	Pre Cal (µS*min)	Post Cal (µS*min)	Average (µS*min)	Deviation (%)		Conc (µg/ml)	Peak Area	RE	Cal Conc	% Dif
0.0	0.00	0.00	0.00	0.00		1.0	0.079	0.079	1.0	-3.13
1	0.080	0.078	0.079	1.08		2.0	0.161	0.080	2.0	-1.04
2	0.160	0.162	0.161	-0.62		5.0	0.424	0.085	5.2	4.37
5	0.395	0.453	0.424	-6.80		10.0	0.824	0.082	10.1	1.37
10	0.810	0.839	0.824	-1.75		25.0	2.000	0.080	24.6	-1.57
25	1.953	2.048	2.000	-2.38		mean RF----->	0.0813			
					2nd std	5.0	0.3828	N/A	4.8	-5.00

CCVs

Conc. (µg/ml)	Inj. #	Peak Area	% Diff	Pass/Fail
5.0	268	0.3924	-7.51	Pass



951 Old Rand Road # 106

Wauconda, IL 60084

Texas NELAP ID: T 104704428-13-5

ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting
Whiting, IN
500 Stack

Lab Project #: 08-700
Project Manager: Steve Flaherty
Received: 12/11/2014
Reported: 12/22/2014

Sample ID: Run 1 Filter
Lab Sample #: 14283
Date Sampled: 12/10/2014
Field #: 54440

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	USEPA Method 5F	Joel Ruggaber	12/22/2014	76.20	mg	
Sulfate	USEPA Method 5F	Joel Ruggaber	12/22/2014	127.3	ug	J

Sample ID: Run 1 Probe Wash
Lab Sample #: 14284
Date Sampled: 12/10/2014
Field #: 75897

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Sample ID: Run 2 Filter
Lab Sample #: 14285
Date Sampled: 12/10/2014
Field #: 55733

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	USEPA Method 5F	Joel Ruggaber	12/22/2014	91.10	mg	
Sulfate	USEPA Method 5F	Joel Ruggaber	12/22/2014	112.1	ug	J

Sample ID: Run 2 Probe Wash
Lab Sample #: 14286
Date Sampled: 12/10/2014
Field #: 75898

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Sample ID: Run 3 Filter
Lab Sample #: 14287
Date Sampled: 12/10/2014
Field #: 75870

951 Old Rand Road # 106
Wauconda, IL 60084

Texas NELAP ID: T 104704428-13-5

ARI ENVIRONMENTAL ANALYTICAL REPORT

BP-Whiting
Whiting, IN
500 Stack

Lab Project #: 08-700
Project Manager: Steve Flaherty
Received: 12/11/2014
Reported: 12/22/2014

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	USEPA Method 5F	Joel Ruggaber	12/22/2014	104.40	mg	
Sulfate	USEPA Method 5F	Joel Ruggaber	12/22/2014	114.9	ug	J

Sample ID: Run 3 Probe Wash
Lab Sample #: 14288
Date Sampled: 12/10/2014
Field #: 75899

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Sample ID: Blank Filter
Lab Sample #: 14289
Date Sampled: 12/10/2014
Field #: 75905

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes
Particulate	USEPA Method 5F	Joel Ruggaber	12/22/2014	2.50	mg	
Sulfate	USEPA Method 5F	Joel Ruggaber	12/22/2014	<8.7	ug	

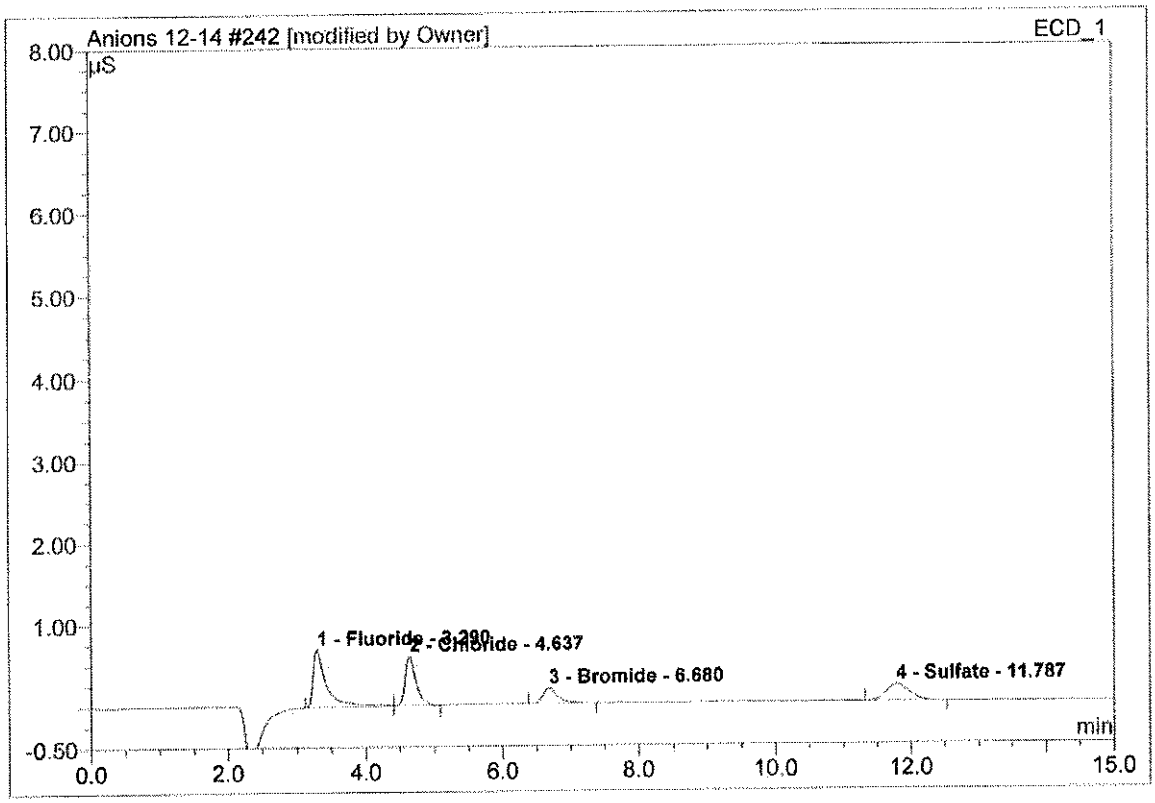
Sample ID: Blank Probe Wash
Lab Sample #: 14290
Date Sampled: 12/10/2014
Field #: 75900

Analyte	Method	Analyst	Analysis Date	Result	Units	Notes

Notes: UA - Not a NELAC accredited analyte under this method.
NA - Sample not tested for this analyte.
D - Value calculated from dilution.
J - Value less than the low standard but above the Limit of Detection (LOD).
L - Sample leaked before receipt.
H - Value greater than the high standard.

242 1 ppm anions 12-16-14

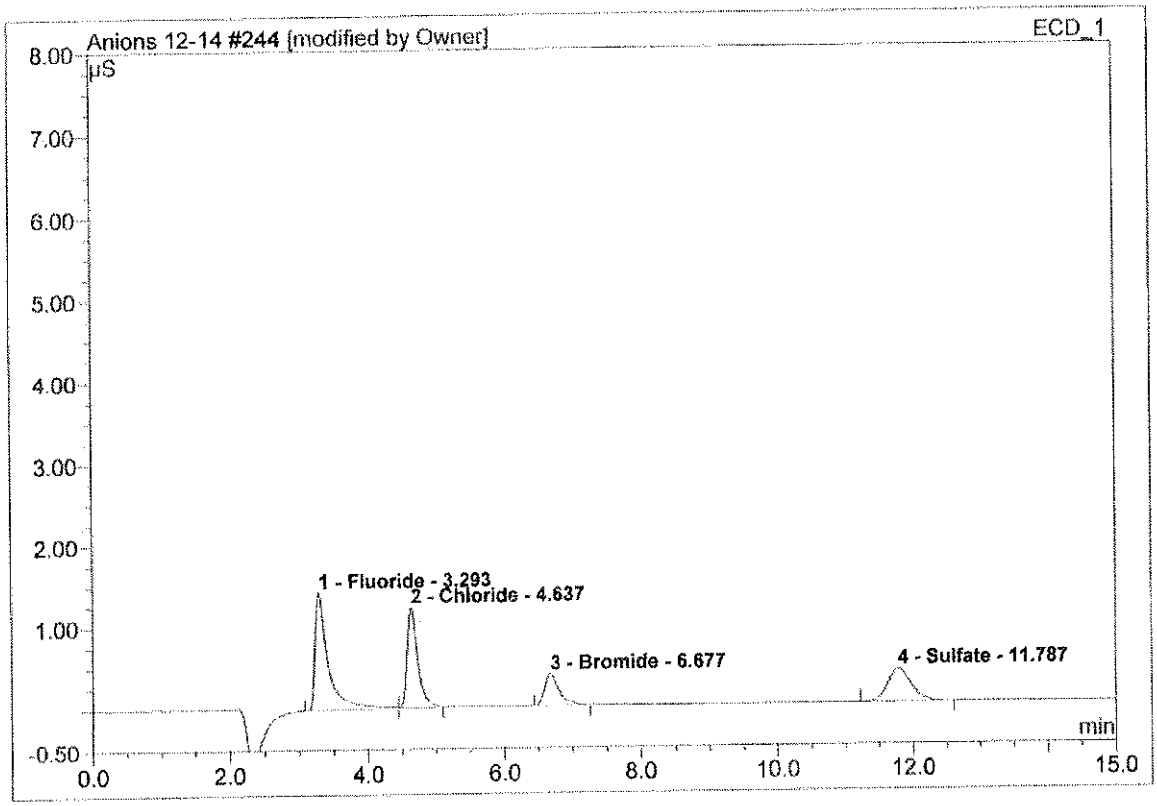
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**238**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**12/17/2014 14:58**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	3.29	Fluoride	0.697	0.1623
2	4.64	Chloride	0.603	0.1128
3	6.68	Bromide	0.187	0.0479
4	11.79	Sulfate	0.200	0.0796

244 2 ppm anions 12-16-14

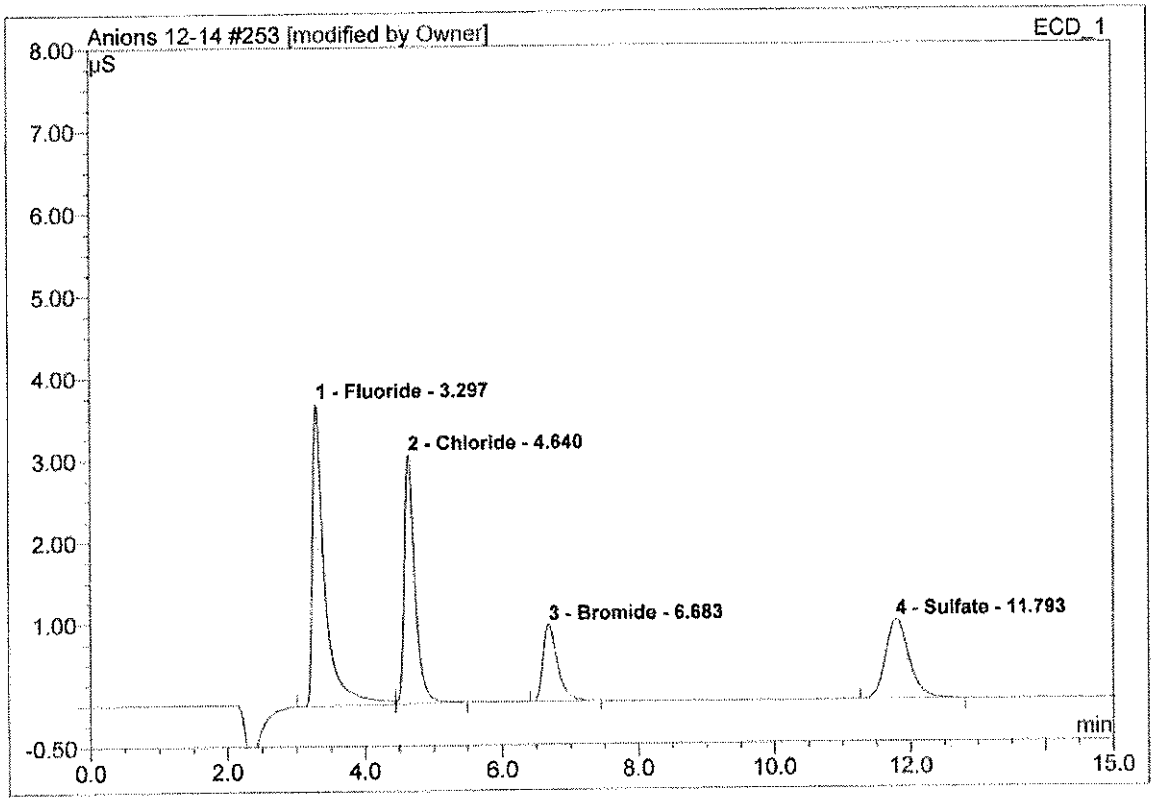
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**240**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**12/17/2014 15:34**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	3.29	Fluoride	1.426	0.3125
2	4.64	Chloride	1.217	0.2190
3	6.68	Bromide	0.377	0.0934
4	11.79	Sulfate	0.396	0.1599

253 5 ppm anions 12-16-14

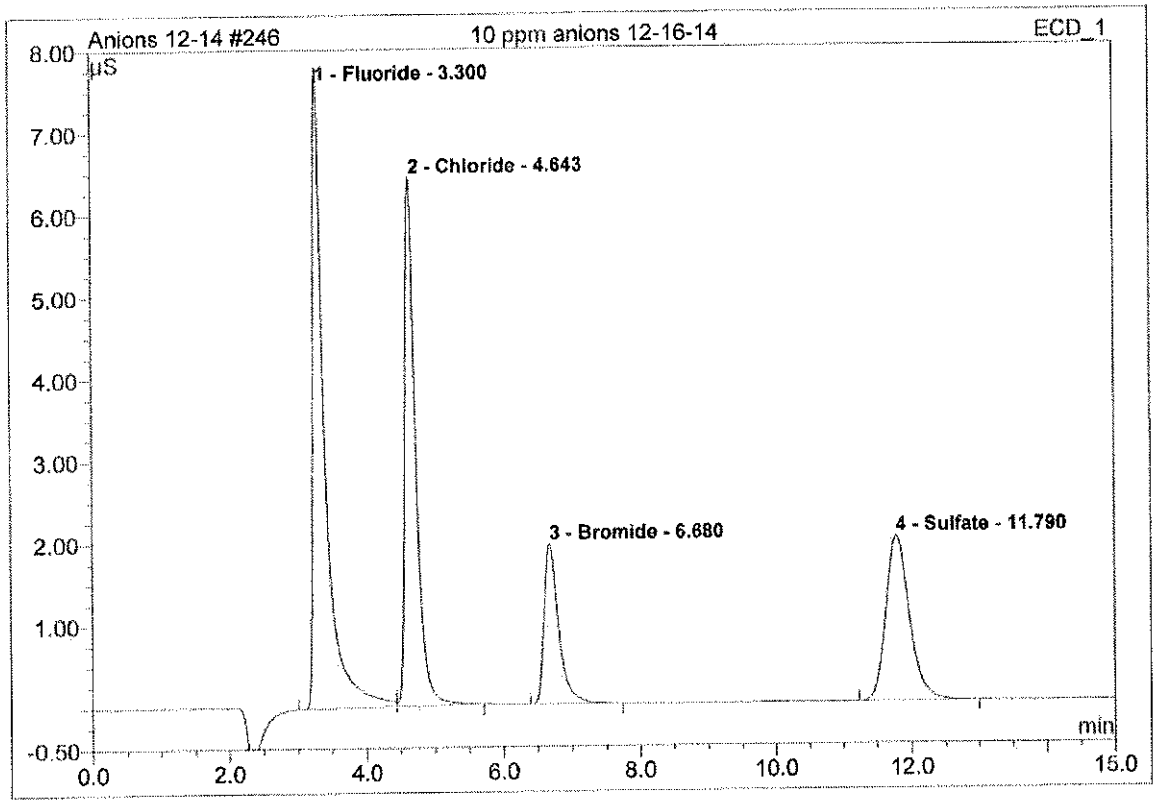
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**249**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**12/17/2014 18:52**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	3.30	Fluoride	3.700	0.7778
2	4.64	Chloride	3.038	0.5488
3	6.68	Bromide	0.942	0.2298
4	11.79	Sulfate	0.972	0.3954

246 10 ppm anions 12-16-14

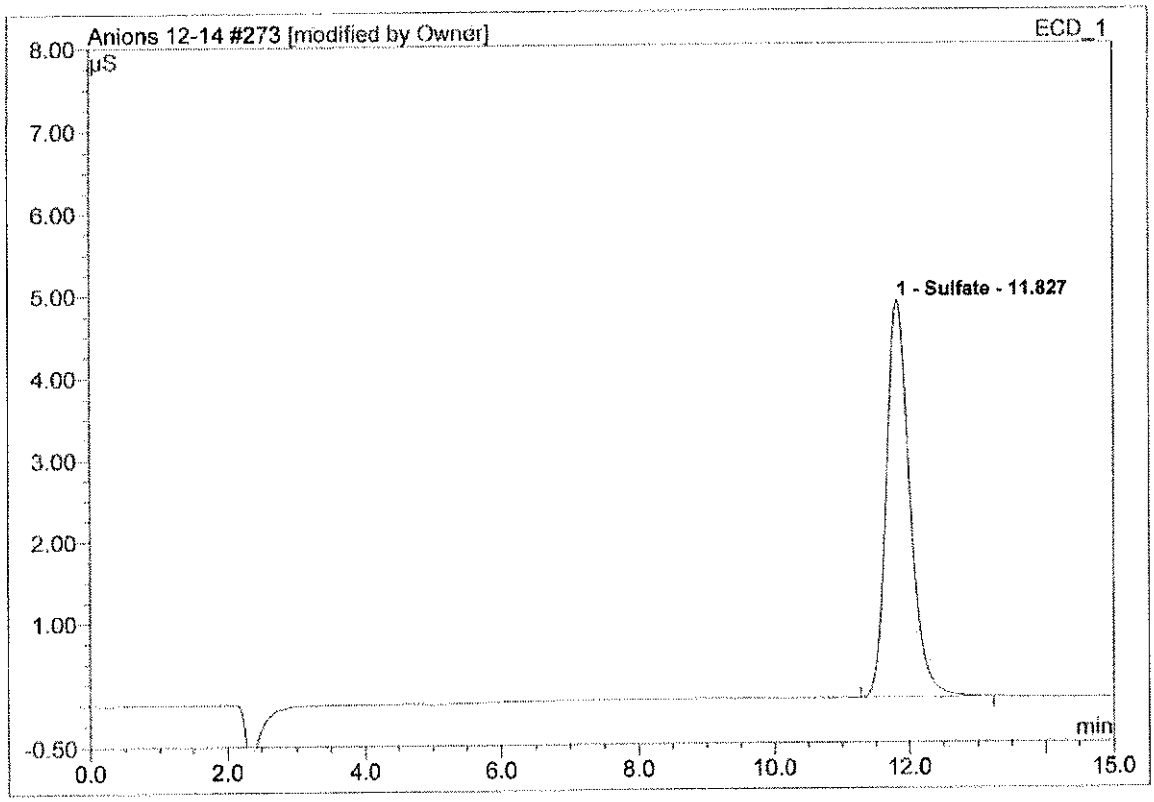
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**242**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**12/17/2014 16:10**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	3.30	Fluoride	7.803	1.5920
2	4.64	Chloride	6.426	1.1569
3	6.68	Bromide	1.938	0.4783
4	11.79	Sulfate	2.004	0.8097

273 25 ppm sulfate 12-17-14

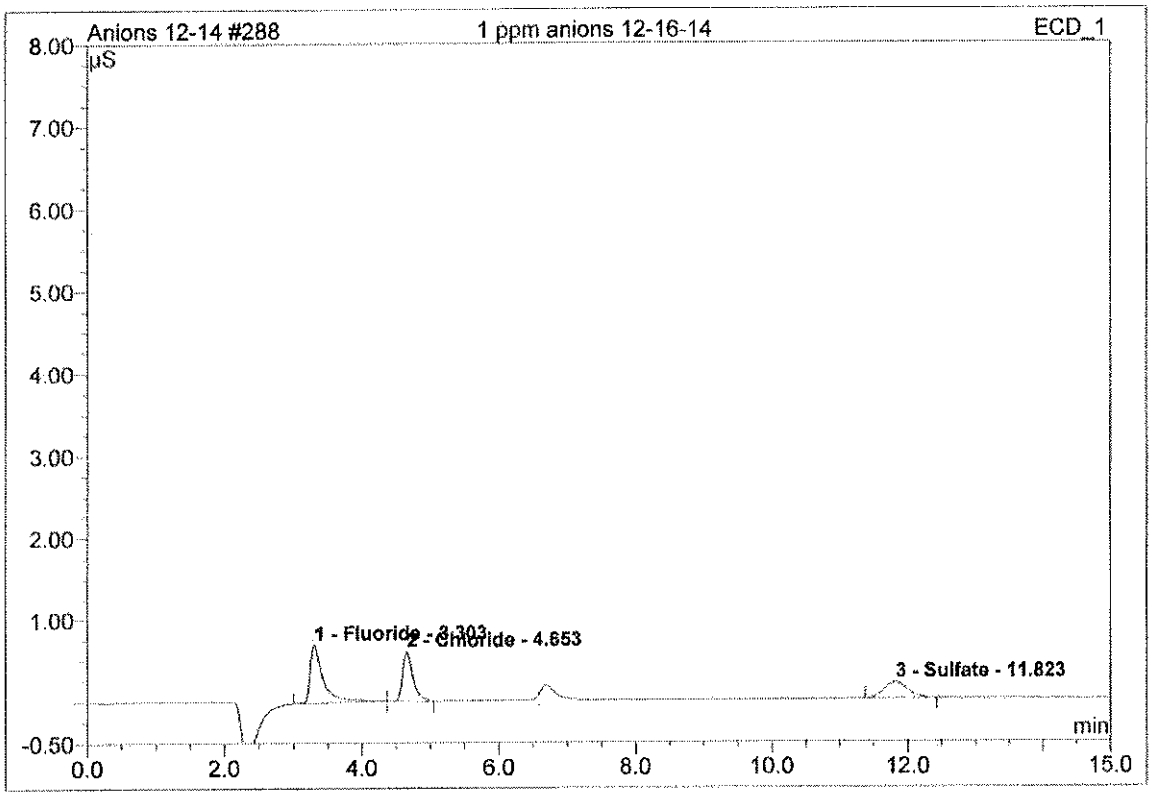
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**274**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**12/18/2014 11:53**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	11.83	Sulfate	4.835	1.9528

288 1 ppm anions 12-16-14

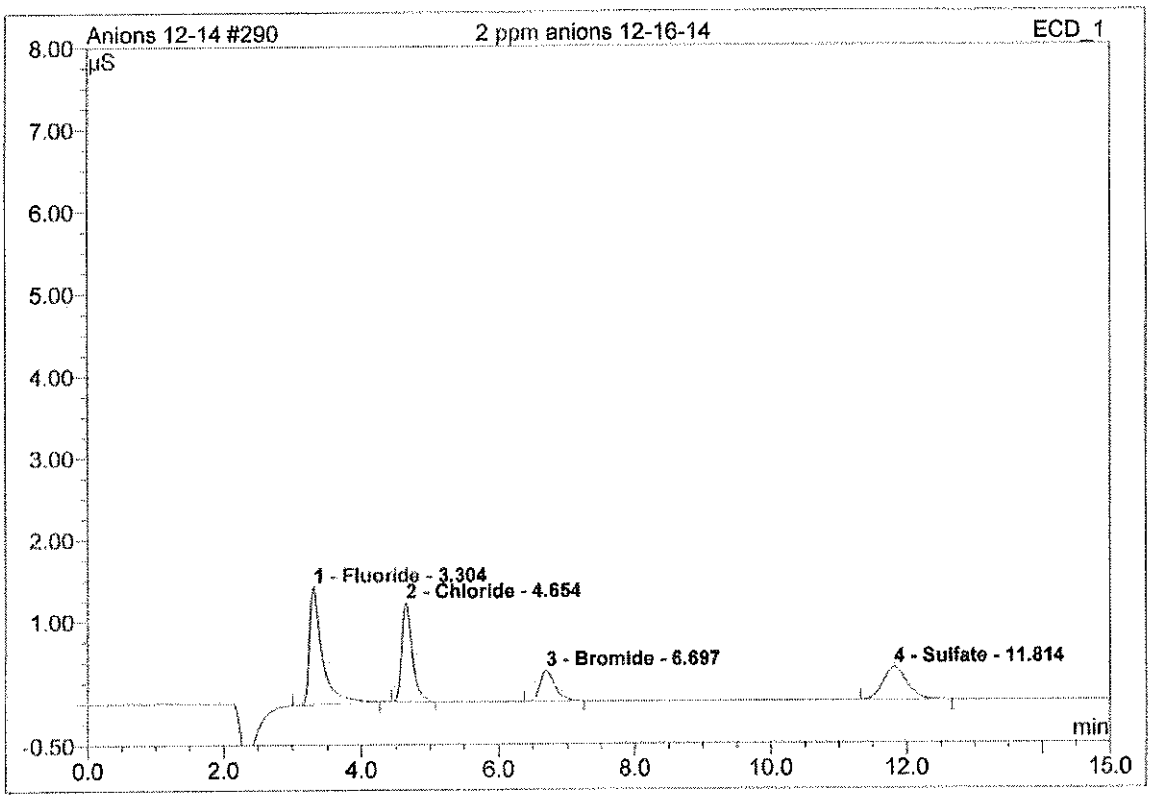
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**289**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**12/18/2014 18:12**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	3.30	Fluoride	0.706	0.1549
2	4.65	Chloride	0.602	0.1081
3	11.82	Sulfate	0.195	0.0779

290 2 ppm anions 12-16-14

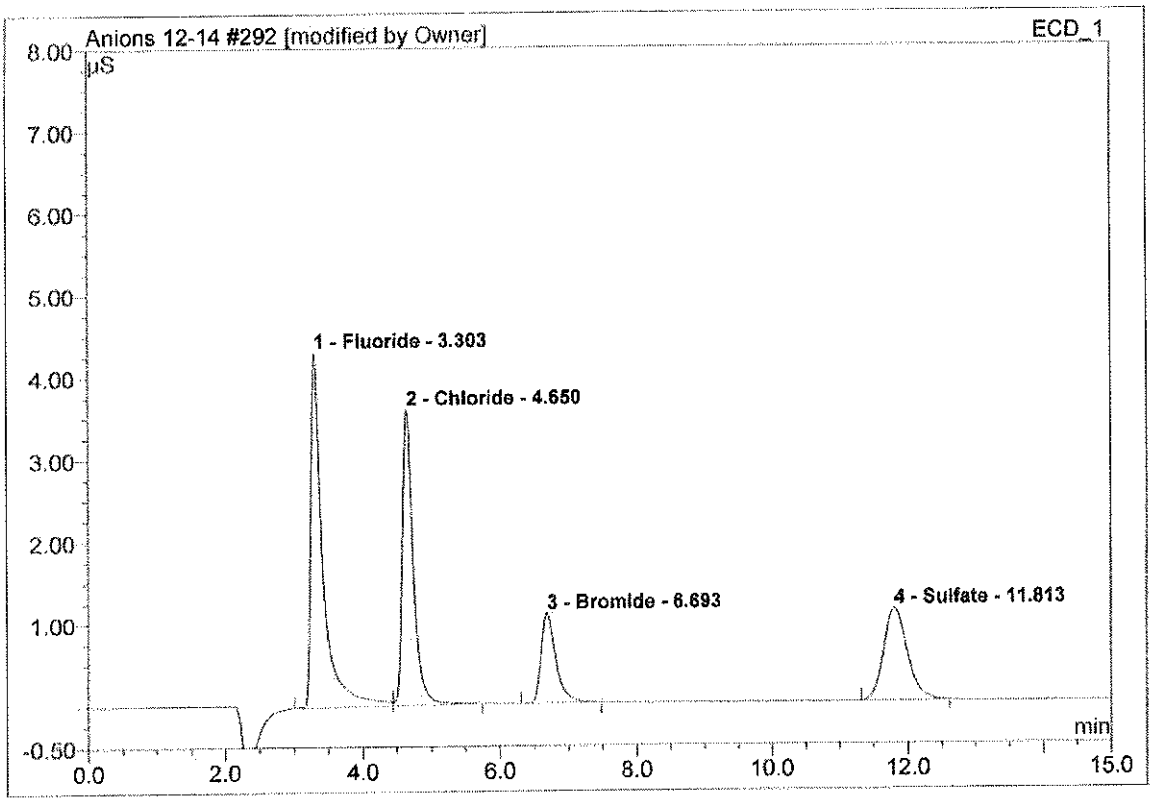
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**291**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**12/18/2014 18:46**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	3.30	Fluoride	1.429	0.3014
2	4.65	Chloride	1.208	0.2183
3	6.70	Bromide	0.373	0.0941
4	11.81	Sulfate	0.391	0.1619

292 5 ppm anions 12-16-14

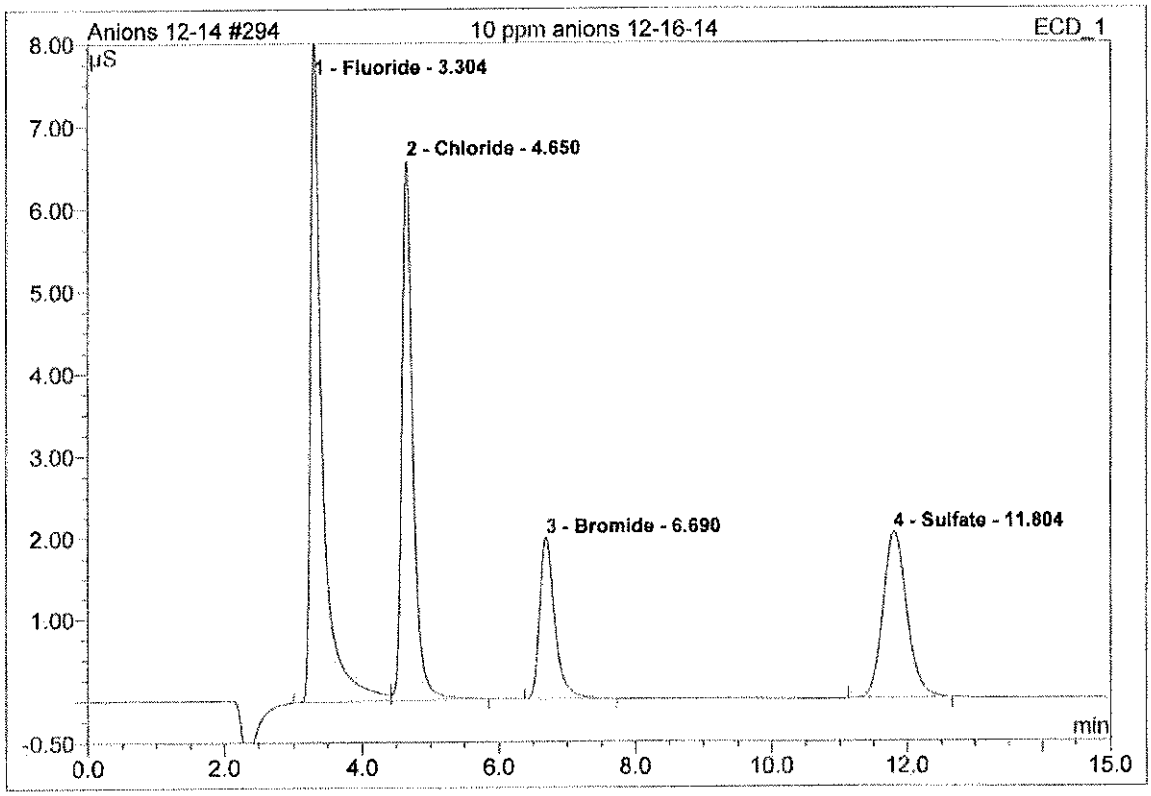
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**293**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**12/18/2014 19:19**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	3.30	Fluoride	4.316	0.8967
2	4.65	Chloride	3.594	0.6518
3	6.69	Bromide	1.096	0.2723
4	11.81	Sulfate	1.122	0.4531

294 10 ppm anions 12-16-14

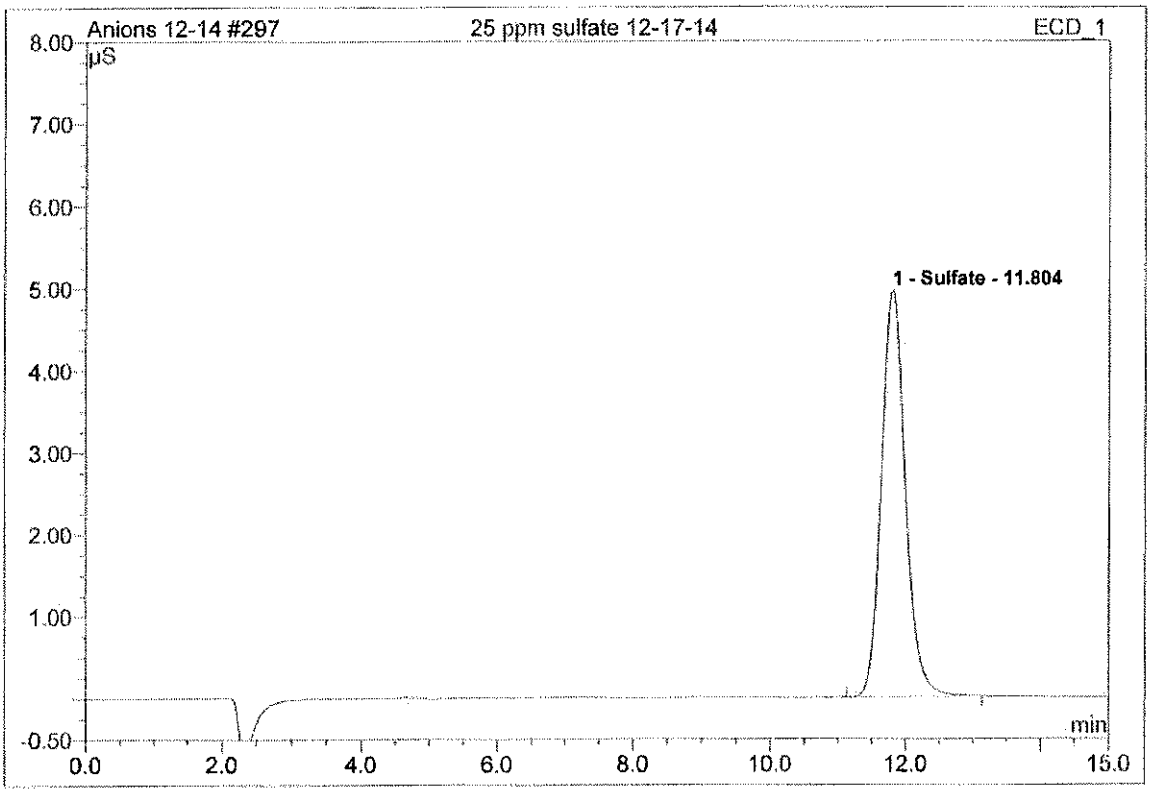
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**295**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**12/18/2014 19:52**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	3.30	Fluoride	8.112	1.6581
2	4.65	Chloride	6.585	1.2230
3	6.69	Bromide	1.972	0.5028
4	11.80	Sulfate	2.028	0.8385

297 25 ppm sulfate 12-17-14

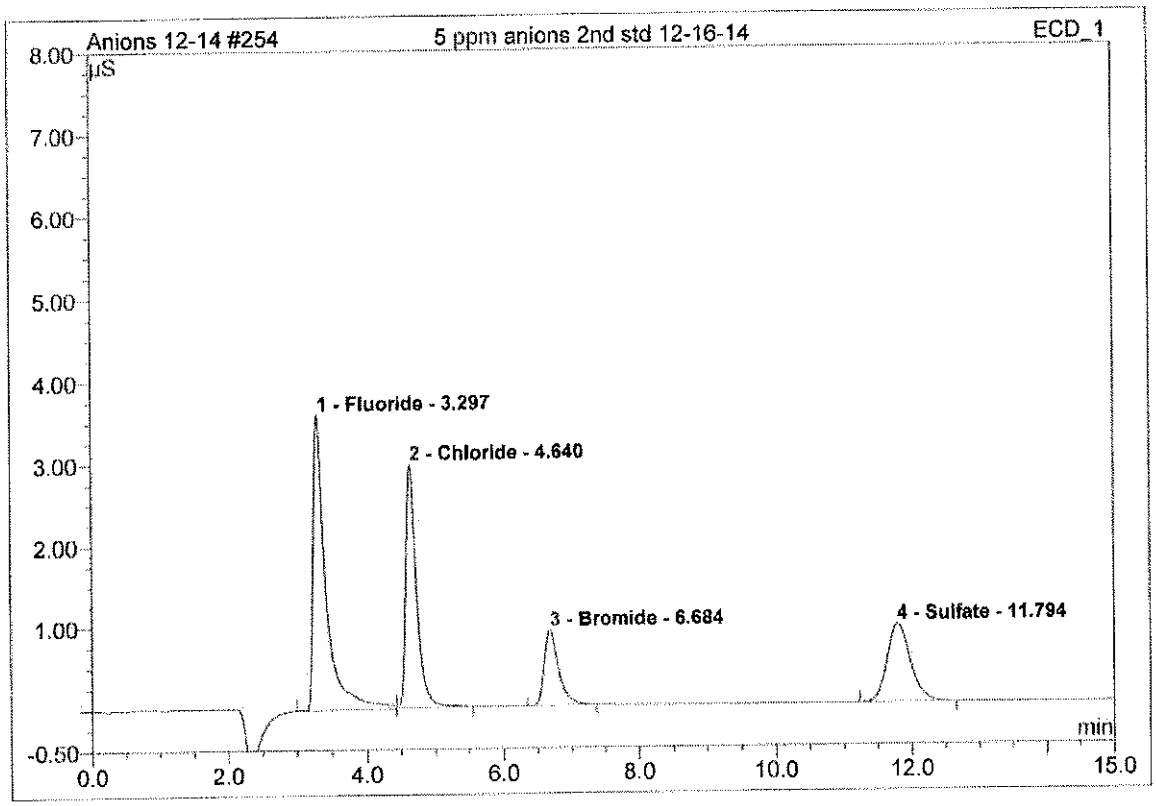
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**298**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**12/18/2014 20:42**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	11.80	Sulfate	4.968	2.0480

254 5 ppm anions 2nd std 12-16-14

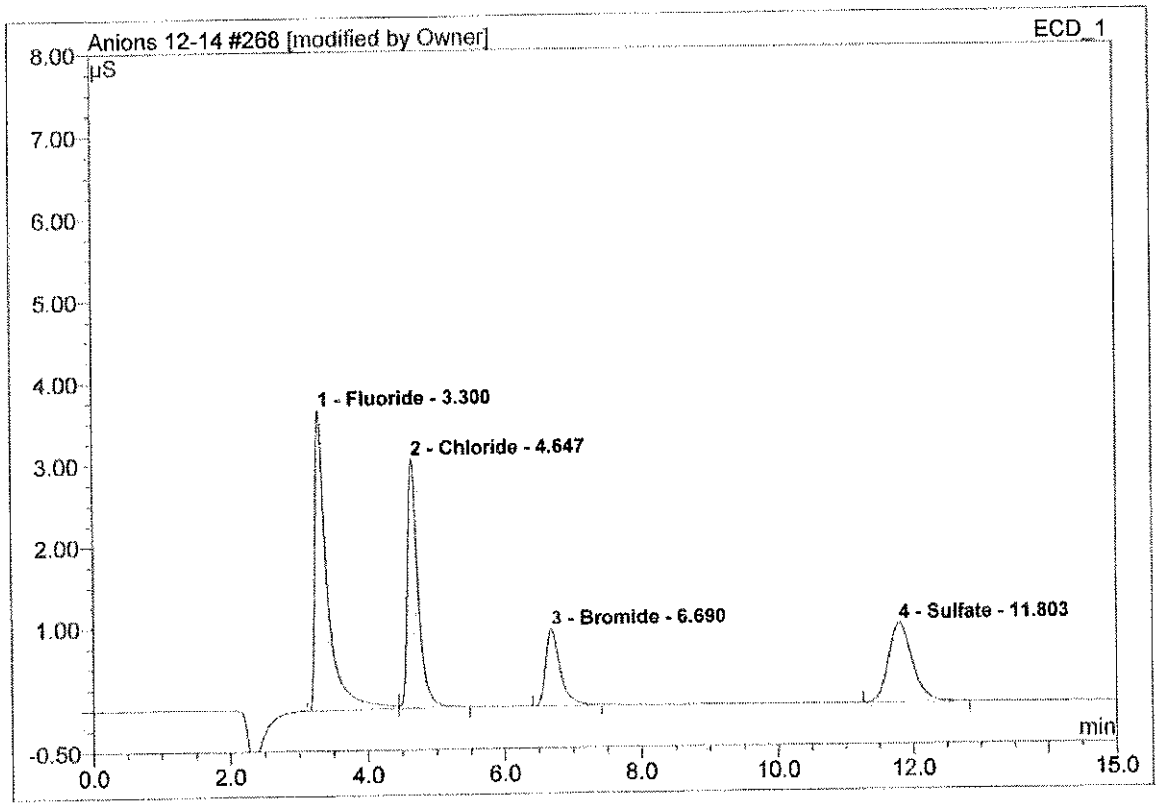
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**250**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**12/17/2014 19:10**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	3.30	Fluoride	3.601	0.7633
2	4.64	Chloride	2.969	0.5377
3	6.68	Bromide	0.916	0.2245
4	11.79	Sulfate	0.949	0.3828

268 5 ppm anions 12-16-14

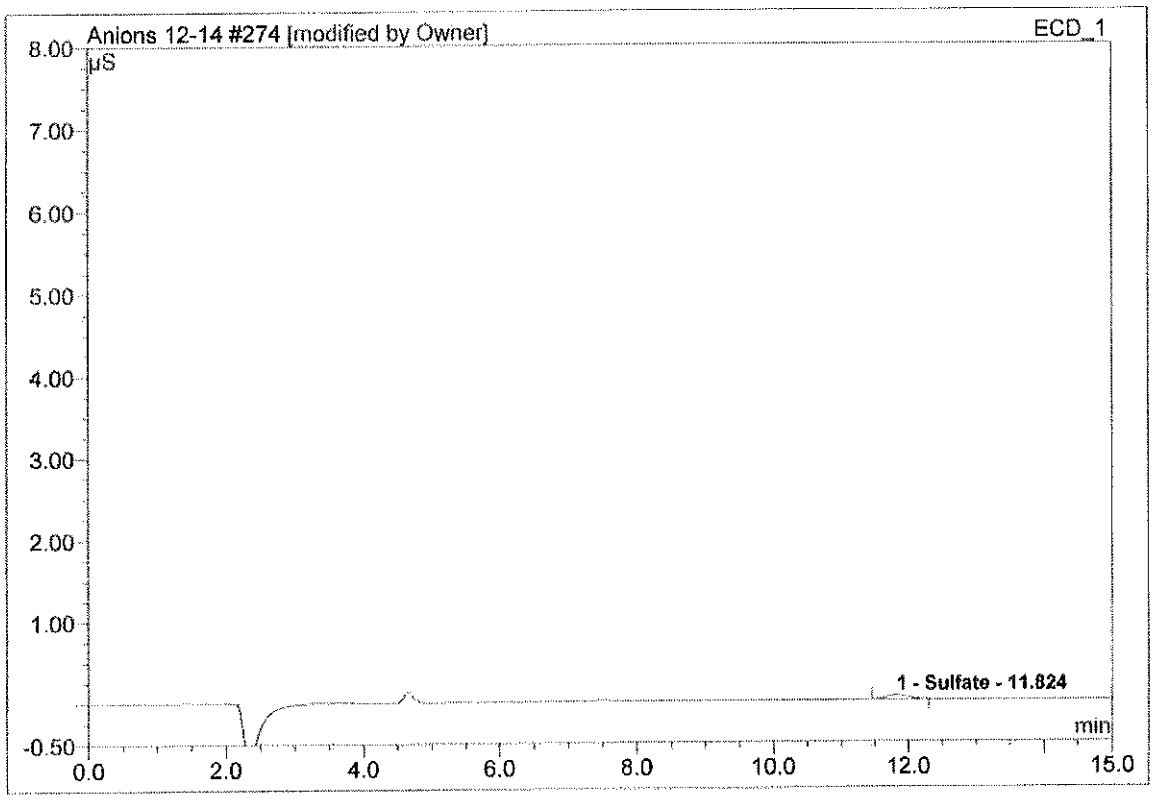
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**266**	*Channel:*	**ECD_1**
Sample Type:	**standard**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**12/18/2014 9:51**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	3.30	Fluoride	3.664	0.7544
2	4.65	Chloride	3.027	0.5404
3	6.69	Bromide	0.927	0.2279
4	11.80	Sulfate	0.960	0.3924

274 M5F run 1 #14283

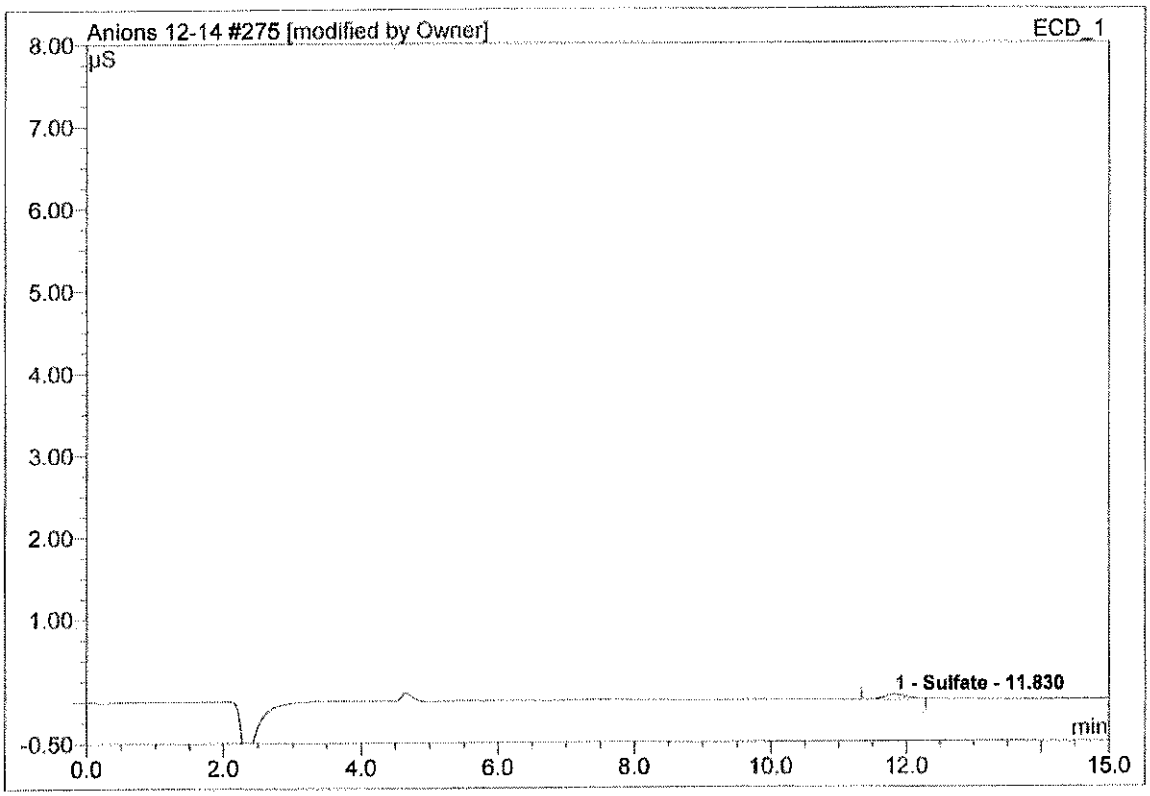
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**275**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**12/18/2014 12:13**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	11.82	Sulfate	0.057	0.0206

275 M5F run 1 #14283

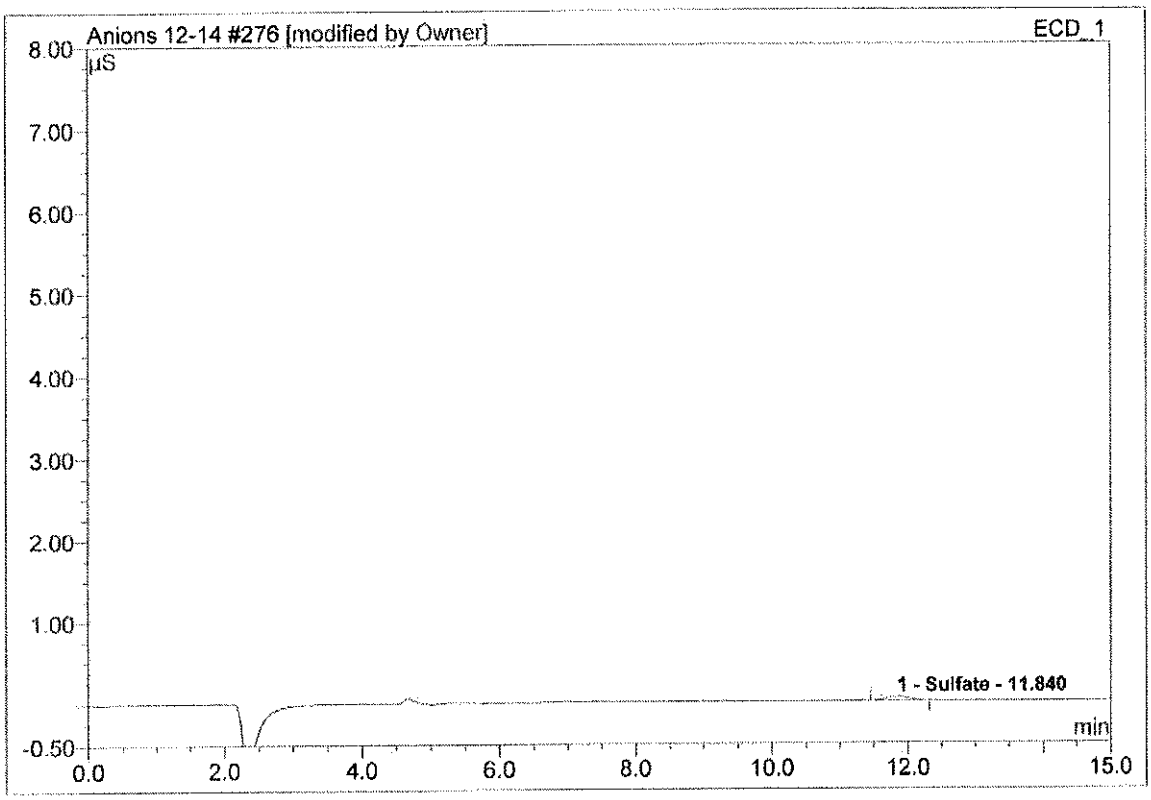
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**276**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**12/18/2014 12:31**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	11.83	Sulfate	0.054	0.0204

276 M5F run 2 #14285

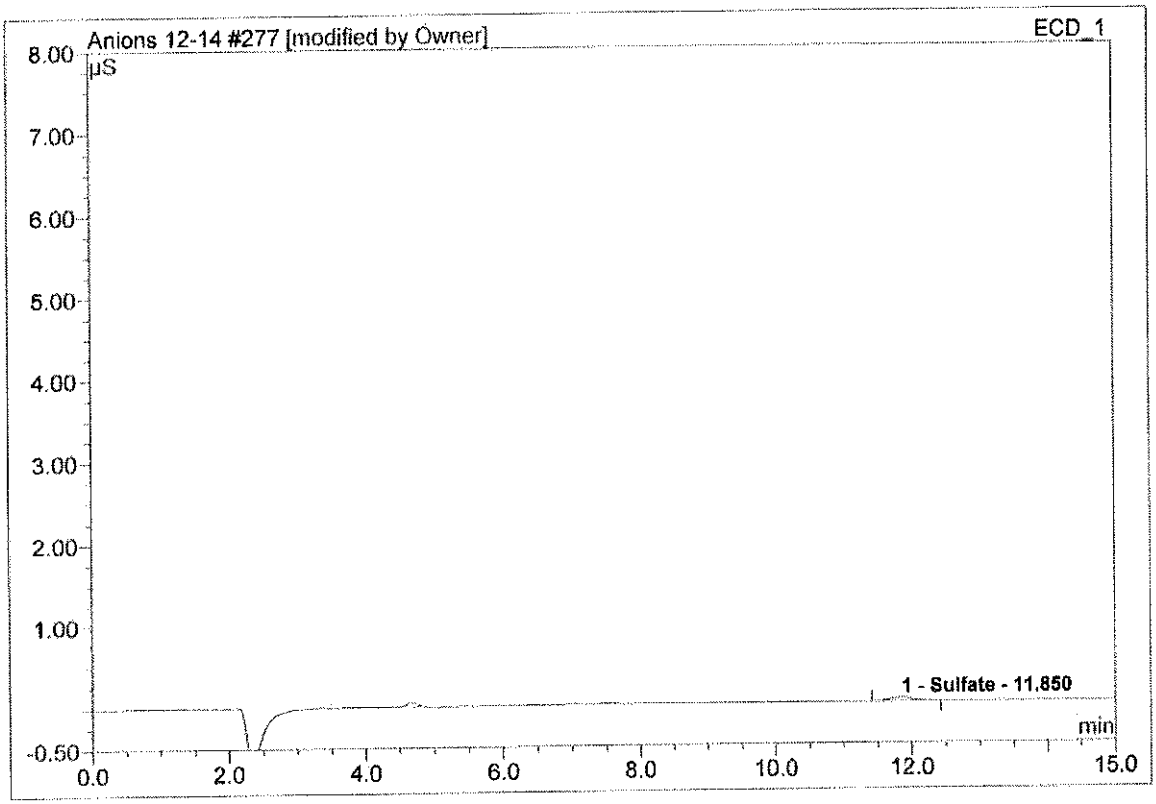
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**277**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**12/18/2014 12:49**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	11.84	Sulfate	0.047	0.0181

277 M5F run 2 #14285

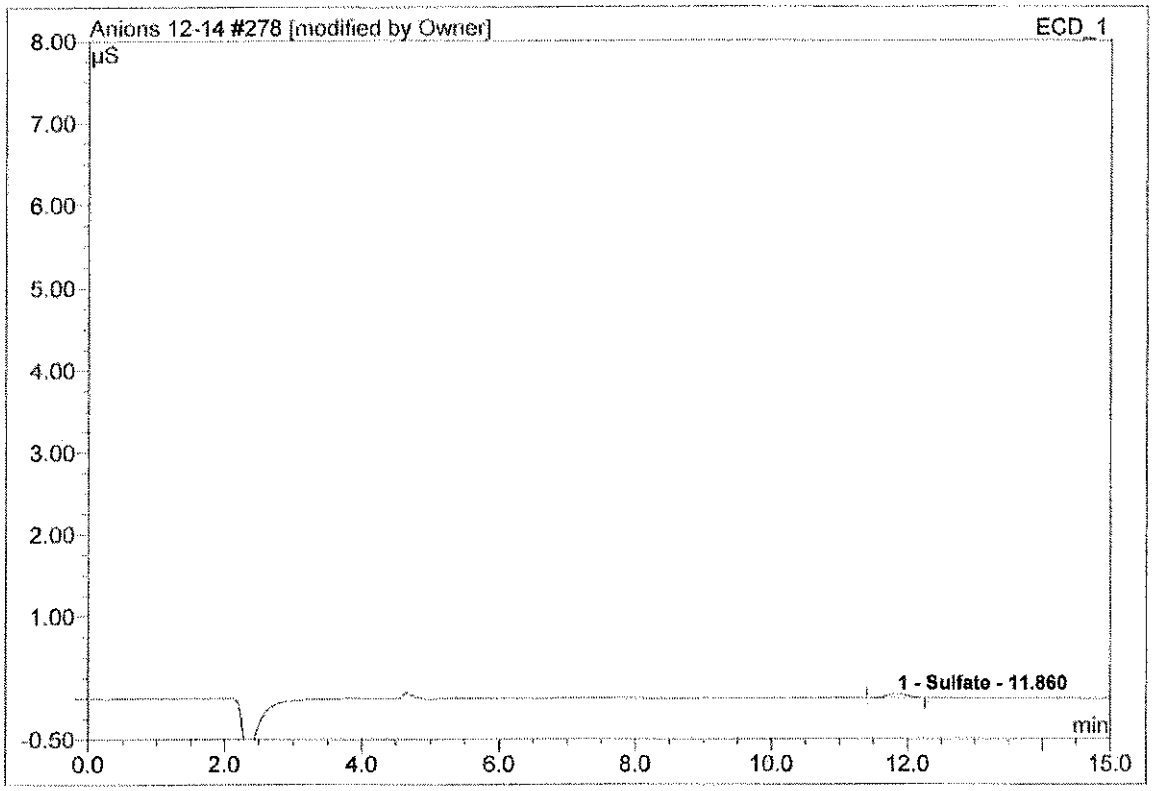
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**278**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**12/18/2014 13:07**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	11.85	Sulfate	0.045	0.0180

278 M5F run 3 #14287

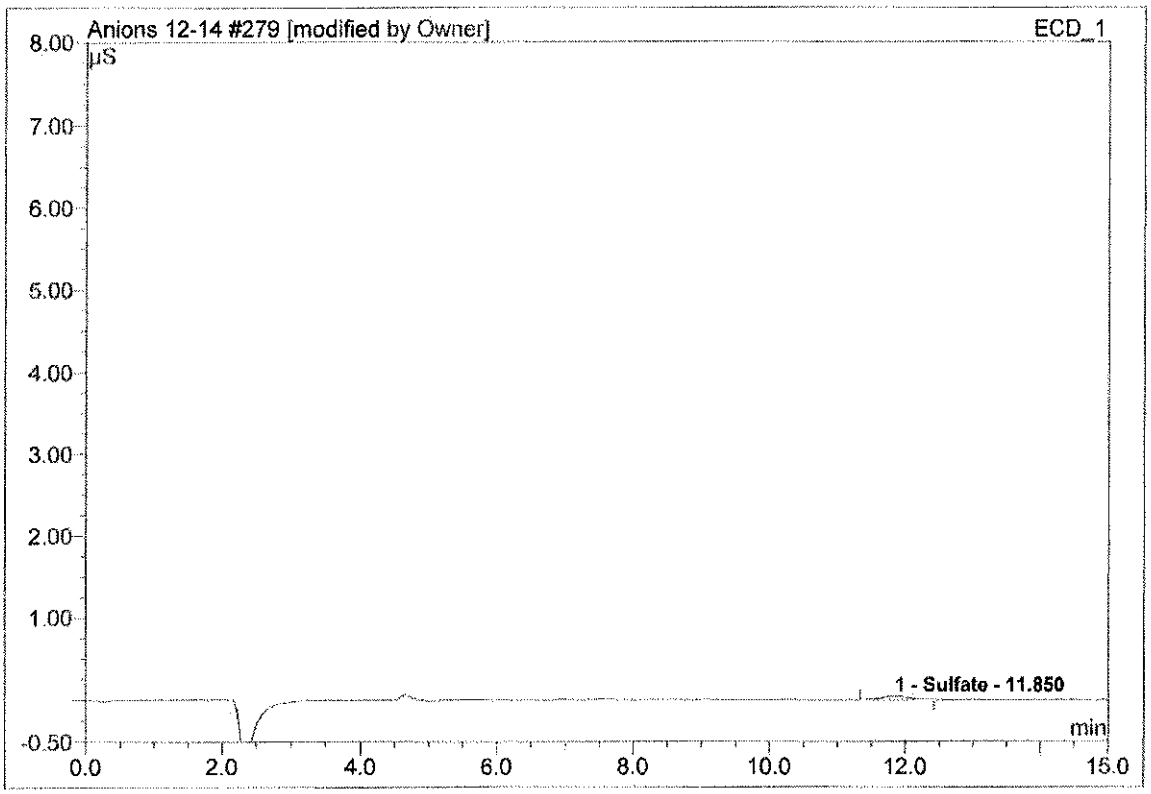
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**279**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**12/18/2014 13:25**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	11.86	Sulfate	0.047	0.0187

279 M5F run 3 #14287

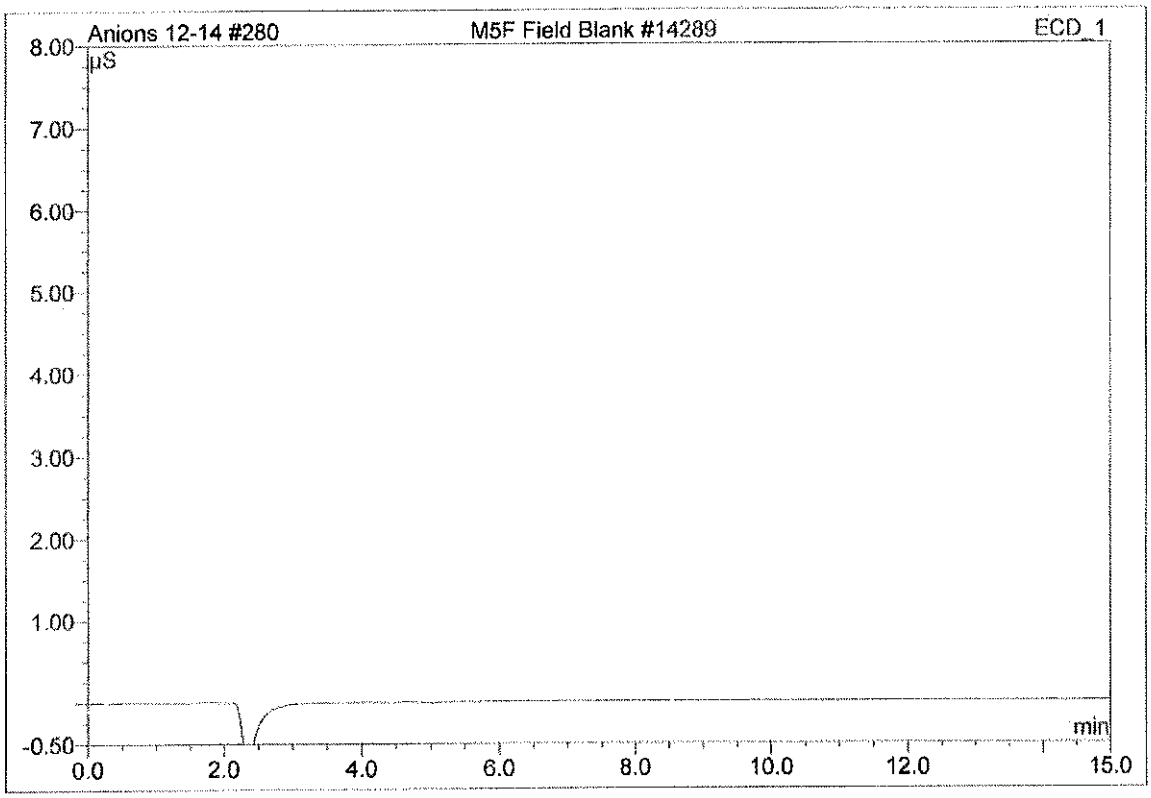
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**280**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**12/18/2014 13:44**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	11.85	Sulfate	0.045	0.0183

280 M5F Field Blank #14289

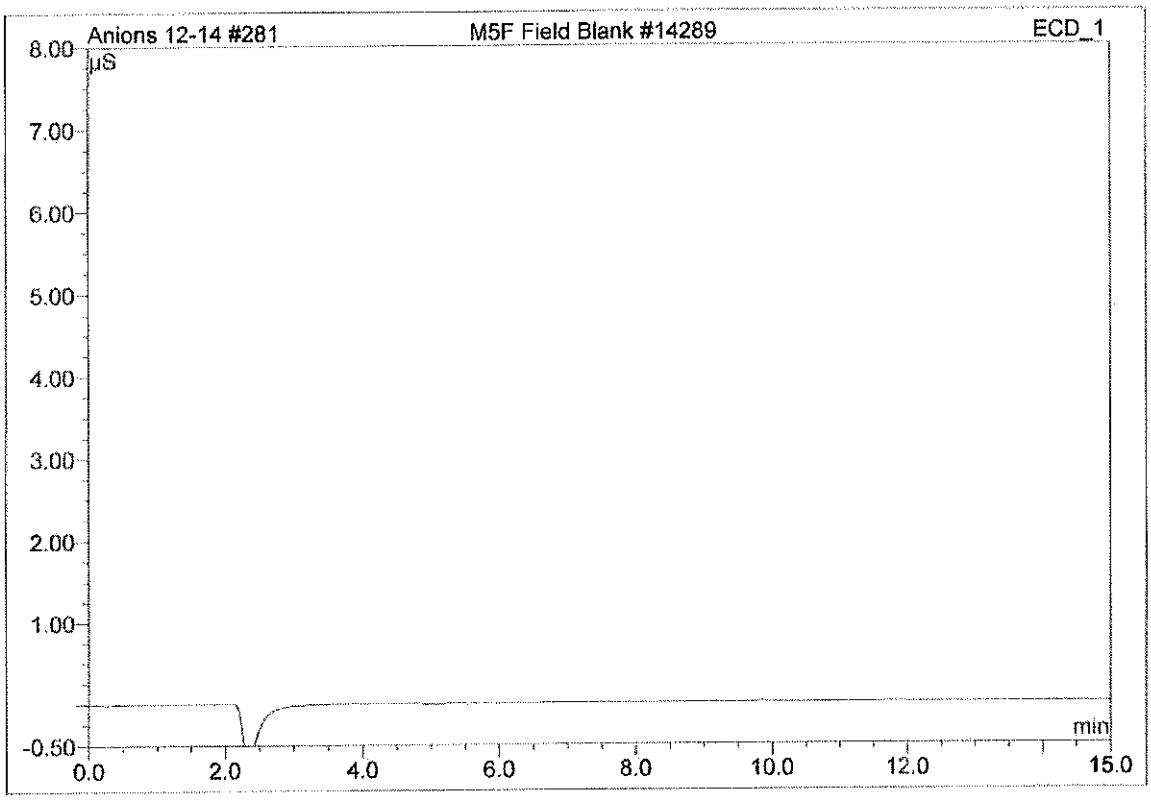
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**281**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**12/18/2014 14:15**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min

281 M5F Field Blank #14289

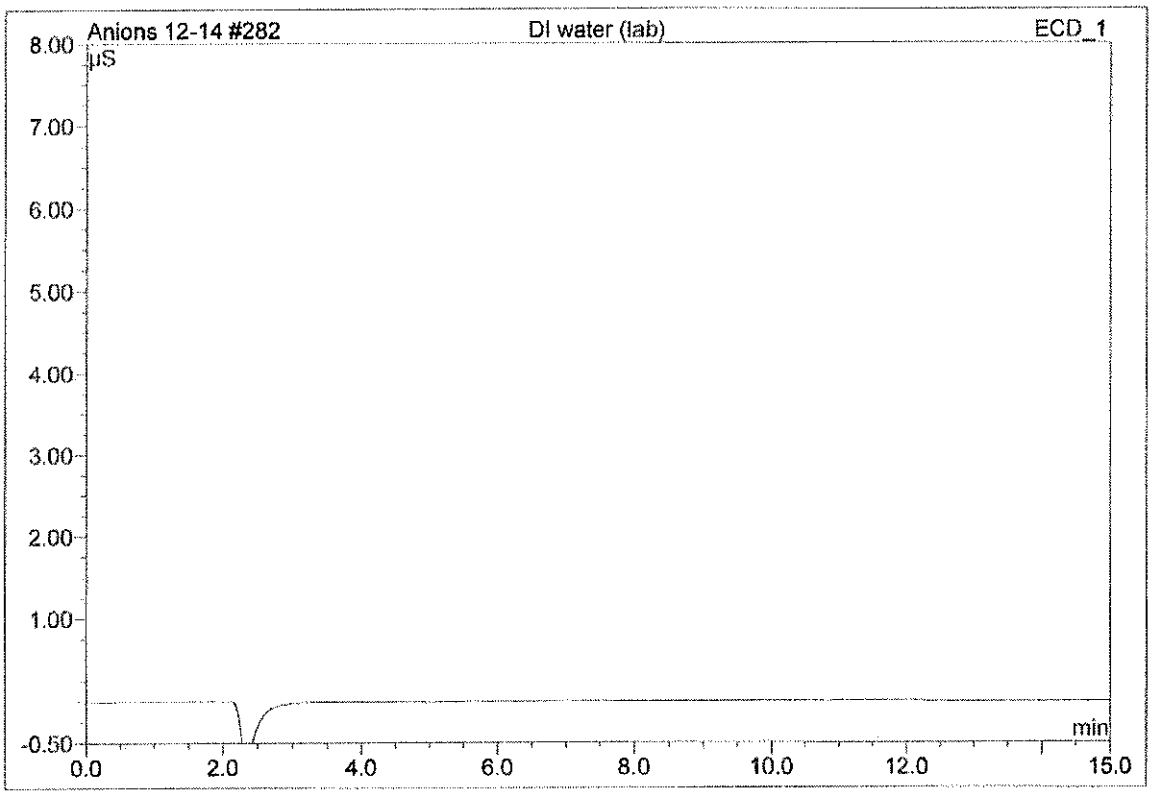
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**282**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**12/18/2014 14:33**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min

282 DI water (lab)

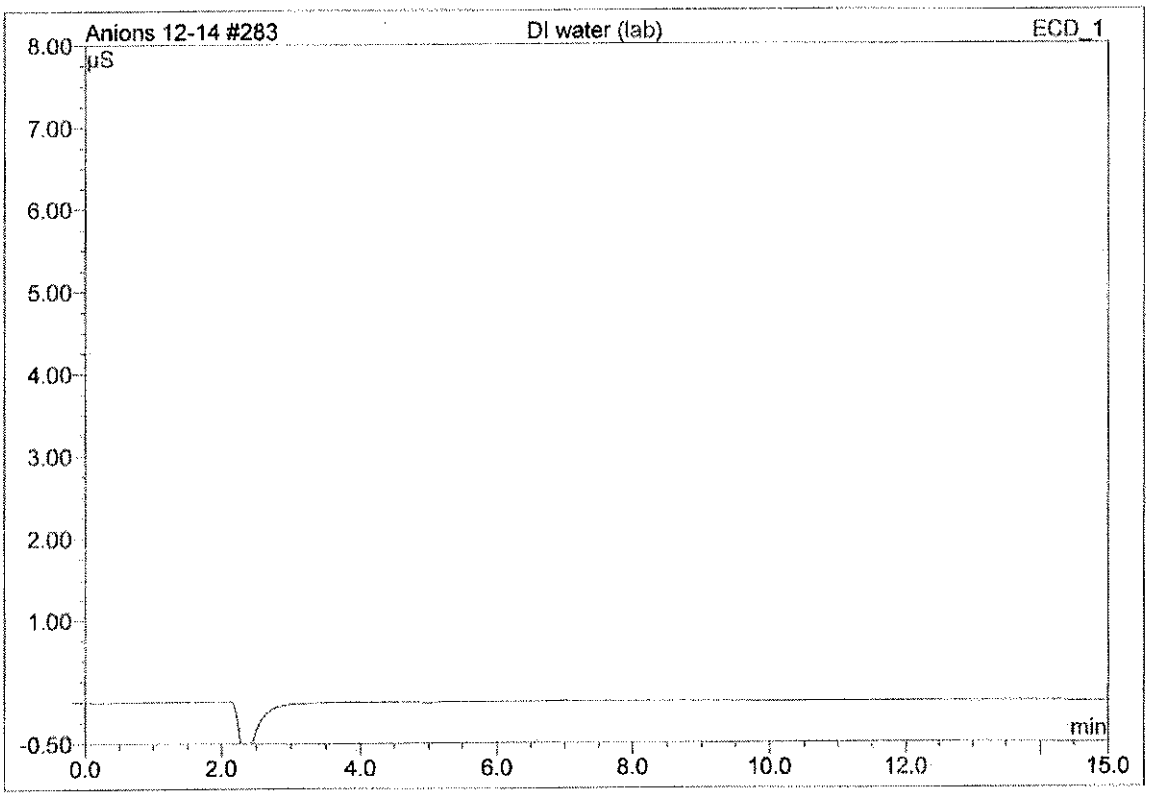
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**283**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**12/18/2014 14:51**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min

283 DI water (lab)

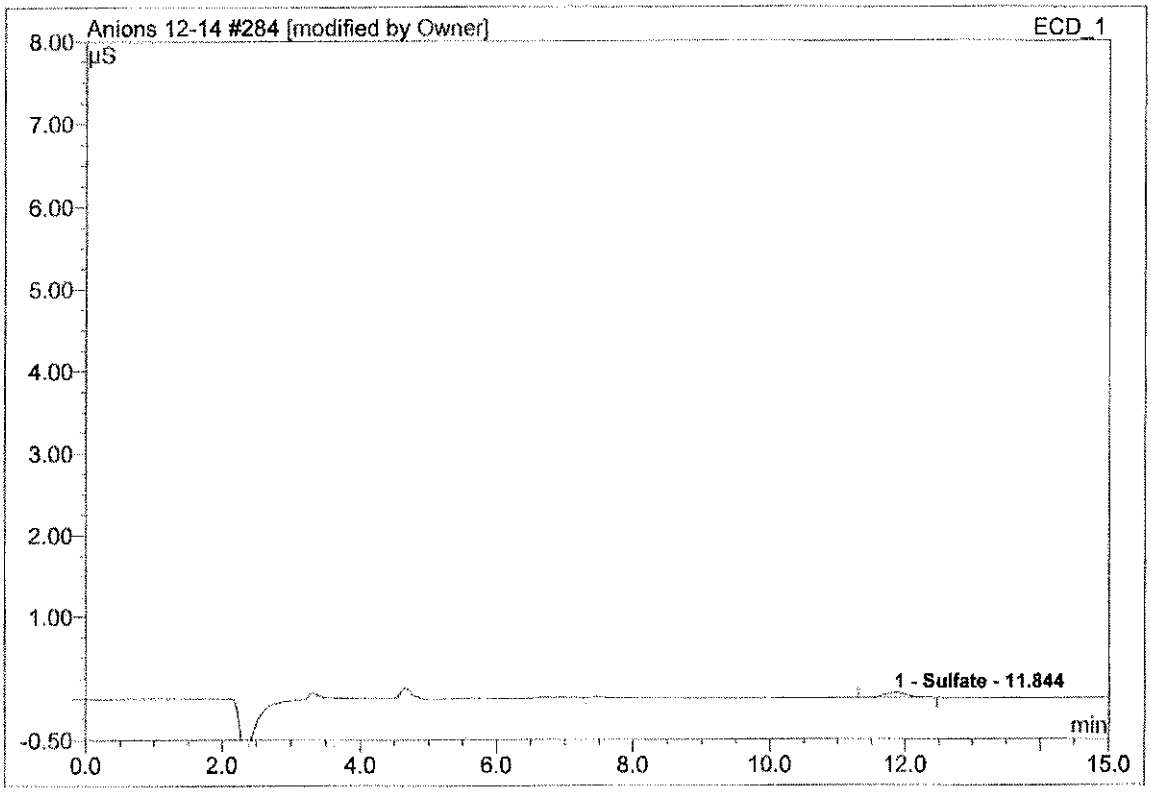
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**284**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**12/18/2014 15:09**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min

284 M5F Run 1 spike-1

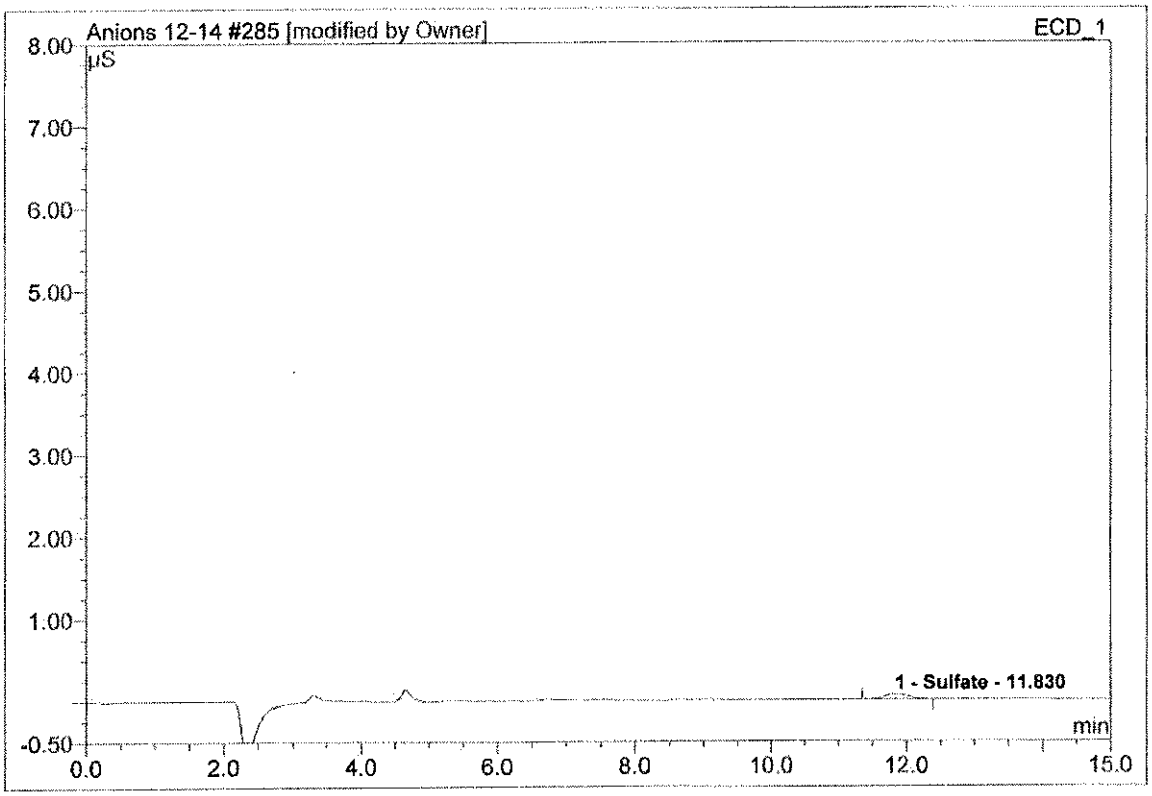
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**285**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**12/18/2014 15:31**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	11.84	Sulfate	0.064	0.0257

285 M5F Run 1 spike-1

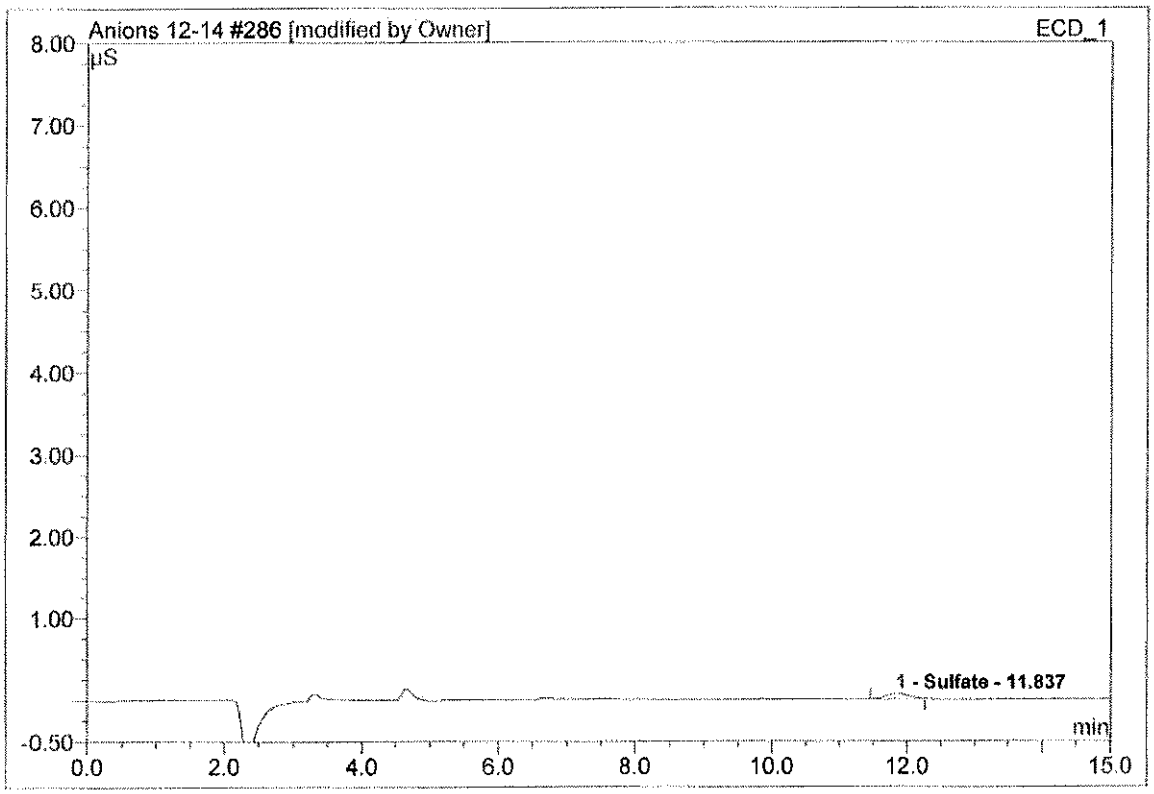
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**286**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**12/18/2014 15:48**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	11.83	Sulfate	0.064	0.0265

286 M5F Run 1 spike-2

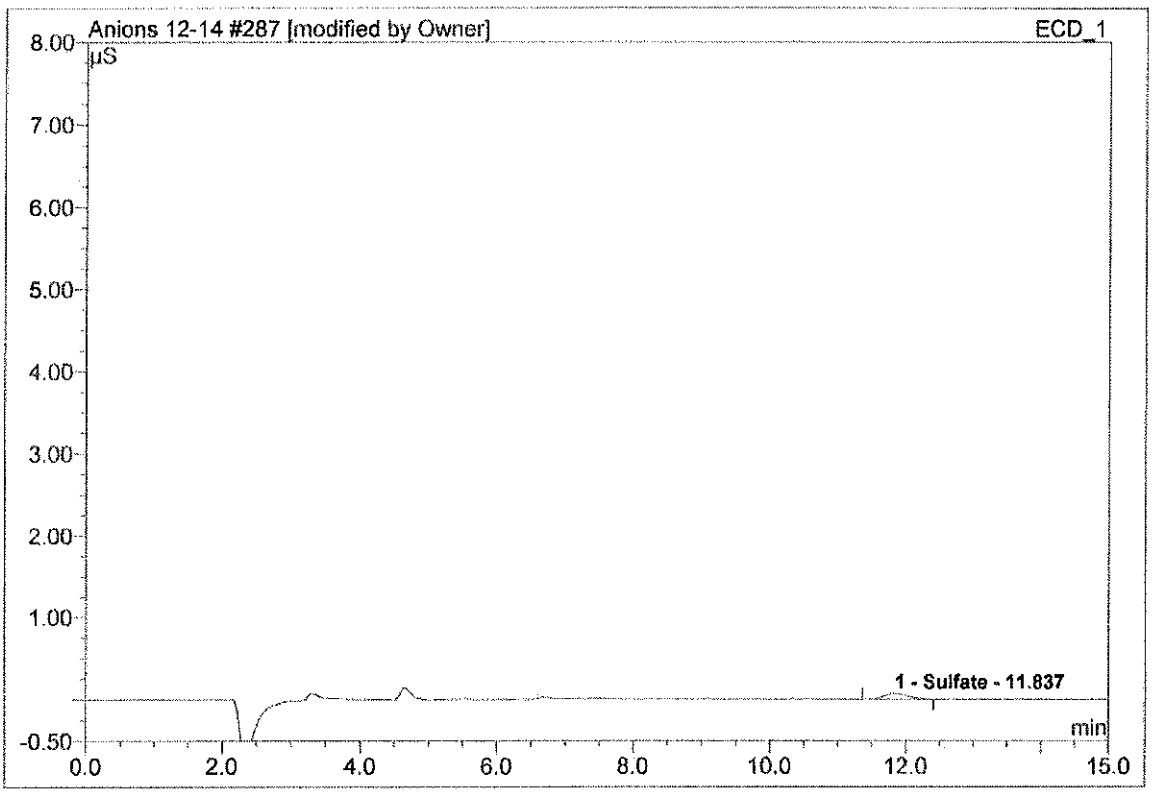
Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**287**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**12/18/2014 16:05**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	11.84	Sulfate	0.069	0.0266

287 M5F Run 1 spike-2

Client	**BP Whiting**	*Injection Volume:*	**20.0**
Vial Number:	**288**	*Channel:*	**ECD_1**
Sample Type:	**unknown**	*Wavelength:*	**n.a.**
Control Program:	**Anions 1000**	*Bandwidth:*	**n.a.**
Quantif. Method:	**ICS_1000_Anions**	*Dilution Factor:*	**1.0000**
Recording Time:	**12/18/2014 16:21**	*Sample Weight:*	**1.0000**
Run Time (min):	**12.00**	*Sample Amount:*	**1.0000**



No.	Ret.Time min	Peak Name	Height µS	Area µS*min
1	11.84	Sulfate	0.071	0.0272

USEPA METHOD 5F TASK SCHEDULE

Client: BP Whiting

Location: Whiting, IN

Project Manager: S. Flaherty

Date Sampled: 12/10/14

Lab Project #: 08-700

Spreadsheet Template ID: USEPA-M5F-Partic-Template-61T-REV3

Analyst: J. Ruggaber

Eluent

Sodium Carbonate (Na_2CO3) manufacturer and lot: Fisher, Lot 095351

Batch Number	Amount weighed/2L	Date/Time Prepared
1	1.6958 g	12/17/14 11:49
2	1.6960 g	12/18/14 16:33
3	g	

Sodium Bicarbonate ($NaHCO_3$) manufacturer and lot: Fisher, Lot 110567

Batch Number	Amount weighed/2L	Date/Time Prepared
1	0.1680 g	12/17/14 11:49
2	0.1679 g	12/18/14 16:33
3	g	

Reagents

Phenolphthalein Solution: WL-LOG#4-Log-037A page 46

Ammonium Hydroxide: 0.0992 N, lot SHBC0698V, Fluka

Standard Identification

1)1.0 ppm anions 12-16-14

2)2.0 ppm anions 12-16--14

3)5.0 ppm anions 12-16-14

4)10.0 ppm anions 12-16-14

5) 25.0 ppm sulfate 12-17-14

Secondary standard solution 5.0 ppm anions 12-16-14

DATE/TIME	EQUIPMENT	TASK
N/A	N/A	If not already performed in the field, remove the filter from the filter holder and place into a Petri dish.
12/12/14	N/A	Cut the filter into small pieces, and transfer to a 250 mL beaker.
12/12/14	N/A	Rinse the Petri dish with water, and transfer the wash to the beaker. Add additional water to approximately 75 mL.
12/12/14	N/A	Reflux on a hot plate for 6-8 hours.
12/12/14	N/A	Cool the flasks, and transfer contents, including particulate and filter pieces, to a 500 mL (or 1000 mL, if needed) volumetric flask.
12/15/14	N/A	Add the probe wash (with rinse) to the volumetric flask. Dilute to volume with water. Repeat for all samples and blanks.
12/18/14	N/A	After solids settle, volumetrically dilute 5 mL to 50 mL with water. Save for sulfate analysis.
12/12/14	Desiccator #1	Place labeled beakers in desiccator (store 24 hrs).
12/15/14	Balance #1	Weigh conditioned beakers and record tares.
12/15/14 – 12/17/14	Oven #1	Evaporate the contents of the volumetric flasks (and rinses) in tared beakers using a 105 °C oven to about 100 mL.
12/17/14	N/A	Remove the beakers from the oven and cool.
12/17/14	N/A	Add approximately 5 drops of phenolphthalein to each beaker. Add concentrated ammonium hydroxide dropwise until the solution turns pink.
12/17/14 – 12/18/14	Oven #1	Return the beakers to the oven and evaporate to dryness.
12/18/14 9:05	Desiccator #1	Place beakers in desiccator (store min. 24 hours)
12/19/14 9:54	Balance #1	Beaker weighing #1

Form LF0022

12/19/14 17:01	Balance #1	Beaker weighing #2 (min. 6 hrs after weighing #1)
N/A	N/A	Beaker weighing #3 (min. 6 hrs after weighing #2)
N/A	N/A	Beaker weighing #4 (min. 6 hrs after weighing #3)
12/17/14	ICS 1000 Anions	Equilibrate the IC instrument
12/17/14	ICS 1000 Anions	Inject each of the 5 standard solutions once. Plot the standard injection areas against sulfate concentrations to determine an initial calibration curve.
12/17/14	ICS 1000 Anions	Inject secondary standard once. Check that the secondary standard is within 15% of the initial calibration curve.
12/17/14 -12/18/14	ICS 1000 Anions	Inject each sample solution in duplicate. Check that the sulfate area count for each duplicate injection is within 5% of the mean.
N/A	N/A	If necessary, dilute sample solutions and re-inject.
12/17/14 – 12/18/14	N/A	Inject the midpoint standard once after every 20 sample injections. Check that the standard is within 15% of the initial calibration curve.
12/18/14	ICS 1000 Anions	Inject each standard solution once at the end of the run.
12/19/14	ICS 1000 Anions	Determine a final calibration curve.
12/19/14	ICS 1000 Anions	Determine the concentrations of each sample using the final calibration curve.
12/22/14	ICS 1000 Anions	Prepare report
		Report QA review
		Report distribution

Sample Receipt Checklist

Client Name: BP Whiting

Site Location: Whiting, IN

ARI Project Manager: Steve Flaherty

Sample Collection Date(s): 12/10/14

Chain-of-Custody Number(s): W01179

Chain-of-Custody Form(s):

Custody release signatures, dates, and times present:	Yes
Preservation code noted:	Yes
Project information clearly identfied:	Yes
Sample information clearly identified:	Yes
Analysis request clearly identified:	Yes
Report tier level noted:	Yes

Sample Containers:

Quantity of samples match number on the COC	Yes
Container label ID numbers and descriptions match COC	Yes
All containers received in good condition	Yes
Liquid levels at marked heights on containers	No
All container labels are legible	Yes
All sample IDs are unique	Yes
Samples received in correct container type	Yes
Samples received within the required holding time	Yes
Samples received under the required preservation code	Yes

Non-Conformances and/or Corrective Actions Applied:

The liquid levels on the polyproylene containers were not marked. There was no evidence of leakage. All other criteria for sample acceptance were met.

Samples Received by: Joel Ruggaber _____ signature

Date and Time received:

Form LF0002

ARI ENVIRONMENTAL, INC.

Chain of Custody Record Number: W01179

Lab Project No. (Lab use only)	Client Name	Client Location
08-700	BP	Whiting, IN
ARI Proposal Number	**ARI Test Plan Number**	**ARI Project Manager**
		Steve Flaherty
ARI Sampler Initials	**Laboratory (Wauconda or Pasadena)**	**Subcontracted Laboratory (if applicable)**
BO, SP, SF	Wauconda	
Engineering or Compliance Test Samples		
Compliance		

Preservation Code
1 = Ambient Temp.
2 = 4°C (Ice Packs)
3 = Dry Ice
4 = Other (Noted)

Label Number	Sample Date	Time of Collection[2]	Sample Identification	Number of Containers	Container Type (Petri, Bottle, Bag, Tube, Summa, Bomb)	Preservation Code	Analysis Request[1]: USEPA MSF				Comments
54440	12/10/14		Run 1 Filter	1	Petri	1	x				
75897	12/10/14		Run 1 PW	1	Bottle	1	x				
55733	12/10/14		Run 2 Filter	1	Petri	1	x				
75898	12/10/14		Run 2 PW	1	Bottle	1	x				
75890	12/10/14		Run 3 Filter	1	Petri	1	x				
75899	12/10/14		Run 3 PW	1	Bottle	1	x				
75905	12/10/14		Blank Filter	1	Petri	1	x				
75900	12/10/14		Blank PW	1	Bottle	1	x				

Special Instructions:	(1) Relinquished By	(2) Relinquished By	(3) Relinquished By	SHIPMENT:
	(1) Date / Time 12/11/14	(2) Date / Time	(3) Date / Time	Hand Carry
Date test results needed: 12/26/14	(1) Company ARI	(2) Company	(3) Company	FedEx UPS
Reporting level: Engineering Compliance	(1) Received By	(2) Received By	(3) Received By	Custody Seal Applied
Route results through: Steve Flaherty	(1) Date / Time 12/11/14 17:22	(2) Date / Time	(3) Date / Time	
Project manager signature: Steve Flaherty	(1) Company ARI	(2) Company	(3) Company	Yes No

1 – Analysis request must be confirmed by project manager signature 2 – End time only and applicable to samples requiring specific holding time limits and/or bag spike recovery determination Form LF0001

APPENDIX D

Calibration Data

APEX INSTRUMENTS METHOD 5 PRE-TEST CONSOLE CALIBRATION
USING CALIBRATED CRITICAL ORIFICES
5-POINT ENGLISH UNITS

Meter Console Information	
Console Model Number	MC522
Console Serial Number	503001
DGM Model Number	MS4
DGM Serial Number	22-Nov-22

Calibration Conditions			
Date	Time	11-Nov-14	11:00
Barometric Pressure		29.0	in Hg
Theoretical Critical Vacuum[1]		13.7	in Hg
Calibration Technician		B. Crane	

Factors/Conversions		
Std Temp	528	°R
Std Press	29.92	in Hg
K_1	17.647	oR/in Hg

[1]For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.

[2]The Critical Orifice Coefficient, K', must be entered in English units, $(ft^{3*}R^{1/2})/(in.Hg*min)$.

Calibration Data

Run Time	Metering Console					Critical Orifice				
Elapsed	DGM Orifice ΔH	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final	Serial Number	Coefficient	Amb Temp Initial	Amb Temp Final	Actual Vacuum
(Θ)	(P_m)	(V_{mi})	(V_{mf})	(t_{mi})	(t_{mf})		K'	(t_{amb})	(t_{amb})	
min	in H_2O	cubic feet	cubic feet	°F	°F		see above2	°F	°F	in Hg
10.0	2.0	562.440	570.150	73	74	OX63	0.5881	75	76	17
10.0	3.5	576.800	587.020	75	76	OX73	0.7801	76	77	15
10.0	1.2	590.300	596.160	77	77	OX55	0.4459	77	77	19
13.0	0.7	598.600	604.510	77	77	OX48	0.3461	77	77	20
18.0	0.3	606.300	611.770	78	78	OX40	0.2316	78	78	21

Results

Standardized Data				Dry Gas Meter				
				Calibration Factor		Flowrate	ΔH@	
Dry Gas Meter		Critical Orifice		Value	Variation	Std & Corr	0.75 SCFM	Variation
$(V_{m(std)})$	$(Q_{m(std)})$	$(Vcr_{(std)})$	$(Q_{crit(std)})$	(Y)	(ΔY)	$(Q_{m(std)corr})$	(ΔH@)	(ΔΔH@)
cubic feet	cfm	cubic feet	cfm			cfm	in H2O	
7.441	0.744	7.378	0.738	0.991	-0.004	0.738	2.006	-0.046
9.864	0.986	9.777	0.978	0.991	-0.004	0.978	2.007	-0.046
5.607	0.561	5.586	0.559	0.996	0.001	0.559	2.078	0.025
5.648	0.434	5.636	0.434	0.998	0.002	0.434	2.064	0.012
5.213	0.290	5.218	0.290	1.001	0.005	0.290	2.109	0.056
				0.996	Y Average		2.053	ΔH@ Average

CAL-MASTERMETER-WORKBOOK-203T-REV1

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR Title 40, Part 60, Appendix A-3, Method 5, 16.2.3

Signature B. Crane Date 11-11-14

ARI Environmental, Inc.
Gas Meter Thermometer Calibration Data Form
Pre -Test

Meter Box: 503001
Calibrator: B. Crane
Date: 11/11/2014
Barometric: 29.03
Ambient Temp: 74
Reference Thermometer: Altek Thermocouple Source CAL-MASTERMETER-WORKBOOK-203T-REV1

Reference Temperature Altek	Thermometer Temperature Inlet	Difference (%) mean Inlet	Thermometer Temperature Outlet	Difference (%) mean Outlet	Thermometer Temperature Probe	Difference (%) mean Probe
0	NA		1	0.22	-1	-0.22
100			101	0.18	98	-0.36
200			203	0.45	200	0.00
300			303	0.39	301	0.13
400			399	-0.12	396	-0.47
500			501	0.10	498	-0.21

Temperature Altek	Temperature Filter	(%) mean Filter	Temperature Exit	(%) mean Exit	Temperature Aux	(%) mean Aux
0	-1	-0.22	0	0.00	0	0.00
100	98	-0.36	98	-0.36	98	-0.36
200	200	0.00	200	0.00	200	0.00
300	300	0.00	301	0.13	301	0.13
400	397	-0.35	397	-0.35	397	-0.35
500	498	-0.21	498	-0.21	499	-0.10

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
0	-1	-0.22
200	200	0.00
400	397	-0.35
600	600	0.00
800	802	0.16
1000	1002	0.14

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
1200	1201	0.06
1400	1399	-0.05
1600	1602	0.10
1800	1801	0.04

Revised 10/03

APEX INSTRUMENTS METHOD 5 POST-TEST CONSOLE CALIBRATION
USING CALIBRATED CRITICAL ORIFICES
3-POINT ENGLISH UNITS

Meter Console Information	
Console Model Number	MC522
Console Serial Number	503001
DGM Model Number	MS-4
DGM Serial Number	1505857.00

Calibration Conditions			
Date	Time	30-Dec-14	1:30
Barometric Pressure		29.9	in Hg
Theoretical Critical Vacuum[1]		14.1	in Hg
Calibration Technician		B. Crane	

Factors/Conversions		
Std Temp	528	°R
Std Press	29.92	in Hg
K_1	17.647	oR/in Hg

[1]For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above.

[2]The Critical Orifice Coefficient, K', must be entered in English units, $(ft^3*°R^{1/2})/(in.Hg*min)$.

Calibration Data

Run Time	Metering Console					Critical Orifice				
Elapsed	DGM Orifice ΔH	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final	Serial Number	Coefficient	Amb Temp Initial	Amb Temp Final	Actual Vacuum
(Θ)	(P_m)	(V_{mi})	(V_{mf})	(t_{mi})	(t_{mf})		K'	(t_{amb})	(t_{amb})	
min	in H_2O	cubic feet	cubic feet	°F	°F		see above2	°F	°F	in Hg
10.0	2.1	965.600	973.300	74	74	OX63	0.5881	75	75	17
10.0	2.1	973.300	981.000	74	75	OX63	0.5881	75	76	17
10.0	2.1	981.000	988.710	75	76	OX63	0.5881	76	76	17

Results

Standardized Data				Dry Gas Meter				
Dry Gas Meter		Critical Orifice		Calibration Factor		Flowrate	ΔH @	
				Value	Variation	Std & Corr	0.75 SCFM	Variation
($V_{m(std)}$)	($Q_{m(std)}$)	($Vcr_{(std)}$)	($Q_{cr(std)}$)	(Y)	(ΔY)	($Q_{m(std)(corr)}$)	(ΔH@)	(ΔΔH@)
cubic feet	cfm	cubic feet	cfm			cfm	in H2O	
7.643	0.764	7.597	0.760	0.994	0.000	0.760	2.043	0.001
7.635	0.764	7.594	0.759	0.995	0.000	0.759	2.043	0.001
7.631	0.763	7.590	0.759	0.995	0.000	0.759	2.042	-0.001
Pretest Gamma	0.996	% Deviation	0.2	0.994	Y Average		2.043	ΔH@ Average

CAL-MASTERMETER-WORKBOOK-203T-REV1

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +-0.02.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR Title 40, Part 60, Appendix A-3, Method 5, 16.2.3

Signature B. Crane Date 12-30-14

ARI Environmental, Inc.
Gas Meter Thermometer Calibration Data Form
Post-Test

Meter Box: 503001
Calibrator: B. Crane
Date: 12/30/2014
Barometric: 29.88
Ambient Temp: 75
Reference Thermometer: Altek Thermocouple Source CAL-MASTERMETER-WORKBOOK-203T-REV1

Reference Temperature Altek	Thermometer Temperature Inlet	Difference (%) mean Inlet	Thermometer Temperature Oulet	Difference (%) mean Oulet	Thermometer Temperature Probe	Difference (%) mean Probe
0	NA		0	0.00	0	0.00
100			99	-0.18	99	-0.18
200			201	0.15	201	0.15
300			301	0.13	301	0.13
400			398	-0.23	398	-0.23
500			499	-0.10	499	-0.10

Reference Temperature Altek	Thermometer Temperature Filter	Difference (%) mean Filter	Thermometer Temperature Exit	Difference (%) mean Exit	Thermometer Temperature Aux	Difference (%) mean Aux
0	0	0.00	1	0.22	1	0.22
100	99	-0.18	99	-0.18	99	-0.18
200	201	0.15	202	0.30	202	0.30
300	301	0.13	301	0.13	301	0.13
400	398	-0.23	398	-0.23	398	-0.23
500	499	-0.10	499	-0.10	499	-0.10

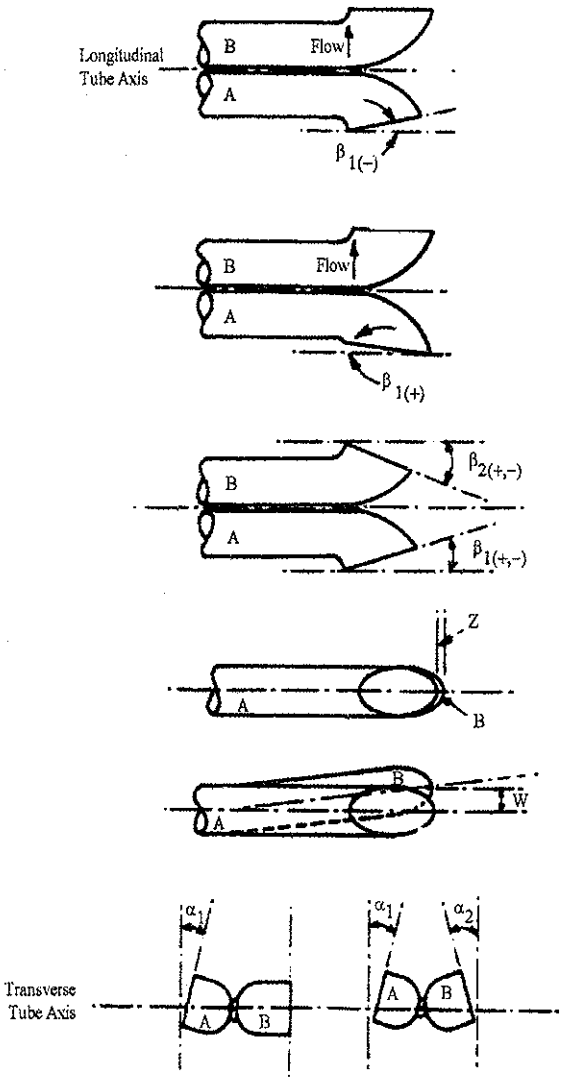
Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
0	0	0.00
200	201	0.15
400	398	-0.23
600	601	0.09
800	803	0.24
1000	1003	0.21

Reference Temperature Altek	Thermometer Temperature Stack	Difference (%) mean Stack
1200	1201	0.06
1400	1400	0.00
1600	1602	0.10
1800	1800	0.00

Revised 10/03

Pitot Tube Inspection Data

Client Name: _____



Pre-Sample Date: 11/1/2014		Post-Sample Date: 12/29/2014
Y	level?	Y
N	obstructions?	N
N	damaged?	N
1	$-10° < \alpha_1 < +10°$	1
0	$-10° < \alpha_2 < +10°$	0
0	$-5° < \beta_1 < +5°$	1
1	$-5° < \beta_2 < +5°$	1
0	γ	0
0	θ	0
0.930	A	0.92
0.465	$0.39375 < P_A < 0.5625$	0.460
0.465	$0.39375 < P_B < 0.5625$	0.460
0.375	$0.1875 \leq D_t \leq 0.375$	0.375
0.000	$A \tan \gamma < 0.125"$	0.000
0.00000	$A \tan \theta < 0.03125"$	0.00000
TRUE	$P_A = P_B$ +/- 0.063	TRUE
PASS	PASS/FAIL	PASS

Comments: 10' effective length M5 probe.

Pitot tube/probe number 731 meets or exceeds all specifications and criteria and/or applicable design features (per 40CFR60 Appendix A; Method 2) and is heareby assigned a pitot tube calibration factor of 0.84.

Signature: _____

Date: 12-29-14

ARI Environmental Inc.
Thermocouple Calibration Data Form

Calibrator: B. Crane
Thermocouple ID. 731

	pretest	posttest
Date:	11/1/2014	12/29/2014
Barometric:	29.67	29.68

Reference Thermometer = Mercury in glass

	Reference Point Number	Source	Reference Thermometer Temperature	Meter Readout Temperature	Difference (%)
Pre-Test	T.C	Ice Water	32.3	32.1	0.04
		Ambient	66.3	65.7	0.11
		Heat Source	295.8	293.6	0.29
Post-Test	T.C	Ice Water	32.3	32.6	-0.05
		Ambient	68.9	68.8	0.02
		Heat Source	295.2	296.6	-0.19

a (temp. diff.) = (ref.temp + 460) - (Thermo. temp. + 460) / (ref. temp. +460) x 100

Where $-1.5 < a < 1.5$

APPENDIX E

Process Data

Process Data Summary Tables **NSPS-Ja**

Run		NSPS-Ja			
		5F-1	5F-2	5F - 3	Test Average
Start time		12/10/2014 13:33	12/10/2014 15:30	12/10/2014 17:10	
End time		12/10/2014 14:40	12/10/2014 16:37	12/10/2014 18:16	
Soot Blowing					
FCCU Regenerator Coke Burn, lb/hr	C05MACK	59288	59242	59151	59227
ESP Total Primary Power, KW	C07101KW	82	82	82	82
ESP Total Secondary Current, milliAmps	C07101SA	2917	2917	2919	2918
SO2, ppm @ 0%O2	C05660B	5.4	5.6	5.4	5.5
NOx, ppm @ 0%O2	C05660A	27	27	27.4	27.1

APPENDIX F Test Program Qualifications

Test Program Qualifications

ARI Environmental's offices in Wauconda, Illinois; Newport, Delaware and Pasadena, Texas specialize in conducting stack emission, fugitive leak detection, ambient air and in-plant OSHA type testing for industrial clients.

ARI is organized so that its facilities and resources meet the requirements of ASTM D7036, Standard Practice for Competence of Air Emission Testing Bodies. ARI's laboratories in Wauconda, Illinois and Pasadena, Texas hold NELAP primary accreditation with the Texas Commission on Environmental Quality (Certificate No. T104704428-13-5), NELAP accreditation with the New Jersey Department of Environmental Protection (Certificate No. IL007), and NELAP/State accreditation with the Louisiana Department of Environmental Quality (Certificate No. 02010). ARI is also registered with the Pennsylvania Laboratory Accreditation Program (Registration No. 68-05220).

During the past 30 years, ARI personnel have conducted over 5,000 separate stack emission tests for a variety of industrial clients throughout North America for the determination of degree of source compliance and to yield emissions data and control equipment performance data for in-house engineering purposes.

ARI presently has over 80 trained personnel for conducting source emission sampling, fugitive leak detection monitoring, ambient air monitoring and OSHA sampling programs. All test programs are supervised and conducted by onsite Qualified Individuals (QI) and/or Qualified Source Testing Individuals (QSTI) pursuant to ASTM D7036.

The key personnel involved in the test program were as follows:

Steven Flaherty
Mr. Flaherty is a Senior Project Manager with ARI. His 14 years of experience includes emission compliance and CEM certification testing for a wide variety of industries including petrochemical, steel mills, electric utilities, cement plants, asphalt plants and general manufacturing plants. Mr. Flaherty is presently certified as a QSTI by the Source Evaluation Society (SES) pursuant to the requirements of ASTM D7036-04.

Brett O'Leary
Mr. O'Leary is a field technician specializing in sampling equipment preparation, maintenance and calibration, equipment setup, field sampling, sample recovery and post-test equipment clean up.

Jonathon Phillips
Mr. Phillips is a field technician specializing in sampling equipment preparation, maintenance and calibration, equipment setup, field sampling, sample recovery and post-test equipment clean up.

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

STEVEN M. FLAHERTY

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS

ISSUED THIS 26TH DAY OF NOVEMBER 2013 AND EFFECTIVE UNTIL NOVEMBER 25TH, 2018

Peter R. Westlin, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2008-237

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

STEVEN M. FLAHERTY

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GASEOUS POLLUTANTS SOURCE SAMPLING METHODS

ISSUED THIS 26TH DAY OF NOVEMBER 2013 AND EFFECTIVE UNTIL NOVEMBER 25TH, 2018

Peter R. Westlin, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2008-237

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

STEVEN M. FLAHERTY

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS

ISSUED THIS 26TH DAY OF NOVEMBER 2013 AND EFFECTIVE UNTIL NOVEMBER 25TH, 2018

Peter R. Westlin, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2008-237

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

STEVEN M. FLAHERTY

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

HAZARDOUS METALS MEASUREMENT SAMPLING METHODS

ISSUED THIS 18TH DAY OF OCTOBER 2011 AND EFFECTIVE UNTIL OCTOBER 17TH , 2016

Peter R. Westlin, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

LeRoy Owens, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2008-237

Appendix 7 – Commercial Unavailability

Supporting Documentation - Commercially Unavailable Claim
LLE-13-09 (2014 Revision) – Jerguson Bonnet Ball/Check Valve

The attached documentation provides documentation supporting the fact that there are no other manufacturers that are available for the equipment application as detailed on the commercially unavailable form.

WBU Valve/Packing Commercial Unavailability Assessment and Documentation Form

Document Number:	EF1209.1
Document Revision Date:	8/6/12
Document Revision #	0

Information for Requested Valve / Packing:	Environmental Use Only:
Manufacturer: Jerguson	Exemption # (LLExempt-YR-XX): -13-09 - R2014
Valve/Packing Type: Bonnet Valve w/ ball check, Braided Carbon Fiber Valve Stem Packing – 4 rings	Exemption Review Due: ~~9/24/14~~ 9/24/15
Size: ¾" x ¾" x ½"	
Service: Rich Amine, Hydrogen, Pure Hydrogen	Valve Certification Master Updated: Yes / No
Process Unit: CFHU	SAP Catalog Updated: Yes / No

Documentation of Manufacturers Contacted for Valve/Packing Substitute and Response
Please list all manufacturers contacted as producing an appropriate substitute valve/packing. (Consent Decree requires 3 manufacturers, where available) These manufacturers must send written documentation or equivalent documentation that they do not produce a substitution for the valve/packing requested. This documentation must be attached to this form.

1.
2.
3.

Certified Low Leak Valve / Packing is NOT AVAILABLE due to:
Please check applicable criteria and provide additional information requested.

√	Criteria	If Yes, provide:
	Valve/Packing Service/Operating Conditions	Service: Rich Amine, Hydrogen, Pure Hydrogen Pressure (psig): 1400 Temperature (°F): 120 F
	Equipment Application	Location: C-802 level Gauge @ CFHU
	Seal Performance	Describe:
	Service Life	Years:
	Packing Friction	Describe:
	Temperature and Pressure Limitations	Pressure (psig): Temperature (°F):
	Requires Retrofit (i.e. re-piping or space limitations)	Describe:
	Valve/packing specification identified by licensor of unit or equipment	Describe:
	Valve/packing vendor or manufacturer recommendation for unit or unit components	Describe:

If more space is needed, attach additional discussion.

Requestor: A minimum of 3 manufacturers have been contacted and certified low leak valve / packing it not commercially available for this service for the reasons described above.

Signed: [signature] **Date:** 9/24/13

Valve Technical Authority	Engineering Authority	Environmental Manager
Based on my review of the information provided, I approve the determination of commercial unavailability.	Based on my review of the information provided, I approve the determination of commercial unavailability.	Based on my review of the information provided, I approve the determination of commercial unavailability.
Signed / Date: [signature] 9-24-13	Signed / Date: [signature] Digitally signed by Tilleman, Charles J DN: cn=Tilleman, Charles J Date: 2013.09.24 15:35:16 -05'00'	Signed / Date: [signature] Digitally signed by linda.wilson2@bp.com DN: cn=linda.wilson2@bp.com Date: 2013.09 24 20:50:07 -05'00'

Sobilo, Richard

From: Gillespie, Jim [jim.gillespie@mrcglobal.com]
Sent: Tuesday, September 24, 2013 11:06 AM
To: Medsker, Shannon
Cc: Gillespie, Jim; Bell, Jeff K
Subject: Jerguson Gauge Glass Valves

Shannon,

In response to your verbal question concerning Jerguson Gage & Glass Co. valves and other possible manufacturer's of this type valve I regret to say I know of no others. There likely are some but most valves for gage glass come as a part of a piece of OEM equipment and thus do not go through the normal distribution channels. In some cases you can't even buy the gage valves without buying the entire gage glass assembly.

Thank You

Jim

Jim Gillespie
Inside Sales Representative

McJunkin Red Man Corporation
an MRC Global Company
P +1-219-922-5349
F +1-219-922-5342
C +1-815-693-2022
jim.gillespie@mrcglobal.com
www.mrcglobal.com

Mik, Brandon J

From: Medsker, Shannon
Sent: Tuesday, August 05, 2014 10:13
To: Mik, Brandon J
Cc: Sobilo, Richard; Wilson, Linda J (Whiting); Despotoski, Lupka
Subject: RE: Jerguson Gauge Glass Valves

Follow Up Flag: Follow up
Due By: Friday, August 08, 2014 10:12
Flag Status: Flagged

Brandon,

There are no other suppliers to supply this type of 'valve'. This is really more of a sight glass than a valve, but we still put it through the commercial unavailability process. Procurement is the function to reach out to the manufacturers to see if we are able to attain a Low E valve. In this situation, there were no manufacturers to even contact to BUY this type of valve from besides Jerguson. I reached out to Jim as a 'expert' since he has been in the valve business for so long. I was asked to have him put in writing that there were no other manufacturer's that he knew of, and he did. This was accepted and signed by Rich, Charlie, and Linda.

I'm not sure what you are looking for....I can contact 3 manufacturers such as Velan, Kitz, and PK, all of whom don't carry, make, or supply this valve, but I thought we were to seek out manufacturers that we can actually purchase this valve from to see if there is a Low E option.

Thanks,

Shannon Medsker
Procurement Specialist
BP | Whiting Refinery
Phone: 219-378-7975
Cell: 219-213-1132
Email: shannon.medsker@bp.com

From: Mik, Brandon J
Sent: Monday, August 04, 2014 4:31 PM
To: jim.gillespie@mrcglobal.com
Cc: Sobilo, Richard; Medsker, Shannon; Wilson, Linda J (Whiting)
Subject: Jerguson Gauge Glass Valves

Mr. Gillespie,
In regards to your e-mail from September 2013, last page of the attached pdf, can you please provide a list of at least three valve manufacturers that would not be able to supply the Jerguson valve referenced in the same pdf – it is part of a sight glass on an MEA Absorber tower.

Our documentation needs to be more complete for this exemption and we are required to contact at least three (3) manufacturers. I agree that Jerguson is the only supplier, but we need to accurately reflect that in our records.

Please respond at your earliest convenience and feel free to contact me with any questions.

Thanks,

Brandon Mik
Environmental Specialist - LDAR
BP Whiting Environmental, RSB 201
Office Phone - (219) 473-3725
Personal Mobile - (501) 944-8212
Refinery Radio - 2117

From: Wilson, Linda J (Whiting)
Sent: Tuesday, September 24, 2013 20:51
To: Tilleman, Charles J; Sobilo, Richard; Medsker, Shannon
Cc: Kendall, Julie
Subject: RE: Jerguson.....AML

Linda Wilson
Environmental Manager
Whiting Business Unit
Office: 219-473-3287
Cell: 219-545-5403

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From: Tilleman, Charles J
Sent: Tuesday, September 24, 2013 3:36 PM
To: Sobilo, Richard
Cc: Medsker, Shannon; Wilson, Linda J (Whiting)
Subject: RE: Jerguson.....AML

Signed copy attached....

Thanks,
Charlie

Charles J. Tilleman, P.E.
Entity Director - S&OR / Engineering Authority
Whiting Business Unit
2815 Indianapolis Blvd.
Whiting, IN 46394
Mobile: +1 (219) 712-0517
Office: +1 (219) 473-3025

From: Sobilo, Richard
Sent: Tuesday, September 24, 2013 12:22 PM
To: Tilleman, Charles J
Cc: Medsker, Shannon; Wilson, Linda J (Whiting)
Subject: RE: Jerguson.....AML

Charlie,

This is needed on the Turnarounds. According to MRM, only Jerguson can supply this valve. The other manufacturer they knew of went out of business.

There are two slightly different installations here.

Thanks,

Rich

From: Medsker, Shannon
Sent: Tuesday, September 24, 2013 10:32 AM
To: Sobilo, Richard
Subject: FW: Jerguson.....AML

Shannon Medsker
Procurement Specialist, MRO
BP | Whiting Refinery
Phone: 219-378-7975
Cell: 219-213-1132
Email: shannon.medsker@bp.com

From: Serletic, John
Sent: Tuesday, September 24, 2013 10:31 AM
To: Medsker, Shannon
Cc: Williams, Bruce A.; Despotoski, Lupka
Subject: RE: Jerguson.....AML

See above please...
There really is no "size" that I can see on spec sheet so I listed out vessel, gage, and drain size.

JOHN D. SERLETIC
PROCUREMENT SPECIALIST (TAR Group)
BP PRODUCTS, NORTH AMERICA
WHITING BUSINESS UNIT
OFFICE 219-378-7785
CELL 219-730-2262
RADIO 4353
BUNKER 219-473-3640

From: Medsker, Shannon
Sent: Tuesday, September 24, 2013 10:23 AM
To: Serletic, John
Cc: Williams, Bruce A.; Despotoski, Lupka
Subject: RE: Jerguson.....AML

Hi John,

If you could just provide the actual size of the valve on the form that would work.

Thanks,

Shannon Medsker
Procurement Specialist, MRO
BP | Whiting Refinery
Phone: 219-378-7975
Cell: 219-213-1132
Email: shannon.medsker@bp.com

From: Serletic, John
Sent: Tuesday, September 24, 2013 10:21 AM
To: Medsker, Shannon
Cc: Williams, Bruce A.; Despotoski, Lupka
Subject: RE: Jerguson.....AML

Shannon,
Please find Unavailability Form above that we discussed. If there is missing info or this is not correct please advise and I will address.

Thanks.

JOHN D. SERLETIC
PROCUREMENT SPECIALIST (TAR Group)
BP PRODUCTS, NORTH AMERICA
WHITING BUSINESS UNIT
OFFICE 219-378-7785
CELL 219-730-2262
RADIO 4353
BUNKER 219-473-3640

From: Medsker, Shannon
Sent: Tuesday, September 24, 2013 10:06 AM
To: Serletic, John
Subject: RE: Jerguson.....AML

Shannon Medsker
Procurement Specialist, MRO
BP | Whiting Refinery
Phone: 219-378-7975
Cell: 219-213-1132
Email: shannon.medsker@bp.com

From: Serletic, John
Sent: Tuesday, September 24, 2013 9:59 AM
To: Medsker, Shannon
Cc: Despotoski, Lupka
Subject: Jerguson.....AML

Miss Shannon,
Heard rumors you were working to get Jerguson added to AML. I have a VERY urgent need above that I would like to have here in refinery by 09-26 for TAR in execution. I need to place order today.....

What am I up against?

JOHN D. SERLETIC
PROCUREMENT SPECIALIST (TAR Group)
BP PRODUCTS, NORTH AMERICA
WHITING BUSINESS UNIT
OFFICE 219-378-7785

CELL 219-730-2262
RADIO 4353
BUNKER 219-473-3640

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Kendall, Julie

From: Wilson, Linda J (Whiting)
Sent: Tuesday, August 05, 2014 11:24 AM
To: Sobilo, Richard; Medsker, Shannon; Mik, Brandon J
Cc: Despotoski, Lupka; Gutyan, Kris
Subject: RE: Jerguson Gauge Glass Valves

Follow Up Flag: Follow up
Due By: Friday, August 08, 2014 11:24 AM
Flag Status: Flagged

Recommend we all sit down and talk about this vs the email frustration. WE (environmental) are in this also....face the pressures also....deal with the LT also....deal with the auditors also....deal with the regulators also.....deal with the reporting also. Understand that we are trying to shore up items that can INCREASE our joint workload. I will set up a recurring meeting.

From: Sobilo, Richard
Sent: Tuesday, August 05, 2014 11:08 AM
To: Medsker, Shannon; Mik, Brandon J
Cc: Wilson, Linda J (Whiting); Despotoski, Lupka; Gutyan, Kris
Subject: RE: Jerguson Gauge Glass Valves

Brandon,

I am in total agreement with Shannon. It seems we spend a lot of time in that auditing mode, checking on what we have done in the past. (The 'Check' in the PDCA CI model.) While I realize that this is important in ensuring we are getting better and improving our processing, we need to have some focus on the 'Act'. Shannon and other procurement people are tasked to buy valves, oftentimes the pressures are tremendous. People are very willing to run issues up to the LT, oftentimes the same day.

We still are spending the majority of our time on these obscure 'valves'? Many of these are not in VOC service, but we still have to write Exemptions against them. Many of them have no protruding stem, but we have to research them and write the exemption. Some are even contained in a larger pressure retaining assembly, so a leak can't even make it to the environment. Others are part of larger equipment assembly, where there is no other manufacturer. All these scenarios exist, but it takes time to get to the level where we realize we are not going to receive a letter or the testing detail to approve these manufacturers.

I think we can make a much bigger impact on the refinery's fugitive emissions if we focus on the 98% of the valve inventory out there - process gate, globe and quarter turn valves. I have limited time to spend on valves and much of it is spent on approving exemptions that are inconsequential. I know you didn't write the CD or you don't work for the EPA, but maybe ECAT can be smarter about *their* requirements. We are trying to be proactive about talking to REG, I&E and others about these obscure components that have the text 'valve' in their SAP description. We are trying to get them pre-approved, but that still takes resources.

Wherever you can help we are open to it.

Thanks,

Rich

From: Medsker, Shannon
Sent: Tuesday, August 05, 2014 10:13 AM
To: Mik, Brandon J

Cc: Sobilo, Richard; Wilson, Linda J (Whiting); Despotoski, Lupka
Subject: RE: Jerguson Gauge Glass Valves

Brandon,

There are no other suppliers to supply this type of 'valve'. This is really more of a sight glass than a valve, but we still put it through the commercial unavailability process. Procurement is the function to reach out to the manufacturers to see if we are able to attain a Low E valve. In this situation, there were no manufacturers to even contact to BUY this type of valve from besides Jerguson. I reached out to Jim as a 'expert' since he has been in the valve business for so long. I was asked to have him put in writing that there were no other manufacturer's that he knew of, and he did. This was accepted and signed by Rich, Charlie, and Linda.

I'm not sure what you are looking for....I can contact 3 manufacturers such as Velan, Kitz, and PK, all of whom don't carry, make, or supply this valve, but I thought we were to seek out manufacturers that we can actually purchase this valve from to see if there is a Low E option.

Thanks,

Shannon Medsker
Procurement Specialist
BP | Whiting Refinery
Phone: 219-378-7975
Cell: 219-213-1132
Email: shannon.medsker@bp.com

From: Mik, Brandon J
Sent: Monday, August 04, 2014 4:31 PM
To: jim.gillespie@mrcglobal.com
Cc: Sobilo, Richard; Medsker, Shannon; Wilson, Linda J (Whiting)
Subject: Jerguson Gauge Glass Valves

Mr. Gillespie,
In regards to your e-mail from September 2013, last page of the attached pdf, can you please provide a list of at least three valve manufacturers that would not be able to supply the Jerguson valve referenced in the same pdf – it is part of a sight glass on an MEA Absorber tower.

Our documentation needs to be more complete for this exemption and we are required to contact at least three (3) manufacturers. I agree that Jerguson is the only supplier, but we need to accurately reflect that in our records.

Please respond at your earliest convenience and feel free to contact me with any questions.

Thanks,

Brandon Mik
Environmental Specialist - LDAR
BP Whiting Environmental, RSB 201
Office Phone - (219) 473-3725
Personal Mobile - (501) 944-8212
Refinery Radio - 2117

From: Wilson, Linda J (Whiting)
Sent: Tuesday, September 24, 2013 20:51
To: Tilleman, Charles J; Sobilo, Richard; Medsker, Shannon

Cc: Kendall, Julie
Subject: RE: Jerguson.....AML

Linda Wilson
Environmental Manager
Whiting Business Unit
Office: 219-473-3287
Cell: 219-545-5403

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From: Tilleman, Charles J
Sent: Tuesday, September 24, 2013 3:36 PM
To: Sobilo, Richard
Cc: Medsker, Shannon; Wilson, Linda J (Whiting)
Subject: RE: Jerguson.....AML

Signed copy attached....

Thanks,
Charlie

Charles J. Tilleman, P.E.
Entity Director - S&OR / Engineering Authority
Whiting Business Unit
2815 Indianapolis Blvd.
Whiting, IN 46394
Mobile: +1 (219) 712-0517
Office: +1 (219) 473-3025

From: Sobilo, Richard
Sent: Tuesday, September 24, 2013 12:22 PM
To: Tilleman, Charles J
Cc: Medsker, Shannon; Wilson, Linda J (Whiting)
Subject: RE: Jerguson.....AML

Charlie,

This is needed on the Turnarounds. According to MRM, only Jerguson can supply this valve. The other manufacturer they knew of went out of business.

There are two slightly different installations here.

Thanks,

Rich

From: Medsker, Shannon
Sent: Tuesday, September 24, 2013 10:32 AM
To: Sobilo, Richard
Subject: FW: Jerguson.....AML

Shannon Medsker
Procurement Specialist, MRO
BP | Whiting Refinery
Phone: 219-378-7975
Cell: 219-213-1132
Email: shannon.medsker@bp.com

From: Serletic, John
Sent: Tuesday, September 24, 2013 10:31 AM
To: Medsker, Shannon
Cc: Williams, Bruce A.; Despotoski, Lupka
Subject: RE: Jerguson.....AML

See above please...
There really is no "size" that I can see on spec sheet so I listed out vessel, gage, and drain size.

JOHN D. SERLETIC
PROCUREMENT SPECIALIST (TAR Group)
BP PRODUCTS, NORTH AMERICA
WHITING BUSINESS UNIT
OFFICE 219-378-7785
CELL 219-730-2262
RADIO 4353
BUNKER 219-473-3640

From: Medsker, Shannon
Sent: Tuesday, September 24, 2013 10:23 AM
To: Serletic, John
Cc: Williams, Bruce A.; Despotoski, Lupka
Subject: RE: Jerguson.....AML

Hi John,

If you could just provide the actual size of the valve on the form that would work.

Thanks,

Shannon Medsker
Procurement Specialist, MRO
BP | Whiting Refinery
Phone: 219-378-7975
Cell: 219-213-1132
Email: shannon.medsker@bp.com

From: Serletic, John
Sent: Tuesday, September 24, 2013 10:21 AM
To: Medsker, Shannon
Cc: Williams, Bruce A.; Despotoski, Lupka
Subject: RE: Jerguson.....AML

Shannon,
Please find Unavailability Form above that we discussed. If there is missing info or this is not correct please advise and I will address.

Thanks.

JOHN D. SERLETIC
PROCUREMENT SPECIALIST (TAR Group)
BP PRODUCTS, NORTH AMERICA
WHITING BUSINESS UNIT
OFFICE 219-378-7785
CELL 219-730-2262
RADIO 4353
BUNKER 219-473-3640

From: Medsker, Shannon
Sent: Tuesday, September 24, 2013 10:06 AM
To: Serletic, John
Subject: RE: Jerguson.....AML

Shannon Medsker
Procurement Specialist, MRO
BP | Whiting Refinery
Phone: 219-378-7975
Cell: 219-213-1132
Email: shannon.medsker@bp.com

From: Serletic, John
Sent: Tuesday, September 24, 2013 9:59 AM
To: Medsker, Shannon
Cc: Despotoski, Lupka
Subject: Jerguson.....AML

Miss Shannon,
Heard rumors you were working to get Jerguson added to AML. I have a VERY urgent need above that I would like to have here in refinery by 09-26 for TAR in execution. I need to place order today.....

What am I up against?

JOHN D. SERLETIC
PROCUREMENT SPECIALIST (TAR Group)
BP PRODUCTS, NORTH AMERICA
WHITING BUSINESS UNIT
OFFICE 219-378-7785
CELL 219-730-2262
RADIO 4353
BUNKER 219-473-3640

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Supporting Documentation - Commercially Unavailable Claim
LLE-13-08 (2014 Revision) – Williams Emergency Shut Off Swing Check Valve

The attached documentation provides documentation supporting the fact that there are no other manufacturers that are available for the equipment application as detailed on the commercially unavailable form.

WBU Valve/Packing Commercial Unavailability Assessment and Documentation Form

Document Number:	EF1209.1
Document Revision Date:	1/17/2014
Document Revision #	1

Information for Requested Valve / Packing:	**Environmental Use Only:**
Manufacturer: Williams	Exemption # (LLExempt-YR-XX): -13-08 R2014
Valve/Packing Type: Emergency Shut Off Swing Check Valve	Exemption Review Due: August 2015
Size: various	
Service: Butane, BB's (butane-butadine), Iso-butane	Valve Certification Master Updated: Yes / No
Process Unit: OMD STFA & CNTF	SAP Catalog Updated: Yes / No

Documentation of Manufacturers Contacted for Valve/Packing Substitute and Response

Please list all manufacturers contacted as producing an appropriate substitute valve/packing. **(Consent Decree requires 3 manufacturers, where available)** These manufacturers must send written documentation or equivalent documentation that they do not produce a substitution for the valve/packing requested. This documentation must be attached to this form.

1. Williams Valve Corporation (no other vendors located, see attached note)

If fewer than three manufacturers are contacted, one of the following reasons must be documented below and attached to this form for determining unavailability of safe and suitable certified low leaking valves/valve packing:

- Cannot meet valve or valve packing specifications identified by the WBU Valve Technical Authority
- Cannot meet the valve or valve packing manufacturer recommendations for the relevant process unit components
- Demonstrate that fewer than three vendors offer valves or valve packing technologies for the service and operating conditions of the valve or valve packing to be replaced

Reason:

Are unable to find any other valve manufacturers that make emergency shut off flanged check valves in the sizes we need. See attached.

Certified Low Leak Valve / Packing is NOT AVAILABLE due to:
Please check applicable criteria and provide additional information requested.

√	Criteria	If Yes, provide:
	Valve/Packing Service/Operating Conditions	Service: Butane, BB's (butane-butadine), Iso-butane Pressure (psig): ~25 psig normally, 65 psig max (sphere RV set point) Temperature (°F): Ambient
X	Equipment Application	Location: Emergency shut off swing check valves on the fill and suction lines to and from spheres in STFA and CNTF. Used for emergency shut off only. During normal operation the flapper in the valve is being held up out of the flow path. The swing arm for the flapper extends through a gland to the outside of the valve where a fusible link connects it to a solenoid. Activation of the solenoid will cause it to release the link and drop the flapper. A fire burning through the fusible link will also cause the flapper to drop. Once the flapper has dropped the valve starts to behave like a normal check valve and will prevent liquid from leaving the sphere. Operation of solenoid is tested at least once a year by Maintenance as part of a PM.
	Seal Performance	Describe: Used for emergency shut off only.
	Service Life	Years: 10-20 years
	Packing Friction	Describe: N/A
	Temperature and Pressure Limitations	Pressure (psig): 65 psig max (sphere RV set point) Temperature (°F): 100 deg F max
	Requires Retrofit (i.e. re-piping or space limitations)	Describe: N/A
	Valve/packing specification identified by licensor of unit or equipment	Describe: As far as I can tell, emergency shut off swing check valves have been installed on all of the sphere fill/suction lines since they were built. They were also installed on the PGP bullets before that unit was decommissioned. If we were to replace them with a different type of ESO valve (i.e. gate, ball, etc) then you'd lose the current flexibility to flood the sphere after the valve has tripped (i.e. the check valve lets flow into the sphere but not out).

WBU Valve/Packing Commercial Unavailability Assessment and Documentation Form

Document Number:	EF1209.1
Document Revision Date:	1/17/2014
Document Revision #	1

X	Valve/packing vendor or manufacturer recommendation for unit or unit components	Describe: The original "Wheatley" brand valves are no longer manufactured. The Williams brand valves are the only ones found to provide the same functionality (solenoid and fusible link trip). Williams does not have the capability of testing for low emissions.

If more space is needed, attach additional discussion.

Requestor: A minimum of 3 manufacturers have been contacted and certified low leak valve / packing it not commercially available for this service for the reasons described above.

Signed: Karen E. Osenga **Date:** 8/18/14

Valve Technical Authority	**Engineering Authority**	**Environmental Manager**
Based on my review of the information provided, I approve the determination of commercial unavailability.	Based on my review of the information provided, I approve the determination of commercial unavailability.	Based on my review of the information provided, I approve the determination of commercial unavailability.
Signed / Date: 8-25-14 [signature]	**Signed / Date:** 8/25/2014 G.G.BALCERAK [signature] for C.J. Tillman (DDA)	**Signed / Date:** linda.wilson2@bp.com Digitally signed by linda.wilson2@bp.com DN: cn=linda.wilson2@bp.com Date: 2014.08.27 11:03:14 -05'00'

Prior to asking for the renewal of this commercial unavailability variance I did another internet search for valves like these but again was unable to come up with another manufacturer who made valves like the ones we need to replace (i.e. flanged swing check with solenoid or fusible link activation).

McJunkin has also searched around their contacts and could not find us another vendor for these valves. Cameron currently owns the Wheatley brand of valves (which our old ESO check valves were) but they no longer make the emergency shut off type of swing check valves.

The only valve we found that matched our needs was the Williams valve.

Karen Osenga

WILLIAMS

Est. 1918
38-52 Review Ave. • Long Island City, NY 11101
(Phone) 718-392-1660 • (Fax) 718-729-5106

August 19, 2014

To whom it may concern.

RE: ESOV Valves

This letter is to confirm that Emergency Shut Off-Valves have not been tested for low emissions. At this point we would not classify these valves as low emissions.

Please feel free to contact us with any questions.

Best regards,

Glen Werthmuller
William E Williams Valve Corp.
38-52 Review Ave
Long Island City, NY 11101
Ph# 718-392-1660 ext. 216

Supporting Documentation - Commercially Unavailable Claim
LLE-14-01 – Valco Instruments 10 Port Diaphragm Valve

The attached documentation provides documentation supporting the fact that there are no other manufacturers that are available for the equipment application as detailed on the commercially unavailable form.

WBU Valve/Packing Commercial Unavailability Assessment and Documentation Form

Document Number:	EF1209.1
Document Revision Date:	1/17/2014
Document Revision #	1

Information for Requested Valve / Packing:	Environmental Use Only:
Manufacturer: **Valco Instruments**	Exemption # (LLExempt-YR-XX): -14-01
Valve/Packing Type: **10 Port Diaphragm Valve**	Exemption Review Due: March 2015
Size:	
Service: Sampling	Valve Certification Master Updated: Yes / No
Process Unit:	SAP Catalog Updated: Yes / No

Documentation of Manufacturers Contacted for Valve/Packing Substitute and Response

Please list all manufacturers contacted as producing an appropriate substitute valve/packing. **(Consent Decree requires 3 manufacturers, where available)** These manufacturers must send written documentation or equivalent documentation that they do not produce a substitution for the valve/packing requested. This documentation must be attached to this form.

1. According to the letter provided by Laura Hutchinson of Valco Instruments Co., Inc. (The valve manufacturer) – Valco Industries does not presently have any valves which are tested to the EPA's Fugitive Emissions specifications. They will be happy to implement such measures in the future but none are in place at this time. In addition, in further phone discussions with Laura, Valco Industries does not have a commercially available (LOW-E) complaint valve to use as a direct replacement in this analyzer unit.
2.
3.

If fewer than three manufacturers are contacted, one of the following reasons must be documented below and attached to this form for determining unavailability of safe and suitable certified low leaking valves/valve packing:

- Cannot meet valve or valve packing specifications identified by the WBU Valve Technical Authority
- Cannot meet the valve or valve packing manufacturer recommendations for the relevant process unit components
- Demonstrate that fewer than three vendors offer valves or valve packing technologies for the service and operating conditions of the valve or valve packing to be replaced

Reason:
This valve is an OEM designed injection port valve for use in the Flare CEM Total Sulfur Analyzers that was purchased from Thermo-Fisher prior to the Fugitive Emission program being instituted at BP Whiting. Its function is to inject sample & low range calibration/validation gas into the analyzer.

Certified Low Leak Valve / Packing is NOT AVAILABLE due to:
Please check applicable criteria and provide additional information requested.

√	Criteria	If Yes, provide:
	Valve/Packing Service/Operating Conditions	Service: Pressure (psig): Temperature (°F):
	Equipment Application	Location:
	Seal Performance	Describe:
	Service Life	Years:
	Packing Friction	Describe:
	Temperature and Pressure Limitations	Pressure (psig): Temperature (°F):
	Requires Retrofit (i.e. re-piping or space limitations)	Describe:
	Valve/packing specification identified by licensor of unit or equipment	Describe: **Valve is special built for analyzer manufacturer for this purpose.**
	Valve/packing vendor or	Describe:

	manufacturer recommendation for unit or unit components	

If more space is needed, attach additional discussion.

Requestor: A minimum of 3 manufacturers have been contacted and certified low leak valve / packing it not commercially available for this service for the reasons described above.

Signed: Kristina M Gray **Date:** 4/16/14

Valve Technical Authority	**Engineering Authority**	**Environmental Manager**
Based on my review of the information provided, I approve the determination of commercial unavailability.	Based on my review of the information provided, I approve the determination of commercial unavailability.	Based on my review of the information provided, I approve the determination of commercial unavailability.
Signed / Date:	**Signed / Date:** Charles J. Tilleman Digitally signed by Tilleman, Charles J DN: cn=Tilleman, Charles J Date: 2014.04.25 16:43:17 -05'00'	**Signed / Date:** linda.wilson2@bp.com Digitally signed by linda.wilson2@bp.com DN: cn=linda.wilson2@bp.com Date: 2014.04.25 16:22:52 -05'00'

Valco Instruments Co. Inc.
VICI AG International

VALCO INJECTORS AND SELECTORS

Valco Injectors and Valves for GC

Overview
About Valco valves
GC injectors/valves
- Sampling/switching valves
- Internal sample injectors

HPLC injectors/valves
Selectors
Sample loops

Valco GC valves have been in almost all commercially-produced gas chromatographs from the time that valves originally began to replace other injection methods. New designs are smaller and easier to service, but still exhibit the quality and value that made them the industry standard.

Medium temperature GC valves have a rotor made of Valco E, a polyaryletherketone/PTFE composite. The high temperature versions use a polyimide/PTFE/carbon composite designated Valcon T.

Available as: Injectors and valves
Internal sample injectors

Injectors and switching valves

Select bore size for product numbers and information.

Temp	Max temp	Pressure	Ports available	Fitting size	SELECT: Bore size
High	330°C	300 psi gas	4, 6, 8, or 10 (3 and 12 optional)	1/32"	0.25 mm
				1/16"	0.40 mm
					0.75 mm
				1/8"	0.75 mm
Medium	225°C	400 psi gas	4, 6, 8, or 10 (3 and 12 optional)	1/32"	0.25 mm
				1/16"	0.40 mm
					0.75 mm
				1/8"	0.75 mm
Low	75°C	100 psi gas	4, 6, or 8	1/4"	4.00 mm

Top

Internal sample injectors

Select sample sizes for product numbers and information.

Temp	Pressure	Fitting	Bore	SELECT: Sample sizes
175°C	1,000 psi liq	1/32"	0.25 mm	.06, .1, .2, or .5 µl
		1/16"	0.40 mm	.06, .1, .2, or .5 µl
			0.75 mm	.2, .5, 1, or 2 µl
		1/8"	0.75 mm	.2, .5, 1, or 2 µl

Top

High temp
Med temp
Low temp
1/32" 1/16"
1/8" 1/4"

MORE INFORMATION
- Which valve do I need?
- Two position applications
- Leak testing
- Materials of construction
- Specifying a special body material
- Operation notes and cleaning instruction
- Dimensional drawings

SEE ALSO
- Diaphragm valves for process GC
- Heated valve enclosures
- Internally purged GC valves

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VICI
Valco Instruments Co. Inc.
TOOLS FOR SCIENCE AND MEDICINE

4/16/14

To Whom It May Concern,

Valco Instruments Co., Inc. does not presently have any valves which are tested to the EPA's Fugitive Emissions specifications. We will be happy to implement such measures in the future but none are in place at this time.

Thank you,

Laura Hutchinson
Compliance Officer
Valco Instruments Co., Inc.
Houston, Texas, USA

P.O. Box 55603 Houston, Texas 77255
(713) 688-9345 (713) 688-3948 fax

Gutyan, Kris

From: Laura Hutchinson <laura.hutchinson@vici.com>
Sent: Wednesday, April 16, 2014 3:20 PM
To: Gutyan, Kris
Subject: Re: FW: Thermo Fisher Part# 75-1340-0, 10-Port Vapor Valve
Attachments: EPA emissions.pdf

Kris,

Please see the attached statement. I hope this meets your needs. If not, let me know.

Regards,

--
Laura Hutchinson
Valco Instruments Co., Inc.
Waterbury 4th floor
P: 713 688 9345 ext. 4995

On Tue, Apr 15, 2014 at 2:41 PM, Gutyan, Kris <Kristina.Gutyan@bp.com> wrote:

Hi Laura:

I want to Thank You again for supplying the testing document last Thursday. However, I was hoping you could help me a bit further with my initial request on the item listed in the subject box above.

In regards to our discussion on Fisher Diaphragm Valve (MPN: 75-1340-0)…

As we discussed previously, this is a Diaphragm type valve that is exclusive to one of the analyzer units that we've purchased from Fisher in the past.

I have been asked to research (with the manufacturer of this Diaphragm valve) – if there has been any testing performed on this valve for its compliance to the EPA's Fugitive Emission program. (Please reference the Test Spec attached). ***I'll need to know if Fisher has performed any testing to comply with this particular specification.***

If so, can you please supply any testing reports that can help us to review & approve the purchase of this valve?

If not, can you let me know if Fisher offers are any other LOW-E certified valves as a direct replacement to this item for use in your analyzer unit?

If you cannot supply a valve that is in compliance with the EPA's regulation for LOW-E technology or any testing documents that support the fact that the valve has been reviewed for fugitive emissions (per the attached spec) – can you please simply provide a statement that would assist me in declaring Commercial Unavailability of this part.

(Basically, is there a (Low-E) equivalent and/or substitution for this valve commercially available for use in our analyzer unit).

Thank you so much for your compliance with this request.

Kind Regards,

Kristina

Kind Regards,

Kristina

Kristina M. Gutyan

Procurement Associate

kristina.gutyan@bp.com

(219) 378-7937 (W)

(219) 689-0094 (Cell)

From: Laura Hutchinson [mailto:laura.hutchinson@vici.com]
Sent: Thursday, April 10, 2014 3:37 PM
To: Gutyan, Kris
Subject: Re: FW: Thermo Fisher Part# 75-1340-0, 10-Port Vapor Valve

Kristina,

I spoke to our engineers about the testing processes used for the diaphragm valves. The valves are tested in a very sensitive detector which would show any leaks and off-gassing. The test results are saved in the form of a chromatographic display, but no test reports are generated. The valves just have to pass the test in order to move to the next step. I've attached an official document regarding the testing process. Let me know if you need more specific documentation or anything else.

Thank you,

--

Laura Hutchinson

Valco Instruments Co., Inc.

Waterbury 4th floor

P: 713 688 9345 ext. 4995

On Thu, Apr 10, 2014 at 2:51 PM, Gutyan, Kris <Kristina.Gutyan@bp.com> wrote:

Hi Laura:

Please review the e-mail I sent to Tim below. If you cannot supply a valve that is in compliance with the EPA's regulation for LOW-E technology or any testing documents that support the fact that the valve has been reviewed for fugitive emissions – can you please simply provide a statement that would assist me in declaring Commercial Unavailability of this part.

Thank you so much for your help.

Kind Regards,

Kristina

Kristina M. Gutyan

Procurement Associate

kristina.gutyan@bp.com

(219) 378-7937 (W)

(219) 689-0094 (Cell)

From: Decaille, Tim [mailto:tim.decaille@thermofisher.com]
Sent: Thursday, April 10, 2014 10:52 AM
To: Gutyan, Kris
Subject: RE: Thermo Fisher Part# 75-1340-0, 10-Port Vapor Valve

Their web site is shown below along with the part number. Only problem is that you won't find this exact part number configuration on the web site because it is special built for Thermo.

http://www.vici.com/vval/vval_gc.php

Tim Decaille

Technical Support Engineer

Thermo Scientific Environmental & Process Monitoring

Thermo Fisher Scientific

1410 Gillingham Lane

Sugar Land, TX 77478

Telephone: (713) 272-2178

Mobile: (832) 928-6147

Tim.decaille@thermofisher.com

www.thermoscientific.com

From: Gutyan, Kris [mailto:Kristina.Gutyan@bp.com]
Sent: Tuesday, April 08, 2014 3:50 PM
To: Decaille, Tim
Subject: RE: Thermo Fisher Part# 75-1340-0, 10-Port Vapor Valve

Tim:

I for to ask, please include the manufacturer of the valve itself in your e-mail response.

Thanks!

Kind Regards,

Kristina

Kristina M. Gutyan

Procurement Associate

kristina.gutyan@bp.com

(219) 378-7937 (W)

(219) 689-0094 (Cell)

From: Gutyan, Kris
Sent: Tuesday, April 08, 2014 3:44 PM
To: 'tim.decaille@thermofisher.com'
Subject: Thermo Fisher Part# 75-1340-0, 10-Port Vapor Valve

Hi Tim:

In regards to our discussion on c…

As we discussed, this is a diaphragm type valve (that is encased in a housing) – that is exclusive to one of the analyzer units we've purchased from Thermo Fisher in the past.

I have been asked to research (with the manufacturer of this Diaphragm valve) – if there has been any testing performed on this valve for its compliance to the EPA's Fugitive Emission program.

If so, can you please supply any testing reports that can help us to review & approve the purchase of this valve?

If not, can you let me know if Fisher offers are any other LOW-E certified valves as a direct replacement to this item in your analyzer unit?

Thank you so much for your compliance with this request.

Kind Regards,

Kristina

Kristina M. Gutyan

Procurement Associate

kristina.gutyan@bp.com

(219) 378-7937 (W)

(219) 689-0094 (Cell)

Appendix 8 – Waste Gas Minimization for LPG Flare

Appendix 8 - LPG Flare Waste Gas Flow

30-Day Rolling Average

DATE	WASTE GAS VOLUMETRIC FLOW 30-DAY AVERAGE (SCFM)	WASTE GAS MASS FLOW 30-DAY AVERAGE (LB/HR)
7/1/2014	55	378
7/2/2014	55	379
7/3/2014	54	371
7/4/2014	54	368
7/5/2014	53	366
7/6/2014	53	363
7/7/2014	52	360
7/8/2014	53	363
7/9/2014	53	363
7/10/2014	53	367
7/11/2014	53	364
7/12/2014	53	362
7/13/2014	52	357
7/14/2014	52	357
7/15/2014	52	354
7/16/2014	51	353
7/17/2014	51	352
7/18/2014	51	349
7/19/2014	51	347
7/20/2014	50	342
7/21/2014	49	337
7/22/2014	48	329
7/23/2014	47	322
7/24/2014	47	321
7/25/2014	48	328
7/26/2014	48	332
7/27/2014	49	335
7/28/2014	48	332
7/29/2014	48	329
7/30/2014	47	326
7/31/2014	46	317
8/1/2014	46	312
8/2/2014	46	314
8/3/2014	46	314
8/4/2014	46	312
8/5/2014	46	314
8/6/2014	46	316
8/7/2014	46	316
8/8/2014	46	315
8/9/2014	46	316
8/10/2014	46	318
8/11/2014	46	318
8/12/2014	46	318
8/13/2014	46	315
8/14/2014	46	316
8/15/2014	46	315
8/16/2014	46	315
8/17/2014	46	315
8/18/2014	46	312

Appendix 8 - LPG Flare Waste Gas Flow

30-Day Rolling Average

DATE	WASTE GAS VOLUMETRIC FLOW 30-DAY AVERAGE (SCFM)	WASTE GAS MASS FLOW 30-DAY AVERAGE (LB/HR)
8/19/2014	45	312
8/20/2014	45	312
8/21/2014	46	315
8/22/2014	46	314
8/23/2014	46	316
8/24/2014	46	318
8/25/2014	46	317
8/26/2014	46	317
8/27/2014	46	319
8/28/2014	47	321
8/29/2014	47	321
8/30/2014	47	323
8/31/2014	47	324
9/1/2014	47	325
9/2/2014	47	322
9/3/2014	45	312
9/4/2014	44	300
9/5/2014	42	288
9/6/2014	41	282
9/7/2014	41	282
9/8/2014	41	281
9/9/2014	41	278
9/10/2014	41	278
9/11/2014	40	272
9/12/2014	39	265
9/13/2014	38	258
9/14/2014	37	255
9/15/2014	36	249
9/16/2014	35	243
9/17/2014	35	241
9/18/2014	34	237
9/19/2014	34	236
9/20/2014	34	232
9/21/2014	33	228
9/22/2014	32	221
9/23/2014	32	217
9/24/2014	31	213
9/25/2014	31	213
9/26/2014	31	212
9/27/2014	31	212
9/28/2014	31	213
9/29/2014	31	212
9/30/2014	31	211
10/1/2014	31	210
10/2/2014	31	215
10/3/2014	33	225
10/4/2014	34	234
10/5/2014	36	244
10/6/2014	36	248

Appendix 8 - LPG Flare Waste Gas Flow

30-Day Rolling Average

DATE	WASTE GAS VOLUMETRIC FLOW 30-DAY AVERAGE (SCFM)	WASTE GAS MASS FLOW 30-DAY AVERAGE (LB/HR)
10/7/2014	36	246
10/8/2014	35	238
10/9/2014	33	229
10/10/2014	32	217
10/11/2014	31	213
10/12/2014	31	210
10/13/2014	30	207
10/14/2014	31	209
10/15/2014	32	221
10/16/2014	33	228
10/17/2014	34	233
10/18/2014	35	243
10/19/2014	37	252
10/20/2014	38	260
10/21/2014	39	271
10/22/2014	42	286
10/23/2014	43	297
10/24/2014	45	309
10/25/2014	46	318
10/26/2014	47	325
10/27/2014	49	334
10/28/2014	50	342
10/29/2014	51	348
10/30/2014	52	356
10/31/2014	53	363
11/1/2014	54	370
11/2/2014	55	377
11/3/2014	56	386
11/4/2014	57	394
11/5/2014	57	392
11/6/2014	57	388
11/7/2014	59	402
11/8/2014	61	419
11/9/2014	64	436
11/10/2014	66	454
11/11/2014	68	468
11/12/2014	70	484
11/13/2014	72	494
11/14/2014	72	497
11/15/2014	73	503
11/16/2014	75	511
11/17/2014	75	512
11/18/2014	74	510
11/19/2014	73	499
11/20/2014	71	488
11/21/2014	69	475
11/22/2014	67	458
11/23/2014	66	451
11/24/2014	65	446

Appendix 8 - LPG Flare Waste Gas Flow

30-Day Rolling Average

DATE	WASTE GAS VOLUMETRIC FLOW 30-DAY AVERAGE (SCFM)	WASTE GAS MASS FLOW 30-DAY AVERAGE (LB/HR)
11/25/2014	65	449
11/26/2014	66	450
11/27/2014	65	449
11/28/2014	65	449
11/29/2014	65	447
11/30/2014	66	450
12/1/2014	66	450
12/2/2014	64	442
12/3/2014	63	432
12/4/2014	61	417
12/5/2014	60	413
12/6/2014	60	411
12/7/2014	58	401
12/8/2014	56	388
12/9/2014	54	373
12/10/2014	52	358
12/11/2014	51	348
12/12/2014	49	337
12/13/2014	47	324
12/14/2014	45	311
12/15/2014	43	297
12/16/2014	41	282
12/17/2014	39	271
12/18/2014	38	261
12/19/2014	38	260
12/20/2014	38	264
12/21/2014	38	263
12/22/2014	39	267
12/23/2014	38	259
12/24/2014	36	250
12/25/2014	34	233
12/26/2014	32	218
12/27/2014	30	204
12/28/2014	28	192
12/29/2014	26	180
12/30/2014	24	165
12/31/2014	23	157

Appendix 9 – Flare Incident – 4UF Flare
August 28, 2014

Flaring Event or SRP Event RCFA Investigation Report Template

Event Type Threshold Exceedance

Flare Event

☒ 500 lbs SO_2 discharge to the atmosphere in any 24 hour period

☐ 500,000 standard cubic feet (scf) above the baseline in any 24 hour period [for South Flare and GOHT Flare Only]

☐ 500 lbs SO_2 discharge to the atmosphere in any 24 hour period due to Acid Gas or Sour Water Stripper Gas Flaring

Sulfur Recovery Plant

☐ 250 ppm SO_2 limit exceedances, if the SO_2 discharge to the atmosphere is 500 lbs greater than the amount that would have been emitted if the emission limits have been met.

40 CFR 60.108a(c)(6)(ix):

Flare or SRP TGU: **4UF Flare**

App D.54.a. / 40 CFR 60.108a(c)(6)(ii):

Start Date and Time of Event:**08/28/2014 2059 hrs.**

End Date and Time of Event: **08/29/2014 1859 hrs.**

The end of the flaring event is determined when the rolling 24-hour average emissions drops below 500 lbs.

App D.54.b. / 40 CFR 60.108a(c)(6)(iii)-(vii)

Volume of Gas Flared or (if SRP Tail Gas Incident) Combusted:

	Total	Over applicable limit
Total Volume of Gas Flared	**2162.23 MSCF**	**N/A**
Quantity of SO2 Emitted:	**1762.33 LBS**	**N/A**
Quantity of H2S Emitted: (assume 99% conversion to SO2)	**17.62 LBS**	**N/A**
Quantity of VOC Emitted:	**330.7 LBS**	**N/A**

Include details and assumptions used in the calculation including volumes and pollutant concentrations of gas (measured concentrations of total sulfur, H2S, or SO2 as appropriate). Use additional space as necessary.

4UF RCFA Emissions Summary_RS.xls

App D.54.c. / 40 CFR 60.108a(c)(6)(viii)

Identify the steps taken to limit the duration of the event, the volume of gas flared or combusted, and the quantity of SO2 and VOC emissions.

Cat Feed Hydrotreater Unit: Executed emergency shutdown procedures to safely depressure the unit to the 4UF Flare including the K801B compressor, unit feed pumps, and furnace.

Blend Oil Unit: Executed the loss of hydrogen emergency shutdown procedures to safely depressure the unit to the 4UF Flare.

The Operations Team metered the amount of nitrogen purge in a controlled manner into the Units' Reactors to minimize the quantity of H_2S/SO_2 emissions generated at the 4UF Flare during the Reactor cool down period.

App D.54.d. / 40 CFR 60.108a(c)(6)(ix)

Identification of the process unit/s involved in causing, or suspected of having caused, the event. (Use additional space as necessary.)

The process units involved in causing the flaring event were the Cat Feed Hydrotreating Unit (CFU) and the Blend Oil Unit (BOU).

App D.54.d. / 40 CFR 60.108a(c)(6)(ix)

Describe in detail the cause and the circumstances that lead to the event. (Use additional space as necessary.)

4UF Flaring Event : Execution of Emergency Shutdown Procedures.

On Thursday, August 27th at approximately 2100 hrs. a fire occurred at the CFHU compressor K-801B. The fire triggered immediate actions to execute the emergency shutdown procedures at both the CFHU and the BOU (CFHU feeds Hydrogen to BOU). At approximately 2300 hrs. on August 27th, the fire was extinguished.

As part of the emergency shutdown procedures, the Reactors at both units were nitrogen purged to the 4UF flare to displace the hydrogen/gas high in H_2S and to cool the Reactor Beds below 400 degree F. Additionally, process streams high in H_2S were drained to the unit's KO Drum, and were released to the 4 UF Flare.
The cause of the incident is still under investigation. This RCFA Report will be updated once the investigation is complete, and is anticipated to be completed by November 27, 2014.

App D.54.e. / 40 CFR 60.108a(c)(6)(x)

Describe the corrective measures undertaken and/or to be undertaken to avoid such an event in the future. Include schedule (including proposed commencement and completion dates) for corrective actions not completed with 45 days. If no corrective actions should be conducted, explain basis for conclusion. (Use additional space as necessary.)

Corrective Action	Complete (Yes/No)	If not complete, provide proposed	
		Commencement Date	Completion Date
The cause of the incident is still under investigation. Corrective actions will be identified in the final report.	**No**	**Pending**	**Pending**

Reported Submitted by (Investigation Team):

Llewellyn Reed II, Area Environmental Specialist (Team Lead)

Devin Halliday, Process Engineer

Nicholas Kornylo, Process Engineer

Rohini Sengupta, Environmental Specialist

Report Approved By

		10/10/14
Cameron Eveland, Operations Area Superintendent		Date

This Root Cause Failure Analysis and Corrective Action Plan shall be submitted to EPA in the semi-annual report due under Part VIII and in the NSPS Ja report, as applicable.

Appendix 10a – 2nd Half 2014 Carbon Canister Report

Appendix 10.a - BWON Single Carbon Canister Breakthrough Monitoring Report
3RD and 4TH Quarter 2014

Carbon Canister ID	Breakthrough Detected		Change - Out		Comments
	Date	*Time*	*Date*	*Time*	
90	7/1/14	7:58	7/1/14	11:05	
92	7/1/14	7:58	7/1/14	11:05	
93	7/1/14	7:58	7/1/14	11:05	
89	7/2/14	7:11	7/2/14	9:10	
95	7/2/14	7:11	7/2/14	9:10	
96	7/2/14	7:11	7/2/14	9:10	
88	7/3/14	8:09	7/3/14	9:30	
92	7/3/14	8:09	7/3/14	9:30	
94	7/3/14	8:09	7/3/14	9:30	
98	7/3/14	8:09	7/3/14	9:30	
91	7/4/14	6:14	7/4/14	6:40	
89	7/5/14	7:46	7/5/14	9:00	
90	7/5/14	7:46	7/5/14	9:00	
92	7/5/14	7:46	7/5/14	9:00	
93	7/5/14	7:46	7/5/14	9:00	
96	7/5/14	7:46	7/5/14	9:00	
98	7/5/14	7:46	7/5/14	9:00	
89	7/6/14	7:21	7/6/14	8:30	
90	7/6/14	7:21	7/6/14	8:30	
91	7/6/14	7:21	7/6/14	8:30	
97	7/6/14	7:21	7/6/14	8:30	
98	7/6/14	7:21	7/6/14	8:30	
88	7/7/14	7:45	7/7/14	9:05	
90	7/7/14	7:45	7/7/14	9:05	
94	7/7/14	7:45	7/7/14	9:05	
92	7/8/14	10:53	7/8/14	11:15	
93	7/8/14	10:53	7/8/14	11:15	
95	7/8/14	10:53	7/8/14	11:15	
96	7/8/14	10:53	7/8/14	11:15	
88	7/9/14	7:43	7/9/14	9:25	
89	7/9/14	7:43	7/9/14	9:25	
90	7/9/14	7:43	7/9/14	9:25	
91	7/9/14	7:43	7/9/14	9:25	
94	7/9/14	7:43	7/9/14	9:25	
92	7/10/14	8:10	7/10/14	11:50	
93	7/10/14	8:10	7/10/14	11:50	
95	7/10/14	8:10	7/10/14	11:50	
96	7/10/14	8:10	7/10/14	11:50	
97	7/10/14	8:10	7/10/14	11:50	
98	7/10/14	8:10	7/10/14	11:50	
90	7/11/14	7:40	7/11/14	8:55	
91	7/11/14	7:40	7/11/14	8:55	
88	7/13/14	7:44	7/13/14	10:30	
89	7/13/14	7:44	7/13/14	10:30	
90	7/13/14	7:44	7/13/14	10:30	
91	7/13/14	7:44	7/13/14	10:30	
92	7/13/14	7:44	7/13/14	10:30	
93	7/13/14	7:44	7/13/14	10:30	
94	7/13/14	7:44	7/13/14	10:30	
95	7/13/14	7:44	7/13/14	10:30	
96	7/13/14	7:44	7/13/14	10:30	
97	7/13/14	7:44	7/13/14	10:30	
98	7/13/14	7:44	7/13/14	10:30	
90	7/15/14	7:52	7/15/14	11:55	
91	7/15/14	7:52	7/15/14	11:55	

Appendix 10.a - BWON Single Carbon Canister Breakthrough Monitoring Report
3RD and 4TH Quarter 2014

Carbon Canister ID	Breakthrough Detected		Change - Out		Comments
	Date	*Time*	*Date*	*Time*	
93	7/15/14	7:52	7/15/14	11:55	
95	7/15/14	7:52	7/15/14	11:55	
97	7/15/14	7:52	7/15/14	11:55	
98	7/15/14	7:52	7/15/14	11:55	
89	7/16/14	8:21	7/16/14	10:15	
92	7/16/14	8:21	7/16/14	10:15	
96	7/16/14	8:21	7/16/14	10:15	
88	7/17/14	8:12	7/17/14	11:25	
94	7/17/14	8:12	7/17/14	11:25	
91	7/19/14	7:11	7/19/14	10:25	
93	7/19/14	7:11	7/19/14	10:25	
95	7/19/14	7:11	7/19/14	10:25	
98	7/19/14	7:11	7/19/14	10:25	
89	7/20/14	7:53	7/20/14	10:25	
90	7/20/14	7:53	7/20/14	10:25	
92	7/20/14	7:53	7/20/14	10:25	
96	7/20/14	7:53	7/20/14	10:25	
97	7/20/14	7:53	7/20/14	10:25	
88	7/21/14	8:12	7/21/14	11:50	
94	7/21/14	8:12	7/21/14	11:50	
91	7/22/14	7:58	7/22/14	10:35	
93	7/22/14	7:58	7/22/14	10:35	
95	7/22/14	7:58	7/22/14	10:35	
98	7/22/14	7:58	7/22/14	10:35	
88	7/23/14	7:46	7/23/14	13:15	
89	7/23/14	7:46	7/23/14	13:15	
90	7/23/14	7:46	7/23/14	13:15	
92	7/23/14	7:46	7/23/14	13:15	
94	7/23/14	7:46	7/23/14	13:15	
96	7/23/14	7:46	7/23/14	13:15	
97	7/23/14	7:46	7/23/14	13:15	
93	7/24/14	7:59	7/24/14	10:40	
95	7/24/14	7:59	7/24/14	10:40	
96	7/24/14	7:59	7/24/14	10:40	
98	7/24/14	7:59	7/24/14	10:40	
88	7/25/14	7:55	7/25/14	10:30	
89	7/25/14	7:55	7/25/14	10:30	
90	7/25/14	7:55	7/25/14	10:30	
91	7/25/14	7:55	7/25/14	10:30	
92	7/25/14	7:55	7/25/14	10:30	
97	7/25/14	7:55	7/25/14	10:30	
94	7/26/14	7:25	7/26/14	11:00	
93	7/27/14	7:50	7/27/14	10:00	
96	7/27/14	7:50	7/27/14	10:00	
98	7/27/14	7:50	7/27/14	10:00	
88	7/28/14	7:54	7/28/14	11:00	
91	7/28/14	7:54	7/28/14	11:00	
97	7/28/14	7:54	7/28/14	11:00	
89	7/29/14	8:32	7/29/14	14:10	
90	7/29/14	8:32	7/29/14	14:10	
92	7/29/14	8:32	7/29/14	14:10	
93	7/29/14	8:32	7/29/14	14:10	
94	7/29/14	8:32	7/29/14	14:10	
95	7/29/14	8:32	7/29/14	14:10	
96	7/29/14	8:32	7/29/14	14:10	

Appendix 10.a - BWON Single Carbon Canister Breakthrough Monitoring Report
3RD and 4TH Quarter 2014

Carbon Canister ID	Breakthrough Detected		Change - Out		Comments
	Date	*Time*	*Date*	*Time*	
98	7/29/14	8:32	7/29/14	14:10	
88	7/30/14	7:45	7/30/14	12:15	
91	7/30/14	7:45	7/30/14	12:15	
97	7/30/14	7:45	7/30/14	12:15	
90	8/1/14	7:44	8/1/14	10:30	
92	8/1/14	7:44	8/1/14	10:30	
98	8/1/14	7:44	8/1/14	10:30	
90	8/2/14	8:09	8/2/14	11:00	
91	8/2/14	8:09	8/2/14	11:00	
98	8/2/14	8:09	8/2/14	11:00	
89	8/3/14	11:47	8/3/14	12:30	
91	8/3/14	11:47	8/3/14	12:30	
92	8/3/14	11:47	8/3/14	12:30	
93	8/3/14	11:47	8/3/14	12:30	
98	8/3/14	11:47	8/3/14	12:30	
94	8/4/14	8:24	8/4/14	10:45	
95	8/4/14	8:24	8/4/14	10:45	
96	8/4/14	8:24	8/4/14	10:45	
97	8/4/14	8:24	8/4/14	10:45	
88	8/6/14	7:50	8/6/14	10:10	
90	8/6/14	7:50	8/6/14	10:10	
91	8/6/14	7:50	8/6/14	10:10	
93	8/6/14	7:50	8/6/14	10:10	
98	8/6/14	7:50	8/6/14	10:10	
89	8/7/14	7:56	8/7/14	10:45	
92	8/7/14	7:56	8/7/14	10:45	
94	8/7/14	7:56	8/7/14	10:45	
95	8/7/14	7:56	8/7/14	10:45	
97	8/7/14	7:56	8/7/14	10:45	
96	8/8/14	7:54	8/8/14	8:45	
90	8/9/14	7:18	8/9/14	12:35	
91	8/9/14	7:18	8/9/14	12:35	
98	8/9/14	7:18	8/9/14	12:35	
88	8/10/14	8:56	8/10/14	11:20	
93	8/10/14	8:56	8/10/14	11:20	
97	8/11/14	7:46	8/11/14	9:05	
89	8/12/14	8:50	8/12/14	12:30	
92	8/12/14	8:50	8/12/14	12:30	
95	8/12/14	8:50	8/12/14	12:30	
96	8/12/14	8:50	8/12/14	12:30	
94	8/13/14	8:32	8/13/14	9:20	
90	8/14/14	8:08	8/14/14	14:30	
91	8/14/14	8:08	8/14/14	14:30	
98	8/14/14	8:08	8/14/14	14:30	
88	8/15/14	7:51	8/15/14	10:55	
88	8/16/14	7:37	8/16/14	10:00	
90	8/16/14	7:37	8/16/14	10:00	
91	8/16/14	7:37	8/16/14	10:00	
92	8/16/14	7:37	8/16/14	10:00	
95	8/16/14	7:37	8/16/14	10:00	
96	8/16/14	7:37	8/16/14	10:00	
97	8/16/14	7:37	8/16/14	10:00	
98	8/16/14	7:37	8/16/14	10:00	
89	8/17/14	7:55	8/17/14	8:40	
94	8/18/14	8:31	8/18/14	9:35	

Appendix 10.a - BWON Single Carbon Canister Breakthrough Monitoring Report
3RD and 4TH Quarter 2014

Carbon Canister ID	Breakthrough Detected		Change - Out		Comments
	Date	*Time*	*Date*	*Time*	
93	8/19/14	7:58	8/19/14	9:50	
88	8/20/14	7:56	8/20/14	9:50	
90	8/20/14	7:56	8/20/14	9:50	
91	8/20/14	7:56	8/20/14	9:50	
92	8/20/14	7:56	8/20/14	9:50	
95	8/20/14	7:56	8/20/14	9:50	
96	8/20/14	7:56	8/20/14	9:50	
97	8/20/14	7:56	8/20/14	9:50	
98	8/20/14	7:56	8/20/14	9:50	
89	8/21/14	8:27	8/21/14	10:20	
93	8/22/14	7:43	8/22/14	9:05	
94	8/22/14	7:43	8/22/14	9:05	
91	8/23/14	7:16	8/23/14	11:15	
92	8/23/14	7:16	8/23/14	11:15	
94	8/23/14	7:16	8/23/14	11:15	
88	8/24/14	7:46	8/24/14	10:00	
90	8/24/14	7:46	8/24/14	10:00	
91	8/24/14	7:46	8/24/14	10:00	
92	8/24/14	7:46	8/24/14	10:00	
94	8/24/14	7:46	8/24/14	10:00	
97	8/24/14	7:46	8/24/14	10:00	
93	8/25/14	8:19	8/25/14	9:20	
95	8/25/14	8:19	8/25/14	9:20	
96	8/25/14	8:19	8/25/14	9:20	
98	8/25/14	8:19	8/25/14	9:20	
88	8/27/14	8:17	8/27/14	9:30	
89	8/27/14	8:17	8/27/14	9:30	
90	8/27/14	8:17	8/27/14	9:30	
92	8/27/14	8:17	8/27/14	9:30	
97	8/29/14	7:51	8/29/14	9:00	
96	8/30/14	8:45	8/30/14	8:45	
98	8/30/14	8:45	8/30/14	8:45	
94	8/31/14	7:37	8/31/14	8:20	
95	8/31/14	7:37	8/31/14	8:20	
90	9/1/14	7:33	9/1/14	9:15	
91	9/1/14	7:33	9/1/14	9:15	
92	9/1/14	7:33	9/1/14	9:15	
94	9/1/14	7:33	9/1/14	9:15	
98	9/1/14	7:33	9/1/14	9:15	
88	9/2/14	8:10	9/2/14	9:40	
89	9/2/14	8:10	9/2/14	9:40	
93	9/2/14	8:10	9/2/14	9:40	
96	9/4/14	7:49	9/4/14	10:20	
97	9/4/14	7:49	9/4/14	10:20	
95	9/5/14	8:14	9/5/14	9:35	
98	9/5/14	8:14	9/5/14	9:35	
88	9/6/14	7:23	9/6/14	10:30	
89	9/6/14	7:23	9/6/14	10:30	
90	9/6/14	7:23	9/6/14	10:30	
91	9/6/14	7:23	9/6/14	10:30	
92	9/6/14	7:23	9/6/14	10:30	
93	9/6/14	7:23	9/6/14	10:30	
94	9/6/14	7:23	9/6/14	10:30	
95	9/6/14	7:23	9/6/14	10:30	
96	9/6/14	7:23	9/6/14	10:30	

Appendix 10.a - BWON Single Carbon Canister Breakthrough Monitoring Report
3RD and 4TH Quarter 2014

Carbon Canister ID	Breakthrough Detected		Change - Out		Comments
	Date	*Time*	*Date*	*Time*	
97	9/6/14	7:23	9/6/14	10:30	
98	9/6/14	7:23	9/6/14	10:30	
88	9/10/14	8:24	9/10/14	9:40	
89	9/10/14	8:24	9/10/14	9:40	
90	9/10/14	8:24	9/10/14	9:40	
91	9/10/14	8:24	9/10/14	9:40	
92	9/10/14	8:24	9/10/14	9:40	
93	9/10/14	8:24	9/10/14	9:40	
95	9/10/14	8:24	9/10/14	9:40	
96	9/10/14	8:24	9/10/14	9:40	
97	9/10/14	8:24	9/10/14	9:40	
98	9/10/14	8:24	9/10/14	9:40	
94	9/13/14	7:18	9/13/14	8:30	
88	9/14/14	7:13	9/14/14	9:20	
89	9/14/14	7:13	9/14/14	9:20	
90	9/14/14	7:13	9/14/14	9:20	
91	9/14/14	7:13	9/14/14	9:20	
92	9/14/14	7:13	9/14/14	9:20	
93	9/14/14	7:13	9/14/14	9:20	
95	9/14/14	7:13	9/14/14	9:20	
96	9/14/14	7:13	9/14/14	9:20	
97	9/14/14	7:13	9/14/14	9:20	
98	9/14/14	7:13	9/14/14	9:20	
88	9/18/14	8:23	9/18/14	11:20	
89	9/18/14	8:23	9/18/14	11:20	
90	9/18/14	8:23	9/18/14	11:20	
91	9/18/14	8:23	9/18/14	11:20	
92	9/18/14	8:23	9/18/14	11:20	
93	9/18/14	8:23	9/18/14	11:20	
94	9/18/14	8:23	9/18/14	11:20	
95	9/18/14	8:23	9/18/14	11:20	
96	9/18/14	8:23	9/18/14	11:20	
97	9/18/14	8:23	9/18/14	11:20	
98	9/18/14	8:23	9/18/14	11:20	
94	9/20/14	8:10	9/20/14	8:45	
96	9/20/14	8:10	9/20/14	8:45	
88	9/21/14	8:04	9/21/14	8:45	
89	9/21/14	8:04	9/21/14	8:45	
90	9/21/14	8:04	9/21/14	8:45	
91	9/21/14	8:04	9/21/14	8:45	
92	9/21/14	8:04	9/21/14	8:45	
93	9/21/14	8:04	9/21/14	8:45	
95	9/21/14	8:04	9/21/14	8:45	
96	9/21/14	8:04	9/21/14	8:45	
97	9/21/14	8:04	9/21/14	8:45	
98	9/21/14	8:04	9/21/14	8:45	
88	9/24/14	8:09	9/24/14	9:25	
89	9/24/14	8:09	9/24/14	9:25	
90	9/24/14	8:09	9/24/14	9:25	
91	9/24/14	8:09	9/24/14	9:25	
92	9/24/14	8:09	9/24/14	9:25	
93	9/24/14	8:09	9/24/14	9:25	
94	9/24/14	8:09	9/24/14	9:25	
95	9/24/14	8:09	9/24/14	9:25	
96	9/24/14	8:09	9/24/14	9:25	

Appendix 10.a - BWON Single Carbon Canister Breakthrough Monitoring Report
3RD and 4TH Quarter 2014

Carbon Canister ID	Breakthrough Detected		Change - Out		Comments
	Date	*Time*	*Date*	*Time*	
97	9/24/14	8:09	9/24/14	9:25	
98	9/24/14	8:09	9/24/14	9:25	
88	9/27/14	7:24	9/27/14	10:30	
89	9/27/14	7:24	9/27/14	10:30	
92	9/27/14	7:24	9/27/14	10:30	
95	9/27/14	7:24	9/27/14	10:30	
96	9/27/14	7:24	9/27/14	10:30	
98	9/27/14	7:24	9/27/14	10:30	
94	9/28/14	8:03	9/28/14	9:15	
95	9/28/14	8:03	9/28/14	9:15	
96	9/28/14	8:03	9/28/14	9:15	
98	9/28/14	8:03	9/28/14	9:15	
94	9/29/14	8:03	9/29/14	9:15	
95	9/29/14	8:03	9/29/14	9:15	
96	9/29/14	8:03	9/29/14	9:15	
98	9/29/14	8:03	9/29/14	9:15	
88	9/30/14	7:47	9/30/14	9:15	
89	9/30/14	7:47	9/30/14	9:15	
92	9/30/14	7:47	9/30/14	9:15	
90	10/2/14	8:07	10/2/14	10:30	
91	10/2/14	8:07	10/2/14	10:30	
93	10/2/14	8:07	10/2/14	10:30	
97	10/2/14	8:07	10/2/14	10:30	
95	10/3/14	7:56	10/3/14	9:20	
96	10/3/14	7:56	10/3/14	9:20	
94	10/4/14	8:25	10/4/14	9:15	
98	10/4/14	8:25	10/4/14	9:15	
88	10/5/14	8:12	10/5/14	9:10	
91	10/5/14	8:12	10/5/14	9:10	
92	10/5/14	8:12	10/5/14	9:10	
97	10/5/14	8:12	10/5/14	9:10	
89	10/6/14	8:03	10/6/14	9:10	
90	10/6/14	8:03	10/6/14	9:10	
93	10/6/14	8:03	10/6/14	9:10	
94	10/6/14	8:03	10/6/14	9:10	
95	10/6/14	8:03	10/6/14	9:10	
96	10/6/14	8:03	10/6/14	9:10	
98	10/6/14	8:03	10/6/14	9:10	
88	10/7/14	7:59	10/7/14	10:12	
92	10/8/14	8:24	10/8/14	9:45	
97	10/8/14	8:24	10/8/14	9:45	
91	10/9/14	7:55	10/9/14	11:35	
89	10/10/14	9:18	10/10/14	11:20	
90	10/10/14	9:18	10/10/14	11:20	
93	10/10/14	9:18	10/10/14	11:20	
94	10/10/14	9:18	10/10/14	11:20	
95	10/10/14	9:18	10/10/14	11:20	
98	10/10/14	9:18	10/10/14	11:20	
88	10/11/14	7:46	10/11/14	8:35	
96	10/11/14	7:46	10/11/14	8:35	
91	10/15/14	8:39	10/15/14	10:12	
92	10/15/14	8:39	10/15/14	10:12	
93	10/15/14	8:39	10/15/14	10:12	
97	10/15/14	8:39	10/15/14	10:12	
88	10/16/14	8:33	10/16/14	10:15	

Appendix 10.a - BWON Single Carbon Canister Breakthrough Monitoring Report
3RD and 4TH Quarter 2014

Carbon Canister ID	Breakthrough Detected		Change - Out		Comments
	Date	*Time*	*Date*	*Time*	
89	10/16/14	8:33	10/16/14	10:15	
90	10/16/14	8:33	10/16/14	10:15	
95	10/16/14	8:33	10/16/14	10:15	
96	10/16/14	8:33	10/16/14	10:15	
94	10/17/14	8:21	10/17/14	10:15	
91	10/18/14	8:19	10/18/14	9:45	
93	10/18/14	8:19	10/18/14	9:45	
97	10/18/14	8:19	10/18/14	9:45	
98	10/18/14	8:19	10/18/14	9:45	
96	10/19/14	8:12	10/19/14	9:18	
88	10/22/14	8:20	10/22/14	9:40	
89	10/22/14	8:20	10/22/14	9:40	
90	10/22/14	8:20	10/22/14	9:40	
91	10/22/14	8:20	10/22/14	9:40	
92	10/22/14	8:20	10/22/14	9:40	
93	10/22/14	8:20	10/22/14	9:40	
94	10/22/14	8:20	10/22/14	9:40	
95	10/22/14	8:20	10/22/14	9:40	
97	10/22/14	8:20	10/22/14	9:40	
96	10/23/14	9:10	10/23/14	11:25	
98	10/23/14	9:10	10/23/14	11:25	
93	10/25/14	7:07	10/25/14	10:10	
88	10/26/14	7:39	10/26/14	9:00	
89	10/26/14	7:39	10/26/14	9:00	
90	10/26/14	7:39	10/26/14	9:00	
97	10/26/14	7:39	10/26/14	9:00	
91	10/27/14	8:03	10/27/14	9:55	
92	10/27/14	8:03	10/27/14	9:55	
94	10/27/14	8:03	10/27/14	9:55	
95	10/27/14	8:03	10/27/14	9:55	
96	10/27/14	8:03	10/27/14	9:55	
98	10/27/14	8:03	10/27/14	9:55	
88	11/1/14	7:42	11/1/14	12:20	
89	11/1/14	7:42	11/1/14	12:20	
90	11/1/14	7:42	11/1/14	12:20	
93	11/1/14	7:42	11/1/14	12:20	
97	11/1/14	7:42	11/1/14	12:20	
95	11/2/14	8:05	11/2/14	9:15	
91	11/4/14	7:39	11/4/14	11:15	
98	11/4/14	7:39	11/4/14	11:15	
90	11/11/14	7:53	11/11/14	11:55	
92	11/11/14	7:53	11/11/14	11:55	
94	11/11/14	7:53	11/11/14	11:55	
97	11/11/14	7:53	11/11/14	11:55	
88	11/13/14	8:08	11/13/14	14:15	
89	11/13/14	8:08	11/13/14	14:15	
93	11/13/14	8:08	11/13/14	14:15	
95	11/15/14	8:40	11/15/14	10:55	
91	11/16/14	8:37	11/16/14	10:00	
90	11/17/14	8:04	11/17/14	9:30	
97	11/17/14	8:04	11/17/14	9:30	
98	11/17/14	8:04	11/17/14	9:30	
88	11/19/14	8:17	11/19/14	11:50	
89	11/19/14	8:17	11/19/14	11:50	
92	11/19/14	8:17	11/19/14	11:50	

Appendix 10.a - BWON Single Carbon Canister Breakthrough Monitoring Report
3RD and 4TH Quarter 2014

Carbon Canister ID	Breakthrough Detected		Change - Out		Comments
	Date	*Time*	*Date*	*Time*	
93	11/19/14	8:17	11/19/14	11:50	
94	11/20/14	8:11	11/20/14	9:25	
95	11/21/14	8:19	11/21/14	12:30	
91	11/23/14	9:06	11/23/14	10:15	
90	11/24/14	8:23	11/24/14	10:00	
96	11/26/14	8:20	11/26/14	9:25	
97	11/26/14	8:20	11/26/14	9:25	
98	11/26/14	8:20	11/26/14	9:25	
89	11/27/14	8:08	11/27/14	9:20	
92	11/30/14	8:25	11/30/14	9:20	
93	11/30/14	8:25	11/30/14	9:20	
94	11/30/14	8:25	11/30/14	9:20	
95	11/30/14	8:25	11/30/14	9:20	
90	12/5/14	8:46	12/5/14	9:40	
91	12/5/14	8:46	12/5/14	9:40	
98	12/6/14	7:48	12/6/14	9:00	
89	12/12/14	8:08	12/12/14	10:30	
93	12/12/14	8:08	12/12/14	10:30	
95	12/12/14	8:08	12/12/14	10:30	
96	12/12/14	8:08	12/12/14	10:30	
97	12/12/14	8:08	12/12/14	10:30	
92	12/13/14	8:33	12/13/14	10:30	
94	12/13/14	8:33	12/13/14	10:30	
90	12/14/14	8:27	12/14/14	9:40	
91	12/15/14	8:25	12/15/14	9:15	
98	12/15/14	8:25	12/15/14	9:15	
91	12/19/14	8:35	12/19/14	9:40	
88	12/21/14	7:50	12/21/14	9:10	
89	12/21/14	7:50	12/21/14	9:10	
95	12/21/14	7:50	12/21/14	9:10	
90	12/22/14	7:58	12/22/14	9:30	
96	12/22/14	7:58	12/22/14	9:30	
97	12/22/14	7:58	12/22/14	9:30	
93	12/23/14	7:50	12/23/14	10:35	
94	12/23/14	7:50	12/23/14	10:35	
91	12/25/14	8:41	12/25/14	9:45	
89	12/28/14	8:48	12/28/14	9:50	
92	12/28/14	8:48	12/28/14	9:50	
88	12/29/14	8:07	12/29/14	9:40	
90	12/29/14	8:07	12/29/14	9:40	
95	12/29/14	8:07	12/29/14	9:40	

Appendix 10b – 2nd Half 2014 Unsafe to Monitor Carbon Canister Report

BWON Semiannual Report
Appendix 10.b Single and Dualbed Canisters Unsafe to Monitor
3RD and 4TH QUARTER 2014

Carbon Canister ID	Scheduled Monitoring Date	Remonitored Date
27	7/17/14	7/18/14
28	7/17/14	7/18/14
29	7/17/14	7/18/14
86	7/29/14	7/30/14
60	7/31/14	8/1/14
66	8/15/14	8/16/14
Temporary Cleaning Frac Tank Carbon Canister System	8/20/14	8/21/14
35	8/24/14	8/25/14
36	8/24/14	8/25/14
123	9/1/14	9/2/14
125	9/1/14	9/2/14
86	9/26/14	9/29/14
66	10/6/14	10/8/14
117	12/7/14	12/8/14
118	12/7/14	12/8/14
108	12/9/14	12/10/14
99	10/2/14	10/4/14
117	11/3/14	11/4/14
125	11/3/14	11/4/14
114	11/3/14	11/4/14

Appendix 11a – Laboratory Audit Report – Microbac

BWON NESHAP LABORATORY AUDIT REPORT

MICROBAC - MERRILLVILLE, INDIANA

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November 24, 2014

Project Number: 141401.0174

BWON NESHAP LABORATORY AUDIT REPORT

Microbac - Merrillville, Indiana

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BWON NESHAP LABORATORY AUDIT REPORT

Microbac - Merrillville, Indiana

1. INTRODUCTION

The BP – Whiting Business Unit (BP) requested that Trinity Consultants (Trinity) perform a Benzene Waste Operations (BWON) NESHAP Laboratory Audit at the Microbac Laboratories, Inc. (Microbac) facility in Merrillville, Indiana. Lead Auditor, Steve Freeman of Trinity completed the audit in accordance with Proposal number 141401.0174 on September 30, 2014. During the audit, Trinity reviewed all of the analytical areas and methods of the laboratory associated with BWON NESHAP analysis of samples submitted by BP. Trinity conducted the audit according to the agreed upon scope of work including but not limited to the following:

- Size, cleanliness, and organization of the laboratory;
- Sample bottle preparation areas, sample receiving, storage and log-in procedures;
- Quantity, age, availability, scheduled maintenance and performance of the instrumentation;
- Availability, appropriateness, and utilization of the Quality Assurance Plan (QAP) and Standard Operating Procedures (SOPs);
- Staff qualifications/experience and personnel training programs;
- Results of performance evaluation (PE) samples (as conducted for state or national certification programs);
- Reagents, standards, and sample storage facilities;
- Standards preparation, preparation logbooks, and raw data;
- Bench sheets and analytical logbook maintenance and review; and
- Review of the sample analysis/data package inspections and data management procedures.

This report provides an overview of the BWON NESHAP Laboratory Audit conducted at the Microbac, Merrillville, Indiana facility.

2. LABORATORY AUDIT METHOD

Prior to the laboratory audit, the Microbac management were asked to complete a pre-audit questionnaire provided by BP. Trinity also requested the following documentation for review:

- Laboratory Organization Chart
- Quality Assurance Plan/Manual
- Standard Operating Procedures - listing of the standard operating procedures
- Health & Safety Plan/Chemical Hygiene Plan
- Laboratory Certifications
- Performance Evaluation Studies

Ms. Donna Ruokonen, the Laboratory Quality Assurance Director, provided the requested documentation including the completed pre-audit questionnaire. Trinity reviewed all the documentation and prepared an audit agenda for the day. This documentation is provided as attachments to this audit report.

At the start of the on-site audit Trinity conducted an opening meeting with Microbac to discuss the audit methodology, the agenda and any logistical considerations necessary to ensure a complete and comprehensive audit. Trinity next toured the facility with Ms. Ruokonen acting as escort. During the audit Trinity met with and interviewed a sampling of the Laboratory Technicians, Supervisors, Laboratory Operations Management, Project Managers and Facility Management. Trinity audited the following laboratory operations:

- Sample container shipping and sample receipt
- Sample handling and storage
- Analytical laboratories with emphasis on volatiles analysis
- Waste disposal storage areas
- Water purification systems
- Quality assurance program and project management
- Data and Report review and preparation
- Data management and storage
- Record retention areas

In addition, the following were audited to determine if the laboratory programs and methods were adequate and effective:

- Personnel including their qualifications, education and training
- Methods of sample container identification, preservation and shipment
- Methods of sample receipt, identification, logging and refrigerated storage
- Lab sample tracking and preparation
- Sample analysis methods including equipment calibration and maintenance
- Test method adherence to standard methods
- Consistency of results by varying technicians and equipment setups
- Management of analytical results and data reporting
- Project management including report writing
- Quality assurance program including multiple reviews of reports
- Internal and external audit programs
- Laboratory certifications to NELAC

3. AUDIT RESULTS

Sample Bottle & Container Area: The sample bottle & container preparation and shipping area was well organized and clean. All sample containers are new and purchased from an outside vendor. When appropriate, the containers are purchased with the required preservative. All bottles and containers arrive in sealed cartons. Lab coolers are owned by Microbac and reused. All coolers are cleaned per procedure and dried prior to shipping to clients. Blank Chain of Custody forms can be shipped with the containers and coolers for the clients to fill out and return with their samples. In general, Microbac field personnel fill out and return the Chain of Custody forms with samples they draw from client sites.

Sample Receipt Area & Sample Storage: The sample receipt area is well organized and clean. All samples are received during normal business hours which are extended as needed to accommodate clients. All samples are checked for sample identification, temperature, integrity, Chain of Custody, custody seals, preservatives, hold times and logged into the lab LIMS system. All BWON NESHAP samples go into refrigerated storage immediately after being logged in and checked. The refrigerator temperature is monitored with routine checks of a calibrated thermometer during the work day but is not checked at times when personnel are not present in the laboratory such as overnight and on weekends. The temperature of the main walk-in cooler for non-BWON NESHAP samples is connected to a 24/7 monitoring system by an outside firm with automatic calls to the Operations Manager if there is an electric power interruption. In these situations, the Operations Managers comes to the laboratory and checks on all the cooler and refrigerator temperatures including the BWON NESHAP refrigerator in the Volatile Lab. A unique aspect of the refrigerated storage used for the BWON NESHAP samples is that the storage refrigerator is inside the Volatile Laboratory that will test the samples. As a result, the BWON NESHAP samples do not get mixed with client non-volatile samples. It also ensures the laboratory technicians that perform the analyses are aware of the presence of the samples and have the ability to fully control the scheduling of the analyses. Any issues are noted in the LIMS System and discussed with the Project Managers and the client.

Laboratories: Analysis laboratories were in good condition, neat and organized. Technicians are notified of samples needing analysis through a daily backlog report which also tracks sample identification and hold times. Each sample has its own unique bar code label that matches the barcodes on the backlog report. The Volatiles laboratory is maintained with a positive air pressure to avoid cross contamination from other labs. Personnel access is also limited and controlled. Appropriate GC/MS instrumentation is utilized for the BWON NESHAP analyses using the accepted 624 & 8260B methodologies. All equipment is calibrated according to established standards. All chemicals used in the analyses are reagent

grade and within allowed expiration dates. Water used is purified using a deionizer followed by an ultra-filtration system. Samples are prescreened to determine appropriate dilution levels and rerun if the dilution is not correct. Method blanks and standards are inserted into the analysis sequence to check for any cross contamination or carry over issues. Auto-samplers run the samples in sequence with the run sheets and computer tracking. Samples, standards and surrogates are maintained in refrigerated storage and within hold times and expiration dates. All equipment is well maintained and calibrated at the appropriate frequency. Any deviations, repairs or adjustments due to maintenance are recorded in logbooks and approved by supervisory personnel. Samples are checked for ph after the GC/MS analysis is complete to ensure that sample preservation occurred properly. Any deviations from normal procedure are noted in the records and discussed with the Project Managers for consultation with the clients.

Waste Management: Samples are retained for 30 days prior to disposal. Non-hazardous waste and samples are appropriately disposed. Hazardous waste is identified, handled and stored within the building. BP NPDES BWON NESHAP samples are emptied into a bucket of limestone gravel for neutralization and disposed into a sink drain leading to the sanitary sewer.

Data and Record Management: All data is managed through the LIMS system. Analytical results are first reviewed by the technician doing the work. A second review occurs by the lab supervision. Records of these reviews are maintained within the LIMS system. After these reviews are completed the data is sent to the Project Manager for writing of the final report. The Project Manager also completes a final review of the data. The Quality Assurance Director completes additional report reviews on a sampling basis. All data on the computer system is partially backed-up during the day to the cloud with a full back-up daily. Macrobac Corporate IT Group in Valpariso, Indiana controls the back-up process. Hard copy records are being phased out and limited to non-client information.

Documentation: Standard Operating Procedures and Manuals were up to date, available and had current revision numbers.

Accreditation: The Microbac Merrillville, Indiana Laboratory has multiple Accreditations for multiple purposes. NELAC Accreditations appropriate to the BWON NESHAP Wastewater analysis for Benzene were current for Illinois, Kansas, Wisconsin and North Carolina. The Kansas Accreditation is primary. The other state Accreditations are through reciprocal arrangements with Kansas based on the Kansas accreditation audit program.

Health and Safety: Commitment to health and safety was good. The Chemical Hygiene Plan defines the laboratory program. Observations indicate the health and safety regulations

were being followed. Technicians were wearing appropriate safety glasses, lab coats, and using chemical resistant gloves. Eye wash/deluge shower stations and fire extinguishers were easily accessible and being inspected properly. Exits were not blocked and were properly marked. Compressed gas cylinders were secured.

Training: Personnel were properly qualified, well trained and very knowledgeable. Records of training and evaluations were up to date and complete. Demonstration of Capability certificates were issued and current with one minor exception.

Security: A perimeter security system monitors the building on a 24 hour, 7 day basis with appropriate alerts going to Microbac personnel. All exterior doors and windows were being maintained closed and locked from the outside except for the main lobby which also serves as the sample receiving door during normal business hours. An issue existed with access to the client sample walk-in cooler located in the main lobby. This did not affect the BWON NESHAP samples that are stored in the Volatile Laboratory refrigerator but could affect other non-BWON samples.

Conclusions: The laboratory was well run and performing analysis in an effective manner. A few minor issues were observed indicating some improvements are desirable. One significant issue was observed and is shown as the one finding for the audit below.

4. AUDIT FINDINGS AND RECOMMENDATIONS

Findings:

1. The Microbac Merrillville, Indiana Laboratory disposes of the analyzed, BP NPDES BWON NESHAP samples by pouring them into a bucket filled with limestone gravel. The samples flow through holes in the bottom of the bucket to a sink drain leading to a sanitary sewer. Oily waste water samples are disposed as hazardous waste according to RCRA requirements. (On the day of the audit, the Microbac personnel most familiar with the disposal process and its regulatory implications were not available. As a result, there was some confusion on the disposal of the clean water waste from BP effluent versus contaminated hazardous waste from any other process samples.)

   The BP NPDES BWON NESHAP samples are checked for pH after being initially analyzed. In some cases the samples are preserved and have a pH at the time of analysis that is sufficient to potentially make them hazardous waste upon disposal. In addition, the samples may contain materials such as benzene or solvents in low quantities. It was stated by Microbac personnel that when these materials were detected the samples would be disposed as hazardous waste. Further, the pH increases with time and the samples are not hazardous waste by the time they are disposed.

   Although the time factor and process of neutralization being used may alter the pH to the point that the samples are not hazardous waste based on their acidity, there was no evidence available during the audit to demonstrate that the process was adequate nor that the resulting wastewater samples were not hazardous waste at the time of disposal. The pH of the treated wastewater was not being checked during the audit and there was no available analysis for any other residual materials such as solvents or benzene. Although requested, no procedures nor verification documentation were made available during the audit as to the effectiveness of this process.

   In response to the issue described, a teleconference with Microbac Labs and BP was held on November 7, 2014 to gather additional information that was not available on the day of the audit. In the interim, Microbac was also asked if they had a Pretreatment waste water permit that might affect the disposal of the BP NPDES BWON NESHAP samples. Microbac stated there was no permit that affects this situation. In the teleconference Microbac stated they would provide their procedures for the disposal of the samples to clarify that only clean nonhazardous waste water samples are disposed by use of the limestone gravel bucket and the verification that

the process was effective. As of the date of this report, November 24, 2014, this additional information has not been received. Microbac has communicated that they are still working on the information and are doing internal audits of their procedures.

Recommendations for Improvement:

1. The client sample walk-in cooler in the main lobby was observed on two occasions to be unlocked while the lobby door was also unlocked. No one was in the lobby to control access to the cooler by individuals entering the building from the outside at these times. This could allow an unknown individual to enter the building and directly access the client samples without detection. It was noted that client BWON NESHAP samples are not kept in this walk-in cooler and therefore would not be at risk; however, other clients' samples were accessible. It is recommended to keep the cooler locked at all times that no one is in the lobby.

2. The Volatile Lab sample refrigerator is monitored for temperature with a calibrated thermometer inside the refrigerator. It may be of benefit to check the distribution of temperature throughout the refrigerator to ensure that all sample storage points inside the refrigerator are within allowed temperature limits. The current single point monitoring may not be representative of all areas inside this large, multiple shelf refrigerator.

3. It was stated that CCV Standards are routinely checked to ensure they are not expired. One vial of CCV Standard was observed in its refrigerator and past its expiration date. This vial was available for use but not actually in use. It is recommended to ensure that all Standards are within their expiration dates immediate prior to each use.

4. The third level reviews of analysis reports are performed by the Project Manager. The evidence that these reviews have occurred is the signature of the Project Manager on the reports; however, the Project Management Procedure does not specify that the evidence of this review is the signature. It is recommended to clarify this point in the procedure.

5. Demonstration of Capability certificates were observed for the laboratory personnel doing the BWON NESHAP analyses. Although everyone had a current certificate,

the certificate for the Volatile Lab Trainee did not specify the analytical procedures were for the 8260B and 624 methods required for the BWON NESHAP samples. This oversight was fixed during the audit.

Sincerely,

TRINITY CONSULTANTS

Steve Freeman
Principal Consultant & EH&S Audit Business Line Manager

Attachments:

a. Audit Checklist
b. Audit Agenda
c. Pre-audit checklist
d. Organizational Chart
e. Standard Operating Procedure List
f. Chemical Hygiene Plan
g. Lab Accreditations
h. Performance Evaluations Studies

LABORATORY AUDIT
BWON AND NPDES SAMPLING
Performed by Steve Freeman, Trinity Consultants
On behalf of BP

LABORATORY AUDIT CHECKLIST

11/29/12

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BENZENE NESHAP LABORATORY AUDIT CHECKLIST

1.0 GENERAL INFORMATION

Item
Laboratory: Microbac Laboratories Inc.
Address: 250 West 84th Drive Merrillville, IN 46410
Phone No.: 219-769-8378
Date Audited: September 30, 2014
Auditor(s):Steve Freeman, Trinity Consultants
Number of Personnel: 41
Certifications: Kansas (Primary), Illinois, North Carolina, Wisconsin for BWON NESHAP
Business/Operating Hours: 8:00 – 5:00 pm Central time Monday - Friday
Square Footage: 12,000 sq. ft.
Year Founded/Years in Current Location: SimaLabs acquired by Microbac 2004 Current Location

1.1 Organization and Personnel

Item	Yes	No	Comment(s)
Is the organization adequately staffed to meet commitments to BP on a timely manner?	Y		
Is the organization structure sufficient for BP NESHAP work to be performed?	Y		
Is there enough emphasis placed on proper health & safety and chemical hygiene practices?	Y		
Do personnel assigned to BWON/NPDES-related work have the appropriate credentials and experience to successfully accomplish the BP's data quality objectives?	Y		
Is training properly documented and records are adequate to attest to personnel expertise at BWON/NPDES analysis?	Y		Demo of Capability was adequate but missing a procedure detail for 1 technician.

1.2 General Laboratory Facilities

Item	Yes	No	Comment(s)
Does the laboratory have a security system to protect the premises from intruders and appropriate sign-in/sign-out procedures?	Y		
Are all of the laboratory areas maintained in a clean and organized manner?	Y		
Do all laboratory personnel appear to have adequate workspace?	Y		
Are health and safety and chemical hygiene training and practices adequate and documented throughout the laboratory and are they in accordance with the H&S Plan and CHP?	Y		

Item	Yes	No	Comment(s)
Are the laboratory's practices for waste storage, sample waste, and bottle storage and disposal adequate and in accordance with regulations and laboratory SOPs?		N	Disposal of BWON NESHAP samples may be adequate but could not be confirmed adequate during the audit. See Audit Findings.
Does the laboratory have an adequate supply of and conduct proper monitoring of the deionized water?	Y		
Are annual ventilation checks and environmental monitoring documented?	Y		
Does the laboratory have sample storage areas of adequate size, that is maintained and monitored to minimize contaminants?	Y		
Are the volatiles laboratories sufficiently ventilated to minimize background contaminants?	Y		

1.3 Sample Receipt and Storage Area

Item	Yes	No	Comment(s)
Is there a designated sample custodian? If yes, name of sample custodian. Name: Donna Ruokonen	Y		
Are written Standard Operating Procedures (SOPs) available for the receipt and storage of samples?	Y		
Does the SOP adequately cover receipt and storage activities?	Y		
Are custody and sample integrity issues adequately addressed and documented for receipt and storage activities?	Y		
Does the laboratory adequately assess and document sample preservation (temperature and acid preservation)?	Y		
Are the measurement devices adequately calibrated?	Y		
Are cold storage units adequately maintained and monitored for possible contaminants?	Y		
Is the laboratory LIMS adequate to document the location, condition and integrity of samples?	Y		
Are all sample receiving and documentation records adequately maintained?	Y		
Do worksheets/logbooks indicate periodic supervisory review?	Y		
Are corrective actions (when necessary) clearly documented?	Y		
Are there any evident health and safety issues in the receipt and/or storage areas?	Y		
Is the receipt of rush samples adequately communicated within the laboratory?	Y		

Item	Yes	No	Comment(s)
Are all activities and documentation aspects of sample receiving and storage adequate for BP samples?	Y		

1.4 Sampling Vessels/Containers

Item	Yes	No	Comment(s)
Does the laboratory have SOPs for the preparation of sampling vessels/containers?	Y		
If yes above, does the laboratory follow the SOPs?	Y		
Does the laboratory appear to have an adequate supply of sampling vessels/containers?	Y		
Does the laboratory reuse the sampling vessels/containers?		N	As applicable to BWON NESHAP. New each time
Does the laboratory lot check the cleanliness of their sampling vessels/containers?	Y		
Does the laboratory ship the sampling vessels/containers under formal Chain-of-Custody and with custody seals?	Y		Chain of Custody and seals provided.
Does the laboratory provide Trip Blanks?	Y		
Are all vessels/containers, preservatives, reagents, etc. completely traceable?	Y		
Are all sampling vessels/containers properly labeled?	Y		

1.5 Benzene by GC/MS Method 624

Item	Yes	No	Comment(s)
Does the laboratory reference the proper methods for the sample analyses?	Y		EPA Method 8260B/624
Does the laboratory have instrumentation dedicated to volatile analysis in a separate climate- and pressure-controlled room dedicated only to volatile organics analysis?	Y		
Does the instrumentation use voltage control devices and have acceptable maintenance (preventive and service) programs and appropriate documentation (operating manuals, logbooks)?	Y		
Are the volatile samples are appropriately stored in a separate refrigerator and are temperature logs kept that includes all appropriate information?	Y		
Does the laboratory initiate, analyze, and document results for holding blanks at the appropriate frequency?	Y		
Are volatile standards appropriately prepared, labeled, stored, documented, and traced?	Y		
Are the current/updated SOPs readily available to the analysts?	Y		

Item	Yes	No	Comment(s)
Does the laboratory have current MDLs available for all methods and all instruments?	Y		
How and when are aqueous samples pH measurements are taken (if applicable)?	Y		After GC/MS analysis
How do analysts keep track of samples so holding times are not missed?	Y		LIMS System and bar code on samples. Back Log report
Are the frequency, concentration, criteria, and corrective action for the GC/MS tune check appropriate?	Y		
Are the frequency, concentration, criteria, and corrective action for the initial calibration and calibration checks appropriate?	Y		
Are the frequency, concentration, criteria, and corrective action for the QC samples and measures (method blanks, MS/MSD, LCS, surrogates, internal standards) appropriate?	Y		
Does the laboratory perform dilutions if any analyte is over calibration range (if applicable)?	Y		
Does the laboratory quantitate samples from the initial calibration?	Y		
Does the laboratory document manual integrations?	Y		
Does the laboratory monitor for carryover?	Y		
Are magnetic tapes/DAT/CDs stored in a secure place?	Y		Corp level backups daily
Do supervisory personnel review the data and sign-off on QC results and analyst logbooks?	Y		

1.6 Vanadium and Mercury by ICP/MS and CVAFS (Methods 200.8 and 1631E)

Item	Yes	No	Comment(s)
Does the laboratory reference the proper methods for the sample analyses?			n/a
Does the laboratory have instrumentation dedicated to metals analysis with a system to minimize contamination?			n/a
Does the instrumentation use voltage control devices and have acceptable maintenance (preventive and service) programs and appropriate documentation (operating manuals, logbooks)?			n/a
Are the mercury samples appropriately stored in a separate refrigerator and are temperature logs kept that includes all appropriate information?			n/a
Are metals standards appropriately prepared, labeled, stored, documented, and traced?			n/a
Are the current/updated SOPs readily available to the analysts?			n/a

Item	Yes	No	Comment(s)
Does the laboratory have current MDLs available for all methods and all instruments?			n/a
How and when are aqueous samples pH measurements are taken (if applicable)?			n/a
How do analysts keep track of samples so holding times are not missed?			n/a
Are the frequency, concentration, criteria, and corrective action for the initial calibration and calibration checks appropriate?			n/a
Are the frequency, concentration, criteria, and corrective action for the QC samples and measures (method blanks, MS/MSD, LCS, surrogates, internal standards) appropriate?			n/a
Does the laboratory perform dilutions if any analyte is over calibration range (or 90% of LDR)?			n/a
Does the laboratory quantitate samples from the initial calibration?			n/a
Does the laboratory monitor for matrix effect carryover?			n/a
Are magnetic tapes/DAT/CDs stored in a secure place?			n/a
Do supervisory personnel review the data and sign-off on QC results and analyst logbooks?			n/a

1.7 Total Residual Chlorine by SM 4500-Cl

Item	Yes	No	Comment(s)
Does the laboratory reference the proper methods for the sample analyses?			n/a
Does the instrumentation use voltage control devices and have acceptable maintenance (preventive and service) programs and appropriate documentation (operating manuals, logbooks)?			n/a
Are the samples appropriately stored in a separate refrigerator and are temperature logs kept that includes all appropriate information?			n/a
Does the laboratory initiate, analyze, and document results for chlorine reagent blanks at the appropriate frequency?			n/a
Are the current/updated SOPs readily available to the analysts?			n/a
Does the laboratory have current MDLs available for all methods and all instruments?			n/a
Are the frequency, concentration, criteria, and corrective action for the QC samples and measures (method blanks, MS/MSD, LCS, surrogates, internal standards) appropriate?			n/a
Does the laboratory perform dilutions if any analyte is over calibration range (if applicable)?			n/a

Item	Yes	No	Comment(s)
Does the laboratory quantitate samples from the initial calibration?			n/a
Do supervisory personnel review the data and sign-off on QC results and analyst logbooks?			n/a

2.0 DATA MANAGEMENT CHECKLIST

2.1 Sample Tracking

Item	Yes	No	Comment(s)
Is computer hardware consistent with questionnaire?	Y		
Is there an adequate sample tracking system in place?	Y		
Is there a warning system for holding time expirations?	Y		

2.2 Data Reporting

Item	Yes	No	Comment(s)
What software is used in report generation?	Y		LIMS/TALS
What types of QC reports are available?	Y		Level 1 thru 4 complete document package
Does the laboratory have a dedicated data package preparation staff?	Y		
How are final reports proofed against input data?	Y		Project Manager review & approval
Are data calculations checked?	Y		
Does either the analyst or a QC reviewer check and sign reports?	Y		
How are anomalies/problems noted, tracked and reported?	Y		Noted in LIMS – reported to client

2.3 Data Archive

Item	Yes	No	Comment(s)
Describe the system backups, including type, frequency, tape rotation, and tape storage.	Y		Partial backups during the day. Full back-up daily. Completed by Corp. office via the cloud.
Where is data archived and is it under limited access?	Y		Corp. responsibility Valparaiso, IN
How long is retained?	Y		5 years minimum - hard copy, Permanent as needed
How is hardcopy data archived by type and how long is retained for (on-site and off-site?)	Y		Only non-client data is retained in hard copy.

3.0 EFFECTIVENESS OF QA PROGRAM

Item	Yes	No	Comment(s)
Does the laboratory maintain a dedicated QA group? What percentage of the data does the QA group review?	Y		50%-70%
Does the laboratory participate in external audit programs?	Y		
Does the laboratory have a regularly scheduled internal QA program (including internal audits)? If so, how frequently?	Y		annual
Does the staff have access to a copy of the facility's Quality Assurance Plan (QAP)?	Y		
Are Data Quality Objectives documented in written form?	Y		
Does the QAP address all necessary elements necessary to generate high-quality data?	Y		
Is there a formal staff training program and are training files adequately maintained?	Y		

4.0 ADDITIONAL NOTES

Item
See audit report. Very good system overall. A few minor issues were observed. One waste issue related to BWON NESHAP sample disposal. One security issue that did not affect BWON NESHAP samples.

5.0 EXIT INTERVIEW WORKSHEETS

5.1 Evaluation Form

Laboratory Facility: Microbac Laboratories Inc.
Date:10/20/2014 Prepared by: Steve Freeman, Trinity Consultants

	1	2	3	Comment
1.0 GENERAL INFORMATION				
1.1 – Organization and Personnel	1			
1.2 – General Laboratory Facilities	2			
1.3 – Sample Receipt and Storage	1			
1.4 – Sampling Vessels/Containers	1			
1.5 – Benzene by GC/MS	1			
1.6 – Mercury and Vanadium	1			
1.7 – Total Residual Chlorine	1			
2.0 DATA MANAGEMENT CHECKLIST				
2.1 - Sample Tracking	1			
2.2 – Data Reporting	1			
2.3 – Data Archive	1			
3.0 Effectiveness of QA Program	1			

1 – Acceptable, no deficiencies identified

2 – Adequate. Some minor deficiencies were identified that require corrective action

3 - Not Acceptable. Significant major and minor deficiencies were identified. All such items should be discussed with laboratory management and corrective actions agreed upon and noted.

5.3 Audit Team Signatures

10/20/2014

Auditor Date

5.4 Audit Report Process

A draft audit report is issued to the laboratory for their comment/correction within 2 weeks of the audit (within 48 hours if significant/critical issues are identified). Once finalized, the laboratory has one week to respond and issue a formal corrective action memorandum to the Audit Team Members.

BWON NESHAP Laboratory Audit
Microbac Laboratories
Merrillville, IN
Date: 09/30/2014

Approx. Time	Tuesday 09/30
8:00-8:30	Opening Meeting
8:30-9:30	Facility Tour
9:30-10:30	Sample Receipt & Storage
11:00 – 12:00	Sample preparation & analysis inc. procedures & records
12:00-12:45 pm	Lunch
12:45-2:00	Sample preparation & analysis inc. procedures & records
2:00-3:00	Reporting, Archival, Disposal inc. procedures & records LIMS
3:00 - 4:00	Training
4:00–4:30	Closing Meeting

LABORATORY AUDIT
BENZENE WASTE NESHAP, PURSUANT TO CONSENT DECREE, SECTION 19.H.

BP

PREPARED FOR USEPA

LABORATORY PRE-AUDIT QUESTIONNAIRE

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1.0 ORGANIZATION AND PERSONNEL

ITEM	
Laboratory Name:	Microbac Laboratories, Inc. - Chicagoland Division
Address:	250 West 84th Drive. Merrillville, IN 46410
Phone No.	219/769-8378
Contact Name	Donna Ruokonen
Number of Personnel:	41
Certifications:	KS, IL, NY and PA NELAP, A2LA ISO, IN DOH, NC, WA, WI and KY UST
Business/Operating Hours:	8:00 -5:00 Central Time. Monday thru. Friday
Square Footage:	12,000 Square feet
Year Founded/Years in Current Location:	SimaLabs acquired by Microbac in 2004. Current location.

Laboratory Manager/Director (individual responsible for overall technical effort)

Name: Robert Crookston
Degree(s): B.S.- Biology — Years of Direct Experience: 27 years

GC/MS Volatiles - Laboratory Supervisor

Name: Sang Chung
Degree(s): M.S.-Env. Mgt; B.S. -Biology — Years of Direct Experience: 19 years

GC/MS Volatiles (NESHAP) - Analyst

Name: Jen Noel
Degree(s): B.S.- Biology — Years of Direct Experience: 18 years

GC Volatiles - Laboratory Supervisor

Name: Sang Chung
Degree(s): M.S.-Env. Mgt; B.S. -Biology — Years of Direct Experience: 19 years

GC Volatiles (NESHAP) - Analyst

Name: Amy Sheehy
Degree(s): B.S.- Biology — Years of Direct Experience: 16 years

QA Officer/Director

Name: Donna Ruokonen
Degree(s): MBA, BA-Biology — Years of Direct Experience: 16 years

Laboratory Project Manager

Name: Kristen Gehlbach
Degree(s): B.S.- Biology — Years of Direct Experience: 18 years

Health & Safety Director

Name: Robert Crookston
Degree(s): B.S.- Biology — Years of Direct Experience: 27 years

ITEM
Item
Will the Quality Assurance Officer be available during the onsite audit? Yes Name: Donna Ruokonen
Will the Project Manager be available during the evaluation? Yes Name: Kristen Gehlbach
Please attach the most recent laboratory organization chart. If there have been changes, please make to appropriate notations *Additional Comments:*

2.0 ANALYTICAL INSTRUMENTATION

2.1 GC and GC/MS Instrumentation utilized for NESHAP projects*

Instrument	Manufacturer	Model/ Revision	Installation Date	GC Column(s)	Analyses Performed
GC ID No.					
GC ID No.					
GC MS ID No. VOA 6	Tekmar	7890	2014		8260B
GC MS ID No. VOA 7	Tekmar	7890	2014		8260B

* A complete list of all analytical instrumentation containing the same information as this questionnaire can substitute for completion of this section.

ITEM
Are manufacturer's operating manuals readily available to the operators? Yes
Is instrument service and maintenance performed under service contracts? Yes
How is maintenance documented? Maintenance Logs
Please describe your lab's internal preventative maintenance program: All instruments have routine maintenance as needed

3.0 CALIBRATION MATERIALS

Test	Source of Standard(s)*	Source of Reference Samples**
Benzene	Supelco	Ultra Scientific
Benzene	Accustandard	Restek

*Standard materials used to prepare calibration standards.
**Reference samples (viz., second source) supplied to verify external accuracy.

ITEM
How long are intermediate and working benzene NESHAP standards held for (as the default)? 6 months
Are all benzene NESHAP standards and spike solutions completely traceable from labeling, preparation logbooks and Certificates of Analysis and available for inspection? Yes
Please describe how your laboratory assures that expired reference materials are not used and how often refrigerators/freezers are cleaned out and expired materials removed: Our LIMs system requires an expiration date. Standards can not be used beyond that date.

4.0 LABORATORY INFORMATION MANAGEMENT SYSTEMS (LIMS)

ITEM
Provide a brief overview of the LIMS (Make/Platform, etc.) Microbac utilizes Promium's Element LIMs. This system is SQL based and allows for data evaluation against analysis code and project specific criteria. All data is uploaded into the LIMs allowing for accurate control chart/trend analysis. All reports and invoices are generated from our LIMs using Crystal Reports.
Are GCs and GC/MSs to be used for benzene NESHAP work directly linked to LIMS? Yes
Provide a complete list of functions that the LIMS provides: Sample control - login, sample ID and location. Records sample receipt conditions and links to COC. All results are uploaded into LIMs for data evaluation and reporting. LIMs offers audit trail for all changes made. LIMs allows for client specific projects where project criteria and flags may be utilized. LIMs functions also include scheduling, reporting, invoicing, control charting and SQL queries.

5.0 DATA REDUCTION/REPORTING

ITEM
What software packages are used in data processing, reduction and reporting? Chemstation instrument Software is used for data processing Promium Element LIMs is used for data reduction and reporting.
Does the lab have versatile capabilities to generate EDDs? List the formats available Several formats are available. In addition, Microbac has a large IT support staff that can create just about any EDD format requested.

6.0 LABORATORY DOCUMENTATION

6.1 Quality Assurance Plan/Manual

Please provide a copy of the Table of Contents for the laboratory's QA Plan/Manual.

6.2 Standard Operating Procedures

Please provide a complete indexed listing of the laboratory's standard operating procedures (include revision numbers and effective dates).

6.3 Health & Safety Plan/Chemical Hygiene Plan

Please provide a copy of the Table of Contents for the laboratory's Health & Safety Plan and Chemical Hygiene Plan.

6.4 Laboratory Certifications

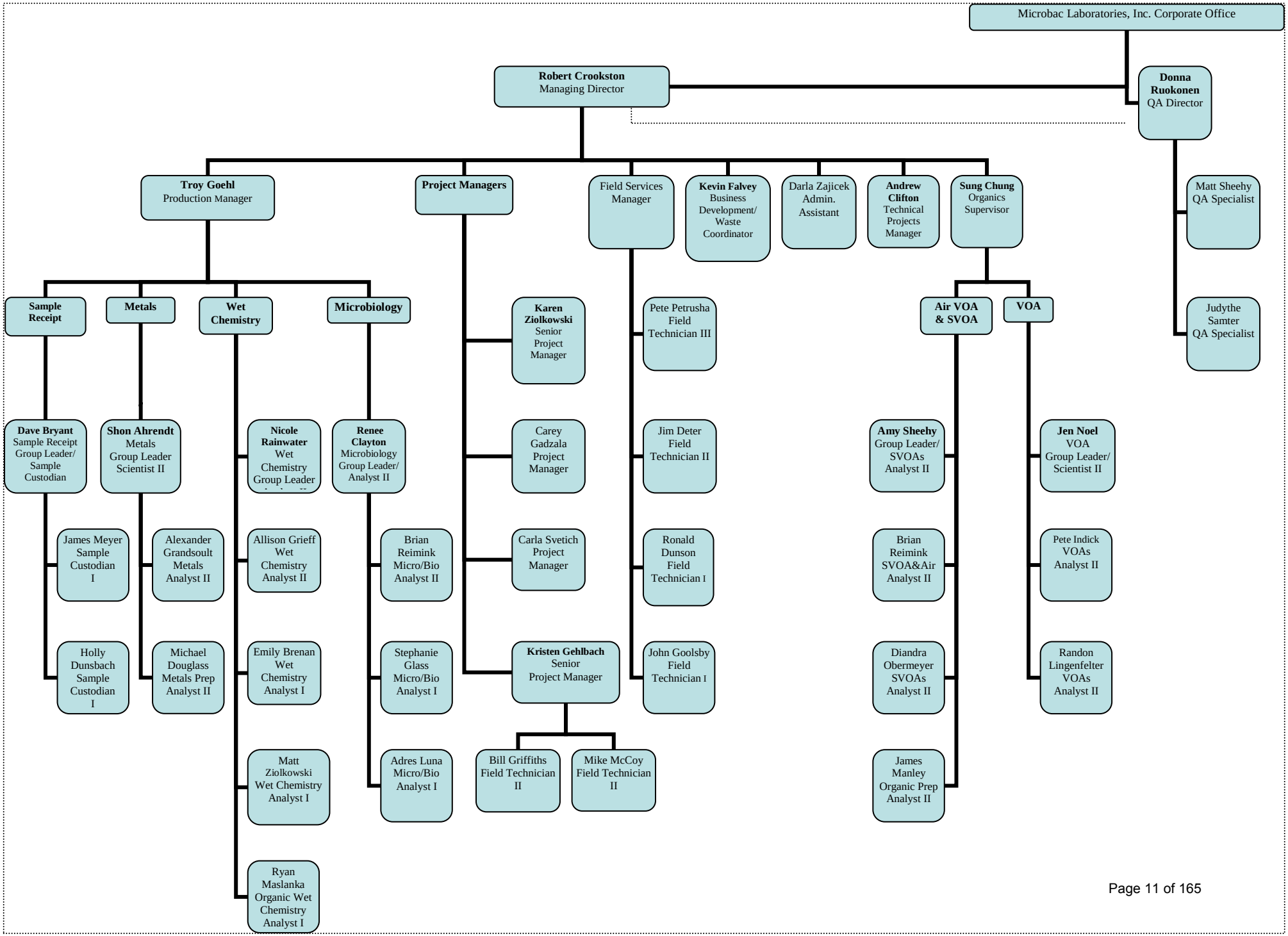
Please provide a complete list the laboratory certifications.

6.5 Performance Evaluation Studies

Please provide a complete copy of the results of laboratory's most recent USEPA performance evaluation studies and any other pertinent performance evaluation studies available for review during the on-site inspection.

ORGANIZATIONAL CHART

Microbac Laboratories, Inc. – Chicagoland Division - Organization Chart – 9/12/2014



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STANDARD OPERATING PROCEDURES

Standard Operating Procedures **as of 9/23/2014 16:42**

TITLE	REV #	FILENAME	LAST REVIEW
Corporate & Local Policies			
Corporate Administrative			
Motor Vehicle Record Policy	1	AD-002-1	9/1/2003
Outside Testing Subcontracting Policy	1	AD-003-1	3/17/2009
Travel and Expense Policy	3	AD-004-3	6/3/2014
Corporate Misc.	*	*	
Confidentiality of Client Data	1	CQA-CONFID	12/29/2000
Total Coliform Analysis by 3M Petrifilm; Dunkin Brand Quality Assurance Plan Procedure	0	CQA-PF	6/1/2006
Customer Care Policy	2	Customer Care Policy	5/1/2007
Cell Phone Policy	1	Local POLICY	3/1/2005
Corporate Element	*	*	
Updating Bids in Element LIMs	0	EL-001-0 Updating Bids in Element	
Inactivating Expired Standards in Element	0	EL-002-0	3/6/2013
Inactivating Standards in Element: Program Installation	0	EL-003-0	3/6/2013
Assigning Salesman Code in Element	0	EL-004-0 Salesman Codes in Element	
Subcontract Pricing in Element	0	EL-007-0 Sub Pricing in Element	
Element Versioned Analyses	0	EL-009-0 Element Versioned Analyses	
Creating and Converting Non-Element Transfer Files	0	EL-012-0_Non-Element Transfer	5/14/2013
Corporate Finance	*	*	
Capital Expenditure Procedure	1	F-001-1 Cap Ex Procedure 05.10	5/28/2010
Fixed Asset Policy	0	F-002-0	10/1/2003
Trade Accounts Receivable Policy & Procedure	0	F-003-0	1/1/2009
General Ledger Closing Policy	1	F-004-1	10/8/2012
Corporate Food Microbiology	*	*	
Reporting Presumptive/Positive Pathogen Results	0	FM-001-0	11/7/2011
Microbiology Sample Handling and Preparation	1	FM-002-1	5/11/2012
Culture Maintenance	1	FM-003-1	3/11/2013
Environmental Monitoring for Microbiology	0	FM-004-0	11/7/2011
Media and Reagent Preparation and Qualification	0	FM-005-0	1/2/2012
Process Control Samples and Control Charting	1	FM-006-1	3/11/2013
Equivocal Results	0	FM-007-0 Equivocal Results	3/15/2013
Housekeeping for Molecular Testing	0	FM-008-0_Housekeeping for Micro	1/7/2014
E.coli O157:H7 by 3M MDS Method	0	FM-100-0_E.coliO157_MDS	8/1/2012
Listeria by 3M MDS Method	1	FM-101-1 Listeria_MDS	4/5/2013
Salmonella by 3M MDS Method	0	FM-102-0	8/1/2012
Aerobic Plate Count - Petrifilm	1	FM-103-1_APC_Petrifilm	1/7/2014
Coliforms and E.coli Counts - Petrifilm	1	FM-104-1_TC-EC_Petrifilm	1/8/2014
Enterobacteriaceae Count - Petrifilm	1	FM-105-1_EB_Petrifilm	1/8/2014
Staphylococcus aureus Count - Petrifilm	1	FM-106-1_Staph_Petrifilm	1/8/2014
Human Resources & Organizational Development	0	HR How To Manual rev 102109	10/22/2009
Corporate Information Technology	*	*	
Password Security Policy	0	IT-100 PasswordSecurity	8/27/2012
Internet Acceptable Use Policy	0	IT-105-0 InternetUsePolicy	10/15/2012
Change Management Policy	0	IT-115-0 Change Mgt Policy	10/15/2012
Request for Change	0	IT-116-0 RFC	10/15/2012
Creating and Managing LIMS Users	1	LIMS Users(1)	6/12/2007

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Standard Operating Procedures **as of 9/23/2014 16:42**

TITLE	REV #	FILENAME	LAST REVIEW
Software Installation and Validation	2	SoftwareValidation(2)	10/15/2010
Corporate Quality Assurance	*	*	
Project Acceptance Protocol for GMP and GLP Regulated Industries	0	Q-001-0	3/5/2009
Ethics and Data Integrity Policy	3	Q-002-03	11/1/2010
Microbac's "Open Door" Policy	0	Q-002-03-1 Appendix ODP	11/1/2010
Manual Integration Policy	1	Q-004-1	12/12/2011
Advertising Accreditation Status	0	Q-006-0	
Administrative	*	*	
After Hours Sample Receipt	2	AfterHoursReceipt(2)	11/2/2012
Analysis Code Maintenance	1	AnalyCodeMaint(1)	1/31/2012
Analytical Data Entry – Metals Section	2	DataEntry-AnalytMetals(2)	2/11/2011
Analytical Data Entry – Organics Section	2	DataEntry-AnalytOrg(2)	3/25/2013
Analytical Data Entry – Wet Chemistry	1	DataEntry-AnalytWetChem(1)	5/15/2007
Bottle Preparation and Shipping	2	BottlePrep&Shipping(2)	8/20/2012
Calibration of Manual Repipetters	2	RepipetterCalib(2)	11/28/2012
Capability and Detection Limit Studies	6	IDC-MDL(6)	8/29/2013
Complaint Feedback	3	complaint(3)	1/31/2012
Daily Balance Calibrations	4	BalCal(4)	7/12/2012
Daily Temperature and Water System Checks	3	DailyTempWaterChecks(3)	8/22/2012
Document Control	2	DocControl(2)	10/24/2012
Employee Training	2	Training(2)	6/11/2012
Estimation of Measurement Uncertainty	3	MeasUncert(3)	11/2/2012
Field Sampling Activities	2	Field Sampling Activities(2)	11/7/2012
Filling Dewar Tanks with Liquid Nitrogen	1	LiquidNitrogenFill(1)	10/29/2012
Generation and Updating of Statistical Recovery Limits	2	StatLimits(2)	10/19/2012
Glassware Washing and Preparation	3	GlassWash(3)	10/11/2012
Good Laboratory Practices (training document)	3	GLP(3)	10/19/2012
Groundwater Sampling	2	Field_Groundwater(2)	10/26/2012
Handling Confidential Business Information	1	CBI(1)	6/11/2012
Internal Audits	5	InternalAudits(5)	9/5/2014
Internal Chain of Custody	2	ICOC(2)	10/12/2012
Labeling of Standards, Reagents, Extracts, and Digestates	3	Labeling(3)	9/9/2014
Logbook Generation	2	LogbookGen(2)	10/12/2012
Manual Integration of Chromatographic Peaks	2	ManualIntegration(2)	10/22/2012
Peer Review and Electronic “QA Validation” of Analytical Results	2	DataEntry-QAValid(2)	6/12/2012
Performing Computer System Backups	5	ServerBackup(5)	8/24/2012
Preparation Batch Data Entry	3	DataEntry-Prep(3)	2/21/2013
Preparation of Standard Operating Procedures	6	SOPSOP(6)	9/2/2014
Processing Deviation / Corrective Action Reports: Root Cause Analysis, Corrective and Preventive Action	2	Deviation-CAR(2)	9/11/2014
Project Management	4	ProjectManagement(4)	11/1/2012
Record Transfer	1	RecordTrans(1)	6/11/2012
Report Generation	5	Report(5)	11/2/2012
Residual Chlorine Using DPD Colorimetry and Portable Chlorine Meters	6	Cl2-330-5(6)	12/26/2012
Revision, Reproduction and Tracking of the Quality Assurance Plan	1	QAP-RevTrack(1)	6/12/2012
Sample Compositing	2	SampleComposite(2)	10/24/2012
Sample Disposal	4	SampleDisposal(4)	2/21/2013

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Standard Operating Procedures **as of 9/23/2014 16:42**

TITLE	REV #	FILENAME	LAST REVIEW
Sample Receipt and Login	11	SampleReceipt(11)	4/16/2013
Supermarket Sanitation Sample Collection	2	Supermarket Sanitation Sample Collection(2)	10/29/2012
Supply Procurement	4	Supply Procurement(4)	6/14/2012
Thermometer Calibration and Use	4	ThermCal(4)	10/24/2012
Timer Verification Using NIST Voice Announcement of Time	0	TimerVerification(0)	6/12/2012
Total Residual Chlorine by Amperometric Titration	2	Cl2-AmpTitration(2)	5/22/2013
Organic	*	*	
Determination of Volatile Organic Compounds (VOCs)in Air Collected in Specially-Prepared Canisters and Analyzed by GC/MS	7	TO-15(7)	8/29/2013
GC/MS Determination of Volatile Organic Compounds and Volatile Petroleum Hydrocarbons	9	624-8260(9)	4/18/2014
GRO/DRO/ERO/ORO/TPH Using GC-FID	1	GRO-DRO-ERO-ORO-TPH(1)	10/30/2012
n-Hexane Extractable Materials and Silica Gel Treated n-Hexane Extractable Materials in Soils and Solids using Soxhlet Extraction	5	HEM-Soxhlet(5)	1/30/2014
Interference Clean Up for PCB Analysis	3	OrgCleanup(3)	10/24/2012
Non-halogenated VOAs using GC-FID	0	8015(0)	10/12/2012
Organochlorine Pesticides by GC-ECD	7	608-8081(7)	2/21/2013
Polychlorinated Biphenyls (PCBs) using GC-ECD	6	608-8082(6)	3/26/2013
Preparation of Aqueous Samples using Manual Liquid-Liquid Extraction	9	AqOrgPrp3510C(9)	9/9/2014
Preparation of Non-Aqueous Samples using Sonication	9	NAqOrgPrp3550(9)	9/4/2014
Preparation of Oil Samples For the Analysis Of Polychlorinated Biphenyls (PCBs)	3	PCB-OilPrep3580A(3)	10/24/2012
Preparation of Pigment Samples for the Analysis of Polychlorinated Biphenyls (PCBs) Congeners	1	PCB Pigment Prep(1)	7/13/2012
Preparation of Solid Samples for non-Volatile Organic Analytes using Soxhlet Extraction	2	NaqOrgPrp3540(2)	7/13/2012
Preparation of Sorbent Tubes for Air Samples Using Soxhlet Extraction	3	TO13 Prep(3)	5/1/2014
Preparation of Wipe Samples For the Analysis Of Polychlorinated Biphenyls (PCBs)	3	PCB-WipePrep3580A(3)	9/11/2012
Semi-Volatile Organic Compounds (SVOA) by GC-MS	12	625-8270(12)	1/30/2014
Metals	*	*	
Extraction of Inorganic Analytes Using Deionized Water	3	WaterExtraction(3)	1/3/2013
Mercury using Cold Vapor Atomic Absorption Spectroscopy (CVAAS)	10	245-7471CETAC(10)	5/1/2014
Mercury using Automatic Fluorescence Spectroscopy	3	Hg-1631(3)	1/24/2014
Metals Using Inductively Coupled Plasma Emission Spectroscopy	10	2007-6010(10)	2/6/2014
Metals by ICP-MS	3	2008-6020(3)	5/1/2014
Methyl Mercury in Water Using Distillation, Aqueous Ethylation, Purge and Trap, and CVAFS	1	MethylMercury(1)	2/28/2014
Preparation of Aqueous Samples and Extracts for Total, Total Recoverable or Dissolved Metals Analysis by Inductively Coupled Plasma Spectroscopy	10	MetAqPrp-ICPFLAA(10)	3/4/2014
Preparation of Non-Aqueous Samples and Extracts for Total Metals Analysis	11	MetNAqPrp(11)	3/4/2014
Synthetic Precipitation Leaching Procedure for Metals, Semi-Volatile Organic Compounds, and Wet Chemistry Analytes	1	SPLP-1312(1)	2/20/2014

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Standard Operating Procedures **as of 9/23/2014 16:42**

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Toxicity Characteristic Leaching Procedure for Metals and Semi-Volatile Organic Compounds	9	TCLP1311MetalSVOA(9)	4/12/2013
Toxicity Characteristic Leaching Procedure for Volatile Organic Compounds	8	TCLP1311VOA(8)	4/16/2013
Turbidity	0	Turb(0)	1/16/2013
Wet Chemistry	*	*	
Acidity	1	Acidity(1)	1/24/2014
Alkaline Digestion of Solid Matrix Samples For Hexavalent Chromium	4	Cr+6Digest(4)	1/24/2014
Alkalinity by Titration	7	Alk(7)	1/24/2014
Ammonia – Nitrogen By Automated Phenate Colorimetry	10	NH3AutoPhen(10)	2/11/2013
API Gravity and Specific Gravity 6060 using Hydrometry	0	API_Spec_Gravity(0)	2/10/2014
Biochemical Oxygen Demand and Carbonaceous Biochemical Oxygen Demand	8	BOD(8)	7/31/2013
BTU by Calorimetry	3	BTU(3)	2/10/2014
Chemical Oxygen Demand Using Manual Colorimetry	8	COD(8)	2/10/2014
Chloride by Silver Nitrate Titration	4	Cl-AgNO3(4)	2/10/2014
Color by Visual Comparison	3	Color-Visual(3)	1/30/2014
Cyanide, Total, Amenable and Weak Acid Dissociable by Midi Distillation and Automated Colorimetry	10	CN-TotalAmenWAD(10)	5/29/2014
Determination of Carbon Dioxide, Mono Ethanol Amine or Heat Stable Salts in Praxair Samples Using Titrimetry	0	HeatStableSalts(0)	12/28/2012
Determination of Specific Gravity and Density using Gravimetry	2	SpGravity(2)	4/10/2012
Dissolved Oxygen	2	DO(2)	10/24/2012
Electrometric Determination of pH	8	pH(8)	4/16/2013
Ferrous Iron using Colorimetry	1	Fe+2(1)	2/28/2014
Fluoride using Manual Ion Selective Electrode Potentiometry	2	Fluoride_manual(2)	2/20/2014
Hexane Extractable Materials by EPA Method 1664B using Solid Phase Extraction	3	HEM-SPE(3)	3/11/2013
Hexavalent Chromium Using Automated Colorimetry	7	Cr+6(7)	3/12/2013
Ignitability (Flash point) using Open Cup and Closed Cup Analysis	6	Flash(6)	5/3/2013
Mechanical Analysis and Neutralizing Value for Liming Materials Using Titration	0	LimingMaterials(0)	1/3/2013
Low-Level Phenolics, Total Recoverable Using Chloroform Extraction and Manual Colorimetry	2	LowLevelPhenolics(2)	1/3/2013
Nitrate/Nitrite, Total as Well as Individual Nitrite and Nitrate Using Automated Colorimetry	4	NO3NO2-CdRed(4)	2/15/2013
Orthophosphate Using Colorimetry	2	OPO4-3651(2)	3/28/2013
Paint Filter Liquids Test	6	PaintFilter(6)	10/24/2012
Percent Free Acid Using Titrimetry	2	FreeAcid(2)	1/3/2013
Phenolics, Total Recoverable Using Automated Colorimetry	12	Phenolics(12)	2/15/2013
Reactive Cyanide or Reactive Sulfide Preparation	5	ReactivityPrep(5)	5/13/2013
Settleable Solids by Standard Methods Method 2540 F	2	SetSolids(2)	2/20/2014
Specific Conductivity	5	SpecCond(5)	2/20/2014
Sulfate Using Turbidity	4	SO4Turb(4)	2/21/2013
Thiocyanate using Standard Methods method 4500-CN- M	3	Thiocyanate(3)	10/10/2012
Total Acid Number using Color-Indicator Titration	0	TAN(0)	12/26/2012
Total Dissolved Solids for Aqueous Samples	7	TDS(7)	3/12/2013
Total and Reactive Sulfide	2	Sulfide(2)	10/19/2012

Standard Operating Procedures **as of 9/23/2014 16:42**

TITLE	REV #	FILENAME	LAST REVIEW
Total Kjeldahl Nitrogen by EPA Method 351.2	10	TKN351(10)	2/21/2013
Total Phosphorus Using Semi-Automated Colorimetry	4	PO4-3653(4)	2/20/2013
Total Solids, Total Volatile Solids, Ash, and Total Organic Content	7	TotalSolids(7)	10/29/2012
Total Suspended Solids for Aqueous Samples	7	TSS(7)	6/3/2013
Vanadium Pentoxide by Colorimetry	1	V5(1)	1/3/2013
Volatile Acids using Titrimetry	2	VolatileAcids(2)	10/24/2012
Microbiology	*	*	
Aerobic and Anaerobic Plate Count on Food, Swabs and Environmental Surfaces	2	APC(2)	11/5/2012
Aerobic Comparative Enumeration Assay	2	AerobicCEA(2)	1/4/2013
Aerobic Plate Count in Food Products, Sponges, Pre-manufactured Products, Swabs and Environmental Surfaces Using Petrifilm	0	APCPetrifilm(0)	9/10/2012
Detection of Salmonella Spp. in Foods Using TECRA Visual Immunoassay Method	0	SalmTECRA(0)	11/7/2012
E. Coli by Membrane Filtration Using MTEC Agar	4	E. coli MF(4)	9/17/2013
E. Coli by IDEXX Quanti-tray/2000	0	E.coli by Quanti-Tray(0)	9/17/2013
Enterobacteriaceae in Food Products, Sponges, Pre-manufactured Products, Swabs and Environmental Surfaces Using Petrifilm	0	EBPetrifilm(0)	9/10/2012
Fecal Coliform Bacteria Using Membrane Filtration	5	Fecal Coliform by MF(5)	10/11/2012
Legionella Using SM Method 9260 J	5	Legionella(5)	10/12/2012
Listeria Monocytogenes Detection in Food, Swabs, and Environmental Surfaces	2	ListeriaAOAC(2)	11/28/2012
Listeria Using BioRad Rapid L.mono Method AOAC 30406	0	Listeria BioRad(0)	11/7/2012
Microbiology Quality Control	1	MicroQC(1)	3/14/2014
Qualitative Determination of E. Coli 0157 in Food Products, Swabs, and Environmental Samples	1	E. coli 0157(1)	7/20/2012
Quantitative Determination of Total Coliform and E. Coli in Food Products, Swabs, Pre-manufactured Products and Environmental Surfaces	1	TCFood(1)	10/11/2012
SalmonellaDetection in Food, Swabs, and Environmental Surfaces	1	Salmonella(1)	12/28/2012
Staphylococcus aureus In Food Samples or Food Contact Surfaces	1	Staph(1)	9/10/2012
Statistical Enumeration Of Escherichia Coli and Total Coliform Using Most Probably Number (MPN) And Total Coliform Bacteria Using Most Probable Number (MPN)	0	MPN_SOP(0)	3/14/2014
Coliform and Escherichia in Food Products, Sponges, Pre-manufactured Products, Swabs and Environmental Surfaces Using Petrifilm	0	EC_TCPetrifilm(0)	9/10/2012
Total Coliform Bacteria Using Membrane Filtration	4	Total Coliform by MF(4)	10/29/2012
Total Coliform Bacteria Using ONPG-MUG	2	Total Coliform by ONPG-MUG(2)	2/11/2013
Yeast and Mold	1	Y_M(1)	3/14/2014

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CHEMICAL HYGIENE PLAN
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MICROBAC®

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LABORATORY ACCREDIATIONS

ACCREDITATIONS AND CERTIFICATIONS

Microbac Laboratories, Inc. is dedicated to producing data of a known and high quality. This position is demonstrated through participation in numerous accreditation or certification programs. Microbac has earned the following accreditations, approvals and certifications:

- The American Association for Laboratory Accreditation [A2LA] for Biological Testing, ISO/IEC 17025 (Certificate# 3045.01)
- The American Association for Laboratory Accreditation [A2LA] for Environmental Department of Defense Testing, ISO/IEC 17025 (Certificate# 3045.02)
- Illinois Environmental Protection Agency for the chemical analysis of wastewater, solid waste, and drinking water in accordance with the requirements of the National Environmental Laboratory Accreditation Program [NELAP] (accreditation #200064)
- Illinois Department of Public Health for the microbiological analysis of drinking water (registry #1755266)
- Indiana State Board of Animal Health for microbiological analysis of dairy containers (18137)
- Indiana Department of Environmental Management approved support laboratory for solid waste and wastewater analyses (BAA-0203)
- Indiana State Department of Health for the chemical analysis of drinking water (lab #C-45-03)
- Indiana State Department of Health for the microbiological analysis of drinking water (lab #M-45-8)
- Kansas Department of Health and Environment for the analysis of drinking water, wastewater, and solid hazardous waste in accordance with the requirements of the National Environmental Laboratory Accreditation Program [NELAP] (Certificate No. E-10397)
- Kentucky Department of Environmental Protection for the analysis of samples applicable to the Kentucky Underground Storage Tank program (lab #75)
- North Carolina Department of the Environment and Natural Resources for the environmental analysis for NPDES effluent, surface water, groundwater, and pretreatment regulations (certificate #597)
- New York State Department of Health [NELAP] (accreditation #49179 & #49386)
- Pennsylvania Department of Environmental Protection (lab# 68-04863).
- Washington State Department of Ecology (lab #C992)
- Wisconsin Department of Natural Resources for the chemical analysis of wastewater and solid waste (lab #998036710)

PERFORMANCE EVALUATION STUDIES

ERA
A Waters Company

14A0737

Donna Ruokonen
Microbac Laboratories - Chicagoland Division
250 W. 84th Drive
Merrillville, IN 46410

WP-228 *Final Report*

WatR™ Pollution Proficiency Testing

WatR™ Pollution Study

Open Date: 01/13/14

Close Date: 02/27/14

Report Issued Date: 03/03/14

ERA
A Waters Company

March 3, 2014

Donna Ruokonen
Microbac Laboratories - Chicagoland Division
250 W. 84th Drive
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Enclosed is your final report for ERA's WP-228 WatR™Pollution Proficiency Testing (PT) study. Your final report includes an evaluation of all results submitted by your laboratory to ERA.

Data Evaluation Protocols: All analytes in ERA's WP-228 WatR™Pollution Proficiency Testing study have been evaluated using the following tiered approach. If the analyte is listed in the current TNI Fields of Proficiency Testing (FoPT) tables, the evaluation was completed by comparing the reported result to the acceptance limits generated using the criteria contained in the current TNI FoPT tables. If the analyte is not included in the TNI FoPT tables, the reported result has been evaluated using the procedures outlined in ERA's Standard Operating Procedure for the Generation of Performance Acceptance Limits (SOP 0260).

Corrective Action Help: As part of your accreditation(s), you may be required to identify the root cause of any "Not Acceptable" results, implement the necessary corrective actions, and then satisfy your PT requirements by participating in a Supplemental (QuiK™Response) or future ERA PT study. ERA's technical staff is available to help your laboratory resolve any technical issues that may be impairing your PT performance and possibly affecting your routine data quality. Our laboratory and technical staff have many years of collective experience in performing the full range of environmental analyses. As part of our technical support, ERA offers QC samples that can be useful in helping you work through your technical issues.

Please note the following changes to our final reports:

- At the request of the TNI Accreditation Council, we have included a Laboratory Exception Report that includes a list of all analytes reported with less than qualifiers when the assigned value was greater than “0.” In addition, because we have received many requests from laboratories, this report also includes a list of all analytes with "Not Acceptable" evaluations.

- Some states have elected not to convert to the 2009 TNI Standards at this time. If you have released your results to a state that has retained the 2003 NELAC Evaluation Criteria, your final report will include a section that evaluates the results according to the 2003 Standard in addition to the 2009 TNI Standards.

Thank you for your participation in ERA's WP-228 WatR™Pollution Proficiency Testing study. If you have any questions, please contact our Proficiency Testing Department at 1-800-372-0122.

Sincerely,

Kristina Sanchez
Quality Officer

attachments

Report Recipient	Contact/Phone Number	Reporting Type	Evaluation Type
Illinois	John South / 217-558-7142	All Analytes	2009 TNI
Kansas	Lyndi Stout / 785-296-3811	All Analytes	2009 TNI
North Carolina (WP)	Dana Satterwhite / 919-733-3908 x 243	All Analytes	2009 TNI
Wisconsin	Rick Mealy / 608-264-6006	All Analytes	2009 TNI

WP-228 Definitions & Study Discussion

Study Dates: 01/13/14 - 02/27/14 **Report Issued: 03/03/14**

WP Study Definitions

The Reported Value is the value that the laboratory reported to ERA.

The ERA Assigned Values are compliant with the most current TNI Fields of Proficiency Testing (FoPT) tables. A parameter not added to the standard is given an Assigned Value of "< PTRL" per the guidelines contained in the 2009 TNI Standards. The assigned values are directly traceable to the commercially prepared starting materials used to manufacture the PT standards.

The Acceptance Limits are established per the criteria contained in the most current USEPA/NELAC FoPT tables, or ERA's SOP for the Generation of Performance Acceptance Limits™ as applicable.

The Performance Evaluation:

Acceptable	= Reported Value falls within the Acceptance Limits.
Not Acceptable	= Reported Value falls outside the Acceptance Limits.
No Evaluation	= Reported Value cannot be evaluated.
Not Reported	= No Value reported.

The Method Description is the method the laboratory reported to ERA.

WP Study Discussion

ERA's WP-228 WatR™Pollution Proficiency Testing study has been reviewed by ERA senior management and certified compliant with the requirements of the 2009 TNI PT Standard and the criteria contained in the most current TNI Fields of Proficiency Testing (FoPT) tables.

ERA's WP-228 WatR™Pollution study standards were examined for any anomalies. A full review of all homogeneity, stability and accuracy verification data was completed. All analytical verification data for all analytes met the acceptance criteria contained in the 2009 TNI PT Standard and the criteria contained in the most current TNI FoPT tables.

The data submitted by participating laboratories was also examined for study anomalies. There was one anomaly observed during the statistical review of the data. If your laboratory received the WP-228 Waste Water Coliform MicrobE™ sample, catalog #576, this anomaly is addresssed on the following page.

ERA's WP-228 WatR™Pollution study reports shall not be reproduced except in their entirety and not without the permission of the participating laboratories. The report must not be used by the participating laboratories to claim product endorsement by any agency of the U. S. government.

The data contained herein are confidential and intended for your use only.

If you have any questions or concerns regarding your assessment in ERA's WatR™Pollution Proficiency Testing program, please contact our Proficiency Testing Department at 1-800-372-0122.

WP-228 Laboratory Exception Report

A Waters Company

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EPA ID: IN00054
ERA Customer Number: A488001
Report Issued: 03/03/14
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2009 TNI Evaluation Checks

There are no values reported with < where the assigned value was greater than 0.

2009 TNI Not Acceptable Evaluations

TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
WP Complex Nutrients (cat# 579)							
1795	Total Kjeldahl Nitrogen	mg/L	23.4	18.4	13.8 - 22.4	Not Acceptable	EPA 351.2 2
WP Demand (cat# 578)							
1565	COD	mg/L	39.6	65.4	46.5 - 81.6	Not Acceptable	EPA 410.4 2
WP Trace Metals (cat# 586)							
1025	Boron	µg/L	1630	1340	1140 - 1540	Not Acceptable	EPA 200.8 5.5
1025	Boron	µg/L	1630	1340	1140 - 1540	Not Acceptable	EPA 6020A
1165	Thallium	µg/L	609	476	391 - 553	Not Acceptable	EPA 6010B 2
WP Volatiles (cat# 830)							
5150	1,2,3-Trichlorobenzene	µg/L	96.1	< 5.00	0.00 - 5.00	Not Acceptable	EPA 8260B 2 1996
5150	1,2,3-Trichlorobenzene	µg/L	96.1	< 5.00	0.00 - 5.00	Not Acceptable	EPA 624 Appendix A 1982
WP Low-Level PAHs (cat# 836)							
5575	Benzo(a)anthracene	µg/L	2.71	4.03	2.73 - 4.49	Not Acceptable	EPA 8270C 3
5575	Benzo(a)anthracene	µg/L	2.71	4.03	2.73 - 4.49	Not Acceptable	EPA 625

Final Report Results For Laboratory
Microbac Laboratories - Chicagoland Division

ERA
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2009 TNI Evaluation Report

Study: **WP-228**

ERA Customer Number: **A488001**

Laboratory Name: **Microbac Laboratories - Chicagoland Division**

Inorganic Results

WP-228 2009 TNI Evaluation Final Complete Report

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TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Minerals (cat# 581)												
1505	Alkalinity as CaCO3	mg/L	82.0	81.1	68.9 - 93.3	Acceptable	SM 2320 B-1997 1997	1/22/2014	0.0811	81.8	2.89	
1575	Chloride	mg/L	46	46.5	40.2 - 52.9	Acceptable	SM 4500-Cl B-1997 1997	1/30/2014	-0.0645	46.1	1.98	
1610	Conductivity at 25°C	µmhos/cm	366	357	321 - 393	Acceptable	EPA 120.1	2/12/2014	-0.419	371	12.0	
1730	Fluoride	mg/L	2	2.02	1.61 - 2.36	Acceptable	SM 4500-F C-1997	1/22/2014	0.508	1.94	0.113	
1125	Potassium	mg/L	22.2	23.2	18.6 - 27.8	Acceptable	EPA 6010B 2 1996	1/21/2014	-0.420	22.7	1.22	
1155	Sodium	mg/L	67.0	66.4	53.1 - 79.7	Acceptable	EPA 6010B 2 1996	1/21/2014	0.0248	66.9	3.69	
2000	Sulfate	mg/L	23.3	23.4	18.6 - 27.2	Acceptable	EPA 9038	2/4/2014	0.720	22.3	1.34	
1955	Total Dissolved Solids at 180°C	mg/L	293	314	269 - 359	Acceptable	SM 2540 C-1997	1/21/2014	0.133	291	18.1	
1950	Total Solids at 105°C	mg/L	296	313	268 - 358	Acceptable	SM 2540 B-1997	2/10/2014	-0.474	304	17.6	
WP Minerals (cat# 581)												
1505	Alkalinity as CaCO3	mg/L		81.1	68.9 - 93.3	Not Reported				81.8	2.89	
1575	Chloride	mg/L		46.5	40.2 - 52.9	Not Reported				46.1	1.98	
1610	Conductivity at 25°C	µmhos/cm	366	357	321 - 393	Acceptable	SM 2510 B-1997 1997	2/12/2014	-0.419	371	12.0	
1730	Fluoride	mg/L		2.02	1.61 - 2.36	Not Reported				1.94	0.113	
1125	Potassium	mg/L	23.2	23.2	18.6 - 27.8	Acceptable	EPA 200.7 5 1998	1/22/2014	0.399	22.7	1.22	
1155	Sodium	mg/L	66.8	66.4	53.1 - 79.7	Acceptable	EPA 200.7 5 1998	1/22/2014	-0.0293	66.9	3.69	
2000	Sulfate	mg/L		23.4	18.6 - 27.2	Not Reported				22.3	1.34	
1955	Total Dissolved Solids at 180°C	mg/L		314	269 - 359	Not Reported				291	18.1	
1950	Total Solids at 105°C	mg/L		313	268 - 358	Not Reported				304	17.6	

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WP Minerals (cat# 581)												
1505	Alkalinity as CaCO3	mg/L		81.1	68.9 - 93.3	Not Reported				81.8	2.89	
1575	Chloride	mg/L		46.5	40.2 - 52.9	Not Reported				46.1	1.98	
1610	Conductivity at 25°C	µmhos/cm		357	321 - 393	Not Reported				371	12.0	
1730	Fluoride	mg/L		2.02	1.61 - 2.36	Not Reported				1.94	0.113	
1125	Potassium	mg/L	22.4	23.2	18.6 - 27.8	Acceptable	EPA 200.8 5.5 1998	2/6/2014	-0.256	22.7	1.22	
1155	Sodium	mg/L	68.3	66.4	53.1 - 79.7	Acceptable	EPA 200.8 5.5 1998	2/6/2014	0.377	66.9	3.69	
2000	Sulfate	mg/L		23.4	18.6 - 27.2	Not Reported				22.3	1.34	
1955	Total Dissolved Solids at 180°C	mg/L		314	269 - 359	Not Reported				291	18.1	
1950	Total Solids at 105°C	mg/L		313	268 - 358	Not Reported				304	17.6	
WP Minerals (cat# 581)												
1505	Alkalinity as CaCO3	mg/L		81.1	68.9 - 93.3	Not Reported				81.8	2.89	
1575	Chloride	mg/L		46.5	40.2 - 52.9	Not Reported				46.1	1.98	
1610	Conductivity at 25°C	µmhos/cm		357	321 - 393	Not Reported				371	12.0	
1730	Fluoride	mg/L		2.02	1.61 - 2.36	Not Reported				1.94	0.113	
1125	Potassium	mg/L	21.9	23.2	18.6 - 27.8	Acceptable	EPA 6020A 1998	1/21/2014	-0.665	22.7	1.22	
1155	Sodium	mg/L	63.5	66.4	53.1 - 79.7	Acceptable	EPA 6020A 1998	1/21/2014	-0.923	66.9	3.69	
2000	Sulfate	mg/L		23.4	18.6 - 27.2	Not Reported				22.3	1.34	
1955	Total Dissolved Solids at 180°C	mg/L		314	269 - 359	Not Reported				291	18.1	
1950	Total Solids at 105°C	mg/L		313	268 - 358	Not Reported				304	17.6	

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TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Hardness (cat# 580)												
1960	Total Suspended Solids	mg/L	37.7	39.1	29.1 - 45.7	Acceptable	SM 2540 D-1997 1997	1/24/2014	0.815	35.6	2.56	
1035	Calcium	mg/L	87.2	94.6	80.4 - 109	Acceptable	EPA 6010B 2 1996	1/21/2014	-1.77	93.3	3.45	
1085	Magnesium	mg/L	26.7	26.5	22.5 - 30.5	Acceptable	EPA 6010B 2 1996	1/21/2014	0.545	26.1	1.19	
1550	Calcium Hardness as CaCO3	mg/L		236	201 - 271	Not Reported				233	8.89	
1755	Total Hardness as CaCO3	mg/L	334	345	293 - 397	Acceptable	SM 2540 D-1997 1997	1/22/2014	-0.325	338	11.3	
WP Hardness (cat# 580)												
1960	Total Suspended Solids	mg/L		39.1	29.1 - 45.7	Not Reported				35.6	2.56	
1035	Calcium	mg/L	90.6	94.6	80.4 - 109	Acceptable	EPA 200.7 5 1998	1/22/2014	-0.786	93.3	3.45	
1085	Magnesium	mg/L	26.1	26.5	22.5 - 30.5	Acceptable	EPA 200.7 5 1998	1/22/2014	0.0414	26.1	1.19	
1550	Calcium Hardness as CaCO3	mg/L		236	201 - 271	Not Reported				233	8.89	
1755	Total Hardness as CaCO3	mg/L		345	293 - 397	Not Reported				338	11.3	
WP Hardness (cat# 580)												
1960	Total Suspended Solids	mg/L		39.1	29.1 - 45.7	Not Reported				35.6	2.56	
1035	Calcium	mg/L	92.2	94.6	80.4 - 109	Acceptable	EPA 200.8 5.5 1998	2/6/2014	-0.322	93.3	3.45	
1085	Magnesium	mg/L	27.1	26.5	22.5 - 30.5	Acceptable	EPA 200.8 5.5 1998	2/6/2014	0.880	26.1	1.19	
1550	Calcium Hardness as CaCO3	mg/L		236	201 - 271	Not Reported				233	8.89	
1755	Total Hardness as CaCO3	mg/L		345	293 - 397	Not Reported				338	11.3	

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TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Hardness (cat# 580)												
1960	Total Suspended Solids	mg/L		39.1	29.1 - 45.7	Not Reported				35.6	2.56	
1035	Calcium	mg/L	93.3	94.6	80.4 - 109	Acceptable	EPA 6020A 1998	1/21/2014	-0.00346	93.3	3.45	
1085	Magnesium	mg/L	24.0	26.5	22.5 - 30.5	Acceptable	EPA 6020A 1998	1/21/2014	-1.72	26.1	1.19	
1550	Calcium Hardness as CaCO3	mg/L		236	201 - 271	Not Reported				233	8.89	
1755	Total Hardness as CaCO3	mg/L		345	293 - 397	Not Reported				338	11.3	
WP pH (cat# 577)												
1900	pH	S.U.	5.78	5.74	5.54 - 5.94	Acceptable	EPA 9045C 3	1/21/2014	0.992	5.73	0.0471	
WP pH (cat# 577)												
1900	pH	S.U.	5.78	5.74	5.54 - 5.94	Acceptable	SM 4500-H+ B-2000 2000	1/21/2014	0.992	5.73	0.0471	
WP Settleable Solids (cat# 883)												
1965	Settleable Solids	mL/L	31	28.8	23.5 - 36.6	Acceptable	SM 2540 F-1997 1997	1/17/2014	0.282	30.3	2.47	
WP Volatile Solids (cat# 884)												
1970	Volatile Solids, Total	mg/L	222	226	156 - 270	Acceptable	EPA 160.4 1979	2/18/2014	0.296	216	20.5	
WP Simple Nutrients (cat# 584)												
1515	Ammonia as N	mg/L	4.46	5.11	3.96 - 6.30	Acceptable	EPA 350.1 2	2/5/2014	-1.62	5.16	0.434	
1820	Nitrate + Nitrite as N	mg/L	3.9	3.97	3.23 - 4.68	Acceptable	EPA 353.2 2	2/4/2014	-0.275	3.97	0.251	
1810	Nitrate as N	mg/L	3.9	3.97	3.16 - 4.75	Acceptable	EPA 353.2 2	2/4/2014	-0.293	3.97	0.237	
1870	ortho-Phosphate as P	mg/L	4.45	4.95	4.21 - 5.69	Acceptable	EPA 365.1 2	2/3/2014	-2.22	4.97	0.235	
WP Complex Nutrients (cat# 579)												
1795	Total Kjeldahl Nitrogen	mg/L	23.4	18.4	13.8 - 22.4	Not Acceptable	EPA 351.2 2	2/7/2014	4.05	18.4	1.25	
1910	Total phosphorus as P	mg/L	3.72	3.68	3.03 - 4.30	Acceptable	EPA 365.1 2	2/6/2014	0.150	3.69	0.197	

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WP Nitrite (cat# 888)												
1840	Nitrite as N	mg/L	1.98	2.27	1.94 - 2.60	Acceptable	EPA 353.2 2	2/4/2014	-2.59	2.29	0.121	
WP Demand (cat# 578)												
1530	BOD	mg/L	29.8	40.6	20.8 - 60.4	Acceptable	SM 5210 B-2001 2001	1/30/2014	-1.63	40.7	6.67	
1555	CBOD	mg/L	32.6	36.8	15.8 - 57.8	Acceptable	SM 5210 B-2001 2001	1/30/2014	-0.805	38.0	6.71	
1565	COD	mg/L	39.6	65.4	46.5 - 81.6	Not Acceptable	EPA 410.4 2	2/4/2014	-3.67	64.8	6.86	
2040	TOC	mg/L		25.9	21.1 - 30.6	Not Reported				26.2	1.73	
WP Oil & Grease (cat# 582)												
1860	n-Hexane Extractable Material(O&G)(Grav)	mg/L	76.9	85.0	59.4 - 99.6	Acceptable	EPA 1664B 2010	1/27/2014	-0.596	79.9	5.05	TS
1860	n-Hexane Extractable Material(O&G)(IR)	mg/L		104	74.1 - 121	Not Reported				109	17.3	

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WP Trace Metals (cat# 586)												
1000	Aluminum	µg/L	1560	1510	1250 - 1740	Acceptable	EPA 6010B 2	1/21/2014	0.934	1480	83.2	
1005	Antimony	µg/L	719	717	586 - 826	Acceptable	EPA 6010B 2	1/21/2014	0.597	698	35.4	
1010	Arsenic	µg/L	332	338	278 - 395	Acceptable	EPA 6010B 2	1/21/2014	0.331	327	14.7	
1015	Barium	µg/L	881	850	722 - 978	Acceptable	EPA 6010B 2	1/21/2014	1.48	832	33.3	
1020	Beryllium	µg/L	105	101	85.8 - 116	Acceptable	EPA 6010B 2	1/21/2014	0.350	103	5.36	
1025	Boron	µg/L	1280	1340	1140 - 1540	Acceptable	EPA 6010B 2	1/21/2014	-0.477	1320	80.4	
1030	Cadmium	µg/L	473	462	393 - 531	Acceptable	EPA 6010B 2	1/21/2014	1.37	449	17.8	
1040	Chromium	µg/L	745	759	645 - 873	Acceptable	EPA 6010B 2	1/21/2014	0.0428	744	31.1	
1050	Cobalt	µg/L	644	610	518 - 702	Acceptable	EPA 6010B 2	1/21/2014	0.694	626	26.2	
1055	Copper	µg/L	431	418	355 - 481	Acceptable	EPA 6010B 2	1/21/2014	1.04	413	17.5	
1070	Iron	µg/L	1660	1650	1400 - 1900	Acceptable	EPA 6010B 2	1/21/2014	0.225	1640	79.1	
1075	Lead	µg/L	971	908	772 - 1040	Acceptable	EPA 6010B 2	1/21/2014	1.67	899	43.5	
1090	Manganese	µg/L	1580	1500	1280 - 1720	Acceptable	EPA 6010B 2	1/21/2014	1.25	1500	64.1	
1100	Molybdenum	µg/L	222	224	190 - 255	Acceptable	EPA 6010B 2	1/21/2014	0.458	218	9.71	
1105	Nickel	µg/L	1600	1500	1330 - 1680	Acceptable	EPA 6010B 2	1/21/2014	2.05	1460	66.8	
1140	Selenium	µg/L	412	415	353 - 477	Acceptable	EPA 6010B 2	1/21/2014	0.505	401	21.3	
1150	Silver	µg/L	289	310	264 - 356	Acceptable	EPA 6010B 2	1/21/2014	-1.05	305	14.7	
1160	Strontium	µg/L	239	240	204 - 276	Acceptable	EPA 6010B 2	1/21/2014	0.235	237	9.63	
1165	Thallium	µg/L	609	476	391 - 553	Not Acceptable	EPA 6010B 2	1/21/2014	5.70	466	25.2	
1185	Vanadium	µg/L	887	897	762 - 1030	Acceptable	EPA 6010B 2	1/21/2014	0.560	870	29.7	

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WP Trace Metals (cat# 586) (Continued)												
1190	Zinc	µg/L	995	987	839 - 1140	Acceptable	EPA 6010B 2	1/21/2014	0.684	962	47.9	

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TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Trace Metals (cat# 586)												
1000	Aluminum	µg/L	1550	1510	1250 - 1740	Acceptable	EPA 200.7 5	1/22/2014	0.814	1480	83.2	
1005	Antimony	µg/L	722	717	586 - 826	Acceptable	EPA 200.7 5	1/22/2014	0.682	698	35.4	
1010	Arsenic	µg/L	332	338	278 - 395	Acceptable	EPA 200.7 5	1/22/2014	0.331	327	14.7	
1015	Barium	µg/L	815	850	722 - 978	Acceptable	EPA 200.7 5	1/22/2014	-0.510	832	33.3	
1020	Beryllium	µg/L	105	101	85.8 - 116	Acceptable	EPA 200.7 5	1/22/2014	0.350	103	5.36	
1025	Boron	µg/L	1220	1340	1140 - 1540	Acceptable	EPA 200.7 5	1/22/2014	-1.22	1320	80.4	
1030	Cadmium	µg/L	460	462	393 - 531	Acceptable	EPA 200.7 5	1/22/2014	0.640	449	17.8	
1040	Chromium	µg/L	736	759	645 - 873	Acceptable	EPA 200.7 5	1/22/2014	-0.246	744	31.1	
1050	Cobalt	µg/L	644	610	518 - 702	Acceptable	EPA 200.7 5	1/22/2014	0.694	626	26.2	
1055	Copper	µg/L	424	418	355 - 481	Acceptable	EPA 200.7 5	1/22/2014	0.638	413	17.5	
1070	Iron	µg/L	1680	1650	1400 - 1900	Acceptable	EPA 200.7 5	1/22/2014	0.478	1640	79.1	
1075	Lead	µg/L	967	908	772 - 1040	Acceptable	EPA 200.7 5	1/22/2014	1.57	899	43.5	
1090	Manganese	µg/L	1540	1500	1280 - 1720	Acceptable	EPA 200.7 5	1/22/2014	0.626	1500	64.1	
1100	Molybdenum	µg/L	231	224	190 - 255	Acceptable	EPA 200.7 5	1/22/2014	1.39	218	9.71	
1105	Nickel	µg/L	1560	1500	1330 - 1680	Acceptable	EPA 200.7 5	1/22/2014	1.45	1460	66.8	
1140	Selenium	µg/L	417	415	353 - 477	Acceptable	EPA 200.7 5	1/22/2014	0.740	401	21.3	
1150	Silver	µg/L	300	310	264 - 356	Acceptable	EPA 200.7 5	1/22/2014	-0.305	305	14.7	
1160	Strontium	µg/L	239	240	204 - 276	Acceptable	EPA 200.7 5	1/22/2014	0.235	237	9.63	
1165	Thallium	µg/L	534	476	391 - 553	Acceptable	EPA 200.7 5	1/22/2014	2.72	466	25.2	
1185	Vanadium	µg/L	870	897	762 - 1030	Acceptable	EPA 200.7 5	1/22/2014	-0.0130	870	29.7	

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TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Trace Metals (cat# 586) (Continued)												
1190	Zinc	µg/L	989	987	839 - 1140	Acceptable	EPA 200.7 5	1/22/2014	0.558	962	47.9	

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WP Trace Metals (cat# 586)												
1000	Aluminum	µg/L	1370	1510	1250 - 1740	Acceptable	EPA 200.8 5.5	1/21/2014	-1.35	1480	83.2	
1005	Antimony	µg/L	664	717	586 - 826	Acceptable	EPA 200.8 5.5	1/21/2014	-0.956	698	35.4	
1010	Arsenic	µg/L	321	338	278 - 395	Acceptable	EPA 200.8 5.5	1/21/2014	-0.416	327	14.7	
1015	Barium	µg/L	823	850	722 - 978	Acceptable	EPA 200.8 5.5	1/21/2014	-0.269	832	33.3	
1020	Beryllium	µg/L	113	101	85.8 - 116	Acceptable	EPA 200.8 5.5	1/23/2014	1.84	103	5.36	
1025	Boron	µg/L	1630	1340	1140 - 1540	Not Acceptable	EPA 200.8 5.5	1/23/2014	3.87	1320	80.4	
1030	Cadmium	µg/L	431	462	393 - 531	Acceptable	EPA 200.8 5.5	1/21/2014	-0.987	449	17.8	
1040	Chromium	µg/L	739	759	645 - 873	Acceptable	EPA 200.8 5.5	1/21/2014	-0.150	744	31.1	
1050	Cobalt	µg/L	635	610	518 - 702	Acceptable	EPA 200.8 5.5	1/21/2014	0.350	626	26.2	
1055	Copper	µg/L	392	418	355 - 481	Acceptable	EPA 200.8 5.5	1/21/2014	-1.19	413	17.5	
1070	Iron	µg/L	1570	1650	1400 - 1900	Acceptable	EPA 200.8 5.5	1/21/2014	-0.914	1640	79.1	
1075	Lead	µg/L	832	908	772 - 1040	Acceptable	EPA 200.8 5.5	1/21/2014	-1.53	899	43.5	
1090	Manganese	µg/L	1460	1500	1280 - 1720	Acceptable	EPA 200.8 5.5	1/21/2014	-0.622	1500	64.1	
1100	Molybdenum	µg/L	216	224	190 - 255	Acceptable	EPA 200.8 5.5	1/21/2014	-0.160	218	9.71	
1105	Nickel	µg/L	1470	1500	1330 - 1680	Acceptable	EPA 200.8 5.5	1/21/2014	0.105	1460	66.8	
1140	Selenium	µg/L	392	415	353 - 477	Acceptable	EPA 200.8 5.5	1/21/2014	-0.432	401	21.3	
1150	Silver	µg/L	284	310	264 - 356	Acceptable	EPA 200.8 5.5	1/21/2014	-1.39	305	14.7	
1160	Strontium	µg/L	232	240	204 - 276	Acceptable	EPA 200.8 5.5	1/21/2014	-0.492	237	9.63	
1165	Thallium	µg/L	441	476	391 - 553	Acceptable	EPA 200.8 5.5	1/21/2014	-0.976	466	25.2	
1185	Vanadium	µg/L	972	897	762 - 1030	Acceptable	EPA 200.8 5.5	1/23/2014	3.42	870	29.7	

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TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Trace Metals (cat# 586) (Continued)												
1190	Zinc	µg/L	929	987	839 - 1140	Acceptable	EPA 200.8 5.5	1/21/2014	-0.694	962	47.9	

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WP Trace Metals (cat# 586)												
1000	Aluminum	µg/L	1460	1510	1250 - 1740	Acceptable	EPA 6020A	1/21/2014	-0.268	1480	83.2	
1005	Antimony	µg/L	723	717	586 - 826	Acceptable	EPA 6020A	1/21/2014	0.710	698	35.4	
1010	Arsenic	µg/L	346	338	278 - 395	Acceptable	EPA 6020A	1/21/2014	1.28	327	14.7	
1015	Barium	µg/L	893	850	722 - 978	Acceptable	EPA 6020A	1/21/2014	1.84	832	33.3	
1020	Beryllium	µg/L	113	101	85.8 - 116	Acceptable	EPA 6020A	1/23/2014	1.84	103	5.36	
1025	Boron	µg/L	1630	1340	1140 - 1540	Not Acceptable	EPA 6020A	1/23/2014	3.87	1320	80.4	
1030	Cadmium	µg/L	460	462	393 - 531	Acceptable	EPA 6020A	1/21/2014	0.640	449	17.8	
1040	Chromium	µg/L	788	759	645 - 873	Acceptable	EPA 6020A	1/21/2014	1.42	744	31.1	
1050	Cobalt	µg/L	671	610	518 - 702	Acceptable	EPA 6020A	1/21/2014	1.73	626	26.2	
1055	Copper	µg/L	420	418	355 - 481	Acceptable	EPA 6020A	1/21/2014	0.409	413	17.5	
1070	Iron	µg/L	1660	1650	1400 - 1900	Acceptable	EPA 6020A	1/21/2014	0.225	1640	79.1	
1075	Lead	µg/L	906	908	772 - 1040	Acceptable	EPA 6020A	1/21/2014	0.172	899	43.5	
1090	Manganese	µg/L	1560	1500	1280 - 1720	Acceptable	EPA 6020A	1/21/2014	0.938	1500	64.1	
1100	Molybdenum	µg/L	230	224	190 - 255	Acceptable	EPA 6020A	1/21/2014	1.28	218	9.71	
1105	Nickel	µg/L	1550	1500	1330 - 1680	Acceptable	EPA 6020A	1/21/2014	1.30	1460	66.8	
1140	Selenium	µg/L	423	415	353 - 477	Acceptable	EPA 6020A	1/21/2014	1.02	401	21.3	
1150	Silver	µg/L	304	310	264 - 356	Acceptable	EPA 6020A	1/21/2014	-0.0341	305	14.7	
1160	Strontium	µg/L	249	240	204 - 276	Acceptable	EPA 6020A	1/21/2014	1.27	237	9.63	
1165	Thallium	µg/L	475	476	391 - 553	Acceptable	EPA 6020A	1/21/2014	0.376	466	25.2	
1185	Vanadium	µg/L	972	897	762 - 1030	Acceptable	EPA 6020A	1/23/2014	3.42	870	29.7	

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TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Trace Metals (cat# 586) (Continued)												
1190	Zinc	µg/L	992	987	839 - 1140	Acceptable	EPA 6020A	1/21/2014	0.621	962	47.9	
WP Mercury (cat# 574)												
1095	Mercury	µg/L	7.85	8.17	5.72 - 10.6	Acceptable	EPA 7470A 1	1/22/2014	-0.407	8.15	0.738	
WP Mercury (cat# 574)												
1095	Mercury	µg/L	7.85	8.17	5.72 - 10.6	Acceptable	EPA 245.1 3	1/22/2014	-0.407	8.15	0.738	
WP Mercury (cat# 574)												
1095	Mercury	µg/L	7.26	8.17	5.72 - 10.6	Acceptable	EPA 6020A	1/21/2014	-1.21	8.15	0.738	
WP Low-Level Mercury (cat# 896)												
1095	Low Level Mercury	ng/L	71	66.8	50.0 - 82.8	Acceptable	EPA 1631E	2/7/2014	0.951	66.5	4.76	
WP Hexavalent Chromium (cat# 898)												
1045	Hexavalent Chromium	µg/L	656	673	566 - 771	Acceptable	EPA 7196A 1	2/4/2014	-0.332	667	33.1	
WP Hexavalent Chromium (cat# 898)												
1045	Hexavalent Chromium	µg/L	656	673	566 - 771	Acceptable	SM 3500-Cr B-2009 2009	2/4/2014	-0.332	667	33.1	
WP Tin & Titanium (cat# 573)												
1175	Tin	µg/L	1820	1690	1180 - 2200	Acceptable	EPA 6010B 2	1/21/2014	1.26	1700	97.2	
1180	Titanium	µg/L	116	114	96.9 - 131	Acceptable	EPA 6010B 2	1/21/2014	0.283	114	6.74	
WP Tin & Titanium (cat# 573)												
1175	Tin	µg/L	1810	1690	1180 - 2200	Acceptable	EPA 200.7 5	1/22/2014	1.16	1700	97.2	
1180	Titanium	µg/L	122	114	96.9 - 131	Acceptable	EPA 200.7 5	1/22/2014	1.17	114	6.74	

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WP Tin & Titanium (cat# 573)												
1175	Tin	µg/L	1560	1690	1180 - 2200	Acceptable	EPA 200.8 5.5	1/21/2014	-1.41	1700	97.2	
1180	Titanium	µg/L	106	114	96.9 - 131	Acceptable	EPA 200.8 5.5	1/21/2014	-1.20	114	6.74	
WP Tin & Titanium (cat# 573)												
1175	Tin	µg/L	1700	1690	1180 - 2200	Acceptable	EPA 6020A	1/21/2014	0.0298	1700	97.2	
1180	Titanium	µg/L	118	114	96.9 - 131	Acceptable	EPA 6020A	1/21/2014	0.580	114	6.74	
WP Color (cat# 882)												
1605	Color	PC units	60	50.0	35.2 - 60.8	Acceptable	SM2120B 21st ED	2/13/2014	2.45	48.5	4.67	
WP Total Cyanide (cat# 588)												
1645	Cyanide, total	mg/L	0.749	0.674	0.438 - 0.910	Acceptable	SM 4500-CN E-1999 1999	1/30/2014	1.23	0.665	0.0680	
1510	Amenable Cyanide	mg/L	0.436	0.359	0.233 - 0.485	Acceptable	EPA 9012B 2002	1/30/2014	0.613	0.398	0.0616	
WP Total Cyanide (cat# 588)												
1645	Cyanide, total	mg/L	0.749	0.674	0.438 - 0.910	Acceptable	EPA 9012B	1/30/2014	1.23	0.665	0.0680	
1510	Amenable Cyanide	mg/L		0.359	0.233 - 0.485	Not Reported				0.398	0.0616	
WP Total Phenolics (4-AAP) (cat# 589)												
1905	Phenolics, total	mg/L	0.689	0.653	0.323 - 0.983	Acceptable	EPA 420.4 1 1993	2/5/2014	0.0847	0.680	0.111	
WP Total Phenolics (4-AAP) (cat# 589)												
1905	Phenolics, total	mg/L	0.689	0.653	0.323 - 0.983	Acceptable	EPA 9066 1986	2/5/2014	0.0847	0.680	0.111	
WP Silica (cat# 890)												
1990	Silica as SiO2	mg/L	195	209	157 - 261	Acceptable	EPA 200.7 5 1998	1/22/2014	-0.909	208	13.9	
WP Silica (cat# 890)												
1990	Silica as SiO2	mg/L	188	209	157 - 261	Acceptable	EPA 6010B 2 1996	1/22/2014	-1.41	208	13.9	

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WP Sulfide (cat# 891)												
2005	Sulfide	mg/L		3.96	1.42 - 5.97	Not Reported				2.93	0.816	
WP Total Residual Chlorine (cat# 587)												
1940	Total Residual Chlorine	mg/L	1.03	1.11	0.825 - 1.33	Acceptable	SM 4500-Cl E-2011 2011	2/13/2014	-0.781	1.10	0.0837	

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Laboratory Name: **Microbac Laboratories - Chicagoland Division**

Organic Results

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TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Volatiles (cat# 830)												
4315	Acetone	µg/L	< 50	< 3.90	0.00 - 3.90	Acceptable	EPA 8260B 2 1996	2/19/2014				
4320	Acetonitrile	µg/L	< 100	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
4325	Acrolein	µg/L	< 100	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
4340	Acrylonitrile	µg/L	< 100	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
4375	Benzene	µg/L	29.4	29.8	20.9 - 38.7	Acceptable	EPA 8260B 2 1996	2/19/2014	-0.192	29.9	2.40	
4385	Bromobenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
4390	Bromochloromethane	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
4395	Bromodichloromethane	µg/L	78	76.0	45.6 - 106	Acceptable	EPA 8260B 2 1996	2/19/2014	-0.196	79.3	6.88	
4400	Bromoform	µg/L	66.5	59.7	35.8 - 83.6	Acceptable	EPA 8260B 2 1996	2/19/2014	0.797	60.6	7.38	
4950	Bromomethane	µg/L	< 10	< 8.00	0.00 - 8.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
4410	2-Butanone (MEK)	µg/L	< 10	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
4435	n-Butylbenzene	µg/L	< 10	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
4440	sec-Butylbenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
4445	tert-Butylbenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
5000	tert-Butyl methyl ether (MTBE)	µg/L	77.2	72.5	48.7 - 98.9	Acceptable	EPA 8260B 2 1996	2/19/2014	0.278	75.5	6.03	
4450	Carbon disulfide	µg/L	< 10	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
4455	Carbon tetrachloride	µg/L	127	124	70.6 - 167	Acceptable	EPA 8260B 2 1996	2/19/2014	0.461	118	19.1	
4475	Chlorobenzene	µg/L	< 5	< 7.00	0.00 - 7.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
4575	Chlorodibromomethane	µg/L	< 5	< 6.00	0.00 - 6.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
4485	Chloroethane	µg/L	32.5	26.7	10.7 - 42.7	Acceptable	EPA 8260B 2 1996	2/19/2014	0.277	31.1	5.23	

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WP Volatiles (cat# 830) (Continued)												
4500	2-Chloroethylvinylether	µg/L	< 10	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
4505	Chloroform	µg/L	< 5	< 7.00	0.00 - 7.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
4960	Chloromethane	µg/L	36.2	24.4	9.76 - 39.0	Acceptable	EPA 8260B 2 1996	2/19/2014	1.54	28.5	4.98	
4535	2-Chlorotoluene	µg/L		< 5.00	0.00 - 5.00	Not Reported						
4540	4-Chlorotoluene	µg/L		< 5.00	0.00 - 5.00	Not Reported						
4570	1,2-Dibromo-3-chloropropane (DBCP)	µg/L	< 5	< 9.00	0.00 - 9.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
4585	1,2-Dibromoethane (EDB)	µg/L	< 5	< 6.50	0.00 - 6.50	Acceptable	EPA 8260B 2 1996	2/19/2014				
4595	Dibromomethane	µg/L	103	100	65.0 - 135	Acceptable	EPA 8260B 2 1996	2/19/2014	-0.106	104	7.95	
4610	1,2-Dichlorobenzene	µg/L	< 10	< 7.00	0.00 - 7.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
4615	1,3-Dichlorobenzene	µg/L	< 10	< 7.00	0.00 - 7.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
4620	1,4-Dichlorobenzene	µg/L	96.3	90.3	63.2 - 117	Acceptable	EPA 8260B 2 1996	2/19/2014	1.25	84.5	9.50	
4625	Dichlorodifluoromethane (Freon 12)	µg/L	< 10	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
4630	1,1-Dichloroethane	µg/L	< 5	< 6.40	0.00 - 6.40	Acceptable	EPA 8260B 2 1996	2/19/2014				
4635	1,2-Dichloroethane	µg/L	107	104	73.9 - 134	Acceptable	EPA 8260B 2 1996	2/19/2014	0.0443	107	9.43	
4640	1,1-Dichloroethylene	µg/L	< 5	< 6.20	0.00 - 6.20	Acceptable	EPA 8260B 2 1996	2/19/2014				
4645	cis-1,2-Dichloroethylene	µg/L	16	16.5	11.4 - 22.3	Acceptable	EPA 8260B 2 1996	2/19/2014	-0.390	16.7	1.72	
4700	trans-1,2-Dichloroethylene	µg/L	58.2	54.8	32.9 - 76.7	Acceptable	EPA 8260B 2 1996	2/19/2014	0.0550	57.9	5.84	
4655	1,2-Dichloropropane	µg/L	< 5	< 7.00	0.00 - 7.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
4660	1,3-Dichloropropane	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
4665	2,2-Dichloropropane	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	2/19/2014				

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TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Volatiles (cat# 830) (Continued)												
4670	1,1-Dichloropropene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
4680	cis-1,3-Dichloropropylene	µg/L	29.1	30.7	20.0 - 41.4	Acceptable	EPA 8260B 2 1996	2/19/2014	0.144	28.7	2.58	
4685	trans-1,3-Dichloropropylene	µg/L	43.2	43.6	28.3 - 58.9	Acceptable	EPA 8260B 2 1996	2/19/2014	0.307	41.9	4.29	
4765	Ethylbenzene	µg/L	89.8	73.2	51.2 - 95.2	Acceptable	EPA 8260B 2 1996	2/19/2014	1.34	77.1	9.50	
4835	Hexachlorobutadiene	µg/L	120	102	11.6 - 122	Acceptable	EPA 8260B 2 1996	2/19/2014	1.41	77.6	30.0	
4840	Hexachloroethane	µg/L	< 20	< 3.30	0.00 - 3.30	Acceptable	EPA 8260B 2 1996	2/19/2014				
4860	2-Hexanone	µg/L	< 10	< 4.40	0.00 - 4.40	Acceptable	EPA 8260B 2 1996	2/19/2014				
4900	Isopropylbenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
4910	4-Isopropyltoluene	µg/L		< 5.00	0.00 - 5.00	Not Reported						
4975	Methylene chloride	µg/L	62.1	58.0	34.8 - 81.2	Acceptable	EPA 8260B 2 1996	2/19/2014	0.144	61.2	6.19	
4995	4-Methyl-2-pentanone (MIBK)	µg/L	< 10	< 2.00	0.00 - 2.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
5005	Naphthalene	µg/L	16.3	17.6	7.58 - 26.2	Acceptable	EPA 8260B 2 1996	2/19/2014	-0.159	16.8	3.33	
5015	Nitrobenzene	µg/L		< 6.20	0.00 - 6.20	Not Reported						
5090	n-Propylbenzene	µg/L	< 10	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
5100	Styrene	µg/L	100	103	67.0 - 139	Acceptable	EPA 8260B 2 1996	2/19/2014	0.0967	98.9	11.3	
5105	1,1,1,2-Tetrachloroethane	µg/L	102	94.8	61.6 - 128	Acceptable	EPA 8260B 2 1996	2/19/2014	0.637	95.0	10.9	
5110	1,1,2,2-Tetrachloroethane	µg/L	56.8	52.5	34.1 - 70.9	Acceptable	EPA 8260B 2 1996	2/19/2014	0.399	54.7	5.30	
5115	Tetrachloroethylene	µg/L	< 5	< 4.30	0.00 - 4.30	Acceptable	EPA 8260B 2 1996	2/19/2014				
5140	Toluene	µg/L	60.8	56.5	39.6 - 73.4	Acceptable	EPA 8260B 2 1996	2/19/2014	0.857	56.8	4.62	
5150	1,2,3-Trichlorobenzene	µg/L	96.1	< 5.00	0.00 - 5.00	Not Acceptable	EPA 8260B 2 1996	2/19/2014				

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WP Volatiles (cat# 830) (Continued)												
5155	1,2,4-Trichlorobenzene	µg/L	96.1	93.1	41.3 - 127	Acceptable	EPA 8260B 2 1996	2/19/2014	0.740	82.4	18.5	
5160	1,1,1-Trichloroethane	µg/L	< 5	< 6.00	0.00 - 6.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
5165	1,1,2-Trichloroethane	µg/L	67.5	62.6	43.8 - 81.4	Acceptable	EPA 8260B 2 1996	2/19/2014	0.424	65.2	5.36	
5170	Trichloroethylene	µg/L	76.8	74.3	47.2 - 96.7	Acceptable	EPA 8260B 2 1996	2/19/2014	0.413	73.9	6.94	
5175	Trichlorofluoromethane	µg/L	< 10	< 8.00	0.00 - 8.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
5180	1,2,3-Trichloropropane (TCP)	µg/L	76.4	94.6	43.7 - 142	Acceptable	EPA 8260B 2 1996	2/19/2014	-1.63	99.4	14.1	
5210	1,2,4-Trimethylbenzene	µg/L	108.7	101	65.6 - 136	Acceptable	EPA 8260B 2 1996	2/19/2014	0.803	95.6	16.3	
5215	1,3,5-Trimethylbenzene	µg/L	105.1	104	67.6 - 140	Acceptable	EPA 8260B 2 1996	2/19/2014	0.670	93.6	17.2	
5225	Vinyl acetate	µg/L	< 10	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
5235	Vinyl chloride	µg/L	< 2	< 8.00	0.00 - 8.00	Acceptable	EPA 8260B 2 1996	2/19/2014				
5240	m&p-Xylene	µg/L	13.2	12.7	7.62 - 17.8	Acceptable	EPA 8260B 2 1996	2/19/2014	0.405	12.5	1.61	
5250	o-Xylene	µg/L	9.55	10.5	6.30 - 14.7	Acceptable	EPA 8260B 2 1996	2/19/2014	-0.720	10.5	1.27	
5260	Xylenes, total	µg/L	23	23.2	13.9 - 32.5	Acceptable	EPA 8260B 2 1996	2/19/2014	-0.0291	23.1	2.66	

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WP Volatiles (cat# 830)												
4315	Acetone	µg/L	< 50	< 3.90	0.00 - 3.90	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4320	Acetonitrile	µg/L	< 100	< 5.00	0.00 - 5.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4325	Acrolein	µg/L	< 100	< 5.00	0.00 - 5.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4340	Acrylonitrile	µg/L	< 100	< 5.00	0.00 - 5.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4375	Benzene	µg/L	29.4	29.8	20.9 - 38.7	Acceptable	EPA 624 Appendix A 1982	2/19/2014	-0.192	29.9	2.40	
4385	Bromobenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4390	Bromochloromethane	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4395	Bromodichloromethane	µg/L	78	76.0	45.6 - 106	Acceptable	EPA 624 Appendix A 1982	2/19/2014	-0.196	79.3	6.88	
4400	Bromoform	µg/L	66.5	59.7	35.8 - 83.6	Acceptable	EPA 624 Appendix A 1982	2/19/2014	0.797	60.6	7.38	
4950	Bromomethane	µg/L	< 10	< 8.00	0.00 - 8.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4410	2-Butanone (MEK)	µg/L	< 10	< 5.00	0.00 - 5.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4435	n-Butylbenzene	µg/L	< 10	< 5.00	0.00 - 5.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4440	sec-Butylbenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4445	tert-Butylbenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
5000	tert-Butyl methyl ether (MTBE)	µg/L	77.2	72.5	48.7 - 98.9	Acceptable	EPA 624 Appendix A 1982	2/19/2014	0.278	75.5	6.03	
4450	Carbon disulfide	µg/L	< 10	< 5.00	0.00 - 5.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4455	Carbon tetrachloride	µg/L	127	124	70.6 - 167	Acceptable	EPA 624 Appendix A 1982	2/19/2014	0.461	118	19.1	
4475	Chlorobenzene	µg/L	< 5	< 7.00	0.00 - 7.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4575	Chlorodibromomethane	µg/L	< 5	< 6.00	0.00 - 6.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4485	Chloroethane	µg/L	32.5	26.7	10.7 - 42.7	Acceptable	EPA 624 Appendix A 1982	2/19/2014	0.277	31.1	5.23	

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WP Volatiles (cat# 830) (Continued)												
4500	2-Chloroethylvinylether	µg/L	< 10	< 5.00	0.00 - 5.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4505	Chloroform	µg/L	< 5	< 7.00	0.00 - 7.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4960	Chloromethane	µg/L	36.2	24.4	9.76 - 39.0	Acceptable	EPA 624 Appendix A 1982	2/19/2014	1.54	28.5	4.98	
4535	2-Chlorotoluene	µg/L		< 5.00	0.00 - 5.00	Not Reported						
4540	4-Chlorotoluene	µg/L		< 5.00	0.00 - 5.00	Not Reported						
4570	1,2-Dibromo-3-chloropropane (DBCP)	µg/L	< 5	< 9.00	0.00 - 9.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4585	1,2-Dibromoethane (EDB)	µg/L	< 5	< 6.50	0.00 - 6.50	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4595	Dibromomethane	µg/L	103	100	65.0 - 135	Acceptable	EPA 624 Appendix A 1982	2/19/2014	-0.106	104	7.95	
4610	1,2-Dichlorobenzene	µg/L	< 10	< 7.00	0.00 - 7.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4615	1,3-Dichlorobenzene	µg/L	< 10	< 7.00	0.00 - 7.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4620	1,4-Dichlorobenzene	µg/L	96.3	90.3	63.2 - 117	Acceptable	EPA 624 Appendix A 1982	2/19/2014	1.25	84.5	9.50	
4625	Dichlorodifluoromethane (Freon 12)	µg/L	< 10	< 5.00	0.00 - 5.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4630	1,1-Dichloroethane	µg/L	< 5	< 6.40	0.00 - 6.40	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4635	1,2-Dichloroethane	µg/L	107	104	73.9 - 134	Acceptable	EPA 624 Appendix A 1982	2/19/2014	0.0443	107	9.43	
4640	1,1-Dichloroethylene	µg/L	< 5	< 6.20	0.00 - 6.20	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4645	cis-1,2-Dichloroethylene	µg/L	16	16.5	11.4 - 22.3	Acceptable	EPA 624 Appendix A 1982	2/19/2014	-0.390	16.7	1.72	
4700	trans-1,2-Dichloroethylene	µg/L	58.2	54.8	32.9 - 76.7	Acceptable	EPA 624 Appendix A 1982	2/19/2014	0.0550	57.9	5.84	
4655	1,2-Dichloropropane	µg/L	< 5	< 7.00	0.00 - 7.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4660	1,3-Dichloropropane	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4665	2,2-Dichloropropane	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				

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WP Volatiles (cat# 830) (Continued)												
4670	1,1-Dichloropropene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4680	cis-1,3-Dichloropropylene	µg/L	29.1	30.7	20.0 - 41.4	Acceptable	EPA 624 Appendix A 1982	2/19/2014	0.144	28.7	2.58	
4685	trans-1,3-Dichloropropylene	µg/L	43.2	43.6	28.3 - 58.9	Acceptable	EPA 624 Appendix A 1982	2/19/2014	0.307	41.9	4.29	
4765	Ethylbenzene	µg/L	89.8	73.2	51.2 - 95.2	Acceptable	EPA 624 Appendix A 1982	2/19/2014	1.34	77.1	9.50	
4835	Hexachlorobutadiene	µg/L	120	102	11.6 - 122	Acceptable	EPA 624 Appendix A 1982	2/19/2014	1.41	77.6	30.0	
4840	Hexachloroethane	µg/L	< 20	< 3.30	0.00 - 3.30	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4860	2-Hexanone	µg/L	< 10	< 4.40	0.00 - 4.40	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4900	Isopropylbenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
4910	4-Isopropyltoluene	µg/L		< 5.00	0.00 - 5.00	Not Reported						
4975	Methylene chloride	µg/L	62.1	58.0	34.8 - 81.2	Acceptable	EPA 624 Appendix A 1982	2/19/2014	0.144	61.2	6.19	
4995	4-Methyl-2-pentanone (MIBK)	µg/L	< 10	< 2.00	0.00 - 2.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
5005	Naphthalene	µg/L	16.3	17.6	7.58 - 26.2	Acceptable	EPA 624 Appendix A 1982	2/19/2014	-0.159	16.8	3.33	
5015	Nitrobenzene	µg/L		< 6.20	0.00 - 6.20	Not Reported						
5090	n-Propylbenzene	µg/L	< 10	< 5.00	0.00 - 5.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
5100	Styrene	µg/L	100	103	67.0 - 139	Acceptable	EPA 624 Appendix A 1982	2/19/2014	0.0967	98.9	11.3	
5105	1,1,1,2-Tetrachloroethane	µg/L	102	94.8	61.6 - 128	Acceptable	EPA 624 Appendix A 1982	2/19/2014	0.637	95.0	10.9	
5110	1,1,2,2-Tetrachloroethane	µg/L	56.8	52.5	34.1 - 70.9	Acceptable	EPA 624 Appendix A 1982	2/19/2014	0.399	54.7	5.30	
5115	Tetrachloroethylene	µg/L	< 5	< 4.30	0.00 - 4.30	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
5140	Toluene	µg/L	60.8	56.5	39.6 - 73.4	Acceptable	EPA 624 Appendix A 1982	2/19/2014	0.857	56.8	4.62	
5150	1,2,3-Trichlorobenzene	µg/L	96.1	< 5.00	0.00 - 5.00	Not Acceptable	EPA 624 Appendix A 1982	2/19/2014				

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WP Volatiles (cat# 830) (Continued)												
5155	1,2,4-Trichlorobenzene	µg/L	96.1	93.1	41.3 - 127	Acceptable	EPA 624 Appendix A 1982	2/19/2014	0.740	82.4	18.5	
5160	1,1,1-Trichloroethane	µg/L	< 5	< 6.00	0.00 - 6.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
5165	1,1,2-Trichloroethane	µg/L	67.5	62.6	43.8 - 81.4	Acceptable	EPA 624 Appendix A 1982	2/19/2014	0.424	65.2	5.36	
5170	Trichloroethylene	µg/L	76.8	74.3	47.2 - 96.7	Acceptable	EPA 624 Appendix A 1982	2/19/2014	0.413	73.9	6.94	
5175	Trichlorofluoromethane	µg/L	< 10	< 8.00	0.00 - 8.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
5180	1,2,3-Trichloropropane (TCP)	µg/L	76.4	94.6	43.7 - 142	Acceptable	EPA 624 Appendix A 1982	2/19/2014	-1.63	99.4	14.1	
5210	1,2,4-Trimethylbenzene	µg/L	108.7	101	65.6 - 136	Acceptable	EPA 624 Appendix A 1982	2/19/2014	0.803	95.6	16.3	
5215	1,3,5-Trimethylbenzene	µg/L	105.1	104	67.6 - 140	Acceptable	EPA 624 Appendix A 1982	2/19/2014	0.670	93.6	17.2	
5225	Vinyl acetate	µg/L	< 10	< 5.00	0.00 - 5.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
5235	Vinyl chloride	µg/L	< 2	< 8.00	0.00 - 8.00	Acceptable	EPA 624 Appendix A 1982	2/19/2014				
5240	m&p-Xylene	µg/L	13.2	12.7	7.62 - 17.8	Acceptable	EPA 624 Appendix A 1982	2/19/2014	0.405	12.5	1.61	
5250	o-Xylene	µg/L	9.55	10.5	6.30 - 14.7	Acceptable	EPA 624 Appendix A 1982	2/19/2014	-0.720	10.5	1.27	
5260	Xylenes, total	µg/L	23	23.2	13.9 - 32.5	Acceptable	EPA 624 Appendix A 1982	2/19/2014	-0.0291	23.1	2.66	
WP PCBs in Water (cat# 832S)												
8880	Aroclor 1016	µg/L	< 1	< 0.800	0.00 - 0.800	Acceptable	EPA 8082 1996	1/30/2014				
8885	Aroclor 1221	µg/L	< 1	< 0.800	0.00 - 0.800	Acceptable	EPA 8082 1996	1/30/2014				
8890	Aroclor 1232	µg/L	< 1	< 0.800	0.00 - 0.800	Acceptable	EPA 8082 1996	1/30/2014				
8895	Aroclor 1242	µg/L	7.48	9.66	3.51 - 13.0	Acceptable	EPA 8082 1996	1/30/2014	-0.788	8.90	1.80	
8900	Aroclor 1248	µg/L	< 1	< 0.800	0.00 - 0.800	Acceptable	EPA 8082 1996	1/30/2014				
8905	Aroclor 1254	µg/L	< 1	< 0.800	0.00 - 0.800	Acceptable	EPA 8082 1996	1/30/2014				
8910	Aroclor 1260	µg/L	< 1	< 0.800	0.00 - 0.800	Acceptable	EPA 8082 1996	1/30/2014				

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WP PCBs in Water (cat# 832S)												
8880	Aroclor 1016	µg/L	< 1	< 0.800	0.00 - 0.800	Acceptable	EPA 608	1/30/2014				
8885	Aroclor 1221	µg/L	< 1	< 0.800	0.00 - 0.800	Acceptable	EPA 608	1/30/2014				
8890	Aroclor 1232	µg/L	< 1	< 0.800	0.00 - 0.800	Acceptable	EPA 608	1/30/2014				
8895	Aroclor 1242	µg/L	7.48	9.66	3.51 - 13.0	Acceptable	EPA 608	1/30/2014	-0.788	8.90	1.80	
8900	Aroclor 1248	µg/L	< 1	< 0.800	0.00 - 0.800	Acceptable	EPA 608	1/30/2014				
8905	Aroclor 1254	µg/L	< 1	< 0.800	0.00 - 0.800	Acceptable	EPA 608	1/30/2014				
8910	Aroclor 1260	µg/L	< 1	< 0.800	0.00 - 0.800	Acceptable	EPA 608	1/30/2014				
WP PCBs in Oil (cat# 835S)												
8880	Aroclor 1016	mg/kg	< 5	< 1.70	0.00 - 1.70	Acceptable	EPA 8082 1996	2/7/2014				
8895	Aroclor 1242	mg/kg	36.6	34.7	5.97 - 47.4	Acceptable	EPA 8082 1996	2/7/2014	0.848	29.9	7.90	
8905	Aroclor 1254	mg/kg	< 5	< 1.60	0.00 - 1.60	Acceptable	EPA 8082 1996	2/7/2014				
8910	Aroclor 1260	mg/kg	< 5	< 2.40	0.00 - 2.40	Acceptable	EPA 8082 1996	2/7/2014				

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EPA ID: IN00054
ERA Customer Number: A488001
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Study Dates: 01/13/14 - 02/27/14

TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Base/Neutrals (cat# 833)												
5500	Acenaphthene	µg/L	41.5	57.1	20.3 - 69.9	Acceptable	EPA 8270C 3	1/30/2014	-0.805	47.4	7.31	
5505	Acenaphthylene	µg/L	58	77.9	27.2 - 97.3	Acceptable	EPA 8270C 3	1/30/2014	-0.753	66.4	11.1	
5145	2-Amino-1-methylbenzene (o-toluidine)	µg/L	< 10	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3	1/30/2014				
5545	Aniline	µg/L	< 10	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3	1/30/2014				
5555	Anthracene	µg/L	< 10	< 3.90	0.00 - 3.90	Acceptable	EPA 8270C 3	1/30/2014				
5595	Benzidine	µg/L	< 50	< 200	0.00 - 200	Acceptable	EPA 8270C 3	1/30/2014				
5575	Benzo(a)anthracene	µg/L	26.1	31.9	14.4 - 40.2	Acceptable	EPA 8270C 3	1/30/2014	-0.428	27.7	3.83	
5585	Benzo(b)fluoranthene	µg/L	< 10	< 7.50	0.00 - 7.50	Acceptable	EPA 8270C 3	1/30/2014				
5600	Benzo(k)fluoranthene	µg/L	< 10	< 7.70	0.00 - 7.70	Acceptable	EPA 8270C 3	1/30/2014				
5590	Benzo(g,h,i)perylene	µg/L	< 10	< 5.10	0.00 - 5.10	Acceptable	EPA 8270C 3	1/30/2014				
5580	Benzo(a)pyrene	µg/L	21.5	24.7	7.92 - 32.5	Acceptable	EPA 8270C 3	1/30/2014	0.255	20.7	3.20	
5630	Benzyl alcohol	µg/L	< 20	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3	1/30/2014				
5660	4-Bromophenyl-phenylether	µg/L	45	52.2	21.8 - 68.7	Acceptable	EPA 8270C 3	1/30/2014	0.167	43.9	6.54	
5670	Butylbenzylphthalate	µg/L	< 10	< 13.4	0.00 - 13.4	Acceptable	EPA 8270C 3	1/30/2014				
5680	Carbazole	µg/L	< 10	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3	1/30/2014				
5745	4-Chloroaniline	µg/L	< 10	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3	1/30/2014				
5760	bis(2-Chloroethoxy)methane	µg/L	25.2	39.3	11.7 - 49.2	Acceptable	EPA 8270C 3	1/30/2014	-0.661	28.9	5.54	
5765	bis(2-Chloroethyl)ether	µg/L	< 10	< 5.90	0.00 - 5.90	Acceptable	EPA 8270C 3	1/30/2014				
5780	bis(2-Chloroisopropyl)ether	µg/L	55.4	86.8	22.3 - 108	Acceptable	EPA 8270C 3	1/30/2014	-0.490	62.8	15.1	
5790	1-Chloronaphthalene	µg/L		< 10.0	0.00 - 10.0	Not Reported						

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WP Base/Neutrals (cat# 833) (Continued)												
5795	2-Chloronaphthalene	µg/L	84.5	116	31.9 - 138	Acceptable	EPA 8270C 3	1/30/2014	-0.367	90.8	17.2	
5825	4-Chlorophenyl-phenylether	µg/L	143	186	66.6 - 226	Acceptable	EPA 8270C 3	1/30/2014	-0.622	163	31.7	
5855	Chrysene	µg/L	< 10	< 5.80	0.00 - 5.80	Acceptable	EPA 8270C 3	1/30/2014				
5895	Dibenz(a,h)anthracene	µg/L	33	35.9	12.7 - 50.1	Acceptable	EPA 8270C 3	1/30/2014	0.133	32.1	6.54	
5905	Dibenzofuran	µg/L	134	194	75.8 - 217	Acceptable	EPA 8270C 3	1/30/2014	-0.656	153	28.8	
5925	Di-n-butylphthalate	µg/L	86	95.0	34.1 - 124	Acceptable	EPA 8270C 3	1/30/2014	0.483	80.3	11.9	
4610	1,2-Dichlorobenzene	µg/L	< 10	< 2.00	0.00 - 2.00	Acceptable	EPA 8270C 3	1/30/2014				
4615	1,3-Dichlorobenzene	µg/L	< 10	< 3.10	0.00 - 3.10	Acceptable	EPA 8270C 3	1/30/2014				
4620	1,4-Dichlorobenzene	µg/L	92.3	170	17.0 - 187	Acceptable	EPA 8270C 3	1/30/2014	-0.449	106	29.9	
5945	3,3'-Dichlorobenzidine	µg/L	< 50	< 5.00	0.00 - 5.00	Acceptable	EPA 8270C 3	1/30/2014				
6070	Diethylphthalate	µg/L	92.6	118	21.8 - 162	Acceptable	EPA 8270C 3	1/30/2014	-0.0493	93.5	18.6	
6135	Dimethylphthalate	µg/L	92.4	117	11.7 - 170	Acceptable	EPA 8270C 3	1/30/2014	0.198	87.5	24.8	
6185	2,4-Dinitrotoluene	µg/L	115	152	66.2 - 185	Acceptable	EPA 8270C 3	1/30/2014	-0.305	122	22.6	
6190	2,6-Dinitrotoluene	µg/L	< 10	< 8.20	0.00 - 8.20	Acceptable	EPA 8270C 3	1/30/2014				
6200	Di-n-octylphthalate	µg/L	87.5	104	30.5 - 146	Acceptable	EPA 8270C 3	1/30/2014	-0.116	89.3	15.5	
6065	bis(2-Ethylhexyl)phthalate	µg/L	87.1	100	34.2 - 132	Acceptable	EPA 8270C 3	1/30/2014	0.105	85.6	14.0	
6265	Fluoranthene	µg/L	< 10	< 15.6	0.00 - 15.6	Acceptable	EPA 8270C 3	1/30/2014				
6270	Fluorene	µg/L	107	144	60.0 - 167	Acceptable	EPA 8270C 3	1/30/2014	-0.561	119	21.8	
6275	Hexachlorobenzene	µg/L	38.6	47.0	20.9 - 56.6	Acceptable	EPA 8270C 3	1/30/2014	-0.143	39.5	6.15	
4835	Hexachlorobutadiene	µg/L	62.8	107	12.3 - 128	Acceptable	EPA 8270C 3	1/30/2014	-0.479	72.5	20.2	

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WP Base/Neutrals (cat# 833) (Continued)												
6285	Hexachlorocyclopentadiene	µg/L	< 10	< 5.00	0.00 - 5.00	Acceptable	EPA 8270C 3	1/30/2014				
4840	Hexachloroethane	µg/L	55.5	97.4	9.74 - 107	Acceptable	EPA 8270C 3	1/30/2014	-0.203	59.3	18.9	
6315	Indeno(1,2,3-cd)pyrene	µg/L	38.7	42.8	12.8 - 58.1	Acceptable	EPA 8270C 3	1/30/2014	0.114	37.9	7.16	
6320	Isophorone	µg/L	< 10	< 7.10	0.00 - 7.10	Acceptable	EPA 8270C 3	1/30/2014				
6385	2-Methylnaphthalene	µg/L	< 10	< 2.00	0.00 - 2.00	Acceptable	EPA 8270C 3	1/30/2014				
5005	Naphthalene	µg/L	76.2	118	28.3 - 138	Acceptable	EPA 8270C 3	1/30/2014	-0.678	88.5	18.2	
6460	2-Nitroaniline	µg/L	< 50	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3	1/30/2014				
6465	3-Nitroaniline	µg/L	< 50	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3	1/30/2014				
6470	4-Nitroaniline	µg/L	< 50	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3	1/30/2014				
5015	Nitrobenzene	µg/L	25.3	37.7	12.0 - 46.2	Acceptable	EPA 8270C 3	1/30/2014	-0.746	29.7	5.90	
6525	N-Nitrosodiethylamine	µg/L	< 10	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3	1/30/2014				
6530	N-Nitrosodimethylamine	µg/L	45.3	93.4	9.34 - 109	Acceptable	EPA 8270C 3	1/30/2014	-0.147	48.0	18.6	
6535	N-Nitrosodiphenylamine	µg/L	< 10	< 5.60	0.00 - 5.60	Acceptable	EPA 8270C 3	1/30/2014				
6545	N-Nitroso-di-n-propylamine	µg/L	96.7	136	44.3 - 171	Acceptable	EPA 8270C 3	1/30/2014	-0.354	104	20.8	
6590	Pentachlorobenzene	µg/L	< 10	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3	1/30/2014				
6615	Phenanthrene	µg/L	138	188	87.8 - 219	Acceptable	EPA 8270C 3	1/30/2014	-0.688	156	25.9	
6665	Pyrene	µg/L	< 10	< 4.90	0.00 - 4.90	Acceptable	EPA 8270C 3	1/30/2014				
5095	Pyridine	µg/L	< 10	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3	1/30/2014				
6715	1,2,4,5-Tetrachlorobenzene	µg/L		< 10.0	0.00 - 10.0	Not Reported						
5155	1,2,4-Trichlorobenzene	µg/L	19.9	30.6	3.06 - 41.0	Acceptable	EPA 8270C 3	1/30/2014	-0.676	23.4	5.12	

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WP Base/Neutrals (cat# 833)												
5500	Acenaphthene	µg/L	41.5	57.1	20.3 - 69.9	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.805	47.4	7.31	
5505	Acenaphthylene	µg/L	58	77.9	27.2 - 97.3	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.753	66.4	11.1	
5145	2-Amino-1-methylbenzene (o-toluidine)	µg/L	< 10	< 10.0	0.00 - 10.0	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
5545	Aniline	µg/L	< 10	< 10.0	0.00 - 10.0	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
5555	Anthracene	µg/L	< 10	< 3.90	0.00 - 3.90	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
5595	Benzidine	µg/L	< 50	< 200	0.00 - 200	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
5575	Benzo(a)anthracene	µg/L	26.1	31.9	14.4 - 40.2	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.428	27.7	3.83	
5585	Benzo(b)fluoranthene	µg/L	< 10	< 7.50	0.00 - 7.50	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
5600	Benzo(k)fluoranthene	µg/L	< 10	< 7.70	0.00 - 7.70	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
5590	Benzo(g,h,i)perylene	µg/L	< 10	< 5.10	0.00 - 5.10	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
5580	Benzo(a)pyrene	µg/L	21.5	24.7	7.92 - 32.5	Acceptable	EPA 625 Appendix A 1982	1/30/2014	0.255	20.7	3.20	
5630	Benzyl alcohol	µg/L	< 20	< 10.0	0.00 - 10.0	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
5660	4-Bromophenyl-phenylether	µg/L	45	52.2	21.8 - 68.7	Acceptable	EPA 625 Appendix A 1982	1/30/2014	0.167	43.9	6.54	
5670	Butylbenzylphthalate	µg/L	< 10	< 13.4	0.00 - 13.4	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
5680	Carbazole	µg/L	< 10	< 10.0	0.00 - 10.0	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
5745	4-Chloroaniline	µg/L	< 10	< 10.0	0.00 - 10.0	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
5760	bis(2-Chloroethoxy)methane	µg/L	25.2	39.3	11.7 - 49.2	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.661	28.9	5.54	
5765	bis(2-Chloroethyl)ether	µg/L	< 10	< 5.90	0.00 - 5.90	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
5780	bis(2-Chloroisopropyl)ether	µg/L	55.4	86.8	22.3 - 108	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.490	62.8	15.1	
5790	1-Chloronaphthalene	µg/L		< 10.0	0.00 - 10.0	Not Reported						

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WP Base/Neutrals (cat# 833) (Continued)												
5795	2-Chloronaphthalene	µg/L	84.5	116	31.9 - 138	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.367	90.8	17.2	
5825	4-Chlorophenyl-phenylether	µg/L	143	186	66.6 - 226	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.622	163	31.7	
5855	Chrysene	µg/L	< 10	< 5.80	0.00 - 5.80	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
5895	Dibenz(a,h)anthracene	µg/L	33	35.9	12.7 - 50.1	Acceptable	EPA 625 Appendix A 1982	1/30/2014	0.133	32.1	6.54	
5905	Dibenzofuran	µg/L	134	194	75.8 - 217	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.656	153	28.8	
5925	Di-n-butylphthalate	µg/L	86	95.0	34.1 - 124	Acceptable	EPA 625 Appendix A 1982	1/30/2014	0.483	80.3	11.9	
4610	1,2-Dichlorobenzene	µg/L	< 10	< 2.00	0.00 - 2.00	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
4615	1,3-Dichlorobenzene	µg/L	< 10	< 3.10	0.00 - 3.10	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
4620	1,4-Dichlorobenzene	µg/L	92.3	170	17.0 - 187	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.449	106	29.9	
5945	3,3'-Dichlorobenzidine	µg/L	< 50	< 5.00	0.00 - 5.00	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
6070	Diethylphthalate	µg/L	92.6	118	21.8 - 162	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.0493	93.5	18.6	
6135	Dimethylphthalate	µg/L	92.4	117	11.7 - 170	Acceptable	EPA 625 Appendix A 1982	1/30/2014	0.198	87.5	24.8	
6185	2,4-Dinitrotoluene	µg/L	115	152	66.2 - 185	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.305	122	22.6	
6190	2,6-Dinitrotoluene	µg/L	< 10	< 8.20	0.00 - 8.20	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
6200	Di-n-octylphthalate	µg/L	87.5	104	30.5 - 146	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.116	89.3	15.5	
6065	bis(2-Ethylhexyl)phthalate	µg/L	87.1	100	34.2 - 132	Acceptable	EPA 625 Appendix A 1982	1/30/2014	0.105	85.6	14.0	
6265	Fluoranthene	µg/L	< 10	< 15.6	0.00 - 15.6	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
6270	Fluorene	µg/L	107	144	60.0 - 167	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.561	119	21.8	
6275	Hexachlorobenzene	µg/L	38.6	47.0	20.9 - 56.6	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.143	39.5	6.15	
4835	Hexachlorobutadiene	µg/L	62.8	107	12.3 - 128	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.479	72.5	20.2	

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WP Base/Neutrals (cat# 833) (Continued)												
6285	Hexachlorocyclopentadiene	µg/L	< 10	< 5.00	0.00 - 5.00	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
4840	Hexachloroethane	µg/L	55.5	97.4	9.74 - 107	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.203	59.3	18.9	
6315	Indeno(1,2,3-cd)pyrene	µg/L	38.7	42.8	12.8 - 58.1	Acceptable	EPA 625 Appendix A 1982	1/30/2014	0.114	37.9	7.16	
6320	Isophorone	µg/L	< 10	< 7.10	0.00 - 7.10	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
6385	2-Methylnaphthalene	µg/L	< 10	< 2.00	0.00 - 2.00	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
5005	Naphthalene	µg/L	76.2	118	28.3 - 138	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.678	88.5	18.2	
6460	2-Nitroaniline	µg/L	< 50	< 10.0	0.00 - 10.0	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
6465	3-Nitroaniline	µg/L	< 50	< 10.0	0.00 - 10.0	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
6470	4-Nitroaniline	µg/L	< 50	< 10.0	0.00 - 10.0	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
5015	Nitrobenzene	µg/L	25.3	37.7	12.0 - 46.2	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.746	29.7	5.90	
6525	N-Nitrosodiethylamine	µg/L	< 10	< 10.0	0.00 - 10.0	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
6530	N-Nitrosodimethylamine	µg/L	45.3	93.4	9.34 - 109	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.147	48.0	18.6	
6535	N-Nitrosodiphenylamine	µg/L	< 10	< 5.60	0.00 - 5.60	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
6545	N-Nitroso-di-n-propylamine	µg/L	96.7	136	44.3 - 171	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.354	104	20.8	
6590	Pentachlorobenzene	µg/L	< 10	< 10.0	0.00 - 10.0	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
6615	Phenanthrene	µg/L	138	188	87.8 - 219	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.688	156	25.9	
6665	Pyrene	µg/L	< 10	< 4.90	0.00 - 4.90	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
5095	Pyridine	µg/L	< 10	< 10.0	0.00 - 10.0	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
6715	1,2,4,5-Tetrachlorobenzene	µg/L		< 10.0	0.00 - 10.0	Not Reported						
5155	1,2,4-Trichlorobenzene	µg/L	19.9	30.6	3.06 - 41.0	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.676	23.4	5.12	

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WP Acids (cat# 834)												
5610	Benzoic acid	µg/L	< 50	< 30.0	0.00 - 30.0	Acceptable	EPA 8270C 3 1996	1/30/2014				
5700	4-Chloro-3-methylphenol	µg/L	79.1	94.5	35.8 - 117	Acceptable	EPA 8270C 3 1996	1/30/2014	-0.200	81.8	13.6	
5800	2-Chlorophenol	µg/L	36.3	55.9	16.7 - 67.7	Acceptable	EPA 8270C 3 1996	1/30/2014	-0.541	41.8	10.1	
6000	2,4-Dichlorophenol	µg/L	64.4	86.8	29.2 - 104	Acceptable	EPA 8270C 3 1996	1/30/2014	-0.403	70.1	14.2	
6005	2,6-Dichlorophenol	µg/L	48	63.8	21.6 - 81.7	Acceptable	EPA 8270C 3 1996	1/30/2014	-0.787	57.1	11.6	
6130	2,4-Dimethylphenol	µg/L	29.4	47.9	14.1 - 60.6	Acceptable	EPA 8270C 3 1996	1/30/2014	-0.783	35.6	7.90	
6360	4,6-Dinitro-2-methylphenol	µg/L	35.5	58.4	16.9 - 85.0	Acceptable	EPA 8270C 3 1996	1/30/2014	-1.22	47.5	9.80	
6175	2,4-Dinitrophenol	µg/L	61.2	107	10.7 - 154	Acceptable	EPA 8270C 3 1996	1/30/2014	-0.743	75.1	18.8	
6400	2-Methylphenol	µg/L	93.6	150	34.1 - 175	Acceptable	EPA 8270C 3 1996	1/30/2014	-0.454	106	26.6	
6410	4-Methylphenol	µg/L	33.2	54.6	5.46 - 73.1	Acceptable	EPA 8270C 3 1996	1/30/2014	-0.444	37.1	8.72	
6490	2-Nitrophenol	µg/L	42.9	60.4	16.8 - 77.6	Acceptable	EPA 8270C 3 1996	1/30/2014	-0.443	47.6	10.6	
6500	4-Nitrophenol	µg/L	34.6	110	11.0 - 149	Acceptable	EPA 8270C 3 1996	1/30/2014	-0.551	49.7	27.5	
6605	Pentachlorophenol	µg/L	34.8	48.7	13.2 - 67.9	Acceptable	EPA 8270C 3 1996	1/30/2014	-0.292	37.2	8.14	
6625	Phenol	µg/L	44.4	141	14.1 - 189	Acceptable	EPA 8270C 3 1996	1/30/2014	-0.571	63.1	32.8	
6735	2,3,4,6-Tetrachlorophenol	µg/L		< 30.0	0.00 - 30.0	Not Reported						
6835	2,4,5-Trichlorophenol	µg/L	48	57.1	21.0 - 73.6	Acceptable	EPA 8270C 3 1996	1/30/2014	0.0714	47.4	8.93	
6840	2,4,6-Trichlorophenol	µg/L	62.3	74.5	28.0 - 91.0	Acceptable	EPA 8270C 3 1996	1/30/2014	-0.231	65.2	12.4	

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TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Acids (cat# 834)												
5610	Benzoic acid	µg/L	< 50	< 30.0	0.00 - 30.0	Acceptable	EPA 625 Appendix A 1982	1/30/2014				
5700	4-Chloro-3-methylphenol	µg/L	79.1	94.5	35.8 - 117	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.200	81.8	13.6	
5800	2-Chlorophenol	µg/L	36.3	55.9	16.7 - 67.7	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.541	41.8	10.1	
6000	2,4-Dichlorophenol	µg/L	64.4	86.8	29.2 - 104	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.403	70.1	14.2	
6005	2,6-Dichlorophenol	µg/L	48	63.8	21.6 - 81.7	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.787	57.1	11.6	
6130	2,4-Dimethylphenol	µg/L	29.4	47.9	14.1 - 60.6	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.783	35.6	7.90	
6360	4,6-Dinitro-2-methylphenol	µg/L	35.5	58.4	16.9 - 85.0	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-1.22	47.5	9.80	
6175	2,4-Dinitrophenol	µg/L	61.2	107	10.7 - 154	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.743	75.1	18.8	
6400	2-Methylphenol	µg/L	93.6	150	34.1 - 175	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.454	106	26.6	
6410	4-Methylphenol	µg/L	33.2	54.6	5.46 - 73.1	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.444	37.1	8.72	
6490	2-Nitrophenol	µg/L	42.9	60.4	16.8 - 77.6	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.443	47.6	10.6	
6500	4-Nitrophenol	µg/L	34.6	110	11.0 - 149	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.551	49.7	27.5	
6605	Pentachlorophenol	µg/L	34.8	48.7	13.2 - 67.9	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.292	37.2	8.14	
6625	Phenol	µg/L	44.4	141	14.1 - 189	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.571	63.1	32.8	
6735	2,3,4,6-Tetrachlorophenol	µg/L		< 30.0	0.00 - 30.0	Not Reported						
6835	2,4,5-Trichlorophenol	µg/L	48	57.1	21.0 - 73.6	Acceptable	EPA 625 Appendix A 1982	1/30/2014	0.0714	47.4	8.93	
6840	2,4,6-Trichlorophenol	µg/L	62.3	74.5	28.0 - 91.0	Acceptable	EPA 625 Appendix A 1982	1/30/2014	-0.231	65.2	12.4	

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WP Low-Level PAHs (cat# 836)												
5500	Acenaphthene	µg/L	3.36	5.26	1.84 - 6.45	Acceptable	EPA 8270C 3	2/1/2014	-1.33	4.28	0.689	
5505	Acenaphthylene	µg/L	12.9	19.1	8.35 - 21.7	Acceptable	EPA 8270C 3	2/1/2014	-0.879	15.3	2.70	
5555	Anthracene	µg/L	2.47	3.46	1.03 - 4.65	Acceptable	EPA 8270C 3	2/1/2014	-0.912	2.90	0.470	
5575	Benzo(a)anthracene	µg/L	2.71	4.03	2.73 - 4.49	Not Acceptable	EPA 8270C 3	2/1/2014	-0.898	3.21	0.558	
5585	Benzo(b)fluoranthene	µg/L	2.2	2.76	1.31 - 3.33	Acceptable	EPA 8270C 3	2/1/2014	-0.284	2.32	0.421	
5600	Benzo(k)fluoranthene	µg/L	1.09	1.51	0.747 - 1.94	Acceptable	EPA 8270C 3	2/1/2014	-0.625	1.25	0.257	
5590	Benzo(g,h,i)perylene	µg/L	1.62	2.00	0.599 - 2.62	Acceptable	EPA 8270C 3	2/1/2014	-0.0681	1.65	0.380	
5580	Benzo(a)pyrene	µg/L	3.13	4.12	1.76 - 4.79	Acceptable	EPA 8270C 3	2/1/2014	-0.0979	3.20	0.703	
5855	Chrysene	µg/L	3.01	4.56	2.56 - 5.56	Acceptable	EPA 8270C 3	2/1/2014	-1.47	3.95	0.637	
5895	Dibenz(a,h)anthracene	µg/L	2.03	2.51	0.858 - 3.24	Acceptable	EPA 8270C 3	2/1/2014	-0.0964	2.07	0.449	
6265	Fluoranthene	µg/L	3.88	4.80	2.56 - 5.70	Acceptable	EPA 8270C 3	2/1/2014	-0.594	4.22	0.575	
6270	Fluorene	µg/L	4.76	6.34	2.65 - 7.41	Acceptable	EPA 8270C 3	2/1/2014	-1.18	5.61	0.719	
6315	Indeno(1,2,3-cd)pyrene	µg/L	1.56	1.77	0.739 - 2.30	Acceptable	EPA 8270C 3	2/1/2014	0.154	1.50	0.361	
5005	Naphthalene	µg/L	5.49	8.97	3.02 - 10.2	Acceptable	EPA 8270C 3	2/1/2014	-1.08	6.69	1.11	
6615	Phenanthrene	µg/L	3.15	4.51	2.26 - 5.30	Acceptable	EPA 8270C 3	2/1/2014	-0.917	3.69	0.587	
6665	Pyrene	µg/L	2.84	3.91	2.13 - 4.58	Acceptable	EPA 8270C 3	2/1/2014	-1.18	3.39	0.463	

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WP Low-Level PAHs (cat# 836)												
5500	Acenaphthene	µg/L	3.36	5.26	1.84 - 6.45	Acceptable	EPA 625	2/1/2014	-1.33	4.28	0.689	
5505	Acenaphthylene	µg/L	12.9	19.1	8.35 - 21.7	Acceptable	EPA 625	2/1/2014	-0.879	15.3	2.70	
5555	Anthracene	µg/L	2.47	3.46	1.03 - 4.65	Acceptable	EPA 625	2/1/2014	-0.912	2.90	0.470	
5575	Benzo(a)anthracene	µg/L	2.71	4.03	2.73 - 4.49	Not Acceptable	EPA 625	2/1/2014	-0.898	3.21	0.558	
5585	Benzo(b)fluoranthene	µg/L	2.2	2.76	1.31 - 3.33	Acceptable	EPA 625	2/1/2014	-0.284	2.32	0.421	
5600	Benzo(k)fluoranthene	µg/L	1.09	1.51	0.747 - 1.94	Acceptable	EPA 625	2/1/2014	-0.625	1.25	0.257	
5590	Benzo(g,h,i)perylene	µg/L	1.62	2.00	0.599 - 2.62	Acceptable	EPA 625	2/1/2014	-0.0681	1.65	0.380	
5580	Benzo(a)pyrene	µg/L	3.13	4.12	1.76 - 4.79	Acceptable	EPA 625	2/1/2014	-0.0979	3.20	0.703	
5855	Chrysene	µg/L	3.01	4.56	2.56 - 5.56	Acceptable	EPA 625	2/1/2014	-1.47	3.95	0.637	
5895	Dibenz(a,h)anthracene	µg/L	2.03	2.51	0.858 - 3.24	Acceptable	EPA 625	2/1/2014	-0.0964	2.07	0.449	
6265	Fluoranthene	µg/L	3.88	4.80	2.56 - 5.70	Acceptable	EPA 625	2/1/2014	-0.594	4.22	0.575	
6270	Fluorene	µg/L	4.76	6.34	2.65 - 7.41	Acceptable	EPA 625	2/1/2014	-1.18	5.61	0.719	
6315	Indeno(1,2,3-cd)pyrene	µg/L	1.56	1.77	0.739 - 2.30	Acceptable	EPA 625	2/1/2014	0.154	1.50	0.361	
5005	Naphthalene	µg/L	5.49	8.97	3.02 - 10.2	Acceptable	EPA 625	2/1/2014	-1.08	6.69	1.11	
6615	Phenanthrene	µg/L	3.15	4.51	2.26 - 5.30	Acceptable	EPA 625	2/1/2014	-0.917	3.69	0.587	
6665	Pyrene	µg/L	2.84	3.91	2.13 - 4.58	Acceptable	EPA 625	2/1/2014	-1.18	3.39	0.463	

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TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Organochlorine Pesticides (cat# 831)												
7025	Aldrin	µg/L	6.1	8.84	3.13 - 11.9	Acceptable	EPA 8081A 1	1/29/2014	-0.748	7.07	1.30	
7110	alpha-BHC	µg/L	2.75	3.17	1.33 - 4.40	Acceptable	EPA 8081A 1	1/29/2014	-0.540	3.04	0.539	
7115	beta-BHC	µg/L	7.75	10.1	4.78 - 13.6	Acceptable	EPA 8081A 1	1/29/2014	-0.849	8.90	1.36	
7105	delta-BHC	µg/L	2.3	3.27	1.36 - 4.75	Acceptable	EPA 8081A 1	1/29/2014	-0.649	2.57	0.422	
7120	gamma-BHC(Lindane)	µg/L	3.8	4.67	2.10 - 6.49	Acceptable	EPA 8081A 1	1/29/2014	-0.821	4.32	0.631	
7240	alpha-Chlordane	µg/L		7.98	3.60 - 10.6	Not Reported				7.20	1.03	
7245	gamma-Chlordane	µg/L		4.40	1.93 - 5.86	Not Reported				3.82	0.485	
7355	4,4'-DDD	µg/L	3.45	4.24	1.88 - 6.06	Acceptable	EPA 8081A 1	1/29/2014	-0.814	3.98	0.651	
7360	4,4'-DDE	µg/L	6.15	8.87	3.85 - 11.9	Acceptable	EPA 8081A 1	1/29/2014	-1.31	7.77	1.24	
7365	4,4'-DDT	µg/L	2.25	2.69	1.07 - 3.98	Acceptable	EPA 8081A 1	1/29/2014	-0.811	2.58	0.402	
7470	Dieldrin	µg/L	6.75	9.77	4.99 - 12.9	Acceptable	EPA 8081A 1	1/29/2014	-1.69	8.81	1.22	
7540	Endrin	µg/L	3	3.77	1.65 - 5.42	Acceptable	EPA 8081A 1	1/29/2014	-1.04	3.61	0.584	
7530	Endrin aldehyde	µg/L	4.65	5.89	2.15 - 8.93	Acceptable	EPA 8081A 1	1/29/2014	-0.584	5.24	1.01	
7535	Endrin ketone	µg/L	5.25	6.94	3.65 - 9.52	Acceptable	EPA 8081A 1	1/29/2014	-0.722	5.92	0.923	
7510	Endosulfan I	µg/L	< 0.25	< 1.40	0.00 - 1.40	Acceptable	EPA 8081A 1	1/29/2014				
7515	Endosulfan II	µg/L	< 0.2	< 1.54	0.00 - 1.54	Acceptable	EPA 8081A 1	1/29/2014				
7520	Endosulfan sulfate	µg/L	8.15	10.9	5.04 - 15.1	Acceptable	EPA 8081A 1	1/29/2014	-1.01	9.66	1.50	
7685	Heptachlor	µg/L	7	9.20	3.31 - 12.4	Acceptable	EPA 8081A 1	2/14/2014	-0.546	7.74	1.35	
7690	Heptachlor epoxide (beta)	µg/L	6.9	8.59	4.35 - 11.4	Acceptable	EPA 8081A 1	1/29/2014	-0.903	7.85	1.05	
7810	Methoxychlor	µg/L	2.5	2.45	0.748 - 4.28	Acceptable	EPA 8081A 1	1/29/2014	0.397	2.34	0.401	

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TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Organochlorine Pesticides (cat# 831)												
7025	Aldrin	µg/L	6.1	8.84	3.13 - 11.9	Acceptable	EPA 608	1/29/2014	-0.748	7.07	1.30	
7110	alpha-BHC	µg/L	2.75	3.17	1.33 - 4.40	Acceptable	EPA 608	1/29/2014	-0.540	3.04	0.539	
7115	beta-BHC	µg/L	7.75	10.1	4.78 - 13.6	Acceptable	EPA 608	1/29/2014	-0.849	8.90	1.36	
7105	delta-BHC	µg/L	2.3	3.27	1.36 - 4.75	Acceptable	EPA 608	1/29/2014	-0.649	2.57	0.422	
7120	gamma-BHC(Lindane)	µg/L	3.8	4.67	2.10 - 6.49	Acceptable	EPA 608	1/29/2014	-0.821	4.32	0.631	
7240	alpha-Chlordane	µg/L		7.98	3.60 - 10.6	Not Reported				7.20	1.03	
7245	gamma-Chlordane	µg/L		4.40	1.93 - 5.86	Not Reported				3.82	0.485	
7355	4,4'-DDD	µg/L	3.45	4.24	1.88 - 6.06	Acceptable	EPA 608	1/29/2014	-0.814	3.98	0.651	
7360	4,4'-DDE	µg/L	6.15	8.87	3.85 - 11.9	Acceptable	EPA 608	1/29/2014	-1.31	7.77	1.24	
7365	4,4'-DDT	µg/L	2.25	2.69	1.07 - 3.98	Acceptable	EPA 608	1/29/2014	-0.811	2.58	0.402	
7470	Dieldrin	µg/L	6.75	9.77	4.99 - 12.9	Acceptable	EPA 608	1/29/2014	-1.69	8.81	1.22	
7540	Endrin	µg/L	3	3.77	1.65 - 5.42	Acceptable	EPA 608	1/29/2014	-1.04	3.61	0.584	
7530	Endrin aldehyde	µg/L	4.65	5.89	2.15 - 8.93	Acceptable	EPA 608	1/29/2014	-0.584	5.24	1.01	
7535	Endrin ketone	µg/L	5.25	6.94	3.65 - 9.52	Acceptable	EPA 608	1/29/2014	-0.722	5.92	0.923	
7510	Endosulfan I	µg/L	< 0.25	< 1.40	0.00 - 1.40	Acceptable	EPA 608	1/29/2014				
7515	Endosulfan II	µg/L	< 0.2	< 1.54	0.00 - 1.54	Acceptable	EPA 608	1/29/2014				
7520	Endosulfan sulfate	µg/L	8.15	10.9	5.04 - 15.1	Acceptable	EPA 608	1/29/2014	-1.01	9.66	1.50	
7685	Heptachlor	µg/L	7	9.20	3.31 - 12.4	Acceptable	EPA 608	2/14/2014	-0.546	7.74	1.35	
7690	Heptachlor epoxide (beta)	µg/L	6.9	8.59	4.35 - 11.4	Acceptable	EPA 608	1/29/2014	-0.903	7.85	1.05	
7810	Methoxychlor	µg/L	2.5	2.45	0.748 - 4.28	Acceptable	EPA 608	1/29/2014	0.397	2.34	0.401	

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WP Chlordane (cat# 837)												
7250	Chlordane, technical	µg/L	3.92	5.00	2.24 - 7.09	Acceptable	EPA 8081A 1	1/27/2014	-0.474	4.31	0.817	
WP Chlordane (cat# 837)												
7250	Chlordane, technical	µg/L	3.92	5.00	2.24 - 7.09	Acceptable	EPA 608	1/27/2014	-0.474	4.31	0.817	
WP Toxaphene (cat# 838)												
8250	Toxaphene	µg/L	19.7	28.6	6.41 - 43.6	Acceptable	EPA 8081A 1	1/29/2014	-0.390	22.1	6.13	
WP Toxaphene (cat# 838)												
8250	Toxaphene	µg/L	19.7	28.6	6.41 - 43.6	Acceptable	EPA 608	1/29/2014	-0.390	22.1	6.13	
WP Gasoline Range Organics (GRO) in Water (cat# 640)												
9408	Gasoline Range Organics (GRO)	µg/L	4470	3450	1340 - 6020	Acceptable	EPA 8015B 2	2/21/2014	0.730	3830	871	
4375	Benzene in GRO	µg/L		35.2	16.4 - 57.5	Not Reported				41.4	10.7	
4765	Ethylbenzene in GRO	µg/L		118	72.9 - 162	Not Reported				133	11.1	
5140	Toluene in GRO	µg/L		291	162 - 380	Not Reported				319	28.7	
5260	Xylenes, total in GRO	µg/L		345	216 - 466	Not Reported				381	73.7	
WP Gasoline Range Organics (GRO) in Water (cat# 640)												
9408	Gasoline Range Organics (GRO)	µg/L	4420	3450	1340 - 6020	Acceptable	EPA 8260B 2	2/14/2014	0.673	3830	871	
4375	Benzene in GRO	µg/L		35.2	16.4 - 57.5	Not Reported				41.4	10.7	
4765	Ethylbenzene in GRO	µg/L		118	72.9 - 162	Not Reported				133	11.1	
5140	Toluene in GRO	µg/L		291	162 - 380	Not Reported				319	28.7	
5260	Xylenes, total in GRO	µg/L		345	216 - 466	Not Reported				381	73.7	
WP Diesel Range Organics (DRO) in Water (cat# 641)												
9369	Diesel Range Organics (DRO)	µg/L	474	1110	111 - 1560	Acceptable	EPA 8015B 2	1/30/2014	-1.21	742	222	

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TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Glycols in Water (cat# 271)												
4720	Diethylene glycol	mg/L	83.7	77.8	31.1 - 124	Acceptable	EPA 8015B 2 1996	2/5/2014	1.95	78.3	2.77	
4785	Ethylene glycol	mg/L	143	140	56.0 - 224	Acceptable	EPA 8015B 2 1996	2/5/2014	0.442	139	9.04	
6657	Propylene glycol	mg/L	98.4	91.4	36.6 - 146	Acceptable	EPA 8015B 2 1996	2/5/2014	0.772	92.1	8.14	
9491	Tetraethylene glycol	mg/L		84.1	33.6 - 135	Not Reported				87.0	11.3	
9646	Triethylene glycol	mg/L	126	104	41.6 - 166	Acceptable	EPA 8015B 2 1996	2/5/2014	1.87	102	13.1	

14G0789

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USA

WP-234 Final Report

WatR™ Pollution Proficiency Testing

WatR™ Pollution Study

Open Date: 07/14/14

Close Date: 08/28/14

Report Issued Date: 09/02/14

ERA
A Waters Company

September 2, 2014

Donna Ruokonen
Microbac Laboratories - Chicagoland Division
250 W. 84th Drive
Merrillville, IN 46410

Enclosed is your final report for ERA's WP-234 WatR™Pollution Proficiency Testing (PT) study. Your final report includes an evaluation of all results submitted by your laboratory to ERA.

Data Evaluation Protocols: All analytes in ERA's WP-234 WatR™Pollution Proficiency Testing study have been evaluated using the following tiered approach. If the analyte is listed in the current TNI Fields of Proficiency Testing (FoPT) tables, the evaluation was completed by comparing the reported result to the acceptance limits generated using the criteria contained in the current TNI FoPT tables. If the analyte is not included in the TNI FoPT tables, the reported result has been evaluated using the procedures outlined in ERA's Standard Operating Procedure for the Generation of Performance Acceptance Limits (SOP 0260).

Corrective Action Help: As part of your accreditation(s), you may be required to identify the root cause of any "Not Acceptable" results, implement the necessary corrective actions, and then satisfy your PT requirements by participating in a Supplemental (QuiK™Response) or future ERA PT study. ERA's technical staff is available to help your laboratory resolve any technical issues that may be impairing your PT performance and possibly affecting your routine data quality. Our laboratory and technical staff have many years of collective experience in performing the full range of environmental analyses. As part of our technical support, ERA offers QC samples that can be useful in helping you work through your technical issues.

At the request of the TNI Accreditation Council, we have included a Laboratory Exception Report that includes a list of all analytes reported with less than qualifiers when the assigned value was greater than “0.” In addition, because we have received many requests from laboratories, this report also includes a list of all analytes with "Not Acceptable" evaluations.

Some states have elected not to convert to the 2009 TNI Standards at this time. If you have released your results to a state that has retained the 2003 NELAC Evaluation Criteria, your final report will include a section that evaluates the results according to the 2003 Standard in addition to the 2009 TNI Standards.

Thank you for your participation in ERA's WP-234 WatR™Pollution Proficiency Testing study. If you have any questions, please contact our Proficiency Testing Department at 1-800-372-0122.

Sincerely,

Kristina Sanchez
Quality Officer

attachments

Report Recipient	Contact/Phone Number	Reporting Type	Evaluation Type
Illinois	John South / 217-558-7142	All Analytes	2009 TNI
Kansas	Lyndi Stout / 785-296-3811	All Analytes	2009 TNI
New York	ELAP Office / 518-485-5570	All Analytes	2003 NELAC
Pennsylvania	Aaren Alger / 717-346-8212	All Analytes	2009 TNI
Ford Motor Company (A488001)	John H. Phillips / (313) 845-1648	All Analytes	2009 TNI
TEI Environmental Solutions (A488001)	James Tomalia /	All Analytes	2009 TNI
USAPHC	Heidi Taylor / 410-436-4336	All Analytes	2009 TNI
USAPHC	Jennifer Webb /	All Analytes	2009 TNI

WP-234 Definitions & Study Discussion

Study Dates: 07/14/14 - 08/28/14 **Report Issued: 09/02/14**

WP Study Definitions

The Reported Value is the value that the laboratory reported to ERA.

The ERA Assigned Values are compliant with the most current TNI Fields of Proficiency Testing (FoPT) tables. A parameter not added to the standard is given an Assigned Value of "< PTRL" per the guidelines contained in the 2009 TNI Standards. The assigned values are directly traceable to the commercially prepared starting materials used to manufacture the PT standards.

The Acceptance Limits are established per the criteria contained in the most current USEPA/NELAC FoPT tables, or ERA's SOP for the Generation of Performance Acceptance Limits™ as applicable.

The Performance Evaluation:

Acceptable	= Reported Value falls within the Acceptance Limits.
Not Acceptable	= Reported Value falls outside the Acceptance Limits.
No Evaluation	= Reported Value cannot be evaluated.
Not Reported	= No Value reported.

The Method Description is the method the laboratory reported to ERA.

WP Study Discussion

ERA's WP-234 WatR™Pollution Proficiency Testing study has been reviewed by ERA senior management and certified compliant with the requirements of the 2009 TNI PT Standard and the criteria contained in the most current TNI Fields of Proficiency Testing (FoPT) tables.

ERA's WP-234 WatR™Pollution study standards were examined for any anomalies. A full review of all homogeneity, stability and accuracy verification data was completed. All analytical verification data for all analytes met the acceptance criteria contained in the 2009 TNI PT Standard and the criteria contained in the most current TNI FoPT tables.

The data submitted by participating laboratories was also examined for study anomalies. There were no anomalies observed during the statistical review of the data.

ERA's WP-234 WatR™Pollution study reports shall not be reproduced except in their entirety and not without the permission of the participating laboratories. The report must not be used by the participating laboratories to claim product endorsement by any agency of the U. S. government.

The data contained herein are confidential and intended for your use only.

If you have any questions or concerns regarding your assessment in ERA's WatR™Pollution Proficiency Testing program, please contact our Proficiency Testing Department at 1-800-372-0122.

WP-234 Laboratory Exception Report

A Waters Company

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EPA ID: IN00054
ERA Customer Number: A488001
Report Issued: 09/02/14
Study Dates: 07/14/14 - 08/28/14

2009 TNI Evaluation Checks

TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
WP Acids (cat# 834)							
6500	4-Nitrophenol	µg/L	< 50.0	150	15.0 - 202	Acceptable	EPA 8270C 3 1996
6500	4-Nitrophenol	µg/L	< 50.0	150	15.0 - 202	Acceptable	EPA 625 Appendix A 1982

2009 TNI Not Acceptable Evaluations

TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
WP Trace Metals (cat# 586)							
1150	Silver	µg/L	355	772	656 - 888	Not Acceptable	EPA 200.7 5 1998
1150	Silver	µg/L	413	772	656 - 888	Not Acceptable	EPA 200.8 5.5 1998
1165	Thallium	µg/L	711	606	501 - 701	Not Acceptable	EPA 200.7 5 1998
WP Low-Level PAHs (cat# 836)							
5600	Benzo(k)fluoranthene	µg/L	2.92	2.22	1.12 - 2.84	Not Acceptable	EPA 8270C 3 1996
5600	Benzo(k)fluoranthene	µg/L	2.92	2.22	1.12 - 2.84	Not Acceptable	EPA 625
5590	Benzo(g,h,i)perylene	µg/L	2.86	2.14	0.638 - 2.80	Not Acceptable	EPA 8270C 3 1996
5590	Benzo(g,h,i)perylene	µg/L	2.86	2.14	0.638 - 2.80	Not Acceptable	EPA 625
5895	Dibenz(a,h)anthracene	µg/L	4.64	3.31	1.16 - 4.21	Not Acceptable	EPA 8270C 3 1996
5895	Dibenz(a,h)anthracene	µg/L	4.64	3.31	1.16 - 4.21	Not Acceptable	EPA 625
6315	Indeno(1,2,3-cd)pyrene	µg/L	2.81	1.67	0.696 - 2.18	Not Acceptable	EPA 8270C 3 1996
6315	Indeno(1,2,3-cd)pyrene	µg/L	2.81	1.67	0.696 - 2.18	Not Acceptable	EPA 625

Final Report Results For Laboratory
Microbac Laboratories - Chicagoland Division

ERA
A Waters Company

2009 TNI Evaluation Report

Study: **WP-234**

ERA Customer Number: **A488001**

Laboratory Name: **Microbac Laboratories - Chicagoland Division**

Inorganic Results

WP-234 2009 TNI Evaluation Final Complete Report

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TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Minerals (cat# 581)												
1505	Alkalinity as CaCO3	mg/L	96.0	91.4	77.7 - 105	Acceptable	SM 2320 B-1997 1997	7/30/2014	1.37	91.7	3.12	ABG
1575	Chloride	mg/L	82.5	79.7	69.7 - 89.9	Acceptable	SM4500Cl- B online	8/6/2014	1.34	78.4	3.10	ABG
1610	Conductivity at 25°C	µmhos/cm	476	463	417 - 509	Acceptable	SM 2510 B-1997 1997	8/6/2014	-0.0146	476	12.0	
1730	Fluoride	mg/L	1.87	1.90	1.51 - 2.23	Acceptable	SM 4500-F C-1997 1997	8/5/2014	0.0277	1.87	0.123	ABG
1125	Potassium	mg/L	19.4	18.6	14.9 - 22.3	Acceptable	EPA 6010B 2 1996	7/23/2014	1.55	18.1	0.832	AG
1155	Sodium	mg/L	98.9	92.3	73.8 - 111	Acceptable	EPA 6010B 2 1996	7/23/2014	1.76	91.2	4.38	AG
2000	Sulfate	mg/L	19.4	18.1	14.1 - 21.2	Acceptable	EPA 9038	7/30/2014	1.95	17.2	1.14	AGRIE
1955	Total Dissolved Solids at 180°C	mg/L	365	383	338 - 428	Acceptable	SM 2540 C-1997	7/23/2014	0.285	360	16.5	TMG
1950	Total Solids at 105°C	mg/L	386	380	335 - 425	Acceptable	SM 2540 B-1997 1997	7/23/2014	0.706	375	15.6	TMG
WP Minerals (cat# 581)												
1505	Alkalinity as CaCO3	mg/L		91.4	77.7 - 105	Not Reported				91.7	3.12	
1575	Chloride	mg/L		79.7	69.7 - 89.9	Not Reported				78.4	3.10	
1610	Conductivity at 25°C	µmhos/cm		463	417 - 509	Not Reported				476	12.0	
1730	Fluoride	mg/L		1.90	1.51 - 2.23	Not Reported				1.87	0.123	
1125	Potassium	mg/L	19.0	18.6	14.9 - 22.3	Acceptable	EPA 200.7 5 1998	7/25/2014	1.07	18.1	0.832	AG
1155	Sodium	mg/L	94.5	92.3	73.8 - 111	Acceptable	EPA 200.7 5 1998	7/25/2014	0.755	91.2	4.38	AG
2000	Sulfate	mg/L		18.1	14.1 - 21.2	Not Reported				17.2	1.14	
1955	Total Dissolved Solids at 180°C	mg/L		383	338 - 428	Not Reported				360	16.5	
1950	Total Solids at 105°C	mg/L		380	335 - 425	Not Reported				375	15.6	

WP-234 2009 TNI Evaluation Final Complete Report

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TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Minerals (cat# 581)												
1505	Alkalinity as CaCO3	mg/L		91.4	77.7 - 105	Not Reported				91.7	3.12	
1575	Chloride	mg/L		79.7	69.7 - 89.9	Not Reported				78.4	3.10	
1610	Conductivity at 25°C	µmhos/cm		463	417 - 509	Not Reported				476	12.0	
1730	Fluoride	mg/L		1.90	1.51 - 2.23	Not Reported				1.87	0.123	
1125	Potassium	mg/L	18.1	18.6	14.9 - 22.3	Acceptable	EPA 200.8 5.5	7/25/2014	-0.0169	18.1	0.832	SA
1155	Sodium	mg/L	89.5	92.3	73.8 - 111	Acceptable	EPA 200.8 5.5	7/28/2014	-0.386	91.2	4.38	SA
2000	Sulfate	mg/L		18.1	14.1 - 21.2	Not Reported				17.2	1.14	
1955	Total Dissolved Solids at 180°C	mg/L		383	338 - 428	Not Reported				360	16.5	
1950	Total Solids at 105°C	mg/L		380	335 - 425	Not Reported				375	15.6	
WP Minerals (cat# 581)												
1505	Alkalinity as CaCO3	mg/L		91.4	77.7 - 105	Not Reported				91.7	3.12	
1575	Chloride	mg/L		79.7	69.7 - 89.9	Not Reported				78.4	3.10	
1610	Conductivity at 25°C	µmhos/cm		463	417 - 509	Not Reported				476	12.0	
1730	Fluoride	mg/L		1.90	1.51 - 2.23	Not Reported				1.87	0.123	
1125	Potassium	mg/L	16.8	18.6	14.9 - 22.3	Acceptable	EPA 6020A 1998	7/29/2014	-1.58	18.1	0.832	RPL
1155	Sodium	mg/L	89.1	92.3	73.8 - 111	Acceptable	EPA 6020A 1998	7/29/2014	-0.478	91.2	4.38	RPL
2000	Sulfate	mg/L		18.1	14.1 - 21.2	Not Reported				17.2	1.14	
1955	Total Dissolved Solids at 180°C	mg/L		383	338 - 428	Not Reported				360	16.5	
1950	Total Solids at 105°C	mg/L		380	335 - 425	Not Reported				375	15.6	

WP-234 2009 TNI Evaluation Final Complete Report

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TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Hardness (cat# 580)												
1960	Total Suspended Solids	mg/L	31	34.7	25.3 - 41.0	Acceptable	SM 2540 D-1997 1997	7/24/2014	-0.470	32.3	2.71	rm
1035	Calcium	mg/L	30.6	30.1	25.6 - 34.6	Acceptable	EPA 6010B 2 1996	7/23/2014	0.514	29.7	1.67	AG
1085	Magnesium	mg/L	16.8	16.0	13.6 - 18.4	Acceptable	EPA 6010B 2 1996	7/23/2014	1.21	15.8	0.799	AG
1550	Calcium Hardness as CaCO3	mg/L		75.3	64.0 - 86.6	Not Reported				74.8	3.47	
1755	Total Hardness as CaCO3	mg/L	129	141	120 - 162	Acceptable	SM2340B online	7/24/2014	-1.68	138	5.54	SA
WP Hardness (cat# 580)												
1960	Total Suspended Solids	mg/L		34.7	25.3 - 41.0	Not Reported				32.3	2.71	
1035	Calcium	mg/L	30.4	30.1	25.6 - 34.6	Acceptable	EPA 200.7 5 1998	7/25/2014	0.394	29.7	1.67	AG
1085	Magnesium	mg/L	15.5	16.0	13.6 - 18.4	Acceptable	EPA 200.7 5 1998	7/25/2014	-0.414	15.8	0.799	AG
1550	Calcium Hardness as CaCO3	mg/L		75.3	64.0 - 86.6	Not Reported				74.8	3.47	
1755	Total Hardness as CaCO3	mg/L		141	120 - 162	Not Reported				138	5.54	
WP Hardness (cat# 580)												
1960	Total Suspended Solids	mg/L		34.7	25.3 - 41.0	Not Reported				32.3	2.71	
1035	Calcium	mg/L	28.0	30.1	25.6 - 34.6	Acceptable	EPA 200.8 5.5	7/25/2014	-1.04	29.7	1.67	SA
1085	Magnesium	mg/L	15.3	16.0	13.6 - 18.4	Acceptable	EPA 200.8 5.5	7/25/2014	-0.664	15.8	0.799	SA
1550	Calcium Hardness as CaCO3	mg/L		75.3	64.0 - 86.6	Not Reported				74.8	3.47	
1755	Total Hardness as CaCO3	mg/L		141	120 - 162	Not Reported				138	5.54	

WP-234 2009 TNI Evaluation Final Complete Report

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TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Hardness (cat# 580)												
1960	Total Suspended Solids	mg/L		34.7	25.3 - 41.0	Not Reported				32.3	2.71	
1035	Calcium	mg/L	26.7	30.1	25.6 - 34.6	Acceptable	EPA 6020A 1998	7/29/2014	-1.82	29.7	1.67	RPL
1085	Magnesium	mg/L	14.4	16.0	13.6 - 18.4	Acceptable	EPA 6020A 1998	7/29/2014	-1.79	15.8	0.799	RPL
1550	Calcium Hardness as CaCO3	mg/L		75.3	64.0 - 86.6	Not Reported				74.8	3.47	
1755	Total Hardness as CaCO3	mg/L		141	120 - 162	Not Reported				138	5.54	
WP pH (cat# 577)												
1900	pH	S.U.	5.99	5.93	5.73 - 6.13	Acceptable	EPA 9045C	7/23/2014	0.959	5.94	0.0533	EB
WP pH (cat# 577)												
1900	pH	S.U.	5.99	5.93	5.73 - 6.13	Acceptable	SM4500H+ B online	7/23/2014	0.959	5.94	0.0533	EB
WP Settleable Solids (cat# 883)												
1965	Settleable Solids	mL/L	31.0	28.8	23.5 - 36.6	Acceptable	SM 2540 F-1997 1997	7/24/2014	0.177	30.7	1.78	EB
WP Volatile Solids (cat# 884)												
1970	Volatile Solids, Total	mg/L	334	314	236 - 360	Acceptable	SM2540F	8/5/2014	1.24	303	24.7	TMG
WP Simple Nutrients (cat# 584)												
1515	Ammonia as N	mg/L	3.88	4.76	3.67 - 5.89	Acceptable	EPA 350.1 2 1993	7/31/2014	-2.30	4.79	0.394	GRIEF
1820	Nitrate + Nitrite as N	mg/L	17.2	17.7	14.8 - 20.4	Acceptable	EPA 353.2 2 1993	7/30/2014	-0.672	17.9	1.02	GRIEF
1810	Nitrate as N	mg/L	17.2	17.7	14.8 - 20.5	Acceptable	EPA 353.2 2 1993	7/30/2014	-0.695	17.9	0.938	GRIEF
1870	ortho-Phosphate as P	mg/L	4.81	4.66	3.96 - 5.36	Acceptable	EPA 365.1 2 1993	7/30/2014	0.711	4.68	0.189	AGRIE
WP Complex Nutrients (cat# 579)												
1795	Total Kjeldahl Nitrogen	mg/L	12.7	12.4	9.16 - 15.4	Acceptable	EPA 351.2 2 1993	8/5/2014	0.415	12.3	0.845	GRIEF
1910	Total phosphorus as P	mg/L	2.80	2.95	2.41 - 3.46	Acceptable	EPA 365.1 2 1993	8/5/2014	-1.21	3.02	0.178	AGRIE

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WP Nitrite (cat# 888)												
1840	Nitrite as N	mg/L	2.62	2.58	2.21 - 2.95	Acceptable	EPA 353.2 2 1993	7/30/2014	0.183	2.60	0.134	AGRIE
WP Demand (cat# 578)												
1530	BOD	mg/L	34.9	40.7	20.9 - 60.6	Acceptable	SM5210B online	8/1/2014	-0.835	40.8	7.01	MZ
1555	CBOD	mg/L	33.3	36.9	15.9 - 58.0	Acceptable	SM5210B online	8/1/2014	-0.694	38.4	7.32	MZ
1565	COD	mg/L	60.8	65.6	46.7 - 81.8	Acceptable	EPA 410.4 2	7/29/2014	-0.700	64.9	5.84	EB
2040	TOC	mg/L		25.9	21.1 - 30.6	Not Reported				26.3	1.87	
WP Oil & Grease (cat# 582)												
1860	n-Hexane Extractable Material(O&G)(Grav)	mg/L	93.3	115	82.6 - 133	Acceptable	EPA 1664B 2010	7/25/2014	-1.19	104	8.89	
1860	n-Hexane Extractable Material(O&G)(IR)	mg/L		141	103 - 161	Not Reported				158	36.1	

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TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Trace Metals (cat# 586)												
1000	Aluminum	µg/L	533	517	411 - 624	Acceptable	EPA 6010B 2 1996	7/23/2014	0.0360	532	30.2	AG
1005	Antimony	µg/L	750	784	643 - 901	Acceptable	EPA 6010B 2 1996	7/23/2014	-0.605	774	40.2	AG
1010	Arsenic	µg/L	137	135	103 - 168	Acceptable	EPA 6010B 2 1996	7/23/2014	0.421	133	8.34	AG
1015	Barium	µg/L	843	791	672 - 910	Acceptable	EPA 6010B 2 1996	7/23/2014	1.55	792	33.1	AG
1020	Beryllium	µg/L	319	312	265 - 359	Acceptable	EPA 6010B 2 1996	7/23/2014	0.0264	319	14.4	AG
1025	Boron	µg/L	895	944	802 - 1090	Acceptable	EPA 6010B 2 1996	7/23/2014	-1.07	956	56.7	AG
1030	Cadmium	µg/L	140	136	116 - 156	Acceptable	EPA 6010B 2 1996	7/23/2014	1.09	134	5.35	AG
1040	Chromium	µg/L	633	634	539 - 729	Acceptable	EPA 6010B 2 1996	7/23/2014	-0.0535	634	26.7	AG
1050	Cobalt	µg/L	571	550	468 - 632	Acceptable	EPA 6010B 2 1996	7/23/2014	-0.221	577	28.9	AG
1055	Copper	µg/L	818	816	694 - 938	Acceptable	EPA 6010B 2 1996	7/23/2014	-0.0809	821	39.6	AG
1070	Iron	µg/L	866	840	714 - 966	Acceptable	EPA 6010B 2 1996	7/23/2014	0.327	852	42.7	AG
1075	Lead	µg/L	707	649	552 - 746	Acceptable	EPA 6010B 2 1996	7/23/2014	1.80	653	29.7	AG
1090	Manganese	µg/L	840	772	656 - 888	Acceptable	EPA 6010B 2 1996	7/23/2014	1.16	797	36.9	AG
1100	Molybdenum	µg/L	276	273	233 - 310	Acceptable	EPA 6010B 2 1996	7/23/2014	0.431	271	12.5	AG
1105	Nickel	µg/L	750	716	628 - 809	Acceptable	EPA 6010B 2 1996	7/23/2014	1.12	713	33.3	AG
1140	Selenium	µg/L	637	660	561 - 759	Acceptable	EPA 6010B 2 1996	7/23/2014	-0.394	651	35.4	AG
1150	Silver	µg/L	800	772	656 - 888	Acceptable	EPA 6010B 2 1996	7/23/2014	0.765	768	41.9	AG
1160	Strontium	µg/L	242	237	201 - 273	Acceptable	EPA 6010B 2 1996	7/23/2014	0.334	238	10.5	AG
1165	Thallium	µg/L	674	606	501 - 701	Acceptable	EPA 6010B 2 1996	7/23/2014	1.94	607	34.4	AG
1185	Vanadium	µg/L	854	888	755 - 1020	Acceptable	EPA 6010B 2 1996	7/23/2014	-0.655	880	39.0	AG

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TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Trace Metals (cat# 586) (Continued)												
1190	Zinc	µg/L	914	895	761 - 1030	Acceptable	EPA 6010B 2 1996	7/23/2014	0.442	894	45.0	AG

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WP Trace Metals (cat# 586)												
1000	Aluminum	µg/L	590	517	411 - 624	Acceptable	EPA 200.7 5 1998	7/25/2014	1.92	532	30.2	AG
1005	Antimony	µg/L	796	784	643 - 901	Acceptable	EPA 200.7 5 1998	7/25/2014	0.540	774	40.2	AG
1010	Arsenic	µg/L	145	135	103 - 168	Acceptable	EPA 200.7 5 1998	7/25/2014	1.38	133	8.34	AG
1015	Barium	µg/L	848	791	672 - 910	Acceptable	EPA 200.7 5 1998	7/25/2014	1.70	792	33.1	AG
1020	Beryllium	µg/L	318	312	265 - 359	Acceptable	EPA 200.7 5 1998	7/25/2014	-0.0429	319	14.4	AG
1025	Boron	µg/L	969	944	802 - 1090	Acceptable	EPA 200.7 5 1998	7/25/2014	0.237	956	56.7	AG
1030	Cadmium	µg/L	141	136	116 - 156	Acceptable	EPA 200.7 5 1998	7/25/2014	1.28	134	5.35	AG
1040	Chromium	µg/L	654	634	539 - 729	Acceptable	EPA 200.7 5 1998	7/25/2014	0.733	634	26.7	AG
1050	Cobalt	µg/L	606	550	468 - 632	Acceptable	EPA 200.7 5 1998	7/25/2014	0.990	577	28.9	AG
1055	Copper	µg/L	854	816	694 - 938	Acceptable	EPA 200.7 5 1998	7/28/2014	0.829	821	39.6	AG
1070	Iron	µg/L	848	840	714 - 966	Acceptable	EPA 200.7 5 1998	7/25/2014	-0.0947	852	42.7	AG
1075	Lead	µg/L	740	649	552 - 746	Acceptable	EPA 200.7 5 1998	7/25/2014	2.91	653	29.7	AG
1090	Manganese	µg/L	824	772	656 - 888	Acceptable	EPA 200.7 5 1998	7/25/2014	0.730	797	36.9	AG
1100	Molybdenum	µg/L	278	273	233 - 310	Acceptable	EPA 200.7 5 1998	7/25/2014	0.591	271	12.5	AG
1105	Nickel	µg/L	770	716	628 - 809	Acceptable	EPA 200.7 5 1998	7/25/2014	1.72	713	33.3	AG
1140	Selenium	µg/L	707	660	561 - 759	Acceptable	EPA 200.7 5 1998	7/25/2014	1.58	651	35.4	AG
1150	Silver	µg/L	355	772	656 - 888	Not Acceptable	EPA 200.7 5 1998	7/28/2014	-9.85	768	41.9	AG
1160	Strontium	µg/L	247	237	201 - 273	Acceptable	EPA 200.7 5 1998	7/25/2014	0.808	238	10.5	AG
1165	Thallium	µg/L	711	606	501 - 701	Not Acceptable	EPA 200.7 5 1998	7/25/2014	3.01	607	34.4	AG
1185	Vanadium	µg/L	870	888	755 - 1020	Acceptable	EPA 200.7 5 1998	7/25/2014	-0.245	880	39.0	AG

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WP Trace Metals (cat# 586) (Continued)												
1190	Zinc	µg/L	918	895	761 - 1030	Acceptable	EPA 200.7 5 1998	7/25/2014	0.531	894	45.0	AG

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WP Trace Metals (cat# 586)												
1000	Aluminum	µg/L	481	517	411 - 624	Acceptable	EPA 6020A 1998	7/29/2014	-1.68	532	30.2	RPL
1005	Antimony	µg/L	772	784	643 - 901	Acceptable	EPA 6020A 1998	7/29/2014	-0.0573	774	40.2	RPL
1010	Arsenic	µg/L	132	135	103 - 168	Acceptable	EPA 6020A 1998	7/29/2014	-0.178	133	8.34	RPL
1015	Barium	µg/L	822	791	672 - 910	Acceptable	EPA 6020A 1998	7/29/2014	0.911	792	33.1	RPL
1020	Beryllium	µg/L	307	312	265 - 359	Acceptable	EPA 6020A 1998	7/29/2014	-0.806	319	14.4	RPL
1025	Boron	µg/L	892	944	802 - 1090	Acceptable	EPA 6020A 1998	8/12/2014	-1.12	956	56.7	RPL
1030	Cadmium	µg/L	120	136	116 - 156	Acceptable	EPA 6020A 1998	7/29/2014	-2.65	134	5.35	RPL
1040	Chromium	µg/L	565	634	539 - 729	Acceptable	EPA 6020A 1998	7/29/2014	-2.60	634	26.7	RPL
1050	Cobalt	µg/L	585	550	468 - 632	Acceptable	EPA 6020A 1998	7/29/2014	0.263	577	28.9	RPL
1055	Copper	µg/L	852	816	694 - 938	Acceptable	EPA 6020A 1998	7/29/2014	0.778	821	39.6	RPL
1070	Iron	µg/L	853	840	714 - 966	Acceptable	EPA 6020A 1998	7/29/2014	0.0223	852	42.7	RPL
1075	Lead	µg/L	658	649	552 - 746	Acceptable	EPA 6020A 1998	7/29/2014	0.155	653	29.7	RPL
1090	Manganese	µg/L	806	772	656 - 888	Acceptable	EPA 6020A 1998	7/29/2014	0.242	797	36.9	RPL
1100	Molybdenum	µg/L	275	273	233 - 310	Acceptable	EPA 6020A 1998	7/29/2014	0.351	271	12.5	RPL
1105	Nickel	µg/L	735	716	628 - 809	Acceptable	EPA 6020A 1998	7/29/2014	0.666	713	33.3	RPL
1140	Selenium	µg/L	678	660	561 - 759	Acceptable	EPA 6020A 1998	7/29/2014	0.764	651	35.4	RPL
1150	Silver	µg/L	747	772	656 - 888	Acceptable	EPA 6020A 1998	7/29/2014	-0.499	768	41.9	RPL
1160	Strontium	µg/L	225	237	201 - 273	Acceptable	EPA 6020A 1998	7/29/2014	-1.28	238	10.5	RPL
1165	Thallium	µg/L	606	606	501 - 701	Acceptable	EPA 6020A 1998	7/29/2014	-0.0368	607	34.4	RPL
1185	Vanadium	µg/L	931	888	755 - 1020	Acceptable	EPA 6020A 1998	7/29/2014	1.32	880	39.0	RPL

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WP Trace Metals (cat# 586) (Continued)												
1190	Zinc	µg/L	923	895	761 - 1030	Acceptable	EPA 6020A 1998	7/29/2014	0.642	894	45.0	RPL

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WP Trace Metals (cat# 586)												
1000	Aluminum	µg/L	518	517	411 - 624	Acceptable	EPA 200.8 5.5 1998	7/25/2014	-0.460	532	30.2	SA
1005	Antimony	µg/L	790	784	643 - 901	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.391	774	40.2	SA
1010	Arsenic	µg/L	137	135	103 - 168	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.421	133	8.34	SA
1015	Barium	µg/L	815	791	672 - 910	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.700	792	33.1	SA
1020	Beryllium	µg/L	306	312	265 - 359	Acceptable	EPA 200.8 5.5 1998	7/25/2014	-0.875	319	14.4	SA
1025	Boron	µg/L	984	944	802 - 1090	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.501	956	56.7	SA
1030	Cadmium	µg/L	123	136	116 - 156	Acceptable	EPA 200.8 5.5 1998	7/25/2014	-2.09	134	5.35	SA
1040	Chromium	µg/L	655	634	539 - 729	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.770	634	26.7	SA
1050	Cobalt	µg/L	594	550	468 - 632	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.575	577	28.9	SA
1055	Copper	µg/L	857	816	694 - 938	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.905	821	39.6	SA
1070	Iron	µg/L	836	840	714 - 966	Acceptable	EPA 200.8 5.5 1998	7/25/2014	-0.376	852	42.7	SA
1075	Lead	µg/L	667	649	552 - 746	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.458	653	29.7	SA
1090	Manganese	µg/L	811	772	656 - 888	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.378	797	36.9	SA
1100	Molybdenum	µg/L	269	273	233 - 310	Acceptable	EPA 200.8 5.5 1998	7/25/2014	-0.129	271	12.5	SA
1105	Nickel	µg/L	733	716	628 - 809	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.606	713	33.3	SA
1140	Selenium	µg/L	673	660	561 - 759	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.623	651	35.4	SA
1150	Silver	µg/L	413	772	656 - 888	Not Acceptable	EPA 200.8 5.5 1998	7/25/2014	-8.47	768	41.9	SA
1160	Strontium	µg/L	249	237	201 - 273	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.998	238	10.5	SA
1165	Thallium	µg/L	617	606	501 - 701	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.283	607	34.4	SA
1185	Vanadium	µg/L	932	888	755 - 1020	Acceptable	EPA 200.8 5.5 1998	7/25/2014	1.34	880	39.0	SA

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WP Trace Metals (cat# 586) (Continued)												
1190	Zinc	µg/L	914	895	761 - 1030	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.442	894	45.0	SA
WP Mercury (cat# 574)												
1095	Mercury	µg/L	12.5	12.2	8.54 - 15.9	Acceptable	EPA 7470A 1 1994	7/22/2014	0.341	12.1	1.17	AG
WP Mercury (cat# 574)												
1095	Mercury	µg/L	12.5	12.2	8.54 - 15.9	Acceptable	EPA 245.1 3 1994	7/22/2014	0.341	12.1	1.17	AG
WP Mercury (cat# 574)												
1095	Mercury	µg/L	8.93	12.2	8.54 - 15.9	Acceptable	EPA 6020A	7/29/2014	-2.71	12.1	1.17	RPL
WP Low-Level Mercury (cat# 896)												
1095	Low Level Mercury	ng/L	31.6	31.4	19.5 - 43.1	Acceptable	EPA 1631E	7/23/2014	-0.534	33.6	3.80	SA
WP Hexavalent Chromium (cat# 898)												
1045	Hexavalent Chromium	µg/L	233	231	191 - 270	Acceptable	EPA 7196A 1 1992	8/5/2014	0.275	229	14.4	AGRIE
WP Hexavalent Chromium (cat# 898)												
1045	Hexavalent Chromium	µg/L	233	231	191 - 270	Acceptable	SM 3500-Cr B-2009 2009	8/5/2014	0.275	229	14.4	AGRIE
WP Tin & Titanium (cat# 573)												
1175	Tin	µg/L	564	559	391 - 727	Acceptable	EPA 6010B 2 1996	7/23/2014	-0.0907	567	30.4	AG
1180	Titanium	µg/L	202	199	169 - 229	Acceptable	EPA 6010B 2 1996	7/23/2014	0.480	199	7.02	AG
WP Tin & Titanium (cat# 573)												
1175	Tin	µg/L	575	559	391 - 727	Acceptable	EPA 200.7 5 1998	7/25/2014	0.271	567	30.4	AG
1180	Titanium	µg/L	204	199	169 - 229	Acceptable	EPA 200.7 5 1998	7/25/2014	0.765	199	7.02	AG

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WP Tin & Titanium (cat# 573)												
1175	Tin	µg/L	476	559	391 - 727	Acceptable	EPA 6020A 1998	7/29/2014	-2.98	567	30.4	RPL
1180	Titanium	µg/L	173	199	169 - 229	Acceptable	EPA 6020A 1998	7/29/2014	-3.65	199	7.02	RPL
WP Tin & Titanium (cat# 573)												
1175	Tin	µg/L	545	559	391 - 727	Acceptable	EPA 200.8 5.5 1998	7/25/2014	-0.715	567	30.4	SA
1180	Titanium	µg/L	196	199	169 - 229	Acceptable	EPA 200.8 5.5 1998	7/25/2014	-0.374	199	7.02	SA
WP Color (cat# 882)												
1605	Color	PC units	35	35.0	22.6 - 44.9	Acceptable	SM 2120 B-2001 2001	8/18/2014	0.530	32.9	3.99	TMG
WP Total Cyanide (cat# 588)												
1645	Cyanide, total	mg/L	0.946	0.963	0.626 - 1.30	Acceptable	SM4500CN E 20th ED 1997	8/4/2014	-0.0335	0.948	0.0744	AGRIE
1510	Amenable Cyanide	mg/L		0.367	0.239 - 0.495	Not Reported				0.350	0.0748	
WP Total Cyanide (cat# 588)												
1645	Cyanide, total	mg/L	0.946	0.963	0.626 - 1.30	Acceptable	EPA 9012B 2002	8/4/2014	-0.0335	0.948	0.0744	AGRIE
1510	Amenable Cyanide	mg/L	0.347	0.367	0.239 - 0.495	Acceptable	EPA 9012B 2002	8/4/2014	-0.0428	0.350	0.0748	
WP Total Phenolics (4-AAP) (cat# 589)												
1905	Phenolics, total	mg/L	0.626	0.576	0.284 - 0.868	Acceptable	EPA 420.4 1 1993	8/6/2014	0.420	0.590	0.0865	
WP Total Phenolics (4-AAP) (cat# 589)												
1905	Phenolics, total	mg/L	0.626	0.576	0.284 - 0.868	Acceptable	EPA 9066 1986	8/6/2014	0.420	0.590	0.0865	
WP Total Phenolics (4-AAP) (cat# 589)												
1905	Phenolics, total	mg/L	0.600	0.576	0.284 - 0.868	Acceptable	EPA 420.1 1978	8/14/2014	0.119	0.590	0.0865	
WP Silica (cat# 890)												
1990	Silica as SiO2	mg/L	65.5	63.7	47.8 - 79.6	Acceptable	EPA 200.7 4.4 1994	7/25/2014	0.295	64.5	3.33	

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WP Silica (cat# 890)												
1990	Silica as SiO2	mg/L	62.1	63.7	47.8 - 79.6	Acceptable	EPA 6010B 2 1996	7/24/2014	-0.725	64.5	3.33	
WP Sulfide (cat# 891)												
2005	Sulfide	mg/L	4.64	5.17	2.15 - 7.58	Acceptable	SM 4500-S2 D-2000 2000	8/7/2014	0.200	4.49	0.738	EB
WP Total Residual Chlorine (cat# 587)												
1940	Total Residual Chlorine	mg/L	1.01	0.996	0.742 - 1.20	Acceptable	SM 4500-Cl E-2000 2000	8/8/2014	0.415	0.975	0.0842	

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Study: **WP-234**

ERA Customer Number: **A488001**

Laboratory Name: **Microbac Laboratories - Chicagoland Division**

Organic Results

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WP Volatiles (cat# 830)												
4315	Acetone	µg/L	55.6	58.8	14.6 - 96.7	Acceptable	EPA 624	8/5/2014	-0.0492	56.1	10.8	rpl
4320	Acetonitrile	µg/L	< 100	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
4325	Acrolein	µg/L	< 100	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
4340	Acrylonitrile	µg/L	< 100	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
4375	Benzene	µg/L	19.7	19.4	13.6 - 25.2	Acceptable	EPA 624	8/5/2014	0.0777	19.5	2.16	rpl
4385	Bromobenzene	µg/L		< 5.00	0.00 - 5.00	Not Reported						
4390	Bromochloromethane	µg/L		< 5.00	0.00 - 5.00	Not Reported						
4395	Bromodichloromethane	µg/L	< 6.00	< 6.00	0.00 - 6.00	Acceptable	EPA 624	8/5/2014				rpl
4400	Bromoform	µg/L	39.8	42.7	25.6 - 59.8	Acceptable	EPA 624	8/5/2014	-0.837	44.2	5.30	rpl
4950	Bromomethane	µg/L	15.0	25.0	10.0 - 40.0	Acceptable	EPA 624	8/5/2014	-0.756	20.7	7.55	rpl
4410	2-Butanone (MEK)	µg/L	< 10.0	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
4435	n-Butylbenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
4440	sec-Butylbenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
4445	tert-Butylbenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
5000	tert-Butyl methyl ether (MTBE)	µg/L	37.0	40.1	26.4 - 55.0	Acceptable	EPA 624	8/5/2014	-0.912	41.1	4.48	rpl
4450	Carbon disulfide	µg/L	< 10.0	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
4455	Carbon tetrachloride	µg/L	81.0	82.1	46.4 - 111	Acceptable	EPA 624	8/5/2014	-0.0452	81.6	13.2	rpl
4475	Chlorobenzene	µg/L	< 7.00	< 7.00	0.00 - 7.00	Acceptable	EPA 624	8/5/2014				rpl

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TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Volatiles (cat# 830) (Continued)												
4575	Chlorodibromomethane	µg/L	86.8	92.0	55.2 - 129	Acceptable	EPA 624	8/5/2014	-0.832	93.8	8.41	rpl
4485	Chloroethane	µg/L	< 10.0	< 8.00	0.00 - 8.00	Acceptable	EPA 624	8/5/2014				rpl
4500	2-Chloroethylvinylether	µg/L	< 10.0	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
4505	Chloroform	µg/L	74.8	73.1	51.2 - 95.0	Acceptable	EPA 624	8/5/2014	-0.00485	74.8	7.95	rpl
4960	Chloromethane	µg/L	< 10.0	< 8.00	0.00 - 8.00	Acceptable	EPA 624	8/5/2014				rpl
4535	2-Chlorotoluene	µg/L		< 5.00	0.00 - 5.00	Not Reported						
4540	4-Chlorotoluene	µg/L		< 5.00	0.00 - 5.00	Not Reported						
4570	1,2-Dibromo-3-chloropropane (DBCP)	µg/L	34.6	43.2	25.9 - 60.5	Acceptable	EPA 624	8/5/2014	-1.31	43.7	6.96	rpl
4585	1,2-Dibromoethane (EDB)	µg/L	< 6.5	< 6.50	0.00 - 6.50	Acceptable	EPA 624	8/5/2014				rpl
4595	Dibromomethane	µg/L	< 6.5	< 6.50	0.00 - 6.50	Acceptable	EPA 624	8/5/2014				rpl
4610	1,2-Dichlorobenzene	µg/L	64.5	66.4	46.5 - 86.3	Acceptable	EPA 624	8/5/2014	0.0554	64.0	8.14	rpl
4615	1,3-Dichlorobenzene	µg/L	106	103	72.1 - 134	Acceptable	EPA 624	8/5/2014	0.487	98.8	14.7	rpl
4620	1,4-Dichlorobenzene	µg/L	45.8	45.3	31.7 - 58.9	Acceptable	EPA 624	8/5/2014	0.328	44.1	5.32	rpl
4625	Dichlorodifluoromethane (Freon 12)	µg/L	< 10.0	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
4630	1,1-Dichloroethane	µg/L	45.1	42.9	27.2 - 58.9	Acceptable	EPA 624	8/5/2014	0.0544	44.8	4.95	rpl
4635	1,2-Dichloroethane	µg/L	127	131	93.1 - 168	Acceptable	EPA 624	8/5/2014	-0.447	132	12.3	rpl
4640	1,1-Dichloroethylene	µg/L	35.7	34.6	20.2 - 50.6	Acceptable	EPA 624	8/5/2014	-0.0736	36.1	5.86	rpl
4645	cis-1,2-Dichloroethylene	µg/L	< 7.00	< 7.00	0.00 - 7.00	Acceptable	EPA 624	8/5/2014				rpl
4665	2,2-Dichloropropane	µg/L		< 5.00	0.00 - 5.00	Not Reported						

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TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Volatiles (cat# 830) (Continued)												
4700	trans-1,2-Dichloroethylene	µg/L	34.4	34.1	20.5 - 47.7	Acceptable	EPA 624	8/5/2014	-0.196	35.2	4.22	rpl
4655	1,2-Dichloropropane	µg/L	127	124	86.8 - 161	Acceptable	EPA 624	8/5/2014	0.200	124	13.1	rpl
4660	1,3-Dichloropropane	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
4670	1,1-Dichloropropene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
4680	cis-1,3-Dichloropropylene	µg/L	47.4	55.5	36.1 - 74.9	Acceptable	EPA 624	8/5/2014	-0.578	50.7	5.68	rpl
4685	trans-1,3-Dichloropropylene	µg/L	83.7	98.0	63.7 - 132	Acceptable	EPA 624	8/5/2014	-0.736	90.5	9.25	rpl
4765	Ethylbenzene	µg/L	36.5	36.3	25.4 - 47.2	Acceptable	EPA 624	8/5/2014	0.235	35.4	4.70	rpl
4835	Hexachlorobutadiene	µg/L	< 50.0	< 4.30	0.00 - 4.30	Acceptable	EPA 624	8/5/2014				rpl
4840	Hexachloroethane	µg/L		< 3.30	0.00 - 3.30	Not Reported						
4860	2-Hexanone	µg/L	< 10.0	< 4.40	0.00 - 4.40	Acceptable	EPA 624	8/5/2014				rpl
4900	Isopropylbenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
4910	4-Isopropyltoluene	µg/L		< 5.00	0.00 - 5.00	Not Reported						
4975	Methylene chloride	µg/L	48.5	53.4	32.0 - 74.8	Acceptable	EPA 624	8/5/2014	-0.921	54.5	6.50	rpl
4995	4-Methyl-2-pentanone (MIBK)	µg/L	< 5.00	< 2.00	0.00 - 2.00	Acceptable	EPA 624	8/5/2014				rpl
5005	Naphthalene	µg/L	14.2	16.6	7.10 - 24.9	Acceptable	EPA 624	8/5/2014	-0.845	16.1	2.22	rpl
5015	Nitrobenzene	µg/L		< 6.20	0.00 - 6.20	Not Reported						
5090	n-Propylbenzene	µg/L		< 5.00	0.00 - 5.00	Not Reported						

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TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Volatiles (cat# 830) (Continued)												
5100	Styrene	µg/L	32.8	35.5	23.1 - 47.9	Acceptable	EPA 624	8/5/2014	-0.363	34.3	4.25	rpl
5105	1,1,1,2-Tetrachloroethane	µg/L	38.4	39.7	25.8 - 53.6	Acceptable	EPA 624	8/5/2014	-0.642	40.9	3.96	rpl
5110	1,1,2,2-Tetrachloroethane	µg/L	55.3	55.2	35.9 - 74.5	Acceptable	EPA 624	8/5/2014	-0.292	57.1	6.25	rpl
5115	Tetrachloroethylene	µg/L	30.4	31.2	16.7 - 41.0	Acceptable	EPA 624	8/5/2014	0.302	29.0	4.65	rpl
5140	Toluene	µg/L	53.2	51.6	36.1 - 67.1	Acceptable	EPA 624	8/5/2014	0.437	51.0	5.04	rpl
5150	1,2,3-Trichlorobenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
5155	1,2,4-Trichlorobenzene	µg/L	98.7	113	50.7 - 154	Acceptable	EPA 624	8/5/2014	-0.185	102	19.0	rpl
5160	1,1,1-Trichloroethane	µg/L	< 6.00	< 6.00	0.00 - 6.00	Acceptable	EPA 624	8/5/2014				rpl
5165	1,1,2-Trichloroethane	µg/L	117	121	84.7 - 157	Acceptable	EPA 624	8/5/2014	-0.520	123	11.9	rpl
5170	Trichloroethylene	µg/L	60.8	60.5	38.4 - 79.0	Acceptable	EPA 624	8/5/2014	0.279	58.9	6.97	rpl
5175	Trichlorofluoromethane	µg/L	31.5	28.9	11.6 - 46.2	Acceptable	EPA 624	8/5/2014	0.171	30.5	5.95	rpl
5180	1,2,3-Trichloropropane (TCP)	µg/L	80.5	90.4	41.6 - 136	Acceptable	EPA 624	8/5/2014	-0.837	90.4	11.8	rpl
5210	1,2,4-Trimethylbenzene	µg/L	18.4	18.0	11.7 - 24.3	Acceptable	EPA 624	8/5/2014	0.477	17.0	2.85	rpl
5215	1,3,5-Trimethylbenzene	µg/L	27.6	30.4	19.8 - 41.0	Acceptable	EPA 624	8/5/2014	-0.0810	28.0	4.96	rpl
5225	Vinyl acetate	µg/L	< 10.0	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
5235	Vinyl chloride	µg/L	< 8.00	< 8.00	0.00 - 8.00	Acceptable	EPA 624	8/5/2014				rpl
5240	m&p-Xylene	µg/L	< 6.0	< 6.00	0.00 - 6.00	Acceptable	EPA 624	8/5/2014				rpl
5250	o-Xylene	µg/L	< 6.0	< 6.00	0.00 - 6.00	Acceptable	EPA 624	8/5/2014				rpl
WP Volatiles (cat# 830) (Continued)												
5260	Xylenes, total	µg/L	< 12.00	< 12.0	0.00 - 12.0	Acceptable	EPA 624	8/5/2014				rpl

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WP Volatiles (cat# 830)												
4315	Acetone	µg/L	55.6	58.8	14.6 - 96.7	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.0492	56.1	10.8	rpl
4320	Acetonitrile	µg/L	< 100	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4325	Acrolein	µg/L	< 100	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4340	Acrylonitrile	µg/L	< 100	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4375	Benzene	µg/L	19.7	19.4	13.6 - 25.2	Acceptable	EPA 8260B 2 1996	8/5/2014	0.0777	19.5	2.16	rpl
4385	Bromobenzene	µg/L		< 5.00	0.00 - 5.00	Not Reported						
4390	Bromochloromethane	µg/L		< 5.00	0.00 - 5.00	Not Reported						
4395	Bromodichloromethane	µg/L	< 6.00	< 6.00	0.00 - 6.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4400	Bromoform	µg/L	39.8	42.7	25.6 - 59.8	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.837	44.2	5.30	rpl
4950	Bromomethane	µg/L	15.0	25.0	10.0 - 40.0	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.756	20.7	7.55	rpl
4410	2-Butanone (MEK)	µg/L	< 10.0	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4435	n-Butylbenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4440	sec-Butylbenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4445	tert-Butylbenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
5000	tert-Butyl methyl ether (MTBE)	µg/L	37.0	40.1	26.4 - 55.0	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.912	41.1	4.48	rpl
4450	Carbon disulfide	µg/L	< 10.0	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4455	Carbon tetrachloride	µg/L	81.0	82.1	46.4 - 111	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.0452	81.6	13.2	rpl
4475	Chlorobenzene	µg/L	< 7.00	< 7.00	0.00 - 7.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl

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WP Volatiles (cat# 830) (Continued)												
4575	Chlorodibromomethane	µg/L	86.8	92.0	55.2 - 129	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.832	93.8	8.41	rpl
4485	Chloroethane	µg/L	< 10.0	< 8.00	0.00 - 8.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4500	2-Chloroethylvinylether	µg/L	< 10.0	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4505	Chloroform	µg/L	74.8	73.1	51.2 - 95.0	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.00485	74.8	7.95	rpl
4960	Chloromethane	µg/L	< 10.0	< 8.00	0.00 - 8.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4535	2-Chlorotoluene	µg/L		< 5.00	0.00 - 5.00	Not Reported						
4540	4-Chlorotoluene	µg/L		< 5.00	0.00 - 5.00	Not Reported						
4570	1,2-Dibromo-3-chloropropane (DBCP)	µg/L	34.6	43.2	25.9 - 60.5	Acceptable	EPA 8260B 2 1996	8/5/2014	-1.31	43.7	6.96	rpl
4585	1,2-Dibromoethane (EDB)	µg/L	< 6.5	< 6.50	0.00 - 6.50	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4595	Dibromomethane	µg/L	< 6.5	< 6.50	0.00 - 6.50	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4610	1,2-Dichlorobenzene	µg/L	64.5	66.4	46.5 - 86.3	Acceptable	EPA 8260B 2 1996	8/5/2014	0.0554	64.0	8.14	rpl
4615	1,3-Dichlorobenzene	µg/L	106	103	72.1 - 134	Acceptable	EPA 8260B 2 1996	8/5/2014	0.487	98.8	14.7	rpl
4620	1,4-Dichlorobenzene	µg/L	45.8	45.3	31.7 - 58.9	Acceptable	EPA 8260B 2 1996	8/5/2014	0.328	44.1	5.32	rpl
4625	Dichlorodifluoromethane (Freon 12)	µg/L	< 10.0	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4630	1,1-Dichloroethane	µg/L	45.1	42.9	27.2 - 58.9	Acceptable	EPA 8260B 2 1996	8/5/2014	0.0544	44.8	4.95	rpl
4635	1,2-Dichloroethane	µg/L	127	131	93.1 - 168	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.447	132	12.3	rpl
4640	1,1-Dichloroethylene	µg/L	35.7	34.6	20.2 - 50.6	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.0736	36.1	5.86	rpl
4645	cis-1,2-Dichloroethylene	µg/L	< 7.00	< 7.00	0.00 - 7.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4665	2,2-Dichloropropane	µg/L		< 5.00	0.00 - 5.00	Not Reported						

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WP Volatiles (cat# 830) (Continued)												
4700	trans-1,2-Dichloroethylene	µg/L	34.4	34.1	20.5 - 47.7	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.196	35.2	4.22	rpl
4655	1,2-Dichloropropane	µg/L	127	124	86.8 - 161	Acceptable	EPA 8260B 2 1996	8/5/2014	0.200	124	13.1	rpl
4660	1,3-Dichloropropane	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4670	1,1-Dichloropropene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4680	cis-1,3-Dichloropropylene	µg/L	47.4	55.5	36.1 - 74.9	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.578	50.7	5.68	rpl
4685	trans-1,3-Dichloropropylene	µg/L	83.7	98.0	63.7 - 132	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.736	90.5	9.25	rpl
4765	Ethylbenzene	µg/L	36.5	36.3	25.4 - 47.2	Acceptable	EPA 8260B 2 1996	8/5/2014	0.235	35.4	4.70	rpl
4835	Hexachlorobutadiene	µg/L	< 50.0	< 4.30	0.00 - 4.30	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4840	Hexachloroethane	µg/L		< 3.30	0.00 - 3.30	Not Reported						
4860	2-Hexanone	µg/L	< 10.0	< 4.40	0.00 - 4.40	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4900	Isopropylbenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4910	4-Isopropyltoluene	µg/L		< 5.00	0.00 - 5.00	Not Reported						
4975	Methylene chloride	µg/L	48.5	53.4	32.0 - 74.8	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.921	54.5	6.50	rpl
4995	4-Methyl-2-pentanone (MIBK)	µg/L	< 5.00	< 2.00	0.00 - 2.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
5005	Naphthalene	µg/L	14.2	16.6	7.10 - 24.9	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.845	16.1	2.22	rpl
5015	Nitrobenzene	µg/L		< 6.20	0.00 - 6.20	Not Reported						
5090	n-Propylbenzene	µg/L		< 5.00	0.00 - 5.00	Not Reported						

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WP Volatiles (cat# 830) (Continued)												
5100	Styrene	µg/L	32.8	35.5	23.1 - 47.9	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.363	34.3	4.25	rpl
5105	1,1,1,2-Tetrachloroethane	µg/L	38.4	39.7	25.8 - 53.6	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.642	40.9	3.96	rpl
5110	1,1,2,2-Tetrachloroethane	µg/L	55.3	55.2	35.9 - 74.5	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.292	57.1	6.25	rpl
5115	Tetrachloroethylene	µg/L	30.4	31.2	16.7 - 41.0	Acceptable	EPA 8260B 2 1996	8/5/2014	0.302	29.0	4.65	rpl
5140	Toluene	µg/L	53.2	51.6	36.1 - 67.1	Acceptable	EPA 8260B 2 1996	8/5/2014	0.437	51.0	5.04	rpl
5150	1,2,3-Trichlorobenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
5155	1,2,4-Trichlorobenzene	µg/L	98.7	113	50.7 - 154	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.185	102	19.0	rpl
5160	1,1,1-Trichloroethane	µg/L	< 6.00	< 6.00	0.00 - 6.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
5165	1,1,2-Trichloroethane	µg/L	117	121	84.7 - 157	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.520	123	11.9	rpl
5170	Trichloroethylene	µg/L	60.8	60.5	38.4 - 79.0	Acceptable	EPA 8260B 2 1996	8/5/2014	0.279	58.9	6.97	rpl
5175	Trichlorofluoromethane	µg/L	31.5	28.9	11.6 - 46.2	Acceptable	EPA 8260B 2 1996	8/5/2014	0.171	30.5	5.95	rpl
5180	1,2,3-Trichloropropane (TCP)	µg/L	80.5	90.4	41.6 - 136	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.837	90.4	11.8	rpl
5210	1,2,4-Trimethylbenzene	µg/L	18.4	18.0	11.7 - 24.3	Acceptable	EPA 8260B 2 1996	8/5/2014	0.477	17.0	2.85	rpl
5215	1,3,5-Trimethylbenzene	µg/L	27.6	30.4	19.8 - 41.0	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.0810	28.0	4.96	rpl
5225	Vinyl acetate	µg/L	< 10.0	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
5235	Vinyl chloride	µg/L	< 8.00	< 8.00	0.00 - 8.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
5240	m&p-Xylene	µg/L	< 6.0	< 6.00	0.00 - 6.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
5250	o-Xylene	µg/L	< 6.0	< 6.00	0.00 - 6.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
WP Volatiles (cat# 830) (Continued)												
5260	Xylenes, total	µg/L	< 12.00	< 12.0	0.00 - 12.0	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl

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TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP PCBs in Water (cat# 832S)												
8880	Aroclor 1016	µg/L	< 0.8	< 0.800	0.00 - 0.800	Acceptable	EPA 8082 1996	8/8/2014				als
8885	Aroclor 1221	µg/L	< 0.8	< 0.800	0.00 - 0.800	Acceptable	EPA 8082 1996	8/8/2014				als
8890	Aroclor 1232	µg/L	< 0.8	< 0.800	0.00 - 0.800	Acceptable	EPA 8082 1996	8/8/2014				als
8895	Aroclor 1242	µg/L	3.07	4.40	1.64 - 6.07	Acceptable	EPA 8082 1996	8/8/2014	-1.86	4.13	0.569	als
8900	Aroclor 1248	µg/L	< 0.8	< 0.800	0.00 - 0.800	Acceptable	EPA 8082 1996	8/8/2014				als
8905	Aroclor 1254	µg/L	< 0.8	< 0.800	0.00 - 0.800	Acceptable	EPA 8082 1996	8/8/2014				als
8910	Aroclor 1260	µg/L	< 0.8	< 0.800	0.00 - 0.800	Acceptable	EPA 8082 1996	8/8/2014				als
WP PCBs in Water (cat# 832S)												
8880	Aroclor 1016	µg/L	< 0.8	< 0.800	0.00 - 0.800	Acceptable	EPA 608	8/8/2014				als
8885	Aroclor 1221	µg/L	< 0.8	< 0.800	0.00 - 0.800	Acceptable	EPA 608	8/8/2014				als
8890	Aroclor 1232	µg/L	< 0.8	< 0.800	0.00 - 0.800	Acceptable	EPA 608	8/8/2014				als
8895	Aroclor 1242	µg/L	3.07	4.40	1.64 - 6.07	Acceptable	EPA 608	8/8/2014	-1.86	4.13	0.569	als
8900	Aroclor 1248	µg/L	< 0.8	< 0.800	0.00 - 0.800	Acceptable	EPA 608	8/8/2014				als
8905	Aroclor 1254	µg/L	< 0.8	< 0.800	0.00 - 0.800	Acceptable	EPA 608	8/8/2014				als
8910	Aroclor 1260	µg/L	< 0.8	< 0.800	0.00 - 0.800	Acceptable	EPA 608	8/8/2014				als
WP PCBs in Oil (cat# 835S)												
8880	Aroclor 1016	mg/kg	14.7	18.5	1.92 - 28.1	Acceptable	EPA 8082 1996	8/8/2014	-0.491	16.6	3.90	als
8895	Aroclor 1242	mg/kg	< 1.7	< 1.70	0.00 - 1.70	Acceptable	EPA 8082 1996	8/8/2014				als
8905	Aroclor 1254	mg/kg	< 1.6	< 1.60	0.00 - 1.60	Acceptable	EPA 8082 1996	8/8/2014				als
8910	Aroclor 1260	mg/kg	< 2.4	< 2.40	0.00 - 2.40	Acceptable	EPA 8082 1996	8/8/2014				als

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TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Base/Neutrals (cat# 833)												
5500	Acenaphthene	µg/L	29.6	38.6	13.9 - 47.6	Acceptable	EPA 625	7/29/2014	-0.202	30.6	5.15	BRR
5505	Acenaphthylene	µg/L	40.9	49.6	17.1 - 62.0	Acceptable	EPA 625	7/29/2014	-0.0295	41.1	6.57	BRR
5145	2-Amino-1-methylbenzene (o-toluidine)	µg/L		< 10.0	0.00 - 10.0	Not Reported						
5545	Aniline	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 625	7/29/2014				BRR
5555	Anthracene	µg/L	< 10.0	< 3.90	0.00 - 3.90	Acceptable	EPA 625	7/29/2014				BRR
5595	Benzidine	µg/L	< 50.0	< 200	0.00 - 200	Acceptable	EPA 625	7/29/2014				BRR
5575	Benzo(a)anthracene	µg/L	37.5	46.2	21.4 - 57.2	Acceptable	EPA 625	7/29/2014	-0.190	38.3	4.12	BRR
5585	Benzo(b)fluoranthene	µg/L	25.0	28.8	10.9 - 37.4	Acceptable	EPA 625	7/29/2014	0.103	24.7	3.10	BRR
5600	Benzo(k)fluoranthene	µg/L	25.8	28.9	6.24 - 45.3	Acceptable	EPA 625	7/29/2014	0.0533	25.6	3.70	BRR
5590	Benzo(g,h,i)perylene	µg/L	24.7	26.7	11.1 - 36.1	Acceptable	EPA 625	7/29/2014	0.276	23.8	3.27	BRR
5580	Benzo(a)pyrene	µg/L	11.5	14.2	3.97 - 19.2	Acceptable	EPA 625	7/29/2014	0.148	11.2	1.73	BRR
5630	Benzyl alcohol	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 625	7/29/2014				BRR
5660	4-Bromophenyl-phenylether	µg/L	49.7	57.7	24.1 - 75.3	Acceptable	EPA 625	7/29/2014	0.379	47.2	6.47	BRR
5670	Butylbenzylphthalate	µg/L	< 10.0	< 13.4	0.00 - 13.4	Acceptable	EPA 625	7/29/2014				BRR
5680	Carbazole	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 625	7/29/2014				BRR
5745	4-Chloroaniline	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 625	7/29/2014				BRR
5760	bis(2-Chloroethoxy)methane	µg/L	57.5	83.2	29.4 - 98.3	Acceptable	EPA 625	7/29/2014	-0.814	65.6	9.90	BRR
5765	bis(2-Chloroethyl)ether	µg/L	< 10.0	< 5.90	0.00 - 5.90	Acceptable	EPA 625	7/29/2014				BRR
5780	bis(2-Chloroisopropyl)ether	µg/L	40.7	58.9	12.9 - 76.3	Acceptable	EPA 625	7/29/2014	-0.345	43.6	8.49	BRR
5790	1-Chloronaphthalene	µg/L		< 10.0	0.00 - 10.0	Not Reported						

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WP Base/Neutrals (cat# 833) (Continued)												
5795	2-Chloronaphthalene	µg/L	65.2	88.5	24.6 - 106	Acceptable	EPA 625	7/29/2014	0.102	64.0	11.9	BRR
5825	4-Chlorophenyl-phenylether	µg/L	64.8	72.0	27.7 - 90.3	Acceptable	EPA 625	7/29/2014	0.306	61.9	9.48	BRR
5855	Chrysene	µg/L	13.2	15.2	7.96 - 21.6	Acceptable	EPA 625	7/29/2014	-0.539	14.3	2.02	BRR
5895	Dibenz(a,h)anthracene	µg/L	< 10.0	< 6.90	0.00 - 6.90	Acceptable	EPA 625	7/29/2014				BRR
5905	Dibenzofuran	µg/L	94.9	123	47.9 - 140	Acceptable	EPA 625	7/29/2014	0.201	91.7	16.0	BRR
5925	Di-n-butylphthalate	µg/L	71.9	77.0	28.1 - 102	Acceptable	EPA 625	7/29/2014	0.924	65.0	7.41	BRR
4610	1,2-Dichlorobenzene	µg/L	30.7	80.1	8.67 - 94.9	Acceptable	EPA 625	7/29/2014	-1.02	47.9	16.8	BRR
4615	1,3-Dichlorobenzene	µg/L	23.1	67.6	6.76 - 80.3	Acceptable	EPA 625	7/29/2014	-0.923	38.1	16.3	BRR
4620	1,4-Dichlorobenzene	µg/L	48.3	139	13.9 - 153	Acceptable	EPA 625	7/29/2014	-0.914	76.7	31.1	BRR
5945	3,3'-Dichlorobenzidine	µg/L	< 50.0	< 5.00	0.00 - 5.00	Acceptable	EPA 625	7/29/2014				BRR
6070	Diethylphthalate	µg/L	95.0	109	19.9 - 150	Acceptable	EPA 625	7/29/2014	0.579	87.4	13.1	BRR
6135	Dimethylphthalate	µg/L	< 10.0	< 11.5	0.00 - 11.5	Acceptable	EPA 625	7/29/2014				BRR
6185	2,4-Dinitrotoluene	µg/L	38.5	43.2	15.4 - 56.5	Acceptable	EPA 625	7/29/2014	0.139	37.8	5.12	BRR
6190	2,6-Dinitrotoluene	µg/L	76.4	93.7	38.0 - 113	Acceptable	EPA 625	7/29/2014	-0.200	78.9	12.5	BRR
6200	Di-n-octylphthalate	µg/L	< 10.0	< 8.20	0.00 - 8.20	Acceptable	EPA 625	7/29/2014				BRR
6065	bis(2-Ethylhexyl)phthalate	µg/L	38.2	41.1	12.7 - 58.7	Acceptable	EPA 625	7/29/2014	0.730	34.9	4.54	BRR
6265	Fluoranthene	µg/L	65.0	78.3	36.2 - 96.4	Acceptable	EPA 625	7/29/2014	-0.249	67.1	8.31	BRR
6270	Fluorene	µg/L	69.4	84.3	35.4 - 101	Acceptable	EPA 625	7/29/2014	0.0654	68.7	10.2	BRR
6275	Hexachlorobenzene	µg/L	< 10.0	< 8.80	0.00 - 8.80	Acceptable	EPA 625	7/29/2014				BRR
4835	Hexachlorobutadiene	µg/L	< 10.0	< 4.30	0.00 - 4.30	Acceptable	EPA 625	7/29/2014				BRR

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WP Base/Neutrals (cat# 833) (Continued)												
6285	Hexachlorocyclopentadiene	µg/L	74.5	83.6	8.36 - 112	Acceptable	EPA 625	7/29/2014	0.629	59.6	23.7	BRR
4840	Hexachloroethane	µg/L	34.2	103	10.3 - 113	Acceptable	EPA 625	7/29/2014	-0.848	56.6	26.4	BRR
6315	Indeno(1,2,3-cd)pyrene	µg/L	< 10.0	< 9.20	0.00 - 9.20	Acceptable	EPA 625	7/29/2014				BRR
6320	Isophorone	µg/L	< 10.0	< 7.10	0.00 - 7.10	Acceptable	EPA 625	7/29/2014				BRR
6385	2-Methylnaphthalene	µg/L	< 10.0	< 2.00	0.00 - 2.00	Acceptable	EPA 625	7/29/2014				BRR
5005	Naphthalene	µg/L	73.0	123	29.5 - 144	Acceptable	EPA 625	7/29/2014	-0.596	86.7	23.0	BRR
6460	2-Nitroaniline	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 625	7/29/2014				BRR
6465	3-Nitroaniline	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 625	7/29/2014				BRR
6470	4-Nitroaniline	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 625	7/29/2014				BRR
5015	Nitrobenzene	µg/L	< 10.0	< 6.20	0.00 - 6.20	Acceptable	EPA 625	7/29/2014				BRR
6525	N-Nitrosodiethylamine	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 625	7/29/2014				BRR
6530	N-Nitrosodimethylamine	µg/L	55.8	116	11.6 - 131	Acceptable	EPA 625	7/29/2014	-0.367	65.9	27.4	BRR
6535	N-Nitrosodiphenylamine	µg/L	< 10.0	< 5.60	0.00 - 5.60	Acceptable	EPA 625	7/29/2014				BRR
6545	N-Nitroso-di-n-propylamine	µg/L	57.1	72.0	23.2 - 90.6	Acceptable	EPA 625	7/29/2014	-0.210	58.8	7.98	BRR
6590	Pentachlorobenzene	µg/L		< 10.0	0.00 - 10.0	Not Reported						
6615	Phenanthrene	µg/L	< 10.0	< 4.70	0.00 - 4.70	Acceptable	EPA 625	7/29/2014				BRR
6665	Pyrene	µg/L	< 10.0	< 4.90	0.00 - 4.90	Acceptable	EPA 625	7/29/2014				BRR
5095	Pyridine	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 625	7/29/2014				BRR
6715	1,2,4,5-Tetrachlorobenzene	µg/L		< 10.0	0.00 - 10.0	Not Reported						
5155	1,2,4-Trichlorobenzene	µg/L	31.0	53.9	8.02 - 67.2	Acceptable	EPA 625	7/29/2014	-0.482	37.0	12.5	BRR

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WP Base/Neutrals (cat# 833)												
5500	Acenaphthene	µg/L	29.6	38.6	13.9 - 47.6	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.202	30.6	5.15	BRR
5505	Acenaphthylene	µg/L	40.9	49.6	17.1 - 62.0	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.0295	41.1	6.57	BRR
5145	2-Amino-1-methylbenzene (o-toluidine)	µg/L		< 10.0	0.00 - 10.0	Not Reported						
5545	Aniline	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
5555	Anthracene	µg/L	< 10.0	< 3.90	0.00 - 3.90	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
5595	Benzidine	µg/L	< 50.0	< 200	0.00 - 200	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
5575	Benzo(a)anthracene	µg/L	37.5	46.2	21.4 - 57.2	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.190	38.3	4.12	BRR
5585	Benzo(b)fluoranthene	µg/L	25.0	28.8	10.9 - 37.4	Acceptable	EPA 8270C 3 1996	7/29/2014	0.103	24.7	3.10	BRR
5600	Benzo(k)fluoranthene	µg/L	25.8	28.9	6.24 - 45.3	Acceptable	EPA 8270C 3 1996	7/29/2014	0.0533	25.6	3.70	BRR
5590	Benzo(g,h,i)perylene	µg/L	24.7	26.7	11.1 - 36.1	Acceptable	EPA 8270C 3 1996	7/29/2014	0.276	23.8	3.27	BRR
5580	Benzo(a)pyrene	µg/L	11.5	14.2	3.97 - 19.2	Acceptable	EPA 8270C 3 1996	7/29/2014	0.148	11.2	1.73	BRR
5630	Benzyl alcohol	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
5660	4-Bromophenyl-phenylether	µg/L	49.7	57.7	24.1 - 75.3	Acceptable	EPA 8270C 3 1996	7/29/2014	0.379	47.2	6.47	BRR
5670	Butylbenzylphthalate	µg/L	< 10.0	< 13.4	0.00 - 13.4	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
5680	Carbazole	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
5745	4-Chloroaniline	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
5760	bis(2-Chloroethoxy)methane	µg/L	57.5	83.2	29.4 - 98.3	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.814	65.6	9.90	BRR
5765	bis(2-Chloroethyl)ether	µg/L	< 10.0	< 5.90	0.00 - 5.90	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
5780	bis(2-Chloroisopropyl)ether	µg/L	40.7	58.9	12.9 - 76.3	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.345	43.6	8.49	BRR
5790	1-Chloronaphthalene	µg/L		< 10.0	0.00 - 10.0	Not Reported						

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WP Base/Neutrals (cat# 833) (Continued)												
5795	2-Chloronaphthalene	µg/L	65.2	88.5	24.6 - 106	Acceptable	EPA 8270C 3 1996	7/29/2014	0.102	64.0	11.9	BRR
5825	4-Chlorophenyl-phenylether	µg/L	64.8	72.0	27.7 - 90.3	Acceptable	EPA 8270C 3 1996	7/29/2014	0.306	61.9	9.48	BRR
5855	Chrysene	µg/L	13.2	15.2	7.96 - 21.6	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.539	14.3	2.02	BRR
5895	Dibenz(a,h)anthracene	µg/L	< 10.0	< 6.90	0.00 - 6.90	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
5905	Dibenzofuran	µg/L	94.9	123	47.9 - 140	Acceptable	EPA 8270C 3 1996	7/29/2014	0.201	91.7	16.0	BRR
5925	Di-n-butylphthalate	µg/L	71.9	77.0	28.1 - 102	Acceptable	EPA 8270C 3 1996	7/29/2014	0.924	65.0	7.41	BRR
4610	1,2-Dichlorobenzene	µg/L	30.7	80.1	8.67 - 94.9	Acceptable	EPA 8270C 3 1996	7/29/2014	-1.02	47.9	16.8	BRR
4615	1,3-Dichlorobenzene	µg/L	23.1	67.6	6.76 - 80.3	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.923	38.1	16.3	BRR
4620	1,4-Dichlorobenzene	µg/L	48.3	139	13.9 - 153	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.914	76.7	31.1	BRR
5945	3,3'-Dichlorobenzidine	µg/L	< 50.0	< 5.00	0.00 - 5.00	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
6070	Diethylphthalate	µg/L	95.0	109	19.9 - 150	Acceptable	EPA 8270C 3 1996	7/29/2014	0.579	87.4	13.1	BRR
6135	Dimethylphthalate	µg/L	< 10.0	< 11.5	0.00 - 11.5	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
6185	2,4-Dinitrotoluene	µg/L	38.5	43.2	15.4 - 56.5	Acceptable	EPA 8270C 3 1996	7/29/2014	0.139	37.8	5.12	BRR
6190	2,6-Dinitrotoluene	µg/L	76.4	93.7	38.0 - 113	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.200	78.9	12.5	BRR
6200	Di-n-octylphthalate	µg/L	< 10.0	< 8.20	0.00 - 8.20	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
6065	bis(2-Ethylhexyl)phthalate	µg/L	38.2	41.1	12.7 - 58.7	Acceptable	EPA 8270C 3 1996	7/29/2014	0.730	34.9	4.54	BRR
6265	Fluoranthene	µg/L	65.0	78.3	36.2 - 96.4	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.249	67.1	8.31	BRR
6270	Fluorene	µg/L	69.4	84.3	35.4 - 101	Acceptable	EPA 8270C 3 1996	7/29/2014	0.0654	68.7	10.2	BRR
6275	Hexachlorobenzene	µg/L	< 10.0	< 8.80	0.00 - 8.80	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
4835	Hexachlorobutadiene	µg/L	< 10.0	< 4.30	0.00 - 4.30	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR

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TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Base/Neutrals (cat# 833) (Continued)												
6285	Hexachlorocyclopentadiene	µg/L	74.5	83.6	8.36 - 112	Acceptable	EPA 8270C 3 1996	7/29/2014	0.629	59.6	23.7	BRR
4840	Hexachloroethane	µg/L	34.2	103	10.3 - 113	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.848	56.6	26.4	BRR
6315	Indeno(1,2,3-cd)pyrene	µg/L	< 10.0	< 9.20	0.00 - 9.20	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
6320	Isophorone	µg/L	< 10.0	< 7.10	0.00 - 7.10	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
6385	2-Methylnaphthalene	µg/L	< 10.0	< 2.00	0.00 - 2.00	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
5005	Naphthalene	µg/L	73.0	123	29.5 - 144	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.596	86.7	23.0	BRR
6460	2-Nitroaniline	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
6465	3-Nitroaniline	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
6470	4-Nitroaniline	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
5015	Nitrobenzene	µg/L	< 10.0	< 6.20	0.00 - 6.20	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
6525	N-Nitrosodiethylamine	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
6530	N-Nitrosodimethylamine	µg/L	55.8	116	11.6 - 131	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.367	65.9	27.4	BRR
6535	N-Nitrosodiphenylamine	µg/L	< 10.0	< 5.60	0.00 - 5.60	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
6545	N-Nitroso-di-n-propylamine	µg/L	57.1	72.0	23.2 - 90.6	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.210	58.8	7.98	BRR
6590	Pentachlorobenzene	µg/L		< 10.0	0.00 - 10.0	Not Reported						
6615	Phenanthrene	µg/L	< 10.0	< 4.70	0.00 - 4.70	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
6665	Pyrene	µg/L	< 10.0	< 4.90	0.00 - 4.90	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
5095	Pyridine	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
6715	1,2,4,5-Tetrachlorobenzene	µg/L		< 10.0	0.00 - 10.0	Not Reported						
5155	1,2,4-Trichlorobenzene	µg/L	31.0	53.9	8.02 - 67.2	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.482	37.0	12.5	BRR

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WP Acids (cat# 834)												
5610	Benzoic acid	µg/L	< 50.0	< 30.0	0.00 - 30.0	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
5700	4-Chloro-3-methylphenol	µg/L	98.1	118	44.6 - 145	Acceptable	EPA 8270C 3 1996	7/29/2014	0.00144	98.1	17.9	BRR
5800	2-Chlorophenol	µg/L	71.9	108	31.0 - 129	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.596	82.8	18.4	BRR
6000	2,4-Dichlorophenol	µg/L	127	166	53.5 - 197	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.292	135	27.6	BRR
6005	2,6-Dichlorophenol	µg/L	159	191	57.5 - 237	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.132	164	39.8	BRR
6130	2,4-Dimethylphenol	µg/L	39.6	57.1	16.5 - 72.0	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.388	43.4	9.76	BRR
6360	4,6-Dinitro-2-methylphenol	µg/L	36	46.7	13.0 - 70.0	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.849	41.8	6.81	BRR
6175	2,4-Dinitrophenol	µg/L	108	161	16.1 - 216	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.369	120	31.5	BRR
6400	2-Methylphenol	µg/L	109	172	39.0 - 200	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.458	124	33.4	BRR
6410	4-Methylphenol	µg/L	94.2	158	15.8 - 203	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.266	102	30.1	BRR
6490	2-Nitrophenol	µg/L	103	141	47.6 - 170	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.495	115	24.4	BRR
6500	4-Nitrophenol	µg/L	< 50.0	150	15.0 - 202	Acceptable	EPA 8270C 3 1996	7/29/2014		72.7	38.6	BRR
6605	Pentachlorophenol	µg/L	142	177	61.7 - 237	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.150	145	21.9	BRR
6625	Phenol	µg/L	39.8	121	12.1 - 163	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.610	62.2	36.7	BRR
6735	2,3,4,6-Tetrachlorophenol	µg/L		40.5	14.1 - 53.6	Not Reported				35.9	5.72	
6835	2,4,5-Trichlorophenol	µg/L	75.0	85.7	31.4 - 107	Acceptable	EPA 8270C 3 1996	7/29/2014	0.222	72.3	12.3	BRR
6840	2,4,6-Trichlorophenol	µg/L	91.3	101	37.7 - 123	Acceptable	EPA 8270C 3 1996	7/29/2014	0.118	89.6	14.7	BRR

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WP Acids (cat# 834)												
5610	Benzoic acid	µg/L	< 50.0	< 30.0	0.00 - 30.0	Acceptable	EPA 625 Appendix A 1982	7/29/2014				BRR
5700	4-Chloro-3-methylphenol	µg/L	98.1	118	44.6 - 145	Acceptable	EPA 625 Appendix A 1982	7/29/2014	0.00144	98.1	17.9	BRR
5800	2-Chlorophenol	µg/L	71.9	108	31.0 - 129	Acceptable	EPA 625 Appendix A 1982	7/29/2014	-0.596	82.8	18.4	BRR
6000	2,4-Dichlorophenol	µg/L	127	166	53.5 - 197	Acceptable	EPA 625 Appendix A 1982	7/29/2014	-0.292	135	27.6	BRR
6005	2,6-Dichlorophenol	µg/L	159	191	57.5 - 237	Acceptable	EPA 625 Appendix A 1982	7/29/2014	-0.132	164	39.8	BRR
6130	2,4-Dimethylphenol	µg/L	39.6	57.1	16.5 - 72.0	Acceptable	EPA 625 Appendix A 1982	7/29/2014	-0.388	43.4	9.76	BRR
6360	4,6-Dinitro-2-methylphenol	µg/L	36	46.7	13.0 - 70.0	Acceptable	EPA 625 Appendix A 1982	7/29/2014	-0.849	41.8	6.81	BRR
6175	2,4-Dinitrophenol	µg/L	108	161	16.1 - 216	Acceptable	EPA 625 Appendix A 1982	7/29/2014	-0.369	120	31.5	BRR
6400	2-Methylphenol	µg/L	109	172	39.0 - 200	Acceptable	EPA 625 Appendix A 1982	7/29/2014	-0.458	124	33.4	BRR
6410	4-Methylphenol	µg/L	94.2	158	15.8 - 203	Acceptable	EPA 625 Appendix A 1982	7/29/2014	-0.266	102	30.1	BRR
6490	2-Nitrophenol	µg/L	103	141	47.6 - 170	Acceptable	EPA 625 Appendix A 1982	7/29/2014	-0.495	115	24.4	BRR
6500	4-Nitrophenol	µg/L	< 50.0	150	15.0 - 202	Acceptable	EPA 625 Appendix A 1982	7/29/2014		72.7	38.6	BRR
6605	Pentachlorophenol	µg/L	142	177	61.7 - 237	Acceptable	EPA 625 Appendix A 1982	7/29/2014	-0.150	145	21.9	BRR
6625	Phenol	µg/L	39.8	121	12.1 - 163	Acceptable	EPA 625 Appendix A 1982	7/29/2014	-0.610	62.2	36.7	BRR
6735	2,3,4,6-Tetrachlorophenol	µg/L		40.5	14.1 - 53.6	Not Reported				35.9	5.72	
6835	2,4,5-Trichlorophenol	µg/L	75.0	85.7	31.4 - 107	Acceptable	EPA 625 Appendix A 1982	7/29/2014	0.222	72.3	12.3	BRR
6840	2,4,6-Trichlorophenol	µg/L	91.3	101	37.7 - 123	Acceptable	EPA 625 Appendix A 1982	7/29/2014	0.118	89.6	14.7	BRR

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WP Low-Level PAHs (cat# 836)												
5500	Acenaphthene	µg/L	9.64	11.5	3.86 - 13.9	Acceptable	EPA 8270C 3 1996	7/28/2014	0.287	9.08	1.97	BRR
5505	Acenaphthylene	µg/L	6.45	7.14	3.02 - 8.28	Acceptable	EPA 8270C 3 1996	7/28/2014	0.397	5.94	1.29	BRR
5555	Anthracene	µg/L	3.58	4.05	1.20 - 5.44	Acceptable	EPA 8270C 3 1996	7/28/2014	0.00530	3.58	0.681	BRR
5575	Benzo(a)anthracene	µg/L	3.71	4.12	2.79 - 4.59	Acceptable	EPA 8270C 3 1996	7/28/2014	0.403	3.49	0.545	BRR
5585	Benzo(b)fluoranthene	µg/L	2.60	2.38	1.13 - 2.89	Acceptable	EPA 8270C 3 1996	7/28/2014	1.42	2.10	0.354	BRR
5600	Benzo(k)fluoranthene	µg/L	2.92	2.22	1.12 - 2.84	Not Acceptable	EPA 8270C 3 1996	7/28/2014	2.35	1.97	0.403	BRR
5590	Benzo(g,h,i)perylene	µg/L	2.86	2.14	0.638 - 2.80	Not Acceptable	EPA 8270C 3 1996	7/28/2014	2.36	1.86	0.421	BRR
5580	Benzo(a)pyrene	µg/L	4.46	3.93	1.68 - 4.58	Acceptable	EPA 8270C 3 1996	7/28/2014	1.83	3.28	0.644	BRR
5855	Chrysene	µg/L	2.36	2.61	1.44 - 3.22	Acceptable	EPA 8270C 3 1996	7/28/2014	-0.238	2.44	0.327	BRR
5895	Dibenz(a,h)anthracene	µg/L	4.64	3.31	1.16 - 4.21	Not Acceptable	EPA 8270C 3 1996	7/28/2014	2.84	2.75	0.663	BRR
6265	Fluoranthene	µg/L	3.76	4.18	2.23 - 4.97	Acceptable	EPA 8270C 3 1996	7/28/2014	0.205	3.64	0.570	BRR
6270	Fluorene	µg/L	8.07	9.10	3.87 - 10.5	Acceptable	EPA 8270C 3 1996	7/28/2014	0.358	7.58	1.36	BRR
6315	Indeno(1,2,3-cd)pyrene	µg/L	2.81	1.67	0.696 - 2.18	Not Acceptable	EPA 8270C 3 1996	7/28/2014	4.17	1.51	0.312	BRR
5005	Naphthalene	µg/L	5.73	7.39	2.46 - 8.49	Acceptable	EPA 8270C 3 1996	7/28/2014	-0.0521	5.80	1.43	BRR
6615	Phenanthrene	µg/L	3.55	4.10	2.05 - 4.83	Acceptable	EPA 8270C 3 1996	7/28/2014	0.0994	3.49	0.575	BRR
6665	Pyrene	µg/L	1.68	1.82	0.998 - 2.17	Acceptable	EPA 8270C 3 1996	7/28/2014	0.166	1.64	0.260	BRR

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WP Low-Level PAHs (cat# 836)												
5500	Acenaphthene	µg/L	9.64	11.5	3.86 - 13.9	Acceptable	EPA 625	7/28/2014	0.287	9.08	1.97	BRR
5505	Acenaphthylene	µg/L	6.45	7.14	3.02 - 8.28	Acceptable	EPA 625	7/28/2014	0.397	5.94	1.29	BRR
5555	Anthracene	µg/L	3.58	4.05	1.20 - 5.44	Acceptable	EPA 625	7/28/2014	0.00530	3.58	0.681	BRR
5575	Benzo(a)anthracene	µg/L	3.71	4.12	2.79 - 4.59	Acceptable	EPA 625	7/28/2014	0.403	3.49	0.545	BRR
5585	Benzo(b)fluoranthene	µg/L	2.60	2.38	1.13 - 2.89	Acceptable	EPA 625	7/28/2014	1.42	2.10	0.354	BRR
5600	Benzo(k)fluoranthene	µg/L	2.92	2.22	1.12 - 2.84	Not Acceptable	EPA 625	7/28/2014	2.35	1.97	0.403	BRR
5590	Benzo(g,h,i)perylene	µg/L	2.86	2.14	0.638 - 2.80	Not Acceptable	EPA 625	7/28/2014	2.36	1.86	0.421	BRR
5580	Benzo(a)pyrene	µg/L	4.46	3.93	1.68 - 4.58	Acceptable	EPA 625	7/28/2014	1.83	3.28	0.644	BRR
5855	Chrysene	µg/L	2.36	2.61	1.44 - 3.22	Acceptable	EPA 625	7/28/2014	-0.238	2.44	0.327	BRR
5895	Dibenz(a,h)anthracene	µg/L	4.64	3.31	1.16 - 4.21	Not Acceptable	EPA 625	7/28/2014	2.84	2.75	0.663	BRR
6265	Fluoranthene	µg/L	3.76	4.18	2.23 - 4.97	Acceptable	EPA 625	7/28/2014	0.205	3.64	0.570	BRR
6270	Fluorene	µg/L	8.07	9.10	3.87 - 10.5	Acceptable	EPA 625	7/28/2014	0.358	7.58	1.36	BRR
6315	Indeno(1,2,3-cd)pyrene	µg/L	2.81	1.67	0.696 - 2.18	Not Acceptable	EPA 625	7/28/2014	4.17	1.51	0.312	BRR
5005	Naphthalene	µg/L	5.73	7.39	2.46 - 8.49	Acceptable	EPA 625	7/28/2014	-0.0521	5.80	1.43	BRR
6615	Phenanthrene	µg/L	3.55	4.10	2.05 - 4.83	Acceptable	EPA 625	7/28/2014	0.0994	3.49	0.575	BRR
6665	Pyrene	µg/L	1.68	1.82	0.998 - 2.17	Acceptable	EPA 625	7/28/2014	0.166	1.64	0.260	BRR

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WP Organochlorine Pesticides (cat# 831)												
7025	Aldrin	µg/L	7.20	8.96	3.17 - 12.1	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.181	7.47	1.52	als
7110	alpha-BHC	µg/L	4.60	5.87	2.54 - 8.05	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.546	5.09	0.900	als
7115	beta-BHC	µg/L	2.90	3.42	1.60 - 4.88	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.515	3.14	0.468	als
7105	delta-BHC	µg/L	4.40	5.40	2.31 - 7.65	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.723	4.88	0.659	als
7120	gamma-BHC(Lindane)	µg/L	3.70	4.62	2.07 - 6.42	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.492	4.01	0.639	als
7240	alpha-Chlordane	µg/L		4.53	2.02 - 6.10	Not Reported				4.03	0.652	
7245	gamma-Chlordane	µg/L		9.05	4.10 - 11.7	Not Reported				8.02	1.47	
7355	4,4'-DDD	µg/L	6.40	7.87	3.91 - 10.8	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.291	6.77	1.28	als
7360	4,4'-DDE	µg/L	3.00	3.79	1.62 - 5.19	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.358	3.28	0.791	als
7365	4,4'-DDT	µg/L	1.30	1.73	0.689 - 2.64	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.687	1.58	0.402	als
7470	Dieldrin	µg/L	9.50	10.9	5.57 - 14.4	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.195	9.83	1.70	als
7540	Endrin	µg/L	6.10	6.96	3.05 - 9.87	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.160	6.26	0.986	als
7530	Endrin aldehyde	µg/L	7.30	9.73	3.64 - 14.0	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.640	8.30	1.56	als
7535	Endrin ketone	µg/L	6.40	7.74	4.09 - 10.5	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.150	6.59	1.24	als
7510	Endosulfan I	µg/L	11.7	14.3	5.57 - 19.2	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.422	12.7	2.40	als
7515	Endosulfan II	µg/L	9.10	11.0	4.55 - 14.9	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.381	9.72	1.62	als
7520	Endosulfan sulfate	µg/L	6.20	7.39	3.38 - 10.6	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.481	6.73	1.10	als
7685	Heptachlor	µg/L	5.80	7.18	2.57 - 9.69	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.203	6.01	1.05	als
7690	Heptachlor epoxide (beta)	µg/L	4.00	4.87	2.43 - 6.51	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.271	4.21	0.765	als
7810	Methoxychlor	µg/L	4.80	5.23	2.06 - 8.04	Acceptable	EPA 8081A 1 1996	8/8/2014	0.0899	4.69	1.20	als

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WP Organochlorine Pesticides (cat# 831)												
7025	Aldrin	µg/L	7.20	8.96	3.17 - 12.1	Acceptable	EPA 608	8/8/2014	-0.181	7.47	1.52	als
7110	alpha-BHC	µg/L	4.60	5.87	2.54 - 8.05	Acceptable	EPA 608	8/8/2014	-0.546	5.09	0.900	als
7115	beta-BHC	µg/L	2.90	3.42	1.60 - 4.88	Acceptable	EPA 608	8/8/2014	-0.515	3.14	0.468	als
7105	delta-BHC	µg/L	4.40	5.40	2.31 - 7.65	Acceptable	EPA 608	8/8/2014	-0.723	4.88	0.659	als
7120	gamma-BHC(Lindane)	µg/L	3.70	4.62	2.07 - 6.42	Acceptable	EPA 608	8/8/2014	-0.492	4.01	0.639	als
7240	alpha-Chlordane	µg/L		4.53	2.02 - 6.10	Not Reported				4.03	0.652	
7245	gamma-Chlordane	µg/L		9.05	4.10 - 11.7	Not Reported				8.02	1.47	
7355	4,4'-DDD	µg/L	6.40	7.87	3.91 - 10.8	Acceptable	EPA 608	8/8/2014	-0.291	6.77	1.28	als
7360	4,4'-DDE	µg/L	3.00	3.79	1.62 - 5.19	Acceptable	EPA 608	8/8/2014	-0.358	3.28	0.791	als
7365	4,4'-DDT	µg/L	1.30	1.73	0.689 - 2.64	Acceptable	EPA 608	8/8/2014	-0.687	1.58	0.402	als
7470	Dieldrin	µg/L	9.50	10.9	5.57 - 14.4	Acceptable	EPA 608	8/8/2014	-0.195	9.83	1.70	als
7540	Endrin	µg/L	6.10	6.96	3.05 - 9.87	Acceptable	EPA 608	8/8/2014	-0.160	6.26	0.986	als
7530	Endrin aldehyde	µg/L	7.30	9.73	3.64 - 14.0	Acceptable	EPA 608	8/8/2014	-0.640	8.30	1.56	als
7535	Endrin ketone	µg/L	6.40	7.74	4.09 - 10.5	Acceptable	EPA 608	8/8/2014	-0.150	6.59	1.24	als
7510	Endosulfan I	µg/L	11.7	14.3	5.57 - 19.2	Acceptable	EPA 608	8/8/2014	-0.422	12.7	2.40	als
7515	Endosulfan II	µg/L	9.10	11.0	4.55 - 14.9	Acceptable	EPA 608	8/8/2014	-0.381	9.72	1.62	als
7520	Endosulfan sulfate	µg/L	6.20	7.39	3.38 - 10.6	Acceptable	EPA 608	8/8/2014	-0.481	6.73	1.10	als
7685	Heptachlor	µg/L	5.80	7.18	2.57 - 9.69	Acceptable	EPA 608	8/8/2014	-0.203	6.01	1.05	als
7690	Heptachlor epoxide (beta)	µg/L	4.00	4.87	2.43 - 6.51	Acceptable	EPA 608	8/8/2014	-0.271	4.21	0.765	als
7810	Methoxychlor	µg/L	4.80	5.23	2.06 - 8.04	Acceptable	EPA 608	8/8/2014	0.0899	4.69	1.20	als

WP-234 2009 TNI Evaluation Final Complete Report

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TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Chlordane (cat# 837)												
7250	Chlordane, technical	µg/L	6.32	8.50	3.60 - 11.7	Acceptable	EPA 8081A 1 1996	8/27/2014	-0.507	7.15	1.64	als
WP Chlordane (cat# 837)												
7250	Chlordane, technical	µg/L	6.32	8.50	3.60 - 11.7	Acceptable	EPA 608	8/27/2014	-0.507	7.15	1.64	als
WP Toxaphene (cat# 838)												
8250	Toxaphene	µg/L	13.4	21.9	5.00 - 34.2	Acceptable	EPA 8081A 1 1996	8/27/2014	-0.833	18.2	5.70	als
WP Toxaphene (cat# 838)												
8250	Toxaphene	µg/L	13.4	21.9	5.00 - 34.2	Acceptable	EPA 608	8/27/2014	-0.833	18.2	5.70	als
WP Gasoline Range Organics (GRO) in Water (cat# 640)												
9408	Gasoline Range Organics (GRO)	µg/L	2620	1740	617 - 3080	Acceptable	EPA 8260B 2	8/5/2014	1.62	1920	433	jln
4375	Benzene in GRO	µg/L		17.7	8.25 - 28.9	Not Reported				20.3	3.38	
4765	Ethylbenzene in GRO	µg/L		59.5	36.7 - 81.9	Not Reported				67.8	8.47	
5140	Toluene in GRO	µg/L		147	82.1 - 192	Not Reported				169	22.2	
5260	Xylenes, total in GRO	µg/L		174	109 - 235	Not Reported				204	24.4	
WP Glycols in Water (cat# 271)												
4720	Diethylene glycol	mg/L	108	111	44.4 - 178	Acceptable	EPA 8015B 2 1996	8/19/2014	-0.0922	108	3.61	als
4785	Ethylene glycol	mg/L	76.3	77.2	30.9 - 124	Acceptable	EPA 8015B 2 1996	8/19/2014	0.560	72.8	6.29	als
6657	Propylene glycol	mg/L	87.9	88.6	35.4 - 142	Acceptable	EPA 8015B 2 1996	8/19/2014	0.120	86.9	8.56	als
9491	Tetraethylene glycol	mg/L		120	48.0 - 192	Not Reported				121	9.90	
9646	Triethylene glycol	mg/L	96.3	92.4	37.0 - 148	Acceptable	EPA 8015B 2 1996	8/19/2014	1.08	93.9	2.24	als

Final Report Results For Laboratory
Microbac Laboratories - Chicagoland Division

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2003 NELAC Evaluation Report

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Inorganic Results

WP-234 2003 NELAC Evaluation Final Complete Report

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WP Minerals (cat# 581)												
1505	Alkalinity as CaCO3	mg/L	96.0	91.4	77.7 - 105	Acceptable	SM 2320 B-1997 1997	7/30/2014	1.37	91.7	3.12	ABG
1575	Chloride	mg/L	82.5	79.7	69.7 - 89.9	Acceptable	SM4500Cl- B online	8/6/2014	1.34	78.4	3.10	ABG
1610	Conductivity at 25°C	µmhos/cm	476	463	417 - 509	Acceptable	SM 2510 B-1997 1997	8/6/2014	-0.0146	476	12.0	
1730	Fluoride	mg/L	1.87	1.90	1.51 - 2.23	Acceptable	SM 4500-F C-1997 1997	8/5/2014	0.0277	1.87	0.123	ABG
1125	Potassium	mg/L	19.4	18.6	14.9 - 22.3	Acceptable	EPA 6010B 2 1996	7/23/2014	1.55	18.1	0.832	AG
1155	Sodium	mg/L	98.9	92.3	73.8 - 111	Acceptable	EPA 6010B 2 1996	7/23/2014	1.76	91.2	4.38	AG
2000	Sulfate	mg/L	19.4	18.1	14.1 - 21.2	Acceptable	EPA 9038	7/30/2014	1.95	17.2	1.14	AGRIE
1955	Total Dissolved Solids at 180°C	mg/L	365	383	338 - 428	Acceptable	SM 2540 C-1997	7/23/2014	0.285	360	16.5	TMG
1950	Total Solids at 105°C	mg/L	386	380	335 - 425	Acceptable	SM 2540 B-1997 1997	7/23/2014	0.706	375	15.6	TMG
WP Minerals (cat# 581)												
1505	Alkalinity as CaCO3	mg/L		91.4	77.7 - 105	Not Reported				91.7	3.12	
1575	Chloride	mg/L		79.7	69.7 - 89.9	Not Reported				78.4	3.10	
1610	Conductivity at 25°C	µmhos/cm		463	417 - 509	Not Reported				476	12.0	
1730	Fluoride	mg/L		1.90	1.51 - 2.23	Not Reported				1.87	0.123	
1125	Potassium	mg/L	19.0	18.6	14.9 - 22.3	Acceptable	EPA 200.7 5 1998	7/25/2014	1.07	18.1	0.832	AG
1155	Sodium	mg/L	94.5	92.3	73.8 - 111	Acceptable	EPA 200.7 5 1998	7/25/2014	0.755	91.2	4.38	AG
2000	Sulfate	mg/L		18.1	14.1 - 21.2	Not Reported				17.2	1.14	
1955	Total Dissolved Solids at 180°C	mg/L		383	338 - 428	Not Reported				360	16.5	
1950	Total Solids at 105°C	mg/L		380	335 - 425	Not Reported				375	15.6	

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WP Minerals (cat# 581)												
1505	Alkalinity as CaCO3	mg/L		91.4	77.7 - 105	Not Reported				91.7	3.12	
1575	Chloride	mg/L		79.7	69.7 - 89.9	Not Reported				78.4	3.10	
1610	Conductivity at 25°C	µmhos/cm		463	417 - 509	Not Reported				476	12.0	
1730	Fluoride	mg/L		1.90	1.51 - 2.23	Not Reported				1.87	0.123	
1125	Potassium	mg/L	18.1	18.6	14.9 - 22.3	Acceptable	EPA 200.8 5.5	7/25/2014	-0.0169	18.1	0.832	SA
1155	Sodium	mg/L	89.5	92.3	73.8 - 111	Acceptable	EPA 200.8 5.5	7/28/2014	-0.386	91.2	4.38	SA
2000	Sulfate	mg/L		18.1	14.1 - 21.2	Not Reported				17.2	1.14	
1955	Total Dissolved Solids at 180°C	mg/L		383	338 - 428	Not Reported				360	16.5	
1950	Total Solids at 105°C	mg/L		380	335 - 425	Not Reported				375	15.6	
WP Minerals (cat# 581)												
1505	Alkalinity as CaCO3	mg/L		91.4	77.7 - 105	Not Reported				91.7	3.12	
1575	Chloride	mg/L		79.7	69.7 - 89.9	Not Reported				78.4	3.10	
1610	Conductivity at 25°C	µmhos/cm		463	417 - 509	Not Reported				476	12.0	
1730	Fluoride	mg/L		1.90	1.51 - 2.23	Not Reported				1.87	0.123	
1125	Potassium	mg/L	16.8	18.6	14.9 - 22.3	Acceptable	EPA 6020A 1998	7/29/2014	-1.58	18.1	0.832	RPL
1155	Sodium	mg/L	89.1	92.3	73.8 - 111	Acceptable	EPA 6020A 1998	7/29/2014	-0.478	91.2	4.38	RPL
2000	Sulfate	mg/L		18.1	14.1 - 21.2	Not Reported				17.2	1.14	
1955	Total Dissolved Solids at 180°C	mg/L		383	338 - 428	Not Reported				360	16.5	
1950	Total Solids at 105°C	mg/L		380	335 - 425	Not Reported				375	15.6	

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WP Hardness (cat# 580)												
1960	Total Suspended Solids	mg/L	31	34.7	25.3 - 41.0	Acceptable	SM 2540 D-1997 1997	7/24/2014	-0.470	32.3	2.71	rm
1035	Calcium	mg/L	30.6	30.1	25.6 - 34.6	Acceptable	EPA 6010B 2 1996	7/23/2014	0.514	29.7	1.67	AG
1085	Magnesium	mg/L	16.8	16.0	13.6 - 18.4	Acceptable	EPA 6010B 2 1996	7/23/2014	1.21	15.8	0.799	AG
1550	Calcium Hardness as CaCO3	mg/L		75.3	64.0 - 86.6	Not Reported				74.8	3.47	
1755	Total Hardness as CaCO3	mg/L	129	141	120 - 162	Acceptable	SM2340B online	7/24/2014	-1.68	138	5.54	SA
WP Hardness (cat# 580)												
1960	Total Suspended Solids	mg/L		34.7	25.3 - 41.0	Not Reported				32.3	2.71	
1035	Calcium	mg/L	30.4	30.1	25.6 - 34.6	Acceptable	EPA 200.7 5 1998	7/25/2014	0.394	29.7	1.67	AG
1085	Magnesium	mg/L	15.5	16.0	13.6 - 18.4	Acceptable	EPA 200.7 5 1998	7/25/2014	-0.414	15.8	0.799	AG
1550	Calcium Hardness as CaCO3	mg/L		75.3	64.0 - 86.6	Not Reported				74.8	3.47	
1755	Total Hardness as CaCO3	mg/L		141	120 - 162	Not Reported				138	5.54	
WP Hardness (cat# 580)												
1960	Total Suspended Solids	mg/L		34.7	25.3 - 41.0	Not Reported				32.3	2.71	
1035	Calcium	mg/L	28.0	30.1	25.6 - 34.6	Acceptable	EPA 200.8 5.5	7/25/2014	-1.04	29.7	1.67	SA
1085	Magnesium	mg/L	15.3	16.0	13.6 - 18.4	Acceptable	EPA 200.8 5.5	7/25/2014	-0.664	15.8	0.799	SA
1550	Calcium Hardness as CaCO3	mg/L		75.3	64.0 - 86.6	Not Reported				74.8	3.47	
1755	Total Hardness as CaCO3	mg/L		141	120 - 162	Not Reported				138	5.54	

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WP Hardness (cat# 580)												
1960	Total Suspended Solids	mg/L		34.7	25.3 - 41.0	Not Reported				32.3	2.71	
1035	Calcium	mg/L	26.7	30.1	25.6 - 34.6	Acceptable	EPA 6020A 1998	7/29/2014	-1.82	29.7	1.67	RPL
1085	Magnesium	mg/L	14.4	16.0	13.6 - 18.4	Acceptable	EPA 6020A 1998	7/29/2014	-1.79	15.8	0.799	RPL
1550	Calcium Hardness as CaCO3	mg/L		75.3	64.0 - 86.6	Not Reported				74.8	3.47	
1755	Total Hardness as CaCO3	mg/L		141	120 - 162	Not Reported				138	5.54	
WP pH (cat# 577)												
1900	pH	S.U.	5.99	5.93	5.73 - 6.13	Acceptable	EPA 9045C	7/23/2014	0.959	5.94	0.0533	EB
WP pH (cat# 577)												
1900	pH	S.U.	5.99	5.93	5.73 - 6.13	Acceptable	SM4500H+ B online	7/23/2014	0.959	5.94	0.0533	EB
WP Settleable Solids (cat# 883)												
1965	Settleable Solids	mL/L	31.0	28.8	23.5 - 36.6	Acceptable	SM 2540 F-1997 1997	7/24/2014	0.177	30.7	1.78	EB
WP Volatile Solids (cat# 884)												
1970	Volatile Solids, Total	mg/L	334	314	236 - 360	Acceptable	SM2540F	8/5/2014	1.24	303	24.7	TMG
WP Simple Nutrients (cat# 584)												
1515	Ammonia as N	mg/L	3.88	4.76	3.67 - 5.89	Acceptable	EPA 350.1 2 1993	7/31/2014	-2.30	4.79	0.394	GRIEF
1820	Nitrate + Nitrite as N	mg/L	17.2	17.7	14.8 - 20.4	Acceptable	EPA 353.2 2 1993	7/30/2014	-0.672	17.9	1.02	GRIEF
1810	Nitrate as N	mg/L	17.2	17.7	14.8 - 20.5	Acceptable	EPA 353.2 2 1993	7/30/2014	-0.695	17.9	0.938	GRIEF
1870	ortho-Phosphate as P	mg/L	4.81	4.66	3.96 - 5.36	Acceptable	EPA 365.1 2 1993	7/30/2014	0.711	4.68	0.189	AGRIE
WP Complex Nutrients (cat# 579)												
1795	Total Kjeldahl Nitrogen	mg/L	12.7	12.4	9.16 - 15.4	Acceptable	EPA 351.2 2 1993	8/5/2014	0.415	12.3	0.845	GRIEF
1910	Total phosphorus as P	mg/L	2.80	2.95	2.41 - 3.46	Acceptable	EPA 365.1 2 1993	8/5/2014	-1.21	3.02	0.178	AGRIE

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WP Nitrite (cat# 888)												
1840	Nitrite as N	mg/L	2.62	2.58	2.21 - 2.95	Acceptable	EPA 353.2 2 1993	7/30/2014	0.183	2.60	0.134	AGRIE
WP Demand (cat# 578)												
1530	BOD	mg/L	34.9	40.7	20.9 - 60.6	Acceptable	SM5210B online	8/1/2014	-0.835	40.8	7.01	MZ
1555	CBOD	mg/L	33.3	36.9	15.9 - 58.0	Acceptable	SM5210B online	8/1/2014	-0.694	38.4	7.32	MZ
1565	COD	mg/L	60.8	65.6	46.7 - 81.8	Acceptable	EPA 410.4 2	7/29/2014	-0.700	64.9	5.84	EB
2040	TOC	mg/L		25.9	21.1 - 30.6	Not Reported				26.3	1.87	
WP Oil & Grease (cat# 582)												
1860	n-Hexane Extractable Material(O&G)(Grav)	mg/L	93.3	115	82.6 - 133	Acceptable	EPA 1664B 2010	7/25/2014	-1.19	104	8.89	
1860	n-Hexane Extractable Material(O&G)(IR)	mg/L		141	103 - 161	Not Reported				158	36.1	

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WP Trace Metals (cat# 586)												
1000	Aluminum	µg/L	533	517	411 - 624	Acceptable	EPA 6010B 2 1996	7/23/2014	0.0360	532	30.2	AG
1005	Antimony	µg/L	750	784	643 - 901	Acceptable	EPA 6010B 2 1996	7/23/2014	-0.605	774	40.2	AG
1010	Arsenic	µg/L	137	135	103 - 168	Acceptable	EPA 6010B 2 1996	7/23/2014	0.421	133	8.34	AG
1015	Barium	µg/L	843	791	672 - 910	Acceptable	EPA 6010B 2 1996	7/23/2014	1.55	792	33.1	AG
1020	Beryllium	µg/L	319	312	265 - 359	Acceptable	EPA 6010B 2 1996	7/23/2014	0.0264	319	14.4	AG
1025	Boron	µg/L	895	944	802 - 1090	Acceptable	EPA 6010B 2 1996	7/23/2014	-1.07	956	56.7	AG
1030	Cadmium	µg/L	140	136	116 - 156	Acceptable	EPA 6010B 2 1996	7/23/2014	1.09	134	5.35	AG
1040	Chromium	µg/L	633	634	539 - 729	Acceptable	EPA 6010B 2 1996	7/23/2014	-0.0535	634	26.7	AG
1050	Cobalt	µg/L	571	550	468 - 632	Acceptable	EPA 6010B 2 1996	7/23/2014	-0.221	577	28.9	AG
1055	Copper	µg/L	818	816	694 - 938	Acceptable	EPA 6010B 2 1996	7/23/2014	-0.0809	821	39.6	AG
1070	Iron	µg/L	866	840	714 - 966	Acceptable	EPA 6010B 2 1996	7/23/2014	0.327	852	42.7	AG
1075	Lead	µg/L	707	649	552 - 746	Acceptable	EPA 6010B 2 1996	7/23/2014	1.80	653	29.7	AG
1090	Manganese	µg/L	840	772	656 - 888	Acceptable	EPA 6010B 2 1996	7/23/2014	1.16	797	36.9	AG
1100	Molybdenum	µg/L	276	273	233 - 310	Acceptable	EPA 6010B 2 1996	7/23/2014	0.431	271	12.5	AG
1105	Nickel	µg/L	750	716	628 - 809	Acceptable	EPA 6010B 2 1996	7/23/2014	1.12	713	33.3	AG
1140	Selenium	µg/L	637	660	561 - 759	Acceptable	EPA 6010B 2 1996	7/23/2014	-0.394	651	35.4	AG
1150	Silver	µg/L	800	772	656 - 888	Acceptable	EPA 6010B 2 1996	7/23/2014	0.765	768	41.9	AG
1160	Strontium	µg/L	242	237	201 - 273	Acceptable	EPA 6010B 2 1996	7/23/2014	0.334	238	10.5	AG
1165	Thallium	µg/L	674	606	501 - 701	Acceptable	EPA 6010B 2 1996	7/23/2014	1.94	607	34.4	AG
1185	Vanadium	µg/L	854	888	755 - 1020	Acceptable	EPA 6010B 2 1996	7/23/2014	-0.655	880	39.0	AG

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WP Trace Metals (cat# 586) (Continued)												
1190	Zinc	µg/L	914	895	761 - 1030	Acceptable	EPA 6010B 2 1996	7/23/2014	0.442	894	45.0	AG

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WP Trace Metals (cat# 586)												
1000	Aluminum	µg/L	590	517	411 - 624	Acceptable	EPA 200.7 5 1998	7/25/2014	1.92	532	30.2	AG
1005	Antimony	µg/L	796	784	643 - 901	Acceptable	EPA 200.7 5 1998	7/25/2014	0.540	774	40.2	AG
1010	Arsenic	µg/L	145	135	103 - 168	Acceptable	EPA 200.7 5 1998	7/25/2014	1.38	133	8.34	AG
1015	Barium	µg/L	848	791	672 - 910	Acceptable	EPA 200.7 5 1998	7/25/2014	1.70	792	33.1	AG
1020	Beryllium	µg/L	318	312	265 - 359	Acceptable	EPA 200.7 5 1998	7/25/2014	-0.0429	319	14.4	AG
1025	Boron	µg/L	969	944	802 - 1090	Acceptable	EPA 200.7 5 1998	7/25/2014	0.237	956	56.7	AG
1030	Cadmium	µg/L	141	136	116 - 156	Acceptable	EPA 200.7 5 1998	7/25/2014	1.28	134	5.35	AG
1040	Chromium	µg/L	654	634	539 - 729	Acceptable	EPA 200.7 5 1998	7/25/2014	0.733	634	26.7	AG
1050	Cobalt	µg/L	606	550	468 - 632	Acceptable	EPA 200.7 5 1998	7/25/2014	0.990	577	28.9	AG
1055	Copper	µg/L	854	816	694 - 938	Acceptable	EPA 200.7 5 1998	7/28/2014	0.829	821	39.6	AG
1070	Iron	µg/L	848	840	714 - 966	Acceptable	EPA 200.7 5 1998	7/25/2014	-0.0947	852	42.7	AG
1075	Lead	µg/L	740	649	552 - 746	Acceptable	EPA 200.7 5 1998	7/25/2014	2.91	653	29.7	AG
1090	Manganese	µg/L	824	772	656 - 888	Acceptable	EPA 200.7 5 1998	7/25/2014	0.730	797	36.9	AG
1100	Molybdenum	µg/L	278	273	233 - 310	Acceptable	EPA 200.7 5 1998	7/25/2014	0.591	271	12.5	AG
1105	Nickel	µg/L	770	716	628 - 809	Acceptable	EPA 200.7 5 1998	7/25/2014	1.72	713	33.3	AG
1140	Selenium	µg/L	707	660	561 - 759	Acceptable	EPA 200.7 5 1998	7/25/2014	1.58	651	35.4	AG
1150	Silver	µg/L	355	772	656 - 888	Not Acceptable	EPA 200.7 5 1998	7/28/2014	-9.85	768	41.9	AG
1160	Strontium	µg/L	247	237	201 - 273	Acceptable	EPA 200.7 5 1998	7/25/2014	0.808	238	10.5	AG
1165	Thallium	µg/L	711	606	501 - 701	Not Acceptable	EPA 200.7 5 1998	7/25/2014	3.01	607	34.4	AG
1185	Vanadium	µg/L	870	888	755 - 1020	Acceptable	EPA 200.7 5 1998	7/25/2014	-0.245	880	39.0	AG

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NELAC Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Trace Metals (cat# 586) (Continued)												
1190	Zinc	µg/L	918	895	761 - 1030	Acceptable	EPA 200.7 5 1998	7/25/2014	0.531	894	45.0	AG

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WP Trace Metals (cat# 586)												
1000	Aluminum	µg/L	481	517	411 - 624	Acceptable	EPA 6020A 1998	7/29/2014	-1.68	532	30.2	RPL
1005	Antimony	µg/L	772	784	643 - 901	Acceptable	EPA 6020A 1998	7/29/2014	-0.0573	774	40.2	RPL
1010	Arsenic	µg/L	132	135	103 - 168	Acceptable	EPA 6020A 1998	7/29/2014	-0.178	133	8.34	RPL
1015	Barium	µg/L	822	791	672 - 910	Acceptable	EPA 6020A 1998	7/29/2014	0.911	792	33.1	RPL
1020	Beryllium	µg/L	307	312	265 - 359	Acceptable	EPA 6020A 1998	7/29/2014	-0.806	319	14.4	RPL
1025	Boron	µg/L	892	944	802 - 1090	Acceptable	EPA 6020A 1998	8/12/2014	-1.12	956	56.7	RPL
1030	Cadmium	µg/L	120	136	116 - 156	Acceptable	EPA 6020A 1998	7/29/2014	-2.65	134	5.35	RPL
1040	Chromium	µg/L	565	634	539 - 729	Acceptable	EPA 6020A 1998	7/29/2014	-2.60	634	26.7	RPL
1050	Cobalt	µg/L	585	550	468 - 632	Acceptable	EPA 6020A 1998	7/29/2014	0.263	577	28.9	RPL
1055	Copper	µg/L	852	816	694 - 938	Acceptable	EPA 6020A 1998	7/29/2014	0.778	821	39.6	RPL
1070	Iron	µg/L	853	840	714 - 966	Acceptable	EPA 6020A 1998	7/29/2014	0.0223	852	42.7	RPL
1075	Lead	µg/L	658	649	552 - 746	Acceptable	EPA 6020A 1998	7/29/2014	0.155	653	29.7	RPL
1090	Manganese	µg/L	806	772	656 - 888	Acceptable	EPA 6020A 1998	7/29/2014	0.242	797	36.9	RPL
1100	Molybdenum	µg/L	275	273	233 - 310	Acceptable	EPA 6020A 1998	7/29/2014	0.351	271	12.5	RPL
1105	Nickel	µg/L	735	716	628 - 809	Acceptable	EPA 6020A 1998	7/29/2014	0.666	713	33.3	RPL
1140	Selenium	µg/L	678	660	561 - 759	Acceptable	EPA 6020A 1998	7/29/2014	0.764	651	35.4	RPL
1150	Silver	µg/L	747	772	656 - 888	Acceptable	EPA 6020A 1998	7/29/2014	-0.499	768	41.9	RPL
1160	Strontium	µg/L	225	237	201 - 273	Acceptable	EPA 6020A 1998	7/29/2014	-1.28	238	10.5	RPL
1165	Thallium	µg/L	606	606	501 - 701	Acceptable	EPA 6020A 1998	7/29/2014	-0.0368	607	34.4	RPL
1185	Vanadium	µg/L	931	888	755 - 1020	Acceptable	EPA 6020A 1998	7/29/2014	1.32	880	39.0	RPL

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WP Trace Metals (cat# 586) (Continued)												
1190	Zinc	µg/L	923	895	761 - 1030	Acceptable	EPA 6020A 1998	7/29/2014	0.642	894	45.0	RPL

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WP Trace Metals (cat# 586)												
1000	Aluminum	µg/L	518	517	411 - 624	Acceptable	EPA 200.8 5.5 1998	7/25/2014	-0.460	532	30.2	SA
1005	Antimony	µg/L	790	784	643 - 901	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.391	774	40.2	SA
1010	Arsenic	µg/L	137	135	103 - 168	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.421	133	8.34	SA
1015	Barium	µg/L	815	791	672 - 910	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.700	792	33.1	SA
1020	Beryllium	µg/L	306	312	265 - 359	Acceptable	EPA 200.8 5.5 1998	7/25/2014	-0.875	319	14.4	SA
1025	Boron	µg/L	984	944	802 - 1090	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.501	956	56.7	SA
1030	Cadmium	µg/L	123	136	116 - 156	Acceptable	EPA 200.8 5.5 1998	7/25/2014	-2.09	134	5.35	SA
1040	Chromium	µg/L	655	634	539 - 729	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.770	634	26.7	SA
1050	Cobalt	µg/L	594	550	468 - 632	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.575	577	28.9	SA
1055	Copper	µg/L	857	816	694 - 938	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.905	821	39.6	SA
1070	Iron	µg/L	836	840	714 - 966	Acceptable	EPA 200.8 5.5 1998	7/25/2014	-0.376	852	42.7	SA
1075	Lead	µg/L	667	649	552 - 746	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.458	653	29.7	SA
1090	Manganese	µg/L	811	772	656 - 888	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.378	797	36.9	SA
1100	Molybdenum	µg/L	269	273	233 - 310	Acceptable	EPA 200.8 5.5 1998	7/25/2014	-0.129	271	12.5	SA
1105	Nickel	µg/L	733	716	628 - 809	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.606	713	33.3	SA
1140	Selenium	µg/L	673	660	561 - 759	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.623	651	35.4	SA
1150	Silver	µg/L	413	772	656 - 888	Not Acceptable	EPA 200.8 5.5 1998	7/25/2014	-8.47	768	41.9	SA
1160	Strontium	µg/L	249	237	201 - 273	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.998	238	10.5	SA
1165	Thallium	µg/L	617	606	501 - 701	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.283	607	34.4	SA
1185	Vanadium	µg/L	932	888	755 - 1020	Acceptable	EPA 200.8 5.5 1998	7/25/2014	1.34	880	39.0	SA

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WP Trace Metals (cat# 586) (Continued)												
1190	Zinc	µg/L	914	895	761 - 1030	Acceptable	EPA 200.8 5.5 1998	7/25/2014	0.442	894	45.0	SA
WP Mercury (cat# 574)												
1095	Mercury	µg/L	12.5	12.2	8.54 - 15.9	Acceptable	EPA 7470A 1 1994	7/22/2014	0.341	12.1	1.17	AG
WP Mercury (cat# 574)												
1095	Mercury	µg/L	12.5	12.2	8.54 - 15.9	Acceptable	EPA 245.1 3 1994	7/22/2014	0.341	12.1	1.17	AG
WP Mercury (cat# 574)												
1095	Mercury	µg/L	8.93	12.2	8.54 - 15.9	Acceptable	EPA 6020A	7/29/2014	-2.71	12.1	1.17	RPL
WP Low-Level Mercury (cat# 896)												
1095	Low Level Mercury	ng/L	31.6	31.4	19.5 - 43.1	Acceptable	EPA 1631E	7/23/2014	-0.534	33.6	3.80	SA
WP Hexavalent Chromium (cat# 898)												
1045	Hexavalent Chromium	µg/L	233	231	191 - 270	Acceptable	EPA 7196A 1 1992	8/5/2014	0.275	229	14.4	AGRIE
WP Hexavalent Chromium (cat# 898)												
1045	Hexavalent Chromium	µg/L	233	231	191 - 270	Acceptable	SM 3500-Cr B-2009 2009	8/5/2014	0.275	229	14.4	AGRIE
WP Tin & Titanium (cat# 573)												
1175	Tin	µg/L	564	559	391 - 727	Acceptable	EPA 6010B 2 1996	7/23/2014	-0.0907	567	30.4	AG
1180	Titanium	µg/L	202	199	169 - 229	Acceptable	EPA 6010B 2 1996	7/23/2014	0.480	199	7.02	AG
WP Tin & Titanium (cat# 573)												
1175	Tin	µg/L	575	559	391 - 727	Acceptable	EPA 200.7 5 1998	7/25/2014	0.271	567	30.4	AG
1180	Titanium	µg/L	204	199	169 - 229	Acceptable	EPA 200.7 5 1998	7/25/2014	0.765	199	7.02	AG

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WP Tin & Titanium (cat# 573)												
1175	Tin	µg/L	476	559	391 - 727	Acceptable	EPA 6020A 1998	7/29/2014	-2.98	567	30.4	RPL
1180	Titanium	µg/L	173	199	169 - 229	Acceptable	EPA 6020A 1998	7/29/2014	-3.65	199	7.02	RPL
WP Tin & Titanium (cat# 573)												
1175	Tin	µg/L	545	559	391 - 727	Acceptable	EPA 200.8 5.5 1998	7/25/2014	-0.715	567	30.4	SA
1180	Titanium	µg/L	196	199	169 - 229	Acceptable	EPA 200.8 5.5 1998	7/25/2014	-0.374	199	7.02	SA
WP Color (cat# 882)												
1605	Color	PC units	35	35.0	22.6 - 44.9	Acceptable	SM 2120 B-2001 2001	8/18/2014	0.530	32.9	3.99	TMG
WP Total Cyanide (cat# 588)												
1645	Cyanide, total	mg/L	0.946	0.963	0.626 - 1.30	Acceptable	SM4500CN E 20th ED 1997	8/4/2014	-0.0335	0.948	0.0744	AGRIE
1510	Amenable Cyanide	mg/L		0.367	0.239 - 0.495	Not Reported				0.350	0.0748	
WP Total Cyanide (cat# 588)												
1645	Cyanide, total	mg/L	0.946	0.963	0.626 - 1.30	Acceptable	EPA 9012B 2002	8/4/2014	-0.0335	0.948	0.0744	AGRIE
1510	Amenable Cyanide	mg/L	0.347	0.367	0.239 - 0.495	Acceptable	EPA 9012B 2002	8/4/2014	-0.0428	0.350	0.0748	
WP Total Phenolics (4-AAP) (cat# 589)												
1905	Phenolics, total	mg/L	0.626	0.576	0.284 - 0.868	Acceptable	EPA 420.4 1 1993	8/6/2014	0.420	0.590	0.0865	
WP Total Phenolics (4-AAP) (cat# 589)												
1905	Phenolics, total	mg/L	0.626	0.576	0.284 - 0.868	Acceptable	EPA 9066 1986	8/6/2014	0.420	0.590	0.0865	
WP Total Phenolics (4-AAP) (cat# 589)												
1905	Phenolics, total	mg/L	0.600	0.576	0.284 - 0.868	Acceptable	EPA 420.1 1978	8/14/2014	0.119	0.590	0.0865	

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WP Silica (cat# 890)												
1990	Silica as SiO2	mg/L	65.5	63.7	47.8 - 79.6	Acceptable	EPA 200.7 4.4 1994	7/25/2014	0.295	64.5	3.33	
WP Silica (cat# 890)												
1990	Silica as SiO2	mg/L	62.1	63.7	47.8 - 79.6	Acceptable	EPA 6010B 2 1996	7/24/2014	-0.725	64.5	3.33	
WP Sulfide (cat# 891)												
2005	Sulfide	mg/L	4.64	5.17	2.15 - 7.58	Acceptable	SM 4500-S2 D-2000 2000	8/7/2014	0.200	4.49	0.738	EB
WP Total Residual Chlorine (cat# 587)												
1940	Total Residual Chlorine	mg/L	1.01	0.996	0.742 - 1.20	Acceptable	SM 4500-Cl E-2000 2000	8/8/2014	0.415	0.975	0.0842	

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Organic Results

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WP Volatiles (cat# 830)												
4315	Acetone	µg/L	55.6	58.8	14.6 - 96.7	Acceptable	EPA 624	8/5/2014	-0.0492	56.1	10.8	rpl
4320	Acetonitrile	µg/L	< 100	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
4325	Acrolein	µg/L	< 100	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
4340	Acrylonitrile	µg/L	< 100	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
4375	Benzene	µg/L	19.7	19.4	13.6 - 25.2	Acceptable	EPA 624	8/5/2014	0.0777	19.5	2.16	rpl
4385	Bromobenzene	µg/L		< 5.00	0.00 - 5.00	Not Reported						
4390	Bromochloromethane	µg/L		< 5.00	0.00 - 5.00	Not Reported						
4395	Bromodichloromethane	µg/L	< 6.00	< 6.00	0.00 - 6.00	Acceptable	EPA 624	8/5/2014				rpl
4400	Bromoform	µg/L	39.8	42.7	25.6 - 59.8	Acceptable	EPA 624	8/5/2014	-0.837	44.2	5.30	rpl
4950	Bromomethane	µg/L	15.0	25.0	10.0 - 40.0	Acceptable	EPA 624	8/5/2014	-0.756	20.7	7.55	rpl
4410	2-Butanone (MEK)	µg/L	< 10.0	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
4435	n-Butylbenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
4440	sec-Butylbenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
4445	tert-Butylbenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
5000	tert-Butyl methyl ether (MTBE)	µg/L	37.0	40.1	26.4 - 55.0	Acceptable	EPA 624	8/5/2014	-0.912	41.1	4.48	rpl
4450	Carbon disulfide	µg/L	< 10.0	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
4455	Carbon tetrachloride	µg/L	81.0	82.1	46.4 - 111	Acceptable	EPA 624	8/5/2014	-0.0452	81.6	13.2	rpl
4475	Chlorobenzene	µg/L	< 7.00	< 7.00	0.00 - 7.00	Acceptable	EPA 624	8/5/2014				rpl

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WP Volatiles (cat# 830) (Continued)												
4575	Chlorodibromomethane	µg/L	86.8	92.0	55.2 - 129	Acceptable	EPA 624	8/5/2014	-0.832	93.8	8.41	rpl
4485	Chloroethane	µg/L	< 10.0	< 8.00	0.00 - 8.00	Acceptable	EPA 624	8/5/2014				rpl
4500	2-Chloroethylvinylether	µg/L	< 10.0	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
4505	Chloroform	µg/L	74.8	73.1	51.2 - 95.0	Acceptable	EPA 624	8/5/2014	-0.00485	74.8	7.95	rpl
4960	Chloromethane	µg/L	< 10.0	< 8.00	0.00 - 8.00	Acceptable	EPA 624	8/5/2014				rpl
4535	2-Chlorotoluene	µg/L		< 5.00	0.00 - 5.00	Not Reported						
4540	4-Chlorotoluene	µg/L		< 5.00	0.00 - 5.00	Not Reported						
4570	1,2-Dibromo-3-chloropropane (DBCP)	µg/L	34.6	43.2	25.9 - 60.5	Acceptable	EPA 624	8/5/2014	-1.31	43.7	6.96	rpl
4585	1,2-Dibromoethane (EDB)	µg/L	< 6.5	< 6.50	0.00 - 6.50	Acceptable	EPA 624	8/5/2014				rpl
4595	Dibromomethane	µg/L	< 6.5	< 6.50	0.00 - 6.50	Acceptable	EPA 624	8/5/2014				rpl
4610	1,2-Dichlorobenzene	µg/L	64.5	66.4	46.5 - 86.3	Acceptable	EPA 624	8/5/2014	0.0554	64.0	8.14	rpl
4615	1,3-Dichlorobenzene	µg/L	106	103	72.1 - 134	Acceptable	EPA 624	8/5/2014	0.487	98.8	14.7	rpl
4620	1,4-Dichlorobenzene	µg/L	45.8	45.3	31.7 - 58.9	Acceptable	EPA 624	8/5/2014	0.328	44.1	5.32	rpl
4625	Dichlorodifluoromethane (Freon 12)	µg/L	< 10.0	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
4630	1,1-Dichloroethane	µg/L	45.1	42.9	27.2 - 58.9	Acceptable	EPA 624	8/5/2014	0.0544	44.8	4.95	rpl
4635	1,2-Dichloroethane	µg/L	127	131	93.1 - 168	Acceptable	EPA 624	8/5/2014	-0.447	132	12.3	rpl
4640	1,1-Dichloroethylene	µg/L	35.7	34.6	20.2 - 50.6	Acceptable	EPA 624	8/5/2014	-0.0736	36.1	5.86	rpl
4645	cis-1,2-Dichloroethylene	µg/L	< 7.00	< 7.00	0.00 - 7.00	Acceptable	EPA 624	8/5/2014				rpl
4665	2,2-Dichloropropane	µg/L		< 5.00	0.00 - 5.00	Not Reported						

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NELAC Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Volatiles (cat# 830) (Continued)												
4700	trans-1,2-Dichloroethylene	µg/L	34.4	34.1	20.5 - 47.7	Acceptable	EPA 624	8/5/2014	-0.196	35.2	4.22	rpl
4655	1,2-Dichloropropane	µg/L	127	124	86.8 - 161	Acceptable	EPA 624	8/5/2014	0.200	124	13.1	rpl
4660	1,3-Dichloropropane	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
4670	1,1-Dichloropropene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
4680	cis-1,3-Dichloropropylene	µg/L	47.4	55.5	36.1 - 74.9	Acceptable	EPA 624	8/5/2014	-0.578	50.7	5.68	rpl
4685	trans-1,3-Dichloropropylene	µg/L	83.7	98.0	63.7 - 132	Acceptable	EPA 624	8/5/2014	-0.736	90.5	9.25	rpl
4765	Ethylbenzene	µg/L	36.5	36.3	25.4 - 47.2	Acceptable	EPA 624	8/5/2014	0.235	35.4	4.70	rpl
4835	Hexachlorobutadiene	µg/L	< 50.0	< 4.30	0.00 - 4.30	Acceptable	EPA 624	8/5/2014				rpl
4840	Hexachloroethane	µg/L		< 3.30	0.00 - 3.30	Not Reported						
4860	2-Hexanone	µg/L	< 10.0	< 4.40	0.00 - 4.40	Acceptable	EPA 624	8/5/2014				rpl
4900	Isopropylbenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
4910	4-Isopropyltoluene	µg/L		< 5.00	0.00 - 5.00	Not Reported						
4975	Methylene chloride	µg/L	48.5	53.4	32.0 - 74.8	Acceptable	EPA 624	8/5/2014	-0.921	54.5	6.50	rpl
4995	4-Methyl-2-pentanone (MIBK)	µg/L	< 5.00	< 2.00	0.00 - 2.00	Acceptable	EPA 624	8/5/2014				rpl
5005	Naphthalene	µg/L	14.2	16.6	7.10 - 24.9	Acceptable	EPA 624	8/5/2014	-0.845	16.1	2.22	rpl
5015	Nitrobenzene	µg/L		< 6.20	0.00 - 6.20	Not Reported						
5090	n-Propylbenzene	µg/L		< 5.00	0.00 - 5.00	Not Reported						

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NELAC Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Volatiles (cat# 830) (Continued)												
5100	Styrene	µg/L	32.8	35.5	23.1 - 47.9	Acceptable	EPA 624	8/5/2014	-0.363	34.3	4.25	rpl
5105	1,1,1,2-Tetrachloroethane	µg/L	38.4	39.7	25.8 - 53.6	Acceptable	EPA 624	8/5/2014	-0.642	40.9	3.96	rpl
5110	1,1,2,2-Tetrachloroethane	µg/L	55.3	55.2	35.9 - 74.5	Acceptable	EPA 624	8/5/2014	-0.292	57.1	6.25	rpl
5115	Tetrachloroethylene	µg/L	30.4	31.2	16.7 - 41.0	Acceptable	EPA 624	8/5/2014	0.302	29.0	4.65	rpl
5140	Toluene	µg/L	53.2	51.6	36.1 - 67.1	Acceptable	EPA 624	8/5/2014	0.437	51.0	5.04	rpl
5150	1,2,3-Trichlorobenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
5155	1,2,4-Trichlorobenzene	µg/L	98.7	113	50.7 - 154	Acceptable	EPA 624	8/5/2014	-0.185	102	19.0	rpl
5160	1,1,1-Trichloroethane	µg/L	< 6.00	< 6.00	0.00 - 6.00	Acceptable	EPA 624	8/5/2014				rpl
5165	1,1,2-Trichloroethane	µg/L	117	121	84.7 - 157	Acceptable	EPA 624	8/5/2014	-0.520	123	11.9	rpl
5170	Trichloroethylene	µg/L	60.8	60.5	38.4 - 79.0	Acceptable	EPA 624	8/5/2014	0.279	58.9	6.97	rpl
5175	Trichlorofluoromethane	µg/L	31.5	28.9	11.6 - 46.2	Acceptable	EPA 624	8/5/2014	0.171	30.5	5.95	rpl
5180	1,2,3-Trichloropropane (TCP)	µg/L	80.5	90.4	41.6 - 136	Acceptable	EPA 624	8/5/2014	-0.837	90.4	11.8	rpl
5210	1,2,4-Trimethylbenzene	µg/L	18.4	18.0	11.7 - 24.3	Acceptable	EPA 624	8/5/2014	0.477	17.0	2.85	rpl
5215	1,3,5-Trimethylbenzene	µg/L	27.6	30.4	19.8 - 41.0	Acceptable	EPA 624	8/5/2014	-0.0810	28.0	4.96	rpl
5225	Vinyl acetate	µg/L	< 10.0	< 5.00	0.00 - 5.00	Acceptable	EPA 624	8/5/2014				rpl
5235	Vinyl chloride	µg/L	< 8.00	< 8.00	0.00 - 8.00	Acceptable	EPA 624	8/5/2014				rpl
5240	m&p-Xylene	µg/L	< 6.0	< 6.00	0.00 - 6.00	Acceptable	EPA 624	8/5/2014				rpl
5250	o-Xylene	µg/L	< 6.0	< 6.00	0.00 - 6.00	Acceptable	EPA 624	8/5/2014				rpl
WP Volatiles (cat# 830) (Continued)												
5260	Xylenes, total	µg/L	< 12.00	< 12.0	0.00 - 12.0	Acceptable	EPA 624	8/5/2014				rpl

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WP Volatiles (cat# 830)												
4315	Acetone	µg/L	55.6	58.8	14.6 - 96.7	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.0492	56.1	10.8	rpl
4320	Acetonitrile	µg/L	< 100	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4325	Acrolein	µg/L	< 100	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4340	Acrylonitrile	µg/L	< 100	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4375	Benzene	µg/L	19.7	19.4	13.6 - 25.2	Acceptable	EPA 8260B 2 1996	8/5/2014	0.0777	19.5	2.16	rpl
4385	Bromobenzene	µg/L		< 5.00	0.00 - 5.00	Not Reported						
4390	Bromochloromethane	µg/L		< 5.00	0.00 - 5.00	Not Reported						
4395	Bromodichloromethane	µg/L	< 6.00	< 6.00	0.00 - 6.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4400	Bromoform	µg/L	39.8	42.7	25.6 - 59.8	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.837	44.2	5.30	rpl
4950	Bromomethane	µg/L	15.0	25.0	10.0 - 40.0	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.756	20.7	7.55	rpl
4410	2-Butanone (MEK)	µg/L	< 10.0	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4435	n-Butylbenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4440	sec-Butylbenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4445	tert-Butylbenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
5000	tert-Butyl methyl ether (MTBE)	µg/L	37.0	40.1	26.4 - 55.0	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.912	41.1	4.48	rpl
4450	Carbon disulfide	µg/L	< 10.0	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4455	Carbon tetrachloride	µg/L	81.0	82.1	46.4 - 111	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.0452	81.6	13.2	rpl
4475	Chlorobenzene	µg/L	< 7.00	< 7.00	0.00 - 7.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl

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WP Volatiles (cat# 830) (Continued)												
4575	Chlorodibromomethane	µg/L	86.8	92.0	55.2 - 129	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.832	93.8	8.41	rpl
4485	Chloroethane	µg/L	< 10.0	< 8.00	0.00 - 8.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4500	2-Chloroethylvinylether	µg/L	< 10.0	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4505	Chloroform	µg/L	74.8	73.1	51.2 - 95.0	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.00485	74.8	7.95	rpl
4960	Chloromethane	µg/L	< 10.0	< 8.00	0.00 - 8.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4535	2-Chlorotoluene	µg/L		< 5.00	0.00 - 5.00	Not Reported						
4540	4-Chlorotoluene	µg/L		< 5.00	0.00 - 5.00	Not Reported						
4570	1,2-Dibromo-3-chloropropane (DBCP)	µg/L	34.6	43.2	25.9 - 60.5	Acceptable	EPA 8260B 2 1996	8/5/2014	-1.31	43.7	6.96	rpl
4585	1,2-Dibromoethane (EDB)	µg/L	< 6.5	< 6.50	0.00 - 6.50	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4595	Dibromomethane	µg/L	< 6.5	< 6.50	0.00 - 6.50	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4610	1,2-Dichlorobenzene	µg/L	64.5	66.4	46.5 - 86.3	Acceptable	EPA 8260B 2 1996	8/5/2014	0.0554	64.0	8.14	rpl
4615	1,3-Dichlorobenzene	µg/L	106	103	72.1 - 134	Acceptable	EPA 8260B 2 1996	8/5/2014	0.487	98.8	14.7	rpl
4620	1,4-Dichlorobenzene	µg/L	45.8	45.3	31.7 - 58.9	Acceptable	EPA 8260B 2 1996	8/5/2014	0.328	44.1	5.32	rpl
4625	Dichlorodifluoromethane (Freon 12)	µg/L	< 10.0	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4630	1,1-Dichloroethane	µg/L	45.1	42.9	27.2 - 58.9	Acceptable	EPA 8260B 2 1996	8/5/2014	0.0544	44.8	4.95	rpl
4635	1,2-Dichloroethane	µg/L	127	131	93.1 - 168	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.447	132	12.3	rpl
4640	1,1-Dichloroethylene	µg/L	35.7	34.6	20.2 - 50.6	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.0736	36.1	5.86	rpl
4645	cis-1,2-Dichloroethylene	µg/L	< 7.00	< 7.00	0.00 - 7.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4665	2,2-Dichloropropane	µg/L		< 5.00	0.00 - 5.00	Not Reported						

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WP Volatiles (cat# 830) (Continued)												
4700	trans-1,2-Dichloroethylene	µg/L	34.4	34.1	20.5 - 47.7	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.196	35.2	4.22	rpl
4655	1,2-Dichloropropane	µg/L	127	124	86.8 - 161	Acceptable	EPA 8260B 2 1996	8/5/2014	0.200	124	13.1	rpl
4660	1,3-Dichloropropane	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4670	1,1-Dichloropropene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4680	cis-1,3-Dichloropropylene	µg/L	47.4	55.5	36.1 - 74.9	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.578	50.7	5.68	rpl
4685	trans-1,3-Dichloropropylene	µg/L	83.7	98.0	63.7 - 132	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.736	90.5	9.25	rpl
4765	Ethylbenzene	µg/L	36.5	36.3	25.4 - 47.2	Acceptable	EPA 8260B 2 1996	8/5/2014	0.235	35.4	4.70	rpl
4835	Hexachlorobutadiene	µg/L	< 50.0	< 4.30	0.00 - 4.30	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4840	Hexachloroethane	µg/L		< 3.30	0.00 - 3.30	Not Reported						
4860	2-Hexanone	µg/L	< 10.0	< 4.40	0.00 - 4.40	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4900	Isopropylbenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
4910	4-Isopropyltoluene	µg/L		< 5.00	0.00 - 5.00	Not Reported						
4975	Methylene chloride	µg/L	48.5	53.4	32.0 - 74.8	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.921	54.5	6.50	rpl
4995	4-Methyl-2-pentanone (MIBK)	µg/L	< 5.00	< 2.00	0.00 - 2.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
5005	Naphthalene	µg/L	14.2	16.6	7.10 - 24.9	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.845	16.1	2.22	rpl
5015	Nitrobenzene	µg/L		< 6.20	0.00 - 6.20	Not Reported						
5090	n-Propylbenzene	µg/L		< 5.00	0.00 - 5.00	Not Reported						

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WP Volatiles (cat# 830) (Continued)												
5100	Styrene	µg/L	32.8	35.5	23.1 - 47.9	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.363	34.3	4.25	rpl
5105	1,1,1,2-Tetrachloroethane	µg/L	38.4	39.7	25.8 - 53.6	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.642	40.9	3.96	rpl
5110	1,1,2,2-Tetrachloroethane	µg/L	55.3	55.2	35.9 - 74.5	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.292	57.1	6.25	rpl
5115	Tetrachloroethylene	µg/L	30.4	31.2	16.7 - 41.0	Acceptable	EPA 8260B 2 1996	8/5/2014	0.302	29.0	4.65	rpl
5140	Toluene	µg/L	53.2	51.6	36.1 - 67.1	Acceptable	EPA 8260B 2 1996	8/5/2014	0.437	51.0	5.04	rpl
5150	1,2,3-Trichlorobenzene	µg/L	< 5	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
5155	1,2,4-Trichlorobenzene	µg/L	98.7	113	50.7 - 154	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.185	102	19.0	rpl
5160	1,1,1-Trichloroethane	µg/L	< 6.00	< 6.00	0.00 - 6.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
5165	1,1,2-Trichloroethane	µg/L	117	121	84.7 - 157	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.520	123	11.9	rpl
5170	Trichloroethylene	µg/L	60.8	60.5	38.4 - 79.0	Acceptable	EPA 8260B 2 1996	8/5/2014	0.279	58.9	6.97	rpl
5175	Trichlorofluoromethane	µg/L	31.5	28.9	11.6 - 46.2	Acceptable	EPA 8260B 2 1996	8/5/2014	0.171	30.5	5.95	rpl
5180	1,2,3-Trichloropropane (TCP)	µg/L	80.5	90.4	41.6 - 136	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.837	90.4	11.8	rpl
5210	1,2,4-Trimethylbenzene	µg/L	18.4	18.0	11.7 - 24.3	Acceptable	EPA 8260B 2 1996	8/5/2014	0.477	17.0	2.85	rpl
5215	1,3,5-Trimethylbenzene	µg/L	27.6	30.4	19.8 - 41.0	Acceptable	EPA 8260B 2 1996	8/5/2014	-0.0810	28.0	4.96	rpl
5225	Vinyl acetate	µg/L	< 10.0	< 5.00	0.00 - 5.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
5235	Vinyl chloride	µg/L	< 8.00	< 8.00	0.00 - 8.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
5240	m&p-Xylene	µg/L	< 6.0	< 6.00	0.00 - 6.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
5250	o-Xylene	µg/L	< 6.0	< 6.00	0.00 - 6.00	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl
WP Volatiles (cat# 830) (Continued)												
5260	Xylenes, total	µg/L	< 12.00	< 12.0	0.00 - 12.0	Acceptable	EPA 8260B 2 1996	8/5/2014				rpl

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WP PCBs in Water (cat# 832S)												
8880	Aroclor 1016	µg/L	< 0.8	< 0.800	0.00 - 0.800	Acceptable	EPA 8082 1996	8/8/2014				als
8885	Aroclor 1221	µg/L	< 0.8	< 0.800	0.00 - 0.800	Acceptable	EPA 8082 1996	8/8/2014				als
8890	Aroclor 1232	µg/L	< 0.8	< 0.800	0.00 - 0.800	Acceptable	EPA 8082 1996	8/8/2014				als
8895	Aroclor 1242	µg/L	3.07	4.40	1.64 - 6.07	Acceptable	EPA 8082 1996	8/8/2014	-1.86	4.13	0.569	als
8900	Aroclor 1248	µg/L	< 0.8	< 0.800	0.00 - 0.800	Acceptable	EPA 8082 1996	8/8/2014				als
8905	Aroclor 1254	µg/L	< 0.8	< 0.800	0.00 - 0.800	Acceptable	EPA 8082 1996	8/8/2014				als
8910	Aroclor 1260	µg/L	< 0.8	< 0.800	0.00 - 0.800	Acceptable	EPA 8082 1996	8/8/2014				als
WP PCBs in Water (cat# 832S)												
8880	Aroclor 1016	µg/L	< 0.8	< 0.800	0.00 - 0.800	Acceptable	EPA 608	8/8/2014				als
8885	Aroclor 1221	µg/L	< 0.8	< 0.800	0.00 - 0.800	Acceptable	EPA 608	8/8/2014				als
8890	Aroclor 1232	µg/L	< 0.8	< 0.800	0.00 - 0.800	Acceptable	EPA 608	8/8/2014				als
8895	Aroclor 1242	µg/L	3.07	4.40	1.64 - 6.07	Acceptable	EPA 608	8/8/2014	-1.86	4.13	0.569	als
8900	Aroclor 1248	µg/L	< 0.8	< 0.800	0.00 - 0.800	Acceptable	EPA 608	8/8/2014				als
8905	Aroclor 1254	µg/L	< 0.8	< 0.800	0.00 - 0.800	Acceptable	EPA 608	8/8/2014				als
8910	Aroclor 1260	µg/L	< 0.8	< 0.800	0.00 - 0.800	Acceptable	EPA 608	8/8/2014				als
WP PCBs in Oil (cat# 835S)												
8880	Aroclor 1016	mg/kg	14.7	18.5	1.92 - 28.1	Acceptable	EPA 8082 1996	8/8/2014	-0.491	16.6	3.90	als
8895	Aroclor 1242	mg/kg	< 1.7	< 1.70	0.00 - 1.70	Acceptable	EPA 8082 1996	8/8/2014				als
8905	Aroclor 1254	mg/kg	< 1.6	< 1.60	0.00 - 1.60	Acceptable	EPA 8082 1996	8/8/2014				als
8910	Aroclor 1260	mg/kg	< 2.4	< 2.40	0.00 - 2.40	Acceptable	EPA 8082 1996	8/8/2014				als

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NELAC Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Base/Neutrals (cat# 833)												
5500	Acenaphthene	µg/L	29.6	38.6	13.9 - 47.6	Acceptable	EPA 625	7/29/2014	-0.202	30.6	5.15	BRR
5505	Acenaphthylene	µg/L	40.9	49.6	17.1 - 62.0	Acceptable	EPA 625	7/29/2014	-0.0295	41.1	6.57	BRR
5145	2-Amino-1-methylbenzene (o-toluidine)	µg/L		< 10.0	0.00 - 10.0	Not Reported						
5545	Aniline	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 625	7/29/2014				BRR
5555	Anthracene	µg/L	< 10.0	< 3.90	0.00 - 3.90	Acceptable	EPA 625	7/29/2014				BRR
5595	Benzidine	µg/L	< 50.0	< 200	0.00 - 200	Acceptable	EPA 625	7/29/2014				BRR
5575	Benzo(a)anthracene	µg/L	37.5	46.2	21.4 - 57.2	Acceptable	EPA 625	7/29/2014	-0.190	38.3	4.12	BRR
5585	Benzo(b)fluoranthene	µg/L	25.0	28.8	10.9 - 37.4	Acceptable	EPA 625	7/29/2014	0.103	24.7	3.10	BRR
5600	Benzo(k)fluoranthene	µg/L	25.8	28.9	6.24 - 45.3	Acceptable	EPA 625	7/29/2014	0.0533	25.6	3.70	BRR
5590	Benzo(g,h,i)perylene	µg/L	24.7	26.7	11.1 - 36.1	Acceptable	EPA 625	7/29/2014	0.276	23.8	3.27	BRR
5580	Benzo(a)pyrene	µg/L	11.5	14.2	3.97 - 19.2	Acceptable	EPA 625	7/29/2014	0.148	11.2	1.73	BRR
5630	Benzyl alcohol	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 625	7/29/2014				BRR
5660	4-Bromophenyl-phenylether	µg/L	49.7	57.7	24.1 - 75.3	Acceptable	EPA 625	7/29/2014	0.379	47.2	6.47	BRR
5670	Butylbenzylphthalate	µg/L	< 10.0	< 13.4	0.00 - 13.4	Acceptable	EPA 625	7/29/2014				BRR
5680	Carbazole	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 625	7/29/2014				BRR
5745	4-Chloroaniline	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 625	7/29/2014				BRR
5760	bis(2-Chloroethoxy)methane	µg/L	57.5	83.2	29.4 - 98.3	Acceptable	EPA 625	7/29/2014	-0.814	65.6	9.90	BRR
5765	bis(2-Chloroethyl)ether	µg/L	< 10.0	< 5.90	0.00 - 5.90	Acceptable	EPA 625	7/29/2014				BRR
5780	bis(2-Chloroisopropyl)ether	µg/L	40.7	58.9	12.9 - 76.3	Acceptable	EPA 625	7/29/2014	-0.345	43.6	8.49	BRR
5790	1-Chloronaphthalene	µg/L		< 10.0	0.00 - 10.0	Not Reported						

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WP Base/Neutrals (cat# 833) (Continued)												
5795	2-Chloronaphthalene	µg/L	65.2	88.5	24.6 - 106	Acceptable	EPA 625	7/29/2014	0.102	64.0	11.9	BRR
5825	4-Chlorophenyl-phenylether	µg/L	64.8	72.0	27.7 - 90.3	Acceptable	EPA 625	7/29/2014	0.306	61.9	9.48	BRR
5855	Chrysene	µg/L	13.2	15.2	7.96 - 21.6	Acceptable	EPA 625	7/29/2014	-0.539	14.3	2.02	BRR
5895	Dibenz(a,h)anthracene	µg/L	< 10.0	< 6.90	0.00 - 6.90	Acceptable	EPA 625	7/29/2014				BRR
5905	Dibenzofuran	µg/L	94.9	123	47.9 - 140	Acceptable	EPA 625	7/29/2014	0.201	91.7	16.0	BRR
5925	Di-n-butylphthalate	µg/L	71.9	77.0	28.1 - 102	Acceptable	EPA 625	7/29/2014	0.924	65.0	7.41	BRR
4610	1,2-Dichlorobenzene	µg/L	30.7	80.1	8.67 - 94.9	Acceptable	EPA 625	7/29/2014	-1.02	47.9	16.8	BRR
4615	1,3-Dichlorobenzene	µg/L	23.1	67.6	6.76 - 80.3	Acceptable	EPA 625	7/29/2014	-0.923	38.1	16.3	BRR
4620	1,4-Dichlorobenzene	µg/L	48.3	139	13.9 - 153	Acceptable	EPA 625	7/29/2014	-0.914	76.7	31.1	BRR
5945	3,3'-Dichlorobenzidine	µg/L	< 50.0	< 5.00	0.00 - 5.00	Acceptable	EPA 625	7/29/2014				BRR
6070	Diethylphthalate	µg/L	95.0	109	19.9 - 150	Acceptable	EPA 625	7/29/2014	0.579	87.4	13.1	BRR
6135	Dimethylphthalate	µg/L	< 10.0	< 11.5	0.00 - 11.5	Acceptable	EPA 625	7/29/2014				BRR
6185	2,4-Dinitrotoluene	µg/L	38.5	43.2	15.4 - 56.5	Acceptable	EPA 625	7/29/2014	0.139	37.8	5.12	BRR
6190	2,6-Dinitrotoluene	µg/L	76.4	93.7	38.0 - 113	Acceptable	EPA 625	7/29/2014	-0.200	78.9	12.5	BRR
6200	Di-n-octylphthalate	µg/L	< 10.0	< 8.20	0.00 - 8.20	Acceptable	EPA 625	7/29/2014				BRR
6065	bis(2-Ethylhexyl)phthalate	µg/L	38.2	41.1	12.7 - 58.7	Acceptable	EPA 625	7/29/2014	0.730	34.9	4.54	BRR
6265	Fluoranthene	µg/L	65.0	78.3	36.2 - 96.4	Acceptable	EPA 625	7/29/2014	-0.249	67.1	8.31	BRR
6270	Fluorene	µg/L	69.4	84.3	35.4 - 101	Acceptable	EPA 625	7/29/2014	0.0654	68.7	10.2	BRR
6275	Hexachlorobenzene	µg/L	< 10.0	< 8.80	0.00 - 8.80	Acceptable	EPA 625	7/29/2014				BRR
4835	Hexachlorobutadiene	µg/L	< 10.0	< 4.30	0.00 - 4.30	Acceptable	EPA 625	7/29/2014				BRR

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WP Base/Neutrals (cat# 833) (Continued)												
6285	Hexachlorocyclopentadiene	µg/L	74.5	83.6	8.36 - 112	Acceptable	EPA 625	7/29/2014	0.629	59.6	23.7	BRR
4840	Hexachloroethane	µg/L	34.2	103	10.3 - 113	Acceptable	EPA 625	7/29/2014	-0.848	56.6	26.4	BRR
6315	Indeno(1,2,3-cd)pyrene	µg/L	< 10.0	< 9.20	0.00 - 9.20	Acceptable	EPA 625	7/29/2014				BRR
6320	Isophorone	µg/L	< 10.0	< 7.10	0.00 - 7.10	Acceptable	EPA 625	7/29/2014				BRR
6385	2-Methylnaphthalene	µg/L	< 10.0	< 2.00	0.00 - 2.00	Acceptable	EPA 625	7/29/2014				BRR
5005	Naphthalene	µg/L	73.0	123	29.5 - 144	Acceptable	EPA 625	7/29/2014	-0.596	86.7	23.0	BRR
6460	2-Nitroaniline	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 625	7/29/2014				BRR
6465	3-Nitroaniline	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 625	7/29/2014				BRR
6470	4-Nitroaniline	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 625	7/29/2014				BRR
5015	Nitrobenzene	µg/L	< 10.0	< 6.20	0.00 - 6.20	Acceptable	EPA 625	7/29/2014				BRR
6525	N-Nitrosodiethylamine	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 625	7/29/2014				BRR
6530	N-Nitrosodimethylamine	µg/L	55.8	116	11.6 - 131	Acceptable	EPA 625	7/29/2014	-0.367	65.9	27.4	BRR
6535	N-Nitrosodiphenylamine	µg/L	< 10.0	< 5.60	0.00 - 5.60	Acceptable	EPA 625	7/29/2014				BRR
6545	N-Nitroso-di-n-propylamine	µg/L	57.1	72.0	23.2 - 90.6	Acceptable	EPA 625	7/29/2014	-0.210	58.8	7.98	BRR
6590	Pentachlorobenzene	µg/L		< 10.0	0.00 - 10.0	Not Reported						
6615	Phenanthrene	µg/L	< 10.0	< 4.70	0.00 - 4.70	Acceptable	EPA 625	7/29/2014				BRR
6665	Pyrene	µg/L	< 10.0	< 4.90	0.00 - 4.90	Acceptable	EPA 625	7/29/2014				BRR
5095	Pyridine	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 625	7/29/2014				BRR
6715	1,2,4,5-Tetrachlorobenzene	µg/L		< 10.0	0.00 - 10.0	Not Reported						
5155	1,2,4-Trichlorobenzene	µg/L	31.0	53.9	8.02 - 67.2	Acceptable	EPA 625	7/29/2014	-0.482	37.0	12.5	BRR

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WP Base/Neutrals (cat# 833)												
5500	Acenaphthene	µg/L	29.6	38.6	13.9 - 47.6	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.202	30.6	5.15	BRR
5505	Acenaphthylene	µg/L	40.9	49.6	17.1 - 62.0	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.0295	41.1	6.57	BRR
5145	2-Amino-1-methylbenzene (o-toluidine)	µg/L		< 10.0	0.00 - 10.0	Not Reported						
5545	Aniline	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
5555	Anthracene	µg/L	< 10.0	< 3.90	0.00 - 3.90	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
5595	Benzidine	µg/L	< 50.0	< 200	0.00 - 200	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
5575	Benzo(a)anthracene	µg/L	37.5	46.2	21.4 - 57.2	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.190	38.3	4.12	BRR
5585	Benzo(b)fluoranthene	µg/L	25.0	28.8	10.9 - 37.4	Acceptable	EPA 8270C 3 1996	7/29/2014	0.103	24.7	3.10	BRR
5600	Benzo(k)fluoranthene	µg/L	25.8	28.9	6.24 - 45.3	Acceptable	EPA 8270C 3 1996	7/29/2014	0.0533	25.6	3.70	BRR
5590	Benzo(g,h,i)perylene	µg/L	24.7	26.7	11.1 - 36.1	Acceptable	EPA 8270C 3 1996	7/29/2014	0.276	23.8	3.27	BRR
5580	Benzo(a)pyrene	µg/L	11.5	14.2	3.97 - 19.2	Acceptable	EPA 8270C 3 1996	7/29/2014	0.148	11.2	1.73	BRR
5630	Benzyl alcohol	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
5660	4-Bromophenyl-phenylether	µg/L	49.7	57.7	24.1 - 75.3	Acceptable	EPA 8270C 3 1996	7/29/2014	0.379	47.2	6.47	BRR
5670	Butylbenzylphthalate	µg/L	< 10.0	< 13.4	0.00 - 13.4	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
5680	Carbazole	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
5745	4-Chloroaniline	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
5760	bis(2-Chloroethoxy)methane	µg/L	57.5	83.2	29.4 - 98.3	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.814	65.6	9.90	BRR
5765	bis(2-Chloroethyl)ether	µg/L	< 10.0	< 5.90	0.00 - 5.90	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
5780	bis(2-Chloroisopropyl)ether	µg/L	40.7	58.9	12.9 - 76.3	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.345	43.6	8.49	BRR
5790	1-Chloronaphthalene	µg/L		< 10.0	0.00 - 10.0	Not Reported						

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WP Base/Neutrals (cat# 833) (Continued)												
5795	2-Chloronaphthalene	µg/L	65.2	88.5	24.6 - 106	Acceptable	EPA 8270C 3 1996	7/29/2014	0.102	64.0	11.9	BRR
5825	4-Chlorophenyl-phenylether	µg/L	64.8	72.0	27.7 - 90.3	Acceptable	EPA 8270C 3 1996	7/29/2014	0.306	61.9	9.48	BRR
5855	Chrysene	µg/L	13.2	15.2	7.96 - 21.6	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.539	14.3	2.02	BRR
5895	Dibenz(a,h)anthracene	µg/L	< 10.0	< 6.90	0.00 - 6.90	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
5905	Dibenzofuran	µg/L	94.9	123	47.9 - 140	Acceptable	EPA 8270C 3 1996	7/29/2014	0.201	91.7	16.0	BRR
5925	Di-n-butylphthalate	µg/L	71.9	77.0	28.1 - 102	Acceptable	EPA 8270C 3 1996	7/29/2014	0.924	65.0	7.41	BRR
4610	1,2-Dichlorobenzene	µg/L	30.7	80.1	8.67 - 94.9	Acceptable	EPA 8270C 3 1996	7/29/2014	-1.02	47.9	16.8	BRR
4615	1,3-Dichlorobenzene	µg/L	23.1	67.6	6.76 - 80.3	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.923	38.1	16.3	BRR
4620	1,4-Dichlorobenzene	µg/L	48.3	139	13.9 - 153	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.914	76.7	31.1	BRR
5945	3,3'-Dichlorobenzidine	µg/L	< 50.0	< 5.00	0.00 - 5.00	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
6070	Diethylphthalate	µg/L	95.0	109	19.9 - 150	Acceptable	EPA 8270C 3 1996	7/29/2014	0.579	87.4	13.1	BRR
6135	Dimethylphthalate	µg/L	< 10.0	< 11.5	0.00 - 11.5	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
6185	2,4-Dinitrotoluene	µg/L	38.5	43.2	15.4 - 56.5	Acceptable	EPA 8270C 3 1996	7/29/2014	0.139	37.8	5.12	BRR
6190	2,6-Dinitrotoluene	µg/L	76.4	93.7	38.0 - 113	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.200	78.9	12.5	BRR
6200	Di-n-octylphthalate	µg/L	< 10.0	< 8.20	0.00 - 8.20	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
6065	bis(2-Ethylhexyl)phthalate	µg/L	38.2	41.1	12.7 - 58.7	Acceptable	EPA 8270C 3 1996	7/29/2014	0.730	34.9	4.54	BRR
6265	Fluoranthene	µg/L	65.0	78.3	36.2 - 96.4	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.249	67.1	8.31	BRR
6270	Fluorene	µg/L	69.4	84.3	35.4 - 101	Acceptable	EPA 8270C 3 1996	7/29/2014	0.0654	68.7	10.2	BRR
6275	Hexachlorobenzene	µg/L	< 10.0	< 8.80	0.00 - 8.80	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
4835	Hexachlorobutadiene	µg/L	< 10.0	< 4.30	0.00 - 4.30	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR

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WP Base/Neutrals (cat# 833) (Continued)												
6285	Hexachlorocyclopentadiene	µg/L	74.5	83.6	8.36 - 112	Acceptable	EPA 8270C 3 1996	7/29/2014	0.629	59.6	23.7	BRR
4840	Hexachloroethane	µg/L	34.2	103	10.3 - 113	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.848	56.6	26.4	BRR
6315	Indeno(1,2,3-cd)pyrene	µg/L	< 10.0	< 9.20	0.00 - 9.20	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
6320	Isophorone	µg/L	< 10.0	< 7.10	0.00 - 7.10	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
6385	2-Methylnaphthalene	µg/L	< 10.0	< 2.00	0.00 - 2.00	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
5005	Naphthalene	µg/L	73.0	123	29.5 - 144	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.596	86.7	23.0	BRR
6460	2-Nitroaniline	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
6465	3-Nitroaniline	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
6470	4-Nitroaniline	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
5015	Nitrobenzene	µg/L	< 10.0	< 6.20	0.00 - 6.20	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
6525	N-Nitrosodiethylamine	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
6530	N-Nitrosodimethylamine	µg/L	55.8	116	11.6 - 131	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.367	65.9	27.4	BRR
6535	N-Nitrosodiphenylamine	µg/L	< 10.0	< 5.60	0.00 - 5.60	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
6545	N-Nitroso-di-n-propylamine	µg/L	57.1	72.0	23.2 - 90.6	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.210	58.8	7.98	BRR
6590	Pentachlorobenzene	µg/L		< 10.0	0.00 - 10.0	Not Reported						
6615	Phenanthrene	µg/L	< 10.0	< 4.70	0.00 - 4.70	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
6665	Pyrene	µg/L	< 10.0	< 4.90	0.00 - 4.90	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
5095	Pyridine	µg/L	< 10.0	< 10.0	0.00 - 10.0	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
6715	1,2,4,5-Tetrachlorobenzene	µg/L		< 10.0	0.00 - 10.0	Not Reported						
5155	1,2,4-Trichlorobenzene	µg/L	31.0	53.9	8.02 - 67.2	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.482	37.0	12.5	BRR

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ERA Customer Number: A488001
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NELAC Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Acids (cat# 834)												
5610	Benzoic acid	µg/L	< 50.0	< 30.0	0.00 - 30.0	Acceptable	EPA 8270C 3 1996	7/29/2014				BRR
5700	4-Chloro-3-methylphenol	µg/L	98.1	118	44.6 - 145	Acceptable	EPA 8270C 3 1996	7/29/2014	0.00144	98.1	17.9	BRR
5800	2-Chlorophenol	µg/L	71.9	108	31.0 - 129	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.596	82.8	18.4	BRR
6000	2,4-Dichlorophenol	µg/L	127	166	53.5 - 197	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.292	135	27.6	BRR
6005	2,6-Dichlorophenol	µg/L	159	191	57.5 - 237	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.132	164	39.8	BRR
6130	2,4-Dimethylphenol	µg/L	39.6	57.1	16.5 - 72.0	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.388	43.4	9.76	BRR
6360	4,6-Dinitro-2-methylphenol	µg/L	36	46.7	13.0 - 70.0	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.849	41.8	6.81	BRR
6175	2,4-Dinitrophenol	µg/L	108	161	16.1 - 216	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.369	120	31.5	BRR
6400	2-Methylphenol	µg/L	109	172	39.0 - 200	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.458	124	33.4	BRR
6410	4-Methylphenol	µg/L	94.2	158	15.8 - 203	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.266	102	30.1	BRR
6490	2-Nitrophenol	µg/L	103	141	47.6 - 170	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.495	115	24.4	BRR
6500	4-Nitrophenol	µg/L	< 50.0	150	15.0 - 202	Not Acceptable	EPA 8270C 3 1996	7/29/2014		72.7	38.6	BRR
6605	Pentachlorophenol	µg/L	142	177	61.7 - 237	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.150	145	21.9	BRR
6625	Phenol	µg/L	39.8	121	12.1 - 163	Acceptable	EPA 8270C 3 1996	7/29/2014	-0.610	62.2	36.7	BRR
6735	2,3,4,6-Tetrachlorophenol	µg/L		40.5	14.1 - 53.6	Not Reported				35.9	5.72	
6835	2,4,5-Trichlorophenol	µg/L	75.0	85.7	31.4 - 107	Acceptable	EPA 8270C 3 1996	7/29/2014	0.222	72.3	12.3	BRR
6840	2,4,6-Trichlorophenol	µg/L	91.3	101	37.7 - 123	Acceptable	EPA 8270C 3 1996	7/29/2014	0.118	89.6	14.7	BRR

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WP Acids (cat# 834)												
5610	Benzoic acid	µg/L	< 50.0	< 30.0	0.00 - 30.0	Acceptable	EPA 625 Appendix A 1982	7/29/2014				BRR
5700	4-Chloro-3-methylphenol	µg/L	98.1	118	44.6 - 145	Acceptable	EPA 625 Appendix A 1982	7/29/2014	0.00144	98.1	17.9	BRR
5800	2-Chlorophenol	µg/L	71.9	108	31.0 - 129	Acceptable	EPA 625 Appendix A 1982	7/29/2014	-0.596	82.8	18.4	BRR
6000	2,4-Dichlorophenol	µg/L	127	166	53.5 - 197	Acceptable	EPA 625 Appendix A 1982	7/29/2014	-0.292	135	27.6	BRR
6005	2,6-Dichlorophenol	µg/L	159	191	57.5 - 237	Acceptable	EPA 625 Appendix A 1982	7/29/2014	-0.132	164	39.8	BRR
6130	2,4-Dimethylphenol	µg/L	39.6	57.1	16.5 - 72.0	Acceptable	EPA 625 Appendix A 1982	7/29/2014	-0.388	43.4	9.76	BRR
6360	4,6-Dinitro-2-methylphenol	µg/L	36	46.7	13.0 - 70.0	Acceptable	EPA 625 Appendix A 1982	7/29/2014	-0.849	41.8	6.81	BRR
6175	2,4-Dinitrophenol	µg/L	108	161	16.1 - 216	Acceptable	EPA 625 Appendix A 1982	7/29/2014	-0.369	120	31.5	BRR
6400	2-Methylphenol	µg/L	109	172	39.0 - 200	Acceptable	EPA 625 Appendix A 1982	7/29/2014	-0.458	124	33.4	BRR
6410	4-Methylphenol	µg/L	94.2	158	15.8 - 203	Acceptable	EPA 625 Appendix A 1982	7/29/2014	-0.266	102	30.1	BRR
6490	2-Nitrophenol	µg/L	103	141	47.6 - 170	Acceptable	EPA 625 Appendix A 1982	7/29/2014	-0.495	115	24.4	BRR
6500	4-Nitrophenol	µg/L	< 50.0	150	15.0 - 202	Not Acceptable	EPA 625 Appendix A 1982	7/29/2014		72.7	38.6	BRR
6605	Pentachlorophenol	µg/L	142	177	61.7 - 237	Acceptable	EPA 625 Appendix A 1982	7/29/2014	-0.150	145	21.9	BRR
6625	Phenol	µg/L	39.8	121	12.1 - 163	Acceptable	EPA 625 Appendix A 1982	7/29/2014	-0.610	62.2	36.7	BRR
6735	2,3,4,6-Tetrachlorophenol	µg/L		40.5	14.1 - 53.6	Not Reported				35.9	5.72	
6835	2,4,5-Trichlorophenol	µg/L	75.0	85.7	31.4 - 107	Acceptable	EPA 625 Appendix A 1982	7/29/2014	0.222	72.3	12.3	BRR
6840	2,4,6-Trichlorophenol	µg/L	91.3	101	37.7 - 123	Acceptable	EPA 625 Appendix A 1982	7/29/2014	0.118	89.6	14.7	BRR

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NELAC Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Low-Level PAHs (cat# 836)												
5500	Acenaphthene	µg/L	9.64	11.5	3.86 - 13.9	Acceptable	EPA 8270C 3 1996	7/28/2014	0.287	9.08	1.97	BRR
5505	Acenaphthylene	µg/L	6.45	7.14	3.02 - 8.28	Acceptable	EPA 8270C 3 1996	7/28/2014	0.397	5.94	1.29	BRR
5555	Anthracene	µg/L	3.58	4.05	1.20 - 5.44	Acceptable	EPA 8270C 3 1996	7/28/2014	0.00530	3.58	0.681	BRR
5575	Benzo(a)anthracene	µg/L	3.71	4.12	2.79 - 4.59	Acceptable	EPA 8270C 3 1996	7/28/2014	0.403	3.49	0.545	BRR
5585	Benzo(b)fluoranthene	µg/L	2.60	2.38	1.13 - 2.89	Acceptable	EPA 8270C 3 1996	7/28/2014	1.42	2.10	0.354	BRR
5600	Benzo(k)fluoranthene	µg/L	2.92	2.22	1.12 - 2.84	Not Acceptable	EPA 8270C 3 1996	7/28/2014	2.35	1.97	0.403	BRR
5590	Benzo(g,h,i)perylene	µg/L	2.86	2.14	0.638 - 2.80	Not Acceptable	EPA 8270C 3 1996	7/28/2014	2.36	1.86	0.421	BRR
5580	Benzo(a)pyrene	µg/L	4.46	3.93	1.68 - 4.58	Acceptable	EPA 8270C 3 1996	7/28/2014	1.83	3.28	0.644	BRR
5855	Chrysene	µg/L	2.36	2.61	1.44 - 3.22	Acceptable	EPA 8270C 3 1996	7/28/2014	-0.238	2.44	0.327	BRR
5895	Dibenz(a,h)anthracene	µg/L	4.64	3.31	1.16 - 4.21	Not Acceptable	EPA 8270C 3 1996	7/28/2014	2.84	2.75	0.663	BRR
6265	Fluoranthene	µg/L	3.76	4.18	2.23 - 4.97	Acceptable	EPA 8270C 3 1996	7/28/2014	0.205	3.64	0.570	BRR
6270	Fluorene	µg/L	8.07	9.10	3.87 - 10.5	Acceptable	EPA 8270C 3 1996	7/28/2014	0.358	7.58	1.36	BRR
6315	Indeno(1,2,3-cd)pyrene	µg/L	2.81	1.67	0.696 - 2.18	Not Acceptable	EPA 8270C 3 1996	7/28/2014	4.17	1.51	0.312	BRR
5005	Naphthalene	µg/L	5.73	7.39	2.46 - 8.49	Acceptable	EPA 8270C 3 1996	7/28/2014	-0.0521	5.80	1.43	BRR
6615	Phenanthrene	µg/L	3.55	4.10	2.05 - 4.83	Acceptable	EPA 8270C 3 1996	7/28/2014	0.0994	3.49	0.575	BRR
6665	Pyrene	µg/L	1.68	1.82	0.998 - 2.17	Acceptable	EPA 8270C 3 1996	7/28/2014	0.166	1.64	0.260	BRR

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WP Low-Level PAHs (cat# 836)												
5500	Acenaphthene	µg/L	9.64	11.5	3.86 - 13.9	Acceptable	EPA 625	7/28/2014	0.287	9.08	1.97	BRR
5505	Acenaphthylene	µg/L	6.45	7.14	3.02 - 8.28	Acceptable	EPA 625	7/28/2014	0.397	5.94	1.29	BRR
5555	Anthracene	µg/L	3.58	4.05	1.20 - 5.44	Acceptable	EPA 625	7/28/2014	0.00530	3.58	0.681	BRR
5575	Benzo(a)anthracene	µg/L	3.71	4.12	2.79 - 4.59	Acceptable	EPA 625	7/28/2014	0.403	3.49	0.545	BRR
5585	Benzo(b)fluoranthene	µg/L	2.60	2.38	1.13 - 2.89	Acceptable	EPA 625	7/28/2014	1.42	2.10	0.354	BRR
5600	Benzo(k)fluoranthene	µg/L	2.92	2.22	1.12 - 2.84	Not Acceptable	EPA 625	7/28/2014	2.35	1.97	0.403	BRR
5590	Benzo(g,h,i)perylene	µg/L	2.86	2.14	0.638 - 2.80	Not Acceptable	EPA 625	7/28/2014	2.36	1.86	0.421	BRR
5580	Benzo(a)pyrene	µg/L	4.46	3.93	1.68 - 4.58	Acceptable	EPA 625	7/28/2014	1.83	3.28	0.644	BRR
5855	Chrysene	µg/L	2.36	2.61	1.44 - 3.22	Acceptable	EPA 625	7/28/2014	-0.238	2.44	0.327	BRR
5895	Dibenz(a,h)anthracene	µg/L	4.64	3.31	1.16 - 4.21	Not Acceptable	EPA 625	7/28/2014	2.84	2.75	0.663	BRR
6265	Fluoranthene	µg/L	3.76	4.18	2.23 - 4.97	Acceptable	EPA 625	7/28/2014	0.205	3.64	0.570	BRR
6270	Fluorene	µg/L	8.07	9.10	3.87 - 10.5	Acceptable	EPA 625	7/28/2014	0.358	7.58	1.36	BRR
6315	Indeno(1,2,3-cd)pyrene	µg/L	2.81	1.67	0.696 - 2.18	Not Acceptable	EPA 625	7/28/2014	4.17	1.51	0.312	BRR
5005	Naphthalene	µg/L	5.73	7.39	2.46 - 8.49	Acceptable	EPA 625	7/28/2014	-0.0521	5.80	1.43	BRR
6615	Phenanthrene	µg/L	3.55	4.10	2.05 - 4.83	Acceptable	EPA 625	7/28/2014	0.0994	3.49	0.575	BRR
6665	Pyrene	µg/L	1.68	1.82	0.998 - 2.17	Acceptable	EPA 625	7/28/2014	0.166	1.64	0.260	BRR

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WP Organochlorine Pesticides (cat# 831)												
7025	Aldrin	µg/L	7.20	8.96	3.17 - 12.1	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.181	7.47	1.52	als
7110	alpha-BHC	µg/L	4.60	5.87	2.54 - 8.05	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.546	5.09	0.900	als
7115	beta-BHC	µg/L	2.90	3.42	1.60 - 4.88	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.515	3.14	0.468	als
7105	delta-BHC	µg/L	4.40	5.40	2.31 - 7.65	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.723	4.88	0.659	als
7120	gamma-BHC(Lindane)	µg/L	3.70	4.62	2.07 - 6.42	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.492	4.01	0.639	als
7240	alpha-Chlordane	µg/L		4.53	2.02 - 6.10	Not Reported				4.03	0.652	
7245	gamma-Chlordane	µg/L		9.05	4.10 - 11.7	Not Reported				8.02	1.47	
7355	4,4'-DDD	µg/L	6.40	7.87	3.91 - 10.8	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.291	6.77	1.28	als
7360	4,4'-DDE	µg/L	3.00	3.79	1.62 - 5.19	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.358	3.28	0.791	als
7365	4,4'-DDT	µg/L	1.30	1.73	0.689 - 2.64	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.687	1.58	0.402	als
7470	Dieldrin	µg/L	9.50	10.9	5.57 - 14.4	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.195	9.83	1.70	als
7540	Endrin	µg/L	6.10	6.96	3.05 - 9.87	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.160	6.26	0.986	als
7530	Endrin aldehyde	µg/L	7.30	9.73	3.64 - 14.0	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.640	8.30	1.56	als
7535	Endrin ketone	µg/L	6.40	7.74	4.09 - 10.5	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.150	6.59	1.24	als
7510	Endosulfan I	µg/L	11.7	14.3	5.57 - 19.2	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.422	12.7	2.40	als
7515	Endosulfan II	µg/L	9.10	11.0	4.55 - 14.9	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.381	9.72	1.62	als
7520	Endosulfan sulfate	µg/L	6.20	7.39	3.38 - 10.6	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.481	6.73	1.10	als
7685	Heptachlor	µg/L	5.80	7.18	2.57 - 9.69	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.203	6.01	1.05	als
7690	Heptachlor epoxide (beta)	µg/L	4.00	4.87	2.43 - 6.51	Acceptable	EPA 8081A 1 1996	8/8/2014	-0.271	4.21	0.765	als
7810	Methoxychlor	µg/L	4.80	5.23	2.06 - 8.04	Acceptable	EPA 8081A 1 1996	8/8/2014	0.0899	4.69	1.20	als

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WP Organochlorine Pesticides (cat# 831)												
7025	Aldrin	µg/L	7.20	8.96	3.17 - 12.1	Acceptable	EPA 608	8/8/2014	-0.181	7.47	1.52	als
7110	alpha-BHC	µg/L	4.60	5.87	2.54 - 8.05	Acceptable	EPA 608	8/8/2014	-0.546	5.09	0.900	als
7115	beta-BHC	µg/L	2.90	3.42	1.60 - 4.88	Acceptable	EPA 608	8/8/2014	-0.515	3.14	0.468	als
7105	delta-BHC	µg/L	4.40	5.40	2.31 - 7.65	Acceptable	EPA 608	8/8/2014	-0.723	4.88	0.659	als
7120	gamma-BHC(Lindane)	µg/L	3.70	4.62	2.07 - 6.42	Acceptable	EPA 608	8/8/2014	-0.492	4.01	0.639	als
7240	alpha-Chlordane	µg/L		4.53	2.02 - 6.10	Not Reported				4.03	0.652	
7245	gamma-Chlordane	µg/L		9.05	4.10 - 11.7	Not Reported				8.02	1.47	
7355	4,4'-DDD	µg/L	6.40	7.87	3.91 - 10.8	Acceptable	EPA 608	8/8/2014	-0.291	6.77	1.28	als
7360	4,4'-DDE	µg/L	3.00	3.79	1.62 - 5.19	Acceptable	EPA 608	8/8/2014	-0.358	3.28	0.791	als
7365	4,4'-DDT	µg/L	1.30	1.73	0.689 - 2.64	Acceptable	EPA 608	8/8/2014	-0.687	1.58	0.402	als
7470	Dieldrin	µg/L	9.50	10.9	5.57 - 14.4	Acceptable	EPA 608	8/8/2014	-0.195	9.83	1.70	als
7540	Endrin	µg/L	6.10	6.96	3.05 - 9.87	Acceptable	EPA 608	8/8/2014	-0.160	6.26	0.986	als
7530	Endrin aldehyde	µg/L	7.30	9.73	3.64 - 14.0	Acceptable	EPA 608	8/8/2014	-0.640	8.30	1.56	als
7535	Endrin ketone	µg/L	6.40	7.74	4.09 - 10.5	Acceptable	EPA 608	8/8/2014	-0.150	6.59	1.24	als
7510	Endosulfan I	µg/L	11.7	14.3	5.57 - 19.2	Acceptable	EPA 608	8/8/2014	-0.422	12.7	2.40	als
7515	Endosulfan II	µg/L	9.10	11.0	4.55 - 14.9	Acceptable	EPA 608	8/8/2014	-0.381	9.72	1.62	als
7520	Endosulfan sulfate	µg/L	6.20	7.39	3.38 - 10.6	Acceptable	EPA 608	8/8/2014	-0.481	6.73	1.10	als
7685	Heptachlor	µg/L	5.80	7.18	2.57 - 9.69	Acceptable	EPA 608	8/8/2014	-0.203	6.01	1.05	als
7690	Heptachlor epoxide (beta)	µg/L	4.00	4.87	2.43 - 6.51	Acceptable	EPA 608	8/8/2014	-0.271	4.21	0.765	als
7810	Methoxychlor	µg/L	4.80	5.23	2.06 - 8.04	Acceptable	EPA 608	8/8/2014	0.0899	4.69	1.20	als

WP-234 2003 NELAC Evaluation Final Complete Report

ERA
A Waters Company

Donna Ruokonen
QA Director
Microbac Laboratories - Chicagoland Division
250 W. 84th Drive
Merrillville, IN 46410
219-769-8378

EPA ID: IN00054
ERA Customer Number: A488001
Report Issued: 09/02/14
Study Dates: 07/14/14 - 08/28/14

NELAC Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Z Score	Study Mean	Study Standard Deviation	Analyst Name
WP Chlordane (cat# 837)												
7250	Chlordane, technical	µg/L	6.32	8.50	3.60 - 11.7	Acceptable	EPA 8081A 1 1996	8/27/2014	-0.507	7.15	1.64	als
WP Chlordane (cat# 837)												
7250	Chlordane, technical	µg/L	6.32	8.50	3.60 - 11.7	Acceptable	EPA 608	8/27/2014	-0.507	7.15	1.64	als
WP Toxaphene (cat# 838)												
8250	Toxaphene	µg/L	13.4	21.9	5.00 - 34.2	Acceptable	EPA 8081A 1 1996	8/27/2014	-0.833	18.2	5.70	als
WP Toxaphene (cat# 838)												
8250	Toxaphene	µg/L	13.4	21.9	5.00 - 34.2	Acceptable	EPA 608	8/27/2014	-0.833	18.2	5.70	als
WP Gasoline Range Organics (GRO) in Water (cat# 640)												
9408	Gasoline Range Organics (GRO)	µg/L	2620	1740	617 - 3080	Acceptable	EPA 8260B 2	8/5/2014	1.62	1920	433	jln
4375	Benzene in GRO	µg/L		17.7	8.25 - 28.9	Not Reported				20.3	3.38	
4765	Ethylbenzene in GRO	µg/L		59.5	36.7 - 81.9	Not Reported				67.8	8.47	
5140	Toluene in GRO	µg/L		147	82.1 - 192	Not Reported				169	22.2	
5260	Xylenes, total in GRO	µg/L		174	109 - 235	Not Reported				204	24.4	
WP Glycols in Water (cat# 271)												
4720	Diethylene glycol	mg/L	108	111	44.4 - 178	Acceptable	EPA 8015B 2 1996	8/19/2014	-0.0922	108	3.61	als
4785	Ethylene glycol	mg/L	76.3	77.2	30.9 - 124	Acceptable	EPA 8015B 2 1996	8/19/2014	0.560	72.8	6.29	als
6657	Propylene glycol	mg/L	87.9	88.6	35.4 - 142	Acceptable	EPA 8015B 2 1996	8/19/2014	0.120	86.9	8.56	als
9491	Tetraethylene glycol	mg/L		120	48.0 - 192	Not Reported				121	9.90	
9646	Triethylene glycol	mg/L	96.3	92.4	37.0 - 148	Acceptable	EPA 8015B 2 1996	8/19/2014	1.08	93.9	2.24	als

CERTIFICATE OF RECOGNITION

ERA congratulates

Microbac Laboratories - Chicagoland Division

WP-234

For your participation and successful evaluation, we recognize the performance of this laboratory for achieving acceptable evaluation in the following standards.

Base/Neutrals	Chlordane	Color	Complex Nutrients	Demand
Gasoline Range Organics (GRO) in Water	Glycols in Water	Hardness	Hexavalent Chromium	Low-Level Mercury
Mercury	Minerals	Nitrite	Oil & Grease	Organochlorine Pesticides
PCBs in Oil	PCBs in Water	pH	Settleable Solids	Silica
Simple Nutrients	Sulfide	Tin & Titanium	Total Cyanide	Total Phenolics (4-AAP)
Total Residual Chlorine	Toxaphene	Volatile Solids	Volatiles	

Kristina Sanchez
Quality Officer

A488001

Appendix 11b – Laboratory Audit Report – Test America

ENVIRONMENTAL STANDARDS

Setting the Standards for Innovative Environmental Solutions

July 23, 2014

Ms. Terese Preston
Quality Assurance Manager
TestAmerica, Inc.
2417 Bond Street
University Park, IL 60484

Dear Ms. Preston:

Enclosed is the final laboratory audit report for the audit that was performed on June 5, 2014, at the TestAmerica, Inc., facility in University Park, Illinois (TestAmerica Chicago). Mr. Michael R. Green Ph.D., MBA, CPEA and Mr. Gary P. Yakub, CQA of Environmental Standards, Inc. conducted the audit for the following purposes:

- To assess the laboratory with regard to capabilities and capacity relative to the analytical service needs of the BP LaMP Laboratory Programs.
- To provide the laboratory feedback on laboratory operating issues relative to method compliance, laboratory systems, and good laboratory practices.

The audit focused on the analytical services provided for BP LaMP. These analytical capabilities, as well as the associated peripheral non-analytical areas, were included in the audit.

During the audit at TestAmerica Chicago, brief interviews were conducted with the analysts and section managers to gain an insight of the laboratory personnel's understanding of the analytical methods and standard operating procedures (SOPs). By the very nature of an audit, some critical statements that should not be regarded as an overall indication of the laboratory's qualifications are presented in this report. These statements should be regarded as representations of areas for laboratory operational improvement and/or areas deviating from the analytical methods, laboratory standard operating procedures, or client program-specific technical requirements.

The findings herein are presented by laboratory operational area and are ranked as "Critical," "Moderate," or "Minor" according to their potential impact on data defensibility, data quality and usability, and laboratory operations. Critical findings require immediate corrective action by laboratory QA personnel.

A pre-audit questionnaire containing general laboratory information is provided as Attachment 1 of this report.

TestAmerica Chicago is requested to provide corrective action responses to the findings in the final report by August 13, 2014. TestAmerica Chicago is requested to include the responses in the Excel file provided via electronic mail.

1140 Valley Forge Road P.O. Box 810 Valley Forge, PA 19482 Tel: 610.935.5577 Fax: 610.935.5583 Web: www.envstd.com

If you have any questions or comments relating to the audit or the audit report, please do not hesitate to call and discuss these issues.

Audit Report Prepared by,

Gary P. Yakub, CQA
Senior Quality Assurance Chemist

Audit Report Prepared by,

Michael R. Green, Ph.D., MBA, CPEA
Senior Advisor

Audit Report Reviewed by,

Stephen T. Zeiner, CEAC
Senior Technical Chemist/
Project Manager

Audit Report Reviewed and Approved by,

Rock J. Vitale, CEAC
Technical Director of Chemistry/
Principal

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GPY/MRG/STZ/RJV:hm
Enc.

ENVIRONMENTAL® STANDARDS	ON-SITE LABORATORY AUDIT
Audit Sponsor(s)	BP LaMP
Laboratory Name	TestAmerica Chicago
Laboratory Location	2417 Bond Street, University Park, IL 60484
Dates of Audit	6/5/14
Audit Team Members	Gary P. Yakub, CQA and Michael R. Green, Ph.D., MBA, CPEA
Scope of Audit (List Methods)	Volatile Organic Compounds by SW-846 Method 8260
	Semivolatile Organic Compounds by SW-846 Method 8270
	PCBs as Aroclors by SW-846 Method 8082
	GRO/DRO Compounds by SW-846 Method 8015
	Metals by SW-846 Methods 6010/6020
	Mercury by SW-846 Methods 7470A/7471A
	TCLP Extraction by SW-846 Method 1311
	Alkalinity by SM 2320
	Hexane Extractable Material (Oil & Grease) by US EPA 1664A
	Anions by US EPA Method 300.0
	TDS/TSS by SM 2540C/D
Date Pre-Audit Requested	5/1/14
Date Pre-Audit Received	5/6/14
Date Draft Report Issued	7/10/14
Date Laboratory Requested to Reply	7/18/14
Date Laboratory Reply Received	7/22/14
Date Report Finalized	7/23/14
Date Response Requested	8/13/14
Date Response Received	
Date Response Adequacy Assessed	

SUMMARY OF FINDINGS

Number of Critical Findings	3
Number of Moderate Findings	10
Number of Minor Findings	5

This audit report has been prepared by Environmental Standards, Inc. for BP LaMP and TestAmerica Chicago and should be considered valid for a period of 1 year, barring any significant changes in personnel, equipment, location, and ownership, from the date on which the audit was performed.

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ENVIRONMENTAL STANDARDS

TestAmerica Chicago, Illinois
Findings of On-Site Laboratory Audit Conducted on June 5, 2014, by Environmental Standards, Inc.

AUDIT AREA	FINDING NUMBER	SEVERITY (CRITICAL, MODERATE, OR MINOR)	FINDING	CITATION	RECOMMENDED CORRECTIVE ACTION
	(To be completed by Environmental Standards, Inc.)				
GENERAL LABORATORY OPERATIONS			No findings were observed in this area.		
PERSONNEL, TRAINING, AND RECORDS			No findings were observed in this area.		
SAMPLE RECEIVING AND STORAGE			No findings were observed in this area.		
BOTTLEWARE AND PRESERVATION	1	Moderate	The formal Chain-of-Custody (COC) information for the bottle shipment was documented on the client copy that was shipped with the bottle order. The information was not recorded on the laboratory copy of the COC which is currently archived.	BP LaMP Technical Requirements Revision 10.1 Section 2.1	Include COC information on the laboratory copy of the bottle order and archive accordingly. Documented training of the analyst with respect to this documentation requirement is appropriate.
SAMPLE ARCHIVE WASTE STORAGE AND DISPOSAL			No findings were observed in this area.		
SAMPLE PREPARATION - GENERAL			No findings were observed in this area.		
SAMPLE PREPARATION - VOLATILES			No findings were observed in this area.		
SAMPLE PREPARATION - SEMIVOLATILES		Comment	Aqueous semivolatile compounds (base, neutral, acid, and PCBs) were extracted using methylene chloride. Solid samples for PCB analysis were extracted using a 1:1 mixture of hexane and acetone.	BP LaMP Technical Requirements Revision 10.1 Section 2.2.a	No Corrective Action is needed. The BP LaMP Project Manager has approved the use of a 1:1 mixture of non-polar and polar solvents for extraction for soil extractions as a permitted variance from the requirement specified below. The BP LaMP Project Manager also approved the use of methylene chloride as the extraction solvent for aqueous semivolatile compounds. Requirement: Semivolatile organic compounds (base, neutral, acid, and PCBs) must be extracted using a 1:1 mixture of methylene chloride and acetone, unless the method specifically mandates use of a single solvent extraction.
SAMPLE PREPARATION - TCLP	2	Moderate	The analyst used a wooden tongue depressor to homogenize and weigh out samples. Wood can absorb organic oils and is not considered to be inert for organic extractions.	BP LaMP Technical Requirements Revision 10.1 Section 3.1.3	Replace the wooden tongue depressors with an inert material for the processing of organic samples. A review of all sample handling equipment for appropriateness should be performed.
SAMPLE PREPARATION - TCLP	3	Moderate	The lot number of the disposable high density polyethylene (HDPE) containers used to tumble metals samples was not recorded in the batch documentation.	BP LaMP Technical Requirements Revision 10.1 Section 3.1.5.L	Record the lot number of the disposable HDPE containers to maintain traceability. A review of the TCLP documentation to verify that the lot numbers of all consumables are documented should be performed.
SAMPLE PREPARATION - METALS	4	Moderate	The analyst used an uncertified volumetric container ("Snap-Cap") to determine the final volume for the soil digestates. These containers are not certified for volume nor are they verified once per lot prior to first use (Lot 06814003 in use).	BP LaMP Technical Requirements Revision 10.1 Section 3.1.4	Develop and implement a documented procedure to verify the volumetric markings on the current containers, inclusive of frequency and acceptance criteria. This must be performed at a minimum of once per lot prior to first use. Alternately, a certified container can be used to determine the final digestate volume.

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ENVIRONMENTAL STANDARDS

TestAmerica Chicago, Illinois
Findings of On-Site Laboratory Audit Conducted on June 5, 2014, by Environmental Standards, Inc.

AUDIT AREA	FINDING NUMBER	SEVERITY (CRITICAL, MODERATE, OR MINOR)	FINDING	CITATION	RECOMMENDED CORRECTIVE ACTION
			(To be completed by Environmental Standards, Inc.)		
SAMPLE PREPARATION - METALS	5	Moderate	The analyst spiked the soil samples after adding 2-3 mL of water to the sample. Samples should be spiked prior to the addition of any reagents.	2009 TNI Volume 1 Module 4 Section 1.7.3.3	Revise the metals soil digestion procedure to include spiking prior to the addition of reagents. Update SOP (UP-SP-3000) and perform documented analyst training.
SAMPLE PREPARATION - METALS	6	Moderate	Several instances were observed where consumable items were stored without the associated lot number documentation ("Snap Cap" containers stored in drawer without lot number (Lot 06814003 in use); mercury digestion cups stored in a box where the lot number was removed (Lot 1312222 in use).	BP LaMP Technical Requirements Revision 10.1 Section 3.1.4	Store all consumable items with the associated lot number to maintain traceability. Review current storage practices laboratory-wide to confirm compliance with this requirement. Documented training to laboratory personnel is warranted.
SAMPLE PREPARATION - METALS	7	Minor	The lot number referenced (69571) was incorrect on the metals preparation Batch 239469. Nitric acid Lot 72716 was in use. This appeared to the Audit Team to be an isolated incident.	BP LaMP Technical Requirements Revision 10.1 Section 3.1.4	Document refresher training with respect to accurate reagent documentation.
GENERAL SUPPORT EQUIPMENT, INSTRUMENTATION AND CALIBRATION	8	Moderate	The balance was not verified daily over the entire working range in the TCLP area.	BP LaMP Technical Requirements Revision 10.1 Section 3.1.4	Extend the daily balance calibration verification to include the entire working range. A review of all balances laboratory-wide for compliance appears appropriate.
METHOD DETECTION LIMITS AND VERIFICATIONS	9	Critical	Numerous reviewed MDLs did not meet the 40 CFR Part 136 Appendix B requirements. The reported spike concentrations were greater than 10-times the calculated MDLs, invalidating the studies. **This is a repeat finding from the 2013 Audit.**	BP LaMP Technical Requirements Revision 10.1 Section 2.1 40 CFR Part 136 Appendix B	Ensure that MDL studies for analytes meet all 40 CFR Part 136 Appendix B requirements prior to approval for use. The MDL studies for non-compliant analytes should be addressed as soon as possible.
INSTRUMENTATION - VOAS BY GC/MS	10	Minor	The certification sheet from Restek for the acrolein standard in use was not provided (8260 Acrolein_00013 Lot A0103433).	2009 TNI Volume 1 Module 2 Section 5.6.4.2 (a)	Locate the missing certification sheet and properly file it in the record keeping system.
INSTRUMENTATION - VOAS BY GC/MS	11	Minor	A box of expired standards (approximately 90) was found in the freezer located in the volatiles laboratory. The box was not labeled as "expired standards, do not use for quantitative work." The analyst indicated that the standards were used in conjunction with screening runs.	2009 TNI Volume 1 Module 2 Section 5.6.4.2 (f)	Label the box of standards "expired standards, do not use for quantitative work" or move the standards out of the volatiles production area.

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ENVIRONMENTAL STANDARDS

TestAmerica Chicago, Illinois
Findings of On-Site Laboratory Audit Conducted on June 5, 2014, by Environmental Standards, Inc.

AUDIT AREA	FINDING NUMBER	SEVERITY (CRITICAL, MODERATE, OR MINOR)	FINDING	CITATION	RECOMMENDED CORRECTIVE ACTION
			(To be completed by Environmental Standards, Inc.)		
INSTRUMENTATION - SEMI-VOAS BY GC/MS	12	Minor	Several instrument logbooks reviewed did not document the return to control event following instrument maintenance. Additionally, one logbook examined by the Audit Team showed that a reviewer had signed the page even though the analyst had not signed/initialed the page - there was no note indicating this deficiency in the logbook. Additional examination of run logs indicated that instruments were returned to a control state prior to running production samples.	BP LaMP Technical Requirements Revision 10.1 Section1.1.4 (l)	Inform laboratory personnel to document return to control events following instrument maintenance. Train logbook reviewers on how to assess logbooks during the review process.
INSTRUMENTATION - METALS BY ICP			No findings were observed in this area.		
INSTRUMENTATION - METALS BY ICP/MS			No findings were observed in this area.		
INSTRUMENTATION - METALS BY CVAA			No findings were observed in this area.		
WET CHEMISTRY ANALYSES	13	Critical	The documented oven temperatures for many days when samples for total dissolved solids (TDS) analyses were run were outside of the method-required range of 178-182°C (May 27 = 164.5°C; May 29 = 176.7°C; May 31 = 174.5°C) and no corrective actions or data qualifications were noted for samples analyzed on these days. Discussion with the analyst and supervisor indicated that oven temperatures were taken at random times and that usage of the ovens may have resulted in lower temperatures being documented on a given day.	Method 2540C Section 3.d	Develop and implement a documented system to ensure that oven temperatures are accurately documented, such as the utilization of a "time in/temperature in, time out/temperature out" format. If a single temperature reading is taken and documented for the oven, that temperature becomes the temperature of record for the analysis, and temperatures outside of the method-required range require appropriate corrective action and qualification. A review of recent client sample data to identify TDS samples analyzed outside of the required temperature range must be performed, and data associated with out-of-specification temperatures must be qualified and re-reported.
WET CHEMISTRY ANALYSES	14	Moderate	The handwritten oven temperatures documented in the TDS and total suspended solids (TSS) batch documentation are theoretical oven temperatures and not actual oven temperatures (the documented temperatures were "104°C" and "180°C" for each day of analysis). Handwritten documentation usually denotes documentation of an observation and can be incorrectly interpreted as the actual oven temperature at the time of analysis.	2009 TNI Volume 1 Module 2 Section 4.13.3.a	Theoretical oven temperatures can be printed on the batch sheet as guidance, but should not be handwritten on a daily basis. This practice is inappropriate and can be confused with the actual temperature documentation. Handwritten documentation of the theoretical oven temperatures is not needed in the batch documentation and should be removed.

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TestAmerica Chicago, Illinois
Findings of On-Site Laboratory Audit Conducted on June 5, 2014, by Environmental Standards, Inc.

AUDIT AREA	FINDING NUMBER	SEVERITY (CRITICAL, MODERATE, OR MINOR)	FINDING	CITATION	RECOMMENDED CORRECTIVE ACTION
	(To be completed by Environmental Standards, Inc.)				
WET CHEMISTRY ANALYSES	15	Moderate	In the TDS analysis, the analyst used a disposable serological pipette to dispense volumes between 1 mL and 10 mL. The serological pipettes were not Class A tolerance.	BP LaMP Technical Requirements Revision 10.1 Section 3.1.4	Replace the disposable serological pipettes with Class A tolerance pipettes. Alternately, the pipettes can be verified to conform to Class A tolerance by verification once per lot prior to first use. Documented verification must include appropriate (*i.e.*, Class A tolerance) acceptance criteria.
WET CHEMISTRY ANALYSES	16	Minor	TSS analysis, the analyst used pre-weighed filters to perform the analysis. The analyst verified the weight of one filter per lot, however, the acceptance criteria for the weight verification was not documented in the SOP (UP-WC-TSS Revision 17). The analyst used an acceptance criteria of +/- 0.0004g.	2009 TNI Volume 1 Module 2 Section 4.2.8.5	Document the acceptance criteria for the filter weight verification in the SOP.
NOTEBOOKS/LOGBOOKS	17	Moderate	The format of the maintenance logbooks laboratory-wide was inconsistent, and the required "problem, maintenance performed, return to service verification" was not always followed.	BP LaMP Technical Requirements Revision 10.1 Section 1.1.4.L	Standardize and update the maintenance logbooks to provide a consistent format that meets the documentation requirements. Documented training of the analysts to the proper format for maintenance documentation is appropriate.
DATA REVIEW AND REPORTING			No findings were observed in this area.		
ELECTRONIC DATA TRANSFER AND ARCHIVING			No findings were observed in this area.		
HARDCOPY DATA STORAGE			No findings were observed in this area.		
STANDARD OPERATING PROCEDURES			No findings were observed in this area other than those previously mentioned.		
AUDITS AND CORRECTIVE ACTION			No findings were observed in this area.		
PERFORMANCE AUDITS			No findings were observed in this area.		
PROJECT MANAGEMENT	18	Critical	A review conducted by the Audit Team of the sample login procedure, identified a client sample that was subcontracted to a non-network laboratory facility for analysis (Sample SP-SPM015-SO03-060214 subcontracted to TA Burlington for Grain Size analysis). No documentation was observed verifying the required approvals from the client to subcontract the sample to a non-network laboratory for analysis.	BP LaMP Technical Requirements Revision 10.1 Section 2.4	Perform a documented root cause investigation to determine the cause of the finding. Perform a documented review of the client notification requirements and ensure a system is in place to meet the requirements.
QUALITY ASSURANCE DOCUMENTATION			No findings were observed in this area.		

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ATTACHMENT 1

ENVIRONMENTAL STANDARDS

Setting the Standards for Innovative Environmental Solutions

PROPRIETARY DOCUMENT
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PRE-AUDIT QUESTIONNAIRE AND INFORMATION REQUEST	
Laboratory Name:	TestAmerica Chicago
Laboratory Address:	2417 Bond Street, University Park, IL 60484
Laboratory Phone Number:	708-534-5200
Laboratory Director:	Michael J. Healy
Laboratory Quality Assurance Manager:	Terese A. Preston
Pre-Audit Interview	
Company Information	
When was your parent company founded (if applicable)?	12/29/06
When was your current company or holding company founded?	1977
How many years have you been operating in your facility?	37
What are the locations of your other network laboratory facilities (if applicable)?; attachments permitted	See Attached
What is the total square footage of your facility?	28000 ft^2
What are your business hours?	8 am – 5 pm
What are your operating hours?	8 am – 5 pm (Full Staff); 2nd Shift (Partial Staff)
What are your sample receipt hours? (including Saturday?)	8 am – 5 pm (M-F); 8 am – 12 pm (Sat) or by appt.
What is the range of your courier service (if applicable)?	Undefined, the lab is supported by 3 service centers
How many total personnel does your facility employ?	98
How many technical personnel does your facility employ? Full time? Part Time?	66
Who is your primary accrediting authority (NELAC if applicable)?	IEPA Cert # 100201
What is the turnover rate of personnel at your facility (within last calendar year)?	2013-12.0%
What is the total revenue of your facility per year?	Approximately 14.8 million
What is the average annual percentage of excess analytical capacity that your facility maintains?	Varies by week; other TestAmerica labs can pick up excess if our laboratory is over capacity.
How many dedicated QA personnel are employed at your facility?	2
What is the date of your last accrediting audit(s)?	IEPA ELAP: 04/21-24/13

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What other certifications and accreditations do you currently possess (list state and/or accrediting bodies or provide as an attachment)?; attachments permitted	See Attached
Company Information (Cont.)	
Over the past year, what changes have occurred at your facility (*e.g.,* added/dropped certifications, methods, equipment, key personnel, major suppliers/vendors, utilities, LIMS, building facilities)?	Merged the TestAmerica Valparaiso Laboratory with the TestAmerica Chicago Laboratory. Some client specific methods were developed and brought on line. 350.1_Low level Ammonia; SM4500CN_E_Low Level Cyanide; SM4500CN_I_Low Level WAD; 218.6_CR+6 by IC; SM4500CN_M_Thiocyanate;
SOPs/Method References	
Where can an employee access copies of the laboratory's SOPs?	The laboratory SOPs are located in hardcopy form in each respective lab area, office area and QA department. Electronic copies are on the all public QA directory on the LAN.
Where can an employee access copies of published methods and references?	Office areas, QA Department, Intranet, on the all public QA directory on the LAN.
What is the process by which updated SOPs are distributed and previous versions are retrieved?	Document control spreadsheet lists previous document # and who/where the document is located. The outdated document is retrieved when the new document is issued.
Please list the principal published methods and respective versions that you reference for the analytical work performed at your facility (*e.g.*, SW-846, Update 3).(attachments permitted)	EPA 600 series; SW846 Update III; SW-846 Update IV. Standard Methods
Vendors/Supplies	
Do you have a process for approving vendors and/or do you maintain an approved vendor list?	Yes, corporate SOP
Briefly describe laboratory practices for procuring and tracking inventories of reagents.	The Thermo Fisher Scientific system is used for the high usage items such as solvents and acids. The individual laboratory sections are responsible for the tracking and ordering of the non-bulk items needed for the preparation and analysis performed within their department.
Facility Security	

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PRE-AUDIT QUESTIONNAIRE AND INFORMATION REQUEST (Cont.)

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What security system is employed at your facility (*e.g.*, burglar and fire alarm)?	Monitored Fire alarm and all doors are secured and locked at all times. Electronic key entry for all employees.
Does your facility have a sign-in/sign-out requirement for visitors?	Yes
How many total entrances does your facility have?	2 electronic key entrances for the employees, 1 designated shipping and receiving entry and 8 other exit doors with keyed access only from the outside.
How many building entrances are unlocked during business hours?	None, doors are locked at all times.
Which entrances are unlocked during business hours?	None, visitors and deliveries need to be let into the building by authorized personnel.
Electrical Power	
Does your facility have an uninterrupted power supply (UPS)? If so, please describe what it is used for.	No
Does your facility lab use surge protection on any instrumentation or equipment? If so, what?	Yes
HVAC	
How many HVAC zones control areas in the facility?	37 HVAC units each unit is considered a zone
What zones are under positive pressure?	37 HVAC units each creates a positive pressure
What zones are under negative pressure?	40 Fume hoods exhaust fans each unit creates a negative pressure.
Water Supply	
How many DI water systems exist?	1
Who is responsible for maintaining the DI water systems?	Siemens (Monthly); QA Department (Weekly and Quarterly Monitoring)
Where are the DI systems located?	DI: TCLP Lab; WC-General Lab; WC-Instrument Lab; Organic Extraction Dishroom; Milli-Q: Organic Extraction Dishroom; Metals Digestion; WC-General Lab; GC/MS Volatiles Lab
What is the final water quality for each system?	Conductivity $\leq$ 1 umhos/cm; pH: 5.5 – 7.5
Hazardous Waste	
What is the laboratory's Generator Status?	Large Quantity Generator
What hazardous and non-hazardous waste disposal companies does your facility use?	Clean Harbors
Service Contracts on Instrumentation	
What analytical instruments are maintained under service contract?	ICP; ICPMS; On-call service contract for all organic instruments.

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LIMS Platform	
What is your LMS?	TestAmerica LIMs (TALs)
Describe the LIMS platform utilized at your facility.	See Attached
How many IT personnel are employed at your facility?	1
Is the LIMS maintained on site?	No, the LIMs servers reside in Denver, CO
Who is responsible for LIMS maintenance (if on site?)	Tim Wilson is our corporate IT representative
What are the electronic data deliverable format types offered by the facility?	See Attached
What processing software is used for organic analysis?	Chrom; Total Chrom
What processing software is used for inorganic analysis?	ICP5: TJA (Version 6.2) ICP6: iTEVA Analyst – LI031813 (Rev. 48) ICP8: iTEVA Analyst – LI031813 (Rev. 29) ICPMS2: Thermo Electron Plasma Lab (Version 2.6.1.335) ICPMS3: Thermo Fisher 2007 (Version 2.6.1.335) ICPMS4: MassHunter Workstation Software for ICP-MS_G7201A Build 291.22 Patch 5 (Version A.01.02) HG5: WinHg (Version 1.7) HG6: Envoy
What processing software is used for wet chemistry?	IC4 (DX-120): PeakNet (Release 5.2.1) IC5 (ICS-1100): Chromeleon v. 7.1.1.1122 IC6 (ICS-1100): Chromeleon v. 7.1.1.1122 AQ2 Seal (AQ2): AQ2-V.AQ 001.2 AQ2 Seal (SEAL2): AQ2-V.AQ 001.2 Man-Tech PC Titrate: 3.0.0.541 Systea: Easy Chem: 1.10.0 Systea2: Easy Chem: 1.9.14 PC-BOD Automax 122: 3.0.0.142 OI_1: WinFlow 4.2

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Appendix 12a – Benzene Waste NESHAP Waste Sampling Training

USER	USER ID	TRAINING TITLE	TRAINING	TRAINING STA	COMPLETION DA	Business Area	Position Title
Baehler, Desiree	EX52GV27	(R) Benzene NESHAP Waste Sampling R3	Material	Completed	10/27/2014	Ops OMD/LF/ASP-LF-H	Operator 5th Yr H/A 1-8-86
Blue, Daniel	MW23SA87	(R) Benzene NESHAP Waste Sampling R3	Material	Completed	12/16/2014	Projects - Project Engineering TAR/WTE	Engineer Project TAR TEG
Carroll, Timothy	FT97LE22	(R) Benzene NESHAP Waste Sampling R3	Material	Completed	12/12/2014	HSSE Health & Safety	Hygienist Industrial
Cimarolli, Ronald	PA13VZ44	(R) Benzene NESHAP Waste Sampling R3	Material	Completed	10/24/2014	HSSE Environmental Tech	Tech PA Environmental
Dippo, Ronald	NM22NX33	(R) Benzene NESHAP Waste Sampling R3	Material	Completed	8/7/2014	US Assets, Other	Project Manager
Garza, Margaret	LM66ZV17	(R) Benzene NESHAP Waste Sampling R3	Material	Completed	12/12/2014	HSSE Area Environmental	Specialist Environmental Area O&W
Gordon, Terry	UG37UN79	(R) Benzene NESHAP Waste Sampling R3	Material	Completed	12/8/2014	HSSE Environmental Tech	Tech PA Environmental
Jakubowski, Eric	NV52BM79	(R) Benzene NESHAP Waste Sampling R3	Material	Completed	7/31/2014	HSSE Environmental Tech	Tech Environmental (Vacant)
Johnston, Jon	JA22KC34	(R) Benzene NESHAP Waste Sampling R3	Material	Completed	8/8/2014	HSSE Environmental	Leader Environmental Area C&C (TL)
Peterson, Patricia	HW99SR38	(R) Benzene NESHAP Waste Sampling R3	Material	Completed	7/25/2014	HSSE Water/Waste	Specialist Environmental Water/Waste
Reed, Llewellyn	EN24DR11	(R) Benzene NESHAP Waste Sampling R3	Material	Completed	11/13/2014	HSSE Area Environmental	Specialist Environmental Area HYD

Appendix 12b – Benzene Waste NESHAP Control Device Training

USER	USER ID	TRAINING TITLE	TRAINING TYPE	TRAINING STATUS	COMPLETION DATE	Business Area	Position Title
Ackerman, Edward	IO19OB92	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/21/2014	Ops FCU/APS-APS	Supt Ops APS (TL)
Ackerman, Edward	IO19OB92	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/21/2014	Ops FCU/APS-APS	Supt Ops APS (TL)
Adamopoulos, Nicholas	HQ31YX74	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/9/2014	Projects - Project Engineering TAR/WTE	Leader Projects TAR Engr (TL)
Adamopoulos, Nicholas	HQ31YX74	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/9/2014	Projects - Project Engineering TAR/WTE	Leader Projects TAR Engr (TL)
Adams, Terrence	AS46KH87	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	7/30/2014	Ops TAR, Projects Integration	Supv Ops OMD (TL) (Vacant)
Adams, Terrence	AS46KH87	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	7/30/2014	Ops TAR, Projects Integration	Supv Ops OMD (TL) (Vacant)
Agnello-Dean, Dwight	MH46YY60	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/10/2014	Technical - Proc Engrng - FCU-APS	Supt Process Engr UR (TL)
Agnello-Dean, Dwight	MH46YY60	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/10/2014	Technical - Proc Engrng - FCU-APS	Supt Process Engr UR (TL)
Aldridge, Darren	TE42WL34	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/27/2014	Ops HN/HS/UT-HS-H	Operator 5th Yr H/A 1-8-86
Aliyeva-Kress, Nailya	IU24BX17	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/4/2014	HSSE Management Systems	Auditor HSSE
Aliyeva-Kress, Nailya	IU24BX17	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/4/2014	HSSE Management Systems	Auditor HSSE
Altman, Aaron	LE06AQ33	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/12/2014	Technical - Process Safety	Engineer Sr Process Safety
Altman, Aaron	LE06AQ33	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/12/2014	Technical - Process Safety	Engineer Sr Process Safety
Appel, James	FU86MS23	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/2/2014	Technical-Process Control Specialist	Specialist Ctrl Systems
Appel, James	FU86MS23	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/2/2014	Technical-Process Control Specialist	Specialist Ctrl Systems
Arredondo, Melissa	PV51UI55	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/31/2014	Ops HN/HS/UT-HS-H	Operator 5th Yr H/A 1-8-86
Arredondo, Melissa	PV51UI55	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/7/2014	Ops HN/HS/UT-HS-H	Operator 5th Yr H/A 1-8-86
Baehler, Desiree	EX52GV27	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/27/2014	Ops OMD/LF/ASP-LF-H	Operator 5th Yr H/A 1-8-86
Baehler, Desiree	EX52GV27	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/4/2014	Ops Shift Team A LKF	Operator 5th Yr H/A 1-8-86
Baird, Jeffrey	VT11UB98	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/10/2014	Ops Shift Team D FCU	Operator 5th Yr H/A 1-8-86
Baird, Jeffrey	VT11UB98	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/10/2014	Ops Shift Team D FCU	Operator 5th Yr H/A 1-8-86
Baran, Mark	VI62OO41	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	10/25/2014	Ops FCU/APS-FCU-H	Operator 5th Yr H/A 1-8-86
Baran, Mark	VI62OO41	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/25/2014	Ops FCU/APS-FCU-H	Operator 5th Yr H/A 1-8-86
Bartels, John	PX15NC36	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/19/2014	Technical - Projects Development	Manager Technical Project Develop (
Bartels, John	PX15NC36	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/19/2014	Technical - Projects Development	Manager Technical Project Develop (
Basiaga, Brian	LM13CV54	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	10/20/2014	Technical - Projects Development	Engineer Sr Process Design
Basiaga, Brian	LM13CV54	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/20/2014	Technical - Projects Development	Engineer Sr Process Design
Basil, James	LE86RW11	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/16/2014	Technical - Proc Engrng - FCU-APS	Engineer Sr Process UR
Basil, James	LE86RW11	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/16/2014	Technical - Proc Engrng - FCU-APS	Engineer Sr Process UR
Batcha, Stuart	VY85PX72	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/27/2014	Ops Shift Team A 12 PS	Chief Operator Field

Batcha, Stuart	VY85PX72	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/27/2014	Ops Shift Team A 12 PS	Chief Operator Field
Beaird, Brian	EA49AF92	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/8/2014	M&R FCU/APS Engineering	Engineer M&R UR
Beaird, Brian	EA49AF92	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/8/2014	M&R FCU/APS Engineering	Engineer M&R UR
Becht, Steven	KX44YA70	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	10/23/2014	M&R TAR Controls	Supt Maint TAR Ctrls (TL)
Becht, Steven	KX44YA70	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/23/2014	M&R TAR Controls	Supt Maint TAR Ctrls (TL)
Benkovich, Kris	KT60RB97	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/1/2014	Ops Shift Team B COKER 2	Chief Operator Cross Qualified
Benkovich, Kris	KT60RB97	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/1/2014	Ops Shift Team B COKER 2	Chief Operator Cross Qualified
Bernacky, William	IA07IL60	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/8/2014	Ops OMD/LF/ASP-OMD-H	Operator 5th Yr H/A 1-8-86
Bernacky, William	IA07IL60	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/8/2014	Ops OMD/LF/ASP-OMD-H	Operator 5th Yr H/A 1-8-86
Bernicky, Christopher	KY15RY62	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/8/2014	Ops FCU/APS-FCU	Specialist Ops Compliance FCU (CAS
Bernicky, Christopher	KY15RY62	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/8/2014	Ops FCU/APS-FCU	Specialist Ops Compliance FCU (CAS
Blagrave, Brandon	GB71TT71	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/8/2014	M&R HN/HS/UT Engineering	Engineer M&R HYD
Blagrave, Brandon	GB71TT71	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/8/2014	M&R HN/HS/UT Engineering	Engineer M&R HYD
Blank, Tony	IS41LD40	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	10/23/2014	Ops Shift Team A	Manager Shift Ops (TL)
Blank, Tony	IS41LD40	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/23/2014	Ops Shift Team A	Manager Shift Ops (TL)
Blue, Daniel	MW23SA87	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/9/2014	Projects - Project Engineering TAR/WTE	Engineer Project TAR TEG
Blue, Daniel	MW23SA87	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/9/2014	Projects - Project Engineering TAR/WTE	Engineer Project TAR TEG
Board, Marc	WG44BG98	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/10/2014	Ops Shift Team D FCU	Operator 5th Yr H/A 1-8-86
Board, Marc	WG44BG98	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/10/2014	Ops Shift Team D FCU	Operator 5th Yr H/A 1-8-86
Bobalik, Kevin	WS82HN97	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/30/2014	Ops Shift Team D UTIL	Operator 5th Yr H/A 1-8-86
Bobalik, Kevin	WS82HN97	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/30/2014	Ops Shift Team D UTIL	Operator 5th Yr H/A 1-8-86
Bobos, Ryan	WR47VR60	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/27/2014	Ops FCU/APS-APS-H	Operator 5th Yr H/A 1-8-86
Bobos, Ryan	WR47VR60	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/15/2014	Ops FCU/APS-APS-H	Operator 5th Yr H/A 1-8-86
Bodie, Mollie	WE54TT79	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/24/2014	Ops Shift Team C	Supv Ops HPN (TL)
Bodie, Mollie	WE54TT79	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/18/2014	Ops Shift Team C HPD N	Supv Ops HPN (TL)
Boland, Christopher	DV76PO73	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/6/2014	Ops Shift Team B OMD	Operator 5th Yr H/A 1-8-86
Boland, Christopher	DV76PO73	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/6/2014	Ops Shift Team B OMD	Operator 5th Yr H/A 1-8-86
Brennan, Glenn	EH87WT88	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/26/2014	Ops Shift Team A HPD N	Operator 5th Yr H/A 1-8-86
Brennan, Glenn	EH87WT88	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/26/2014	Ops Shift Team A HPD N	Operator 5th Yr H/A 1-8-86
Brown, David	DF05RF77	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/1/2014	Technical - Proc Engrng - FCU-APS	Engineer Process UR
Brown, David	DF05RF77	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/1/2014	Technical - Proc Engrng - FCU-APS	Engineer Process UR
Buckley, Ryan	UC80NZ53	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/4/2014	M&R Rotating Equip Pump/Programs	Engineer M&R Compressors

Buckley, Ryan	UC80NZ53	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/4/2014	M&R Rotating Equip Pump/Programs	Engineer M&R Compressors
Bunde, Edward	BK76GV49	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/10/2014	Ops Shift Team B OMD	Chief Operator Field
Bunde, Edward	BK76GV49	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/10/2014	Ops Shift Team B OMD	Chief Operator Field
Burns, Robert	QG91BK20	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/23/2014	Ops Shift Team D HPD N	Operator 5th Yr H/A 1-8-86
Burns, Robert	QG91BK20	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/23/2014	Ops Shift Team D HPD N	Operator 5th Yr H/A 1-8-86
Camarillo, Steve	SI99TL08	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/23/2014	Ops FCU/APS-APS-H	Operator 5th Yr H/A 1-8-86
Camarillo, Steve	SI99TL08	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/10/2014	Ops Shift Team O APS	Operator 5th Yr H/A 1-8-86
Camp, Marcus	VA03TL53	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/7/2014	Ops OMD/LF/ASP-OMD	Specialist Ops Compliance OMD (CA
Camp, Marcus	VA03TL53	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/7/2014	Ops OMD/LF/ASP-OMD	Specialist Ops Compliance OMD (CA
Campbell, Dean	TZ24HD17	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/26/2014	Ops OMD/LF/ASP-OMD	Specialist Hydrocarbon Loss
Campbell, Dean	TZ24HD17	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/26/2014	Ops OMD/LF/ASP-OMD	Specialist Hydrocarbon Loss
Carroll, Emily	FP34CN53	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/2/2014	Technical - Proc Engrng - OMD/LF/Aspha	Engineer Process UR
Carroll, Emily	FP34CN53	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/2/2014	Technical - Proc Engrng - OMD/LF/Aspha	Engineer Process UR
Casey, Jason	DJ05SK02	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/12/2014	Projects - Area Projects HPD/FCU/APS	Engineer Project HYD/UR
Casey, Jason	DJ05SK02	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/12/2014	Projects - Area Projects HPD/FCU/APS	Engineer Project HYD/UR
Casteel, Jeffrey	BS29WG52	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/15/2014	M&R TAR FCU/APS	Planner Maint TAR UR
Casteel, Jeffrey	BS29WG52	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/15/2014	M&R TAR FCU/APS	Planner Maint TAR UR
Castillo Betancourt, Cesar	TM39JN72	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/17/2014	Technical-Process Control FCU/APS & HP	Engineer Process Ctrl UR/HPN/HPS
Castillo Betancourt, Cesar	TM39JN72	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/17/2014	Technical-Process Control FCU/APS & HP	Engineer Process Ctrl UR/HPN/HPS
Chaplin, Nicole	LY56CM85	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	7/22/2014	Commercial-Planners	Planner Commercial LP
Chaplin, Nicole	LY56CM85	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	7/22/2014	Commercial-Planners	Planner Commercial LP
Cheng, Leanna	KS74SX83	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/10/2014	Technical - Proc Engrng - Crude & Cokin	Engineer Process C&C
Cheng, Leanna	KS74SX83	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/10/2014	Technical - Proc Engrng - Crude & Cokin	Engineer Process C&C
Chessor, Scott	UD27JE16	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/10/2014	Ops Shift Team D COKER 2	Supv Ops CKR (TL)
Chessor, Scott	UD27JE16	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/10/2014	Ops Shift Team D COKER 2	Supv Ops CKR (TL)
Clark, Gary	AU81MU52	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/10/2014	Ops Shift Team D UTIL	Chief Operator Field
Clark, Gary	AU81MU52	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/10/2014	Ops Shift Team D UTIL	Chief Operator Field
Clem, David	WR72FU36	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	8/15/2014	Ops TAR, Projects Integration FGR/FGI	Specialist Project O&M
Clem, David	WR72FU36	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	8/15/2014	Ops TAR, Projects Integration FGR/FGI	Specialist Project O&M
Cloghessy, James	QQ90DZ53	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/18/2014	Ops Shift Team O HPD S	Operator After 3rd Yr H/A 1-8-84
Cloghessy, James	QQ90DZ53	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/18/2014	Ops Shift Team O HPD S	Operator After 3rd Yr H/A 1-8-84
Cloutier, Brian	FU98VY23	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/21/2014	Ops OMD/LF/ASP-OMD	Supt Ops OMD (Deputy) (TL)

Cloutier, Brian	FU98VY23	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/21/2014	Ops OMD/LF/ASP-OMD	Supt Ops OMD (Deputy) (TL)
Colbert, Michael	VH12IH19	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/4/2014	M&R OMD/LF/ASP-OMD	Supt Maint OMD (TL) (Vacant)
Colbert, Michael	VH12IH19	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/4/2014	M&R OMD/LF/ASP-OMD	Supt Maint OMD (TL) (Vacant)
Collina, Carl	DZ56TZ49	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/20/2014	Ops Shift Team A	Supv Ops LKF (TL)
Collina, Carl	DZ56TZ49	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/29/2014	Ops Shift Team A	Supv Ops LKF (TL)
Collingbourne, Austin	KX17ZX08	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/11/2014	Technical - Proc Engrng - Crude & Cokin	Engineer Process C&C
Collingbourne, Austin	KX17ZX08	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/11/2014	Technical - Proc Engrng - Crude & Cokin	Engineer Process C&C
Cornelius, Chadd	UI45UR67	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/5/2014	Ops Shift Team O	Supv Ops 11P (TL)
Cornelius, Chadd	UI45UR67	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/5/2014	Ops Shift Team O	Supv Ops 11P (TL)
Craney, Mark	WJ89DY29	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/14/2014	Ops OMD/LF/ASP	Supt Ops ASP/LKF (TL)
Craney, Mark	WJ89DY29	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/14/2014	Ops OMD/LF/ASP	Supt Ops ASP/LKF (TL)
Cribari, Dominic	GJ07EG22	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/12/2014	Ops Shift Team C UTIL	Chief Operator Field
Cribari, Dominic	GJ07EG22	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/12/2014	Ops Shift Team C UTIL	Chief Operator Field
Crispino, Angelica	IA97HG85	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/3/2014	Technical - Proc Engrng - HPDN/HPDS/U	Engineer Process HYD
Crispino, Angelica	IA97HG85	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/3/2014	Technical - Proc Engrng - HPDN/HPDS/U	Engineer Process HYD
Crittenden, Sandra	RL05VM17	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/8/2014	Ops Shift Team C	Supv Ops UTL (TL)
Crittenden, Sandra	RL05VM17	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/8/2014	Ops Shift Team C	Supv Ops UTL (TL)
Cuevas, Daniel	GS22ET05	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/20/2014	Ops Shift Team O APS	Operator 5th Yr H/A 1-8-86
Cuevas, Daniel	GS22ET05	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/20/2014	Ops Shift Team O APS	Operator 5th Yr H/A 1-8-86
Dare, Matthew	JY50LT62	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/3/2014	Technical - Proc Engrng - Crude & Cokin	Engineer Process C&C
Dare, Matthew	JY50LT62	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/3/2014	Technical - Proc Engrng - Crude & Cokin	Engineer Process C&C
Daugherty, David	FV95YV52	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/30/2014	Ops HN/HS/UT-UT	Supv Ops LR
Daugherty, David	FV95YV52	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/30/2014	Ops HN/HS/UT-UT	Supv Ops LR
Davis, Brian	EE82EM06	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/18/2014	Ops HN/HS/UT-HN-H	Operator 5th Yr H/A 1-8-86
Davis, Brian	EE82EM06	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/18/2014	Ops HN/HS/UT-HN-H	Operator 5th Yr H/A 1-8-86
Dejesus, John	WV96WT55	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/22/2014	Ops Shift Team A HPD S	Chief Operator Board
Dejesus, John	WV96WT55	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/22/2014	Ops Shift Team A HPD S	Chief Operator Board
Del Real, Sergio	WR05RS34	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/10/2014	Ops Shift Team D ASPH	Operator 5th Yr H/A 1-8-86
Del Real, Sergio	WR05RS34	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/10/2014	Ops Shift Team D ASPH	Operator 5th Yr H/A 1-8-86
Dippo, Ronald	NM22NX33	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	8/7/2014	US Assets, Other	Project Manager
Dippo, Ronald	NM22NX33	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	8/7/2014	US Assets, Other	Project Manager
Dittmer, Cheryl	EU89PZ02	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/5/2014	Technical - Projects Development - A	Lead Technical Project Develop (TL)

Dittmer, Cheryl	EU89PZ02	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/5/2014	Technical - Projects Development - A	Lead Technical Project Develop (TL)
Dobrowolski, Steve	NH14FD82	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/25/2014	Ops OMD/LF/ASP-OMD-H	Operator 5th Yr H/A 1-8-86
Dobrowolski, Steve	NH14FD82	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/10/2014	Ops Shift Team C OMD	Operator 5th Yr H/A 1-8-86
Dombrowski, Carl	PD62RM70	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/20/2014	Ops Shift Team D FCU	Supv Ops FCU (TL)
Dubec, John	PC64BA83	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	10/22/2014	Technical-Process Control FCU/APS & HP	Engineer Process Ctrl Major Project
Dubec, John	PC64BA83	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/22/2014	Technical-Process Control FCU/APS & HP	Engineer Process Ctrl Major Project
Dumas, Michael	CC35BF69	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/17/2014	Ops FCU/APS-APS-H	Operator 5th Yr H/A 1-8-86
Dumas, Michael	CC35BF69	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/17/2014	Ops FCU/APS-APS-H	Operator 5th Yr H/A 1-8-86
Dvorscak, Jerome	BQ98XS46	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/26/2014	Ops OMD/LF/ASP-OMD	Supv Ops TAR (Temp)
Dvorscak, Jerome	BQ98XS46	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/26/2014	Ops OMD/LF/ASP-OMD	Supv Ops TAR (Temp)
Esquivel, Everardo	TU53UI84	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/2/2014	Ops Shift Team A 11 PS	Operator 5th Yr H/A 1-8-86
Esquivel, Everardo	TU53UI84	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/2/2014	Ops Shift Team A 11 PS	Operator 5th Yr H/A 1-8-86
Etnire, Matthew	JQ65SO24	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/4/2014	Ops FCU/APS-FCU-H	Operator 5th Yr H/A 1-8-86
Etnire, Matthew	JQ65SO24	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/4/2014	Ops FCU/APS-FCU-H	Operator 5th Yr H/A 1-8-86
Farley, Robert	NV84QR45	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/19/2014	Ops Shift Team D 11 PS	Operator 5th Yr H/A 1-8-86
Farley, Robert	NV84QR45	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/19/2014	Ops Shift Team D 11 PS	Operator 5th Yr H/A 1-8-86
Ferguson, Anthony	IR40JG82	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	10/25/2014	Ops OMD/LF/ASP-LF-H	Chief Operator Field
Ferguson, Anthony	IR40JG82	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/25/2014	Ops OMD/LF/ASP-LF-H	Chief Operator Field
Field, Joseph	HC11DB10	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/8/2014	Technical - Proc Engrng - FCU-APS	Engineer Process UR
Field, Joseph	HC11DB10	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/8/2014	Technical - Proc Engrng - FCU-APS	Engineer Process UR
Fischer, Gregory	QH05JO52	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/28/2014	Ops HN/HS/UT-HN-H	Operator 5th Yr H/A 1-8-86
Fischer, Gregory	QH05JO52	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/6/2014	Ops HN/HS/UT-HN-H	Operator 5th Yr H/A 1-8-86
Flores, Henry	JA33UR66	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/26/2014	Ops Shift Team C 11 PS	Operator 5th Yr H/A 1-8-86
Flores, Henry	JA33UR66	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/26/2014	Ops Shift Team C 11 PS	Operator 5th Yr H/A 1-8-86
Flores, Juanita	KR07PL90	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/28/2014	Ops Shift Team B OMD	Chief Operator Board
Flores, Juanita	KR07PL90	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/28/2014	Ops Shift Team B OMD	Chief Operator Board
Freeze, Michael	JG94GS88	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/15/2014	Technical - BI Continuous Improvement	Lead Technical CI
Freeze, Michael	JG94GS88	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/15/2014	Technical - BI Continuous Improvement	Lead Technical CI
Fumagalli, Mark	GE82YZ55	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/14/2014	Ops Shift Team B HPD N	Supv Ops HPN (TL)
Fumagalli, Mark	GE82YZ55	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/14/2014	Ops Shift Team B HPD N	Supv Ops HPN (TL)
Furto, Jeremy	JY31QH11	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/10/2014	Ops Shift Team D APS	Operator 5th Yr H/A 1-8-86
Furto, Jeremy	JY31QH11	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/10/2014	Ops Shift Team D APS	Operator 5th Yr H/A 1-8-86

Gaal, Barbara	FD92PR10	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/19/2014	Ops Shift Team D UTIL	Supv Ops UTL (TL)
Gaal, Barbara	FD92PR10	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/19/2014	Ops Shift Team D UTIL	Supv Ops UTL (TL)
Gallegos, Rudy	BL90KM98	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	8/9/2014	Ops Shift Team O	Manager Shift Ops (TL)
Gallegos, Rudy	BL90KM98	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	8/9/2014	Ops Shift Team O	Manager Shift Ops (TL)
Galloway, Caleb	BA36HT27	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/2/2014	Ops OMD/LF/ASP-OMD-H	Operator 5th Yr H/A 1-8-86
Galloway, Caleb	BA36HT27	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/2/2014	Ops OMD/LF/ASP-OMD-H	Operator 5th Yr H/A 1-8-86
Galvez, Jesus	MG73UW07	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/28/2014	Ops Shift Team D APS	Chief Operator Board
Galvez, Jesus	MG73UW07	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/28/2014	Ops Shift Team D APS	Chief Operator Board
Gamez, Mark	HJ42SY99	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/29/2014	Ops Shift Team D ASPH	Chief Operator Field
Gamez, Mark	HJ42SY99	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/29/2014	Ops Shift Team D ASPH	Chief Operator Field
Ganger, Tim	UQ19IL07	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/15/2014	M&R TAR Hydropower	Planner Maint TAR UR
Ganger, Tim	UQ19IL07	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/15/2014	M&R TAR Hydropower	Planner Maint TAR UR
Garnello, Jesse	IW38ZJ97	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/2/2014	Ops Shift Team B HPD S	Supv Ops HPS (TL)
Garnello, Jesse	IW38ZJ97	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/2/2014	Ops Shift Team B HPD S	Supv Ops HPS (TL)
Garrison, James	JI91CY75	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/2/2014	M&R HN/HS/UT-HS	Supv Maint Metals HPN (TL)
Garrison, James	JI91CY75	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/2/2014	M&R HN/HS/UT-HS	Supv Maint Metals HPN (TL)
Garza, Margaret	LM66ZV17	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/12/2014	HSSE Area Environmental	Specialist Environmental Area O&W
Garza, Margaret	LM66ZV17	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/12/2014	HSSE Area Environmental	Specialist Environmental Area O&W
Gatotho, Nelly	LD27RR23	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/3/2014	Technical - Proc Engrng - HPDN/HPDS/U	Engineer Process HYD
Gatotho, Nelly	LD27RR23	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/3/2014	Technical - Proc Engrng - HPDN/HPDS/U	Engineer Process HYD
Gavin, Brian	QS62FC12	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/5/2014	M&R TAR FCU/APS	Manager Maint TAR UR (TL)
Gavin, Brian	QS62FC12	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/5/2014	M&R TAR FCU/APS	Manager Maint TAR UR (TL)
Gavini, Ayyanna	MW30QB07	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/2/2014	Technical-Process Control FCU/APS & HP	Engineer Process Ctrl UR/HPN/HPS
Gavini, Ayyanna	MW30QB07	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/2/2014	Technical-Process Control FCU/APS & HP	Engineer Process Ctrl UR/HPN/HPS
Gazibara, Milutin	FN31KE51	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/29/2014	Ops Shift Team C ASPH	Operator 5th Yr H/A 1-8-86
Gazibara, Milutin	FN31KE51	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/29/2014	Ops Shift Team C ASPH	Operator 5th Yr H/A 1-8-86
Gehrig, Gary	PH31VT47	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/2/2014	Ops C&C 12PS	Specialist Ops 12P (COS)
Gehrig, Gary	PH31VT47	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/2/2014	Ops C&C 12PS	Specialist Ops 12P (COS)
Gilbert, Brett	MR28FK35	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/10/2014	Ops FCU/APS-FCU-H	Chief Operator Field
Gilbert, Brett	MR28FK35	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/10/2014	Ops FCU/APS-FCU-H	Chief Operator Field
Gill, Patrick	BB10YK30	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/14/2014	M&R HN/HS/UT-UT	Supv Maint Boiler Outage UTL (TL)
Gill, Patrick	BB10YK30	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/14/2014	M&R HN/HS/UT-UT	Supv Maint Boiler Outage UTL (TL)

Gin, Megan	SV02DN36	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/8/2014	Technical - Proc Engrng - FCU-APS	Engineer Process UR
Gin, Megan	SV02DN36	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/8/2014	Technical - Proc Engrng - FCU-APS	Engineer Process UR
Goins, David	OB66IT81	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/6/2014	Ops Shift Team A 12 PS	Supv Ops 12P (TL)
Goins, David	OB66IT81	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/7/2014	Ops Shift Team A 12 PS	Supv Ops 12P (TL)
Gong, Joe	NG26AO33	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	10/1/2014	Technical - Projects Development	Engineer Sr Process Design
Gong, Joe	NG26AO33	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/1/2014	Technical - Projects Development	Engineer Sr Process Design
Good, Brian	PT44LH55	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/29/2014	Ops Shift Team B FCU	Operator 5th Yr H/A 1-8-86
Good, Brian	PT44LH55	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/29/2014	Ops Shift Team B FCU	Operator 5th Yr H/A 1-8-86
Gordon, Terry	UG37UN79	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/2/2014	HSSE Environmental Tech	Tech PA Environmental
Gordon, Terry	UG37UN79	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/2/2014	HSSE Environmental Tech	Tech PA Environmental
Grabovac, John	BM65HK82	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/22/2014	Ops HN/HS/UT-UT-H	Chief Operator Field
Green, Lori	QG18SJ00	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/11/2014	Technical - PSM	Engineer Process Safety
Green, Lori	QG18SJ00	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/11/2014	Technical - PSM	Engineer Process Safety
Greiner, Keith	PW63ON26	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/11/2014	Ops Shift Team A COKER 2	Supv Ops CKR (TL)
Greiner, Keith	PW63ON26	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/11/2014	Ops Shift Team A COKER 2	Supv Ops CKR (TL)
Grimm, Jeff	CI78SW79	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/16/2014	M&R HN/HS/UT Engineering	Engineer M&R HYD
Grimm, Jeff	CI78SW79	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/16/2014	M&R HN/HS/UT Engineering	Engineer M&R HYD
Haddad, Joseph	BO82IU16	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/10/2014	Ops Shift Team O	Supv Ops APS (TL)
Haddad, Joseph	BO82IU16	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/10/2014	Ops Shift Team O	Supv Ops APS (TL)
Halle, Richard	MB13AH78	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/6/2014	HR L&D Ops Trng	Supv Training Ops (TL)
Halle, Richard	MB13AH78	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/6/2014	HR L&D Ops Trng	Supv Training Ops (TL)
Harris, Richard	DV62XF32	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/5/2014	Ops C&C 12PS	Specialist Ops Compliance 12P (CAS
Harris, Richard	DV62XF32	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/5/2014	Ops C&C 12PS	Specialist Ops Compliance 12P (CAS
Havekost, Josh	MW41SW40	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/16/2014	M&R Reliability Engineering-Projects	Lead M&R Project Engr (TL)
Havekost, Josh	MW41SW40	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/16/2014	M&R Reliability Engineering-Projects	Lead M&R Project Engr (TL)
Heard, Tanecia	AM08PZ93	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/14/2014	Commercial-Schedulers	Scheduler Commercial Distillate
Heard, Tanecia	AM08PZ93	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/14/2014	Commercial-Schedulers	Scheduler Commercial Distillate
Henderson, Lindsay	VR74NV02	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/7/2014	Ops Shift Team C HPD N	Chief Operator Cross Qualified
Henderson, Lindsay	VR74NV02	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/7/2014	Ops Shift Team C HPD N	Chief Operator Cross Qualified
Hlebasko, David	SK24IV97	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/21/2014	Ops Shift Team D ASPH	Supv Ops ASP (TL)
Hlebasko, David	SK24IV97	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/21/2014	Ops Shift Team D ASPH	Supv Ops ASP (TL)
Hornyak, Mark	OP89QK04	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/1/2014	Ops C&C 11PS	Specialist Ops 11P (COS) (SA)

Hornyak, Mark	OP89QK04	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/1/2014	Ops C&C 11PS	Specialist Ops 11P (COS) (SA)
Hughes, Eddie	MU43ZR84	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/20/2014	Ops Shift Team D UTIL	Operator 5th Yr H/A 1-8-86
Hughes, Eddie	MU43ZR84	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/20/2014	Ops Shift Team D UTIL	Operator 5th Yr H/A 1-8-86
Humenik, David	FQ80IN76	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/27/2014	Ops Shift Team C ASPH	Chief Operator Field
Humenik, David	FQ80IN76	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/28/2014	Ops Shift Team C ASPH	Chief Operator Field
Hurley, Brian	VS96KG53	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/17/2014	Ops Shift Team B HPD N	Chief Operator Board
Irizarry, Alfonso	NQ93VG88	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/6/2014	Ops Shift Team A APS	Operator 5th Yr H/A 1-8-86
Irizarry, Alfonso	NQ93VG88	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/6/2014	Ops Shift Team A APS	Operator 5th Yr H/A 1-8-86
James, Gary	HN51HE97	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/28/2014	Ops Shift Team B HPD N	Operator 5th Yr H/A 1-8-86
James, Gary	HN51HE97	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/28/2014	Ops Shift Team B HPD N	Operator 5th Yr H/A 1-8-86
Jancich, James	CN27IT20	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/18/2014	Ops Shift Team A ASPH	Supv Ops ASP (TL)
Jancich, James	CN27IT20	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/18/2014	Ops Shift Team A ASPH	Supv Ops ASP (TL)
Jansky, Raymond	TW11KH21	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/7/2014	Ops Shift Team C	Supv Ops HPS (TL)
Jansky, Raymond	TW11KH21	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/7/2014	Ops Shift Team C	Supv Ops HPS (TL)
Johnson, Howard	TN84PH88	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/11/2014	Ops Shift Team D HPD N	Operator 5th Yr H/A 1-8-86
Johnson, Howard	TN84PH88	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/11/2014	Ops Shift Team D HPD N	Operator 5th Yr H/A 1-8-86
Johnson, Stephen	GU43SH76	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/20/2014	Ops Shift Team B UTIL	Chief Operator Board
Johnson, Stephen	GU43SH76	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/20/2014	Ops Shift Team B UTIL	Chief Operator Board
Johnston, Jon	JA22KC34	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	8/8/2014	HSSE Environmental	Leader Environmental Area C&C (TL
Johnston, Jon	JA22KC34	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	8/8/2014	HSSE Environmental	Leader Environmental Area C&C (TL
Jones, Luke	DG25EG08	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	8/22/2014	Projects - Area Projects C&C/OMD/LF/AS	Engineer Project C&C/O&W
Jones, Luke	DG25EG08	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	8/22/2014	Projects - Area Projects C&C/OMD/LF/AS	Engineer Project C&C/O&W
Jordan, Chris	MN84NB74	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/21/2014	Ops Shift Team C ASPH	Supv Ops ASP (TL)
Jordan, Chris	MN84NB74	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/21/2014	Ops Shift Team C ASPH	Supv Ops ASP (TL)
Jorgenson, Dan	EZ40FR32	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/19/2014	Ops FCU/APS-FCU	Specialist Ops FCU (COS)
Jorgenson, Dan	EZ40FR32	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/19/2014	Ops FCU/APS-FCU	Specialist Ops FCU (COS)
Julovich, Steven	AS15WM74	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/1/2014	Ops Shift Team D UTIL	Operator 5th Yr H/A 1-8-86
Julovich, Steven	AS15WM74	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/1/2014	Ops Shift Team D UTIL	Operator 5th Yr H/A 1-8-86
Kaminsky, Tom	WJ04ID27	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/11/2014	Ops Shift Team C	Specialist Shift Ops Optimization
Kaminsky, Tom	WJ04ID27	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/11/2014	Ops Shift Team C	Specialist Shift Ops Optimization
Kammerer, Deborah	AK18YW11	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/10/2014	M&R FCU/APS-FCU	Coordinator Ops LDAR & Project
Kammerer, Deborah	AK18YW11	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/10/2014	M&R FCU/APS-FCU	Coordinator Ops LDAR & Project

Kane, Michael	KI78NF80	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/5/2014	Technical-Process Control C&C O&W & U	Engineer Process Ctrl C&C/O&W/UTI
Kane, Michael	KI78NF80	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/5/2014	Technical-Process Control C&C O&W & U	Engineer Process Ctrl C&C/O&W/UTI
Keating, Kevin	CS74FM62	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/31/2014	Ops HN/HS/UT-HN-H	Operator 5th Yr H/A 1-8-86
Kessinger, Brett	SH00QZ56	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/1/2014	Ops FCU/APS-APS	Supv Ops APS (TL) (SA)
Kessinger, Brett	SH00QZ56	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/1/2014	Ops FCU/APS-APS	Supv Ops APS (TL) (SA)
Kieltyka, Lawrence	FY41OR62	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/25/2014	HR L&D Compliance Trng	Specialist Training Compliance
Kieltyka, Lawrence	FY41OR62	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/25/2014	HR L&D Compliance Trng	Specialist Training Compliance
Kietzman, Joshua	CK94YL18	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/2/2014	Ops Shift Team A FCU	Operator 5th Yr H/A 1-8-86
Kietzman, Joshua	CK94YL18	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/2/2014	Ops Shift Team A FCU	Operator 5th Yr H/A 1-8-86
Kinzie, Jerry	OY93SY19	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/15/2014	M&R FCU/APS-APS	Supv Maint Project APS (TL)
Kinzie, Jerry	OY93SY19	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/15/2014	M&R FCU/APS-APS	Supv Maint Project APS (TL)
Kirchhoff, Dave	BL83IX38	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	7/3/2014	Technical-Process Control Development	Lead Technical Training Simulators
Kirchhoff, Dave	BL83IX38	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	7/3/2014	Technical-Process Control Development	Lead Technical Training Simulators
Kloock, Lauren	NX01OK56	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	10/31/2014	Commercial-Schedulers	Scheduler Commercial Gasoline
Kloock, Lauren	NX01OK56	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/31/2014	Commercial-Schedulers	Scheduler Commercial Gasoline
Kornylo, Nicholas	UH40FI60	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/20/2014	Technical - Proc Engrng - HPDN/HPDS/U	Engineer Process HYD
Kornylo, Nicholas	UH40FI60	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/20/2014	Technical - Proc Engrng - HPDN/HPDS/U	Engineer Process HYD
Kreischer, Keith	SB31MH70	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/26/2014	Ops Shift Team D UTIL	Operator 5th Yr H/A 1-8-86
Kreischer, Keith	SB31MH70	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/26/2014	Ops Shift Team D UTIL	Operator 5th Yr H/A 1-8-86
Krenkel, David	II92AR24	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/24/2014	Ops HN/HS/UT-UT-H	Operator After 3rd Yr
Krenkel, David	II92AR24	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/18/2014	Ops Shift Team D UTIL	Operator After 3rd Yr
Krieg, Eric	MX67HE42	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/10/2014	M&R C&C 12PS/VRU300	Supt Maint 12P (TL)
Krieg, Eric	MX67HE42	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/22/2014	M&R C&C 12PS/VRU300	Supt Maint 12P (TL)
Kristek, Michael	QF43GQ13	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	10/31/2014	Ops HN/HS/UT-HS	Supt Ops HPS (TL)
Kristek, Michael	QF43GQ13	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/31/2014	Ops HN/HS/UT-HS	Supt Ops HPS (TL)
Kruhaj, Kenneth	IG00GP78	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/29/2014	Ops Shift Team B OMD	Chief Operator Field
Kruhaj, Kenneth	IG00GP78	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/29/2014	Ops Shift Team B OMD	Chief Operator Field
Lambert, Bryon	WX84JM52	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/8/2014	Ops Shift Team O	Supv Ops FCU (TL)
Lambert, Bryon	WX84JM52	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/8/2014	Ops Shift Team O	Supv Ops FCU (TL)
Lambert, Randy	NW64WX43	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/2/2014	Ops OMD/LF/ASP-ASP-H	Operator 5th Yr H/A 1-8-86
Lambert, Randy	NW64WX43	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/18/2014	Ops OMD/LF/ASP-ASP-H	Operator 5th Yr H/A 1-8-86
Lawson, Elliott	BR13LZ42	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/5/2014	Ops Shift Team D	Supv Ops OMD (TL)

Lawson, Elliott	BR13LZ42	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/5/2014	Ops Shift Team D	Supv Ops OMD (TL)
Lawson, Kenneth	GQ08QX95	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/3/2014	Ops Shift Team O HPD S	Supv Ops HPS (TL)
Lawson, Kenneth	GQ08QX95	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/3/2014	Ops Shift Team O HPD S	Supv Ops HPS (TL)
Layman, Michelle	DI79JM56	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	7/1/2014	Ops FCU/APS	Manager Area UR (TL)
Layman, Michelle	DI79JM56	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	7/1/2014	Ops FCU/APS	Manager Area UR (TL)
Leffel, Brent	VX01VU82	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/14/2014	HSSE Contractor Safety/NIP	Specialist H&S TAR
Leffel, Brent	VX01VU82	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/14/2014	HSSE Contractor Safety/NIP	Specialist H&S TAR
Lentz, Kevin	AI32VE33	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/8/2014	Ops Shift Team B 12 PS	Supv Ops 12P (TL)
Lentz, Kevin	AI32VE33	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/8/2014	Ops Shift Team B 12 PS	Supv Ops 12P (TL)
Licina, Michael	GH19AD47	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/24/2014	Ops C&C 11PS-H	Operator 5th Yr H/A 1-8-86
Licina, Michael	GH19AD47	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/8/2014	Ops Shift Team C 11 PS	Operator 5th Yr H/A 1-8-86
Lill, Stephen	TL04TD20	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	10/24/2014	Techncial-Process Computing	Leader Process Computing (TL)
Lill, Stephen	TL04TD20	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/24/2014	Techncial-Process Computing	Leader Process Computing (TL)
Lindeman, Timothy	SD55VV28	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	10/20/2014	Technical-Process Control Development	Specialist Ops Simulator Training
Lindeman, Timothy	SD55VV28	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/20/2014	Technical-Process Control Development	Specialist Ops Simulator Training
Lopez, Alvaro	QA41CQ12	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/4/2014	Ops C&C 12PS	Supv Ops LR
Lopez, Alvaro	QA41CQ12	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/4/2014	Ops C&C 12PS	Supv Ops LR
Lucas, Richard	MI52KI74	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/23/2014	Ops Shift Team D HPD N	Operator 5th Yr H/A 1-8-86
Lucas, Richard	MI52KI74	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/23/2014	Ops Shift Team D HPD N	Operator 5th Yr H/A 1-8-86
Lucas, Rick	FH33JO35	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/17/2014	RT Eng Coking	Principal Engineer- Coking
Lucas, Rick	FH33JO35	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/17/2014	RT Eng Coking	Principal Engineer- Coking
Luketich, Ian	OF63AW66	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/4/2014	Ops O&M Coker 2/VRU 400-H	Operator 5th Yr H/A 1-8-86
Luketich, Ian	OF63AW66	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/4/2014	Ops O&M Coker 2/VRU 400-H	Operator 5th Yr H/A 1-8-86
Luketich, Raymond	GC58RT63	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/26/2014	Ops Shift Team B OMD	Chief Operator Board
Luketich, Raymond	GC58RT63	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/26/2014	Ops Shift Team B OMD	Chief Operator Board
Lush, Todd	MR33LX26	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/20/2014	Ops Shift Team A FCU	Operator 5th Yr H/A 1-8-86
Lush, Todd	MR33LX26	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/20/2014	Ops Shift Team A FCU	Operator 5th Yr H/A 1-8-86
Lyday, Vic	DV25LQ25	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/16/2014	Technical - Projects Development	Lead Technical Project Develop
Lyday, Vic	DV25LQ25	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/16/2014	Technical - Projects Development	Lead Technical Project Develop
Magner, Jeff	JG93IC70	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/3/2014	Technical - Proc Engrng - HPDN/HPDS/U	Engineer Process HYD
Magner, Jeff	JG93IC70	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/3/2014	Technical - Proc Engrng - HPDN/HPDS/U	Engineer Process HYD
Mark, Chris	DQ01BA18	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/3/2014	Technical - Proc Engrng - Crude & Cokin	Engineer Process C&C

Mark, Chris	DQ01BA18	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/3/2014	Technical - Proc Engrng - Crude & Cokin	Engineer Process C&C
Markusic, Mark	RW49LC49	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/18/2014	Ops Shift Team A FCU	Operator 5th Yr H/A 1-8-86
Markusic, Mark	RW49LC49	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/18/2014	Ops Shift Team A FCU	Operator 5th Yr H/A 1-8-86
Martin, Jim	JR49SL43	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/28/2014	Ops OMD/LF/ASP-OMD-H	Operator After 3rd Yr
Martin, Jim	JR49SL43	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/3/2014	Ops Shift Team B OMD	Operator After 3rd Yr
Matlamela, Lerato	QK18ZQ46	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/11/2014	Technical - Proc Engrng - OMD/LF/Aspha	Engineer Process O&W
Matlamela, Lerato	QK18ZQ46	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/11/2014	Technical - Proc Engrng - OMD/LF/Aspha	Engineer Process O&W
Maty, Ronald	HH00IY06	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/13/2014	Ops HN/HS/UT-HS-H	Chief Operator Field
Maty, Ronald	HH00IY06	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/13/2014	Ops HN/HS/UT-HS-H	Chief Operator Field
Maxwell, David	TS23XA84	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/5/2014	M&R Reliability Engineering-QA	Lead M&R QA (TL)
Maxwell, David	TS23XA84	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/5/2014	M&R Reliability Engineering-QA	Lead M&R QA (TL)
McGee, Michael	JW49PH74	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/14/2014	Ops Shift Team B APS	Supv Ops APS (TL)
McGee, Michael	JW49PH74	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/4/2014	Ops Shift Team B APS	Supv Ops APS (TL)
McMurray, Thattus	LE29WR09	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/3/2014	Ops Shift Team D HPD S	Supv Ops HPS (TL)
McMurray, Thattus	LE29WR09	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/8/2014	Ops Shift Team D HPD S	Supv Ops HPS (TL)
Miegl, Jonathan	FG17DH80	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/29/2014	Ops Shift Team B COKER 2	Chief Operator Board
Miegl, Jonathan	FG17DH80	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/29/2014	Ops Shift Team B COKER 2	Chief Operator Board
Mikels, Charles	CR78QI53	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/8/2014	Ops C&C 12PS	Coordinator Ops Automation Integra
Mikels, Charles	CR78QI53	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/8/2014	Ops C&C 12PS	Coordinator Ops Automation Integra
Mikesell, Mike	KM72RV18	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/10/2014	Ops Shift Team D HPD N	Chief Operator Field
Mikesell, Mike	KM72RV18	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/10/2014	Ops Shift Team D HPD N	Chief Operator Field
Miller, Satanya	RA14SD29	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/5/2014	Ops FCU/APS-FCU-H	Operator 5th Yr H/A 1-8-86
Miller, Satanya	RA14SD29	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/5/2014	Ops FCU/APS-FCU-H	Operator 5th Yr H/A 1-8-86
Miranda, Elsa	DZ53FZ30	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/10/2014	Ops Shift Team O APS	Chief Operator Field
Miranda, Elsa	DZ53FZ30	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/10/2014	Ops Shift Team O APS	Chief Operator Field
Mize, Roy	PP66CB50	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	8/28/2014	Technical - Proc Engrng - Crude & Cokin	Engineer Sr Process C&C
Mize, Roy	PP66CB50	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	8/28/2014	Technical - Proc Engrng - Crude & Cokin	Engineer Sr Process C&C
Montgomery, Chris	DO46YQ38	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/26/2014	Ops Shift Team C LKF	Supv Ops LKF (TL)
Montgomery, Chris	DO46YQ38	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/26/2014	Ops Shift Team C LKF	Supv Ops LKF (TL)
Moore, Jerry	JG28MP66	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	8/25/2014	M&R Planning & Scheduling-HPDN/HPDS	Planner Maint UTL
Moore, Jerry	JG28MP66	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	8/25/2014	M&R Planning & Scheduling-HPDN/HPDS	Planner Maint UTL
Morales, Jorge	QQ88YJ42	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/27/2014	Ops HN/HS/UT-HN-H	Operator 5th Yr H/A 1-8-86

Morales, Jorge	QQ88YJ42	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/28/2014	Ops Shift Team A HPD N	Operator 5th Yr H/A 1-8-86
Mossberger, Michael	RV21ZD93	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/3/2014	Ops Shift Team B ASPH	Chief Operator Field
Mossberger, Michael	RV21ZD93	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/3/2014	Ops Shift Team B ASPH	Chief Operator Field
Moye, David	WE67GI34	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	10/30/2014	Ops TAR, Projects Integration LF/DNF	Rep Ops LKF
Moye, David	WE67GI34	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/30/2014	Ops TAR, Projects Integration LF/DNF	Rep Ops LKF
Mudde, John	MQ98EX23	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	7/28/2014	Technical-Process Control Specialist	Specialist Process Ctrl Graphics
Mudde, John	MQ98EX23	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	7/29/2014	Technical-Process Control Specialist	Specialist Process Ctrl Graphics
Mueller-Brown, Cindy	MN10AV29	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/2/2014	Ops FCU/APS-FCU	Supv Ops FCU (TL)
Mueller-Brown, Cindy	MN10AV29	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/2/2014	Ops FCU/APS-FCU	Supv Ops FCU (TL)
Myers, Julie	QF23QL17	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/12/2014	Ops HN/HS/UT-UT-H	Operator 5th Yr H/A 1-8-86
Myers, Julie	QF23QL17	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/12/2014	Ops HN/HS/UT-UT-H	Operator 5th Yr H/A 1-8-86
Napierski, Matthew	KG50QV19	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	10/31/2014	Technical-Process Control Development	Specialist Process Ctrl Sr (Vacant)
Napierski, Matthew	KG50QV19	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/31/2014	Technical-Process Control Development	Specialist Process Ctrl Sr (Vacant)
Neal, Leonard	QO68IC59	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/5/2014	Ops HN/HS/UT-UT-H	Chief Operator Field
Neal, Leonard	QO68IC59	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/5/2014	Ops HN/HS/UT-UT-H	Chief Operator Field
Nesbit, Malcolm	KH68DG53	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/5/2014	Ops Shift Team B ASPH	Supv Ops ASP (TL)
Nesbit, Malcolm	KH68DG53	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/5/2014	Ops Shift Team B ASPH	Supv Ops ASP (TL)
Nicholson, Matt	TH34TA25	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/15/2014	M&R TAR FCU/APS	Engineer Project TAR UR
Nicholson, Matt	TH34TA25	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/15/2014	M&R TAR FCU/APS	Engineer Project TAR UR
Northcott, Mark	KA64DJ91	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/23/2014	Ops FCU/APS-FCU	Supt Ops FCU (TL)
Northcott, Mark	KA64DJ91	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/23/2014	Ops FCU/APS-FCU	Supt Ops FCU (TL)
Novak, Brent	SK64DG59	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/19/2014	Ops FCU/APS	Supt Ops FCU (TL) (SA)
Novak, Brent	SK64DG59	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/5/2014	Ops FCU/APS	Supt Ops FCU (TL) (SA)
Novak, Steve	NN54AJ32	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/9/2014	Ops Shift Team O HPD S	Operator 5th Yr H/A 1-8-86
Novak, Steve	NN54AJ32	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/9/2014	Ops Shift Team O HPD S	Operator 5th Yr H/A 1-8-86
Nurse, Amanda	VF20ZS31	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/2/2014	M&R HN/HS/UT Engineering	Engineer M&R HYD
Nurse, Amanda	VF20ZS31	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/2/2014	M&R HN/HS/UT Engineering	Engineer M&R HYD
O'Brien, Joseph	PY76WQ13	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	8/1/2014	Projects - Systems & Performance	Manager Project Sr Systems (TL)
O'Brien, Joseph	PY76WQ13	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	8/1/2014	Projects - Systems & Performance	Manager Project Sr Systems (TL)
O'Connell, Sean	QI27ZY80	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/23/2014	HSSE Area Environmental	Area Environmental Specialist
O'Connell, Sean	QI27ZY80	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/23/2014	HSSE Area Environmental	Area Environmental Specialist
Ogle, Douglas	BC12RC06	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/9/2014	Ops Shift Team O UTIL	Supv Ops UTL (TL)

O'Larey, Ryan	FT57JY39	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/9/2014	Ops OMD/LF/ASP-LF&ASP	Specialist Ops LKF/ASP (COS)
O'Larey, Ryan	FT57JY39	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/9/2014	Ops OMD/LF/ASP-LF&ASP	Specialist Ops LKF/ASP (COS)
Olen, Joseph	NA84SG88	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/10/2014	Technical - Proc Engrng - HPDN/HPDS/U	Engineer Process HYD
Olen, Joseph	NA84SG88	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/10/2014	Technical - Proc Engrng - HPDN/HPDS/U	Engineer Process HYD
Orsi, Phillip	BM40UY93	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/28/2014	Ops FCU/APS-APS-H	Chief Operator Cross Qualified
Orsi, Phillip	BM40UY93	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/9/2014	Ops Shift Team B APS	Chief Operator Cross Qualified
Outlaw, Carmen	LU73YL67	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/12/2014	Technical - Proc Engrng - OMD/LF/Aspha	Engineer Process O&W
Outlaw, Carmen	LU73YL67	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/12/2014	Technical - Proc Engrng - OMD/LF/Aspha	Engineer Process O&W
Page, Barry	AQ31ZP14	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/29/2014	HR L&D Maint Trng	Lead Training Metals
Page, Barry	AQ31ZP14	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/29/2014	HR L&D Maint Trng	Lead Training Metals
Papaioannou, Charalambos	RZ27MJ11	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/11/2014	Technical - Proc Engrng - OMD/LF/Aspha	Engineer Process O&W
Papaioannou, Charalambos	RZ27MJ11	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/11/2014	Technical - Proc Engrng - OMD/LF/Aspha	Engineer Process O&W
Patel, Akshaykumar	DA07LQ91	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/17/2014	Ops Shift Team D COKER 2	Operator 5th Yr H/A 1-8-86
Patel, Akshaykumar	DA07LQ91	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/17/2014	Ops Shift Team D COKER 2	Operator 5th Yr H/A 1-8-86
Peart, Brock	VX23GE45	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/2/2014	Ops Shift Team A 12 PS	Chief Operator Board
Peart, Brock	VX23GE45	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/2/2014	Ops Shift Team A 12 PS	Chief Operator Board
Pellechi, Courtney	DU37OM49	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/7/2014	M&R HN/HS/UT-HS	Supt Maint HPS (TL)
Pellechi, Courtney	DU37OM49	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/7/2014	M&R HN/HS/UT-HS	Supt Maint HPS (TL)
Pergola, Jessica	HE99IX75	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/5/2014	Technical - PSM	Supt Technical PSM (TL)
Pergola, Jessica	HE99IX75	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/5/2014	Technical - PSM	Supt Technical PSM (TL)
Perino, James	DR78PA72	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/24/2014	Ops FCU/APS-APS-H	Chief Operator Field
Perino, James	DR78PA72	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/6/2014	Ops FCU/APS-APS-H	Chief Operator Field
Peterson, Patricia	HW99SR38	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	7/25/2014	HSSE Water/Waste	Specialist Environmental Water/Was
Peterson, Patricia	HW99SR38	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	7/25/2014	HSSE Water/Waste	Specialist Environmental Water/Was
Philbrook, Robert	AP18SF45	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/28/2014	Ops Shift Team B HPD S	Operator 5th Yr H/A 1-8-86
Philbrook, Robert	AP18SF45	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/28/2014	Ops Shift Team B HPD S	Operator 5th Yr H/A 1-8-86
Piekarz, Michael	WO81DT36	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	10/26/2014	Technical - Proc Engrng - HPDN/HPDS/U	Engineer Process C&C
Piekarz, Michael	WO81DT36	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/26/2014	Technical - Proc Engrng - HPDN/HPDS/U	Engineer Process C&C
Pilz, Gregory	FF35KD82	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/21/2014	Technical-Refinery Optimization	Lead Technical WBU Optimization
Pilz, Gregory	FF35KD82	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/7/2014	Technical-Refinery Optimization	Lead Technical WBU Optimization
Pinerski, Lance	VC93MM83	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	8/6/2014	Technical-Process Control Specialist	Specialist Ctrl Systems
Pinerski, Lance	VC93MM83	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	8/6/2014	Technical-Process Control Specialist	Specialist Ctrl Systems

Pinkerton, Charles	OE86TQ59	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/16/2014	Ops Shift Team D HPD N	Operator 5th Yr H/A 1-8-86
Pinkerton, Charles	OE86TQ59	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/16/2014	Ops Shift Team D HPD N	Operator 5th Yr H/A 1-8-86
Piunti, Anthony	LV27JQ91	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	10/16/2014	M&R Central Maintenance-Builders	Builder CC
Plemons, Greg	EZ05OT08	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/16/2014	Ops Shift Team A FCU	Chief Operator Board
Plemons, Greg	EZ05OT08	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/2/2014	Ops Shift Team A FCU	Chief Operator Board
Polster, Dale	AH50UI10	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/15/2014	Ops Shift Team A COKER 2	Operator 5th Yr H/A 1-8-86
Polster, Dale	AH50UI10	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/15/2014	Ops Shift Team A COKER 2	Operator 5th Yr H/A 1-8-86
Potosky, Steven	CA37DY28	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/5/2014	Ops C&C 11PS	Specialist Ops 11P (COS)
Potosky, Steven	CA37DY28	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/5/2014	Ops C&C 11PS	Specialist Ops 11P (COS)
Prising, Anu	WM62SA45	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	8/7/2014	Technical - Proc Engrng - OMD/LF/Aspha	Engineer Sr Process O&W
Prising, Anu	WM62SA45	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	8/7/2014	Technical - Proc Engrng - OMD/LF/Aspha	Engineer Sr Process O&W
Przeslawski, Ben	AG11NV87	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/2/2014	M&R Reliability Engineering-Reliability	Engineer M&R Reliability
Przeslawski, Ben	AG11NV87	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/2/2014	M&R Reliability Engineering-Reliability	Engineer M&R Reliability
Puente, Anthony	KO38UH16	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/6/2014	Ops HN/HS/UT-HN	Catalyst Change Out Specialist
Puente, Anthony	KO38UH16	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/6/2014	Ops HN/HS/UT-HN	Catalyst Change Out Specialist
Randall, Paul	KA82LI02	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/6/2014	Technical - Proc Engrng - FCU-APS	Engineer Process UR
Randall, Paul	KA82LI02	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/6/2014	Technical - Proc Engrng - FCU-APS	Engineer Process UR
Rees, David	SC89TC93	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/26/2014	Ops Shift Team O UTIL	Chief Operator Field
Rees, David	SC89TC93	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/26/2014	Ops Shift Team O UTIL	Chief Operator Field
Restauri, Nicholas	MM18VW32	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/20/2014	Ops Shift Team D HPD N	Operator 5th Yr H/A 1-8-86
Restauri, Nicholas	MM18VW32	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/20/2014	Ops Shift Team D HPD N	Operator 5th Yr H/A 1-8-86
Riggs, Philip	AB34CV78	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/12/2014	Technical - Projects Development	Engineer Sr Process Design
Riggs, Philip	AB34CV78	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/12/2014	Technical - Projects Development	Engineer Sr Process Design
Rodriguez, Beata	KL95TD35	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/21/2014	HSSE Water/Waste	Specialist Environmental Water/Was
Rodriguez, Beata	KL95TD35	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/21/2014	HSSE Water/Waste	Specialist Environmental Water/Was
Roedel, Jerry	UT36TT69	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/27/2014	Ops FCU/APS-FCU-H	Chief Operator Board
Roedel, Jerry	UT36TT69	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/12/2014	Ops Shift Team B FCU	Chief Operator Board
Rogers, James	FK46AD65	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/27/2014	Ops Shift Team A COKER 2	Chief Operator Cross Qualified
Rogers, James	FK46AD65	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/27/2014	Ops Shift Team A COKER 2	Chief Operator Cross Qualified
Rongers, Charlotte	CP25YF45	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/2/2014	HR L&D Ops Trng	Lead Training Ops UR
Rongers, Charlotte	CP25YF45	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/2/2014	HR L&D Ops Trng	Lead Training Ops UR
Ross, Ken	KS15RW41	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/23/2014	Technical - Proc Engrng - Crude & Cokin	Supt Process Engr C&C (TL)

Rozic, Ron	KO84KQ55	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	7/1/2014	Technical-Refinery Optimiz & Controls	Manager Automation (TL)
Rozic, Ron	KO84KQ55	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	7/1/2014	Technical-Refinery Optimiz & Controls	Manager Automation (TL)
Rummel, James	LB19FE68	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	10/21/2014	M&R TAR Crude & Coker	Engineer Project TAR C&C
Rummel, James	LB19FE68	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/23/2014	M&R TAR Crude & Coker	Engineer Project TAR C&C
Salazar, Wilfred	PV61CD25	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/5/2014	Ops Shift Team B OMD	Operator 5th Yr H/A 1-8-86
Salazar, Wilfred	PV61CD25	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/5/2014	Ops Shift Team B OMD	Operator 5th Yr H/A 1-8-86
Salus, Joseph	EG10LM11	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/19/2014	Ops Shift Team D 11 PS	Chief Operator Board
Salus, Joseph	EG10LM11	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/19/2014	Ops Shift Team D 11 PS	Chief Operator Board
Schmidt, Julie	ME04RO18	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	10/27/2014	Technical - Projects Development	Lead Technical Project Develop
Schmidt, Julie	ME04RO18	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/27/2014	Technical - Projects Development	Lead Technical Project Develop
Schmitt, Thomas	JR13JL47	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/15/2014	Ops Shift Team D APS	Chief Operator Field
Schmitt, Thomas	JR13JL47	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/15/2014	Ops Shift Team D APS	Chief Operator Field
Scudder, Cindy	EK07XL87	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/31/2014	Ops HN/HS/UT-HN-H	Operator 5th Yr H/A 1-8-86
Scudder, Cindy	EK07XL87	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/10/2014	Ops Shift Team A HPD N	Operator 5th Yr H/A 1-8-86
Sellin, Brian	TE85LB43	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/11/2014	Ops Shift Team D FCU	Operator 5th Yr H/A 1-8-86
Sellin, Brian	TE85LB43	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/11/2014	Ops Shift Team D FCU	Operator 5th Yr H/A 1-8-86
Shallcross, Kevin	VL45TA56	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/18/2014	Technical - Proc Engrng - OMD/LF/Aspha	Engineer Process O&W
Shallcross, Kevin	VL45TA56	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/18/2014	Technical - Proc Engrng - OMD/LF/Aspha	Engineer Process O&W
Sharpe, Walter	AX38YQ96	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/3/2014	Ops Shift Team D OMD	Supv Ops OMD (TL)
Sharpe, Walter	AX38YQ96	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/3/2014	Ops Shift Team D OMD	Supv Ops OMD (TL)
Shuttleworth, Nicola	GA81GS98	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/15/2014	Technical - Proc Engrng - FCU-APS	Engineer Process HYD
Shuttleworth, Nicola	GA81GS98	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/15/2014	Technical - Proc Engrng - FCU-APS	Engineer Process HYD
Sigward, Bryan	UM53WX82	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	10/24/2014	Technical - Proc Engrng - HPDN/HPDS/U	Engineer Process HYD
Sigward, Bryan	UM53WX82	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/27/2014	Technical - Proc Engrng - HPDN/HPDS/U	Engineer Process HYD
Smith, Brenda	FP48VR89	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	7/21/2014	Ops FCU/APS-APS	Specialist Ops Compliance APS (CAS
Smith, Brenda	FP48VR89	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	7/21/2014	Ops FCU/APS-APS	Specialist Ops Compliance APS (CAS
Smith, Clyde	FQ15CG16	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/29/2014	Ops Shift Team A LKF	Operator 5th Yr H/A 1-8-86
Smith, Clyde	FQ15CG16	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/29/2014	Ops Shift Team A LKF	Operator 5th Yr H/A 1-8-86
Smith, Timothy	CE30BF47	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/9/2014	Ops Shift Team B OMD	Operator 5th Yr H/A 1-8-86
Smith, Timothy	CE30BF47	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/9/2014	Ops Shift Team B OMD	Operator 5th Yr H/A 1-8-86
Smrekar, John	WZ86QY03	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/15/2014	M&R Central Maintenance-Machinist	Leader Maint (Craft) Machinist (TL)
Smrekar, John	WZ86QY03	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/15/2014	M&R Central Maintenance-Machinist	Leader Maint (Craft) Machinist (TL)

Starcevich, Gregory	LX06WZ85	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/4/2014	Ops Shift Team D HPD N	Chief Operator Board
Starcevich, Gregory	LX06WZ85	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/4/2014	Ops Shift Team D HPD N	Chief Operator Board
Starks, Barrett	GA42OZ34	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/3/2014	Ops Shift Team D HPD N	Operator 5th Yr H/A 1-8-86
Starks, Barrett	GA42OZ34	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/3/2014	Ops Shift Team D HPD N	Operator 5th Yr H/A 1-8-86
Stasny, Philip	SD37TP34	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/11/2014	Ops Shift Team D HPD N	Supv Ops HPN (TL)
Stasny, Philip	SD37TP34	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/11/2014	Ops Shift Team D HPD N	Supv Ops HPN (TL)
Stiers, Susan	BE02BY81	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/3/2014	HSSE Health & Safety	Specialist H&S Area HYD
Stiers, Susan	BE02BY81	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/3/2014	HSSE Health & Safety	Specialist H&S Area HYD
Stoces, Shawn	QH27WO08	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/29/2014	Ops Shift Team C COKER 2	Operator 3rd Yr H/A 1-8-86
Stoces, Shawn	QH27WO08	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/29/2014	Ops Shift Team C COKER 2	Operator 3rd Yr H/A 1-8-86
Strezo, Fred	SU77YF84	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/8/2014	Ops Shift Team D UTIL	Operator 5th Yr H/A 1-8-86
Strezo, Fred	SU77YF84	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/8/2014	Ops Shift Team D UTIL	Operator 5th Yr H/A 1-8-86
Sullivan, William	LM86FS44	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/4/2014	Ops TAR, Projects Integration	Ops Superintendent TAR Integration
Sullivan, William	LM86FS44	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/4/2014	Ops TAR, Projects Integration	Ops Superintendent TAR Integration
Swanson, Dan	SA30VX67	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/2/2014	Ops Shift Team B COKER 2	Operator 4th Yr H/A 1-8-86
Swanson, Dan	SA30VX67	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/2/2014	Ops Shift Team B COKER 2	Operator 4th Yr H/A 1-8-86
Swierc, David	TF03MK12	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/23/2014	Ops C&C 11PS-H	Chief Operator Field
Swierc, David	TF03MK12	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/9/2014	Ops Shift Team C 11 PS	Chief Operator Field
Szczepaniak, Jeffrey	DZ12DW96	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/22/2014	Ops Shift Team D HPD N	Operator 5th Yr H/A 1-8-86
Szczepaniak, Jeffrey	DZ12DW96	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/22/2014	Ops Shift Team D HPD N	Operator 5th Yr H/A 1-8-86
Tavernier, Kevin	GB52XC09	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/24/2014	Ops HN/HS/UT-HS-H	Operator 5th Yr H/A 1-8-86
Tavernier, Kevin	GB52XC09	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/29/2014	Ops Shift Team O HPD S	Operator 5th Yr H/A 1-8-86
Taylor, Thomas	HS59UR94	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/3/2014	Technical-Process Control Development	Specialist Process Ctrl
Taylor, Thomas	HS59UR94	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/3/2014	Technical-Process Control Development	Specialist Process Ctrl
Tenbusch, Keith	BM01HY45	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	10/23/2014	Projects - Major Projects-FGR	Engineer Project FGR
Tenbusch, Keith	BM01HY45	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/23/2014	Projects - Major Projects-FGR	Engineer Project FGR
Terrano, Joseph	DG54MF06	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/10/2014	Technical - Proc Engrng - HPDN/HPDS/U	Engineer Process HYD
Terrano, Joseph	DG54MF06	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/10/2014	Technical - Proc Engrng - HPDN/HPDS/U	Engineer Process HYD
Thacker, Andrew	CC54AB70	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/13/2014	M&R HN/HS/UT Engineering	Engineer M&R HYD
Thacker, Andrew	CC54AB70	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/13/2014	M&R HN/HS/UT Engineering	Engineer M&R HYD
Thakkar, Jenny	SJ72PA30	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/15/2014	Commercial-Schedulers	Scheduler Commercial Crude
Thakkar, Jenny	SJ72PA30	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/15/2014	Commercial-Schedulers	Scheduler Commercial Crude

Tibbitts, Julie	DC35QT36	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/19/2014	M&R FCU/APS Engineering	Engineer M&R UR
Tibbitts, Julie	DC35QT36	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/19/2014	M&R FCU/APS Engineering	Engineer M&R UR
Titus, Robert	HZ06IV67	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/19/2014	Ops Shift Team D HPD N	Operator 5th Yr H/A 1-8-86
Torres, Julio	TX32WZ09	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/10/2014	Ops Shift Team O	Specialist Shift Ops Optimization
Torres, Julio	TX32WZ09	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/10/2014	Ops Shift Team O	Specialist Shift Ops Optimization
Towner, Carl	NH52XU44	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/8/2014	Technical-Process Control FCU/APS & HP	Engineer Process Ctrl Advanced
Towner, Carl	NH52XU44	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/8/2014	Technical-Process Control FCU/APS & HP	Engineer Process Ctrl Advanced
Turner, James	HH90SS46	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/9/2014	Ops OMD/LF/ASP-OMD-H	Chief Operator Field
Turner, James	HH90SS46	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/9/2014	Ops OMD/LF/ASP-OMD-H	Chief Operator Field
Twardowski, George	LX20LV16	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/7/2014	M&R FCU/APS Engineering	Supt M&R Engr UR (TL)
Twardowski, George	LX20LV16	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/7/2014	M&R FCU/APS Engineering	Supt M&R Engr UR (TL)
Tzavaras, Louis	NQ05OD01	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/23/2014	Ops FCU/APS-FCU-H	Operator 5th Yr H/A 1-8-86
Tzavaras, Louis	NQ05OD01	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/9/2014	Ops Shift Team A FCU	Operator 5th Yr H/A 1-8-86
Van Doren, John	SK88DD71	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/3/2014	Ops HN/HS/UT-HS	Specialist Ops HPS (COS)
Van Doren, John	SK88DD71	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/3/2014	Ops HN/HS/UT-HS	Specialist Ops HPS (COS)
Vania, Randall	GL30UU60	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/31/2014	Ops HN/HS/UT-HS-H	Operator 5th Yr H/A 1-8-86
Vania, Randall	GL30UU60	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/7/2014	Ops HN/HS/UT-HS-H	Operator 5th Yr H/A 1-8-86
Vargas, James	EP63HW57	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/8/2014	Ops Shift Team A APS	Supv Ops APS (TL)
Vargas, James	EP63HW57	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/8/2014	Ops Shift Team A APS	Supv Ops APS (TL)
Velasquez, Nicholas	LU39FK70	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/8/2014	Ops Shift Team C COKER 2	Chief Operator Cross Qualified
Velasquez, Nicholas	LU39FK70	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/8/2014	Ops Shift Team C COKER 2	Chief Operator Cross Qualified
Vivo, Wilfred	LP71TV98	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	10/1/2014	Technical-Process Control C&C O&W & U	Engineer Process Ctrl C&C/O&W/UTI
Vivo, Wilfred	LP71TV98	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/17/2014	Technical-Process Control C&C O&W & U	Engineer Process Ctrl C&C/O&W/UTI
Vodicka, Chris	CN44GS53	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	8/29/2014	Technical - Proc Engrng - Crude & Cokin	Engineer Process C&C
Vodicka, Chris	CN44GS53	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	8/29/2014	Technical - Proc Engrng - Crude & Cokin	Engineer Process C&C
Vrabel, Michael	UW72KZ43	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/17/2014	Ops Shift Team A 11 PS	Chief Operator Cross Qualified
Vrabel, Michael	UW72KZ43	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/17/2014	Ops Shift Team A 11 PS	Chief Operator Cross Qualified
Vujko, Jonathan	VL71YS82	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/10/2014	Ops Shift Team D HPD S	Operator 5th Yr H/A 1-8-86
Vujko, Jonathan	VL71YS82	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/10/2014	Ops Shift Team D HPD S	Operator 5th Yr H/A 1-8-86
Wacnik, Chris	BP25GA52	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	10/28/2014	Projects - Project Services	Leader Project Ctrls Field
Wacnik, Chris	BP25GA52	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/28/2014	Projects - Project Services	Leader Project Ctrls Field
Walton, Donald	DG43KL67	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/14/2014	Ops FCU/APS-FCU-H	Chief Operator Board

Walton, Donald	DG43KL67	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/14/2014	Ops FCU/APS-FCU-H	Chief Operator Board
Wanicki, Fred	KO71QV58	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/9/2014	Ops HN/HS/UT-HS-H	Operator 5th Yr H/A 1-8-86
Wanicki, Fred	KO71QV58	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/9/2014	Ops HN/HS/UT-HS-H	Operator 5th Yr H/A 1-8-86
Warzyniak, Robert	BT54SZ86	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	7/21/2014	M&R Reliability Engineering-Reliability	Engineer M&R Reliability
Warzyniak, Robert	BT54SZ86	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	7/21/2014	M&R Reliability Engineering-Reliability	Engineer M&R Reliability
Weathersby, Garry	ST79LB80	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/13/2014	Technical - BI Continuous Improvement	Lead Technical CI
Weathersby, Garry	ST79LB80	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/13/2014	Technical - BI Continuous Improvement	Lead Technical CI
Wells, Richard	OC81WD80	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/8/2014	Ops HN/HS/UT-UT	Specialist Ops UTL (COS)
Wells, Richard	OC81WD80	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/8/2014	Ops HN/HS/UT-UT	Specialist Ops UTL (COS)
Whitlock, Jeffery	FD35DC18	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/19/2014	Ops Shift Team O APS	Operator 5th Yr H/A 1-8-86
Whitlock, Jeffery	FD35DC18	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/19/2014	Ops Shift Team O APS	Operator 5th Yr H/A 1-8-86
Withrow, Matthew	WZ68WS88	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/2/2014	Ops HN/HS/UT-UT-H	Chief Operator Field
Withrow, Matthew	WZ68WS88	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/4/2014	Ops Shift Team D UTIL	Chief Operator Field
Witt, Marty	DO20IS45	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	10/27/2014	Technical - Proc Engrng - Crude & Cokin	Engineer Process C&C
Witt, Marty	DO20IS45	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	10/27/2014	Technical - Proc Engrng - Crude & Cokin	Engineer Process C&C
Wloch, John	EI82CU91	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/15/2014	Projects - Area Projects HPD/FCU/APS	Engineer Project HYD/UR
Wloch, John	EI82CU91	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/15/2014	Projects - Area Projects HPD/FCU/APS	Engineer Project HYD/UR
Xhaferllari, Alban	RW16YJ32	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/9/2014	Technical - Proc Engrng - Crude & Cokin	Engineer Process C&C
Xhaferllari, Alban	RW16YJ32	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/9/2014	Technical - Proc Engrng - Crude & Cokin	Engineer Process C&C
Young, James	UV70LQ96	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	8/12/2014	RT Eng FCC & Alky	Principal Engineer - Alkylation
Young, James	UV70LQ96	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	8/12/2014	RT Eng FCC & Alky	Principal Engineer - Alkylation
Yurkiv, Taras	UM86CU25	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/20/2014	Technical - Proc Engrng - HPDN/HPDS/U	Engineer Sr Process HYD
Yurkiv, Taras	UM86CU25	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/20/2014	Technical - Proc Engrng - HPDN/HPDS/U	Engineer Sr Process HYD
Zajac, Michael	UF40KR77	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/4/2014	Ops OMD/LF/ASP-LF-H	Operator 5th Yr H/A 1-8-86
Zajac, Michael	UF40KR77	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/4/2014	Ops OMD/LF/ASP-LF-H	Operator 5th Yr H/A 1-8-86
Zajac, Michael	KV31ZG73	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	12/5/2014	Ops OMD/LF/ASP-OMD	Specialist Ops (SA) OMD
Zajac, Michael	KV31ZG73	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	12/5/2014	Ops OMD/LF/ASP-OMD	Specialist Ops (SA) OMD
Zentz, Donald	LE72PF13	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	9/15/2014	Technical-Process Control C&C O&W & U	Engineer Process Ctrl Advanced
Zentz, Donald	LE72PF13	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	9/15/2014	Technical-Process Control C&C O&W & U	Engineer Process Ctrl Advanced
Ziec, Irena	OB18NL18	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	8/12/2014	Technical - Proc Engrng - FCU-APS	Engineer Process UR
Ziec, Irena	OB18NL18	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	8/12/2014	Technical - Proc Engrng - FCU-APS	Engineer Process UR
Zweig, Brian	BK62FW09	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Material)	Material	Completed	11/1/2014	Technical - BI Central	Manager Business Improvement (TL

Zweig, Brian	BK62FW09	(R) Benzene NESHAP-NSPS QQQ SOP Refresh (Test)	Test	Completed	11/1/2014	Technical - BI Central	Manager Business Improvement (TL