BOILER NUMBER ONE
EPA SECTION 114 INFORMATION REQUEST
EMISSIONS TEST REPORT

L'ANSE WARDEN ELECTRIC COMPANY, LLC.

157 South Main Street
L'Anse, Michigan 49946

August, 2016

W.O. No. 14464.007.004

CERTIFICATION STATEMENT

I certify under penalty of law that I have examined and am familiar with the information in the enclosed documents, including all attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the statements and information are, to the best of my knowledge and belief, true and complete. I am aware that there are significant penalties for knowingly submitting false statements and information, including the possibility of fines or imprisonment pursuant to Section 113(c)(2) of the Clean Air Act and 18 U.S.C. §§ 1001 and 1341.

Mr. Steve Walsh
Chief Executive Officer

L'Anse Warden Electric Company, LLC.
157 South Main Street
L'Anse, Michigan 49946
906-885-7910

RENEWABLE OPERATING PERMIT REPORT CERTIFICATION

DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

RENEWABLE OPERATING PERMIT REPORT CERTIFICATION

Authorized by 1994 P.A. 451, as amended. Failure to provide this information may result in civil and/or criminal penalties.

Reports submitted pursuant to R 336.1213 (Rule 213), subrules (3)(c) and/or (4)(c), of Michigan's Renewable Operating (RO) Permit program must be certified by a responsible official. Additional information regarding the reports and documentation listed below must be kept on file for at least 5 years, as described in General Condition No. 22 in the RO Permit and be made available to the Department of Environmental Quality, Air Quality Division upon request.

Source Name L'Anse Warden Electric Company LLC County Baraga

Source Address 157 S. Main Street City L'Anse

AQD Source ID (SRN) B4260 RO Permit No. MI-ROP-B4260-2011 RO Permit Section No. ______

Please check the appropriate box(es):

☐ **Annual Compliance Certification** **(General Condition No. 28 and No. 29 of the RO Permit)**

Reporting period (provide inclusive dates): From ______ To ______

☐ 1. During the entire reporting period, this source was in compliance with **ALL** terms and conditions contained in the RO Permit, each term and condition of which is identified and included by this reference. The method(s) used to determine compliance is/are the method(s) specified in the RO Permit.

☐ 2. During the entire reporting period this source was in compliance with all terms and conditions contained in the RO Permit, each term and condition of which is identified and included by this reference, **EXCEPT** for the deviations identified on the enclosed deviation report(s). The method used to determine compliance for each term and condition is the method specified in the RO Permit, unless otherwise indicated and described on the enclosed deviation report(s).

☐ **Semi-Annual (or More Frequent) Report Certification** **(General Condition No. 23 of the RO Permit)**

Reporting period (provide inclusive dates): From ______ To ______

☐ 1. During the entire reporting period, **ALL** monitoring and associated recordkeeping requirements in the RO Permit were met and no deviations from these requirements or any other terms or conditions occurred.

☐ 2. During the entire reporting period, all monitoring and associated recordkeeping requirements in the RO Permit were met and no deviations from these requirements or any other terms or conditions occurred, **EXCEPT** for the deviations identified on the enclosed deviation report(s).

☒ **Other Report Certification**

Reporting period (provide inclusive dates): From ______ To ______

Additional monitoring reports or other applicable documents required by the RO Permit are attached as described:

Emissions Test Report

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

Steve Walsh	Chief Executive Officer	906-885-7910
Name of Responsible Official (print or type)	Title	Phone Number

Steve Walsh — Signature of Responsible Official

4 Aug 2016 — Date

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1. INTRODUCTION

Weston Solutions Inc. (WESTON) was retained by L'Anse Warden Electric Company LLC (LWEC) to perform an emissions testing program on the Boiler No. 1 exhaust duct at the LWEC facility located in L'Anse Baraga County, Michigan. Boiler No. 1 which is permitted to operate on several different biomass or renewable fuels was previously a coal oil and gas-fired steam generating unit. The objective of this test program was to satisfy the requirements of the U.S. Environmental Protection Agency (EPA) Region V Section 114 Information Request submitted on 1 April 2016. Boiler No. 1 is identified as EUBOILER No. 1 and the facility currently operates under the State of Michigan Renewable Operating Permit (ROP) No. MI-ROP-B4260□2011 and Permit to Install (PTI) 168-07D.

The EPA Region V 114 letter initially requested emissions testing under two operating conditions. Test condition one included a typical fuel mix under the existing permitting of wood tire derived fuel (TDF) wood from creosote treated railroad ties and pentachlorophenol (PCP) treated railroad ties. Test condition two was the same as test condition one but excluded the use of PCP ties. However LWEC has discontinued the use of PCP tie fuel and has submitted a permit application (PTI Application No. 67-16) to the Michigan Department of Environmental Quality (MDEQ) to remove PCP ties as an authorized fuel. As LWEC no longer had PCP ties available for combustion and submitted a permit application to remove PCP ties as a fuel EPA Region V modified its 1 April 2016 request to include only test condition two. The resulting Section 114 Test Program was conducted pursuant to the EPA Region V approved test protocol submitted May 17 2016 and the test protocol addendum submitted June 22 2016.

WESTON's Integrated Air Services (IAS) group completed all required testing during 6-7 July 2016. A representative of the MDEQ was present throughout the testing.

1.1 PLANT INFORMATION

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Mr. JR Richardson Technical Manager
Phone: 906-885-7187

1.2 TESTING FIRM INFORMATION

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Mr. Ken Hill Senior Project Manager
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1.3 ANALYTICAL LABORATORIES

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Mississauga Ontario Canada
Mr. Clayton Johnson, Project Manager – Air Toxics
Phone: 905-817-5769

ALS Environmental
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Tucson AZ 85714
Ms. Wendy Hyatt Client Services Manager
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1.4 SUMMARY OF TEST PARAMETERS

All testing was performed pursuant to WESTON's Emissions Test Protocol (Revision 1) and the Addendum to Emissions Test Protocol (Revision 2) submitted in May and June 2016 respectively. These documents are included in Appendix I – Project Correspondence. Table 1-1 provides the test parameters associated test methods and reporting units for this test program.

Following this introduction Section 2 provides a summary of the test results. Section 3 provides a description of the process and sampling locations. Section 4 provides a description of the sampling and analytical procedures. Section 5 outlines the fuel processing fuel sampling and analytical procedures to be used during the test program. Section 6 provides quality assurance and quality control procedures (QA/QC). Appendix A provides detailed test results. Raw test data boiler operating data laboratory reports fuel sample results quality control records example calculations listing of project participants and related project correspondence are provided in Appendices B through I, respectively.

Table 1-1
Summary of Test Parameters

Test Parameter[(1)]	Test Method[(2)]	Reporting Units[(3)]
Total Particulate (filterable)	EPA M5 (combined with EPA M29)	gr/dscf lb/MMBtu lb/hr
$PM_{10}/PM_{2.5}$ (filterable and condensable)	EPA M201A/202	gr/dscf lb/MMBtu lb/hr
Metals (nickel lead arsenic manganese)	EPA M29	ug/m^3 lb/hr
Polychlorinated Dibenzo-p-dioxins/ Polychlorinated Dibenzofurans (PCDD/PCDF)	EPA M23	ug/m^3 @ 7% O_2 TEQ lb/hr TEQ
Cresol Isomers	EPA SW846 M0010 (combined with EPA 23)	ug/m^3 lb/hr
Hydrogen Chloride/Chlorine	EPA M26A (modified)	ppmvd lb/hr
Volatile Organic Compounds (VOCs) as methane	EPA M25A	ppmvd @ 7% O_2 lb/hr
Opacity	EPA M9	%

1. Cresol isomers include m-cresol o-cresol and p-cresol.
2. EPA Method 26A was modified by collecting the sample non-isokinetically from a single traverse point (similar to EPA Method 26).
3. The exhaust gas O_2 concentration (diluent gas) and a facility provided F-factor (F_d 9561) were used to calculate emission rates in terms of lb/MMBtu.

2. SUMMARY OF TEST RESULTS

2.1 TEST RESULTS DISCUSSION

Table 2-1 of this section provide a summary of the compliance test results for each pollutant parameter [particulate matter (PM) particulate matter ≤ 10 microns and PM ≤ 2.5 microns ($PM_{10}/PM_{2.5}$) metals (includes Pb As Mn and Ni) hydrogen chloride (HCl) and chlorine (Cl) polychlorinated dibenzo-p-dioxins/polychlorinated dibenzo furans (PCDD/PCDF) as 2 3 7 8 TCDD Toxic Equivalent, cresol isomers volatile organic compounds (VOC)] and opacity. Any differences in the test results summary tables and detailed test results shown in the appendices are due to rounding the results for presentation purposes.

As discussed in the Addendum to Emissions Test Protocol (Revision 2 June 2016) WESTON calculated the stack exit velocity and recorded the gas temperature at the stack inlet duct. The stack exit velocity (in terms of ft/s) and stack inlet duct temperature data can be found in the detailed results tables presented in Appendix A.

It should be noted WESTON experienced sampling difficulties during the first $PM_{10}/PM_{2.5}$ run conducted on 6 July. Due to a misaligned pitot tube/PM sampling head assembly the measured stack gas velocity head (ΔP) readings were lower than the preliminary traverse readings resulting in a low-biased calculation of volumetric flow rate and subsequent PM mass rate in terms of lb/hr. Since it was believed the results may not be representative and biased low WESTON elected not to analyze the sample and attempted a repeat of the run on 7 July. During the repeated run WESTON inadvertently broke the glass sample probe while changing test ports and after a discussion with Mr. Tom Gasloli of the MDEQ a decision was made to scrap the run and start over. WESTON successfully repeated the run later that morning and completed all $PM_{10}/PM_{2.5}$ testing on 7 July 2016. Please note the PM runs are numbered Runs 2-4 throughout the report vs.1-3 for all other sample trains.

There were no other sampling or operational issues that impacted the field testing and the results presented are believed to be representative of the emissions encountered during the test periods.

Table 2-1
Boiler No.1
Summary of Test Results

Pollutant	Test Run Number					PTI 168-07D Emissions Limit
	1	2	3	4	Average	
Particulate Matter (PM) (lb/hr)	0.8	1.9	1.2	--	1.3	19.2 lb/hr
Particulate Matter (PM) (lb/MMBtu)	0.003	0.006	0.004	--	0.004	0.06 lb/MMBtu
Particulate Matter ≤ 10 microns (PM_{10}) (lb/hr)	--	5.3	8.0	8.3	7.2	15.4 lb/hr
Particulate Matter ≤ 10 microns (PM_{10}) (lb/MMBtu)	--	0.020	0.029	0.030	0.026	--
Particulate Matter ≤ 2.5 microns ($PM_{2.5}$) (lb/hr)	--	4.7	7.3	7.1	6.3	--
Particulate Matter ≤ 2.5 microns ($PM_{2.5}$) (lb/MMBtu)	--	0.018	0.027	0.026	0.023	--
Lead (Pb) (lb/hr)	1.19E-03	1.00E-03	1.13E-03	--	1.10E-03	0.02 lb/hr
Arsenic (As) (lb/hr)	< 1.24E-04	1.41E-04	1.43E-04	--	≤ 1.36E-04	--
Manganese (Mn) (lb/hr)	1.51E-03	2.88E-03	2.87E-03	--	2.42E-03	--
Nickel (Ni) (lb/hr)	1.20E-03	4.70E-04	6.04E-04	--	7.60E-04	--
Hydrogen Chloride (HCl) (lb/hr)	1.73	1.91	1.61	--	1.75	2.17 lb/hr
Chlorine (Cl_2) (lb/hr)	< 0.25	< 0.26	< 0.26	--	< 0.26	--
2 3 7 8-TCDD Toxic Equivalent (µg/dscm @ 7% O_2)	7.72E-06	6.35E-06	5.70E-06	--	6.59E-06	--
2 3 7 8-TCDD Toxic Equivalent (lb/hr)	2.06E-09	1.66E-09	1.54E-09	--	1.75E-09	--
Volatile Organic Compounds (ppmvd @ 7% O_2) as methane	< 0.12	< 0.12	< 0.12	--	< 0.12	50 ppmvd @ 7% O_2
Volatile Organic Compounds (lb/hr) as methane	< 0.02	< 0.02	< 0.02	--	< 0.02	9.1 lb/hr
Cresol Isomers (lb/hr)	< 7.77E-04	< 8.44E-04	< 8.15E-04	--	< 8.12E-04	--
Opacity	0	0	0	--	0	--
Average Stack Exit Velocity 6 July (ft/s)[1]	57.6					--
Average Stack Exit Velocity 7 July (ft/s)[1]	56.1					--
Average Stack Inlet Duct Temp 6 July (°F)[1]	442.3					--
Average Stack Inlet Duct Temp 7 July (°F)[1]	439.4					--

1. See Appendix A for detailed exit velocity and temperature data.

3. DESCRIPTION OF PROCESS AND SAMPLING LOCATIONS

3.1 PROCESS OVERVIEW

LWEC is a cogeneration facility consisting of a single boiler generating process steam and electric power to the grid firing primarily biomass materials. The boiler typically produces steam at 180 000 lbs/hr and maximum gross power generation from 15.9 to 16.4 megawatts (MW).

3.1.1 Basic Operating Parameters

The fuel feed to the boiler is regulated to meet process steam and electrical generation requirements. The fuel blend and excess air may be modified to improve combustion characteristics. Adjustments to air fuel blend or load will be made as necessary to conform to emissions monitoring limits.

3.1.2 Test Program Boiler Load

The hourly boiler operating limit is 324 million British thermal units (MMBtu). The maximum annual heat input is 2 656 800 MMBtu based on 8 200 hours of operation per year.

As noted in the Addendum to Emissions Test Protocol (Revision 2 June 2016) the boiler "maximum rate of electricity production" for the stack test was determined by calculating an average gross annualized MW range for the years 2012 to 2015 (ranging from 15.92 to 16.37 MW). The boiler load was maintained within this range during the Section 114 Information Request Test Program.

3.1.3 Test Program Fuel Mix and Firing Rates

The fuel mix during the Section 114 Test Program consisted of wood creosote treated railroad ties, and TDF at a target feed rate of 15 tons per hour for creosote treated railroad ties and 7.5 tons per hour for wood (i.e. at a 2:1 ratio of creosote treated railroad ties to wood). As required by the 114 Request fuel samples were collected during the test program during each test run in accordance with 40 CFR 63 Subpart 7521(c and d). However as noted in the Addendum to Emissions Test Protocol (Revision 2 June 2016) due to safety and operational necessity the belt was not stopped to collect fuel samples; LWEC designated personnel collected fuel samples from a point where each fuel drops onto the conveyor belt feeding the boiler.

To calculate the feed rates during the Section 114 Test Program, LWEC:

1. Established a fixed indicator line across where the three cables that raise and lower the fuel feed rakes are located on the south side of the Fuel Storage Building.

2. At the start of testing, a mark was put on each cable at the indicator line, signifying the elevation of each fuel feed rake at that time.

3. Individual bins were filled with the separate fuel types (one bin with wood, the other two bins with creosote treated railroad ties) and the tonnage of fuel added to each bin was recorded. As the fuel was added, the rakes were raised up toward the top of each pile. The fuel weights as received at the fuel bins were determined based upon the fuel weights determined at the Fuel Aggregation Facility before delivery to the power plant and boiler.

4. Stack testing proceeded for the specified run times.

5. When the rakes once again reached the elevation where they started, signified by the mark on each cable re-aligning with the indicator, the respective times were recorded.

6. The known tonnage added to each bin was then divided by the difference in times to yield a tons per hour value for each bin over the course of the testing day.

7. The above procedure was repeated for the second day of testing.

The fuel feed rates were calculated and the creosote treated railroad tie to wood ratio was determined on a dry basis using average moisture contents by fuel per day supplied by the laboratory from analysis of the collected fuel samples. The fuel feed rate ratios were 2.14 and 2.48 tons of creosote treated railroad ties to tons of wood for 6 July 2016 and 7 July 2016, respectively. LWEC utilized a professional engineer (Mr. Jed Chrestensen from Mannik Smith Group) to assist with the fuel accounting method and perform quality control of the calculations.

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Data and the calculation methodology are provided in Appendix E.

3.2 AIR POLLUTION CONTROL EQUIPMENT

Particulate emissions are controlled by a multi-cyclone followed by a single chamber, three-field electrostatic precipitator (ESP).

3.2.1 ESP Operating Parameters

The precipitator electrical controls and rapping sequence, intensity and frequency are set for optimum performance and are not generally modified after this optimization exercise unless emissions issues are observed.

3.3 REFERENCE METHOD TEST LOCATION

The reference method sample ports (two sets) are located on a section of rectangular ductwork that runs horizontally from the exit of the ESP prior to the exhaust stack. The rectangular ductwork is six feet by six feet six inches (6’ x 6½’) and has a straight run of fifty-seven feet (57’). All dimensions and port locations were verified prior to testing.

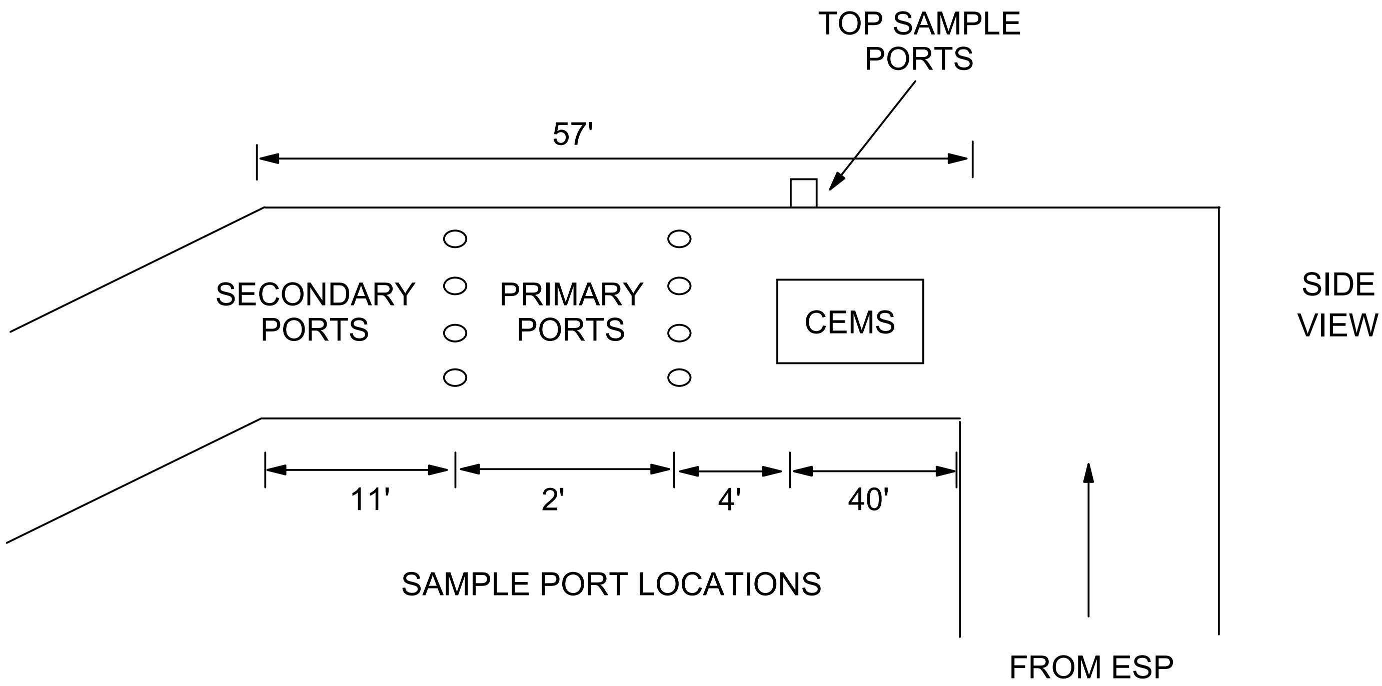
A second set of four sample ports are installed approximately 2 feet downstream from the primary sample ports and allows for additional sample trains to be operated simultaneously. Air flow disturbances in the secondary sample ports were minimized by port selection and placement of the upstream sampling equipment. Additionally, a third set of sample ports located on top of the ESP outlet ductwork was used for single point sampling (continuous emissions monitoring). All dimensions and port locations were verified prior to testing.

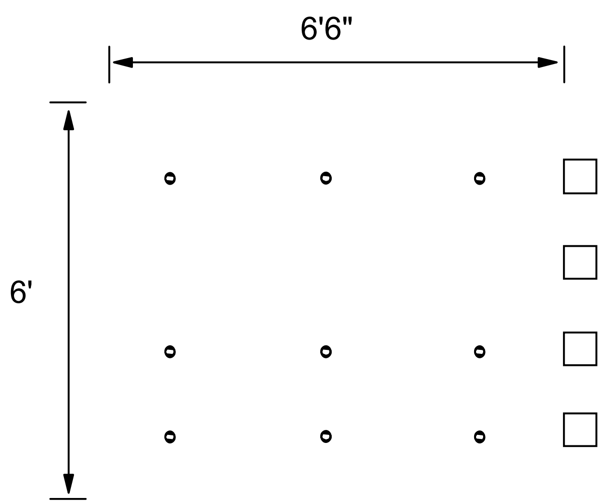
Figure 3-1 presents a diagram of the sample port and traverse point location.

3.3.1 Flue Gas Parameters

The expected flue gas parameters at this location are as follows:

Temperature: approximately 370-450 °F, load dependent
Moisture: approximately 15% v/v, fuel moisture dependent
Volumetric Flow Rate: Up to about 150,000 ACFM, load dependent





Reference Method Traverse Point Number	Distance From Inside Near Wall
1	13"
2	39"
3	65"

DRAWING NOT TO SCALE

FIGURE 3-1
SAMPLE PORT AND TRAVERSE POINT LOCATIONS

4. SAMPLING AND ANALYTICAL PROCEDURES

The purpose of this section is to detail the stack sampling and analytical procedures utilized during the test program. Table 4-1 summarizes the sampling and analytical methods.

4.1 PRE-TEST DETERMINATIONS

Preliminary test data was obtained at the sampling location. Geometry measurements were measured and recorded and traverse point distances verified. A preliminary velocity traverse was performed utilizing a calibrated "S" type pitot tube and a Dwyer inclined manometer to determine velocity profiles. Flue gas temperatures were observed with a calibrated direct readout pyrometer equipped with a chromel-alumel thermocouple. Water vapor content was based on previous test data (preliminary only).

A check for the presence or absence of cyclonic flow was conducted at the test location. The results demonstrated the location was suitable for testing with no significant turbulent flow (20 average flow angle) noted. Preliminary test data was used for nozzle sizing and sampling rate determinations for isokinetic sampling procedures.

Pre-test calibration of probe nozzles pitot tubes metering systems and temperature measurement devices were performed as specified in Section 5 of EPA Method 5 test procedures.

4.2 FORMAL TESTING

4.2.1 Gas Volumetric Flow Rate

A series of three test runs was performed for each parameter. The gas velocity was measured using EPA Methods 1 and 2. Velocity measurements were performed using an “S-type” pitot tube fastened alongside the EPA Methods 5/29 23/0010 and 201A/202 sample probes. The stack gas pressure differential was measured with inclined manometers. Flue gas temperatures were measured with calibrated digital temperature readouts equipped with chromel-alumel (type-K) thermocouples.

Table 4-1
Summary of Sampling and Analytical Methods

Sample	No. of Test Runs	Sampling Duration	Sampling Method	Sample Size	Analytical Parameters	Preparation Method	Analytical Method
Stack Gas	3	1-hr composite sample per run	Modified M26A	30-50 ft^3	HCl/Cl_2	NA	Ion Chromatography (SW846-9057)
		1 to 1.5-hr composite sample per run	M 5/29	30-50 ft^3	Particulate Metals	Desiccation Acid digestion (SW-846□ 3050A)	Gravimetric (EPA Method 5) ICP and AAS (SW-846-6010A)
		1 to 1.5-hr composite sample per run	M201A/202	30-50 ft^3	$PM_{10}/PM_{2.5}$	Desiccation	Gravimetric (EPA Method 5)
		3-hr composite sample per run	M23/M0010	> 90 ft^3	PCDD-PCDF/ Cresol Isomers	Extraction	M23/SW 846-8270
		Continuous	M3A	NA	CO_2/O_2	NA	CEM
		Continuous	M25A	NA	VOC	NA	CEM
		Concurrent	M1-4	NA	Moisture	NA	Gravimetric
					Temperature	NA	Temperature
					Velocity	NA	Pitot Tube
		1-hour observation per run	M9	NA	Opacity	NA	NA

Notes:

M5/M29	=	Combined Method 5 and Method 29 sampling train.
ICP	=	Inductively coupled plasma emission spectroscopy.
AAS	=	Atomic absorption spectroscopy.
Metals	=	Pb Ni As Mn
M23/M0010	=	Combined Method 23 and Method 0010 sampling train.

Velocity measurements and stack gas temperatures were incorporated in the isokinetic sampling trains which traverse across the stack diameter. Velocity and volumetric flow rate were used for determining the parameter mass rate calculations. Likewise moisture content was determined concurrently with each test. The moisture content of the gas stream was determined by the volume increase of the impinger water rand weight increase of the silica gel in comparison to the volume of gas sampled.

The gas stream composition [oxygen (O_2) and carbon dioxide content (CO_2)] of the flue gas was measured according to EPA Method 3A or 3/3A procedures using a Reference Method Continuous Emission Monitoring (CEM) system.

4.3 PARTICULATE AND METALS SAMPLING TRAIN

The sampling train utilized to perform the particulate and metals sampling was an EPA Reference Method 5/29 train (see Figure 4-1).

A calibrated glass nozzle was attached to a heated (~250°F) borosilicate probe. The probe was connected to a heated (~250°F) borosilicate filter holder containing a 9-centimeter (cm) quartz filter (preweighed to a constant 0.1 milligram (mg) weight). The filter holder was connected to the first of four impingers by means of rigid glass connectors. The first moisture knockout impinger (if used) was dry. The second and third impingers each contained 100 ml of nitric acid (HNO_3)/hydrogen peroxide (H_2O_2) solution and the fourth impinger contained 300 grams (g) of dry silica gel. The third impinger was a standard Greensburg-Smith type while all other impingers were of a modified design. All impingers were maintained in an ice bath. A control console with a leakless vacuum pump a calibrated dry gas meter a calibrated orifice and inclined manometers were connected to the final impinger via an umbilical cord to complete the train.

During particulate/metals sampling gas stream velocities were measured by inserting a calibrated "S"-type pitot tube into the gas stream adjacent to the sampling nozzle. The velocity pressure differential was observed immediately after positioning the nozzle at each traverse point and the sampling rate was adjusted to maintain isokineticity ± 10 percent. Flue gas temperature was monitored at each point with a calibrated pyrometer and thermocouple.

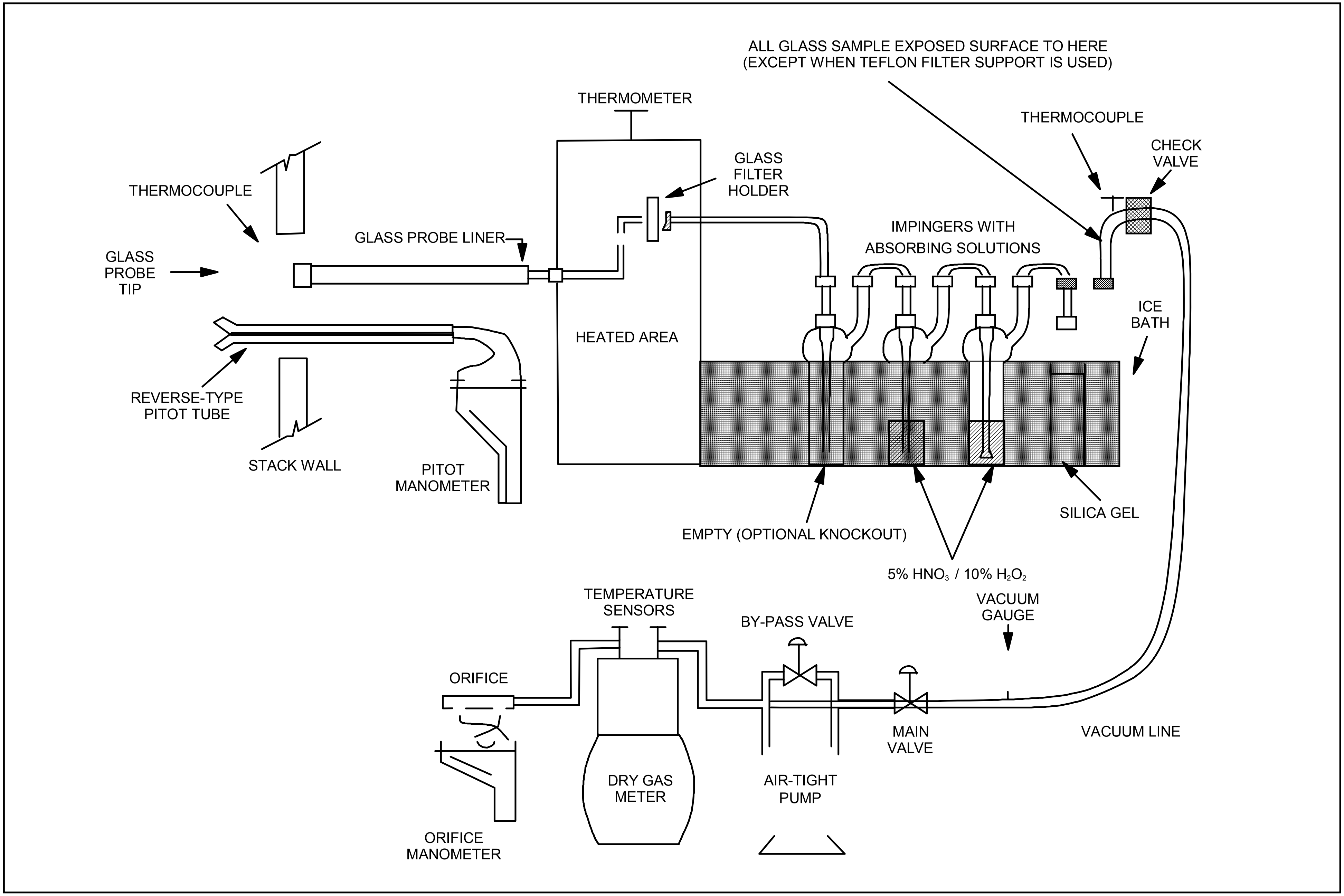


FIGURE 4-1
EPA METHOD 5/29
PARTICULATE AND METALS SAMPLING TRAIN

IASDATA\LWEC\14464.007.004\FIGURE 4-1 EPA5- 29

Probe filter box and impinger exit gas temperatures were monitored with a calibrated direct readout pyrometer equipped with chromel-alumel thermocouples positioned in the heated filter chamber and in the sample gas stream after the last impinger.

Isokinetic test data was recorded at each traverse point during all test periods. Leak checks were performed on the sampling apparatus according to reference method instructions prior to and following each run and/or component change.

4.3.1 Particulate and Metals Sample Recovery

At the conclusion of each test the sampling train was dismantled the openings sealed and the components transported to the field laboratory.

A consistent procedure was employed for sample recovery as follows:

1. The quartz fiber filter(s) was removed from its holder with tweezers and placed in its original container (petri dish) along with any loose particulate and filter fragments (Sample type 1).

2. The probe and nozzle were separated and the particulate rinsed with acetone into a borosilicate container with a Teflon-lined closure while brushing with a non-metallic (Teflon) brush a minimum of three times. Particulate adhering to the brush was rinsed with acetone into the same container. The front-half of the filter holder and connecting glassware were rinsed with acetone while brushing a minimum of three times. The acetone rinses were combined in a borosilicate container and sealed with a Teflon-lined closure (Sample type 2). A separate 0.1N HNO_3 acid rinse of the probe nozzle front-half of the filter holder and connecting glassware was performed after the acetone rinse. The 0.1N HNO_3 rinses were combined and sealed with a Teflon-lined closure (Sample type 3).

3. The total volume of HNO_3/H_2O_2 and condensate in impingers 1 2 and 3 was measured to the nearest ml and the value recorded. The liquid was then placed in a borosilicate container along with a 100-ml HNO_3 rinse of the impingers connectors and back half of the filter holder. The container was sealed with a Teflon-lined closure (sample type 4).

4. The silica gel was removed from the last impinger and immediately weighed to the nearest 0.1 g.

5. Samples of acetone and 0.1 N HNO_3 acid and HNO_3/H_2O_2 were retained for blank analysis.

Each sample bottle was labeled to clearly identify its contents. The height of the fluid level was marked on each bottle. Sample integrity was assured by maintaining chain-of-custody records.

4.3.2 Particulate Analysis

The particulate analysis proceeded as follows:

1. The filters (Sample type 1) and any loose fragments were desiccated for 24-hours and weighed to the nearest 0.1 mg to a constant (± 0.5 mg) weight.
2. The front-half acetone wash samples (Sample type 2) and an acetone blank were evaporated at ambient temperature and pressure in tared beakers then desiccated and weighed to constant 0.5-mg weight.

The total weight of material measured in the acetone-rinse fraction plus the weight of material collected on the quartz filter represents the total particulate catch. Blank corrections were made where appropriate for all sample weights.

Following the gravimetric particulate analysis of the filter the sample was analyzed for metals. Likewise upon completion of the gravimetric analysis of the front-half acetone samples the residue was resolubilized with 0.1 N HNO_3 and combined with the front half nitric sample for metals analysis.

4.3.3 Metals Analysis

Samples collected for metals analysis were contained in three different media:

- Front Half Nitric Acid (including resolubilized particulate residue for front-half acetone samples)
- Filter (following particulate analysis)
- Back Half Nitric Acid

The front half nitric acid and particulate filter samples were combined with the back half nitric acid impingers and condensate in the laboratory for analysis. The metals were solubilized by the addition of nitric acid and 30% H_2O_2. Sample volume was reduced to 50 ml on a hot plate. The sample was brought to 300 ml final volume and analyzed for Atomic Absorption Spectroscopy (AAS) and Inductively Coupled Argon Plasma (ICP) metals.

Following digestion the metals samples were ready for analysis by ICP-AAS.

4.4 EPA METHOD 26A (MODIFIED) – HYDROGEN CHLORIDE/CHLORINE SAMPLING TRAIN

The sampling train utilized to perform the hydrogen chloride sampling was configured as an EPA Reference Method 26A full-size sampling train except there was no borosilicate nozzle attached to the sample probe (see Figure 4-2). This modification was implemented to allow non isokinetic sampling from a single traverse point similar to EPA Method 26. A heated (≥248 F) borosilicate probe was attached to a heated (≥248 F) borosilicate filter holder containing a 9-cm quartz filter. The filter folder was connected to the first of six impingers by means of rigid glass connectors. The first moisture knockout impinger contained 50 ml of 0.1 normal sulfuric acid. The second and third impingers each contained 100 ml of 0.1 N sulfuric acid. The fourth and fifth impingers each contained 100 ml of 0.1 N sodium hydroxide and the sixth impinger contained 300 grams of dry silica gel. The second and third impingers were a standard Greenburg-Smith type and all other impingers were of a modified design. All impingers were maintained in an ice bath. A control console with a leakless vacuum pump a calibrated dry gas meter a calibrated orifice and inclined manometers was connected to the final impinger via an umbilical cord to complete the train. Probe filter box and impinger exit gas temperatures were monitored with a calibrated direct read-out pyrometer equipped with a chromel-alumel thermocouples.

Sampling was conducted in conjunction with the isokinetic sample trains and continuous monitoring parameters and these stack gas velocities and stack gas composition (O_2/CO_2 content) were used to determine hydrogen chloride/chlorine mass rates.

4.4.1 Hydrogen Chloride/Chlorine Sample Recovery

At the conclusion of each test the sampling train is dismantled the openings sealed and the components are transported to the field laboratory.

A consistent procedure was employed for sample recovery as follows:

1. The quartz fiber filter or thimble was removed from its holder with tweezers and discarded.

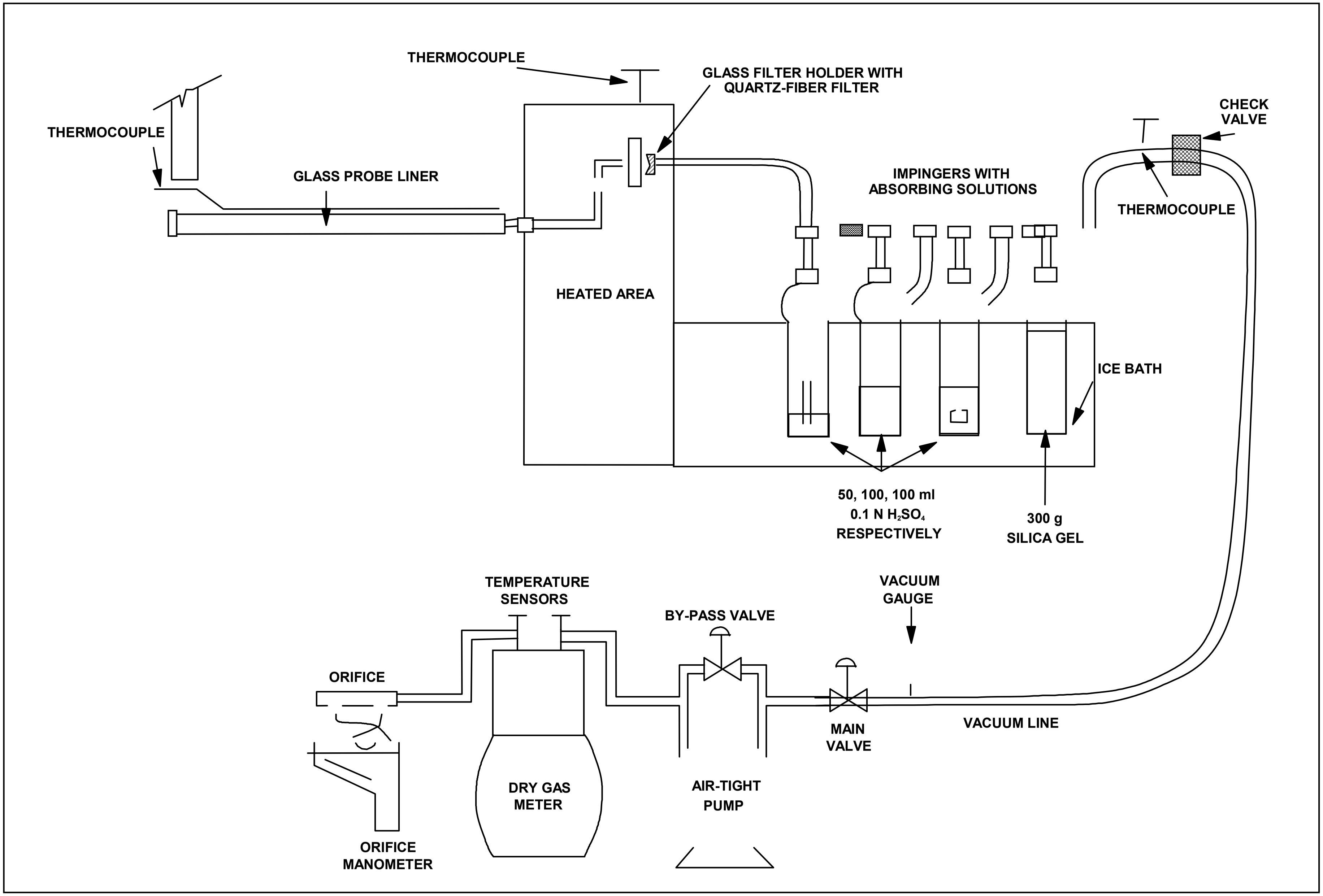


FIGURE 4-2
EPA METHOD 26A (MODIFIED)
HYDROGEN CHLORIDE AND CHLORINE SAMPLING TRAIN

IASDATA\LWEC\14464.007.004\FIGURE 4-2 EPA 26

2. The total liquid content of impingers one two and three (0.1 N H_2SO_4) was measured and the sample placed in a polyethylene container fitted with a Teflon-lined closure (Sample type 1). Also included in this sample was distilled water rinse of the impingers and connectors. The sample was labeled for chloride analysis.

3. The total liquid content of impingers four and five (0.1 N NaOH) were measured and the sample placed in a polyethylene container fitted with a Teflon-lined closure (Sample type 2). Also included in this sample was a distilled water rinse of the impingers and connectors. The sample was labeled for chlorine analysis. Sodium thiosulfate was added to the NaOH samples as a preservative per Method 26A procedures.

4. The silica gel impinger was immediately weighed to the nearest 0.5 g.

5. Samples of sulfuric acid sodium hydroxide and distilled water used for this program were retained for blank analysis.

Each sample bottle was labeled to clearly identify its contents. The height of the fluid level was marked on each bottle. The samples were then transported to the subcontract laboratories. Sample integrity was assured by maintaining chain-of-custody records.

4.4.2 Hydrogen Chloride Analysis

The samples from the H_2SO_4 impingers were analyzed for chloride (Cl^-) by the procedures outlined in EPA SW-846 Method 9057 (ion chromatography) and reported as HCl. The samples from the NaOH impingers were analyzed for chlorine (Cl_2) by the procedures outlined in EPA SW846 Method 9057 (ion chromatography) and reported as chlorine.

4.5 EPA METHOD 23/EPA SW846 METHOD 1 - PCDD/PCDF AND CRESOL SAMPLING TRAIN

The test train utilized to perform the polychlorinated dibenzo-p-dioxins/polychlorinated dibenzo furans (PCDD/PCDF) and the cresol isomers sampling was conducted using a combined EPA Method 23 and EPA SW846 Method 0010 sample train (see Figure 4-3).

A borosilicate nozzle was attached to a heated (~250°F) borosilicate probe. The probe was connected directly to a heated borosilicate filter holder containing a solvent extracted

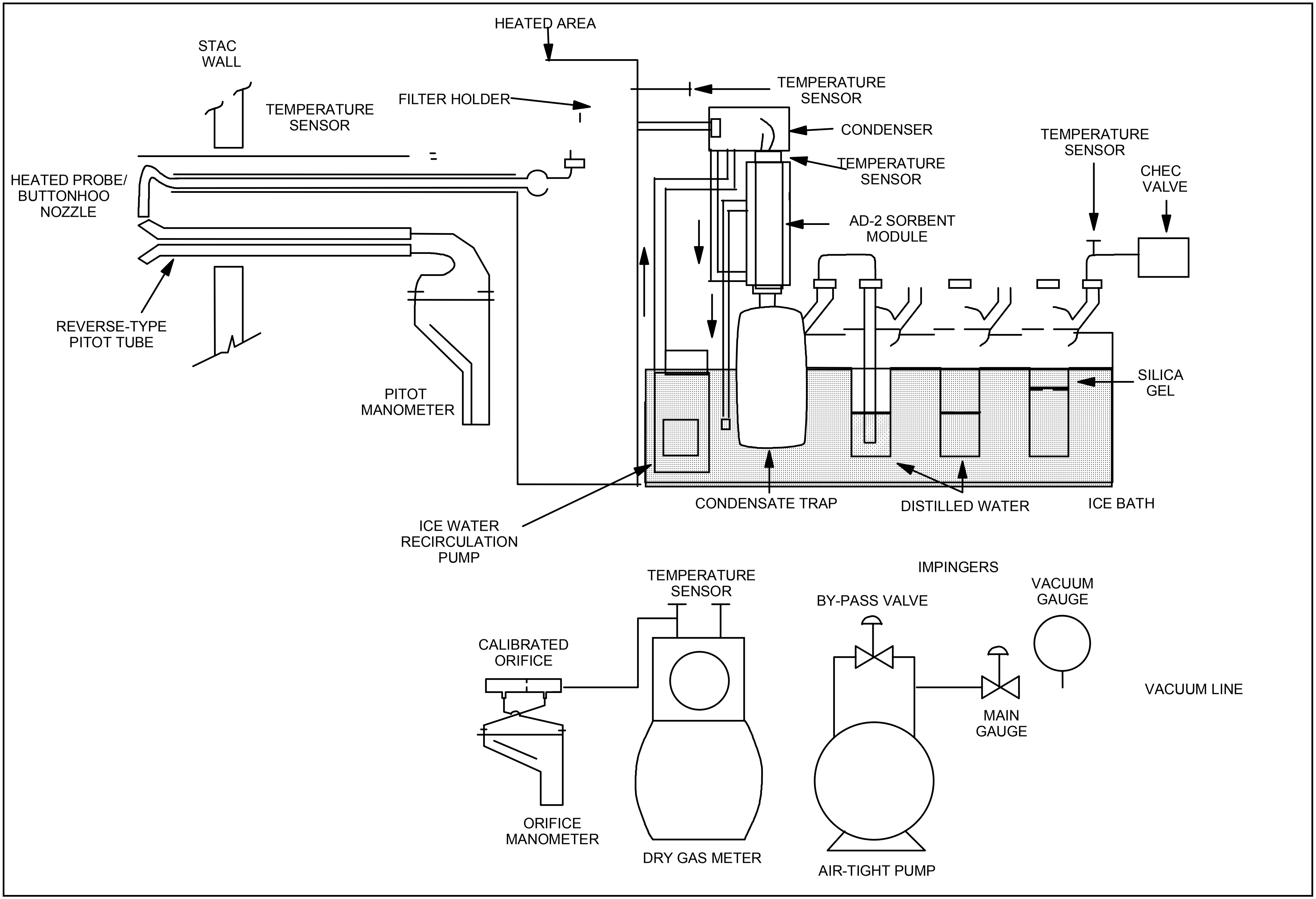


FIGURE 4-3
EPA METHOD 23/ EPA SW846 METHOD 1
PCDD/PCDFAND CRESOL SAMPLING TRAIN

IASDATA\LWEC\14464.007.004\FIGURE 4-3 EPA METHOD 23 glass fiber filter. A section of borosilicate tubing joined the filter holder exit to a spiral type ice water-cooled condenser an ice water-jacketed sorbent module containing approximately 40 g of 30/60 mesh XAD-2 resin. A thermowell is located on the outlet of the condenser so the XAD module inlet temperature is monitored. The XAD module was connected to a condensate trap followed by a series of three impingers. The first two impingers each contained 100-ml of high purity distilled water. The final impinger contained 300 g of dry pre-weighed silica gel. All impingers and the condensate trap were maintained in an ice bath. A control console with a leakless vacuum pump a calibrated orifice and dual inclined manometers was connected to the final impinger via an umbilical cord to complete the sample train.

During PCDD/PCDF and cresol sampling gas stream velocities were measured by inserting a calibrated "S"-type pitot tube into the gas stream adjacent to the sampling nozzle. The velocity pressure differential was observed immediately after positioning the nozzle at each traverse point and the sampling rate was adjusted to maintain isokineticity ± 10 percent. Flue gas temperature was monitored at each point with a calibrated pyrometer and thermocouple. Probe filter box XAD module and impinger exit gas temperatures were monitored with a calibrated direct readout pyrometer equipped with chromel-alumel thermocouples. The thermocouples were positioned in the heated filter chamber and between the condenser and XAD module and after the last impinger.

Isokinetic test data was recorded at each traverse point during all test periods. Leak checks were performed on the sampling apparatus according to reference method instructions prior to and following each run, and/or component change.

4.5.1 EPA Method 23/EPA SW846 Method 1 - PCDD/PCDF and Cresol Sample Recovery

At the conclusion of each test the sampling train was dismantled the openings sealed and the components transported to the field laboratory.

A consistent procedure was employed for sample recovery:

1. The foil covered XAD-2 module was sealed, labeled and placed in an ice-cooled chest (sample type 1).

2. The glass fiber filter was removed from its holder with tweezers and placed in a borosilicate container with a Teflon-lined closure along with any loose particulate and filter fragments (sample type 2).

3. The particulate adhering to the internal surfaces of the nozzle probe and front half of the filter holder were rinsed with acetone into a borosilicate container while brushing a minimum of three times until no visible particulate remained. Particulate adhering to the brush was rinsed with acetone into the same container. The container was sealed with a Teflon®-lined closure (sample type 3).

4. The components from the aforementioned step were rinsed with methylene chloride while brushing. The solvent was added to Sample Type 3.

5. The volume of liquid collected in the condensate trap was measured the value recorded and the contents poured into a glass sample bottle along with deionized water rinse of the back-half of the filter holder connectors condenser coil and condensate trap. The borosilicate sample container was capped with a Teflon-lined closure (sample type 4). The train components in the aforementioned step were washed with acetone followed by methylene chloride and the solvent rinses placed in a separate borosilicate container with a Teflon-lined closure (sample type 5).

6. The volume of liquid in impingers one and two was measured the values recorded.

7. All Method 23 test train components up to the exit of the condenser were rinsed with toluene. The toluene rinse was placed in a borosilicate sample container capped with a Teflon lined closure (sample type 6).

8. The silica gel in the third and final impinger was weighed and the weight gain value recorded.

9. Site blank samples of the solvents XAD-2 module filter and distilled water were retained for analysis.

Each container was labeled to clearly identify its contents. The height of the fluid level was marked on the container of each liquid sample to provide a reference point for a leakage check after transport.

4.5.2 EPA Method 23 - PCDD/PCDF Sample Analysis

The front-half solvent wash filter XAD-2 resin back-half solvent and toluene rinse contents were extracted. The extracts were combined into a train total composite extract and analyzed as per the procedures outlined in EPA Method 23 utilizing high resolution capillary column GC/high resolution mass spectrometry (MS) procedures.

4.5.3 EPA SW846 Method 1 – Cresol Sample Analysis

General analysis for cresol isomers followed the analytical procedures summarized below. Refer to SW 846 Method 8270 for detailed specifications of this analysis procedure. Analysis was limited to three target cresol isomers; m-cresol o-cresol and p-cresol.

First each front-half wash sample is concentrated to 1-5 ml using a rotary evaporator apparatus. The sample container is rinsed three times with methylene chloride added to the concentrated solution and concentrated further to near dryness.

The above concentrate is added to the filter and XAD-2 resin in a soxhlet apparatus that contained a precleaned glass extraction thimble and silica gel. Internal standards are added covered with a plug of precleaned glass wool and refluxed with toluene for 16 hours. The extract is transferred using three 10-ml rinses of toluene to a rotary evaporator concentrated to approximately 8 ml and reduced to l ml under nitrogen stream. The sample is split in half one split is analyzed and the second archived.

The back-half impinger solvent rinse is concentrated to 2 ml using a rotary evaporator then added to the impinger water/condensate sample. Following solvent addition the sample is spiked with the appropriate internal standards. A liquid extraction is then conducted using methylene chloride. The extract is combined with the front-half soxhlet extract for cleanup and analysis. The remaining extract is analyzed for the targeted cresol isomers utilizing GC with low-resolution MS.

Site blanks and laboratory blanks are analyzed with each group of source samples using the above procedure as QC contamination or performance checks as appropriate. All GC/MS analyses include analysis of method blank a method blank spike a matrix spike and a laboratory control standard. In addition appropriate surrogate compounds for the cresols are spiked into each XAD-2 module. Recoveries from method spikes and surrogate compounds are calculated and recorded on control charts to maintain a history of system performance.

4.6 PM_1 /$PM_{2.5}$ SAMPLING TRAIN

Particle size (PM_{10}/$PM_{2.5}$) was collected using EPA Method 201A. The sampling train also incorporated the revision to EPA 202 procedures for determination of condensible particulate also referred to as the dry impinger method (see Figure 4-4).

The sampling train consisted of the following components:

- A stainless steel nozzle with an inside diameter sized to sample isokinetically connected to a cyclonic separator.
- A PM_{10}/$PM_{2.5}$ dual stage sampling cyclone.
- A borosilicate probe equipped with a calibrated thermocouple to measure flue gas temperature and a calibrated S-type Pitot tube to measure flue gas velocity pressure.
- A heated (at stack temperature) borosilicate filter holder containing a tared quartz fiber filter.
- The pitot tube tip mounted slightly beyond the combined cyclone head assembly and at least one inch off the gas flow path to the cyclone nozzle.
- A section of borosilicate connections from the outlet of the filter holder to the water cooled coil condenser. The outlet of the condenser is connected to the first impinger.
- An impinger train consisting of four impingers. The first two impingers were empty and have a short stem and modified stem respectively. The third impinger was of a standard design and contained 100 ml of distilled water. The fourth impinger contained 300 grams of dry preweighed silica gel.
- An untared Teflon filter and glass filter holder was located between the second (dry) impinger and the third impinger. The filter exit temperature was monitored and maintained between 65°F and 85°F.
- A vacuum hose with adapter to connect the outlet of the impinger train to a control module.
- A control module containing a 3-cfm carbon vane vacuum pump (sample gas mover) a calibrated dry gas meter (sample gas volume measurement device) a calibrated orifice (sample gas flow rate monitor) and inclined manometers (orifice and gas stream pressure indicators).
- A switchable calibrated digital pyrometer to monitor flue and sample gas temperatures.

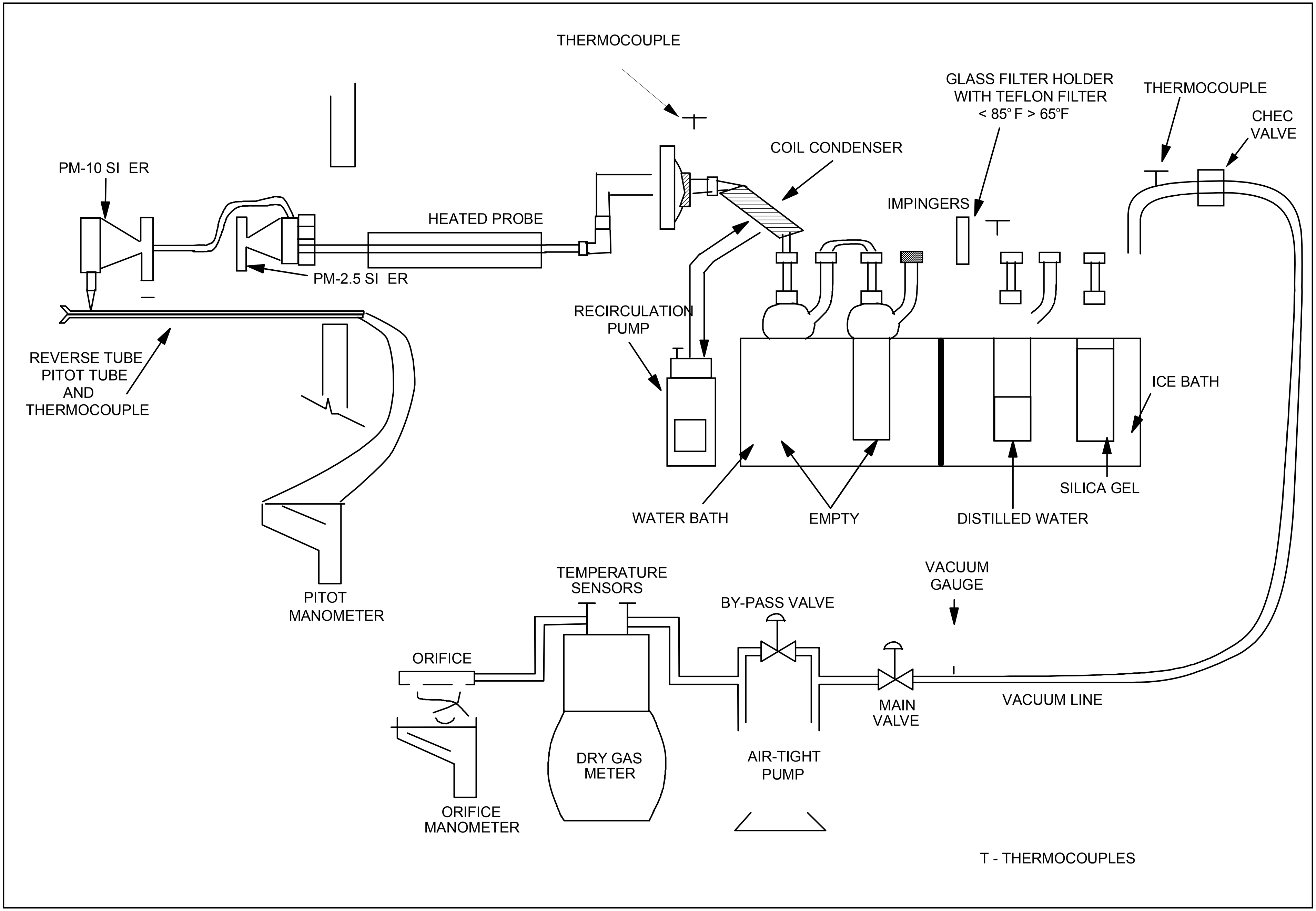


FIGURE 4-4
EPA METHOD 2 1A (PM_1 /$PM_{2.5}$) / 2 2 SAMPLING TRAIN

IASDATA\LWEC\14464.007.004\FIGURE 4-4 METHOD 201A-202

Leak checks of the entire sampling train were performed prior to sampling. At test completion a final leak check was performed at the sample probe inlet. Per EPA 201A procedures no leak check of the PM_{10}/$PM_{2.5}$ cyclone and filter housing was performed at test completion. This is to minimize particle bypass through the cyclone during the leak check.

During PM_{10}/$PM_{2.5}$ flue gas velocity was measured with a calibrated S-type pitot tube (provided with extensions) fastened slightly beyond the combined cyclone head and at least one inch from nozzle. Flue gas temperature was monitored with a calibrated direct readout pyrometer equipped with a chromel-alumel (Type K) thermocouple positioned near the sampling nozzle. The probe filter box CPM filter exit and impinger exit gas temperatures were monitored with a calibrated direct readout pyrometer equipped with Type K thermocouples. The PM_{10}/$PM_{2.5}$ sample was collected at a constant rate based on stack gas conditions. The sampling time at each traverse point was adjusted based on the stack velocity measured at each point to ensure the sample is collected isokinetically.

4.6.1 PM_1 /$PM_{2.5}$ SAMPLE RECOVERY

At the conclusion of each PM_{10}/$PM_{2.5}$ test the sampling train was dismantled. The openings sealed and the components transported to the field laboratory.

Following test completion and prior to the start of sample recovery the impinger portion of the EPA 201A/202 train was purged with nitrogen at a minimum of 14 liters per minute for 60 minutes. The CPM filter was maintained between 65°F and 85°F during the purge. This purge is to expel any dissolved sulfur dioxide.

A consistent procedure was employed for sample recovery:

1. The pre-weighed quartz fiber filter was removed from the borosilicate filter housing with tweezers and placed in its original container (petri dish) along with any loose particulate and filter fragments (sample type 1).

2. The particulate adhering to the internal surfaces of the nozzle and PM_{10} cyclone were rinsed with acetone into a borosilicate container while brushing a minimum of three times until no visible particulate remained. Particulate adhering to the brush was rinsed with acetone into the same container. The container was sealed with a Teflon lined closure (sample type 2-PM greater than 10 m).

3. The particulate adhering to the internal surfaces of the PM_{10} cyclone exit connecting tube and the internal surfaces of the $PM_{2.5}$ cylcone was rinsed with acetone into a borosilicate container while brushing a minimum of three times until no visible particulate remained. Particulate adhering to the brush was rinsed with acetone into the same container. The container was sealed with a Teflon lined closure (sample type 3-PM less than 10 m but greater than 2.5 m).

4. The particulate adhering to the internal surfaces of the $PM_{2.5}$ cyclone to filter holder connecting tube ($PM_{2.5}$ cyclone exit) and filter holder was rinsed with acetone into a borosilicate container while brushing a minimum of three times with no visible particulate remained. Particulate adhering to the brush was rinsed with acetone into the same container. The container was sealed with a Teflon-lined closure (sample type 4-PM less than 2.5 m).

5. Following completion of the nitrogen purge the total liquid content of impingers one and two were measured volumetrically or gravimetrically and the sample placed in a borosilicate container (sample type 5).

6. The coil condenser the first two impingers the back half of the filterable particulate filter holder the front half of the condensable filter housing and the connectors were rinsed twice with distilled water. The rinsate was added to sample type 5.

7. The coil condenser the first two impingers the back half of the filterable particulate filter holder the front half of the condensable filter housing and the connectors were rinsed twice with acetone and hexane. The rinses were placed in a borosilicate container with Teflon-lined closure (sample type 6).

8. The Teflon filter (CPM filter) located between impingers 2 and 3 was removed from its filter holder and placed into a petri dish or borosilicate container (sample type 7).

9. The total liquid content of impinger three was measured volumetrically and discarded.

10. The silica gel was removed from the last impinger and immediately weighed to the nearest one-tenth gram. The weight gain was recorded.

11. Acetone $PM_{2.5}$ filter distilled water and hexane blank samples were placed into a borosilicate/Teflon container or petri dish and sealed for gravimetric analysis.

Each container was labeled to clearly identify its contents. The height of the fluid level was marked on the container of each liquid sample to determine whether or not leakage occurred during transport.

4.6.2 Filterable PM_1 /$PM_{2.5}$ (EPA 2 1A) Analysis

- The filters and any loose fragments were desiccated for 24 hours and weighed to the nearest 0.1 mg to a constant weight of no more than 0.5 mg between 2 consecutive weighings with no less than six hours of desiccation time between weighings.
- The front-half acetone wash samples (nozzle/PM_{10} cyclone rinse PM_{10} cyclone exit/$PM_{2.5}$ cyclone rinse and $PM_{2.5}$ exit/filter holder rinse) were evaporated at ambient temperature and pressure in tared beakers and then desiccated to constant weight to the nearest 0.1 mg.
- A blank sample of acetone and a filter was analyzed along with the PM_{10}/$PM_{2.5}$ source samples.

The residue weight of the nozzle PM_{10}/cyclone rinse sample represents the particulate catch greater than 10 microns (PM_{10}). The PM cyclone exit $PM_{2.5}$ cyclone rinses represent the particulate catch less than 2.5 microns (PM_{10}) The $PM_{2.5}$ filter holder rinse sample plus the filter residue represents the filterable particulate catch less than and equal to 2.5 microns ($PM_{2.5}$).

4.6.3 Condensable Particulate (EPA 2 2) Analysis

- The total volume of sample type 5 was measured.
- The Teflon filter was extracted (rinsed).
- The remaining contents of sample type 5 and the acetone/hexane rinse (sample type 6) were combined in a separatory funnel. After mixing the organic phase was removed and retained in a tared beaker. Two separate additions of 75 ml of hexane were added to the separatory funnel and removed (following mixing and separation) to the tared beaker. The organic fraction was evaporated at room temperature and desiccated to the nearest 0.1 mg to a constant weight.
- The resulting water (inorganic fraction) was placed in a tared beaker and taken to near dryness (~ 50 ml) on a hot plate and then evaporated to dryness in an oven at 105°C.

The total of the organic and inorganic fractions represent the condensible particulate catch. The total PM_{10}/$PM_{2.5}$ includes the filterable PM_{10}/$PM_{2.5}$ catch plus the organic and inorganic condensables.

4.7 CONTINUOUS EMISSIONS MONITORING SYSTEM

A diagram of the reference method sampling system used to measure VOC and O_2/CO_2 is presented in Figure 4-5. The system conformed to the requirements of EPA Reference Methods 25A and 3A. A flame ionization analyzer was used to measure VOC concentrations. A non□

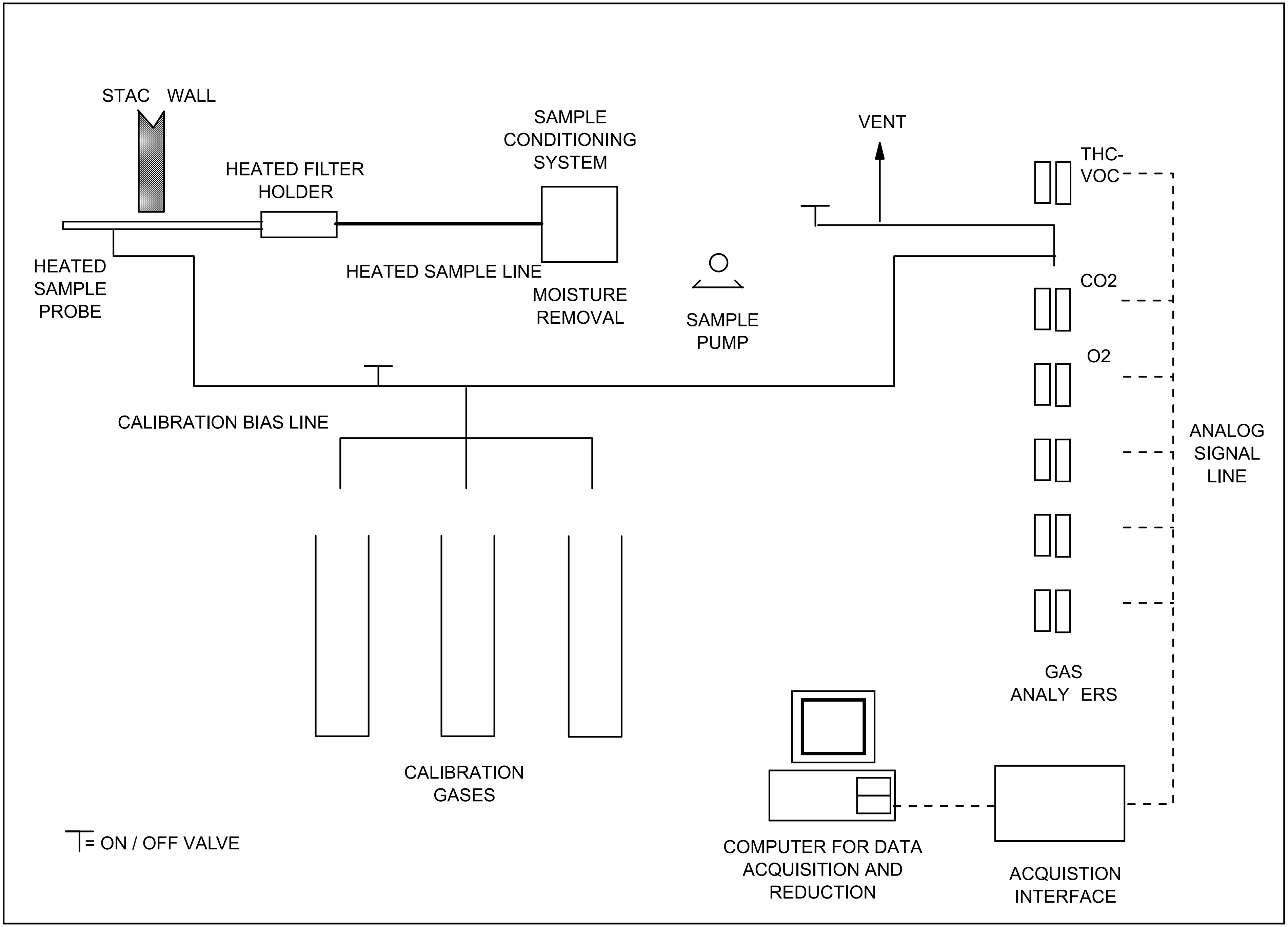


FIGURE 4-5
WESTON CEM SAMPLING SYSTEM

IASDATA\LWEC\14464.007.004\FIGURE 4-5 WESTON SAMPLING SYSTEM dispersive infrared (NDIR) analyzer was used to measure CO_2 and a paramagnetic analyzer was used to measure O_2 concentrations.

Stack gas was withdrawn from the stack through a heated stainless steel probe and heated filter via a heated sample line maintaining a temperature of 250°F. The probe was inserted into a dedicated sample port at a single point in the gas stream. The outlet of the heated sample line was connected to a sample conditioning system for moisture removal. The clean dried sample was then transported to the O_2 and CO_2 analyzers via a Teflon® sample line. The VOC sample was drawn directly to the flame ionization analyzer from a "T" located before the sample conditioners. The flame ionization analyzers measures VOC on a wet basis. A separate Teflon® line was used for introduction of VOC and O_2/CO_2 bias gases to the probe outlet.

4.7.1 VOC and O_2/CO_2 Monitoring Procedures

The VOC and O_2/CO_2 analyzers were calibrated daily by introduction of EPA Protocol calibration gases to the analyzers. After the analyzer calibration a system bias check was conducted by introducing a zero gas (zero air or nitrogen) and one selected VOC and O_2/CO_2 calibration gas to the sample probe outlet. The bias check was repeated at the end of each test run to determine sampling system bias and instrument drift for each analyzer.

The interference checks on WESTON's O_2/CO_2 instrumental analyzers were previously performed (December 2014) in accordance with EPA Method 7E and were not repeated for this test program.

Additionally an O_2 stratification check was performed prior to the test effort in accordance with EPA Method 7E – Section 8.1.2. Sampling during formal testing was performed at a single point based on the results of the stratification test (5% difference for each traverse point compared to the average result).

Three formal test runs of one hour or longer duration coincided with the isokinetic sample runs in order to correct wet concentrations to a dry basis and calculate mass rates in terms of lb/hr.

The output from the analyzers was directed to a data acquisition system and recorded by a computer equipped with data reduction software designed by WESTON. The software calculated the average one-minute measured concentrations which were used to compute an average concentration for the test run.

4.8 OPACITY

Opacity was determined by a certified visible emissions (VE) evaluator pursuant to EPA Reference Method 9. A 60-minute opacity observation (3 total) was conducted in conjunction with each EPA 5/29 and 201A/202 test train pairing. General procedures related to EPA 9 are presented below:

- A qualified observer stood at a distance to provide a clear view of the emissions with the sun oriented in the 140° sector to his/her back.
- The observers' line of vision was perpendicular to the plume direction.
- The observer recorded all pertinent atmospheric conditions and pertinent site information.
- Opacity observations were made at the point of greatest opacity of the plume and at a point without condensed water vapor.
- The exhaust plume was observed in 15 second intervals to make a reading for a minimum of 240 readings per 60-minute period. The reported % opacity was calculated as the average of the 240 consecutive observations.

5. FUEL SAMPLING AND ANALYSIS

LWEC fuel is supplied by M.A. Energy Resources LLC (MAER). MAER operates a fuel aggregation facility where raw materials are processed then conveyed to the facility.

As required by the 114 Request fuel samples were collected during the test program during each test run in accordance with 40 CFR 63 Subpart 7521(c and d). LWEC designated personnel to collect fuel samples at least twice per run (approximately beginning and mid-point) from a point where each fuel drops onto the conveyor belt feeding the boiler. A composite sample of each fuel type per test run was submitted for analysis.

Prior to the stack test program LWEC personnel collected samples of each fuel fired in the boiler on fifteen separate occasions (19 May – 2 June 2016).

The stack test composites and all fuel samples collected prior to formal testing were submitted for analysis as listed in Table 5-1.

Table 5-1
Fuel Sample Analytical Methods

Fuel Type	Required Analysis	Analytical Methods	Minimum Detection Level
TDF	Moisture Content	ASTM D3173 *"Standard Test Method for Moisture in the Analysis Sample of Coal and Coke"*	Not Applicable
	Chlorine Concentration	EPA 5050/9056 *"Determination of Inorganic Anions by Ion Chromatography"*	~50 ppm
	Sulfur Concentration	ASTM D4239 *"Standard Test Method for Sulfur in the Analysis Sample of Coal and Coke Using High-Temperature Tube Furnace Combustion"*	0.02 weight %
Wood	Moisture Content	ASTM D3173 *"Standard Test Method for Moisture in the Analysis Sample of Coal and Coke"*	Not Applicable
	Chlorine Concentration	EPA 5050/9056 *"Determination of Inorganic Anions by Ion Chromatography"*	~50 ppm
	Sulfur Concentration	ASTM D4239 *"Standard Test Method for Sulfur in the Analysis Sample of Coal and Coke Using High-Temperature Tube Furnace Combustion"*	0.02 weight %
Creosote Ties	Moisture Content	ASTM D3173 *"Standard Test Method for Moisture in the Analysis Sample of Coal and Coke"*	Not Applicable
	Chlorine Concentration	EPA 5050/9056 *"Determination of Inorganic Anions by Ion Chromatography"*	~50 ppm
	Sulfur Concentration	ASTM D4239 *"Standard Test Method for Sulfur in the Analysis Sample of Coal and Coke Using High-Temperature Tube Furnace Combustion"*	0.02 weight %

6. QUALITY ASSURANCE/QUALITY CONTROL

6.1 QUALITY CONTROL PROCEDURES

As part of the compliance test WESTON implemented a QA/QC program. QA and QC are defined as follows:

- Quality Control: The overall system of activities whose purpose is to provide a quality product or service: for example the routine application of procedures for obtaining prescribed standards of performance in the monitoring and measurement process.

- Quality Assurance: A system of activities whose purpose is to provide assurance that the overall quality control is being done effectively. Further

The field team manager for stack sampling was responsible for implementation of field QA/QC procedures. Individual laboratory managers were responsible for implementation of analytical QA/QC procedures. The overall project manager oversaw all QA/QC procedures to ensure that sampling and analyses met the QA/QC requirements and that accurate data resulted from the test program.

6.2 GAS STREAM SAMPLING QA PROCEDURES

General QA checks were conducted during testing and apply to all methods including the following:

- Performance of leak checks.
- Use of standardized forms labels and checklists.
- Maintenance of sample traceability.
- Collection of appropriate blanks.
- Use of calibrated instrumentation.
- Review of data sheets in the field to verify completeness.
- Use of validated spreadsheets for calculation of results.

The following section details specific QA procedures applied to the isokinetic methods.

6.2.1 Stack Gas Velocity/Volumetric Flow Rate QA Procedures

The QA procedures followed for velocity/volumetric flow rate determinations followed guidelines set forth by EPA Method 2. Incorporated into this method were sample point determinations by EPA Method 1 and gas moisture content determination by EPA Method 4. QA procedures for Methods 1 and 2 are discussed below.

Volumetric flow rates were determined during the isokinetic flue gas tests. The following QC steps were followed during these tests:

- The S-type pitot tube was visually inspected before sampling.
- Both legs of the pitot tube were leak checked before sampling.
- Proper orientation of the S-type tube was maintained while making measurements. The yaw and pitch axes of the S-type pitot tube were maintained at 90° to the flow.
- The manometer oil was leveled and zeroed before each run.
- Pitot tube coefficients were determined based on physical measurement techniques as delineated in Method 2.

6.2.2 Moisture and Sample Gas Volume QA Procedures

Gas stream moisture was determined as part of the isokinetic test trains. The following QA procedures were followed in determining the volume of moisture collected:

- Preliminary impinger train tare weights were weighed or measured volumetrically to the nearest 0.1 g or 1.0 ml.
- The balance was leveled and placed in a clean motionless environment for weighing.
- The indicating silica gel was fresh for each run and periodically inspected and replaced during runs if needed.
- The silica gel impinger gas temperature was maintained below 68°F.

The QA procedures that were followed in regards to accurate sample gas volume determination were:

- The dry gas meter was fully calibrated annually using an EPA approved intermediate standard device.

- Pre-test port-change and post-test leak-checks were completed (must be less than 0.02 cfm or 4 percent of the average sample rate).
- The gas meter was read to the thousandth of a cubic foot for all initial and final readings.
- Readings of the dry gas meter meter orifice pressure (Delta H) and meter temperatures were taken at every sampling point.
- Accurate barometric pressures were recorded at least once per day.
- Pre- and Post-test dry gas meter checks were completed to verify the accuracy of the meter calibration constant (Y).

6.2.3 Isokinetic Sampling Train QA Procedures

The Quality Assurance procedures outlined in this section were designed to ensure collection of representative, high quality test parameter (HCl/HF) concentrations and mass emissions data. The sampling QA procedures followed to ensure representative measurements were:

- All glassware was prepared per reference method procedures.
- The sample rates were within ± 10 percent of the true isokinetic (100 percent) rate.
- All sampling nozzles were manufactured and calibrated according to EPA standards.
- Recovery procedures were completed in a clean environment.
- Sample containers for liquids and filters were constructed of borosilicate or polyethylene with Teflon®-lined lids.
- At least one reagent blank of each type of solution or filter was retained and analyzed.
- All test train components from the nozzle through the last impinger were constructed of glass (with the exception of the filter support pad which is Teflon®).
- All recovery equipment (i.e. brushes graduated cylinders etc.) were non-metallic.

6.2.4 Sample Identification and Custody

Sample custody procedures for this program were based on EPA recommended procedures. Since samples were analyzed at remote laboratories the custody procedures emphasized careful documentation of sample collection and field analytical data and the use of chain-of-custody records for samples being transferred. These procedures are discussed below.

The Field Team Manager was responsible for ensuring that all stack samples taken were accounted for and that all proper custody and documentation procedures were followed for the field sampling and field analytical efforts. The Field Team Manager was assisted in this effort by key sampling personnel involved in sample recovery.

Following sample collection all stack samples were given a unique sample identification code. Stack sample labels were completed and affixed to the sample container. The sample volumes were determined and recorded and the liquid levels on each bottle were marked. Sample bottle lids were sealed on the outside with Teflon® tape to prevent leakage. Additionally the samples were stored in a secure area until they are shipped.

As the samples were packed for travel chain-of-custody forms were completed for each shipment. The chain-of-custody forms specifying the treatment of each sample were also enclosed in the sample shipment container.

6.2.5 Data Reduction and Validation QC Checks

All data and/or calculations for flow rates moisture contents and isokinetic rates were made using a computer software program validated by an independent check. In addition all calculations were spot checked for accuracy and completeness by the Field Team Leader.

In general all measurement data was validated based on the following criteria:

- Process conditions during sampling or testing.
- Acceptable sample collection procedures.
- Consistency with expected or other results.
- Adherence to prescribed QC procedures.

Any suspect data was flagged and identified with respect to the nature of the problem and potential effect on the data quality.

6.3 REFERENCE METHOD CEMS QA/QC CHEC S

- Continuous emissions monitoring system (probe to sample conditioner) were checked for leaks prior to the testing.

- Pre and post-test calibration bias tests were performed as required by the reference methods.

- Prior to formal testing a three point stratification check using O_2/CO_2 was performed pursuant to Section 8.1.2 of EPA Method 7E. The three points (16.7 50 and 83.3 percent of the stack diameter) were each sampled for a minimum of two times the system response. Based on the stratification test results (each point compared to the mean difference was no more than ± 5.0 %) all sampling was performed at a single point at the stack midpoint.

- A permanent data record of analyzer response was made using computer software designed by WESTON.

- All calibration gases used met EPA Protocol standards.

6.4 LABORATORY AUDIT SAMPLES

Laboratory audit samples for metals (Pb Ni As Mn) and HCl were obtained from a Stationary Source Audit Sample (SSAS) provider in accordance with the EPA SSAS program. The audit samples were analyzed in conjunction with the stack samples and the laboratory report indicates passing results for all audit samples submitted.

APPENDIX A
DETAILED TEST RESULTS

A.1 Emissions Test Results

A.2 Stack Inlet Temperature Data

A.1 EMISSIONS TEST RESULTS

L'Anse Warden Electric Company
L'Anse, MI
Boiler No. 1
Summary o Particulate and Metals Test Data and Test Results

Test Data					
Test run number	1	2	3		
Location		Boiler No.1			
Date	7/6/16	7/7/16	7/7/16		
Time period	1314-1521	0840-1055	1515-1704		
F-Factor	9561	9561	9561		
SAMPLING DATA:					
Sampling duration, min.	96	96	96		
Nozzle diameter, in.	0.250	0.250	0.250		
Cross sectional nozzle area, sq.ft.	0.000341	0.000341	0.000341		
Barometric pressure, in. Hg	29.27	29.38	29.38		
Avg. orifice press. diff., in H_2O	1.64	1.71	1.81		
Avg. dry gas meter temp., deg F	92	77	71		
Avg. abs. dry gas meter temp., deg. R	552	537	531		
Total liquid collected by train, ml	274.9	268.3	257.8		
Std. vol. of H_2O vapor coll., cu.ft.	12.9	12.6	12.1		
Dry gas meter calibration factor	1.0017	1.0017	1.0017		
Sample vol. at meter cond., dcf	63.332	63.749	65.414		
Sample vol. at std. cond., dscf (1)	59.552	61.850	64.228		
Percent of isokinetic sampling	101.7	103.5	103.9		
GAS STREAM COMPOSITION DATA:					
CO_2, % by volume, dry basis	13.8	13.3	13.1		
O_2, % by volume, dry basis	6.6	7.1	7.3		
N_2, % by volume, dry basis	79.6	79.6	79.6		
Molecular wt. of dry gas, lb/lb mole	30.5	30.4	30.4		
H_20 vapor in gas stream, prop. by vol.	0.179	0.170	0.159		
Mole fraction of dry gas	0.821	0.830	0.841		
Molecular wt. of wet gas, lb/lb mole	28.2	28.3	28.4		
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:					
Static pressure, in. H_2O	-12.6	-12.4	-12.4		
Absolute pressure, in. Hg	28.34	28.47	28.47		
Avg. temperature, deg. F	437	430	434		
Avg. absolute temperature, deg.R	897	890	894		
Pitot tube coefficient	0.84	0.84	0.84		
Total number of traverse points	12	12	12		
Duct Avg. gas stream velocity, ft./sec.	65.2	65.0	66.6		
Duct cross sectional area, sq.ft.	39.000	39.000	39.000		
Stack exit avg. gas stream velocity, ft./sec.	57.5	57.4	58.8		
Stack cross sectional area, sq.ft.	44.179	44.179	44.179		
Avg. gas stream volumetric flow, wacf/min.	152549	152064	155914		
Avg. gas stream volumetric flow, dscf/min.	69828	71231	73689		
PARTICULATE LABORATORY REPORT DATA					
Front half acetone rinse, g	0.0035	0.0056	0.0033		
Filter, g	0.0020	0.0070	0.0049		
Total catch, g	0.0055	0.0126	0.0082		
PARTICULATE EMISSIONS				Average	Limit
Conc., gr/dscf	0.0014	0.0031	0.0020	0.0022	--
Mass rate, lb/hr	0.85	1.92	1.24	1.34	19.20
Mass rate, lb/MMBtu (2)	0.003	0.007	0.004	0.004	0.06
METALS MASS EMISSION RATES, lb/hr					
Arsenic (As)	< 1.24E-04	1.42E-04	1.44E-04	1.37E-04	--
Lead (Pb)	1.19E-03	1.01E-03	1.13E-03	1.11E-03	0.02
Manganese (Mn)	1.52E-03	2.89E-03	2.88E-03	2.43E-03	--
Nickel (Ni)	1.21E-03	4.72E-04	6.07E-04	7.63E-04	--

(1) - Standard conditions = 68 deg. F. (20 deg. C.) and 29.92 in Hg (760 mm Hg).
(2) - Calculated using facility provided F-factor of 9561.

L'Anse Warden Electric Company

L'Anse, MI

Boiler No. 1

Summary of PM10 and PM2.5 Test Data and Results

TEST DATA:					
Test run number	2	3	4		
Location		Boiler No. 1			
Test date	7/7/16	7/7/16	7/7/16		
Test time period	1057-1251	1513-1704	1742-1926		
SAMPLING DATA:					
Avg Sqrt Delta P, sqrt(inches H2O)	0.84955	0.87248	0.87529		
Sampling duration, min.	105.50	103.50	97.5		
Nozzle-1 diameter, in.	0.190	0.190	0.190		
Barometric pressure, in. Hg	29.38	29.38	29.38		
Avg. orifice press. diff., in H_2O	0.39	0.39	0.37		
Avg. dry gas meter temp., deg F	81.11	76.37	79.0		
Avg. abs. dry gas meter temp., deg. R	541	536	539		
Total liquid collected by train, ml	164.4	154.6	141.4		
Std. vol. of H_2O vapor coll., cu.ft.	7.74	7.28	6.66		
Dry gas meter calibration factor	0.9915	0.9915	0.9915		
Sample vol. at meter cond., dcf	36.455	36.261	33.193		
Sample vol. at std. cond., dscf (1)	34.653	34.773	31.676		
Percent of isokinetic sampling	100.9	99.62	96.1		
Particle Diam. with 50% penetration, um (PM_{10} cyclone)	10.053	9.988	10.216		
Cyclone flow rate (actual), cfm	0.713	0.722	0.699		
Particle Diam. with 50% penetration, um ($PM_{2.5}$ cyclone D50)	2.429	2.399	2.492		
Particle Diam. with 50% penetration, um ($PM_{2.5}$ cyclone D50-1)	2.425	2.394	2.491		
Ratio of Cyclone IV D50 values	1.001	1.002	1.000		
Delta P minimum, in H2O (Nozzle -1)	0.344	0.355	0.328		
Delta P maximum, in H2O (Nozzle-1)	1.190	1.222	1.150		
GAS STREAM COMPOSITION DATA:					
CO_2, % by volume, dry basis	13.1	13.2	13.3		
O_2, % by volume, dry basis	7.3	7.3	7.2		
N_2, % by volume, dry basis	79.6	79.5	79.5		
Molecular wt. of dry gas, lb/lb mole	30.39	30.40	30.42		
H_20 vapor in gas stream, prop. by vol.	0.183	0.173	0.174		
Mole fraction of dry gas	0.817	0.827	0.826		
Molecular wt. of wet gas, lb/lb mole	28.13	28.26	28.26		
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:					
Static pressure, in. H_2O	-12.40	-12.40	-12.80		
Absolute pressure, in. Hg	28.47	28.47	28.44		
Avg. temperature, deg. F	431.5	432.1	432.2		
Avg. absolute temperature, deg.R	892	892	892		
Pitot tube coefficient	0.781	0.781	0.781		
Total number of traverse points	12	12	12		
DuctAvg. gas stream velocity, ft./sec.	59.9	61.3	61.6		
Duct cross sectional area, sq.ft.	39.00	39.00	39.00		
Stack exit avg. gas stream velocity, ft./sec.	52.8	54.2	54.4		
Stack cross sectional area, sq.ft.	44.179	44.179	44.179		
Avg. gas stream volumetric flow, wacf/min.	140056	143549	144091		
Avg. gas stream volumetric flow, dscf/min. (1)	64488	66820	66946		
LABORATORY REPORT DATA (2)					
Acetone rinse greater than $PM_{2.5}$ and less than PM_{10}, g	0.0024	0.0027	0.0044		
Acetone rinse less than $PM_{2.5}$, g	0.0065	0.0030	0.0036		
Filter, g	0.0010	<0.0003	<0.0003		
H_2O Impinger (inorganic) residue, g	0.0088	0.0220	0.0200		
Solvent Impinger (organic) residue, g	0.0028	0.0036	0.0017		
Filterable $PM_{2.5}$ catch, g	0.0075	0.0030	0.0036		
Filterable PM_{10} catch, g	0.0099	0.0057	0.0080		
Total $PM_{2.5}$ catch, g	0.0191	0.0286	0.0253		
Total PM_{10} catch, g	0.0215	0.0313	0.0297		
				Average	Limit
Total $PM_{2.5}$ Emission rate, lb/hr	4.7	7.3	7.1	6.3	--
Total $PM_{2.5}$ Emission rate, lb/MMBtu (3)	0.0179	0.0266	0.0257	0.0234	--
TOTAL PM_{10} EMISSIONS					
Total PM_{10} Conc., gr/dscf	0.00957	0.01389	0.01447	0.01264	--
Total PM_{10} Emission rate, lb/hr	5.3	8.0	8.3	7.2	15.4
Total PM_{10} Emission rate, lb/MMBtu (3)	0.0201	0.0292	0.0301	0.0265	--

(1) Standard conditions = 68 deg. F. (20 deg. C.) and 29.92 inches Hg (760mm Hg).
(2) Nondetect values are labeled as "<" and are not included in emission calculations..
(3) Calculated using facility provided F-factor of 9561.

L'Anse Warden Electric Company
L'Anse, MI
Boiler No. 1
Summary o Dioxin / Furan Test Data and Test Results

TEST DATA			
Run number	1	2	3
Location		Boiler No. 1	
Date	7/6/2016	7/6/2016	7/7/016
Time period	0914-1231	1552-1907	1135-1450
SAMPLING DATA			
Sampling duration, min.	180.0	180.0	180.0
Nozzle diameter, in.	0.252	0.250	0.250
Cross sectional nozzle area, sq.ft.	0.000346	0.000341	0.000341
Barometric pressure, in. Hg	29.27	29.27	29.38
Avg. orifice press. diff., in H_2O	1.88	1.63	1.80
Avg. dry gas meter temp., deg F	87	97	77
Avg. abs. dry gas meter temp., deg. R	547	557	537
Total liquid collected by train, ml	543.4	477.6	466.3
Std. vol. of H_2O vapor coll., cu.ft.	25.58	22.48	21.95
Dry gas meter calibration factor	1.0017	1.0017	1.0017
Sample vol. at meter cond., dcf	126.625	118.288	122.983
Sample vol. at std. cond., dscf (1)	120.370	110.269	119.330
Percent of isokinetic sampling	106.5	99.6	103.1
GAS STREAM COMPOSITION DATA			
CO_2, % by volume, dry basis	13.4	13.2	13.2
O_2, % by volume, dry basis	6.9	7.1	7.3
N_2, % by volume, dry basis	79.7	79.7	79.5
Molecular wt. of dry gas, lb/lb mole	30.42	30.40	30.40
H_20 vapor in gas stream, prop. by vol.	0.175	0.169	0.155
Mole fraction of dry gas	0.825	0.831	0.845
Molecular wt. of wet gas, lb/lb mole	28.24	28.30	28.48
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA			
Static pressure, in. H_2O	-12.60	-12.60	-12.80
Absolute pressure, in. Hg	28.34	28.34	28.44
Avg. temperature, deg. F	437	434	436
Avg. absolute temperature, deg.R	897	894	896
Pitot tube coefficient	0.84	0.84	0.84
Total number of traverse points	12	12	12
Duct Avg. gas stream velocity, ft./sec.	65.7	64.8	66.5
Duct cross sectional area, sq.ft.	39.00	39.00	39.00
Stack exit avg. gas stream velocity, ft./sec.	58.0	57.2	58.7
Stack cross sectional area, sq.ft.	44.179	44.179	44.179
Avg. gas stream volumetric flow, wacf/min.	153756	151548	155498
Avg. gas stream volumetric flow, dscf/min.	70699	70374	73550
DIOXIN LABORATORY REPORT DATA, µg.			
Total TCDD	1.50E-04	5.66E-05	6.97E-05
2,3,7,8-TCDD	6.90E-06	4.70E-06	5.90E-06
Total PeCDD	2.08E-04	9.66E-05	9.02E-05
1,2,3,7,8-PeCDD	1.43E-05	9.30E-06	8.80E-06
Total HxCDD	1.10E-04	9.18E-05	5.15E-05
1,2,3,4,7,8-HxCDD	5.80E-06	5.60E-06	4.00E-06
1,2,3,6,7,8-HxCDD	1.06E-05	1.26E-05	5.60E-06
1,2,3,7,8,9-HxCDD	1.42E-05	1.29E-05	6.80E-06
Total HpCDD	8.07E-05	1.62E-04	4.07E-05
1,2,3,4,6,7,8-HpCDD	3.06E-05	8.15E-05	1.72E-05
Total OCDD	9.59E-05	2.38E-04	5.31E-05
FURAN LABORATORY REPORT DATA, µg.			
Total TCDF	7.86E-05	3.02E-05	3.05E-05
2,3,7,8-TCDF (2)	2.30E-05	1.07E-05	1.20E-05
Total PeCDF	1.70E-05	3.90E-06	7.50E-06
1,2,3,7,8-PeCDF	3.80E-06	3.90E-06	3.50E-06
2,3,4,7,8-PeCDF	4.00E-06	3.90E-06	3.70E-06
Total HxCDF	1.02E-05	5.40E-06	3.80E-06
1,2,3,4,7,8-HxCDF	5.20E-06	5.40E-06	3.80E-06
1,2,3,6,7,8-HxCDF	3.50E-06	3.70E-06	3.30E-06
2,3,4,6,7,8-HxCDF	3.90E-06	4.00E-06	3.60E-06
1,2,3,7,8,9-HxCDF	4.20E-06	4.40E-06	4.00E-06
Total HpCDF	1.04E-05	1.71E-05	3.40E-06
1,2,3,4,6,7,8-HpCDF	6.00E-06	7.70E-06	3.40E-06
1,2,3,4,7,8,9-HpCDF	4.10E-06	3.80E-06	3.30E-06
Total OCDF	7.90E-06	1.50E-05	3.80E-06

Not detected
(1) Standard conditions   68 deg. F. (20 deg. C.) and 29.92 in Hg (760 mm Hg)

L'Anse Warden Electric Company
L'Anse, MI
Boiler No. 1
Summary of Dioxin / Furan Test Data and Test Results

TEST DATA			
Run number	1	2	3
Location		Boiler No. 1	
Date	7/6/2016	7/6/2016	7/7/016
Time period	0914-1231	1552-1907	1135-1450
DIOXIN LABORATORY REPORT DATA, µg.			
Total TCDD	1.50E-04	5.66E-05	6.97E-05
2,3,7,8-TCDD	6.90E-06	4.70E-06	5.90E-06
Total PeCDD	2.08E-04	9.66E-05	9.02E-05
1,2,3,7,8-PeCDD	1.43E-05	9.30E-06	8.80E-06
Total HxCDD	1.10E-04	9.18E-05	5.15E-05
1,2,3,4,7,8-HxCDD	5.80E-06	5.60E-06	4.00E-06
1,2,3,6,7,8-HxCDD	1.06E-05	1.26E-05	5.60E-06
1,2,3,7,8,9-HxCDD	1.42E-05	1.29E-05	6.80E-06
Total HpCDD	8.07E-05	1.62E-04	4.07E-05
1,2,3,4,6,7,8-HpCDD	3.06E-05	8.15E-05	1.72E-05
Total OCDD	9.59E-05	2.38E-04	5.31E-05
DIOXIN CONCENTRATION, lb/dsc			
Total TCDD	2.75E-15	1.13E-15	1.29E-15
2,3,7,8-TCDD	1.26E-16	9.40E-17	1.09E-16
Total PeCDD	3.81E-15	1.93E-15	1.67E-15
1,2,3,7,8-PeCDD	2.62E-16	1.86E-16	1.63E-16
Total HxCDD	2.01E-15	1.84E-15	9.51E-16
1,2,3,4,7,8-HxCDD	1.06E-16	1.12E-16	7.39E-17
1,2,3,6,7,8-HxCDD	1.94E-16	2.52E-16	1.03E-16
1,2,3,7,8,9-HxCDD	2.60E-16	2.58E-16	1.26E-16
Total HpCDD	1.48E-15	3.24E-15	7.52E-16
1,2,3,4,6,7,8-HpCDD	5.60E-16	1.63E-15	3.18E-16
Total OCDD	1.76E-15	4.76E-15	9.81E-16
DIOXIN CONCENTRATION, µg/dscm.			
Total TCDD	4.40E-05	1.81E-05	2.06E-05
2,3,7,8-TCDD	2.02E-06	1.51E-06	1.75E-06
Total PeCDD	6.10E-05	3.09E-05	2.67E-05
1,2,3,7,8-PeCDD	4.20E-06	2.98E-06	2.60E-06
Total HxCDD	3.23E-05	2.94E-05	1.52E-05
1,2,3,4,7,8-HxCDD	1.70E-06	1.79E-06	1.18E-06
1,2,3,6,7,8-HxCDD	3.11E-06	4.04E-06	1.66E-06
1,2,3,7,8,9-HxCDD	4.17E-06	4.13E-06	2.01E-06
Total HpCDD	2.37E-05	5.19E-05	1.20E-05
1,2,3,4,6,7,8-HpCDD	8.98E-06	2.61E-05	5.09E-06
Total OCDD	2.81E-05	7.62E-05	1.57E-05
DIOXIN CONCENTRATION, µg/dscm. @ % O_2			
Total TCDD	4.37E-05	1.83E-05	2.11E-05
2,3,7,8-TCDD	2.01E-06	1.52E-06	1.78E-06
Total PeCDD	6.06E-05	3.12E-05	2.73E-05
1,2,3,7,8-PeCDD	4.17E-06	3.00E-06	2.66E-06
Total HxCDD	3.20E-05	2.96E-05	1.56E-05
1,2,3,4,7,8-HxCDD	1.69E-06	1.81E-06	1.21E-06
1,2,3,6,7,8-HxCDD	3.09E-06	4.06E-06	1.69E-06
1,2,3,7,8,9-HxCDD	4.14E-06	4.16E-06	2.06E-06
Total HpCDD	2.35E-05	5.23E-05	1.23E-05
1,2,3,4,6,7,8-HpCDD	8.91E-06	2.63E-05	5.20E-06
Total OCDD	2.79E-05	7.68E-05	1.61E-05
DIOXIN EMISSIONS, lb/hr.			
Total TCDD	1.17E-08	4.78E-09	5.68E-09
2,3,7,8-TCDD	5.36E-10	3.97E-10	4.81E-10
Total PeCDD	1.62E-08	8.15E-09	7.35E-09
1,2,3,7,8-PeCDD	1.11E-09	7.85E-10	7.17E-10
Total HxCDD	8.55E-09	7.75E-09	4.20E-09
1,2,3,4,7,8-HxCDD	4.51E-10	4.73E-10	3.26E-10
1,2,3,6,7,8-HxCDD	8.24E-10	1.06E-09	4.57E-10
1,2,3,7,8,9-HxCDD	1.10E-09	1.09E-09	5.54E-10
Total HpCDD	6.27E-09	1.37E-08	3.32E-09
1,2,3,4,6,7,8-HpCDD	2.38E-09	6.88E-09	1.40E-09
Total OCDD	7.45E-09	2.01E-08	4.33E-09

Non detect value

L'Anse Warden Electric Company
L'Anse, MI
Boiler No. 1
Summary o Dioxin / Furan Test Data and Test Results

TEST DATA			
Run number	1	2	3
Location		Boiler No. 1	
Date	7/6/2016	7/6/2016	7/7/016
Time period	0914-1231	1552-1907	1135-1450
FURAN LABORATORY REPORT DATA, ug.			
Total TCDF	7.86E-05	3.02E-05	3.05E-05
2,3,7,8-TCDF	2.30E-05	1.07E-05	1.20E-05
Total PeCDF	1.70E-05	3.90E-06	7.50E-06
1,2,3,7,8-PeCDF	3.80E-06	3.90E-06	3.50E-06
2,3,4,7,8-PeCDF	4.00E-06	3.90E-06	3.70E-06
Total HxCDF	1.02E-05	5.40E-06	3.80E-06
1,2,3,4,7,8-HxCDF	5.20E-06	5.40E-06	3.80E-06
1,2,3,6,7,8-HxCDF	3.50E-06	3.70E-06	3.30E-06
2,3,4,6,7,8-HxCDF	3.90E-06	4.00E-06	3.60E-06
1,2,3,7,8,9-HxCDF	4.20E-06	4.40E-06	4.00E-06
Total HpCDF	1.04E-05	1.71E-05	3.40E-06
1,2,3,4,6,7,8-HpCDF	6.00E-06	7.70E-06	3.40E-06
1,2,3,4,7,8,9-HpCDF	4.10E-06	3.80E-06	3.30E-06
Total OCDF	7.90E-06	1.50E-05	3.80E-06
FURAN CONCENTRATION, lb/dsc			
Total TCDF	1.44E-15	6.04E-16	5.63E-16
2,3,7,8-TCDF	4.21E-16	2.14E-16	2.22E-16
Total PeCDF	3.11E-16	7.80E-17	1.39E-16
1,2,3,7,8-PeCDF	6.96E-17	7.80E-17	6.47E-17
2,3,4,7,8-PeCDF	7.33E-17	7.80E-17	6.84E-17
Total HxCDF	1.87E-16	1.08E-16	7.02E-17
1,2,3,4,7,8-HxCDF	9.52E-17	1.08E-16	7.02E-17
1,2,3,6,7,8-HxCDF	6.41E-17	7.40E-17	6.10E-17
2,3,4,6,7,8-HxCDF	7.14E-17	8.00E-17	6.65E-17
1,2,3,7,8,9-HxCDF	7.69E-17	8.80E-17	7.39E-17
Total HpCDF	1.90E-16	3.42E-16	6.28E-17
1,2,3,4,6,7,8-HpCDF	1.10E-16	1.54E-16	6.28E-17
1,2,3,4,7,8,9-HpCDF	7.51E-17	7.60E-17	6.10E-17
Total OCDF	1.45E-16	3.00E-16	7.02E-17
FURAN CONCENTRATION, µg./dscm.			
Total TCDF	2.31E-05	9.67E-06	9.03E-06
2,3,7,8-TCDF	6.75E-06	3.43E-06	3.55E-06
Total PeCDF	4.99E-06	1.25E-06	2.22E-06
1,2,3,7,8-PeCDF	1.11E-06	1.25E-06	1.04E-06
2,3,4,7,8-PeCDF	1.17E-06	1.25E-06	1.10E-06
Total HxCDF	2.99E-06	1.73E-06	1.12E-06
1,2,3,4,7,8-HxCDF	1.53E-06	1.73E-06	1.12E-06
1,2,3,6,7,8-HxCDF	1.03E-06	1.19E-06	9.77E-07
2,3,4,6,7,8-HxCDF	1.14E-06	1.28E-06	1.07E-06
1,2,3,7,8,9-HxCDF	1.23E-06	1.41E-06	1.18E-06
Total HpCDF	3.05E-06	5.48E-06	1.01E-06
1,2,3,4,6,7,8-HpCDF	1.76E-06	2.47E-06	1.01E-06
1,2,3,4,7,8,9-HpCDF	1.20E-06	1.22E-06	9.77E-07
Total OCDF	2.32E-06	4.80E-06	1.12E-06
FURAN CONCENTRATION, µg./dscm @ % O_2			
Total TCDF	2.29E-05	9.74E-06	9.22E-06
2,3,7,8-TCDF	6.70E-06	3.45E-06	3.63E-06
Total PeCDF	4.95E-06	1.26E-06	2.27E-06
1,2,3,7,8-PeCDF	1.11E-06	1.26E-06	1.06E-06
2,3,4,7,8-PeCDF	1.17E-06	1.26E-06	1.12E-06
Total HxCDF	2.97E-06	1.74E-06	1.15E-06
1,2,3,4,7,8-HxCDF	1.51E-06	1.74E-06	1.15E-06
1,2,3,6,7,8-HxCDF	1.02E-06	1.19E-06	9.98E-07
2,3,4,6,7,8-HxCDF	1.14E-06	1.29E-06	1.09E-06
1,2,3,7,8,9-HxCDF	1.22E-06	1.42E-06	1.21E-06
Total HpCDF	3.03E-06	5.52E-06	1.03E-06
1,2,3,4,6,7,8-HpCDF	1.75E-06	2.48E-06	1.03E-06
1,2,3,4,7,8,9-HpCDF	1.19E-06	1.23E-06	9.98E-07
Total OCDF	2.30E-06	4.84E-06	1.15E-06
FURAN EMISSIONS, lb/hr.			
Total TCDF	6.11E-09	2.55E-09	2.49E-09
2,3,7,8-TCDF (1)	1.79E-09	9.03E-10	9.78E-10
Total PeCDF	1.32E-09	3.29E-10	6.11E-10
1,2,3,7,8-PeCDF	2.95E-10	3.29E-10	2.85E-10
2,3,4,7,8-PeCDF	3.11E-10	3.29E-10	3.02E-10
Total HxCDF	7.92E-10	4.56E-10	3.10E-10
1,2,3,4,7,8-HxCDF	4.04E-10	4.56E-10	3.10E-10
1,2,3,6,7,8-HxCDF	2.72E-10	3.12E-10	2.69E-10
2,3,4,6,7,8-HxCDF	3.03E-10	3.38E-10	2.94E-10
1,2,3,7,8,9-HxCDF	3.26E-10	3.71E-10	3.26E-10
Total HpCDF	8.08E-10	1.44E-09	2.77E-10
1,2,3,4,6,7,8-HpCDF	4.66E-10	6.50E-10	2.77E-10
1,2,3,4,7,8,9-HpCDF	3.19E-10	3.21E-10	2.69E-10
Total OCDF	6.14E-10	1.27E-09	3.10E-10

ND Non detect value

L'Anse Warden Electric Company

L'Anse, MI

Boiler No. 1

Summary o Dioxin / Furan Test Data and Test Results

TEST DATA						
Run number		1	2	3		
Location			Boiler No. 1			
Date		7/6/2016	7/6/2016	7/7/016		
Time period		0914-1231	1552-1907	1135-1450		
TOXIC EQUIVALENCY EMISSIONS (WHO/2005), ug/dscm @ 7% O_2	(WHO/2005)					
Total TCDD	0	0.00E+00	0.00E+00	0.00E+00		
2,3,7,8-TCDD	1	2.01E-06	1.52E-06	1.78E-06		
Total PeCDD	0	0.00E+00	0.00E+00	0.00E+00		
1,2,3,7,8-PeCDD	1	4.17E-06	3.00E-06	2.66E-06		
Total HxCDD	0	0.00E+00	0.00E+00	0.00E+00		
1,2,3,4,7,8-HxCDD	0.1	1.69E-07	1.81E-07	1.21E-07		
1,2,3,6,7,8-HxCDD	0.1	3.09E-07	4.06E-07	1.69E-07		
1,2,3,7,8,9-HxCDD	0.1	4.14E-07	4.16E-07	2.06E-07		
Total HpCDD	0	0.00E+00	0.00E+00	0.00E+00		
1,2,3,4,6,7,8-HpCDD	0.01	8.91E-08	2.63E-07	5.20E-08		
Total OCDD	0.0003	8.38E-09	2.30E-08	4.82E-09		
Total TCDF	0	0.00E+00	0.00E+00	0.00E+00		
2,3,7,8-TCDF	0.1	6.70E-07	3.45E-07	3.63E-07		
Total PeCDF	0	0.00E+00	0.00E+00	0.00E+00		
1,2,3,7,8-PeCDF	0.03	3.32E-08	3.77E-08	3.18E-08		
2,3,4,7,8-PeCDF	0.3	3.50E-07	3.77E-07	3.36E-07		
Total HxCDF	0	0.00E+00	0.00E+00	0.00E+00		
1,2,3,4,7,8-HxCDF	0.1	1.51E-07	1.74E-07	1.15E-07		
1,2,3,6,7,8-HxCDF	0.1	1.02E-07	1.19E-07	9.98E-08		
2,3,4,6,7,8-HxCDF	0.1	1.14E-07	1.29E-07	1.09E-07		
1,2,3,7,8,9-HxCDF	0.1	1.22E-07	1.42E-07	1.21E-07		
Total HpCDF	0	0.00E+00	0.00E+00	0.00E+00		
1,2,3,4,6,7,8-HpCDF	0.01	1.75E-08	2.48E-08	1.03E-08		
1,2,3,4,7,8,9-HpCDF	0.01	1.19E-08	1.23E-08	9.98E-09		
Total OCDF	0.0003	6.90E-10	1.45E-09	3.45E-10		Previous
					Average	Limit
TOTAL TOXIC EQUIVALENCY EMISSIONS (WHO/2005), ug/dscm @ 7% O_2 (1)		7.72E-06	6.35E-06	5.70E-06	6.59E-06	1.33E-02
TOXIC EQUIVALENCY EMISSIONS (WHO/2005), lb/hr.	(WHO/2005)					
Total TCDD	0	0.00E+00	0.00E+00	0.00E+00		
2,3,7,8-TCDD	1	5.36E-10	3.97E-10	4.81E-10		
Total PeCDD	0	0.00E+00	0.00E+00	0.00E+00		
1,2,3,7,8-PeCDD	1	1.11E-09	7.85E-10	7.17E-10		
Total HxCDD	0	0.00E+00	0.00E+00	0.00E+00		
1,2,3,4,7,8-HxCDD	0.1	4.51E-11	4.73E-11	3.26E-11		
1,2,3,6,7,8-HxCDD	0.1	8.24E-11	1.06E-10	4.57E-11		
1,2,3,7,8,9-HxCDD	0.1	1.10E-10	1.09E-10	5.54E-11		
Total HpCDD	0	0.00E+00	0.00E+00	0.00E+00		
1,2,3,4,6,7,8-HpCDD	0.01	2.38E-11	6.88E-11	1.40E-11		
Total OCDD	0.0003	2.24E-12	6.03E-12	1.30E-12		
Total TCDF	0	0.00E+00	0.00E+00	0.00E+00		
2,3,7,8-TCDF	0.1	1.79E-10	9.03E-11	9.78E-11		
Total PeCDF	0	0.00E+00	0.00E+00	0.00E+00		
1,2,3,7,8-PeCDF	0.03	8.86E-12	9.88E-12	8.56E-12		
2,3,4,7,8-PeCDF	0.3	9.32E-11	9.88E-11	9.05E-11		
Total HxCDF	0	0.00E+00	0.00E+00	0.00E+00		
1,2,3,4,7,8-HxCDF	0.1	4.04E-11	4.56E-11	3.10E-11		
1,2,3,6,7,8-HxCDF	0.1	2.72E-11	3.12E-11	2.69E-11		
2,3,4,6,7,8-HxCDF	0.1	3.03E-11	3.38E-11	2.94E-11		
1,2,3,7,8,9-HxCDF	0.1	3.26E-11	3.71E-11	3.26E-11		
Total HpCDF	0	0.00E+00	0.00E+00	0.00E+00		
1,2,3,4,6,7,8-HpCDF	0.01	4.66E-12	6.50E-12	2.77E-12		
1,2,3,4,7,8,9-HpCDF	0.01	3.19E-12	3.21E-12	2.69E-12		
Total OCDF	0.0003	1.84E-13	3.80E-13	9.29E-14		Previous
					Average	Limit
TOTAL TOXIC EQUIVALENCY EMISSIONS (WHO/2005), lb/hr. (1)		2.06E-09	1.66E-09	1.54E-09	1.75E-09	3.95E-06

(1) Toxic equivalency does not include detection limit values.

Non detect value

L'Anse Warden Electric Company
L'Anse, MI
Boiler No. 1
Summary of Cresol Isomer Test Data and Test Results

TEST DATA					
Run number	1	2	3		
Location		Boiler No. 1			
Date	7/6/2016	7/6/2016	7/7/016		
Time period	0914-1231	1552-1907	1135-1450		
SAMPLING DATA:					
Sampling duration, min.	180.0	180.0	180.0		
Nozzle diameter, in.	0.252	0.250	0.250		
Cross sectional nozzle area, sq.ft.	0.000346	0.000341	0.000341		
Barometric pressure, in. Hg	29.27	29.27	29.38		
Avg. orifice press. diff., in H_2O	1.88	1.63	1.80		
Avg. dry gas meter temp., deg F	86.6	97.1	77.4		
Avg. abs. dry gas meter temp., deg. R	547	557	537		
Total liquid collected by train, ml	543.4	477.6	466.3		
Std. vol. of H_2O vapor coll., cu.ft.	25.6	22.5	22.0		
Dry gas meter calibration factor	1.0017	1.0017	1.0017		
Sample vol. at meter cond., dcf	126.625	118.288	122.983		
Sample vol. at std. cond., dscf (1)	120.370	110.269	119.330		
Percent of isokinetic sampling	106.5	99.6	103.1		
GAS STREAM COMPOSITION DATA					
CO_2, % by volume, dry basis	13.4	13.2	13.2		
O_2, % by volume, dry basis	6.9	7.1	7.3		
N_2, % by volume, dry basis	79.7	79.7	79.5		
Molecular wt. of dry gas, lb/lb mole	30.42	30.40	30.40		
H_20 vapor in gas stream, prop. by vol.	0.175	0.169	0.155		
Mole fraction of dry gas	0.825	0.831	0.845		
Molecular wt. of wet gas, lb/lb mole	28.24	28.30	28.48		
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA					
Static pressure, in. H_2O	-12.60	-12.60	-12.80		
Absolute pressure, in. Hg	28.34	28.34	28.44		
Avg. temperature, deg. F	437	434	436		
Avg. absolute temperature, deg.R	897	894	896		
Pitot tube coefficient	0.84	0.84	0.84		
Total number of traverse points	12	12	12		
Duct Avg. gas stream velocity, ft./sec.	65.7	64.8	66.5		
Duct cross sectional area, sq.ft.	39.00	39.00	39.00		
Stack exit avg. gas stream velocity, ft./sec.	58.0	57.2	58.7		
Stack cross sectional area, sq.ft.	44.179	44.179	44.179		
Avg. gas stream volumetric flow, wacf/min.	153756	151548	155498		
Avg. gas stream volumetric flow, dscf/min.	70699	70374	73550		
CRESOL ISOMER LABORATORY REPORT DATA, ug.					
2-Methylphenol	5.0	5.0	5.0		
3-Methylphenol & 4-Methylphenol	5.0	5.0	5.0		
CRESOL ISOMER CONCENTRATIONS, lb/dsc .					
2-Methylphenol	9.16E-11	1.00E-10	9.24E-11		
3-Methylphenol & 4-Methylphenol	9.16E-11	1.00E-10	9.24E-11		
CRESOL ISOMER EMISSION RESULTS, lb/hr				Average	Previous Limit
2-Methylphenol	3.88E-04	4.22E-04	4.08E-04	4.06E-04	--
3-Methylphenol & 4-Methylphenol	3.88E-04	4.22E-04	4.08E-04	4.06E-04	--
2-Methylphenol, 3-Methylphenol, & 4-Methylphenol	7.77E-04	8.44E-04	8.15E-04	8.12E-04	0.34

L'Anse Warden Electric Company
L'Anse,, MI
Boiler No. 1
Summary o Hydrogen Chloride and Chlorine Test Data and Test Results

TEST DATA					
Test run number	1	2	3		
Location		Boiler No. 1			
Test date	07/06/2016	07/06/2016	07/07/2015		
Test time period	0935-1040	1621-1726	1334-1439		
F-Factor	9561	9561	9561		
SAMPLING DATA					
Sampling duration, min.	65	65	65		
Barometric pressure, in. Hg	29.27	29.27	29.38		
Avg. orifice press. diff., in H2O	1.80	1.80	1.80		
Avg. dry gas meter temp., deg F	84.2	103.8	75.6		
Avg. abs. dry gas meter temp., deg. R	544	564	536		
Total liquid collected by train, ml	212.1	186.0	184.4		
Std. vol. of H2O vapor coll., cu.ft.	9.985	8.756	8.681		
Dry gas meter calibration factor	0.9915	0.9915	0.9915		
Sample vol. at meter cond., dcf	46.886	46.930	46.500		
Sample vol. at std. cond., dscf (1)	44.309	42.802	44.812		
GAS STREAM COMPOSITION DATA					
CO2, % by volume, dry basis	13.6	13.0	13.0		
O2, % by volume, dry basis	6.7	7.4	7.5		
N2, % by volume, dry basis	79.7	79.6	79.5		
Molecular wt. of dry gas, lb/lb mole	30.44	30.38	30.38		
H2O vapor in gas stream, prop. by vol.	0.184	0.170	0.162		
Mole fraction of dry gas	0.816	0.830	0.838		
Molecular wt. of wet gas, lb/lb mole	28.16	28.27	28.37		
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA					
Static pressure, in. H2O	-12.60	-12.60	-12.80		
Static pressure, in. Hg	-0.926	-0.926	-0.941		
Absolute pressure, in. Hg	28.34	28.34	28.44		
Avg. temperature, deg. F	450	444	443		
Avg. absolute temperature, deg.R	910	904	903		
Pitot tube coefficient	0.84	0.84	0.84		
Duct Avg. gas stream velocity, ft./sec.	65.7	64.8	66.5		
Duct cross sectional area, sq.ft.	39.000	39.000	39.000		
Stack exit avg. gas stream velocity, ft./sec.	58.0	57.2	58.7		
Stack cross sectional area, sq.ft.	44.179	44.179	44.179		
Avg. gas stream volumetric flow, wacf/min.	153756	151548	155498		
Avg. gas stream volumetric flow, dscf/min. (2)	70699	70374	73550		
HCl and Cl_2 LABORATORY REPORT DATA					
Total HCl, mg	8.20	8.80	7.40		
Total Cl_2, mg	1.2	1.2	1.2		
HCl EMISSIONS				Average	Limit
Concentration, lb/dscf	4.08E-07	4.53E-07	3.64E-07	4.08E-07	--
Concentration, ppm/v	4.31	4.79	3.85	4.32	--
Mass rate, lb/hr	1.73	1.91	1.61	1.75	2.17
Cl_2 EMISSIONS					
Concentration, lb/dscf	5.97E-08	6.18E-08	5.90E-08	6.02E-08	--
Concentration, ppm/v	0.32	0.34	0.32	0.33	--
Mass rate, lb/hr	0.25	0.26	0.26	0.26	--

(1) Standard conditions   68 deg. F. (20 deg. C.) and 29.92 in Hg (760 mm Hg)
(2) Volumetric flow rate from EPA Method 23 sanpling train data.

L'Anse Warden Electric Company
L'Anse, MI
Boiler No. 1
Summary of VOC Test Results

Run No.	Date	Time	Volumetric Flow (dsc m)[1]	Stack Moisture (%)[1]	Concentrations and Emission Rates					
					O_2 (%)	CO_2 (%)	VOC as methane			
							VOC (ppmvw)	VOC (ppmvd)	VOC (ppmvd @ 7% O_2)	VOC (lb/hr)
1	6-Jul-16	1315-1415	69828	17.9	6.7	13.7	0.10	0.12	0.12	0.02
2	7-Jun-16	0930-1030	71231	17.0	7.2	13.2	0.10	0.12	0.12	0.02
3	7-Jun-07	1545-1645	73689	15.9	7.6	12.9	0.10	0.12	0.12	0.02
Average			**1583**	**16.9**	**7.2**	**13.3**	**< 0.1**	**< 0.12**	**< 0.12**	**< 0.02**
							Limit		**50**	**9.1**

[1] Mass rates are calculated using the volumetric flow and moisture content from corresponding EPA Reference Method 5/29 test.

A.2 STAC INLET TEMPERATURE DATA

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/6/2016 9:38
Stop Time	7/6/2016 15:20
Elasped Time	00000Day05:42:01
Interval Time	0:01:00
Data Number	343

Data Purpose:

NO.	Date/Time	T1	T2
1	7/6/2016 9:38	443	80.7
2	7/6/2016 9:39	442.9	79.7
3	7/6/2016 9:40	442.9	86
4	7/6/2016 9:41	443	79.6
5	7/6/2016 9:42	442.7	77.2
6	7/6/2016 9:43	443.1	76.4
7	7/6/2016 9:44	443.2	76.3
8	7/6/2016 9:45	443.3	76.8
9	7/6/2016 9:46	443.4	77.9
10	7/6/2016 9:47	443.4	79.7
11	7/6/2016 9:48	443.3	79.8
12	7/6/2016 9:49	443.2	77.9
13	7/6/2016 9:50	443	76.1
14	7/6/2016 9:51	442.7	76.6
15	7/6/2016 9:52	442.4	78.4
16	7/6/2016 9:53	442	83
17	7/6/2016 9:54	441.6	78.4
18	7/6/2016 9:55	441.3	83.6
19	7/6/2016 9:56	441.2	81.2
20	7/6/2016 9:57	441.5	77
21	7/6/2016 9:58	441.7	75.9
22	7/6/2016 9:59	442.1	75.1
23	7/6/2016 10:00	441.5	72.3
24	7/6/2016 10:01	442.6	75
25	7/6/2016 10:02	442.9	76.9
26	7/6/2016 10:03	441.3	74.3
27	7/6/2016 10:04	442.8	80.4
28	7/6/2016 10:05	443	81.8
29	7/6/2016 10:06	442.8	77.4
30	7/6/2016 10:07	442.8	77.6
31	7/6/2016 10:08	442.8	85.5
32	7/6/2016 10:09	443	78.9
33	7/6/2016 10:10	443.3	79.9
34	7/6/2016 10:11	443.4	84.7
35	7/6/2016 10:12	443.7	75.1

Measure Unit	¢XF		
Measure Type	K-Type		
Start Time	7/6/2016 9:38		
Stop Time	7/6/2016 15:20		
Elasped Time	00000Day05:42:01		
Interval Time	0:01:00		
Data Number	343		

Data Purpose:

NO.	Date/Time	T1	T2
36	7/6/2016 10:13	443.9	78.8
37	7/6/2016 10:14	444.1	78.5
38	7/6/2016 10:15	444.3	80.3
39	7/6/2016 10:16	444.4	74.2
40	7/6/2016 10:17	444.5	74.5
41	7/6/2016 10:18	444.9	76.8
42	7/6/2016 10:19	444.9	76.6
43	7/6/2016 10:20	445.1	72.9
44	7/6/2016 10:21	445.2	78.9
45	7/6/2016 10:22	445.4	77.5
46	7/6/2016 10:23	445.5	76.5
47	7/6/2016 10:24	445.5	78.5
48	7/6/2016 10:25	445.6	75.4
49	7/6/2016 10:26	445.5	83.8
50	7/6/2016 10:27	445.5	78.6
51	7/6/2016 10:28	445.7	71.7
52	7/6/2016 10:29	445.8	74.8
53	7/6/2016 10:30	445.8	78
54	7/6/2016 10:31	445.9	75
55	7/6/2016 10:32	445.3	78.2
56	7/6/2016 10:33	446	81.5
57	7/6/2016 10:34	446.1	77.9
58	7/6/2016 10:35	446.2	83.2
59	7/6/2016 10:36	446.3	79.3
60	7/6/2016 10:37	446.4	75.8
61	7/6/2016 10:38	446.5	80.4
62	7/6/2016 10:39	446.5	80.2
63	7/6/2016 10:40	446.5	80.3
64	7/6/2016 10:41	444.5	76.7
65	7/6/2016 10:42	441.4	79.9
66	7/6/2016 10:43	445.5	79.3
67	7/6/2016 10:44	446.1	81.8
68	7/6/2016 10:45	446.3	81.5
69	7/6/2016 10:46	446.1	76.9
70	7/6/2016 10:47	445.8	82.4

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/6/2016 9:38
Stop Time	7/6/2016 15:20
Elasped Time	00000Day05:42:01
Interval Time	0:01:00
Data Number	343

Data Purpose:

NO.	Date/Time	T1	T2
71	7/6/2016 10:48	445.7	80.1
72	7/6/2016 10:49	445.8	81.2
73	7/6/2016 10:50	444.7	80.8
74	7/6/2016 10:51	444.3	81.2
75	7/6/2016 10:52	445.6	76.4
76	7/6/2016 10:53	444.6	77.9
77	7/6/2016 10:54	445.1	79.8
78	7/6/2016 10:55	445.4	79.8
79	7/6/2016 10:56	445.7	85.5
80	7/6/2016 10:57	446.1	79.3
81	7/6/2016 10:58	446.1	76.5
82	7/6/2016 10:59	446.1	78
83	7/6/2016 11:00	446	82.6
84	7/6/2016 11:01	446.3	80.9
85	7/6/2016 11:02	446.5	80.3
86	7/6/2016 11:03	446.6	81.4
87	7/6/2016 11:04	447.1	81.2
88	7/6/2016 11:05	447.2	82.8
89	7/6/2016 11:06	447.4	83
90	7/6/2016 11:07	447.7	81.1
91	7/6/2016 11:08	447.8	79.3
92	7/6/2016 11:09	447.9	85.1
93	7/6/2016 11:10	447.9	86.8
94	7/6/2016 11:11	448.1	83.8
95	7/6/2016 11:12	448.3	86.8
96	7/6/2016 11:13	448.4	85.6
97	7/6/2016 11:14	448.5	84.4
98	7/6/2016 11:15	448.6	85
99	7/6/2016 11:16	448.6	85.5
100	7/6/2016 11:17	448.7	80.3
101	7/6/2016 11:18	448.8	80.7
102	7/6/2016 11:19	448.5	84.9
103	7/6/2016 11:20	448.3	85.6
104	7/6/2016 11:21	448.4	81.1
105	7/6/2016 11:22	448.6	83.9

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/6/2016 9:38
Stop Time	7/6/2016 15:20
Elasped Time	00000Day05:42:01
Interval Time	0:01:00
Data Number	343

Data Purpose:

NO.	Date/Time	T1	T2
106	7/6/2016 11:23	448.6	82
107	7/6/2016 11:24	448.9	82.3
108	7/6/2016 11:25	449	82.8
109	7/6/2016 11:26	449	82.2
110	7/6/2016 11:27	449.1	81.3
111	7/6/2016 11:28	449.1	78.8
112	7/6/2016 11:29	449.2	84.5
113	7/6/2016 11:30	449.1	91.6
114	7/6/2016 11:31	449.1	87
115	7/6/2016 11:32	449	86.9
116	7/6/2016 11:33	449	82.9
117	7/6/2016 11:34	449.2	86.8
118	7/6/2016 11:35	449.4	76.7
119	7/6/2016 11:36	449.4	81.5
120	7/6/2016 11:37	449.5	78.6
121	7/6/2016 11:38	449.6	80.9
122	7/6/2016 11:39	449.7	79.5
123	7/6/2016 11:40	449.5	83.9
124	7/6/2016 11:41	449.9	84.9
125	7/6/2016 11:42	449.8	84.6
126	7/6/2016 11:43	449.6	84.2
127	7/6/2016 11:44	447.8	85.2
128	7/6/2016 11:45	448.7	83.8
129	7/6/2016 11:46	448.7	86.5
130	7/6/2016 11:47	448.3	86.1
131	7/6/2016 11:48	447.7	81.2
132	7/6/2016 11:49	447.6	86.9
133	7/6/2016 11:50	447.6	87
134	7/6/2016 11:51	447.8	76.4
135	7/6/2016 11:52	448	86.6
136	7/6/2016 11:53	448.1	87.1
137	7/6/2016 11:54	448	79.5
138	7/6/2016 11:55	447.9	82.7
139	7/6/2016 11:56	447.6	79.3
140	7/6/2016 11:57	447.4	85.8

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/6/2016 9:38
Stop Time	7/6/2016 15:20
Elasped Time	00000Day05:42:01
Interval Time	0:01:00
Data Number	343

Data Purpose:

NO.	Date/Time	T1	T2
141	7/6/2016 11:58	447.2	90.3
142	7/6/2016 11:59	446.8	86.9
143	7/6/2016 12:00	447.1	81.4
144	7/6/2016 12:01	446.9	82.3
145	7/6/2016 12:02	446.8	81.5
146	7/6/2016 12:03	446.4	87.9
147	7/6/2016 12:04	446.1	87
148	7/6/2016 12:05	446	84.7
149	7/6/2016 12:06	446.1	85.9
150	7/6/2016 12:07	446.1	80.3
151	7/6/2016 12:08	445.9	84.7
152	7/6/2016 12:09	445.7	84.8
153	7/6/2016 12:10	445.5	88.5
154	7/6/2016 12:11	445.4	79.9
155	7/6/2016 12:12	445.5	83.8
156	7/6/2016 12:13	445.6	78.7
157	7/6/2016 12:14	445.2	83.8
158	7/6/2016 12:15	446	83
159	7/6/2016 12:16	446.4	83.3
160	7/6/2016 12:17	446.4	87.9
161	7/6/2016 12:18	446.2	86.4
162	7/6/2016 12:19	446.1	88.6
163	7/6/2016 12:20	446.1	88
164	7/6/2016 12:21	446	84.6
165	7/6/2016 12:22	445.9	83.2
166	7/6/2016 12:23	445.8	81
167	7/6/2016 12:24	445.7	81.1
168	7/6/2016 12:25	445.6	83.2
169	7/6/2016 12:26	445.5	84.8
170	7/6/2016 12:27	445.3	84.5
171	7/6/2016 12:28	445.2	87.3
172	7/6/2016 12:29	445.2	85.4
173	7/6/2016 12:30	445.1	89.2
174	7/6/2016 12:31	444.8	80.2
175	7/6/2016 12:32	444.4	86.4

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/6/2016 9:38
Stop Time	7/6/2016 15:20
Elasped Time	00000Day05:42:01
Interval Time	0:01:00
Data Number	343

Data Purpose:

NO.	Date/Time	T1	T2
176	7/6/2016 12:33	443.9	83.3
177	7/6/2016 12:34	444.7	82.2
178	7/6/2016 12:35	444.8	79.6
179	7/6/2016 12:36	444.9	80.9
180	7/6/2016 12:37	444.9	84
181	7/6/2016 12:38	444.8	82.1
182	7/6/2016 12:39	444.6	83.7
183	7/6/2016 12:40	444.3	81.1
184	7/6/2016 12:41	444.4	85.5
185	7/6/2016 12:42	444.5	82.8
186	7/6/2016 12:43	444.1	82.2
187	7/6/2016 12:44	443.1	83.8
188	7/6/2016 12:45	442.6	89.3
189	7/6/2016 12:46	442.8	85.5
190	7/6/2016 12:47	443.5	85.9
191	7/6/2016 12:48	444	83.3
192	7/6/2016 12:49	443.9	83
193	7/6/2016 12:50	443.4	85.7
194	7/6/2016 12:51	443.5	84
195	7/6/2016 12:52	444	83.5
196	7/6/2016 12:53	444.4	80.6
197	7/6/2016 12:54	444.4	79.9
198	7/6/2016 12:55	443.8	81.4
199	7/6/2016 12:56	443.5	79.8
200	7/6/2016 12:57	443.5	82.9
201	7/6/2016 12:58	443.5	81.7
202	7/6/2016 12:59	443.6	85.6
203	7/6/2016 13:00	443.7	87.6
204	7/6/2016 13:01	443.9	82.1
205	7/6/2016 13:02	444	85.1
206	7/6/2016 13:03	443.9	82.9
207	7/6/2016 13:04	443.8	86.9
208	7/6/2016 13:05	442.6	85.2
209	7/6/2016 13:06	438.4	86.1
210	7/6/2016 13:07	440	86.1

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/6/2016 9:38
Stop Time	7/6/2016 15:20
Elasped Time	00000Day05:42:01
Interval Time	0:01:00
Data Number	343

Data Purpose:

NO.	Date/Time	T1	T2
211	7/6/2016 13:08	440.9	83.6
212	7/6/2016 13:09	440.9	85.1
213	7/6/2016 13:10	441.1	82.4
214	7/6/2016 13:11	441.7	83
215	7/6/2016 13:12	441.9	88.3
216	7/6/2016 13:13	442	85.7
217	7/6/2016 13:14	442	85.8
218	7/6/2016 13:15	442	82.7
219	7/6/2016 13:16	441.9	87.9
220	7/6/2016 13:17	441.7	87.2
221	7/6/2016 13:18	441.8	85.4
222	7/6/2016 13:19	442	85.2
223	7/6/2016 13:20	441.8	86.6
224	7/6/2016 13:21	440.4	88
225	7/6/2016 13:22	441.5	88
226	7/6/2016 13:23	441.4	87.8
227	7/6/2016 13:24	441.6	83.7
228	7/6/2016 13:25	441.8	82.5
229	7/6/2016 13:26	442	77.6
230	7/6/2016 13:27	442.1	82
231	7/6/2016 13:28	442.1	80.5
232	7/6/2016 13:29	442.1	80.6
233	7/6/2016 13:30	442	81.2
234	7/6/2016 13:31	441.9	84
235	7/6/2016 13:32	442	80.2
236	7/6/2016 13:33	442	87.1
237	7/6/2016 13:34	442.1	85.4
238	7/6/2016 13:35	442.3	77.4
239	7/6/2016 13:36	442.6	85.2
240	7/6/2016 13:37	442.7	80.1
241	7/6/2016 13:38	441.7	89.1
242	7/6/2016 13:39	437.1	85.9
243	7/6/2016 13:40	436.1	81.5
244	7/6/2016 13:41	435.7	80.6
245	7/6/2016 13:42	439.7	88

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/6/2016 9:38
Stop Time	7/6/2016 15:20
Elasped Time	00000Day05:42:01
Interval Time	0:01:00
Data Number	343

Data Purpose:

NO.	Date/Time	T1	T2
246	7/6/2016 13:43	440.6	84.9
247	7/6/2016 13:44	441.2	78.5
248	7/6/2016 13:45	441.5	84.7
249	7/6/2016 13:46	441.9	83.4
250	7/6/2016 13:47	441.9	80.6
251	7/6/2016 13:48	441.7	77.4
252	7/6/2016 13:49	441.6	80.1
253	7/6/2016 13:50	441.8	90.7
254	7/6/2016 13:51	441.9	90.5
255	7/6/2016 13:52	442.2	81.3
256	7/6/2016 13:53	441.7	81.8
257	7/6/2016 13:54	442	80.7
258	7/6/2016 13:55	441.9	86.1
259	7/6/2016 13:56	441.5	83.5
260	7/6/2016 13:57	441.4	84.7
261	7/6/2016 13:58	440	81.4
262	7/6/2016 13:59	440.5	87.5
263	7/6/2016 14:00	437.1	87
264	7/6/2016 14:01	434.1	86.6
265	7/6/2016 14:02	440.7	86.9
266	7/6/2016 14:03	441	81.9
267	7/6/2016 14:04	440.9	84.7
268	7/6/2016 14:05	440.9	86.6
269	7/6/2016 14:06	441	80.9
270	7/6/2016 14:07	441	84.6
271	7/6/2016 14:08	441.6	84.5
272	7/6/2016 14:09	442	80.6
273	7/6/2016 14:10	442.2	89.2
274	7/6/2016 14:11	441.9	93.9
275	7/6/2016 14:12	441.5	84.1
276	7/6/2016 14:13	441.3	84.2
277	7/6/2016 14:14	440.6	80.9
278	7/6/2016 14:15	441	82.8
279	7/6/2016 14:16	441.2	86.5
280	7/6/2016 14:17	441.1	82.2

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/6/2016 9:38
Stop Time	7/6/2016 15:20
Elasped Time	00000Day05:42:01
Interval Time	0:01:00
Data Number	343

Data Purpose:

NO.	Date/Time	T1	T2
281	7/6/2016 14:18	441.2	86.3
282	7/6/2016 14:19	441.3	81.3
283	7/6/2016 14:20	441.5	80.2
284	7/6/2016 14:21	434.3	83.1
285	7/6/2016 14:22	437.6	86.6
286	7/6/2016 14:23	441.3	86.7
287	7/6/2016 14:24	441	78.3
288	7/6/2016 14:25	440.2	89.2
289	7/6/2016 14:26	438.1	87.3
290	7/6/2016 14:27	437.6	89.1
291	7/6/2016 14:28	438.8	86.9
292	7/6/2016 14:29	439.5	83.9
293	7/6/2016 14:30	439.5	87.7
294	7/6/2016 14:31	439.4	86
295	7/6/2016 14:32	439.5	86.4
296	7/6/2016 14:33	439.6	79.1
297	7/6/2016 14:34	438.4	79.2
298	7/6/2016 14:35	439.5	82.4
299	7/6/2016 14:36	440	87.7
300	7/6/2016 14:37	439.9	84.8
301	7/6/2016 14:38	439.8	79.6
302	7/6/2016 14:39	439.7	80.1
303	7/6/2016 14:40	439.8	85.6
304	7/6/2016 14:41	439.8	81.1
305	7/6/2016 14:42	437.5	89.1
306	7/6/2016 14:43	429.6	77.7
307	7/6/2016 14:44	435	77.7
308	7/6/2016 14:45	439.5	80.2
309	7/6/2016 14:46	440	85.3
310	7/6/2016 14:47	440.2	83
311	7/6/2016 14:48	440	84.3
312	7/6/2016 14:49	439.4	87
313	7/6/2016 14:50	435.1	81.4
314	7/6/2016 14:51	436.8	86
315	7/6/2016 14:52	439.2	87.7

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/6/2016 9:38
Stop Time	7/6/2016 15:20
Elasped Time	00000Day05:42:01
Interval Time	0:01:00
Data Number	343

Data Purpose:

NO.		Date/Time	T1	T2
	316	7/6/2016 14:53	439.5	87.8
	317	7/6/2016 14:54	437.9	89.9
	318	7/6/2016 14:55	437.6	88.4
	319	7/6/2016 14:56	437.5	90.1
	320	7/6/2016 14:57	439.4	82.3
	321	7/6/2016 14:58	439.9	84.6
	322	7/6/2016 14:59	440.3	85
	323	7/6/2016 15:00	440.5	85.4
	324	7/6/2016 15:01	439.4	86.1
	325	7/6/2016 15:02	441	84.7
	326	7/6/2016 15:03	441.4	84.2
	327	7/6/2016 15:04	441.5	80
	328	7/6/2016 15:05	441.7	79.3
	329	7/6/2016 15:06	441.9	78
	330	7/6/2016 15:07	442.2	83.2
	331	7/6/2016 15:08	441.9	83
	332	7/6/2016 15:09	441.3	83.2
	333	7/6/2016 15:10	440.8	82.7
	334	7/6/2016 15:11	440.8	82.9
	335	7/6/2016 15:12	441.2	83.6
	336	7/6/2016 15:13	441.5	89.4
	337	7/6/2016 15:14	441.8	78.7
	338	7/6/2016 15:15	441.8	85.2
	339	7/6/2016 15:16	441.5	84
	340	7/6/2016 15:17	441.4	85.5
	341	7/6/2016 15:18	441.5	87.9
	342	7/6/2016 15:19	441.6	81.9
	343	7/6/2016 15:20	441.7	83.3
Average			**443.6**	**82.7**

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/6/2016 16:16
Stop Time	7/6/2016 19:10
Elasped Time	00000Day02:54:01
Interval Time	0:01:00
Data Number	175

Data Purpose:

NO.	Date/Time	T1	T2
1	7/6/2016 16:16	437.5	78.1
2	7/6/2016 16:17	437.4	77.9
3	7/6/2016 16:18	437.2	77.5
4	7/6/2016 16:19	437.1	77.9
5	7/6/2016 16:20	437	78.3
6	7/6/2016 16:21	432.6	77.4
7	7/6/2016 16:22	434.9	77.1
8	7/6/2016 16:23	436.1	78.7
9	7/6/2016 16:24	436.2	77.2
10	7/6/2016 16:25	436.4	79
11	7/6/2016 16:26	436.8	78.3
12	7/6/2016 16:27	436.9	79.2
13	7/6/2016 16:28	436.6	79.3
14	7/6/2016 16:29	436.4	78.5
15	7/6/2016 16:30	436.1	77.9
16	7/6/2016 16:31	436	77.6
17	7/6/2016 16:32	436.4	78.3
18	7/6/2016 16:33	437.1	76.3
19	7/6/2016 16:34	437.5	77.6
20	7/6/2016 16:35	437.5	77.3
21	7/6/2016 16:36	437.3	77.4
22	7/6/2016 16:37	437.3	77.8
23	7/6/2016 16:38	437.6	78
24	7/6/2016 16:39	435.5	78.8
25	7/6/2016 16:40	435.2	77.9
26	7/6/2016 16:41	435	78.6
27	7/6/2016 16:42	437.1	76.7
28	7/6/2016 16:43	438.3	76.4
29	7/6/2016 16:44	439	78.3
30	7/6/2016 16:45	439.1	78.6
31	7/6/2016 16:46	439.1	77.8
32	7/6/2016 16:47	439.2	77.5
33	7/6/2016 16:48	439.4	78.5
34	7/6/2016 16:49	439.3	77.8
35	7/6/2016 16:50	439.5	77.5
36	7/6/2016 16:51	439.8	78.6

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/6/2016 16:16
Stop Time	7/6/2016 19:10
Elasped Time	00000Day02:54:01
Interval Time	0:01:00
Data Number	175

Data Purpose:

NO.	Date/Time	T1	T2
37	7/6/2016 16:52	440.4	77.5
38	7/6/2016 16:53	440.9	79.1
39	7/6/2016 16:54	441.2	77.1
40	7/6/2016 16:55	441.3	79.1
41	7/6/2016 16:56	441.7	78.5
42	7/6/2016 16:57	442	77.9
43	7/6/2016 16:58	442.3	78.4
44	7/6/2016 16:59	442.6	78.4
45	7/6/2016 17:00	442.7	78.8
46	7/6/2016 17:01	442.8	77.9
47	7/6/2016 17:02	443	79.4
48	7/6/2016 17:03	442.9	78.2
49	7/6/2016 17:04	442.8	79.1
50	7/6/2016 17:05	442.9	78.7
51	7/6/2016 17:06	443.5	78.5
52	7/6/2016 17:07	443.9	78.3
53	7/6/2016 17:08	444.1	78.5
54	7/6/2016 17:09	444.2	77.8
55	7/6/2016 17:10	444.3	78.2
56	7/6/2016 17:11	444.1	79.1
57	7/6/2016 17:12	444.5	78.1
58	7/6/2016 17:13	444	77.5
59	7/6/2016 17:14	443.2	79.3
60	7/6/2016 17:15	442.7	79.7
61	7/6/2016 17:16	442.8	77.8
62	7/6/2016 17:17	443.1	78.6
63	7/6/2016 17:18	443.4	79
64	7/6/2016 17:19	443.6	78.5
65	7/6/2016 17:20	443.7	78.7
66	7/6/2016 17:21	443.9	78.4
67	7/6/2016 17:22	443.8	78.6
68	7/6/2016 17:23	443.4	79.9
69	7/6/2016 17:24	442.9	78.1
70	7/6/2016 17:25	442.8	78.6
71	7/6/2016 17:26	442.9	79.4
72	7/6/2016 17:27	443	79.7

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/6/2016 16:16
Stop Time	7/6/2016 19:10
Elasped Time	00000Day02:54:01
Interval Time	0:01:00
Data Number	175

Data Purpose:

NO.	Date/Time	T1	T2
73	7/6/2016 17:28	438.7	79.9
74	7/6/2016 17:29	440.3	80
75	7/6/2016 17:30	441.2	80.2
76	7/6/2016 17:31	441.1	80.2
77	7/6/2016 17:32	441.8	80
78	7/6/2016 17:33	442.1	80.2
79	7/6/2016 17:34	442.2	80.3
80	7/6/2016 17:35	442.2	80.7
81	7/6/2016 17:36	442.1	80.7
82	7/6/2016 17:37	441.8	80.4
83	7/6/2016 17:38	441.2	80.5
84	7/6/2016 17:39	440.7	80.1
85	7/6/2016 17:40	440.6	79.8
86	7/6/2016 17:41	440.8	80.3
87	7/6/2016 17:42	441.3	80
88	7/6/2016 17:43	441.5	80.6
89	7/6/2016 17:44	441.3	80.7
90	7/6/2016 17:45	440.3	80.8
91	7/6/2016 17:46	440.1	80.1
92	7/6/2016 17:47	439.6	81.2
93	7/6/2016 17:48	439.4	81.1
94	7/6/2016 17:49	439.5	81.6
95	7/6/2016 17:50	439.6	81.1
96	7/6/2016 17:51	439.5	81.8
97	7/6/2016 17:52	439.7	81.1
98	7/6/2016 17:53	440.2	82
99	7/6/2016 17:54	440.7	81.7
100	7/6/2016 17:55	441	81.9
101	7/6/2016 17:56	440.5	81.6
102	7/6/2016 17:57	439.7	81.2
103	7/6/2016 17:58	439.2	81.6
104	7/6/2016 17:59	439	81.3
105	7/6/2016 18:00	438.8	81.8
106	7/6/2016 18:01	439	81.4
107	7/6/2016 18:02	439.4	81.7
108	7/6/2016 18:03	439.4	82.8

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/6/2016 16:16
Stop Time	7/6/2016 19:10
Elasped Time	00000Day02:54:01
Interval Time	0:01:00
Data Number	175

Data Purpose:

NO.	Date/Time	T1	T2
109	7/6/2016 18:04	439.5	82.2
110	7/6/2016 18:05	439.3	82.2
111	7/6/2016 18:06	439.2	81.9
112	7/6/2016 18:07	438.9	82.1
113	7/6/2016 18:08	438.5	81.2
114	7/6/2016 18:09	438.2	81.5
115	7/6/2016 18:10	438.2	82.1
116	7/6/2016 18:11	438.1	81
117	7/6/2016 18:12	438.2	82.3
118	7/6/2016 18:13	438.1	82.4
119	7/6/2016 18:14	437.9	82.1
120	7/6/2016 18:15	437.6	82.8
121	7/6/2016 18:16	437.5	83.2
122	7/6/2016 18:17	437.1	83.1
123	7/6/2016 18:18	435.7	84.6
124	7/6/2016 18:19	436.2	83.7
125	7/6/2016 18:20	435.3	84.3
126	7/6/2016 18:21	436.3	83.9
127	7/6/2016 18:22	437	82.3
128	7/6/2016 18:23	437.9	80.9
129	7/6/2016 18:24	438.5	82.7
130	7/6/2016 18:25	438.2	81.8
131	7/6/2016 18:26	437.2	82.4
132	7/6/2016 18:27	436.3	82.9
133	7/6/2016 18:28	435.9	81.3
134	7/6/2016 18:29	436	83.4
135	7/6/2016 18:30	436.2	82.2
136	7/6/2016 18:31	436.3	83.1
137	7/6/2016 18:32	436.5	83.6
138	7/6/2016 18:33	436.8	83.3
139	7/6/2016 18:34	436.9	83.9
140	7/6/2016 18:35	436.3	84.2

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/6/2016 16:16
Stop Time	7/6/2016 19:10
Elasped Time	00000Day02:54:01
Interval Time	0:01:00
Data Number	175

Data Purpose:

NO.	Date/Time	T1	T2
141	7/6/2016 18:36	436.8	83.7
142	7/6/2016 18:37	436.6	83.7
143	7/6/2016 18:38	436.5	81.6
144	7/6/2016 18:39	436.7	83.6
145	7/6/2016 18:40	437.2	82.7
146	7/6/2016 18:41	437.8	82.5
147	7/6/2016 18:42	438.3	83
148	7/6/2016 18:43	438.8	83
149	7/6/2016 18:44	439.3	82.7
150	7/6/2016 18:45	439.7	83.5
151	7/6/2016 18:46	439.7	82.5
152	7/6/2016 18:47	439.6	82
153	7/6/2016 18:48	439.7	82.8
154	7/6/2016 18:49	440	83.3
155	7/6/2016 18:50	440.3	83.7
156	7/6/2016 18:51	439.4	84.3
157	7/6/2016 18:52	440.4	83.8
158	7/6/2016 18:53	440.8	82.9
159	7/6/2016 18:54	441.2	82.5
160	7/6/2016 18:55	441.7	82.4
161	7/6/2016 18:56	442.4	80.9
162	7/6/2016 18:57	443	80.6
163	7/6/2016 18:58	443.4	81
164	7/6/2016 18:59	443.3	82.5
165	7/6/2016 19:00	442.8	81.6
166	7/6/2016 19:01	442.2	82.6
167	7/6/2016 19:02	441.7	81.7
168	7/6/2016 19:03	441.4	81
169	7/6/2016 19:04	441.1	81.2
170	7/6/2016 19:05	441.1	81.6
171	7/6/2016 19:06	441.1	80.7
172	7/6/2016 19:07	441.1	79.1
173	7/6/2016 19:08	441.2	81.1
174	7/6/2016 19:09	440.2	79.7
175	7/6/2016 19:10	441.6	79.4
Average		**439.7**	**80.4**

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/7/2016 9:01
Stop Time	7/7/2016 19:36
Elasped Time	00000Day10:35:02
Interval Time	0:01:00
Data Number	636

Data Purpose:

NO.	Date/Time	T1	T2
1	7/7/2016 9:01	436.9	65.4
2	7/7/2016 9:02	435.7	68.2
3	7/7/2016 9:03	434.6	65.9
4	7/7/2016 9:04	431.6	69
5	7/7/2016 9:05	434.7	70.5
6	7/7/2016 9:06	434.2	69.3
7	7/7/2016 9:07	434.8	68.7
8	7/7/2016 9:08	435.4	68.8
9	7/7/2016 9:09	435.6	70.5
10	7/7/2016 9:10	435.8	70.8
11	7/7/2016 9:11	434.7	70.3
12	7/7/2016 9:12	428.2	69.6
13	7/7/2016 9:13	435.5	67.6
14	7/7/2016 9:14	436.7	68
15	7/7/2016 9:15	437	68.2
16	7/7/2016 9:16	437.3	73.4
17	7/7/2016 9:17	437.5	67.3
18	7/7/2016 9:18	437.7	68.2
19	7/7/2016 9:19	437.8	70.8
20	7/7/2016 9:20	437	69.8
21	7/7/2016 9:21	438.2	70.3
22	7/7/2016 9:22	438.4	70.6
23	7/7/2016 9:23	438.8	71.6
24	7/7/2016 9:24	439.1	70.8
25	7/7/2016 9:25	439.2	71.8
26	7/7/2016 9:26	439.1	70.7
27	7/7/2016 9:27	438.8	70.6
28	7/7/2016 9:28	438.6	68.5
29	7/7/2016 9:29	438.7	70.7
30	7/7/2016 9:30	438.7	68.4
31	7/7/2016 9:31	438.6	67.4
32	7/7/2016 9:32	434	68.3
33	7/7/2016 9:33	436.2	67.7
34	7/7/2016 9:34	438.1	66.7
35	7/7/2016 9:35	438.3	66.9

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/7/2016 9:01
Stop Time	7/7/2016 19:36
Elasped Time	00000Day10:35:02
Interval Time	0:01:00
Data Number	636

Data Purpose:

NO.	Date/Time	T1	T2
36	7/7/2016 9:36	438.1	67.9
37	7/7/2016 9:37	438	67.5
38	7/7/2016 9:38	437.8	65.8
39	7/7/2016 9:39	437.6	68.8
40	7/7/2016 9:40	437.5	66.3
41	7/7/2016 9:41	437.7	66.7
42	7/7/2016 9:42	438	66.5
43	7/7/2016 9:43	438.3	68.1
44	7/7/2016 9:44	438.6	66.8
45	7/7/2016 9:45	438.9	69.6
46	7/7/2016 9:46	439.2	68.6
47	7/7/2016 9:47	439.3	70.7
48	7/7/2016 9:48	439.5	67.1
49	7/7/2016 9:49	439.6	68.2
50	7/7/2016 9:50	439.3	68.6
51	7/7/2016 9:51	439	67.6
52	7/7/2016 9:52	438.8	66.3
53	7/7/2016 9:53	438.9	67.4
54	7/7/2016 9:54	439.1	66.9
55	7/7/2016 9:55	439.1	68.3
56	7/7/2016 9:56	438.6	67.8
57	7/7/2016 9:57	438.3	66.1
58	7/7/2016 9:58	438.5	67.4
59	7/7/2016 9:59	438	65.9
60	7/7/2016 10:00	436.7	65.9
61	7/7/2016 10:01	436.8	66
62	7/7/2016 10:02	438.6	66.4
63	7/7/2016 10:03	439.4	67.7
64	7/7/2016 10:04	439.7	66.2
65	7/7/2016 10:05	439.9	67.2
66	7/7/2016 10:06	439.8	67.6
67	7/7/2016 10:07	439.8	70.3
68	7/7/2016 10:08	440.1	67.3
69	7/7/2016 10:09	439.6	68.6
70	7/7/2016 10:10	440.2	67.4

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/7/2016 9:01
Stop Time	7/7/2016 19:36
Elasped Time	00000Day10:35:02
Interval Time	0:01:00
Data Number	636

Data Purpose:

NO.	Date/Time	T1	T2
71	7/7/2016 10:11	440.5	69.3
72	7/7/2016 10:12	440.5	67.3
73	7/7/2016 10:13	440.2	69.4
74	7/7/2016 10:14	439.7	69
75	7/7/2016 10:15	439.5	67.5
76	7/7/2016 10:16	439.6	69.1
77	7/7/2016 10:17	438.6	68.6
78	7/7/2016 10:18	439.4	67.4
79	7/7/2016 10:19	439.4	68.8
80	7/7/2016 10:20	439.1	69.1
81	7/7/2016 10:21	438.5	70.1
82	7/7/2016 10:22	438.2	70.1
83	7/7/2016 10:23	438.2	71
84	7/7/2016 10:24	438	70.9
85	7/7/2016 10:25	437.7	72.3
86	7/7/2016 10:26	437.4	71.4
87	7/7/2016 10:27	437.2	71.4
88	7/7/2016 10:28	435.1	70.8
89	7/7/2016 10:29	435.7	70.5
90	7/7/2016 10:30	436.1	70.7
91	7/7/2016 10:31	437.4	69.6
92	7/7/2016 10:32	437.3	68.2
93	7/7/2016 10:33	437.3	67.9
94	7/7/2016 10:34	437.5	68.4
95	7/7/2016 10:35	437.4	70.2
96	7/7/2016 10:36	437.2	70.3
97	7/7/2016 10:37	436.9	70.7
98	7/7/2016 10:38	437.3	72.5
99	7/7/2016 10:39	437.9	71.2
100	7/7/2016 10:40	438	73
101	7/7/2016 10:41	438.1	68.4
102	7/7/2016 10:42	438	69.4
103	7/7/2016 10:43	437.8	72
104	7/7/2016 10:44	437.9	70.5
105	7/7/2016 10:45	438.1	70.2

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/7/2016 9:01
Stop Time	7/7/2016 19:36
Elasped Time	00000Day10:35:02
Interval Time	0:01:00
Data Number	636

Data Purpose:

NO.	Date/Time	T1	T2
106	7/7/2016 10:46	437.9	70.8
107	7/7/2016 10:47	438.3	69.8
108	7/7/2016 10:48	438.5	70
109	7/7/2016 10:49	438.9	70.3
110	7/7/2016 10:50	439.3	69.7
111	7/7/2016 10:51	439.6	70.2
112	7/7/2016 10:52	439.5	69.4
113	7/7/2016 10:53	439.5	69.9
114	7/7/2016 10:54	439.2	71.7
115	7/7/2016 10:55	439.5	71.3
116	7/7/2016 10:56	440.2	68.3
117	7/7/2016 10:57	439.6	72.1
118	7/7/2016 10:58	436	70.4
119	7/7/2016 10:59	436.1	70.9
120	7/7/2016 11:00	437.4	68.7
121	7/7/2016 11:01	437.5	70.4
122	7/7/2016 11:02	437.9	68.5
123	7/7/2016 11:03	438.9	70.6
124	7/7/2016 11:04	439	70
125	7/7/2016 11:05	438.8	70.2
126	7/7/2016 11:06	438.8	70.3
127	7/7/2016 11:07	438.6	69.2
128	7/7/2016 11:08	439.2	67.9
129	7/7/2016 11:09	440.5	68.2
130	7/7/2016 11:10	440.9	68.6
131	7/7/2016 11:11	441.2	68.8
132	7/7/2016 11:12	441.4	70.2
133	7/7/2016 11:13	441.4	69.4
134	7/7/2016 11:14	441.7	67.8
135	7/7/2016 11:15	442	69.6
136	7/7/2016 11:16	442.3	67.9
137	7/7/2016 11:17	442.5	67.7
138	7/7/2016 11:18	439.3	66.7
139	7/7/2016 11:19	441.5	67.2
140	7/7/2016 11:20	441.9	66.8

Measure Unit	¢XF		
Measure Type	K-Type		
Start Time	7/7/2016 9:01		
Stop Time	7/7/2016 19:36		
Elasped Time	00000Day10:35:02		
Interval Time	0:01:00		
Data Number	636		

Data Purpose:

NO.	Date/Time	T1	T2
141	7/7/2016 11:21	442.1	66.8
142	7/7/2016 11:22	442.2	66.9
143	7/7/2016 11:23	442.4	66.8
144	7/7/2016 11:24	442.5	67
145	7/7/2016 11:25	442.6	66.8
146	7/7/2016 11:26	442.8	64.9
147	7/7/2016 11:27	442.8	66.4
148	7/7/2016 11:28	442.2	65.8
149	7/7/2016 11:29	440.2	66.7
150	7/7/2016 11:30	442.4	65.7
151	7/7/2016 11:31	440.3	67.3
152	7/7/2016 11:32	441.8	66.5
153	7/7/2016 11:33	441.5	65.7
154	7/7/2016 11:34	441.5	66.4
155	7/7/2016 11:35	441.4	66.2
156	7/7/2016 11:36	441.5	66.6
157	7/7/2016 11:37	441.6	66
158	7/7/2016 11:38	441.6	65.2
159	7/7/2016 11:39	441.6	67.1
160	7/7/2016 11:40	439.7	66.3
161	7/7/2016 11:41	441	64.3
162	7/7/2016 11:42	441.4	66.3
163	7/7/2016 11:43	440.5	65.5
164	7/7/2016 11:44	440	65.9
165	7/7/2016 11:45	439.8	66.8
166	7/7/2016 11:46	439.7	66.2
167	7/7/2016 11:47	439.6	65.9
168	7/7/2016 11:48	439.6	66.8
169	7/7/2016 11:49	436.5	66.8
170	7/7/2016 11:50	439.8	66
171	7/7/2016 11:51	440.5	65.5
172	7/7/2016 11:52	440.9	66.2
173	7/7/2016 11:53	440.8	67
174	7/7/2016 11:54	440.2	67.1
175	7/7/2016 11:55	439.1	66.2

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/7/2016 9:01
Stop Time	7/7/2016 19:36
Elasped Time	00000Day10:35:02
Interval Time	0:01:00
Data Number	636

Data Purpose:

NO.	Date/Time	T1	T2
176	7/7/2016 11:56	438.3	66.3
177	7/7/2016 11:57	438.1	65.5
178	7/7/2016 11:58	438.3	66.5
179	7/7/2016 11:59	438.6	66
180	7/7/2016 12:00	434.5	66.6
181	7/7/2016 12:01	433.5	66.1
182	7/7/2016 12:02	436.7	66.4
183	7/7/2016 12:03	438.5	67.1
184	7/7/2016 12:04	438.3	66.7
185	7/7/2016 12:05	438.5	66
186	7/7/2016 12:06	438.5	66.3
187	7/7/2016 12:07	438.6	65.9
188	7/7/2016 12:08	438.9	66.5
189	7/7/2016 12:09	438.2	66.2
190	7/7/2016 12:10	439.1	66.4
191	7/7/2016 12:11	440	68.5
192	7/7/2016 12:12	440.3	66.3
193	7/7/2016 12:13	440.5	67.2
194	7/7/2016 12:14	440.8	66.3
195	7/7/2016 12:15	440.9	68
196	7/7/2016 12:16	441.1	67.1
197	7/7/2016 12:17	441.3	68
198	7/7/2016 12:18	441.2	69
199	7/7/2016 12:19	438.5	68.6
200	7/7/2016 12:20	439.5	68.1
201	7/7/2016 12:21	439.7	67.9
202	7/7/2016 12:22	438.1	68.6
203	7/7/2016 12:23	437.9	66.8
204	7/7/2016 12:24	436.7	67.6
205	7/7/2016 12:25	436.9	68.1
206	7/7/2016 12:26	437.3	66.6
207	7/7/2016 12:27	438.8	66.9
208	7/7/2016 12:28	430.3	67.1
209	7/7/2016 12:29	427.5	65.5
210	7/7/2016 12:30	426.4	65.5

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/7/2016 9:01
Stop Time	7/7/2016 19:36
Elasped Time	00000Day10:35:02
Interval Time	0:01:00
Data Number	636

Data Purpose:

NO.	Date/Time	T1	T2
211	7/7/2016 12:31	426.2	66.9
212	7/7/2016 12:32	436.2	66.5
213	7/7/2016 12:33	436.9	66.3
214	7/7/2016 12:34	438.9	65.6
215	7/7/2016 12:35	439.5	68.3
216	7/7/2016 12:36	439.8	67
217	7/7/2016 12:37	439.7	65.7
218	7/7/2016 12:38	439.7	66.9
219	7/7/2016 12:39	440.4	66.6
220	7/7/2016 12:40	440.7	67.2
221	7/7/2016 12:41	440.8	66.3
222	7/7/2016 12:42	441.1	67.7
223	7/7/2016 12:43	441.4	67.1
224	7/7/2016 12:44	439.8	67.8
225	7/7/2016 12:45	440.5	69.3
226	7/7/2016 12:46	441.2	67.7
227	7/7/2016 12:47	441.6	66.4
228	7/7/2016 12:48	441.8	66.8
229	7/7/2016 12:49	441.7	69.2
230	7/7/2016 12:50	441.2	68.2
231	7/7/2016 12:51	440.7	68.5
232	7/7/2016 12:52	439.2	66.2
233	7/7/2016 12:53	440.3	67.2
234	7/7/2016 12:54	440.3	67.1
235	7/7/2016 12:55	440.5	69.5
236	7/7/2016 12:56	440.6	65.5
237	7/7/2016 12:57	440.9	68.1
238	7/7/2016 12:58	441.1	67.2
239	7/7/2016 12:59	441.1	68.1
240	7/7/2016 13:00	441.2	67
241	7/7/2016 13:01	441.3	67.9
242	7/7/2016 13:02	441.4	68.8
243	7/7/2016 13:03	441.3	68.2
244	7/7/2016 13:04	441	66.8
245	7/7/2016 13:05	440.6	68.8

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/7/2016 9:01
Stop Time	7/7/2016 19:36
Elasped Time	00000Day10:35:02
Interval Time	0:01:00
Data Number	636

Data Purpose:

NO.	Date/Time	T1	T2
246	7/7/2016 13:06	440.3	67.6
247	7/7/2016 13:07	440.3	69.9
248	7/7/2016 13:08	440.4	67.3
249	7/7/2016 13:09	440.4	71.1
250	7/7/2016 13:10	440.3	68.1
251	7/7/2016 13:11	440.1	68.5
252	7/7/2016 13:12	438.6	68.8
253	7/7/2016 13:13	437.1	66.4
254	7/7/2016 13:14	436.8	69.1
255	7/7/2016 13:15	435.6	66.6
256	7/7/2016 13:16	438.4	67.7
257	7/7/2016 13:17	439	68.5
258	7/7/2016 13:18	438.8	68.2
259	7/7/2016 13:19	438.6	69.5
260	7/7/2016 13:20	438.5	68.5
261	7/7/2016 13:21	438.8	69.8
262	7/7/2016 13:22	439.1	69.9
263	7/7/2016 13:23	439.2	70.6
264	7/7/2016 13:24	438.9	70.2
265	7/7/2016 13:25	438.5	69.1
266	7/7/2016 13:26	438.3	68.8
267	7/7/2016 13:27	438	68.8
268	7/7/2016 13:28	437.8	71.3
269	7/7/2016 13:29	437.9	69.4
270	7/7/2016 13:30	438.1	68.9
271	7/7/2016 13:31	438.4	68.1
272	7/7/2016 13:32	438.8	65.9
273	7/7/2016 13:33	439.1	65.8
274	7/7/2016 13:34	438.3	69.3
275	7/7/2016 13:35	439.5	67.4
276	7/7/2016 13:36	439.4	68.5
277	7/7/2016 13:37	438.8	67.7
278	7/7/2016 13:38	439.1	66.6
279	7/7/2016 13:39	439.2	67.2
280	7/7/2016 13:40	439.3	65.5

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/7/2016 9:01
Stop Time	7/7/2016 19:36
Elasped Time	00000Day10:35:02
Interval Time	0:01:00
Data Number	636

Data Purpose:

NO.	Date/Time	T1	T2
281	7/7/2016 13:41	439.7	65.2
282	7/7/2016 13:42	440	65.6
283	7/7/2016 13:43	440.4	66.2
284	7/7/2016 13:44	440.7	65.8
285	7/7/2016 13:45	440.2	66.2
286	7/7/2016 13:46	440.7	65.7
287	7/7/2016 13:47	440.5	64.2
288	7/7/2016 13:48	440.3	64.7
289	7/7/2016 13:49	440.4	64.2
290	7/7/2016 13:50	440.5	65.1
291	7/7/2016 13:51	440.7	66.2
292	7/7/2016 13:52	440.7	68.5
293	7/7/2016 13:53	440.7	65.8
294	7/7/2016 13:54	440.8	64.3
295	7/7/2016 13:55	441	65.6
296	7/7/2016 13:56	441.4	65.6
297	7/7/2016 13:57	441.6	67.2
298	7/7/2016 13:58	441.6	65.7
299	7/7/2016 13:59	441.3	64.3
300	7/7/2016 14:00	441	66.2
301	7/7/2016 14:01	441	65.4
302	7/7/2016 14:02	441.1	64.8
303	7/7/2016 14:03	439.3	66.5
304	7/7/2016 14:04	439.4	67
305	7/7/2016 14:05	441	65.7
306	7/7/2016 14:06	441.3	64.5
307	7/7/2016 14:07	441.4	64.5
308	7/7/2016 14:08	441.7	64.5
309	7/7/2016 14:09	442	66
310	7/7/2016 14:10	442.2	63.7
311	7/7/2016 14:11	442.4	63.7
312	7/7/2016 14:12	442.2	65.2
313	7/7/2016 14:13	442	64.7
314	7/7/2016 14:14	441.9	64.4
315	7/7/2016 14:15	442	65.5

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/7/2016 9:01
Stop Time	7/7/2016 19:36
Elasped Time	00000Day10:35:02
Interval Time	0:01:00
Data Number	636

Data Purpose:

NO.	Date/Time	T1	T2
316	7/7/2016 14:16	442	63.6
317	7/7/2016 14:17	442	64.2
318	7/7/2016 14:18	441.7	65.1
319	7/7/2016 14:19	441.4	64.6
320	7/7/2016 14:20	441	64.1
321	7/7/2016 14:21	440.8	64.7
322	7/7/2016 14:22	440.5	64.6
323	7/7/2016 14:23	440.2	64.3
324	7/7/2016 14:24	440.2	63.9
325	7/7/2016 14:25	440.2	64
326	7/7/2016 14:26	440	64.1
327	7/7/2016 14:27	439.9	64.3
328	7/7/2016 14:28	440	63.3
329	7/7/2016 14:29	440	64.5
330	7/7/2016 14:30	440	64
331	7/7/2016 14:31	440.1	64.5
332	7/7/2016 14:32	440	64.8
333	7/7/2016 14:33	439.8	63.3
334	7/7/2016 14:34	439.3	64.1
335	7/7/2016 14:35	439.2	64.2
336	7/7/2016 14:36	439.2	65.4
337	7/7/2016 14:37	439	64.7
338	7/7/2016 14:38	438.8	63.8
339	7/7/2016 14:39	438.7	63.9
340	7/7/2016 14:40	438.8	63.8
341	7/7/2016 14:41	439.1	63.8
342	7/7/2016 14:42	436.5	64
343	7/7/2016 14:43	439.4	65
344	7/7/2016 14:44	439.8	64.2
345	7/7/2016 14:45	439.9	65
346	7/7/2016 14:46	440	63.8
347	7/7/2016 14:47	440.1	64.5
348	7/7/2016 14:48	440.2	65
349	7/7/2016 14:49	440.2	64
350	7/7/2016 14:50	440.2	65.8

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/7/2016 9:01
Stop Time	7/7/2016 19:36
Elasped Time	00000Day10:35:02
Interval Time	0:01:00
Data Number	636

Data Purpose:

NO.	Date/Time	T1	T2
351	7/7/2016 14:51	440	64.6
352	7/7/2016 14:52	439.8	64.8
353	7/7/2016 14:53	438.8	65
354	7/7/2016 14:54	439.3	65.2
355	7/7/2016 14:55	440.1	65.1
356	7/7/2016 14:56	440.1	65.4
357	7/7/2016 14:57	440	64.4
358	7/7/2016 14:58	439.8	64.5
359	7/7/2016 14:59	439.8	64.5
360	7/7/2016 15:00	439.7	65
361	7/7/2016 15:01	439.7	66.3
362	7/7/2016 15:02	439.7	64.6
363	7/7/2016 15:03	439.8	63.7
364	7/7/2016 15:04	439.8	65.4
365	7/7/2016 15:05	440	66.2
366	7/7/2016 15:06	439.9	66.4
367	7/7/2016 15:07	439.8	64.6
368	7/7/2016 15:08	439.7	63.7
369	7/7/2016 15:09	439.5	63.8
370	7/7/2016 15:10	439.4	63.8
371	7/7/2016 15:11	438.6	64
372	7/7/2016 15:12	438.8	64.9
373	7/7/2016 15:13	436.9	64.7
374	7/7/2016 15:14	438.3	64.5
375	7/7/2016 15:15	437.3	70.3
376	7/7/2016 15:16	438.8	64.7
377	7/7/2016 15:17	439.3	67.5
378	7/7/2016 15:18	439.7	65.1
379	7/7/2016 15:19	439.9	64.9
380	7/7/2016 15:20	440	64.2
381	7/7/2016 15:21	439.9	64.8
382	7/7/2016 15:22	439.7	65.1
383	7/7/2016 15:23	439.5	65.2
384	7/7/2016 15:24	439.2	64.4
385	7/7/2016 15:25	438.6	65.6

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/7/2016 9:01
Stop Time	7/7/2016 19:36
Elasped Time	00000Day10:35:02
Interval Time	0:01:00
Data Number	636

Data Purpose:

NO.	Date/Time	T1	T2
386	7/7/2016 15:26	438.3	64.6
387	7/7/2016 15:27	438.3	65.3
388	7/7/2016 15:28	438.4	65.1
389	7/7/2016 15:29	438.5	65.3
390	7/7/2016 15:30	438.5	65.1
391	7/7/2016 15:31	437.9	65.7
392	7/7/2016 15:32	438.7	64.9
393	7/7/2016 15:33	438.9	65.7
394	7/7/2016 15:34	438.3	64.9
395	7/7/2016 15:35	438.2	65.2
396	7/7/2016 15:36	438.6	64.7
397	7/7/2016 15:37	438.3	66.1
398	7/7/2016 15:38	437.9	64.9
399	7/7/2016 15:39	437.6	65.5
400	7/7/2016 15:40	437.5	64.2
401	7/7/2016 15:41	436.5	65.3
402	7/7/2016 15:42	435.8	64.3
403	7/7/2016 15:43	437	64.8
404	7/7/2016 15:44	437.6	64.7
405	7/7/2016 15:45	438.1	65.5
406	7/7/2016 15:46	436.7	67.1
407	7/7/2016 15:47	434	64.9
408	7/7/2016 15:48	436	63.9
409	7/7/2016 15:49	436.7	64.5
410	7/7/2016 15:50	436.8	64.6
411	7/7/2016 15:51	436.8	66.3
412	7/7/2016 15:52	436.7	65.8
413	7/7/2016 15:53	436.8	66
414	7/7/2016 15:54	437	64.7
415	7/7/2016 15:55	437.3	64
416	7/7/2016 15:56	437.3	65.8
417	7/7/2016 15:57	437.4	65
418	7/7/2016 15:58	437.5	64.5
419	7/7/2016 15:59	437.8	64.3
420	7/7/2016 16:00	438.1	64.2

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/7/2016 9:01
Stop Time	7/7/2016 19:36
Elasped Time	00000Day10:35:02
Interval Time	0:01:00
Data Number	636

Data Purpose:

NO.	Date/Time	T1	T2
421	7/7/2016 16:01	437.9	64.7
422	7/7/2016 16:02	438.8	64.5
423	7/7/2016 16:03	439.3	64.5
424	7/7/2016 16:04	439.7	63.8
425	7/7/2016 16:05	440	65.1
426	7/7/2016 16:06	440.2	64.5
427	7/7/2016 16:07	439.9	63.4
428	7/7/2016 16:08	439.4	64.7
429	7/7/2016 16:09	439.1	64.1
430	7/7/2016 16:10	438.1	64.8
431	7/7/2016 16:11	440	65.5
432	7/7/2016 16:12	438.6	64.7
433	7/7/2016 16:13	438.5	66.6
434	7/7/2016 16:14	439.1	63.8
435	7/7/2016 16:15	438.9	64.5
436	7/7/2016 16:16	438.5	64.4
437	7/7/2016 16:17	439.2	64.6
438	7/7/2016 16:18	438.9	65.2
439	7/7/2016 16:19	438	64.3
440	7/7/2016 16:20	439.1	65.2
441	7/7/2016 16:21	439.6	66.6
442	7/7/2016 16:22	439.9	66.2
443	7/7/2016 16:23	439.8	65.5
444	7/7/2016 16:24	439.7	65.7
445	7/7/2016 16:25	439.6	65.1
446	7/7/2016 16:26	439.6	65.3
447	7/7/2016 16:27	439.8	65.8
448	7/7/2016 16:28	439.3	64.7
449	7/7/2016 16:29	440.1	64.6
450	7/7/2016 16:30	439.9	65.4
451	7/7/2016 16:31	439.6	64.9
452	7/7/2016 16:32	439.6	65.8
453	7/7/2016 16:33	439.8	65.2
454	7/7/2016 16:34	440.1	65.4
455	7/7/2016 16:35	440.4	66.2

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/7/2016 9:01
Stop Time	7/7/2016 19:36
Elasped Time	00000Day10:35:02
Interval Time	0:01:00
Data Number	636

Data Purpose:

NO.	Date/Time	T1	T2
456	7/7/2016 16:36	440.7	65.1
457	7/7/2016 16:37	440.9	64.3
458	7/7/2016 16:38	440.8	65.5
459	7/7/2016 16:39	440.1	66.3
460	7/7/2016 16:40	441.1	65.2
461	7/7/2016 16:41	441.8	63.9
462	7/7/2016 16:42	442	66.2
463	7/7/2016 16:43	441	65.3
464	7/7/2016 16:44	441.8	64.7
465	7/7/2016 16:45	439.7	66.2
466	7/7/2016 16:46	439	64.3
467	7/7/2016 16:47	441.6	65.6
468	7/7/2016 16:48	442.1	64.6
469	7/7/2016 16:49	442.2	64.6
470	7/7/2016 16:50	442.1	64.4
471	7/7/2016 16:51	441.9	64.7
472	7/7/2016 16:52	441.8	64.6
473	7/7/2016 16:53	440.8	64.7
474	7/7/2016 16:54	441.6	65.1
475	7/7/2016 16:55	441.6	64.6
476	7/7/2016 16:56	442.1	64.1
477	7/7/2016 16:57	441.7	63.9
478	7/7/2016 16:58	441.3	63.8
479	7/7/2016 16:59	441	63.3
480	7/7/2016 17:00	440.9	63.5
481	7/7/2016 17:01	440.9	64.7
482	7/7/2016 17:02	440.8	64.6
483	7/7/2016 17:03	440.5	64
484	7/7/2016 17:04	440.1	64.2
485	7/7/2016 17:05	438.4	63.9
486	7/7/2016 17:06	439.3	64.3
487	7/7/2016 17:07	439.4	64.3
488	7/7/2016 17:08	439.2	64.2
489	7/7/2016 17:09	439.6	64.4
490	7/7/2016 17:10	439.9	64.3

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/7/2016 9:01
Stop Time	7/7/2016 19:36
Elasped Time	00000Day10:35:02
Interval Time	0:01:00
Data Number	636

Data Purpose:

NO.	Date/Time	T1	T2
491	7/7/2016 17:11	439.8	64.1
492	7/7/2016 17:12	439.6	62.7
493	7/7/2016 17:13	439.5	63.9
494	7/7/2016 17:14	439.5	63.8
495	7/7/2016 17:15	439.7	63.8
496	7/7/2016 17:16	439.9	63.8
497	7/7/2016 17:17	440.1	64
498	7/7/2016 17:18	440.3	63.7
499	7/7/2016 17:19	440.4	63.8
500	7/7/2016 17:20	440.3	64.7
501	7/7/2016 17:21	439.9	64.4
502	7/7/2016 17:22	439.5	62.7
503	7/7/2016 17:23	439.3	63.1
504	7/7/2016 17:24	439.2	63.2
505	7/7/2016 17:25	439.2	63.4
506	7/7/2016 17:26	439.2	63.2
507	7/7/2016 17:27	439.2	63.4
508	7/7/2016 17:28	439.3	63.5
509	7/7/2016 17:29	439.5	64.1
510	7/7/2016 17:30	439.8	64
511	7/7/2016 17:31	440.2	63.2
512	7/7/2016 17:32	440.4	63.4
513	7/7/2016 17:33	440.3	62.8
514	7/7/2016 17:34	439.8	63.9
515	7/7/2016 17:35	438.8	63.9
516	7/7/2016 17:36	439	63
517	7/7/2016 17:37	438.2	64.8
518	7/7/2016 17:38	439.1	62.8
519	7/7/2016 17:39	438.8	63.5
520	7/7/2016 17:40	438.6	62.8
521	7/7/2016 17:41	438.7	62.8
522	7/7/2016 17:42	436.3	64.3
523	7/7/2016 17:43	438.7	62.2
524	7/7/2016 17:44	437.8	62.2
525	7/7/2016 17:45	437.8	64

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/7/2016 9:01
Stop Time	7/7/2016 19:36
Elasped Time	00000Day10:35:02
Interval Time	0:01:00
Data Number	636

Data Purpose:

NO.	Date/Time	T1	T2
526	7/7/2016 17:46	438.2	64.1
527	7/7/2016 17:47	438.6	64.1
528	7/7/2016 17:48	439.1	63.2
529	7/7/2016 17:49	439.6	61.7
530	7/7/2016 17:50	439.9	62
531	7/7/2016 17:51	439.9	62.9
532	7/7/2016 17:52	439.8	64
533	7/7/2016 17:53	439.8	63
534	7/7/2016 17:54	440	62
535	7/7/2016 17:55	440.4	62.1
536	7/7/2016 17:56	440.6	64.4
537	7/7/2016 17:57	440.8	63
538	7/7/2016 17:58	441.1	63
539	7/7/2016 17:59	441.4	62
540	7/7/2016 18:00	441.4	63.2
541	7/7/2016 18:01	441.4	62.6
542	7/7/2016 18:02	441.5	61.6
543	7/7/2016 18:03	439.7	62.9
544	7/7/2016 18:04	441.5	62.2
545	7/7/2016 18:05	442.2	63.3
546	7/7/2016 18:06	442.5	63.8
547	7/7/2016 18:07	439	63.9
548	7/7/2016 18:08	441.1	63.7
549	7/7/2016 18:09	441.1	64.4
550	7/7/2016 18:10	441.2	65
551	7/7/2016 18:11	441.5	64.5
552	7/7/2016 18:12	441.4	63.5
553	7/7/2016 18:13	442.3	63
554	7/7/2016 18:14	442.9	63.4
555	7/7/2016 18:15	443.2	64
556	7/7/2016 18:16	443.6	63.5
557	7/7/2016 18:17	443.9	64.4
558	7/7/2016 18:18	443.8	62.7
559	7/7/2016 18:19	443.2	62.9
560	7/7/2016 18:20	442.7	64.1

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/7/2016 9:01
Stop Time	7/7/2016 19:36
Elasped Time	00000Day10:35:02
Interval Time	0:01:00
Data Number	636

Data Purpose:

NO.	Date/Time	T1	T2
561	7/7/2016 18:21	442.5	65.6
562	7/7/2016 18:22	442.6	63.1
563	7/7/2016 18:23	442.8	65.2
564	7/7/2016 18:24	442.8	64.5
565	7/7/2016 18:25	442.6	65.2
566	7/7/2016 18:26	442.3	63.9
567	7/7/2016 18:27	439.9	62.9
568	7/7/2016 18:28	440.1	64.3
569	7/7/2016 18:29	438.3	65.7
570	7/7/2016 18:30	441.3	63.2
571	7/7/2016 18:31	441.6	64.4
572	7/7/2016 18:32	441.3	64.1
573	7/7/2016 18:33	441.1	66.1
574	7/7/2016 18:34	441.1	64.2
575	7/7/2016 18:35	441	63.6
576	7/7/2016 18:36	440.8	63.4
577	7/7/2016 18:37	440.5	64.4
578	7/7/2016 18:38	440.4	64
579	7/7/2016 18:39	440.3	65.4
580	7/7/2016 18:40	440.2	64.8
581	7/7/2016 18:41	440	65.3
582	7/7/2016 18:42	439.9	65.8
583	7/7/2016 18:43	439.8	64.4
584	7/7/2016 18:44	439.7	65.3
585	7/7/2016 18:45	439.9	64.8
586	7/7/2016 18:46	440	64.6
587	7/7/2016 18:47	439.9	65.9
588	7/7/2016 18:48	440.3	66.3
589	7/7/2016 18:49	440.4	64.1
590	7/7/2016 18:50	440.4	65.2
591	7/7/2016 18:51	440.2	65.3
592	7/7/2016 18:52	439.9	65.2
593	7/7/2016 18:53	439.6	64.8
594	7/7/2016 18:54	439.5	63
595	7/7/2016 18:55	439.6	64.2

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/7/2016 9:01
Stop Time	7/7/2016 19:36
Elasped Time	00000Day10:35:02
Interval Time	0:01:00
Data Number	636

Data Purpose:

NO.	Date/Time	T1	T2
596	7/7/2016 18:56	439.7	64.1
597	7/7/2016 18:57	439.4	64.5
598	7/7/2016 18:58	438.2	64.6
599	7/7/2016 18:59	436.4	63.6
600	7/7/2016 19:00	439.4	62.8
601	7/7/2016 19:01	439.5	64.8
602	7/7/2016 19:02	439.3	63.6
603	7/7/2016 19:03	439.3	65.6
604	7/7/2016 19:04	439.4	64.8
605	7/7/2016 19:05	439.6	63.8
606	7/7/2016 19:06	439.6	65
607	7/7/2016 19:07	439.6	66.2
608	7/7/2016 19:08	439.5	66
609	7/7/2016 19:09	439.5	64.4
610	7/7/2016 19:10	439.7	65.2
611	7/7/2016 19:11	439.9	65.7
612	7/7/2016 19:12	439.7	66
613	7/7/2016 19:13	439.4	63.6
614	7/7/2016 19:14	439.2	64.5
615	7/7/2016 19:15	439.3	63.3
616	7/7/2016 19:16	439.5	64.8
617	7/7/2016 19:17	439.9	64.4
618	7/7/2016 19:18	440.2	66.1
619	7/7/2016 19:19	440.5	65.3
620	7/7/2016 19:20	440.3	66
621	7/7/2016 19:21	439.8	65.2
622	7/7/2016 19:22	439.3	65.6
623	7/7/2016 19:23	439.5	64.9
624	7/7/2016 19:24	439.2	65
625	7/7/2016 19:25	439.8	64.8
626	7/7/2016 19:26	441.4	64.3
627	7/7/2016 19:27	439.6	63.5
628	7/7/2016 19:28	440.1	64.1
629	7/7/2016 19:29	441.8	64.1
630	7/7/2016 19:30	441.9	64

Measure Unit	¢XF
Measure Type	K-Type
Start Time	7/7/2016 9:01
Stop Time	7/7/2016 19:36
Elasped Time	00000Day10:35:02
Interval Time	0:01:00
Data Number	636

Data Purpose:

NO.		Date/Time	T1	T2
	631	7/7/2016 19:31	441.6	64
	632	7/7/2016 19:32	441.4	64.4
	633	7/7/2016 19:33	441.4	64.2
	634	7/7/2016 19:34	441.7	63.7
	635	7/7/2016 19:35	442.1	63.8
	636	7/7/2016 19:36	442.1	63.3
Average			**439.4**	**66.1**

APPENDIX B
RAW TEST DATA

B.1 Test Log

B.2 Particulate/Metals

B.3 PM_{10}/$PM_{2.5}$

B.4 PCDD/PCDF and Cresol Isomers

B.5 Hydrogen Chloride/Chlorine

B.6 VOCs

B.7 O_2/CO_2

B.8 Opacity

B.1 TEST LOG

WESTON SOLUTIONS

SHEET 1 of 1

CLIENT/SUBJECT LWEC 114 TEST W.O. NO. ______

TASK DESCRIPTION STACK SAMPLE RUNS TASK NO. ______

PREPARED BY ______ DEPT ______ DATE ______

MATH CHECK BY ______ DEPT ______ DATE ______

METHOD REV. BY ______ DEPT ______ DATE ______

APPROVED BY KL

DEPT ______ DATE 7/6/2016

0914	START M23/0010, BOILER @ LOAD
0935	START M26
1040	M26 COMPLETE
1231	M23/0010 COMPLETE
1314	START PM/metals (M5/29) & PM10-2.5 (M201A/202)
1500	PM10-2.5 COMPLETE. Head & PITOT ASSEMBLY TWISTED, ΔPs LOW
1521	M5/29 COMPLETE
1552	START R2 M23/0010
1621	START R2 M26
1726	R2 M26 COMPLETE
1907	R2 M23/0010 COMPLETE

* TEMPS RECORDED @ STACK INLET DUCT DURING ALL RUNS.

** CEMS M3A/M25A ONLINE ENTIRE DAY. WILL USE VFR FROM M5/29 TO CALCULATE lb/hr VOC

*** OPACITY (M9) CONDUCTED DURING PM/METALS (1340-1440)

WESTON SOLUTIONS

SHEET 1 of 2

CLIENT/SUBJECT LWEC 114 TEST W.O. NO. ______

TASK DESCRIPTION STACK SAMPLE RUNS TASK NO. ______

PREPARED BY ______ DEPT ______ DATE ______

MATH CHECK BY ______ DEPT ______ DATE ______

METHOD REV. BY ______ DEPT ______ DATE ______

APPROVED BY KL DEPT ______ DATE 2/7/2016

0840 START R2 PM/METALS, BOILER @ LOAD

0849 START R2 PM10-2.5 (Repeat of R1, VFR Believed NOT REPRESENTATIVE)

0930 R2 PM10-2.5 STOP
Probe TEMP LOW. INSPECTED PROBE & FOUND SHORT/CRACK IN glass. SPOKE WITH TOM G. of DEQ And concluded we should SCRAP RUN & START OVER

1055 R2 PM/METALS COMPLETE

1057 START R2 PM10-2.5 (2nd ATTEMPT)

1135 START R3 M23/0010

1251 R2 PM10-2.5 COMPLETE

1334 START R3 M26

1439 R3 M26 COMPLETE

1450 R3 M23/0010 COMPLETE

1513 START R3 PM10-2.5

1515 START R3 PM/METALS

1704 R3 PM/METALS & PM10-2.5 COMPLETE

1742 START R4 PM10-2.5

1926 R4 PM10-2.5 COMPLETE

04P-0685

an employee-owned company

WESTON SOLUTIONS

SHEET 2 of 2

CLIENT/SUBJECT LWEC 114 TEST W.O. NO. ______

TASK DESCRIPTION STACK SAMPLE RUNS TASK NO. ______

PREPARED BY ______ DEPT ______ DATE ______

MATH CHECK BY ______ DEPT ______ DATE ______

METHOD REV. BY ______ DEPT ______ DATE ______

APPROVED BY KY
DEPT ______ DATE 7/7/2016

* TEMPS RECORDED @ STACK INLET DUCT DURING ALL RUNS

** CEMS M3A/25A ONLINE ALL DAY.

*** OPACITY (M9) CONDUCTED DURING R2 PM/METALS (0900-1000) AND R3 PM/METALS (1530-1630)

~2100 STACK SAMPLES PICKED UP BY MAXXAM COURIER

04P-0885

an employee-owned company

WESTON SOLUTIONS

SHEET 1 of 1

CLIENT/SUBJECT: LWEC 114 TEST

W.O. NO.:

TASK DESCRIPTION: Fuel samples

TASK NO.:

PREPARED BY: ____ DEPT ____ DATE ____

MATH CHECK BY: ____ DEPT ____ DATE ____

METHOD REV. BY: ____ DEPT ____ DATE ____

APPROVED BY: KW

DEPT ____ DATE 7/6/201

Series 1
- R1 M23/0010
- R1 M26

Series 2
- ~~R1 PM10-2.5~~ (KW)
- R1 PM/metals

(R1) Fuel samples R1A & R1B

Series 1
- R2 M23/0010
- R2 M26

(R2) Fuel samples R2A

04P-0685

an employee-owned company

WESTON SOLUTIONS

SHEET 1 of 1

CLIENT/SUBJECT LWEC 114 TEST W.O. NO.

TASK DESCRIPTION Fuel samples TASK NO.

PREPARED BY DEPT DATE

MATH CHECK BY DEPT DATE

METHOD REV. BY DEPT DATE

APPROVED BY KG

DEPT DATE 7/7/2016

Series 2 — R2 PM/METALS; ~~R2 PM10-2.5~~ (KW) — (R2) Fuel samples R2B

Series 1 — R3 M23/0010; R3 M26; R2 PM10-2.5 — (R3) Fuel samples R3A

Series 2 — R3 PM/METALS; R3 PM10-2.5 — (R3) Fuel samples R3B

SOLO → R4 PM10-2.5 — (R3) Fuel samples R3C

04P-0685

an employee-owned company

B.2 PARTICULATE/METALS

Sample and Velocity Traverse Point Data Sheet - Method 1

Client: LWEC
Location/Plant: L'Anse, MI
Source: Boiler No. 1 (ESP Outlet)

Operator: ______
Date: ______
W.O. Number: ______

Duct Type	☐	Circular	☒	Rectangular Duct	Indicate appropriate type
Traverse Type	☐	Particulate Traverse	☐	Velocity Traverse	

Distance from far wall to outside of port (in.) = C	90.0
Port Depth (in.) = D	12.0
Depth of Duct, diameter (in.) = C-D	78
Area of Duct (ft^2)	39.00
Total Traverse Points	12
Total Traverse Points per Port	3
Rectangular Ducts Only	
Width of Duct, rectangular duct only (in.)	72
Total Ports (rectangular duct only)	4

Traverse Point Locations

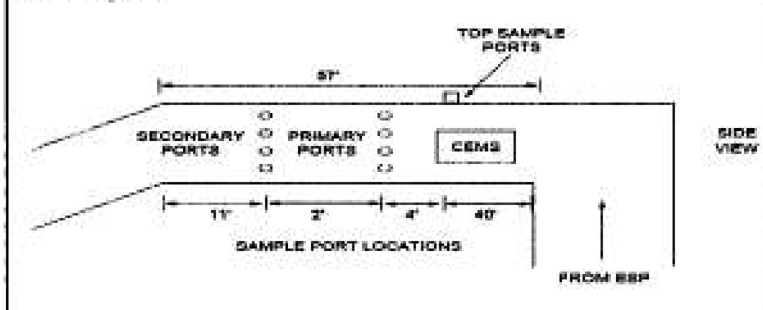
Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)
1	16.67	13.00	25
2	50.00	39.00	51
3	83.33	65.00	77
4			
5			
6			
7			
8			
9			
10			
11			
12			

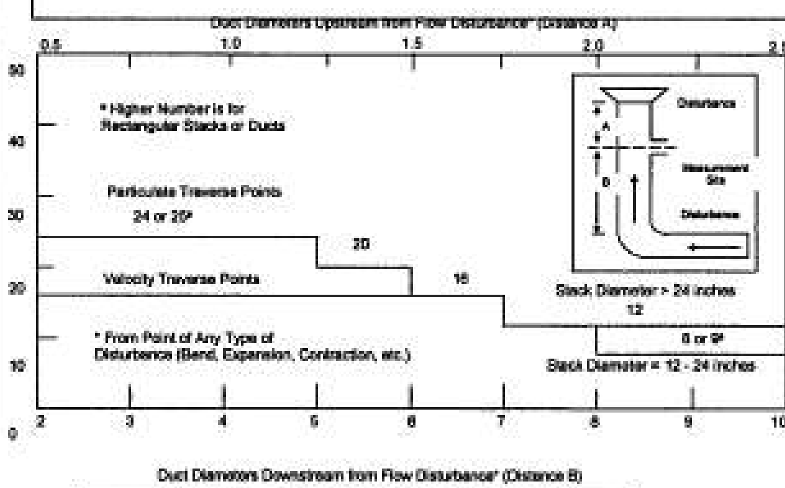
Equivalent Diameter = (2*L*W)/(L+W)

Flow Disturbances

Upstream - A (ft)	11.0
Downstream - B (ft)	44.0
Upstream - A (duct diameters)	1.8
Downstream - B (duct diameters)	7.1

Stack Diagram





Traverse Point Location Percent of Stack -Circular

Traverse Location Point	Number of Traverse Points: 1	2	3	4	5	6	7	8	9	10	11	12
1		14.6		6.7		4.4		3.2		2.6		2.1
2		85.4		25		14.6		10.5		8.2		6.7
3				75		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
6						95.6		80.6		65.8		35.6
7								89.5		77.4		64.4
8								96.8		85.4		75
9										91.8		82.3
10										97.4		88.2
11												93.3
12												97.9

Traverse Point Location Percent of Stack -Rectangular

Traverse Location Point	Number of Traverse Points: 1	2	3	4	5	6	7	8	9	10	11	12
1		25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2		75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3			83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4				87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5					90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6						91.7	78.6	68.8	61.1	55.0	50.0	45.8
7							92.9	81.3	72.2	65.0	59.1	54.2
8								93.8	83.3	75.0	68.2	62.5
9									94.4	85.0	77.3	70.8
10										95.0	86.4	79.2
11											95.5	87.5
12												95.8

Rectangular Stack Points & Matrix
9 - 3 x 3
12 - 4 x 3
16 - 4 x 4
20 - 5 x 4
25 - 5 x 5
30 - 6 x 5
36 - 6 x 6
42 - 7 x 6
49 - 7 x 7

Sample and Velocity Traverse Point Data Sheet - Method 1

Client: LWEC
Loaction/Plant: L'Anse
Source: E3 Outlet

Operator: Mills
Date: 2/13/09
W.O. Number:

✓ 7/5/16

Duct Type	☐ Circular	☒ Rectangular Duct
Traverse Type	☐ Particulate Traverse	☐ Velocity Traverse

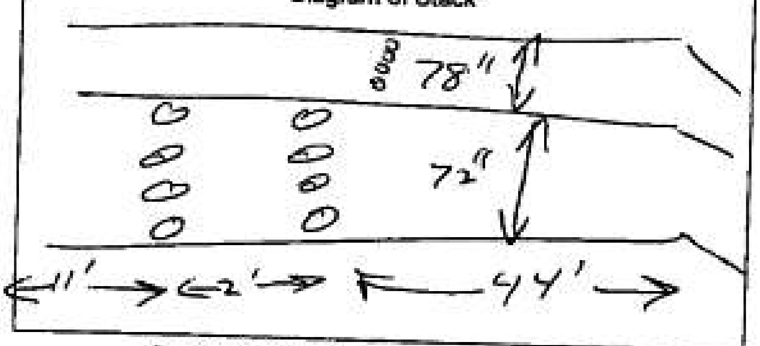
Indicate appropriate type

Distance from far wall to outside of port (in.) = C	90
Port Depth (in.) = D	12
Depth of Duct, diameter (in.) = C-D	78
Area of Duct (ft²)	39.00
Total Traverse Points	12
Total Traverse Points per Port	3

Rectangular Ducts Only	
Width of Duct, rectangular duct only (in.)	72"
Total Ports (rectangular duct only)	4

Flow Disturbances	
Upstream - A (ft)	11
Downstream - B (ft)	44
Upstream - A (duct diameters)	
Downstream - B (duct diameters)	

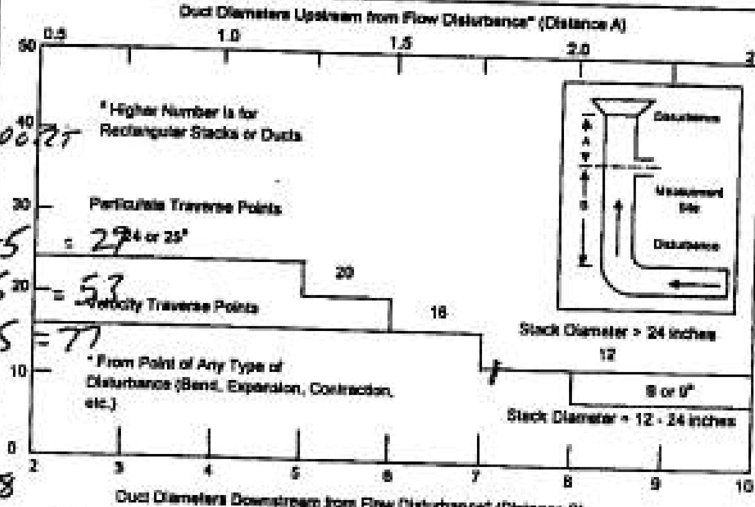
Diagram of Stack



Traverse Point Locations

Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)	
1	0.167	13.026	25.026	25
2	0.500	39	51	51
3	0.833	64.974	76.974	77
4				
5				
6				17" port
7	CEM			
8	0.167	12.024	24.024	24 +5 = 29
9	0.500	36	48	48 +5 = 53
10	0.833	59.976	71.976	72 +5 = 77
11				
12				

Equivalent Diameter = (2*L*W)/(L+W) = 74.88



Traverse Point Location Percent of Stack -Circular

Traverse Point Location	1	2	3	4	5	6	7	8	9	10	11	12
1		14.6		6.7		4.4		3.2		2.6		2.1
2		85.4		25		14.6		10.5		8.2		6.7
3				75		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
6						95.6		80.6		65.8		35.6
7								89.5		77.4		64.4
8								96.8		85.4		75
9										91.8		82.3
10										97.4		88.2
11												93.3
12												97.9

(Columns: Number of Traverse Points)

Traverse Point Location Percent of Stack -Rectangular

Traverse Point Location	1	2	3	4	5	6	7	8	9	10	11	12
1		25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2		75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3			83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4				87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5					90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6						91.7	78.6	68.8	61.1	55.0	50.0	45.8
7							92.9	81.3	72.2	65.0	59.1	54.2
8								93.8	83.3	75.0	68.2	62.5
9									94.4	85.0	77.3	70.8
10										95.0	86.4	79.2
11											95.5	87.5
12												95.8

(Columns: Number of Traverse Points)

Rectangular Stack Points & Matrix
9 - 3 x 3
12 - 4 x 3
16 - 4 x 4
20 - 5 x 4
25 - 5 x 5
30 - 6 x 5
36 - 6 x 6
42 - 7 x 6
49 - 7 x 7

WESTON

Method1.xls

L'Anse Warden Electric Company
L'Anse, MI
Boiler No. 1
Inputs for Particulate and Metals Calculations

Test Data			
Test run number	1	2	3
Location		Boiler No.1	
Date	7/6/16	7/7/16	7/7/16
Time period	1314-1521	0840-1055	1515-1704
Operator	DF	DF	DF
Inputs For Calcs.			
Sq. rt. delta P	0.85750	0.86097	0.88282
Delta H	1.6367	1.7083	1.8125
Stack temp. (deg.F)	437.3	430.3	433.7
Meter temp. (deg.F)	92.3	77.4	71.1
Sample volume (act.)	63.332	63.749	65.414
Barometric press. (in.Hg)	29.27	29.38	29.38
Volume H_2O imp. (ml)	252	244	235
Weight change sil. gel (g)	22.9	24.3	22.8
% CO_2	13.8	13.3	13.1
% O_2	6.6	7.1	7.3
% N	79.6	79.6	79.6
Area of stack (sq.ft.)	39.000	39.000	39.000
Sample time (min.)	96	96	96
Static pressure (in.H_2O)	-12.6	-12.4	-12.4
Nozzle dia. (in.)	0.250	0.250	0.250
Meter box cal.	1.0017	1.0017	1.0017
Cp of pitot tube	0.84	0.84	0.84
Traverse points	12	12	12
Particulate Laboratory Report Data			
Front half acetone rinse, g	0.0035	0.0056	0.0033
Filter, g	0.002	0.007	0.0049
Total catch, g	0.0055	0.0126	0.0082
Laboratory Report Data			
Arsenic (As), ug	< 0.80	0.93	0.95
Lead (Pb), ug	7.68	6.62	7.45
Manganese (Mn), ug	9.80	19.0	19.0
Nickel (Ni), ug	7.80	3.10	4.00

L'Anse Warden Electric Company
L'Anse, MI
Boiler No.1
Method 5 PM Acetone Blank Correction Worksheet

Blank liq vol =	160	ml
Blank particulate catch =	1.0	mg
particulate correction =	0.0063	mg/ml
max. particulate correction =	0.0100	mg/ml

TEST CONDITION		TEST RUN	FHA Particulate (lab results) (mg)	INITIAL VOLUME Acetone (rinse vol) (ml)	Blank Correction value (mg)	SAMPLE Corrected value (mg)	filter wt (mg)	TOTAL Particulate catch (g)
PM-FHA		1	4.4	140	0.88	3.5	2.0	0.0055
PM-FHA		2	6.7	180	1.13	5.6	7.0	0.0126
PM-FHA		3	4.5	190	1.19	3.3	4.9	0.0082

L'Anse Warden Electric Company
Metals Blank Correction Calculations
Boiler No.1

CLIENT		LOCATION		RUN #		
Lanse Warden		ESP		ONE		
FILTER SIZE (mm) 90		COMBINED FRONT + BACK HALF CATCH (ug)		COMBINED FRONT + BACK HALF BLANK (ug)		TOTAL CATCH (ug)
BLANK LIMIT 13.805						
Arsenic (As), ug	<	0.80	<	0.80	<	0.80
Lead (Pb), ug		8.18		0.50		7.68
Manganese, (Mn), ug		11.6		1.8		9.80
Nickel (Ni), ug		9.8		2.0		7.80

CLIENT		LOCATION		RUN #		
Lanse Warden		ESP		TWO		
FILTER SIZE (mm) 90		COMBINED FRONT + BACK HALF CATCH (ug)		COMBINED FRONT + BACK HALF BLANK (ug)		TOTAL CATCH (ug)
BLANK LIMIT 13.805						
Arsenic (As), ug		0.93	<	0.80		0.93
Lead (Pb), ug		7.12		0.50		6.62
Manganese (Mn), ug		20.8		1.8		19.0
Nickel (Ni), ug		5.1		2.0		3.10

Lanse Warden		ESP		THREE		
FILTER SIZE (mm) 90		COMBINED FRONT + BACK HALF CATCH (ug)		COMBINED FRONT + BACK HALF BLANK (ug)		TOTAL CATCH (ug)
BLANK LIMIT 13.805						
Arsenic (As), ug		0.95	<	0.80		0.95
Lead (Pb), ug		7.95		0.50		7.45
Manganese (Mn), ug		20.8		1.8		19.0
Nickel (Ni), ug		6.0		2.0		4.00

Determination of Stack Gas Velocity - Method 2

Client	LWEC	Operator	DE/KS	Pitot Coeff (Cp)	0.84
Location/Plant		Date	7/7/16	Stack Area, ft² (As)	39
Source	ESP	W.O. Number		Pitot Tube/Thermo ID	P3/06

Run Number	1		
Time	1730-1740		
Barometric Press, in Hg (Pb)	29.38		
Static Press, in H_2O (Pstatic)			
Source Moisture, % (BWS)	16		
O_2, %	7		
CO_2, %	12		

Cyclonic Flow Determination		Traverse Location		Leak Check good ? (Y) N		Leak Check good ? Y / N		Leak Check good ? Y / N	
Delta P at 0°	Angle yeilding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
0	<5°	A	1		430				
.05	<5°		2		435				
0	0		3		435				
.05	<5°	B	1		430				
0	0		2		420				
0	0		3		420				
0	0	C	1		420				
0	0		2		425				
0	0		3		419				
0	0	D	1		421				
0	0		2		421				
.05	<5°		3		421				
Avg Angle		Avg Delta P & Temp							
		Avg SQRT Delta P							
		Average gas stream velocity, ft/sec.							
		Vol. flow rate @ actual conditions, wacf/min							
		Vol. flow rate at standard conditions, dscf/min							

Comments ______

M2 sheets xls

ISOKINETIC FIELD DATA SHEET

EPA Method 5/29 - PM/METALS [redacted]

Client	LWEC
W.O #	14484.007.004
Project ID	LWEC
Mode/Source ID	114
Samp. Loc. ID	STK
Run No.ID	1
Test Method ID	M29
Date ID	4JUL2016
Source/Location	ESP Stack
Sample Date	7/6/16
Baro. Press (in Hg)	29.27
Operator	DF

Stack Conditions	Assumed	Actual
% Moisture	18	
Impinger Vol (ml)		252
Silica gel (g)		22.9
CO2, % by Vol	13	13.4
O2, % by Vol	7	6.6
Temperature (°F)	435	
Meter Temp (°F)	95	
Static Press (in H2O)	-13	-12.6
Ambient Temp (°F)	80	

Meter Box ID	26
Meter Box Y	~~1.0077~~ 1.0017
Meter Box Del H	1.914
Probe ID / Length	P154 / 5'
Probe Material	Boro
Pitot / Thermocouple ID	
Pitot Coefficient	0.84
Nozzle ID	~~.235~~ .250
Avg Nozzle Dia (in)	~~.235~~ .250
Area of Stack (ft²)	~~23~~ 39
Sample Time	96
Total Traverse Pts	12

K Factor 2.21

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft³)	0.006	—	0.000
Leak Check @ (in Hg)	15"	—	5"
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	80	85
Reference Temp	80	85
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response ?	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (°F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)	filter 6H	COMMENTS
	0	1314			316.315								
D 1	4		.60	1.3	312.6	433	86	240	252	66	2.0	249	
1	8		.60	1.3	315.0	445	87	243	251	66	2.0	249	1320 pawa
2	12		0.58	1.28	317.3	445	87	230	253	64	2.0	248	1338 Loemc
2	16		.60	1.3	319.7	442	87	260	251	61	2.0	250	
3	20		.60	~~1.1~~ 1.3	322.0	438	88	254	250	59	2.0	251	13.921
3	24	1357	.50	1.1	324.236	438	88	248	250	60	2.0	251	
		1400	—	—	324.236	—	—	—	—	—	—	—	
C 1	28		.73	1.6	326.8	425	88	243	248	66	2.5	250	
1	32		.73	1.6	329.4	448	89	250	250	66	2.5	251	
2	36		.70	1.5	331.9	448	89	252	250	65	2.5	251	15.039
2	40		.70	1.5	334.4	445	89	256	250	64	2.5	251	
3	44		.60	1.3	336.8	443	90	251	250	63	2.0	250	
3	48	1424	.60	1.3	339.275	438	91	248	250	64	2.0	250	
		1429	—	—	339.275	—	—	—	—	—	—	—	
B 1	52		.80	1.8	342.0	425	92	241	249	64	2.5	250	
1	56		.80	1.8	344.7	444	93	244	251	66	2.5	251	16.748
2	60		.85	1.9	347.6	446	93	249	251	63	2.5	251	
2	64		.80	1.8	350.4	442	94	256	251	64	2.5	251	
3	68		.80	1.8	353.2	425	95	252	250	64	2.5	250	
3	72	1453	.80	1.8	356.021	427	96	249	250	65	2.5	250	
		1457	—	—	356.021	—	—	—	—	—	—	—	
A 1	76		.95	2.1	359.0	435	97	243	249	66	3.0	250	
1	80		.95	2.1	362.0	434	98	250	251	66	3.0	251	
2	84		.95	2.1	365.0	437	99	250	250	64	3.0	250	
2	88		.95	2.1	368.0	432	99	254	250	64	3.0	250	
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
			Avg Sqrt Delta P	Avg Sqrt Del H	Comments								

WESTON

EPA 5/29 from 40CFR60

ISOKINETIC FIELD DATA SHEET

EPA Method 5/29 - PM/METALS [redacted]

Client: LWEC
Source: ESP
Sample Loc.: Stack
Operator: DF
Run No.: 1
Date:
K Factor: 2.21

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)	Filter Exit	COMMENTS
	88				366.0									
3	92		.80	1.8	370.8	430		100	249	249	64	3.0	250	
3	96	1521	.80	1.8	373.647	430		100	247	250	65	3.0	250	17.626

Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max Temp	Max Vac	Max Temp
~~.853~~ .8525	1.637	63.332	437.3	92.3	240/260	248/253	66	3.0	251

Avg Sqrt Del H: 1.274

Comments:

Avg .741

102.0
17.8 %
70000.4
59.872

WESTON SOLUTIONS

ISOKINETIC FIELD DATA SHEET

EPA Method 5/29 - PM/METALS [redacted]

Page 1 of 2

K Factor 2.29

			Stack Conditions	Assumed	Actual		
Client	LWEC					Meter Box ID	26
W.O.#	14464.007.004					Meter Box Y	1.0017
Project ID	LWEC		% Moisture	16		Meter Box Del H	2.1714
Mode/Source ID	114		Impinger Vol (ml)		244	Probe ID / Length	P524 / 5'
Samp. Loc. ID	STK		Silica gel (g)		24.3	Probe Material	Boro
Run No ID	2		CO2, % by Vol	13	13.0	Pitot / Thermocouple ID	P524
Test Method ID	M29		O2, % by Vol	7	7.1	Pitot Coefficient	0.84
Date ID	4JUL2016		Temperature (°F)	430		Nozzle ID	.250
Source/Location	ESP Stack		Meter Temp (°F)	90		Avg Nozzle Dia (in)	.250
Sample Date	7-7-16		Static Press (in H2O)	-13	-12.4	Area of Stack (ft²)	39
Baro. Press (in Hg)	29.38					Sample Time	~~100~~ 96
Operator	DF		Ambient Temp (°F)	70		Total Traverse Pts	12

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft³)	0.010	0.010	0.000
Leak Check @ (in Hg)	15"	10"	6"
Pitot good	yes / no	yes / no	yes / no
Orsat good	~~yes / no~~	~~yes / no~~	~~yes / no~~

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	70	72
Reference Temp	70	73
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	~~DGM INLET TEMP (°F)~~	DGM ~~OUTLET~~ TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (°F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)	Filter Exit	COMMENTS
	0	0840			492.769									
A 1	4		1.0	2.3	495.8	425		70	243	250	66	4.0	243	
1	8		1.0	2.3	498.9	436		71	254	251	55	4.0	250	
2	12		1.0	2.3	502.0	436		72	251	250	50	4.0	255	
2	16		1.0	2.3	505.1	425		72	253	250	50	4.0	255	
3	20		0.85	1.9	507.9	423		73	253	250	54	3.5	258	
3	24	0904	.85	1.9	510.761	420		74	247	250	59	3.5	258	
		0907	–	–	510.761	–		–	–	–	–	–	–	34.751
B 1	28		.80	1.8	513.4	420		75	246	252	66	3.5	257	
1	32		.80	1.8	516.3	439		75	248	251	65	3.5	260	
2	36		.85	1.9	519.0	490		76	250	250	62	3.5	260	
2	40		.85	1.9	521.8	433		77	256	250	62	3.5	261	
3	44		.85	1.9	524.6	420		78	251	250	61	3.5	260	
3	48	0931	.80	1.8	527.520	420		78	249	249	62	3.5	260	Stopped @ 0931
		1002	–	–	527.687	–		–	–	–	–	–	–	
C 1	52		.70	1.6	530.1	420		79	248	247	62	3.5	260	Started @ 1002
1	56		.70	1.6	532.6	442		80	251	251	63	3.5	261	
2	60		.70	1.6	535.2	444		80	250	251	59	3.5	260	
2	64		.70	1.6	537.8	440		80	251	250	59	3.5	266	15.331
3	68		.65	1.5	540.4	425		80	251	251	60	3.0	260	
3	72	1026	.70	1.6	543.018	425		80	249	250	62	3.5	261	
		1031	–	–	543.102	–		–	–	–	–	–	–	
D 1	76		.55	1.3	545.4	420		81	242	251	66	3.0	260	
1	80		.55	1.3	547.7	436		81	245	251	65	3.0	260	13.667
2	84		.55	1.3	550.1	442		81	251	251	61	3.0	261	
2	88		.55	1.3	552.4	433		81	255	250	59	3.0	260	
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts		Avg Tm	Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	

Avg Sqrt Del H

Comments:

EPA 5/29 from 40CFR60

103.5
16.96 %
71230
61.847

WESTON

ISOKINETIC FIELD DATA SHEET

EPA Method 5/29 - PM/METALS

Client	LWEC	Operator	DF
Source	ESP	Run No.	2
Sample Loc.	Stack	Date	7 [illegible] 7 - 16
		K Factor	2.29

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)	Filter Exit	COMMENTS
	Ø 88				552.4									
3	92		.50	1.1	554.7	430		81	248	250	64	3.0	260	
3	96	1055	.50	1.1	556.769	430		82	247	250	61	3.0	260	
			Avg Sqrt Delta P .861 ✓	Avg Delta H 1.708 ✓	Total Volume 63.749 ✓	Avg Ts 430.3 ✓	Avg Tm 77.4 ✓		Min/Max 242/256	Min/Max 247/252	Max Temp 66	Max Vac 4.0	Max Temp 261	
				Avg Sqrt Del H 1.300 ✓	Comments:									

.750 ✓

WESTON SOLUTIONS

ISOKINETIC FIELD DATA SHEET

EPA Method 5/29 - PM/METALS [redacted]

			Stack Conditions				
			Assumed	Actual			
Client	LWEC				Meter Box ID	26	
W.O.#	14464.007.004				Meter Box Y	1.0017	
Project ID	LWEC	% Moisture	16		Meter Box Del H	2.1714	
Mode/Source ID	114	Impinger Vol (ml)		~~430~~ 235	Probe ID / Length	P154	5'
Samp. Loc. ID	STK	Silica gel (g)		(DF) ~~26.7~~	Probe Material	Boro	
Run No ID	3	CO2, % by Vol	12	12.9	Pitot / Thermocouple ID	P154	
Test Method ID	M29	O2, % by Vol	7	7.1	Pitot Coefficient	0.84	
Date ID	4JUL2016	Temperature (°F)	430		Nozzle ID	250	
Source/Location	ESP Stack	Meter Temp (°F)	90		Avg Nozzle Dia (in)	.250	
Sample Date	7/7/16	Static Press (in H2O)	-13	-12.4	Area of Stack (ft²)	(DF) ~~.250~~ 39	
Baro. Press (in Hg)	29.38				Sample Time	96	
Operator	DF	Ambient Temp (°F)	70		Total Traverse Pts	12	

K Factor 2.29

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft³)	0.008	~~0.000~~	0.008
Leak Check @ (in Hg)	15"	10"	10"
Pitot good	(yes) / no	(yes) / no	(yes) / no
Orsat good	~~yes / no~~	~~yes / no~~	~~yes~~ / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	68	
Reference Temp	69	
Pass/Fail (+/- 2°)	(Pass) / Fail	Pass / Fail
Temp Change Response	(yes) / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM ~~INLET~~ TEMP (°F)	DGM ~~OUTLET~~ TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (°F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)	Filter Exit	COMMENTS
(DF)	0	1515			680.798									
~~F~~ D 1	4		.60	1.4	683.1	430		70	250	248	61	2.5	255	
1	8		.60	1.4	685.6	439		71	248	242	60	2.5	250	
2	12		.60	1.4	(DF) ~~688~~.688.0	444		71	242	252	60	2.5	255	
2	16		.55	1.3	690.2	444		71	245	253	59	2.5	258	14.213
3	20		.55	1.3	692.7	420		71	248	244	52	2.5	258	
3	24	1539	.55	1.3	695.011	420		71	248	250	51	2.5	258	
		1544	—	—	695.011	—		—	—	—	—	—	—	
(DF) ~~E~~ C 1	28		.75	1.7	697.6	430		70	248	248	54	3.0	255	
1	32		.75	1.7	700.2	441		71	250	250	53	3.0	255	
2	36		.73	1.7	702.9	440		71	253	249	52	3.0	253	15.784
2	40		.73	1.7	705.5	433		70	253	248	52	3.0	253	
3	44		.75	1.7	708.2	432		71	250	250	54	3.0	253	
3	48	1608	.70	1.6	710.795	430		71	250	250	55	3.0	252	
		1613	—	—	710.857	—		—	—	—	—	—	—	
(DF) ~~C~~ B 1	52		1.0	2.3	713.9	435		70	249	251	60	3.5	250	
1	56		.95	2.2	716.9	439		72	248	250	59	3.5	250	
2	60		1.0	2.3	719.9	443		71	252	250	57	3.5	250	17.571
2	64		1.0	2.3	723.1	438		71	253	250	57	3.5	250	
3	68		.75	1.7	725.7	437		71	251	250	60	(DF) ~~3.5~~ 3.0	255	
3	72	1637	.75	1.7	728.428	437		72	248	249	62	3.0	254	
		1640	—	—	728.426	—		—	—	—	—	—	—	
(DF) ~~B~~ A 1	76		1.0	2.3	731.4	438		71	250	246	64	3.5	250	
1	80		1.0	2.3	734.5	428		72	244	249	64	3.5	251	
2	84		1.0	2.3	737.6	437		72	252	251	64	3.5	250	
2	88		1.0	2.3	740.7	428		72	254	250	64	3.5	250	
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
				Avg Sqrt Del H	Comments:									

WESTON

EPA 5/29 from 40CFR60

ISOKINETIC FIELD DATA SHEET

EPA Method 5/29 - PM/METALS[redacted]

Client: LWEC
Source: ESP
Sample Loc.: Stack
Operator: DF
Run No.: 3
Date: 7/7/16
K Factor: 2.29

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)	Filter Exit	COMMENTS
	Ø88				740.7									
3	92		.80	1.8	743.5	425		72	250	250	60	3.0	253	
3	96	1704	.80	1.8	746.274	420		72	248	249	57	3.0	250	17.846

Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max Temp	Max Vac	Max Temp
.883 ✓	1.813 ✓	65.414 ✓	433.7 ✓	71.1 ✓	242/253	242/253	64	3.5	258

Avg Sqrt Del H: 1.339 ✓

Comments:

.788 ✓

103.6
15.9%
73908.8
64.232

WESTON

SAMPLE RECOVERY FIELD DATA

EPA Method 5/29 - PM/METALS [redacted]

Client	LWEC	W.O. #	14464.007.004
Location/Plant	L'Anse, Michigan	Source & Location	ESP Stack

Run No. 1 | Sample Date 7/6/16 | Recovery Date 7/6/16

Sample I.D. LWEC - 114 - STK - 1 - M29 - | Analyst [illegible] | Filter Number 16050919

	Impinger 1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HNO3 / H2O2	HNO3 / H2O2	Empty	[redacted]				Silica Gel	
Final	128	200	124						322.9	
Initial	0	100	100		100	100			300	
Gain	128	100	24					252	22.9	

Impinger Color: Clear colorless | Labeled? ✓

Silica Gel Condition: 1/2 Blue | Sealed? ✓

Run No. 2 | Sample Date 7/7/16 | Recovery Date 7/7/16

Sample I.D. LWEC - 114 - STK - 2 - M29 - | Analyst [illegible] | Filter Number 1605092

	Impinger 1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HNO3 / H2O2	HNO3 / H2O2	Empty	[redacted]				Silica Gel	
Final	118	196	130						324.3	
Initial	0	100	100		100	100			300	
Gain	118	96	30					244	24.3	

Impinger Color: Clear colorless | Labeled? ✓

Silica Gel Condition: 1/2 Blue | Sealed? ✓

Run No. 3 | Sample Date 7/7/16 | Recovery Date 7/7/16

Sample I.D. LWEC - 114 - STK - 3 - M29 - | Analyst [illegible] | Filter Number 1605092

	Impinger 1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HNO3 / H2O2	HNO3 / H2O2	Empty	[redacted]				Silica Gel	
Final	150	175	110						322.8	
Initial	0	100	100		100	100			300	
Gain	150	75	10					235	22.8	

Impinger Color: clear Colorless | Labeled? ✓

Silica Gel Condition: 1/2 Blue | Sealed? ✓

Check COC for Sample IDs of Media Blanks

WESTON SOLUTIONS

B.3 PM_{10}/$PM_{2.5}$

PM10 AND PM 2.5 RUN TEST DATA

SOURCE ID: Boiler No. 1
DATE: 7/7/16
TEST CONDITION: High Load

CLIENT: LWEC
FACILITY: L'Anse, MI
RUN: 2

DWELL TIME CALCULATION
(For the dwell time calculation, input the the total run time and the most recent Average Delta P)

Total run time 105 minutes
Number of points 12 Twelve points are all that is required

Avg. Delta P (from LAST velocity traverse) 0.720 in. H2O
NOTE: This is NOT the square root of Delta P
NOTE: If stack diameter is less than 24 inches preliminary velocity is adjusted for blockage. 0.000
Insert the value for each Delta P, prior to sampling that point. The appropriate TOTAL sample time will be calculated for that point. NOTE: All dwell times are based on the Delta P for point#1 and the avg. Delta P from the last traverse (above).

Point Number	Delta P	PORT A SQRT Delta P	Sample Time	Point Number	Delta P	PORT A SQRT Delta P	Sample Time
D-1	0.95	0.97	10.05	B-1	0.63	0.79	8.20
D-2	0.93	0.96	9.94	B-2	0.62	0.79	8.10
D-3	0.95	0.97	10.05	B-3	0.57	0.75	7.80
A-1	0.85	0.92	9.51	C-1	0.46	0.68	7.00
A-2	0.73	0.85	8.81	C-2	0.50	0.71	7.30
A-3	0.80	0.89	9.22	C-3	0.52	0.72	7.40
		Time(min)	57.58			Time(min)	45.80

This calculation establishes the # of points and min/pt necessary to meet the standard Method 5 criteria of recording data every <= 5 min, and the Method 201A criteria of rounding to a 15 sec interval

PORT A # points	min/pt
2	5.00
2	5.00
2	5.00
2	5.00
2	4.75
2	4.75

PORT B # points	min/pt
2	4.75
2	4.50
2	3.50
2	3.50
2	3.50
2	3.50

INPUT FOR ISOKINETIC CALCULATION
(At the end of the run verify isokinetic ratio)

Port	Point #	Sample Time	Total Time	Delta P	Sqrt Dp	Delta H	Stack Temp	Meter Temp-1		
A	1	5.00	5.00	0.95	0.97	0.39	427	81		
	1	5.00	10.00	0.95	0.97	0.39	441	81		
	2	5.00	15.00	0.93	0.96	0.39	433	81		
	2	5.00	20.00	0.93	0.96	0.39	420	81		
	3	5.00	25.00	0.95	0.97	0.39	421	82		
	3	5.00	30.00	0.95	0.97	0.39	425	82		
B	1	5.00	35.00	0.85	0.92	0.39	445	82		
	1	5.00	40.00	0.85	0.92	0.39	449	82		
	2	4.75	44.75	0.73	0.85	0.39	436	82		
	2	4.75	49.50	0.73	0.85	0.39	433	82		
	3	4.75	54.25	0.80	0.89	0.39	420	81		
	3	4.75	59.00	0.80	0.89	0.39	418	81		
C	1	4.75	63.75	0.63	0.79	0.39	442	81		
	1	4.75	68.50	0.63	0.79	0.39	444	81		
	2	4.50	73.00	0.62	0.79	0.39	438	81		
	2	4.50	77.50	0.62	0.79	0.39	428	81		
	3	3.50	81.00	0.57	0.75	0.39	420	81		
	3	3.50	84.50	0.57	0.75	0.39	410	81		
D	1	3.50	88.00	0.46	0.68	0.39	436	81		
	1	3.50	91.50	0.46	0.68	0.39	440	80		
	2	3.50	95.00	0.50	0.71	0.39	436	80		
	2	3.50	98.50	0.50	0.71	0.39	426	80		
	3	3.50	102.00	0.52	0.72	0.39	426	80		
	3	3.50	105.50	0.52	0.72	0.39	424	80		
			105.50							
			105.50							
			105.50							
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			105.50							
			105.50							
			105.50							
		105.5		0.7092	0.83509	0.39	431.17	81.04		
		Time Weighted Averages		0.7322	0.84955	0.39	431.52	81.11		

SOURCE ID:	Boiler No. 1		CLIENT:	LWEC
DATE:	7/7/16		FACILITY:	L'Anse, MI
TEST CONDITION:	High Load		RUN:	2

PM10 AND PM2.5 INPUT DATA FOR CALCULATIONS

	RUN	2	
	TEST PERIOD	1057-1251	
Y	Meter Box y	0.9915	
Delta H@	Meter Box Delta H@	1.5873	
VM	Meter volume, ft^3	36.455	
CO2	CO2 concentration, %	13.1	
O2	Oxygen concentration, %	7.3	
	Nozzle diameter, inches	0.190	
A	Stack Area, sq. ft.	39.000	
Pb	Barometric Pressure, inches Hg	29.38	
Pg	Static Pressure, inches H2O	-12.40	
	Impinger water collected, g	150	
	Silica Gel collected, g	14.4	
	Total Imp catch	164.4	
Cp	Pitot Coeff	0.781	
Delta P	Avg Sqrt Delta P, sqrt(inches H2O)(time weighted average)	0.8496	
	Sample Time, min	105.5	
Ts	Average Stack Temp.deg F (time weighted average)	431.52	
Ts	Average Stack Temp.deg R	891.52	
Tm	Meter temperature (time weighted average)	81.11	
Delta H	Avg Delta H, inches H2O	0.39	
O2(wet)	Oxygen concentration--WET	6.0	
	Nitrogen(+ CO) concentration	79.6	
Bws	Fraction moisture content	0.183	(Ex. 4% = 0.04)
	Moisture percentage	18.257	
Md	Mole fraction of wet gas	0.817	
MWd	Molecular Weight(Dry)	30.39	
MW	Molecular Weight(Wet)	28.13	
Ps	Absolute Stack Pressure	28.47	in.Hg
MwPs/Ts	Intermediate Calc	0.898	
Ts/MwPs	Intermediate Calc	1.113	
(Vmstd)	Standard Meter Volume, cu.ft	34.853	
Qs	Cyclone flowrate (actual), cfm	0.713	
Us2.5	Viscosity of Stack gas	245.44	micropoise
Cunn Corr2.5		1.11	
Nre		2255	
D50-Nre<3162		2.43	
D50-Nre>=3162		2.14	
Cr2.5-Ne<3162		1.114	
Cr2.5-Ne>3162		1.130	
D50-1-Nre<3162		2.43	
D50-1-Nre>=3162		2.12	
ZNe>3162		1.00	
Zne<3162		1.01	
Dn	Nozzle diameter	0.190	inches
Vn	Nozzle Velocity	60.388	ft/sec
R min. (Noz-1)	minimum R	0.684	ft/sec
R max. (Noz-1)	maximum R	1.273	ft/sec
V min (Noz-1)	minimum velocity	41.31	ft/sec
V max (Noz-1)	maximum velocity	76.88	ft/sec
Delta p min. (Noz-1)	0.344	in.H2O	
Delta p max. (Noz-1)	1.190	in.H2O	
FRONT HALF ANALYTICAL DATA			
	Mass >PM 10 (front half cyclone I0) >PM10, g (FHA1)	0.0053	
	Mass PM 10 (cyclone 10 exit tube & front half cyclone IV) <PM10, g (FHA2)	0.0024	
	Mass PM 2.5 (cyclone IV exit tube & front half filter holder) <PM2.5, g (FHA3)	0.0065	
	Mass (filter)<PM2.5, g	0.0010	
BACK HALF ANALYTICAL DATA			
	H2O (inorganic) residue, g	0.0088	
	MeCl (organic) residue, g	0.0028	

PM10 AND PM 2.5 RUN TEST DATA

PM2.5 PROGRAM

SOURCE ID:	Perryman 6	CLIENT:	LWEC
DATE:	7/7/16	FACILITY:	L'Anse, MI
TEST CONDITION:	High Load	RUN:	3

DWELL TIME CALCULATION

(For the dwell time calculation, input the the total run time and the most recent Average Delta P)

Total run time	100	minutes
Number of points	12	Twelve points are all that is required

Avg. Delta P (from LAST velocity traverse) 0.740 in. H2O

NOTE: This is NOT the square root of Delta P

NOTE: If stack diameter is less than 24 inches preliminary velocity is adjusted for blockage. [illegible]

Insert the value for each Delta P, prior to sampling that point. The appropriate TOTAL sample time will be calculated for that point. NOTE: All dwell times are based on the Delta P for point#1 and the avg. Delta P from the last traverse (above).

Point Number	Delta P	PORT A SQRT Delta P	Sample Time	Point Number	Delta P	PORT A SQRT Delta P	Sample Time
D-1	0.98	0.99	9.59	B-1	0.68	0.82	8.00
D-2	0.96	0.98	9.49	B-2	0.65	0.81	7.90
D-3	0.98	0.99	9.59	B-3	0.70	0.84	8.10
A-1	0.86	0.93	8.98	C-1	0.52	0.72	7.00
A-2	0.83	0.91	8.83	C-2	0.49	0.70	6.80
A-3	0.80	0.89	8.66	C-3	0.47	0.69	6.60
		Time(min)	55.14			Time(min)	44.30

This calculation establishes the # of points and min/pt necessary to meet the standard Method 5 criteria of recording data every <= 5 min, and the Method 201A criteria of rounding to a 15 sec interval

PORT A # points	min/pt
2	5.00
2	5.00
2	5.00
2	4.75
2	4.75
2	4.75

PORT B # points	min/pt
2	4.50
2	3.50
2	4.50
2	3.50
2	3.25
2	3.25

INPUT FOR ISOKINETIC CALCULATION

(At the end of the run verify isokinetic rate)

Port	Point #	Sample Time	Total Time	Delta P	Sqrt Dp	Delta H	Stack Temp	Meter Temp-1		
A	1	5.00	5.00	0.98	0.99	0.39	436	75		
	1	5.00	10.00	0.98	0.99	0.39	448	75		
	2	5.00	15.00	0.96	0.98	0.39	428	75		
	2	5.00	20.00	0.96	0.98	0.39	438	75		
	3	5.00	25.00	0.98	0.99	0.39	426	75		
	3	5.00	30.00	0.98	0.99	0.39	418	76		
B	1	4.75	34.75	0.86	0.93	0.39	441	76		
	1	4.75	39.50	0.86	0.93	0.39	448	75		
	2	4.75	44.25	0.83	0.91	0.39	440	76		
	2	4.75	49.00	0.83	0.91	0.39	429	76		
	3	4.75	53.75	0.80	0.89	0.39	422	76		
	3	4.75	58.50	0.80	0.89	0.39	415	76		
C	1	4.50	63.00	0.68	0.82	0.39	445	77		
	1	4.50	67.50	0.68	0.82	0.39	445	77		
	2	3.50	71.00	0.65	0.81	0.38	436	77		
	2	3.50	74.50	0.65	0.81	0.38	436	78		
	3	4.50	79.00	0.70	0.84	0.39	429	78		
	3	4.50	83.50	0.70	0.84	0.39	419	78		
D	1	3.50	87.00	0.52	0.72	0.38	436	78		
	1	3.50	90.50	0.52	0.72	0.38	442	78		
	2	3.25	93.75	0.49	0.70	0.38	431	78		
	2	3.25	97.00	0.49	0.70	0.39	428	78		
	3	3.25	100.25	0.49	0.70	0.38	420	78		
	3	3.25	103.50	0.49	0.70	0.38	411	78		
			103.50							
			103.50							
			103.50							
			103.50							
			103.50							
			103.50							
			103.50							
			103.50							
			103.50							
			103.50							
			103.50							
			103.50							
			103.50							
			103.50							
			103.50							
			103.50							
			103.50							
			103.50							
		103.5		0.745	0.857	0.39	431.79	76.54		
		Time Weighted Averages		0.771	0.872	0.39	432.10	76.37		

SOURCE ID:	Boiler No. 1		CLIENT:	LWEC
DATE:	7/7/16		FACILITY:	L'Anse, MI
TEST CONDITION:	High Load		RUN:	3

PM10 AND PM2.5 INPUT DATA FOR CALCULATIONS

	RUN	3	
	TEST PERIOD	1513-1704	
Y	Meter Box y	0.9915	
Delta H@	Meter Box Delta H@	1.8873	
VM	Meter volume, ft^3	38.261	
CO2	CO2 concentration, %	13.2	
O2	Oxygen concentration, %	7.3	
	Nozzle diameter, inches	0.190	
A	Stack Area, sq. ft.	39.000	
Pb	Barometric Pressure, inches Hg	29.38	
Pq	Static Pressure, inches H2O	-12.40	
	Impinger water collected, g	138	
	Silica Gel collected, g	16.6	
	Total Imp catch	154.6	
Cp	Pitot Coeff	0.781	
Delta P	Avg Sqrt Delta P, sqrt(inches H2O)(time weighted average)	0.8725	
	Sample Time, min	103.5	
Ts	Average Stack Temp.deg F (time weighted average)	432.10	
Ts	Average Stack Temp.deg R	892.10	
Tm	Meter temperature (time weighted average)	76.37	
Delta H	Avg Delta H, inches H2O	0.39	
O2(wet)	Oxygen concentration--WET	6.0	
	Nitrogen(+ CO) concentration	79.5	
Bws	Fraction moisture content	0.173	(Ex. 4% = 0.04)
	Moisture percentage	17.308	
Md	Mole fraction of wet gas	0.827	
MWd	Molecular Weight(Dry)	30.40	
MW	Molecular Weight(Wet)	28.26	
Ps	Absolute Stack Pressure	28.47	in.Hg
MwPs/Ts	Intermediate Calc	0.902	
Ts/MwPs	Intermediate Calc	1.109	
(Vmstd)	Standard Meter Volume, cu.ft	34.773	
Qs	Cyclone flowrate (actual), cfm	0.722	
Us2.5	Viscosity of Stack gas	248.37	micropoise
Cunn Corr2.5		1.11	
Nre		2282	
D50-Nre<3162		2.40	
D50-Nre>=3162		2.12	
Cr2.5-Ne<3162		1.116	
Cr2.5-Ne>3162		1.131	
D50-1-Nre<3162		2.39	
D50-1-Nre>=3162		2.10	
ZNe>3162		1.00	
Zne<3162		1.01	
Dn	Nozzle diameter	0.190	inches
Vn	Nozzle Velocity	61.100	ft/sec
R min. (Noz-1)	minimum R	0.685	ft/sec
R max. (Noz-1)	maximum R	1.272	ft/sec
V min (Noz-1)	minimum velocity	41.86	ft/sec
V max (Noz-1)	maximum velocity	77.73	ft/sec
Delta p min. (Noz-1)	0.355	in.H2O	
Delta p max. (Noz-1)	1.222	in.H2O	
FRONT HALF ANALYTICAL DATA			
Mass >PM 10 (front half cyclone I0) >PM10, g (FHA1)		0.0031	
Mass PM 10 (cyclone 10 exit tube & front half cyclone IV) <PM10, g (FHA2)		0.0027	
Mass PM 2.5 (cyclone IV exit tube & front half filter holder) <PM2.5, g (FHA3)		0.0030	
Mass (filter-1)<PM2.5, g		<0.0003	
BACK HALF ANALYTICAL DATA			
H2O (inorganic) residue, g		0.0220	
MeCl (organic) residue, g		0.0038	

PM10 AND PM 2.5 RUN TEST DATA

PM2.5 PROGRAM

SOURCE ID:	Boiler No. 1	**CLIENT:**	LWEC
DATE:	7/7/16	**FACILITY:**	L'Anse, MI
TEST CONDITION:	High Load	**RUN:**	4

DWELL TIME CALCULATION

(For the dwell time calculation, input the the total run time and the most recent Average Delta P)

Total run time 96 minutes

Number of points 12 Twelve points are all that is required

Avg. Delta P (from LAST velocity traverse) 0.740 in. H2O

NOTE: This is NOT the square root of Delta P

NOTE: If stack diameter is less than 24 inches preliminary velocity is adjusted for blockage. 0.740

Insert the value for each Delta P, prior to sampling that point. The appropriate TOTAL sample time will be calculated for that point. NOTE: All dwell times are based on the Delta P for point#1 and the avg. Delta P from the last traverse (above).

Point Number	Delta P	PORT A SQRT Delta P	Sample Time	Point Number	Delta P	PORT A SQRT Delta P	Sample Time
1	0.51	0.71	6.64	1	0.86	0.93	8.60
2	0.50	0.71	6.57	2	0.84	0.92	8.50
3	0.52	0.72	6.70	3	0.85	0.92	8.60
4	0.70	0.84	7.78	4	0.98	0.99	9.20
5	0.66	0.81	7.55	5	0.96	0.98	9.10
6	0.68	0.82	7.67	6	0.92	0.96	8.90
		Time(min)	42.91			Time(min)	52.90

This calculation establishes the # of points and min/pt necessary to meet the standard Method 5 criteria of recording data every <= 5 min, and the Method 201A criteria of rounding to a 15 sec interval

PORT A # points	PORT A min/pt	PORT B # points	PORT B min/pt
2	3.25	2	4.75
2	3.25	2	4.75
2	3.25	2	4.75
2	3.50	2	4.75
2	3.50	2	4.75
2	3.50	2	4.75

INPUT FOR ISOKINETIC CALCULATION (At the end of the run verify isokinetic rate)										
Port	Point #	Sample Time	Total Time	Delta P	Sqrt Dp	Delta H	Stack Temp	Meter Temp-1		
D	1	3.25	3.25	0.51	0.71	0.37	436	78		
	1	3.25	6.50	0.51	0.71	0.37	432	78		
	2	3.25	9.75	0.50	0.71	0.37	426	78		
	2	3.25	13.00	0.50	0.71	0.37	429	78		
	3	3.25	16.25	0.52	0.72	0.37	420	79		
	3	3.25	19.50	0.52	0.72	0.37	412	79		
C	1	3.50	23.00	0.70	0.84	0.37	446	78		
	1	3.50	26.50	0.70	0.84	0.37	446	79		
	2	3.50	30.00	0.66	0.81	0.37	440	79		
	2	3.50	33.50	0.66	0.81	0.37	431	78		
	3	3.50	37.00	0.68	0.82	0.37	429	78		
	3	3.50	40.50	0.68	0.82	0.37	424	78		
	1	4.75	45.25	0.86	0.93	0.37	438	78		
B	1	4.75	50.00	0.86	0.93	0.37	441	78		
	2	4.75	54.75	0.84	0.92	0.37	435	79		
	2	4.75	59.50	0.84	0.92	0.37	430	79		
	3	4.75	64.25	0.85	0.92	0.37	425	79		
	3	4.75	69.00	0.85	0.92	0.37	420	79		
A	1	4.75	73.75	0.98	0.99	0.37	448	79		
	1	4.75	78.50	0.98	0.99	0.37	449	79		
	2	4.75	83.25	0.96	0.98	0.37	431	80		
	2	4.75	88.00	0.96	0.98	0.37	433	81		
	3	4.75	92.75	0.92	0.96	0.37	424	81		
	3	4.75	97.50	0.92	0.96	0.37	421	81		
			97.50							
			97.50							
			97.50							
			97.50							
			97.50							
			97.50							
		97.5		0.748	0.859	0.37	432.00	78.88		
		Time Weighted Averages		0.776	0.875	0.37	432.24	78.97		

SOURCE ID:	Boiler No. 1	CLIENT:	LWEC
DATE:	7/7/16	FACILITY:	L'Anse, MI
TEST CONDITION:	High Load	RUN:	4

PM10 AND PM2.5 INPUT DATA FOR CALCULATIONS

	RUN	4	
	TEST PERIOD	1742-1926	
Y	Meter Box y	0.9915	
Delta H@	Meter Box Delta H@	1.6873	
VM	Meter volume, ft^3	33.193	
CO2	CO2 concentration, %	13.3	
O2	Oxygen concentration, %	7.2	
	Nozzle diameter, inches	0.190	
A	Stack Area, sq. ft.	39.000	
Pb	Barometric Pressure, inches Hg	29.38	
Pg	Static Pressure, inches H2O	-12.80	
	Impinger water collected, g	124	
	Silica Gel collected, g	17.4	
	Total Imp catch	141.4	
Cp	Pitot Coeff	0.781	
Delta P	Avg Sqrt Delta P, sqrt(inches H2O)(time weighted average)	0.8753	
	Sample Time, min	97.5	
Ts	Average Stack Temp deg F (time weighted average)	432.24	
Ts	Average Stack Temp deg R	892.24	
Tm	Meter temperature (time weighted average)	78.97	
Delta H	Avg Delta H, inches H2O	0.37	
O2(wet)	Oxygen concentration--WET	5.9	
	Nitrogen(+ CO) concentration	79.5	
Bws	Fraction moisture content	0.174	(Ex. 4% = 0.04)
	Moisture percentage	17.366	
Md	Mole fraction of wet gas	0.826	
MWd	Molecular Weight(Dry)	30.42	
MW	Molecular Weight(Wet)	28.26	
Ps	Absolute Stack Pressure	28.44	in.Hg
MwPs/Ts	Intermediate Calc	0.901	
Ts/MwPs	Intermediate Calc	1.110	
(Vmstd)	Standard Meter Volume, cu.ft	31.676	
Qs	Cyclone flowrate (actual), cfm	0.699	
Us2.5	Viscosity of Stack gas	246.30	micropoise
Cunn Corr2.5		1.11	
Nre		2209	
D50-Nre<3162		2.49	
D50-Nre>=3162		2.18	
Cr2.5-Ne<3162		1.112	
Cr2.5-Ne>3162		1.128	
D50-1-Nre<3162		2.49	
D50-1-Nre>=3162		2.16	
ZNe>3162		1.00	
Zne<3162		1.01	
Dn	Nozzle diameter	0.190	inches
Vn	Nozzle Velocity	59.195	ft/sec
R min. (Noz-1)	minimum R	0.681	ft/sec
R max. (Noz-1)	maximum R	1.274	ft/sec
V min (Noz-1)	minimum velocity	40.31	ft/sec
V max (Noz-1)	maximum velocity	75.44	ft/sec
Delta p min. (Noz-1)	0.328	in.H2O	
Delta p max. (Noz-1)	1.150	in.H2O	
FRONT HALF ANALYTICAL DATA			
	Mass >PM 10 (front half cyclone I0) >PM10, g (FHA1)	0.0036	
	Mass PM 10 (cyclone 10 exit tube & front half cyclone IV) <PM10, g (FHA2	0.0044	
	Mass PM 2.5 (cyclone IV exit tube & front half filter holder) <PM2.5, g (FHA	0.0036	
	Mass (filter-1)<PM2.5, g	<0.0003	
BACK HALF ANALYTICAL DATA			
	H2O (inorganic) residue, g	0.0200	
	MeCl (organic) residue, g	0.0017	

ISOKINETIC FIELD DATA SHEET

EPA Method 201A/202 - PM10/2.5

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Client	LWEC
W.O.#	14464.007.004
Project ID	LWEC
Mode/Source ID	114
Samp. Loc. ID	STK
Run No.ID	2
Test Method ID	TPM10/2.5
Date ID	4JUL2016
Source/Location	ESP Stack
Sample Date	7/7/16
Baro. Press (in Hg)	29.37
Operator	SR

Stack Conditions

	Assumed	Actual
% Moisture	10	
Impinger Vol (ml)		150
Silica gel (g)		14.4
CO2, % by Vol	13	12.4
O2, % by Vol	7	7.2
Temperature (°F)	430	
Meter Temp (°F)	81	
Static Press (in H2O)	-12.6	-12.4
Ambient Temp (°F)	80	

Meter Box ID	22
Meter Box Y	.9918
Meter Box Del H	1.8873
Probe ID / Length	P-6
Probe Material	Boro
Pitot / Thermocouple ID	P463 (34)
Pitot Coefficient	.791
Nozzle ID	
Avg Nozzle Dia (in)	.190
Area of Stack (ft²)	39
Sample Time	
Total Traverse Pts	12

K Factor

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft³)	.016		.009
Leak Check @ (in Hg)	15		3
Pitot good	yes / no	yes / no	yes / no
Orsat good	~~yes / no~~	~~yes / no~~	~~yes / no~~

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	73	79
Reference Temp	74.2	78.3
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)	COND FILTER Temp OUT (F)>65 < 85 F	COMMENTS
	0	1057			101.051									
A 1	5.00		.95	.39	102.7	427	NA	91	451	458	68	3.0	71	
1	10.00		.85	.39	104.4	441		91	421	456	67	3.0	67	
2	15.00		.93	.37	106.1	433		91	436	459	64	3.0	68	
2	20.00		.93	.39	107.8	426		91	482	460	61	3.0	67	
3	25.00		.95	.39	109.6	421		82	418	464	58	3.5	66	
3	30.00	1127	.93	.39	111.400	425		82	460	464	57	3.5	66	
B 1	35.00	1136	.85	.39	113.6	445		82	483	460	59	3.5	66	
1	40.00		.85	.39	114.7	449		82	451	462	57	3.5	67	
2	44.75		.73	.39	116.4	436		82	436	463	56	3.5	68	
2	49.50		.73	.39	117.8	433		82	437	461	56	3.5	68	
3	54.25		.90	.39	119.6	420		81	451	454	54	3.5	67	
C 3	59.00	1159	.80	.39	121.280	418		81	455	460	56	3.5	66	
1	63.75	1201	.63	.39	122.8	442		81	450	462	58	3.5	66	
1	68.50		.63	.39	123.8	444		81	434	459	56	3.5	66	
2	[illegible]	1200	.68	.39	125.9	438		81	437	458	56	3.5	67	
2	[illegible]	1250	.62	.39	127.6	428		81	454	465	58	3.5	66	
3	81.00		.57	.39	128.7	420		81	464	458	56	3.5	66	
3	84.50		.57	.39	130.115	410		81	462	465	58	3.5	67	
D 1	88.00		.46	.39	131.3	458		81	422	451	58	3.5	67	
1	91.50		.46	.39	132.4	440		80	428	455	58	3.5	66	
2	95.00		.50	.39	133.6	436		80	434	460	57	3.5	66	
2	98.50		.50	.39	134.8	429		80	447	460	57	3.5	66	
3	102.00		.52	.39	135.9	426		80	457	460	59	3.5	66	
3	105.56	1251	.52	.39	137.496	424		80	452	461	58	3.5	66	

Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max Temp	Max Vac	Max Temp
.9356	.39	36.455	431.2	81.0					

Avg Sqrt Del H: .709

Comments:

WESTON

EPA 201A and 202 from 40CFR Part 60 App A

ISOKINETIC FIELD DATA SHEET

EPA Method 201A/202 - PM10/2.5

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Client	LWEC
W.O.#	14464.007.004
Project ID	LWEC
Mode/Source ID	114
Samp. Loc. ID	STK
Run No.ID	3
Test Method ID	TPM10/2.5
Date ID	4JUL2016
Source/Location	ESP Stack
Sample Date	7/7/16
Baro. Press (in Hg)	29.38
Operator	SK

Stack Conditions	Assumed	Actual
% Moisture	16	
Impinger Vol (ml)		139
Silica gel (g)		16.6
CO2, % by Vol	13	12.9
O2, % by Vol	7	7.3
Temperature (°F)		
Meter Temp (°F)		
Static Press (in H2O)	-12.6	-12.9
Ambient Temp (°F)		

Meter Box ID	22
Meter Box Y	.9515
Meter Box Del H	1.8973
Probe ID / Length	P963
Probe Material	Boro
Pitot / Thermocouple ID	P963
Pitot Coefficient	.781
Nozzle ID	
Avg Nozzle Dia (in)	.190
Area of Stack (ft²)	39
Sample Time	103.5
Total Traverse Pts	12

K Factor	Initial	Mid-Point	Final
Leak Checks			
Sample Train (ft³)	.010	/	.008
Leak Check @ (in Hg)	15	/	8
Pitot good	yes / no	yes / no	yes / no
Orsat good (N/A)	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	64	65
Reference Temp	64.9	66.3
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)	COND FILTER Temp OUT (F)>65 < 85 F	COMMENTS
	0	1513			186.704									
A 1	5		.98	.39	188.9	435	NA	75	446	468	62	3.5	69	
1	10		.98	.39	190.9	449		75	452	457	60	3.5	69	
2	15		.96	.39	192.6	428		75	459	443	60	3.5	70	
2	20		.96	.39	194.3	438		75	453	459	61	3.5	70	
3	25		.98	.39	196.0	426		75	454	445	61	3.5	69	
3	30	1543	.98	.39	197.772	418		75	456	455	61	3.5	69	
B 1	34.75	1546	.86	.39	199.3	441		75	462	453	61	3.5	71	
1	39.5		.86	.39	201.0	442		75	463	450	61	3.5	70	
2	44.25		.85	.39	202.6	490		76	462	454	60	3.5	70	
2	49		.83	.39	204.4	429		76	470	438	59	3.5	69	
3	53.75		.80	.39	206.1	422		76	465	459	58	3.5	69	
3	58.5	1615	.80	.39	207.563	415		76	450	465	58	3.5	69	
C 1	63.0	1615	.68	.39	209.1	445		77	458	460	59	3.5	70	
1	67.5		.68	.39	210.6	449		77	459	451	60	3.5	70	
2	71		.65	.39	211.9	436		77	459	442	60	3.6	69	
2	74.5		.65	.39	213.7	430		78	457	458	60	3.5	70	
3	79		.70	.39	214	429		78	460	463	61	3.5	71	
3	83.5	1641	.70	.39	216.070	419		78	461	469	60	3.5	71	
D 1	87.0	1644	.52	.39	217.4	436		78	467	458	59	3.5	70	
1	90.5		.52	.39	218.5	442		78	460	443	59	3.5	70	
2	93.75		.49	.39	219.3	431		78	451	458	59	3.5	70	
2	97		.49	.39	220.6	424		79	450	456	58	3.6	69	
3	100.25		.49	.39	221.2	420		78	459	464	58	3.5	69	
3	103.5	1704	.49	.39	222.965	411		79	459	451	59	3.5	69	
			Avg Sqrt Delta P .95676	Avg Delta H .39	Total Volume 36.261	Avg Ts 431.9	Avg Tm 76.5		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
			.745	Avg Sqrt Del H	Comments:									

WESTON

EPA 201A and 202 from 40CFR Part 60 App A

ISOKINETIC FIELD DATA SHEET

EPA Method 201A/202 - PM10/2.5

Page ___ of ___

			Stack Conditions	Assumed	Actual				
Client	LWEC					Meter Box ID	22		
W.O.#	14484.007.004					Meter Box Y	.9918		
Project ID	LWEC		% Moisture	17	[redacted]	Meter Box Del H	1.8893	Leak Checks	
Mode/Source ID	114		Impinger Vol (ml)	[redacted]	126	Probe ID / Length	P963	Sample Train (ft³)	
Samp. Loc. ID	STK		Silica gel (g)	[redacted]	17.4	Probe Material	Boro	Leak Check @ (in Hg)	
Run No.ID	4		CO2, % by Vol	13	12.9	Pitot / Thermocouple ID	P963	Pitot good	
Test Method ID	TPM10/2.5		O2, % by Vol	7	7.2	Pitot Coefficient	.781	Orsat good	NA
Date ID	4JUL2016		Temperature (°F)	440	[redacted]	Nozzle ID		Temp Check	
Source/Location	ESP Stack		Meter Temp (°F)	78	[redacted]	Avg Nozzle Dia (in)	.190	Meter Box Temp	
Sample Date	7/7/16		Static Press (in H2O)	-12.4	-12.8	Area of Stack (ft²)	39	Reference Temp	
Baro. Press (in Hg)	29.39					Sample Time	97.5	Pass/Fail (+/- 2°)	
Operator	SR		Ambient Temp (°F)	70		Total Traverse Pts	12	Temp Change Response	

K Factor			
	Initial	Mid-Point	Final
Sample Train (ft³)	.012		.008
Leak Check @ (in Hg)	15		6
Pitot good	yes / no	yes / no	yes / no
Orsat good	~~yes / no~~	~~yes / no~~	~~yes / no~~
	Pre-Test Set		Post-Test Set
Meter Box Temp	66		64
Reference Temp	67.4		65.0
Pass/Fail (+/- 2°)	Pass / Fail		Pass / Fail
Temp Change Response	yes / no		yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)	COND FILTER Temp OUT (F)>68 < 85 F	COMMENTS
	0	1742			223.005									
D 1	3.25		.51	.37	224.0	436	NA	78	425	445	63	3.5	70	
1	6.5		.51	.37	225.2	432		78	438	426	62	3.5	70	
2	9.75		.50	.37	226.4	426		78	431	418	61	3.5	69	
2	14.25		.50	.37	227.6	429		78	432	408	63	3.5	69	
3	16.25		.52	.37	228.5	420		79	440	418	62	3.5	70	
3	19.50	1802	.52	.37	230.150	412		79	430	417	60	3.5	70	
C 1	23.25	1806	.70	.37	231.1	446		78	449	421	63	3.5	72	
1	26.50		.70	.37	232.1	498		79	458	431	62	3.5	71	
2	30.00		.66	.37	233.2	440		79	456	439	61	3.5	71	
2	33.50		.66	.37	234.2	431		78	457	422	61	3.5	71	
3	37.00		.64	.37	235.6	429		79	451	416	61	3.5	70	
3	40.50	1826	.64	.37	236.984	424		78	430	428	60	3.5	70	
B 1	45.25	1829	.86	.37	238.9	438		78	436	435	60	3.5	70	
1	50.00		.86	.37	240.2	441		78	445	422	60	3.5	71	
2	54.75		.84	.37	241.6	435		79	459	429	60	3.5	71	
2	59.50		.84	.37	243.0	430		79	452	440	59	3.5	70	
3	64.25		.85	.37	244.5	425		79	459	422	59	3.5	70	
3	69.00	1857	.85	.37	246.196	420		79	438	431	58	3.5	70	
A 1	73.75	1859	.98	.37	249.0	448		79	441	441	58	3.5	70	
1	79.50		.98	.37	249.7	449		79	425	449	58	3.5	70	
2	83.25		.96	.37	250.9	431		80	433	430	57	3.5	69	
2	88.00		.96	.37	252.3	433		81	429	421	59	3.5	69	
3	92.75		.92	.37	254.5	424		81	422	431	59	3.5	69	
3	97.50	1926	.92	.37	256.193	421		81	419	445	61	3.5	69	
			Avg Sqrt Delta P .85923 / .748	Avg Delta H .37	Total Volume 33.193	Avg Ts 432.0	Avg Tm 79.88		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
				Avg Sqrt Del H	Comments:									

WESTON SOLUTIONS

EPA 201A and 202 from 40CFR Part 60 App A

SAMPLE RECOVERY FIELD DATA

EPA Method 201A/202 - PM10/2.5

Client: LWEC | W.O. #: 14464.007.004

Location/Plant: L'Anse, Michigan | Source & Location: ESP Stack

Nx Purge 1543-1643 15 Liter/min

Run No. 1 | Sample Date 7/6/16 | Recovery Date 7/6/16

Sample I.D. LWEC - 114 - STK - 1 - TPM10/2.5 - | Analyst | Filter Number 16061327 16061328

	Impinger 1	2	3	4	5	6	7	Imp. Total	8	Total
Contents	Empty	Empty	Di H20						Silica Gel	
Final	130	0	96						314.5	
Initial	0	0	100						300	
Gain	130	0	-4						14.5	

Impinger Color: Clear Colorless | Labeled? ✓

Silica Gel Condition: 1/2 Blue | Sealed?

1325-1425 15 Liter/min

Run No. 2 | Sample Date 7/7/16 | Recovery Date 7/7/16

Sample I.D. LWEC - 114 - STK - 2 - TPM10/2.5 - | Analyst | Filter Number 16061329

	Impinger 1	2	3	4	5	6	7	Imp. Total	8	Total
Contents	Empty	Empty	Di H20						Silica Gel	
Final	150	0	100						314.4	
Initial	0	0	100						300	
Gain	150	0	0						14.4	

Impinger Color: Clear Colorless | Labeled?

Silica Gel Condition: 1/2 Blue | Sealed?

1738-1838 5 Liter/min

Run No. 3 | Sample Date 7/7/16 | Recovery Date 7/7/16

Sample I.D. LWEC - 114 - STK - 3 - TPM10/2.5 - | Analyst [illegible] | Filter Number 1606[illegible]13

	Impinger 1	2	3	4	5	6	7	Imp. Total	8	Total
Contents	Empty	Empty	Di H20						Silica Gel	
Final	138	0	100						316.6	
Initial	0	0	100						300	
Gain	138	0	0					138	16.6	

Impinger Color: Clear Colorless | Labeled? C

Silica Gel Condition: 1/2 Blue | Sealed? C

Check COC for Sample IDs of Media Blanks

WESTON SOLUTIONS

R1		R2		R3	
10	67°F	10	65°F	10	68°F
20	66°F	20	66°F	20	67°F
30	65°F	30	66°F	30	67°F
40	65°F	40	65°F	40	66°F
50	65°F	50	65°F	50	66°F
60	65°F	60	65°F	60	66°F

SAMPLE RECOVERY FIELD DATA

EPA Method 201A/202 - PM10/2.5

Client: LWEC — W.O. #: 14464.007.004

Location/Plant: L'Anse, Michigan — Source & Location: ESP Stack

Run No. 2 — Sample Date ____ — Recovery Date ____

Sample I.D. LWEC - 114 - STK - 2 - TPM10/2.5 - — Analyst ____ — Filter Number ____

	Impinger 1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	Empty	Di H20						Silica Gel	
Final										
Initial			100						300	
Gain										

Impinger Color ____ — Labeled? ____

Silica Gel Condition ____ — Sealed? ____

Run No. BT — Sample Date 7/7/16 — Recovery Date 7/7/16

Sample I.D. LWEC - 114 - STK - 3 - TPM10/2.5 - — Analyst ____ — Filter Number NA

	Impinger 1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	Empty	Di H20						Silica Gel	
Final	8	94	98						300.4	
Initial	8	100	100						300	
Gain	0	-6	-2							

Impinger Color: clear colorless — Labeled? ✓

Silica Gel Condition: 100% Blue — Sealed? ✓

1838 - 1938 15 L/min MIN

Run No. 4 — Sample Date 7/7/16 — Recovery Date 7/7/16

Sample I.D. LWEC - 114 - STK - 4 - TPM10/2.5 - — Analyst ____ — Filter Number ____

	Impinger 1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	Empty	Di H20						Silica Gel	
Final	126	8	98						317.4	
Initial	0	8	100						300	
Gain	126	0	-2						17.4	

Impinger Color: clear Colorless — Labeled? ✓

Silica Gel Condition: 1/2 Blue — Sealed? ✓

Purge 1938-2038 = 15 L/min MIN

Check COC for Sample IDs of Media Blanks

WESTON

10 66°F
20 66°F
30 65°F
40 65°F
50 65°F
60 65°F

B.4 PCDD/PCDF AND CRESOL ISOMERS

L'Anse Warden Electric Company
L'Anse, MI
Boiler No. 1
Inputs for Dioxin / Furan Calculations

Test Data

Run number	1	2	3
Location		Boiler No. 1	
Date	7/6/2016	7/6/2016	7/7/016
Time period	0914-1231	1552-1907	1135-1450
Operator	DF	DF	DF

Inputs For Calcs.

Sq. rt. delta P	0.86450	0.85405	0.87985
Delta H	1.87500	1.62778	1.79722
Stack temp. (deg.F)	436.8	434.3	435.8
Meter temp. (deg.F)	86.6	97.1	77.4
Sample volume (act.)	126.625	118.288	122.983
Barometric press. (in.Hg)	29.27	29.27	29.38
Volume H_2O imp. (ml)	512.0	443.9	430.0
Weight chnge sil. gel (g)	31.4	33.7	36.3
% CO_2	13.4	13.2	13.2
% O_2	6.9	7.1	7.3
% N_2	79.7	79.7	79.5
Area of stack (sq.ft.)	39.00	39.00	39.00
Sample time (min.)	180	180	180
Static pressure (in.H_2O)	-12.6	-12.6	-12.8
Nozzle dia. (in.)	0.252	0.250	0.250
Meter box cal.	1.0017	1.0017	1.0017
Cp of pitot tube	0.84	0.84	0.84
Traverse points	12	12	12

Dioxin Laboratory Report Data, pg

Total TCDD	150.0	56.6	69.70
2,3,7,8-TCDD	6.9	4.7	5.90
Total PeCDD	208.0	96.6	90.20
1,2,3,7,8-PeCDD	14.3	9.3	8.80
Total HxCDD	110.0	91.8	51.50
1,2,3,4,7,8-HxCDD	5.8	5.6	< 4.00
1,2,3,6,7,8-HxCDD	10.6	12.6	5.60
1,2,3,7,8,9-HxCDD	14.2	12.9	6.80
Total HpCDD	80.7	162.0	40.70
1,2,3,4,6,7,8-HpCDD	30.6	81.5	17.20
Total OCDD	95.9	238.0	53.10

Furan Laboratory Report Data, pg

Total TCDF	78.6	30.2	30.5
2,3,7,8-TCDF (1)	< 23.00	10.70	12.00
Total PeCDF	17.00	< 3.90	7.50
1,2,3,7,8-PeCDF	3.80	< 3.900	< 3.50
2,3,4,7,8-PeCDF	4.00	< 3.90	3.70
Total HxCDF	10.20	5.40	3.80
1,2,3,4,7,8-HxCDF	5.20	5.40	3.80
1,2,3,6,7,8-HxCDF	< 3.50	< 3.70	< 3.30
2,3,4,6,7,8-HxCDF	< 3.90	< 4.00	< 3.60
1,2,3,7,8,9-HxCDF	< 4.20	< 4.40	< 4.00
Total HpCDF	10.40	17.10	3.40
1,2,3,4,6,7,8-HpCDF	6.00	7.70	3.40
1,2,3,4,7,8,9-HpCDF	< 4.10	< 3.80	< 3.30
Total OCDF	< 7.90	< 15.00	< 3.80

< = Not detected

(1) Test runs 1 and 2 data is from Confirmation analysis utilizing a DB-225 column.

L'Anse Warden Electric Company
L'Anse, MI
Boiler No. 1
Inputs for Semivolatile Organics Calculations

Test Data						
Run number		1		2		3
Location				Boiler No. 1		
Date		7/6/2016		7/6/2016		7/7/016
Time period		0914-1231		1552-1907		1135-1450
Operator		DF		DF		DF
Inputs For Calcs.						
Sq. rt. delta P		0.86450		0.85405		0.87985
Delta H		1.8750		1.6278		1.7972
Stack temp. (deg.F)		436.8		434.3		435.8
Meter temp. (deg.F)		86.6		97.1		77.4
Sample volume (act.)		126.625		118.288		122.983
Barometric press. (in.Hg)		29.27		29.27		29.38
Volume H_2O imp. (ml)		512.0		443.9		430.0
Weight change sil. gel (g)		31.4		33.7		36.3
% CO_2		13.4		13.2		13.2
% O_2		6.9		7.1		7.3
% N_2		79.7		79.7		79.5
Area of stack (sq.ft.)		39.00		39.00		39.00
Sample time (min.)		180		180		180
Static pressure (in.H_2O)		-12.6		-12.6		-12.8
Nozzle dia. (in.)		0.252		0.250		0.250
Meter box cal.		1.0017		1.0017		1.0017
Cp of pitot tube		0.84		0.84		0.84
Traverse points		12		12		12
CRESOL ISOMER LABORATORY REPORT DATA, ug.						
2-Methylphenol	<	5.0	<	5.0	<	5.0
3-Methylphenol & 4-Methylphenol	<	5.0	<	5.0	<	5.0

96 235

ISOKINETIC FIELD DATA SHEET

EPA Method 0010/23 - SVOC/DF

Field	Value
Client	LWEC
W.O #	14484.007.004
Project ID	LWEC
Mode/Source ID	114
Samp. Loc. ID	STK
Run No.ID	1
Test Method ID	M0010/23
Date ID	4JUL2016
Source/Location	ESP, Stack
Sample Date	7/6/16
Baro. Press (in Hg)	29.29
Operator	DF

Stack Conditions

	Assumed	Actual
% Moisture	(DF) ~~13~~ 14	
Impinger Vol (ml)		512 ✓
Silica gel (g)		31.4 ✓
CO2, % by Vol	(DF) ~~11~~ 12	13.1
O2, % by Vol	(DF) ~~9~~ 8	6.9
Temperature (°F)	(DF) ~~375~~ 405	
Meter Temp (°F)	95	
Static Press (in H_2O)	-12	-12.6
Ambient Temp (°F)	(DF) ~~80~~ 76	

Field	Value
Meter Box ID	26
Meter Box Y	1.0017
Meter Box Del H	2.1714
Probe ID / Length	P524 5'
Probe Material	Boro
Pitot / Thermocouple ID	
Pitot Coefficient	0.84
Nozzle ID	.252
Avg Nozzle Dia (in)	.252
Area of Stack (ft²)	39
Sample Time	180
Total Traverse Pts	12

K Factor (DF) ~~2.04~~ 2.47

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft³)	0.010	0.005	0.000
Leak Check @ (in Hg)	15"	10"	8"
Pitot good	(yes) / no	(yes) / no	(yes) / no
Orsat good	~~yes / no~~	~~yes / no~~	~~yes / no~~

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	73	80
Reference Temp	74	81
Pass/Fail (+/- 2°)	(Pass) / Fail	(Pass) / Fail
Temp Change Response ?	(yes) / no	(yes) / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (°F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)	COMMENTS	filter exit
	0	0914			183.062 ~~182.874~~									
A 1	5		1.0	2.5	187.1	413	81	242	248	68	2.0	59		250
1	10		1.0	2.5	191.1	435	82	238	251	68	6.0	43		250
1	15		1.0	2.5	195.1	435	83	246	248	65	7.0	45		250
2	20		0.9	2.2	198.9	436	83	234	250	63	6.5	46		250
2	25		0.9	2.2	202.7	434	83	253	250	62	6.5	45	34.606 ✓	250
2	30		0.85	2.1	206.3	433	84	250	242	62	6.5	46		250
3	35		0.85	2.1	210.2	423	84	249	249	63	6.5	45		250
3	40		0.85	2.1	213.9	420	84	249	250	64	6.5	47		250
3	45	0959	0.85	2.1	217.668	421	84	250	250	63	6.5	48		251
		1003	—	—	217.778	—	—	—	—	—	—	—		
B 1	50		0.80	2.0	221.4	425	84	249	249	66	6.5	56		251
1	55		0.80	2.0	225.0	445	84	243	251	63	6.5	45		251
1	60		0.80	2.0	228.7	447	85	249	250	58	6.5	43		251
2	65		0.80	2.0	232.3	450	86	251	250	56	6.5	42	32.781 ✓	250
2	70		0.80	2.0	235.9	447	85	255	250	55	6.5	43		250
2	75		0.80	2.0	239.6	446	85	250	250	55	6.5	45		250
3	80		0.80	2.0	243.2	425	86	250	250	56	6.5	46		250
3	85		0.80	2.0	246.9	425	86	247	250	57	6.5	48		250
3	90	1048	0.80	2.0	250.559	420	86	249	250	60	6.5	49		250
		1053	—	—	250.688	—	—	~~246~~	→	—	—	—		
C 1	95		.70	1.7	254.0	435	86	240	248	66	6.0	58		251
1	100		.75	1.9	257.5	444	87	251	250	64	6.0	52		251
1	105		.75	1.9	261.1	450	88	251	251	63	6.0	56		251
2	110		.75	1.9	264.7	452	89	246	251	65	6.5	51		251
2	115		.75	1.9	268.2	430	89	255	250	65	6.5	51		251
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max Temp	Max Vac	Max Temp		
			Avg Sqrt Delta P	Avg Sqrt Del H	Comments									

WESTON SOLUTIONS

EPA Method 0010 from EPA SW-846 EPA Method 23 from 40CFR

ISOKINETIC FIELD DATA SHEET

EPA Method 0010/23 - SVOC/DF

Client: LWEC
Source: ESP
Sample Loc.: Stack
Operator: DF
Run No.: (DF) ~~[illegible]~~ 1
Date: 7/6/16
K Factor: (DF) ~~2.04~~ 2.47

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	~~DGM INLET TEMP (°F)~~	DGM ~~OUTLET~~ TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)	COMMENTS	Filter Tc
	0/115				268.2										
2	120		0.70	1.7	271.6	450		89	249	249	65	6.0	52	(SR)	251
3	125		0,70	1.7	275.0	449		89	251	250	65	6.0	53	~~31.098~~	251
3	130		0.70	1.7	278.3	420		88	250	250	66	6.0	57	31.098	251
3	135	1138	0.70	1.7	281.766	420		88	250	250	66	6.0	61		251
		1146	—	—	281.877	—		—	—	—	—	—	—		
D 1	140		.60	1.5	285.0	420		89	245	250	66	(DF) ~~5.0~~ 5.5	61		250
1	145		.55	1.4	288.0	447		90	240	251	66	5.5	58		250
1	150		.60	1.5	291.2	449		91	249	249	66	5.5	51		250
2	155		.55	1.4	294.3	449		91	253	250	66	5.5	45	28.146	250
2	160		.55	1.4	297.4	444		91	250	249	62	5.5	46		250
2	165		.55	1.4	300.5	442		90	251	250	60	5.5	47		250
3	170		.60	1.5	303.6	441		96	249	251	58	5.5	47		250
3	175		.60	1.5	306.8	440		96	297	250	59	5.5	48		250
3	180	1231	.60	1.5	310.617	440		90	251	250	61	5.5	48		250

Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max Temp	Max Vac	Max Temp
.864 ✓	1.875 ✓	(SR) ~~126.605~~	436.8 ✓	86.6 ✓	238/255	242/251	68	7.0	61

.753 ✓

Avg Sqrt Del H: 1.365 ✓

Comments: 126.625 ✓

106.4

17.5%

70806.3

120.360

(SR)

WESTON

ISOKINETIC FIELD DATA SHEET

EPA Method 0010/23 - SVOC/DF

Page 1 of 2

Client	LWEC
W.O.#	14464.007.004
Project ID	LWEC
Mode/Source ID	114
Samp. Loc. ID	STK
Run No.ID	2
Test Method ID	M0010/23
Date ID	4JUL2016
Source/Location	ESP Stack
Sample Date	7/6/16
Baro. Press (in Hg)	29.27
Operator	DF

Stack Conditions	Assumed	Actual
% Moisture	14	
Impinger Vol (ml)		413.9
Silica gel (g)		33.7
CO2, % by Vol	12	12.4
O2, % by Vol	8	7.1
Temperature (°F)	435	
Meter Temp (°F)	95	
Static Press (in H_2O)	-13	-12.6
Ambient Temp (°F)	85	

Meter Box ID	26
Meter Box Y	1.0017
Meter Box Del H	2.1714
Probe ID / Length	7524 / 5'
Probe Material	Boro
Pitot / Thermocouple ID	
Pitot Coefficient	0.84
Nozzle ID	.250
Avg Nozzle Dia (in)	.260
Area of Stack (ft²)	39
Sample Time	180
Total Traverse Pts	12

K Factor 2.21

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft³)	0.010	0.003	0.000
Leak Check @ (in Hg)	15"	10"	7"
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	85	80
Reference Temp	85	81
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (°F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)	COMMENTS
	0	1552			~~373.911~~ 376.315									
A 1	5		1.0	2.2	377.7	430		99	240	253	66	5.0	46	
1	10		1.0	2.2	381.5	438		99	240	252	66	5.5	46	
1	15		1.0	2.2	385.3	434		100	251	251	64	5.5	45	
2	20		1.0	2.2	389.2	433		100	251	250	64	5.5	46	
2	25		.90	2.0	392.9	428		100	250	249	64	5.5	49	33.406
2	30		.90	2.0	396.5	427		99	251	249	64	5.5	43	
3	35		.85	1.9	400.1	426		99	248	249	61	5.0	44	
3	40		.85	1.9	403.7	420		99	249	251	60	5.0	44	
3	45	1637	.85	1.9	407.317	420		99	249	251	60	5.0	44	
		1641	—	—	407.358	—		—	—	—	—	—	—	
B 1	50		.85	1.5	410.9	425		97	249	249	66	5.5	54	
1	55		.90	2.0	414.5	439		98	244	253	62	5.5	54	
1	60		.90	2.0	418.2	444		98	250	250	60	5.5	47	
2	65		.90	2.0	421.9	445		97	252	250	61	5.5	49	
2	70		.90	2.0	425.5	445		97	250	249	63	5.5	53	32.335
2	75		.90	2.0	429.2	445		97	248	250	62	5.5	52	
3	80		.80	1.8	432.7	432		97	249	250	63	5.5	48	
3	85		.80	1.8	436.2	431		97	249	251	62	5.5	47	
3	90	1726	.80	1.8	439.723	430		97	250	249	62	5.5	47	
		1731	—	—	439.723	—		—	—	—	—	—	—	
C 1	95		.65	1.4	442.7	435		96	249	246	66	4.5	60	
1	100		.65	1.4	445.8	441		97	254	253	65	4.5	48	
1	105		.65	1.4	448.9	444		97	251	251	62	4.5	50	
2	110		.60	1.3	451.8	449		97	249	250	64	4.5	53	
2	115		.60	1.3	454.8	442		98	249	250	65	4.5	51	
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	

Avg Sqrt Del H

Comments

WESTON

EPA Method 0010 from EPA SW-846 EPA Method 23 from 40CFR

ISOKINETIC FIELD DATA SHEET

EPA Method 0010/23 - SVOC/DF

Client: LWEC
Source: ESP
Sample Loc: Stack
Operator: DF
Run No.: 2
Date: 7/6/10
K Factor: 2.21

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)	COMMENTS
	115				454.8									
2	120		.70	1.5	458.0	493		97	249	250	65	4.5	50	
3	125		.60	1.3	460.9	443		97	252	251	64	4.5	53	27.171
3	130		.60	1.3	463.9	425		97	249	249	65	4.5	55	
3	135	1816	.60	1.3	466.894	420		95	249	250	64	4.5	58	
—	—	1822	—	—	466.894	—		—	—	—	—	—	—	
D 1	140		.55	1.2	469.7	421		94	245	247	66	4.5	60	
1	145		.55	1.2	472.5	437		94	252	253	64	4.5	60	
1	150		.55	1.2	475.4	438		94	252	251	64	4.5	55	
2	155		.50	1.1	478.1	439		94	250	250	64	4.0	43	25.376
2	160		.50	1.1	480.8	437		94	250	250	64	4.0	44	
2	165		.55	1.2	483.6	437		95	249	250	62	4.0	44	
3	170		.55	1.2	486.5	439		96	250	251	60	4.5	44	
3	175		.55	1.2	489.4	430		97	248	250	60	4.5	46	
3	180	1907	.55	1.2	492.270	430		97	252	249	61	4.5	48	

Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max Temp	Max Vac	Max Temp
.854 ✓	1.628 ✓	118.285 ✓	434.3 ✓	97.1 ✓	240/254	246/253	66	5.5	66

Avg Sqrt Del H: 1.267 ✓

Comments:

.739 ✓

99.5
16.9
70473.7
110.265

SL

WESTON SOLUTIONS

ISOKINETIC FIELD DATA SHEET

EPA Method 0010/23 - SVOC/DF

Client	LWEC
W.O.#	14464.007.004
Project ID	LWEC
Mode/Source ID	114
Samp. Loc. ID	STK
Run No.ID	3
Test Method ID	M0010/23
Date ID	4JUL2016
Source/Location	ESP Stack
Sample Date	7/7/16
Baro. Press (in Hg)	29.38
Operator	DE

Stack Conditions

	Assumed	Actual
% Moisture	16	
Impinger Vol (ml)		430 ✓
Silica gel (g)		34.3 ✓
CO2, % by Vol	12	12.8
O2, % by Vol	7	7.3
Temperature (°F)	430	
Meter Temp (°F)	95	
Static Press (in H2O)	-13	-12.8
Ambient Temp (°F)	70	

Meter Box ID	26
Meter Box Y	1.0417
Meter Box Del H	2.1714
Probe ID / Length	P524 / 5'
Probe Material	Boro
Pitot / Thermocouple ID	
Pitot Coefficient	0.84
Nozzle ID	.250
Avg Nozzle Dia (in)	.250
Area of Stack (ft²)	39
Sample Time	180
Total Traverse Pts	12

K Factor 2.29

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft³)	0.016	0.010	0.000
Leak Check @ (in Hg)	15"	10"	10"
Pitot good	(yes) / no	(yes) / no	(yes) / no
Orsat good	~~yes / no~~	~~yes / no~~	~~yes / no~~

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	70	70
Reference Temp	71	71
Pass/Fail (+/- 2°)	(Pass) / Fail	(Pass) / Fail
Temp Change Response	(yes) / no	(yes) / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (°F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)	COMMENTS
	0	1135			557.267									
D 1	5		.65	1.5	560.3	420		80	240	245	66	4.5	66	
1	10		.65	1.5	563.5	445		80	240	252	63	4.5	42	
1	15		.60	1.4	566.5	446		80	248	251	62	5.0	44	
2	20		.60	1.4	569.6	446		80	249	256	60	5.0	44	
2	25		.60	1.4	572.6	442		80	252	249	60	5.0	45	26.498
2	30		.60	1.4	575.6	440		80	250	250	60	5.0	48	
3	35		.50	1.1	578.3	424		80	248	251	61	4.0	50	
3	40		.50	1.1	581.0	421		80	247	249	62	4.5	53	
3	45	1220	.50	1.1	583.765	420		80	250	249	63	4.5	56	
90		1225	—	—	583.847	—		—	—	—	—	—	—	
B 1	50		.90	2.1	587.8	432		79	253	245	61	6.5	58	
1	55		.90	2.1	591.1	444		80	248	250	66	6.5	50	
1	60		.90	2.1	594.9	446		80	252	250	66	6.5	53	
2	65		.90	2.1	598.6	446		80	253	253	66	6.5	41	32.028
2	70		.90	2.1	602.7	442		80	251	250	62	6.5	39	
2	75		.90	2.1	606.0	441		79	250	250	57	6.5	40	
3	80		.70	1.6	609.6	441		79	250	249	54	5.0	40	
3	85		.70	1.6	612.6	430		79	250	250	54	5.0	40	
3	90	1310	.70	1.6	615.875	430		79	249	251	54	5.0	41	
90		1315	—	—	~~616~~ 615.989	—		—	—	—		—	—	
C 1	95		.75	1.7	619.2	435		78	248	246	59	5.5	52	
1	100		.75	1.7	622.7	440		79	246	249	56	5.5	45	
1	105		.75	1.7	626.0	444		79	245	251	55	5.5	48	
2	110		.75	1.7	629.3	444		78	250	250	60	6.0	55	
2	115		.75	1.7	632.8	444		78	249	250	63	6.0	56	
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts		Avg Tm	Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	

Avg Sqrt Del H

Comments:

WESTON

EPA Method 0010 from EPA SW-846 EPA Method 23 from 40CFR

102.4

15.57%

73768.5

119.340

ISOKINETIC FIELD DATA SHEET

EPA Method 0010/23 - SVOC/DF

Client: LWEC
Source: ESP
Sample Loc.: Stack
Operator: DF
Run No.: 3
Date: 7/7/16
K Factor: 2.29

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)	COMMENTS
	115				632.8									
2	120		.75	1.7	636.0	443		77	257	249	64	6.0	58	
3	125		.75	1.7	639.4	443		77	249	255	64	6.0	58	30.143
3	130		.75	1.7	642.7	434		76 ~~74.6~~	248	250	65	6.0	58	
3	135	1400	.75	1.7	646.132	438		75	251	247	65	6.0	58	
		1405	—	—	646.132	—		—	—	—	—	—	—	
A 1	140		1.0	2.3	649.9	430		73	248	249	64	7.0	58	
1	145		1.0	2.3	653.8	434		73	251	246	64	7.0	58	
1	150		1.0	2.3	657.7	436		74	251	249	62	7.0	47	
2	155		1.0	2.3	661.6	436		73	250	250	62	7.0	44	39.314
2	160		1.0	2.3	665.4	433		73	254	259	57	7.0	45	
2	165		1.0	2.3	669.4	429		73	248	249	54	7.0	45	
3	170		.90	2.1	673.0	426		73	250	250	55	6.5	47	
3	175		.90	2.1	676.8	420		72	248	249	56	6.3	47	
3	180	1450	.90	2.1	680.446	420		72	249	250	57	6.5	49	

Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max Temp	Max Vac	Max Temp
.880 ✓	1.797 ✓	122.983 ✓	435.8 ✓	77.4 ✓	240/257	246/255	66	7.0	66

Avg Sqrt Del H: 1.333 ✓

Comments:

.782 ✓

WESTON

SL

SAMPLE RECOVERY FIELD DATA

EPA Method 0010/23 - SVOC/DF

Client: LWEC W.O. #: 14464.007.004
Location/Plant: L'Anse, Michigan Source & Location: ESP Stack

250
120
370

Run No. 1 Sample Date 7/6/16 Recovery Date 7/6/16
Sample I.D. LWEC - 114 - STK - 1 - M0010/23 - Analyst Jm Filter Number

	Impinger 1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20	Empty			XAD		Silica Gel	
Final	370	225	108	2			312.9		331.4	
Initial	0	100	100	0			305.9		300	
Gain	370	125	8	2			7	512	31.4	

Impinger Color: Clear colorless Labeled? ✓
Silica Gel Condition: 1/4 Blue Sealed? ✓

250
130
380

Run No. 2 Sample Date 7/6/16 Recovery Date 7/6/16
Sample I.D. LWEC - 114 - STK - 2 - M0010/23 - Analyst Filter Number

	Impinger 1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20	Empty			XAD		Silica Gel	
Final	380	155	100	0			320.0		333.7	
Initial	0	100	100	0			311.1		300	
Gain	380	55	0	0			8.9	443.9	33.7	

Impinger Color: Clear colorless Labeled?
Silica Gel Condition: 1/4 Blue Sealed?

250
120
370

Run No. 3 Sample Date 7/7/16 Recovery Date 7/7/16
Sample I.D. LWEC - 114 - STK - 3 - M0010/23 - Analyst Jm Filter Number

	Impinger 1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20	Empty			XAD		Silica Gel	
Final	370	160	90	2			333.6		336.3	
Initial	0	100	100	0			325.6		300	
Gain	370	60	-10	2			8	430	36.3	

Impinger Color: Clear colorless Labeled? ✓
Silica Gel Condition: 1/4 Blue Sealed? ✓

Check COC for Sample IDs of Media Blanks

BT

				XAD	Silica Gel
0	98	100	2	316.8	301.1
0	100	100	0	316.7	300
0	-2	0	2		1.1

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B.5 HYDROGEN CHLORIDE/CHLORINE

L'Anse Warden Electric Company
Inputs for Hydrogen Chloride and Chlorine Calculations

Test Data			
Run number	1	2	3
Location		Boiler No. 1	
Date	07/06/2016	07/06/2016	07/07/2015
Time period	0935-1040	1621-1726	1334-1439
Operator	KS	KS	KS
Inputs For Calcs.			
Delta H	1.8000	1.8000	1.8000
Stack temp. (deg.F)	450.2	444.2	443.4
Meter temp. (deg.F)	84.2	103.8	75.6
Sample volume (act.)	46.886	46.930	46.500
Barometric press. (in.Hg)	29.27	29.27	29.38
Volume H2O imp. (ml)	198.0	174.0	168.0
Weight change sil. gel (g)	14.1	12.0	16.4
% CO2	13.6	13.0	13.0
% O2	6.7	7.4	7.5
% N	79.7	79.6	79.5
Area of stack (sq.ft.)	39.000	39.000	39.000
Sample time (min.)	65	65	65
Static pressure (in.H2O)	-12.60	-12.60	-12.80
Meter box cal.	0.9915	0.9915	0.9915
Cp of pitot tube	0.84	0.84	0.84
Traverse Points	12	12	12
HCl Laboratory Report Data			
HCl, mg	8.20	8.80	7.40
Cl_2, mg	< 1.2	< 1.2	< 1.2

ISOKINETIC FIELD DATA SHEET

EPA Method 26A - HCl & Cl2

Page 1 of 1

Client	LWEC
W.O.#	14464.007.004
Project ID	LWEC
Mode/Source ID	114
Samp. Loc. ID	STK
Run No.ID	1
Test Method ID	M26A
Date ID	4JUL2016
Source/Location	ESP Stack
Sample Date	7/6/16
Baro. Press (in Hg)	29.24
Operator	SL/KS

Stack Conditions

	Assumed	Actual
% Moisture	14	
Impinger Vol (ml)		148
Silica gel (g)		19.1
CO2, % by Vol	12	10.1
O2, % by Vol	8	6.4
Temperature (°F)	405	
Meter Temp (°F)	80	
Static Press (in H2O)	-12.5	-12.6
Ambient Temp (°F)	80	

Meter Box ID	22
Meter Box Y	.9915
Meter Box Del H	1.8873
Probe ID / Length	P153 / 5'
Probe Material	Boro
Pitot / Thermocouple ID	P153 / 5'
Pitot Coefficient	0.84
Nozzle ID	
Avg Nozzle Dia (in)	
Area of Stack (ft²)	39
Sample Time	65
Total Traverse Pts	1

K Factor

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft³)	.012		.005
Leak Check @ (in Hg)	15		8
Pitot good	yes / no	yes / no	yes / no
Orsat good NA	~~yes / no~~	~~yes / no~~	~~yes / no~~

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	77	81
Reference Temp	78.6	82.4
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response ?	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (°F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	935			957.430								
C 1	5		0.74	1.8	961.0	449	81	256	261	65	5.0		
1	10		0.71	1.8	964.6	449	82	262	264	63	5.0		
1	15		0.70	1.8	968.3	449	82	263	263	58	5.0		
1	20		0.70	1.8	971.9	450	83	263	264	57	5.0		
1	25		0.66	1.8	975.6	449	84	262	263	56	5.0		
1	30		0.70	1.8	979.1	449	84	263	263	56	5.0		
1	35		0.70	1.8	982.7	450	84	262	264	55	5.0		
1	40		0.71	1.8	986.3	450	85	264	265	54	5.0		
1	45		0.71	1.8	989.9	451	85	263	263	53	5.0		
1	50		0.71	1.8	993.5	451	85	263	263	53	5.0		
1	55		0.73	1.8	997.1	452	86	263	264	53	5.0		
1	60		0.72	1.8	1000.7	452	86	263	263	55	5.0		
1	65	1040	0.72	1.8	1004.316	452	87	263	263	55	5.0		

Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max Temp	Max Vac	Max Temp
	1.8	46.886	450.2	84.2	256/264	261/265	65	5.0	

Avg Sqrt Delta P	Avg Sqrt Del H	Comments:
	1.3416	

WESTON

EPA 26A from 40CFR Part 60 App A

SL

ISOKINETIC FIELD DATA SHEET

EPA Method 26A - HCl & Cl2

Client	LWEC
W.O.#	14464.007.004
Project ID	LWEC
Mode/Source ID	114
Samp. Loc. ID	STK
Run No.ID	2
Test Method ID	M26A
Date ID	4JUL2016
Source/Location	ESP Stack
Sample Date	7/6/16
Baro. Press (in Hg)	25.27
Operator	KF/SR

Stack Conditions

	Assumed	Actual
% Moisture	17	
Impinger Vol (ml)		174
Silica gel (g)		12.3
CO2, % by Vol	13	12.4
O2, % by Vol	8	7.1
Temperature (°F)	450	
Meter Temp (°F)	110	
Static Press (in H_2O)	-12.5	-12.6
Ambient Temp (°F)	83	

Meter Box ID	22
Meter Box Y	0.9915
Meter Box Del H	1.8873
Probe ID / Length	P153
Probe Material	Boro
Pitot / Thermocouple ID	P153
Pitot Coefficient	0.84
Nozzle ID	
Avg Nozzle Dia (in)	
Area of Stack (ft^2)	39
Sample Time	65
Total Traverse Pts	1

K Factor

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	0.014		0.005
Leak Check @ (in Hg)	15		9
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

N/A

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	82	85
Reference Temp	83.2	85.7
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (°F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1621			37.375									
C1	5		0.70	1.8	40.4	433	N/A	105	253	264	67	4.5		
1	10		0.70	1.8	44.1	440		105	257	267	67	4.5		
1	15		0.70	1.8	47.8	442		105	267	267	67	4.5		
1	20		0.73	1.8	51.4	442		105	266	262	60	4.5		
1	25		0.71	1.8	55.1	443		104	266	267	58	4.5		
1	30		0.72	1.8	58.7	444		104	265	263	56	4.5		
1	35		0.72	1.8	62.3	445		104	265	266	57	4.5		
1	40		0.75	1.8	66.0	446		103	266	263	57	4.5		
1	45		0.75	1.8	69.6	447		103	266	260	58	5.0		
1	50		0.75	1.8	73.3	448		103	266	262	57	5.0		
1	55		0.75	1.8	76.9	449		103	266	267	58	5.0		
1	60		0.68	1.8	80.6	448		103	266	262	59	5.0		
1	65	1726	0.71	1.8	84.305	448		103	266	262	61	5.0		

Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts		Avg Tm	Min/Max	Min/Max	Max Temp	Max Vac	Max Temp
		46.930 ✓	444.2 ✓	N/A	103.8 ✓	253/267	260/267	67	5.0	

Avg Sqrt Del H

Comments:

EPA 26A from 40CFR Part 60 App A

WESTON

1

ISOKINETIC FIELD DATA SHEET

EPA Method 26A - HCl & Cl2

			Stack Conditions	Assumed	Actual		
Client	LWEC					Meter Box ID	22
W.O.#	14464.007.004					Meter Box Y	0.9915
Project ID	LWEC		% Moisture	16		Meter Box Del H	1.8873
Mode/Source ID	114		Impinger Vol (ml)		169	Probe ID / Length	P153 / 5'
Samp. Loc. ID	STK		Silica gel (g)		16.4	Probe Material	Boro
Run No.ID	3		CO2, % by Vol	13	12.9	Pitot / Thermocouple ID	P153 / 5'
Test Method ID	M26A		O2, % by Vol	7	7.3	Pitot Coefficient	0.84
Date ID	4JUL2016		Temperature (°F)	430		Nozzle ID	
Source/Location	ESP Stack		Meter Temp (°F)	80		Avg Nozzle Dia (in)	
Sample Date	7/7/16		Static Press (in H_2O)	-12.6	-12.8	Area of Stack (ft²)	39
Baro. Press (in Hg)	29.37					Sample Time	65
Operator	KJ		Ambient Temp (°F)	72		Total Traverse Pts	1

K Factor

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft³)	0.009		0.005
Leak Check @ (in Hg)	15		8
Pitot good	yes / no	yes / no	yes / no
Orsat good	NA yes / no	yes / no	yes / no
Temp Check	Pre-Test Set		Post-Test Set
Meter Box Temp	65		66
Reference Temp	65.3		67.2
Pass/Fail (+/- 2°)	Pass / Fail		Pass / Fail
Temp Change Response	yes / no		yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (°F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1334			138.150									
B1	5		0.97	1.8	141.7	439	NA	76	254	260	65	5.0		
1	10		0.96	1.8	145.2	443		76	260	264	65	5.0		
1	15		0.97	1.8	148.8	440		76	263	263	64	5.0		
1	20		0.95	1.8	152.3	444		76	263	264	64	5.0		
1	25		0.96	1.8	155.9	444		76	263	264	62	5.0		
1	30		0.95	1.8	159.5	444		75	262	264	60	5.0		
1	35		0.95	1.8	163.0	445		76	262	265	60	5.0		
1	40		0.97	1.8	166.5	445		75	263	264	60	5.0		
1	45		0.96	1.8	170.1	445		75	263	263	61	5.0		
1	50		0.93	1.8	173.8	445		76	263	264	61	5.0		
1	55		0.89	1.8	177.4	444		75	264	264	61	5.0		
1	60		0.90	1.8	181.0	443		76	262	264	62	5.0		
1	65	1439	0.88	1.8	184.650	443		75	263	264	62	5.0		
			Avg Sqrt Delta P	Avg Delta H	Total Volume 46.500	Avg Ts 443.4	N/A	Avg Tm 75.6	Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
				Avg Sqrt Del H	Comments:									

WESTON

EPA 26A from 40CFR Part 60 App A

SAMPLE RECOVERY FIELD DATA

EPA Method 26A - HCl & Cl2

Client: LWEC | W.O. #: 14464.007.004
Location/Plant: L'Anse, Michigan | Source & Location: ESP Stack

Run No. 1 | Sample Date 7/6/16 | Recovery Date 7/6/16
Sample I.D. LWEC - 114 - STK - 1 - M26A - | Analyst Jm | Filter Number NA

	Impinger 1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	H2SO4	H2SO4	H2SO4	NaOH	NaOH				Silica Gel	
Final	190	146	110	102	100				314.1	
Initial	50	100	100	100	100				300	
Gain	140	46	10	2	0			198	14.1	

Impinger Color: Clear Colorless | Labeled? ✓
Silica Gel Condition: 1/2 Blue | Sealed? ✓

Run No. 2 | Sample Date 7/6/16 | Recovery Date 7/6/16
Sample I.D. LWEC - 114 - STK - 2 - M26A - | Analyst Jm | Filter Number NA

	Impinger 1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	H2SO4	H2SO4	H2SO4	NaOH	NaOH				Silica Gel	
Final	182	142	96	104	100				312.0	
Initial	50	100	100	100	100				300	
Gain	132	42	-4	4	0			174	12.0	

Impinger Color: Clear Colorless | Labeled? ✓
Silica Gel Condition: 1/2 Blue | Sealed? ✓

Run No. 3 | Sample Date 7/7/16 | Recovery Date 7/7/16
Sample I.D. LWEC - 114 - STK - 3 - M26A - | Analyst Jm | Filter Number NA

	Impinger 1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	H2SO4	H2SO4	H2SO4	NaOH	NaOH				Silica Gel	
Final	160	144	110	104	100				316.4	
Initial	50	100	100	100	100				300	
Gain	110	44	10	4	0			168	16.4	

Impinger Color: Clear colorless | Labeled? ✓
Silica Gel Condition: 1/2 Blue | Sealed? ✓

Check COC for Sample IDs of Media Blanks

WESTON SOLUTIONS

B.6 VOCs

METHODS AND ANALYZERS

Client:	**LWEC**	Project Number:	**14464.007.004.0001**
Location:	**L'Anse, Michigan**	Operator:	**TB**
Source:	**Boiler # 1**	Date:	**6 Jul 2016**

File: C:\DATA\LWEC\2016\7-6-16 test day #1.cem
Program Version: 2.0, built 21 Feb 2015 **File Version:** 2.02
Computer: WSWCAIRSERVICES **Trailer:** 27
Analog Input Device: Keithley KUSB-3108

Channel 1

Analyte	**O_2**
Method	**EPA 3A**, Using Bias
Analyzer Make, Model & Serial No.	**Servomex 4900**
Full-Scale Output, mv	**10000**
Analyzer Range, %	**25.0**
Span Concentration, %	**21.3**

Channel 2

Analyte	**CO_2**
Method	**EPA 3A**, Using Bias
Analyzer Make, Model & Serial No.	**Servomex 4900**
Full-Scale Output, mv	**10000**
Analyzer Range, %	**20.0**
Span Concentration, %	**16.7**

Channel 6

Analyte	**THC**
Method	**EPA 25A**, Not Using Bias
Analyzer Make, Model & Serial No.	**JUM 3-300A**
Full-Scale Output, mv	**10000**
Analyzer Range, ppm	**10.0**
Span Concentration, ppm	**10.0**

WESTON

CALIBRATION DATA
Number 1

Client:	**LWEC**	Project Number:	**14464.007.004.0001**
Location:	**L'Anse, Michigan**	Operator:	**TB**
Source:	**Boiler # 1**	Date:	**6 Jul 2016**

Start Time: 08:07

O_2
Method: EPA 3A
Calibration Type: Linear Zero and High Span

Calibration Standards

%	Cylinder ID
11.9	XC016048B
21.3	SG9168232

Calibration Results

Zero	16 mv
Span, 21.3 %	8121 mv

Curve Coefficients

Slope	Intercept
380.5	16

CO_2
Method: EPA 3A
Calibration Type: Linear Zero and High Span

Calibration Standards

%	Cylinder ID
8.9	XC016048
16.7	SG9168232

Calibration Results

Zero	-1 mv
Span, 16.7 %	8378 mv

Curve Coefficients

Slope	Intercept
500.5	-1

WESTON

CALIBRATION DATA
Number 1

Client:	**LWEC**	Project Number:	**14464.007.004.0001**
Location:	**L'Anse, Michigan**	Operator:	**TB**
Source:	**Boiler # 1**	Date:	**6 Jul 2016**

Start Time: 08:07

THC
Method: EPA 25A
Calibration Type: Linear Zero and High Span

Calibration Standards

ppm	Cylinder ID
2.54	CC261812
5.10	CC37650
8.56	CC344084

Calibration Results

Zero	-17 mv
Span, 8.56 ppm	8582 mv

Curve Coefficients

Slope	Intercept
1005	-17

WESTON

CALIBRATION ERROR DATA
Number 1

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **6 Jul 2016**

Start Time: 08:07

O_2
Method: EPA 3A
Span Conc. 21.3 %
Slope 380.5 **Intercept** 16.0

Standard %	Result %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	Pass
12.0	12.2	0.2	0.9	Pass
21.3	21.3	0.0	0.0	Pass

CO_2
Method: EPA 3A
Span Conc. 16.7 %
Slope 500.5 **Intercept** -1.0

Standard %	Result %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	Pass
8.9	8.7	-0.2	-1.2	Pass
16.7	16.7	0.0	0.0	Pass

THC
Method: EPA 25A
Span Conc. 10.00 ppm
Slope 1005 **Intercept** -17.00

Standard ppm	Result ppm	Difference ppm	Error %	Status
Zero	0.00	0.00	0.0	Pass
2.54	2.57	0.03	1.2	Pass
5.10	5.13	0.03	0.6	Pass
8.56	8.56	0.00	0.0	Pass

WESTON

BIAS
Number 1

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **6 Jul 2016**

Start Time: 08:36

O_2
Method: EPA 3A
Span Conc. 21.3 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	12.2	12.2	0.0	0.0	Pass

CO_2
Method: EPA 3A
Span Conc. 16.7 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.7	8.6	-0.1	-0.6	Pass

WESTON

BIAS AND CALIBRATION DRIFT

Number 2

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **6 Jul 2016**

Start Time: 12:35

O_2
Method: EPA 3A
Span Conc. 21.3 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.1	0.1	0.5	Pass
Span	12.2	12.1	-0.1	-0.5	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.0	0.1	0.1	0.5	Pass
Span	12.2	12.1	-0.1	-0.5	Pass

*Bias No. 1

CO_2
Method: EPA 3A
Span Conc. 16.7 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.1	0.1	0.6	Pass
Span	8.7	8.6	-0.1	-0.6	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.0	0.1	0.1	0.6	Pass
Span	8.6	8.6	0.0	0.0	Pass

*Bias No. 1

BIAS AND CALIBRATION DRIFT
Number 2

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **6 Jul 2016**

Start Time: 12:35

THC
Method: EPA 25A
Span Conc. 10.00 ppm

Calibration Drift

Standard Gas	Initial* ppm	Final ppm	Difference ppm	Drift %	Status
Zero	0.00	0.01	0.01	0.1	Pass
Span	2.57	2.59	0.02	0.2	Pass

*Cal No. 1

WESTON

RUN DATA
Number 1

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **6 Jul 2016**

Time	O_2 %	CO_2 %	THC ppm
13:16	6.6	13.4	0.14
13:17	6.5	13.7	0.04
13:18	7.3	12.7	0.07
13:19	7.1	13.0	0.08
13:20	6.0	14.0	0.05
13:21	6.3	13.7	0.03
13:22	6.7	13.3	0.03
13:23	7.5	12.5	0.05
13:24	7.1	13.0	0.04
13:25	6.5	13.6	0.46
13:26	6.1	14.0	0.04
13:27	6.5	13.5	0.07
13:28	7.1	13.0	0.04
13:29	6.6	13.5	0.04
13:30	6.9	13.2	0.03
13:31	7.1	13.0	0.05
13:32	7.3	12.8	0.07
13:33	6.7	13.3	0.14
13:34	6.5	13.6	0.06
13:35	6.7	13.4	0.06
13:36	6.9	13.3	0.12
13:37	6.6	13.6	0.24
13:38	6.7	13.3	0.07
13:39	6.6	13.4	0.08
13:40	6.9	13.1	0.03
13:41	6.7	13.3	0.01
13:42	6.9	13.2	0.03
13:43	6.8	13.2	0.03
13:44	6.8	13.3	0.03
13:45	6.9	13.2	0.03
13:46	6.5	13.6	0.11
13:47	6.4	13.8	0.06
13:48	6.8	13.3	0.06
13:49	7.8	12.2	0.06
13:50	7.1	12.9	0.08
13:51	6.9	13.2	0.04
13:52	6.3	13.8	0.18
13:53	7.3	12.7	0.07
13:54	6.7	13.3	0.08
13:55	7.0	13.1	0.05
13:56	6.8	13.3	0.10
13:57	7.3	12.8	0.08

WESTON

RUN DATA
Number 1

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **6 Jul 2016**

Time	O_2 %	CO_2 %	THC ppm
13:58	7.0	13.1	0.06
13:59	6.7	13.5	0.14
14:00	6.4	13.7	0.06
14:01	6.8	13.2	0.09
14:02	6.2	13.8	0.05
14:03	6.9	13.1	0.04
14:04	7.3	12.8	0.03
14:05	7.2	12.8	0.02
14:06	6.6	13.4	0.00
14:07	6.6	13.5	0.03
14:08	7.1	13.1	0.04
14:09	6.6	13.3	0.07
14:10	6.3	13.8	0.04
14:11	6.6	13.4	0.07
14:12	7.5	12.4	0.04
14:13	8.0	11.9	0.08
14:14	7.6	12.4	0.05
14:15	6.5	13.4	0.06
Avgs	**6.8**	**13.2**	**0.07**

RUN SUMMARY

Number 1

Client: **LWEC**		Project Number:	**14464.007.004.0001**
Location: **L'Anse, Michigan**		Operator:	**TB**
Source: **Boiler # 1**	Calibration **1**	Date:	**6 Jul 2016**

	O_2	CO_2	THC
Method	EPA 3A	EPA 3A	EPA 25A
Conc. Units	%	%	ppm

Time: 13:15 to 14:15

Run Averages

	6.8	13.2	0.07

Pre-run Bias at 12:35

Zero Bias	0.1	0.1	N/A
Span Bias	12.1	8.6	N/A
Span Gas	11.9	8.9	N/A

Post-run Bias at 15:23

Zero Bias	0.1	0.0	N/A
Span Bias	12.1	8.6	N/A
Span Gas	11.9	8.9	N/A

Averages corrected for the average of the pre-run and post-run bias

	6.7	13.7	0.07*

*No Correction

BIAS AND CALIBRATION DRIFT

Number 3

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **6 Jul 2016**

Start Time: 15:23

O_2
Method: EPA 3A
Span Conc. 21.3 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.1	0.1	0.5	Pass
Span	12.2	12.1	-0.1	-0.5	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.1	0.1	0.0	0.0	Pass
Span	12.1	12.1	0.0	0.0	Pass

*Bias No. 2

CO_2
Method: EPA 3A
Span Conc. 16.7 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.7	8.6	-0.1	-0.6	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.1	0.0	-0.1	-0.6	Pass
Span	8.6	8.6	0.0	0.0	Pass

*Bias No. 2

WESTON

BIAS AND CALIBRATION DRIFT
Number 3

Client:	**LWEC**	Project Number:	**14464.007.004.0001**
Location:	**L'Anse, Michigan**	Operator:	**TB**
Source:	**Boiler # 1**	Date:	**6 Jul 2016**

Calibration **1**

Start Time: 15:23

THC
Method: EPA 25A
Span Conc. 10.00 ppm

Calibration Drift

Standard Gas	Initial* ppm	Final ppm	Difference ppm	Drift %	Status
Zero	0.00	0.01	0.01	0.1	Pass
Span	2.57	2.61	0.04	0.4	Pass

*Cal No. 1

WESTON SOLUTIONS

METHODS AND ANALYZERS

Client:	**LWEC**	Project Number:	**14464.007.004.0001**
Location:	**L'Anse, Michigan**	Operator:	**TB**
Source:	**Boiler # 1**	Date:	**7 Jul 2016**

File: C:\DATA\LWEC\2016\7-7-16 test day 2.cem
Program Version: 2.0, built 21 Feb 2015 **File Version:** 2.02
Computer: WSWCAIRSERVICES **Trailer:** 27
Analog Input Device: Keithley KUSB-3108

Channel 1

Analyte	**O_2**
Method	**EPA 3A**, Using Bias
Analyzer Make, Model & Serial No.	**Servomex 4900**
Full-Scale Output, mv	**10000**
Analyzer Range, %	**25.0**
Span Concentration, %	**21.3**

Channel 2

Analyte	**CO_2**
Method	**EPA 3A**, Using Bias
Analyzer Make, Model & Serial No.	**Servomex 4900**
Full-Scale Output, mv	**10000**
Analyzer Range, %	**20.0**
Span Concentration, %	**16.7**

Channel 6

Analyte	**THC**
Method	**EPA 25A**, Not Using Bias
Analyzer Make, Model & Serial No.	**JUM 3-300A**
Full-Scale Output, mv	**10000**
Analyzer Range, ppm	**10.0**
Span Concentration, ppm	**10.0**

WESTON SOLUTIONS

CALIBRATION DATA

Number 1

Client:	**LWEC**	Project Number:	**14464.007.004.0001**
Location:	**L'Anse, Michigan**	Operator:	**TB**
Source:	**Boiler # 1**	Date:	**7 Jul 2016**

Start Time: 07:58

O_2

Method: EPA 3A

Calibration Type: Linear Zero and High Span

Calibration Standards

%	**Cylinder ID**
11.9	XC016048B
21.3	SG9168232

Calibration Results

Zero	10 mv
Span, 21.3 %	8124 mv

Curve Coefficients

Slope	**Intercept**
380.9	10

CO_2

Method: EPA 3A

Calibration Type: Linear Zero and High Span

Calibration Standards

%	**Cylinder ID**
8.9	XC016048
16.7	SG9168232

Calibration Results

Zero	11 mv
Span, 16.7 %	8369 mv

Curve Coefficients

Slope	**Intercept**
499.3	11

WESTON SOLUTIONS

CALIBRATION DATA

Number 1

Client:	**LWEC**	Project Number:	**14464.007.004.0001**
Location:	**L'Anse, Michigan**	Operator:	**TB**
Source:	**Boiler # 1**	Date:	**7 Jul 2016**

Start Time: 07:58

THC

Method: EPA 25A

Calibration Type: Linear Zero and High Span

Calibration Standards

ppm	Cylinder ID
2.54	CC261812
5.10	CC37650
8.56	CC344084

Calibration Results

Zero	-55 mv
Span, 8.56 ppm	8556 mv

Curve Coefficients

Slope	Intercept
1006	-55

CALIBRATION ERROR DATA

Number 1

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Start Time: 07:58

O_2
Method: EPA 3A
Span Conc. 21.3 %
Slope 380.9 **Intercept** 10.0

Standard %	**Result** %	**Difference** %	**Error** %	**Status**
Zero	0.0	0.0	0.0	Pass
12.0	12.2	0.2	0.9	Pass
21.3	21.3	0.0	0.0	Pass

CO_2
Method: EPA 3A
Span Conc. 16.7 %
Slope 499.3 **Intercept** 11.0

Standard %	**Result** %	**Difference** %	**Error** %	**Status**
Zero	0.0	0.0	0.0	Pass
8.9	8.7	-0.2	-1.2	Pass
16.7	16.7	0.0	0.0	Pass

THC
Method: EPA 25A
Span Conc. 10.00 ppm
Slope 1006 **Intercept** -55.00

Standard ppm	**Result** ppm	**Difference** ppm	**Error** %	**Status**
Zero	0.00	0.00	0.0	Pass
2.54	2.54	0.00	0.0	Pass
5.10	5.11	0.01	0.2	Pass
8.56	8.56	0.00	0.0	Pass

WESTON

BIAS
Number 1

Client:	**LWEC**	Project Number:	**14464.007.004.0001**
Location:	**L'Anse, Michigan**	Operator:	**TB**
Source:	**Boiler # 1**	Date:	**7 Jul 2016**

Calibration **1**

Start Time: 08:08

O_2
Method: EPA 3A
Span Conc. 21.3 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.1	0.1	0.5	Pass
Span	12.2	12.1	-0.1	-0.5	Pass

CO_2
Method: EPA 3A
Span Conc. 16.7 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.7	8.6	-0.1	-0.6	Pass

WESTON SOLUTIONS

RUN DATA

Number 2

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Time	O_2 %	CO_2 %	THC ppm
09:31	7.7	12.3	0.00
09:32	7.5	12.6	0.00
09:33	6.7	13.4	0.00
09:34	7.4	12.7	0.00
09:35	7.7	12.2	0.00
09:36	6.9	13.2	0.30
09:37	7.1	13.0	0.00
09:38	7.5	12.6	0.00
09:39	7.5	12.6	0.00
09:40	7.5	12.7	0.00
09:41	7.0	13.1	0.00
09:42	7.4	12.8	0.00
09:43	7.7	12.4	0.00
09:44	7.4	12.6	0.00
09:45	6.9	13.2	0.00
09:46	6.8	13.3	0.00
09:47	7.0	13.0	0.00
09:48	7.2	13.0	0.00
09:49	7.2	12.9	0.00
09:50	7.7	12.4	0.00
09:51	8.1	11.9	0.00
09:52	8.1	12.1	0.00
09:53	7.2	12.8	0.05
09:54	6.7	13.3	0.00
09:55	8.0	12.0	0.00
09:56	8.9	11.1	0.00
09:57	8.8	11.3	0.00
09:58	7.5	12.5	0.00
09:59	7.1	13.1	0.00
10:00	7.6	12.5	0.00
10:01	7.8	12.3	0.00
10:02	8.3	11.7	0.00
10:03	7.1	12.9	0.00
10:04	6.7	13.4	0.00
10:05	7.6	12.4	0.00
10:06	8.4	11.7	0.00
10:07	7.6	12.5	0.36
10:08	6.5	13.6	0.00
10:09	7.3	12.8	0.00
10:10	7.1	13.1	0.00
10:11	7.3	12.7	0.00
10:12	7.0	13.2	0.00

WESTON

RUN DATA

Number 2

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Time	O_2 %	CO_2 %	THC ppm
10:13	7.7	12.5	0.00
10:14	7.7	12.4	0.00
10:15	6.4	13.6	0.00
10:16	6.9	13.2	0.00
10:17	7.2	12.8	0.00
10:18	6.7	13.4	0.00
10:19	6.4	13.7	0.00
10:20	7.8	12.3	0.00
10:21	7.5	12.5	0.00
10:22	6.8	13.3	0.00
10:23	6.3	13.9	0.15
10:24	7.2	12.8	0.00
10:25	7.5	12.5	0.00
10:26	7.0	13.2	0.00
10:27	6.4	13.7	0.00
10:28	7.1	12.9	0.00
10:29	7.0	13.1	0.00
10:30	6.4	13.6	0.00
Avgs	**7.3**	**12.8**	**0.01**

WESTON SOLUTIONS

RUN SUMMARY

Number 2

Client: **LWEC**		Project Number:	**14464.007.004.0001**
Location: **L'Anse, Michigan**		Operator:	**TB**
Source: **Boiler # 1**	Calibration **1**	Date:	**7 Jul 2016**

	O_2	CO_2	THC
Method	EPA 3A	EPA 3A	EPA 25A
Conc. Units	%	%	ppm

Time: 09:30 to 10:30

Run Averages

	O_2	CO_2	THC
	7.3	12.8	0.01

Pre-run Bias at 08:08

	O_2	CO_2	THC
Zero Bias	0.1	0.0	N/A
Span Bias	12.1	8.6	N/A
Span Gas	11.9	8.9	N/A

Post-run Bias at 10:57

	O_2	CO_2	THC
Zero Bias	0.1	0.0	N/A
Span Bias	12.1	8.6	N/A
Span Gas	11.9	8.9	N/A

Averages corrected for the average of the pre-run and post-run bias

	O_2	CO_2	THC
	7.2	13.2	0.01*

*No Correction

WESTON

BIAS AND CALIBRATION DRIFT

Number 2

Client:	**LWEC**	Project Number:	**14464.007.004.0001**
Location:	**L'Anse, Michigan**	Operator:	**TB**
Source:	**Boiler # 1**	Calibration **1**	Date: **7 Jul 2016**

Start Time: 10:57

O_2
Method: EPA 3A
Span Conc. 21.3 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.1	0.1	0.5	Pass
Span	12.2	12.1	-0.1	-0.5	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.1	0.1	0.0	0.0	Pass
Span	12.1	12.1	0.0	0.0	Pass

*Bias No. 1

CO_2
Method: EPA 3A
Span Conc. 16.7 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.7	8.6	-0.1	-0.6	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.6	8.6	0.0	0.0	Pass

*Bias No. 1

WESTON SOLUTIONS

BIAS AND CALIBRATION DRIFT

Number 2

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Start Time: 10:57

THC
Method: EPA 25A
Span Conc. 10.00 ppm

Calibration Drift

Standard Gas	Initial* ppm	Final ppm	Difference ppm	Drift %	Status
Zero	0.00	0.04	0.04	0.4	Pass
Span	2.54	2.59	0.05	0.5	Pass

*Cal No. 1

BIAS AND CALIBRATION DRIFT

Number 3

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Start Time: 14:53

O_2
Method: EPA 3A
Span Conc. 21.3 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	12.2	12.1	-0.1	-0.5	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.1	0.0	-0.1	-0.5	Pass
Span	12.1	12.1	0.0	0.0	Pass

*Bias No. 2

CO_2
Method: EPA 3A
Span Conc. 16.7 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.7	8.6	-0.1	-0.6	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.6	8.6	0.0	0.0	Pass

*Bias No. 2

BIAS AND CALIBRATION DRIFT

Number 3

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Start Time: 14:53

THC
Method: EPA 25A
Span Conc. 10.00 ppm

Calibration Drift

Standard Gas	Initial* ppm	Final ppm	Difference ppm	Drift %	Status
Zero	0.00	0.03	0.03	0.3	Pass
Span	2.54	2.54	0.00	0.0	Pass

*Cal No. 1

RUN DATA

Number 3

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Time	O_2 %	CO_2 %	THC ppm
15:46	6.6	13.6	0.07
15:47	7.8	12.2	0.09
15:48	8.2	11.9	0.07
15:49	7.1	13.0	0.04
15:50	6.9	13.4	0.01
15:51	7.1	13.0	0.02
15:52	7.9	12.1	0.05
15:53	7.4	12.8	0.08
15:54	7.2	12.9	0.06
15:55	7.0	13.2	0.34
15:56	7.0	13.2	0.09
15:57	7.7	12.4	0.08
15:58	7.6	12.6	0.09
15:59	7.4	12.8	0.11
16:00	7.4	12.8	0.10
16:01	8.2	11.9	0.12
16:02	8.0	12.1	0.12
16:03	7.3	12.8	0.07
16:04	7.7	12.4	0.10
16:05	6.7	13.3	0.15
16:06	7.0	13.1	0.07
16:07	8.2	11.9	0.07
16:08	8.7	11.5	0.09
16:09	8.0	12.2	0.07
16:10	8.0	12.2	0.09
16:11	7.7	12.5	0.10
16:12	7.6	12.6	0.12
16:13	7.8	12.3	0.10
16:14	7.7	12.4	0.08
16:15	8.0	12.1	0.05
16:16	8.6	11.4	0.03
16:17	8.7	11.4	0.06
16:18	8.5	11.7	0.05
16:19	8.0	12.3	0.08
16:20	7.1	13.0	0.05
16:21	7.1	13.1	0.05
16:22	8.0	12.2	0.05
16:23	8.3	11.8	0.06
16:24	8.5	11.6	0.07
16:25	7.7	12.5	0.07
16:26	7.8	12.4	0.08
16:27	7.7	12.7	0.09

WESTON

RUN DATA
Number 3

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Time	O_2 %	CO_2 %	THC ppm
16:28	6.9	13.2	0.27
16:29	7.5	12.7	0.08
16:30	8.2	12.0	0.09
16:31	8.2	12.0	0.09
16:32	8.0	12.2	0.10
16:33	7.3	12.9	0.08
16:34	7.5	12.8	0.08
16:35	8.0	12.1	0.11
16:36	8.3	11.9	0.12
16:37	7.6	12.6	0.20
16:38	7.1	13.2	0.10
16:39	7.5	12.6	0.14
16:40	7.6	12.6	0.13
16:41	8.1	12.0	0.14
16:42	7.3	12.8	0.12
16:43	7.4	12.8	0.12
16:44	7.8	12.4	0.13
16:45	7.7	12.6	0.11
Avgs	**7.7**	**12.5**	**0.09**

WESTON SOLUTIONS

RUN SUMMARY

Number 3

Client:	**LWEC**	Project Number:	**14464.007.004.0001**
Location:	**L'Anse, Michigan**	Operator:	**TB**
Source:	**Boiler # 1**	Calibration **1**	Date: **7 Jul 2016**

	O_2	CO_2	THC
Method	EPA 3A	EPA 3A	EPA 25A
Conc. Units	%	%	ppm

Time: 15:45 to 16:45

Run Averages

	O_2	CO_2	THC
	7.7	12.5	0.09

Pre-run Bias at 14:53

	O_2	CO_2	THC
Zero Bias	0.0	0.0	N/A
Span Bias	12.1	8.6	N/A
Span Gas	11.9	8.9	N/A

Post-run Bias at 17:08

	O_2	CO_2	THC
Zero Bias	0.1	0.0	N/A
Span Bias	12.1	8.6	N/A
Span Gas	11.9	8.9	N/A

Averages corrected for the average of the pre-run and post-run bias

	O_2	CO_2	THC
	7.6	12.9	0.09*

*No Correction

WESTON SOLUTIONS

BIAS AND CALIBRATION DRIFT

Number 4

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Start Time: 17:08

O_2
Method: EPA 3A
Span Conc. 21.3 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.1	0.1	0.5	Pass
Span	12.2	12.1	-0.1	-0.5	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.0	0.1	0.1	0.5	Pass
Span	12.1	12.1	0.0	0.0	Pass

*Bias No. 3

CO_2
Method: EPA 3A
Span Conc. 16.7 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.7	8.6	-0.1	-0.6	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.6	8.6	0.0	0.0	Pass

*Bias No. 3

WESTON SOLUTIONS

BIAS AND CALIBRATION DRIFT

Number 4

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Start Time: 17:08

THC
Method: EPA 25A
Span Conc. 10.00 ppm

Calibration Drift

Standard Gas	Initial* ppm	Final ppm	Difference ppm	Drift %	Status
Zero	0.00	0.00	0.00	0.0	Pass
Span	2.54	2.55	0.01	0.1	Pass

*Cal No. 1

BIAS AND CALIBRATION DRIFT

Number 5

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Start Time: 19:30

O_2
Method: EPA 3A
Span Conc. 21.3 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	12.2	12.1	-0.1	-0.5	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.1	0.0	-0.1	-0.5	Pass
Span	12.1	12.1	0.0	0.0	Pass

*Bias No. 4

CO_2
Method: EPA 3A
Span Conc. 16.7 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.7	8.6	-0.1	-0.6	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.6	8.6	0.0	0.0	Pass

*Bias No. 4

WESTON SOLUTIONS

BIAS AND CALIBRATION DRIFT

Number 5

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Start Time: 19:30

THC
Method: EPA 25A
Span Conc. 10.00 ppm

Calibration Drift

Standard Gas	Initial* ppm	Final ppm	Difference ppm	Drift %	Status
Zero	0.00	0.04	0.04	0.4	Pass
Span	2.54	2.56	0.02	0.2	Pass

*Cal No. 1

B.7 O_2/CO_2

METHODS AND ANALYZERS

Client:	**LWEC**	Project Number:	**14464.007.004.0001**
Location:	**L'Anse, Michigan**	Operator:	**TB**
Source:	**Boiler # 1**	Date:	**6 Jul 2016**

File: C:\DATA\LWEC\2016\7-6-16 test day #1.cem
Program Version: 2.0, built 4 Dec 2014 **File Version:** 2.02
Computer: WSWCAIRSERVICES **Trailer:** 27
Analog Input Device: Keithley KUSB-3108

Channel 1

Analyte	O_2
Method	**EPA 3A**, Using Bias
Analyzer Make, Model & Serial No.	**Servomex 4900**
Full-Scale Output, mv	**10000**
Analyzer Range, %	**25.0**
Span Concentration, %	**21.3**

Channel 2

Analyte	CO_2
Method	**EPA 3A**, Using Bias
Analyzer Make, Model & Serial No.	**Servomex 4900**
Full-Scale Output, mv	**10000**
Analyzer Range, %	**20.0**
Span Concentration, %	**16.7**

WESTON

CALIBRATION DATA
Number 1

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **6 Jul 2016**

Start Time: 08:07

O_2
Method: EPA 3A
Calibration Type: Linear Zero and High Span

Calibration Standards

%	Cylinder ID
11.9	XC016048B
21.3	SG9168232

Calibration Results

Zero	16 mv
Span, 21.3 %	8121 mv

Curve Coefficients

Slope	Intercept
380.5	16

CO_2
Method: EPA 3A
Calibration Type: Linear Zero and High Span

Calibration Standards

%	Cylinder ID
8.9	XC016048
16.7	SG9168232

Calibration Results

Zero	-1 mv
Span, 16.7 %	8378 mv

Curve Coefficients

Slope	Intercept
500.5	-1

WESTON

CALIBRATION ERROR DATA

Number 1

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **6 Jul 2016**

Start Time: 08:07

O_2

Method: EPA 3A

Span Conc. 21.3 %

Slope 380.5 **Intercept** 16.0

Standard %	Result %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	Pass
12.0	12.2	0.2	0.9	Pass
21.3	21.3	0.0	0.0	Pass

CO_2

Method: EPA 3A

Span Conc. 16.7 %

Slope 500.5 **Intercept** -1.0

Standard %	Result %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	Pass
8.9	8.7	-0.2	-1.2	Pass
16.7	16.7	0.0	0.0	Pass

WESTON

BIAS
Number 1

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **6 Jul 2016**

Start Time: 08:36

O_2
Method: EPA 3A
Span Conc. 21.3 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	12.2	12.2	0.0	0.0	Pass

CO_2
Method: EPA 3A
Span Conc. 16.7 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.7	8.6	-0.1	-0.6	Pass

WESTON SOLUTIONS

RUN DATA

Number 1

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **6 Jul 2016**

Time	O_2 %	CO_2 %
09:15	7.0	12.9
09:16	6.8	13.3
09:17	6.0	13.9
09:18	7.2	12.8
09:19	8.1	11.8
09:20	7.2	12.7
09:21	6.4	13.6
09:22	7.2	12.8
09:23	6.1	13.8
09:24	6.9	13.1
09:25	9.9	10.1
09:26	8.1	11.8
09:27	6.7	13.3
09:28	7.2	12.8
09:29	6.8	13.3
09:30	6.9	13.1
09:31	7.0	13.0
09:32	6.6	13.5
09:33	6.9	13.1
09:34	6.9	13.1
09:35	6.9	13.1
09:36	6.7	13.2
09:37	7.1	13.0
09:38	7.2	12.8
09:39	6.9	13.2
09:40	6.6	13.5
09:41	6.3	13.8
09:42	6.3	13.8
09:43	6.8	13.2
09:44	7.0	13.0
09:45	6.5	13.6
09:46	6.7	13.4
09:47	6.9	13.1
09:48	6.6	13.4
09:49	6.4	13.7
09:50	6.3	13.8
09:51	6.9	13.1
09:52	6.6	13.4
09:53	6.3	13.8
09:54	6.8	13.2
09:55	6.9	13.2
09:56	6.9	13.1

WESTON SOLUTIONS

RUN DATA
Number 1

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **6 Jul 2016**

Time	O_2 %	CO_2 %
09:57	6.2	13.8
09:58	6.1	14.0
09:59	6.4	13.7
10:00	6.6	13.5
10:01	7.0	13.1
10:02	7.0	13.0
10:03	6.5	13.5
10:04	5.6	14.3
10:05	6.5	13.5
10:06	7.4	12.6
10:07	7.5	12.4
10:08	6.5	13.5
10:09	7.1	12.9
10:10	7.2	12.8
10:11	7.8	12.1
10:12	7.6	12.3
10:13	7.1	12.9
10:14	5.6	14.3
10:15	6.2	13.7
10:16	7.3	12.7
10:17	7.5	12.4
10:18	7.3	12.8
10:19	8.0	12.1
10:20	7.6	12.3
10:21	5.7	14.2
10:22	7.2	12.8
10:23	7.5	12.4
10:24	8.1	11.9
10:25	7.9	12.0
10:26	6.7	13.2
10:27	5.8	14.2
10:28	7.0	13.0
10:29	6.9	13.0
10:30	6.5	13.5
10:31	7.0	12.9
10:32	7.1	13.0
10:33	7.1	12.9
10:34	7.0	13.2
10:35	7.5	12.5
10:36	7.5	12.6
10:37	6.9	13.1
10:38	6.0	14.0

WESTON

RUN DATA
Number 1

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **6 Jul 2016**

Time	O_2 %	CO_2 %
10:39	5.3	14.6
10:40	6.5	13.5
10:41	8.1	11.9
10:42	8.0	12.0
10:43	6.7	13.3
10:44	5.9	14.1
10:45	6.4	13.6
10:46	6.4	13.7
10:47	7.3	12.7
10:48	7.2	13.0
10:49	6.4	13.7
10:50	6.3	13.9
10:51	6.7	13.3
10:52	6.8	13.2
10:53	7.2	12.8
10:54	7.1	13.1
10:55	6.6	13.5
10:56	6.9	13.2
10:57	6.2	13.8
10:58	6.6	13.4
10:59	7.2	12.7
11:00	7.2	12.8
11:01	6.6	13.4
11:02	6.3	13.7
11:03	7.2	12.7
11:04	7.4	12.6
11:05	7.4	12.6
11:06	7.0	13.0
11:07	6.8	13.2
11:08	7.4	12.7
11:09	7.2	12.9
11:10	6.7	13.4
11:11	6.0	13.9
11:12	6.9	13.0
11:13	8.0	12.0
11:14	7.6	12.5
11:15	7.6	12.5
11:16	6.8	13.2
11:17	6.6	13.4
11:18	7.1	12.9
11:19	7.7	12.3
11:20	7.1	13.0

WESTON

RUN DATA
Number 1

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **6 Jul 2016**

Time	O_2 %	CO_2 %
11:21	7.3	12.8
11:22	7.0	13.2
11:23	7.2	12.9
11:24	6.7	13.4
11:25	6.6	13.4
11:26	6.6	13.5
11:27	7.0	13.1
11:28	6.6	13.5
11:29	7.1	13.0
11:30	7.7	12.3
11:31	7.5	12.5
11:32	6.1	13.8
11:33	6.2	13.9
11:34	7.5	12.5
11:35	7.8	12.3
11:36	7.8	12.2
11:37	6.5	13.4
11:38	5.4	14.5
11:39	5.2	14.8
11:40	7.1	12.9
11:41	8.0	12.1
11:42	7.8	12.3
11:43	7.0	13.0
11:44	6.7	13.5
11:45	6.8	13.3
11:46	6.5	13.6
11:47	5.9	14.1
11:48	7.3	12.7
11:49	7.1	13.0
11:50	6.4	13.7
11:51	6.2	13.9
11:52	7.0	13.1
11:53	6.6	13.5
11:54	6.2	14.0
11:55	6.6	13.5
11:56	6.9	13.1
11:57	7.0	13.0
11:58	7.0	13.1
11:59	6.5	13.6
12:00	7.0	13.1
12:01	6.5	13.6
12:02	6.6	13.4

WESTON

RUN DATA
Number 1

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **6 Jul 2016**

Time	O_2 %	CO_2 %
12:03	7.1	12.9
12:04	7.2	12.9
12:05	6.4	13.6
12:06	6.9	13.2
12:07	6.7	13.4
12:08	7.2	12.8
12:09	7.0	13.1
12:10	7.0	13.1
12:11	7.3	12.7
12:12	6.9	13.2
12:13	7.4	12.7
12:14	8.1	11.9
12:15	8.0	12.1
12:16	7.2	12.9
12:17	7.9	12.2
12:18	9.5	10.6
12:19	10.2	9.9
12:20	8.9	11.1
12:21	8.8	11.3
12:22	9.3	10.7
12:23	8.5	11.4
12:24	7.1	12.9
12:25	7.4	12.7
12:26	7.9	12.2
12:27	8.2	11.8
12:28	7.9	12.3
12:29	8.7	11.4
12:30	9.0	11.1
12:31	8.8	11.3
Avgs	**7.0**	**13.0**

WESTON SOLUTIONS

RUN SUMMARY

Number 1

Client: **LWEC**		Project Number:	**14464.007.004.0001**
Location: **L'Anse, Michigan**		Operator:	**TB**
Source: **Boiler # 1**	Calibration **1**	Date:	**6 Jul 2016**

	O_2	CO_2
Method	EPA 3A	EPA 3A
Conc. Units	%	%

Time: 09:14 to 12:31

Run Averages

	7.0	13.0

Pre-run Bias at 08:36

Zero Bias	0.0	0.0
Span Bias	12.2	8.6
Span Gas	11.9	8.9

Post-run Bias at 12:35

Zero Bias	0.1	0.1
Span Bias	12.1	8.6
Span Gas	11.9	8.9

Averages corrected for the average of the pre-run and post-run bias

	6.9	13.4

*No Correction

WESTON

RUN SUMMARY

Number 1

Client: **LWEC**		Project Number:	**14464.007.004.0001**
Location: **L'Anse, Michigan**		Operator:	**TB**
Source: **Boiler # 1**	Calibration **1**	Date:	**6 Jul 2016**

	O_2	CO_2
Method	EPA 3A	EPA 3A
Conc. Units	%	%

Time: 09:35 to 10:40

Run Averages

	6.8	13.2

Pre-run Bias at 08:36

Zero Bias	0.0	0.0
Span Bias	12.2	8.6
Span Gas	11.9	8.9

Post-run Bias at 12:35

Zero Bias	0.1	0.1
Span Bias	12.1	8.6
Span Gas	11.9	8.9

Averages corrected for the average of the pre-run and post-run bias

	6.7	13.6

*No Correction

WESTON

BIAS AND CALIBRATION DRIFT

Number 2

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **6 Jul 2016**

Start Time: 12:35

O_2
Method: EPA 3A
Span Conc. 21.3 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.1	0.1	0.5	Pass
Span	12.2	12.1	-0.1	-0.5	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.0	0.1	0.1	0.5	Pass
Span	12.2	12.1	-0.1	-0.5	Pass

*Bias No. 1

CO_2
Method: EPA 3A
Span Conc. 16.7 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.1	0.1	0.6	Pass
Span	8.7	8.6	-0.1	-0.6	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.0	0.1	0.1	0.6	Pass
Span	8.6	8.6	0.0	0.0	Pass

*Bias No. 1

WESTON

RUN DATA
Number 2

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **6 Jul 2016**

Time	O_2 %	CO_2 %
13:15	6.6	13.4
13:16	6.6	13.4
13:17	6.5	13.7
13:18	7.3	12.7
13:19	7.1	13.0
13:20	6.0	14.0
13:21	6.3	13.7
13:22	6.7	13.3
13:23	7.5	12.5
13:24	7.1	13.0
13:25	6.5	13.6
13:26	6.1	14.0
13:27	6.5	13.5
13:28	7.1	13.0
13:29	6.6	13.5
13:30	6.9	13.2
13:31	7.1	13.0
13:32	7.3	12.8
13:33	6.7	13.3
13:34	6.5	13.6
13:35	6.7	13.4
13:36	6.9	13.3
13:37	6.6	13.6
13:38	6.7	13.3
13:39	6.6	13.4
13:40	6.9	13.1
13:41	6.7	13.3
13:42	6.9	13.2
13:43	6.8	13.2
13:44	6.8	13.3
13:45	6.9	13.2
13:46	6.5	13.6
13:47	6.4	13.8
13:48	6.8	13.3
13:49	7.8	12.2
13:50	7.1	12.9
13:51	6.9	13.2
13:52	6.3	13.8
13:53	7.3	12.7
13:54	6.7	13.3
13:55	7.0	13.1
13:56	6.8	13.3

WESTON SOLUTIONS

RUN DATA
Number 2

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **6 Jul 2016**

Time	O_2 %	CO_2 %
13:57	7.3	12.8
13:58	7.0	13.1
13:59	6.7	13.5
14:00	6.4	13.7
14:01	6.8	13.2
14:02	6.2	13.8
14:03	6.9	13.1
14:04	7.3	12.8
14:05	7.2	12.8
14:06	6.6	13.4
14:07	6.6	13.5
14:08	7.1	13.1
14:09	6.6	13.3
14:10	6.3	13.8
14:11	6.6	13.4
14:12	7.5	12.4
14:13	8.0	11.9
14:14	7.6	12.4
14:15	6.5	13.4
14:16	6.9	13.1
14:17	7.2	12.9
14:18	7.3	12.8
14:19	6.9	13.2
14:20	7.1	13.0
14:21	7.4	12.7
14:22	7.4	12.7
14:23	5.6	14.4
14:24	5.6	14.4
14:25	8.0	12.0
14:26	7.8	12.2
14:27	6.7	13.3
14:28	5.9	14.0
14:29	6.2	13.8
14:30	6.8	13.1
14:31	7.0	13.1
14:32	6.5	13.6
14:33	6.7	13.3
14:34	6.6	13.6
14:35	6.4	13.6
14:36	5.8	14.4
14:37	6.5	13.6
14:38	7.1	13.0

WESTON

RUN DATA
Number 2

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **6 Jul 2016**

Time	O_2 %	CO_2 %
14:39	6.9	13.3
14:40	6.3	13.8
14:41	6.7	13.3
14:42	6.4	13.8
14:43	6.3	13.8
14:44	6.2	13.9
14:45	6.6	13.5
14:46	6.6	13.5
14:47	6.5	13.5
14:48	5.4	14.5
14:49	6.9	13.1
14:50	7.8	12.3
14:51	7.0	12.9
14:52	5.4	14.6
14:53	5.8	14.3
14:54	6.4	13.6
14:55	6.7	13.5
14:56	6.9	13.2
14:57	6.2	13.7
14:58	6.6	13.5
14:59	6.0	14.1
15:00	6.4	13.7
15:01	6.5	13.6
15:02	6.8	13.2
15:03	6.1	14.1
15:04	6.7	13.2
15:05	7.1	13.0
15:06	7.5	12.5
15:07	6.5	13.5
15:08	5.1	14.8
15:09	6.2	13.8
15:10	7.8	12.2
15:11	7.4	12.6
15:12	5.8	14.2
15:13	6.1	14.0
15:14	6.4	13.6
15:15	6.4	13.6
15:16	6.7	13.3
15:17	7.4	12.7
15:18	6.1	13.9
15:19	6.2	13.8
15:20	6.7	13.4

WESTON

RUN DATA
Number 2

Client:	**LWEC**
Location:	**L'Anse, Michigan**
Source:	**Boiler # 1**

Calibration **1**

Project Number:	**14464.007.004.0001**
Operator:	**TB**
Date:	**6 Jul 2016**

Time	O_2 %	CO_2 %
15:21	7.2	12.8
Avgs	**6.7**	**13.3**

WESTON SOLUTIONS

RUN SUMMARY
Number 2

Client:	**LWEC**	Project Number:	**14464.007.004.0001**
Location:	**L'Anse, Michigan**	Operator:	**TB**
Source:	**Boiler # 1**	Calibration **1** / Date:	**6 Jul 2016**

	O_2	CO_2
Method	EPA 3A	EPA 3A
Conc. Units	%	%

Time: 13:14 to 15:21

Run Averages

	O_2	CO_2
	6.7	13.3

Pre-run Bias at 12:35

	O_2	CO_2
Zero Bias	0.1	0.1
Span Bias	12.1	8.6
Span Gas	11.9	8.9

Post-run Bias at 15:23

	O_2	CO_2
Zero Bias	0.1	0.0
Span Bias	12.1	8.6
Span Gas	11.9	8.9

Averages corrected for the average of the pre-run and post-run bias

	O_2	CO_2
	6.6	13.8

*No Correction

WESTON SOLUTIONS

BIAS AND CALIBRATION DRIFT

Number 3

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **6 Jul 2016**

Start Time: 15:23

O_2
Method: EPA 3A
Span Conc. 21.3 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.1	0.1	0.5	Pass
Span	12.2	12.1	-0.1	-0.5	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.1	0.1	0.0	0.0	Pass
Span	12.1	12.1	0.0	0.0	Pass

*Bias No. 2

CO_2
Method: EPA 3A
Span Conc. 16.7 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.7	8.6	-0.1	-0.6	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.1	0.0	-0.1	-0.6	Pass
Span	8.6	8.6	0.0	0.0	Pass

*Bias No. 2

WESTON

RUN DATA
Number 3

Client:	**LWEC**	Project Number:	**14464.007.004.0001**
Location:	**L'Anse, Michigan**	Operator:	**TB**
Source:	**Boiler # 1**	Date:	**6 Jul 2016**

Calibration **1**

Time	O_2 %	CO_2 %
15:53	6.6	13.4
15:54	7.4	12.6
15:55	8.4	11.5
15:56	7.8	12.2
15:57	6.4	13.5
15:58	6.7	13.3
15:59	6.3	13.5
16:00	6.0	13.9
16:01	8.8	11.2
16:02	8.8	11.2
16:03	7.9	12.1
16:04	6.6	13.3
16:05	6.8	13.1
16:06	6.3	13.7
16:07	7.8	12.1
16:08	7.5	12.5
16:09	7.7	12.3
16:10	7.4	12.6
16:11	7.2	12.8
16:12	8.8	11.2
16:13	5.5	14.4
16:14	6.6	13.3
16:15	8.1	11.8
16:16	6.5	13.4
16:17	6.6	13.4
16:18	7.8	12.2
16:19	7.5	12.5
16:20	7.2	12.8
16:21	7.2	12.7
16:22	7.9	12.0
16:23	8.2	11.9
16:24	8.2	11.9
16:25	7.9	12.1
16:26	7.5	12.4
16:27	6.7	13.3
16:28	7.7	12.2
16:29	8.0	12.0
16:30	8.1	12.0
16:31	9.5	10.7
16:32	7.2	12.7
16:33	5.7	14.2
16:34	5.0	14.9

WESTON

RUN DATA

Number 3

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **6 Jul 2016**

Time	O_2 %	CO_2 %
16:35	8.0	12.0
16:36	10.5	9.6
16:37	7.8	12.2
16:38	6.5	13.5
16:39	7.3	12.8
16:40	8.0	12.0
16:41	8.8	11.2
16:42	7.4	12.6
16:43	6.8	13.2
16:44	6.5	13.5
16:45	7.8	12.1
16:46	8.1	11.9
16:47	7.2	12.6
16:48	7.0	13.1
16:49	7.9	12.1
16:50	8.0	12.0
16:51	7.1	12.8
16:52	7.4	12.6
16:53	7.6	12.6
16:54	7.1	13.0
16:55	7.5	12.6
16:56	7.5	12.5
16:57	5.4	14.5
16:58	6.9	13.1
16:59	8.9	11.1
17:00	8.6	11.4
17:01	7.0	12.9
17:02	6.9	13.2
17:03	7.7	12.3
17:04	8.5	11.6
17:05	8.2	11.9
17:06	7.1	12.9
17:07	6.6	13.5
17:08	8.0	12.1
17:09	8.8	11.3
17:10	6.9	13.1
17:11	5.6	14.4
17:12	6.5	13.6
17:13	8.0	12.0
17:14	8.3	11.7
17:15	8.1	12.1
17:16	7.1	12.9

RUN DATA
Number 3

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **6 Jul 2016**

Time	O_2 %	CO_2 %
17:17	6.8	13.3
17:18	6.8	13.4
17:19	7.6	12.5
17:20	7.1	13.1
17:21	6.7	13.5
17:22	6.3	13.8
17:23	7.3	12.7
17:24	8.0	12.1
17:25	7.5	12.5
17:26	6.7	13.4
17:27	6.4	13.7
17:28	6.0	14.1
17:29	7.7	12.3
17:30	7.8	12.3
17:31	7.7	12.2
17:32	6.1	13.9
17:33	6.3	13.8
17:34	7.3	12.8
17:35	6.9	13.1
17:36	6.5	13.6
17:37	6.6	13.4
17:38	7.1	13.0
17:39	7.3	12.7
17:40	7.3	12.9
17:41	6.4	13.6
17:42	6.3	13.8
17:43	6.1	13.9
17:44	7.0	13.1
17:45	6.7	13.3
17:46	7.1	13.0
17:47	7.1	13.0
17:48	7.3	12.8
17:49	6.0	14.0
17:50	6.7	13.4
17:51	7.2	12.8
17:52	7.3	12.8
17:53	6.5	13.6
17:54	6.1	14.0
17:55	5.8	14.3
17:56	6.4	13.6
17:57	8.0	12.0
17:58	7.9	12.0

WESTON SOLUTIONS

RUN DATA

Number 3

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **6 Jul 2016**

Time	O_2 %	CO_2 %
17:59	6.8	13.2
18:00	6.7	13.4
18:01	6.7	13.3
18:02	6.6	13.4
18:03	6.8	13.3
18:04	7.2	12.9
18:05	7.3	12.8
18:06	6.8	13.2
18:07	7.0	13.1
18:08	7.3	12.7
18:09	7.5	12.5
18:10	6.9	13.1
18:11	6.8	13.3
18:12	6.8	13.3
18:13	6.8	13.3
18:14	7.0	13.0
18:15	7.1	13.0
18:16	6.9	13.2
18:17	6.8	13.2
18:18	7.2	12.8
18:19	7.4	12.7
18:20	7.2	13.0
18:21	7.3	12.7
18:22	7.6	12.5
18:23	7.0	13.0
18:24	6.2	13.9
18:25	6.0	13.9
18:26	8.2	11.7
18:27	7.9	12.0
18:28	7.6	12.4
18:29	6.4	13.5
18:30	6.8	13.2
18:31	7.4	12.6
18:32	7.8	12.2
18:33	6.9	13.2
18:34	7.5	12.5
18:35	7.0	13.1
18:36	6.8	13.2
18:37	7.3	12.8
18:38	7.8	12.2
18:39	7.1	12.9
18:40	6.9	13.2

WESTON

RUN DATA
Number 3

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **6 Jul 2016**

Time	O_2 %	CO_2 %
18:41	7.0	13.1
18:42	7.5	12.6
18:43	7.6	12.6
18:44	7.1	12.9
18:45	6.8	13.3
18:46	7.3	12.8
18:47	8.2	11.8
18:48	7.6	12.4
18:49	7.5	12.6
18:50	7.4	12.7
18:51	7.6	12.4
18:52	7.8	12.3
18:53	8.0	12.1
18:54	7.1	13.0
18:55	7.4	12.6
18:56	7.1	13.0
18:57	6.9	13.1
18:58	6.1	13.8
18:59	6.9	13.0
19:00	7.6	12.4
19:01	7.4	12.7
19:02	6.9	13.1
19:03	7.3	12.7
19:04	7.4	12.7
19:05	6.5	13.5
19:06	6.7	13.4
19:07	6.8	13.2
Avgs	**7.2**	**12.8**

WESTON

RUN SUMMARY
Number 3

Client:	**LWEC**	Project Number:	**14464.007.004.0001**
Location:	**L'Anse, Michigan**	Operator:	**TB**
Source:	**Boiler # 1** Calibration **1**	Date:	**6 Jul 2016**

	O_2	CO_2
Method	EPA 3A	EPA 3A
Conc. Units	%	%

Time: 15:52 to 19:07

Run Averages

	O_2	CO_2
	7.2	12.8

Pre-run Bias at 15:23

	O_2	CO_2
Zero Bias	0.1	0.0
Span Bias	12.1	8.6
Span Gas	11.9	8.9

Post-run Bias at 19:09

	O_2	CO_2
Zero Bias	0.0	0.0
Span Bias	12.1	8.6
Span Gas	11.9	8.9

Averages corrected for the average of the pre-run and post-run bias

	O_2	CO_2
	7.1	13.2

*No Correction

WESTON

RUN SUMMARY

Number 3

Client:	**LWEC**	Project Number:	**14464.007.004.0001**
Location:	**L'Anse, Michigan**	Operator:	**TB**
Source:	**Boiler # 1** Calibration **1**	Date:	**6 Jul 2016**

	O_2	CO_2
Method	EPA 3A	EPA 3A
Conc. Units	%	%

Time: 16:21 to 17:26

Run Averages

	O_2	CO_2
	7.5	12.6

Pre-run Bias at 15:23

	O_2	CO_2
Zero Bias	0.1	0.0
Span Bias	12.1	8.6
Span Gas	11.9	8.9

Post-run Bias at 19:09

	O_2	CO_2
Zero Bias	0.0	0.0
Span Bias	12.1	8.6
Span Gas	11.9	8.9

Averages corrected for the average of the pre-run and post-run bias

	O_2	CO_2
	7.4	13.0

*No Correction

WESTON SOLUTIONS

BIAS AND CALIBRATION DRIFT

Number 4

Client:	**LWEC**	Project Number:	**14464.007.004.0001**
Location:	**L'Anse, Michigan**	Operator:	**TB**
Source:	**Boiler # 1**	Date:	**6 Jul 2016**

Calibration **1**

Start Time: 19:09

O_2
Method: EPA 3A
Span Conc. 21.3 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	12.2	12.1	-0.1	-0.5	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.1	0.0	-0.1	-0.5	Pass
Span	12.1	12.1	0.0	0.0	Pass

*Bias No. 3

CO_2
Method: EPA 3A
Span Conc. 16.7 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.7	8.6	-0.1	-0.6	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.6	8.6	0.0	0.0	Pass

*Bias No. 3

WESTON SOLUTIONS

METHODS AND ANALYZERS

Client:	**LWEC**	Project Number:	**14464.007.004.0001**
Location:	**L'Anse, Michigan**	Operator:	**TB**
Source:	**Boiler # 1**	Date:	**7 Jul 2016**

File: C:\DATA\LWEC\2016\7-7-16 test day 2.cem
Program Version: 2.0, built 4 Dec 2014 **File Version:** 2.02
Computer: WSWCAIRSERVICES **Trailer:** 27
Analog Input Device: Keithley KUSB-3108

Channel 1

Analyte	O_2
Method	**EPA 3A**, Using Bias
Analyzer Make, Model & Serial No.	**Servomex 4900**
Full-Scale Output, mv	**10000**
Analyzer Range, %	**25.0**
Span Concentration, %	**21.3**

Channel 2

Analyte	CO_2
Method	**EPA 3A**, Using Bias
Analyzer Make, Model & Serial No.	**Servomex 4900**
Full-Scale Output, mv	**10000**
Analyzer Range, %	**20.0**
Span Concentration, %	**16.7**

CALIBRATION DATA
Number 1

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Start Time: 07:58

O_2
Method: EPA 3A
Calibration Type: Linear Zero and High Span

Calibration Standards

%	Cylinder ID
11.9	XC016048B
21.3	SG9168232

Calibration Results

Zero	10 mv
Span, 21.3 %	8124 mv

Curve Coefficients

Slope	Intercept
380.9	10

CO_2
Method: EPA 3A
Calibration Type: Linear Zero and High Span

Calibration Standards

%	Cylinder ID
8.9	XC016048
16.7	SG9168232

Calibration Results

Zero	11 mv
Span, 16.7 %	8369 mv

Curve Coefficients

Slope	Intercept
499.3	11

WESTON SOLUTIONS

CALIBRATION ERROR DATA

Number 1

Client:	**LWEC**	Project Number:	**14464.007.004.0001**
Location:	**L'Anse, Michigan**	Operator:	**TB**
Source:	**Boiler # 1**	Date:	**7 Jul 2016**

Calibration **1**

Start Time: 07:58

O_2
Method: EPA 3A
Span Conc. 21.3 %
Slope 380.9 **Intercept** 10.0

Standard %	Result %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	Pass
12.0	12.2	0.2	0.9	Pass
21.3	21.3	0.0	0.0	Pass

CO_2
Method: EPA 3A
Span Conc. 16.7 %
Slope 499.3 **Intercept** 11.0

Standard %	Result %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	Pass
8.9	8.7	-0.2	-1.2	Pass
16.7	16.7	0.0	0.0	Pass

BIAS

Number 1

Client:	**LWEC**		Project Number:	**14464.007.004.0001**
Location:	**L'Anse, Michigan**		Operator:	**TB**
Source:	**Boiler # 1**	Calibration **1**	Date:	**7 Jul 2016**

Start Time: 08:08

O_2

Method: EPA 3A

Span Conc. 21.3 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.1	0.1	0.5	Pass
Span	12.2	12.1	-0.1	-0.5	Pass

CO_2

Method: EPA 3A

Span Conc. 16.7 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.7	8.6	-0.1	-0.6	Pass

RUN DATA

Number 1

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Time	O_2 %	CO_2 %
08:41	7.8	12.3
08:42	7.8	12.4
08:43	7.7	12.4
08:44	7.7	12.4
08:45	6.7	13.3
08:46	6.6	13.5
08:47	7.2	12.8
08:48	7.3	12.7
08:49	7.3	12.8
08:50	7.1	13.1
08:51	6.9	13.3
08:52	7.4	12.7
08:53	7.4	12.7
08:54	7.0	13.1
08:55	6.9	13.3
08:56	7.7	12.4
08:57	7.5	12.5
08:58	7.1	13.1
08:59	5.7	14.2
09:00	6.2	13.9
09:01	7.8	12.2
09:02	8.5	11.6
09:03	7.2	12.8
09:04	6.4	13.8
09:05	6.5	13.6
09:06	7.2	12.9
09:07	7.8	12.2
09:08	7.7	12.4
09:09	7.1	12.9
09:10	7.0	13.1
09:11	6.5	13.6
09:12	6.5	13.7
09:13	7.1	13.0
09:14	7.7	12.3
09:15	8.2	12.0
09:16	7.7	12.3
09:17	7.2	12.8
09:18	7.6	12.5
09:19	8.1	12.0
09:20	7.6	12.5
09:21	7.2	12.9
09:22	7.9	12.1

WESTON SOLUTIONS

RUN DATA

Number 1

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Time	O_2 %	CO_2 %
09:23	7.3	12.8
09:24	7.2	13.0
09:25	7.1	13.0
09:26	8.0	12.0
09:27	8.5	11.6
09:28	7.7	12.2
09:29	6.8	13.3
09:30	6.9	13.2
09:31	7.7	12.3
09:32	7.5	12.6
09:33	6.7	13.4
09:34	7.4	12.7
09:35	7.7	12.2
09:36	6.9	13.2
09:37	7.1	13.0
09:38	7.5	12.6
09:39	7.5	12.6
09:40	7.5	12.7
09:41	7.0	13.1
09:42	7.4	12.8
09:43	7.7	12.4
09:44	7.4	12.6
09:45	6.9	13.2
09:46	6.8	13.3
09:47	7.0	13.0
09:48	7.2	13.0
09:49	7.2	12.9
09:50	7.7	12.4
09:51	8.1	11.9
09:52	8.1	12.1
09:53	7.2	12.8
09:54	6.7	13.3
09:55	8.0	12.0
09:56	8.9	11.1
09:57	8.8	11.3
09:58	7.5	12.5
09:59	7.1	13.1
10:00	7.6	12.5
10:01	7.8	12.3
10:02	8.3	11.7
10:03	7.1	12.9
10:04	6.7	13.4

WESTON SOLUTIONS

RUN DATA

Number 1

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Time	O_2 %	CO_2 %
10:05	7.6	12.4
10:06	8.4	11.7
10:07	7.6	12.5
10:08	6.5	13.6
10:09	7.3	12.8
10:10	7.1	13.1
10:11	7.3	12.7
10:12	7.0	13.2
10:13	7.7	12.5
10:14	7.7	12.4
10:15	6.4	13.6
10:16	6.9	13.2
10:17	7.2	12.8
10:18	6.7	13.4
10:19	6.4	13.7
10:20	7.8	12.3
10:21	7.5	12.5
10:22	6.8	13.3
10:23	6.3	13.9
10:24	7.2	12.8
10:25	7.5	12.5
10:26	7.0	13.2
10:27	6.4	13.7
10:28	7.1	12.9
10:29	7.0	13.1
10:30	6.4	13.6
10:31	6.6	13.4
10:32	7.2	12.8
10:33	6.3	13.7
10:34	6.1	14.1
10:35	6.4	13.7
10:36	7.1	12.9
10:37	7.1	13.0
10:38	6.5	13.6
10:39	5.9	14.2
10:40	6.5	13.6
10:41	7.2	12.9
10:42	6.8	13.3
10:43	7.2	13.0
10:44	6.3	13.7
10:45	6.1	14.0
10:46	6.9	13.2

WESTON

RUN DATA

Number 1

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Time	O_2 %	CO_2 %
10:47	7.5	12.6
10:48	6.7	13.3
10:49	6.8	13.3
10:50	6.2	13.9
10:51	7.3	12.7
10:52	7.6	12.5
10:53	7.4	12.4
10:54	7.4	12.7
10:55	6.9	13.0
Avgs	**7.2**	**12.9**

WESTON

RUN SUMMARY

Number 1

Client:	**LWEC**	Project Number:	**14464.007.004.0001**
Location:	**L'Anse, Michigan**	Operator:	**TB**
Source:	**Boiler # 1**	Date:	**7 Jul 2016**

Calibration **1**

	O_2	CO_2
Method	EPA 3A	EPA 3A
Conc. Units	%	%

Time: 08:40 to 10:55

Run Averages

	O_2	CO_2
	7.2	12.9

Pre-run Bias at 08:08

	O_2	CO_2
Zero Bias	0.1	0.0
Span Bias	12.1	8.6
Span Gas	11.9	8.9

Post-run Bias at 10:57

	O_2	CO_2
Zero Bias	0.1	0.0
Span Bias	12.1	8.6
Span Gas	11.9	8.9

Averages corrected for the average of the pre-run and post-run bias

	O_2	CO_2
	7.1	13.3

*No Correction

WESTON SOLUTIONS

BIAS AND CALIBRATION DRIFT

Number 2

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Start Time: 10:57

O_2
Method: EPA 3A
Span Conc. 21.3 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.1	0.1	0.5	Pass
Span	12.2	12.1	-0.1	-0.5	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.1	0.1	0.0	0.0	Pass
Span	12.1	12.1	0.0	0.0	Pass

*Bias No. 1

CO_2
Method: EPA 3A
Span Conc. 16.7 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.7	8.6	-0.1	-0.6	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.6	8.6	0.0	0.0	Pass

*Bias No. 1

RUN DATA

Number 2

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Time	O_2 %	CO_2 %
11:01	7.7	12.4
11:02	6.5	13.5
11:03	5.8	14.1
11:04	7.5	12.4
11:05	8.3	11.7
11:06	8.0	12.0
11:07	7.1	12.9
11:08	7.7	12.2
11:09	5.7	14.3
11:10	6.7	13.2
11:11	8.1	11.9
11:12	8.7	11.4
11:13	8.1	12.1
11:14	7.0	13.0
11:15	7.7	12.3
11:16	7.7	12.4
11:17	8.5	11.7
11:18	9.0	11.1
11:19	6.8	13.1
11:20	6.1	13.9
11:21	6.9	13.1
11:22	7.3	12.8
11:23	9.0	11.1
11:24	8.3	11.7
11:25	6.6	13.4
11:26	6.7	13.3
11:27	8.9	11.2
11:28	9.5	10.7
11:29	7.7	12.3
11:30	7.3	12.9
11:31	7.7	12.4
11:32	8.5	11.5
11:33	8.0	12.1
11:34	7.7	12.3
11:35	7.2	12.9
11:36	6.5	13.5
11:37	6.8	13.2
11:38	6.5	13.5
11:39	6.0	14.0
11:40	7.3	12.8
11:41	8.0	12.0
11:42	8.5	11.7

WESTON SOLUTIONS

RUN DATA

Number 2

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Time	O_2 %	CO_2 %
11:43	8.5	11.6
11:44	7.2	13.0
11:45	6.7	13.4
11:46	6.8	13.4
11:47	7.7	12.4
11:48	7.3	12.8
11:49	6.9	13.4
11:50	7.1	13.1
11:51	7.0	13.1
11:52	6.3	13.9
11:53	6.9	13.2
11:54	7.7	12.4
11:55	8.3	11.8
11:56	7.5	12.6
11:57	7.1	13.1
11:58	7.5	12.5
11:59	7.7	12.3
12:00	6.4	13.6
12:01	6.6	13.5
12:02	7.4	12.8
12:03	7.9	12.1
12:04	7.3	12.9
12:05	7.2	13.0
12:06	7.2	12.9
12:07	7.5	12.7
12:08	8.0	12.1
12:09	8.3	11.9
12:10	8.6	11.5
12:11	6.5	13.5
12:12	5.7	14.4
12:13	6.4	13.6
12:14	7.7	12.3
12:15	7.5	12.7
12:16	6.9	13.1
12:17	7.3	12.8
12:18	7.9	12.2
12:19	7.6	12.5
12:20	7.4	12.8
12:21	6.8	13.3
12:22	7.0	13.2
12:23	7.2	12.9
12:24	7.8	12.3

WESTON

RUN DATA
Number 2

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Time	O_2 %	CO_2 %
12:25	7.6	12.6
12:26	6.4	13.6
12:27	6.1	14.0
12:28	7.3	12.8
12:29	8.4	11.7
12:30	8.2	11.9
12:31	7.2	12.9
12:32	7.0	13.1
12:33	7.6	12.5
12:34	7.1	13.0
12:35	7.7	12.4
12:36	7.2	13.0
12:37	7.8	12.3
12:38	7.6	12.5
12:39	7.0	13.1
12:40	7.5	12.6
12:41	7.3	12.8
12:42	7.2	13.0
12:43	7.3	12.8
12:44	7.9	12.2
12:45	8.2	11.9
12:46	7.5	12.6
12:47	6.4	13.6
12:48	6.8	13.3
12:49	7.7	12.4
12:50	8.2	11.8
12:51	7.2	12.9
12:52	7.8	12.4
12:53	7.1	13.0
12:54	7.3	12.9
12:55	7.1	13.1
12:56	7.3	13.0
12:57	7.0	13.2
12:58	7.6	12.5
12:59	7.7	12.5
13:00	7.3	12.8
13:01	6.9	13.3
13:02	7.2	12.9
13:03	6.7	13.4
13:04	7.7	12.4
13:05	7.6	12.6
13:06	7.2	13.1

WESTON

RUN DATA
Number 2

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Time	O_2 %	CO_2 %
13:07	7.2	13.0
13:08	7.0	13.2
13:09	6.9	13.3
13:10	7.4	12.7
13:11	7.7	12.3
13:12	7.0	13.2
13:13	7.4	12.8
13:14	7.3	12.9
13:15	7.0	13.2
13:16	6.7	13.5
13:17	7.6	12.5
13:18	7.7	12.5
13:19	7.6	12.6
13:20	7.6	12.5
13:21	7.1	12.9
13:22	6.8	13.3
13:23	7.4	12.7
13:24	7.7	12.4
13:25	8.3	11.7
13:26	7.8	12.3
13:27	7.5	12.7
13:28	7.4	12.8
13:29	8.0	12.1
13:30	8.6	11.6
13:31	7.9	12.2
13:32	7.7	12.4
13:33	7.2	13.0
13:34	7.5	12.7
13:35	8.3	11.8
13:36	8.2	11.9
13:37	7.4	12.8
13:38	7.8	12.3
13:39	7.8	12.4
13:40	7.7	12.5
13:41	7.6	12.7
13:42	7.4	12.8
13:43	8.1	12.1
13:44	7.1	12.9
13:45	7.2	13.0
13:46	8.3	11.7
13:47	8.4	11.8
13:48	7.8	12.4

WESTON

RUN DATA
Number 2

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Time	O_2 %	CO_2 %
13:49	7.7	12.5
13:50	7.3	12.9
13:51	7.7	12.5
13:52	8.0	12.2
13:53	8.0	12.2
13:54	7.9	12.4
13:55	7.5	12.6
13:56	7.0	13.2
13:57	7.1	13.1
13:58	7.7	12.4
13:59	8.3	11.9
14:00	8.1	12.1
14:01	7.5	12.8
14:02	7.4	12.9
14:03	6.7	13.5
14:04	7.8	12.3
14:05	8.3	11.8
14:06	8.0	12.3
14:07	7.6	12.7
14:08	7.2	13.0
14:09	7.8	12.4
14:10	7.3	12.9
14:11	7.4	12.8
14:12	8.1	12.1
14:13	7.8	12.5
14:14	8.0	12.3
14:15	7.3	12.9
14:16	7.3	13.0
14:17	7.5	12.7
14:18	7.5	12.8
14:19	7.8	12.3
14:20	7.4	12.7
14:21	7.1	13.1
14:22	7.9	12.3
14:23	7.8	12.5
14:24	6.9	13.3
14:25	7.3	12.9
14:26	7.5	12.7
14:27	7.4	12.8
14:28	7.6	12.6
14:29	7.2	13.1
14:30	7.3	13.0

WESTON

RUN DATA

Number 2

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Time	O_2 %	CO_2 %
14:31	7.2	12.9
14:32	6.4	13.7
14:33	7.9	12.3
14:34	7.8	12.3
14:35	6.9	13.3
14:36	6.9	13.4
14:37	7.3	12.8
14:38	7.6	12.6
14:39	7.8	12.5
14:40	6.7	13.4
14:41	6.3	14.0
14:42	7.0	13.2
14:43	7.5	12.7
14:44	7.5	12.7
14:45	7.2	13.0
14:46	7.6	12.5
14:47	7.0	13.0
14:48	7.0	13.1
14:49	6.7	13.4
14:50	7.1	13.1
Avgs	**7.4**	**12.7**

WESTON SOLUTIONS

RUN SUMMARY
Number 2

Client: **LWEC**		Project Number:	**14464.007.004.0001**
Location: **L'Anse, Michigan**		Operator:	**TB**
Source: **Boiler # 1**	Calibration **1**	Date:	**7 Jul 2016**

	O_2	CO_2
Method	EPA 3A	EPA 3A
Conc. Units	%	%

Time: 11:00 to 12:51

Run Averages

	7.4	12.7

Pre-run Bias at 10:57

Zero Bias	0.1	0.0
Span Bias	12.1	8.6
Span Gas	11.9	8.9

Post-run Bias at 14:53

Zero Bias	0.0	0.0
Span Bias	12.1	8.6
Span Gas	11.9	8.9

Averages corrected for the average of the pre-run and post-run bias

	7.3	13.1

*No Correction

WESTON SOLUTIONS

RUN SUMMARY

Number 2

Client: **LWEC**		Project Number:	**14464.007.004.0001**
Location: **L'Anse, Michigan**		Operator:	**TB**
Source: **Boiler # 1**	Calibration **1**	Date:	**7 Jul 2016**

	O_2	CO_2
Method	EPA 3A	EPA 3A
Conc. Units	%	%

Time: 11:35 to 14:50

Run Averages

	O_2	CO_2
	7.4	12.7

Pre-run Bias at 10:57

	O_2	CO_2
Zero Bias	0.1	0.0
Span Bias	12.1	8.6
Span Gas	11.9	8.9

Post-run Bias at 14:53

	O_2	CO_2
Zero Bias	0.0	0.0
Span Bias	12.1	8.6
Span Gas	11.9	8.9

Averages corrected for the average of the pre-run and post-run bias

	O_2	CO_2
	7.3	13.2

*No Correction

WESTON SOLUTIONS

RUN SUMMARY
Number 2

Client: **LWEC**		Project Number:	**14464.007.004.0001**
Location: **L'Anse, Michigan**		Operator:	**TB**
Source: **Boiler # 1**	Calibration **1**	Date:	**7 Jul 2016**

	O_2	CO_2
Method	EPA 3A	EPA 3A
Conc. Units	%	%

Time: 13:34 to 14:39

Run Averages

	O_2	CO_2
	7.6	12.6

Pre-run Bias at 10:57

	O_2	CO_2
Zero Bias	0.1	0.0
Span Bias	12.1	8.6
Span Gas	11.9	8.9

Post-run Bias at 14:53

	O_2	CO_2
Zero Bias	0.0	0.0
Span Bias	12.1	8.6
Span Gas	11.9	8.9

Averages corrected for the average of the pre-run and post-run bias

	O_2	CO_2
	7.5	13.0

*No Correction

WESTON SOLUTIONS

BIAS AND CALIBRATION DRIFT

Number 3

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Start Time: 14:53

O_2
Method: EPA 3A
Span Conc. 21.3 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	12.2	12.1	-0.1	-0.5	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.1	0.0	-0.1	-0.5	Pass
Span	12.1	12.1	0.0	0.0	Pass

*Bias No. 2

CO_2
Method: EPA 3A
Span Conc. 16.7 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.7	8.6	-0.1	-0.6	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.6	8.6	0.0	0.0	Pass

*Bias No. 2

WESTON

RUN DATA

Number 3

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Time	O_2 %	CO_2 %
15:14	6.6	13.6
15:15	6.6	13.6
15:16	7.5	12.6
15:17	7.4	12.8
15:18	6.7	13.4
15:19	6.4	13.7
15:20	7.2	12.9
15:21	7.2	13.0
15:22	6.9	13.2
15:23	6.6	13.5
15:24	7.3	12.8
15:25	7.6	12.5
15:26	7.6	12.7
15:27	7.2	13.0
15:28	6.9	13.3
15:29	7.1	13.1
15:30	7.1	13.1
15:31	7.3	12.8
15:32	7.1	13.2
15:33	7.2	13.0
15:34	7.2	12.9
15:35	7.4	12.7
15:36	6.9	13.3
15:37	7.0	13.1
15:38	7.4	12.7
15:39	7.6	12.6
15:40	7.1	13.1
15:41	6.4	13.7
15:42	7.1	13.1
15:43	7.7	12.4
15:44	7.2	13.0
15:45	6.1	13.9
15:46	6.6	13.6
15:47	7.8	12.2
15:48	8.2	11.9
15:49	7.1	13.0
15:50	6.9	13.4
15:51	7.1	13.0
15:52	7.9	12.1
15:53	7.4	12.8
15:54	7.2	12.9
15:55	7.0	13.2

WESTON

RUN DATA

Number 3

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Time	O_2 %	CO_2 %
15:56	7.0	13.2
15:57	7.7	12.4
15:58	7.6	12.6
15:59	7.4	12.8
16:00	7.4	12.8
16:01	8.2	11.9
16:02	8.0	12.1
16:03	7.3	12.8
16:04	7.7	12.4
16:05	6.7	13.3
16:06	7.0	13.1
16:07	8.2	11.9
16:08	8.7	11.5
16:09	8.0	12.2
16:10	8.0	12.2
16:11	7.7	12.5
16:12	7.6	12.6
16:13	7.8	12.3
16:14	7.7	12.4
16:15	8.0	12.1
16:16	8.6	11.4
16:17	8.7	11.4
16:18	8.5	11.7
16:19	8.0	12.3
16:20	7.1	13.0
16:21	7.1	13.1
16:22	8.0	12.2
16:23	8.3	11.8
16:24	8.5	11.6
16:25	7.7	12.5
16:26	7.8	12.4
16:27	7.7	12.7
16:28	6.9	13.2
16:29	7.5	12.7
16:30	8.2	12.0
16:31	8.2	12.0
16:32	8.0	12.2
16:33	7.3	12.9
16:34	7.5	12.8
16:35	8.0	12.1
16:36	8.3	11.9
16:37	7.6	12.6

RUN DATA
Number 3

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Time	O_2 %	CO_2 %
16:38	7.1	13.2
16:39	7.5	12.6
16:40	7.6	12.6
16:41	8.1	12.0
16:42	7.3	12.8
16:43	7.4	12.8
16:44	7.8	12.4
16:45	7.7	12.6
16:46	7.6	12.7
16:47	7.5	12.8
16:48	7.3	13.0
16:49	7.3	12.8
16:50	7.4	12.8
16:51	7.9	12.3
16:52	7.4	12.9
16:53	7.7	12.6
16:54	6.9	13.2
16:55	6.3	13.9
16:56	6.4	13.7
16:57	7.6	12.5
16:58	7.7	12.5
16:59	7.3	12.9
17:00	7.0	13.3
17:01	6.8	13.5
17:02	6.7	13.6
17:03	7.1	13.0
17:04	7.0	13.4
Avgs	**7.4**	**12.7**

RUN SUMMARY

Number 3

Client:	**LWEC**	Project Number:	**14464.007.004.0001**
Location:	**L'Anse, Michigan**	Operator:	**TB**
Source:	**Boiler # 1** Calibration **1**	Date:	**7 Jul 2016**

	O_2	CO_2
Method	EPA 3A	EPA 3A
Conc. Units	%	%

Time: 15:13 to 17:04

Run Averages

	O_2	CO_2
	7.4	12.7

Pre-run Bias at 14:53

	O_2	CO_2
Zero Bias	0.0	0.0
Span Bias	12.1	8.6
Span Gas	11.9	8.9

Post-run Bias at 17:08

	O_2	CO_2
Zero Bias	0.1	0.0
Span Bias	12.1	8.6
Span Gas	11.9	8.9

Averages corrected for the average of the pre-run and post-run bias

	O_2	CO_2
	7.3	13.2

*No Correction

WESTON SOLUTIONS

RUN SUMMARY

Number 3

Client: **LWEC**		Project Number:	**14464.007.004.0001**
Location: **L'Anse, Michigan**		Operator:	**TB**
Source: **Boiler # 1**	Calibration **1**	Date:	**7 Jul 2016**

	O_2	CO_2
Method	EPA 3A	EPA 3A
Conc. Units	%	%

Time: 15:15 to 17:04

Run Averages

	7.4	12.7

Pre-run Bias at 14:53

Zero Bias	0.0	0.0
Span Bias	12.1	8.6
Span Gas	11.9	8.9

Post-run Bias at 17:08

Zero Bias	0.1	0.0
Span Bias	12.1	8.6
Span Gas	11.9	8.9

Averages corrected for the average of the pre-run and post-run bias

	7.3	13.1

*No Correction

WESTON

BIAS AND CALIBRATION DRIFT

Number 4

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Start Time: 17:08

O_2

Method: EPA 3A
Span Conc. 21.3 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.1	0.1	0.5	Pass
Span	12.2	12.1	-0.1	-0.5	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.0	0.1	0.1	0.5	Pass
Span	12.1	12.1	0.0	0.0	Pass

*Bias No. 3

CO_2

Method: EPA 3A
Span Conc. 16.7 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.7	8.6	-0.1	-0.6	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.6	8.6	0.0	0.0	Pass

*Bias No. 3

RUN DATA

Number 4

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Time	O_2 %	CO_2 %
17:52	7.6	12.6
17:53	8.0	12.1
17:54	7.8	12.5
17:55	6.9	13.2
17:56	7.3	12.9
17:57	7.9	12.2
17:58	7.7	12.3
17:59	7.3	12.8
18:00	7.8	12.4
18:01	7.8	12.3
18:02	7.6	12.6
18:03	7.9	12.3
18:04	7.8	12.4
18:05	7.6	12.6
18:06	7.4	12.8
18:07	6.9	13.2
18:08	7.3	12.8
18:09	8.4	11.7
18:10	8.2	12.0
18:11	6.8	13.2
18:12	6.5	13.7
18:13	7.7	12.5
18:14	8.1	12.2
18:15	7.7	12.5
18:16	7.1	13.1
18:17	6.5	13.7
18:18	6.9	13.4
18:19	7.7	12.5
18:20	8.1	12.1
18:21	7.9	12.3
18:22	7.3	12.9
18:23	6.9	13.3
18:24	6.6	13.6
18:25	7.3	12.8
18:26	7.5	12.7
18:27	7.7	12.5
18:28	7.4	12.9
18:29	6.7	13.4
18:30	6.5	13.7
18:31	7.2	12.9
18:32	7.5	12.7
18:33	7.2	12.9

WESTON

RUN DATA
Number 4

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Time	O_2 %	CO_2 %
18:34	6.4	13.6
18:35	6.1	14.2
18:36	6.7	13.5
18:37	7.6	12.5
18:38	7.2	13.0
18:39	6.6	13.6
18:40	6.9	13.3
18:41	7.0	13.1
18:42	7.2	13.1
18:43	7.1	13.1
18:44	7.2	13.1
18:45	6.9	13.4
18:46	6.8	13.5
18:47	6.7	13.5
18:48	7.4	12.7
18:49	7.0	13.2
18:50	7.0	13.2
18:51	6.9	13.3
18:52	7.5	12.5
18:53	7.1	13.0
18:54	7.4	12.6
18:55	7.0	13.2
18:56	6.9	13.2
18:57	6.9	13.3
18:58	7.2	12.9
18:59	7.9	12.2
19:00	7.1	12.8
19:01	7.3	12.8
19:02	7.7	12.3
19:03	7.8	12.4
19:04	6.6	13.5
19:05	7.4	12.8
19:06	7.3	12.8
19:07	8.2	11.9
19:08	8.7	11.5
19:09	8.7	11.6
19:10	7.7	12.3
19:11	7.4	12.9
19:12	7.7	12.5
19:13	9.5	10.7
19:14	8.8	11.4
19:15	8.4	11.7

WESTON

RUN DATA
Number 4

Client:	**LWEC**	Project Number:	**14464.007.004.0001**
Location:	**L'Anse, Michigan**	Operator:	**TB**
Source:	**Boiler # 1**	Date:	**7 Jul 2016**

Calibration **1**

Time	O_2 %	CO_2 %
19:16	5.7	14.3
19:17	4.7	15.2
19:18	4.8	15.2
19:19	4.9	15.1
19:20	6.1	13.9
19:21	8.1	11.9
19:22	9.5	10.6
19:23	8.5	11.6
19:24	6.5	13.5
19:25	5.9	14.2
19:26	8.4	11.6
Avgs	**7.3**	**12.8**

WESTON

RUN SUMMARY

Number 4

Client: **LWEC**		Project Number:	**14464.007.004.0001**
Location: **L'Anse, Michigan**		Operator:	**TB**
Source: **Boiler # 1**	Calibration **1**	Date:	**7 Jul 2016**

	O_2	CO_2
Method	EPA 3A	EPA 3A
Conc. Units	%	%

Time: 17:51 to 19:26

Run Averages

	O_2	CO_2
	7.3	12.8

Pre-run Bias at 17:08

	O_2	CO_2
Zero Bias	0.1	0.0
Span Bias	12.1	8.6
Span Gas	11.9	8.9

Post-run Bias at 19:30

	O_2	CO_2
Zero Bias	0.0	0.0
Span Bias	12.1	8.6
Span Gas	11.9	8.9

Averages corrected for the average of the pre-run and post-run bias

	O_2	CO_2
	7.2	13.3

*No Correction

WESTON

BIAS AND CALIBRATION DRIFT

Number 5

Client: **LWEC**
Location: **L'Anse, Michigan**
Source: **Boiler # 1**

Calibration **1**

Project Number: **14464.007.004.0001**
Operator: **TB**
Date: **7 Jul 2016**

Start Time: 19:30

O_2
Method: EPA 3A
Span Conc. 21.3 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	12.2	12.1	-0.1	-0.5	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.1	0.0	-0.1	-0.5	Pass
Span	12.1	12.1	0.0	0.0	Pass

*Bias No. 4

CO_2
Method: EPA 3A
Span Conc. 16.7 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.7	8.6	-0.1	-0.6	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.6	8.6	0.0	0.0	Pass

*Bias No. 4

WESTON

B.8 OPACITY

EPA METHOD 9

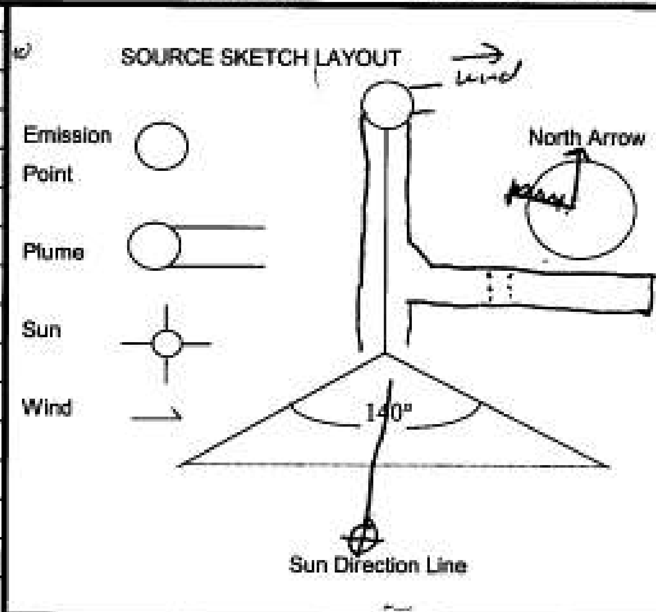
VISIBLE EMISSIONS OBSERVATION FORM

CLIENT L'anse Warden Electric Company
SOURCE Boiler Number One
SOURCE ADDRESS 157 South Main Street
L'Anse, MI 49946

W.O.# 14464.007.004.0001
DATE 7/6/16

Control Device, Process Equipment, Operating Mode: Normal Operating Mode/High Load
Emission Point Description: Main Stack @ LWEC Large silver stack
Source Height: ~150 ft Height Relative to Observer: 150 ft
Distance from Observer: 600 ft Direction from Observer: Start: ~~East North~~ End: East north
Plume Type: (Continuous, Fugutive, or Intermittent) Start: Cont End: Cont
Description of Emission: (Coning, Fanning, Looping, (Lofting), or Fumigating) Start: Loft End: Loft
Plume Color: Start: Clear/Heat End: Clear/Heat
Water Droplets Present: (Y/N) NO Plume: (Attached, Detached, or N/A) Attached
Plume Background Description: Start: Sky End: Sky Background Color: Blue/Gray
Point in Plume Where Opacity was Determined: ~1' from stack exit
Sky Conditions: Start: Mostly Cloudy End: Scattered Ambient Temperature: Start: 72 F° End: 74 F°
Wind Direction: Start: West End: West Wind Speed: Start: 1-3 mph End: 1-3 mph
Relative Humidity: Start: 85% End: 83% Wet Bulb Temp: Start: 65 F° End: [illegible] F°

Min.	0	15	30	45	Avg	Min.	0	15	30	45	Avg
0	0	0	0	0	0	30	0	0	0	0	0
1	0	0	0	0	0	31	0	0	0	0	0
2	0	0	0	0	0	32	0	0	0	0	0
3	0	0	0	0	0	33	0	0	0	0	0
4	0	0	0	0	0	34	0	0	0	0	0
5	0	0	0	0	0	35	0	0	0	0	0
6	0	0	0	0	0	36	0	0	0	0	0
7	0	0	0	0	0	37	0	0	0	0	0
8	0	0	0	0	0	38	0	0	0	0	0
9	0	0	0	0	0	39	0	0	0	0	0
10	0	0	0	0	0	40	0	0	0	0	0
11	0	0	0	0	0	41	0	0	0	0	0
12	0	0	0	0	0	42	0	0	0	0	0
13	0	0	0	0	0	43	0	0	0	0	0
14	0	0	0	0	0	44	0	0	0	0	0
15	0	0	0	0	0	45	0	0	0	0	0
16	0	0	0	0	0	46	0	0	0	0	0
17	0	0	0	0	0	47	0	0	0	0	0
18	0	0	0	0	0	48	0	0	0	0	0
19	0	0	0	0	0	49	0	0	0	0	0
20	0	0	0	0	0	50	0	0	0	0	0
21	0	0	0	0	0	51	0	0	0	0	0
22	0	0	0	0	0	52	0	0	0	0	0
23	0	0	0	0	0	53	0	0	0	0	0
24	0	0	0	0	0	54	0	0	0	0	0
25	0	0	0	0	0	55	0	0	0	0	0
26	0	0	0	0	0	56	0	0	0	0	0
27	0	0	0	0	0	57	0	0	0	0	0
28	0	0	0	0	0	58	0	0	0	0	0
29	0	0	0	0	0	59	0	0	0	0	0



Highest six minute average: 0

A six minute average greater than 20% opacity occured 0 times.

A six minute average greater than 40% opacity occured 0 times.

Opacity Time: Start: 1340 End: 1439

60-Minute Averge: 0

Observer's Name: Tyson Belknap
Certified By: Penn State Continuing Education
Exp. Date: October 18, 2016
Signature: [signature] Date: 7-6-16

WESTON SOLUTIONS.

EPA METHOD 9

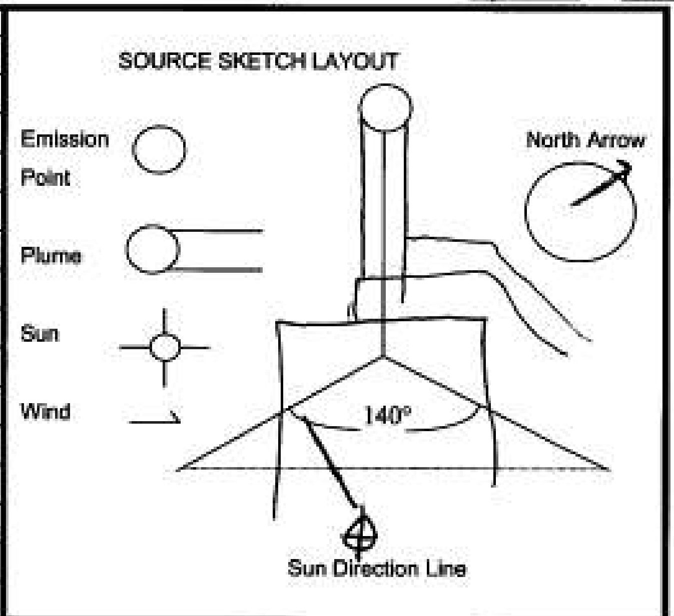
VISIBLE EMISSIONS OBSERVATION FORM

CLIENT L'anse Warden Electric Company
SOURCE Boiler Number One
SOURCE ADDRESS 157 South Main Street
L'Anse, MI 49946

W.O.# 14464.007.004.0001
DATE 7/7/16

Control Device, Process Equipment, Operating Mode: Normal Operating Mode/High Load
Emission Point Description: Main Stack Over Large Silver Stack
Source Height: 150 ft Height Relative to Observer: 150 ft
Distance from Observer: 456 ft Direction from Observer: Start: NW End: NW
Plume Type: (Continuous, Fugutive, or Intermittent) Start: Cont End: Cont
Description of Emission: (Coning, Fanning, Looping, Lofting, or Fumigating) Start: Loft End: Loft
Plume Color: Start: Clear/Heat End: Clear/Heat
Water Droplets Present: (Y/N) NO Plume: (Attached, Detached, or N/A) Attached
Plume Background Description: Start: Sky End: Sky Background Color: grey/white
Point in Plume Where Opacity was Determined: 1 ' from stack exit
Sky Conditions: Start: Overcast End: Overcast Ambient Temperature: Start: 61 F° End: 63 F°
Wind Direction: Start: WNW End: WNW Wind Speed: Start: 0-1 mph End: 0-1 mph
Relative Humidity: Start: 88 End: 94% Wet Bulb Temp: Start: 59 F° End: 62 F°

Min.	0	15	30	45	Avg	Min.	0	15	30	45	Avg
0	0	0	0	0	0	30	0	0	0	0	0
1	0	0	0	0	0	31	0	0	0	0	0
2	0	0	0	0	0	32	0	0	0	0	0
3	0	0	0	0	0	33	0	0	0	0	0
4	0	0	0	0	0	34	0	0	0	0	0
5	0	0	0	0	0	35	0	0	0	0	0
6	0	0	0	0	0	36	0	0	0	0	0
7	0	0	0	0	0	37	0	0	0	0	0
8	0	0	0	0	0	38	0	0	0	0	0
9	0	0	0	0	0	39	0	0	0	0	0
10	0	0	0	0	0	40	0	0	0	0	0
11	0	0	0	0	0	41	0	0	0	0	0
12	0	0	0	0	0	42	0	0	0	0	0
13	0	0	0	0	0	43	0	0	0	0	0
14	0	0	0	0	0	44	0	0	0	0	0
15	0	0	0	0	0	45	0	0	0	0	0
16	0	0	0	0	0	46	0	0	0	0	0
17	0	0	0	0	0	47	0	0	0	0	0
18	0	0	0	0	0	48	0	0	0	0	0
19	0	0	0	0	0	49	0	0	0	0	0
20	0	0	0	0	0	50	0	0	0	0	0
21	0	0	0	0	0	51	0	0	0	0	0
22	0	0	0	0	0	52	0	0	0	0	0
23	0	0	0	0	0	53	0	0	0	0	0
24	0	0	0	0	0	54	0	0	0	0	0
25	0	0	0	0	0	55	0	0	0	0	0
26	0	0	0	0	0	56	0	0	0	0	0
27	0	0	0	0	0	57	0	0	0	0	0
28	0	0	0	0	0	58	0	0	0	0	0
29	0	0	0	0	0	59	0	0	0	0	0



Highest six minute average: 0

A six minute average greater than 20% opacity occured 0 times.

A six minute average greater than 40% opacity occured 0 times.

Opacity Time: Start: 0900 End: 0959

60-Minute Averge: 0

Observer's Name: Tyson Belknap
Certified By: Penn State Continuing Education
Exp. Date: October 18, 2016
Signature: [signature] Date: 7-7-16

WESTON SOLUTIONS

I:\080557\Metals Air LWEC VE Observation Form.xls

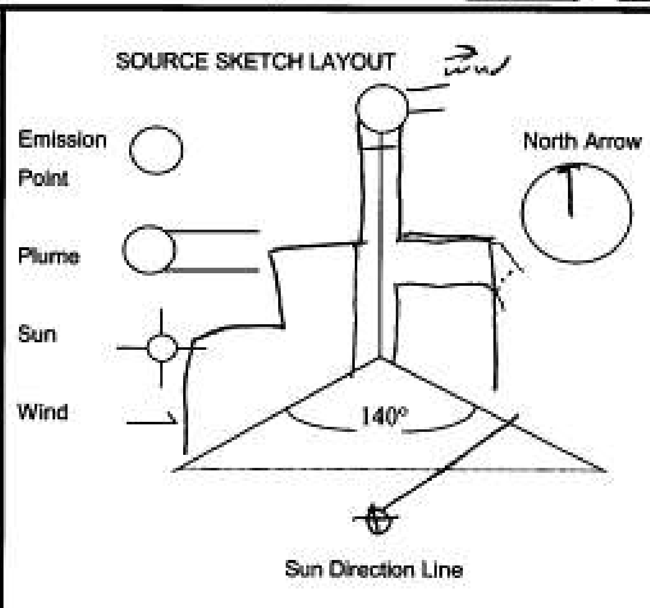
EPA METHOD 9
VISIBLE EMISSIONS OBSERVATION FORM

CLIENT L'anse Warden Electric Company
SOURCE Boiler Number One
SOURCE ADDRESS 157 South Main Street
L'Anse, MI 49946

W.O.# 14464.007.004.0001
DATE 7-7-16

Control Device, Process Equipment, Operating Mode: Normal Operating Mode/High Load
Emission Point Description:
Source Height: 150 ft Height Relative to Observer: 150 ft
Distance from Observer: 450 ft Direction from Observer: Start: North End: North
Plume Type: (Continuous, Fugutive, or Intermittent) Start: Cont End: Cont
Description of Emission: (Coning, Fanning, Looping, Lofting, or Fumigating) Start: Loft End: Loft
Plume Color: Start: Clear/heat End: Clear/heat
Water Droplets Present: (Y/N) No Plume: (Attached, Detached, or N/A) Attach
Plume Background Description: Start: Sky End: Sky Background Color: Grey/white
Point in Plume Where Opacity was Determined: ~1 ' from stack exit
Sky Conditions: Start: overcast End: overcast Ambient Temperature: Start: 63 F° End: 64 F°
Wind Direction: Start: west End: West Wind Speed: Start: 3-5 mph End: 3-5 mph
Relative Humidity: Start: 83% End: 77% Wet Bulb Temp: Start: 60 F° End: 60 F°

Min.	0	15	30	45	Avg	Min.	0	15	30	45	Avg
0	0	0	0	0	0	30	0	0	0	0	0
1	0	0	0	0	0	31	0	0	0	0	0
2	0	0	0	0	0	32	0	0	0	0	0
3	0	0	0	0	0	33	0	0	0	0	0
4	0	0	0	0	0	34	0	0	0	0	0
5	0	0	0	0	0	35	0	0	0	0	0
6	0	0	0	0	0	36	0	0	0	0	0
7	0	0	0	0	0	37	0	0	0	0	0
8	0	0	0	0	0	38	0	0	0	0	0
9	0	0	0	0	0	39	0	0	0	0	0
10	0	0	0	0	0	40	0	0	0	0	0
11	0	0	0	0	0	41	0	0	0	0	0
12	0	0	0	0	0	42	0	0	0	0	0
13	0	0	0	0	0	43	0	0	0	0	0
14	0	0	0	0	0	44	0	0	0	0	0
15	0	0	0	0	0	45	0	0	0	0	0
16	0	0	0	0	0	46	0	0	0	0	0
17	0	0	0	0	0	47	0	0	0	0	0
18	0	0	0	0	0	48	0	0	0	0	0
19	0	0	0	0	0	49	0	0	0	0	0
20	0	0	0	0	0	50	0	0	0	0	0
21	0	0	0	0	0	51	0	0	0	0	0
22	0	0	0	0	0	52	0	0	0	0	0
23	0	0	0	0	0	53	0	0	0	0	0
24	0	0	0	0	0	54	0	0	0	0	0
25	0	0	0	0	0	55	0	0	0	0	0
26	0	0	0	0	0	56	0	0	0	0	0
27	0	0	0	0	0	57	0	0	0	0	0
28	0	0	0	0	0	58	0	0	0	0	0
29	0	0	0	0	0	59	0	0	0	0	0



Highest six minute average: 0

A six minute average greater than 20% opacity occured 0 times.

A six minute average greater than 40% opacity occured 0 times.

Opacity Time: Start: 1530 End: 1629

60-Minute Averge: 0

Observer's Name: Tyson Belknap
Certified By: Penn State Continuing Education
Exp. Date: October 18, 2016
Signature: [signature] Date: 7-7-16

WESTON SOLUTIONS

APPENDIX C
BOILER OPERATING DATA

PROCESS OPERATING DATA LOG SHEET FOR EMISSIONS TESTING

Taken by: Bruce Parker 7-6-16 asst operator

POWER BOILERS--RECOMENDED EVERY 15 MINUTES; START 15 MIN B4 TEST, AND CONTINUE 15 MIN AFTER TEST

Plant	DATE	TIME (use military time)	#3 Fuel in place – R/R Ties Totalizer	Rake Speed (SPECIFY UNITS: % output)	TPH	Bin #2 Fuel in place – Wood Chips Totalizer	Rake Speed (SPECIFY UNITS: % output)	TPH	#1 Fuel in place – R/R Ties Totalizer	Rake Speed (SPECIFY UNITS: % output)	TPH	TDF BIN Screw Speed (SPECIFY UNITS: % output)	TDF BIN Totalizer	TPH Rate (if TDF)	Main Belt – Main Fuel belt Totalizer	Oxygen Levels – BOILER O2 (% (specify wet or dry))	Oxygen Levels – STACK O2, From CEM (% (specify wet or dry))	Production Rates – STEAMING RATE (KPPH)	Production Rates – MW (specify gross or net)	Fan – ID Fan Load (%)	Air – Air Flow (%)
7-6-16	Start Time: 0915 / 1314 / 1556	Stop Time: 1233 / 1522 / 1907																			
LWEC	7/6/2016	800																			
LWEC	7/6/2016	815																			
LWEC	7/6/2016	830																			
LWEC	7/6/2016	845	101.14	10		89.34	10		14.27	10		8.0	9.12		189.12	9.9	7.4	189,000	16.89	87.6	74
LWEC	7/6/2016	900	101.14	11		92.99	11		16.72	11		8.0	9.36		194.69	9.8	6.9	192,000	17.14	91.7	74
LWEC	7/6/2016	915	101.14	12		98.81	12		16.72	12		8.0	9.57		199.45	10.1	7.3	195,000	17.03	96.4	74
LWEC	7/6/2016	930	101.14	12		108.99	12		16.72	12		8.0	9.76		205.74	10.0	7.2	193,000	17.14	89.9	73
LWEC	7/6/2016	945	103.10	11		108.99	11		20.66	11		8.0	10.00		213.90	9.6	6.7	192,000	17.12	91.0	74
LWEC	7/6/2016	1000	105.14	11		108.99	11		24.65	11		8.0	10.20		219.34	9.5	6.4	192,000	17.09	90.3	74
LWEC	7/6/2016	1015	107.59	11		108.99	11		28.23	11		8.0	10.44		225.86	10.1	8.0	192,000	17.11	92.5	75
LWEC	7/6/2016	1030	107.59	12		108.99	12		30.18	12		8.0	10.64		231.73	9.9	6.9	193,000	17.13	98.1	75
LWEC	7/6/2016	1045	107.59	11		108.99	11		30.18	11		8.0	10.88		239.01	9.3	5.9	191,000	17.20	89.9	74
LWEC	7/6/2016	1100	107.59	11		108.99	11		37.03	11		8.0	11.08		244.58	9.9	7.0	194,000	17.19	95.4	73
LWEC	7/6/2016	1115	107.59	12		108.99	12		40.70	12		8.0	11.30		250.55	10.1	7.3	193,000	17.28	95.1	75
LWEC	7/6/2016	1130	113.52	13		108.99	13		41.34	13		8.0	11.54		257.30	9.9	8.4	196,000	17.14	99.3	74
LWEC	7/6/2016	1145	114.67	11		108.99	11		46.53	11		8.0	11.74		264.87	9.8	6.9	193,000	17.15	88.2	74
LWEC	7/6/2016	1200	114.67	11		119.24	11		46.53	11		8.0	11.96		270.49	9.8	7.3	194,000	17.10	90.4	74
LWEC	7/6/2016	1215	115.98	12		128.28	12		46.53	12		8.0	12.20		276.75	11.1	8.5	179,000	16.92	96.0	76
LWEC	7/6/2016	1230	122.97	11		128.28	11		46.53	11		8.0	12.42		285.23	11.4	9.4	180,000	15.89	95.2	76
LWEC	7/6/2016	1245																			72
LWEC	7/6/2016	1300	127.98	11		128.28	11		52.25	11		8.0	12.84		295.38	10.0	7.2	183,000	17.10	89.4	72
LWEC	7/6/2016	1315	127.98	11		128.28	11		56.41	11		8.0	13.06		300.58	9.7	6.0	186,000	17.11	86.5	74
LWEC	7/6/2016	1330	132.57	11		128.28	11		59.00	11		8.0	13.29		307.11	9.7	7.3	191,000	17.05	82.3	72
LWEC	7/6/2016	1345	135.72	11		128.28	11		62.45	11		8.0	13.48		313.50	9.8	6.9	193,000	17.14	90.2	72
LWEC	7/6/2016	1400	136.84	11		134.65	11		63.75	11		8.0	13.70		319.67	9.8	6.6	193,000	17.11	90.9	72
LWEC	7/6/2016	1415	136.84	11		145.21	10		64.94	11		8.0	13.96		326.17	10.1	7.8	194,000	17.05	88.7	72
LWEC	7/6/2016	1430	136.84	11		145.21	10		67.62	11		8.0	14.16		332.48	9.2	6.7	190,000	17.11	88.2	72
LWEC	7/6/2016	1445	138.57	11		145.21	10		74.00	11		8.0	14.36		339.22	9.4	6.5	185,000	17.12	87.2	72
LWEC	7/6/2016	1500	141.11	11		145.21	10		76.49	11		8.0	14.56		345.35	9.6	5.8	186,000	17.14	91.1	72
LWEC	7/6/2016	1515	145.83	10		145.21	9		76.49	10		8.0	14.98		351.04	9.7	6.9	193,000	17.14	90.1	74
LWEC	7/5/2016	1530																			71
LWEC	7/6/2016	1545	150.47	10		145.21	9		81.02	10		8.0	15.26		363.62	10.2	7.4	196,000	16.60	85.4	71
LWEC	7/6/2016	1600	150.67	10		145.21	9		85.40	10		8.0	15.46		368.77	10.7	8.2	190,000	17.24	87.6	75
LWEC	7/6/2016	1615	150.67	11		153.48	10		85.44	11		8.0	15.62		372.78	10.0	7.9	192,000	17.13	85.4	73
LWEC	7/6/2016	1630	150.67	10		167.22	9		85.44	10		8.0	15.82		378.51	10.3	7.3	199,000	17.19	97.3	73
LWEC	7/6/2016	1645	150.67	10		171.34	9		88.97	10		8.0	16.06		384.13	10.2	6.8	190,000	17.14	89.0	76
LWEC	7/6/2016	1700	150.67	11		171.34	10		95.46	11		8.0	16.26		390.46	10.3	6.4	190,000	17.15	96.5	76
LWEC	7/6/2016	1715	152.67	11		171.34	10		100.30	11		8.0	16.48		398.21	10.1	7.2	190,000	17.08	91.1	70
LWEC	7/6/2016	1730	154.29	11		171.34	10		101.43	11		8.0	16.67		404.90	10.2	8.1	186,000	17.05	84.4	76
LWEC	7/6/2016	1745	159.51	10		171.34	9		101.43	10		8.0	16.90		409.96	9.9	7.6	187,000	17.10	81.3	72
LWEC	7/6/2016	1800	160.42	10		171.34	8		104.40	10		8.0	17.14		416.90	9.9	7.1	189	17.06	86.0	69
LWEC	7/6/2016	1815	160.42	8		176.10	8		105.30	8		8.0	17.36		423.51	9.7	7.4	187	17.09	84.1	70
LWEC	7/6/2016	1830	160.42	9		187.60	8		107.30	9		8.0	17.58		427.60	10.0	7.5	178	17.08	85.1	69
LWEC	7/6/2016	1845	160.42	9		195.56	9		110.78	9		8.0	17.80		433.37	10.2	9.1	189	17.17	91.3	75
LWEC	7/6/2016	1900	160.42	11		195.56	9		112.35	11		8.0	18.02		440.51	10.1	7.9	188	17.10	83.8	72
LWEC	7/6/2016	1915	161.92	10		195.56	9		112.35	10		8.0	18.20		447.81	9.9	7.1	189	17.05	85.9	70
LWEC	7/6/2016	1930	167.30	10		195.56	9		112.35	10		8.0	18.44		452.80	9.7	6.0	190	17.09	86.5	70
LWEC	7/6/2016	1945																			
LWEC	7/6/2016	2000																			

PROCESS OPERATING DATA LOG SH

Taken by: 7-06-16 Terry Lundvall (Plant oper.)

POWER BOILERS--RECOMENDED E

	Start Time	Stop Time	Stack Monitors			ESP POWER DATA				ESP POWER DATA				ESP POWER DATA				
	0915 1314 1852	1235 1500 1907	OPACITY	CO	Flue Gas Temp	Primary	ESP Field 1 (Inlet)	ESP Field 1 (Inlet)	Spark Rate	Primary	ESP Field 2 (Center)	ESP Field 2 (Center)	Spark Rate	Primary	ESP Field 3 (Outlet)	ESP Field 3 (Outlet)	Spark Rate	TIME
Plant	DATE	TIME (use military time)	%	lb/mmbtu	(Precip Gas Out)	Voltage	Secondary kV	Secondary mA	SPM	Voltage	Secondary kV	Secondary mA	SPM	Voltage	Secondary kV	Secondary mA	SPM	Use military time
LWEC	7/6/2016	800																800
LWEC	7/6/2016	815																815
LWEC	7/6/2016	830																830
LWEC	7/6/2016	845	1.0	164	431	262	33	650	1	246	33	644	0	210	29	535	2	845
LWEC	7/6/2016	900	1.1	123	431	260	35	648	4	246	33	642	0	212	29	540	0	900
LWEC	7/6/2016	915	1.4	133	431	248	34	650	26	248	33	644	6	212	28	522	0	915
LWEC	7/6/2016	930	1.1	124	433	255	34	649	1	240	35	644	0	210	29	554	0	930
LWEC	7/6/2016	945	1.1	126	433	246	36	650	5	246	33	536	0	218	29	532	0	945
LWEC	7/6/2016	1000	1.1	100	431	258	37	650	1	248	33	648	0	210	29	538	0	1000
LWEC	7/6/2016	1015	1.1	115	434	248	33	548	13	250	31	565	21	204	29	526	3	1015
LWEC	7/6/2016	1030	1.2	157	434	253	34	648	2	244	32	634	1	208	29	546	0	1030
LWEC	7/6/2016	1045	1.1	102	436	262	37	496	1	248	33	644	0	210	29	540	1	1045
LWEC	7/6/2016	1100	1.1	134	436	270	36	650	5	246	33	648	1	212	30	540	1	1100
LWEC	7/6/2016	1115	1.1	138	433	254	34	654	5	240	33	644	6	210	30	540	1	1115
LWEC	7/6/2016	1130	1.2	152	433	258	36	646	0	246	33	648	0	210	29	540	0	1130
LWEC	7/6/2016	1145	1.2	178	431	262	36	649	6	247	33	644	0	212	29	532	0	1145
LWEC	7/6/2016	1200	1.1	125	432	246	35	642	13	262	31	494	11	210	29	536	0	1200
LWEC	7/6/2016	1215	1.2	180	436	246	34	640	3	230	33	650	31	204	29	498	12	1215
LWEC	7/6/2016	1230	1.2	178	434	241	34	552	1	240	30	650	1	202	26	346	6	1230
LWEC	7/6/2016	1245																1245
LWEC	7/6/2016	1300	0.9	091	434	254	33	514	9	254	33	634	3	208	29	526	0	1300
LWEC	7/6/2016	1315	0.9	102	435	266	35	644	1	246	33	626	0	212	29	528	0	1315
LWEC	7/6/2016	1330	1.1	097	434	260	33	646	2	246	33	646	2	210	29	632	6	1330
LWEC	7/6/2016	1345	1.2	096	433	240	33	650	10	244	33	648	23	208	29	528	0	1345
LWEC	7/6/2016	1400	1.1	098	433	254	36	648	0	246	33	646	3	212	29	536	1	1400
LWEC	7/6/2016	1415	1.9	093	460	260	35	650	0	240	33	646	3	204	29	522	4	1415
LWEC	7/6/2016	1430	1.1	095	431	216	37	650	0	242	33	640	0	210	29	532	1	1430
LWEC	7/6/2016	1445	1.2	095	431	252	34	649	3	170	32	212	0	216	30	546	0	1445
LWEC	7/6/2016	1500	1.1	095	433	240	35	649	0	240	33	640	0	212	29	640	1	1500
LWEC	7/6/2016	1515	1.3	092	433	274	37	620	0	248	33	649	1	208	29	540	8	1515
LWEC	7/6/2016	1530																1530
LWEC	7/6/2016	1545	0.9	101	433	254	34	645	3	240	33	650	2	208	29	336	4	1545
LWEC	7/6/2016	1600	2.0	172	429	263	37	676	4	216	30	466	46	194	26	276	15	1600
LWEC	7/6/2016	1615	1.1	125	431	260	36	650	0	246	33	649	1	210	29	536	3	1615
LWEC	7/6/2016	1630	0.9	145	431	252	34	649	2	246	33	649	3	212	29	536	1	1630
LWEC	7/6/2016	1645	0.9	172	429	262	35	650	5	236	33	649	0	262	29	462	5	1645
LWEC	7/6/2016	1700	0.9	135	438	250	35	648	1	240	33	648	0	196	28	634	1	1700
LWEC	7/6/2016	1715	0.9	142	433	246	34	542	13	244	33	640	9	208	29	525	8	1715
LWEC	7/6/2016	1730	0.9	117	429	244	34	618	0	232	33	616	12	202	29	453	3	1730
LWEC	7/6/2016	1745	0.9	115	431	260	35	648	0	246	33	644	0	194	26	342	2	1745
LWEC	7/6/2016	1800	0.9	.104	429	240	33	490	1	240	33	654	0	196	25	488	7	1800
LWEC	7/6/2016	1815	1.0	.091	428	248	34	648	3	240	33	650	0	264	28	552	6	1815
LWEC	7/6/2016	1830	1.0	.104	427	266	37	550	1	240	33	636	3	204	29	484	5	1830
LWEC	7/6/2016	1845	1.1	.125	430	240	35	648	0	238	32	626	3	194	29	530	7	1845
LWEC	7/6/2016	1900	1.0	.118	433	248	37	616	10	246	33	494	3	212	28	536	8	1900
LWEC	7/6/2016	1915	1.3	.106	432	258	35	650	1	246	32	654	0	210	29	542	0	1915
LWEC	7/6/2016	1930	1.3	.089	427	272	37	650	1	262	33	644	0	210	29	526	5	1930
LWEC	7/6/2016	1945																1945
LWEC	7/6/2016	2000																2000

1231 1st test done

LWEC	DATE:	7/6/2016	
TIME	WOOD CHIPS TOTALIZER	RAIL TIES TOTALIZER	CDW TOTALIZER/RAIL TIES
	RECLAIMER #2	RECLAIMER #3	RECLAIMER #1
0900	92.49	101.14	16.72
0948	108.99	103.70	20.06
1000	—	105.14	~~[illegible]~~
1014	—	107.59	27.15
1055	—	—	35.50
1230	128.28	123.58	46.53
1315	128.28	129.00	57.03

— end of 1st test (handwritten beside the 1230 row)

7-6-16 [signature] (Plant oper.)

PROCESS OPERATING DATA LOG SHEET FOR EMISSIONS TESTING

Taken by: Bruce Rocha 7-7-16 Asst operator

POWER BOILERS--RECOMENDED EVERY 15 MINUTES; START 15 MIN B4 TEST, AND CONTINUE 15 MIN AFTER TEST

Date: 7-7-16	Start Time	Stop Time	FUEL STORAGE BUILDING						Rail Ties			TDF BIN			Main Belt	Oxygen Levels		Production Rates		Fan	Air
	0840 1056 1513 1742	1055 1450 1704 1926	Bin #1 Fuel In place	Rake Speed	TPH	Bin #2 Fuel In place	Rake Speed	TPH	Bin #3 Fuel in place	Rake Speed	TPH	Screw Speed	Totalizer	TPH Rate (if TDF)	Main Fuel belt	BOILER O2	STACK O2, From CEM	STEAMING RATE	MW (specify gross or net)	ID Fan Load	Air Flow
Plant	DATE	TIME (use military time)	R/R Ties Totalizer	SPECIFY UNITS %		Wood Chips Totalizer	SPECIFY UNITS %		R/R Ties Totalizer	SPECIFY UNITS %		SPECIFY UNITS %			Totalizer	% (specify wet or dry) [wet circled]	% (specify wet or dry) [dry circled]	KPPH	[gross circled]	%	%
LWEC	7/7/2016	800	11.63	10		70.13	10		98.91	10		12	8.56		174.73	9.5	6.7	194000	17.05	92.9	70
LWEC	7/7/2016	815	6.33	12		70.13	11		96.35	12		8	8.84		181.00	10.0	NA	191000	17.20	92.3	76
LWEC	7/7/2016	830	13.87	12		70.13	11		96.35	12		8	9.00		185.79	10.1	8.1	191000	17.11	94.9	75
LWEC	7/7/2016	845	19.67	11		70.15	10		96.35	11		8	9.22		192.57	10.1	6.9	189000	17.16	89.6	74
LWEC	7/7/2016	900	20.47	11		70.15	10		101.10	11		8	9.41		198.48	9.8	5.8	186000	17.25	82.2	75
LWEC	7/7/2016	915	27.00	11		70.13	10		101.46	11		8	9.70		204.89	10.4	7.3	190000	17.05	96.3	75
LWEC	7/7/2016	930	28.19	11		70.13	10		104.55	11		8	9.96		210.92	10.2	8.2	190000	17.07	89.1	75
LWEC	7/7/2016	945	28.19	11		76.44	16		106.54	11		8	10.10		215.91	10.0	6.9	196000	17.15	96.1	75
LWEC	7/7/2016	1000	28.19	14		81.95	14		106.54	14		8	10.30		221.58	10.3	7.8	194000	17.05	94.9	74
LWEC	7/7/2016	1015	28.13	11		96.16	10		106.54	11		8	10.56		229.36	10.0	7.5	194000	17.09	94.5	74
LWEC	7/7/2016	1030	32.25	11		96.16	10		106.54	11		8	10.76		236.08	9.8	6.6	193000	17.07	86.1	72
LWEC	7/7/2016	1045	36.35	10		96.16	9		107.31	10		8	11.00		244.67	9.9	6.7	193000	17.08	87.8	74
LWEC	7/7/2016	1100	36.00	10		96.16	9		109.84	10		8	11.29		246.82	10.2	7.6	193000	17.00	87.7	70
LWEC	7/7/2016	1115	40.35	11		96.16	10		109.84	11		8	11.46		251.87	10.3	7.4	195000	17.09	95.4	76
LWEC	7/7/2016	1130	45.38	12		96.16	11		109.82	12		8	11.66		257.70	10.6	7.7	194000	17.05	97.5	76
LWEC	7/7/2016	1145	49.33	10		96.16	10		110.63	10		8	11.88		265.70	10.4	9.2	193000	17.03	92.3	73
LWEC	7/7/2016	1200	49.90	11		96.16	10		113.50	11		8	12.08		270.91	10.0	6.5	194000	17.11	95.3	72
LWEC	7/7/2016	1215	49.90	12		96.16	11		117.74	12		8	12.32		277.47	10.2	7.2	191000	17.17	86.6	76
LWEC	7/7/2016	1230	50.34	12		96.16	11		124.70	12		8	12.52		283.38	10.1	7.1	194000	17.07	98.1	72
LWEC	7/7/2016	1245	55.18	12		96.16	11		124.70	12		8	12.74		289.89	10.5	8.9	195000	17.05	94.5	75
LWEC	7/7/2016	1300	60.97	10		96.16	9		124.70	10		8	12.96		296.34	10.2	7.3	193000	17.12	86.5	73
LWEC	7/7/2016	1315	61.79	10		105.91	10		124.70	10		8	13.20		301.98	10.1	7.1	193000	17.15	85.9	74
LWEC	7/7/2016	1330	61.79	11		116.21	10		124.70	11		8	13.40		306.46	10.6	8.0	195000	17.06	94.1	74
LWEC	7/7/2016	1345	61.79	11		122.82	10		145.30	11		8	13.62		311.22	10.5	7.6	191000	17.11	86.8	78
LWEC	7/7/2016	1400	64.64	11		122.82	10		128.11	11		8	13.82		318.49	10.5	8.2	194000	17.00	89.7	73
LWEC	7/7/2016	1415	68.64	11		122.82	10		128.11	11		8	14.06		326.08	10.0	7.0	194000	17.11	91.6	74
LWEC	7/7/2016	1430	74.96	11		122.82	10		128.11	11		8	14.30		332.26	9.9	6.4	193000	17.16	90.1	74
LWEC	7/7/2016	1445	77.64	11		122.82	10		130.38	11		8	14.52		338.47	10.2	8.2	193000	17.06	89.2	75
LWEC	7/7/2016	1500	77.64	11		122.82	10		136.38	11		8	14.72		344.27	10.0	7.0	193000	17.13	88.0	71
LWEC	7/7/2016	1515	80.64	11		122.82	10		140.70	11		8	14.94		350.27	10.0	7.1	194000	17.07	93.1	72
LWEC	7/7/2016	1530	85.55	10		122.82	9		140.70	10		8	15.16		356.20	10.0	7.3	194000	17.08	89.4	73
LWEC	7/7/2016	1545	88.22	10		133.83	9		143.81	10		8	15.40		361.66	10.2	7.5	191000	17.06	84.8	75
LWEC	7/7/2016	1600	88.22	10		146.98	9		145.82	10		8	15.60		366.18	10.4	7.7	193000	17.05	90.7	75
LWEC	7/7/2016	1615	88.22	11		148.27	10		145.82	11		8	15.84		372.30	10.8	9.7	194000	17.02	90.2	71
LWEC	7/7/2016	1630	88.22	11		149.70	10		146.77	11		8	16.04		377.11	10.5	7.9	193000	17.00	90.0	74
LWEC	7/7/2016	1645	90.41	11		149.70	10		148.88	11		8	16.24		384.64	10.3	7.5	191000	17.10	89.8	73
LWEC	7/7/2016	1700	94.98	11		149.70	10		149.69	11		8	16.46		390.62	10.1	6.9	192000	17.12	89.5	73
LWEC	7/7/2016	1715	100.14	10		149.70	9		149.69	10		8	16.70		397.26	9.9	7.4	193000	17.11	88.8	73
LWEC	7/7/2016	1730	100.14	10		149.70	9		149.67	10		8	16.92		404.87	9.9	6.8	195000	17.17	90.1	74
LWEC	7/7/2016	1745	100.18	11		149.70	10		149.69	11		8	17.14		408.80	9.4	7.5	195000	17.00	90.5	79
LWEC	7/7/2016	1800	100.18	13		149.70	12		151.49	12		8	17.36		413.13	10.2	8.0	194000	17.10	91.0	74
LWEC	7/7/2016	1815	100.74	12		149.70	11		157.32	12		8	17.56		420.19	10.0	6.7	193000	17.19	90.3	78
LWEC	7/7/2016	1830	105.58	11		149.70	10		157.32	11		8	17.80		428.30	10.1	7.0	193000	17.05	94.0	77
LWEC	7/7/2016	1845	111.87	11		149.70	9		157.32	10		8	18.02		433.50	9.4	6.2	194000	17.17	90.9	74
LWEC	7/7/2016	1900	116.99	10		149.70	9		158.19	10		8	18.21		439.05	10.4	7.0	193000	17.17	89.8	72
LWEC	7/7/2016	1915	117.60	10		150.10	9		161.90	10		8	18.46		445.16	9.7	6.0	210000	17.40	92.0	77
LWEC	7/7/2016	1930	117.60	10		161.90	10		161.66	10		8	18.64		449.70	10.4	7.7	194000	17.20	92.2	77
LWEC	7/7/2016	1945	121.64	10		162.90	9		164.22	10		8	18.73		457.34	10.0	7.0	194000	17.10	88.0	76
LWEC	7/7/2016	2000																			

PROCESS OPERATING DATA LOG SI

Taken by: Terry Ludwall 7-7-16 (Plant oper.)

POWER BOILERS--RECOMENDED E

	Start Time	Stop Time	Stack Monitors			ESP POWER DATA				ESP POWER DATA				ESP POWER DATA				
7-7-16	0940 1056 1513 1542	1055 1450 1704 1926	OPACITY	CO	Flue Gas Temp	Primary	ESP Field 1 (Inlet)	ESP Field 1 (Inlet)	Spark Rate	Primary	ESP Field 2 (Center)	ESP Field 2 (Center)	Spark Rate	Primary	ESP Field 3 (Outlet)	ESP Field 3 (Outlet)	Spark Rate	TIME
Plant	DATE	TIME (use military time)	%	lb/mmbtu	(Precip Gas Out)	Voltage	Secondary kV	Secondary mA	SPM	Voltage	Secondary kV	Secondary mA	SPM	Voltage	Secondary kV	Secondary mA	SPM	Use military time
LWEC	7/7/2016	800	1.0	101	416	272	37	644	3	248	33	648	0	216	30	536	0	800
LWEC	7/7/2016	815	2.4	113	429	254	34	648	25	258	34	626	9	216	29	536	1	815
LWEC	7/7/2016	830	0.9	162	430	254	35	644	1	248	35	644	13	210	29	526	0	830
LWEC	7/7/2016	845	1.0	146	431	266	36	644	0	246	33	636	0	203	29	515	0	845
LWEC	7/7/2016	900	1.1	120	429	262	36	658	1	246	33	568	0	208	29	540	2	900
LWEC	7/7/2016	915	0.9	130	429	258	34	650	3	244	33	650	6	204	29	532	1	915
LWEC	7/7/2016	930	0.8	097	430	260	35	648	0	248	33	630	8	208	29	532	3	930
LWEC	7/7/2016	945	1.0	123	429	258	37	596	1	246	33	612	8	203	27	536	1	945
LWEC	7/7/2016	1000	1.4	104	431	236	31	582	21	234	27	520	19	198	29	496	14	1000
LWEC	7/7/2016	1015	0.9	119	430	254	34	650	0	244	33	648	8	210	29	542	1	1015
LWEC	7/7/2016	1030	0.9	109	429	266	36	648	1	244	33	644	0	212	29	523	1	1030
LWEC	7/7/2016	1045	0.9	101	431	290	35	636	1	241	33	641	0	210	29	500	0	1045
LWEC	7/7/2016	1100	0.9	135	427	250	33	640	1	244	33	644	4	212	30	522	0	1100
LWEC	7/7/2016	1115	1.0	144	433	268	36	654	5	244	33	648	1	201	29	542	3	1115
LWEC	7/7/2016	1130	0.9	145	431	262	35	644	4	243	33	656	1	204	29	490	4	1130
LWEC	7/7/2016	1145	0.9	164	433	202	29	338	4	238	37	634	1	204	29	516	1	1145
LWEC	7/7/2016	1200	0.9	120	432	272	37	606	4	244	33	646	13	203	29	540	0	1200
LWEC	7/7/2016	1215	1.1	165	433	269	36	654	3	248	32	648	0	196	28	434	1	1215
LWEC	7/7/2016	1230	1.0	169	429	266	36	648	1	240	32	650	0	204	28	509	4	1230
LWEC	7/7/2016	1245	1.6	166	433	245	34	636	13	232	30	580	33	210	29	542	3	1245
LWEC	7/7/2016	1300	0.9	136	432	254	34	610	0	249	33	654	6	193	27	535	8	1300
LWEC	7/7/2016	1315	1.0	117	426	260	35	648	4	240	32	640	4	193	28	470	4	1315
LWEC	7/7/2016	1330	1.1	140	429	239	32	424	11	232	31	540	21	188	27	352	5	1330
LWEC	7/7/2016	1345	0.9	116	431	260	35	626	3	239	32	612	21	186	26	320	11	1345
LWEC	7/7/2016	1400	0.9	127	432	260	35	650	1	244	33	644	0	196	28	482	1	1400
LWEC	7/7/2016	1415	0.9	120	432	259	35	616	1	244	33	636	1	201	29	536	2	1415
LWEC	7/7/2016	1430	0.9	120	431	244	33	641	4	244	33	644	1	205	29	532	1	1430
LWEC	7/7/2016	1445	0.9	130	431	259	34	650	3	244	33	643	4	205	29	536	3	1445
LWEC	7/7/2016	1500	1.9	110	431	263	36	676	3	244	33	650	2	191	27	369	6	1500
LWEC	7/7/2016	1515	0.9	106	431	262	35	650	11	246	33	650	2	202	29	456	6	1515
LWEC	7/7/2016	1530	1.1	114	431	246	33	644	5	259	33	532	22	204	29	533	8	1530
LWEC	7/7/2016	1545	1.0	118	430	274	37	618	2	244	33	650	15	203	29	526	7	1545
LWEC	7/7/2016	1600	1.2	130	429	266	35	466	5	244	33	644	22	196	28	542	13	1600
LWEC	7/7/2016	1615	1.2	136	435	194	33	650	9	219	30	503	35	190	26	518	13	1615
LWEC	7/7/2016	1630	1.1	117	430	265	36	644	1	238	32	630	17	187	27	316	3	1630
LWEC	7/7/2016	1645	1.5	123	432	260	35	650	0	244	33	648	0	197	26	566	6	1645
LWEC	7/7/2016	1700	1.0	111	433	266	36	650	2	244	33	648	1	204	28	499	1	1700
LWEC	7/7/2016	1715	0.9	165	431	260	35	650	0	240	32	650	0	209	28	532	2	1715
LWEC	7/7/2016	1730	1.1	111	431	266	36	648	3	241	33	648	2	216	25	528	1	1730
LWEC	7/7/2016	1745	1.1	126	429	262	36	649	2	216	33	648	9	216	27	536	2	1745
LWEC	7/7/2016	1800	1.1	126	432	252	33	512	18	248	33	650	14	219	27	542	2	1800
LWEC	7/7/2016	1815	1.1	169	434	264	37	630	6	244	33	650	9	210	27	543	1	1815
LWEC	7/7/2016	1830	1.1	165	432	271	37	650	6	244	33	650	5	205	24	532	4	1830
LWEC	7/7/2016	1845	1.1	130	432	272	36	650	1	246	33	654	6	208	25	546	4	1845
LWEC	7/7/2016	1900	1.2	111	429	262	36	650	10	234	32	636	26	219	24	532	12	1900
LWEC	7/7/2016	1915	1.2	121	431	268	37	654	14	235	32	676	14	216	25	532	3	1915
LWEC	7/7/2016	1930	1.1	111	429	290	36	653	9	240	32	649	9	192	27	497	3	1930
LWEC	7/7/2016	1945	1.0	121	431	262	35	648	9	241	32	626	12	244	24	27 332	1	1945
LWEC	7/7/2016	2000																2000

Terry Lundall (Plant Oper.)

LWEC	DATE:	7/7/2016	
TIME	WOOD CHIPS TOTALIZER	RAIL TIES TOTALIZER	CDW TOTALIZER/RAIL TIES
	RECLAIMER #2	RECLAIMER #3	RECLAIMER #1
0827	70.13	96.35	17.85
0840	70.13	96.35	18.42

← mark Reclaimers
← start test

L'Anse Warden Electric Company

Fuel Moisture Testing

July 2016		Samples From Main Fuel Belt into Plant						Samples From Direct Loads to Plant				Samples From FAF - Wood Chips & Ties			
		Wood Chips			Railroad Ties			Wood Chips							
Date	Crew	Test 1	Test 2	Avg	Test 1	Test 2	Avg	Source	Test 1	Test 2	Avg	Truck Dumper	Loading Bin	Chip Pile	Ground Ties
07/01/16		38.7	58.3		34.3	31.0									
07/02/16		45.44	53.24		32.3	28.81									
07/03/16		37.16	35.03		30.8	26.5									
07/04/16		40.3	37.40		26.0	27									
07/05/16	1	42	41	41.5	28	40	34								
07/06/16	1	49.6	40.8	[illegible] 44.8	28.6	29.7	29.15								
07/07/16	1	48.[illegible]	45	46.5	35.[illegible]	32	33.5								
07/08/16															
07/09/16															
07/10/16															
07/11/16															
07/12/16															
07/13/16															
07/14/16															
07/15/16															
07/16/16															
07/17/16															
07/18/16															
07/19/16															
07/20/16															
07/21/16															
07/22/16															
07/23/16															
07/24/16															
07/25/16															
07/26/16															
07/27/16															
07/28/16															
07/29/16															
07/30/16															
07/31/16															

WC Test 3 43.89

10/22/13 Monthly A #DIV/0! Monthly A #DIV/0! Monthly A #DIV/0! Monthly A #DIV/0!

Fuel Feed Rates
USEPA 114 Compliance Testing
L'Anse Warden Electric Company, LLC

7/6/2016

Bin	Contents	Start Tons	End Tons	Delta Tons	Start Time	End Time	Delta Time	Min/60	Delta Time (Hrs)	Tons/Hr
1	RR Ties	16.72	112.35	95.63	9:00	19:07	10:07	0.116667	10.12	9.5
2	Wood Chips	92.49	195.56	103.07	9:00	20:08	11:08	0.133333	11.13	9.3
3	RR Ties	101.14	160.42	59.28	9:00	19:07	10:07	0.116667	10.12	5.9

Tons/Hr RR Ties (Wet)	Tons/Hr Wood Chips (Wet)	RR Ties to Wood Chips Ratio (Wet)
15.3	9.3	1.65
Avg RR Ties Moisture	**Avg Wood Chips Moisture**	**RR Ties to Wood Chips Ratio (Dry)**
30.56%	46.33%	2.14

7/7/2016

Bin	Contents	Start Tons	End Tons	Delta Tons	Start Time	End Time	Delta Time	Min/60	Delta Time (Hrs)	Tons/Hr
1	RR Ties	17.85	119.35	101.5	8:27	19:35	11:08	0.133333	11.13	9.1
2	Wood Chips	70.13	158.65	88.52	8:27	20:10	11:43	0.716667	11.72	7.6
3	RR Ties	96.35	164.02	67.67	8:27	19:36	11:09	0.15	11.15	6.1

Tons/Hr RR Ties (Wet)	Tons/Hr Wood Chips (Wet)	RR Ties to Wood Chips Ratio (Wet)
15.2	7.6	2.01
Avg RR Ties Moisture	**Avg Wood Chips Moisture**	**RR Ties to Wood Chips Ratio (Dry)**
29.07%	42.45%	2.48

Notes:
% = Percent
Avg = Average
Hr/Hrs = Hour/Hours
Min = Minutes
RR Ties = Railroad Ties
Moisture contents from laboratory analysis results.

APPENDIX D
LABORATORY REPORTS

D.1 PM, Metals, HCl, and Cl_2

D.2 PCDD/PCDF and Cresol Isomers

D.3 SSAS

D.1 PM, METALS, HCl AND Cl_2

Maxxam
A Bureau Veritas Group Company

Your Project #: 14464.007.004
Site Location: LWEC, L'ANSE, MICHIGAN

Attention:Ken Hill
Weston Solutions Inc
1400 Weston Way
West Chester, PA
USA 19380

Report Date: 2016/07/19
Report #: R4071890
Version: 3 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6E1777
Received: 2016/07/08, 20:00

Sample Matrix: Stack Sampling Train
Samples Received: 25

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Extractable Condensables (M202)	5	2016/07/12	2016/07/18	BRL SOP-00118	EPA 202 m
Non Extractable Condensibles (M202)	5	2016/07/13	2016/07/18	BRL SOP-00118 / BRL SOP-00109	EPA 202 m
Halogens in NaOH Impinger	5	2016/07/12	2016/07/12	BRL SOP-00108	EPA 26A m
Hydrogen Halides in H2SO4 Imp.	6	2016/07/11	2016/07/11	BRL SOP-00108	EPA 26A m
Metals B.H. in H2O2/HNO3 Imp.(6020A)	1	2016/07/12	2016/07/14	BRL SOP-00103 / BRL SOP-00102	EPA M29/CARB 436 m
Metals in Combined Train (6020A)	4	2016/07/12	2016/07/14	BRL SOP-00103/ BRL SOP-00102	EPA M29/CARB 436 m
Metals F.H. in Filter + Rinses (6020A)	1	2016/07/12	2016/07/14	BRL SOP-00103/ BRL SOP-00102	EPA M29/CARB 436 m
>10um Particulates in Rinse	3	2016/07/13	2016/07/15	BRL SOP-00109	EPA M201A/OTM-027 m
2.5-10um Particulates in Rinse	3	2016/07/13	2016/07/15	BRL SOP-00109	EPA M201A/OTM-027 m
2.5 um Particulates on Filter	4	N/A	2016/07/12	BRL SOP-00109	EPA M201A/OTM-027 m
<2.5um Particulates in Rinse	3	2016/07/13	2016/07/15	BRL SOP-00109	EPA M201A/OTM-027 m
Particulates/Acetone Rinse (M5/315/M201)	5	2016/07/13	2016/07/14	BRL SOP-00109	EPA 5/315 m
Particulates/Filter (M5/315/NJATM1/M201)	4	N/A	2016/07/12	BRL SOP-00109	EPA 5/315/NJATM1 m
Final Volume of Acetone Probe Rinse	5	N/A	2016/07/14	BRL SOP-00109	
Final Volume of Acetone Probe Rinse	3	N/A	2016/07/15	BRL SOP-00109	
Volume of Sulfuric Acid Impinger	5	N/A	2016/07/11		
Volume of Sodium Hydroxide Impinger	5	N/A	2016/07/12		
Weight of Solvent from Impingers	5	N/A	2016/07/18		
Weight of Water from Impingers	5	N/A	2016/07/18		

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

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Maxxam
A Bureau Veritas Group Company

Your Project #: 14464.007.004
Site Location: LWEC, L'ANSE, MICHIGAN

Attention:Ken Hill
Weston Solutions Inc
1400 Weston Way
West Chester, PA
USA 19380

Report Date: 2016/07/19
Report #: R4071890
Version: 3 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6E1777
Received: 2016/07/08, 20:00

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Clayton Johnson, Project Manager - Air Toxics, Source Evaluation
Email: CJohnson@maxxam.ca
Phone# (905)817-5769

==

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Maxxam Job #: B6E1777
Report Date: 2016/07/19

Weston Solutions Inc
Client Project #: 14464.007.004
Site Location: LWEC, L'ANSE, MICHIGAN

EPA M201A - PARTICULATES (STACK SAMPLING TRAIN)

Maxxam ID		CRF934	CRF936	CRF937	CRF950			
Sampling Date		2016/07/07	2016/07/07	2016/07/07	2016/07/07			
	UNITS	M201A- SB	M201A- R2	M201A- R3	M201A- R4	RDL	MDL	QC Batch
> 10 Particulate Weight in Acetone Rinse	mg	N/A	5.3	3.1	3.6	0.5	0.1	4576454
< 2.5 Particulate Weight in Acetone Rinse	mg	N/A	6.5	3.0	3.6	0.5	0.5	4576393
2.5 - 10 Particulate Weight in Acetone Rinse	mg	N/A	2.4	2.7	4.4	0.5	0.5	4576450
< 2.5 Particulate Weight on Filter	mg	0.80	1.00	<0.30	<0.30	0.30	0.30	4574320
Acetone Rinse Volume	ml	N/A	120	160	140	1	1	4576399
Acetone Rinse Volume (10)	ml	N/A	70	81	85	1	N/A	4576399
Acetone Rinse Volume (2.5 - 10)	ml	N/A	100	66	140	1	N/A	4576399
Acetone Rinse Volume (2.5)	ml	N/A	190	200	210	1	N/A	4576399

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

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Maxxam Job #: B6E1777
Report Date: 2016/07/19

Weston Solutions Inc
Client Project #: 14464.007.004
Site Location: LWEC, L'ANSE, MICHIGAN

EPA M202 CONDENSIBLE PM (STACK SAMPLING TRAIN)

Maxxam ID		CRF938	CRF939	CRF941	CRF942	CRF951			
Sampling Date		2016/07/07	2016/07/07	2016/07/07	2016/07/07	2016/07/07			
	UNITS	M202- SB	M202- BT	M202- R2	M202- R3	M202- R4	RDL	MDL	QC Batch
Weight	g	200	280	240	290	260	0.1	0.1	4574709
Weight of Solvent	g	130	120	120	120	130	0.1	N/A	4574699
Inorganic Condensibles	mg	2.4	3.2	8.8	22	20	0.5	0.1	4576561
Organic Condensibles	mg	<1.0	2.6	2.8	3.6	1.7	1.0	0.20	4574675

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

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Maxxam Job #: B6E1777
Report Date: 2016/07/19

Weston Solutions Inc
Client Project #: 14464.007.004
Site Location: LWEC, L'ANSE, MICHIGAN

EPA M26A HYDROGEN HALIDES AND HALOGENS (STACK SAMPLING TRAIN)

Maxxam ID		CRF920	CRF921	CRF922	CRF923	CRF923			
Sampling Date		2016/07/07	2016/07/07	2016/07/07	2016/07/06	2016/07/06			
	UNITS	M26A- SB H2SO4	M26A- SB DI	M26A- SB NAOH	M26A- R1 H2SO4	M26A- R1 H2SO4 Lab-Dup	RDL	MDL	QC Batch
Sulfuric Acid Volume	ml	225	163	N/A	612	N/A	1	1	4572990
Sodium Hydroxide Volume	ml	N/A	163	168	N/A	N/A	1	1	4575109
Chlorine	ug	N/A	<1200	<1200	N/A	N/A	1200	130	4575114
Hydrochloric Acid	ug	<250	<250	N/A	8200	8200	250	75	4573698

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

Maxxam ID		CRF924	CRF925	CRF926	CRF926	CRF927			
Sampling Date		2016/07/06	2016/07/07	2016/07/06	2016/07/06	2016/07/06			
	UNITS	M26A- R2 H2SO4	M26A- R3 H2SO4	M26A- R1 NAOH	M26A- R1 NAOH Lab-Dup	M26A- R2 NAOH	RDL	MDL	QC Batch
Sulfuric Acid Volume	ml	562	563	N/A	N/A	N/A	1	1	4572990
Sodium Hydroxide Volume	ml	N/A	N/A	295	N/A	308	1	1	4575109
Chlorine	ug	N/A	N/A	<1200	<1200	<1200	1200	130	4575114
Hydrochloric Acid	ug	8800	7400	N/A	N/A	N/A	250	75	4573698

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

Maxxam ID		CRF933			
Sampling Date		2016/07/07			
	UNITS	M26A- R3 NAOH	RDL	MDL	QC Batch
Sodium Hydroxide Volume	ml	313	1	1	4575109
Chlorine	ug	<1200	1200	130	4575114

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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EPA M29 METALS (COMBINED TRAIN)

Maxxam ID		CRF943	CRF944	CRF944	CRF945	CRF946			
Sampling Date		2016/07/07	2016/07/06	2016/07/06	2016/07/07	2016/07/07			
	UNITS	M5/29- SB	M5/29- R1	M5/29- R1 Lab-Dup	M5/29- R2	M5/29- R3	RDL	MDL	QC Batch
Combined Train Arsenic (As)	ug	<0.80	<0.80	<0.80	0.93	0.95	0.80	0.080	4578442
Combined Train Lead (Pb)	ug	0.50	8.18	8.05	7.12	7.95	0.40	0.040	4578442
Combined Train Manganese (Mn)	ug	1.8	11.6	11.6	20.8	20.8	1.5	0.10	4578442
Combined Train Nickel (Ni)	ug	2.0	9.8	10.0	5.1	6.0	1.0	0.20	4578442

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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EPA M5 PARTICULATE MATTER (PM)

Maxxam ID		CRF943	CRF944	CRF945	CRF946			
Sampling Date		2016/07/07	2016/07/06	2016/07/07	2016/07/07			
	UNITS	M5/29- SB	M5/29- R1	M5/29- R2	M5/29- R3	RDL	MDL	QC Batch
Acetone Rinse Particulate Weight in Acetone Rinse	mg	1.0	4.4	6.7	4.5	0.5	0.1	4576378
Front Half Particulate Weight on Filter	mg	0.50	2.00	7.00	4.90	0.30	0.060	4574313
Acetone Rinse Volume	ml	160	140	180	190	1	1	4576379

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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RESULTS OF ANALYSES OF STACK SAMPLING TRAIN

Maxxam ID		CRF934	CRF947			
Sampling Date		2016/07/07				
	UNITS	M201A- 5B	AUDIT-SSAS205-PEA1941	RDL	MDL	QC Batch
Acetone Rinse Particulate Weight in Acetone Rinse	mg	0.6	N/A	0.5	0.1	4576378
Acetone Rinse Volume	ml	120	N/A	1	1	4576379
Hydrochloric Acid	ug	N/A	39	0.50	0.15	4573698

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

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Maxxam Job #: B6E1777
Report Date: 2016/07/19

Weston Solutions Inc
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ELEMENTS BY ICP/MS (STACK SAMPLING TRAIN)

Maxxam ID		CRF948	CRF949			
Sampling Date						
	UNITS	AUDIT-SSAS205-PEA1945	AUDIT-SSAS205-PEA1948	RDL	MDL	QC Batch
Front Half Arsenic (As)	ug	21.8	N/A	0.80	0.080	4578361
Front Half Lead (Pb)	ug	22.2	N/A	0.40	0.040	4578361
Front Half Manganese (Mn)	ug	11.8	N/A	1.5	0.10	4578361
Front Half Nickel (Ni)	ug	22.7	N/A	1.0	0.20	4578361
Back Half Arsenic (As)	ug	N/A	0.563	0.0020	0.00040	4578356
Back Half Lead (Pb)	ug	N/A	1.20	0.0010	0.00040	4578356
Back Half Manganese (Mn)	ug	N/A	0.538	0.0020	0.00048	4578356
Back Half Nickel (Ni)	ug	N/A	1.16	0.0020	0.00048	4578356

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

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Maxxam Job #: B6E1777
Report Date: 2016/07/19

Weston Solutions Inc
Client Project #: 14464.007.004
Site Location: LWEC, L'ANSE, MICHIGAN

TEST SUMMARY

Maxxam ID: CRF920
Sample ID: M26A- SB H2SO4
Matrix: Stack Sampling Train

Collected: 2016/07/07
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hydrogen Halides in H2SO4 Imp.	IC/SPEC	4573698	2016/07/11	2016/07/11	Ann-Marie Stern
Volume of Sulfuric Acid Impinger		4572990	N/A	2016/07/11	Lang Le

Maxxam ID: CRF921
Sample ID: M26A- SB DI
Matrix: Stack Sampling Train

Collected: 2016/07/07
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Halogens in NaOH Impinger	IC/SPEC	4575114	2016/07/12	2016/07/12	Ann-Marie Stern
Hydrogen Halides in H2SO4 Imp.	IC/SPEC	4573698	2016/07/11	2016/07/11	Ann-Marie Stern
Volume of Sulfuric Acid Impinger		4572990	N/A	2016/07/11	Lang Le
Volume of Sodium Hydroxide Impinger		4575109	N/A	2016/07/12	Lang Le

Maxxam ID: CRF922
Sample ID: M26A- SB NAOH
Matrix: Stack Sampling Train

Collected: 2016/07/07
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Halogens in NaOH Impinger	IC/SPEC	4575114	2016/07/12	2016/07/12	Ann-Marie Stern
Volume of Sodium Hydroxide Impinger		4575109	N/A	2016/07/12	Lang Le

Maxxam ID: CRF923
Sample ID: M26A- R1 H2SO4
Matrix: Stack Sampling Train

Collected: 2016/07/06
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hydrogen Halides in H2SO4 Imp.	IC/SPEC	4573698	2016/07/11	2016/07/11	Ann-Marie Stern
Volume of Sulfuric Acid Impinger		4572990	N/A	2016/07/11	Lang Le

Maxxam ID: CRF923 Dup
Sample ID: M26A- R1 H2SO4
Matrix: Stack Sampling Train

Collected: 2016/07/06
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hydrogen Halides in H2SO4 Imp.	IC/SPEC	4573698	2016/07/11	2016/07/11	Ann-Marie Stern

Maxxam ID: CRF924
Sample ID: M26A- R2 H2SO4
Matrix: Stack Sampling Train

Collected: 2016/07/06
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hydrogen Halides in H2SO4 Imp.	IC/SPEC	4573698	2016/07/11	2016/07/11	Ann-Marie Stern
Volume of Sulfuric Acid Impinger		4572990	N/A	2016/07/11	Lang Le

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Maxxam Job #: B6E1777
Report Date: 2016/07/19

Weston Solutions Inc
Client Project #: 14464.007.004
Site Location: LWEC, L'ANSE, MICHIGAN

TEST SUMMARY

Maxxam ID: CRF925
Sample ID: M26A- R3 H2SO4
Matrix: Stack Sampling Train

Collected: 2016/07/07
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hydrogen Halides in H2SO4 Imp.	IC/SPEC	4573698	2016/07/11	2016/07/11	Ann-Marie Stern
Volume of Sulfuric Acid Impinger		4572990	N/A	2016/07/11	Lang Le

Maxxam ID: CRF926
Sample ID: M26A- R1 NAOH
Matrix: Stack Sampling Train

Collected: 2016/07/06
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Halogens in NaOH Impinger	IC/SPEC	4575114	2016/07/12	2016/07/12	Ann-Marie Stern
Volume of Sodium Hydroxide Impinger		4575109	N/A	2016/07/12	Lang Le

Maxxam ID: CRF926 Dup
Sample ID: M26A- R1 NAOH
Matrix: Stack Sampling Train

Collected: 2016/07/06
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Halogens in NaOH Impinger	IC/SPEC	4575114	2016/07/12	2016/07/12	Ann-Marie Stern

Maxxam ID: CRF927
Sample ID: M26A- R2 NAOH
Matrix: Stack Sampling Train

Collected: 2016/07/06
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Halogens in NaOH Impinger	IC/SPEC	4575114	2016/07/12	2016/07/12	Ann-Marie Stern
Volume of Sodium Hydroxide Impinger		4575109	N/A	2016/07/12	Lang Le

Maxxam ID: CRF933
Sample ID: M26A- R3 NAOH
Matrix: Stack Sampling Train

Collected: 2016/07/07
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Halogens in NaOH Impinger	IC/SPEC	4575114	2016/07/12	2016/07/12	Ann-Marie Stern
Volume of Sodium Hydroxide Impinger		4575109	N/A	2016/07/12	Lang Le

Maxxam ID: CRF934
Sample ID: M201A- SB
Matrix: Stack Sampling Train

Collected: 2016/07/07
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
2.5 um Particulates on Filter	BAL	4574320	N/A	2016/07/12	Brenda Moore
Particulates/Acetone Rinse (M5/315/M201)	BAL	4576378	2016/07/13	2016/07/14	Farag Farag
Final Volume of Acetone Probe Rinse		4576379	N/A	2016/07/14	Farag Farag

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Maxxam Job #: B6E1777
Report Date: 2016/07/19

Weston Solutions Inc
Client Project #: 14464.007.004
Site Location: LWEC, L'ANSE, MICHIGAN

TEST SUMMARY

Maxxam ID: CRF936
Sample ID: M201A- R2
Matrix: Stack Sampling Train

Collected: 2016/07/07
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
>10um Particulates in Rinse	BAL	4576454	2016/07/13	2016/07/15	Farag Farag
2.5-10um Particulates in Rinse	BAL	4576450	2016/07/13	2016/07/15	Farag Farag
2.5 um Particulates on Filter	BAL	4574320	N/A	2016/07/12	Brenda Moore
<2.5um Particulates in Rinse	BAL	4576393	2016/07/13	2016/07/15	Farag Farag
Final Volume of Acetone Probe Rinse		4576399	N/A	2016/07/15	Farag Farag

Maxxam ID: CRF937
Sample ID: M201A- R3
Matrix: Stack Sampling Train

Collected: 2016/07/07
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
>10um Particulates in Rinse	BAL	4576454	2016/07/13	2016/07/15	Farag Farag
2.5-10um Particulates in Rinse	BAL	4576450	2016/07/13	2016/07/15	Farag Farag
2.5 um Particulates on Filter	BAL	4574320	N/A	2016/07/12	Brenda Moore
<2.5um Particulates in Rinse	BAL	4576393	2016/07/13	2016/07/15	Farag Farag
Final Volume of Acetone Probe Rinse		4576399	N/A	2016/07/15	Farag Farag

Maxxam ID: CRF938
Sample ID: M202- SB
Matrix: Stack Sampling Train

Collected: 2016/07/07
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Extractable Condensables (M202)	BAL	4574675	2016/07/12	2016/07/18	Muhammad M Rahman
Non Extractable Condensibles (M202)	BAL	4576561	2016/07/13	2016/07/18	Muhammad M Rahman
Weight of Solvent from Impingers		4574699	N/A	2016/07/18	Muhammad M Rahman
Weight of Water from Impingers		4574709	N/A	2016/07/18	Muhammad M Rahman

Maxxam ID: CRF939
Sample ID: M202- BT
Matrix: Stack Sampling Train

Collected: 2016/07/07
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Extractable Condensables (M202)	BAL	4574675	2016/07/12	2016/07/18	Muhammad M Rahman
Non Extractable Condensibles (M202)	BAL	4576561	2016/07/13	2016/07/18	Muhammad M Rahman
Weight of Solvent from Impingers		4574699	N/A	2016/07/18	Muhammad M Rahman
Weight of Water from Impingers		4574709	N/A	2016/07/18	Muhammad M Rahman

Maxxam ID: CRF941
Sample ID: M202- R2
Matrix: Stack Sampling Train

Collected: 2016/07/07
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Extractable Condensables (M202)	BAL	4574675	2016/07/12	2016/07/18	Muhammad M Rahman
Non Extractable Condensibles (M202)	BAL	4576561	2016/07/13	2016/07/18	Muhammad M Rahman
Weight of Solvent from Impingers		4574699	N/A	2016/07/18	Muhammad M Rahman
Weight of Water from Impingers		4574709	N/A	2016/07/18	Muhammad M Rahman

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TEST SUMMARY

Maxxam ID: CRF942
Sample ID: M202- R3
Matrix: Stack Sampling Train

Collected: 2016/07/07
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Extractable Condensables (M202)	BAL	4574675	2016/07/12	2016/07/18	Muhammad M Rahman
Non Extractable Condensibles (M202)	BAL	4576561	2016/07/13	2016/07/18	Muhammad M Rahman
Weight of Solvent from Impingers		4574699	N/A	2016/07/18	Muhammad M Rahman
Weight of Water from Impingers		4574709	N/A	2016/07/18	Muhammad M Rahman

Maxxam ID: CRF943
Sample ID: M5/29- SB
Matrix: Stack Sampling Train

Collected: 2016/07/07
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Combined Train (6020A)	ICP1/MS	4578442	2016/07/12	2016/07/14	Nan Raykha
Particulates/Acetone Rinse (M5/315/M201)	BAL	4576378	2016/07/13	2016/07/14	Farag Farag
Particulates/Filter (M5/315/NJATM1/M201)	BAL	4574313	N/A	2016/07/12	Brenda Moore
Final Volume of Acetone Probe Rinse		4576379	N/A	2016/07/14	Farag Farag

Maxxam ID: CRF944
Sample ID: M5/29- R1
Matrix: Stack Sampling Train

Collected: 2016/07/06
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Combined Train (6020A)	ICP1/MS	4578442	2016/07/12	2016/07/14	Nan Raykha
Particulates/Acetone Rinse (M5/315/M201)	BAL	4576378	2016/07/13	2016/07/14	Farag Farag
Particulates/Filter (M5/315/NJATM1/M201)	BAL	4574313	N/A	2016/07/12	Brenda Moore
Final Volume of Acetone Probe Rinse		4576379	N/A	2016/07/14	Farag Farag

Maxxam ID: CRF944 Dup
Sample ID: M5/29- R1
Matrix: Stack Sampling Train

Collected: 2016/07/06
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Combined Train (6020A)	ICP1/MS	4578442	2016/07/14	2016/07/14	Nan Raykha

Maxxam ID: CRF945
Sample ID: M5/29- R2
Matrix: Stack Sampling Train

Collected: 2016/07/07
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Combined Train (6020A)	ICP1/MS	4578442	2016/07/12	2016/07/14	Nan Raykha
Particulates/Acetone Rinse (M5/315/M201)	BAL	4576378	2016/07/13	2016/07/14	Farag Farag
Particulates/Filter (M5/315/NJATM1/M201)	BAL	4574313	N/A	2016/07/12	Brenda Moore
Final Volume of Acetone Probe Rinse		4576379	N/A	2016/07/14	Farag Farag

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TEST SUMMARY

Maxxam ID: CRF946
Sample ID: M5/29- R3
Matrix: Stack Sampling Train

Collected: 2016/07/07
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Combined Train (6020A)	ICP1/MS	4578442	2016/07/12	2016/07/14	Nan Raykha
Particulates/Acetone Rinse (M5/315/M201)	BAL	4576378	2016/07/13	2016/07/14	Farag Farag
Particulates/Filter (M5/315/NJATM1/M201)	BAL	4574313	N/A	2016/07/12	Brenda Moore
Final Volume of Acetone Probe Rinse		4576379	N/A	2016/07/14	Farag Farag

Maxxam ID: CRF947
Sample ID: AUDIT-SSAS205-PEA1941
Matrix: Stack Sampling Train

Collected:
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hydrogen Halides in H2SO4 Imp.	IC/SPEC	4573698	2016/07/11	2016/07/11	Ann-Marie Stern

Maxxam ID: CRF948
Sample ID: AUDIT-SSAS205-PEA1945
Matrix: Stack Sampling Train

Collected:
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals F.H. in Filter + Rinses (6020A)	ICP1/MS	4578361	2016/07/12	2016/07/14	Nan Raykha

Maxxam ID: CRF949
Sample ID: AUDIT-SSAS205-PEA1948
Matrix: Stack Sampling Train

Collected:
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals B.H. in H2O2/HNO3 Imp.(6020A)	ICP1/MS	4578356	2016/07/12	2016/07/14	Nan Raykha

Maxxam ID: CRF950
Sample ID: M201A- R4
Matrix: Stack Sampling Train

Collected: 2016/07/07
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
>10um Particulates in Rinse	BAL	4576454	2016/07/13	2016/07/15	Farag Farag
2.5-10um Particulates in Rinse	BAL	4576450	2016/07/13	2016/07/15	Farag Farag
2.5 um Particulates on Filter	BAL	4574320	N/A	2016/07/12	Brenda Moore
<2.5um Particulates in Rinse	BAL	4576393	2016/07/13	2016/07/15	Farag Farag
Final Volume of Acetone Probe Rinse		4576399	N/A	2016/07/15	Farag Farag

Maxxam ID: CRF951
Sample ID: M202- R4
Matrix: Stack Sampling Train

Collected: 2016/07/07
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Extractable Condensables (M202)	BAL	4574675	2016/07/12	2016/07/18	Muhammad M Rahman
Non Extractable Condensibles (M202)	BAL	4576561	2016/07/13	2016/07/18	Muhammad M Rahman
Weight of Solvent from Impingers		4574699	N/A	2016/07/18	Muhammad M Rahman
Weight of Water from Impingers		4574709	N/A	2016/07/18	Muhammad M Rahman

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GENERAL COMMENTS

FILTERS : Untared filters were received.

Sample CRF936-01 : LFT Loose filter material in the petri dish

Sample CRF937-01 : LFT Loose filter material in the petri dish

Sample CRF938-01 : ORGANIC EXTRACTION : Whitish residue found in vial.
INORGANIC EXTRACTION : Whitish residue found in Teflon dish.

Sample CRF939-01 : ORGANIC EXTRACTION : Oily material found in vial.
INORGANIC EXTRACTION : Whitish residue found in Teflon dish.

Sample CRF941-01 : ORGANIC EXTRACTION : Oily material found in vial.
INORGANIC EXTRACTION : Brownish residue found in Teflon dish.

Sample CRF942-01 : ORGANIC EXTRACTION : Oily material found in vial.
INORGANIC EXTRACTION : Yellowishresidue found in Teflon dish.

Sample CRF944-01 : LFT Loose filter material in the petri dish

Sample CRF945-01 : LPC Loose particulate material in the petri dish
LFT Loose filter material in the petri dish

Sample CRF946-01 : LPC Loose particulate material in the petri dish
LFT Loose filter material in the petri dish

Sample CRF947-01 : Audit reported in mg/l

Sample CRF950-01 : LFT Loose filter material in the petri dish
DE Edges of the filter are frayed
FT Filter torn

Sample CRF951-01 : ORGANIC EXTRACTION : Oily material found in vial.
INORGANIC EXTRACTION : Brownish residue found in Teflon dish.

EPA M29 METALS (COMBINED TRAIN)

Metals in Combined Train (6020A): Post digestion duplicate and spike were done on sample CRF944.

ELEMENTS BY ICP/MS (STACK SAMPLING TRAIN)

Metals B.H. in H2O2/HNO3 Imp.(6020A): Data for this sample is reported in ug/mL.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
4573698	A_S	Matrix Spike(CRF923)	Hydrochloric Acid	2016/07/11		94	%	80 - 120
4573698	A_S	Spiked Blank	Hydrochloric Acid	2016/07/11		102	%	90 - 110
4573698	A_S	Method Blank	Hydrochloric Acid	2016/07/11	<250		ug	
4573698	A_S	RPD - Sample/Sample Dup	Hydrochloric Acid	2016/07/11	0.69		%	20
4574675	MOR	Spiked Blank	Organic Condensibles	2016/07/18		92	%	70 - 130
4574675	MOR	Method Blank	Organic Condensibles	2016/07/18	<1.0		mg	
4575114	A_S	Matrix Spike(CRF926)	Chlorine	2016/07/12		102	%	80 - 120
4575114	A_S	Spiked Blank	Chlorine	2016/07/12		101	%	90 - 110
4575114	A_S	Method Blank	Chlorine	2016/07/12	<1200		ug	
4575114	A_S	RPD - Sample/Sample Dup	Chlorine	2016/07/12	NC		%	20
4576378	FF	Method Blank	Acetone Rinse Particulate Weight in Acetone	2016/07/14	<0.5		mg	
4576393	FF	Method Blank	< 2.5 Particulate Weight in Acetone Rinse	2016/07/15	<0.5		mg	
4576450	FF	Method Blank	2.5 - 10 Particulate Weight in Acetone Rinse	2016/07/15	<0.5		mg	
4576454	FF	Method Blank	> 10 Particulate Weight in Acetone Rinse	2016/07/15	<0.5		mg	
4576561	MOR	Method Blank	Inorganic Condensibles	2016/07/18	<0.5		mg	
4578356	N_R	Spiked Blank	Back Half Arsenic (As)	2016/07/14		101	%	85 - 115
			Back Half Lead (Pb)	2016/07/14		106	%	85 - 115
			Back Half Manganese (Mn)	2016/07/14		103	%	85 - 115
			Back Half Nickel (Ni)	2016/07/14		101	%	85 - 115
4578356	N_R	Spiked Blank DUP	Back Half Arsenic (As)	2016/07/14		99	%	85 - 115
			Back Half Lead (Pb)	2016/07/14		107	%	85 - 115
			Back Half Manganese (Mn)	2016/07/14		101	%	85 - 115
			Back Half Nickel (Ni)	2016/07/14		102	%	85 - 115
4578356	N_R	RPD	Back Half Arsenic (As)	2016/07/14	2.1		%	20
			Back Half Lead (Pb)	2016/07/14	0.49		%	20
			Back Half Manganese (Mn)	2016/07/14	2.0		%	20
			Back Half Nickel (Ni)	2016/07/14	0.33		%	20
4578356	N_R	Method Blank	Back Half Arsenic (As)	2016/07/14	<0.0020		ug	
			Back Half Lead (Pb)	2016/07/14	<0.0010		ug	
			Back Half Manganese (Mn)	2016/07/14	<0.0020		ug	
			Back Half Nickel (Ni)	2016/07/14	<0.0020		ug	
4578361	N_R	Spiked Blank	Front Half Arsenic (As)	2016/07/14		100	%	85 - 115
			Front Half Lead (Pb)	2016/07/14		102	%	85 - 115
			Front Half Manganese (Mn)	2016/07/14		99	%	85 - 115
			Front Half Nickel (Ni)	2016/07/14		100	%	85 - 115
4578361	N_R	Spiked Blank DUP	Front Half Arsenic (As)	2016/07/14		99	%	85 - 115
			Front Half Lead (Pb)	2016/07/14		103	%	85 - 115
			Front Half Manganese (Mn)	2016/07/14		99	%	85 - 115
			Front Half Nickel (Ni)	2016/07/14		100	%	85 - 115
4578361	N_R	RPD	Front Half Arsenic (As)	2016/07/14	0.40		%	20
			Front Half Lead (Pb)	2016/07/14	1.2		%	20
			Front Half Manganese (Mn)	2016/07/14	0.093		%	20
			Front Half Nickel (Ni)	2016/07/14	0.51		%	20
4578361	N_R	Method Blank	Front Half Arsenic (As)	2016/07/14	<0.80		ug	
			Front Half Lead (Pb)	2016/07/14	<0.40		ug	
			Front Half Manganese (Mn)	2016/07/14	<1.5		ug	
			Front Half Nickel (Ni)	2016/07/14	<1.0		ug	
4578442	N_R	Matrix Spike(CRF944)	Combined Train Arsenic (As)	2016/07/14		97	%	70 - 130
			Combined Train Lead (Pb)	2016/07/14		104	%	70 - 130
			Combined Train Manganese (Mn)	2016/07/14		100	%	70 - 130
			Combined Train Nickel (Ni)	2016/07/14		101	%	70 - 130
4578442	N_R	Matrix Spike DUP(CRF944)	Combined Train Arsenic (As)	2016/07/14		95	%	70 - 130
			Combined Train Lead (Pb)	2016/07/14		104	%	70 - 130

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Combined Train Manganese (Mn)	2016/07/14		99	%	70 - 130
			Combined Train Nickel (Ni)	2016/07/14		100	%	70 - 130
4578442	N_R	MS/MSD RPD	Combined Train Arsenic (As)	2016/07/14	2.1		%	20
			Combined Train Lead (Pb)	2016/07/14	0		%	20
			Combined Train Manganese (Mn)	2016/07/14	1.0		%	20
			Combined Train Nickel (Ni)	2016/07/14	1.0		%	20
4578442	N_R	Spiked Blank	Combined Train Arsenic (As)	2016/07/14		98	%	85 - 115
			Combined Train Lead (Pb)	2016/07/14		100	%	85 - 115
			Combined Train Manganese (Mn)	2016/07/14		98	%	85 - 115
			Combined Train Nickel (Ni)	2016/07/14		99	%	85 - 115
4578442	N_R	Spiked Blank DUP	Combined Train Arsenic (As)	2016/07/14		100	%	85 - 115
			Combined Train Lead (Pb)	2016/07/14		105	%	85 - 115
			Combined Train Manganese (Mn)	2016/07/14		101	%	85 - 115
			Combined Train Nickel (Ni)	2016/07/14		102	%	85 - 115
4578442	N_R	RPD	Combined Train Arsenic (As)	2016/07/14	2.6		%	20
			Combined Train Lead (Pb)	2016/07/14	4.3		%	20
			Combined Train Manganese (Mn)	2016/07/14	3.5		%	20
			Combined Train Nickel (Ni)	2016/07/14	2.8		%	20
4578442	N_R	Method Blank	Combined Train Arsenic (As)	2016/07/14	<0.80		ug	
			Combined Train Lead (Pb)	2016/07/14	<0.40		ug	
			Combined Train Manganese (Mn)	2016/07/14	<1.5		ug	
			Combined Train Nickel (Ni)	2016/07/14	<1.0		ug	
4578442	N_R	RPD - Sample/Sample Dup	Combined Train Arsenic (As)	2016/07/14	NC		%	20
			Combined Train Lead (Pb)	2016/07/14	1.6		%	20
			Combined Train Manganese (Mn)	2016/07/14	0.67		%	20
			Combined Train Nickel (Ni)	2016/07/14	2.0		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

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VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Brenda Moore, Team Lead

Frank Mo, B.Sc., Inorganic Lab. Manager

Ralph Siebert, Operations Manager - Inorganic Analyses

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Lab Tracking Number

B6E1117

Chain-of-Custody Record/Lab Work Request

WESTON

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Client	UWEC - [illegible]		
Work Order Number	[illegible]	Phone Number	[illegible]
Contact Person	[illegible]	Turn Around Time	[illegible]

Analyses Requested/Other Info

Lab ID	Field Sample ID	Sample Collection Date	Analysis				Lab Use Only
	UWEC - 114 - STK - 1 - M26A - H2SO4	7/6/16	M26A				
	UWEC - 114 - STK - 1 - M26A - NAOH		M26A				
	UWEC - 114 - STK - 2 - M26A - H2SO4		M26A				
	UWEC - 114 - STK - 2 - M26A - NAOH		M26A				
	UWEC - 114 - STK - 3 - M26A - H2SO4	7/7/16	M26A				
	UWEC - 114 - STK - 3 - M26A - NAOH		M26A				
	UWEC - 114 - STK - BT - M26A - H2SO4		M26A				
	UWEC - 114 - STK - BT - M26A - NAOH		M26A				
	UWEC 114 - STK - SB - M26A - H2SO4		M26A				
	UWEC 114 - STK - SB - M26A - NAOH		M26A				
	UWEC - 114 - STK - SB - M26A - DIH2O		M26A				

Notes: M26A - Chlorides by IC per Method 9057. Analyze samples in duplicate as per Method. Starting Impinger volumes: H2SO4 250 ml, NAOH 150 ml. Approximate Final pH [illegible]
Full Data package required

Relinquished By	Received By	Date	Time	Lab Use Only	
[signature]		7/7/16	2030		Air Bill #
				Opened By	Date/Time
	[signature]	7/7/16		Temp °C	Condition
		[illegible]		Custody Seals: Yes No None N/A	

Laboratory Comments:

Lab Tracking Number

Chain-of-Custody Record/Lab Work Request

WESTON

Page 1 of 1

Client	LWEC L'Anse, Michigan		
Work Order Number	14494.007.004	Phone Number	610.701.3043
Contact Person	Ken Hill	Turn Around Time	Rush

Lab ID	Field Sample ID	Sample Collection Date	Analyses Requested/Other Info: Analysis	Filter #			Sample Check-off
	LWEC - 114 - STK - 4 - TPM102.5 - FHA1	7/7/16	TPM102.5				
	LWEC - 114 - STK - 4 - TPM102.5 - FHA2		TPM102.5				
	LWEC - 114 - STK - 4 - TPM102.5 - FHA3		TPM102.5				
	LWEC - 114 - STK - 4 - TPM102.5 - BHC		TPM102.5				
	LWEC - 114 - STK - 4 - TPM102.5 - FH FILT		TPM102.5	NCC 133			
	LWEC - 114 - STK - 4 - TPM102.5 - CPM FILT		TPM102.5				
	LWEC - 114 - STK - 4 - TPM102.5 - BHB		TPM102.5				

Notes: TPM102.5 - Gravimetric Analysis per EPA Method 201A for front half and EPA 202 for Back Half

Full Data package required

Relinquished By	Received By	Date	Time	Lab Use Only	
[signature]		7/7/16	2030	Shipper	Air Bill #
	[signature]	7/7/16		Opened By	Date/Time
				Temp °C	Condition
		[illegible]		Custody Seals: Yes No None N/A	

Laboratory Comments:

Lab Tracking Number

Chain-of-Custody Record/Lab Work Request

WESTON

Page 1 of 1

Client	LWEC - L'Anse, Michigan		
Work Order Number	14484.007.004	Phone Number	[illegible]
Contact Person	[illegible]	Turn Around Time	Rush

Lab ID	Field Sample ID	Sample Collection Date	Analyses	Filter #			Sample Comments
	LWEC - 114 - STK - 1 - TPM102.5 - FHA1	7/6/16	TPM102.5			X	
	LWEC - 114 - STK - 1 - TPM102.5 - FHA2		TPM102.5			X	
	LWEC - 114 - STK - 1 - TPM102.5 - FHA3		TPM102.5			X	
	LWEC - 114 - STK - 1 - TPM102.5 - BHC		TPM102.5			X	
	LWEC - 114 - STK - 1 - TPM102.5 - FHFILT		TPM102.5	16061927 + 16061928			
	LWEC - 114 - STK - 1 - TPM102.5 - CPMFILT		TPM102.5			X	
	LWEC - 114 - STK - 1 - TPM102.5 - BHS		TPM102.5			X	
	LWEC - 114 - STK - 2 - TPM102.5 - FHA1	7/7/16	TPM102.5				
	LWEC - 114 - STK - 2 - TPM102.5 - FHA2		TPM102.5				
	LWEC - 114 - STK - 2 - TPM102.5 - FHA3		TPM102.5				
	LWEC - 114 - STK - 2 - TPM102.5 - BHC		TPM102.5				
	LWEC - 114 - STK - 2 - TPM102.5 - FHFILT		TPM102.5	16061929			
	LWEC - 114 - STK - 2 - TPM102.5 - CPMFILT		TPM102.5				
	LWEC - 114 - STK - 2 - TPM102.5 - BHS		TPM102.5				
	LWEC - 114 - STK - 3 - TPM102.5 - FHA1		TPM102.5				
	LWEC - 114 - STK - 3 - TPM102.5 - FHA2		TPM102.5				
	LWEC - 114 - STK - 3 - TPM102.5 - FHA3		TPM102.5				
	LWEC - 114 - STK - 3 - TPM102.5 - BHC		TPM102.5				
	LWEC - 114 - STK - 3 - TPM102.5 - FHFILT		TPM102.5	16061930			
	LWEC - 114 - STK - 3 - TPM102.5 - CPMFILT		TPM102.5				
	LWEC - 114 - STK - 3 - TPM102.5 - BHS		TPM102.5				
	~~LWEC - 114 - STK - BT - TPM102.5 - FHA1~~		TPM102.5				
	~~LWEC - 114 - STK - BT - TPM102.5 - FHA2~~		TPM102.5				
	~~LWEC - 114 - STK - BT - TPM102.5 - FHA3~~		TPM102.5				
	LWEC - 114 - STK - BT - TPM102.5 - BHC		TPM102.5				
	~~LWEC - 114 - STK - BT - TPM102.5 - FHFILT~~		TPM102.5				
	LWEC - 114 - STK - BT - TPM102.5 - CPMFILT	7/7/16	TPM102.5				
	LWEC - 114 - STK - BT - TPM102.5 - BHS		TPM102.5				
	LWEC 114 - STK - SB - TPM102.5 - ACE		TPM102.5				
	LWEC - 114 - STK - SB - TPM102.5 - FILT		TPM102.5	16061935			
	LWEC - 114 - STK - SB - TPM102.5 - Hex		TPM102.5				
	LWEC - 114 - STK - SB - TPM102.5 - DIH2O		TPM102.5				
	LWEC - 114 - STK - SB - TPM102.5 - CPMFILT		TPM102.5				

Notes: TPM102.5 - Gravimetric Analysis per EPA Method 201A for front half and EPA 202 for Back Half

Full Data package required.

Relinquished By	Received By	Date	Time	Lab Use Only	
[signature]		7/7/16	2030	Shipper	Air Bill #
				Opened By	Date/Time
	[signature]	7/7/16		Temp °C	Condition
				Custody Seals: Yes No None N/A	

Laboratory Comments:

Lab Tracking Number

Chain-of-Custody Record/Lab Work Request

WESTON

Page 1 of 1

Client	LWEC, L'Anse, Michigan		
Work Order Number	14484.027.004	Phone Number	610-[illegible]
Contact Person	Ken Hill	Turn Around Time	Rush

Analyses Requested/Other

Lab ID	Field Sample ID	Sample Collection Date	Analysis	Filter #			Sample Check-off
	LWEC - 114 - STK - 1 - M29 - THHNO3	7/6/16	M29				
	LWEC - 114 - STK - 1 - M29 - FILT		M29	1605969			
	LWEC - 114 - STK - 1 - M29 - BHHNO3		M29				
	[redacted]						
	LWEC - 114 - STK - 1 - M29 - FHA	7/6/16	M29				
	LWEC - 114 - STK - 2 - M29 - THHNO3	7/7/16	M29				
	LWEC - 114 - STK - 2 - M29 - FILT		M29	1605970			
	LWEC - 114 - STK - 2 - M29 - BHHNO3		M29				
	[redacted]						
	LWEC - 114 - STK - 2 - M29 - FHA	7/7/16	M29				
	LWEC - 114 - STK - 3 - M29 - FHHNO3		M29				
	LWEC - 114 - STK - 3 - M29 - FILT		M29	1605[illegible]			
	LWEC - 114 - STK - 3 - M29 - BHHNO3		M29				
	[redacted]						
	LWEC - 114 - STK - 3 - M29 - FHA	7/7/16	M29				
	LWEC 114 - STK - SB - M29 - HNO3		M29				
	LWEC 114 - STK - SB - M29 - FILT		M29	1605972			
	LWEC - 114 - STK - SB - M29 - HNO3/H2O2		M29				
	[redacted]						
	LWEC 114 - STK - SB - M29 - ACETONE	7/7/16					

Notes: M5/29 - PM analysis per EPA Method 5/29 [illegible]. Metals analysis per EPA Method 29 for the following metals: Ni, Pb, As, Mn

Full Data package required. * Report PM results prior to metals analysis

Relinquished By	Received By	Date	Time	Lab Use Only	
[signature]		7/7/16	2023	Shipper	Air Bill #
	[signature]			Opened By	Date/Time
		7/7/16		Temp °C	Condition
	[signature]	[illegible]		Custody Seals: Yes No None N/A	

Laboratory Comments: [illegible]

D.2 PCDD/PCDF AND CRESOL ISOMERS

Maxxam
A Bureau Veritas Group Company

Your Project #: 14464.007.004
Site Location: LWEC, L'ANSE, MICHIGAN

Attention:Ken Hill

Weston Solutions Inc
1400 Weston Way
West Chester, PA
USA 19380

Report Date: 2016/07/27
Report #: R4083058
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6E1667
Received: 2016/07/08, 20:00

Sample Matrix: Stack Sampling Train
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
SVOCs in MM5 SamplingTrain (EPA0010)	5	2016/07/11	2016/07/18	BRL SOP-00200	EPA 8270D/M0010 m
Dioxins/Furans in Air (Method 23)	5	2016/07/11	2016/07/19	BRL SOP-00404	EPA M23/23A m

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Clayton Johnson, Project Manager - Air Toxics, Source Evaluation
Email: CJohnson@maxxam.ca
Phone# (905)817-5769

==

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

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Maxxam Job #: B6E1667
Report Date: 2016/07/27

Weston Solutions Inc
Client Project #: 14464.007.004
Site Location: LWEC, L'ANSE, MICHIGAN

SEMI-VOLATILE ORGANICS BY GC-MS (STACK SAMPLING TRAIN)

Maxxam ID		CRF656	CRF661	CRF687	CRF688	CRF689			
Sampling Date		2016/07/07	2016/07/07	2016/07/06	2016/07/06	2016/07/07			
	UNITS	M23/0010 - SB	M23/0010 - BT	M23/0010 - R1	M23/0010 - R2	M23/0010 - R3	RDL	MDL	QC Batch
2-Methylphenol	ug	<5	<5	<5	<5	<5	5	1	4572741
3 & 4-methylphenol	ug	<5	<5	<5	<5	<5	5	1	4572741
Surrogate Recovery (%)									
2,4,6-Tribromophenol	%	113	119	117	109	113	N/A	N/A	4572741
2,6-Dibromo-4-fluorophenol (FS)	%	98	104	98	95	97	N/A	N/A	4572741
2-Fluorobiphenyl	%	106	111	107	109	104	N/A	N/A	4572741
2-Fluorophenol	%	96	105	107	106	102	N/A	N/A	4572741
D10-Pyrene (FS)	%	114	119	123	120	114	N/A	N/A	4572741
D14-Terphenyl	%	113	119	124	118	118	N/A	N/A	4572741
D5-Nitrobenzene	%	102	109	103	102	101	N/A	N/A	4572741
D5-Phenol	%	105	114 (1)	115 (1)	112	110	N/A	N/A	4572741

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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A Bureau Veritas Group Company

Maxxam Job #: B6E1667
Report Date: 2016/07/27

Weston Solutions Inc
Client Project #: 14464.007.004
Site Location: LWEC, L'ANSE, MICHIGAN

DIOXINS AND FURANS BY HRMS (STACK SAMPLING TRAIN)

Maxxam ID		CRF656							
Sampling Date		2016/07/07				TOXIC EQUIVALENCY		# of	
	UNITS	M23/0010 - SB	EDL	RDL	MDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
2,3,7,8-Tetra CDD *	pg	<3.7	3.7	30	6.0	1.00	3.70	N/A	4583299
1,2,3,7,8-Penta CDD *	pg	<3.2	3.2	30	6.0	1.00	3.20	N/A	4583299
1,2,3,4,7,8-Hexa CDD *	pg	<3.4	3.4	30	6.0	0.100	0.340	N/A	4583299
1,2,3,6,7,8-Hexa CDD *	pg	<3.4	3.4	30	6.0	0.100	0.340	N/A	4583299
1,2,3,7,8,9-Hexa CDD *	pg	<3.0	3.0	30	6.0	0.100	0.300	N/A	4583299
1,2,3,4,6,7,8-Hepta CDD *	pg	<3.9	3.9	30	9.0	0.0100	0.0390	N/A	4583299
1,2,3,4,6,7,8,9-Octa CDD *	pg	11.2	3.5	300	9.0	0.000300	0.00336	N/A	4583299
Total Tetra CDD *	pg	<7.7 (1)	7.7	30	N/A	N/A	N/A	0	4583299
Total Penta CDD *	pg	<8.7 (1)	8.7	30	N/A	N/A	N/A	0	4583299
Total Hexa CDD *	pg	<19 (1)	19	30	N/A	N/A	N/A	0	4583299
Total Hepta CDD *	pg	<3.9	3.9	30	N/A	N/A	N/A	0	4583299
2,3,7,8-Tetra CDF **	pg	<3.3	3.3	30	6.0	0.100	0.330	N/A	4583299
1,2,3,7,8-Penta CDF **	pg	<3.7	3.7	30	6.0	0.0300	0.111	N/A	4583299
2,3,4,7,8-Penta CDF **	pg	<3.7	3.7	30	6.0	0.300	1.11	N/A	4583299
1,2,3,4,7,8-Hexa CDF **	pg	<3.6	3.6	30	6.0	0.100	0.360	N/A	4583299
1,2,3,6,7,8-Hexa CDF **	pg	<3.3	3.3	30	6.0	0.100	0.330	N/A	4583299
2,3,4,6,7,8-Hexa CDF **	pg	<3.6	3.6	30	6.0	0.100	0.360	N/A	4583299
1,2,3,7,8,9-Hexa CDF **	pg	<3.9	3.9	30	6.0	0.100	0.390	N/A	4583299
1,2,3,4,6,7,8-Hepta CDF **	pg	<3.1	3.1	30	9.0	0.0100	0.0310	N/A	4583299
1,2,3,4,7,8,9-Hepta CDF **	pg	<3.8	3.8	30	6.0	0.0100	0.0380	N/A	4583299
1,2,3,4,6,7,8,9-Octa CDF **	pg	<3.6	3.6	300	15	0.000300	0.00108	N/A	4583299
Total Tetra CDF **	pg	<3.3	3.3	30	N/A	N/A	N/A	0	4583299
Total Penta CDF **	pg	<3.7	3.7	30	N/A	N/A	N/A	0	4583299
Total Hexa CDF **	pg	<3.6	3.6	30	N/A	N/A	N/A	0	4583299
Total Hepta CDF **	pg	<3.4	3.4	30	N/A	N/A	N/A	0	4583299
TOTAL TOXIC EQUIVALENCY	pg	N/A	N/A	N/A	N/A	N/A	11.0	N/A	N/A
Surrogate Recovery (%)									
C13-1234678 HeptaCDD *	%	96	N/A	N/A	N/A	N/A	N/A	N/A	4583299

EDL = Estimated Detection Limit
RDL = Reportable Detection Limit
TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.
WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds
QC Batch = Quality Control Batch
* CDD = Chloro Dibenzo-p-Dioxin
N/A = Not Applicable
** CDF = Chloro Dibenzo-p-Furan
(1) EMPC / NDR - Peak detected does not meet ratio criteria and has resulted in an elevated detection limit.

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Maxxam Job #: B6E1667
Report Date: 2016/07/27

Weston Solutions Inc
Client Project #: 14464.007.004
Site Location: LWEC, L'ANSE, MICHIGAN

DIOXINS AND FURANS BY HRMS (STACK SAMPLING TRAIN)

Maxxam ID		CRF656							
Sampling Date		2016/07/07				TOXIC EQUIVALENCY		# of	
	UNITS	M23/0010 - SB	EDL	RDL	MDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
C13-1234678 HeptaCDF **	%	102	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-123478 HexaCDD *	%	106	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-123478 HexaCDF **	%	109	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-1234789 HeptaCDF **	%	101	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-123678 HexaCDD *	%	100	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-123678 HexaCDF **	%	106	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-12378 PentaCDD *	%	93	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-12378 PentaCDF **	%	110	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-123789 HexaCDF **	%	102	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-23478 PentaCDF **	%	92	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-2378 TetraCDD *	%	95	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-2378 TetraCDF **	%	105	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-Octachlorodibenzo-p-Dioxin	%	95	N/A	N/A	N/A	N/A	N/A	N/A	4583299
Cl37-2378 TetraCDD *	%	106	N/A	N/A	N/A	N/A	N/A	N/A	4583299

EDL = Estimated Detection Limit
RDL = Reportable Detection Limit
TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.
WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds
QC Batch = Quality Control Batch
** CDF = Chloro Dibenzo-p-Furan
N/A = Not Applicable
* CDD = Chloro Dibenzo-p-Dioxin

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Maxxam Job #: B6E1667
Report Date: 2016/07/27

Weston Solutions Inc
Client Project #: 14464.007.004
Site Location: LWEC, L'ANSE, MICHIGAN

DIOXINS AND FURANS BY HRMS (STACK SAMPLING TRAIN)

Maxxam ID		CRF661							
Sampling Date		2016/07/07				TOXIC EQUIVALENCY		# of	
	UNITS	M23/0010 - BT	EDL	RDL	MDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
2,3,7,8-Tetra CDD *	pg	<3.9	3.9	30	6.0	1.00	3.90	N/A	4583299
1,2,3,7,8-Penta CDD *	pg	<3.8	3.8	30	6.0	1.00	3.80	N/A	4583299
1,2,3,4,7,8-Hexa CDD *	pg	<3.5	3.5	30	6.0	0.100	0.350	N/A	4583299
1,2,3,6,7,8-Hexa CDD *	pg	<3.6	3.6	30	6.0	0.100	0.360	N/A	4583299
1,2,3,7,8,9-Hexa CDD *	pg	<3.2	3.2	30	6.0	0.100	0.320	N/A	4583299
1,2,3,4,6,7,8-Hepta CDD *	pg	<4.1	4.1	30	9.0	0.0100	0.0410	N/A	4583299
1,2,3,4,6,7,8,9-Octa CDD *	pg	26.0	3.7	300	9.0	0.000300	0.00780	N/A	4583299
Total Tetra CDD *	pg	<7.4 (1)	7.4	30	N/A	N/A	N/A	0	4583299
Total Penta CDD *	pg	<8.5 (1)	8.5	30	N/A	N/A	N/A	0	4583299
Total Hexa CDD *	pg	<19 (1)	19	30	N/A	N/A	N/A	0	4583299
Total Hepta CDD *	pg	<4.8 (1)	4.8	30	N/A	N/A	N/A	0	4583299
2,3,7,8-Tetra CDF **	pg	<3.9	3.9	30	6.0	0.100	0.390	N/A	4583299
1,2,3,7,8-Penta CDF **	pg	<3.1	3.1	30	6.0	0.0300	0.0930	N/A	4583299
2,3,4,7,8-Penta CDF **	pg	<3.1	3.1	30	6.0	0.300	0.930	N/A	4583299
1,2,3,4,7,8-Hexa CDF **	pg	<3.7	3.7	30	6.0	0.100	0.370	N/A	4583299
1,2,3,6,7,8-Hexa CDF **	pg	<3.4	3.4	30	6.0	0.100	0.340	N/A	4583299
2,3,4,6,7,8-Hexa CDF **	pg	<3.7	3.7	30	6.0	0.100	0.370	N/A	4583299
1,2,3,7,8,9-Hexa CDF **	pg	<4.1	4.1	30	6.0	0.100	0.410	N/A	4583299
1,2,3,4,6,7,8-Hepta CDF **	pg	<2.8	2.8	30	9.0	0.0100	0.0280	N/A	4583299
1,2,3,4,7,8,9-Hepta CDF **	pg	<3.4	3.4	30	6.0	0.0100	0.0340	N/A	4583299
1,2,3,4,6,7,8,9-Octa CDF **	pg	<3.6	3.6	300	15	0.000300	0.00108	N/A	4583299
Total Tetra CDF **	pg	<3.9	3.9	30	N/A	N/A	N/A	0	4583299
Total Penta CDF **	pg	<3.1	3.1	30	N/A	N/A	N/A	0	4583299
Total Hexa CDF **	pg	<3.7	3.7	30	N/A	N/A	N/A	0	4583299
Total Hepta CDF **	pg	<3.1	3.1	30	N/A	N/A	N/A	0	4583299
TOTAL TOXIC EQUIVALENCY	pg	N/A	N/A	N/A	N/A	N/A	11.7	N/A	N/A
Surrogate Recovery (%)									
C13-1234678 HeptaCDD *	%	95	N/A	N/A	N/A	N/A	N/A	N/A	4583299

EDL = Estimated Detection Limit
RDL = Reportable Detection Limit
TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.
WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds
QC Batch = Quality Control Batch
* CDD = Chloro Dibenzo-p-Dioxin
N/A = Not Applicable
** CDF = Chloro Dibenzo-p-Furan
(1) EMPC / NDR - Peak detected does not meet ratio criteria and has resulted in an elevated detection limit.

DIOXINS AND FURANS BY HRMS (STACK SAMPLING TRAIN)

Maxxam ID		CRF661							
Sampling Date		2016/07/07				TOXIC EQUIVALENCY		# of	
	UNITS	M23/0010 - BT	EDL	RDL	MDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
C13-1234678 HeptaCDF **	%	100	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-123478 HexaCDD *	%	113	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-123478 HexaCDF **	%	102	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-1234789 HeptaCDF **	%	102	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-123678 HexaCDD *	%	96	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-123678 HexaCDF **	%	112	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-12378 PentaCDD *	%	90	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-12378 PentaCDF **	%	109	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-123789 HexaCDF **	%	102	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-23478 PentaCDF **	%	91	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-2378 TetraCDD *	%	92	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-2378 TetraCDF **	%	101	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-Octachlorodibenzo-p-Dioxin	%	94	N/A	N/A	N/A	N/A	N/A	N/A	4583299
Cl37-2378 TetraCDD *	%	106	N/A	N/A	N/A	N/A	N/A	N/A	4583299

EDL = Estimated Detection Limit
RDL = Reportable Detection Limit
TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.
WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds
QC Batch = Quality Control Batch
** CDF = Chloro Dibenzo-p-Furan
N/A = Not Applicable
* CDD = Chloro Dibenzo-p-Dioxin

DIOXINS AND FURANS BY HRMS (STACK SAMPLING TRAIN)

Maxxam ID		CRF687							
Sampling Date		2016/07/06				TOXIC EQUIVALENCY		# of	
	UNITS	M23/0010 - R1	EDL	RDL	MDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
2,3,7,8-Tetra CDD *	pg	6.9 (1)	3.9	30	6.0	1.00	6.90	N/A	4583299
1,2,3,7,8-Penta CDD *	pg	14.3	3.7	30	6.0	1.00	14.3	N/A	4583299
1,2,3,4,7,8-Hexa CDD *	pg	5.8 (1)	4.0	30	6.0	0.100	0.580	N/A	4583299
1,2,3,6,7,8-Hexa CDD *	pg	10.6	4.1	30	6.0	0.100	1.06	N/A	4583299
1,2,3,7,8,9-Hexa CDD *	pg	14.2	3.6	30	6.0	0.100	1.42	N/A	4583299
1,2,3,4,6,7,8-Hepta CDD *	pg	30.6	3.9	30	9.0	0.0100	0.306	N/A	4583299
1,2,3,4,6,7,8,9-Octa CDD *	pg	95.9	3.5	300	9.0	0.000300	0.0288	N/A	4583299
Total Tetra CDD *	pg	150	3.9	30	N/A	N/A	N/A	9	4583299
Total Penta CDD *	pg	208	3.7	30	N/A	N/A	N/A	12	4583299
Total Hexa CDD *	pg	110	3.9	30	N/A	N/A	N/A	5	4583299
Total Hepta CDD *	pg	80.7	3.9	30	N/A	N/A	N/A	2	4583299
2,3,7,8-Tetra CDF **	pg	<23 (2)	23	30	6.0	0.100	2.30	N/A	4583299
1,2,3,7,8-Penta CDF **	pg	3.8	3.6	30	6.0	0.0300	0.114	N/A	4583299
2,3,4,7,8-Penta CDF **	pg	4.0	3.5	30	6.0	0.300	1.20	N/A	4583299
1,2,3,4,7,8-Hexa CDF **	pg	5.2	3.8	30	6.0	0.100	0.520	N/A	4583299
1,2,3,6,7,8-Hexa CDF **	pg	<3.5	3.5	30	6.0	0.100	0.350	N/A	4583299
2,3,4,6,7,8-Hexa CDF **	pg	<3.9	3.9	30	6.0	0.100	0.390	N/A	4583299
1,2,3,7,8,9-Hexa CDF **	pg	<4.2	4.2	30	6.0	0.100	0.420	N/A	4583299
1,2,3,4,6,7,8-Hepta CDF **	pg	6.0	3.4	30	9.0	0.0100	0.0600	N/A	4583299
1,2,3,4,7,8,9-Hepta CDF **	pg	<4.1	4.1	30	6.0	0.0100	0.0410	N/A	4583299
1,2,3,4,6,7,8,9-Octa CDF **	pg	<7.9 (3)	7.9	300	15	0.000300	0.00237	N/A	4583299
Total Tetra CDF **	pg	78.6	3.3	30	N/A	N/A	N/A	9	4583299
Total Penta CDF **	pg	17.0	3.5	30	N/A	N/A	N/A	4	4583299
Total Hexa CDF **	pg	10.2	3.8	30	N/A	N/A	N/A	2	4583299

EDL = Estimated Detection Limit
RDL = Reportable Detection Limit
TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.
WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds
QC Batch = Quality Control Batch
* CDD = Chloro Dibenzo-p-Dioxin
N/A = Not Applicable
** CDF = Chloro Dibenzo-p-Furan
(1) EMPC / Ratio - Isotopic ratio adjusted to meet theoretical
(2) RT > 3 seconds - PCDD/DF analysis - Peak detected exceeds expected retention time (from internal standard) by greater than 3 seconds.
(3) EMPC / DPE - Diphenylether interference present caused dibenzofuran detected to become a "non-detect" with an elevated detection limit.

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B6E1667
Report Date: 2016/07/27

Weston Solutions Inc
Client Project #: 14464.007.004
Site Location: LWEC, L'ANSE, MICHIGAN

DIOXINS AND FURANS BY HRMS (STACK SAMPLING TRAIN)

Maxxam ID		CRF687							
Sampling Date		2016/07/06				TOXIC EQUIVALENCY		# of	
	UNITS	M23/0010 - R1	EDL	RDL	MDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
Total Hepta CDF **	pg	10.4	3.7	30	N/A	N/A	N/A	2	4583299
TOTAL TOXIC EQUIVALENCY	pg	N/A	N/A	N/A	N/A	N/A	30.0	N/A	N/A
Surrogate Recovery (%)									
C13-1234678 HeptaCDD *	%	97	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-1234678 HeptaCDF **	%	102	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-123478 HexaCDD *	%	107	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-123478 HexaCDF **	%	101	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-1234789 HeptaCDF **	%	102	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-123678 HexaCDD *	%	99	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-123678 HexaCDF **	%	118	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-12378 PentaCDD *	%	96	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-12378 PentaCDF **	%	111	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-123789 HexaCDF **	%	105	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-23478 PentaCDF **	%	91	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-2378 TetraCDD *	%	94	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-2378 TetraCDF **	%	105	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-Octachlorodibenzo-p-Dioxin	%	96	N/A	N/A	N/A	N/A	N/A	N/A	4583299
Cl37-2378 TetraCDD *	%	106	N/A	N/A	N/A	N/A	N/A	N/A	4583299

EDL = Estimated Detection Limit
RDL = Reportable Detection Limit
TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.
WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds
QC Batch = Quality Control Batch
** CDF = Chloro Dibenzo-p-Furan
N/A = Not Applicable
* CDD = Chloro Dibenzo-p-Dioxin

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Maxxam Job #: B6E1667
Report Date: 2016/07/27

Weston Solutions Inc
Client Project #: 14464.007.004
Site Location: LWEC, L'ANSE, MICHIGAN

DIOXINS AND FURANS BY HRMS (STACK SAMPLING TRAIN)

Maxxam ID		CRF688							
Sampling Date		2016/07/06				TOXIC EQUIVALENCY		# of	
	UNITS	M23/0010 - R2	EDL	RDL	MDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
2,3,7,8-Tetra CDD *	pg	4.7 (1)	4.1	30	6.0	1.00	4.70	N/A	4583299
1,2,3,7,8-Penta CDD *	pg	9.3	3.9	30	6.0	1.00	9.30	N/A	4583299
1,2,3,4,7,8-Hexa CDD *	pg	5.6	3.3	30	6.0	0.100	0.560	N/A	4583299
1,2,3,6,7,8-Hexa CDD *	pg	12.6	3.3	30	6.0	0.100	1.26	N/A	4583299
1,2,3,7,8,9-Hexa CDD *	pg	12.9	2.9	30	6.0	0.100	1.29	N/A	4583299
1,2,3,4,6,7,8-Hepta CDD *	pg	81.5	3.8	30	9.0	0.0100	0.815	N/A	4583299
1,2,3,4,6,7,8,9-Octa CDD *	pg	238	3.7	300	9.0	0.000300	0.0714	N/A	4583299
Total Tetra CDD *	pg	56.6	4.1	30	N/A	N/A	N/A	6	4583299
Total Penta CDD *	pg	96.6	3.9	30	N/A	N/A	N/A	9	4583299
Total Hexa CDD *	pg	91.8	3.2	30	N/A	N/A	N/A	6	4583299
Total Hepta CDD *	pg	162	3.8	30	N/A	N/A	N/A	2	4583299
2,3,7,8-Tetra CDF **	pg	10.7	3.5	30	6.0	0.100	1.07	N/A	4583299
1,2,3,7,8-Penta CDF **	pg	<3.9	3.9	30	6.0	0.0300	0.117	N/A	4583299
2,3,4,7,8-Penta CDF **	pg	<3.9	3.9	30	6.0	0.300	1.17	N/A	4583299
1,2,3,4,7,8-Hexa CDF **	pg	5.4	4.0	30	6.0	0.100	0.540	N/A	4583299
1,2,3,6,7,8-Hexa CDF **	pg	<3.7	3.7	30	6.0	0.100	0.370	N/A	4583299
2,3,4,6,7,8-Hexa CDF **	pg	<4.0	4.0	30	6.0	0.100	0.400	N/A	4583299
1,2,3,7,8,9-Hexa CDF **	pg	<4.4	4.4	30	6.0	0.100	0.440	N/A	4583299
1,2,3,4,6,7,8-Hepta CDF **	pg	7.7	3.1	30	9.0	0.0100	0.0770	N/A	4583299
1,2,3,4,7,8,9-Hepta CDF **	pg	<3.8	3.8	30	6.0	0.0100	0.0380	N/A	4583299
1,2,3,4,6,7,8,9-Octa CDF **	pg	<15 (2)	15	300	15	0.000300	0.00450	N/A	4583299
Total Tetra CDF **	pg	30.2	3.5	30	N/A	N/A	N/A	5	4583299
Total Penta CDF **	pg	<3.9	3.9	30	N/A	N/A	N/A	0	4583299
Total Hexa CDF **	pg	5.4	4.0	30	N/A	N/A	N/A	1	4583299
Total Hepta CDF **	pg	17.1	3.4	30	N/A	N/A	N/A	2	4583299
TOTAL TOXIC EQUIVALENCY	pg	N/A	N/A	N/A	N/A	N/A	22.2	N/A	N/A

EDL = Estimated Detection Limit
RDL = Reportable Detection Limit
TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.
WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds
QC Batch = Quality Control Batch
* CDD = Chloro Dibenzo-p-Dioxin
N/A = Not Applicable
** CDF = Chloro Dibenzo-p-Furan
(1) EMPC / Ratio - Isotopic ratio adjusted to meet theoretical
(2) EMPC / DPE - Diphenylether interference present caused dibenzofuran detected to become a "non-detect" with an elevated detection limit.

DIOXINS AND FURANS BY HRMS (STACK SAMPLING TRAIN)

Maxxam ID		CRF688							
Sampling Date		2016/07/06				TOXIC EQUIVALENCY		# of	
	UNITS	M23/0010 - R2	EDL	RDL	MDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
Surrogate Recovery (%)									
C13-1234678 HeptaCDD *	%	105	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-1234678 HeptaCDF **	%	102	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-123478 HexaCDD *	%	110	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-123478 HexaCDF **	%	100	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-1234789 HeptaCDF **	%	107	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-123678 HexaCDD *	%	106	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-123678 HexaCDF **	%	84	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-12378 PentaCDD *	%	103	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-12378 PentaCDF **	%	120	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-123789 HexaCDF **	%	112	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-23478 PentaCDF **	%	90	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-2378 TetraCDD *	%	103	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-2378 TetraCDF **	%	114	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-Octachlorodibenzo-p-Dioxin	%	102	N/A	N/A	N/A	N/A	N/A	N/A	4583299
Cl37-2378 TetraCDD *	%	103	N/A	N/A	N/A	N/A	N/A	N/A	4583299

EDL = Estimated Detection Limit
RDL = Reportable Detection Limit
TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.
WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds
QC Batch = Quality Control Batch
* CDD = Chloro Dibenzo-p-Dioxin
N/A = Not Applicable
** CDF = Chloro Dibenzo-p-Furan

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Maxxam Job #: B6E1667
Report Date: 2016/07/27

Weston Solutions Inc
Client Project #: 14464.007.004
Site Location: LWEC, L'ANSE, MICHIGAN

DIOXINS AND FURANS BY HRMS (STACK SAMPLING TRAIN)

Maxxam ID		CRF689							
Sampling Date		2016/07/07				TOXIC EQUIVALENCY		# of	
	UNITS	M23/0010 - R3	EDL	RDL	MDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
2,3,7,8-Tetra CDD *	pg	5.9 (1)	4.0	30	6.0	1.00	5.90	N/A	4583299
1,2,3,7,8-Penta CDD *	pg	8.8	4.2	30	6.0	1.00	8.80	N/A	4583299
1,2,3,4,7,8-Hexa CDD *	pg	<4.0	4.0	30	6.0	0.100	0.400	N/A	4583299
1,2,3,6,7,8-Hexa CDD *	pg	5.6	4.0	30	6.0	0.100	0.560	N/A	4583299
1,2,3,7,8,9-Hexa CDD *	pg	6.8	3.6	30	6.0	0.100	0.680	N/A	4583299
1,2,3,4,6,7,8-Hepta CDD *	pg	17.2	3.6	30	9.0	0.0100	0.172	N/A	4583299
1,2,3,4,6,7,8,9-Octa CDD *	pg	53.1	3.6	300	9.0	0.000300	0.0159	N/A	4583299
Total Tetra CDD *	pg	69.7	4.0	30	N/A	N/A	N/A	7	4583299
Total Penta CDD *	pg	90.2	4.2	30	N/A	N/A	N/A	9	4583299
Total Hexa CDD *	pg	51.5	3.8	30	N/A	N/A	N/A	4	4583299
Total Hepta CDD *	pg	40.7	3.6	30	N/A	N/A	N/A	2	4583299
2,3,7,8-Tetra CDF **	pg	12.0	3.7	30	6.0	0.100	1.20	N/A	4583299
1,2,3,7,8-Penta CDF **	pg	<3.5	3.5	30	6.0	0.0300	0.105	N/A	4583299
2,3,4,7,8-Penta CDF **	pg	3.7	3.5	30	6.0	0.300	1.11	N/A	4583299
1,2,3,4,7,8-Hexa CDF **	pg	3.8	3.6	30	6.0	0.100	0.380	N/A	4583299
1,2,3,6,7,8-Hexa CDF **	pg	<3.3	3.3	30	6.0	0.100	0.330	N/A	4583299
2,3,4,6,7,8-Hexa CDF **	pg	<3.6	3.6	30	6.0	0.100	0.360	N/A	4583299
1,2,3,7,8,9-Hexa CDF **	pg	<4.0	4.0	30	6.0	0.100	0.400	N/A	4583299
1,2,3,4,6,7,8-Hepta CDF **	pg	3.4 (1)	2.7	30	9.0	0.0100	0.0340	N/A	4583299
1,2,3,4,7,8,9-Hepta CDF **	pg	<3.3	3.3	30	6.0	0.0100	0.0330	N/A	4583299
1,2,3,4,6,7,8,9-Octa CDF **	pg	<3.8	3.8	300	15	0.000300	0.00114	N/A	4583299
Total Tetra CDF **	pg	30.5	3.7	30	N/A	N/A	N/A	5	4583299
Total Penta CDF **	pg	7.5	3.5	30	N/A	N/A	N/A	2	4583299
Total Hexa CDF **	pg	3.8	3.6	30	N/A	N/A	N/A	1	4583299
Total Hepta CDF **	pg	3.4	3.0	30	N/A	N/A	N/A	1	4583299
TOTAL TOXIC EQUIVALENCY	pg	N/A	N/A	N/A	N/A	N/A	20.5	N/A	N/A
Surrogate Recovery (%)									
C13-1234678 HeptaCDD *	%	103	N/A	N/A	N/A	N/A	N/A	N/A	4583299

EDL = Estimated Detection Limit
RDL = Reportable Detection Limit
TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.
WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds
QC Batch = Quality Control Batch
* CDD = Chloro Dibenzo-p-Dioxin
N/A = Not Applicable
** CDF = Chloro Dibenzo-p-Furan
(1) EMPC / Ratio - Isotopic ratio adjusted to meet theoretical

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Maxxam Job #: B6E1667
Report Date: 2016/07/27

Weston Solutions Inc
Client Project #: 14464.007.004
Site Location: LWEC, L'ANSE, MICHIGAN

DIOXINS AND FURANS BY HRMS (STACK SAMPLING TRAIN)

Maxxam ID		CRF689							
Sampling Date		2016/07/07				TOXIC EQUIVALENCY		# of	
	UNITS	M23/0010 - R3	EDL	RDL	MDL	TEF (2005 WHO)	TEQ(DL)	Isomers	QC Batch
C13-1234678 HeptaCDF **	%	108	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-123478 HexaCDD *	%	103	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-123478 HexaCDF **	%	103	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-1234789 HeptaCDF **	%	103	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-123678 HexaCDD *	%	113	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-123678 HexaCDF **	%	118	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-12378 PentaCDD *	%	98	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-12378 PentaCDF **	%	115	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-123789 HexaCDF **	%	114	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-23478 PentaCDF **	%	92	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-2378 TetraCDD *	%	103	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-2378 TetraCDF **	%	113	N/A	N/A	N/A	N/A	N/A	N/A	4583299
C13-Octachlorodibenzo-p-Dioxin	%	103	N/A	N/A	N/A	N/A	N/A	N/A	4583299
Cl37-2378 TetraCDD *	%	104	N/A	N/A	N/A	N/A	N/A	N/A	4583299

EDL = Estimated Detection Limit
RDL = Reportable Detection Limit
TEF = Toxic Equivalency Factor, TEQ = Toxic Equivalency Quotient,
The Total Toxic Equivalency (TEQ) value reported is the sum of Toxic Equivalent Quotients for the congeners tested.
WHO(2005): The 2005 World Health Organization, Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds
QC Batch = Quality Control Batch
** CDF = Chloro Dibenzo-p-Furan
N/A = Not Applicable
* CDD = Chloro Dibenzo-p-Dioxin

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Maxxam Job #: B6E1667
Report Date: 2016/07/27

Weston Solutions Inc
Client Project #: 14464.007.004
Site Location: LWEC, L'ANSE, MICHIGAN

TEST SUMMARY

Maxxam ID: CRF656
Sample ID: M23/0010 - SB
Matrix: Stack Sampling Train

Collected: 2016/07/07
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
SVOCs in MM5 SamplingTrain (EPA0010)	GC/MS	4572741	2016/07/11	2016/07/18	Lidija Tomic
Dioxins/Furans in Air (Method 23)	HRMS/MS	4583299	2016/07/11	2016/07/19	Owen Cosby

Maxxam ID: CRF661
Sample ID: M23/0010 - BT
Matrix: Stack Sampling Train

Collected: 2016/07/07
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
SVOCs in MM5 SamplingTrain (EPA0010)	GC/MS	4572741	2016/07/11	2016/07/18	Lidija Tomic
Dioxins/Furans in Air (Method 23)	HRMS/MS	4583299	2016/07/11	2016/07/19	Owen Cosby

Maxxam ID: CRF687
Sample ID: M23/0010 - R1
Matrix: Stack Sampling Train

Collected: 2016/07/06
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
SVOCs in MM5 SamplingTrain (EPA0010)	GC/MS	4572741	2016/07/11	2016/07/18	Lidija Tomic
Dioxins/Furans in Air (Method 23)	HRMS/MS	4583299	2016/07/11	2016/07/19	Owen Cosby

Maxxam ID: CRF688
Sample ID: M23/0010 - R2
Matrix: Stack Sampling Train

Collected: 2016/07/06
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
SVOCs in MM5 SamplingTrain (EPA0010)	GC/MS	4572741	2016/07/11	2016/07/18	Lidija Tomic
Dioxins/Furans in Air (Method 23)	HRMS/MS	4583299	2016/07/11	2016/07/19	Owen Cosby

Maxxam ID: CRF689
Sample ID: M23/0010 - R3
Matrix: Stack Sampling Train

Collected: 2016/07/07
Shipped:
Received: 2016/07/08

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
SVOCs in MM5 SamplingTrain (EPA0010)	GC/MS	4572741	2016/07/11	2016/07/18	Lidija Tomic
Dioxins/Furans in Air (Method 23)	HRMS/MS	4583299	2016/07/11	2016/07/19	Owen Cosby

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GENERAL COMMENTS

Results relate only to the items tested.

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Maxxam Job #: B6E1667
Report Date: 2016/07/27

Weston Solutions Inc
Client Project #: 14464.007.004
Site Location: LWEC, L'ANSE, MICHIGAN

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
4572741	LTO	Spiked Blank	2,4,6-Tribromophenol	2016/07/18		113	%	24 - 121
			2-Fluorobiphenyl	2016/07/18		107	%	30 - 115
			2-Fluorophenol	2016/07/18		53	%	30 - 130
			2-Methylphenol	2016/07/18		102	%	N/A
			3 & 4-methylphenol	2016/07/18		109	%	N/A
			D14-Terphenyl	2016/07/18		111	%	18 - 137
			D5-Nitrobenzene	2016/07/18		102	%	23 - 120
			D5-Phenol	2016/07/18		100	%	24 - 113
4572741	LTO	Spiked Blank DUP	2,4,6-Tribromophenol	2016/07/18		113	%	24 - 121
			2-Fluorobiphenyl	2016/07/18		109	%	30 - 115
			2-Fluorophenol	2016/07/18		41	%	30 - 130
			2-Methylphenol	2016/07/18		92	%	N/A
			3 & 4-methylphenol	2016/07/18		102	%	N/A
			D14-Terphenyl	2016/07/18		112	%	18 - 137
			D5-Nitrobenzene	2016/07/18		103	%	23 - 120
			D5-Phenol	2016/07/18		101	%	24 - 113
4572741	LTO	RPD	2-Methylphenol	2016/07/18	9.4		%	50
			3 & 4-methylphenol	2016/07/18	7.2		%	50
4572741	LTO	Method Blank	2,4,6-Tribromophenol	2016/07/18		111	%	24 - 121
			2-Fluorobiphenyl	2016/07/18		110	%	30 - 115
			2-Fluorophenol	2016/07/18		80	%	30 - 130
			2-Methylphenol	2016/07/18	<5		ug	
			3 & 4-methylphenol	2016/07/18	<5		ug	
			D14-Terphenyl	2016/07/18		126	%	18 - 137
			D5-Nitrobenzene	2016/07/18		104	%	23 - 120
			D5-Phenol	2016/07/18		100	%	24 - 113
4583299	OBC	Spiked Blank	C13-1234678 HeptaCDD	2016/07/19		93	%	25 - 130
			C13-1234678 HeptaCDF	2016/07/19		99	%	25 - 130
			C13-123678 HexaCDD	2016/07/19		97	%	40 - 130
			C13-123678 HexaCDF	2016/07/19		94	%	40 - 130
			C13-12378 PentaCDD	2016/07/19		89	%	40 - 130
			C13-12378 PentaCDF	2016/07/19		104	%	40 - 130
			C13-123789 HexaCDF	2016/07/19		100	%	40 - 130
			C13-2378 TetraCDD	2016/07/19		89	%	40 - 130
			C13-2378 TetraCDF	2016/07/19		99	%	40 - 130
			C13-Octachlorodibenzo-p-Dioxin	2016/07/19		94	%	25 - 130
			2,3,7,8-Tetra CDD	2016/07/19		106	%	80 - 140
			1,2,3,7,8-Penta CDD	2016/07/19		105	%	80 - 140
			1,2,3,4,7,8-Hexa CDD	2016/07/19		112	%	80 - 140
			1,2,3,6,7,8-Hexa CDD	2016/07/19		112	%	80 - 140
			1,2,3,7,8,9-Hexa CDD	2016/07/19		112	%	80 - 140
			1,2,3,4,6,7,8-Hepta CDD	2016/07/19		96	%	80 - 140
			1,2,3,4,6,7,8,9-Octa CDD	2016/07/19		102	%	80 - 140
			2,3,7,8-Tetra CDF	2016/07/19		104	%	80 - 140
			1,2,3,7,8-Penta CDF	2016/07/19		99	%	80 - 140
			2,3,4,7,8-Penta CDF	2016/07/19		97	%	80 - 140
			1,2,3,4,7,8-Hexa CDF	2016/07/19		114	%	80 - 140
			1,2,3,6,7,8-Hexa CDF	2016/07/19		108	%	80 - 140
			2,3,4,6,7,8-Hexa CDF	2016/07/19		125	%	80 - 140
			1,2,3,7,8,9-Hexa CDF	2016/07/19		120	%	80 - 140
			1,2,3,4,6,7,8-Hepta CDF	2016/07/19		100	%	80 - 140
			1,2,3,4,7,8,9-Hepta CDF	2016/07/19		101	%	80 - 140
			1,2,3,4,6,7,8,9-Octa CDF	2016/07/19		105	%	80 - 140

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Maxxam Job #: B6E1667
Report Date: 2016/07/27

Weston Solutions Inc
Client Project #: 14464.007.004
Site Location: LWEC, L'ANSE, MICHIGAN

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
4583299	OBC	Spiked Blank DUP	C13-1234678 HeptaCDD	2016/07/19		94	%	25 - 130
			C13-1234678 HeptaCDF	2016/07/19		98	%	25 - 130
			C13-123678 HexaCDD	2016/07/19		96	%	40 - 130
			C13-123678 HexaCDF	2016/07/19		97	%	40 - 130
			C13-12378 PentaCDD	2016/07/19		92	%	40 - 130
			C13-12378 PentaCDF	2016/07/19		105	%	40 - 130
			C13-123789 HexaCDF	2016/07/19		104	%	40 - 130
			C13-2378 TetraCDD	2016/07/19		90	%	40 - 130
			C13-2378 TetraCDF	2016/07/19		101	%	40 - 130
			C13-Octachlorodibenzo-p-Dioxin	2016/07/19		94	%	25 - 130
			2,3,7,8-Tetra CDD	2016/07/19		105	%	80 - 140
			1,2,3,7,8-Penta CDD	2016/07/19		106	%	80 - 140
			1,2,3,4,7,8-Hexa CDD	2016/07/19		117	%	80 - 140
			1,2,3,6,7,8-Hexa CDD	2016/07/19		109	%	80 - 140
			1,2,3,7,8,9-Hexa CDD	2016/07/19		115	%	80 - 140
			1,2,3,4,6,7,8-Hepta CDD	2016/07/19		96	%	80 - 140
			1,2,3,4,6,7,8,9-Octa CDD	2016/07/19		100	%	80 - 140
			2,3,7,8-Tetra CDF	2016/07/19		105	%	80 - 140
			1,2,3,7,8-Penta CDF	2016/07/19		99	%	80 - 140
			2,3,4,7,8-Penta CDF	2016/07/19		98	%	80 - 140
			1,2,3,4,7,8-Hexa CDF	2016/07/19		112	%	80 - 140
			1,2,3,6,7,8-Hexa CDF	2016/07/19		111	%	80 - 140
			2,3,4,6,7,8-Hexa CDF	2016/07/19		125	%	80 - 140
			1,2,3,7,8,9-Hexa CDF	2016/07/19		118	%	80 - 140
			1,2,3,4,6,7,8-Hepta CDF	2016/07/19		101	%	80 - 140
			1,2,3,4,7,8,9-Hepta CDF	2016/07/19		101	%	80 - 140
			1,2,3,4,6,7,8,9-Octa CDF	2016/07/19		104	%	80 - 140
4583299	OBC	RPD	2,3,7,8-Tetra CDD	2016/07/19	NC		%	20
			1,2,3,7,8-Penta CDD	2016/07/19	NC		%	20
			1,2,3,4,7,8-Hexa CDD	2016/07/19	NC		%	20
			1,2,3,6,7,8-Hexa CDD	2016/07/19	NC		%	20
			1,2,3,7,8,9-Hexa CDD	2016/07/19	NC		%	20
			1,2,3,4,6,7,8-Hepta CDD	2016/07/19	NC		%	20
			1,2,3,4,6,7,8,9-Octa CDD	2016/07/19	NC		%	20
			2,3,7,8-Tetra CDF	2016/07/19	NC		%	20
			1,2,3,7,8-Penta CDF	2016/07/19	NC		%	20
			2,3,4,7,8-Penta CDF	2016/07/19	NC		%	20
			1,2,3,4,7,8-Hexa CDF	2016/07/19	NC		%	20
			1,2,3,6,7,8-Hexa CDF	2016/07/19	NC		%	20
			2,3,4,6,7,8-Hexa CDF	2016/07/19	NC		%	20
			1,2,3,7,8,9-Hexa CDF	2016/07/19	NC		%	20
			1,2,3,4,6,7,8-Hepta CDF	2016/07/19	NC		%	20
			1,2,3,4,7,8,9-Hepta CDF	2016/07/19	NC		%	20
			1,2,3,4,6,7,8,9-Octa CDF	2016/07/19	NC		%	20
4583299	OBC	Method Blank	C13-1234678 HeptaCDD	2016/07/19		97	%	25 - 130
			C13-1234678 HeptaCDF	2016/07/19		102	%	25 - 130
			C13-123678 HexaCDD	2016/07/19		96	%	40 - 130
			C13-123678 HexaCDF	2016/07/19		102	%	40 - 130
			C13-12378 PentaCDD	2016/07/19		95	%	40 - 130
			C13-12378 PentaCDF	2016/07/19		111	%	40 - 130
			C13-123789 HexaCDF	2016/07/19		99	%	40 - 130
			C13-2378 TetraCDD	2016/07/19		92	%	40 - 130
			C13-2378 TetraCDF	2016/07/19		102	%	40 - 130

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Weston Solutions Inc
Client Project #: 14464.007.004
Site Location: LWEC, L'ANSE, MICHIGAN

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			C13-Octachlorodibenzo-p-Dioxin	2016/07/19		96	%	25 - 130
			2,3,7,8-Tetra CDD	2016/07/19	<3.5, EDL=3.5		pg	
			1,2,3,7,8-Penta CDD	2016/07/19	<3.2, EDL=3.2		pg	
			1,2,3,4,7,8-Hexa CDD	2016/07/19	<4.0, EDL=4.0		pg	
			1,2,3,6,7,8-Hexa CDD	2016/07/19	<4.1, EDL=4.1		pg	
			1,2,3,7,8,9-Hexa CDD	2016/07/19	<3.6, EDL=3.6		pg	
			1,2,3,4,6,7,8-Hepta CDD	2016/07/19	<3.2, EDL=3.2		pg	
			1,2,3,4,6,7,8,9-Octa CDD	2016/07/19	<3.9, EDL=3.9		pg	
			Total Tetra CDD	2016/07/19	<7.3, EDL=7.3 (1)		pg	
			Total Penta CDD	2016/07/19	<5.5, EDL=5.5 (1)		pg	
			Total Hexa CDD	2016/07/19	<15, EDL=15 (1)		pg	
			Total Hepta CDD	2016/07/19	<3.2, EDL=3.2		pg	
			2,3,7,8-Tetra CDF	2016/07/19	<4.1, EDL=4.1		pg	
			1,2,3,7,8-Penta CDF	2016/07/19	<2.9, EDL=2.9		pg	
			2,3,4,7,8-Penta CDF	2016/07/19	<2.9, EDL=2.9		pg	
			1,2,3,4,7,8-Hexa CDF	2016/07/19	<3.4, EDL=3.4		pg	
			1,2,3,6,7,8-Hexa CDF	2016/07/19	<3.1, EDL=3.1		pg	
			2,3,4,6,7,8-Hexa CDF	2016/07/19	<3.4, EDL=3.4		pg	
			1,2,3,7,8,9-Hexa CDF	2016/07/19	<3.7, EDL=3.7		pg	
			1,2,3,4,6,7,8-Hepta CDF	2016/07/19	<1.6, EDL=1.6		pg	
			1,2,3,4,7,8,9-Hepta CDF	2016/07/19	<1.9, EDL=1.9		pg	
			1,2,3,4,6,7,8,9-Octa CDF	2016/07/19	<2.9, EDL=2.9		pg	
			Total Tetra CDF	2016/07/19	<4.1, EDL=4.1		pg	
			Total Penta CDF	2016/07/19	<2.9, EDL=2.9		pg	
			Total Hexa CDF	2016/07/19	<3.4, EDL=3.4		pg	

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Client Project #: 14464.007.004
Site Location: LWEC, L'ANSE, MICHIGAN

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	% Recovery	UNITS	QC Limits
			Total Hepta CDF	2016/07/19	<1.7, EDL=1.7		PG	

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

(1) EMPC / NDR - Peak detected does not meet ratio criteria and has resulted in an elevated detection limit.

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Karen Nicol

Karen Nicol, Supervisor, Semi-Volatiles

Kay Shaw

Kay Shaw, C. Chem, Sr Scientific Specialist, HRMS Services

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

B6E1667

Lab Tracking Number

Chain-of-Custody Record/Lab Work Request

WESTON

Page 1 of 1

Client	LWEC, L'Anse, Michigan		
Work Order Number	[illegible]	Phone Number	[illegible]
Contact Person	Ken Hill	Turn Around Time	[illegible]

Lab ID	Field Sample ID	Sample Collection Date	Analysis (Analyses Requested/Other Info)	XAD #			Sample Checked
	LWEC - 114 - STK - 1 - M0010/23 - FBHS	7/6/16	M0010/23				
	LWEC - 114 - STK - 1 - M0010/23 - FILT		M0010/23				
	LWEC - 114 - STK - 1 - M0010/23 - BHC		M0010/23				
	LWEC - 114 - STK - 1 - M0010/23 - BHS		M0010/23				
	LWEC - 114 - STK - 1 - M0010/23 - XAD		M0010/23	#1			
	LWEC - 114 - STK - 1 - M0010/23 - TOL		M0010/23				
	LWEC - 114 - STK - 2 - M0010/23 - FBHS		M0010/23				
	LWEC - 114 - STK - 2 - M0010/23 - FILT		M0010/23				
	LWEC - 114 - STK - 2 - M0010/23 - BHC		M0010/23				
	LWEC - 114 - STK - 2 - M0010/23 - BHS		M0010/23				
	LWEC - 114 - STK - 2 - M0010/23 - XAD		M0010/23	#2			
	LWEC - 114 - STK - 2 - M0010/23 - TOL		M0010/23				
	LWEC - 114 - STK - 3 - M0010/23 - FBHS	7/7/16	M0010/23				
	LWEC - 114 - STK - 3 - M0010/23 - FILT		M0010/23				
	LWEC - 114 - STK - 3 - M0010/23 - BHC		M0010/23				
	LWEC - 114 - STK - 3 - M0010/23 - BHS		M0010/23				
	LWEC - 114 - STK - 3 - M0010/23 - XAD		M0010/23	#3			
	LWEC - 114 - STK - 3 - M0010/23 - TOL		M0010/23				
	LWEC - 114 - STK - BT - M0010/23 - FBHS		M0010/23				
	LWEC - 114 - STK - BT - M0010/23 - FILT		M0010/23				
	LWEC - 114 - STK - BT - M0010/23 - BHC		M0010/23				
	LWEC - 114 - STK - BT - M0010/23 - BHS		M0010/23				
	LWEC - 114 - STK - BT - M0010/23 - XAD		M0010/23	#4			
	LWEC - 114 - STK - BT - M0010/23 - TOL		M0010/23				
	LWEC 114 - STK - SB - M0010/23 - ACE/DCM		M0010/23				
	LWEC 114 - STK - SB - M0010/23 - FILT		M0010/23				
	LWEC - 114 - STK - SB - M0010/23 - XAD		M0010/23	#5			
	LWEC - 114 - STK - SB - M0010/23 - TOL		M0010/23				
	LWEC - 114 - STK - SB - M0010/23 - H2O		M0010/23				

Notes: PCDD/PCDF Analysis per EPA 23, SVOC Analysis per EPA 8270

Full Data package required CRESOLS — M0010 ✓ WITH K HILL

Relinquished By	Received By	Date	Time	Lab Use Only	
[illegible]		7/7/16	20[illegible]	Shipper	Air Bill #
	[illegible]	7/7/16		Opened By	Date/Time
				Temp °C	Condition
	[illegible]	[illegible]	[illegible]	Custody Seals Yes No None N/A	

Laboratory Comments:

[illegible]

D.3 SSAS

APPENDIX E
FUEL SAMPLE RESULTS

E.1 Stack Test Samples

E.2 15-Day Pretest Samples

E.1 STACK TEST SAMPLES

ALS Environmental

L'Anse Warden Compliance Testing - Master Data Compilation Table

Revision	Sample ID:	Sample Date	Sample Time	Lab No.	Moisture (D3173)	Sulfur		Chlorine		Comments
						As Received	Moist. Free	As Received	Moist. Free	
					wt %	wt %	wt %	mg/kg	mg/kg	
Rev1	Run 1A Woodchips	7/6/16	1236	T1601194-001	46.70	0.01	0.03	<48	<48	
Rev1	Run 1A RR Tie	7/6/16	1238	T1601194-002	31.59	0.09	0.14	66	97	
Rev1	Run 1A TDF	7/6/16	1240	T1601194-003	12.31	1.59	1.82	378	431	
Rev1	Run 1A Combined Fuel	7/6/16	1228	T1601194-004	32.11	0.09	0.13	35	52	
Rev1	Run 1B Woodchips	7/6/16	1444	T1601194-005	45.40	0.02	0.04	62	114	
Rev1	Run 1B RR Tie	7/6/16	1447	T1601194-006	29.55	0.11	0.16	72	102	
Rev1	Run 1B TDF	7/6/16	1449	T1601194-007	7.51	1.59	1.72	574	621	
Rev1	Run 1B Combined Fuel	7/6/16	1454	T1601194-008	30.61	0.13	0.19	46	66	
Rev1	Run 2A Woodchips	7/6/16	1800	T1601194-009	46.88	0.01	0.02	<48	<48	
Rev1	Run 2A RR Tie	7/6/16	1802	T1601194-010	30.53	0.11	0.15	55	79	
Rev1	Run 2A TDF	7/6/16	1804	T1601194-011	9.88	1.69	1.87	382	424	
Rev1	Run 2A Combined Fuel	7/6/16	1808	T1601194-012	27.62	0.16	0.22	60	83	
Rev1	Run 2B Woodchips	7/7/16	1030	T1601194-013	46.47	0.02	0.04	<48	<48	
Rev1	Run 2B RR Tie	7/7/16	1032	T1601194-014	31.03	0.12	0.18	65	94	
Rev1	Run 2B TDF	7/7/16	1034	T1601194-015	12.41	1.58	1.81	398	455	
Rev1	Run 2B Combined Fuel	7/7/16	1036	T1601194-016	34.42	0.06	0.10	41	62	
Rev1	Run 3A Woodchips	7/7/16	1421	T1601194-017	43.44	0.02	0.03	<54	<54	
Rev1	Run 3A RR Tie	7/7/16	1423	T1601194-018	29.03	0.11	0.16	53	74	
Rev1	Run 3A TDF	7/7/16	1425	T1601194-019	5.49	1.71	1.81	424	449	
Rev1	Run 3A Combined Fuel	7/7/16	1429	T1601194-020	36.73	0.05	0.08	44	69	
Rev1	Run 3B Woodchips	7/7/16	1617	T1601194-021	41.11	0.01	0.02	<48	<48	
Rev1	Run 3B RR Tie	7/7/16	1619	T1601194-022	26.88	0.10	0.13	61	83	
Rev1	Run 3B TDF	7/7/16	1621	T1601194-023	11.33	1.86	2.10	384	433	
Rev1	Run 3B Combined Fuel	7/7/16	1625	T1601194-024	29.30	0.10	0.15	46	65	
Rev1	Run 3C Woodchips	7/7/16	1852	T1601194-025	38.76	0.07	0.12	<48	<48	
Rev1	Run 3C RR Tie	7/7/16	1854	T1601194-026	29.36	0.09	0.12	56	79	
Rev1	Run 3C TDF	7/7/16	1856	T1601194-027	5.75	1.85	1.96	479	509	
Rev1	Run 3C Combined Fuel	7/7/16	1900	T1601194-028	29.21	0.10	0.15	54	76	

August 04, 2016 Service Request No:T1601194

Mr. J.R. Richardson
L'Anse Warden Electric Co., LLC
157 S. Main St.
L'Anse, MI 49946

Laboratory Results for: USEPA 114 Compliance Testing

Dear Mr.Richardson,

Enclosed are the results of the sample(s) submitted to our laboratory July 11, 2016
For your reference, these analyses have been assigned our service request number **T1601194.**

All analyses were performed according to our laboratory's quality assurance program. All results are intended to be considered in their entirety, and ALS Environmental is not responsible for use of less than the complete report. Results
apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 7102. You may also contact me via email at Wendy.Hyatt@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Wendy Hyatt
Client Services
Manager

ADDRESS 3860 S. Palo Verde Road, Suite 302, Tucson, AZ 85714
PHONE +1 520 573 1061 | FAX +1 520 573 1063
ALS Group USA, Corp.
dba ALS Environmental

Client: L'Anse Warden Electric Co., LLC **Service Request:**T1601194
Project: USEPA 114 Compliance Testing

SAMPLE CROSS-REFERENCE

SAMPLE #	CLIENT SAMPLE ID	DATE	TIME
T1601194-001	Run 1A Woodchips	7/6/2016	1236
T1601194-002	Run 1A RR Tie	7/6/2016	1238
T1601194-003	Run 1A TDF	7/6/2016	1240
T1601194-004	Run 1A Combined Fuel	7/6/2016	1228
T1601194-005	Run 1B Woodchips	7/6/2016	1444
T1601194-006	Run 1B RR Tie	7/6/2016	1447
T1601194-007	Run 1B TDF	7/6/2016	1449
T1601194-008	Run 1B Combined Fuel	7/6/2016	1454
T1601194-009	Run 2A Woodchips	7/6/2016	1800
T1601194-010	Run 2A RR Tie	7/6/2016	1802
T1601194-011	Run 2A TDF	7/6/2016	1804
T1601194-012	Run 2A Combined Fuel	7/6/2016	1808
T1601194-013	Run 2B Woodchips	7/7/2016	1030
T1601194-014	Run 2B RR Tie	7/7/2016	1032
T1601194-015	Run 2B TDF	7/7/2016	1034
T1601194-016	Run 2B Combined Fuel	7/7/2016	1036
T1601194-017	Run 3A Woodchips	7/7/2016	1421
T1601194-018	Run 3A RR Tie	7/7/2016	1423
T1601194-019	Run 3A TDF	7/7/2016	1425
T1601194-020	Run 3A Combined Fuel	7/7/2016	1429
T1601194-021	Run 3B Woodchips	7/7/2016	1617
T1601194-022	Run 3B RR Tie	7/7/2016	1619
T1601194-023	Run 3B TDF	7/7/2016	1621
T1601194-024	Run 3B Combined Fuel	7/7/2016	1625
T1601194-025	Run 3C Woodchips	7/7/2016	1852
T1601194-026	Run 3C RR Tie	7/7/2016	1854
T1601194-027	Run 3C TDF	7/7/2016	1856
T1601194-028	Run 3C Combined Fuel	7/7/2016	1900

Chain of Custody

ALS Environmental - Tucson
ADDRESS 3860 S. Palo Verde Road, Suite 302, Tucson, AZ 85714
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ALS Group

Work Order No.: T1601194 5
L'Anse Warden Electric Co., LLC
USEPA 114 Compliance Testing

PAGE 1 of 3

Project Manager:	JR Richardson		Bill to:	Midge Axley	
Client Name:	L'Anse Warden Electric Company, LLC		Company:	L'Anse Warden Electric Company, LLC	
Address:	157 South Main Street		Address:	P.O. Box 695	
City, State ZIP:	L'Anse, MI 49946		City, State ZIP:	White Pine, MI 49971	
Email:	jr.richardson@pmpowergroup.com	Phone: 906.885.7187	Email:	midge.axley@pmpowergroup.co	Phone: 906.885.7400
Project Name:	USEPA 114 Compliance Testing				
Project Number:					
P.O. Number:					
Sampler's Name:	Jed Chrestensen, Mannik Smith Group				

SAMPLE RECEIPT

Temperature (°C):				Temp Blank Present
Received Intact:	Yes	No	N/A	Wet Ice / Blue Ice
Cooler Custody Seals:	Yes	No	N/A	Total Containers:
Sample Custody Seals:	Yes	No	N/A	

REQUESTED ANALYSIS

Sample Identification	Matrix	Date Sampled	Time Sampled	Lab ID	No. of Containers	Prep Grind	Moisture, Total - ASTM E871	Moisture, Total - ASTM D3173	Sulfur, Total - ASTM D6700-01	Sulfur, Total - ASTM D4239	Chlorine, Total - EPA 5050/9056	Comments
Run 1A Woodchips	Solid	7/6/16	12:36		1	X	X			X	X	Copy report to
Run 1A RR Tie	Solid	7/6/16	12:38		1	X	X			X	X	
Run 1A TDF	Solid	7/6/16	12:40		1	X		X	X		X	
Run 1A Combined Fuel	Solid	7/6/16	12:28		1	X	X			X	X	
Run 1B Woodchips	Solid	7/6/16	14:44		1	X	X			X	X	
Run 1B RR Tie	Solid	7/6/16	14:47		1	X	X			X	X	
Run 1B TDF	Solid	7/6/16	14:49		1	X		X	X		X	
Run 1B Combined Fuel	Solid	7/6/16	14:54		1	X	X			X	X	
Run 2A Woodchips	Solid	7/6/16	18:00		1	X	X			X	X	
Run 2A RR Tie	Solid	7/6/16	18:02		1	X	X			X	X	

TAT
- [x] Routine
- [ ] Same Day *
- [ ] Next Day *
- [ ] 3 Day*
- [ ] 6 Day*

* Please call for availability. Rush charges will apply.

Due Date:

Additional Methods Available Upon Request

RELINQUISHED BY			RECEIVED BY		
Print Name	Signature	Date/Time	Print Name	Signature	Date/Time
JED CHRESTENSEN	[signature]	7-8-16 13:40	UPS TRACKING #1ZF55A9401 93172960 #1ZF55A9401 92876958	[signature] JUL 11 2016	0933

Revised: 7/7/2016

Page 3 of 12

Chain of Custody

ALS Environmental - Tucson
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ALS Group

Work Order No.: T1601194 5 SE 2 OF 3
L'Anse Warden Electric Co., LLC
USEPA 114 Compliance Testing

Project Manager:	JR Richardson	Bill to:	Midge Axley
Client Name:	L'Anse Warden Electric Company, LLC	Company:	L'Anse Warden Electric Company, LLC
Address:	157 South Main Street	Address:	P.O. Box 695
City, State ZIP:	L'Anse, MI 49946	City, State ZIP:	White Pine, MI 49971
Email:	jr.richardson@pmpowergroup.com Phone: 906.885.7187	Email:	midge.axley@pmpowergroup.co Phone: 906.885.7400
Project Name:	USEPA 114 Compliance Testing		
Project Number:			
P.O. Number:			
Sampler's Name:	Jed Chrestensen, Mannik Smith Group		

SAMPLE RECEIPT

Temperature (°C):		Temp Blank Present
Received Intact:	Yes No N/A	Wet Ice / Blue Ice
Cooler Custody Seals:	Yes No N/A	Total Containers:
Sample Custody Seals:	Yes No N/A	

REQUESTED ANALYSIS

Sample Identification	Matrix	Date Sampled	Time Sampled	Lab ID	No. of Containers	Prep Grind	Moisture, Total - ASTM E871	Moisture, Total - ASTM D3173	Sulfur, Total - ASTM D6700-01	Sulfur, Total - ASTM D4239	Chlorine, Total - EPA 5050/9056	Comments
Run 2A TDF	Solid	7/6/16	18:04		1	X		X	X		X	Copy report to
Run 2A Combined Fuel	Solid	7/6/16	18:08		1	X	X			X	X	
Run 2B Woodchips	Solid	7/7/16	10:30		1	X	X			X	X	
Run 2B RR Tie	Solid	7/7/16	10:32		1	X	X			X	X	
Run 2B TDF	Solid	7/7/16	10:34		1	X		X	X		X	
Run 2B Combined Fuel	Solid	7/7/16	10:36		1	X	X			X	X	
Run 3A Woodchips	Solid	7/7/16	14:21		1	X	X			X	X	
Run 3A RR Tie	Solid	7/7/16	14:23		1	X	X			X	X	
Run 3A TDF	Solid	7/7/16	14:25		1	X		X	X		X	
Run 3A Combined Fuel	Solid	7/7/16	14:29		1	X	X			X	X	

TAT
- [x] Routine
- [ ] Same Day *
- [ ] Next Day *
- [ ] 3 Day*
- [ ] 6 Day*

* Please call for availability. Rush charges will apply.

Due Date:

Additional Methods Available Upon Request

RELINQUISHED BY			RECEIVED BY		
Print Name	Signature	Date/Time	Print Name	Signature	Date/Time
JED CHRESTENSEN	[signature]	7-8-16 13:40	UPS TRACKING # 1Z F55 A94 01 9347 3160 / 1Z F55 A94 01 9876 9358	Cynthia [signature]	0933
				JUL 11 2016	

Revised: 7/7/2016

Chain of Custody

ALS Environmental - Tucson
ADDRESS 3860 S. Palo Verde Road, Suite 302, Tucson, AZ 85714
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ALS Group

Work Order No.: T1601194 5
L'Anse Warden Electric Co., LLC
USEPA 114 Compliance Testing

PAGE 3 OF 3

Project Manager:	JR Richardson	Bill to:	Midge Axley
Client Name:	L'Anse Warden Electric Company, LLC	Company:	L'Anse Warden Electric Company, LLC
Address:	157 South Main Street	Address:	P.O. Box 695
City, State ZIP:	L'Anse, MI 49946	City, State ZIP:	White Pine, MI 49971
Email:	jr.richardson@pmpowergroup.com Phone: 906.885.7187	Email:	midge.axley@pmpowergroup.co Phone: 906.885.7400
Project Name:	USEPA 114 Compliance Testing		
Project Number:			
P.O. Number:			
Sampler's Name:	Jed Chrestensen, Mannik Smith Group		

SAMPLE RECEIPT

Temperature (°C):				Temp Blank Present
Received Intact:	Yes	No	N/A	Wet Ice / Blue Ice
Cooler Custody Seals:	Yes	No	N/A	Total Containers:
Sample Custody Seals:	Yes	No	N/A	

TAT
- [x] Routine
- [ ] Same Day *
- [ ] Next Day *
- [ ] 3 Day*
- [ ] 6 Day*

* Please call for availability. Rush charges will apply.

Due Date:

REQUESTED ANALYSIS

Sample Identification	Matrix	Date Sampled	Time Sampled	Lab ID	No. of Containers	Prep Grind	Moisture, Total - ASTM E871	Moisture, Total - ASTM D3173	Sulfur, Total - ASTM D6700-01	Sulfur, Total - ASTM D4239	Chlorine, Total - EPA 5050/9056	Comments
Run 3B Woodchips	Solid	7/7/16	16:17		1	X	X			X	X	Copy report to
Run 3B RR Tie	Solid	7/7/16	16:19		1	X	X			X	X	
Run 3B TDF	Solid	7/7/16	16:21		1	X		X	X		X	
Run 3B Combined Fuel	Solid	7/7/16	16:25		1	X	X			X	X	
Run 3C Woodchips	Solid	7/7/16	18:52		1	X	X			X	X	
Run 3C RR Tie	Solid	7/7/16	18:54		1	X	X			X	X	
Run 3C TDF	Solid	7/7/16	18:56		1	X		X	X		X	
Run 3C Combined Fuel	Solid	7/7/16	19:00		1	X	X			X	X	

Additional Methods Available Upon Request

RELINQUISHED BY			RECEIVED BY		
Print Name	Signature	Date/Time	Print Name	Signature	Date/Time
JED CHRESTENSEN	[signature]	7-8-16 13:40	UPS tracking # 12F55A940193173960 12F55A9401 92776958	Cynthia [signature]	0933

JUL 1 1 2016

Revised: 7/7/2016

3860 S. Palo Verde Road, Suite 302
Tucson, AZ 85714
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F: +1 520 573 1063

T1601194 5
L'Anse Warden Electric Co., LLC
USEPA 114 Compliance Testing

Sample Receipt Form

Client/Project: L'Anse Warden Elec

Work Order Number:

Received by: Cynthia Vroegh Date & Time: 7/11/16 0933 Matrix: Solid

Samples were received via?: UPS Samples were received in: Box (2)

Were custody seals on containers? ○ Yes ◉ No ○ NA If yes, how many and where?

If present were custody seals intact? ○ Yes ◉ No If present, were they signed and dated? ○ Yes ◉ No

Cooler Temp C	Temp Blank C	Tracking Number
na	na	1zF55A940192176958
na	na	1zF55A940193973960

Packing material used? Bags | Bubble Wrap

Did all the bottles arrive in good condition (unbroken)? ○ Yes ○ No ◉ NA If No, record comments below

Did all sample labels and tags agree with COC? ◉ Yes ○ No ○ NA If No, record discrepancies below

Were all the appropriate containers and volumes received for the tests indicated? ◉ Yes ○ No ○ NA

Are samples received deemed acceptable? ◉ Yes ○ No

Comments:
28 - lg ziploc plastic bags with bark, RR ties and TDF.

Notes, discrepancies, & resolutions:

As a part of ISO 17025 protocols, ALS must notify clients that the quoted analytical methods performed by ALS may have minor modifications from the methods as published. These modifications are written into our Standard Operating Procedures and do not impact the quality of the data. Receipt of this document will be considered an acceptance of the procedures used by the laboratory for analysis unless notified by the client.
Modifications may include, but are not limited to:

- The analysis of a sample matrix that differs from that stated in the published method (example - ASTM D5865 Standard Test Method for Gross Calorific Value of Coal and Coke is used for other matrices such as biomass, Tire Derived Fuel, etc.).
- Analyzing a sample mass that differs from those in the published method (example - to accommodate samples with high concentrations of analyte, samples of limited volume, or to comply with the instrument manufacturer's operating guidelines).
- Instruments used for the analysis may differ from those listed in the published method (example - using ICP-OES when the method references flame Atomic Absorption Spectroscopy)

Client: L'Anse Warden Electric Co., LLC
157 S. Main St.
L'Anse, MI 49946
Attn: J.R. Richardson
Project: USEPA 114 Compliance Testing   Date Received: 7/11/16

Certificate of Analysis

Sample ID:	Sample Date and Time:		Lab #:	Moisture D3173 wt%	Sulfur D4239 Moist. Free wt%	Chlorine, Total 5050/9056 Moist. Free mg/kg	
Run 1A Woodchips	7/6/16	1236	T1601194-001	46.70	0.03	<48	
Run 1A RR Tie	7/6/16	1238	T1601194-002	31.59	0.14	97	
Run 1A TDF	7/6/16	1240	T1601194-003	12.31	1.82	431	
Run 1A Combined Fuel	7/6/16	1228	T1601194-004	32.11	0.13	52	
Run 1B Woodchips	7/6/16	1444	T1601194-005	45.40	0.04	114	
Run 1B RR Tie	7/6/16	1447	T1601194-006	29.55	0.16	102	
Run 1B TDF	7/6/16	1449	T1601194-007	7.51	1.72	621	
Run 1B Combined Fuel	7/6/16	1454	T1601194-008	30.61	0.19	66	
Run 2A Woodchips	7/6/16	1800	T1601194-009	46.88	0.02	<48	
Run 2A RR Tie	7/6/16	1802	T1601194-010	30.53	0.15	79	
Run 2A TDF	7/6/16	1804	T1601194-011	9.88	1.87	424	
Run 2A Combined Fuel	7/6/16	1808	T1601194-012	27.62	0.22	83	
Run 2B Woodchips	7/7/16	1030	T1601194-013	46.47	0.04	<48	
Run 2B RR Tie	7/7/16	1032	T1601194-014	31.03	0.18	94	
Run 2B TDF	7/7/16	1034	T1601194-015	12.41	1.81	455	

Client: L'Anse Warden Electric Co., LLC
157 S. Main St.
L'Anse, MI 49946
Attn: J.R. Richardson
Project: USEPA 114 Compliance Testing

Date Received: 7/11/16

Certificate of Analysis

Sample ID:	Sample Date and Time:		Lab #:	Moisture D3173 wt%	Sulfur D4239 Moist. Free wt%	Chlorine, Total 5050/9056 Moist. Free mg/kg	
Run 2B Combined Fuel	7/7/16	1036	T1601194-016	34.42	0.10	62	
Run 3A Woodchips	7/7/16	1421	T1601194-017	43.44	0.03	<54	
Run 3A RR Tie	7/7/16	1423	T1601194-018	29.03	0.16	74	
Run 3A TDF	7/7/16	1425	T1601194-019	5.49	1.81	449	
Run 3A Combined Fuel	7/7/16	1429	T1601194-020	36.73	0.08	69	
Run 3B Woodchips	7/7/16	1617	T1601194-021	41.11	0.02	<48	
Run 3B RR Tie	7/7/16	1619	T1601194-022	26.88	0.13	83	
Run 3B TDF	7/7/16	1621	T1601194-023	11.33	2.10	433	
Run 3B Combined Fuel	7/7/16	1625	T1601194-024	29.30	0.15	65	
Run 3C Woodchips	7/7/16	1852	T1601194-025	38.76	0.12	<48	
Run 3C RR Tie	7/7/16	1854	T1601194-026	29.36	0.12	79	
Run 3C TDF	7/7/16	1856	T1601194-027	5.75	1.96	509	
Run 3C Combined Fuel	7/7/16	1900	T1601194-028	29.21	0.15	76	

Notes:
Samples were air dried then ground to < 1 mm prior to analysis.

Client: L'Anse Warden Electric Co., LLC
157 S. Main St.
L'Anse, MI 49946
Attn: J.R. Richardson
Project: USEPA 114 Compliance Testing | Date Received: 7/11/16

Certificate of Analysis

Sample ID:	Sample Date and Time:		Lab #:		Sulfur D4239 As Received wt%	Chlorine, Total 5050/9056 As Received mg/kg	
Run 1A Woodchips	7/6/16	1236	T1601194-001		0.01	<48	
Run 1A RR Tie	7/6/16	1238	T1601194-002		0.09	66	
Run 1A TDF	7/6/16	1240	T1601194-003		1.59	378	
Run 1A Combined Fuel	7/6/16	1228	T1601194-004		0.09	35	
Run 1B Woodchips	7/6/16	1444	T1601194-005		0.02	62	
Run 1B RR Tie	7/6/16	1447	T1601194-006		0.11	72	
Run 1B TDF	7/6/16	1449	T1601194-007		1.59	574	
Run 1B Combined Fuel	7/6/16	1454	T1601194-008		0.13	46	
Run 2A Woodchips	7/6/16	1800	T1601194-009		0.01	<48	
Run 2A RR Tie	7/6/16	1802	T1601194-010		0.11	55	
Run 2A TDF	7/6/16	1804	T1601194-011		1.69	382	
Run 2A Combined Fuel	7/6/16	1808	T1601194-012		0.16	60	
Run 2B Woodchips	7/7/16	1030	T1601194-013		0.02	<48	
Run 2B RR Tie	7/7/16	1032	T1601194-014		0.12	65	
Run 2B TDF	7/7/16	1034	T1601194-015		1.58	398	

Client: L'Anse Warden Electric Co., LLC
157 S. Main St.
L'Anse, MI 49946
Attn: J.R. Richardson
Project: USEPA 114 Compliance Testing **Date Received:** 7/11/16

Certificate of Analysis

Sample ID:	Sample Date and Time:		Lab #:		Sulfur D4239 As Received wt%	Chlorine, Total 5050/9056 As Received mg/kg	
Run 2B Combined Fuel	7/7/16	1036	T1601194-016		0.06	41	
Run 3A Woodchips	7/7/16	1421	T1601194-017		0.02	<54	
Run 3A RR Tie	7/7/16	1423	T1601194-018		0.11	53	
Run 3A TDF	7/7/16	1425	T1601194-019		1.71	424	
Run 3A Combined Fuel	7/7/16	1429	T1601194-020		0.05	44	
Run 3B Woodchips	7/7/16	1617	T1601194-021		0.01	<48	
Run 3B RR Tie	7/7/16	1619	T1601194-022		0.10	61	
Run 3B TDF	7/7/16	1621	T1601194-023		1.86	384	
Run 3B Combined Fuel	7/7/16	1625	T1601194-024		0.10	46	
Run 3C Woodchips	7/7/16	1852	T1601194-025		0.07	<48	
Run 3C RR Tie	7/7/16	1854	T1601194-026		0.09	56	
Run 3C TDF	7/7/16	1856	T1601194-027		1.85	479	
Run 3C Combined Fuel	7/7/16	1900	T1601194-028		0.10	54	

E.2 15-DAY PRETEST SAMPLES

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DR lo r Ro on

July 11, 2016 Service Request No:T1600851

Mr. J.R. Richardson
L'Anse Warden Electric Co., LLC
157 S. Main St.
L'Anse, MI 49946

Laboratory Results for: USEPA Compliance Testing

Dear Mr.Richardson,

Enclosed are the results of the sample(s) submitted to our laboratory May 25, 2016
For your reference, these analyses have been assigned our service request number **T1600851.**

All analyses were performed according to our laboratory's quality assurance program. All results are intended to be considered in their entirety, and ALS Environmental is not responsible for use of less than the complete report. Results
apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 7102. You may also contact me via email at Wendy.Hyatt@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

W Hyatt

Wendy Hyatt
Client Services
Manager

ADDRESS 3860 S. Palo Verde Road, Suite 302, Tucson, AZ 85714
PHONE +1 520 573 1061 | FAX +1 520 573 1063
ALS Group USA, Corp.
dba ALS Environmental

Client: L'Anse Warden Electric Co., LLC
Project: USEPA Compliance Testing

Service Request: T1600851

SAMPLE CROSS-REFERENCE

SAMPLE #	CLIENT SAMPLE ID	DATE	TIME
T1600851-001	R/R Tie	5/19/2016	1300
T1600851-002	Wood Chips	5/19/2016	1330
T1600851-003	TDF	5/19/2016	1345

Chain of Custody

ALS Environmental - Tucson
ADDRESS 3860 S. Palo Verde Road, Suite 302, Tucson, AZ 85714
PHONE +1 520 573 1061 FAX +1 520 573 1063
ALS Group

Work Order No.: T1600851 5
L'Anse Warden Electric Co., LLC
USEPA Compliance Testing

Project Manager:	JR Richardson	Bill to:	Susan Basile
Client Name:	L'Anse Warden Electric Co., LLC	Company:	L'Anse Warden Electric Co., LLC
Address:	157 S. Main St.	Address:	PO Box 695
City, State ZIP:	L'Anse, MI 49946	City, State ZIP:	White Pine, MI 49971
Email:	jr.richardson@pmpowergroup.com Phone: 906.885.7187	Email:	Phone: 906.885.7402
Project Name:	USEPA Compliance Testing		
Project Number:			
P.O. Number:	108672		
Sampler's Name:	John Polkky		

SAMPLE RECEIPT

Temperature (°C):				Temp Blank Present	
Received Intact:	Yes	No	N/A	Wet Ice / Blue Ice	
Cooler Custody Seals:	Yes	No	N/A	Total Containers:	
Sample Custody Seals:	Yes	No	N/A		

REQUESTED ANALYSIS

Sample Identification	Matrix	Date Sampled	Time Sampled	Lab ID	No. of Containers	Prep Grind	Moisture, Total - D3173 / E871	Sulfur, Total - D4239	Chlorine, Total - 5050 / 9056	Comments
R/R Tie		5/19/2016	1300		1	x	x	x	x	Copy report to
Wood Chips		5/19/2016	1330		1	x	x	x	x	k.hill@westonsolutions.com
TDF		5/19/2016	1345		1	x	x	x	x	

TAT
- [x] Routine
- [ ] Same Day *
- [ ] Next Day *
- [ ] 3 Day*
- [ ] 6 Day*

* Please call for availability. Rush charges will apply.

Due Date:

Additional Methods Available Upon Request

RELINQUISHED BY			RECEIVED BY		
Print Name	Signature	Date/Time	Print Name	Signature	Date/Time
John Polkky	[signature]	5-19-16/1615	U.P.S Cynthia Vnegh	[signature]	5/19/2016
					5/23/16 [illegible]

Revised: [illegible]

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Tucson, AZ 85714
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F: +1 520 573 1063

T1600851 5
L'Anse Warden Electric Co., LLC
USEPA Compliance Testing

Sample Receipt Form

Client/Project: L'Anse Warden Elec

Work Order Number:

Received by: Cynthia Vroegh

Date & Time: 5/25/16 1010

Matrix: Solid

Samples were received via?: UPS

Samples were received in: Box

Were custody seals on containers? ○ Yes ◉ No ○ NA

If yes, how many and where?

If present were custody seals intact? ○ Yes ◉ No

If present, were they signed and dated? ○ Yes ◉ No

Cooler Temp C	Temp Blank C	Tracking Number
na	na	1z526f7e0398517258

Packing material used? Bags

Did all the bottles arrive in good condition (unbroken)? ○ Yes ○ No ◉ NA — If No, record comments below

Did all sample labels and tags agree with COC? ◉ Yes ○ No ○ NA — If No, record discrepancies below

Were all the appropriate containers and volumes received for the tests indicated? ◉ Yes ○ No ○ NA

Are samples received deemed acceptable? ◉ Yes ○ No

Comments:
3 - lg ziplock bags with RR ties and TDF

Notes, discrepancies, & resolutions:

As a part of ISO 17025 protocols, ALS must notify clients that the quoted analytical methods performed by ALS may have minor modifications from the methods as published. These modifications are written into our Standard Operating Procedures and do not impact the quality of the data. Receipt of this document will be considered an acceptance of the procedures used by the laboratory for analysis unless notified by the client.
Modifications may include, but are not limited to:

- The analysis of a sample matrix that differs from that stated in the published method (example - ASTM D5865 Standard Test Method for Gross Calorific Value of Coal and Coke is used for other matrices such as biomass, Tire Derived Fuel, etc.).
- Analyzing a sample mass that differs from those in the published method (example - to accommodate samples with high concentrations of analyte, samples of limited volume, or to comply with the instrument manufacturer's operating guidelines).
- Instruments used for the analysis may differ from those listed in the published method (example - using ICP- OES when the method references flame Atomic Absorption Spectroscopy)

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Environmental

Client: L'Anse Warden Electric Co., LLC
157 S. Main St.
L'Anse, MI 49946
Attn: J.R. Richardson
Project: USEPA Compliance Testing

Date Received: 5/25/16

Certificate of Analysis

Sample ID:	Sample Date and Time:		Lab #:	Moisture D3173 wt%	Sulfur D4239 Moist. Free wt%	Chlorine, Total 5050/9056 Moist. Free mg/kg	
R/R Tie	5/19/16	1300	T1600851-001	31.58	0.16	512	
Wood Chips	5/19/16	1330	T1600851-002	36.89	0.02	52	
TDF	5/19/16	1345	T1600851-003	1.33	1.68	503	

ALS Environmental

Client: L'Anse Warden Electric Co., LLC
157 S. Main St.
L'Anse, MI 49946
Attn: J.R. Richardson
Project: USEPA Compliance Testing

Date Received: 5/25/16

Certificate of Analysis

Sample ID:	Sample Date and Time:		Lab #:		Sulfur D4239 As Received wt%	Chlorine, Total 5050/9056 As Received mg/kg	
R/R Tie	5/19/16	1300	T1600851-001		0.11	351	
Wood Chips	5/19/16	1330	T1600851-002		0.01	33	
TDF	5/19/16	1345	T1600851-003		1.66	497	

ADDRESS 3860 S. Palo Verde Road, Suite 302, Tucson, AZ 85714
PHONE +1 520 573 1061
FAX +1 520 573 1063

July 11, 2016 Service Request No:T1600895

Mr. J.R. Richardson
L'Anse Warden Electric Co., LLC
157 S. Main St.
L'Anse, MI 49946

Laboratory Results for: USEPA Compliance Testing

Dear Mr.Richardson,

Enclosed are the results of the sample(s) submitted to our laboratory May 26, 2016
For your reference, these analyses have been assigned our service request number **T1600895.**

All analyses were performed according to our laboratory's quality assurance program. All results are intended to be considered in their entirety, and ALS Environmental is not responsible for use of less than the complete report. Results
apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 7102. You may also contact me via email at Wendy.Hyatt@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Wendy Hyatt
Client Services
Manager

ADDRESS 3860 S. Palo Verde Road, Suite 302, Tucson, AZ 85714
PHONE +1 520 573 1061 | FAX +1 520 573 1063
ALS Group USA, Corp.
dba ALS Environmental

Client: L'Anse Warden Electric Co., LLC

Project: USEPA Compliance Testing

Service Request: T1600895

SAMPLE CROSS-REFERENCE

SAMPLE #	CLIENT SAMPLE ID	DATE	TIME
T1600895-001	R/R Tie	5/20/2016	1345
T1600895-002	Wood Chips	5/20/2016	1345
T1600895-003	TDF	5/20/2016	1345

Chain of Custody

ALS Environmental - Tucson
ADDRESS 3860 S. Palo Verde Road, Suite 302, Tucson, AZ 85714
PHONE +1 520 573 1061 FAX +1 520 573 1063
ALS Group

Work Order No.: T1600895 5
L'Anse Warden Electric Co., LLC
USEPA Compliance Testing

Project Manager:	JR Richardson	Bill to:	Susan Basile
Client Name:	L'Anse Warden Electric Co., LLC	Company:	L'Anse Warden Electric Co., LLC
Address:	157 S. Main St.	Address:	PO Box 695
City, State ZIP:	L'Anse, MI 49946	City, State ZIP:	White Pine, MI 49971
Email:	jr.richardson@pmpowergroup.com Phone: 906.885.7187	Email:	Phone: 906.885.7402
Project Name:	USEPA Compliance Testing		
Project Number:			
P.O. Number:	108672		
Sampler's Name:	John Polkky		

SAMPLE RECEIPT

Temperature (°C):				Temp Blank Present	
Received Intact:	Yes	No	N/A	Wet Ice / Blue Ice	
Cooler Custody Seals:	Yes	No	N/A	Total Containers:	
Sample Custody Seals:	Yes	No	N/A		

REQUESTED ANALYSIS

Sample Identification	Matrix	Date Sampled	Time Sampled	Lab ID	No. of Containers	Prep Grind	Moisture, Total - D3173 / E871	Sulfur, Total - D4239	Chlorine, Total - 5050 / 9056	Comments
R/R Tie		5/20/2016	1345		1	x	x	x	x	Copy report to
Wood Chips		5/20/2016	1345		1	x	x	x	x	k.hill@westonsolutions.com
TDF		5/20/2016	1345		1	x	x	x	x	

TAT
- [x] Routine
- [ ] Same Day *
- [ ] Next Day *
- [ ] 3 Day*
- [ ] 6 Day*

* Please call for availability. Rush charges will apply.

Due Date:

Additional Methods Available Upon Request

RELINQUISHED BY			RECEIVED BY		
Print Name	Signature	Date/Time	Print Name	Signature	Date/Time
John Polkky	[signature]	5-20-16/1610	U.P.S		5/20/2016
			Sonia N. Gonzalez	[signature]	5/21/16 (1012)

Revised: 5/20/2016

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Tucson, AZ 85714
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F: +1 520 573 1063

ALS

Sample Receipt Form

T1600895 5
L'Anse Warden Electric Co., LLC
USEPA Compliance Testing

Client/Project: L'Anse Warden Work Order Number:

Received by: Sonia Gonzalez Date & Time: 5/26/16 1012 Matrix: Solid

Samples were received via?: UPS Samples were received in: Box

Were custody seals on containers? ○ Yes ◉ No ○ NA If yes, how many and where?

If present were custody seals intact? ○ Yes ○ No If present, were they signed and dated? ○ Yes ○ No

Cooler Temp C	Temp Blank C	Tracking Number
Ambient	n/a	1Z 526 F7E 03 9252 3056

Packing material used? None

Did all the bottles arrive in good condition (unbroken)? ◉ Yes ○ No ○ NA If No, record comments below

Did all sample labels and tags agree with COC? ◉ Yes ○ No ○ NA If No, record discrepancies below

Were all the appropriate containers and volumes received for the tests indicated? ◉ Yes ○ No ○ NA

Are samples received deemed acceptable? ◉ Yes ○ No

Comments:
3 ziploc bags

Notes, discrepancies, & resolutions:

As a part of ISO 17025 protocols, ALS must notify clients that the quoted analytical methods performed by ALS may have minor modifications from the methods as published. These modifications are written into our Standard Operating Procedures and do not impact the quality of the data. Receipt of this document will be considered an acceptance of the procedures used by the laboratory for analysis unless notified by the client.
Modifications may include, but are not limited to:

- The analysis of a sample matrix that differs from that stated in the published method (example - ASTM D5865 Standard Test Method for Gross Calorific Value of Coal and Coke is used for other matrices such as biomass, Tire Derived Fuel, etc.).
- Analyzing a sample mass that differs from those in the published method (example - to accommodate samples with high concentrations of analyte, samples of limited volume, or to comply with the instrument manufacturer's operating guidelines).
- Instruments used for the analysis may differ from those listed in the published method (example - using ICP-OES when the method references flame Atomic Absorption Spectroscopy)

ALS Environmental

Client: L'Anse Warden Electric Co., LLC
157 S. Main St.
L'Anse, MI 49946
Attn: J.R. Richardson
Project: USEPA Compliance Testing
Date Received: 5/26/16

Certificate of Analysis

Sample ID:	Sample Date and Time:		Lab #:	Moisture D3173 wt%	Sulfur D4239 Moist. Free wt%	Chlorine, Total 5050/9056 Moist. Free mg/kg	
R/R Tie	5/20/16	1345	T1600895-001	24.33	0.15	334	
Wood Chips	5/20/16	1345	T1600895-002	34.70	0.02	53	
TDF	5/20/16	1345	T1600895-003	0.98	1.66	285	

ALS Environmental

Client: L'Anse Warden Electric Co., LLC
157 S. Main St.
L'Anse, MI 49946
Attn: J.R. Richardson
Project: USEPA Compliance Testing

Date Received: 5/26/16

Certificate of Analysis

Sample ID:	Sample Date and Time:		Lab #:		Sulfur D4239 As Received wt%	Chlorine, Total 5050/9056 As Received mg/kg	
R/R Tie	5/20/16	1345	T1600895-001		0.12	253	
Wood Chips	5/20/16	1345	T1600895-002		0.02	34	
TDF	5/20/16	1345	T1600895-003		1.64	282	

August 04, 2016

Service Request No:T1600901

Mr. J.R. Richardson
L'Anse Warden Electric Co., LLC
157 S. Main St.
L'Anse, MI 49946

Laboratory Results for: USEPA Compliance Testing

Dear Mr.Richardson,

Enclosed are the results of the sample(s) submitted to our laboratory May 27, 2016
For your reference, these analyses have been assigned our service request number **T1600901.**

All analyses were performed according to our laboratory's quality assurance program. All results are intended to be considered in their entirety, and ALS Environmental is not responsible for use of less than the complete report. Results
apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 7102. You may also contact me via email at Wendy.Hyatt@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Wendy Hyatt
Client Services
Manager

ADDRESS 3860 S. Palo Verde Road, Suite 302, Tucson, AZ 85714
PHONE +1 520 573 1061 | FAX +1 520 573 1063
ALS Group USA, Corp.
dba ALS Environmental

Client: L'Anse Warden Electric Co., LLC **Service Request:**T1600901
Project: USEPA Compliance Testing

SAMPLE CROSS-REFERENCE

SAMPLE #	CLIENT SAMPLE ID	DATE	TIME
T1600901-001	R/R Tie 5/21	5/21/2016	1130
T1600901-002	Wood Chips 5/21	5/21/2016	1530
T1600901-003	TDF 5/21	5/21/2016	1535
T1600901-004	R/R Tie 5/22	5/22/2016	1630
T1600901-005	Wood Chips 5/22	5/22/2016	1500
T1600901-006	TDF 5/22	5/22/2016	1535
T1600901-007	R/R Tie 5/23	5/23/2016	1445
T1600901-008	Wood Chips 5/23	5/23/2016	1445
T1600901-009	TDF 5/23	5/23/2016	1445

Chain of Custody

ALS Environmental - Tucson
ADDRESS 3860 S. Palo Verde Road, Suite 302, Tucson, AZ 85714
PHONE +1 520 573 1061 FAX +1 520 573 1063
ALS Group

Work Order No.: T1600901 5
L'Anse Warden Electric Co., LLC
USEPA Compliance Training

Project Manager:	JR Richardson			Bill to:	Susan Basile
Client Name:	L'Anse Warden Electric Co., LLC			Company:	L'Anse Warden Electric Co., LLC
Address:	157 S. Main St.			Address:	PO Box 695
City, State ZIP:	L'Anse, MI 49946			City, State ZIP:	White Pine, MI 49971
Email:	jr.richardson@pmpowergroup.com	Phone:	906.885.7187	Email:	Phone: 906.885.7402
Project Name:	USEPA Compliance Testing				
Project Number:					
P.O. Number:	108672				
Sampler's Name:	John Polkky				

SAMPLE RECEIPT

Temperature (°C):			Temp Blank Present	
Received Intact:	Yes	No	N/A	Wet Ice / Blue Ice
Cooler/Custody Seals:	Yes	No	N/A	Total Containers:
Sample Custody Seals:	Yes	No	N/A	

REQUESTED ANALYSIS

Sample Identification	Matrix	Date Sampled	Time Sampled	Lab ID	No. of Containers	Prep Grind	Moisture, Total - D3173 / E871	Sulfur, Total - D4239	Chlorine, Total - 5050 / 9056	Comments
R/R Tie		5/21/16	1130	001	1	x	x	x	x	Copy report to
Wood Chips		5/21/16	1530	002	1	x	x	x	x	k.hill@westonsolutions.com
TDF		5/21/16	1535	003	1	x	x	x	x	
R/R Tie		5/22/16	1630	004	1	x	x	x	x	
Wood Chips		5/22/16	1500	005	1	x	x	x	x	
TDF		5/22/16	1535	006	1	x	x	x	x	
R/R Tie		5/23/16	1445	007	1	x	x	x	x	
Wood Chips		5/23/16	1445	008	1	x	x	x	x	
TDF		5/23/16	1445	009	1	x	x	x	x	
				NMS						

TAT
- [x] Routine
- [ ] Same Day *
- [ ] Next Day *
- [ ] 3 Day*
- [ ] 6 Day*

* Please call for availability. Rush charges will apply.

Due Date:

Additional Methods Available Upon Request

RELINQUISHED BY			RECEIVED BY		
Print Name	Signature	Date/Time	Print Name	Signature	Date/Time
John Polkky		5-23-16/1610	U.P.S		5/23/2016
			[signature]	Sonia N. Gonzalez	5/27/16 (1115)

Revised: 5/23/2016

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T1600901 5
L'Anse Warden Electric Co., LLC
USEPA Compliance Training

Sample Receipt Form

Client/Project: L'Anse Warden Electric

Work Order Number:

Received by: Sonia Gonzalez   Date & Time: 5/27/16 1115   Matrix: Solid

Samples were received via?: UPS   Samples were received in: Box

Were custody seals on containers? ○ Yes ◉ No ○ NA   If yes, how many and where?

If present were custody seals intact? ○ Yes ○ No   If present, were they signed and dated? ○ Yes ○ No

Cooler Temp C	Temp Blank C	Tracking Number
Ambient	n/a	1Z 526 F7E 03 9801 9868

Packing material used? None

Did all the bottles arrive in good condition (unbroken)? ◉ Yes ○ No ○ NA   If No, record comments below

Did all sample labels and tags agree with COC? ◉ Yes ○ No ○ NA   If No, record discrepancies below

Were all the appropriate containers and volumes received for the tests indicated? ◉ Yes ○ No ○ NA

Are samples received deemed acceptable? ◉ Yes ○ No

Comments:
9 ziploc bags

Notes, discrepancies, & resolutions:

As a part of ISO 17025 protocols, ALS must notify clients that the quoted analytical methods performed by ALS may have minor modifications from the methods as published. These modifications are written into our Standard Operating Procedures and do not impact the quality of the data. Receipt of this document will be considered an acceptance of the procedures used by the laboratory for analysis unless notified by the client.
Modifications may include, but are not limited to:

- The analysis of a sample matrix that differs from that stated in the published method (example - ASTM D5865 Standard Test Method for Gross Calorific Value of Coal and Coke is used for other matrices such as biomass, Tire Derived Fuel, etc.).
- Analyzing a sample mass that differs from those in the published method (example - to accommodate samples with high concentrations of analyte, samples of limited volume, or to comply with the instrument manufacturer's operating guidelines).
- Instruments used for the analysis may differ from those listed in the published method (example - using ICP-OES when the method references flame Atomic Absorption Spectroscopy)

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Environmental

Client: L'Anse Warden Electric Co., LLC
157 S. Main St.
L'Anse, MI 49946
Attn: J.R. Richardson
Project: USEPA Compliance Testing

Date Received: 5/27/16

Certificate of Analysis

Sample ID:	Sample Date and Time:		Lab #:	Moisture D3173 wt%	Sulfur D4239 Moist. Free wt%	Chlorine, Total 5050/9056 Moist. Free mg/kg	
R/R Tie 5/21	5/21/16	1130	T1600901-001	29.39	0.15	141	
Wood Chips 5/21	5/21/16	1530	T1600901-002	36.39	0.02	62	
TDF 5/21	5/21/16	1535	T1600901-003	1.61	1.66	620	
R/R Tie 5/22	5/22/16	1630	T1600901-004	31.39	0.14	367	
Wood Chips 5/22	5/22/16	1500	T1600901-005	39.08	0.02	<50	
TDF 5/22	5/22/16	1535	T1600901-006	1.13	1.74	470	
R/R Tie 5/23	5/23/16	1445	T1600901-007	28.50	0.12	251	
Wood Chips 5/23	5/23/16	1445	T1600901-008	37.00	0.03	<50	
TDF 5/23	5/23/16	1445	T1600901-009	1.22	1.79	512	

Notes:
Samples were air dried then ground to < 1 mm prior to analysis.

ALS Environmental

Client: L'Anse Warden Electric Co., LLC
157 S. Main St.
L'Anse, MI 49946
Attn: J.R. Richardson
Project: USEPA Compliance Testing

Date Received: 5/27/16

Certificate of Analysis

Sample ID:	Sample Date and Time:		Lab #:		Sulfur D4239 As Received wt%	Chlorine, Total 5050/9056 As Received mg/kg	
R/R Tie 5/21	5/21/16	1130	T1600901-001		0.11	100	
Wood Chips 5/21	5/21/16	1530	T1600901-002		0.02	39	
TDF 5/21	5/21/16	1535	T1600901-003		1.64	610	
R/R Tie 5/22	5/22/16	1630	T1600901-004		0.09	252	
Wood Chips 5/22	5/22/16	1500	T1600901-005		0.01	<50	
TDF 5/22	5/22/16	1535	T1600901-006		1.72	465	
R/R Tie 5/23	5/23/16	1445	T1600901-007		0.09	179	
Wood Chips 5/23	5/23/16	1445	T1600901-008		0.02	<50	
TDF 5/23	5/23/16	1445	T1600901-009		1.77	506	

July 11, 2016

Service Request No:T1600903

Mr. J.R. Richardson
L'Anse Warden Electric Co., LLC
157 S. Main St.
L'Anse, MI 49946

Laboratory Results for: USEPA Compliance Testing

Dear Mr.Richardson,

Enclosed are the results of the sample(s) submitted to our laboratory May 31, 2016
For your reference, these analyses have been assigned our service request number **T1600903.**

All analyses were performed according to our laboratory's quality assurance program. All results are intended to be considered in their entirety, and ALS Environmental is not responsible for use of less than the complete report. Results
apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 7102. You may also contact me via email at Wendy.Hyatt@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Wendy Hyatt
Client Services
Manager

ADDRESS 3860 S. Palo Verde Road, Suite 302, Tucson, AZ 85714
PHONE +1 520 573 1061 | FAX +1 520 573 1063
ALS Group USA, Corp.
dba ALS Environmental

Client: L'Anse Warden Electric Co., LLC **Service Request:** T1600903
Project: USEPA Compliance Testing

SAMPLE CROSS-REFERENCE

SAMPLE #	CLIENT SAMPLE ID	DATE	TIME
T1600903-001	R/R Tie	5/24/2016	1310
T1600903-002	Wood Chips	5/24/2016	1310
T1600903-003	TDF	5/24/2016	1310

Chain of Custody

ALS Environmental - Tucson
ADDRESS 3860 S. Palo Verde Road, Suite 302, Tucson, AZ 85714
PHONE +1 520 573 1061 FAX +1 520 573 1063
ALS Group

Work Order No.: T1600903 5
L'Anse Warden Electric Co., LLC
USEPA Compliance Testing

Project Manager:	JR Richardson	Bill to:	Susan Basile
Client Name:	L'Anse Warden Electric Co., LLC	Company:	L'Anse Warden Electric Co., LLC
Address:	157 S. Main St.	Address:	PO Box 695
City, State ZIP:	L'Anse, MI 49946	City, State ZIP:	White Pine, MI 49971
Email:	jr.richardson@pmpowergroup.com Phone: 906.885.7187	Email:	Phone: 906.885.7402
Project Name:	USEPA Compliance Testing		
Project Number:			
P.O. Number:	108672		
Sampler's Name:	John Polkky		

SAMPLE RECEIPT

Temperature (°C):				Temp Blank Present
Received Intact:	Yes	No	N/A	Wet Ice / Blue Ice
Cooler Custody Seals:	Yes	No	N/A	Total Containers:
Sample Custody Seals:	Yes	No	N/A	

REQUESTED ANALYSIS

Sample Identification	Matrix	Date Sampled	Time Sampled	Lab ID	No. of Containers	Prep Grind	Moisture, Total - D3173 / E871	Sulfur, Total - D4239	Chlorine, Total - 5050 / 9056	Comments
R/R Tie		5/24/16	1310		1	x	x	x	x	Copy report to
Wood Chips		5/24/16	1310		1	x	x	x	x	k.hill@westonsolutions.com
TDF		5/24/16	1310		1	x	x	x	x	

TAT
- [x] Routine
- [ ] Same Day *
- [ ] Next Day *
- [ ] 3 Day*
- [ ] 6 Day*

* Please call for availability. Rush charges will apply.

Due Date:

Additional Methods Available Upon Request

RELINQUISHED BY			RECEIVED BY		
Print Name	Signature	Date/Time	Print Name	Signature	Date/Time
John Polkky		5-24-16/1610	U.P.S		5/24/2016
			Sonia N. Gonzalez		5/31/16 (1015)

Revised: [illegible]

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F: +1 520 573 1063

ALS

Sample Receipt Form

T1600903 5
L'Anse Warden Electric Co., LLC
USEPA Compliance Testing

Client/Project: L'Anse Warden Electric

Work Order Number:

Received by: Sonia Gonzalez Date & Time: 5/31/16 1015 Matrix: Solid

Samples were received via?: UPS Samples were received in: Box

Were custody seals on containers? ( ) Yes (•) No ( ) NA If yes, how many and where?

If present were custody seals intact? ( ) Yes ( ) No If present, were they signed and dated? ( ) Yes ( ) No

Cooler Temp C	Temp Blank C	Tracking Number
Ambient	n/a	1Z 526 F7E 03 9771 4873

Packing material used? None

Did all the bottles arrive in good condition (unbroken)? (•) Yes ( ) No ( ) NA If No, record comments below

Did all sample labels and tags agree with COC? (•) Yes ( ) No ( ) NA If No, record discrepancies below

Were all the appropriate containers and volumes received for the tests indicated? (•) Yes ( ) No ( ) NA

Are samples received deemed acceptable? (•) Yes ( ) No

Comments:
3 ziploc bags

Notes, discrepancies, & resolutions:

As a part of ISO 17025 protocols, ALS must notify clients that the quoted analytical methods performed by ALS may have minor modifications from the methods as published. These modifications are written into our Standard Operating Procedures and do not impact the quality of the data. Receipt of this document will be considered an acceptance of the procedures used by the laboratory for analysis unless notified by the client.
Modifications may include, but are not limited to:

- The analysis of a sample matrix that differs from that stated in the published method (example - ASTM D5865 Standard Test Method for Gross Calorific Value of Coal and Coke is used for other matrices such as biomass, Tire Derived Fuel, etc.).
- Analyzing a sample mass that differs from those in the published method (example - to accommodate samples with high concentrations of analyte, samples of limited volume, or to comply with the instrument manufacturer's operating guidelines).
- Instruments used for the analysis may differ from those listed in the published method (example - using ICP-OES when the method references flame Atomic Absorption Spectroscopy)

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Environmental

Client: L'Anse Warden Electric Co., LLC
157 S. Main St.
L'Anse, MI 49946
Attn: J.R. Richardson
Project: USEPA Compliance Testing

Date Received: 5/31/16

Certificate of Analysis

Sample ID:	Sample Date and Time:		Lab #:	Moisture D3173 wt%	Sulfur D4239 Moist. Free wt%	Chlorine, Total 5050/9056 Moist. Free mg/kg	
R/R Tie	5/24/16	1310	T1600903-001	24.20	0.09	189	
Wood Chips	5/24/16	1310	T1600903-002	43.57	0.02	<52	
TDF	5/24/16	1310	T1600903-003	1.96	1.64	561	

Notes:
Samples were air dried then ground to < 1 mm prior to analysis.

ALS Environmental

Client: L'Anse Warden Electric Co., LLC
157 S. Main St.
L'Anse, MI 49946
Attn: J.R. Richardson
Project: USEPA Compliance Testing

Date Received: 5/31/16

Certificate of Analysis

Sample ID:	Sample Date and Time:		Lab #:		Sulfur D4239 As Received wt%	Chlorine, Total 5050/9056 As Received mg/kg	
R/R Tie	5/24/16	1310	T1600903-001		0.07	143	
Wood Chips	5/24/16	1310	T1600903-002		0.01	<52	
TDF	5/24/16	1310	T1600903-003		1.61	550	

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July 11, 2016

Service Request No:T1600910

Mr. J.R. Richardson
L'Anse Warden Electric Co., LLC
157 S. Main St.
L'Anse, MI 49946

Laboratory Results for: USEPA Compliance Testing

Dear Mr.Richardson,

Enclosed are the results of the sample(s) submitted to our laboratory June 01, 2016
For your reference, these analyses have been assigned our service request number **T1600910.**

All analyses were performed according to our laboratory's quality assurance program. All results are intended to be considered in their entirety, and ALS Environmental is not responsible for use of less than the complete report. Results
apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 7102. You may also contact me via email at Wendy.Hyatt@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Wendy Hyatt
Client Services
Manager

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ALS Group USA, Corp.
dba ALS Environmental

Client: L'Anse Warden Electric Co., LLC

Service Request: T1600910

Project: USEPA Compliance Testing

SAMPLE CROSS-REFERENCE

SAMPLE #	CLIENT SAMPLE ID	DATE	TIME
T1600910-001	R/R Tie	5/25/2016	1300
T1600910-002	Wood Chips	5/25/2016	1300
T1600910-003	TDF	5/25/2016	1300

Chain of Custody

ALS Environmental - Tucson
ADDRESS 3860 S. Palo Verde Road, Suite 302, Tucson, AZ 85714
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ALS Group

Work Order No.: T1600910 5
L'Anse Warden Electric Co., LLC
USEPA Compliance Testing

Project Manager:	JR Richardson	Bill to:	Susan Basile
Client Name:	L'Anse Warden Electric Co., LLC	Company:	L'Anse Warden Electric Co., LLC
Address:	157 S. Main St.	Address:	PO Box 695
City, State ZIP:	L'Anse, MI 49946	City, State ZIP:	White Pine, MI 49971
Email:	jr.richardson@pmpowergroup.com Phone: 906.885.7187	Email:	Phone: 906.885.7402
Project Name:	USEPA Compliance Testing		
Project Number:			
P.O. Number:	108672		
Sampler's Name:	John Polkky		

SAMPLE RECEIPT

Temperature (°C):			Temp Blank Present	
Received Intact:	Yes	No	N/A	Wet Ice / Blue Ice
Cooler Custody Seals:	Yes	No	N/A	Total Containers:
Sample Custody Seals:	Yes	No	N/A	

REQUESTED ANALYSIS

Sample Identification	Matrix	Date Sampled	Time Sampled	Lab ID	No. of Containers	Prep Grind	Moisture, Total - D3173 / E871	Sulfur, Total - D4239	Chlorine, Total - 5050 / 9056	Comments
R/R Tie		5/25/16	1300		1	x	x	x	x	Copy report to
Wood Chips		5/25/16	1300		1	x	x	x	x	k.hill@westonsolutions.com
TDF		5/25/16	1300		1	x	x	x	x	

TAT
- [x] Routine
- [ ] Same Day *
- [ ] Next Day *
- [ ] 3 Day*
- [ ] 6 Day*

* Please call for availability. Rush charges will apply.

Due Date:

Additional Methods Available Upon Request

RELINQUISHED BY Print Name	Signature	Date/Time	RECEIVED BY Print Name	Signature	Date/Time
John Polkky	[signature]	5-25-16/1700	U.P.S		5/25/2016
			[signature]	[signature]	6/1/16 1002

Revised: 5/26/2016

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T1600910 5
L'Anse Warden Electric Co., LLC
USEPA Compliance Testing

Sample Receipt Form

Client/Project: L'Anse Warden Electric

Work Order Number

Received by: Andi Barton

Date & Time: 6/1/16 1002

Matrix: Solid

Samples were received via?: UPS

Samples were received in: Box

Were custody seals on containers? ○ Yes ◉ No ○ NA

If yes, how many and where?

If present were custody seals intact? ○ Yes ○ No

If present, were they signed and dated? ○ Yes ○ No

Cooler Temp C	Temp Blank C	Tracking Number
N/A	N/A	1Z 526 F7E 03 9459 1265

Packing material used? Paper

Did all the bottles arrive in good condition (unbroken)? ◉ Yes ○ No ○ NA — If No, record comments below

Did all sample labels and tags agree with COC? ◉ Yes ○ No ○ NA — If No, record discrepancies below

Were all the appropriate containers and volumes received for the tests indicated? ◉ Yes ○ No ○ NA

Are samples received deemed acceptable? ◉ Yes ○ No

Comments:
3 - Large Ziplock Bags

Notes, discrepancies, & resolutions:

As a part of ISO 17025 protocols, ALS must notify clients that the quoted analytical methods performed by ALS may have minor modifications from the methods as published. These modifications are written into our Standard Operating Procedures and do not impact the quality of the data. Receipt of this document will be considered an acceptance of the procedures used by the laboratory for analysis unless notified by the client.
Modifications may include, but are not limited to:

- The analysis of a sample matrix that differs from that stated in the published method (example - ASTM D5865 Standard Test Method for Gross Calorific Value of Coal and Coke is used for other matrices such as biomass, Tire Derived Fuel, etc.).
- Analyzing a sample mass that differs from those in the published method (example – to accommodate samples with high concentrations of analyte, samples of limited volume, or to comply with the instrument manufacturer's operating guidelines).
- Instruments used for the analysis may differ from those listed in the published method (example - using ICP- OES when the method references flame Atomic Absorption Spectroscopy)

ALS Environmental

Client: L'Anse Warden Electric Co., LLC
157 S. Main St.
L'Anse, MI 49946
Attn: J.R. Richardson
Project: USEPA Compliance Testing

Date Received: 6/ 1/16

Certificate of Analysis

Sample ID:	Sample Date and Time:		Lab #:	Moisture D3173 wt%	Sulfur D4239 Moist. Free wt%	Chlorine, Total 5050/9056 Moist. Free mg/kg	
R/R Tie	5/25/16	1300	T1600910-001	26.81	0.11	319	
Wood Chips	5/25/16	1300	T1600910-002	38.39	0.02	<52	
TDF	5/25/16	1300	T1600910-003	3.33	1.59	573	

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ALS Environmental

Client: L'Anse Warden Electric Co., LLC
157 S. Main St.
L'Anse, MI 49946
Attn: J.R. Richardson
Project: USEPA Compliance Testing

Date Received: 6/ 1/16

Certificate of Analysis

Sample ID:	Sample Date and Time:		Lab #:		Sulfur D4239 As Received wt%	Chlorine, Total 5050/9056 As Received mg/kg	
R/R Tie	5/25/16	1300	T1600910-001		0.08	234	
Wood Chips	5/25/16	1300	T1600910-002		0.01	<52	
TDF	5/25/16	1300	T1600910-003		1.54	554	

July 11, 2016

Service Request No:T1600952

Mr. J.R. Richardson
L'Anse Warden Electric Co., LLC
157 S. Main St.
L'Anse, MI 49946

Laboratory Results for: USEPA Compliance Testing

Dear Mr.Richardson,

Enclosed are the results of the sample(s) submitted to our laboratory June 07, 2016
For your reference, these analyses have been assigned our service request number **T1600952.**

All analyses were performed according to our laboratory's quality assurance program. All results are intended to be considered in their entirety, and ALS Environmental is not responsible for use of less than the complete report. Results
apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 7102. You may also contact me via email at Wendy.Hyatt@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Wendy Hyatt
Client Services
Manager

ADDRESS 3860 S. Palo Verde Road, Suite 302, Tucson, AZ 85714
PHONE +1 520 573 1061 | FAX +1 520 573 1063
ALS Group USA, Corp.
dba ALS Environmental

Client: L'Anse Warden Electric Co., LLC **Service Request:**T1600952
Project: USEPA Compliance Testing

SAMPLE CROSS-REFERENCE

SAMPLE #	CLIENT SAMPLE ID	DATE	TIME
T1600952-001	R/R Tie 5/26	5/26/2016	1310
T1600952-002	Wood Chips 5/26	5/26/2016	1310
T1600952-003	TDF 5/26	5/26/2016	1310
T1600952-004	R/R Tie 5/27	5/27/2016	1330
T1600952-005	Wood Chips 5/27	5/27/2016	1330
T1600952-006	TDF 5/27	5/27/2016	1330
T1600952-007	R/R Tie 5/28	5/28/2016	1330
T1600952-008	Wood Chips 5/28	5/28/2016	1330
T1600952-009	TDF 5/28	5/28/2016	1330
T1600952-010	R/R Tie 5/29	5/29/2016	1310
T1600952-011	Wood Chips 5/29	5/29/2016	1310
T1600952-012	TDF 5/29	5/29/2016	1310
T1600952-013	R/R tie 5/30	5/30/2016	1330
T1600952-014	Wood Chips 5/30	5/30/2016	1330
T1600952-015	TDF 5/30	5/30/2016	1330

Chain of Custody

ALS Environmental - Tucson
ADDRESS 3860 S. Palo Verde Road, Suite 302, Tucson, AZ 85714
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ALS Group

Work Order No.: T1600952 5
L'Anse Warden Electric Co., LLC
USEPA Compliance Testing

Project Manager:	JR Richardson	Bill to:	Susan Basile
Client Name:	L'Anse Warden Electric Co., LLC	Company:	L'Anse Warden Electric Co., LLC
Address:	157 S. Main St.	Address:	PO Box 695
City, State ZIP:	L'Anse, MI 49946	City, State ZIP:	White Pine, MI 49971
Email:	jr.richardson@pmpowergroup.com Phone: 906.885.7187	Email:	Phone: 906.885.7402
Project Name:	USEPA Compliance Testing		
Project Number:			
P.O. Number:	108672		
Sampler's Name:	John Polkky		

SAMPLE RECEIPT

Temperature (°C):				Temp Blank Present
Received Intact:	Yes	No	N/A	Wet Ice / Blue Ice
Cooler Custody Seals:	Yes	No	N/A	Total Containers:
Sample Custody Seals:	Yes	No	N/A	

REQUESTED ANALYSIS

Sample Identification	Matrix	Date Sampled	Time Sampled	Lab ID	No. of Containers	Prep Grind	Moisture, Total - D3173 / E871	Sulfur, Total - D4239	Chlorine, Total - 5050 / 9056	Comments
R/R Tie		5/26/16	1310	001	1	x	x	x	x	Copy report to
Wood Chips		5/26/16	1310	002	1	x	x	x	x	k.hill@westonsolutions.com
TDF		5/26/16	1310	003	1	x	x	x	x	
R/R Tie		5/27/16	1330	004	1	x	x	x	x	
Wood Chips		5/27/16	1330	005	1	x	x	x	x	
TDF		5/27/16	1330	006	1	x	x	x	x	
R/R Tie		5/28/16	1330	007	1	x	x	x	x	
Wood Chips		5/28/16	1330	008	1	x	x	x	x	
TDF		5/28/16	1330	009	1	x	x	x	x	

TAT
- [x] Routine
- [ ] Same Day *
- [ ] Next Day *
- [ ] 3 Day*
- [ ] 6 Day*

* Please call for availability. Rush charges will apply.

Due Date:

Additional Methods Available Upon Request

RELINQUISHED BY			RECEIVED BY		
Print Name	Signature	Date/Time	Print Name	Signature	Date/Time
John Polkky	[signature]	5-31-16/1630	U.P.S Cynthia Vraagh	[signature]	5/31/2016
					6/7/16 1114

Revised: 5/31/2016

Page 3 of 9

Chain of Custody

ALS Environmental - Tucson
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ALS Group

Work Order No.: T1600952 5
L'Anse Warden Electric Co., LLC
USEPA Compliance Testing

Project Manager:	JR Richardson	Bill to:	Susan Basile
Client Name:	L'Anse Warden Electric Co., LLC	Company:	L'Anse Warden Electric Co., LLC
Address:	157 S. Main St.	Address:	PO Box 695
City, State ZIP:	L'Anse, MI 49946	City, State ZIP:	White Pine, MI 49971
Email:	jr.richardson@pmpowergroup.com Phone: 906.885.7187	Email:	Phone: 906.885.7402
Project Name:	USEPA Compliance Testing		
Project Number:			
P.O. Number:	108672		
Sampler's Name:	John Polkky		

SAMPLE RECEIPT

Temperature (°C):				Temp Blank Present	
Received Intact:	Yes	No	N/A	Wet Ice / Blue Ice	
Cooler Custody Seals:	Yes	No	N/A	Total Containers:	
Sample Custody Seals:	Yes	No	N/A		

REQUESTED ANALYSIS

Sample Identification	Matrix	Date Sampled	Time Sampled	Lab ID	No. of Containers	Prep Grind	Moisture, Total - D3173 / E871	Sulfur, Total - D4239	Chlorine, Total - 5050 / 9056	Comments
R/R Tie		5/29/16	1310	010	1	x	x	x	x	Copy report to
Wood Chips		5/29/16	1310	011	1	x	x	x	x	k.hill@westonsolutions.com
TDF		5/29/16	1310	012	1	x	x	x	x	
R/R Tie		5/30/16	1330	013	1	x	x	x	x	
Wood Chips		5/30/16	1330	014	1	x	x	x	x	
TDF		5/30/16	1330	015	1	x	x	x	x	

TAT:
- [x] Routine
- [ ] Same Day *
- [ ] Next Day *
- [ ] 3 Day*
- [ ] 6 Day*

* Please call for availability. Rush charges will apply.

Due Date:

Additional Methods Available Upon Request

RELINQUISHED BY			RECEIVED BY		
Print Name	Signature	Date/Time	Print Name	Signature	Date/Time
John Polkky	[signature]	5-31-16/1630	U.P.S Cynthia Vroegh	[signature]	5/31/2016

Revised: 5/31/2016

Page 4 of 9

3860 S. Palo Verde Road, Suite 302
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Sample Receipt Form

T1600952 5
L'Anse Warden Electric Co., LLC
USEPA Compliance Testing

Client/Project: L'Anse Warden Elec

Work Order Number

Received by: Cynthia Vroegh

Date & Time: 6/7/16 1114

Matrix: Solid

Samples were received via?: UPS

Samples were received in: Box

Were custody seals on containers? ○ Yes ◉ No ○ NA

If yes, how many and where?

If present were custody seals intact? ○ Yes ◉ No

If present, were they signed and dated? ○ Yes ◉ No

Cooler Temp C	Temp Blank C	Tracking Number
na	na	1z526f7e0392134879

Packing material used?

Did all the bottles arrive in good condition (unbroken)? ○ Yes ○ No ◉ NA — If No, record comments below

Did all sample labels and tags agree with COC? ◉ Yes ○ No ○ NA — If No, record discrepancies below

Were all the appropriate containers and volumes received for the tests indicated? ◉ Yes ○ No ○ NA

Are samples received deemed acceptable? ◉ Yes ○ No

Comments:
15 - lg plastic ziplock bags

Notes, discrepancies, & resolutions:

As a part of ISO 17025 protocols, ALS must notify clients that the quoted analytical methods performed by ALS may have minor modifications from the methods as published. These modifications are written into our Standard Operating Procedures and do not impact the quality of the data. Receipt of this document will be considered an acceptance of the procedures used by the laboratory for analysis unless notified by the client.
Modifications may include, but are not limited to:

- The analysis of a sample matrix that differs from that stated in the published method (example – ASTM D5865 Standard Test Method for Gross Calorific Value of Coal and Coke is used for other matrices such as biomass, Tire Derived Fuel, etc.).
- Analyzing a sample mass that differs from those in the published method (example - to accommodate samples with high concentrations of analyte, samples of limited volume, or to comply with the instrument manufacturer's operating guidelines).
- Instruments used for the analysis may differ from those listed in the published method (example - using ICP- OES when the method references flame Atomic Absorption Spectroscopy)

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Environmental

Client: L'Anse Warden Electric Co., LLC
157 S. Main St.
L'Anse, MI 49946
Attn: J.R. Richardson
Project: USEPA Compliance Testing   Date Received: 6/ 7/16

Certificate of Analysis

Sample ID:	Sample Date and Time:		Lab #:	Moisture D3173 wt%	Sulfur D4239 Moist. Free wt%	Chlorine, Total 5050/9056 Moist. Free mg/kg	
R/R Tie 5/26	5/26/16	1310	T1600952-001	29.79	0.16	233	
Wood Chips 5/26	5/26/16	1310	T1600952-002	43.16	0.02	53	
TDF 5/26	5/26/16	1310	T1600952-003	4.77	1.74	414	
R/R Tie 5/27	5/27/16	1330	T1600952-004	32.39	0.13	245	
Wood Chips 5/27	5/27/16	1330	T1600952-005	41.43	0.03	<50	
TDF 5/27	5/27/16	1330	T1600952-006	3.14	1.64	382	
R/R Tie 5/28	5/28/16	1330	T1600952-007	34.18	0.09	233	
Wood Chips 5/28	5/28/16	1330	T1600952-008	42.91	0.02	<50	
TDF 5/28	5/28/16	1330	T1600952-009	2.12	1.68	382	
R/R Tie 5/29	5/29/16	1310	T1600952-010	27.14	0.11	248	
Wood Chips 5/29	5/29/16	1310	T1600952-011	41.53	0.02	<50	
TDF 5/29	5/29/16	1310	T1600952-012	2.85	1.77	563	
R/R tie 5/30	5/30/16	1330	T1600952-013	29.76	0.12	415	
Wood Chips 5/30	5/30/16	1330	T1600952-014	44.17	0.02	<50	
TDF 5/30	5/30/16	1330	T1600952-015	6.05	1.67	509	

Notes:
Samples were air dried then ground to < 1 mm prior to analysis.

ADDRESS 3860 S. Palo Verde Road, Suite 302, Tucson, AZ 85714
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FAX +1 520 573 1063

ALS Environmental

Client: L'Anse Warden Electric Co., LLC
157 S. Main St.
L'Anse, MI 49946
Attn: J.R. Richardson
Project: USEPA Compliance Testing

Date Received: 6/ 7/16

Certificate of Analysis

Sample ID:	Sample Date and Time:		Lab #:		Sulfur D4239 As Received wt%	Chlorine, Total 5050/9056 As Received mg/kg	
R/R Tie 5/26	5/26/16	1310	T1600952-001		0.11	163	
Wood Chips 5/26	5/26/16	1310	T1600952-002		0.01	30	
TDF 5/26	5/26/16	1310	T1600952-003		1.65	394	
R/R Tie 5/27	5/27/16	1330	T1600952-004		0.09	166	
Wood Chips 5/27	5/27/16	1330	T1600952-005		0.02	<50	
TDF 5/27	5/27/16	1330	T1600952-006		1.59	370	
R/R Tie 5/28	5/28/16	1330	T1600952-007		0.06	154	
Wood Chips 5/28	5/28/16	1330	T1600952-008		0.01	<50	
TDF 5/28	5/28/16	1330	T1600952-009		1.65	374	
R/R Tie 5/29	5/29/16	1310	T1600952-010		0.08	180	
Wood Chips 5/29	5/29/16	1310	T1600952-011		0.01	<50	
TDF 5/29	5/29/16	1310	T1600952-012		1.72	547	
R/R tie 5/30	5/30/16	1330	T1600952-013		0.08	291	
Wood Chips 5/30	5/30/16	1330	T1600952-014		0.01	<50	
TDF 5/30	5/30/16	1330	T1600952-015		1.57	478	

July 11, 2016

Service Request No:T1600991

Mr. J.R. Richardson
L'Anse Warden Electric Co., LLC
157 S. Main St.
L'Anse, MI 49946

Laboratory Results for: USEPA Compliance Testing

Dear Mr.Richardson,

Enclosed are the results of the sample(s) submitted to our laboratory June 14, 2016
For your reference, these analyses have been assigned our service request number **T1600991.**

All analyses were performed according to our laboratory's quality assurance program. All results are intended to be considered in their entirety, and ALS Environmental is not responsible for use of less than the complete report. Results
apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 7102. You may also contact me via email at Wendy.Hyatt@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Wendy Hyatt
Client Services
Manager

ADDRESS 3860 S. Palo Verde Road, Suite 302, Tucson, AZ 85714
PHONE +1 520 573 1061 | FAX +1 520 573 1063
ALS Group USA, Corp.
dba ALS Environmental

Client: L'Anse Warden Electric Co., LLC **Service Request:** T1600991
Project: USEPA Compliance Testing

SAMPLE CROSS-REFERENCE

SAMPLE #	CLIENT SAMPLE ID	DATE	TIME
T1600991-001	R/R Tie 5/31	5/31/2016	1500
T1600991-002	Wood Chips 5/31	5/31/2016	1500
T1600991-003	TDF 5/31	5/31/2016	1500
T1600991-004	R/R Tie 6/1	6/1/2016	1630
T1600991-005	Wood Chips 6/1	6/1/2016	1630
T1600991-006	TDF 6/1	6/1/2016	1630
T1600991-007	R/R Tie 6/2	6/2/2016	1500
T1600991-008	Wood Chips 6/2	6/2/2016	1500
T1600991-009	TDF 6/2	6/2/2016	1500

ALS Environmental - Tucson
ADDRESS 3860 S. Palo Verde Road, Suite 302, Tucson, AZ 85714
PHONE +1 520 573 1061 FAX +1 520 573 1063
ALS Group

Chain of Custody

Work Order No.: T1600991 5
L'Anse Warden Electric Co., LLC
USEPA Compliance Testing

Project Manager:	JR Richardson		Bill to:	Susan Basile
Client Name:	L'Anse Warden Electric Co., LLC		Company:	L'Anse Warden Electric Co., LLC
Address:	157 S. Main St.		Address:	PO Box 695
City, State ZIP:	L'Anse, MI 49946		City, State ZIP:	White Pine, MI 49971
Email:	jr.richardson@pmpowergroup.com Phone: 906.885.7187		Email:	Phone: 906.885.7402
Project Name:	USEPA Compliance Testing			
Project Number:				
P.O. Number:	108672			
Sampler's Name:	John Polkky			

SAMPLE RECEIPT

Temperature (°C):		Temp Blank Present		
Received Intact:	Yes	No	N/A	Wet Ice / Blue Ice
Cooler Custody Seals:	Yes	No	N/A	Total Containers:
Sample Custody Seals:	Yes	No	N/A	

REQUESTED ANALYSIS

Sample Identification	Matrix	Date Sampled	Time Sampled	Lab ID	No. of Containers	Prep Grind	Moisture, Total - D3173 / E871	Sulfur, Total - D4239	Chlorine, Total - 5050 / 9056	Comments
R/R Tie		5/31/16	1500		1	x	x	x	x	Copy report to
Wood Chips		5/31/16	1500		1	x	x	x	x	k.hill@westonsolutions.com
TDF		5/31/16	1500		1	x	x	x	x	
R/R Tie		6/1/16	1630		1	x	x	x	x	
Wood Chips		6/1/16	1630		1	x	x	x	x	
TDF		6/1/16	1630		1	x	x	x	x	
R/R Tie		6/2/16	1500		1	x	x	x	x	
Wood Chips		6/2/16	1500		1	x	x	x	x	
TDF		6/2/16	1500		1	x	x	x	x	

TAT
- [x] Routine
- [ ] Same Day *
- [ ] Next Day *
- [ ] 3 Day*
- [ ] 6 Day*

* Please call for availability. Rush charges will apply.

Due Date:

Additional Methods Available Upon Request

RELINQUISHED BY			RECEIVED BY		
Print Name	Signature	Date/Time	Print Name	Signature	Date/Time
John Polkky		6-06-16/1630	U.P.S		6/6/2016
			Cynthia Vnegh	Cynthia Vnegh	6/14/16 1031

Revised: 6/4/2016

Page 3 of 7

3860 S. Palo Verde Road, Suite 302
Tucson, AZ 85714
T: +1 520 573 1061
F: +1 520 573 1063

Sample Receipt Form

T1600991 5
L'Anse Warden Electric Co., LLC
USEPA Compliance Testing

Client/Project: L'Anse Warden Elec

Work Order Number:

Received by: Cynthia Vroegh Date & Time: 6/14/16 1021 Matrix: Solid

Samples were received via?: UPS Samples were received in: Box

Were custody seals on containers? ○ Yes ◉ No ○ NA If yes, how many and where?

If present were custody seals intact? ○ Yes ◉ No If present, were they signed and dated? ○ Yes ◉ No

Cooler Temp C	Temp Blank C	Tracking Number
na	na	1z526f7e0395218283

Packing material used?

Did all the bottles arrive in good condition (unbroken)? ○ Yes ○ No ◉ NA If No, record comments below

Did all sample labels and tags agree with COC? ◉ Yes ○ No ○ NA If No, record discrepancies below

Were all the appropriate containers and volumes received for the tests indicated? ◉ Yes ○ No ○ NA

Are samples received deemed acceptable? ◉ Yes ○ No

Comments:
9 - lg ziplock bags with RR ties, bark, TDF

Notes, discrepancies, & resolutions:

As a part of ISO 17025 protocols, ALS must notify clients that the quoted analytical methods performed by ALS may have minor modifications from the methods as published. These modifications are written into our Standard Operating Procedures and do not impact the quality of the data. Receipt of this document will be considered an acceptance of the procedures used by the laboratory for analysis unless notified by the client.
Modifications may include, but are not limited to:

- The analysis of a sample matrix that differs from that stated in the published method (example - ASTM D5865 Standard Test Method for Gross Calorific Value of Coal and Coke is used for other matrices such as biomass, Tire Derived Fuel, etc.).
- Analyzing a sample mass that differs from those in the published method (example - to accommodate samples with high concentrations of analyte, samples of limited volume, or to comply with the instrument manufacturer's operating guidelines).
- Instruments used for the analysis may differ from those listed in the published method (example - using ICP-OES when the method references flame Atomic Absorption Spectroscopy)

ALS Environmental

Client: L'Anse Warden Electric Co., LLC
157 S. Main St.
L'Anse, MI 49946
Attn: J.R. Richardson
Project: USEPA Compliance Testing

Date Received: 6/14/16

Certificate of Analysis

Sample ID:	Sample Date and Time:		Lab #:	Moisture D3173 wt%	Sulfur D4239 Moist. Free wt%	Chlorine, Total 5050/9056 Moist. Free mg/kg	
R/R Tie 5/31	5/31/16	1500	T1600991-001	31.53	0.13	229	
Wood Chips 5/31	5/31/16	1500	T1600991-002	45.81	0.02	<58	
TDF 5/31	5/31/16	1500	T1600991-003	5.26	1.84	363	
R/R Tie 6/1	6/1/16	1630	T1600991-004	34.78	0.11	103	
Wood Chips 6/1	6/1/16	1630	T1600991-005	36.80	0.02	<57	
TDF 6/1	6/1/16	1630	T1600991-006	2.80	1.73	496	
R/R Tie 6/2	6/2/16	1500	T1600991-007	31.35	0.15	231	
Wood Chips 6/2	6/2/16	1500	T1600991-008	41.85	0.02	<58	
TDF 6/2	6/2/16	1500	T1600991-009	4.70	1.72	742	

Notes:
Samples were air dried then ground to < 1 mm prior to analysis.

ALS Environmental

Client: L'Anse Warden Electric Co., LLC
157 S. Main St.
L'Anse, MI 49946
Attn: J.R. Richardson
Project: USEPA Compliance Testing

Date Received: 6/14/16

Certificate of Analysis

Sample ID:	Sample Date and Time:		Lab #:		Sulfur D4239 As Received wt%	Chlorine, Total 5050/9056 As Received mg/kg	
R/R Tie 5/31	5/31/16	1500	T1600991-001		0.09	157	
Wood Chips 5/31	5/31/16	1500	T1600991-002		0.01	<58	
TDF 5/31	5/31/16	1500	T1600991-003		1.74	344	
R/R Tie 6/1	6/1/16	1630	T1600991-004		0.07	67	
Wood Chips 6/1	6/1/16	1630	T1600991-005		0.01	<57	
TDF 6/1	6/1/16	1630	T1600991-006		1.68	482	
R/R Tie 6/2	6/2/16	1500	T1600991-007		0.10	159	
Wood Chips 6/2	6/2/16	1500	T1600991-008		0.01	<58	
TDF 6/2	6/2/16	1500	T1600991-009		1.63	707	

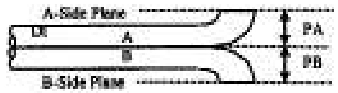
APPENDIX F
QUALITY CONTROL RECORDS

Type S Pitot Tube Inspection Data Form

Pitot Tube Identification Number: **P-153**

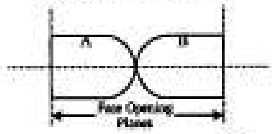
Inspection Date 1/8/16 Individual Conducting Inspection SR

If all Criteria PASS Cp is equal to 0.84

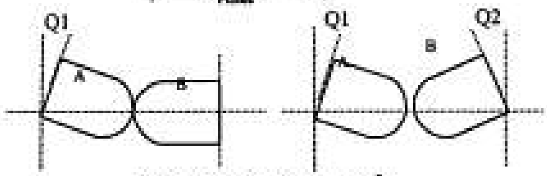


		PASS/FAIL
Distance to A Plane (PA) - inches	0.467	PASS
Distance to B Plane (PB) - inches	0.467	PASS
Pitot OD (D_t) - inches	0.375	

$1.05\ D_t < P < 1.5\ D_t$ PA must Equal PB

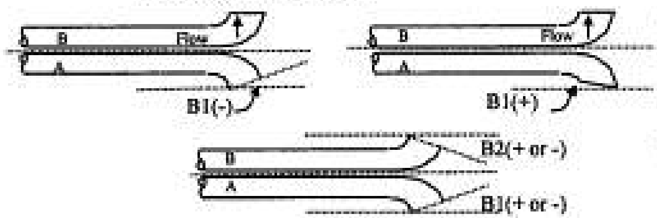


Are Open Faces Aligned Perpendicular to the Tube Axis ◉ YES ○ NO — PASS



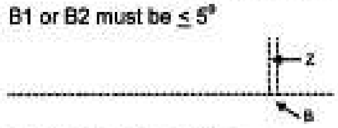
Angle of Q1 from vertical A Tube- degrees (absolute)	1	PASS
Angle of Q2 from vertical B Tube- degrees (absolute)	0	PASS

Q1 and Q2 must be ≤ 10°

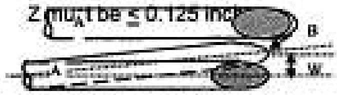


Angle of B1 from vertical A Tube- degrees (absolute)	0	PASS
Angle of B1 from vertical B Tube- degrees (absolute)	0	PASS

B1 or B2 must be ≤ 5°

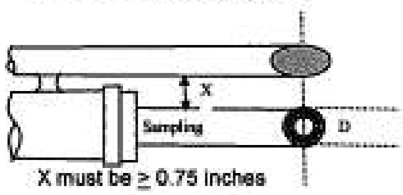


Z must be ≤ 0.125 inches



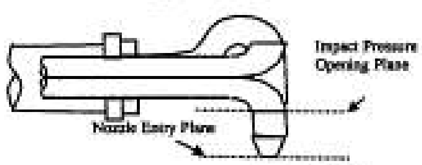
W must be ≤ 0.03125 inches

Horizontal offset between A and B Tubes (Z) - inches	0.016	PASS
Vertical offset between A and B Tubes (W) - inches	0.027	PASS



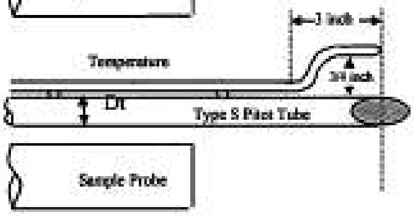
X must be ≥ 0.75 inches

Distance between Sample Nozzle and Pitot (X) - inches	0.976	PASS



Impact Pressure Opening Plane is above the Nozzle Entry Plane ◉ YES ○ NO ○ NA

Thermocouple meets the Distance Criteria in the adjacent figure ◉ YES ○ NO ○ NA



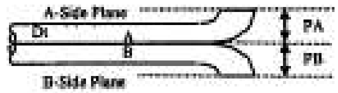
Thermocouple meets the Distance Criteria in the adjacent figure ○ YES ○ NO ◉ NA

Type S Pitot Tube Inspection Data Form

Pitot Tube Identification Number: **P-154**

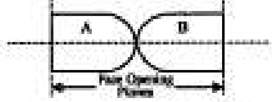
Inspection Date 1/26/16 Individual Conducting Inspection SR

If all Criteria PASS Cp is equal to 0.84

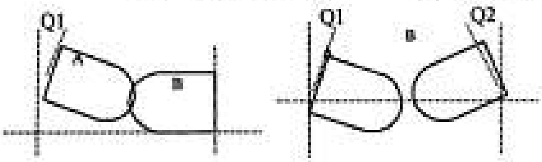


		PASS/FAIL
Distance to A Plane (PA) - inches	0.469	PASS
Distance to B Plane (PB) - inches	0.469	PASS
Pitot OD (D_t) - inches	0.375	

$1.05\ D_t < P < 1.5\ D_t$ PA must Equal PB

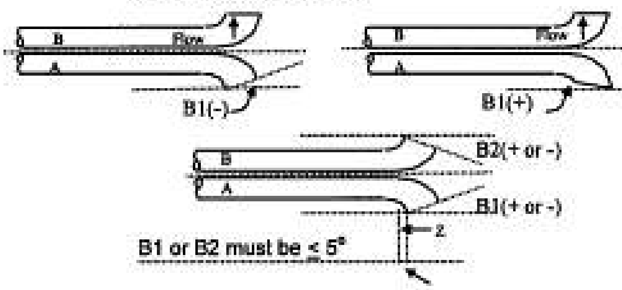


Are Open Faces Aligned Perpendicular to the Tube Axis ◉ YES ○ NO — PASS



Angle of Q1 from vertical A Tube- degrees (absolute)	0	PASS
Angle of Q2 from vertical B Tube- degrees (absolute)	2	PASS

Q1 and Q2 must be $\leq 10^{o}$

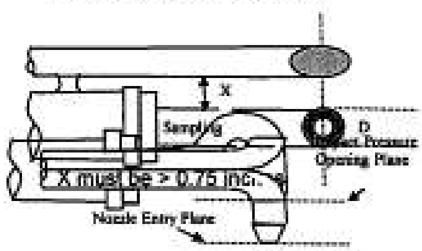


Angle of B1 from vertical A Tube- degrees (absolute)	1	PASS
Angle of B1 from vertical B Tube- degrees (absolute)	0	PASS

B1 or B2 must be $\leq 5^{o}$

Horizontal offset between A and B Tubes (Z) - inches	0.009	PASS
Vertical offset between A and B Tubes (W) - inches	0.015	PASS

W must be $\leq$ 0.03125 inches



Distance between Sample Nozzle and Pitot (X) - inches	0.907	PASS

Impact Pressure Opening Plane is above the Nozzle Entry Plane ◉ YES ○ NO ○ NA

Thermocouple meets the Distance Criteria in the adjacent figure ○ YES ○ NO ◉ NA

Thermocouple meets the Distance Criteria in the adjacent figure ◉ YES ○ NO ○ NA

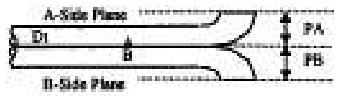
Sample Probe

Type S Pitot Tube Inspection Data Form

Pitot Tube Identification Number: **P-366**

If all Criteria PASS Cp is equal to 0.84

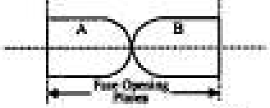
Inspection Date 12/30/15 Individual Conducting Inspection SR



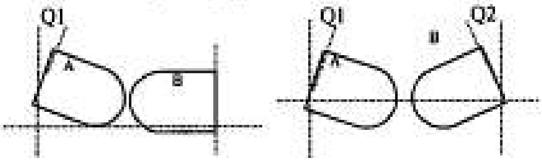
1.05 D_t < P < 1.5 D_t

PA must Equal PB

		PASS/FAIL
Distance to A Plane (PA) - inches	0.472	PASS
Distance to B Plane (PB) - inches	0.472	PASS
Pitot OD (D_t) - inches	0.375	

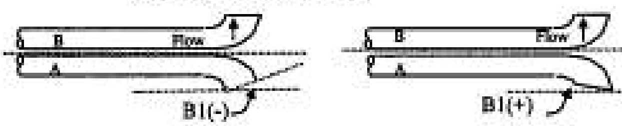


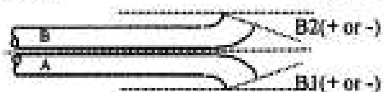
Are Open Faces Aligned Perpendicular to the Tube Axis — ◉ YES ○ NO — PASS



Q1 and Q2 must be ≤ 10°

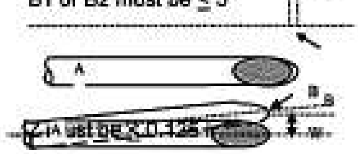
Angle of Q1 from vertical A Tube- degrees (absolute)	1	PASS
Angle of Q2 from vertical B Tube- degrees (absolute)	0	PASS





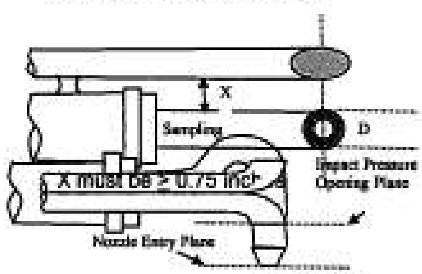
Angle of B1 from vertical A Tube- degrees (absolute)	0	PASS
Angle of B1 from vertical B Tube- degrees (absolute)	1	PASS

B1 or B2 must be ≤ 5°



Horizontal offset between A and B Tubes (Z) - inches	0.037	PASS
Vertical offset between A and B Tubes (W) - inches	0.01	PASS

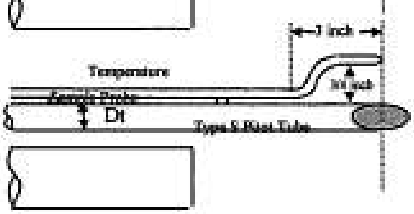
W must be ≤ 0.03125 inches



Distance between Sample Nozzle and Pitot (X) - inches NA

Impact Pressure Opening Plane is above the Nozzle Entry Plane — ○ YES ○ NO ◉ NA

Thermocouple meets the Distance Criteria in the adjacent figure — ◉ YES ○ NO ○ NA



Thermocouple meets the Distance Criteria in the adjacent figure — ○ YES ○ NO ◉ NA

Sample Probe

Type S Pitot Tube Inspection Data Form

Pitot Tube Identification Number: **P-524**

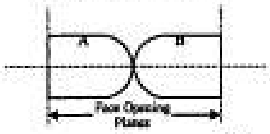
Inspection Date 1/18/16 Individual Conducting Inspection SR

If all Criteria PASS Cp is equal to 0.84

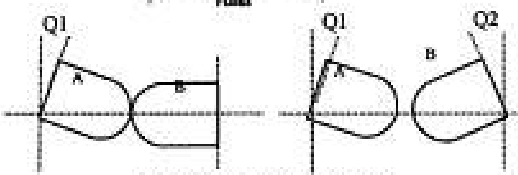
PASS/FAIL

		PASS/FAIL
Distance to A Plane (PA) - inches	0.424	PASS
Distance to B Plane (PB) - inches	0.424	PASS
Pitot OD (D_t) - inches	0.375	

$1.05\ D_t < P < 1.5\ D_t$ PA must Equal PB

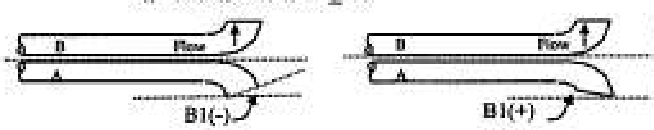


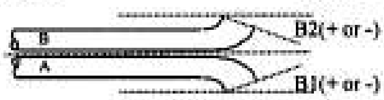
Are Open Faces Aligned Perpendicular to the Tube Axis ◉ YES ○ NO PASS



Angle of Q1 from vertical A Tube- degrees (absolute)	2	PASS
Angle of Q2 from vertical B Tube- degrees (absolute)	1	PASS

Q1 and Q2 must be ≤ 10°

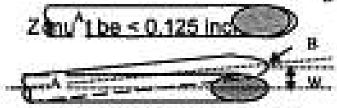




Angle of B1 from vertical A Tube- degrees (absolute)	1	PASS
Angle of B1 from vertical B Tube- degrees (absolute)	1	PASS

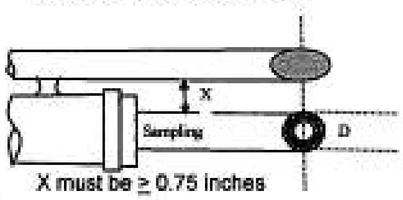
B1 or B2 must be ≤ 5°

Z must be ≤ 0.125 inch



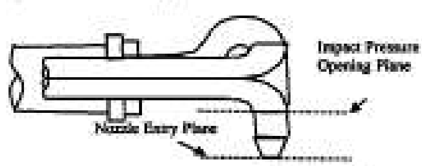
W must be ≤ 0.03125 inches

Horizontal offset between A and B Tubes (Z) - inches	0.032	PASS
Vertical offset between A and B Tubes (W) - inches	0.02	PASS



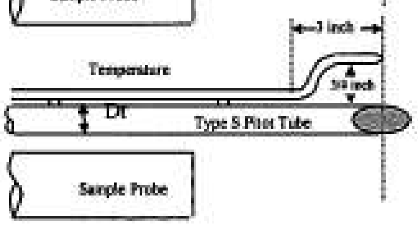
X must be ≥ 0.75 inches

Distance between Sample Nozzle and Pitot (X) - inches	1.356	PASS



Impact Pressure Opening Plane is above the Nozzle Entry Plane ◉ YES ○ NO ○ NA

Thermocouple meets the Distance Criteria in the adjacent figure ○ YES ○ NO ◉ NA



Thermocouple meets the Distance Criteria in the adjacent figure ◉ YES ○ NO ○ NA

Environmental Supply Company, Inc.

Quality Source Sampling Systems & Accessories

Wind Tunnel Pitot Calibration

S-type Pitot ID:	P-963	Date:	13-Jul-15
Standard Pitot ID:	001	Personnel:	KMR
Cp(std):	0.99	Cp(actual):	0.735
Part Number:	PPS12-Y-PM1025	P_{bar}(in Hg):	29.36
Test Velocity (fps):	50	T(°F):	86
Wind Tunnel Location:	Calera, AL	Tunnel Size:	20" x 40"
Customer:	WESTON		

A-SIDE

ΔP_{std} (in. H_2O)	ΔP_s (in. H_2O)	Cp(s)	Deviation*
0.560	1.019	0.734	0.002
0.562	1.016	0.736	-0.001
0.560	1.018	0.734	0.000
	AVERAGE	0.735	0.001
		Std deviation	0.002

NOTES:

1. **Pitot calibrated with an Environmental Supply Co. PM10 cyclone.**
2. **C_p is only valid when used with PM10 cyclone.**
3. **C_p is only valid with 1" spacing from PM10 cyclone.**

$$Cp(s) = Cp(std)\sqrt{\frac{\Delta P(std)}{\Delta P(s)}}$$

*Deviation = {Cp(s) - *AVG* Cp(s)} {must be <0.010}

Standard deviation of the deviations must be less than 0.02 for both sides.

Pitot tube S/N P-963 was calibrated in accordance with the CFR 40, Part 60 Appendix A, Method 2, Section 10.

[signature] 7/13/15

Signature Date

708 E. Club Blvd., Durham, North Carolina 27704 www.environsupply.com 919-956-9688 FAX: 919-682-0333

Long Cal and Temperature Cal Datasheet for Standard Dry Gas Meter Console

Calibrator: SR | Meter Box Number: 22 | Ambient Temp: 72

Date: 19-Jan-16 | Wet Test Meter Number: P-2952 | Temp Reference Source: Thermocouple Simulator (Accuracy +/- 1°F)

Dry Gas Meter Number: 15550528

Baro Press, in Hg (Pb)	29.7

Setting: Orifice Manometer in H_2O (ΔH)	Gas Volume: Wet Test Meter ft^3 (Vw)	Gas Volume: Dry gas Meter ft^3 (Vd)	Temperatures: Wet Test Meter °F (Tw)	Temperatures: Dry Gas Meter Outlet, °F (Td_o)	Temperatures: Dry Gas Meter Inlet, °F (Td_i)	Temperatures: Dry Gas Meter Average, °F (Td)	Time, min (O)	Calibration Results: Y	Calibration Results: ΔH
		408.155		76.00	76.00				
0.5	5.0	413.209	72.0	76.00	76.00	76.0	12.6	0.9955	1.7895
		5.054		76.00	76.00				
		413.209		77.00	77.00				
1.0	6.0	419.270	72.0	77.00	77.00	77.0	10.9	0.9968	1.8565
		6.061		77.00	77.00				
		419.270		77.00	77.00				
1.5	10.0	429.400	72.0	77.00	77.00	77.0	15.0	0.9928	1.8986
		10.130		77.00	77.00				
		429.400		79.00	78.00				
2.0	10.0	439.575	72.0	79.00	78.00	78.5	13.0	0.9899	1.8961
		10.175		79.00	78.00				
		439.575		80.00	79.00				
3.0	10.0	449.820	72.0	80.00	79.00	79.5	10.90	0.9825	1.9958
		10.245		80.00	79.00				
							Average	0.9915	1.8873

Vw - Gas Volume passing through the wet test meter
Vd - Gas Volume passing through the dry gas meter
Tw - Temp of gas in the wet test meter
Tdi - Temp of the inlet gas of the dry gas meter
Tdo - Temp of the outlet gas of the dry gas meter
Td - Average temp of the gas in the dry gas meter

0 - Time of calibration run
Pb - Barometric Pressure
ΔH - Pressure differential across orifice
Y - Ratio of accuracy of wet test meter to dry gas meter

$$Y = \frac{Vw * Pb * (td + 460)}{Vd * \left[Pb + \frac{(\Delta H)}{13.6}\right] * (tw + 460)}$$

$$\Delta H = \left[\frac{0.0317 * \Delta H}{Pb * (td + 460)}\right] * \left[\frac{(tw + 460) * O}{Vw}\right]^2$$

Reference Temperature (Select Temperature: ○ °C ◉ °F)	Temperature Reading from Individual Thermocouple Input[1] Channel Number 1	2	3	4	5	6	Average Temperature Reading	Temp Difference[2] (%)
32	32	32	32	32	31		31.8	0.0%
212	212	213	213	213	212		212.6	-0.1%
932	932	933	933	933	932		932.6	0.0%
1832	1832	1832	1832	1832	1832		1832.0	0.0%

1 - Channel Temps must agree with +/- 5°F or 3°C
2 - Acceptable Temperature Difference less than 1.5 %

$$\text{Temp Diff} = \left[\frac{(\text{Reference Temp}(°F) + 460) - (\text{Test Temp}(°F) + 460)}{\text{Reference Temp}(°F) + 460}\right]$$

Long Cal box#22 1-19-16.xls

Y Factor Calibration Check Calculation

PARTICULATE (PM_{10}/$PM_{2.5}$) TEST TRAIN
METER BOX NO. 22
RUN NO. 4 07/07/16

MWd = Dry molecular weight source gas, lb/lb-mole.	
0.32 = Molecular weight of oxygen, divided by 100.	
0.44 = Molecular weight of carbon dioxide, divided by 100.	
0.28 = Molecular weight of nitrogen or carbon monoxide, divided by 100.	
% CO_2 = Percent carbon dioxide by volume, dry basis.	13.3
% O_2 = Percent oxygen by volume, dry basis.	7.2

MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))

MWd = (0.32 * 7.2) + (0.44 * 13.3) + (0.28 * (100 - (13.3 + 7.2)))

MWd = (2.30) + (5.85) + (22.26)

MWd = 30.42

Tma = Source Temperature, absolute(°R)	
Tm = Average dry gas meter temperature , deg F.	79.0

Tma = Ts + 460

Tma = 78.97 + 460

Tma = 538.97

Ps = Absolute meter pressure, inches Hg.	
13.60 = Specific gravity of mercury.	
delta H = Avg pressure drop across the orifice meter during sampling, in H2O	0.37000
Pb = Barometric Pressure, in Hg.	29.38

Pm = Pb + (delta H / 13.6)

Pm = 29.38 + (0.37 / 13.6)

Pm = 29.41

Yqa = dry gas meter calibration check value, dimensionless.	
0.03 = (29.92/528)(0.75)2 (in. Hg/°/R) cfm2.	
29.00 = dry molecular weight of air, lb/lb-mole.	
Vm = Volume of gas sample measured by the dry gas meter at meter conditions, dcf.	33.193
Y = Dry gas meter calibration factor (based on full calibration)	0.9915
Delta H@ = Dry Gas meter orifice calibration coefficient, in. H2O.	1.8873
vg SQRT Delta H = Avg SQRT press. drop across the orifice meter during sampling , in. H_2O	0.60828
O = Total sampling time, minutes.	97.5

Yqa = (O / Vm) * SQRT (0.0319 * Tma * 29) / (Delta H@ * Pm * MWd) * avg SQRT Delta H

Yqa = (97.50 / 33.19) * SQRT (0.0319 * 538.97 * 29) / (1.89 * 29.41 * 30.42) * 0.61

Yqa = 2.937 * SQRT 498.598 / 1,688.255 * 0.61

Yqa = 0.9710

Diff = Absolute difference between Yqa and Y	

Diff = ((Y - Yqa) / Y) * 100

Diff = ((0.9915 - 0.9710) / 0.9915) * 100

Diff = 2.07
Allowable = 5.0

Long Cal and Temperature Cal Datasheet for Standard Dry Gas Meter Console

Calibrator: PM | Meter Box Number: 26 | Ambient Temp: 72

Date: 13-Jul-15 | Wet Test Meter Number: P-2952 | Temp Reference Source: Thermocouple Simulator (Accuracy +/- 1°F)

Dry Gas Meter Number: 16300942

Baro Press, in Hg (Pb)	29.69

Setting	Gas Volume		Temperatures					Calibration Results	
Orifice Manometer	Wet Test Meter	Dry gas Meter	Wet Test Meter	Dry Gas Meter					
in H_20 (ΔH)	ft^3 (Vw)	ft^3 (Vd)	°F (Tw)	Outlet, °F (Td_o)	Inlet, °F (Td_i)	Average, °F (Td)	Time, min (O)	Y	ΔH
0.5	5.0	429.136 434.141 5.005	73.0	74.00 75.00 74.50	74.00 75.00 74.50	74.5	13.3	1.0006	2.0077
1.0	5.0	434.141 439.147 5.006	73.0	75.00 77.00 76.00	75.00 77.00 76.00	76.0	9.6	1.0019	2.0861
1.5	10.0	439.147 449.183 10.036	73.0	77.00 80.00 78.50	77.00 80.00 78.50	78.5	16.4	1.0030	2.2725
2.0	10.0	449.183 459.241 10.058	73.0	80.00 81.00 80.50	80.00 81.00 80.50	80.5	14.1	1.0033	2.2314
3.0	10.0	459.241 469.336 10.095	73.0	81.00 83.00 82.00	81.00 83.00 82.00	82.0	11.6	0.9999	2.2591
							Average	1.0017	2.1714

Vw - Gas Volume passing through the wet test meter
Vd - Gas Volume passing through the dry gas meter
Tw - Temp of gas in the wet test meter
Tdi - Temp of the inlet gas of the dry gas meter
Tdo - Temp of the outlet gas of the dry gas meter
Td - Average temp of the gas in the dry gas meter

0 - Time of calibration run
Pb - Barometric Pressure
ΔH - Pressure differential across orifice
Y - Ratio of accuracy of wet test meter to dry gas meter

$$Y = \frac{Vw * Pb * (td + 460)}{Vd * \left[Pb + \frac{(\Delta H)}{13.6}\right] * (tw + 460)}$$

$$\Delta H = \left[\frac{0.0317 * \Delta H}{Pb * (td + 460)}\right] * \left[\frac{(tw + 460) * O}{Vw}\right]^2$$

Reference Temperature Select Temperature ○ °C ◉ °F	Temperature Reading from Individual Thermocouple Input [1] Channel Number 1	2	3	4	5	6	Average Temperature Reading	Temp Difference [2] (%)
32	32	32	32	32	32		32.0	0.0%
212	212	212	212	212	212		212.0	0.0%
932	932	932	932	932	932		932.0	0.0%
1832	1830	1830	1830	1830	1830		1830.0	0.1%

1 - Channel Temps must agree with +/- 5°F or 3°C
2 - Acceptable Temperature Difference less than 1.5 %

$$\text{Temp Diff} = \left[\frac{(\text{Reference Temp}(°F) + 460) - (\text{Test Temp}(°F) + 460)}{\text{Reference Temp}(°F) + 460}\right]$$

Long Cal Box 26 7-13-15.xls

Y Factor Calibration Check Calculation

METHOD 29 TEST TRAIN
METER BOX NO. 26
RUN NO. 3 07/06/16

MWd = Dry molecular weight source gas, lb/lb-mole.	
0.32 = Molecular weight of oxygen, divided by 100.	
0.44 = Molecular weight of carbon dioxide, divided by 100.	
0.28 = Molecular weight of nitrogen or carbon monoxide, divided by 100.	
% CO_2 = Percent carbon dioxide by volume, dry basis.	13.1
% O_2 = Percent oxygen by volume, dry basis.	7.3

MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))

MWd = (0.32 * 7.3) + (0.44 * 13.1) + (0.28 * (100 - (13.1 + 7.3)))

MWd = (2.34) + (5.76) + (22.29)

MWd = 30.39

Tma = Source Temperature, absolute(°R)	
Tm = Average dry gas meter temperature , deg F.	71.1

Tma = Ts + 460

Tma = 71.13 + 460

Tma = 531.13

Ps = Absolute meter pressure, inches Hg.	
13.60 = Specific gravity of mercury.	
delta H = Avg pressure drop across the orifice meter during sampling, in H2O	1.813
Pb = Barometric Pressure, in Hg.	29.38

Pm = Pb + (delta H / 13.6)

Pm = 29.38 + (1.8125 / 13.6)

Pm = 29.51

Yqa = dry gas meter calibration check value, dimensionless.	
0.03 = (29.92/528)(0.75)2 (in. Hg/°/R) cfm2.	
29.00 = dry molecular weight of air, lb/lb-mole.	
Vm = Volume of gas sample measured by the dry gas meter at meter conditions, dcf.	65.414
Y = Dry gas meter calibration factor (based on full calibration)	1.0017
Delta H@ = Dry Gas meter orifice calibration coefficient, in. H2O.	2.1714
SQRT Delta H = Avg SQRT press. drop across the orifice meter during sampling , in. H_2O	1.3394
O = Total sampling time, minutes.	96

Yqa = (O / Vm) * SQRT (0.0319 * Tma * 29) / (Delta H@ * Pm * MWd) * avg SQRT Delta H

Yqa = (96.00 / 65.41) * SQRT (0.0319 * 531.13 * 29) / (2.17 * 29.51 * 30.39) * 1.34

Yqa = 1.468 * SQRT 491.344 / 1,947.203 * 1.34

Yqa = 0.987

Diff = Absolute difference between Yqa and Y	

Diff = ((Y - Yqa) / Y) * 100

Diff = ((1.0017 - 0.987) / 1.0017) * 100

ALLOWABLE <5

Diff = 1.47

INTERFERENCE CHECK

Date: 12/4/14-12/5/14
Analyzer Type: Servomex - O_2
Model No: 4900
Serial No: 49000-652921
Calibration Span: 21.09 %
Pollutant: 21.09% O_2 - CC418692

INTERFERENT GAS	ANALYZER RESPONSE		% OF CALIBRATION SPAN[(a)]
	INTERFERENT GAS RESPONSE (%)	INTERFERENT GAS RESPONSE, WITH BACKGROUND POLLUTANT (%)	
CO_2 (30.17% CC199689)	0.00	-0.01	0.00
NO (445 ppm CC346681)	0.00	0.02	0.11
NO_2 (23.78 ppm CC500749)	NA	NA	NA
N_2O (90.4 ppm CC352661)	0.00	0.05	0.24
CO (461.5 ppm XC006064B)	0.00	0.02	0.00
SO_2 (451.2 ppm CC409079)	0.00	0.05	0.23
CH_4 (453.1 ppm SG901795)	NA	NA	NA
H_2 (552 ppm ALM048043)	0.00	0.09	0.44
HCl (45.1 ppm CC17830)	0.00	0.03	0.14
NH_3 (9.69 ppm CC58181)	0.00	0.01	0.03
TOTAL INTERFERENCE RESPONSE			1.20
METHOD SPECIFICATION			< 2.5%

[(a)] The larger of the absolute values obtained for the interferent tested with and without the pollutant present was used in summing the interferences.

Chad Walker

INTERFERENCE CHECK

Date: 12/4/14-12/5/14
Analyzer Type: Servomex - CO_2
Model No: 4900
Serial No: 49000-652921
Calibration Span: 16.65%
Pollutant: 16.65% CO_2 - CC418692

INTERFERENT GAS	ANALYZER RESPONSE		% OF CALIBRATION SPAN[(a)]
	INTERFERENT GAS RESPONSE (%)	INTERFERENT GAS RESPONSE, WITH BACKGROUND POLLUTANT (%)	
CO_2 (30.17% CC199689)	NA	NA	NA
NO (445 ppm CC346681)	0.00	0.02	0.10
NO_2 (23.78 ppm CC500749)	0.00	0.00	0.02
N_2O (90.4 ppm CC352661)	0.00	0.01	0.04
CO (461.5 ppm XC006064B)	0.00	0.01	0.00
SO_2 (451.2 ppm CC409079)	0.00	0.11	0.64
CH_4 (453.1 ppm SG901795)	0.00	0.07	0.44
H_2 (552 ppm ALM048043)	0.00	0.04	0.22
HCl (45.1 ppm CC17830)	0.10	0.06	0.60
NH_3 (9.69 ppm CC58181)	0.00	0.02	0.14
TOTAL INTERFERENCE RESPONSE			2.19
METHOD SPECIFICATION			< 2.5%

[(a)] The larger of the absolute values obtained for the interferent tested with and without the pollutant present was used in summing the interferences.

Chad Walker

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CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E03NI79E15A00E4	Reference Number:	82-124547137-1
Cylinder Number:	XC016048B	Cylinder Volume:	150.5 CF
Laboratory:	ASG - Riverton - NJ	Cylinder Pressure:	2015 PSIG
PGVP Number:	B52016	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	Mar 29, 2016

Expiration Date: Mar 29, 2024

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON DIOXIDE	9.000 %	8.882 %	G1	+/- 0.7% NIST Traceable	03/29/2016
OXYGEN	12.00 %	11.95 %	G1	+/- 0.4% NIST Traceable	03/29/2016
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13060819	CC417106	24.04 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 16, 2019
NTRMplus	09060208	CC262337	9.961 % OXYGEN/NITROGEN	+/- 0.3%	Nov 08, 2018

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Horiba VIA 510-CO2-LDH9LRNS	NDIR	Mar 03, 2016
Horiba MPA 510-O2-7TWMJ041	Paramagnetic	Mar 03, 2016

Triad Data Available Upon Request

Signature on file

Approved for Release

Airgas

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E03NI62E15A0224	Reference Number:	82-124470561-1
Cylinder Number:	SG9168232BAL	Cylinder Volume:	157.2 CF
Laboratory:	ASG - Riverton - NJ	Cylinder Pressure:	2015 PSIG
PGVP Number:	B52015	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	Jan 14, 2015

Expiration Date: Jan 14, 2023

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON DIOXIDE	17.00 %	16.74 %	G1	+/- 0.7% NIST Traceable	01/14/2015
OXYGEN	21.00 %	21.30 %	G1	+/- 1.0% NIST Traceable	01/14/2015
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13060705	CC411739	16.939 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 08, 2019
NTRM	09061414	CC273609	22.53 % OXYGEN/NITROGEN	+/- 0.4%	Mar 08, 2019

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Horiba VIA 510-CO2-LDH9LRNS	NDIR	Dec 19, 2014
Siemens Oxymat 6E-O2-N1-M1-0603	Paramagnetic	Jan 12, 2015

Triad Data Available Upon Request

Signature on file

Approved for Release

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CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02AI99E15AC232	Reference Number:	82-124386516-1
Cylinder Number:	CC261812	Cylinder Volume:	146.2 CF
Laboratory:	ASG - Riverton - NJ	Cylinder Pressure:	2015 PSIG
PGVP Number:	B52013	Valve Outlet:	590
Gas Code:	CH4,BALA	Certification Date:	Jul 30, 2013

Expiration Date: Jul 30, 2021

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
METHANE	2.500 PPM	2.543 PPM	G1	+/- 1.0% NIST Traceable	07/30/2013
AIR	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRMplus	07060416	CC206028	4.495 PPM METHANE/AIR	+/- 1.0%	Apr 19, 2017

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 APW1100391 CH4	FTIR	Jul 03, 2013

Triad Data Available Upon Request

Signature on file

Approved for Release

Airgas.

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02AI99E15A0448	Reference Number:	82-124454428-1
Cylinder Number:	CC37650	Cylinder Volume:	146.2 CF
Laboratory:	ASG - Riverton - NJ	Cylinder Pressure:	2015 PSIG
PGVP Number:	B52014	Valve Outlet:	590
Gas Code:	CH4,BALA	Certification Date:	Sep 24, 2014

Expiration Date: Sep 24, 2022

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
METHANE	5.000 PPM	5.104 PPM	G1	+/- 0.9% NIST Traceable	09/24/2014
AIR	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	12060611	CC357484	9.91 PPM METHANE/AIR	+/- 0.4%	Nov 29, 2017

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801933 CH4	FTIR	Sep 24, 2014

Triad Data Available Upon Request

Signature on file

Approved for Release

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Airgas

Airgas, Inc.
600 Union Landing Road
Cinnaminson, NJ 08077
856-829-7878 Fax: 856-829-6576
www.airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number:	E02AI99E15A0361	Reference Number:	82-124439683-1
Cylinder Number:	CC344084	Cylinder Volume:	146.2 CF
Laboratory:	ASG - Riverton - NJ	Cylinder Pressure:	2015 PSIG
PGVP Number:	B52014	Valve Outlet:	590
Gas Code:	CH4,BALA	Certification Date:	Jun 17, 2014

Expiration Date: Jun 17, 2022

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
METHANE	8.500 PPM	8.556 PPM	G1	+/- 0.9% NIST Traceable	06/17/2014
AIR	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	07060510	CC207907	10.00 PPM METHANE/AIR	+/- 0.8%	Apr 27, 2017

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801933 CH4	FTIR	Jun 12, 2014

Triad Data Available Upon Request

Notes:

Approved for Release

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RUN DATA

Stratification Check

Client:	**LWEC**	Project Number:	**14464.007.004.0001**
Location:	**L'Anse, Michigan**	Operator:	**TB**
Source:	**Boiler # 1**	Calibration: 1	Date: **05 Jul 2016**

Time	O_2 %	CO_2 %
Response Time < 1 minute (40 seconds)		
Point A 1		
13:53	6.7	13.3
13:54	6.6	14.3
13:55	6.9	15.3
Average	**6.7**	**14.3**
A 2		
13:56	6.6	13.4
13:57	7.2	14.4
13:58	7.3	15.4
Average	**7.0**	**14.4**
A 3		
14:02	7.5	12.5
14:03	7.3	13.5
14:04	7.4	14.5
Average	**7.4**	**13.5**
Overall Average	**7.1**	**14.1**
5% minimum	**6.7**	**13.4**
5% maximum	**7.4**	**14.8**

PENNSTATE

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Continuing Education

Visible Emissions Evaluation Program

This certifies that

TYSON BELKNAP

has met the specifications of Federal EPA Reference Method 9 and qualified as a visible emissions evaluator. Maximum deviation on white and black smoke did not exceed 7.5% opacity and no single error exceeding 15% opacity was incurred during the certification test conducted by The Pennsylvania State University.

Certification valid

FROM: *April 19, 2016* TO: *October 18, 2016*

Director of Conferences

Visible Emissions Certification
Field Test Instructor

APPENDIX G
SAMPLE CALCULATIONS

SAMPLE CALCULATIONS FOR
BIAS CORRECTION OF OXYGEN AND CARBON DIOXIDE

Client: L'Anse Warden Electric Company | Plant: L'Anse, MI
Test Number: Run 1 | Test Date: 7/6/16
Test Location: Boiler No. 1 | Test Period: 1315-1415

1. Bias corrected value of Oxygen (%).

$$Cd = \frac{(AVG - bias)}{(Sbias - bias)} \times SPAN\ GAS$$

$$Cd = \frac{6.8 - 0.1}{12.1 - 0.1} \times 11.9$$

Cd = 6.7

Where:

Cd = Oxygen concentration measured on a dry basis (ppmvd), bias corrected.

AVG = Average Oxygen concentration for the test run.

bias = The average of pre and post test zero bias checks.

Sbias = The average of pre and post test span bias check.

SPAN GAS = The calibration gas concentration, which was used for the BIAS check.

2. Bias corrected value of Carbon Dioxide (%).

$$Cd = \frac{(AVG - bias)}{(Sbias - bias)} \times SPAN\ GAS$$

$$Cd = \frac{13.200 - 0.05}{8.60 - 0.05} \times 8.9$$

Cd = 13.7

Where:

Cd = Carbon Dioxide concentration measured on a dry basis (ppmvd), bias corrected.

AVG = Average Carbon Dioxide concentration for the test run.

bias = The average of pre and post test zero bias checks.

Sbias = The average of pre and post test span bias check.

SPAN GAS = The calibration gas concentration, which was used for the BIAS check.

SAMPLE CALCULATIONS FOR
VOC CONCENTRATIONS AND EMISSION RATES

Client: L'Anse Warden Electric Company — Plant: L'Anse, MI
Test Number: 1 — Test Date: 7/6/16
Test Location: Boiler No. 1 — Test Period: 1315-1415

1. Moisture corrected value of VOC, dry basis (ppm/v).

$$C(VOC) = \frac{AvgVOC}{(100 - MOISTURE)/100}$$

$$C(VOC) = \frac{<0.10}{(100 - 17.8)/100}$$

$$C(VOC) = <0.12$$

Where:

AvgVOC = VOC concentration measured on a wet basis (total hydrocarbons, parts per million by volume) as methane.

C(VOC) = The concentration of total VOC, corrected for moisture.

MOISTURE = The percentage of water vapor in the gas stream from corresponding isokinetic test train.

2. VOC concentration, ppm @ 7% O2.

$$C(VOC)corr = \frac{C(VOC) \times [20.9 - 7 \quad O2]}{[20.9 - O2(measured)]}$$

$$C(VOC)corr = \frac{<0.12 \times 13.9}{20.9 - 6.7}$$

$$C(VOC)corr = <0.12$$

Where:

C(VOC)corr = VOC concentration of sample, as methane, corrected to 7 O2.

O2 (measured) = Average oxygen concentration for test run as measured, .

3. VOC mass emission rate dry basis, lbs/hr.

$$MR1(VOC) = \frac{C(VOC) \times Qs(std) \times 16.04 \times 60 \text{ min/hr}}{385.35 \times 10^6}$$

$$MR1(VOC) = \frac{<0.12 \times 69882 \times 16.04 \times 60 \text{ min/hr}}{385.35 \times 10^6}$$

$$MR1(VOC) = <0.02$$

Where:

MR1(VOC) = VOC mass emission rate, lbs/hr.

Qs(std) = Average volumetric gas stream flow rate at standard conditions, dscf/min.

16.04 = Molecular weight of methane

385.35x10^6 = Conversion factor from ppm to lbs.

SAMPLE CALCULATIONS FOR PARTICULATE

Client: L'Anse Warden Electric Company	Plant: L'Anse, MI
Test Number: Run 1	Test Date: 7/6/16
Test Location: Boiler No. 1	Test Period: 1314-1521

1. Particulate Concentration, gr/dscf.

$$C1 = 15.432 \times \frac{Mt}{Vm(std)}$$

$$C1 = 15.432 \times \frac{0.00550}{59.552}$$

$$= 0.0014$$

Where:

C1 = Particulate concentration, gr/dscf.
Mt = Total weight of particulate caught by train adjusted for the site blank sample
15.432 = Conversion factor from gms to gr.

2. Particulate mass emission rate, lb/hr.

PMR1 = 0.008571 x C1 x Qs(std)

PMR1 = 0.008571 x 0.0014 x 69828

= 0.85

Where:

PMR1 = Particulate mass emission rate, lb/hr.
0.008571 = Conversion factor relating grains to pounds (7,000) and minutes to hours.

3. Particulate mass emission rate, lb/MMBtu.

PMR2 = C1 x .000142857 x Fd x (20.9/(20.9-%O2))

PMR2 = 0.0014 x 0.000142857 x 9561 x (20.9/(20.9-6.6)
= 0.003

Where:

PMR2 = Particulate mass emission rate, lb/MMBtu.
0.000142857 = Conversion factor relating grains to pounds
Fd = Facility Provided F-factor of 9561.
O2 = Oxygen measured during the run, dry basis.

SAMPLE CALCULATIONS FOR
CONCENTRATIONS AND EMISSION RATES OF HCl AND Cl_2

Client: L'Anse, Warden Electric Comp-any | Facility: L'Anse, MI
Test Number: Run 1 | Test Date: 7/6/16
Test Location: Boiler No. 1 | Test Period: 0935-1040

1. Hydrogen chloride concentration, lb/dscf.

$$C1(HCl) = \frac{W(HCl) \times 2.2046 \times 10^{-6}}{V_{dm}(std)}$$

$$C1(HCl) = \frac{8.2000 \times 2.2046 \times 10^{-6}}{44.309}$$

C1(HCl) = 4.08E-07

Where:

W(HCl) = Weight of hydrogen chloride collected in sample, mg.
C1(HCl) = Hydrogen chloride concentration, lbs/dscf.
2.2046×10^{-6} = Conversion factor from mg to lbs.

2. Hydrogen chloride concentration, ppmv.

$$C2(HCl) = \frac{385.35 \times 10^{6}}{MW} \times C1(HCl)$$

$$C2(HCl) = \frac{385.35 \times 10^{6}}{36.45} \times 0.0000004080$$

= 4.31

Where:

C2(HCl) = Concentration of HCl in stack gas, parts per million by volume (dry basis).
385.35×10^{6} = Conversion factor from lbs/ppm.

2. Hydrogen chloride mass emission rate, lb/hr.

PMR1(HCl) = C1(HCl) x Qs(std) x 60

PMR1(HCl) = 0.0000004080 x 70699 x 60

= 1.73

Where:

PMR1(HCl) = Hydrogen chloride mass emission rate, lb/hr.

3. Chlorine concentration, lb/dscf.

$$C1(Cl_2) = \frac{W(Cl_2) \times 2.2046 \times 10^{-6}}{V_{dm}(std)}$$

$$C1(Cl_2) = \frac{< 1.2000 \times 2.2046 \times 10^{-6}}{44.309}$$

$C1(Cl_2)$ = < 5.97E-08

Where:

$W(Cl_2)$ = Weight of Chlorine collected in sample, mg.
$C1(Cl_2)$ = Chlorine concentration, lbs/dscf.
2.2046×10^{-6} = Conversion factor from mg to lbs.

4. Chlorine concentration, ppm/v.

$$C2(Cl_2) = \frac{385.35 \times 10^{6}}{MW} \times C1(CL_2)$$

$$C2(Cl_2) = \frac{385.35 \times 10^{6}}{70.906} \times <0.0000000597$$

= < 0.32

Where:

$C2(Cl_2)$ = Concentration of Cl_2 in stack gas, parts per million by volume (dry basis).
385.35 x 10^6 = Conversion factor from lbs/ppm.

5. Chlorine mass emission rate, lb/hr.

$PMR1(Cl_2)$ = $C1(Cl_2) \times Qs(std) \times 60$

PMR1(Cl2) = < 0.0000000597 x 70699 x 60

= < 0.25

Where:

$PMR1(Cl_2)$ = Chlorine mass emission rate, lb/hr.

SAMPLE CALCULATIONS FOR LEAD

Client: L'Anse Warden Elecric Company
Test Number: Run 1
Test Location: Boiler No. 1

Plant: L'Anse, MI
Test Date: 7/18/00
Test Period: 1314-1521

1. Lead concentration, lb/dscf.

$$C_1 = \frac{W \times 2.2046 \times 10^{-9}}{Vm_{(std)}}$$

$$C_1 = \frac{7.68 \times 2.2046 \times 10^{-9}}{59.552}$$

$$= 2.84E-10$$

Where:

W = Weight of Lead collected in sample in ug.

C_1 = Lead concentration, lb/dscf.

2.2046×10^{-9} = Conversion factor from ug to pounds.

2. Lead mass emission rate, lb/hr.

PMR = C_1 x Qs(std) x 60

PMR = 0.0000000003 x 69828 x 60

PMR = 1.19E-03

Where:

PMR = Lead mass emission rate, lb/hr.

60 = Conversion factor from minutes to hours.

SAMPLE CALCULATIONS FOR DIOXIN/FURAN (METHOD 23)

Client: L'Anse, Warden Electric Company	Plant: L'Anse, MI
Test Number: Run 1	Test Date: 7/6/16
Test Location: Boiler No. 1	Test Period: 0914-1231

1. 2,3,7,8-TCDF concentration, lb/dscf.

$$C_1 = \frac{W \times 2.2046 \times 10^{-12}}{Vm_{(std)}}$$

$$C_1 = \frac{< 0.023 \times 2.2046 \times 10^{-12}}{120.370}$$

$$= < 4.21E-16$$

Where:

W = Weight of 2,3,7,8-TCDF collected in sample in ng.
C_1 = 2,3,7,8-TCDF concentration, lb/dscf.
$2.2046x10^{-12}$ = Conversion factor from ng to pounds.

2. 2,3,7,8-TCDF concentration, ug/dscm.

$$C_2 = 35.316x \frac{W}{Vm_{(std)}}$$

$$C_2 = 35.316 \times \frac{< 0.000023}{120.370}$$

$$= < 0.00000675$$

Where:

C_2 = 2,3,7,8-TCDF concentration, ug/dscm.
W = Weight of 2,3,7,8-TCDF collected in sample in ug.
35.32 = Conversion factor from cubic feet to cubic meters.

3. 2,3,7,8-TCDF concentration, ug/dscm @ 7% O2.

C3 = C2 x (21 - 7 O2) / (21 - Actual O2)

C3 = < 0.00000675 x (21 - 7)/ (21 -6.90)

C3 = < 0.00000670

Where:

C3 = 2,3,7,8-TCDF concentration, ug/dscm @ 7 O2.

4. 2,3,7,8-TCDF mass emission rate, lb/hr.

MR1 = C_1 x Qs(std) x 60

MR1 = < 0.00000000000000042 x 70699 x 60

MR1 = < 1.79E-09

Where:

MR1 = 2,3,7,8-TCDF mass emission rate, lb/hr.
60 = Conversion factor from minutes to hours.

SAMPLE CALCULATIONS FOR
CRESOLS (2-Methylphenol)

Client: L'Anse Warden Electric Company	**Plant: L'Anse, MI**
Test Number: Run 1	**Test Date: 7/6/16**
Test Location: Boiler No. 1	**Test Period: 914-1231**

1. 2-Methylphenol concentration, lbs/dscf.

$$C_1 = \frac{W \times 2.2046 \times 10^{-9}}{Vm(std)}$$

$$C_1 = \frac{< 5.000 \times 2.2046 \times 10\text{-}9}{120.370}$$

$$= < 9.16E\text{-}11$$

Where:

W = Weight of 2-Methylphenol collected in sample in ug.

C_1 = 2-Methylphenol concentration, lbs/dscf.

2.2046×10^{-9} = Conversion factor from ug to lbs.

2. 2-Methylphenol mass emission rate, lb/hr.

PMR1 = C_1 x Qs(std) x 60 min/hr

PMR1 = < 9.16E-11 x 70699 x 60

= < 3.88E-04

Where:

PMR1 = 2-Methylphenol mass emission rate, lb/hr.

APPENDIX H
PROJECT PARTICIPANTS

Team Member	Title	Company
Steve Walsh	CEO	LWEC
JR Richardson	Technical Manager	
John Polky	Plant Fuels Supervisor	
Chris Anderson	Operations/Maintenance Manager	
Al Clishe	Senior Consultant	
Steve Kohl	Legal Counsel	Warner Norcross & Judd LLP
Jed Chrestensen	Project Engineer	Mannik Smith Group
Ken Hill	Senior Project Manager	Weston Solutions, Inc.
Jack Mills	Senior Project Scientist	
Brian Allan	Report Coordinator	
Tyson Belknap	Project Scientist	
Steve Rathfon	Technician V	
Kyle Schweitzer	Technician III	
Donny Fetzer	Technician IV	

APPENDIX I
PROJECT CORRESPONDENCE

L.W.E.C.

L'ANSE WARDEN ELECTRIC COMPANY, LLC
PO Box 695 29639 Willow Road
White Pine, Michigan 49971

May 17, 2016

Attn: Compliance Tracker, AE-17J
Air Enforcement Compliance Branch
U.S. Environmental Protection Agency, Region 5
77 W. Jackson, Blvd.
Chicago, Illinois 60604

Re: **L'Anse Warden Electric Company – Modified Submittal in Response to April 1, 2016 Section 114 Request**

Following discussion with US EPA Region 5 on Thursday, May 12, 2016, enclosed please find a revised stack test protocol for US EPA's review. In addition, L'Anse Warden Electric Company (LWEC) would like to clarify that based upon discussions with the Michigan Department of Environmental Quality (MDEQ), the acceptable chlorine content for creosote treated ties has been modified as compared to the criteria outlined in the April 1 request. As a consequence, a reading of 1600 ppm on the Olympus XRF meter will be used for screening of ties as acceptable fuel. Additionally, as discussed on May 12, 2016, LWEC intends to conduct testing as required by the April 1 request between June 22 and June 30, 2016 so that this requested testing can be conducted in conjunction with LWEC's required Part 60 RATA testing. LWEC understands that US EPA will try to accommodate LWEC with regard to this test schedule.

I certify under penalty of law that I have examined and am familiar with the information in the enclosed documents, including all attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the statements and information are, to the best of my knowledge and belief, true and complete. I am aware that there are significant penalties for knowingly submitting false statements and information, including the possibility of fines or imprisonment pursuant to Section 113(c)(2) of the Clean Air Act and 18 U.S.C. §§ 1001 and 1341.

L'Anse Warden Electric Company, LLC

By: [signature]

Its: CEO

Date: 5/17/16

Cc via Email:

Molly Smith, USEPA
Nicole Cantello, USEPA

BOILER NUMBER ONE
EPA SECTION 114 INFORMATION REQUEST
EMISSIONS TEST PROTOCOL

REVISION 1, MAY 2016

L.W.E.C.

BRINGING GREEN
TO MICHIGAN

L'ANSE WARDEN ELECTRIC COMPANY, LLC.
157 South Main Street
L'Anse, Michigan 49946

May 2016

W.O. No. 14464.007.004

RENEWABLE OPERATING PERMIT REPORT CERTIFICATION

DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

RENEWABLE OPERATING PERMIT REPORT CERTIFICATION

Authorized by 1994 P.A. 451, as amended. Failure to provide this information may result in civil and/or criminal penalties.

Reports submitted pursuant to R 336.1213 (Rule 213), subrules (3)(c) and/or (4)(c), of Michigan's Renewable Operating (RO) Permit program must be certified by a responsible official. Additional information regarding the reports and documentation listed below must be kept on file for at least 5 years, as described in General Condition No. 22 in the RO Permit and be made available to the Department of Environmental Quality, Air Quality Division upon request.

Source Name: L'Anse Warden Electric Company LLC   County: Baraga

Source Address: 157 S. Main Street   City: L'Anse

AQD Source ID (SRN): B4260   RO Permit No.: MI-ROP-B4260-2011   RO Permit Section No.: ______

Please check the appropriate box(es):

☐ **Annual Compliance Certification** **(General Condition No. 28 and No. 29 of the RO Permit)**

Reporting period (provide inclusive dates): From ______ To ______

☐ 1. During the entire reporting period, this source was in compliance with **ALL** terms and conditions contained in the RO Permit, each term and condition of which is identified and included by this reference. The method(s) used to determine compliance is/are the method(s) specified in the RO Permit.

☐ 2. During the entire reporting period this source was in compliance with all terms and conditions contained in the RO Permit, each term and condition of which is identified and included by this reference, **EXCEPT** for the deviations identified on the enclosed deviation report(s). The method used to determine compliance for each term and condition is the method specified in the RO Permit, unless otherwise indicated and described on the enclosed deviation report(s).

☐ **Semi-Annual (or More Frequent) Report Certification** **(General Condition No. 23 of the RO Permit)**

Reporting period (provide inclusive dates): From ______ To ______

☐ 1. During the entire reporting period, **ALL** monitoring and associated recordkeeping requirements in the RO Permit were met and no deviations from these requirements or any other terms or conditions occurred.

☐ 2. During the entire reporting period, all monitoring and associated recordkeeping requirements in the RO Permit were met and no deviations from these requirements or any other terms or conditions occurred, **EXCEPT** for the deviations identified on the enclosed deviation report(s).

☒ **Other Report Certification**

Reporting period (provide inclusive dates): From ______ To ______

Additional monitoring reports or other applicable documents required by the RO Permit are attached as described:

Emissions Test Protocol

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

James R. Richardson	Technical Manager	907-885-7187
Name of Responsible Official (print or type)	Title	Phone Number

[signature]
Signature of Responsible Official   Date: 5/17/16

I:\SDATA\LWEC\14464.007.004\EPA 114 LETTER PROTOCOL REV 1-LW   5/17/2016

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1. INTRODUCTION

Weston Solutions, Inc. (WESTON) has been retained by L'Anse Warden Electric Company, LLC (LWEC) to perform an emissions testing program on the Boiler No. 1 exhaust duct at the LWEC facility located in L'Anse, Baraga County, Michigan. Boiler No. 1 was previously a coal, oil, and gas-fired steam generating station and has been converted to burn biomass. The objective of this test program is to satisfy the requirements of the U.S. Environmental Protection Agency (EPA) Region V Section 114 Information Request submitted on 1 April 2016. Boiler No. 1 is identified as EUBOILER No. 1, and the facility currently operates under the State of Michigan Renewable Operating Permit (ROP) No. MI-ROP-B4260-2011 and Permit to Install (PTI) 168-07D.

The EPA Region V 114 letter requests emissions testing under two operating conditions. Test condition one would include a typical fuel mix of wood, tire derived fuel (TDF), wood from creosote treated railroad ties and pentachlorophenol (PCP) treated railroad ties. Test condition two would be the same as test condition one but would exclude the PCP ties. At this time, the emissions test program encompasses condition two only. LWEC has decided to discontinue the use of PCP tie fuel and is in the process of modifying the operating permit. Representatives from EPA Region V have agreed LWEC will not be required to conduct testing for condition one, based on LWEC discontinuing use of PCP ties.

1.1 PLANT INFORMATION

L'Anse Warden Electric Company, LLC
157 South Main Street
L'Anse, Michigan 49946
Mr. JR Richardson
Phone: 906-885-7187

1.2 TESTING FIRM INFORMATION

Weston Solutions, Inc.
1400 Weston Way
West Chester, PA 19380
Mr. Ken Hill
Phone: 610-701-3043

1.3 SUMMARY OF TEST PARAMETERS

Table 1-1 provides the test parameters, associated test methods, and reporting units for this test program.

Following this introduction, Section 2 provides a description of the process and sampling locations. Section 3 provides a description of the sampling and analytical procedures. Section 4 outlines the fuel processing, fuel sampling and analytical procedures to be used during the test program. Section 5 provides quality assurance and quality control procedures (QA/QC). Section 6 provides an outline of the test report. Appendix A provides the fuel sampling procedures. Example calculations and field data sheets are provided in Appendices B and C.

Table 1-1
Summary of Test Parameters

Test Parameter[1]	Test Method[2][3]	Reporting Units[4]
Total Particulate (filterable)	EPA M5 (combined with EPA M29)	gr/dscf, lb/MMBtu, lb/hr
$PM_{10}/PM_{2.5}$ (filterable and condensable)	EPA M201A/202	gr/dscf, lb/MMBtu, lb/hr
Metals (nickel, lead, arsenic, manganese)	EPA M29	ug/m^3, lb/hr
Polychlorinated Dibenzo-p-dioxins/ Polychlorinated Dibenzofurans (PCDD/PCDF)	EPA M23	ug/m^3 @ 7% O_2 TEQ, lb/hr TEQ
Cresol Isomers	EPA SW846 M0010 (combined with EPA 23)	ug/m^3, lb/hr
Hydrogen Chloride/Chlorine	EPA M26A (modified)	ppmvd, lb/hr
Volatile Organic Compounds (VOCs) as methane	EPA M25A/EPA M18	ppmvd @ 7% O_2, lb/hr
Opacity	EPA M9	%

1. Cresol isomers are m-cresol, o-cresol and p-cresol.
2. The proposed EPA Method 26A sampling modifications are for the sample to be collected non-isokinetically from a single traverse point similar to EPA Method 26.
3. If required, methane analysis will be determined by gas chromatography (GC) analysis of a bag sample which will be subtracted from the measured VOC to yield non-methane VOC.
4. The exhaust gas O_2 concentration (diluent gas) and a facility provided F-factor will be used to calculate emission rates in terms of lb/MMBtu.

2. DESCRIPTION OF PROCESS AND SAMPLING LOCATIONS

2.1 PROCESS OVERVIEW

LWEC is a cogeneration facility, consisting of a single boiler generating process steam and electric power to the grid firing primarily biomass materials. The boiler typically produces steam at 180,000 lbs/hr and gross power generation from 14 to 17.7 MW/hr.

2.1.1 Basic Operating Parameters

The fuel feed to the boiler is regulated to meet process steam and electrical generation requirements. The fuel blend and excess air may be modified to improve combustion characteristics. Adjustments to air, fuel blend or load are made as necessary to conform to emissions monitoring limits.

2.1.2 Boiler Operations

The hourly boiler operating limit is 324 million British thermal units (MMBtu). The maximum annual heat input is 2,656,800 MMBtu, based on 8,200 hours of operation per year.

The boiler load will be determined by the demand for process steam and electricity. The boiler load will be maintained at 90% of capacity during the test program.

2.1.3 Test Program Fuel Mix and Firing Rates

The fuel mix during the Section 114 Test Program will consist of wood, creosote treated railroad ties, and TDF. As requested by EPA, the firing rates for each of the fuels will be within the range consistent for normal operations and the MDEQ ROP testing conducted in September 2015 (7.5-10 TPH wood, 12-15 TPH creosote ties, and 1.5-2.0 TPH TDF).

2.2 AIR POLLUTION CONTROL EQUIPMENT

Particulate emissions are controlled with a single chamber, three-field electrostatic precipitator (ESP).

2.2.1 ESP Operating Parameters

The precipitator electrical controls and rapping sequence, intensity and frequency are set for optimum performance and are not generally modified after this optimization exercise unless emissions issues are observed.

2.2.2 ESP Rated Capacity and Efficiency

The original design specifications for the precipitator were: 98.1% efficiency at 110,000 actual cubic feet per minute (ACFM) at a temperature of 370°F.

2.3 REFERENCE METHOD TEST LOCATION

The reference method sample ports (two sets) are located on a section of rectangular ductwork that runs horizontally from the exit of the ESP prior to the exhaust stack. The rectangular ductwork is six feet by six feet six inches (6' x 6½') and has a straight run of fifty-seven feet (57'). All dimensions and port locations will be verified prior to testing.

A second set of four sample ports are installed approximately 2 feet downstream from the primary sample ports and allows for additional sample trains to be operated simultaneously. Air flow disturbances in the secondary sample ports will be minimized by port selection and placement of the upstream sampling equipment. Additionally, a third set of sample ports located on top of the ESP outlet ductwork that may be used for single point sampling (HCl/Cl_2 and continuous emissions monitoring). All dimensions and port locations will be verified prior to testing.

Figure 2-1 presents a diagram of the sample port and traverse point location.

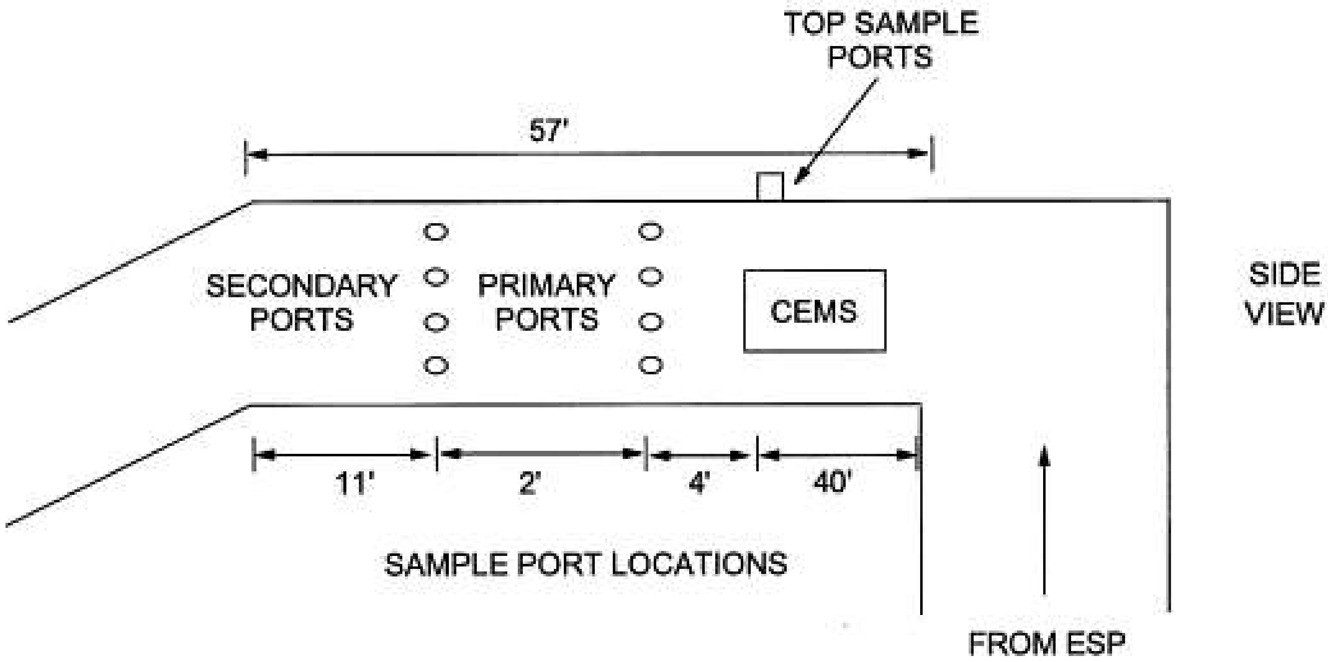
2.3.1 Flue Gas Parameters

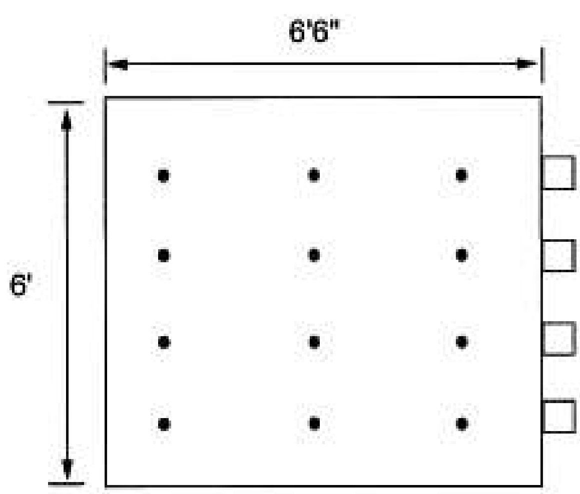
The expected flue gas parameters at this location are as follows:

Temperature: approximately 370 °F

Moisture: approximately 15% v/v

Volumetric Flow Rate: Up to about 125,000 ACFM





Reference Method Traverse Point Number	Distance From Inside Near Wall
1	13"
2	39"
3	65"

DRAWING NOT TO SCALE

FIGURE 2-1
SAMPLE PORT AND TRAVERSE POINT LOCATIONS

IASDATA\LWEC\14464.007.004\FIGURE 2-1 TEST LOCATION

3. SAMPLING AND ANALYTICAL PROCEDURES

The purpose of this section is to detail the stack sampling and analytical procedures to be utilized during the test program. Table 3-1 summarizes the sampling and analytical methods.

3.1 PRE-TEST DETERMINATIONS

Preliminary test data will be obtained at the sampling location. Geometry measurements will be measured and recorded, and traverse point distances verified. A preliminary velocity traverse will be performed utilizing a calibrated "S" type pitot tube and a Dwyer inclined manometer to determine velocity profiles. Flue gas temperatures will be observed with a calibrated direct readout pyrometer equipped with a chromel-alumel thermocouple. Water vapor content will be measured by performing an EPA Method 4 moisture test, or will be based on previous test data (preliminary only).

A check for the presence or absence of cyclonic flow will be conducted at the test location. If the average cyclonic flow check angle is < 20°, then that will verify the suitability of the test site for obtaining representative samples.

Preliminary test data will be used for nozzle sizing and sampling rate determinations for isokinetic sampling procedures.

Pre-test calibration of probe nozzles, pitot tubes, metering systems, and temperature measurement devices will be performed as specified in Section 5 of EPA Method 5 test procedures.

3.2 FORMAL TESTING

3.2.1 Gas Volumetric Flow Rate

A series of three test runs will be performed for each parameter. The gas velocity will be measured using EPA Methods 1 and 2. Velocity measurements will be performed using an "S-type" pitot tube fastened alongside the EPA Methods 5/29, 23/0010 and 201A/202 sample probes. The stack gas pressure differential will be measured with inclined manometers. Flue gas temperatures will be measured with calibrated digital temperature readouts equipped with

Table 3-1
Summary of Sampling and Analytical Methods

Sample	No. of Test Runs	Sampling Duration	Sampling Method	Sample Size	Analytical Parameters	Preparation Method	Analytical Method
Stack Gas	3	1-hr composite sample per run	Modified M26A	30-50 ft^3	HCl/Cl_2	NA	Ion Chromatography (SW846-9057)
		1 to 1.5-hr composite sample per run	M 5/29	30-50 ft^3	Particulate Metals	Desiccation Acid digestion (SW-846-3050A)	Gravimetric (EPA Method 5) ICP and AAS (SW-846-6010A)
		1 to 1.5-hr composite sample per run	M201A/202	30-50 ft^3	$PM_{10}/PM_{2.5}$	Desiccation	Gravimetric (EPA Method 5)
		3-hr composite sample per run	M23/M0010	> 90 ft^3	PCDD-PCDF/ Cresol Isomers	Extraction	M23/SW 846-8270
		Continuous	M3A	NA	CO_2/O_2	NA	CEM
		Continuous	M25A	NA	VOC	NA	CEM
		1-hr composite sample per run (optional)	M18	30 liters	Methane	NA	GC/FID
		Concurrent	M1-4	NA	Moisture	NA	Gravimetric
					Temperature	NA	Temperature
					Velocity	NA	Pitot Tube
		1-hour observation per run	M9	NA	Opacity	NA	NA

Notes:

M5/M29 = Combined Method 5 and Method 29 sampling train.
ICP = Inductively coupled plasma emission spectroscopy.
AAS = Atomic absorption spectroscopy.
GC/FID = Gas Chromatograph/Flame Ionization Detector
Metals = Pb, Ni, As, Mn
M23/M0010 = Combined Method 23 and Method 0010 sampling train.

chromel-alumel (type-K) thermocouples. Velocity measurements and stack gas temperatures will be incorporated in the isokinetic sampling trains which traverse across the stack diameter. The velocity and volumetric flow rate will be used for determining the parameter mass rate calculations. Likewise moisture content will be determined concurrently with each test. The moisture content of the gas stream will be determined by the volume increase of the impinger water rand weight increase of the silica gel in comparison to the volume of gas sampled.

The gas stream composition [oxygen (O_2) and carbon dioxide content (CO_2)] of the flue gas will be measured according to EPA Method 3A or 3/3A procedures using a Reference Method Continuous Emission Monitoring (CEM) system.

As an option for parameters that do not require an O_2 correction, a Tedlar bag sample technique may be used to determine the gas stream composition. The Tedlar bag samples of O_2 and CO_2 will be collected from the exhaust of the control console calibrated orifice at a constant rate of ~0.5 liters per minute. This provides an integrated, conditioned (dry) sample. The gas passing through the control console orifice is conditioned by the impinger train. The sample is also integrated with respect to time and location in the stack.

Analysis of the Tedlar bag samples will be performed using EPA Reference Method 3A analytical procedures. The conditioned Tedlar bag samples will be analyzed directly by calibrated analyzers such as a paramagnetic O_2 analyzer and a non-dispersive Infrared (NDIR) CO_2 analyzer. The O_2 and CO_2 analyzers were configured and calibrated in accordance with the gas analyzer requirements outlined in EPA Reference Method 3A. The dry molecular weight of the gas stream will be calculated using the measured oxygen and carbon dioxide concentrations. The balance of the gas stream is assumed to be nitrogen.

3.3 PARTICULATE AND METALS SAMPLING TRAIN

The sampling train utilized to perform the particulate and metals sampling will be an EPA Reference Method 5/29 train (see Figure 3-1).

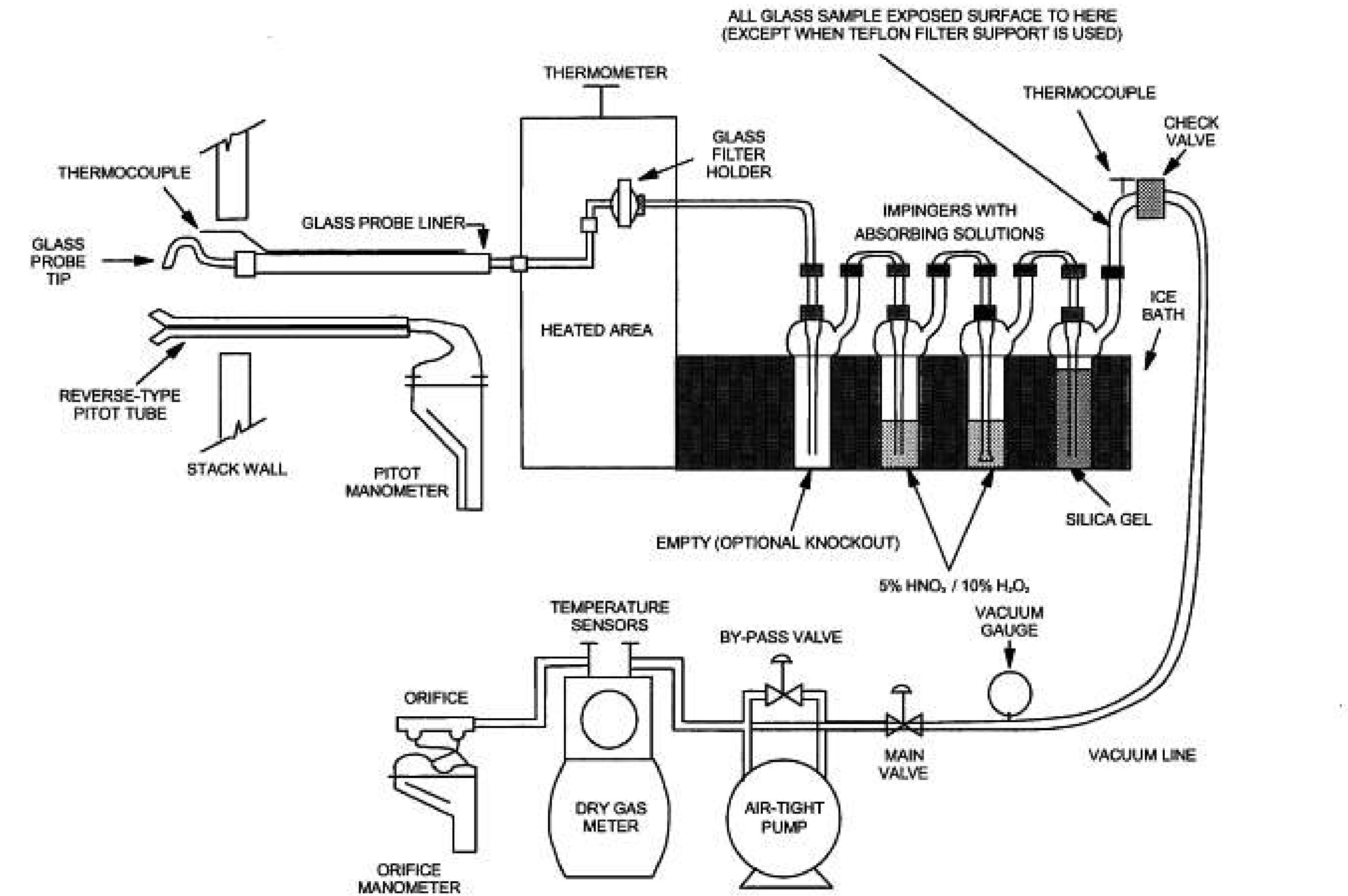


FIGURE 3-1
EPA METHOD 5/29
PARTICULATE AND METALS SAMPLING TRAIN

IASDATA\LWEC\14464.004\FIGURE 4-1 EPA5- 29

A calibrated glass nozzle will be attached to a heated (~250°F) borosilicate probe. The probe will be connected to a heated (~250°F) borosilicate filter holder containing a 9-centimeter (cm) quartz filter (preweighed to a constant 0.1 milligram (mg) weight). The filter holder will be connected to the first of four impingers by means of rigid glass connectors. The first moisture knockout impinger (if used) will be dry. The second and third impingers will each contain 100 ml of nitric acid (HNO_3)/hydrogen peroxide (H_2O_2) solution, and the fourth impinger will contain 300 grams (g) of dry silica gel. The third impinger will be a standard Greensburg-Smith type, while all other impingers will be of a modified design. All impingers will be maintained in an ice bath. A control console with a leakless vacuum pump, a calibrated dry gas meter, a calibrated orifice, and inclined manometers will be connected to the final impinger via an umbilical cord to complete the train.

During particulate/metals sampling, gas stream velocities will be measured by inserting a calibrated "S"-type pitot tube into the gas stream adjacent to the sampling nozzle. The velocity pressure differential will be observed immediately after positioning the nozzle at each traverse point, and the sampling rate will be adjusted to maintain isokineticity ± 10 percent. Flue gas temperature will be monitored at each point with a calibrated pyrometer and thermocouple.

Probe, filter box, and impinger exit gas temperatures will be monitored with a calibrated direct readout pyrometer equipped with chromel-alumel thermocouples positioned in the heated filter chamber and in the sample gas stream after the last impinger.

Isokinetic test data will be recorded at each traverse point during all test periods. Leak checks will be performed on the sampling apparatus according to reference method instructions, prior to and following each run, and/or component change.

3.3.1 Particulate and Metals Sample Recovery

At the conclusion of each test, the sampling train will be dismantled, the openings sealed, and the components transported to the field laboratory.

A consistent procedure will be employed for sample recovery as follows:

1. The quartz fiber filter(s) will be removed from its holder with tweezers and placed in its original container (petri dish), along with any loose particulate and filter fragments (Sample type 1).

2. The probe and nozzle will be separated and the particulate rinsed with acetone into a borosilicate container with a Teflon-lined closure while brushing with a non-metallic (Teflon) brush a minimum of three times. Particulate adhering to the brush will be rinsed with acetone into the same container. The front-half of the filter holder and connecting glassware will be rinsed with acetone while brushing a minimum of three times. The acetone rinses will be combined in a borosilicate container and sealed with a Teflon-lined closure (Sample type 2). A separate 0.1N HNO_3 acid rinse of the probe, nozzle, front-half of the filter holder and connecting glassware will be performed after the acetone rinse. The 0.1N HNO_3 rinses will be combined and sealed with a Teflon-lined closure (Sample type 3).

3. The total volume of HNO_3/H_2O_2 and condensate in impingers 1, 2 and 3 will be measured to the nearest ml and the value recorded. The liquid will then be placed in a borosilicate container along with a 100-ml HNO_3 rinse of the impingers, connectors, and back half of the filter holder. The container will be sealed with a Teflon-lined closure (sample type 4).

4. The silica gel will be removed from the last impinger and immediately weighed to the nearest 0.1 g.

5. Samples of acetone and 0.1 N HNO_3 acid and HNO_3/H_2O_2 will be retained for blank analysis.

Each sample bottle will be labeled to clearly identify its contents. The height of the fluid level will be marked on each bottle. Sample integrity will be assured by maintaining chain-of-custody records.

3.3.2 Particulate Analysis

The particulate analysis will proceed as follows:

1. The filters (Sample type 1) and any loose fragments will be desiccated for 24-hours and weighed to the nearest 0.1 mg to a constant (± 0.5 mg) weight.

2. The front-half acetone wash samples (Sample type 2) and an acetone blank will be evaporated at ambient temperature and pressure in tared beakers, then desiccated and weighed to constant 0.5-mg weight.

The total weight of material measured in the acetone-rinse fraction plus the weight of material collected on the quartz filter represents the total particulate catch. Blank corrections will be made where appropriate for all sample weights.

Following the gravimetric particulate analysis of the filter, the sample will be analyzed for metals. Likewise upon completion of the gravimetric analysis of the front-half acetone samples, the residue will be resolubilized with 0.1 N HNO_3 and combined with the front half nitric sample for metals analysis.

3.3.3 Metals Analysis

Samples collected for metals analysis will be contained in three different media:

- Front Half Nitric Acid (including resolubilized particulate residue for front-half acetone samples)
- Filter (following particulate analysis)
- Back Half Nitric Acid

The front half nitric acid and particulate filter samples will be combined with the back half nitric acid impingers and condensate in the laboratory for analysis. The metals will be solubilized by the addition of nitric acid and 30% H_2O_2. Sample volume will be reduced to 50 ml on a hot plate. The sample will be brought to 300 ml final volume and analyzed for Atomic Absorption Spectroscopy (AAS) and Inductively Coupled Argon Plasma (ICP) metals.

Following digestion, the metals samples will be ready for analysis by ICP-AAS.

3.4 EPA METHOD 26A – HYDROGEN CHLORIDE/CHLORINE SAMPLING TRAIN

The sampling train utilized to perform the hydrogen chloride sampling will be configured as an EPA Reference Method 26A full-size sampling train except there will be no borosilicate nozzle attached to the sample probe (see Figure 3-2). This modification will be implemented to allow non-isokinetic sampling from a single traverse point similar to EPA Method 26. A heated (≥248°F) borosilicate probe will be attached to a heated (≥248°F) borosilicate filter holder containing a 9-cm quartz filter. The filter folder will be connected to the first of six impingers by means of rigid glass connectors. The first moisture knockout impinger will contain 50 ml of 0.1 normal sulfuric acid. The second and third impingers will each contain 100 ml of

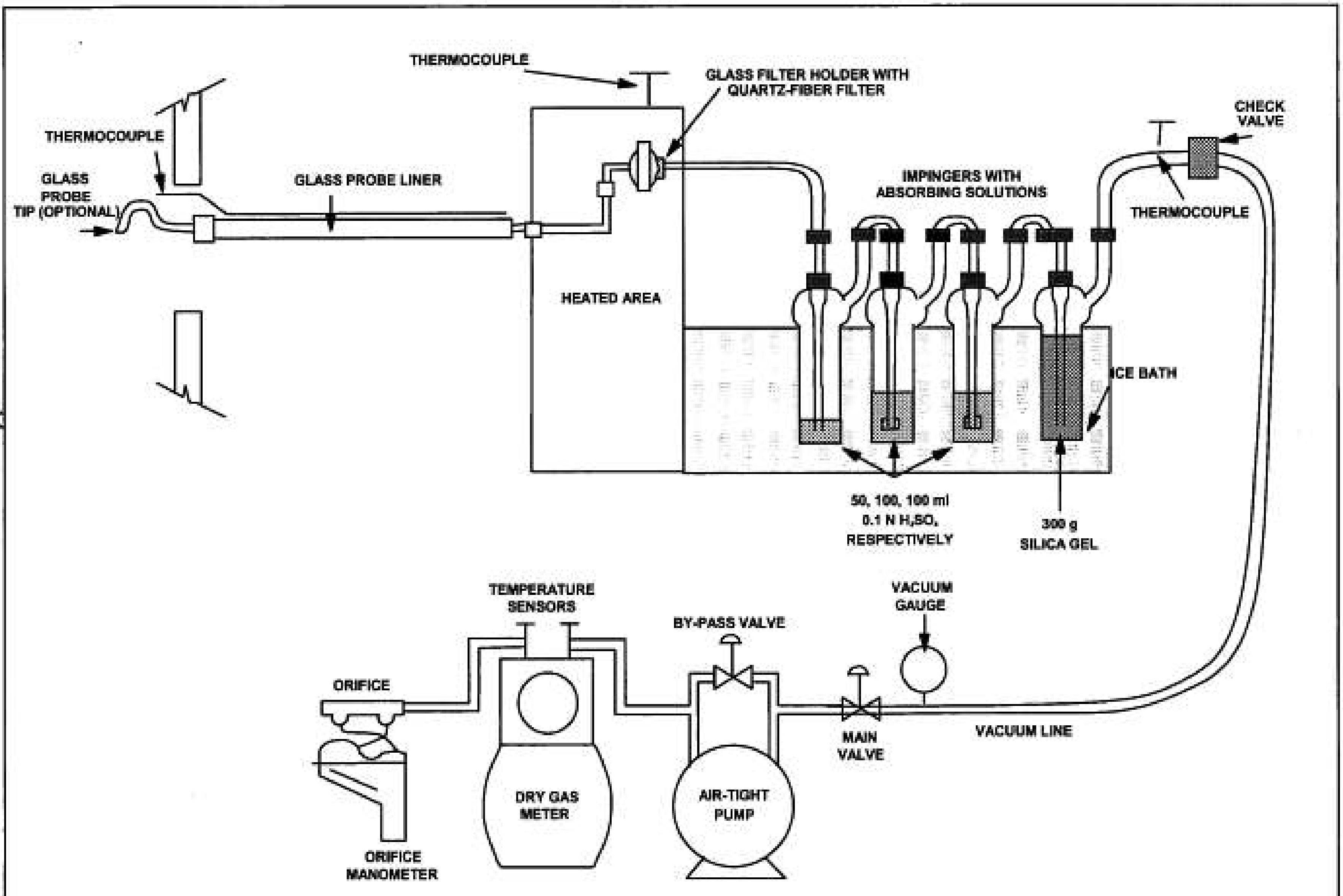


FIGURE 3-2
EPA METHOD 26A
HYDROGEN CHLORIDE AND CHLORINE SAMPLING TRAIN

IASDATA\LWEC\14464.004\FIGURE 4-2 EPA 26

0.1 N sulfuric acid. The fourth and fith impingers will each contain 100 ml of 0.1 N sodium hydroxide, and the sixth impinger will contain 300 grams of dry silica gel. The second and third impingers will be a standard Greenburg-Smith type and all other impingers will be of a modified design. All impingers will be maintained in an ice bath. A control console with a leakless vacuum pump, a calibrated dry gas meter, a calibrated orifice, and inclined manometers will be connected to the final impinger via an umbilical cord to complete the train. Probe, filter box, and impinger exit gas temperatures will be monitored with a calibrated direct read-out pyrometer equipped with a chromel-alumel thermocouples.

This sample will be conducted in conjunction with other isokinetic sample trains and CEM monitoring or independent stack gas velocities, and stack gas composition (O_2/CO_2 content) will be measured to determine hydrogen chloride/chlorine mass rates.

3.4.1 Hydrogen Chloride/Chlorine Sample Recovery

At the conclusion of each test, the sampling train is dismantled, the openings sealed, and the components are transported to the field laboratory.

A consistent procedure will be employed for sample recovery as follows:

1. The quartz fiber filter or thimble will be removed from its holder with tweezers and discarded.
2. The total liquid content of impingers one, two and three (0.1 N H_2SO_4) was measured and the sample placed in a polyethylene container fitted with a Teflon-lined closure (Sample type 1). Also included in this sample was distilled water rinse of the impingers and connectors. The sample was labeled for chloride analysis.
3. The total liquid content of impingers four and five (0.1 N NaOH) were measured and the sample placed in a polyethylene container fitted with a Teflon-lined closure (Sample type 2). Also included in this sample was a distilled water rinse of the impingers and connectors. The sample was labeled for chlorine analysis. Sodium thiosulfate was added to the NaOH samples as a preservative per Method 26A procedures.
4. The silica gel impinger was immediately weighed to the nearest 0.5 g.
5. Samples of sulfuric acid, sodium hydroxide and distilled water used for this program were retained for blank analysis.

Each sample bottle was labeled to clearly identify its contents. The height of the fluid level was marked on each bottle. The samples were then transported to the subcontract laboratories. Sample integrity was assured by maintaining chain-of-custody records.

3.4.2 Hydrogen Chloride Analysis

The samples from the H_2SO_4 impingers will be analyzed for chloride (Cl^-) by the procedures outlined in EPA SW-846 Method 9057 (ion chromatography) and reported as HCl. The samples from the NaOH impingers will be analyzed for chlorine (Cl_2) by the procedures outlined in EPA SW846 Method 9057 (ion chromatography) and reported as chlorine.

3.5 EPA METHOD 23/EPA SW846 METHOD 0010 - PCDD/PCDF AND CRESOL SAMPLING TRAIN

The test train utilized to perform the polychlorinated dibenzo-p-dioxins/polychlorinated dibenzo furans (PCDD/PCDF) and the cresol isomers sampling will be conducted using a combined EPA Method 23 and EPA SW846 Method 0010 sample train (see Figure 3-3).

A borosilicate nozzle will be attached to a heated (~250°F) borosilicate probe. The probe will be connected directly to a heated borosilicate filter holder containing a solvent extracted Reeve Angel 934 AH glass fiber filter. A section of borosilicate tubing will join the filter holder exit to a Grahm (spiral) type ice water-cooled condenser, an ice water-jacketed sorbent module containing approximately 40 g of 30/60 mesh XAD-2 resin. A thermowell is located on the outlet of the condenser so the XAD module inlet temperature is monitored. The XAD module will be connected to a condensate trap followed by a series of three impingers. The first two impingers will each contain 100-ml of high purity distilled water. The final impinger will contain 300 g of dry pre-weighed silica gel. All impingers and the condensate trap will be maintained in an ice bath. A control console with a leakless vacuum pump, a calibrated orifice, and dual inclined manometers will be connected to the final impinger via an umbilical cord to complete the sample train.

During PCDD/PCDF and cresol sampling, gas stream velocities will be measured by inserting a calibrated "S"-type pitot tube into the gas stream adjacent to the sampling nozzle. The velocity pressure differential will be observed immediately after positioning the nozzle at each traverse point, and the sampling rate will be adjusted to maintain isokineticity ± 10 percent. Flue gas temperature will be monitored at each point with a calibrated pyrometer and thermocouple. Probe, filter box, XAD module, and impinger exit gas temperatures will be monitored with a calibrated direct readout pyrometer equipped with chromel-alumel thermocouples. The thermocouples will be positioned in the heated filter chamber and between the condenser and XAD module and after the last impinger.

Isokinetic test data will be recorded at each traverse point during all test periods. Leak checks will be performed on the sampling apparatus according to reference method instructions, prior to and following each run, and/or component change.

3.5.1 EPA Method 23/EPA SW846 Method 0010 - PCDD/PCDF and Cresol Sample Recovery

At the conclusion of each test, the sampling train will be dismantled, the openings sealed, and the components transported to the field laboratory.

A consistent procedure will be employed for sample recovery:

1. The foil covered XAD-2 module will be sealed, labeled, and placed in an ice-cooled chest (sample type 1).
2. The glass fiber filter will be removed from its holder with tweezers and placed in a borosilicate container with a Teflon-lined closure along with any loose particulate and filter fragments (sample type 2).
3. The particulate adhering to the internal surfaces of the nozzle, probe and front half of the filter holder will be rinsed with acetone into a borosilicate container while brushing a minimum of three times until no visible particulate remains. Particulate adhering to the brush will be rinsed with acetone into the same container. The container will be sealed with a Teflon®-lined closure (sample type 3).
4. The components from the aforementioned step will be rinsed with methylene chloride while brushing. The solvent will be added to Sample Type 3.

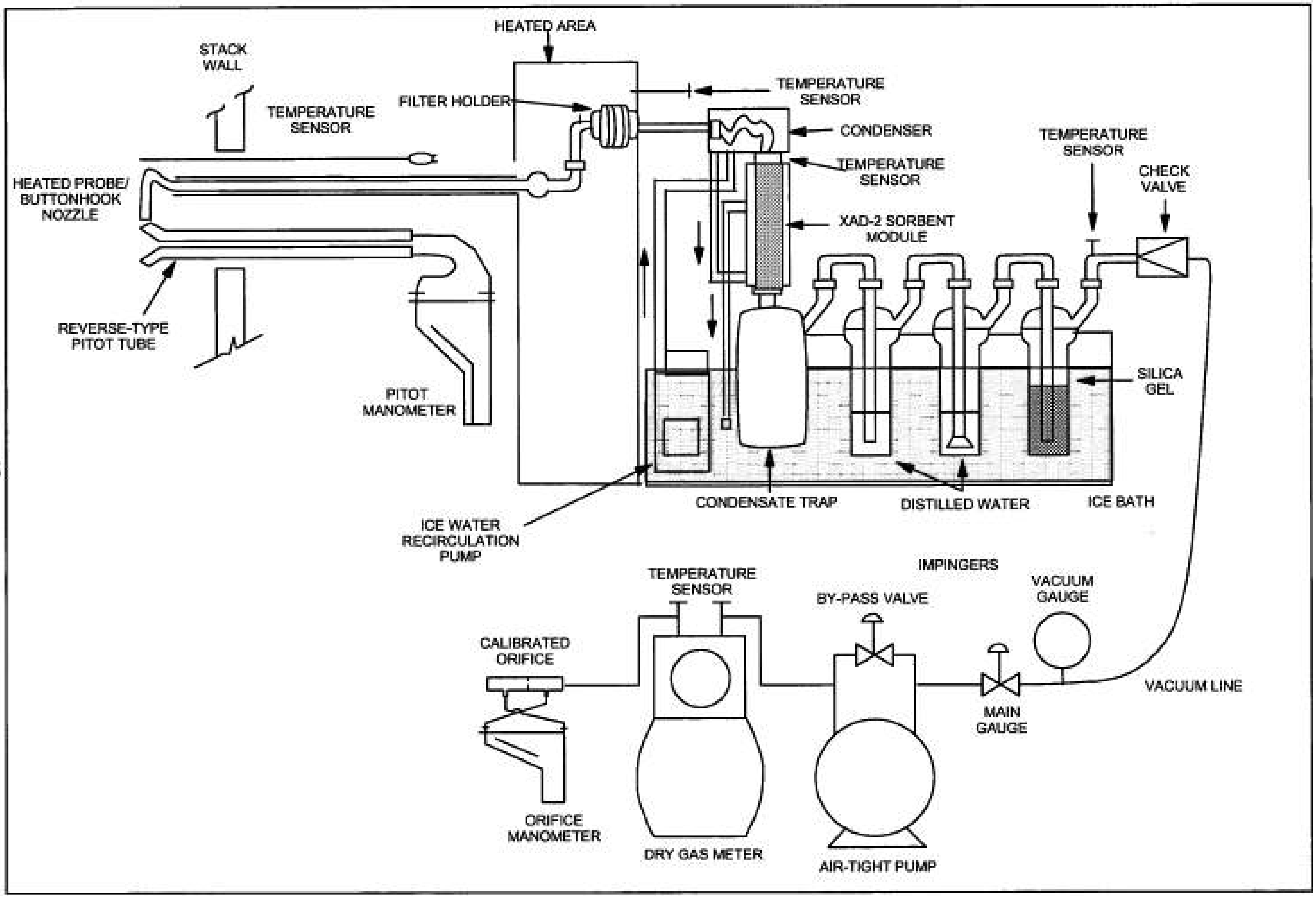


FIGURE 3-3
EPA METHOD 23/ EPA SW846 METHOD 0010
PCDD/PCDFAND CRESOL SAMPLING TRAIN

I:\SDATA\KEYSTONE\02329.048\FIGURE 4-1 EPA METHOD 23

5. The volume of liquid collected in the condensate trap will be measured, the value recorded, and the contents poured into a glass sample bottle along with deionized water rinse of the back-half of the filter holder, connectors, condenser coil and condensate trap. The borosilicate sample container will be capped with a Teflon-lined closure (sample type 4). The train components in the aforementioned step will be washed with acetone followed by methylene chloride and the solvent rinses placed in a separate borosilicate container with a Teflon-lined closure (sample type 5).

6. The volume of liquid in impingers one and two will be measured, the values recorded, and discarded.

7. All Method 23 test train components up to the exit of the condenser will be rinsed with toluene. The toluene rinse will be placed in a borosilicate sample container capped with a Teflon lined closure (sample type 6).

8. The silica gel in the third and final impinger will be weighed and the weight gain value recorded.

9. Site blank samples of the solvents, XAD-2 module, filter and distilled water will be retained for analysis.

Each container will be labeled to clearly identify its contents. The height of the fluid level will be marked on the container of each liquid sample to provide a reference point for a leakage check after transport.

3.5.2 EPA Method 23 - PCDD/PCDF Sample Analysis

The front-half solvent wash, filter, XAD-2 resin, back-half solvent and toluene rinse contents will be extracted. The extracts will be combined into a train total composite extract and analyzed as per the procedures outlined in EPA Method 23 utilizing high resolution capillary column GC/high resolution mass spectrometry (MS) procedures.

3.5.3 EPA SW846 Method 0010 – Cresol Sample Analysis

General analysis for cresol isomers will follow the analytical procedures summarized below. Refer to SW 846 Method 8270 for detailed specifications of this analysis procedure. Analysis will be limited to three target cresol isomers; m-cresol, o-cresol and p-cresol.

First each front-half wash sample is concentrated to 1-5 ml using a rotary evaporator apparatus. The sample container is rinsed three times with methylene chloride, added to the concentrated solution, and concentrated further to near dryness.

The above concentrate is added to the filter and XAD-2 resin in a soxhlet apparatus that contained a precleaned glass extraction thimble and silica gel. Internal standards are added, covered with a plug of precleaned glass wool and refluxed with toluene for 16 hours. The extract is transferred using three 10-ml rinses of toluene to a rotary evaporator, concentrated to approximately 8 ml, and reduced to 1 ml under nitrogen stream. The sample is split in half, one split is analyzed, and the second archived.

The back-half impinger solvent rinse is concentrated to 2 ml using a rotary evaporator, then added to the impinger water/condensate sample. Following solvent addition, the sample is spiked with the appropriate internal standards. A liquid extraction is then conducted using methylene chloride. The extract is combined with the front-half soxhlet extract for cleanup and analysis. The remaining extract is analyzed for the targeted cresol isomers utilizing GC with low-resolution MS.

Site blanks and laboratory blanks are analyzed with each group of source samples using the above procedure as QC, contamination or performance checks, as appropriate. All GC/MS analyses include analysis of method blank, a method blank spike, a matrix spike, and a laboratory control standard. In addition, appropriate surrogate compounds for the cresols are spiked into each XAD-2 module. Recoveries from method spikes and surrogate compounds are calculated and recorded on control charts to maintain a history of system performance.

3.6 $PM_{10}/PM_{2.5}$ SAMPLING TRAIN

Particle size ($PM_{10}/PM_{2.5}$) will be collected using EPA Method 201A. The sampling train will also incorporate the revision to EPA 202 procedures for determination of condensible particulate also referred to as the dry impinger method (see Figure 3-4).

The sampling train will consist of the following components:

- A stainless steel nozzle with an inside diameter sized to sample isokinetically connected to a cyclonic separator.

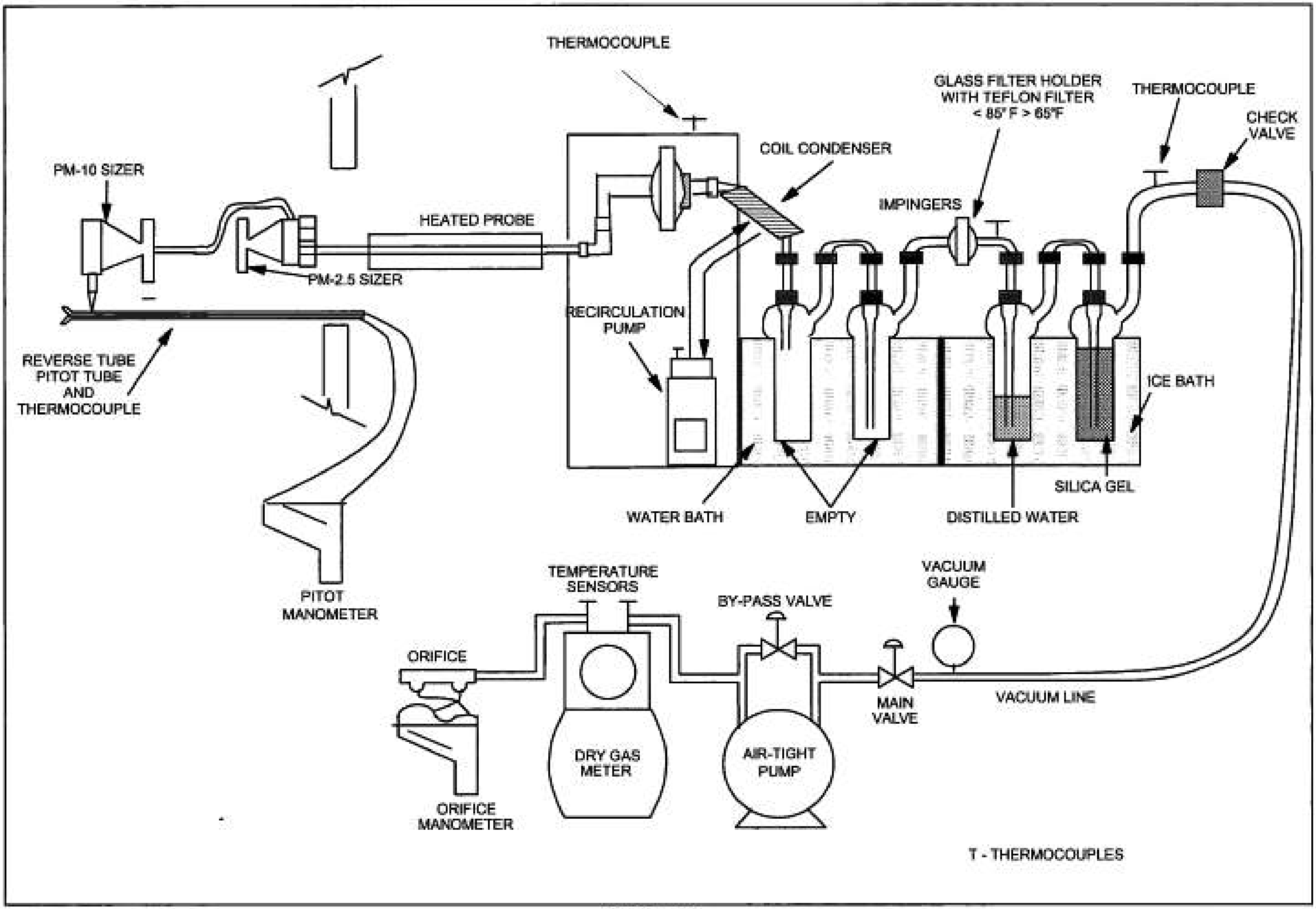


FIGURE 3-4
EPA $PM_{10}/PM_{2.5}$ CONDENSABLES SAMPLING TRAIN
METHOD 201A/202

IASDATA\LWEC METHOD 201A-202

- A $PM_{10}/PM_{2.5}$ dual stage sampling cyclone.
- A borosilicate probe equipped with a calibrated thermocouple to measure flue gas temperature and a calibrated S-type Pitot tube to measure flue gas velocity pressure.
- A heated (at stack temperature) borosilicate filter holder containing a tared quartz fiber filter.
- The pitot tube tip will be mounted slightly beyond the combined cyclone head assembly and at least one inch off the gas flow path to the cyclone nozzle.
- A section of borosilicate connections from the outlet of the probe to the water cooled coil condenser. The outlet of the condenser is connected to the first impinger.
- An impinger train consisting of four impingers. The first two impingers will be empty and have a short stem and modified stem, respectively. The third impinger will be of a standard design and will contain 100 ml of distilled water. The fourth impinger will contain 300 grams of dry preweighed silica gel.
- An untared Teflon filter and glass filter holder is located between the second (dry) impinger and the third impinger. The filter exit temperature is monitored and maintained between 65°F and 85°F.
- A vacuum hose with adapter to connect the outlet of the impinger train to a control module.
- A control module containing a 3-cfm carbon vane vacuum pump (sample gas mover), a calibrated dry gas meter (sample gas volume measurement device), a calibrated orifice (sample gas flow rate monitor), and inclined manometers (orifice and gas stream pressure indicators).
- A switchable calibrated digital pyrometer to monitor flue and sample gas temperatures.

Leak checks of the entire sampling train will be performed prior to sampling. At test completion, a final leak check will be performed at the sample probe inlet. Per EPA 201A procedures, no leak check of the $PM_{10}/PM_{2.5}$ cyclone and filter housing will be performed at test completion. This is to minimize particle bypass through the cyclone during the leak check.

During $PM_{10}/PM_{2.5}$, flue gas velocity will be measured with a calibrated S-type pitot tube (provided with extensions) fastened slightly beyond the combined cyclone head and at least one inch from nozzle. Flue gas temperature is monitored with a calibrated direct readout pyrometer equipped with a chromel-alumel (Type K) thermocouple positioned near the sampling nozzle. The probe, filter box, CPM filter exit, and impinger exit gas temperatures are monitored with a calibrated direct readout pyrometer equipped with Type K thermocouples. The $PM_{10}/PM_{2.5}$ sample will be collected at a constant rate based on stack gas conditions. The sampling time at each traverse point will be adjusted based on the stack velocity measured at each point to ensure the sample is collected isokinetically.

3.6.1 $PM_{10}/PM_{2.5}$ SAMPLE RECOVERY

At the conclusion of each $PM_{10}/PM_{2.5}$ test, the sampling train will be dismantled. The openings sealed and the components transported to the field laboratory.

Following test completion and prior to the start of sample recovery the impinger portion of the EPA 201A/202 train will be purged with nitrogen at a minimum of 14 liters per minute for 60 minutes. The CPM filter will be maintained between 65°F and 85°F during the purge. This purge is to expel any dissolved sulfur dioxide.

A consistent procedure will be employed for sample recovery:

1. The pre-weighed quartz fiber filter will be removed from the borosilicate filter housing with tweezers and placed in its original container (petri dish) along with any loose particulate and filter fragments (sample type 1).

2. The particulate adhering to the internal surfaces of the nozzle and PM_{10} cyclone will be rinsed with acetone into a borosilicate container while brushing a minimum of three times until no visible particulate remains. Particulate adhering to the brush will be rinsed with acetone into the same container. The container will be sealed with a Teflon lined closure (sample type 2-PM greater than 10 µm).

3. The particulate adhering to the internal surfaces of the PM_{10} cyclone exit connecting tube and the internal surfaces of the $PM_{2.5}$ cylcone will be rinsed with acetone into a borosilicate container while brushing a minimum of three times until no visible particulate remains. Particulate adhering to the brush will be rinsed with acetone into the same container. The container will be sealed with a Teflon lined closure (sample type 3-PM less than 10 µm but greater than 2.5 µm).

4. The particulate adhering to the internal surfaces of the $PM_{2.5}$ cyclone to filter holder connecting tube ($PM_{2.5}$ cyclone exit) and filter holder will be rinsed with acetone into a borosilicate container while brushing a minimum of three times with no visible particulate remains. Particulate adhering to the brush will be rinsed with acetone into the same container. The container will be sealed with a Teflon-lined closure (sample type 4-PM less than 2.5 µm).

5. Following completion of the nitrogen purge, the total liquid content of impingers one and two will be measured volumetrically or gravimetrically and the sample will be placed in a borosilicate container (sample type 5).

6. The coil condenser, the first two impingers, the back half of the filterable particulate filter holder, the front half of the condensable filter housing, and the connectors will be rinsed twice with distilled water. The rinsate will be added to sample type 5.

7. The coil condenser, the first two impingers, the back half of the filterable particulate filter holder, the front half of the condensable filter housing, and the connectors will be rinsed twice with acetone and hexane. The rinses will be placed in a borosilicate container with Teflon-lined closure (sample type 6).

8. The Teflon filter (CPM filter) located between impingers 2 and 3 was removed from its filter holder and placed into a petri dish or borosilicate container (sample type 7).

9. The total liquid content of impinger three will be measured volumetrically and discarded.

10. The silica gel will be removed from the last impinger and immediately weighed to the nearest one-tenth gram. The weight gain will be recorded.

11. Acetone, $PM_{2.5}$ filter, distilled water and hexane blank samples will be placed into a borosilicate/Teflon container or petri dish and sealed for gravimetric analysis.

Each container will be labeled to clearly identify its contents. The height of the fluid level will be marked on the container of each liquid sample to determine whether or not leakage occurred during transport.

3.6.2 Filterable $PM_{10}/PM_{2.5}$ (EPA 201A) Analysis

- The filters and any loose fragments will be desiccated for 24 hours and weighed to the nearest 0.1 mg to a constant weight of no more than 0.5 mg between 2 consecutive weighings with no less than six hours of desiccation time between weighings.

- The front-half acetone wash samples (nozzle/PM_{10} cyclone rinse, PM_{10} cyclone exit/$PM_{2.5}$ cyclone rinse and $PM_{2.5}$ exit/filter holder rinse) will be evaporated at ambient temperature and pressure in tared beakers, and then desiccated to constant weight to the nearest 0.1 mg.

- A blank sample of acetone and a filter will be analyzed along with the $PM_{10}/PM_{2.5}$ source samples.

The residue weight of the nozzle PM_{10}/cyclone rinse sample represents the particulate catch greater than 10 microns (>PM_{10}). The PM cyclone exit $PM_{2.5}$ cyclone rinses represent the particulate catch less than 2.5 microns (< PM_{10}), The $PM_{2.5}$ filter holder rinse sample plus the filter residue represents the filterable particulate catch less than and equal to 2.5 microns ($PM_{2.5}$).

3.6.3 Condensable Particulate (EPA 202) Analysis

- The total volume of sample type 5 will be measured.
- The Teflon filter will be extracted (rinsed).
- The remaining contents of sample type 5 and the acetone/hexane rinse (sample type 6) will be combined in a separatory funnel. After mixing, the organic phase will be removed and retained in a tared beaker. Two separate additions of 75 ml of hexane will be added to the separatory funnel and removed (following mixing and separation) to the tared beaker. The organic fraction will be evaporated at room temperature and desiccated to the nearest 0.1 mg to a constant weight.
- The resulting water (inorganic fraction) will be placed in a tared beaker and taken to near dryness (~ 50 ml) on a hot plate and then evaporated to dryness in an oven at 105°C.

The total of the organic and inorganic fractions represent the condensible particulate catch. The total PM_{10}/$PM_{2.5}$ includes the filterable PM_{10}/$PM_{2.5}$ catch plus the organic and inorganic condensables.

3.7 CONTINUOUS EMISSIONS MONITORING SYSTEM

A diagram of the reference method sampling system used to measure VOC and O_2/CO_2 is presented in Figure 3-5. The system will conform to the requirements of EPA Reference Methods 25A and 3A. A flame ionization analyzer will be used to measure VOC concentrations. A non-dispersive infrared (NDIR) analyzer will be used to measure CO_2 and a paramagnetic analyzer will be used to measure O_2 concentrations.

Stack gas will be withdrawn from the stack through a heated stainless steel probe and heated filter via a heated sample line maintaining a temperature of 250°F. The probe will be inserted into a dedicated sample port at a single point in the gas stream. The outlet of the heated sample

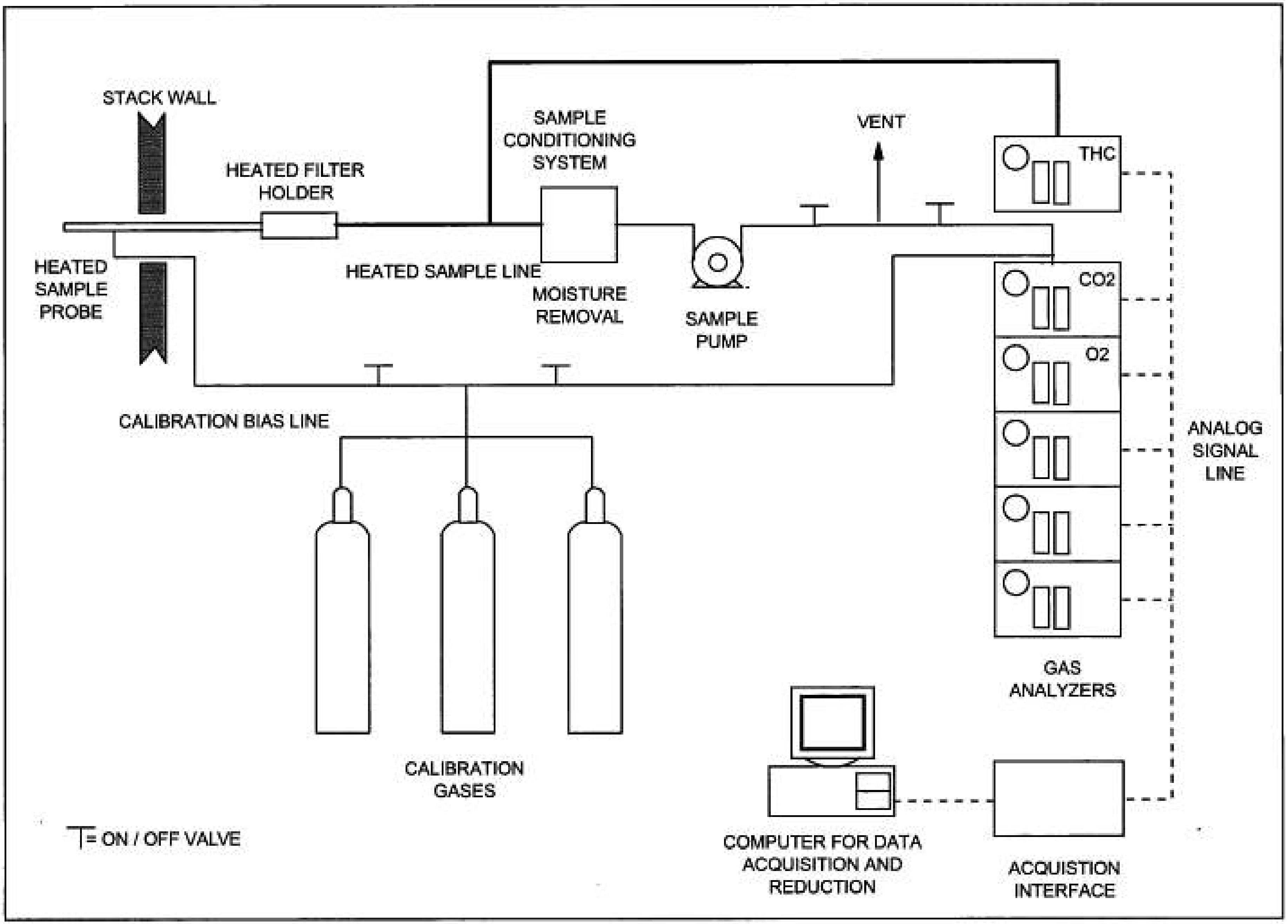


FIGURE 3-5
WESTON CEM SAMPLING SYSTEM

IASDATA\AXALTA\FIGURE 3-1 WESTON SAMPLING SYSTEM line will be connected to a sample conditioning system for moisture removal. The clean, dried sample will then be transported to the O_2 and CO_2 analyzers via a Teflon® sample line. The VOC sample will be drawn directly to the flame ionization analyzer from a "T" located before the sample conditioners. The flame ionization analyzers measures VOC on a wet basis. A separate Teflon® line will be used for introduction of VOC and O_2/CO_2 bias gases to the probe outlet.

3.7.1 VOC and O_2/CO_2 Monitoring Procedures

The VOC and O_2/CO_2 analyzers will be calibrated daily by direct introduction of EPA Protocol calibration gases to the analyzers. These gases are prepared with a balance of nitrogen and nitrogen is also used as the zero gas. After the analyzer calibration, a system bias check will be conducted by introducing the zero gas and one selected VOC and O_2/CO_2, calibration gas to the sample probe outlet. The bias check will be repeated at the end of each test run to determine sampling system bias and instrument drift for each analyzer.

The interference checks on WESTON's O_2/CO_2 instrumental analyzers were previously performed (December 2014) in accordance with EPA Method 7E and will not be repeated for this test program.

Additionally, an O_2 stratification check will be performed prior to the test effort in accordance with EPA Method 7E – Section 8.1.2. The number of points sampled during formal testing will be determined by the stratification test results.

Three formal test runs of one hour or longer will coincide with the isokinetic sample runs. The VOC testing will be conducted during isokinetic testing so gas moisture content and stack volumetric flow rate data can be used to calculate VOC concentrations and mass rates.

The output from the analyzers will be directed to a data acquisition system and recorded by a computer equipped with data reduction software designed by WESTON. The software will calculate the average one-minute measured concentrations which will be used to compute an average concentration for the test run.

As an option, LWEC may analyze the gas sample for methane content using an on-site GC/FID per EPA Method 18. The methane concentrations measured are subtracted from the total VOC concentrations measured using EPA Method 25A to yield non-methane VOC. A gas sample would be collected from a slipstream of the CEM sampling system. This would ensure that a representative sample was collected concurrently with the Method 25A continuous monitoring.

3.8 OPACITY

Opacity will be determined by a certified visible emissions (VE) evaluator pursuant to EPA Reference Method 9. A 60-minute opacity observation (3 total) will be conducted in conjunction with each EPA 5/29 and 201A/202 test train pairing. General procedures related to EPA 9 are presented below:

- A qualified observer will stand at a distance to provide a clear view of the emissions with the sun oriented in the 140° sector to his/her back.
- The observers' line of vision will be perpendicular to the plume direction.
- The observer will record all pertinent atmospheric conditions and pertinent site information.
- Opacity observations will be made at the point of greatest opacity of the plume and at a point without condensed water vapor.
- The exhaust plume will be observed in 15 second intervals to make a reading for a minimum of 240 readings per 60-minute period. The reported % opacity will be calculated as the average of the 240 consecutive observations.

4. FUEL SAMPLING AND ANALYSIS

LWEC fuel is supplied by M.A. Energy Resources LLC (MAER). MAER operates a fuel aggregation facility where raw materials are processed then conveyed to the facility.

As required by the 114 letter, fuel samples will be collected during the test program during each test run in accordance with 40 CFR 63 Subpart 7521(c and d), as presented in Appendix A. LWEC designated personnel will collect fuel samples twice per run (approximately beginning and mid-point). A composite sample of each fuel type per test run will be submitted for analysis as listed in Table 4-1.

Table 4-1
Fuel Sample Analytical Methods

Fuel Type	Required Analysis	Analytical Methods	Expected Minimum Detection Level
TDF	Sulfur Concentration	ASTM D6700-01, *"Standard Practice for Use of Scrap Tire- Derived Fuel"*	Not Applicable (ash) 0.02 weight % (Sulfur)
	Moisture Content	ASTM E3173, *"Standard Test Method for Moisture in the Analysis Sample of Coal and Coke"*	Not Applicable
	Chlorine Concentration	SW-846-9056A, *"Determination of Inorganic Anions by Ion Chromatography"*	2.0 ppm
Wood	Moisture Content	ASTM E871, *"Standard Method of Moisture Analysis of Particulate Wood Fuels"*	Not Applicable
	Chlorine Concentration	SW-846-9056A, *"Determination of Inorganic Anions by Ion Chromatography"*	2.0 ppm
	Sulfur Concentration	ASTM D4239, *"Standard Test Method for Sulfur in the Analysis Sample of Coal and Coke Using High-Temperature Tube Furnace Combustion"*	0.02 weight %
Creosote Ties	Moisture Content	ASTM E871, *"Standard Method of Moisture Analysis of Particulate Wood Fuels"*	Not Applicable
	Chlorine Concentration	SW-846-9056A, *"Determination of Inorganic Anions by Ion Chromatography"*	2.0 ppm
	Sulfur Concentration	ASTM D4239, *"Standard Test Method for Sulfur in the Analysis Sample of Coal and Coke Using High-Temperature Tube Furnace Combustion"*	0.02 weight %

5. QUALITY ASSURANCE/QUALITY CONTROL

5.1 QUALITY CONTROL PROCEDURES

As part of the compliance test, WESTON will implement a QA/QC program. QA and QC are defined as follows:

- Quality Control: The overall system of activities whose purpose is to provide a quality product or service: for example, the routine application of procedures for obtaining prescribed standards of performance in the monitoring and measurement process.
- Quality Assurance: A system of activities whose purpose is to provide assurance that the overall quality control is being done effectively. Further,

The field team manager for stack sampling will be responsible for implementation of field QA/QC procedures. Individual laboratory managers will be responsible for implementation of analytical QA/QC procedures. The overall project manager oversees all QA/QC procedures to ensure that sampling and analyses meet the QA/QC requirements and that accurate data results from the test program.

5.2 GAS STREAM SAMPLING QA PROCEDURES

General QA checks that will be conducted during testing and apply to all methods include the following:

- Performance of leak checks.
- Use of standardized forms, labels and checklists.
- Maintenance of sample traceability.
- Collection of appropriate blanks.
- Use of calibrated instrumentation.
- Review of data sheets in the field to verify completeness.
- Use of validated spreadsheets for calculation of results.

The following section details specific QA procedures to be applied to the isokinetic methods.

5.2.1 Stack Gas Velocity/Volumetric Flow Rate QA Procedures

The QA procedures followed for velocity/volumetric flow rate determinations will follow guidelines set forth by EPA Method 2. Incorporated into this method, are sample point determinations by EPA Method 1, and gas moisture content determination by EPA Method 4. QA procedures for Methods 1 and 2 are discussed below.

Volumetric flow rates will be determined during the isokinetic flue gas tests. The following QC steps will be followed during these tests:

- The S-type pitot tube will be visually inspected before sampling.
- Both legs of the pitot tube will be leak checked before sampling.
- Proper orientation of the S-type tube will be maintained while making measurements. The yaw and pitch axes of the S-type pitot tube will be maintained at 90° to the flow.
- The manometer oil will be leveled and zeroed before each run.
- Pitot tube coefficients will be determined based on physical measurement techniques as delineated in Method 2.

5.2.2 Moisture and Sample Gas Volume QA Procedures

Gas stream moisture will be determined as part of the isokinetic test trains. The following QA procedures will be followed in determining the volume of moisture collected:

- Preliminary impinger train tare weights are weighed or measured volumetrically to the nearest 0.1 g or 1.0 ml.
- The balance is leveled and placed in a clean, motionless, environment for weighing.
- The indicating silica gel is fresh for each run and periodically inspected and replaced during runs if needed.
- The silica gel impinger gas temperature is maintained below 68°F.

The QA procedures that are followed in regards to accurate sample gas volume determination will be:

- The dry gas meter is fully calibrated annually using an EPA approved intermediate standard device.

- Pre-test, port-change, and post-test leak-checks are completed (must be less than 0.02 cfm or 4 percent of the average sample rate).
- The gas meter is read to the thousandth of a cubic foot for all initial and final readings.
- Readings of the dry gas meter, meter orifice pressure (Delta H) and meter temperatures are taken at every sampling point.
- Accurate barometric pressures are recorded at least once per day.
- Pre- and Post-test dry gas meter checks are completed to verify the accuracy of the meter calibration constant (Y).

5.2.3 Isokinetic Sampling Train QA Procedures

The Quality Assurance procedures outlined in this section are designed to ensure collection of representative, high quality test parameter (HCl/HF) concentrations and mass emissions data. The sampling QA procedures to be followed to ensure representative measurements are:

- All glassware will be prepared per reference method procedures.
- The sample rates must be within ± 10 percent of the true isokinetic (100 percent) rate.
- All sampling nozzles will be manufactured and calibrated according to EPA standards.
- Recovery procedures are completed in a clean environment.
- Sample containers for liquids and filters will be constructed of borosilicate or polyethylene with Teflon®-lined lids.
- At least one reagent blank of each type of solution or filter will be retained and analyzed.
- All test train components from the nozzle through the last impinger are constructed of glass (with the exception of the filter support pad which is Teflon®).
- All recovery equipment (i.e., brushes, graduated cylinders, etc.) will be non-metallic.

5.2.4 Sample Identification and Custody

Sample custody procedures for this program are based on EPA recommended procedures. Since samples are analyzed at remote laboratories, the custody procedures emphasize careful documentation of sample collection and field analytical data and the use of chain-of-custody records for samples being transferred. These procedures are discussed below.

The Field Team Manager is responsible for ensuring that all stack samples taken are accounted for and that all proper custody and documentation procedures are followed for the field sampling and field analytical efforts. The Field Team Manager is assisted in this effort by key sampling personnel involved in sample recovery.

Following sample collection, all stack samples are given a unique sample identification code. Stack sample labels are completed and affixed to the sample container. The sample volumes are determined and recorded and the liquid levels on each bottle are marked. Sample bottle lids are sealed on the outside with Teflon® tape to prevent leakage. Additionally, the samples will be stored in a secure area until they are shipped.

As the samples are packed for travel, chain-of-custody forms are completed for each shipment. The chain-of-custody forms specifying the treatment of each sample are also enclosed in the sample shipment container.

5.2.5 Data Reduction and Validation QC Checks

All data and/or calculations for flow rates, moisture contents, and isokinetic rates, are made using a computer software program validated by an independent check. In addition, all calculations are spot checked for accuracy and completeness by the Field Team Leader.

In general, all measurement data are validated based on the following criteria:

- Process conditions during sampling or testing.
- Acceptable sample collection procedures.
- Consistency with expected or other results.
- Adherence to prescribed QC procedures.

Any suspect data will be flagged and identified with respect to the nature of the problem and potential effect on the data quality.

5.3 REFERENCE METHOD CEMS QA/QC CHECKS

- Continuous emissions monitoring system (probe to sample conditioner) will be checked for leaks prior to the testing.
- Pre and post-test calibration bias tests will be performed as required by the reference methods.
- A permanent data record of analyzer response will be made using computer software designed by WESTON.
- All calibration gases used will meet EPA Protocol standards.

5.4 LABORATORY AUDIT SAMPLES

Laboratory audit samples for metals (Pb, Ni, As, Mn) and HCl will be obtained from a Stationary Source Audit Sample (SSAS) provider in accordance with the EPA SSAS program. The audit samples will be analyzed in conjunction with the stack samples and the results will be included in the final test report.

6. TEST REPORT OUTLINE

The results of the test program will be submitted after the test program has been completed and the results have been assembled in report format. LWEC will submit the test report within 30 days after completion of the test program.

The compliance test report will contain the following information as a minimum:

a. Summary of Results
   1. Results of the above specified emission tests;
   2. Process and control equipment data related to determining compliance;
   3. Discussion of test errors;
   4. Discussion of any deviations from the reference test methods;
   5. Production data; and
   6. Fuel usage logs.

b. Facility Operations
   1. Description of the process and control equipment in operation and
   2. Facility operating parameters that demonstrate that the facility was being operated at maximum production rates.

c. Sampling and Analytical Procedures
   1. Sampling port location(s) and dimensions of cross-section;
   2. Sampling point description, including labeling system;
   3. Brief description of sampling procedures, including equipment and diagram;
   4. Description of sampling procedures (planned and accidental) that deviated from any standard method;
   5. Brief description of analytical procedures, including calibration;
   6. Description of analytical procedures (planned or accidental) that deviated from any standard method; and
   7. Quality control/ quality assurance procedures, tests, and results.

d. Appendix
   1. Complete results with example calculations;
   2. Raw field data (original, not computer printouts);
   3. Laboratory report, with signed chain-of-custody forms;
   4. Calibration procedures and results;
   5. Raw process and control equipment data, signed by plant representative;
   6. Test log;
   7. Project participants and titles; and
   8. Related correspondence.

APPENDIX A
FUEL SAMPLING PROCEDURES

Fuel Sampling and Sample Preparation Procedures

40 C.F.R. § 63.7521(c)

At a minimum, you must obtain three composite fuel samples for each fuel type according to the procedures in paragraph (c)(1) or (2) of this section.

(1) If sampling from a belt (or screw) feeder, collect fuel samples according to paragraphs (c)(1)(i) and (ii) of this section.

  (i) Stop the belt and withdraw a 6-inch wide sample from the full cross-section of the stopped belt to obtain a minimum two pounds of sample. Collect all the material (fines and course) in the full cross-section. Transfer the sample to a clean plastic bag.

  (ii) Each composite sample will consist of a minimum of three samples collected at approximately equal intervals during the testing period.

(2) If sampling from a fuel pile or truck, collect fuel samples according to paragraphs (c)(2)(i) through (iii) of this section.

  (i) For each composite sample, select a minimum of five sampling locations uniformly spaced over the surface of the pile.

  (ii) At each sampling site, dig into the pile to a depth of 18 inches. Insert a clean flat square shovel into the hole and withdraw a sample, making sure that large pieces do not fall off during sampling.

  (iii) Transfer all samples to a clean plastic bag for further processing.

40 C.F.R. § 63.7521(d)

Prepare each composite sample according to the procedures in paragraphs (d)(1) through (7) of this section.

(1) Thoroughly mix and pour the entire composite sample over a clean plastic sheet.

(2) Break sample pieces larger than 3 inches into smaller sizes.

(3) Make a pie shape with the entire composite sample and subdivide it into four equal parts.

(4) Separate one of the quarter samples as the first subset.

(5) If this subset is too large for grinding, repeat the procedure in paragraph (d)(3) of this section with the quarter sample and obtain a one-quarter subset from this sample.

(6) Grind the sample in a mill.

(7) Use the procedure in paragraph (d)(3) of this section to obtain a one-quarter subsample for analysis. If the quarter sample is too large, subdivide it further using the same procedure.

APPENDIX B
EXAMPLE CALCULATIONS AND FIELD DATA SHEETS

EXAMPLE CALCULATIONS FOR
VELOCITY, MOISTURE, AND ISOKINETICS

1. Volume of dry gas sampled at standard conditions (68 deg F, 29.92 in. Hg), dscf.

$$Vm(std) = \frac{17.64 \times Y \times Vm \times \left(Pb + \frac{\text{delta H}}{13.6} \right)}{(Tm + 460)}$$

Where:

Vm(std) =	Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscf.
Vm =	Volume of gas sample measured by the dry gas meter at meter conditions, dcf.
Pb =	Barometric Pressure, in Hg.
delt H =	Average pressure drop across the orifice meter, in H_2O
Tm =	Average dry gas meter temperature , deg F.
Y =	Dry gas meter calibration factor.
17.64 =	Factor that includes ratio of standard temperature (528 deg R) to standard pressure (29.92 in. Hg), deg R/in. Hg.
13.6 =	Specific gravity of mercury.

2. Volume of water vapor in the gas sample corrected to standard conditions, scf.

Vw(std) = (0.04707 x Vwc) + (0.04715 x Wwsg)

Where:

Vw(std) =	Volume of water vapor in the gas sample corrected to standard conditions, scf.
Vwc =	Volume of liquid condensed in impingers, ml.
Wwsg =	Weight of water vapor collected in silica gel, g.
0.04707 =	Factor which includes the density of water (0.002201 lb/ml), the molecular weight of water (18.0 lb/lb-mole), the ideal gas constant 21.85 (in. Hg) (ft^3/lb-mole)(deg R); absolute temperature at standard conditions (528 deg R), absolute pressure at standard conditions (29.92 in. Hg), ft^3/ml.
0.04715 =	Factor which includes the molecular weight of water (18.0 lb/lb-mole), the ideal gas constant 21.85 (in. Hg) (ft^3/lb-mole)(deg R); absolute temperature at standard conditions (528 deg R), absolute pressure at standard conditions (29.92 in. Hg), and 453.6 g/lb, ft^3/g.

3. Moisture content

$$bws = \frac{Vw(std)}{Vw(std) + Vm(std)}$$

Where:

bws =	Proportion of water vapor, by volume, in the gas stream, dimensionless.

4. Mole fraction of dry gas.

$$Md = 1 - bws$$

Where:

Md =	Mole fraction of dry gas, dimensionless.

5. Dry molecular weight of gas stream, lb/lb-mole.

$$MWd = (0.440 \times \%\ CO_2) + (0.320 \times \%\ O_2) + (0.280 \times (\%\ N_2))$$

Where:

MWd =	Dry molecular weight , lb/lb-mole.
% CO_2 =	Percent carbon dioxide by volume, dry basis.
% O_2 =	Percent oxygen by volume, dry basis.
% N_2 =	Percent nitrogen by volume, dry basis.
0.440 =	Molecular weight of carbon dioxide, divided by 100.
0.320 =	Molecular weight of oxygen, divided by 100.
0.280 =	Molecular weight of nitrogen or carbon monoxide, divided by 100.

6. Actual molecular weight of gas stream (wet basis), lb/lb-mole.

$$MWs = (MWd \times Md) + (18 \times (1 - Md))$$

Where:

MWs =	Molecular weight of wet gas, lb/lb-mole.
18 =	Molecular weight of water, lb/lb-mole.

7. Average velocity of gas stream at actual conditions, ft/sec.

$$Vs = 85.49 \times Cp \times ((delt\ p)^{1/2})avg \times \left(\frac{Ts\ (avg)}{Ps \times MWs} \right)^{1/2}$$

Where:

Vs =	Average gas stream velocity, ft/sec.
85.49 =	Pitot tube constant, ft/sec x $\frac{(lb/lb\text{-}mole)(in.\ Hg)^{1/2}}{(deg\ R)(in\ H_2O)}$
Cp =	Pitot tube coefficient, dimensionless.
Ts =	Absolute gas stream temperature, deg R = Ts, deg F + 460.
Ps =	Absolute gas stack pressure, in. Hg. = Pb + $\frac{P(static)}{13.6}$
delt p =	Velocity head of stack, in. H_2O

8. Average gas stream volumetric flowrate at actual conditions, wacf/min.

$$Qs(act) = 60 \times Vs \times As$$

Where:

Qs(act) =	Volumetric flowrate of wet stack gas at actual conditions, wacf/min.
As =	Cross-sectional area of stack, ft^2.
60 =	Conversion factor from seconds to minutes.

9. Average gas stream dry volumetric flowrate at standard conditions, dscf/min.

$$Qs(std) = 17.64 \times Md \times \frac{Ps}{Ts} \times Qs(act)$$

Where:

Qs(std) =	Volumetric flowrate of dry stack gas at standard conditions, dscf/min.

10. Isokinetic variation calculated from intermediate values, percent.

$$I = \frac{17.327 \times Ts \times Vm(std)}{Vs \times O \times Ps \times Md \times (Dn)^2}$$

Where:

I =	Percent of isokinetic sampling.
O =	Total sampling time, minutes.
Dn =	Diameter of nozzle, inches.
17.327 =	Factor which includes standard temperature (528 deg R), standard pressure (29.92 in. Hg), the formula for calculating area of circle $D^{2/4}$, conversion of square feet to square inches (144), conversion of seconds to minutes (60), and conversion to percent (100), $\frac{(in.\ Hg)(in^2)(min)}{(deg\ R)(ft^2)(sec)}$

EXAMPLE CALCULATIONS FOR HYDROGEN CHLORIDE AND CHLORINE

1. Hydrogen Chloride concentration, lb/dscf.

$$C1(HCl) = \frac{W(HCl) \times 2.2046 \times 10^{-6}}{V_{dm}(std)}$$

Where:

W(HCl)	=	Weight of hydrogen chloride collected in sample, mg.
C1(HCl)	=	Hydrogen chloride concentration, lb/dscf.
Vdm(std)	=	Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscf.
2.2046×10^{-6}	=	Conversion factor from mg to lbs.

2. Hydrogen Chloride concentration, ppmv.

$$C2(HCl) = \frac{385.35 \times 10^6}{MW} \times C1(HCl)$$

Where:

C2(HCl)	=	Concentration of hydrogen chloride in stack gas, parts per million by volume (dry basis).
385.35×10^6	=	Conversion factor from lbs/ppm.
MW	=	Molecular weight of hydrogen chloride (36.46).

3. Hydrogen Chloride mass emission rate, lb/hr.

$$MR1(HCl) = C1(HCl) \times Qs(std) \times 60$$

Where:

MR1(HCl)	=	Hydrogen chloride mass emission rate, lb/hr.
Qs(std)	=	Volumetric flowrate of dry stack gas at standard conditions, dscf/min.

4. Chlorine concentration, lb/dscf.

$$C1(Cl_2) = \frac{W(Cl_2) \times 2.2046 \times 10^{-6}}{V_{dsf}(std)}$$

Where:

$W(Cl_2)$	=	Weight of Chlorine collected in sample, mg.
$C1(Cl_2)$	=	Chlorine concentration, lbs/dscf.
2.2046×10^{-6}	=	Conversion factor from mg to lbs.

5. Chlorine concentration, ppm/v.

$$C2(Cl_2) = \frac{385.35 \times 10^6}{MW} \times C1(CL_2)$$

Where:

$C2(Cl_2)$	=	Concentration of Cl_2 in stack gas, parts per million by volume (dry basis).
385.35 x 10^6	=	Conversion factor from lbs/ppm.
MW	=	Molecular weight of Chlorine (70.9).

6. Chlorine mass emission rate, lb/hr.

$$MR1(Cl_2) = C1(Cl_2) \times Qs(std) \times 60$$

Where:

$MR1(Cl_2)$	=	Chlorine mass emission rate, lb/hr.

EXAMPLE CALCULATIONS FOR
FILTERABLE AND CONDENSIBLE PM-10 PARTICULATE MATTER

1. Filterable PM-10 particulate concentration, gr/dscf.

$$FPMC1 = 15.432 \times \frac{FPMwt}{Vm(std)}$$

Where:

FPMC1 =	Filterable particulate concentration, gr/dscf.
FPMwt =	Total weight of particulate caught on filter and probe wash adjusted for the site blank samples.
Vm(std) =	Volume of water vapor in the gas sample corrected to standard conditions, scf.
15.432 =	Conversion factor from grams to grains.

2. Filterable PM-10 particulate mass emission rate, lb/hr.

$$FPMR1 = 0.008571 \times FPMC1 \times Qs(std)$$

Where:

FPMR1 =	Filterable particulate mass emission rate, lb/hr.
Qs(std) =	Volumetric flow rate of dry stack gas at standard conditions, dscf/min.
0.008571 =	Conversion factor relating grains to pounds and minutes to hours.

3. Condensible PM-10 particulate concentration, gr/dscf.

$$CPMC1 = 15.432 \times \frac{CPMwt}{Vm(std)}$$

Where:

CPMC1 =	Condensible particulate concentration, gr/dscf.
CPMwt =	Total weight of Organic particulate plus Inorganic particulate, corrected for blank train samples.
Vm(std) =	Volume of water vapor in the gas sample corrected to standard conditions, scf.
15.432 =	Conversion factor from grams to grains.

4. Condensible PM-10 particulate mass emission rate, lb/hr.

$$CPMR1 = 0.008571 \times CPMC1 \times Qs(std)$$

Where:

CPMR1 =	Condensible particulate mass emission rate, lb/hr.
Qs(std) =	Volumetric flow rate of dry stack gas at standard conditions, dscf/min.
0.008571 =	Conversion factor relating grains to pounds and minutes to hours.

5. Total PM-10 concentration, gr/dscf.

$$TPMC1 = 15.432 \times \frac{CPMwt + FPMwt}{Vm(std)}$$

Where:

TPMC1 = Total particulate concentration, gr/dscf.
TPMwt = Total weight of Filterable particulate plus Condensible particulate minus blank correction.
Vm(std) = Volume of water vapor in the gas sample corrected to standard conditions, scf.
15.432 = Conversion factor from grams to grains.

6. Total PM-10 mass emission rate, lb/hr.

$$TMR1 = 0.008571 \times TPMC1 \times Qs(std)$$

Where:

TMR1 = Total particulate mass emission rate, lb/hr.
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min.
0.008571 = Conversion factor relating grains to pounds and minutes to hours.

EXAMPLE CALCULATIONS FOR LEAD

1. Lead concentration, lb/dscf.

$$C_1 = \frac{W \times 2.2046 \times 10^{-9}}{Vm_{(std)}}$$

Where:

W = Weight of Lead collected in sample in ug (corrected for site blanks).
C_1 = Lead concentration, lb/dscf
2.2046×10^{-9} = Conversion factor from ug to pounds.
Vm(std) = Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscf.

2. Lead mass emission rate, lb/hr.

$$MR1 = C_1 \times Qs(std) \times 60$$

Where:

MR1 = Lead mass emission rate, lb/hr.
60 = Conversion factor from minutes to hours.
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min.

3. Lead concentration, ug/dscm.

$$C_2 = 35.31 \times \frac{W}{Vm_{(std)}}$$

Where:

C_2 = Lead concentration, ug/dscm.
W = Weight of Lead collected in sample in ug.
35.31 = Conversion factor from cubic feet to cubic meters.

Note: Calculations identical for all target metals

EXAMPLE CALCULATION FOR
BIAS CORRECTION OF OXYGEN AND CARBON DIOXIDE.

1. Bias corrected value of Oxygen and Carbon Dioxide, dry basis (%).

$$Cd = \frac{(AVG - Zbias)}{(Sbias - Zbias)} \times SPAN\ GAS$$

Where:

Cd = O_2 and CO_2 concentration measured on a dry basis (percent by volume), bias corrected.

AVG = Average O_2 and CO_2 concentration for the test run.

Zbias = The average of pre and post test zero bias checks.

Sbias = The average of pre and post test span bias check.

SPAN GAS = The calibration gas closest to the gas stream concentration, was used for the BIAS check.

EXAMPLE CALCULATIONS FOR
MOISTURE, BIAS, O_2 CORRECTION, AND MASS EMISSION RATES OF
TOTAL VOC

1. Bias corrected value of total VOC as methane, dry basis (ppm/v).

$$C(corr) = \frac{AVG - ZERO}{BIAS - ZERO} \times SPAN\ GAS$$

Where:

AVG	=	Average VOC concentration for the test run as methane as reported by the analyzer.
ZERO	=	The average of pre and post test zero bias check of the complete system with "zero" air.
BIAS	=	The average of pre and post test bias check of the complete system with the calibration span gas.
SPAN GAS	=	The calibration gas closest to the gas stream concentration, which was used for a BIAS check.
C(corr)	=	The bias corrected VOC concentration as methane.

2. Moisture corrected value of VOC, dry basis (ppm/v).

$$CVOC = \frac{C(corr)}{(100 - \%\ MOISTURE\ ) / 100}$$

Where:

C(corr)	=	The bias corrected VOC concentration as methane.
CVOC	=	The concentration of VOC, corrected for moisture, as methane.
% MOISTURE	=	The precentage of water vapor in the gas stream.

3. VOC concentration dry basis, ppm @ 7% O2.

$$VOC(corr) = \frac{CVOC x\ [\ 20.9 - 7\%\ O2\ ]}{[\ 20.9 - O2(measured)\ ]}$$

Where:

VOC(corr)	=	VOC concentration corrected to 7% O2.
CVOC	=	Average VOC concentration for the test run bias and moisture corrected.
O2(measured)	=	Average oxygen concentration for test run as measured, %.

4. VOC mass emission rate dry basis, lb/hr.

$$MR1(VOC) = \frac{CVOC \times Qs(std) \times 16 \times 60\ min/hr}{385.35 \times 10^{\wedge}6}$$

Where:

MR1(VOC)	=	VOC mass emission rate, lb/hr.
Qs(std)	=	Average volumetric gas stream flow rate at standard conditions, dscf/min.
16	=	Molecular weight of methane.
385.35x106	=	Conversion factor from ppm to lbs.

SAMPLE CALCULATIONS FOR DIOXIN/FURAN (METHOD 23)

2,3,7,8-TCDF concentration, lb/dscf.

$$C_1 = \frac{W \times 2.2046 \times 10^{-15}}{Vm_{(std)}}$$

Where:

W = Weight of 2,3,7,8-TCDF collected in sample in pg.
C_1 = 2,3,7,8-TCDF concentration, lb/dscf.
2.2046×10^{-15} = Conversion factor from pg to pounds.
Vm(std) = Volume of gas sampled measured by the dry gas meter, corrected to standard conditions, dscf.

2,3,7,8-TCDF concentration, ng/dscm.

$$C_2 = 35.316 \times \frac{W}{Vm_{(std)}}$$

Where:

C_2 = 2,3,7,8-TCDF concentration, ng/dscm.
W = Weight of 2,3,7,8-TCDF collected in sample in ng.
35.316 = Conversion factor from cubic feet to cubic meters.

2,3,7,8-TCDF concentration, ng/dscm @ 7% O2.

C_3 = C2 x (21 % - 7% O2) / (21% - Actual O2%)

Where:

C_3 = 2,3,7,8-TCDF concentration, ng/dscm @ 7% O2.
Actual O2% = Percent O2 measured during the test run.

2,3,7,8-TCDF Toxic Equivalency concentration, ng/dscm @ 7% O2.

$C_4 = C_3 \times TEF$

Where:

C_4 = 2,3,7,8-TCDF concentration, ng/dscm @ 7% O2 corrected for the Toxic Equivalency Factors. (WHO TEF's/2005).
WHO-2005 TEF = The 20005 World Health Organization Toxic Equivalency Factor.

2,3,7,8-TCDF mass emission rate, lbs/hr.

MR1 = C_1 x Qs(std) x 60

Where:

MR1 = 2,3,7,8-TCDF mass emission rate, lbs/hr.
60 = Conversion factor from minutes to hours.
Qs(std) = Volumetric flowrate of dry stack gas at standard conditions, dscf/min.

SAMPLE CALCULATIONS FOR SEMI-VOLATILE ORGANIC COMPOUNDS (METHOD 0010)

1. 2-methylphenol concentration, lbs/dscf.

$$C_1 = \frac{W \times 2.2046 \times 10^{-9}}{Vm(std)}$$

Where:

W = Weight of 2-methylphenol collected in sample in ug.

C_1 = 2-methylphenol concentration, lbs/dscf.

2.2046×10^{-9} = Conversion factor from ug to lbs.

2. 2-methylphenol concentration, ug/dscm.

C_2 = W / (Vm(std) x 0.02832)

Where:

C_2 = 2-methylphenol concentration, ug/dscm.

0.02832 = Conversion factor from cubic feet to cubic meters.

3. 2-methylphenol mass emission rate, lbs/hr.

MR1 = C_1 x Qs(std) x 60 min/hr

Where:

MR1 = 2-methylphenol mass emission rate, lbs/hr.

Sample and Velocity Traverse Point Data Sheet - Method 1

Client ______________________ Operator ______________________

Loaction/Plant ______________________ Date ______________________

Source ______________________ W.O. Number ______________________

Duct Type	☐	Circular	☐	Rectangular Duct	Indicate appropriate type
Traverse Type	☐	Particulate Traverse	☐	Velocity Traverse	☐ CEM Traverse

Distance from far wall to outside of port (in.) = C	
Port Depth (in.) = D	
Depth of Duct, diameter (in.) = C-D	
Area of Duct (ft^2)	
Total Traverse Points	
Total Traverse Points per Port	
Port Diameter (in.) —(Flange-Threaded-Hole)	
Monorail Length	
Rectangular Ducts Only	
Width of Duct, rectangular duct only (in.)	
Total Ports (rectangular duct only)	
Equivalent Diameter = (2*L*W)/(L+W)	

Flow Disturbances	
Upstream - A (ft)	
Downstream - B (ft)	
Upstream - A (duct diameters)	
Downstream - B (duct diameters)	

Diagram of Stack

Traverse Point Locations

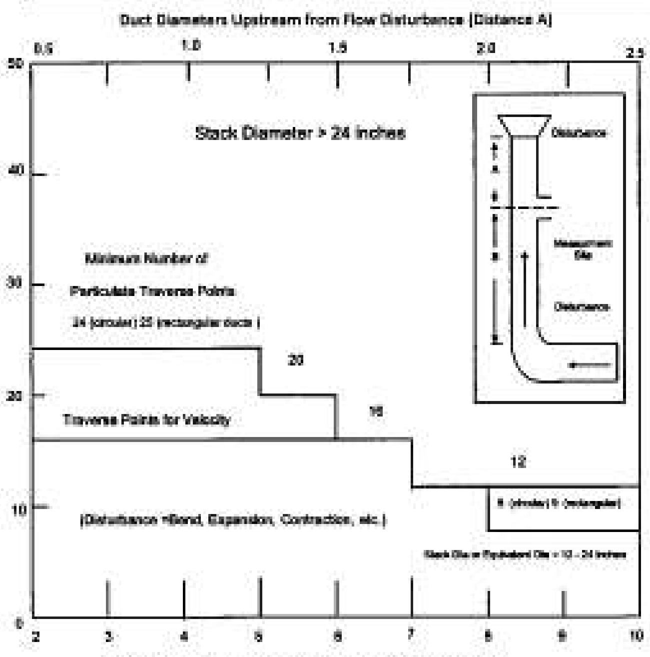
Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

CEM 3 Point(Long Measurement Line) Stratification Point Locations

1	0.167		
2	0.50		
3	0.833		

Note: If stack dia < 12 inch use EPA Method 1A
(Sample port upstream of pitot port)

Note: If stack dia >24" then adjust traverse point to 1 inch from wall
If stack dia <24" then adjust traverse point to 0.5 inch from wall



Traverse Point Location Percent of Stack -Circular

Traverse Location Point	Number of Traverse Points: 1	2	3	4	5	6	7	8	9	10	11	12
1		14.6		6.7		4.4		3.2		2.6		2.1
2		85.4		25		14.6		10.5		8.2		6.7
3				75		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
6						95.6		80.6		65.8		35.6
7								89.5		77.4		64.4
8								96.8		85.4		75
9										91.8		82.3
10										97.4		88.2
11												93.3
12												97.9

Traverse Point Location Percent of Stack -Rectangular

Traverse Location Point	Number of Traverse Points: 1	2	3	4	5	6	7	8	9	10	11	12
1		25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2		75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3			83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4				87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5					90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6						91.7	78.6	68.8	61.1	55.0	50.0	45.8
7							92.9	81.3	72.2	65.0	59.1	54.2
8								93.8	83.3	75.0	68.2	62.5
9									94.4	85.0	77.3	70.8
10										95.0	86.4	79.2
11											95.5	87.5
12												95.8

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Determination of Stack Gas Velocity - Method 2

Client		Operator		Pitot Coeff (Cp)	
Location/Plant		Date		Stack Area, ft^2 (As)	
Source		W.O. Number		Pitot Tube/Thermo ID	

Run Number			
Time			
Barometric Press, in Hg (Pb)			
Static Press, in H_20 (Pstatic)			
Source Moisture, % (BWS)			
O_2, %			
CO_2, %			

Cyclonic Flow Determination		Traverse Location		Leak Check good ? Y / N		Leak Check good ? Y / N		Leak Check good ? Y / N	
Delta P at O°	Angle yeilding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
Avg Angle		Avg Delta P & Temp							

avg $\sqrt{DeltaP}$			
Average gas stream velocity, ft/sec.			
Vol. flow rate @ actual conditions, wacf/min			
Vol. flow rate at standard conditions, dscf/min			

$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$

$MWs = (MWd * (1 - (BWS/100))) + (18 * (BWS/100))$

$Tss = Ts + 460$

$Ps = Pb + (Pstatic/13.6)$

$Vs = 85.49 * Cp * avg \sqrt{DeltaP} * \sqrt{Tss/(Ps * MWs)}$

$Qs(act) = 60 * Vs * As$

$Qs(std) = 17.64 * (1 - (BWS/100)) * (Ps/Tss) * Qs(act)$

where:
MWd = Dry molecular weight source gas, lb/lb-mole.
MWs = Wet molecular weight source gas, lb/lb-mole.
Tss = Source Temperature, absolute(oR)
Ps = Absolute stack static pressure, inches Hg.
Vs = Average gas stream velocity, ft/sec.
Qs(act) = Volumetric flow rate of wet stack gas at actual, wacf/min
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min

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Comments ____________________

method2.xls

Source Gas Analysis Data Sheet - Modified Method 3/3A

Client ______________ Analyst ______________________________

Location/Plant ______________ Date ______________________________

Source ______________ Analyzer Make & Model ______________________________

W.O. Number ______________________________

Calibration ______________

Analysis Number	Span	Calibration Gas Value O_2 (%)	Calibration Gas Value CO_2 (%)	Analyzer Response O_2 (%)	Analyzer Response CO_2 (%)
1	Zero				
2	Mid				
3	High				
	Average				

Run Number	Analysis Time	Analyzer Response O_2 (%)	Analyzer Response CO_2 (%)
1			
2			
3			
	Average		

Run Number	Analysis Time	Analyzer Response O_2 (%)	Analyzer Response CO_2 (%)
1			
2			
3			
	Average		

Span	Cylinder ID
Mid	
High	

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**Report all values to the nearest 0.1 percent

Determination of Moisture Content in Stack Gases - Method 4

Client ____________________

Location/Plant ____________________ Operator __________ Date __________

Source ____________________ Meter Box ID __________ Meter Box Y __________

W.O. Number ____________________ Temperature °C or °F __________ Sample Volume, ft³ or L __________

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer)		Meter Press, Delta H (in H_2O)	Impinger Exit Temp (°F)	Impinger Volume, ml	Silica Gel Weight, g	Corrected Volume, Vm(std)	Leak Rate Check
				Inlet	Outlet						Initial
	End Test										Final
Baro Press., Pb (in Hg)	Start Test									Moisture Volume, Vw(std)	Percent Moisture (%), BWS
	Avg. or Total										

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer)		Meter Press, Delta H (in H_2O)	Impinger Exit Temp (°F)	Impinger Volume, ml	Silica Gel Weight, g	Corrected Volume, Vm(std)	Leak Rate Check
				Inlet	Outlet						Initial
	End Test										Final
Baro Press., Pb (in Hg)	Start Test									Moisture Volume, Vw(std)	Percent Moisture (%), BWS
	Avg. or Total										

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer)		Meter Press, Delta H (in H_2O)	Impinger Exit Temp (°F)	Impinger Volume, ml	Silica Gel Weight, g	Corrected Volume, Vm(std)	Leak Rate Check
				Inlet	Outlet						Initial
	End Test										Final
Baro Press., Pb (in Hg)	Start Test									Moisture Volume, Vw(std)	Percent Moisture (%), BWS
	Avg. or Total										

$$BWS = \left(\frac{Vw(std)}{Vw(std) + Vm(std)}\right) * 100$$

$$Vw(std) = (0.04707 * Vwc) + (0.04715 * Wwsg)$$

if Vm is liters than $Vm = Vml * 28.32$

if Tm is C° than $Tm = (Tmc * 1.8) + 32$

$$Vm(std) = \frac{17.64 * Y * Vm * (Pb + (deltaH / 13.6))}{(Tm + 460)}$$

WHERE:

Vm(std)= Sample volume corrected to standard temp and pressure, scf or L

Vm= Actual sample volume, calculated, scf

Vml= Actual sample volume, calculated, Liters

Y= Dry gas meter calibration factor.

Pb= Barometric pressure, in. Hg

delta H= Meter pressure, in H2O

Tm= Average temperature of meter (DGM is used) or rotomter, degrees °F

Tmc= Average temperature of meter (DGM is used) or rotomter, degrees °C

Vw(std)= Volume of water vapor at standard conditions, scf or L

Vwc= Volume of water condensed, mL

Wwsg= Weight of Silica Gel, g

Bws= Water vapor in gas stream, percent

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Use either ft³ or liters in calculations. DO NOT MIX CUBIC FEET AND LITERS IN ANY CALCULATION.

As per EPA approval: The meter box may be set-up to record the meter box outlet temperature only.

ISOKINETIC FIELD DATA SHEET

Page ____ of ____

Client ____________
W.O.# ____________
Project ID ____________
Mode/Source ID ____________
Samp. Loc. ID ____________
Run No.ID ____________
Test Method ID ____________
Date ID ____________
Source/Location ____________
Sample Date ____________
Baro. Press (in Hg) ____________
Operator ____________

Stack Conditions

	Assumed	Actual
% Moisture		
Impinger Vol (ml)		
Silica gel (g)		
CO2, % by Vol		
O2, % by Vol		
Temperature (°F)		
Meter Temp (°F)		
Static Press (in H_2O)		
Ambient Temp (°F)		

Meter Box ID	
Meter Box Y	
Meter Box Del H	
Probe ID / Length	
Probe Material	Boro
Pitot / Thermocouple ID	
Pitot Coefficient	0.84
Nozzle ID	
Avg Nozzle Dia (in)	
Area of Stack (ft^2)	
Sample Time	
Total Traverse Pts	

K Factor

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)			
Leak Check @ (in Hg)			
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp		
Reference Temp		
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0													
			Avg Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
			Avg Sqrt Delta P	Avg Sqrt Del H	Comments:									

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EPA 5 from 40CFR Part 60 App A

ISOKINETIC FIELD DATA SHEET

Page ____ of ____

Client ____________________ Operator ____________________

Source ____________________ Run No. ____________________

Sample Loc. ____________________ Date ____________________ K Factor ____________________

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPING EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)	COND FILTER Temp OUT (F) < 65 F	COMMENTS
	0													
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
				Avg Sqrt Del H	Comments:									

SAMPLE RECOVERY FIELD DATA

Client ______ W.O. # ______
Location/Plant ______ Source & Location ______

Run No. ___ Sample Date ______ Recovery Date ______
Sample I.D. ______ Analyst ______ Filter Number ______

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents									Silica Gel	
Final										
Initial										
Gain										

Impinger Color ______ Labeled? ______
Silica Gel Condition ______ Sealed? ______

Run No. ___ Sample Date ______ Recovery Date ______
Sample I.D. ______ Analyst ______ Filter Number ______

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents									Silica Gel	
Final										
Initial										
Gain										

Impinger Color ______ Labeled? ______
Silica Gel Condition ______ Sealed? ______

Run No. ___ Sample Date ______ Recovery Date ______
Sample I.D. ______ Analyst ______ Filter Number ______

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents									Silica Gel	
Final										
Initial										
Gain										

Impinger Color ______ Labeled? ______
Silica Gel Condition ______ Sealed? ______

Check COC for Sample IDs of Media Blanks

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EPA METHOD 9

VISIBLE EMISSIONS OBSERVATION FORM

CLIENT ______________________ W.O.# ______________________

SOURCE ______________________ DATE ______________________

SOURCE ADDRESS ______________________

____

Control Device, Process Equipment, Operating Mode: ______________________

Emission Point Description: ______________________

Source Height: ______ ft Height Relative to Observer: ______ ft

Distance from Observer: ______ ft Direction from Observer: Start: ______ End: ______

Plume Type: (Continuous, Fugutive, or Intermittent) Start: ______ End: ______

Description of Emission: (Coning, Fanning, Looping, Lofting, or Fumigating) Start: ______ End: ______

Plume Color: Start: ______ End: ______

Water Droplets Present: (Y/N) ______ Plume: (Attached, Detached, or N/A) ______

Plume Background Description: Start: ______ End: ______ Background Color: ______

Point in Plume Where Opacity was Determined: ~ ' from stack exit

Sky Conditions: Start: ______ End: ______ Ambient Temperature: Start: ______ F° End: ______ F°

Wind Direction: Start: ______ End: ______ Wind Speed: Start: ______ mph End: ______ mph

Relative Humidity: Start: ______ End: ______ Wet Bulb Temp: Start: ______ F° End: ______ F°

Min.	0	15	30	45	Avg	Min.	0	15	30	45	Avg
0						30					
1						31					
2						32					
3						33					
4						34					
5						35					
6						36					
7						37					
8						38					
9						39					
10						40					
11						41					
12						42					
13						43					
14						44					
15						45					
16						46					
17						47					
18						48					
19						49					
20						50					
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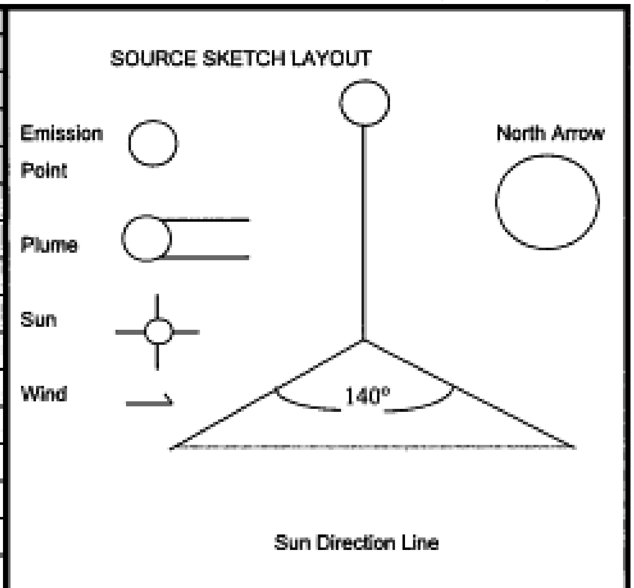
27						57					
28						58					
29						59					



Highest six minute average: ______

A six minute average greater than 20% opacity occured ______ times.

A six minute average greater than 40% opacity occured ______ times.

Opacity Time: Start: ______ End: ______

60-Minute Averge: ______

Observer's Name: ______________________

Certified By: Penn State ______________________

Certification #: ______________ Exp. Date: ______________

Signature: ______________ Date: ______________

WESTON SOLUTIONS.

Boiler Number One
EPA Section 114 Information Request
Addendum to Emissions Test Protocol
Revision 2

L'Anse Warden Electric Company, LLC.
157 South Main Street
L'Anse, Michigan 49946

June 2016

I. Introduction

On May 17, 2016 L'Anse Warden Electric Company ("LWEC") submitted to US EPA, Region 5, via email, a revised stack test protocol in accordance with US EPA, Region 5's Section 114 Request of April 1, 2016. This April 1 request requires LWEC to conduct stack testing for various parameters upon the existing biomass boiler at the LWEC facility in L'Anse, Michigan. On May 25, 2016 LWEC provided notice to US EPA, via email, of its notice of intent to conduct during the week of June 20, 2016. On June 13, 2016 LWEC provided notice to US EPA, via email, of its notice of intent to conduct on July 6 and 7, 2016. US EPA has requested that test runs under the revised protocol commence no earlier than 9:00 AM. LWEC and its testing contractor, Weston Solutions, Inc. will accommodate this request.

In response to the submittal of the revised stack test protocol, US EPA conditioned its approval of the protocol as follows:

> To facilitate the performance of the stack test, EPA requests the following parameters be addressed and included in the final testing execution and reporting process. These elements are essential for the acceptability of the test results and this approval is conditioned on LWEC's compliance with these conditions:

1. LWEC must operate the creosote treated wood fuel (railroad ties) at a rate of 15 tons per hour (tph), plus or minus one-half ton. Reference Section 2.1.3 in the protocol.

2. LWEC must operate the wood chip fuel at a rate of 7.5 tph, plus or minus one-half ton. Reference Section 2.1.3 in the protocol.

3. In accordance with Item #10, in the April 1, 2015 Information Request, LWEC must collect fifteen separate fuel samples prior to the stack testing. These samples must be collected on separate days. Multiple samples cannot be taken in one day.

4. During the stack testing, LWEC must not blend or mix the wood chip fuel or the creosote treated wood fuel in the fuel storage facility/bins. The facility must be able to accurately track the hourly addition rate of each fuel into the boiler.

5. As a part of the final stack test report, LWEC must include the following information:

a. Exact location of the stack;
b. Height of the stack;
c. Diameter of the stack;
d. Average exit velocity of the stack (at exit, not sampling port); and
e. Average exit temperature of the stack (at exit, not sampling port).

To clarify the capability of the LWEC facility to meet US EPA's requirements as outlined above, LWEC submits this addendum to the previously submitted protocol.

II. Railroad Tie and Wood Chip Fuel Feed Rates

After several visits to the LWEC facility and reviewing LWEC's prior Section 114 responses, US EPA should understand that LWEC does not have the ability to separately weigh and feed various approved fuels on an hourly basis. (LWEC's permit allows for fuel feed averaging on a 24 hour basis.)

In order to accommodate US EPA's request that stack testing be conducted while railroad ties are fed to the boiler at the rate of 15 tons/hour and wood fed at the rate of 7.5 tons/hour, LWEC proposes,, prior to the testing, to grind and mix railroad tie and wood at a 2 to 1 ratio. Weights for this fuel mixture will be verified by weighing the fuels after grinding using a front-end loader and its weighometer. The 2 to 1 ratio will be established by mixing 2 loader buckets of ties with one loader bucket of wood.[1] The prepared railroad tie and wood mixture will be staged in the facility's fuel storage building for feeding to the boiler while stack testing is being conducted. The mixed material will be loaded to the 3 storage bins at the power plant. Hourly rates of the mixture as feed to the boiler will be based upon the weight as measured by the scale on the combined fuel belt. This scale will be calibrated in advance of the test runs. Actual feed rates may vary from a nominal rate of the mixed fuel of 22.5 tons/hour in order to maintain the plant within the MW rate range discussed in Section V (below).

However, LWEC recognizes that US EPA has requested that LWEC to not mix wood and railroad ties in the storage bins at the power plant. US EPA has requested that the LWEC boiler operator monitor the speed of the drag chain or "rake" from each fuel bin with separately sorted fuels in order to achieve a wood and railroad tie feed rate totaling 22.5 tons/hour at a tie to wood ratio of 2 to 1. LWEC wishes to clarify that the boiler operator does not have the ability to separately weigh and feed the various fuels on an hourly basis. The main fuel belt scale weighs mixed fuel (ties and wood chips). The operator does control the speed and height of the three reclaimer rakes assigned to each fuel bin. The rake speed and elevation are indicators for fuel feed rates, but they are not definitive for actual feed rates. The rakes draw fuel from the three fuel bin areas which typically have some overlapping or sloughing of fuel into adjoining bins.

For purposes of complying with US EPA's request to separately measure rates of fuel feed for wood and railroad ties during the course of the stack test runs, LWEC will adopt the following procedure:

1. An indicator pointer will be established adjacent to where the three cables that raise and lower the rakes are located on the south side of the Fuel Storage Building.
2. At times that will be recorded, a paint mark will be put on each cable at the indicator, signifying the elevation of the rake at that time.

[1] LWEC intends to have a professional engineer audit the mixing of the railroad ties and wood to verify the 2 to 1 ratio mixture.

3. Individual bins will then be filled with the separate fuel types, with the tonnage of fuel added to each bin recorded. As the fuel is added, the rakes are raised up toward the top of each pile.
4. Stack testing will proceed for the specified run time.
5. When the rakes once again reach the elevation where they started, signified by the paint mark on the cable re-aligning with the indicator, the time will be recorded.
6. The known tonnage added to the bin will then be divided by the difference in times to yield a tons per hour for each bin for the testing day.
7. The above procedure will be repeated for the duration of the testing.

The fuel tonnage weights as received at the fuel bins will be determined based upon the fuel weights determined at the Fuel Aggregation Facility before delivery to the power plant and boiler.

While the above process will provide a reasonably accurate measurement of the tonnage of each fuel fed to the boiler over time, LWEC wishes to emphasize that its boiler operators must use their best judgments with regard to the necessary rake speed needed to approximate a feed rate of 15 tons per hour for railroad ties and 7.5 tons per hour for wood. As the operators cannot directly measure the weight of each fuel as it is added to the boiler, some variation from these feed rates may result.

III. Fuel Sample Collection

As specified in the previously submitted Emission Test Protocol, Rev.1, May 2016, LWEC will collect fuel samples in accordance the procedures specified in 40 CFR 63.7521. However, due to safety and operational necessity, the belt will not be stopped to collect fuel samples; fuel samples will be collected where they drop on to the belt. Analysis for the requested parameters will use the methods specified at page 29 of the May 2016 submittal except that EPA 5050/9056 will be used for chlorine concentration analysis.

LWEC has obtained approval from MISO for a scheduled maintenance outage to conduct routine maintenance on the boiler and maintenance on the turbine. The request for approval was first submitted in January of 2015 and a revised request was submitted in January of 2016. Under the MISO approval, the outage is schedule to begin on June 5, 2016 and to end on June 15, 2016. Because of the scheduled outage, LWEC has already commenced sample collection to assure that 15 days of sampling can be completed prior to the scheduled stack test.

IV. Stack Exit Accessibility

LWEC does not routinely access the top of the stack for any reason. In February of 2016 an independent firm conducted an inspection and noted repairs were needed on the upper portion of the stack and that access to the top of the stack could not be obtained consistent with OSHA requirements for worker safety. As a consequence, direct measurements of stack gas exit velocity and stack gas temperature at the exit from the stack cannot be obtained. LWEC's consultant, Weston Solutions advises that measuring temperature at the stack inlet duct (see Figure No.1) is the only safe access point and will be representative of exit temperature considering that the stack is gunite lined and well insulated for a June test event. Please note this location is downstream of the sample ports shown in the 114 Test Protocol. Weston Solutions also advises that it can calculate the stack exit velocity based upon measurements at the sampling port and other relevant parameters. A calculation for stack exit velocity will be included in the final test report.

V. Boiler Capacity

LWEC wishes to clarify the "maximum rate of electricity production" under representative operating conditions for the stack test event. LWEC's gross annualized MW rate for years 2012 to 2015 ranged from a high of 16.37 to a low of 15.92. LWEC intends to operate within this range during the stack testing event.

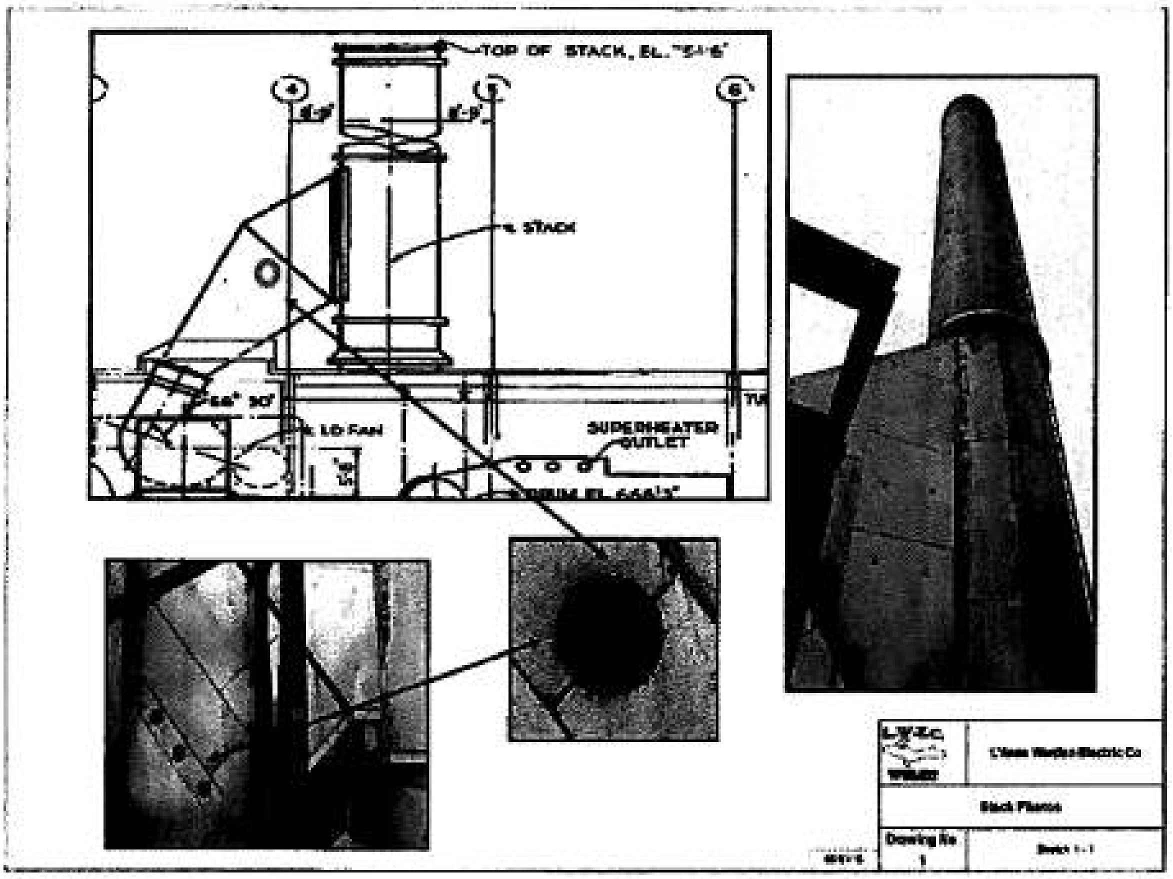
L'Anse Warden Electric Company, LLC

By: [signature]

Its: Steve Walsh CEO

Date: 21 June 2016

Figure 1


TOP OF STACK, EL. 75'-6"
4
5
6
STACK
SUPERHEATER
OUTLET
Stack Flanges
Drawing No
1

END OF REPORT

THIS PAGE INTENTIONALLY LEFT BLAN