

17 March 2022

Ms. Karen Kajiya-Mills
Michigan Department of Environment, Great Lakes, and Energy
Constitution Hall
525 West Allegan Street
Lansing, MI 48913



Re: Stack Testing Results for
American Chemical Solutions LLC (SRN B4302)
2406 Roberts St., Muskegon, MI

Dear Ms. Kajiya-Mills,

At the request of American Chemical Solutions LLC (ACS), Environmental Resources Management Michigan, Inc. (ERM) is providing results (attached) for the stack testing conducted on November 10, 2021 on EU-WWStripper for the above referenced facility. The testing was conducted in accordance with the requirements in PTI No.17-19, Special Condition V.1 for EU-WWStripper.

ACS is located in Muskegon, Michigan and is a chemical manufacturing operation. The facility consists of four process lines. The process lines will produce products or materials in semi-continuous batch operations and will utilize toluene and/or methanol. The lines will be equipped with heat exchanges to condense toluene or methanol vapors at the process vessels. Any residual vapors from the heat exchangers will be directed to the VOC condenser for further removal. The condensed toluene and methanol will be recycled back into the process.

Two air strippers were used to treat waste water from the facility to ensure that waste water discharges to the municipal sewer system comply with the federal discharge standards for the organic chemical, plastic, and synthetic (OPSF) industry discharge standards for waste water. The waste water will originate from the process but stormwater may also be processed. The process waste water is expected to contain toluene and methanol.

The attached testing report summarizes the results and presents the sampling and analytical procedures. Also attached are the operating data collected during the testing: scrubber water flow rate and tower air flow.

The purpose of the testing was to determine an emission rate for VOC, toluene and methanol. The previous stack test conducted February 6 and 7th, 2020 was not able to determine reliable emission rates of Methanol and Toluene due to frozen water in the wastewater storage tank, resulting in a higher concentration of Methanol and Toluene being sent to the strippers. The stack test was repeated November 10, 2021 to determine emission rates for VOC, toluene and methanol. The test results are summarized in the table below but please note that the results are still undergoing internal review.

Table 1 – Results Summary

Stack Testing Results Summary

	Pollutant	North Scrubber	South Scrubber	Total
Emissions, lbs/hr	Methanol	13.470	9.947	23.417
	Toluene	0.132	0.0009	0.133
	VOC	8.877	3.6240	12.501

Please contact me at (616) 283-7157 if you have any questions.

Sincerely,

Rob Adams, CSP
ERM Senior Consultant

Attachments:

1. Stack Testing Report
2. Operating Data

cc: ACS (electronic copy)
File

ERM

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Holland, Michigan
49424

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Attachment A

Stack Testing Report

**Stack Test Group, Inc.**
Air Compliance & Emissions Solutions

Chicago Office:
1500 Boyce Memorial Dr.
Ottawa, IL 61350
Phone 815-433-0545
888 STACK TEST
Fax 815-433-0592

**REPORT OF VOC, TOLUENE AND METHANOL EMISSIONS TESTING ON THE
NORTH AND SOUTH SCRUBBER EXHAUST STACKS AT THE AMERICAN
CHEMICAL SOLUTIONS FACILITY LOCATED IN MUSKEGON, MI**

Prepared for:

ERM
3352 128th AVENUE
HOLLAND, MI 49424

Prepared by:

STACK TEST GROUP, INC.
1500 BOYCE MEMORIAL DRIVE
OTTAWA, IL 61350

NOVEMBER 10, 2021
STACK TEST GROUP, INC. PROJECT NO. 21-3399

Report Prepared By:


Bill J. Byczynski
Principal

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CALIBRATION GAS CERTIFICATION SHEETS

1.0 EXECUTIVE SUMMARY

On November 10, 2021, The Stack Test Group, Inc. performed volatile organic compound (VOC), toluene and methanol emission testing on the north and south scrubber exhaust stacks at the American Chemical Solutions facility located in Muskegon, MI. Three one-hour tests were conducted on each source in order to determine the VOC, toluene and methanol emission rates. Presented below are the average results of these tests.

North Scrubber Exhaust Stack:

Toluene Emissions:	0.132 lb/hr
Methanol Emissions:	13.47 lb/hr
Total VOC Emissions:	8.877 lb/hr

South Scrubber Exhaust Stack:

Toluene Emissions:	0.0009 lb/hr
Methanol Emissions:	9.947 lb/hr
Total VOC Emissions:	3.624 lb/hr

2.0 INTRODUCTION

On November 10, 2021, The Stack Test Group, Inc. performed VOC, toluene and methanol emission testing on the north and south scrubber exhaust stacks at the American Chemical Solutions facility located in Muskegon, MI. Testing was performed to determine the emission rates of the above mentioned compounds.

Testing was conducted while American Chemical Solutions personnel operated the process at normal rate and the scrubbers at normal conditions.

Testing was supervised by Mr. Bill J. Byczynski, Mr. Ryan Schueller and Mr. Gary Kohnke of the Stack Test Group, Inc. Testing was coordinated by Mr. Rob Adams of ERM. Testing was witnessed by Ms. Lindsey Wells from EGGLE.

All testing followed the guidelines of U.S. EPA Reference Methods 1 through 4, 18 and 25A. This report contains a summary of results for the above mentioned tests and all the supporting field, process, and computer generated data.

3.0 SAMPLING AND ANALYTICAL PROCEDURES

3.1 Exhaust Gas Parameters

3.1.1 Traverse and Sampling Points

Testing was conducted on the north and south scrubber exhaust stacks. The number of velocity traverse and sample measurement points for each stack was determined using EPA Method 1.

The two exhaust stack inside diameters measured 23 inches. The test ports were located approximately 20 feet (greater than 2.0 diameters) downstream and 15 feet (greater than 0.5 equivalent diameters) upstream of the nearest flow disturbances. Velocity measurements were taken at each of 16 points, 8 points in each of the two ports set at 90 degrees to each other.

3.1.2 Velocity Traverse

Velocity measurements were performed during each emission test in accordance with EPA Method 2. An "S" type Pitot Tube with an attached type "K" thermocouple was used to conduct the velocity traverse.

3.1.3 Gas Composition

Gas composition for oxygen, carbon dioxide, and nitrogen was determined employing EPA Method 3. An integrated gas sample was collected during each emission test. Gas analysis was conducted using a calibrated Servomex Model 1440C O₂/CO₂ analyzer.

3.1.4 Moisture Content

The north and south scrubber exhaust gas moisture content was determined using the wet bulb/dry bulb technique. The temperatures for the wet bulb/dry bulb are included on the field data sheets.

3.2 TOLUENE & METHANOL EMISSION TESTING

3.2.1 Sample Collection

Testing on the north and south scrubber exhaust stacks for toluene and methanol was performed using U.S. EPA Reference Method 18. This method is titled:

U.S. EPA Reference Method 18 Measurement of Gaseous Organic Compound Emissions from Stationary Sources

A sample was transported to a set of charcoal and silica gel tubes through a Teflon line from the exhaust stack. The dry gas meter was calibrated prior to the test series. The pump was set at 0.50 liters per minute. Immediately following the test, the sample tubes were removed from the stack, capped-off, placed on ice and sent overnighted to the laboratory for analysis.

Samples were collected in duplicate with one set of tubes pre-spiked with a known amount of toluene and methanol.

3.2.2 Sample Duration and Frequency

The Method 18 samples were collected in triplicate with each test lasting sixty minutes in duration. Testing on the north and south exhaust stacks were conducted simultaneously.

3.2.3 Calibrations

All sampling equipment was calibrated according to the procedures outlined in EPA Reference Method 18.

3.2.4 Analytical Procedures

The samples were analyzed per the specifications of U.S. EPA Reference Method 18. A recovery study following the guidelines of U.S. EPA Reference Method 18 was performed on the samples. The results of this recovery study is included in the laboratory Appendix of the report.

3.3 VOLATILE ORGANIC COMPOUND (VOC) TESTING

3.3.1 Sample Collection

Testing for total VOC's on the north and south scrubber exhaust stacks was performed using U.S. EPA Reference Method 25A. A J.U.M. Model 3-300 Flame Ionization Detector (FID) was used to determine the emission concentrations at each location. A sample was transported through a heated Teflon line from the exhaust stack and inlet duct to the FIDs which analyzed the samples continuously. The output signal from the FIDs were then recorded at one minute averages throughout the test. Copies of this data may be found in Appendix E.

At the beginning of the test series, the analyzers were calibrated and then checked for calibration error by introducing zero, low-range, mid-range and high-range calibration gases to the back of the analyzers. Before and after each individual test run, a system bias was performed by introducing a zero and mid-range propane calibration gas to the outlet of the probes. Calibration gases used were U.S. EPA Protocol 1 certified.

3.3.2 Sample Duration and Frequency

The Method 25A train samples were collected in triplicate with each test lasting sixty minutes in duration. Testing on the north and south scrubber exhaust stacks was conducted simultaneously.

3.3.3 Calibrations

All sampling equipment was calibrated according to the procedures outlined in EPA Reference Method 25A. Copies of the FID calibrations are included in Appendix D.

4.0 TEST RESULTS

Presented in this section are the results of this test series. Test results are reported in Tables 4.1 and 4.2. Table 4.1 reports the results for the north scrubber exhaust including stack gas temperature, percent carbon dioxide and oxygen, percent moisture, molecular weight of the stack gas dry and wet, and flow rate in actual cubic feet per minute (acfm), standard cubic feet per minute (scfm), and dry standard cubic feet per minute (dscfm).

Tables 4.1 also presents the VOC, toluene and methanol results for the north scrubber exhaust stack. The toluene and methanol results are presented in terms of pounds per dry standard cubic feet (lb/DSCF) and pounds per hour (lb/hr). The total VOC results are presented in terms of ppm as propane, lb/DSCF and lb/hr.

Table 4.2 presents the results for the south scrubber exhaust stack in the same manner and format as Table 4.1.

Copies of the calculations used to determine these emission rates may be found in Appendix A. Copies of the field data sheets are presented in Appendix B. Copies of the laboratory report are presented in Appendix E.

Table 4.1

VOC, Toluene & Methanol Results
American Chemical Solutions
Muskegon, MI
11/10/21
North Scrubber Exhaust Stack

Test No:	<u>T1</u>	<u>T2</u>	<u>T3</u>	<u>Avg.</u>
Start Time:	10:30 AM	01:46 PM	04:07 PM	
Finish Time:	11:30 AM	02:46 PM	05:07 PM	
Stack Gas Temperature, oF:	98.3	99.4	108.3	102.0
% Carbon Dioxide:	0.1	0.1	0.1	0.1
% Oxygen:	20.90	20.90	20.90	20.90
% Moisture:	2.90	2.80	2.80	2.83
Molecular Weight dry, lb/lb-Mole:	28.85	28.85	28.85	28.85
Molecular Weight wet, lb/lb-Mole:	28.54	28.55	28.55	28.54
Velocity and Flow Results:				
Average Stack Gas Velocity FPS:	13.76	14.22	14.61	14.20
Stack Gas Flow Rate, ACFM:	2,386	2,466	2,533	2,462
Stack Gas Flow Rate, SCFM:	2,229	2,299	2,325	2,285
Stack Gas Flow Rate, DSCF/HR:	129,881	134,097	135,618	133,199
Stack Gas Flow Rate, DSCFM:	2,165	2,235	2,260	2,220
VOC Results:				
PPM as Propane:	412.5	482.7	798.7	564.6
LBS/DSCF:	4.71E-05	5.51E-05	9.12E-05	6.45E-05
LBS/HR:	6.301	7.605	12.726	8.877
Toluene Results:				
Grains Per DSCF:	7.38E-03	6.12E-03	7.38E-03	6.96E-03
LBS/DSCF:	1.06E-06	8.75E-07	1.06E-06	9.95E-07
LBS/HR:	0.137	0.117	0.143	0.132
Methanol Results:				
Grains Per DSCF:	1.77E+04	2.24E+04	3.06E+04	2.35E+04
LBS/DSCF:	5.17E-01	6.03E-01	8.97E-01	6.72E-01
LBS/HR:	0.000	0.000	0.000	0.000
	10.19	12.23	17.99	13.47

Table 4.2

VOC, Toluene & Methanol Results
American Chemical Solutions
Muskegon, MI
11/10/21
South Scrubber Exhaust Stack

Test No:	<u>T1</u>	<u>T2</u>	<u>T3</u>	<u>Avg.</u>
Start Time:	10:30 AM	01:46 PM	04:07 PM	
Finish Time:	11:30 AM	02:46 PM	05:07 PM	
Stack Gas Temperature, oF:	88.3	99.0	97.1	94.8
% Carbon Dioxide:	0.1	0.1	0.1	0.1
% Oxygen:	20.90	20.90	20.90	20.90
% Moisture:	2.90	2.80	2.80	2.83
Molecular Weight dry, lb/lb-Mole:	28.85	28.85	28.85	28.85
Molecular Weight wet, lb/lb-Mole:	28.54	28.55	28.55	28.54
Velocity and Flow Results:				
Average Stack Gas Velocity FPS:	13.76	14.22	14.61	14.20
Stack Gas Flow Rate, ACFM:	2,386	2,466	2,533	2,462
Stack Gas Flow Rate, SCFM:	2,229	2,299	2,325	2,285
Stack Gas Flow Rate, DSCF/HR:	129,881	134,097	135,618	133,199
Stack Gas Flow Rate, DSCFM:	2,165	2,235	2,260	2,220
VOC Results:				
PPM as Propane:	196.8	176.3	287.2	220.1
LBS/DSCF:	2.25E-05	2.01E-05	3.28E-05	2.51E-05
LBS/HR:	3.197	2.938	4.738	3.624
Toluene Results:				
Grains Per DSCF:	4.82E-05	4.32E-05	4.41E-05	4.52E-05
LBS/DSCF:	6.89E-09	6.18E-09	6.30E-09	6.46E-09
LBS/HR:	0.0010	0.0009	0.0009	0.0009
Methanol Results:				
Grains Per DSCF:	3.45E-01	4.32E-01	7.11E-01	4.96E-01
LBS/DSCF:	4.93E-05	6.18E-05	1.02E-04	7.09E-05
LBS/HR:	6.811	8.765	14.266	9.947

APPENDIX A
SAMPLE CALCULATIONS

SAMPLE CALCULATIONS

The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

1. Volume of water collected (wscf)

$$V_{wstd} = (0.04707)(V_{lc})$$

Where:

V_{lc}	total volume of liquid collected in impingers and silica gel (ml)
V_{wstd}	volume of water collected at standard conditions (ft ³)
0.04707	conversion factor (ft ³ /ml)

2. Volume of gas metered, standard conditions (dscf)

$$V_{mstd} = \frac{(17.64)(V_m) \left(P_{bar} + \frac{\Delta H}{13.6} \right) (Y_d)}{(460 + T_m)}$$

Where:

P_{bar}	barometric pressure (in. Hg)
T_m	average dry gas meter temperature (°F)
V_m	volume of gas sample through the dry gas meter at meter conditions (ft ³)
V_{mstd}	volume of gas sample through the dry gas meter at standard conditions (ft ³)
Y_d	gas meter correction factor (dimensionless)
ΔH	average pressure drop across meter box orifice (in. H ₂ O)
17.64	conversion factor (°R/in. Hg)
13.6	conversion factor (in. H ₂ O/in. Hg)
460	°F to °R conversion constant

3. Volume of gas metered, standard conditions (dscm)

$$V_{mstd(m)} = \frac{(V_{mstd(ft)})}{35.35}$$

Where:

$V_{mstd(ft)}$	volume of gas sample through the dry gas meter at standard conditions (ft ³)
$V_{mstd(m)}$	volume of gas sample through the dry gas meter at standard conditions (m ³)
35.35	conversion factor (ft ³ to m ³)
13.6	conversion factor (in. H ₂ O/in. Hg)

4. Sample gas pressure (in. Hg)

$$P_s = P_{bar} + \left(\frac{P_g}{13.6} \right)$$

Where:

P_{bar}	barometric pressure (in. Hg)
P_g	sample gas static pressure (in. H ₂ O)

SAMPLE CALCULATIONS (CONTINUED)

P_s absolute sample gas pressure (in. Hg)
13.6 conversion factor (in. H₂O/in. Hg)

5. Actual vapor pressure (in. Hg)¹

$$P_v = P_s$$

Where:

P_v vapor pressure, actual (in. Hg)
 P_s absolute sample gas pressure (in. Hg)

6. Moisture content (%)

$$B_{wo} = \frac{V_{wstd}}{V_{mstd} + V_{wstd}}$$

Where:

B_{wo} proportion of water vapor in the gas stream by volume (%)
 V_{mstd} volume of gas sample through the dry gas meter at standard conditions (ft³)
 V_{wstd} volume of water collected at standard conditions (ft³)

7. Saturated moisture content (%)

$$B_{ws} = \frac{(P_v)}{(P_s)}$$

Where:

B_{ws} proportion of water vapor in the gas stream by volume at saturated conditions (%)
 P_s absolute sample gas pressure (in. Hg)
 P_v vapor pressure, actual (in. Hg)

Whichever moisture value is smaller is used for B_{wo} in the following calculations.

8. Molecular weight of dry gas stream (lb/lb·mole)

$$M_d = M_{CO_2} \frac{(CO_2)}{(100)} + M_{O_2} \frac{(O_2)}{(100)} + M_{CO+N_2} \frac{(CO + N_2)}{(100)}$$

Where:

M_d dry molecular weight of sample gas (lb/lb·mole)
 M_{CO_2} molecular weight of carbon dioxide (lb/lb·mole)
 M_{O_2} molecular weight of oxygen (lb/lb·mole)
 M_{CO+N_2} molecular weight of carbon monoxide and nitrogen (lb/lb·mole)
 CO_2 proportion of carbon dioxide in the gas stream by volume (%)
 O_2 proportion of oxygen in the gas stream by volume (%)
 $CO+N_2$ proportion of carbon monoxide and nitrogen in the gas stream by volume (%)
100 conversion factor (%)

¹ For effluent gas temperatures over 212°F, P_v is assumed to be equal to P_s .

SAMPLE CALCULATIONS (CONTINUED)

9. Molecular weight of sample gas (lb/lb·mole)

$$M_s = (M_d)(1 - B_{wo}) + (M_{H_2O})(B_{wo})$$

Where:

B_{wo}	proportion of water vapor in the gas stream by volume
M_d	dry molecular weight of sample gas (lb/lb·mole)
M_{H_2O}	molecular weight of water (lb/lb·mole)
M_s	molecular weight of sample gas, wet basis (lb/lb·mole)

10. Velocity of sample gas (ft/sec)

$$V_s = (K_p)(C_p)(\sqrt{\Delta P}) \left(\sqrt{\frac{(T_s + 460)}{(M_s)(P_s)}} \right)$$

Where:

K_p	velocity pressure coefficient (dimensionless)
C_p	pitot tube constant
M_s	molecular weight of sample gas, wet basis (lb/lb·mole)
P_s	absolute sample gas pressure (in. Hg)
T_s	average sample gas temperature (°F)
V_s	sample gas velocity (ft/sec)
$\sqrt{\Delta P}$	average square roots of velocity heads of sample gas (in. H ₂ O)
460	°F to °R conversion constant

11. Total flow of sample gas (acfm)

$$Q_a = (60)(A_s)(V_s)$$

Where:

A_s	cross sectional area of sampling location (ft ²)
Q_a	volumetric flow rate at actual conditions (acfm)
V_s	sample gas velocity (ft/sec)
60	conversion factor (sec/min)

12. Total flow of sample gas (dscfm)

$$Q_{std} = \frac{(Q_a)(P_s)(17.64)(1 - B_{wo})}{(T_s + 460)}$$

Where:

B_{wo}	proportion of water vapor in the gas stream by volume
P_s	absolute sample gas pressure (in. Hg)
Q_a	volumetric flow rate at actual conditions (acfm)
Q_{std}	volumetric flow rate at standard conditions, dry basis (dscfm)
T_s	average sample gas temperature (°F)
17.64	conversion factor (°R/in. Hg)
460	°F to °R conversion constant

SAMPLE CALCULATIONS (CONTINUED)

13. VOC concentration (lb/scf)

$$E_{lb/scf} = \frac{(ppm)(MW)}{(385.3 \times 10^6)}$$

Where:

$E_{lb/scf}$	emission rate
C_{ppm}	measured concentration in the gas stream (ppm _v)
MW	molecular weight of Methane (16)
385.3	conversion factor

14. VOC emission (lb/hr)

$$E_{lb/hr} = (lb/scf)(60)(scfm)$$

Where:

$E_{lb/hr}$	emission rate
$E_{lb/scf}$	concentration
SCFM	flow rate
$60_{min/hr}$	conversion factor

APPENDIX B
FIELD DATA SHEET

A

FLOW AND MOISTURE DATA SHEET

Location: ACS
 Unit: NORTH SCRUBBER Run: 1 VOC's Testing Method 1-4, 18, 25A Project Number 21-3399
 Inlet Outlet

Client: <u>ERM</u>	Meter Lk Ck Pre: <u>.001 @ 9</u> "	Method 1	Bar. Press. (in. Hg): <u>29.51</u>
Plant: <u>MUSKEGON, MI</u>	Meter Lk Ck Post: <u>@</u> "		Probe ID No.: <u>STG-4C</u>
Meter Operator: <u>MO/GK</u>	Pitot Lk Ck: + <u>@</u> - <u>@</u> "		Pitot Coef.: <u>0.84</u>
Probe Operator: <u>EF/BB</u>	Start Time (approx.): <u>10:40</u>		O ₂ (dry, vol. %): <u>DATA</u>
Date: <u>11/10/2021</u>	Stop Time (approx.): <u>11:30</u>		CO ₂ (dry, vol. %): <u>LOGGER</u>
Meter Box No.: <u>30B - A SIDE</u>	Static Press. (in. H2O):	Duct Dimensions (in.): <u>23</u>	H ₂ O (condensate, ml):
Y _d : <u>ΔH:</u>	First Point (all the way): <u>X</u> (out)		Port Length (in.):

~~Pre Velocity Traverse~~

Moisture Train

Post Velocity Traverse

Traverse Point Number	Pitot ΔP (in. H2O)	Stack Temp Ts (°F)	Min. Pitot 5 Elapsed Time	Metered Vol.	Sample 2x 1 in. N (in. H2O)	Dry Gas Meter		Exit Temp. (°F)	Pump Vac (in. H2O)	Pitot ΔP (in. H2O)	Stack Temp Ts (°F)	Notes
				(SCFM)		Tml (°F)	Tmo (°F)					
A-1	0.08	97	5	0.000	1.0	74		74	2.0	0.040	98	
A-2	0.09	98	10	4.356	1.0	75		75	2.0	0.045	99	
A-3	0.095	97	15	8.558	1.0	75		75	2.0	0.050	100	
A-4	0.095	97	20	13.000	1.0	75		75	2.0	0.050	100	
A-5	0.095	91 mo	25	16.937	1.0	75		75	2.0	0.050	100	
A-6	0.095	90	30	21.132	0.8	75		75	2.0	0.055	99	
A-7	0.10	87	35	25.206	0.8	75		75	2.0	0.055	99	
A-8	0.10	80	40	29.300	0.8	75		75	2.0	0.055	98	
B-1	0.105	93	45	33.370	0.8	75		75	2.0	0.055	98	
B-2	0.10	97	50	37.654	0.8	75		75	2.0	0.045	98	
B-3	0.105	98	55	41.798	0.8	75		75	2.0	0.050	98	
B-4	0.105	99	60	46.174	0.8	75		75	2.0	0.060	97	
B-5	0.105	99		50.504	0.8	75		75	2.0	0.065	95	
B-6	0.105	99								0.075	97	
B-7	0.105	98								0.070	98	
B-8	0.105	95								0.065	98	

Avg.						75.75				.2356	98.25	
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A

FLOW AND MOISTURE DATA SHEET

Location: ACS
 Unit: North Scrubber Run: 2 VOC¹⁵ Testing Method 1-4, 18 Project Number 21-3399
 Inlet Outlet

Client: <u>ERM</u>	Meter Lk Ck Pre: <u>.001 @ 9</u> "	Method 1	Bar. Press. (in. Hg): <u>29.51</u>
Plant: <u>Muskegon, MI</u>	Meter Lk Ck Post: <u>@</u> "		Probe ID No.: <u>4C</u>
Meter Operator: <u>AK/MD</u>	Pitot Lk Ck: + <u>@</u> - <u>@</u> "		Pitot Coef.: <u>0.84</u>
Probe Operator: <u>BB/EF</u>	Start Time (approx.): <u>13:46</u>		O ₂ (dry, vol. %): <u>DATA</u>
Date: <u>11-10-21</u>	Stop Time (approx.): <u>14:47</u>		CO ₂ (dry, vol. %): <u>LOGGER</u>
Meter Box No.: <u>30B</u>	Static Press. (in. H ₂ O): <u>-0.09</u>		H ₂ O (condensate, ml):
Y _d : <u>ΔH:</u>	First Point (all the way): <u>(in)</u> (out)	Duct Dimensions (in.): <u>13</u>	Port Length (in.): <u>4"</u>
			Total H ₂ O (g):

Velocity Traverse

Moisture Train

Post Velocity Traverse

Traverse Point Number	Pitot ΔP (in. H ₂ O)	Stack Temp Ts (°F)	Min./Pt 5 Elapsed Time	Metered Vol.	Sample ΔH (in. H ₂ O)	Dry Gas Meter		Exit Temp. (°F)	Pump Vac (in. H ₂ O)	Pitot ΔP (in. H ₂ O)	Stack Temp Ts (°F)	Notes
				(ft ³)		Tmi (°F)	Tmo (°F)					
A-1	0.050	98	5	4.439	1.0	77			2.0			
A-2	0.050	98	10	8.617	0.82	77			2.0			
A-3	0.060	98	15	12.841	0.82	77			2.0			
A-4	0.065	97	20	17.032	0.82	77			2.0			
A-5	0.055	98	25	21.163	0.82	77			2.0			
A-6	0.050	99	30	25.460	0.82	77			2.0			
A-7	0.055	98	35	29.739	0.80	77			2.0			
A-8	0.055	100	40	33.889	0.80	77			2.0			
B-1	0.055	102	45	38.046	0.80	77			2.0			
B-2	0.060	102	50	42.264	0.80	77			2.0			
B-3	0.060	102	55	46.453	0.80	77			2.0			
B-4	0.065	102	60	50.675	0.81	77			2.0			
B-5	0.065	100										
B-6	0.070	100										
B-7	0.070	98										
B-8	0.065	98										

Avg.	<u>.2433</u>	<u>99.38</u>				<u>77.00</u>						
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FLOW AND MOISTURE DATA SHEET

Location: ACS
Unit: SOUTH SCARBOROUGH 1 VOC Testing Method 1-4, 10, 25A Project Number 21-3399
 Inlet Outlet

Client: <u>ERM</u>	Meter Lk Ck Pre: <u>001 @ 9</u> "	Method 1	Bar. Press. (in. Hg): <u>29.57</u>
Plant: <u>MORNING STAR</u>	Meter Lk Ck Post: <u>@</u> "		Probe ID No.: <u>STGA-4C</u>
Meter Operator: <u>MO/GK</u>	Pitot Lk Ck: <u>+0.0 @ 6 - 0.0 @</u> "		Pitot Coef.: <u>0.84</u>
Probe Operator: <u>EF/BB</u>	Start Time (approx.): <u>10:30</u>		O ₂ (dry, vol. %): <u>DATA</u>
Date: <u>11/10/2021</u>	Stop Time (approx.): <u>11:30</u>		CO ₂ (dry, vol. %): <u>LOGGER</u>
Meter Box No.: <u>70B - B-SIDE</u>	Static Press. (in. H ₂ O): <u>-0.08</u>		H ₂ O (condensate, ml):
Y _d : <u>ΔH:</u>	First Point (all the way): <u>X</u> (out)	Duct Dimensions (in.): <u>23</u>	Port Length (in.): <u>4"</u>
			Total H ₂ O (g):

Velocity Traverse

Moisture Train

Post Velocity Traverse

Traverse Point Number	Pitot ΔP (in. H ₂ O)	Stack Temp T _s (°F)	Min./Pt 5 Elapsed Time	Metered Vol. (ft ³)	Sample Vol. (ft ³)	Dry Gas Meter		Exit Temp. (°F)	Pump Vac (in. H ₂ O)	Pitot ΔP (in. H ₂ O)	Stack Temp T _s (°F)	Notes
				0.000		T _{ml} (°F)	T _{mo} (°F)					
A-1	0.045	88	5	4.903	1.0	82			2.5			
A-2	0.055	88	10	10.058	1.0	82			2.5			
A-3	0.060	88	15	15.115	1.0	83			2.5			
A-4	0.065	89	20	19.332	1.0	83			2.5			
A-5	0.070	89	25	24.286	1.0	83			2.5			
A-6	0.070	89	30	29.179	0.9	84			2.5			
A-7	0.065	89	35	33.975	0.9	84			2.5			
A-8	0.065	89	40	38.632	0.9	84			2.5			
B-1	0.040	87	45	43.462	0.91	84			2.5			
B-2	0.045	88	50	48.194	0.8	84			2.5			
B-3	0.055	89	55	53.058	0.81	84			2.5			
B-4	0.065	88	60	57.823	0.82	84			2.5			
B-5	0.070	88										
B-6	0.075	88										
B-7	0.070	88										
B-8	0.080	87										

Avg.	.2483	88.25										
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33.372

B

FLOW AND MOISTURE DATA SHEET

Location: ACS
 Unit: South Scrubber Run: 2 VOCs Testing Method 1-4, 18 Project Number 21-3399
 Inlet Outlet

Client: <u>ERM</u>	Meter Lk Ck Pre: <u>.001 @ 6</u> "	Method 1	Bar. Press. (in. Hg): <u>29.51</u>
Plant: <u>Muskogee, MI</u>	Meter Lk Ck Post: @ "		Probe ID No.: <u>4C</u>
Meter Operator: <u>MW/MO</u>	Pitot Lk Ck: + @ - @ "		Pitot Coef.: <u>0.84</u>
Probe Operator: <u>BB/EF</u>	Start Time (approx.): <u>13:46</u>		O ₂ (dry, vol. %): <u>DATA</u>
Date: <u>11-10-21</u>	Stop Time (approx.): <u>14:47</u>		CO ₂ (dry, vol. %): <u>LOGGER</u>
Meter Box No.: <u>30B</u>	Static Press. (in. H ₂ O): <u>-0.08</u>		H ₂ O (condensate, ml):
Y _d : ΔH:	First Point (all the way): (in) (out)	Duct Dimensions (in.): <u>23</u>	Port Length (in.): <u>4</u>
		Total H ₂ O (g):	

Raw Velocity Traverse

Moisture Train

Post Velocity Traverse

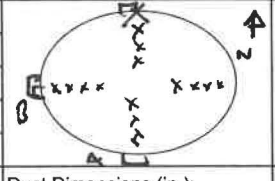
Traverse Point Number	Pitot ΔP (in. H ₂ O)	Stack Temp T _s (°F)	Min./Pt 5 Elapsed Time	Metered Vol. (ft ³)	Sample ΔH (in. H ₂ O)	Dry Gas Meter		Exit Temp. (°F)	Pump Vac (in. H ₂ O)	Pitot ΔP (in. H ₂ O)	Stack Temp T _s (°F)	Notes
				0.000		T _{m1} (°F)	T _{m2} (°F)					
A-1	0.050	101	5	6.057	1.0	86			4.0			
A-2	0.060	102	10	11.668	1.0	86			4.0			
A-3	0.065	101	15	17.362	1.0	85			4.0			
A-4	0.065	101	20	23.022	1.0	85			4.0			
A-5	0.070	100	25	28.644	1.0	85			4.0			
A-6	0.065	99	30	34.342	1.0	85			4.0			
A-7	0.070	98	35	40.722	1.0	85			4.0			
A-8	0.070	98	40	45.728	1.0	85			4.0			
B-1	0.065	98	45	51.289	1.0	85			4.0			
B-2	0.065	99	50	56.952	1.0	85			4.0			
B-3	0.060	98	55	62.592	1.0	85			4.0			
B-4	0.065	98	60	68.188	1.0	85			4.0			
B-5	0.070	97										
B-6	0.070	98										
B-7	0.075	98										
B-8	0.075	98										

Avg.	.2571	99					85.17				
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B

FLOW AND MOISTURE DATA SHEET

Location: ACS
 Unit: South Inlet Outlet Run: 3 VOC'S Testing Method 1-4, 18 Project Number 21-3399

Client: <u>ERM</u>	Meter Lk Ck Pre: <u>.001 @ 8</u> "	Method 1	Bar. Press. (in. Hg): <u>29.53</u>
Plant: <u>Muskegon, MI</u>	Meter Lk Ck Post: <u>@</u> "		Probe ID No.: <u>STGPT4C</u>
Meter Operator: <u>MJ/GK</u>	Pitot Lk Ck: + <u>@</u> "		Pitot Coef.: <u>0.84</u>
Probe Operator: <u>EF/RS</u>	Start Time (approx.): <u>14:07</u> <u>16:07</u>		O ₂ (dry, vol. %): <u>DATA</u>
Date: <u>11/10/2021</u>	Stop Time (approx.): <u>17:07</u>		CO ₂ (dry, vol. %): <u>LOGGER</u>
Meter Box No.: <u>30B-BS0C</u>	Static Press. (in. H2O): <u>-0.08</u>	Duct Dimensions (in.):	H ₂ O (condensate, ml):
Y _d : <u>ΔH:</u>	First Point (all the way): <u>X</u> (out)	Port Length (in.): <u>4"</u>	Total H ₂ O (g):

Pre Velocity Traverse

Moisture Train

Post Velocity Traverse

Traverse Point Number	Pitot ΔP (in. H2O)	Stack Temp Ts (°F)	Min./Pt 5 Elapsed Time	Metered Vol. (ft ³)	Sample ΔH (in. H2O)	Dry Gas Meter		Exit Temp. (°F)	Pump Vac (in. H2O)	Pitot ΔP (in. H2O)	Stack Temp Ts (°F)	Notes
				0.000		Tmt (°F)	Tmo (°F)					
A-1	0.045	97	5	5.486	1.0	84			4.0			
A-2	0.050	98	10	10.976	1.0	84			4.0			
A-3	0.060	96	15	16.384	1.0	84			4.0			
A-4	0.070	99	20	21.043	1.0	84			4.0			
A-5	0.075	102	25	27.308	1.0	84			4.0			
A-6	0.070	101	30	32.768	1.0	84			4.0			
A-7	0.070	100	35	38.239	1.0	85			4.0			
A-8	0.065	100	40	43.588	1.0	85			4.0			
B-1	0.050	98	45	49.156	1.0	85			4.0			
B-2	0.060	97	50	54.558	1.0	85			4.0			
B-3	0.065	96	55	59.998	1.0	85			4.0			
B-4	0.065	95	60	65.441	1.0	85			4.0			
B-5	0.075	95										
B-6	0.075	95										
B-7	0.070	93										
B-8	0.075	92										

Avg.	.2542	97.13										
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M18 Sample Volumes

American Chemical
21-3399
11/10/2021

South (Toluene)						
Run #	Side	Start	Finish	Avg	Total (cc)	Total (L)
Run 1	spiked	267.4	300.7	284.1	17043	17.04
	unspiked	284.5	266.0	275.3	16515	16.52
Run 2	spiked	246.4	246.7	246.6	14793	14.79
	unspiked	305.0	308.0	306.5	18390	18.39
Run 3	spiked	241.0	234.4	237.7	14262	14.26
	unspiked	299.5	300.5	300.0	18000	18.00

North (Toluene)						
Run #	Side	Start	Finish	Avg	Total (cc)	Total (L)
Run 1	spiked	361.9	381.8	371.9	22311	22.31
	unspiked	307.0	304.2	305.6	18336	18.34
Run 2	spiked	286.6	291.1	288.9	17331	17.33
	unspiked	287.9	288.8	288.4	17301	17.30
Run 3	spiked	260.7	220.0	240.4	14421	14.42
	unspiked	270.1	261.3	265.7	15942	15.94

M18 Sample Volumes

American Chemical
21-3399
11/10/2021

South (Methanol)						
Run #	Side	Start	Finish	Avg	Total (cc)	Total (L)
Run 1	spiked	194.3	208.7	201.5	12090	12.09
	unspiked	267.0	264.5	265.8	15945	15.95
Run 2	spiked	322.5	320.1	321.3	19278	19.28
	unspiked	289.1	289.1	289.1	17346	17.35
Run 3	spiked	329.7	329.8	329.8	19785	19.79
	unspiked	262.2	268.9	265.6	15933	15.93

North (Methanol)						
Run #	Side	Start	Finish	Avg	Total (cc)	Total (L)
Run 1	spiked	235.2	236.2	235.7	14142	14.14
	unspiked	353.8	365.0	359.4	21564	21.56
Run 2	spiked	345.5	348.9	347.2	20832	20.83
	unspiked	267.7	269.0	268.4	16101	16.10
Run 3	spiked	339.3	341.2	340.3	20415	20.42
	unspiked	234.1	243.4	238.8	14325	14.33

M18 Sample Volumes

American Chemical
21-3399
11/10/2021

South (Methanol)		
Run #	Side	Total (L)
Run 1	spiked	12.09
	unspiked	15.95
Run 2	spiked	19.28
	unspiked	17.35
Run 3	spiked	19.79
	unspiked	15.93

North (Methanol)		
Run #	Side	Total (L)
Run 1	spiked	14.14
	unspiked	21.56
Run 2	spiked	20.83
	unspiked	16.10
Run 3	spiked	20.42
	unspiked	14.33

M18 Sample Volumes

American Chemical
21-3399
11/10/2021

South (Toluene)		
Run #	Side	Total (L)
Run 1	spiked	17.04
	unspiked	16.52
Run 2	spiked	14.79
	unspiked	18.39
Run 3	spiked	14.26
	unspiked	18.00

North (Toluene)		
Run #	Side	Total (L)
Run 1	spiked	22.31
	unspiked	18.34
Run 2	spiked	17.33
	unspiked	17.30
Run 3	spiked	14.42
	unspiked	15.94

APPENDIX C
FIELD PARAMETER SHEET

STACK TEST GROUP, INC.
Air Quality Services

VOC, Toluene Sampling Train Calculations

Client:	American Chemical Solutions
Project No:	21-3399
Date:	11/10/21
Source:	North Scrubber Exhaust Stack

Test No:	T1	T2	T3	Avg.
Start Time	10:30 AM	01:46 PM	04:07 PM	
Finish Time	11:30 AM	02:46 PM	05:07 PM	
Pitot Cal. Factor	0.84	0.84	0.84	
Meter Calibration Factor:	0.975	0.975	0.975	
Stack Length, inches:	0	0	0	
Stack Width, inches:	0	0	0	
Stack Diameter, inches:	23	23	23	
Barometric Pressure, inches Hg:	29.57	29.57	29.57	
Static Pressure in Stack, Inches H2O:	-0.08	-0.08	-0.08	
Duration of Sample, minutes:	60	60	60	
Meter Start Volume:	0.000	0.000	0.000	
Meter Final Volume:	0.611	0.648	0.563	
Average Meter Pressure, Inches H2O:	0.8000	0.8000	0.8000	0.8000
Average Meter Temperature, degrees F:	75.8	77.0	76.0	76.3
Average Sqrt. Velocity Pressure:	0.2356	0.2433	0.2479	0.2423
Stack Gas Temperature, degrees F:	98.3	99.4	108.3	102.0
% Carbon Dioxide:	0.1	0.1	0.1	0.1
% Oxygen:	20.9	20.9	20.9	20.9
% Carbon Monoxide:	0.0	0.0	0.0	0.0

Sample Train Calculations

Meter Volume, Actual:	0.611	0.648	0.563	0.607
Meter Volume, STP:	0.581	0.615	0.535	0.577
% Moisture:	2.90	2.80	2.80	2.83
Area of Stack, Square Feet:	2.89	2.89	2.89	2.89
Molecular Weight dry, lb/lb-Mole:	28.85	28.85	28.85	28.85
Molecular Weight wet, lb/lb-Mole:	28.54	28.55	28.55	28.54
Absolute Stack Gas Pressure, in Hg:	29.56	29.56	29.56	29.56

Velocity and Flow Calculations

Average Stack Gas Velocity FPS:	13.76	14.22	14.61	14.20
Stack Gas Flow Rate, ACFM:	2,386	2,466	2,533	2,462
Stack Gas Flow Rate, SCFM:	2,229	2,299	2,325	2,285
Stack Gas Flow Rate, DSCF/HR:	129,881	134,097	135,618	133,199
Stack Gas Flow Rate, DSCFM:	2,165	2,235	2,260	2,220

Toluene Calculations:

Toluene Concentration, ug:	278.0	244.0	256.0	259.3
Grains Per DSCF:	7.38E-03	6.12E-03	7.38E-03	6.96E-03
LBS/DSCF:	1.06E-06	8.75E-07	1.06E-06	9.95E-07
LBS/HR:	0.137	0.117	0.143	0.132

VOC Calculations:

PPM as Propane:	412.5	482.7	798.7	564.6
LBS/DSCF:	4.71E-05	5.51E-05	9.12E-05	6.45E-05
LBS/HR:	6.301	7.605	12.726	8.877

STACK TEST GROUP, INC.
Air Quality Services

Methanol Sampling Train Calculations

Client:	American Chemical Solutions
Project No:	21-3399
Date:	11/10/21
Source:	North Scrubber Exhaust Stack

Test No:	T1	T2	T3	Avg.
Start Time	10:30 AM	01:46 PM	04:07 PM	
Finish Time	11:30 AM	02:46 PM	05:07 PM	
Pitot Cal. Factor	0.84	0.84	0.84	
Meter Calibration Factor:	0.975	0.975	0.975	
Stack Length, inches:	0	0	0	
Stack Width, inches:	0	0	0	
Stack Diameter, inches:	23	23	23	
Barometric Pressure, inches Hg:	29.57	29.57	29.57	
Static Pressure in Stack, Inches H2O:	-0.08	-0.09	-0.08	
Duration of Sample, minutes:	60	60	60	
Meter Start Volume:	0.000	0.000	0.000	
Meter Final Volume:	0.563	0.613	0.563	
Average Meter Pressure, Inches H2O:	0.8000	0.8000	0.8000	0.8000
Average Meter Temperature, degrees F:	83.4	85.2	84.5	84.4
Average Sqrt. Velocity Pressure:	0.2483	0.2571	0.2542	0.2532
Stack Gas Temperature, degrees F:	88.3	99	97.1	94.8
% Carbon Dioxide:	0.1	0.1	0.1	0.1
% Oxygen:	20.9	20.9	20.9	20.9
% Carbon Monoxide:	0.0	0.0	0.0	0.0

Sample Train Calculations

Meter Volume, Actual:	0.563	0.613	0.563	0.579
Meter Volume, STP:	0.528	0.573	0.526	0.542
% Moisture:	2.90	2.80	2.80	2.83
Area of Stack, Square Feet:	2.89	2.89	2.89	2.89
Molecular Weight dry, lb/lb-Mole:	28.85	28.85	28.85	28.85
Molecular Weight wet, lb/lb-Mole:	28.54	28.55	28.55	28.54
Absolute Stack Gas Pressure, in Hg:	29.56	29.56	29.56	29.56

Velocity and Flow Calculations

Average Stack Gas Velocity FPS:	14.37	15.03	14.83	14.74
Stack Gas Flow Rate, ACFM:	2,492	2,606	2,572	2,556
Stack Gas Flow Rate, SCFM:	2,371	2,432	2,408	2,404
Stack Gas Flow Rate, DSCF/HR:	138,113	141,837	140,427	140,126
Stack Gas Flow Rate, DSCFM:	2,302	2,364	2,340	2,335

Methanol Calculations:

Methanol Concentration, ug:	17675.0	22401.0	30563.0	23546.3
Grains Per DSCF:	5.17E-01	6.03E-01	8.97E-01	6.72E-01
LBS/DSCF:	7.38E-05	8.62E-05	1.28E-04	9.60E-05
LBS/HR:	10.195	12.227	17.992	13.471

STACK TEST GROUP, INC.
Air Quality Services

VOC, Toluene Sampling Train Calculations

Client: American Chemical Solutions
 Project No: 21-3399
 Date: 11/10/21
 Source: South Scrubber Exhaust Stack

Test No:	T1	T2	T3	Avg.
Start Time	10:30 AM	01:46 PM	04:07 PM	
Finish Time	11:30 AM	02:46 PM	05:07 PM	
Pitot Cal. Factor	0.84	0.84	0.84	
Meter Calibration Factor:	0.975	0.975	0.975	
Stack Length, inches:	0	0	0	
Stack Width, inches:	0	0	0	
Stack Diameter, inches:	23	23	23	
Barometric Pressure, inches Hg:	29.57	29.57	29.57	
Static Pressure in Stack, Inches H2O:	-0.08	-0.08	-0.08	
Duration of Sample, minutes:	60	60	60	
Meter Start Volume:	0.000	0.000	0.000	
Meter Final Volume:	0.583	0.649	0.636	
Average Meter Pressure, Inches H2O:	0.8000	0.8000	0.8000	0.8000
Average Meter Temperature, degrees F:	83.4	85.2	84.5	84.4
Average Sqrt. Velocity Pressure:	0.2483	0.2571	0.2542	0.2532
Stack Gas Temperature, degrees F:	88.3	99	97.1	94.8
% Carbon Dioxide:	0.1	0.1	0.1	0.1
% Oxygen:	20.9	20.9	20.9	20.9
% Carbon Monoxide:	0.0	0.0	0.0	0.0

Sample Train Calculations

Meter Volume, Actual:	0.583	0.649	0.636	0.623
Meter Volume, STP:	0.547	0.607	0.595	0.583
% Moisture:	2.90	2.80	2.80	2.83
Area of Stack, Square Feet:	2.89	2.89	2.89	2.89
Molecular Weight dry, lb/lb-Mole:	28.85	28.85	28.85	28.85
Molecular Weight wet, lb/lb-Mole:	28.54	28.55	28.55	28.54
Absolute Stack Gas Pressure, in Hg:	29.56	29.56	29.56	29.56

Velocity and Flow Calculations

Average Stack Gas Velocity FPS:	14.37	15.03	14.83	14.74
Stack Gas Flow Rate, ACFM:	2,492	2,606	2,572	2,556
Stack Gas Flow Rate, SCFM:	2,371	2,432	2,408	2,404
Stack Gas Flow Rate, DSCF/HR:	138,113	141,837	140,427	140,126
Stack Gas Flow Rate, DSCFM:	2,302	2,364	2,340	2,335

Toluene Calculations:

Toluene Concentration, ug:	1.7	1.7	1.7	1.7
Grains Per DSCF:	4.82E-05	4.32E-05	4.41E-05	4.52E-05
LBS/DSCF:	6.89E-09	6.18E-09	6.30E-09	6.46E-09
LBS/HR:	0.0010	0.0009	0.0009	0.0009

VOC Calculations:

PPM as Propane:	196.8	176.3	287.2	220.1
LBS/DSCF:	2.25E-05	2.01E-05	3.28E-05	2.51E-05
LBS/HR:	3.197	2.938	4.738	3.624

STACK TEST GROUP, INC.
Air Quality Services

Methanol Sampling Train Calculations

Client:	American Chemical Solutions
Project No:	21-3399
Date:	11/10/21
Source:	South Scrubber Exhaust Stack

Test No:	T1	T2	T3	Avg.
Start Time	10:30 AM	01:46 PM	04:07 PM	
Finish Time	11:30 AM	02:46 PM	05:07 PM	
Pitot Cal. Factor	0.84	0.84	0.84	
Meter Calibration Factor:	0.975	0.975	0.975	
Stack Length, inches:	0	0	0	
Stack Width, inches:	0	0	0	
Stack Diameter, inches:	23	23	23	
Barometric Pressure, inches Hg:	29.57	29.57	29.57	
Static Pressure in Stack, Inches H2O:	-0.08	-0.08	-0.08	
Duration of Sample, minutes:	60	60	60	
Meter Start Volume:	0.000	0.000	0.000	
Meter Final Volume:	0.563	0.613	0.563	
Average Meter Pressure, Inches H2O:	0.8000	0.8000	0.8000	0.8000
Average Meter Temperature, degrees F:	83.4	85.2	84.5	84.4
Average Sqrt. Velocity Pressure:	0.2483	0.2571	0.2542	0.2532
Stack Gas Temperature, degrees F:	88.3	99	97.1	94.8
% Carbon Dioxide:	0.1	0.1	0.1	0.1
% Oxygen:	20.9	20.9	20.9	20.9
% Carbon Monoxide:	0.0	0.0	0.0	0.0

Sample Train Calculations

Meter Volume, Actual:	0.563	0.613	0.563	0.579
Meter Volume, STP:	0.528	0.573	0.526	0.542
% Moisture:	2.90	2.80	2.80	2.83
Area of Stack, Square Feet:	2.89	2.89	2.89	2.89
Molecular Weight dry, lb/lb-Mole:	28.85	28.85	28.85	28.85
Molecular Weight wet, lb/lb-Mole:	28.54	28.55	28.55	28.54
Absolute Stack Gas Pressure, in Hg:	29.56	29.56	29.56	29.56

Velocity and Flow Calculations

Average Stack Gas Velocity FPS:	14.37	15.03	14.83	14.74
Stack Gas Flow Rate, ACFM:	2,492	2,606	2,572	2,556
Stack Gas Flow Rate, SCFM:	2,371	2,432	2,408	2,404
Stack Gas Flow Rate, DSCF/HR:	138,113	141,837	140,427	140,126
Stack Gas Flow Rate, DSCFM:	2,302	2,364	2,340	2,335

Methanol Calculations:

Methanol Concentration, ug:	11808.0	16058.0	24234.0	17366.7
Grains Per DSCF:	3.45E-01	4.32E-01	7.11E-01	4.96E-01
LBS/DSCF:	4.93E-05	6.18E-05	1.02E-04	7.09E-05
LBS/HR:	6.811	8.765	14.266	9.947

APPENDIX D
CALIBRATIONS

American Chemical Solutions
 VOC Calibration Data
 1000.0 11/10/21
 North Scubber

CALIBRATION GAS CONCENTRATIONS, ppm

	Zero	Mid-Range	High-Range	Low Range
0	0	505.9	916.0	307.4

System Bias Check
505.9

PRE-TEST ANALYZER CALIBRATION DATA AND ERROR

Test No.	Cal. Gas Cylinder Value (ppm)	Analyzer Calibration Response (ppm)	Absolute Difference (ppm)	Calibration Error Percent of Span
1	0.0	0.4	0.4	0.04
1	307.4	302.1	-5.3	-0.53
1	505.9	503.2	-2.7	-0.27
1	916.0	915.7	-0.3	-0.03
2	0.0	0.4	0.4	0.04
2	307.4	302.1	-5.3	-0.53
2	505.9	503.2	-2.7	-0.27
2	916.0	915.7	-0.3	-0.03
3	0.0	0.4	0.4	0.04
3	307.4	302.1	-5.3	-0.53
3	505.9	503.2	-2.7	-0.27
3	916.0	915.7	-0.3	-0.03

SYSTEM CALIBRATION BIAS AND DRIFT DATA

Test No.	Analyzer Calibration Response (ppm)	Initial System Calibration Response (ppm)	Initial Calibration Bias (% of Span)	Final System Calibration Response (ppm)	Final Calibration Bias (% of Span)	Gas Calibration Range	Calibration Drift (% of Span)
1	0.4	0.4	0.00	6.4	0.60	Zero	0.60
1	503.2	503.2	0.00	503.7	0.05	Mid	0.05
2	0.4	2.3	0.19	11.2	1.08	Zero	0.89
2	503.2	500.6	-0.26	510.7	0.75	Mid	1.01
3	0.4	1.0	0.06	4.3	0.39	Zero	0.33
3	503.2	513.7	1.05	514.3	1.11	Mid	0.06

American Chemical Solutions
 VOC Calibration Data
 11/10/21
 South Scubber

CALIBRATION GAS CONCENTRATIONS, ppm
 Zero Mid-Range High-Range Low Range
 0 505.9 916.0 307.4
 Syatem Bias Check
 505.9

PRE-TEST ANALYZER CALIBRATION DATA AND ERROR

Test No.	Cal. Gas Cylinder Value (ppm)	Analyzer Calibration Response (ppm)	Absolute Difference (ppm)	Calibration Error Percent of Span
1	0.0	0.5	0.5	0.05
1	307.4	307.0	-0.4	-0.04
1	505.9	505.3	-0.6	-0.06
1	916.0	916.2	0.2	0.02
2	0.0	0.5	0.5	0.05
2	307.4	307.0	-0.4	-0.04
2	505.9	505.3	-0.6	-0.06
2	916.0	916.2	0.2	0.02
3	0.0	0.5	0.5	0.05
3	307.4	307.0	-0.4	-0.04
3	505.9	505.3	-0.6	-0.06
3	916.0	916.2	0.2	0.02

SYSTEM CALIBRATION BIAS AND DRIFT DATA

Test No.	Analyzer Calibration Response (ppm)	Initial System Calibration Response (ppm)	Initial Calibration Bias (%of Span)	Final System Calibration Response (ppm)	Final Calibration Bias (%of Span)	Gas Calibration Range	Calibration Drift (% of Span)
1	0.5	0.5	0.00	6.2	0.57	Zero	0.57
1	505.3	505.3	0.00	520.5	1.52	Mid	1.52
2	0.5	0.4	-0.01	6.0	0.55	Zero	0.56
2	505.3	510.7	0.54	521.3	1.60	Mid	1.06
3	0.5	0.8	0.03	6.6	0.61	Zero	0.58
3	505.3	509.0	0.37	522.8	1.75	Mid	1.38

Pitot Tube Calibration Sheet

STG Project No. 21-3399
 Client: ACS
 Plant: Muskegon, MI
 Probe No. P-4C (S-Type)

Date Calibrated: 7/1/2021
 Calibrated By: M. Oleszko

External Tubing Diameter 0.375 inches
 Base To Opening Plane Distance(P_a) 0.522 inches
 Base To Opening Plane Distance(P_b) 0.522 inches
 Pitot Coefficient 0.84

	Measured	Allowable
P_a/D_t	1.389	1.05-1.50
P_b/D_t	1.389	1.05-1.50
Angle a1°	0.0	10.0
Angle a1°	0.0	10.0
Angle b1°	0.0	5.0
Angle b1°	0.0	5.0
z (inches)	0	0.125 in.
w(inches)	0.000	0.031 in.

Pyrometer Calibration Sheet

STG Project No. 21-3399
Client: ACS
Plant: Muskegon, MI
Probe No. P-4C (S-Type)

Date Calibrated: 7/1/2021
Temperature Scale Used: °F
Reference Used: Mercury Thermometer
Calibrated By: M. Oleszko

Calibration Reference Settings °F	Pyrometer Reading °F	Difference +/-
30	30	0
78	77	1
220	221	-1

APPENDIX E
LABORATORY REPORT

Stack Test Group, Inc.

1500 Boyce Memorial Drive
Ottawa, IL 61350

American Chemical

Client Project # 21.3399

Analytical Report
(1121-025)

EPA Method 18 (Adsorbents)

Methanol
Toluene



Enthalpy Analytical, LLC

Phone: (919) 850 - 4392 / Fax: (919) 850 - 9012 / www.enthalpy.com
800-1 Capitola Drive Durham, NC 27713-4385

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

- Have been checked for completeness
- Are accurate, error-free, and legible
- Have been conducted in accordance with approved protocol, and that all deviations and analytical problems are summarized in the appropriate narrative(s)

This analytical report was prepared in Portable Document Format (.PDF) and contains 395 pages.



Digitally signed by Alexa Cross

DN: dc=com, dc=montrose-
env, dc=meg, ou=meg,
ou=Sites, ou=053-Durham,
ou=Users, cn=Alexa Cross,
email=alexa.cross@enthalpy.c
om

Date: 2021.12.31 15:14:11
-05'00'

Report Issued: 12/31/21



Summary of Results



Enthalpy Analytical

Company: Stack Test Group

Job No.: 1121-025 - EPA Method 18 (SiGel Tubes)

Client No.: 21.3399 Site: American Chemical

Summary Table - Methanol

Sample ID	Catch Weight (ug)
North Scrubber Run 1	17,675
North Scrubber Run 2	22,401
North Scrubber Run 3	30,563

Sample ID	Adjusted Catch Weight (ug)
South Scrubber Run 1	11,808
South Scrubber Run 2	16,058
South Scrubber Run 3	24,234

Enthalpy Analytical

Company: Stack Test Group

Job No.: 1121-025 - EPA Method 18 (A747 Tubes)

Client No.: 21.3399 Site: Americal Chemical

Summary Table - Toluene

Sample ID	Catch Weight (ug)
North Scrubber Run 1	278
North Scrubber Run 2	244
North Scrubber Run 3	256
South Scrubber Run 1	1.71 ND
South Scrubber Run 2	1.71 ND
South Scrubber Run 3	1.71 ND
Blank	1.66 ND

Results



Enthalpy Analytical

Company: Stack Test Group

Job No.: 1121-025 - EPA Method 18 (SiGel Tubes)

Client No.: 21.3399 Site: American Chemical

Methanol

Sample ID	Filename #1	Filename #2	Filename #3	MDL	Curve Min	Curve Max	Ret Time (min)	Ret Time (min)	Ret Time (min)	%dif RT	Conc #1 (ug/mL)	Conc #2 (ug/mL)	Conc #3 (ug/mL)	%dif conc	Avg Conc (ug/mL)	DF	Liquid Vol (mL)	Catch Weight (ug)	Rec Eff (%)	Catch Weight (ug)	Flag
North Scrubber Run 1 SPK.Cond	032B0201.D	032B0202.D	032B0203.D	0.394	3.94	1,977	3.42	3.41	3.42	0.1	434	410	436	3.9	427	1	41.5	17,715	100	17,715	
North Scrubber Run 1 SPK.SG-FH	046B1701.D	046B1702.D	046B1703.D	0.394	3.94	1,977	3.41	3.41	3.41	0.0	169	172	172	1.1	171	1	5.00	857	100	857	
North Scrubber Run 1 SPK.SG-BH	040B1001.D	040B1002.D	040B1003.D	0.394	3.94	1,977	NA	NA	NA	NA	0.394	0.394	0.394	0.0	0.394	1	5.00	1.97	100	1.97	ND
																				18,572	
North Scrubber Run 1.Cond	014F0601.D	014F0602.D	014F0603.D	0.394	3.94	1,977	3.28	3.28	3.28	0.0	423	418	418	0.8	419	1	41.5	17,399	100	17,399	
North Scrubber Run 1.SG-FH	026F1901.D	026F1902.D	026F1903.D	0.394	3.94	1,977	3.28	3.28	3.28	0.0	32.8	33.4	33.8	1.6	33.3	1	5.00	167	100	167	
North Scrubber Run 1.SG-BH	020F1301.D	020F1302.D	020F1303.D	0.394	3.94	1,977	3.28	3.28	3.28	0.0	22.0	21.9	21.7	0.9	21.9	1	5.00	109	100	109	
																				17,675	
North Scrubber Run 2 SPK.Cond	034B0401.D	034B0402.D	034B0403.D	0.394	3.94	1,977	3.41	3.41	3.41	0.0	770	768	767	0.2	768	1	42.0	32,264	100	32,264	
North Scrubber Run 2 SPK.SG-FH	048B1901.D	048B1902.D	048B1903.D	0.394	3.94	1,977	3.41	3.41	3.41	0.0	193	194	206	4.2	197	1	5.00	987	100	987	
North Scrubber Run 2 SPK.SG-BH	041B1101.D	041B1102.D	041B1103.D	0.394	3.94	1,977	3.41	3.41	3.41	0.0	34.7	35.0	34.9	0.4	34.9	1	5.00	174	100	174	
																				33,426	
North Scrubber Run 2.Cond	015F0701.D	015F0702.D	015F0703.D	0.394	3.94	1,977	3.28	3.28	3.28	0.0	527	515	521	1.2	521	1	42.5	22,150	100	22,150	
North Scrubber Run 2.SG-FH	027F2001.D	027F2002.D	027F2003.D	0.394	3.94	1,977	3.28	3.28	3.28	0.0	51.2	49.9	49.5	2.0	50.2	1	5.00	251	100	251	
North Scrubber Run 2.SG-BH	021F1401.D	021F1402.D	021F1403.D	0.394	3.94	1,977	NA	NA	NA	NA	0.394	0.394	0.394	0.0	0.394	1	5.00	1.97	100	1.97	ND
																				22,401	
North Scrubber Run 3 SPK.Cond	035B0501.D	035B0502.D	035B0503.D	0.394	3.94	1,977	3.41	3.41	3.41	0.0	1,182	1,178	1,190	0.6	1,183	1	43.0	50,876	100	50,876	
North Scrubber Run 3 SPK.SG-FH	049B2001.D	049B2002.D	049B2003.D	0.394	3.94	1,977	3.41	3.41	3.41	0.0	263	281	260	4.9	268	1	5.00	1,341	100	1,341	
North Scrubber Run 3 SPK.SG-BH	042B1301.D	042B1302.D	042B1303.D	0.394	3.94	1,977	3.41	3.41	3.42	0.2	0.975	0.939	0.924	3.1	0.946	1	5.00	4.73	100	4.73	J
																				52,222	
North Scrubber Run 3.Cond	016F0801.D	016F0802.D	016F0803.D	0.394	3.94	1,977	3.28	3.28	3.28	0.0	716	736	716	1.8	723	1	42.0	30,357	100	30,357	
North Scrubber Run 3.SG-FH	028F2101.D	028F2102.D	028F2103.D	0.394	3.94	1,977	3.28	3.28	3.28	0.0	41.4	41.5	40.9	0.9	41.3	1	5.00	206	100	206	
North Scrubber Run 3.SG-BH	022F1501.D	022F1502.D	022F1503.D	0.394	3.94	1,977	NA	NA	NA	NA	0.394	0.394	0.394	0.0	0.394	1	5.00	1.97	100	1.97	ND
																				30,563	

Enthalpy Analytical

Company: Stack Test Group

Job No.: 1121-025 - EPA Method 18 (SiGel Tubes)

Client No.: 21.3399 Site: American Chemical

Methanol

Sample ID	Filename #1	Filename #2	Filename #3	MDL	Curve Min	Curve Max	Ret Time (min)	Ret Time (min)	Ret Time (min)	%dif RT	Conc #1 (ug/mL)	Conc #2 (ug/mL)	Conc #3 (ug/mL)	%dif conc	Avg Conc (ug/mL)	DF	Liquid Vol (mL)	Catch Weight (ug)	Rec Eff (%)	Catch Weight (ug)	Flag
South Scrubber Run 1 SPK.Cond	036B0601.D	036B0602.D	036B0603.D	0.394	3.94	1,977	3.42	3.42	3.42	0.0	278	276	276	0.5	277	1	42.0	11,618	100	11,618	
South Scrubber Run 1 SPK.SG-FH	050B2101.D	050B2102.D	050B2103.D	0.394	3.94	1,977	3.41	3.41	3.41	0.0	189	197	187	3.0	191	1	5.00	955	100	955	
South Scrubber Run 1 SPK.SG-BH	043B1401.D	043B1402.D	043B1403.D	0.394	3.94	1,977	NA	NA	NA	NA	0.394	0.394	0.394	0.0	0.394	1	5.00	1.97	100	1.97	ND
																				12,573	
South Scrubber Run 1.Cond	017F0901.D	017F0902.D	017F0903.D	0.394	3.94	1,977	3.28	3.28	3.28	0.0	232	229	232	0.9	231	1	43.0	9,933	85.8	11,577	
South Scrubber Run 1.SG-FH	029F2201.D	029F2202.D	029F2203.D	0.394	3.94	1,977	3.28	3.28	3.28	0.0	24.6	25.3	25.0	1.3	25.0	1	5.00	125	85.8	146	
South Scrubber Run 1.SG-BH	023F1601.D	023F1602.D	023F1603.D	0.394	3.94	1,977	3.28	3.28	3.28	0.0	14.3	14.9	14.8	2.7	14.7	1	5.00	73.3	85.8	85.4	
																				11,808	
South Scrubber Run 2 SPK.Cond	038B0801.D	038B0802.D	038B0803.D	0.394	3.94	1,977	3.42	3.42	3.41	0.0	452	441	439	1.7	444	1	42.0	18,642	100	18,642	
South Scrubber Run 2 SPK.SG-FH	052B2401.D	052B2402.D	052B2403.D	0.394	3.94	1,977	3.41	3.41	3.41	0.0	174	175	173	0.6	174	1	5.00	871	100	871	
South Scrubber Run 2 SPK.SG-BH	044B1501.D	044B1502.D	044B1503.D	0.394	3.94	1,977	3.41	3.41	3.41	0.0	13.8	13.9	13.9	0.7	13.9	1	5.00	69.3	100	69.3	
																				19,582	
South Scrubber Run 2.Cond	018F1001.D	018F1002.D	018F1003.D	0.394	3.94	1,977	3.28	3.28	3.28	0.0	321	331	321	2.0	324	1	42.0	13,617	85.8	15,871	
South Scrubber Run 2.SG-FH	030F2401.D	030F2402.D	030F2403.D	0.394	3.94	1,977	3.28	3.28	3.28	0.0	32.3	31.7	32.2	1.1	32.1	1	5.00	160	85.8	187	
South Scrubber Run 2.SG-BH	024F1701.D	024F1702.D	024F1703.D	0.394	3.94	1,977	NA	NA	NA	NA	0.394	0.394	0.394	0.0	0.394	1	5.00	1.97	85.8	2.30	ND
																				16,058	
South Scrubber Run 3 SPK.Cond	039B0901.D	039B0902.D	039B0903.D	0.394	3.94	1,977	3.41	3.42	3.41	0.0	659	682	677	2.0	672	1	42.5	28,574	100	28,574	
South Scrubber Run 3 SPK.SG-FH	053B2501.D	053B2502.D	053B2503.D	0.394	3.94	1,977	3.41	3.41	3.41	0.0	209	210	201	2.8	207	1	5.00	1,033	100	1,033	
South Scrubber Run 3 SPK.SG-BH	045B1601.D	045B1602.D	045B1603.D	0.394	3.94	1,977	3.41	3.42	3.41	0.0	1.98	1.95	1.98	0.9	1.97	1	5.00	9.86	100	9.86	J
																				29,617	
South Scrubber Run 3.Cond	019F1101.D	019F1102.D	019F1103.D	0.394	3.94	1,977	3.28	3.28	3.28	0.0	489	479	485	1.2	484	1	42.5	20,583	85.8	23,989	
South Scrubber Run 3.SG-FH	031F2501.D	031F2502.D	031F2503.D	0.394	3.94	1,977	3.28	3.28	3.28	0.1	43.0	39.8	43.2	5.1	42.0	1	5.00	210	85.8	245	
South Scrubber Run 3.SG-BH	025F1801.D	025F1802.D	025F1803.D	0.394	3.94	1,977	NA	NA	NA	NA	0.394	0.394	0.394	0.0	0.394	1	5.00	1.97	85.8	2.30	ND
																				24,234	

Enthalpy Analytical

Company: Stack Test Group

Job No.: 1121-025 - EPA Method 18 (SiGel Tubes)

Client No.: 21.3399 Site: American Chemical

Spike and Recovery Calculations

Analyte: Methanol

	Spike Amount		"ND"	Catch (ug)	Sample Volume	Recovery (%)
North Scrubber Run 1	5,034	Spiked Train		18,572	14.14	139%
		Un-spiked Train		17,675	21.56	
North Scrubber Run 2	5,034	Spiked Train		33,426	20.83	88.3%
		Un-spiked Train		22,401	16.10	
North Scrubber Run 3	5,034	Spiked Train		52,222	20.42	172%
		Un-spiked Train		30,563	14.33	
Average Recovery						133%

Analyte: Methanol

	Spike Amount		"ND"	Catch (ug)	Sample Volume	Recovery (%)
South Scrubber Run 1	5,034	Spiked Train		12,573	12.09	97.2%
		Un-spiked Train		10,131	15.95	
South Scrubber Run 2	5,034	Spiked Train		19,582	19.28	84.9%
		Un-spiked Train		13,778	17.35	
South Scrubber Run 3	5,034	Spiked Train		29,617	19.79	75.2%
		Un-spiked Train		20,793	15.93	
Average Recovery						85.8%

Enthalpy Analytical

Company: Stack Test Group

Job No.: 1121-025 - EPA Method 18 (SiGel Tubes)

Client No.: 21.3399 Site: American Chemical

QC Samples

QC Type	QC Sample Name		Methanol
Spiked Blank Solvent	GCPREP4462 #LCS-AQ	catch (ug)	4,508
	spiked:	spike (ug)	4,508
	Spikeprep1580.SP * 300uL	recovery	100%
Spiked Blank Tube	GCPREP4462 #LCS-SG	catch (ug)	484
	spiked:	spike (ug)	526
	Spikeprep1580.SP * 35uL	recovery	92.1%
Lab Dup	N-R1-SPK-LD.COND	ug/mL	418
	N-R1-SPK.COND	ug/mL	427
		RD	2.2%
Lab Dup	S-R1-SPK-LD.COND	ug/mL	275
	S-R1-SPK.COND	ug/mL	277
		RD	0.7%
Lab Dup	N-R1-SPK-LD.SGFH	ug/mL	181
	N-R1-SPK.SGFH	ug/mL	171
		RD	5.6%
Lab Dup	S-R1-SPK-LD.SGFH	ug/mL	196
	S-R1-SPK.SGFH	ug/mL	191
		RD	2.4%
Blank Solvent	GCPREP4462 #AQ-MB	ug/mL	ND
Blank Media	GCPREP4462 #SG-MB	ug/mL	ND

Enthalpy Analytical

Company: Stack Test Group

Job No.: 1121-025 - EPA Method 18 (A747 Tubes)

Client No.: 21.3399 Site: Americal Chemical

Toluene

Sample ID	Filename #1	Filename #2	Filename #3	MDL	Curve Min	Curve Max	Ret Time (min)	Ret Time (min)	Ret Time (min)	%dif RT	Conc #1 (ug/mL)	Conc #2 (ug/mL)	Conc #3 (ug/mL)	%dif conc	Avg Conc (ug/mL)	DF	Liquid Vol (mL)	Catch Weight (ug)	Rec Eff (%)	Catch Weight (ug)	Flag
North Scrubber Run 1.A747-FH	079F0501.D	079F0502.D	079F0503.D	0.333	2.59	1,038	1.18	1.18	1.18	0.0	49.8	49.7	49.5	0.4	49.7	1	5.00	248	89.4	278	
North Scrubber Run 1.A747-BH	080F0601.D	080F0602.D	080F0603.D	0.333	2.59	1,038	NA	NA	NA	NA	0.333	0.333	0.333	0.0	0.333	1	5.00	1.66	89.4	1.86	ND
																				278	
North Scrubber Run 1 SPK.A747-FH	094F2001.D	094F2002.D	094F2003.D	0.333	2.59	1,038	1.18	1.18	1.18	0.0	74.5	74.6	74.4	0.2	74.5	1	5.00	372	100	372	
North Scrubber Run 1 SPK.A747-BH	096F2201.D	096F2202.D	096F2203.D	0.333	2.59	1,038	NA	NA	NA	NA	0.333	0.333	0.333	0.0	0.333	1	5.00	1.66	100	1.66	ND
																				372	
North Scrubber Run 2.A747-FH	081F0701.D	081F0702.D	081F0703.D	0.333	2.59	1,038	1.18	1.18	1.18	0.0	43.8	43.8	43.5	0.4	43.7	1	5.00	218	89.4	244	
North Scrubber Run 2.A747-BH	082F0801.D	082F0802.D	082F0803.D	0.333	2.59	1,038	NA	NA	NA	NA	0.333	0.333	0.333	0.0	0.333	1	5.00	1.66	89.4	1.86	ND
																				244	
North Scrubber Run 2 SPK.A747-FH	097F2301.D	097F2302.D	097F2303.D	0.333	2.59	1,038	1.18	1.18	1.18	0.0	52.1	53.0	52.5	0.8	52.5	1	5.00	263	100	263	
North Scrubber Run 2 SPK.A747-BH	099F2501.D	099F2502.D	099F2503.D	0.333	2.59	1,038	NA	NA	NA	NA	0.333	0.333	0.333	0.0	0.333	1	5.00	1.66	100	1.66	ND
																				263	
North Scrubber Run 3.A747 - FH	083F0901.D	083F0902.D	083F0903.D	0.333	2.59	1,038	1.18	1.18	1.18	0.0	46.0	45.6	45.9	0.6	45.8	1	5.00	229	89.4	256	
North Scrubber Run 3.A747 - BH	084F1001.D	084F1002.D	084F1003.D	0.333	2.59	1,038	NA	NA	NA	NA	0.333	0.333	0.333	0.0	0.333	1	5.00	1.66	89.4	1.86	ND
																				256	
North Scrubber Run 3 SPK.A747	100F2601.D	100F2602.D	100F2603.D	0.333	2.59	1,038	1.18	1.18	1.18	0.1	47.6	47.7	47.5	0.2	47.6	1	5.00	238	100	238	

Enthalpy Analytical

Company: Stack Test Group

Job No.: 1121-025 - EPA Method 18 (A747 Tubes)

Client No.: 21.3399 Site: Americal Chemical

Toluene

Sample ID	Filename #1	Filename #2	Filename #3	MDL	Curve Min	Curve Max	Ret Time (min)	Ret Time (min)	Ret Time (min)	%dif RT	Conc #1 (ug/mL)	Conc #2 (ug/mL)	Conc #3 (ug/mL)	%dif conc	Avg Conc (ug/mL)	DF	Liquid Vol (mL)	Catch Weight (ug)	Rec Eff (%)	Catch Weight (ug)	Flag
South Scrubber Run 1.A747-FH	085F1101.D	085F1102.D	085F1103.D	0.333	2.59	1,038	NA	NA	NA	NA	0.333	0.333	0.333	0.0	0.333	1	5.00	1.66	97.5	1.71	ND
South Scrubber Run 1.A747-BH	086F1201.D	086F1202.D	086F1203.D	0.333	2.59	1,038	NA	NA	NA	NA	0.333	0.333	0.333	0.0	0.333	1	5.00	1.66	97.5	1.71	ND
																				1.71	ND
South Scrubber Run 1 SPK.A747-FH	002F2701.D	002F2702.D	002F2703.D	0.333	2.59	1,038	1.18	1.18	1.18	0.1	21.2	21.0	21.1	0.4	21.1	1	5.00	105	100	105	
South Scrubber Run 1 SPK.A747-BH	004F2901.D	004F2902.D	004F2903.D	0.333	2.59	1,038	NA	NA	NA	NA	0.333	0.333	0.333	0.0	0.333	1	5.00	1.66	100	1.66	ND
																				105	
South Scrubber Run 2.A747-FH	088F1401.D	088F1402.D	088F1403.D	0.333	2.59	1,038	NA	NA	NA	NA	0.333	0.333	0.333	0.0	0.333	1	5.00	1.66	97.5	1.71	ND
South Scrubber Run 2.A747-BH	089F1501.D	089F1502.D	089F1503.D	0.333	2.59	1,038	NA	NA	NA	NA	0.333	0.333	0.333	0.0	0.333	1	5.00	1.66	97.5	1.71	ND
																				1.71	ND
South Scrubber Run 2 SPK.A747-FH	005F3001.D	005F3002.D	005F3003.D	0.333	2.59	1,038	1.18	1.18	1.18	0.1	20.7	21.2	21.3	1.7	21.1	1	5.00	105	100	105	
South Scrubber Run 2 SPK.A747-BH	006F3101.D	006F3102.D	006F3103.D	0.333	2.59	1,038	NA	NA	NA	NA	0.333	0.333	0.333	0.0	0.333	1	5.00	1.66	100	1.66	ND
																				105	
South Scrubber Run 3.A747-FH	090F1601.D	090F1602.D	090F1603.D	0.333	2.59	1,038	NA	NA	NA	NA	0.333	0.333	0.333	0.0	0.333	1	5.00	1.66	97.5	1.71	ND
South Scrubber Run 3.A747-BH	091F1701.D	091F1702.D	091F1703.D	0.333	2.59	1,038	NA	NA	NA	NA	0.333	0.333	0.333	0.0	0.333	1	5.00	1.66	97.5	1.71	ND
																				1.71	ND
South Scrubber Run 3 SPK.A747-FH	007F3201.D	007F3202.D	007F3203.D	0.333	2.59	1,038	1.18	1.18	1.18	0.0	21.2	21.0	21.0	0.8	21.1	1	5.00	105	100	105	
South Scrubber Run 3 SPK.A747-BH	008F3301.D	008F3302.D	008F3303.D	0.333	2.59	1,038	NA	NA	NA	NA	0.333	0.333	0.333	0.0	0.333	1	5.00	1.66	100	1.66	ND
																				105	
Blank	078F0401.D	078F0402.D	078F0403.D	0.333	2.59	1,038	NA	NA	NA	NA	0.333	0.333	0.333	0.0	0.333	1	5.00	1.66	100	1.66	ND

Enthalpy Analytical

Company: Stack Test Group

Job No.: 1121-025 - EPA Method 18 (A747 Tubes)

Client No.: 21.3399 Site: Americal Chemical

Spike and Recovery Calculations

Analyte: Toluene

	Spike Amount		"ND"	Catch (ug)	Sample Volume	Recovery (%)
North Scrubber Run 1	54.1	Spiked Train		372	22.31	130%
		Un-spiked Train		248	18.34	

	Spike Amount		"ND"	Catch (ug)	Sample Volume	Recovery (%)
North Scrubber Run 2	54.1	Spiked Train		263	17.33	81.2%
		Un-spiked Train		218	17.30	

	Spike Amount		"ND"	Catch (ug)	Sample Volume	Recovery (%)
North Scrubber Run 3	54.1	Spiked Train		238	14.42	57.1%
		Un-spiked Train		229	15.94	

Average Recovery

89.4%

Analyte: Toluene

	Spike Amount		"ND"	Catch (ug)	Sample Volume	Recovery (%)
South Scrubber Run 1	108	Spiked Train		105	17.04	97.5%
		Un-spiked Train	ND	1.66	16.52	

	Spike Amount		"ND"	Catch (ug)	Sample Volume	Recovery (%)
South Scrubber Run 2	108	Spiked Train		105	14.79	97.5%
		Un-spiked Train	ND	1.66	18.39	

	Spike Amount		"ND"	Catch (ug)	Sample Volume	Recovery (%)
South Scrubber Run 3	108	Spiked Train		105	14.26	97.5%
		Un-spiked Train	ND	1.66	18.00	

Average Recovery

97.5%

Enthalpy Analytical

Company: Stack Test Group

Job No.: 1121-025 - EPA Method 18 (A747 Tubes)

Client No.: 21.3399 Site: Americal Chemical

QC Samples

QC Type	QC Sample Name		Toluene
Spiked Blank Tube	gcprep4462 #LCS-Low	catch (ug)	52.5
	spiked:	spike (ug)	54.1
	Spikeprep1581.SP * 25uL	recovery	97.1%
Spiked Blank Tube	gcprep4462 #LCS-High	catch (ug)	104
	spiked:	spike (ug)	108
	Spikeprep1581.Sp * 50uL	recovery	96.0%
Lab Dup	N-R1-SPK-LD.747FH	ug/mL	75.1
	N-R1-SPK.747FH	ug/mL	74.5
		RD	0.8%
Lab Dup	S-R1-SPK-LD.747FH	ug/mL	21.2
	S-R1-SPK.747FH	ug/mL	21.1
		RD	0.4%
Blank Media	gcprep4462 #MB-Tube	ug/mL	ND

Narrative Summary



Enthalpy Analytical Narrative Summary

Company	Stack Test Group
Job #	1121-025 - EPA Method 18 (Silica Gel)
Client #	21.3399 Site: American Chemical

Custody Alyssa Miller received the samples on 11/23/21 at 1.0°C after being relinquished by Stack Test Group. The samples were received in good condition.

Prior to, during, and after analysis, the samples were kept under lock with access only to authorized personnel by Enthalpy Analytical, LLC.

Analysis The samples were analyzed for methanol using the analytical procedures in EPA Method 18, Measurement of Gaseous Organic Compound Emissions by Gas Chromatography (40 CFR Part 60, Appendix A).

The standards and samples were analyzed following the procedures specified in section 8.2.4, Adsorption Tube Procedure.

Each sample train consisted of one condensate and two SKC silica gel (Cat# 226-10-03) tubes, the only exception being Run 1 which had one SKC silica gel tube.

The tubes were desorbed in two fractions: the front half (FH) consisting of the whole first tube combined with the front section of the second tube in series and the back half (BH) consisting of the rear section of the second tube. The *Run 1* tubes were desorbed in two fractions: front half (FH) and back half (BH). All fractions were desorbed using 5 mL of a solvent and were shaken. The tubes were desorbed on 11/23/21.

The Gas Chromatograph ("Disco Stu") was equipped with Flame Ionization Detectors for these analyses.

Calibration The calibration curves are located in the back of this report. For each calibration curve used, the first page of the curve contains all method specific parameters (i.e., curve type, origin, weight, etc.) used to quantify the samples. The calibration curve section also includes a table with the Retention Time (RetTime), Level (Lvl), Amount (corresponding units), Area, Response Factor (Amt/Area) and the analyte Name. The calibration table is used to identify (by retention time) and quantify each target compound.

Chromatographic Conditions A copy of the acquisition method (DISCO_STU_P407.M) may be made available upon request.



Enthalpy Analytical Narrative Summary (continued)

QC Notes

Methanol was not identified at levels greater than their detection limit in the analysis of the laboratory method blank.

Laboratory Duplicates (LD) were analyzed using aliquots of samples *North Scrubber Run 1 Spike.Cond*, *South Scrubber Run 1 Spike.Cond*, *North Scrubber Run 1 Spike.SG-FH*, and *South Scrubber Run 1 Spike.SG-FH*. The original and duplicate analyses differed by 5.6% or less.

As required by section 8.4.3, Recovery Study for Adsorption Tube Sampling, a recovery study is performed for the compounds of interest during the field test.

The laboratory prepared 12 aqueous spikes containing 4,508 µg/mL of methanol and 12 tube spikes containing 526 µg of methanol. Ten (of each) of the spikes were provided to the client prior to sample collection while two were retained by the lab to be used as a Laboratory Control Samples (LCS).

The train collection efficiency (R) was calculated using equations 18-7, 18-8, and 18-9 in EPA Method 18. The recovery efficiency values met the method-required limits of 70% - 130% for the South Scrubber. However, the North scrubber did not pass. The reported results for the South Scrubber have been adjusted using the average recovery efficiency value. The North scrubber results are being reported as measured.

One of the retained aqueous LCS vials was analyzed with the samples, yielding a percent recovery value of 100%.

One of the retained tube LCS vials was analyzed with the samples, yielding a percent recovery value of 92%.

Reporting Notes

These analyses met the requirements of the TNI Standard. Any deviations from the requirements of the reference method or TNI Standard have been stated above.

The results presented in this report are representative of the samples as provided to the laboratory.



Enthalpy Analytical Narrative Summary

Company	Stack Test Group
Job #	1121-025 - EPA Method 18 (Silica Gel)
Client #	21.3399 Site: American Chemical

Custody Alyssa Miller received the samples on 11/23/21 at 1.0°C after being relinquished by Stack Test Group. The samples were received in good condition.

Prior to, during, and after analysis, the samples were kept under lock with access only to authorized personnel by Enthalpy Analytical, LLC.

Analysis The samples were analyzed for toluene using the analytical procedures in EPA Method 18, Measurement of Gaseous Organic Compound Emissions by Gas Chromatography (40 CFR Part 60, Appendix A).

The standards and samples were analyzed following the procedures specified in section 8.2.4, Adsorption Tube Procedure.

Each sample train consisted of two SKC anasorb 747 (Cat# 226-84) tubes.

The tubes were desorbed in two fractions: front half (FH) and back half (BH). All fractions were desorbed using 5 mL of a solvent and were shaken. The tubes were desorbed on 11/23/21.

The back-half portion of sample North Scrubber Run 3 Spike was missing upon receipt. The tubes for samples *North Scrubber Run 3*, *North Scrubber Run 3 Spike*, *North Scrubber Run 2*, and *South Scrubber Run 3* were received wet.

The Gas Chromatograph ("Lucy") was equipped with Flame Ionization Detectors for these analyses.

Calibration The calibration curve is located in the back of this report. For each calibration curve used, the first page of the curve contains all method specific parameters (i.e., curve type, origin, weight, etc.) used to quantify the samples. The calibration curve section also includes a table with the Retention Time (RetTime), Level (Lvl), Amount (corresponding units), Area, Response Factor (Amt/Area) and the analyte Name. The calibration table is used to identify (by retention time) and quantify each target compound.



Enthalpy Analytical Narrative Summary (continued)

Chromatographic Conditions A copy of the acquisition method (LUCY0301.M) may be made available upon request.

QC Notes Toluene was not identified at levels greater than their detection limit in the analyses of the client's blank or laboratory method blank.

Laboratory Duplicates (LD) were analyzed using aliquots of samples *North Scrubber Run 1 Spike.A747-FH*, and *South Scrubber Run 1 Spike.A747-FH*. The original and duplicate analyses differed by 0.8% or less.

As required by section 8.4.3, Recovery Study for Adsorption Tube Sampling, a recovery study is performed for the compounds of interest during the field test.

The laboratory prepared seven tube spikes containing 54.14 µg of toluene and seven tube spikes containing 108 µg of tube spikes. Five (of each) of the spikes were provided to the client prior to sample collection while two were retained by the lab to be used as a Laboratory Control Samples (LCS).

The train collection efficiency (R) was calculated using equations 18-7, 18-8, and 18-9 in EPA Method 18. The recovery efficiency values met the method-required limits of 70% - 130% for both sources. The results have been adjusted using the average recovery efficiency values for the corresponding source.

One of each of the retained tube LCS vials were analyzed with the samples. They yielded percent recovery values of 97% and 96%.

Reporting Notes These analyses met the requirements of the TNI Standard. Any deviations from the requirements of the reference method or TNI Standard have been stated above.

The results presented in this report are representative of the samples as provided to the laboratory.



General Reporting Notes

The following are general reporting notes that are applicable to all Enthalpy Analytical, LLC data reports, unless specifically noted otherwise.

- Any analysis which refers to the method as “*Type*” represents a planned deviation from the reference method. For instance a Hydrogen Sulfide assay from a Tedlar bag would be labeled as “EPA Method 16-*Type*” because Tedlar bags are not mentioned as one of the collection options in EPA Method 16.
- The acronym *MDL* represents the Minimum Detection Limit. Below this value the laboratory cannot determine the presence of the analyte of interest reliably.
- The acronym *LOQ* represents the Limit of Quantification. Below this value the laboratory cannot quantitate the analyte of interest within the criteria of the method.
- The acronym *ND* following a value indicates a non-detect or analytical result below the MDL.
- The letter *J* in the Qualifier or Flag column in the results indicates that the value is between the MDL and the LOQ. The laboratory can positively identify the analyte of interest as present, but the value should be considered an estimate.
- The letter *E* in the Qualifier or Flag column indicates an analytical result exceeding 100% of the highest calibration point. The associated value should be considered as an estimate.
- Sample results are presented ‘as measured’ for single injection methodologies, or an average value if multiple injections are made. If all injections are below the MDL, the sample is considered non-detect and the ND value is presented. If one, but not all, are below the MDL, the MDL value is used for any injections that are below the MDL. For example, if the MDL is 0.500 and LOQ is 1.00, and the instrument measures 0.355, 0.620, and 0.442 - the result reported is the average of 0.500, 0.620, and 0.500 - - - i.e. 0.540 with a J flag.
- When a spike recovery (Bag Spike, Collocated Spike Train, or liquid matrix spike) is being calculated, the native (unspiked) sample result is used in the calculations, as long as the value is above the MDL. If a sample is ND, then 0 is used as the native amount (not the MDL value).
- The acronym *DF* represents Dilution Factor. This number represents dilution of the sample during the preparation and/or analysis process. The analytical result taken from a laboratory instrument is multiplied by the DF to determine the final undiluted sample results.
- The addition of *MS* to the Sample ID represents a Matrix Spike. An aliquot of an actual sample is spiked with a known amount of analyte so that a percent recovery value can be determined. The MS analysis indicates what effect the sample matrix may have on the target analyte, i.e. whether or not anything in the sample matrix interferes with the analysis of the analyte(s).



General Reporting Notes (continued)

- The addition of **MSD** to the Sample ID represents a Matrix Spike Duplicate. Prepared in the same manner as a MS, the use of duplicate matrix spikes allows further confirmation of laboratory quality by showing the consistency of results gained by performing the same steps multiple times.
- The addition of **LD** to the Sample ID represents a Laboratory Duplicate. The analyst prepares an additional aliquot of sample for testing and the results of the duplicate analysis are compared to the initial result. The result should have a difference value of within 10% of the initial result (if the results of the original analysis are greater than the LOQ).
- The addition of **AD** to the Sample ID represents an Alternate Dilution. The analyst prepares an additional aliquot at a different dilution factor (usually double the initial factor). This analysis helps confirm that no additional compound is present and coeluting or sharing absorbance with the analyte of interest, as they would have a different response/absorbance than the analyte of interest.
- The Sample ID **LCS** represents a Laboratory Control Sample. Clean matrix, similar to the client sample matrix, prepared and analyzed by the laboratory using the same reagents, spiking standards and procedures used for the client samples. The LCS is used to assess the control of the laboratory's analytical system. Whenever spikes are prepared for our client projects, two spikes are retained as LCSs. The LCSs are labeled with the associated project number and kept in-house at the appropriate temperature conditions. When the project samples are received for analysis, the LCSs are analyzed to confirm that the analyte could be recovered from the media, separate from the samples which were used on the project and which may have been affected by source matrix, sample collection, and/or sample transport.
- **Significant Figures:** Where the reported value is much greater than unity (1.00) in the units expressed, the number is rounded to a whole number of units, rather than to 3 significant figures. For example, a value of 10,456.45 ug catch is rounded to 10,456 ug. There are five significant digits displayed, but no confidence should be placed on more than two significant digits. In the case of small numbers, generally 3 significant figures are presented, but still only 2 should be used with confidence. Many neat materials are only certified to 3 digits, and as the mathematically correct final result is always 1 digit less than all its pre-cursors - 2 significant figures are what are most defensible.
- **Manual Integration:** The data systems used for processing will flag manually integrated peaks with an "M". There are several reasons a peak may be manually integrated. These reasons will be identified by the following two letter designations on sample chromatograms, if provided in the report. The peak was *not integrated* by the software "NI", the peak was *integrated incorrectly* by the software "II" or the *wrong peak* was integrated by the software "WP". These codes will accompany the analyst's manual integration stamp placed next to the compound name on the chromatogram.



Sample Custody



CHAIN OF CUSTODY RECORD

Project Name: American Chemical
 Project No.: 21.3399
 Sampling Date(s): 11/10/21
 Laboratory: Enthalpy
 Shipping Date(s): 11/22/21
 Shipper's Name: Fed Ex

Project Manager: Mike Oleszko
 TRC Office: Ottawa
 Phone No.: (815)433-0545
 PM Email: MikeO@stacktestgroup.com

Sample Code	Sampled Date	Container		MATRIX	Description	ANALYSIS	Box No.	Comments
		Size	G/P					
North Scrubber R1	11/10/21	40ml	Glass	Air	Spiked side Imp Solution	Methanol		Method 18
North Scrubber R1	11/10/21	Tube	Glass	Air	Spiked Side Tube A #9131402533	Methanol		Method 18
North Scrubber R1	11/10/21	Tube	Glass	Air	Spiked Side Tube B #9131403017	Methanol		Method 18
North Scrubber R1	11/10/21	40ml	Glass	Air	Unspiked side Imp Solution	Methanol		Method 18
North Scrubber R1	11/10/21	Tube	Glass	Air	Unspiked Side Tube A #9131402851	Methanol		Method 18
North Scrubber R2	11/10/21	40ml	Glass	Air	Spiked side Imp Solution	Methanol		Method 18
North Scrubber R2	11/10/21	Tube	Glass	Air	Spiked Side Tube A #9131402528	Methanol		Method 18
North Scrubber R2	11/10/21	Tube	Glass	Air	Spiked Side Tube B #9131402846	Methanol		Method 18
North Scrubber R2	11/10/21	40ml	Glass	Air	Unspiked side Imp Solution	Methanol		Method 18
North Scrubber R2	11/10/21	Tube	Glass	Air	Unspiked Side Tube A #9131402855	Methanol		Method 18
North Scrubber R2	11/10/21	Tube	Glass	Air	Unspiked Side Tube B #9131402857	Methanol		Method 18
North Scrubber R3	11/10/21	40ml	Glass	Air	Spiked side Imp Solution	Methanol		Method 18
North Scrubber R3	11/10/21	Tube	Glass	Air	Spiked Side Tube A #9131402529	Methanol		Method 18
North Scrubber R3	11/10/21	Tube	Glass	Air	Spiked Side Tube B #9131402853	Methanol		Method 18
North Scrubber R3	11/10/21	40ml	Glass	Air	Unspiked side Imp Solution	Methanol		Method 18
North Scrubber R3	11/10/21	Tube	Glass	Air	Unspiked Side Tube A #9131403012	Methanol		Method 18
North Scrubber R3	11/10/21	Tube	Glass	Air	Unspiked Side Tube B #9131403015	Methanol		Method 18

Relinquished by: [Signature] Date/Time: 11/22/21 @ 1530 Relinquished by: [Signature] ^{RCD} 11-23-21 1020

1.0°C Baytek 2, good condition Amms 11.23.21

CHAIN OF CUSTODY RECORD

Project Name: American Chemical
Project No.: 21.3399
Sampling Date(s): 11/10/21
Shipping Date(s): Shipping Day
Shipper's Name: Fed Ex

Project Manager: Mike Oleszko
TRC Office: Ottawa
Phone No.: (815)433-0545
PM Email: MikeO@stacktestgroup.com

Sample Code	Sampled Date	Container		MATRIX	Description	ANALYSIS	Box No.	Comments
		Size	G/P					
South Scrubber R1	11/10/21	40ml	Glass	Air	Spiked side Imp Solution	Methanol		Method 18
South Scrubber R1	11/10/21	Tube	Glass	Air	Spiked Side Tube A #9131402536	Methanol		Method 18
South Scrubber R1	11/10/21	Tube	Glass	Air	Spiked Side Tube B #9131403010	Methanol		Method 18
South Scrubber R1	11/10/21	40ml	Glass	Air	Unspiked side Imp Solution	Methanol		Method 18
South Scrubber R1	11/10/21	Tube	Glass	Air	Unspiked Side Tube A #9131402854	Methanol		Method 18
South Scrubber R2	11/10/21	40ml	Glass	Air	Spiked side Imp Solution	Methanol		Method 18
South Scrubber R2	11/10/21	Tube	Glass	Air	Spiked Side Tube A #9131402535	Methanol		Method 18
South Scrubber R2	11/10/21	Tube	Glass	Air	Spiked Side Tube B #9131402852	Methanol		Method 18
South Scrubber R2	11/10/21	40ml	Glass	Air	Unspiked side Imp Solution	Methanol		Method 18
South Scrubber R2	11/10/21	Tube	Glass	Air	Unspiked Side Tube A #9131403014	Methanol		Method 18
South Scrubber R2	11/10/21	Tube	Glass	Air	Unspiked Side Tube B #9131403016	Methanol		Method 18
South Scrubber R3	11/10/21	40ml	Glass	Air	Spiked side Imp Solution	Methanol		Method 18
South Scrubber R3	11/10/21	Tube	Glass	Air	Spiked Side Tube A #9131402569	Methanol		Method 18
South Scrubber R3	11/10/21	Tube	Glass	Air	Spiked Side Tube B #9131403011	Methanol		Method 18
South Scrubber R3	11/10/21	40ml	Glass	Air	Unspiked side Imp Solution	Methanol		Method 18
South Scrubber R3	11/10/21	Tube	Glass	Air	Unspiked Side Tube A #9131402848	Methanol		Method 18
South Scrubber R3	11/10/21	Tube	Glass	Air	Unspiked Side Tube B #9131402850	Methanol		Method 18

Relinquished by: MLC Date/Time: 11/22/21 @ 1500 Relinquished by:

Received by: Amy M. Miller Date/Time: 11-23-21 1030 Received by:

Remarks (*):
1.0°C Raytek 2, good condition Amm³ 11-23-21

CHAIN OF CUSTODY RECORD

Project Name: American Chemical
 Project No.: 21.3399
 Sampling Date(s): 11/10/21
 Laboratory: Enthalpy
 Shipping Date(s): 11/22/21
 Shipper's Name: Fed Ex

Project Manager: Mike Oleszko
 Office: Ottawa
 Phone No.: (815)433-0545
 PM Email: MikeO@stacktestgroup.com

Sample Code	Sampled Date	Container		MATRIX	Description	ANALYSIS	Box No.	Comments
		Size	G/P					
North Scrubber R1	11/10/21	Tube	Glass	Air	Spiked Tube#992800062	Toluene		Method 18
North Scrubber R1	11/10/21	Tube	Glass	Air	Unspiked Tube#9779200247	Toluene		Method 18
North Scrubber R2	11/10/21	Tube	Glass	Air	Spiked Tube#992800092	Toluene		Method 18
North Scrubber R2	11/10/21	Tube	Glass	Air	Unspiked Tube#977920091	Toluene		Method 18
North Scrubber R3	11/10/21	Tube	Glass	Air	Spiked Tube#992800037	Toluene		Method 18
North Scrubber R3	11/10/21	Tube	Glass	Air	Unspiked Tube#9779200263	Toluene		Method 18
South Scrubber R1	11/10/21	Tube	Glass	Air	Spiked Tube#992800073	Toluene		Method 18
South Scrubber R1	11/10/21	Tube	Glass	Air	Unspiked Tube#9779200179	Toluene		Method 18
South Scrubber R2	11/10/21	Tube	Glass	Air	Spiked Tube#992800077	Toluene		Method 18
South Scrubber R2	11/10/21	Tube	Glass	Air	Unspiked Tube#9779200029	Toluene		Method 18
South Scrubber R3	11/10/21	petri	Plastic	Air	Spiked Tube#992800086	Toluene		Method 18
South Scrubber R3	11/10/21	Tube	Glass	Air	Unspiked Tube#9779200186	Toluene		Method 18
BLANK	11/10/21	Tube	GLASS	AIR	BLANK TUBE	Toluene		M18

Relinquished by: [Signature] Date/Time: 11/22/21 @ 1330 Relinquished by:

Received by: Amy Hammel Date/Time: 11-23-21 1030 Received by:

Remarks (*):
1.0°C Raytek?, good condition Amm3 11-23-21

APPENDIX F

RAW VOC DATALOGGER DATA

American Chemical Solutions
 Muskegon, MI
 Test 1
 VOC as PPM Propane

Date	Time	O2 %	CO2 %	North PPM	South PPM
2021/11/10	10:30:00	20.9	0.1	412.4	308.1
2021/11/10	10:31:00	20.9	0.1	334.2	221.4
2021/11/10	10:32:00	20.9	0.1	361.3	182.0
2021/11/10	10:33:00	20.9	0.1	438.4	155.9
2021/11/10	10:34:00	20.9	0.1	629.6	162.5
2021/11/10	10:35:00	20.9	0.1	486.7	184.8
2021/11/10	10:36:00	20.9	0.1	359.0	193.8
2021/11/10	10:37:00	20.9	0.1	374.6	186.6
2021/11/10	10:38:00	20.9	0.1	388.2	731.4
2021/11/10	10:39:00	20.9	0.1	506.7	139.0
2021/11/10	10:40:00	20.9	0.1	568.8	145.3
2021/11/10	10:41:00	20.9	0.1	479.6	164.3
2021/11/10	10:42:00	20.9	0.1	303.1	176.0
2021/11/10	10:43:00	20.9	0.1	319.8	176.0
2021/11/10	10:44:00	20.9	0.1	382.4	147.9
2021/11/10	10:45:00	20.9	0.1	467.1	819.7
2021/11/10	10:46:00	20.9	0.1	463.3	173.6
2021/11/10	10:47:00	20.9	0.1	448.2	180.6
2021/11/10	10:48:00	20.9	0.1	270.2	187.8
2021/11/10	10:49:00	20.9	0.1	363.6	193.7
2021/11/10	10:50:00	20.9	0.1	392.2	144.7
2021/11/10	10:51:00	20.9	0.1	418.8	147.4
2021/11/10	10:52:00	20.9	0.1	513.2	158.0
2021/11/10	10:53:00	20.9	0.1	353.2	184.2
2021/11/10	10:54:00	20.9	0.1	259.6	174.0
2021/11/10	10:55:00	20.9	0.1	437.3	169.4
2021/11/10	10:56:00	20.9	0.1	398.7	156.2
2021/11/10	10:57:00	20.9	0.1	480.9	159.6
2021/11/10	10:58:00	20.9	0.1	430.7	174.0
2021/11/10	10:59:00	20.9	0.1	403.9	191.1
2021/11/10	11:00:00	20.9	0.1	408.1	180.5
2021/11/10	11:01:00	20.9	0.1	313.8	174.0
2021/11/10	11:02:00	20.9	0.1	406.1	178.3
2021/11/10	11:03:00	20.9	0.1	396.4	157.4
2021/11/10	11:04:00	20.9	0.1	407.1	162.2
2021/11/10	11:05:00	20.9	0.1	516.4	165.7
2021/11/10	11:06:00	20.9	0.1	240.7	184.6
2021/11/10	11:07:00	20.9	0.1	346.5	155.2
2021/11/10	11:08:00	20.9	0.1	400.7	148.7
2021/11/10	11:09:00	20.9	0.1	409.5	185.6
2021/11/10	11:10:00	20.9	0.1	324.0	187.6
2021/11/10	11:11:00	20.9	0.1	1023.2	185.7
2021/11/10	11:12:00	20.9	0.1	215.8	175.1
2021/11/10	11:13:00	20.9	0.1	340.1	166.4
2021/11/10	11:14:00	20.9	0.1	373.0	132.9
2021/11/10	11:15:00	20.9	0.1	291.5	125.1

2021/11/10	11:16:00	21.0	0.1	351.4	127.3
2021/11/10	11:17:00	20.9	0.1	395.3	141.7
2021/11/10	11:18:00	20.9	0.1	390.0	162.4
2021/11/10	11:19:00	20.9	0.1	399.2	172.5
2021/11/10	11:20:00	20.9	0.1	409.5	193.7
2021/11/10	11:21:00	20.9	0.1	395.8	190.5
2021/11/10	11:22:00	20.9	0.1	405.9	200.2
2021/11/10	11:23:00	21.1	0.1	396.8	204.9
2021/11/10	11:24:00	21.1	0.1	402.2	197.0
2021/11/10	11:25:00	21.2	0.1	457.0	203.0
2021/11/10	11:26:00	21.2	0.1	333.8	214.3
2021/11/10	11:27:00	21.2	0.1	362.8	195.6
2021/11/10	11:28:00	21.3	0.1	837.7	190.3
2021/11/10	11:29:00	21.3	0.1	355.5	262.2
	Avg.	20.9	0.1	412.5	196.8

American Chemical Solutions
 Muskegon, MI
 Test 2
 VOC as PPM Propane

Date	Time	O2 %	CO2 %	North PPM	South PPM	
2021/11/10	13:46:00		21.3	0.1	125.8	89.9
2021/11/10	13:47:00		21.3	0.1	135.9	76.8
2021/11/10	13:48:00		21.4	0.1	147.9	70.5
2021/11/10	13:49:00		21.4	0.1	125.1	83.5
2021/11/10	13:50:00		21.3	0.1	140.7	75.1
2021/11/10	13:51:00		21.3	0.1	138.7	73.2
2021/11/10	13:52:00		21.3	0.1	146.9	83.9
2021/11/10	13:53:00		21.3	0.1	165.6	76.4
2021/11/10	13:54:00		21.3	0.1	146.5	91.7
2021/11/10	13:55:00		21.3	0.1	176.4	92
2021/11/10	13:56:00		21.3	0.1	174.9	86.9
2021/11/10	13:57:00		21.3	0.1	196.2	98.7
2021/11/10	13:58:00		21.3	0.1	231.3	97.1
2021/11/10	13:59:00		21.3	0.1	196.6	114.3
2021/11/10	14:00:00		21.3	0.1	226.6	119.8
2021/11/10	14:01:00		21.3	0.1	242.4	109.5
2021/11/10	14:02:00		21.3	0.1	251.6	118.3
2021/11/10	14:03:00		21.3	0.1	276.5	118.8
2021/11/10	14:04:00		21.3	0.1	272.6	134.5
2021/11/10	14:05:00		21.3	0.1	321.7	143
2021/11/10	14:06:00		21.3	0.1	345.7	142.3
2021/11/10	14:07:00		21.3	0.1	332	169.3
2021/11/10	14:08:00		21.3	0.1	367.3	164.7
2021/11/10	14:09:00		21.3	0.1	446.5	159.3
2021/11/10	14:10:00		21.3	0.1	347.8	182.7
2021/11/10	14:11:00		21.3	0.1	433.4	181.6
2021/11/10	14:12:00		21.3	0.1	508.9	180.3
2021/11/10	14:13:00		21.3	0.1	570.8	200.1
2021/11/10	14:14:00		21.3	0.1	664.6	240.2
2021/11/10	14:15:00		21.3	0.1	452.4	266.2
2021/11/10	14:16:00		21.3	0.1	392.1	259.4
2021/11/10	14:17:00		21.3	0.1	655.8	222.5
2021/11/10	14:18:00		21.3	0.1	522.6	165.9
2021/11/10	14:19:00		21.3	0.1	658.8	157.8
2021/11/10	14:20:00		21.3	0.1	680.2	203.7
2021/11/10	14:21:00		21.3	0.1	650.7	262.6
2021/11/10	14:22:00		21.3	0.1	475.8	278.7
2021/11/10	14:23:00		21.3	0.1	400.5	252.9
2021/11/10	14:24:00		21.3	0.1	547.3	204.8
2021/11/10	14:25:00		21.3	0.1	703.5	183.3
2021/11/10	14:26:00		21.3	0.1	855.9	205.7
2021/11/10	14:27:00		21.3	0.1	729.9	234.6
2021/11/10	14:28:00		21.3	0.1	545	275.8
2021/11/10	14:29:00		21.2	0.1	455.7	249.2
2021/11/10	14:30:00		21.3	0.1	553.3	204.9
2021/11/10	14:31:00		21.2	0.1	772.7	171.9

2021/11/10	14:32:00	21.3	0.1	904.4	190.6
2021/11/10	14:33:00	21.3	0.1	1102.4	238.6
2021/11/10	14:34:00	21.3	0.1	637.2	281.9
2021/11/10	14:35:00	21.3	0.1	393.5	272.7
2021/11/10	14:36:00	21.3	0.1	579	226.7
2021/11/10	14:37:00	21.3	0.1	766.9	188.8
2021/11/10	14:38:00	21.3	0.1	870.1	194.7
2021/11/10	14:39:00	21.3	0.1	1333	226.8
2021/11/10	14:40:00	21.3	0.1	745.3	222.8
2021/11/10	14:41:00	21.3	0.1	398.6	255.4
2021/11/10	14:42:00	21.3	0.1	623.2	229
2021/11/10	14:43:00	21.3	0.1	803.3	199.3
2021/11/10	14:44:00	21.3	0.1	921.8	229.6
2021/11/10	14:45:00	21.2	0.1	974.1	246.1
	Avg.	21.3	0.1	482.7	176.3

American Chemical Solutions
 Muskegon, MI
 Test 3
 VOC as PPM Propane

Date	Time	O2 %	CO2 %	North PPM	South PPM	
2021/11/10	16:07:00		21.2	0.1	794.7	139.6
2021/11/10	16:08:00		21.2	0.1	874.1	253
2021/11/10	16:09:00		21.2	0.1	955.1	339
2021/11/10	16:10:00		21.3	0.1	1024.7	351.9
2021/11/10	16:11:00		21.2	0.1	603.9	341.9
2021/11/10	16:12:00		21.2	0.1	405.7	246
2021/11/10	16:13:00		21.2	0.1	666.9	150.4
2021/11/10	16:14:00		21.3	0.1	749.8	134.8
2021/11/10	16:15:00		21.3	0.1	796.5	220.1
2021/11/10	16:16:00		21.3	0.1	852.8	299
2021/11/10	16:17:00		21.3	0.1	577.1	327.1
2021/11/10	16:18:00		21.3	0.1	381.1	267.7
2021/11/10	16:19:00		21.3	0.1	622.3	178
2021/11/10	16:20:00		21.3	0.1	832.8	140.1
2021/11/10	16:21:00		21.2	0.1	879.8	181.1
2021/11/10	16:22:00		21.2	0.1	866.4	248.7
2021/11/10	16:23:00		21.3	0.1	579.6	286.8
2021/11/10	16:24:00		21.2	0.1	455.7	256.2
2021/11/10	16:25:00		21.2	0.1	1217.7	199.5
2021/11/10	16:26:00		21.3	0.1	830.5	182.3
2021/11/10	16:27:00		21.3	0.1	1219.3	214
2021/11/10	16:28:00		21.2	0.1	841.6	266.1
2021/11/10	16:29:00		21.3	0.1	586.1	303.6
2021/11/10	16:30:00		21.2	0.1	737.6	283.6
2021/11/10	16:31:00		21.2	0.1	701.4	237.9
2021/11/10	16:32:00		21.2	0.1	880.6	210.6
2021/11/10	16:33:00		21.3	0.1	1075.3	220.9
2021/11/10	16:34:00		21.2	0.1	891.3	257.9
2021/11/10	16:35:00		21.2	0.1	718.2	297.4
2021/11/10	16:36:00		21.3	0.1	408.8	289.2
2021/11/10	16:37:00		21.3	0.1	734.5	247.1
2021/11/10	16:38:00		21.2	0.1	958.8	220.8
2021/11/10	16:39:00		21.3	0.1	972	225.1
2021/11/10	16:40:00		21.2	0.1	926	249.2
2021/11/10	16:41:00		21.3	0.1	629	231.7
2021/11/10	16:42:00		21.3	0.1	423.3	205.9
2021/11/10	16:43:00		21.3	0.1	700.1	186.7
2021/11/10	16:44:00		21.3	0.1	983.1	197.2
2021/11/10	16:45:00		21.3	0.1	618.1	234.7
2021/11/10	16:46:00		21.2	0.1	863.4	238.8
2021/11/10	16:47:00		21.3	0.1	909.4	240
2021/11/10	16:48:00		21.3	0.1	1267.1	269.3
2021/11/10	16:49:00		21.3	0.1	1079.5	293.8
2021/11/10	16:50:00		21.3	0.1	642	475.7
2021/11/10	16:51:00		21.3	0.1	488.2	317.2

2021/11/10	16:52:00	21.3	0.1	642.9	247.3
2021/11/10	16:53:00	21.3	0.1	900.1	219.5
2021/11/10	16:54:00	21.3	0.1	944.6	234.6
2021/11/10	16:55:00	21.3	0.1	1008.7	264.7
2021/11/10	16:56:00	21.3	0.1	665.2	277.8
2021/11/10	16:57:00	21.3	0.1	807.2	268.1
2021/11/10	16:58:00	21.3	0.1	638.7	243.6
2021/11/10	16:59:00	21.4	0.1	831.8	220.9
2021/11/10	17:00:00	21.3	0.1	1025.5	230.3
2021/11/10	17:01:00	21.3	0.1	1442.5	255.5
2021/11/10	17:02:00	21.3	0.1	706.2	306.9
2021/11/10	17:03:00	21.3	0.1	569.8	279
2021/11/10	17:04:00	21.2	0.1	651.8	249.1
2021/11/10	17:05:00	21.4	0.1	802.4	225.2
2021/11/10	17:06:00	21.3	0.1	1064.9	1349.6
	Avg.	21.3	0.1	798.7	267.2

APPENDIX G
CALIBRATION GAS CERTIFICATION SHEETS

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E02NI99E15A0681	Reference Number: 54-402111863-1
Cylinder Number: CC346019	Cylinder Volume: 144.4 CF
Laboratory: 124 - Chicago (SAP) - IL	Cylinder Pressure: 2015 PSIG
PGVP Number: B12021	Valve Outlet: 350
Gas Code: PPN,BALN	Certification Date: May 17, 2021

Expiration Date: May 17, 2029

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 mole/mole 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
PROPANE	300.0 PPM	307.4 PPM	G1	+/- 0.8% NIST Traceable	05/17/2021
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	10060515	CC281302	495.3 PPM PROPANE/AIR	+/- 0.5%	Jan 06, 2022

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801332	FTIR	May 03, 2021

Triad Data Available Upon Request




 Approved for Release

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E02NI99E15A0932	Reference Number: 54-124499779-12
Cylinder Number: CC154341	Cylinder Volume: 144.4 CF
Laboratory: ASG - Chicago - IL	Cylinder Pressure: 2015 PSIG
PGVP Number: B12015	Valve Outlet: 350
Gas Code: PPN,BALN	Certification Date: Jun 22, 2015

Expiration Date: Jun 22, 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
PROPANE	500.0 PPM	505.9 PPM	G1	+/- 0.8% NIST Traceable	06/22/2015
NITROGEN	Balance				

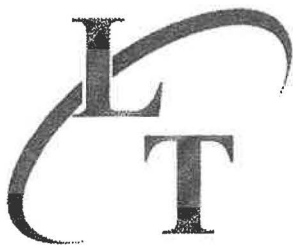
CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	10060523	CC281408	495.3 PPM PROPANE/AIR	+/- 0.5%	Feb 19, 2016

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801332	FTIR	Jun 08, 2015

Triad Data Available Upon Request



Approved for Release



LIQUID TECHNOLOGY CORPORATION

"INDUSTRY LEADER IN SPECIALTY GASES"

Certificate of Analysis **- EPA PROTOCOL GAS -**

Customer Stack Test Group (Ottawa, IL)
Date April 30, 2014
Delivery Receipt DR-51311
Gas Standard 900 ppm Propane/Nitrogen - EPA PROTOCOL
Final Analysis Date April 28, 2014
Expiration Date April 28, 2022

Component Propane
Balance Gas Air

Analytical Data:
EPA Protocol, Section No. 2.2, Procedure G-1

DO NOT USE BELOW 100 psig

Reported Concentrations
Propane: 916 ppm +/- 3.0 ppm
Nitrogen: Balance

Reference Standards:

SRM/GMIS:	GMIS	GMIS
Cylinder Number:	CC-125618	CC-165614
Concentration:	497.23 ppm Propane/Nitrogen	1011.92 ppm Propane/Nitrogen
Expiration Date:	04/09/20	04/09/20

Certification Instrumentation

Component: Propane
Make/Model: Agilent 7890A
Serial Number: CN10736166
Principal of Measurement: GC-FID
Last Calibration: April 09, 2014

Cylinder Data

Cylinder Serial Number:	CC-185323	Cylinder Outlet:	CGA 350
Cylinder Volume:	140 Cubic Feet	Cylinder Pressure:	2000 psig, 70°F

Analytical Uncertainty and NIST Traceability are in compliance with EPA-600/R-12/531.

Certified by:

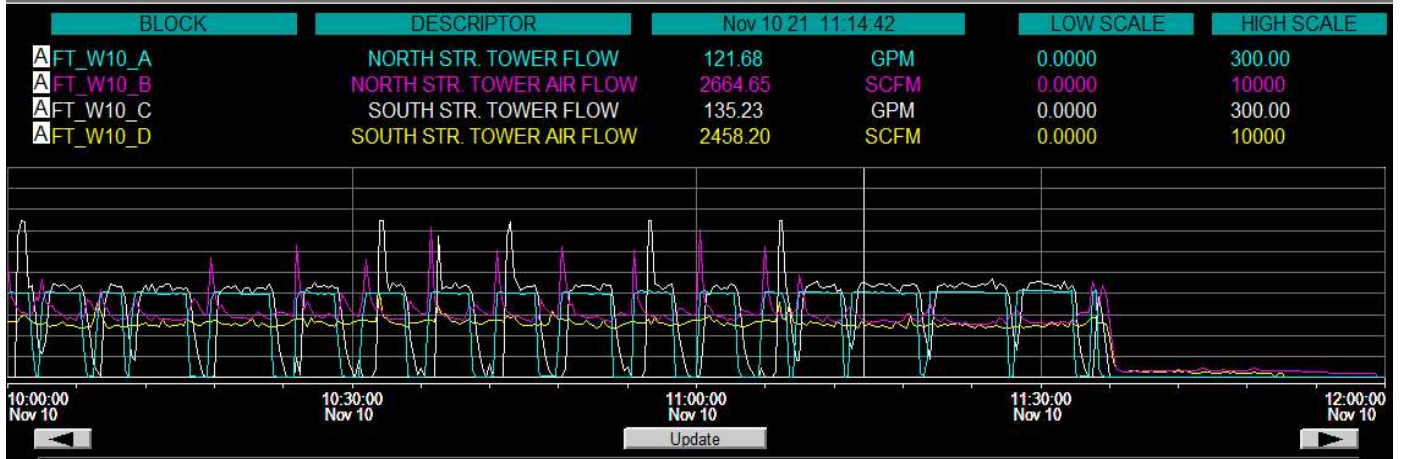
Cole Dylewski

PGVP Vendor ID: E12014

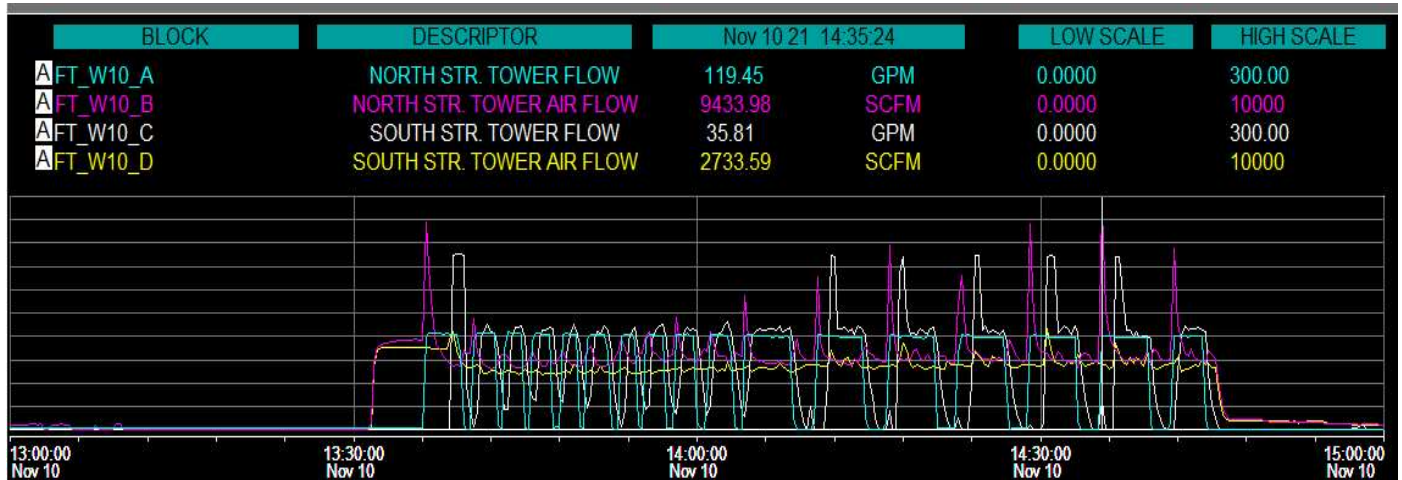
Attachment 2

Operating Data

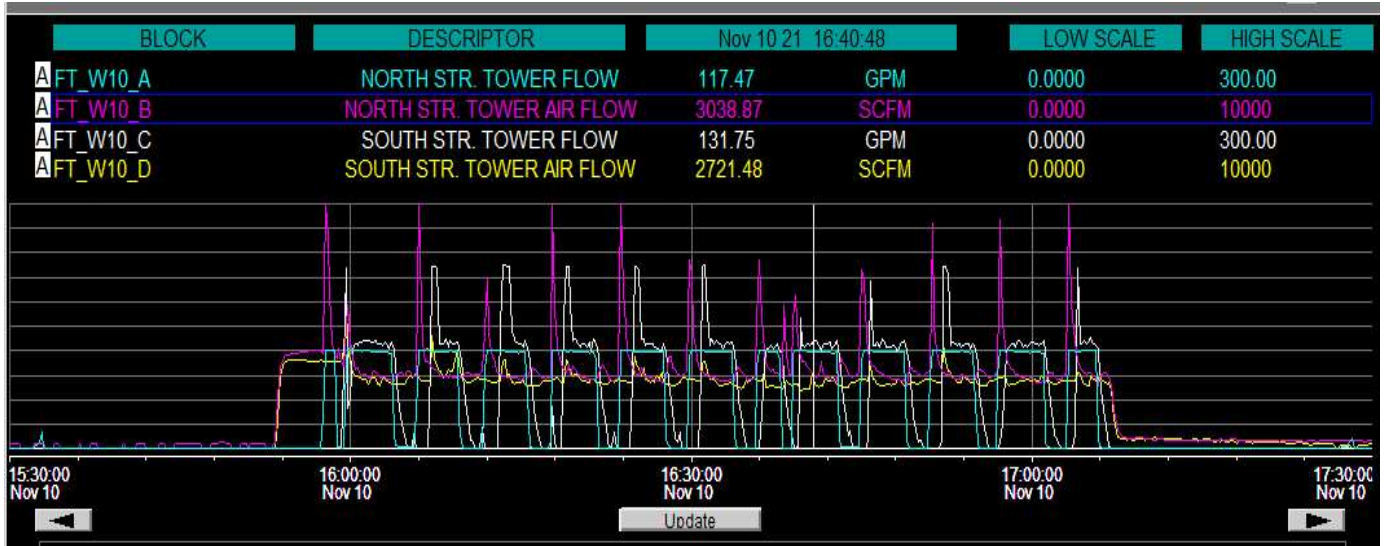
First Run 10:30 am to 11:30 am



Second Run 1:46 pm to 2:46 pm



Third Run 4:07 pm to 5:07 pm



Run 1

Time (minutes)	North Tower Water Flow (GPM)	North Tower Air Flow (SCFM)	South Tower Water Flow (GPM)	South Tower Water Flow (SCFM)
10:30	0	3068.95	5.8	2559.18
10:35	0	3650.2	54.54	2579.3
10:40	118.83	3356.05	128.42	2735.55
10:45	118.92	2732.62	128.21	2425.98
10:50	119.45	2908.79	130.14	2501.76
10:55	121.4	3754.49	0	2595.31
11:00	85.9	3280.66	0	2719.34
11:05	0	2984.57	4.02	2556.25
11:10	120.84	2916.02	131.7	2580.86
11:15	121.8	2602.15	131.52	2502.73
11:20	0.54	3028	56	2386.52
11:25	121.1	2520.9	128.17	2343.75
11:30	123.38	2529.1	131.92	2365.43
Averages	80.94	3025.58	79.26	2527.07

Run 2

Time (minutes)	North Tower Water Flow (GPM)	North Tower Air Flow (SCFM)	South Tower Water Flow (GPM)	South Tower Water Flow (SCFM)
1:46	123.39	2926.37	73.6	2500
1:51	122.44	2877.54	121.07	2377.34
1:56	122.08	4130.27	76.09	2537.89
2:01	106.19	4008.79	5.52	2581.25
2:06	118.77	2819.34	129.86	2606.84
2:11	121.18	3673.44	0	2720.12
2:16	0	2935.74	0	2687.3
2:21	0	3122.85	88.08	2640.82
2:26	119.19	2988.28	126.15	3111.72
2:31	118.43	3015.82	222.87	3100
2:36	119.7	3634.77	0	2582.62
2:41	0	2905.08	0	2757.81
2:46	0	757.42	0	547.27
Averages	82.41	3061.21	64.86	2519.31

Run 3

Time (minutes)	North Tower Water Flow (GPM)	North Tower Air Flow (SCFM)	South Tower Water Flow (GPM)	South Tower Water Flow (SCFM)
4:07	119	3439.65	99.6	2757.62
4:12	121.15	5284.18	0	2770.7
4:17	0	2880	0	2705
4:22	0	3220.51	84.37	2662.7
4:27	117.92	2754.3	134.5	2881.05
4:32	117.59	2857.81	132.44	2819.73
4:37	119.03	3173.63	126.53	2552.93
4:42	117.47	2882.81	127.96	2732.42
4:47	117.95	2973.83	126.87	2516.21
4:52	118.46	3153.91	7.04	2684.38
4:57	118.01	10017	0	2861.33
5:02	0	3001.76	24.69	2588.67
5:07	0	2543.16	0	2446.09
Averages	82.04	3706.35	66.46	2690.68