1.0 INTRODUCTION AND SUMMARY

1.1 PROGRAM OBJECTIVES

Montrose Air Quality Services, LLC (Montrose) was contracted by DTE Energy (DTE) to perform a series of air emission tests at the Dean Peaking Facility (DPF) located in China Township, MI. The compliance tests were conducted on four (4) simple cycle gas turbine generators (CTG 11-1, CTG 11-2, CTG 12-1, and CTG 12-2), to determine compliance with the source testing conditions of the Michigan Department of Environment, Great Lakes and Energy (EGLE).

The testing was conducted by Mr. John Hamner, Mr. Brandon Check, Mr. Brian Romani, Mr. Jeremy DeVires, Mr. John Ziber, and Mr. Thomas Cassin of Montrose on March 1st and 2nd, 2022. Mr. Brian Romani was the qualified individual on site, his QI Certifications are located in Appendix A. Mr. Mark Grigereit of DTE Energy coordinated the testing program. The tests were conducted according to a Protocol which was submitted to EGLE. Montrose performed the tests to measure the following emission parameters:

- Emission Compliance:
  - PM (total) as PM10/2.5 (lb/hr)
  - O_2 and CO_2 (% volume dry) – for molecular weight & dilution calculations
  - Stack volumetric flow rate (dscfm per Method 2) and moisture content (% by volume)

    Fuel analysis ("F_d" factor, HHV)

This report presents the test results and supporting data, descriptions of the testing procedures, descriptions of the facility and sampling locations, and a summary of the quality assurance procedures used by Montrose. The average emission test results are summarized and compared to their respective permit limits and performance specifications in Table 1-1 and Table 1-2. Detailed results for individual test runs can be found in Section 5.0. All supporting data can be found in the appendices.

TABLE 1-1
SUMMARY OF AVERAGE COMPLIANCE RESULTS
DTE DEAN PEAKER FACILITY
TURBINES CTG 11-1 & 12-2
BASE CONDITION (March 1, 2022)

Parameter	CTG11-1	CTG12-2	Permit Limit
Total Particulate Matter (PM2.5/PM10):			
PM 10 lb/hr	1.88	3.02	9.0
lb/MMscf	0.0549	0.0870	--
Heat Input:			
MMBtu/hr	1,334.5	1338.17	--

TABLE 1-2
SUMMARY OF AVERAGE COMPLIANCE RESULTS
DTE DEAN PEAKER FACILITY
TURBINES CTG 11-2 & 12-1
BASE CONDITION (March 2, 2022)

Parameter	CTG11-2	CTG12-1	Permit Limit
Total Particulate Matter (PM2.5/PM10):			
PM 10 lb/hr	3.96	2.21	9.0
lb/MMscf	0.115	0.0646	--
Heat Input:			
MMBtu/hr	1,321.3	1,369.3	--

1.2 PROJECT CONTACTS

A list of project participants is included below:

Facility Information

Source Location:	Dean Peaker Facility 4490 River Road China Township, MI 48054
Project Contact:	Mr. Mark Grigereit
Company:	DTE Energy
Telephone:	(313) 412-0305
Email:	Mark.grigereit@dteenergy.com

Agency Information

Regulatory Agency:	Michigan Department of Environment, Great Lakes and Energy
Agency Contact:	Ms. Gina Angellotti
Telephone:	(313) 418-0895
Email:	AngellottiR1@michigan.gov

Testing Company Information

Testing Firm:	Montrose Air Quality Services, LLC (Montrose)
Contact:	John Hamner
Title:	Client Project Manager
Telephone:	(630) 715-3259
Email:	jhamner@montrose-env.com

2.0 SOURCE LOCATION INFORMATION

2.1 FACILITY DESCRIPTION

The plant provides electric power when requested to do so during periods of peak power demand or system need, and does not operate outside of those system requests so its operation is batch like. During periods of operation, there is not significant emissions variability. Each peaker turbine is nominally rated at 82.4 MW.

2.2 Process Operating Data

During each test run, gas flow, NOx, CO, and O2% input to the gas turbine were continuously recorded on a data acquisition system. The data is averaged for each test run in the final report.

2.3 SAMPLING LOCATIONS

A total of six 6" flanged sample ports are installed on each unit exhaust duct. Four ports were selected for use on this program.

Information regarding the sampling location is presented below:

Sample location ID: CTG 11-1, 11-2, 12-1, & 12-2 Exhaust Stack
Stack exit height: 75 feet 0 inches
Configuration: Rectangle, Vertical
Dimensions: Depth 108 inches, and Width 228 inches
Port locations: 50 feet
Port access: Ladder climb to a permanent test platform.

Traverse point information is presented below:
- Particulate tests - 24 points total, 6 from each of 4 ports.

3.0 TEST DESCRIPTION

3.1 PROGRAM OBJECTIVES

The objective of this test program was to prove compliance of CTG 11-1, 11-2, 12-1, and 12-2 with the permit limits. The results are presented in units consistent with those stated in the permit.

3.2 TEST CONDITIONS

Emission tests were performed while the source units were operating at the condition required by the permit. Tests were performed at the following condition:

- Condition 1: Base Load

Plant personnel established the test conditions and collected all applicable unit-operating data. Montrose monitored the collection of process data.

3.3 TEST PROGRAM SCHEDULE

The test program schedule is presented in Table 3-1.

TABLE 3-1
TEST MATRIX AND SCHEDULE

Date	Source ID/ Activity	Sample Runs	Sample Duration
February 28, 2022	Set-up	--	--
March 1, 2022	**CTG 11-1 & 12-2**		
	O_2 & CO_2	3	2 hour
	PM	3	2 hour
March 2, 2022	**CTG 11-2 & 12-1**		
	O_2 & CO_2	3	2 hour
	PM	3	2 hour

3.4 MONTROSE TEST PROCEDURES

The test procedures used for this test program are summarized in Table 3-2 below. Additional information regarding specific applications or modifications to standard procedures is presented in the following sub-sections.

TABLE 3-2
TEST PROCEDURES

Parameter	Measurement Principle	Reference Method
Volumetric flow rate	Pitot/temperature traverse	EPA 1, 2
Volumetric flow rate	Stoichiometric calculation	EPA 19
O_2	Paramagnetism	EPA 3A
CO_2	Non-dispersive infrared	EPA 3A
Moisture	Impinger weight gain	EPA 4
Particulate Matter	Gravimetry with condensable analysis	EPA 5/202

3.4.1 Gaseous Emissions

Concentrations of the gaseous constituents of stack gas carbon dioxide (CO_2) and oxygen (O_2) were measured using Montrose's dry extractive reference method (RM) monitor system in accordance with Methods 3A. This system meets the requirements of EPA methods for gaseous species. Pertinent information regarding the performance of the method is presented below:

- Method Deviations: None
- Method Options: N/A

3.4.2 Particulate Matter Emissions

Emissions of total particulate matter (PM) were measured using a combination of EPA Methods 5 and 202. Pertinent information regarding the performance of the methods are presented below:

- Method Deviations: None
    - Method Options: A field train recovery blank was collected on-site; the glassware was baked for 6 hours prior to use. Additionally, pressurized nitrogen was used to purge all trains
    - Target and/or Minimum Required Sample Duration: 120 Minutes
    - Target and/or Minimum Required Sample Volume: >70 dscf
    - Analytical Laboratory: Montrose Elk Grove Village, IL

3.4.3 Volumetric Flow Rate

Stack gas volumetric flow rates were determined by the procedures outlined in EPA Method 2. Pertinent information regarding the performance of the method is presented below:

- Method Options
    - S-type pitot coefficient is 0.84

3.4.4 Fuel Analysis

Sample gas from the facility's natural gas fuel supply pipeline was collected and submitted for analysis. Pertinent information regarding the fuel analysis is presented below:

- Analytical Method: ASTM D-1945/ASTM D-3246
    - Sample Containers: Teflon-coated pressurized fuel bombs
    - Analytical Laboratory: Texas Oil Tech Laboratories, Inc., Houston

3.4.5 Process Data

The plant's unit operating data was used to document process conditions during the test runs. Unit operating data was provided by DTE personnel. Data presented in this report includes the following:

- CO ppm, CO lb/hr, CO MMBtu/hr
- NOx ppm, NOx lb/hr, NOx MMBtu/hr
- Gas Flow
- O2%

4.0 QUALITY ASSURANCE AND REPORTING

4.1 SAMPLING AND ANALYTICAL QA/QC

Montrose has instituted a rigorous QA/QC program for all of its air pollution testing. Quality assurance audits are performed as part of the test program to ensure that the final results are calculated from the highest quality data. The program ensures that the emission data reported are as accurate as possible. The procedures included in the cited reference methods were followed for all steps of preparation, sampling, calibration, and analysis. Montrose was responsible for preparation, calibration and cleaning of the sampling apparatus. Montrose also conducted the sampling and sample recovery, storage, and shipping.

Contract laboratories conducted some of the preparation and sample analyses as needed. The laboratories that were used are established leaders in development and performance of the reference methods for which they have been selected. Their credentials for adherence to the required quality assurance procedures are well known.

4.2 QUALITY CONTROL PROCEDURES

Our Quality Assurance Program provides our equipment maintenance and calibration schedule, quality control acceptance limits, and any corrective action that may be needed. For additional quality control, Montrose followed the procedures outlined below and in the method write-ups in Section 3.4.

4.2.1 Equipment Inspection and Maintenance

- Each critical piece of field equipment was assigned a unique identification number to allow tracking of its calibration history
    - All field equipment was visually inspected prior to testing and included pre-test calibration checks

4.3 DATA ANALYSIS, VALIDATION, AND UNCERTAINTY

The raw data collected during the sampling and analysis procedures were used to calculate the results of the testing program. The analysis or reduction of the data to the final results followed these steps, where appropriate to the test method:

- Check field-sampling data for accuracy and calculate appropriate data averages (e.g., temperatures, pressures, volumes, etc.).
    - Double check calculation of the data averages.
    - Review all in-house and contract laboratory reports and ensure that appropriate and/or required QA/QC steps were followed.
    - Enter field and laboratory data to established and verified computer spreadsheets for calculation of volumetric flow rates, mass emission rates or other appropriate results.
    - Double-check all lab and field data inputs.
    - Perform example calculations by hand using raw data on a single test run for each type of emission result reported.
    - Compile summary tables of results and review all table inputs.

This report includes copies of spreadsheet printouts (data input and results output) and example calculation checks. The field data sheets with average data calculations are also included. Standard conditions used for data reduction are 29.92 inches of mercury and 68 °F.

Both qualitative and quantitative factors contribute to field measurement uncertainty and should be taken into consideration when interpreting the results contained within this report. Whenever possible, Montrose personnel reduce the impact of these uncertainty factors by using approved and validated test methods. In addition, Montrose personnel perform routine instrument and equipment calibrations and ensure that the calibration standards, instruments, and equipment used during test events meet, at a minimum, test method specifications as well as the specifications of our Quality Manual and ASTM D 7036-04. The limitations of the various methods, instruments, equipment, and materials utilized during this test have been reasonably considered, but the ultimate impact of the cumulative uncertainty of this project is not fully identified within the results of this report.

5.0 DISCUSSION OF RESULTS

5.1 DETAILED DISCUSSION OF RESULTS

The average results are compared to the performance specifications in Table 1-1. Detailed results from the individual compliance test runs are presented in Tables 5-1 through 5-4.

Additional information is included in the appendices. Appendix A presents the quality assurance information, including instrument calibration data. Data sheets and plant data is included in Appendix B. Appendix C presents the general and specific equations used for the emissions calculations and computer spreadsheets. Appendix D presents the outside lab results.

5.2 PROBLEMS/DEVIATIONS/EXCEPTIONS

There no problems encountered during the testing. All results were within their respective permit limits.

TABLE 5-1
PARTICULATE TEST RESULTS
CTG 11-1

Client				DTE
Unit / Location				GT 11-1
A (stack area), ft²				171.000
T_{std} (reference temperature), °F				68
F_d (fuel "F" factor @ 68°F), dscf/MMBtu				8,609
F_d (fuel "F" factor @ T_{std}), dscf/MMBtu				8,609
Test number	Run 1	Run 2	Run 3	Average
Date	3/7/22	3/7/22	3/7/22	--
Start / Stop time	9:54-11:03	11:25-13:31	13:49-15:57	--
Meter box number	CS 1	CS 1	CS 1	--
C_p (pitot coefficient), dimensionless	0.8400	0.8400	0.8400	0.8400
Y (meter calibration factor), dimensionless	1.006	1.006	1.006	1.006
Θ (sample time), min	120.00	120.00	120.00	120.00
Nozzle diameter, in	0.216	0.216	0.216	0.216
P_{bar} (barometric pressure), in Hg	29.56	29.56	29.56	29.56
V_m (meter box volume), acf	93.350	93.480	92.410	93.080
V_{lc} (impinger liquid volume), ml	135.1	134.0	135.8	134.9
T_m (meter temperature), °F	57.8	66.7	69.8	64.7
ΔH (meter pressure), in. H_2O	2.167	2.113	2.125	2.135
ΔP (velocity head), in. H_2O	3.1493	3.0429	3.0609	3.0844
P_s (static pressure), in. Hg	1.00	1.00	1.00	1.00
T_s (stack temperature), °F	991.0	995.5	997.0	994.5
%O_2 (oxygen stack gas), % volume dry	14.81	14.77	14.34	14.64
%CO_2 (carbon dioxide stack gas), % volume dry	3.11	3.14	3.36	3.20
m_f (F½ particulate matter catch - filter), mg	0.0000	0.0000	0.0000	0.0000
m_a (F½ particulate matter catch - acetone rinse), mg	1.1000	0.8000	0.4000	0.7667
m_{con} (B½ particulate matter catch - total condensible, blank correct	2.20	1.10	1.40	1.57
m_n (total particulate matter catch), mg	3.30	1.90	1.80	2.33
$V_{m(std)}$ (standard sample volume), dscf	95.119	93.630	92.026	93.592
$V_{w(std)}$ (water vapor volume), scf	6.356	6.304	6.389	6.350
B_{ws} (moisture fraction), non-dimensional	0.0626	0.0631	0.0649	0.0635
Moisture, %	6.26	6.31	6.49	6.35
MW_d (stack gas molecular weight), dry	29.090	29.093	29.111	29.099
MW_{wet} (stack gas molecular weight), wet	28.395	28.393	28.390	28.393
P_g (absolute stack pressure), in Hg	29.634	29.634	29.634	29.634
V_s (stack gas velocity), ft/sec	167.074	164.490	165.066	165.544
Q (stack flow rate), acfm	1,714,181	1,687,669	1,693,579	1,698,476
Q_{sw} (stack flow rate), wscfm	617,796	606,343	607,875	610,671
Q_s (stack flow rate), dscfm	579,097	568,093	568,410	571,867
I (isokinetic ratio), %	92.00	92.32	90.68	91.67
G (F½ grain loading), gr/dscf	0.000	0.000	0.000	0.000
M (F½ mass emissions), lb/hr	0.885	0.642	0.327	0.618
E (F½ mass emissions), lb/MMBtu	0.001	0.001	0.000	0.001
G (B½ grain loading), gr/dscf	0.000	0.000	0.000	0.000
M (B½ mass emissions), lb/hr	1.771	0.883	1.144	1.266
E (B½ mass emissions), lb/MMBtu	0.002	0.001	0.001	0.001
G (total grain loading), gr/dscf	0.0005	0.0003	0.0003	0.0004
M (total mass emissions), lb/hr	2.66	1.52	1.47	1.88
E (total mass emissions), lb/MMBtu	0.0023	0.0013	0.0012	0.0016

TABLE 5-2
PARTICULATE TEST RESULTS
CTG 11-2

Client				DTE
Unit / Location				GT 11-2
A (stack area), ft²				171.000
T_{std} (reference temperature), °F				68
F_d (fuel "F" factor @ 68°F), dscf/MMBtu				8,609
F_d (fuel "F" factor @ T_{std}), dscf/MMBtu				8,609
Test number	Run 1	Run 2	Run 3	Average
Date	3/2022	3/2022	3/2022	--
Start / Stop time	7:57-10:05	10:28-12:34	12:56-15:02	--
Meter box number	CS 1	CS 1	CS 1	--
C_p (pitot coefficient), dimensionless	0.8400	0.8400	0.8400	0.8400
Y (meter calibration factor), dimensionless	1.006	1.006	1.006	1.006
Θ (sample time), min.	120.00	120.00	120.00	120.00
Nozzle diameter, in.	0.216	0.216	0.216	0.216
P_{bar} (barometric pressure), in Hg	29.89	29.89	29.89	29.89
V_m (meter box volume), acf	95.070	93.770	94.060	94.280
V_{lc} (impinger liquid volume), ml	135.2	170.2	129.9	145.1
T_m (meter temperature), °F	50.3	45.8	52.2	49.4
ΔH (meter pressure), in. H_2O	2.146	2.121	2.125	2.131
ΔP (velocity head), in. H2O	3.0779	3.0480	3.0425	3.0562
P_s (static pressure), in. Hg	1.00	1.00	1.00	1.00
T_s (stack temperature), °F	985.6	988.3	994.3	989.7
$\%O_2$ (oxygen stack gas), % volume dry	15.29	15.27	15.26	15.27
$\%CO_2$ (carbon dioxide stack gas), % volume dry	3.24	3.24	3.21	3.23
m_f (F½ particulate matter catch - filter), mg	0.4000	0.0000	1.3000	0.5667
m_a (F½ particulate matter catch - acetone rinse), mg	3.7000	2.7000	0.0000	2.4000
m_{acn} (B½ particulate matter catch - total condensible, blank correct	1.70	2.30	2.60	2.20
m_n (total particulate matter catch), mg	5.80	5.00	4.70	5.17
$V_{m(std)}$ (standard sample volume), dscf	99.386	98.830	97.961	98.726
$V_{w(std)}$ (water vapor volume), scf	6.361	8.009	6.112	6.827
B_{ws} (moisture fraction), non-dimensional	0.0602	0.0750	0.0587	0.0646
Moisture, %	6.02	7.50	5.87	6.46
MW_{dry} (stack gas molecular weight), dry	29.130	29.129	29.124	29.128
MW_{wet} (stack gas molecular weight), wet	28.460	28.295	28.471	28.409
P_s (absolute stack pressure), in Hg	29.964	29.964	29.964	29.964
V_s (stack gas velocity), ft/sec	163.763	163.653	163.276	163.564
Q (stack flow rate), acfm	1,680,210	1,679,079	1,675,213	1,678,168
Q_w (stack flow rate), wscfm	614,590	612,588	609,111	612,096
Q_d (stack flow rate), dscfm	577,621	566,665	573,341	572,542
I (isokinetic ratio), %	96.37	97.69	95.70	96.59
G (F½ grain loading), grl/dscf	0.001	0.000	0.000	0.000
M (F½ mass emissions), lb/hr	3.152	2.047	1.626	2.275
E (F½ mass emissions), lb/MMBtu	0.003	0.002	0.002	0.002
G (B½ grain loading), grl/dscf	0.000	0.000	0.000	0.000
M (B½ mass emissions), lb/hr	1.307	1.744	2.013	1.688
E (B½ mass emissions), lb/MMBtu	0.001	0.002	0.002	0.002
G (total grain loading), grl/dscf	0.0009	0.0008	0.0007	0.0008
M (total mass emissions), lb/hr	4.46	3.79	3.64	3.96
E (total mass emissions), lb/MMBtu	0.0041	0.0036	0.0034	0.0037

TABLE 5-3
PARTICULATE TEST RESULTS
CTG 12-1

Client				DTE
Unit / Location				GT 12-1
A (stack area), ft²				171.000
T_{std} (reference temperature), °F				68
F_d (fuel "F" factor @ 68°F), dscf/MMBtu				8,609
F_d (fuel "F" factor @ T_{std}), dscf/MMBtu				8,609
Test number	Run 1	Run 2	Run 3	Average
Date	3/2/22	3/2/22	3/2/22	--
Start / Stop time	7:56-10:04	10:54-13:03	13:22-15:30	--
Meter box number	CS 7	CS 7	CS 7	--
C_p (pitot coefficient), dimensionless	0.8400	0.8400	0.8400	0.8400
Y (meter calibration factor), dimensionless	0.986	0.986	0.986	0.986
Θ (sample time), min	120.00	120.00	120.00	120.00
Nozzle diameter, in.	0.212	0.212	0.212	0.212
P_{bar} (barometric pressure), in Hg	29.89	29.89	29.89	29.89
V_m (meter box volume), acf	92.340	94.730	95.780	94.283
V_{lc} (impinger liquid volume), ml	142.8	124.9	137.2	134.9
T_m (meter temperature), °F	34.5	37.0	40.2	37.2
ΔH (meter pressure), in. H_2O	1.754	1.821	1.850	1.808
ΔP (velocity head), in. H_2O	2.8997	3.0450	3.0784	3.0077
P_s (static pressure), in. Hg	1.00	1.00	1.00	1.00
T_s (stack temperature), °F	979.9	983.8	987.3	983.7
$\%O_2$ (oxygen stack gas), % volume dry	15.20	15.19	15.19	15.19
$\%CO_2$ (carbon dioxide stack gas), % volume dry	3.26	3.25	3.27	3.26
m_f (F½ particulate matter catch - filter), mg	0.3000	1.2000	0.8000	0.7667
m_a (F½ particulate matter catch - acetone rinse), mg	0.9000	2.1000	0.0000	1.0000
m_{cp} (B½ particulate matter catch - total condensible, blank correct	1.20	1.10	1.10	1.13
m_n (total particulate matter catch), mg	2.40	4.40	1.90	2.90
15 $V_{m(std)}$ (standard sample volume), dscf	97.537	99.566	100.048	99.050
16 $V_{w(std)}$ (water vapor volume), scf	6.719	5.876	6.455	6.350
17 B_{ws} (moisture fraction), non-dimensional	0.0644	0.0557	0.0606	0.0603
Moisture, %	6.44	5.57	6.06	6.03
18 MW_{dry} (stack gas molecular weight), dry	29.130	29.128	29.131	29.129
19 MW_{wet} (stack gas molecular weight), wet	28.412	28.507	28.456	28.459
20 P_s (absolute stack pressure), in Hg	29.964	29.964	29.964	29.964
21 V_s (stack gas velocity), ft/sec	158.773	162.648	163.887	161.769
22 Q (stack flow rate), acfm	1,629,014	1,668,766	1,681,476	1,659,752
23 Q_w (stack flow rate), wscfm	596,209	611,190	614,310	607,899
24 Q_d (stack flow rate), dscfm	559,654	577,121	577,078	571,285
25 I (isokinetic ratio), %	101.34	100.31	100.81	100.82
26a G (F½ grain loading), grf/dscf	0.000	0.001	0.000	0.000
26c M (F½ mass emissions), lb/hr	0.911	2.530	0.610	1.350
26d E (F½ mass emissions), lb/MMBtu	0.001	0.002	0.001	0.001
26a G (B½ grain loading), grf/dscf	0.000	0.000	0.000	0.000
26c M (B½ mass emissions), lb/hr	0.911	0.843	0.839	0.864
26d E (B½ mass emissions), lb/MMBtu	0.001	0.001	0.001	0.001
26a G (total grain loading), grf/dscf	0.0004	0.0007	0.0003	0.0005
26c M (total mass emissions), lb/hr	1.82	3.37	1.45	2.21
26d E (total mass emissions), lb/MMBtu	0.0017	0.0031	0.0013	0.0020

TABLE 5-4
PARTICULATE TEST RESULTS
CTG 12-2

Client				DTE
Unit / Location				GT 12-2
A (stack area), ft²				171.000
T_{std} (reference temperature), °F				68
F_d (fuel "F" factor @ 68°F), dscf/MMBtu				8,609
F_d (fuel "F" factor @ T_{std}), dscf/MMBtu				8,609
Test number	Run 1	Run 2	Run 3	Average
Date	3/1/22	3/1/22	3/1/22	--
Start / Stop time	9:14-11:29	12:00-14:06	14:26-16:32	--
Meter box number	CS 7	CS 7	CS 7	--
C_p (pitot coefficient), dimensionless	0.8400	0.8400	0.8400	0.8400
Y (meter calibration factor), dimensionless	0.986	0.986	0.985	0.986
Θ (sample time), min.	120.00	120.00	120.00	120.00
Nozzle diameter, in.	0.212	0.212	0.212	0.212
P_{bar} (barometric pressure), in Hg	29.56	29.56	29.56	29.56
V_m (meter box volume), acf	95.050	96.300	96.900	96.083
V_{lc} (impinger liquid volume), ml	127.8	139.4	145.7	137.6
T_m (meter temperature), °F	44.7	47.8	47.1	46.5
ΔH (meter pressure), in. H_2O	1.875	1.871	1.871	1.872
ΔP (velocity head), in. H_2O	3.1136	3.1222	3.1489	3.1282
P_s (static pressure), in. Hg	1.00	1.00	1.00	1.00
T_s (stack temperature), °F	987.9	990.7	992.3	990.3
$\%O_2$ (oxygen stack gas), % volume dry	14.60	14.68	14.69	14.66
$\%CO_2$ (carbon dioxide stack gas), % volume dry	3.22	3.17	3.13	3.17
m_f (F½ particulate matter catch - filter), mg	1.4000	0.4000	0.3000	0.7000
m_a (F½ particulate matter catch - acetone rinse), mg	2.1000	2.0000	1.8000	1.9667
m_{acn} (B½ particulate matter catch - total condensible, blank correct	1.10	1.10	1.40	1.20
m_n (total particulate matter catch), mg	4.60	3.50	3.50	3.87
19 $V_{m(std)}$ (standard sample volume), dscf	97.320	98.005	98.749	98.025
8 $V_{wc(std)}$ (water vapor volume), scf	6.014	6.558	6.854	6.475
12 B_{ws} (moisture fraction), non-dimensional	0.0582	0.0627	0.0649	0.0619
Moisture, %	5.82	6.27	6.49	6.19
14 MW_{dry} (stack gas molecular weight), dry	29.099	29.094	29.088	29.094
15 MW_{wet} (stack gas molecular weight), wet	28.453	28.399	28.369	28.407
17 P_g (absolute stack pressure), in Hg	29.634	29.634	29.634	29.634
19 V_s (stack gas velocity), ft/sec	165.777	166.323	167.219	166.440
18 Q (stack flow rate), acfm	1,700,875	1,706,479	1,715,663	1,707,672
11 Q_{ws} (stack flow rate), wscfm	614,323	615,161	617,762	615,749
11 Q_{dry} (stack flow rate), dscfm	578,569	576,589	577,666	577,605
16 I (isokinetic ratio), %	97.81	98.83	99.40	98.68
20 G (F½ grain loading), grd/dscf	0.001	0.000	0.000	0.000
22 M (F½ mass emissions), lb/hr	2.752	1.867	1.625	2.081
24 E (F½ mass emissions), lb/MMBtu	0.002	0.002	0.001	0.002
20 G (B½ grain loading), grd/dscf	0.000	0.000	0.000	0.000
22 M (B½ mass emissions), lb/hr	0.865	0.856	1.083	0.935
24 E (B½ mass emissions), lb/MMBtu	0.001	0.001	0.001	0.001
20 G (total grain loading), grd/dscf	0.0007	0.0006	0.0005	0.0006
22 M (total mass emissions), lb/hr	3.62	2.72	2.71	3.02
24 E (total mass emissions), lb/MMBtu	0.0030	0.0023	0.0023	0.0025