COMPLIANCE STACK EMISSION TEST REPORT

NATURAL GAS-FIRED RICE UNIT 1100, UNIT 2100 (EURICE1), UNIT 2200 (EURICE2), UNIT 2300 (EURICE3)

Determination of Nitrogen Oxides, Carbon Monoxide, and Volatile Organic Compound Emissions and Carbon Monoxide Destruction Efficiency

Utilizing US EPA Methods 3A, 4, 7E, 10, 18, 19, and 25A

Test Date(s): June 18-20 and June 25, 2019
Facility ID: N7421
Facility Name: DTE Energy - Willow Run Compressor Station
Source Location: Ypsilanti, Michigan
Permit: EGLE Permit-to-Install No. 44-16A

Prepared For:

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to ASTM D7036 ONLY
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Source Name:	**RICE Unit 1100**	**RICE Unit 2100**
Source ID Number:	**-**	**EURICE1**
Control Device:	**CAT-OX**	**CAT-OX**
Test Date:	**6/18/2019**	**6/20/2019**
Sampling Location(s):	**CAT-OX Inlet/Exhaust**	**CAT-OX Inlet/Exhaust**
Engine Load (bhp)*	**4,489**	**4,357**
CO Destruction Efficiency (%)†	**98.4**	**>99.4**
Permit Limit - CO Destruction Efficiency (%)	>93	>93
Compliance Acceptability Criteria Met (Yes/No)	*Yes*	*Yes*

Source Name:	**RICE Unit 2200**	**RICE Unit 2300**
Source ID Number:	**EURICE2**	**EURICE3**
Control Device:	**CAT-OX**	**CAT-OX**
Test Date:	**6/19/2019**	**6/25/2019**
Sampling Location(s):	**CAT-OX Inlet/Exhaust**	**CAT-OX Inlet/Exhaust**
Engine Load (bhp)*	**2,227**	**2,204**
CO Destruction Efficiency (%)†	**>98.4**	**>99.2**
Permit Limit - CO Destruction Efficiency (%)	>93	>93
Compliance Acceptability Criteria Met (Yes/No)	*Yes*	*Yes*
Permit No.	**EGLE Permit-to-Install No. 44-16A**	

TEST RESULTS SUMMARY - CONTINUED

Source Name:	RICE Unit 2100	RICE Unit 2200	RICE Unit 2300
Source ID Number:	**EURICE1**	**EURICE2**	**EURICE3**
Control Device:	**CAT-OX**	**CAT-OX**	**CAT-OX**
Test Date:	**6/20/2019**	**6/19/2019**	**6/25/2019**
Sampling Location:	**Exhaust**	**Exhaust**	**Exhaust**
Engine Load (bhp)*	**4,357**	**2,227**	**2,204**
NO_x Emissions (lb/hr) (as NO_2)	**3.05**	**1.81**	**1.59**
Permit Limit - NO_x Emissions (lb/hr) (as NO_2)	*5.51*	*2.76*	*2.76*
Compliance Acceptability Criteria Met (Yes/No)	*Yes*	*Yes*	*Yes*
NO_x Concentration (ppmvd) (corrected to 15% O_2)	**26**	**31**	**29**
Permit Limit - NO_x Concentration (ppmvd) (corrected to 15% O_2)	*83*	*82*	*82*
Compliance Acceptability Criteria Met (Yes/No)	*Yes*	*Yes*	*Yes*
CO Concentration (ppmvd) (corrected to 15% O_2)§	**<1.0**	**<1.1**	**<1.3**
Permit Limit - CO Concentration (ppmvd) (corrected to 15% O_2)	*271*	*270*	*270*
Compliance Acceptability Criteria Met (Yes/No)	*Yes*	*Yes*	*Yes*
VOC Concentration (ppmvd) (corrected to 15% O_2)	**35**	**0.0**	**55**
Permit Limit - VOC Concentration (ppmvd) (corrected to 15% O_2)	*83*	*82*	*82*
Compliance Acceptability Criteria Met (Yes/No)	*Yes*	*Yes*	*Yes*
Permit No.	**EGLE Permit-to-Install No. 44-16A**		

* Production data was provided by DTE Energy - Willow Run Compressor Station personnel.

† The VOC concentration at the EURICE2 Exhaust Duct is assigned a value of zero. See Section 2.3 for details.

§ The compound was not present in quantities above the Minimum Detection Limit (MDL) of the analytical method.

REVIEW AND CERTIFICATION

The results of the Compliance Test conducted on June 18-20 and June 25, 2019 are a product of the application of the United States Environmental Protection Agency (US EPA) Stationary Source Sampling Methods listed in 40 CFR Part 60, Appendix A, that were in effect at the time of this test.

All work, calculations, and other activities and tasks performed and presented in this document were carried out by me or under my direction and supervision. I hereby certify that, to the best of my knowledge, Montrose operated in conformance with the requirements of the Montrose Quality Management System and ASTM D7036-04 during this test project.

Signature: _____ P.P Date: 8/22/19

Name: Steven Smith Title: Client Project Manager

I have reviewed, technically and editorially, details, calculations, results, conclusions, and other appropriate written materials contained herein. I hereby certify that, to the best of my knowledge, the presented material is authentic, accurate, and conforms to the requirements of the Montrose Quality Management System and ASTM D7036-04.

Signature: _____ P.E. Date: 8/22/19

Name: Randal Tysar Title: District Manager

1.0 INTRODUCTION

1.1 SUMMARY OF TEST PROGRAM

The DTE Energy - Willow Run Compressor Station (Facility ID: N7421), located in Ypsilanti, Michigan, contracted Montrose Air Quality Services, LLC (Montrose) of Detroit, Michigan, to conduct compliance stack emission testing for their Natural Gas-Fired Reciprocating Internal Combustion Engine (RICE) Units 1100, 2100 (EURICE1), 2200 (EURICE2), and 2300 (EURICE3). Testing was performed to satisfy the emissions testing requirements pursuant to Michigan Department of Environment, Great Lakes and Energy (EGLE) Permit-to-Install (PTI) No. 44-16A, 40 CFR Part 60 Subpart JJJJ, and 40 CFR Part 63 Subpart ZZZZ. The testing was performed on June 18-20 and June 25, 2019.

Simultaneous sampling was performed at the oxidation catalyst (CAT-OX) inlet and exhaust ducts associated with RICE Units 1100, 2100, 2200, and 2300 to determine carbon monoxide (CO) destruction efficiency (DE). Testing was conducted during maximum operating conditions.

Sampling was also performed at the CAT-OX exhaust ducts associated RICE Units 2100, 2200, and 2300 to determine the emissions of nitrogen oxides (NO_x) (as NO_2) and the concentrations, corrected to 15% O_2, of NO_x, CO, and volatile organic compounds (VOC). Testing was conducted during maximum operating conditions.

During this test RICE units 1100, 2100, 2200, and 2300 were each controlled by a CAT-OX.

The test methods that were conducted during this test were US EPA Methods 3A, 4, 7E, 10, 18, 19, and 25A.

1.2 KEY PERSONNEL

The key personnel who coordinated this test program (and their phone numbers) were:

- Jason Logan, Environmental Specialist-Environmental Field Services Group, DTE Energy Corporate Services, LLC, 734-548-2128
- Karen Kajiya-Mills, Environmental Manager, Michigan Department of Environment, Great Lakes and Energy, 517-284-6780
- Mark Dziadosz, Environmental Quality Analyst, Michigan Department of Environment, Great Lakes and Energy, 586-753-3745
- Steve Smith, Client Project Manager, Montrose, 734-751-9701

2.0 SUMMARY AND DISCUSSION OF TEST RESULTS

2.1 OBJECTIVES AND TEST MATRIX

The purpose of this test was to determine the CO DE of the CAT-OXs associated with RICE Units 1100, 2100, 2200, and 2300. The purpose of the test was also to determine the emissions of NO_x (as NO_2) and the concentrations, corrected to 15% O_2, of NO_x, CO, and VOC at the CAT-OX exhaust ducts associated with RICE Units 2100, 2200, and 2300. Testing was performed during maximum operating conditions. Testing was performed to satisfy the emissions testing requirements pursuant to EGLE PTI No. 44-16A, 40 CFR Part 60 Subpart JJJJ, and 40 CFR Part 63 Subpart ZZZZ.

The specific test objectives for this test were as follows:

- Simultaneously measure the concentrations of oxygen (O_2) and CO at the CAT-OX inlet and exhaust ducts associated with RICE Units 1100, 2100, 2200, and 2300.
- Measure moisture content and the concentration of NO_x, methane (CH_4) ethane (C_2H_6) and TGO at the CAT-OX exhaust ducts associated with RICE Units 2100, 2200, and 2300.
- Utilize the above variables, in conjunction with facility provided fuel flow and US EPA Method 19, to determine the CO DE of the CAT-OXs associated with RICE Units 1100, 2100, 2200, and 2300 during maximum operating conditions.
- Utilize the above variables, in conjunction with facility provided fuel flow and US EPA Method 19, to determine the emissions of NO_x (as NO_2) and the concentrations, corrected to 15% O_2, of NO_x (as NO_2), CO, and VOC (methane/ethane corrected TGO) from the CAT-OX exhaust ducts associated with RICE Units 2100, 2200, and 2300 during maximum operating conditions.

Tables 2.1.1 to 2.1.4 present the sampling matrix log for this test.

2.2 FIELD TEST CHANGES AND PROBLEMS

The US EPA Method 18 Tedlar bag samples for Unit 2100 Run 2 and Unit 2200 Run 1 that were shipped to Enthalpy Analytical, Inc., had deflated upon arrival. As a result, the samples for Unit 2100 Run 2 and Unit 2200 Run 1 were not analyzed. Montrose has calculated the CH_4 and C_2H_6 concentration for Unit 2100 Run 2 by averaging the concentrations of Runs 1 and 3. Similarly, the CH_4 and C_2H_6 concentration for Unit 2200 Run 1 was calculated by averaging the concentrations of Runs 2 and 3.

2.3 PRESENTATION OF RESULTS

One sampling train was utilized at the RICE Unit 1100 CAT-OX Inlet Duct and one sampling train was utilized at the RICE Unit 1100 CAT-OX Exhaust Duct to determine the CO DE of the CAT-OX associated with RICE Unit 1100. These sampling trains measured the concentrations of O_2 and CO at the Rice Unit 1100 CAT-OX Inlet Duct and Rice Unit 1100 CAT-OX Exhaust Duct.

One sampling train was utilized at the CAT-OX inlet ducts associated with RICE Units 2100, 2200, and 2300 and three sample sampling trains were utilized at the CAT-OX exhaust ducts associated with RICE Units 2100, 2200, and 2300 to determine the CO DE of the CAT-OXs, the emissions of NO_x (as NO_2), and concentrations, corrected to 15% O_2, of NO_x, CO, and VOC. At the CAT-OX Inlet ducts the sampling train measured the concentrations of O_2 and CO. At the CAT-OX exhaust ducts, one sampling train measured the concentrations of O_2, NO_x, CO, and TGO. A second sampling train was utilized for CH_4 and C_2H_6 concentration determination, and a third sampling train measured the duct gas moisture content.

Table 2.2.1 displays the CO DE of the CAT-OXs associated with RICE Units 1100 and 2100 during maximum achievable operations.

Table 2.2.2 displays the CO DE of the CAT-OXs associated with RICE Units 2200 and 2300 during maximum achievable operations.

Table 2.3.1 displays the emissions of NO_x (as NO_2), CO, and VOC, and the concentration of NO_x, CO, and VOC corrected to 15% O_2 measured at RICE Unit 2100 CAT-OX Exhaust Duct and RICE Unit 2200 CAT-OX Exhaust Duct during maximum achievable operations.

Table 2.3.2 displays the emissions of NO_x (as NO_2), CO, and VOC, and the concentration of NO_x, CO, and VOC corrected to 15% O_2 measured at RICE Unit 2300 CAT-OX Exhaust Duct during maximum achievable operations.

The CH_4/C_2H_6 corrected TGO (VOC) concentration values in Table 2.3 Runs 1 to 3 at the RICE Unit 2200 CAT-OX Exhaust Duct resulted in negative values and are assigned a value of zero.

Concentration values in Tables 2.2.1 to 2.3.2 denoted with a '<' were measured to be below the minimum detection limit (MDL) of the applicable analytical method. Emissions denoted with a '<' in Tables 2.2.1 to 2.3.2 were calculated utilizing the applicable MDL concentration value instead of the "as measured" concentration value.

The graphs that present the raw, uncorrected concentration data measured in the field by the US EPA Method 3A, 7E, 10, and 25A sampling systems at the CAT-OX inlet and exhaust ducts associated with RICE Units 1100, 2100, 2200, and 2300 are located in the Field Data section of the Appendix.

TABLE 2.1.1
SAMPLING MATRIX OF TEST METHODS UTILIZED

Date	Run No.	Sampling Location	US EPA METHOD 3A (O_2) Sampling Time / Duration (min)	US EPA METHOD 10 (CO) Sampling Time / Duration (min)
6/18/2019	1	RICE Unit 1100 CAT-OX Inlet Duct	8:11 - 8:26 / 15	8:11 - 8:26 / 15
6/18/2019	2	RICE Unit 1100 CAT-OX Inlet Duct	8:39 - 8:54 / 15	8:39 - 8:54 / 15
6/18/2019	3	RICE Unit 1100 CAT-OX Inlet Duct	9:02 - 9:17 / 15	9:02 - 9:17 / 15
6/18/2019	1	RICE Unit 1100 CAT-OX Exhaust Duct	8:11 - 8:26 / 15	8:11 - 8:26 / 15
6/18/2019	2	RICE Unit 1100 CAT-OX Exhaust Duct	8:39 - 8:54 / 15	8:39 - 8:54 / 15
6/18/2019	3	RICE Unit 1100 CAT-OX Exhaust Duct	9:02 - 9:17 / 15	9:02 - 9:17 / 15

All times are Eastern Daylight Time.

TABLE 2.1.2
SAMPLING MATRIX OF TEST METHODS UTILIZED

Date	Run No.	Sampling Location	US EPA METHOD 3A (O_2) Sampling Time / Duration (min)	US EPA METHOD 4 ($\%H_2O$) Sampling Time / Duration (min)	US EPA METHOD 7E (NO_x) Sampling Time / Duration (min)
6/19/2019	1	RICE Unit 2200 CAT-OX Inlet Duct	15:52 - 16:52 / 60	-	-
6/19/2019	2	RICE Unit 2200 CAT-OX Inlet Duct	17:10 - 18:10 / 60	-	-
6/19/2019	3	RICE Unit 2200 CAT-OX Inlet Duct	18:32 - 19:32 / 60	-	-
6/19/2019	1	RICE Unit 2200 CAT-OX Exhaust Duct	15:52 - 16:52 / 60	15:58 - 16:48 / 40	15:52 - 16:52 / 60
6/19/2019	2	RICE Unit 2200 CAT-OX Exhaust Duct	17:10 - 18:10 / 60	17:25 - 18:05 / 40	17:10 - 18:10 / 60
6/19/2019	3	RICE Unit 2200 CAT-OX Exhaust Duct	18:32 - 19:32 / 60	18:35 - 19:15 / 40	18:32 - 19:32 / 60

Date	Run No.	Sampling Location	US EPA METHOD 10 (CO) Sampling Time / Duration (min)	US EPA METHOD 18 (Methane/Ethane) Sampling Time / Duration (min)	US EPA METHOD 25A (TGO) Sampling Time / Duration (min)
6/19/2019	1	RICE Unit 2200 CAT-OX Inlet Duct	15:52 - 16:52 / 60	-	-
6/19/2019	2	RICE Unit 2200 CAT-OX Inlet Duct	17:10 - 18:10 / 60	-	-
6/19/2019	3	RICE Unit 2200 CAT-OX Inlet Duct	18:32 - 19:32 / 60	-	-
6/20/2019	1	RICE Unit 2200 CAT-OX Exhaust Duct	15:52 - 16:52 / 60	15:52 - 16:52 / 60	15:52 - 16:52 / 60
6/20/2019	2	RICE Unit 2200 CAT-OX Exhaust Duct	17:10 - 18:10 / 60	17:10 - 18:10 / 60	17:10 - 18:10 / 60
6/20/2019	3	RICE Unit 2200 CAT-OX Exhaust Duct	18:32 - 19:32 / 60	18:32 - 19:32 / 60	18:32 - 19:32 / 60

All times are Eastern Daylight Time.

TABLE 2.1.3
SAMPLING MATRIX OF TEST METHODS UTILIZED

Date	Run No.	Sampling Location	US EPA METHOD 3A (O_2) Sampling Time / Duration (min)	US EPA METHOD 4 ($\%H_2O$) Sampling Time / Duration (min)	US EPA METHOD 7E (NO_x) Sampling Time / Duration (min)
6/20/2019	1	RICE Unit 2100 CAT-OX Inlet Duct	8:33 - 9:33 / 60	-	-
6/20/2019	2	RICE Unit 2100 CAT-OX Inlet Duct	9:49 - 10:49 / 60	-	-
6/20/2019	3	RICE Unit 2100 CAT-OX Inlet Duct	11:02 - 12:02 / 60	-	-
6/20/2019	1	RICE Unit 2100 CAT-OX Exhaust Duct	8:33 - 9:33 / 60	8:35 - 9:15 / 40	8:33 - 9:33 / 60
6/20/2019	2	RICE Unit 2100 CAT-OX Exhaust Duct	9:49 - 10:49 / 60	9:55 - 10:35 / 40	9:49 - 10:49 / 60
6/20/2019	3	RICE Unit 2100 CAT-OX Exhaust Duct	11:02 - 12:02 / 60	11:15 - 11:55 / 40	11:02 - 12:02 / 60

Date	Run No.	Sampling Location	US EPA METHOD 10 (CO) Sampling Time / Duration (min)	US EPA METHOD 18 (Methane/Ethane) Sampling Time / Duration (min)	US EPA METHOD 25A (TGO) Sampling Time / Duration (min)
6/20/2019	1	RICE Unit 2100 CAT-OX Inlet Duct	8:33 - 9:33 / 60	-	-
6/20/2019	2	RICE Unit 2100 CAT-OX Inlet Duct	9:49 - 10:49 / 60	-	-
6/20/2019	3	RICE Unit 2100 CAT-OX Inlet Duct	11:02 - 12:02 / 60	-	-
6/20/2019	1	RICE Unit 2100 CAT-OX Exhaust Duct	8:33 - 9:33 / 60	8:33 - 9:33 / 60	8:33 - 9:33 / 60
6/20/2019	2	RICE Unit 2100 CAT-OX Exhaust Duct	9:49 - 10:49 / 60	9:49 - 10:49 / 60	9:49 - 10:49 / 60
6/20/2019	3	RICE Unit 2100 CAT-OX Exhaust Duct	11:02 - 12:02 / 60	11:02 - 12:02 / 60	11:02 - 12:02 / 60

All times are Eastern Daylight Time.

TABLE 2.1.4
SAMPLING MATRIX OF TEST METHODS UTILIZED

Date	Run No.	Sampling Location	US EPA METHOD 3A (O_2) Sampling Time / Duration (min)	US EPA METHOD 4 ($\%H_2O$) Sampling Time / Duration (min)	US EPA METHOD 7E (NO_x) Sampling Time / Duration (min)
6/25/2019	1	RICE Unit 2300 CAT-OX Inlet Duct	8:51 - 9:51 / 60	-	-
6/25/2019	2	RICE Unit 2300 CAT-OX Inlet Duct	10:12 - 11:12 / 60	-	-
6/25/2019	3	RICE Unit 2300 CAT-OX Inlet Duct	11:25 - 12:48 / 60	-	-
6/25/2019	1	RICE Unit 2300 CAT-OX Exhaust Duct	8:51 - 9:51 / 60	8:51 - 9:21 / 30	8:51 - 9:51 / 60
6/25/2019	2	RICE Unit 2300 CAT-OX Exhaust Duct	10:12 - 11:12 / 60	10:13 - 10:43 / 30	10:12 - 11:12 / 60
6/25/2019	3	RICE Unit 2300 CAT-OX Exhaust Duct	11:25 - 12:48 / 60	11:33 - 12:13 / 30	11:25 - 12:48 / 60

Date	Run No.	Sampling Location	US EPA METHOD 10 (CO) Sampling Time / Duration (min)	US EPA METHOD 18 (Methane/Ethane) Sampling Time / Duration (min)	US EPA METHOD 25A (TGO) Sampling Time / Duration (min)
6/25/2019	1	RICE Unit 2300 CAT-OX Inlet Duct	8:51 - 9:51 / 60	-	-
6/25/2019	2	RICE Unit 2300 CAT-OX Inlet Duct	10:12 - 11:12 / 60	-	-
6/25/2019	3	RICE Unit 2300 CAT-OX Inlet Duct	11:25 - 12:48 / 60	-	-
6/25/2019	1	RICE Unit 2300 CAT-OX Exhaust Duct	8:51 - 9:51 / 60	8:51 - 9:51 / 60	8:51 - 9:51 / 60
6/25/2019	2	RICE Unit 2300 CAT-OX Exhaust Duct	10:12 - 11:12 / 60	10:12 - 11:12 / 60	10:12 - 11:12 / 60
6/25/2019	3	RICE Unit 2300 CAT-OX Exhaust Duct	11:25 - 12:48 / 60	11:25 - 12:48 / 60	11:25 - 12:48 / 60

All times are Eastern Daylight Time.

TABLE 2.2.1
EMISSION RESULTS

Parameter	RICE Unit 1100 CAT-OX Inlet Duct				RICE Unit 1100 CAT-OX Exhaust Duct			
	Run 1	Run 2	Run 3	Average	Run 1	Run 2	Run 3	Average
Engine Load (bhp)*	-	-	-	-	4,539	4,482	4,447	4,489
Carbon Monoxide Destruction Efficiency (%)	-	-	-	-	97.4	98.8	99.0	98.4
Carbon Monoxide Emissions (lb/hr)	16.9	17.2	17.2	17.1	0.44	0.21	0.17	0.27
Carbon Monoxide Concentration (ppmvd)	405	410	413	409	10.6	5.06	4.11	6.59
Percent by Volume Oxygen in Stack Gas (%-dry)	11.6	11.7	11.6	11.6	11.6	11.6	11.6	11.6

Parameter	RICE Unit 2100 CAT-OX Inlet Duct				RICE Unit 2100 CAT-OX Exhaust Duct			
	Run 1	Run 2	Run 3	Average	Run 1	Run 2	Run 3	Average
Engine Load (bhp)*	-	-	-	-	4,401	4,329	4,342	4,357
Carbon Monoxide Destruction Efficiency (%)	-	-	-	-	> 99.4	> 99.4	> 99.4	> 99.4
Carbon Monoxide Emissions (lb/hr)†	11.6	11.6	11.6	11.6	< 0.075	< 0.075	< 0.075	< 0.075
Carbon Monoxide Concentration (ppmvd)†	277	277	277	277	< 1.80	< 1.80	< 1.80	< 1.80
Percent by Volume Oxygen in Stack Gas (%-dry)	10.8	11.0	10.8	10.9	10.7	10.7	10.8	10.7

* Process data provided by DTE-Willow Run Compressor Station personnel.
† The "<" symbol indicates that compound was below the Minimum Detection Limit (MDL) of the analytical method. See Section 2.3 for details.

TABLE 2.2.2
EMISSION RESULTS

Parameter	RICE Unit 2200 CAT-OX Inlet Duct				RICE Unit 2200 CAT-OX Exhaust Duct			
	Run 1	Run 2	Run 3	Average	Run 1	Run 2	Run 3	Average
Engine Load (bhp)*	-	-	-	-	2,220	2,172	2,290	2,227
Carbon Monoxide Destruction Efficiency (%)	-	-	-	-	> 98.4	> 98.4	> 98.5	> 98.4
Carbon Monoxide Emissions (lb/hr)†	5.53	5.87	5.54	5.64	< 0.038	< 0.039	< 0.037	< 0.038
Carbon Monoxide Concentration (ppmvd)†	270	271	269	270	< 1.80	< 1.80	< 1.80	< 1.80
Percent by Volume Oxygen in Stack Gas (%-dry)	11.0	11.0	10.9	11.0	11.1	11.1	10.9	11.1

Parameter	RICE Unit 2300 CAT-OX Inlet Duct				RICE Unit 2300 CAT-OX Exhaust Duct			
	Run 1	Run 2	Run 3	Average	Run 1	Run 2	Run 3	Average
Engine Load (bhp)*	-	-	-	-	2,290	2,169	2,153	2,204
Carbon Monoxide Destruction Efficiency (%)	-	-	-	-	> 99.3	> 99.3	99.0	> 99.2
Carbon Monoxide Emissions (lb/hr)†	5.84	5.72	5.51	5.69	< 0.039	< 0.038	0.055	< 0.044
Carbon Monoxide Concentration (ppmvd)†	281	276	274	277	< 1.80	< 1.80	2.69	< 2.10
Percent by Volume Oxygen in Stack Gas (%-dry)	11.2	11.2	11.2	11.2	11.4	11.3	11.3	11.3

* Process data provided by DTE-Willow Run Compressor Station personnel.
† The "<" symbol indicates that compound was below the Minimum Detection Limit (MDL) of the analytical method. See Section 2.3 for details.

TABLE 2.3.1
EMISSION RESULTS

Parameter	RICE Unit 2100 CAT-OX Exhaust Duct				RICE Unit 2200 CAT-OX Exhaust Duct			
	Run 1	Run 2	Run 3	Average	Run 1	Run 2	Run 3	Average
Engine Load (bhp)*	4,401	4,329	4,342	4,357	2,220	2,172	2,290	2,227
Fuel Flow (scfh)*	30,871	30,919	30,971	30,920	14,804	15,544	14,977	15,108
Nitrogen Oxides Emissions (lb/hr) (as NO_2)	3.02	3.01	3.10	3.05	1.73	1.88	1.83	1.81
Nitrogen Oxides Concentration (ppmvd) (corrected to 15% O_2)	25.6	25.5	26.2	25.8	30.5	31.6	31.9	31.4
Nitrogen Oxides Concentration (ppmvd)	44.2	43.9	45.1	44.4	50.5	52.6	53.9	52.4
Carbon Monoxide Concentration (ppmvd) (corrected to 15% O_2)†	< 1.04	< 1.05	< 1.05	< 1.05	< 1.09	< 1.08	< 1.07	< 1.08
Carbon Monoxide Concentration (ppmvd)†	< 1.80	< 1.80	< 1.80	< 1.80	< 1.80	< 1.80	< 1.80	< 1.80
VOC (ppmvd as propane) (corrected to 15% O_2)§	40.5	33.7	31.0	35.1	0.0	0.0	0.0	0.0
CH_4/C_2H_6 Corrected TGO Concentration (ppmvd as propane)§	69.9	58.1	53.5	60.5	0.0	0.0	0.0	0.0
Total Gaseous Organic Concentration (ppmvd as propane)	461	455	456	457	440	409	420	409
Ethane (C_2H_6) Concentration (ppmvd as propane)	40.6	40.9 ‡	41.3	40.9	50.1**	51.2	49.0	50.1
Methane (CH_4) Concentration (ppmvd as propane)	350	356 ‡	361	356	485**	491	479	485
Measured Stack Gas Percent by Volume Moisture (%H_2O)	12.97	11.66	11.48	12.04	9.57	9.02	8.53	9.04
Percent by Volume Oxygen in Stack Gas (%-dry)	10.71	10.73	10.75	10.73	11.14	11.08	10.94	11.05

* Process data provided by DTE-Willow Run Compressor Station personnel.
† The "<" symbol indicates that compound was below the Minimum Detection Limit (MDL) of the analytical method. See Section 2.3 for details.
§ Methane/Ethane corrected TGO (VOC) at the EURICE2 CAT-OX Exhaust Duct, Runs 1-3, were negative and assigned a value of zero. See Section 2.3 for details.
‡ The concentration of Run 2 is determined by averaging the concentrations of Runs 1 and 3. See Section 2.2 for details.
** The concentration of Run 1 is determined by averaging the concentrations of Runs 2 and 3. See Section 2.2 for details.

TABLE 2.3.2
EMISSION RESULTS

Parameter	RICE Unit 2300 CAT-OX Exhaust Duct			
	Run 1	Run 2	Run 3	Average
Engine Load (bhp)*	2,290	2,169	2,153	2,204
Fuel Flow (scfh)*	14,795	14,641	14,259	14,565
Nitrogen Oxides Emissions (lb/hr) (as NO_2)	1.59	1.62	1.57	1.59
Nitrogen Oxides Concentration (ppmvd) (corrected to 15% O_2)	28.1	28.9	28.7	28.6
Nitrogen Oxides Concentration (ppmvd)	45.1	47.2	46.7	46.3
Carbon Monoxide Concentration (ppmvd) (corrected to 15% O_2)†	< 1.12	< 1.10	1.65	< 1.29
Carbon Monoxide Concentration (ppmvd)†	< 1.80	< 1.80	2.69	< 2.10
VOC (ppmvd as propane) (corrected to 15% O_2)	105.9	31.1	27.3	54.8
CH_4/C_2H_6 Corrected TGO Concentration (ppmvd as propane)	170.1	50.8	44.5	88.5
Total Gaseous Organic Concentration (ppmvd as propane)	507	448	458	451
Ethane (C_2H_6) Concentration (ppmvd as propane)	39.4	63.3	40.5	47.8
Methane (CH_4) Concentration (ppmvd as propane)	297	388	416	367
Measured Stack Gas Percent by Volume Moisture (%H_2O)	11.86	10.67	8.66	10.39
Percent by Volume Oxygen in Stack Gas (%-dry)	11.42	11.26	11.30	11.33

* Process data provided by DTE-Willow Run Compressor Station personnel.
† The "<" symbol indicates that compound was below the Minimum Detection Limit (MDL) of the analytical method. See Section 2.3 for details.

3.0 PLANT AND SAMPLING LOCATION DESCRIPTIONS

3.1 PROCESS DESCRIPTION AND OPERATION

DTE Energy - Willow Run Compressor Station transports natural gas using compressor engines (RICE). RICE Units 1100, 2100, 2200, and 2300 were in operation during this test event.

Table 3.1 displays the process data. Figures 3.1 and 3.2 schematically depict the sampling locations.

3.2 CONTROL EQUIPMENT DESCRIPTION

During this test, emissions from RICE Units 1100, 2100, 2200, and 2300 were each controlled by a CAT-OX.

3.3 SAMPLING LOCATION(S)

3.3.1 RICE Unit 1100 CAT-OX Inlet Duct

The RICE Unit 1100 CAT-OX Inlet Duct had an inner diameter of 24-inches and was oriented in the horizontal plane. During emissions sampling, the duct was traversed for O_2 and CO concentration determination at 16.7%, 50%, and 83.3% of the measurement line.

3.3.2 RICE Unit 1100 CAT-OX Exhaust Duct

The RICE Unit 1100 CAT-OX Exhaust Duct had an inner diameter of 24-inches and was oriented in the horizontal plane. During emissions sampling, the duct was traversed for O_2 and CO concentration determination at 16.7%, 50%, and 83.3% of the measurement line.

3.3.3 RICE Unit 2100 CAT-OX Inlet Duct

The RICE Unit 2100 CAT-OX Inlet Duct had an inner diameter of 36-inches and was oriented in the horizontal plane. During emissions sampling, the duct was traversed for O_2 and CO concentration determination at 16.7%, 50%, and 83.3% of the measurement line.

3.3.4 RICE Unit 2100 CAT-OX Exhaust Duct

The RICE Unit 2100 CAT-OX Exhaust Duct had an inner diameter of 36-inches and was oriented in the horizontal plane. During emissions sampling, the duct was traversed for O_2 NO_x, CO, and TGO concentration determination at 16.7%, 50%, and 83.3% of the measurement line. A point in the duct was utilized to measure duct gas moisture content. A second point in the duct was utilized for CH_4 and C_2H_6 sampling.

3.3.5 RICE Unit 2200 CAT-OX Inlet Duct

The RICE Unit 2200 CAT-OX Inlet Duct had an inner diameter of 24-inches and was oriented in the horizontal plane. During emissions sampling, the duct was traversed for O_2 and CO concentration determination at 16.7%, 50%, and 83.3% of the measurement line.

3.3.6 RICE Unit 2200 CAT-OX Exhaust Duct

The RICE Unit 2200 CAT-OX Exhaust Duct had an inner diameter of 24-inches and was oriented in the horizontal plane. During emissions sampling, the duct was traversed for O_2 NO_x, CO, and TGO concentration determination at 16.7%, 50%, and 83.3% of the measurement line. A point in the duct was utilized to measure duct gas moisture content. A second point in the duct was utilized for CH_4 and C_2H_6 sampling.

3.3.7 RICE Unit 2300 CAT-OX Inlet Duct

The RICE 2300 CAT-OX Inlet Duct had an inner diameter of 24-inches and was oriented in the horizontal plane. During emissions sampling, the duct was traversed for O_2 and CO concentration determination at 16.7%, 50%, and 83.3% of the measurement line.

3.3.8 RICE Unit 2300 CAT-OX Exhaust Duct

The RICE Unit 2300 CAT-OX Exhaust Duct had an inner diameter of approximately 24-inches and was oriented in the horizontal plane. During emissions sampling, the duct was traversed for O_2, NO_x, CO, and TGO concentration determination at 16.7%, 50%, and 83.3% of the measurement line. A point in the duct was utilized to measure duct gas moisture content. A second point in the duct was utilized for CH_4 and C_2H_6 sampling.

3.4 PROCESS SAMPLING LOCATION(S)

The US EPA Reference Test Methods performed did not specifically require that process samples were to be taken during the performance of this testing event. It is in the best knowledge of Montrose that no process samples were obtained and therefore no process sampling location was identified in this report.

TABLE 3.1
PROCESS DATA

Parameter	RICE Unit 1100			RICE Unit 2100		
	Run 1	Run 2	Run 3	Run 1	Run 2	Run 3
RICE Unit Rating (bhp)	4735	4735	4735	5000	5000	5000
Fuel Flow Reading 1 (scfh)	28,296	28,325	28,028	31,114	31,102	30,910
Fuel Flow Reading 2 (scfh)	28,042	28,061	28,198	30,853	30,777	31,223
Fuel Flow Reading 3 (scfh)	-	-	-	30,647	30,877	30,781
Average Fuel Flow Reading (scfh)	**28,169**	**28,193**	**28,113**	**30,871**	**30,919**	**30,971**
Actual RICE BHP Reading 1 (bhp)	4,582	4,494	4,449	4449	4350	4339
Actual RICE BHP Reading 2 (bhp)	4,492	4,398	4,446	4423	4311	4341
Actual RICE BHP Reading 3 (bhp)	4,589	4,495	4,447	4333	4325	4346
Actual RICE BHP Reading 4 (bhp)	4,494	4,542	4,444	4440	4349	4342
Actual RICE BHP Reading 5 (bhp)	-	-	-	4423	4312	4340
Actual RICE BHP Reading 6 (bhp)	-	-	-	4335	4325	4343
Average RICE Load (bhp)	**4,539**	**4,482**	**4,447**	**4,401**	**4,329**	**4,342**

Parameter	RICE Unit 2200			RICE Unit 2300		
	Run 1	Run 2	Run 3	Run 1	Run 2	Run 3
RICE Unit Rating (bhp)	2500	2500	2500	2500	2500	2500
Fuel Flow Reading 1 (scfh)	14,840	15,511	14,982	13,658	14,636	14,528
Fuel Flow Reading 2 (scfh)	14,829	15,617	14,918	15,418	14,798	14,004
Fuel Flow Reading 3 (scfh)	14,742	15,505	15,031	15,309	14,488	14,245
Average Fuel Flow Reading (scfh)	**14,804**	**15,544**	**14,977**	**14,795**	**14,641**	**14,259**
Actual RICE BHP Reading 1 (bhp)	2198.0	2193.0	2182	2182	2151	2165
Actual RICE BHP Reading 2 (bhp)	2227.0	2166.0	2430	2430	2173	2144
Actual RICE BHP Reading 3 (bhp)	2240.0	2153.0	2269	2269	2170	2167
Actual RICE BHP Reading 4 (bhp)	2189.0	2184.0	2162	2162	2173	2165
Actual RICE BHP Reading 5 (bhp)	2222.0	2177.0	2419	2419	2180	2134
Actual RICE BHP Reading 6 (bhp)	2243.0	2158.0	2275	2275	2164	2145
Average RICE Load (bhp)	**2,220**	**2,172**	**2,290**	**2,290**	**2,169**	**2,153**

FIGURE 3.1
UNIT 1100 AND 2100 SAMPLING LOCATION SCHEMATIC

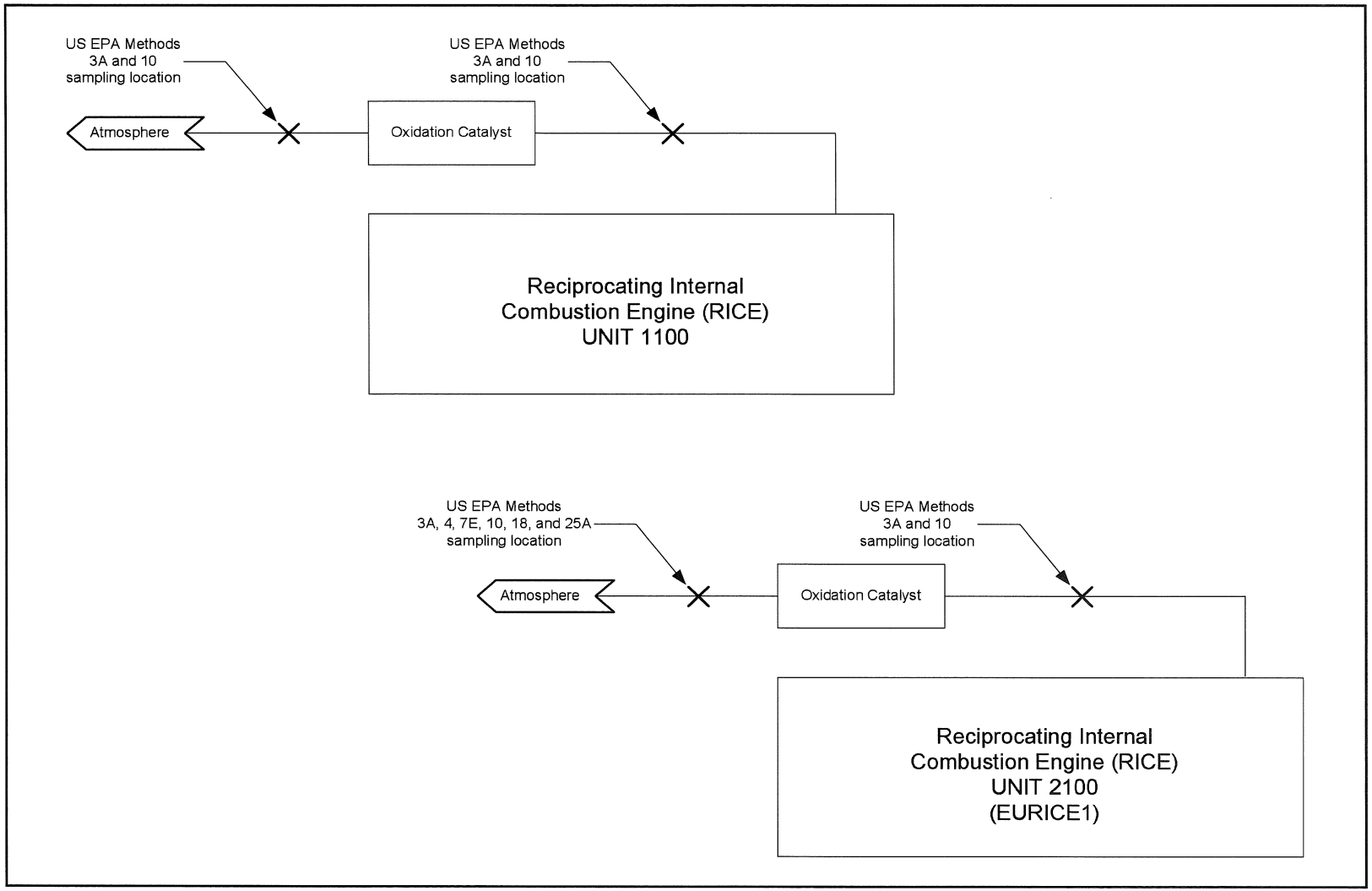
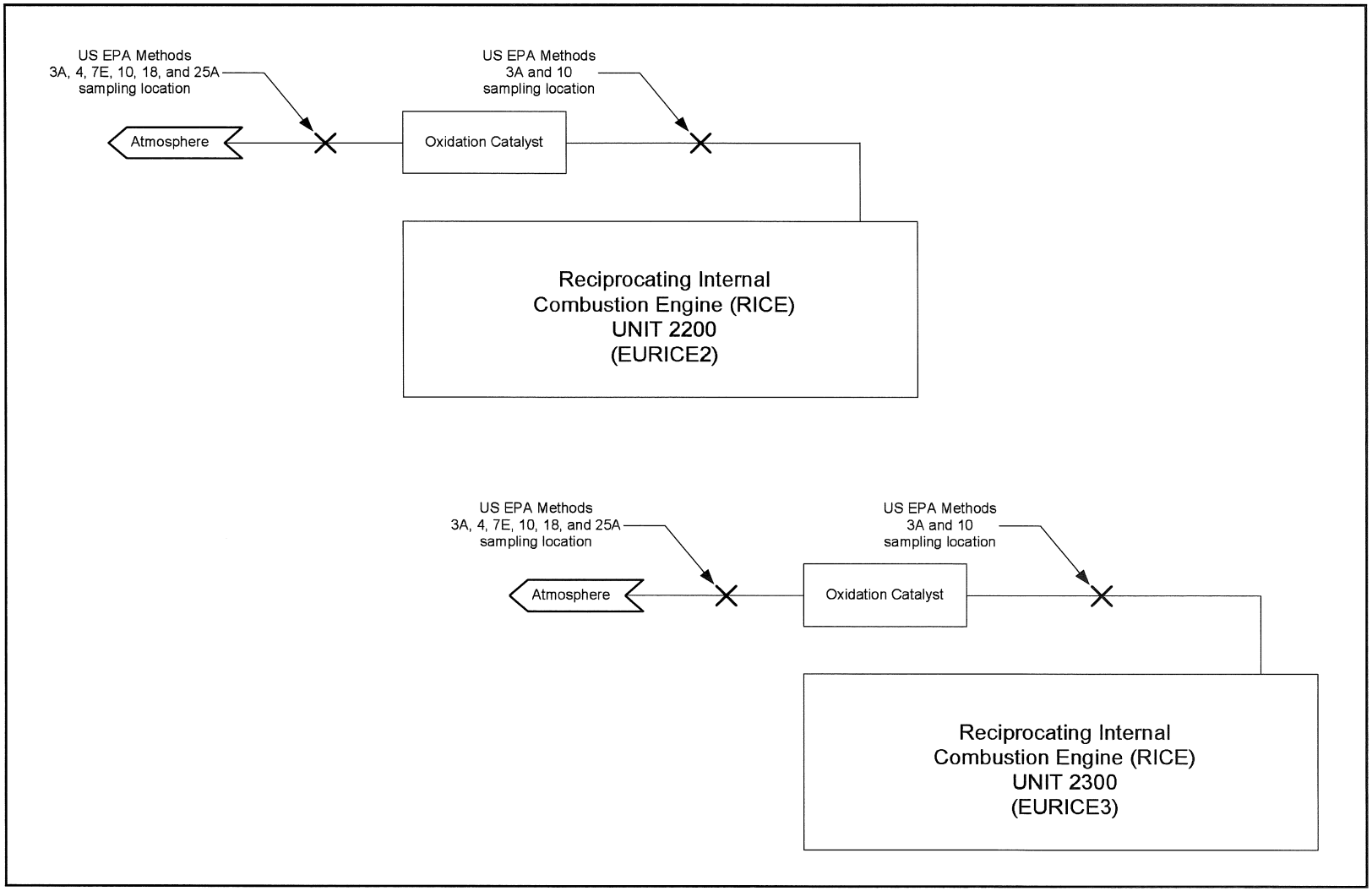


FIGURE 3.2
UNIT 2200 AND UNIT 2300 SAMPLING LOCATION SCHEMATIC



4.0 SAMPLING AND ANALYTICAL PROCEDURES

4.1 TEST METHODS

4.1.1 US EPA Method 3A: "Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)"

Principle: A gas sample is continuously extracted from the effluent stream. A portion of the sample stream is conveyed to an instrumental analyzer(s) for determination of O_2 and CO_2 concentration(s). Performance specifications and test procedures are provided to ensure reliable data. This method was utilized in its entirety as per the procedures outlined in 40 CFR Part 60, Appendix A. During this test event, only O_2 was measured.

4.1.2 US EPA Method 4: "Determination of Moisture Content in Stack Gases"

Principle: A gas sample is extracted at a constant rate from the source; moisture is removed from the sample stream and determined either volumetrically or gravimetrically. This method was utilized in its entirety as per the procedures outlined in 40 CFR Part 60, Appendix A.

4.1.3 US EPA Method 7E: "Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer Procedure)"

Principle: A gas sample is continuously extracted from the effluent stream. A portion of the sample stream is conveyed to an instrumental analyzer for the determination of NO_x concentration. NO and NO_2 may be measured separately or simultaneously. For the purposes of this method, NO_x is the sum of NO and NO_2. Performance specifications and test procedures are provided to ensure reliable data. This method was utilized in its entirety as per the procedures outlined in 40 CFR Part 60, Appendix A.

4.1.4 US EPA Method 10: "Determination of Carbon Monoxide Emissions from Stationary Sources (Instrumental Analyzer Procedure)"

Principle: A gas sample is continuously extracted from the effluent stream. A portion of the sample stream is conveyed to an instrumental analyzer for determination of CO concentration. Performance specifications and test procedures are provided to ensure reliable data. This method was utilized in its entirety as per the procedures outlined in 40 CFR Part 60, Appendix A.

4.1.5 US EPA Method 18: "Determination of Gaseous Organic Compound Emissions Chromatography"

Principle: This method is based on separating the major components of a gas mixture with a gas chromatograph (GC) and measuring the separated components with a suitable detector. The retention times of each separated component are compared with those of known compounds under identical conditions. Therefore, the analyst confirms the identity and approximate concentrations of the organic emission components beforehand. With this information, the analyst then prepares or purchases commercially available standard mixtures to calibrate the GC under conditions identical to those of the samples. The analyst also determines the need for sample dilution to avoid detector saturation, gas stream filtration to eliminate particulate matter, and prevention of moisture condensation. This method was utilized in its entirety as per the procedures outlined in 40 CFR Part 60, Appendix A. During this test the gas mixture was only analyzed for methane and ethane.

4.1.6 US EPA Method 19: "Determination of Sulfur Dioxide Removal Efficiency and Particulate Matter, Sulfur Dioxide, and Nitrogen Oxides Emission Rates"

Principle: Oxygen (O_2) or carbon dioxide (CO_2) concentrations and appropriate F factors (ratios of combustion gas volumes to heat inputs) are used to calculate pollutant emission rates from pollutant concentrations. During this test only O_2 was utilized to calculate pollutant emission rates.

4.1.7 US EPA Method 25A: "Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer"

Principle: A gas sample is extracted from the source through a heated sample line, if necessary, and glass fiber filter to a flame ionization analyzer (FIA). Results are reported as volume concentration equivalents of the calibration gas or as carbon equivalents. Performance specifications and test procedures are provided to ensure reliable data. This method was utilized in its entirety as per the procedures outlined in 40 CFR Part 60, Appendix A.

The sampling trains utilized during this testing project are depicted in Figures 4.1 to 4.4.

4.2 PROCEDURES FOR OBTAINING PROCESS DATA

Process data was recorded by DTE Energy - Willow Run Compressor Station personnel utilizing their typical record keeping procedures. Recorded process data was provided to Montrose personnel at the conclusion of this test event. The process data is displayed in Tables 2.2.1, 2.2.2, 2.3.1, 2.3.2, 3.1, and in the Process Data section of the Appendix.

FIGURE 4.1
US EPA METHOD 4 SAMPLING TRAIN SCHEMATIC

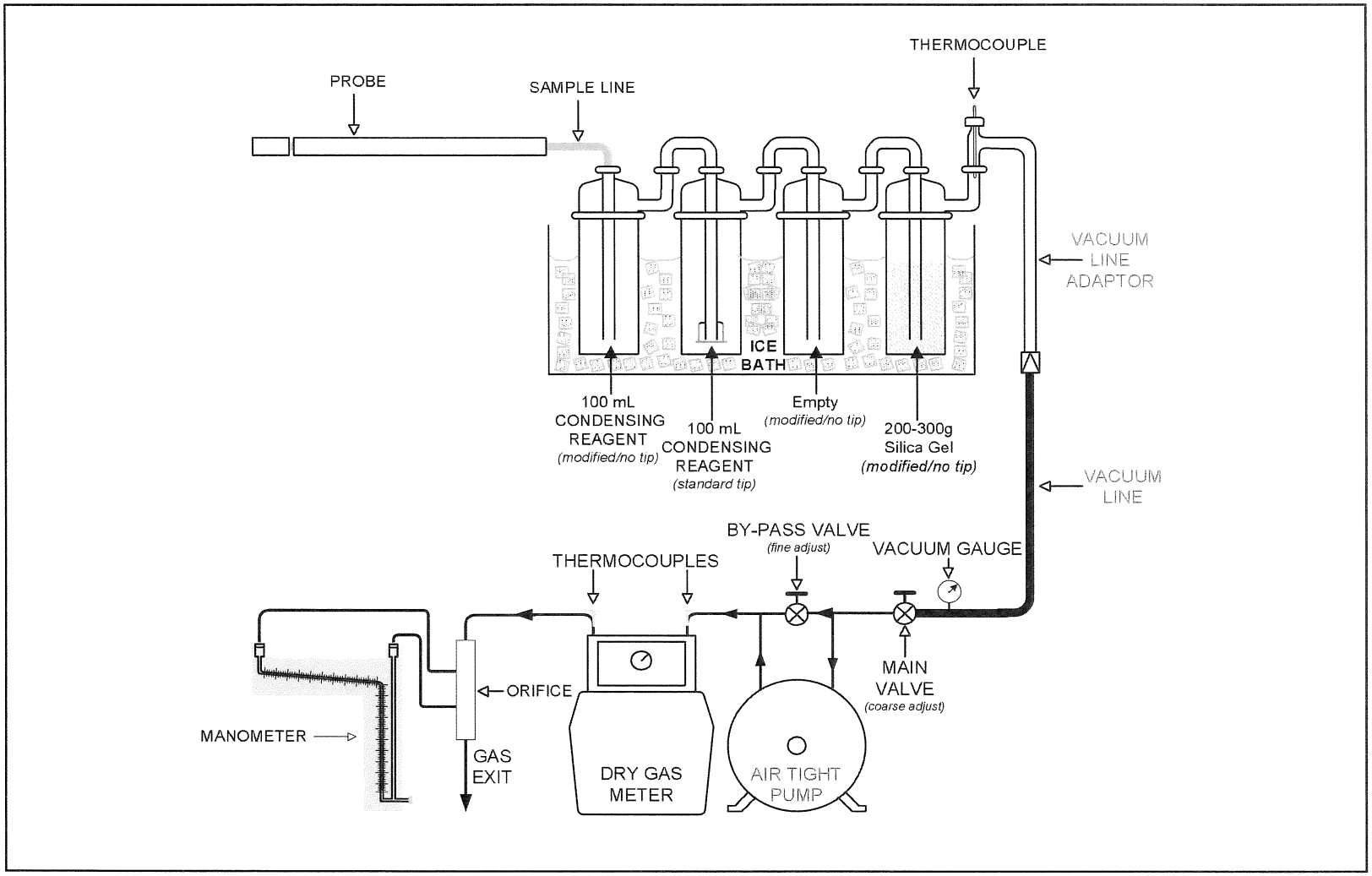


FIGURE 4.2
US EPA METHOD 18 SAMPLING TRAIN SCHEMATIC

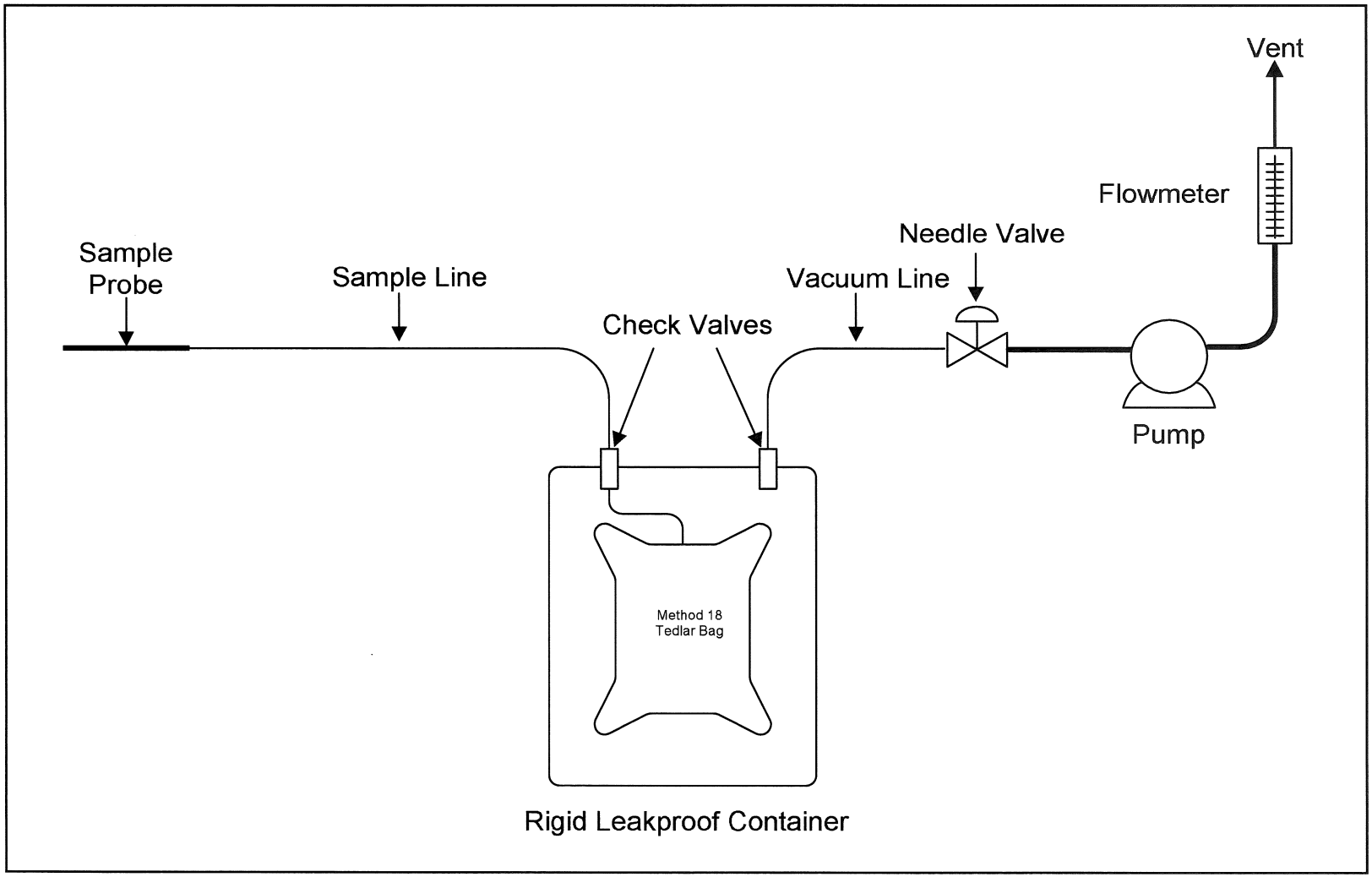


FIGURE 4.3
US EPA METHOD 3A AND 10 SAMPLING TRAIN SCHEMATIC

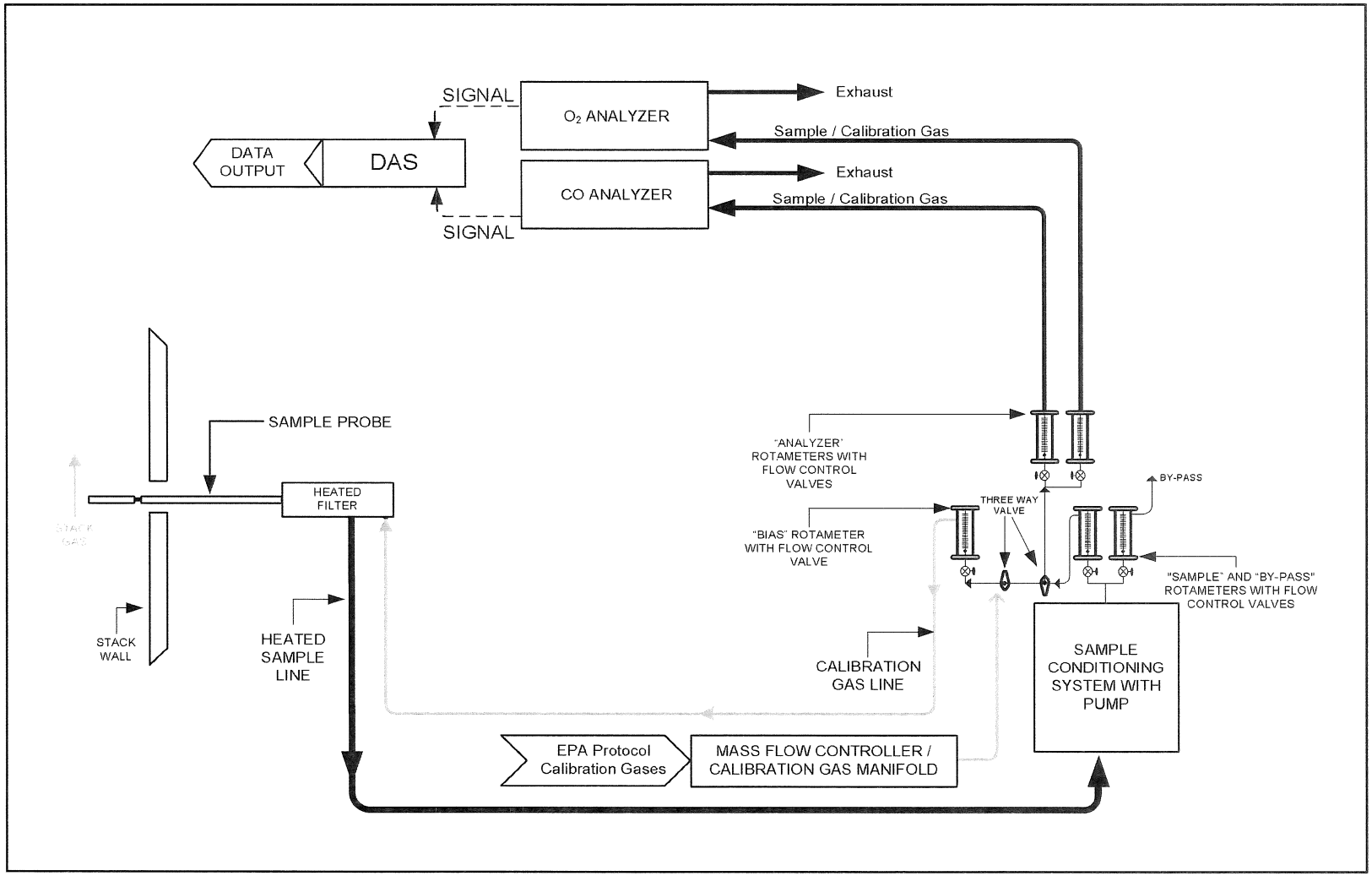
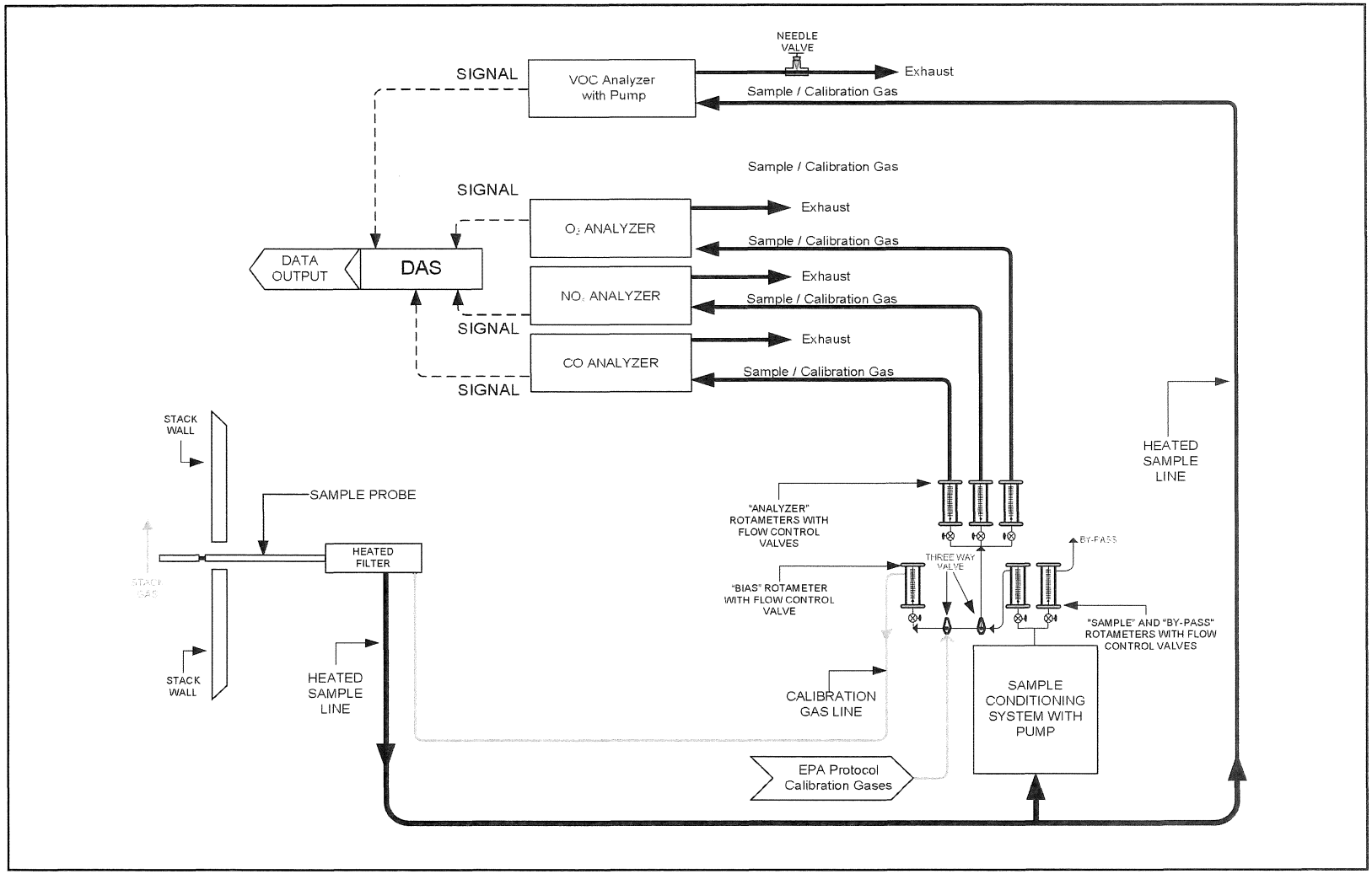


FIGURE 4.4
US EPA METHOD 3A, 7E, 10, AND 25A SAMPLING TRAIN SCHEMATIC



5.0 INTERNAL QA/QC ACTIVITIES

5.1 QA AUDITS

Tables 5.1 to 5.9 illustrate the QA audits that were performed during this test.

All meter boxes and sampling trains used during sampling performed within the requirements of their respective methods as is shown in Tables 5.1 and 5.2. All post-test leak checks were well below the applicable limit. Minimum metered volumes were also met where applicable.

Tables 5.3.1 to 5.5.4 illustrate the O_2, NO_x, and CO calibration audits which were performed during this test (and integral to performing US EPA Method 3A, 7E, and 10 correctly) were all within the Measurement System Performance Specifications of ±3% of span for the Zero and Calibration Drift Checks, ±5% of span for the System Calibration Bias Checks, and ±2% of span for the Calibration Error Checks.

Tables 5.6 illustrate the FIA calibration audits which were performed during this test (and integral to performing US EPA Method 25A correctly) were, except where noted, within the Measurement System Performance Specifications of ±3% of span for the Zero and Calibration Drift Checks, and ±5% of the respective cylinder concentrations for the Calibration Error Checks.

Table 5.7 displays the NO_2 to NO converter efficiency check. The converter efficiency check was conducted as per the procedures contained in US EPA Method 7E, Section 8.2.4.1 which require a conversion of at least 90%. As shown, an average converter efficiency of 93.81% was achieved for the NO_x analyzer utilized at RICE Unit 1100 Exhaust Duct, RICE Unit 2100 Exhaust Duct, RICE Unit 2200 Exhaust Duct, and RICE Unit 2300 Exhaust Duct.

Table 5.8 displays the US EPA Method 205 field evaluation of the calibration gas dilution system utilized during this test event. As shown, the average concentration output at each dilution level was within ±2% of the predicted value. The average concentration output of the direct inject gas was also within ±2% of the certified concentration.

Table 5.9 displays the laboratory QA results for US EPA Method 18. The average spike recovery efficiencies were within the acceptable range of 70% to 130%.

5.2 QA/QC PROBLEMS

No QA/QC problems occurred during this test event.

5.3 QUALITY STATEMENT

Montrose is qualified to conduct this test program and has established a quality management system that led to accreditation with ASTM Standard D7036-04 (Standard Practice for Competence of Air Emission Testing Bodies). Montrose participates in annual functional assessments for conformance with D7036-04 which are conducted by the American Association for Laboratory Accreditation (A2LA). All testing performed by Montrose is supervised on site by at least one Qualified Individual (QI) as defined in D7036-04 Section 8.3.2. Data quality objectives for estimating measurement uncertainty within the documented limits in the test methods are met by using approved test protocols for each project as defined in D7036-04 Sections 7.2.1 and 12.10. Additional quality assurance information is presented in the report appendices.

TABLE 5.1
US EPA METHOD 4 SAMPLING TRAIN AUDIT RESULTS

Parameter	Run 1	Run 2	Run 3
Sampling Location	**RICE Unit 2100 CAT-OX Exhaust Duct**		
Post-Test Leak Rate Observed (cfm)	0.000	0.002	0.005
Applicable Method Allowable Leak Rate (cfm)	0.020	0.020	0.020
Acceptable	Yes	Yes	Yes
Volume of Dry Gas Collected (dscf)	22.146	21.074	21.820
Recommended Volume of Dry Gas Collected (dscf)	21.000	21.000	21.000
Acceptable	Yes	Yes	Yes
Sampling Location	**RICE Unit 2200 CAT-OX Exhaust Duct**		
Post-Test Leak Rate Observed (cfm)	0.000	0.001	0.002
Applicable Method Allowable Leak Rate (cfm)	0.020	0.020	0.020
Acceptable	Yes	Yes	Yes
Volume of Dry Gas Collected (dscf)	21.387	21.887	21.755
Recommended Volume of Dry Gas Collected (dscf)	21.000	21.000	21.000
Acceptable	Yes	Yes	Yes
Sampling Location	**RICE Unit 2300 CAT-OX Exhaust Duct**		
Post-Test Leak Rate Observed (cfm)	0.000	0.000	0.000
Applicable Method Allowable Leak Rate (cfm)	0.020	0.020	0.020
Acceptable	Yes	Yes	Yes
Volume of Dry Gas Collected (dscf)	22.430	22.505	22.383
Recommended Volume of Dry Gas Collected (dscf)	21.000	21.000	21.000
Acceptable	Yes	Yes	Yes

TABLE 5.2
US EPA METHOD 4 DRY GAS METER AUDIT RESULTS

Sampling Location	Pre-Test Dry Gas Meter Calibration Factor (Y)	Average Post-Test Dry Gas Meter Calibration Check Value (Yqa)	Post Test Dry Gas Meter Calibration Check Value Difference From Pre-Test Calibration Factor (%)	Applicable Method Allowable Difference (%)	Acceptable
RICE Unit 2100 CAT-OX Exhaust Duct	1.0210	1.0179	0.30%	5.00%	Yes
RICE Unit 2200 CAT-OX Exhaust Duct	1.0210	1.0119	0.89%	5.00%	Yes
RICE Unit 2300 CAT-OX Exhaust Duct	1.0210	1.0521	-3.05%	5.00%	Yes

TABLE 5.3.1
US EPA METHOD 3A (O_2) ANALYZER CALIBRATION AND QA

	RICE Unit 1100 CAT-OX Inlet Duct					
OXYGEN ANALYZER	**RUN 1**	**Acceptable**	**RUN 2**	**Acceptable**	**RUN 3**	**Acceptable**
Analyzer Span During Test Run (%)	20.3	YES	20.3	YES	20.3	YES
Initial System Calibration Response for Zero Gas (%)	0.02	N/A	0.00	N/A	0.00	N/A
Final System Calibration Response for Zero Gas (%)	0.00	N/A	0.00	N/A	0.01	N/A
Actual Concentration of the Upscale Calibration Gas (%)	10.01	N/A	10.01	N/A	10.01	N/A
Initial System Calibration Response for Upscale Gas (%)	9.94	N/A	9.97	N/A	9.96	N/A
Final System Calibration Response for Upscale Gas (%)	9.97	N/A	9.96	N/A	9.97	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	0.10	YES	0.00	YES	0.00	YES
Final System Calibration Bias for Zero Gas (% of Span)	0.00	YES	0.00	YES	0.05	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	-0.30	YES	-0.15	YES	-0.20	YES
Final System Calibration Bias for Upscale Gas (% of Span)	-0.15	YES	-0.20	YES	-0.15	YES
System Drift for Zero Gas (% of Span)	-0.10	YES	0.00	YES	0.05	YES
System Drift for Upscale Gas (% of Span)	0.15	YES	-0.05	YES	0.05	YES
Analyzer Calibration Error for Zero Gas (% of Span)	0.00	YES	0.00	YES	0.00	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	-0.05	YES	-0.05	YES	-0.05	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	0.15	YES	0.15	YES	0.15	YES

	RICE Unit 1100 CAT-OX Exhaust Duct					
OXYGEN ANALYZER	**RUN 1**	**Acceptable**	**RUN 2**	**Acceptable**	**RUN 3**	**Acceptable**
Analyzer Span During Test Run (%)	20.3	YES	20.3	YES	20.3	YES
Initial System Calibration Response for Zero Gas (%)	0.18	N/A	0.12	N/A	0.16	N/A
Final System Calibration Response for Zero Gas (%)	0.12	N/A	0.16	N/A	0.13	N/A
Actual Concentration of the Upscale Calibration Gas (%)	10.01	N/A	10.01	N/A	10.01	N/A
Initial System Calibration Response for Upscale Gas (%)	10.13	N/A	10.09	N/A	10.10	N/A
Final System Calibration Response for Upscale Gas (%)	10.09	N/A	10.10	N/A	10.08	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	0.59	YES	0.30	YES	0.49	YES
Final System Calibration Bias for Zero Gas (% of Span)	0.30	YES	0.49	YES	0.35	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	0.00	YES	-0.20	YES	-0.15	YES
Final System Calibration Bias for Upscale Gas (% of Span)	-0.20	YES	-0.15	YES	-0.25	YES
System Drift for Zero Gas (% of Span)	-0.30	YES	0.20	YES	-0.15	YES
System Drift for Upscale Gas (% of Span)	-0.20	YES	0.05	YES	-0.10	YES
Analyzer Calibration Error for Zero Gas (% of Span)	0.30	YES	0.30	YES	0.30	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	0.59	YES	0.59	YES	0.59	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	0.59	YES	0.59	YES	0.59	YES

TABLE 5.3.2
US EPA METHOD 3A (O_2) ANALYZER CALIBRATION AND QA

	RICE Unit 2100 CAT-OX Inlet Duct					
OXYGEN ANALYZER	**RUN 1**	**Acceptable**	**RUN 2**	**Acceptable**	**RUN 3**	**Acceptable**
Analyzer Span During Test Run (%)	20.3	YES	20.3	YES	20.3	YES
Initial System Calibration Response for Zero Gas (%)	0.11	N/A	0.05	N/A	0.04	N/A
Final System Calibration Response for Zero Gas (%)	0.05	N/A	0.04	N/A	0.12	N/A
Actual Concentration of the Upscale Calibration Gas (%)	10.03	N/A	10.03	N/A	10.03	N/A
Initial System Calibration Response for Upscale Gas (%)	10.00	N/A	9.95	N/A	9.96	N/A
Final System Calibration Response for Upscale Gas (%)	9.95	N/A	9.96	N/A	9.96	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	0.35	YES	0.05	YES	0.00	YES
Final System Calibration Bias for Zero Gas (% of Span)	0.05	YES	0.00	YES	0.39	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	-0.15	YES	-0.39	YES	-0.35	YES
Final System Calibration Bias for Upscale Gas (% of Span)	-0.39	YES	-0.35	YES	-0.35	YES
System Drift for Zero Gas (% of Span)	-0.30	YES	-0.05	YES	0.39	YES
System Drift for Upscale Gas (% of Span)	-0.25	YES	0.05	YES	0.00	YES
Analyzer Calibration Error for Zero Gas (% of Span)	0.20	YES	0.20	YES	0.20	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	0.00	YES	0.00	YES	0.00	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	-0.30	YES	-0.30	YES	-0.30	YES

	RICE Unit 2100 CAT-OX Exhaust Duct					
OXYGEN ANALYZER	**RUN 1**	**Acceptable**	**RUN 2**	**Acceptable**	**RUN 3**	**Acceptable**
Analyzer Span During Test Run (%)	20.3	YES	20.3	YES	20.3	YES
Initial System Calibration Response for Zero Gas (%)	0.16	N/A	0.15	N/A	0.14	N/A
Final System Calibration Response for Zero Gas (%)	0.15	N/A	0.14	N/A	0.14	N/A
Actual Concentration of the Upscale Calibration Gas (%)	10.03	N/A	10.03	N/A	10.03	N/A
Initial System Calibration Response for Upscale Gas (%)	10.05	N/A	10.05	N/A	10.03	N/A
Final System Calibration Response for Upscale Gas (%)	10.05	N/A	10.03	N/A	10.04	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	0.59	YES	0.54	YES	0.49	YES
Final System Calibration Bias for Zero Gas (% of Span)	0.54	YES	0.49	YES	0.49	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	0.10	YES	0.10	YES	0.00	YES
Final System Calibration Bias for Upscale Gas (% of Span)	0.10	YES	0.00	YES	0.05	YES
System Drift for Zero Gas (% of Span)	-0.05	YES	-0.05	YES	0.00	YES
System Drift for Upscale Gas (% of Span)	0.00	YES	-0.10	YES	0.05	YES
Analyzer Calibration Error for Zero Gas (% of Span)	0.20	YES	0.20	YES	0.20	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	0.00	YES	0.00	YES	0.00	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	-0.30	YES	-0.30	YES	-0.30	YES

TABLE 5.3.3
US EPA METHOD 3A (O_2) ANALYZER CALIBRATION AND QA

	RICE Unit 2200 CAT-OX Inlet Duct					
OXYGEN ANALYZER	**RUN 1**	**Acceptable**	**RUN 2**	**Acceptable**	**RUN 3**	**Acceptable**
Analyzer Span During Test Run (%)	20.3	YES	20.3	YES	20.3	YES
Initial System Calibration Response for Zero Gas (%)	0.24	N/A	0.21	N/A	0.24	N/A
Final System Calibration Response for Zero Gas (%)	0.23	N/A	-0.02	N/A	0.23	N/A
Actual Concentration of the Upscale Calibration Gas (%)	10.03	N/A	10.03	N/A	10.03	N/A
Initial System Calibration Response for Upscale Gas (%)	9.92	N/A	9.89	N/A	9.92	N/A
Final System Calibration Response for Upscale Gas (%)	9.85	N/A	9.93	N/A	9.85	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	1.18	YES	1.04	YES	1.18	YES
Final System Calibration Bias for Zero Gas (% of Span)	1.14	YES	-0.10	YES	1.14	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	-0.79	YES	-0.94	YES	-0.79	YES
Final System Calibration Bias for Upscale Gas (% of Span)	-1.14	YES	-0.74	YES	-1.14	YES
System Drift for Zero Gas (% of Span)	-0.05	YES	-1.14	YES	-0.05	YES
System Drift for Upscale Gas (% of Span)	-0.35	YES	0.20	YES	-0.35	YES
Analyzer Calibration Error for Zero Gas (% of Span)	0.00	YES	0.00	YES	0.00	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	0.25	YES	0.25	YES	0.25	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	-0.74	YES	-0.74	YES	-0.74	YES

	RICE Unit 2200 CAT-OX Inlet Duct					
OXYGEN ANALYZER	**RUN 1**	**Acceptable**	**RUN 2**	**Acceptable**	**RUN 3**	**Acceptable**
Analyzer Span During Test Run (%)	20.3	YES	20.3	YES	20.3	YES
Initial System Calibration Response for Zero Gas (%)	0.15	N/A	0.18	N/A	0.16	N/A
Final System Calibration Response for Zero Gas (%)	0.15	N/A	0.16	N/A	0.16	N/A
Actual Concentration of the Upscale Calibration Gas (%)	10.03	N/A	10.03	N/A	10.03	N/A
Initial System Calibration Response for Upscale Gas (%)	10.11	N/A	10.09	N/A	10.08	N/A
Final System Calibration Response for Upscale Gas (%)	10.13	N/A	10.08	N/A	10.13	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	0.49	YES	0.64	YES	0.54	YES
Final System Calibration Bias for Zero Gas (% of Span)	0.49	YES	0.54	YES	0.54	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	-0.30	YES	-0.39	YES	-0.44	YES
Final System Calibration Bias for Upscale Gas (% of Span)	-0.20	YES	-0.44	YES	-0.20	YES
System Drift for Zero Gas (% of Span)	0.00	YES	-0.10	YES	0.00	YES
System Drift for Upscale Gas (% of Span)	0.10	YES	-0.05	YES	0.25	YES
Analyzer Calibration Error for Zero Gas (% of Span)	0.25	YES	0.25	YES	0.25	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	0.69	YES	0.69	YES	0.69	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	0.39	YES	0.39	YES	0.39	YES

TABLE 5.3.4
US EPA METHOD 3A (O_2) ANALYZER CALIBRATION AND QA

	RICE Unit 2300 CAT-OX Inlet Duct					
OXYGEN ANALYZER	**RUN 1**	**Acceptable**	**RUN 2**	**Acceptable**	**RUN 3**	**Acceptable**
Analyzer Span During Test Run (%)	20.3	YES	20.3	YES	20.3	YES
Initial System Calibration Response for Zero Gas (%)	-0.07	N/A	0.21	N/A	-0.16	N/A
Final System Calibration Response for Zero Gas (%)	-0.17	N/A	-0.16	N/A	-0.12	N/A
Actual Concentration of the Upscale Calibration Gas (%)	10.03	N/A	10.03	N/A	10.03	N/A
Initial System Calibration Response for Upscale Gas (%)	9.90	N/A	9.89	N/A	9.85	N/A
Final System Calibration Response for Upscale Gas (%)	9.86	N/A	9.85	N/A	9.87	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	0.49	YES	1.88	YES	0.05	YES
Final System Calibration Bias for Zero Gas (% of Span)	0.00	YES	0.05	YES	0.25	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	-0.25	YES	-0.30	YES	-0.49	YES
Final System Calibration Bias for Upscale Gas (% of Span)	-0.44	YES	-0.49	YES	-0.39	YES
System Drift for Zero Gas (% of Span)	-0.49	YES	-1.83	YES	0.20	YES
System Drift for Upscale Gas (% of Span)	-0.20	YES	-0.20	YES	0.10	YES
Analyzer Calibration Error for Zero Gas (% of Span)	-0.84	YES	-0.84	YES	-0.84	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	-0.39	YES	-0.39	YES	-0.39	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	-0.20	YES	-0.20	YES	-0.20	YES

	RICE Unit 2300 CAT-OX Exhaust Duct					
OXYGEN ANALYZER	**RUN 1**	**Acceptable**	**RUN 2**	**Acceptable**	**RUN 3**	**Acceptable**
Analyzer Span During Test Run (%)	20.3	YES	20.3	YES	20.3	YES
Initial System Calibration Response for Zero Gas (%)	0.13	N/A	0.18	N/A	0.15	N/A
Final System Calibration Response for Zero Gas (%)	0.14	N/A	0.15	N/A	0.15	N/A
Actual Concentration of the Upscale Calibration Gas (%)	10.03	N/A	10.03	N/A	10.03	N/A
Initial System Calibration Response for Upscale Gas (%)	10.09	N/A	10.09	N/A	10.15	N/A
Final System Calibration Response for Upscale Gas (%)	10.11	N/A	10.15	N/A	10.14	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	0.44	YES	0.69	YES	0.54	YES
Final System Calibration Bias for Zero Gas (% of Span)	0.49	YES	0.54	YES	0.54	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	-0.05	YES	-0.05	YES	0.25	YES
Final System Calibration Bias for Upscale Gas (% of Span)	0.05	YES	0.25	YES	0.20	YES
System Drift for Zero Gas (% of Span)	0.05	YES	-0.15	YES	0.00	YES
System Drift for Upscale Gas (% of Span)	0.10	YES	0.30	YES	-0.05	YES
Analyzer Calibration Error for Zero Gas (% of Span)	0.20	YES	0.20	YES	0.20	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	0.35	YES	0.35	YES	0.35	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	-0.20	YES	-0.20	YES	-0.20	YES

TABLE 5.4.1
US EPA METHOD 7E ANALYZER CALIBRATION AND QA

	RICE Unit 2100 CAT-OX Exhaust Duct					
NITROGEN OXIDES ANALYZER	**RUN 1**	**Acceptable**	**RUN 2**	**Acceptable**	**RUN 3**	**Acceptable**
Analyzer Span During Test Run (ppm)	93.9	YES	93.9	YES	93.9	YES
Initial System Calibration Response for Zero Gas (ppm)	0.48	N/A	0.75	N/A	1.02	N/A
Final System Calibration Response for Zero Gas (ppm)	0.75	N/A	1.02	N/A	1.22	N/A
Actual Concentration of the Upscale Calibration Gas (ppm)	50.38	N/A	50.38	N/A	50.38	N/A
Initial System Calibration Response for Upscale Gas (ppm)	48.86	N/A	48.57	N/A	49.17	N/A
Final System Calibration Response for Upscale Gas (ppm)	48.57	N/A	49.17	N/A	48.76	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	0.45	YES	0.73	YES	1.02	YES
Final System Calibration Bias for Zero Gas (% of Span)	0.73	YES	1.02	YES	1.24	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	-0.35	YES	-0.66	YES	-0.02	YES
Final System Calibration Bias for Upscale Gas (% of Span)	-0.66	YES	-0.02	YES	-0.46	YES
System Drift for Zero Gas (% of Span)	0.29	YES	0.29	YES	0.21	YES
System Drift for Upscale Gas (% of Span)	-0.31	YES	0.64	YES	-0.44	YES
Analyzer Calibration Error for Zero Gas (% of Span)	0.06	YES	0.06	YES	0.06	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	-1.27	YES	-1.27	YES	-1.27	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	-1.00	YES	-1.00	YES	-1.00	YES

	RICE Unit 2200 CAT-OX Exhaust Duct					
NITROGEN OXIDES ANALYZER	**RUN 1**	**Acceptable**	**RUN 2**	**Acceptable**	**RUN 3**	**Acceptable**
Analyzer Span During Test Run (ppm)	93.9	YES	93.9	YES	93.9	YES
Initial System Calibration Response for Zero Gas (ppm)	0.61	N/A	0.42	N/A	1.63	N/A
Final System Calibration Response for Zero Gas (ppm)	2.14	N/A	1.63	N/A	0.88	N/A
Actual Concentration of the Upscale Calibration Gas (ppm)	50.38	N/A	50.38	N/A	50.38	N/A
Initial System Calibration Response for Upscale Gas (ppm)	50.36	N/A	49.72	N/A	49.59	N/A
Final System Calibration Response for Upscale Gas (ppm)	50.45	N/A	49.59	N/A	48.28	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	0.64	YES	0.44	YES	1.73	YES
Final System Calibration Bias for Zero Gas (% of Span)	2.27	YES	1.73	YES	0.93	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	0.47	YES	-0.21	YES	-0.35	YES
Final System Calibration Bias for Upscale Gas (% of Span)	0.56	YES	-0.35	YES	-1.75	YES
System Drift for Zero Gas (% of Span)	1.63	YES	1.29	YES	-0.80	YES
System Drift for Upscale Gas (% of Span)	0.10	YES	-0.14	YES	-1.40	YES
Analyzer Calibration Error for Zero Gas (% of Span)	0.01	YES	0.01	YES	0.01	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	-0.49	YES	-0.49	YES	-0.49	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	-0.03	YES	-0.03	YES	-0.03	YES

TABLE 5.4.2
US EPA METHOD 7E ANALYZER CALIBRATION AND QA

	RICE Unit 2300 CAT-OX Exhaust Duct					
NITROGEN OXIDES ANALYZER	**RUN 1**	**Acceptable**	**RUN 2**	**Acceptable**	**RUN 3**	**Acceptable**
Analyzer Span During Test Run (ppm)	94	YES	94	YES	94	YES
Initial System Calibration Response for Zero Gas (ppm)	0.6	N/A	0.4	N/A	1.1	N/A
Final System Calibration Response for Zero Gas (ppm)	1.0	N/A	1.1	N/A	1.5	N/A
Actual Concentration of the Upscale Calibration Gas (ppm)	50.4	N/A	50.4	N/A	50.4	N/A
Initial System Calibration Response for Upscale Gas (ppm)	50.2	N/A	49.7	N/A	50.1	N/A
Final System Calibration Response for Upscale Gas (ppm)	50.3	N/A	50.1	N/A	50.2	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	0.47	YES	0.33	YES	1.03	YES
Final System Calibration Bias for Zero Gas (% of Span)	0.99	YES	1.03	YES	1.43	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	0.20	YES	-0.30	YES	0.07	YES
Final System Calibration Bias for Upscale Gas (% of Span)	0.32	YES	0.07	YES	0.24	YES
System Drift for Zero Gas (% of Span)	0.52	YES	0.70	YES	0.39	YES
System Drift for Upscale Gas (% of Span)	0.12	YES	0.37	YES	0.17	YES
Analyzer Calibration Error for Zero Gas (% of Span)	0.12	YES	0.12	YES	0.12	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	-0.40	YES	-0.40	YES	-0.40	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	-0.28	YES	-0.28	YES	-0.28	YES

TABLE 5.5.1
US EPA METHOD 10 ANALYZER CALIBRATION AND QA

	RICE Unit 1100 CAT-OX Inlet Duct					
CARBON MONOXIDE ANALYZER	**RUN 1**	**Acceptable**	**RUN 2**	**Acceptable**	**RUN 3**	**Acceptable**
Analyzer Span During Test Run (ppm)	900.0	YES	900.0	YES	900.0	YES
Initial System Calibration Response for Zero Gas (ppm)	4.33	N/A	4.52	N/A	4.99	N/A
Final System Calibration Response for Zero Gas (ppm)	4.52	N/A	4.99	N/A	4.66	N/A
Actual Concentration of the Upscale Calibration Gas (ppm)	500.00	N/A	500.00	N/A	500.00	N/A
Initial System Calibration Response for Upscale Gas (ppm)	501.94	N/A	502.77	N/A	503.52	N/A
Final System Calibration Response for Upscale Gas (ppm)	502.77	N/A	503.52	N/A	502.39	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	0.17	YES	0.19	YES	0.24	YES
Final System Calibration Bias for Zero Gas (% of Span)	0.19	YES	0.24	YES	0.21	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	0.72	YES	0.82	YES	0.90	YES
Final System Calibration Bias for Upscale Gas (% of Span)	0.82	YES	0.90	YES	0.77	YES
System Drift for Zero Gas (% of Span)	0.02	YES	0.05	YES	-0.04	YES
System Drift for Upscale Gas (% of Span)	0.09	YES	0.08	YES	-0.13	YES
Analyzer Calibration Error for Zero Gas (% of Span)	0.31	YES	0.31	YES	0.31	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	-0.51	YES	-0.51	YES	-0.51	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	0.23	YES	0.23	YES	0.23	YES

	RICE Unit 1100 CAT-OX Exhaust Duct					
CARBON MONOXIDE ANALYZER	**RUN 1**	**Acceptable**	**RUN 2**	**Acceptable**	**RUN 3**	**Acceptable**
Analyzer Span During Test Run (ppm)	90.0	YES	90.0	YES	90.0	YES
Initial System Calibration Response for Zero Gas (ppm)	2.62	N/A	1.85	N/A	1.90	N/A
Final System Calibration Response for Zero Gas (ppm)	1.85	N/A	1.90	N/A	1.61	N/A
Actual Concentration of the Upscale Calibration Gas (ppm)	50.00	N/A	50.00	N/A	50.00	N/A
Initial System Calibration Response for Upscale Gas (ppm)	50.04	N/A	51.58	N/A	51.46	N/A
Final System Calibration Response for Upscale Gas (ppm)	51.58	N/A	51.46	N/A	51.04	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	2.79	YES	1.93	YES	1.99	YES
Final System Calibration Bias for Zero Gas (% of Span)	1.93	YES	1.99	YES	1.67	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	1.01	YES	2.72	YES	2.59	YES
Final System Calibration Bias for Upscale Gas (% of Span)	2.72	YES	2.59	YES	2.12	YES
System Drift for Zero Gas (% of Span)	-0.86	YES	0.06	YES	-0.32	YES
System Drift for Upscale Gas (% of Span)	1.71	YES	-0.13	YES	-0.47	YES
Analyzer Calibration Error for Zero Gas (% of Span)	0.12	YES	0.12	YES	0.12	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	-0.97	YES	-0.97	YES	-0.97	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	0.06	YES	0.06	YES	0.06	YES

TABLE 5.5.2
US EPA METHOD 10 ANALYZER CALIBRATION AND QA

	RICE Unit 2100 CAT-OX Inlet Duct					
CARBON MONOXIDE ANALYZER	**RUN 1**	**Acceptable**	**RUN 2**	**Acceptable**	**RUN 3**	**Acceptable**
Analyzer Span During Test Run (ppm)	900.0	YES	900.0	YES	900.0	YES
Initial System Calibration Response for Zero Gas (ppm)	3.83	N/A	3.68	N/A	4.18	N/A
Final System Calibration Response for Zero Gas (ppm)	3.68	N/A	4.18	N/A	4.13	N/A
Actual Concentration of the Upscale Calibration Gas (ppm)	500.00	N/A	500.00	N/A	500.00	N/A
Initial System Calibration Response for Upscale Gas (ppm)	499.86	N/A	498.55	N/A	500.23	N/A
Final System Calibration Response for Upscale Gas (ppm)	498.55	N/A	500.23	N/A	489.25	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	0.01	YES	0.00	YES	0.05	YES
Final System Calibration Bias for Zero Gas (% of Span)	0.00	YES	0.05	YES	0.05	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	0.28	YES	0.13	YES	0.32	YES
Final System Calibration Bias for Upscale Gas (% of Span)	0.13	YES	0.32	YES	-0.90	YES
System Drift for Zero Gas (% of Span)	-0.02	YES	0.06	YES	-0.01	YES
System Drift for Upscale Gas (% of Span)	-0.15	YES	0.19	YES	-1.22	YES
Analyzer Calibration Error for Zero Gas (% of Span)	0.41	YES	0.41	YES	0.41	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	-0.29	YES	-0.29	YES	-0.29	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	0.31	YES	0.31	YES	0.31	YES

	RICE Unit 2100 CAT-OX Exhaust Duct					
CARBON MONOXIDE ANALYZER	**RUN 1**	**Acceptable**	**RUN 2**	**Acceptable**	**RUN 3**	**Acceptable**
Analyzer Span During Test Run (ppm)	90.1	YES	90.1	YES	90.1	YES
Initial System Calibration Response for Zero Gas (ppm)	1.54	N/A	1.31	N/A	1.43	N/A
Final System Calibration Response for Zero Gas (ppm)	1.31	N/A	1.43	N/A	1.30	N/A
Actual Concentration of the Upscale Calibration Gas (ppm)	49.40	N/A	49.40	N/A	49.40	N/A
Initial System Calibration Response for Upscale Gas (ppm)	49.51	N/A	48.92	N/A	49.26	N/A
Final System Calibration Response for Upscale Gas (ppm)	48.92	N/A	49.26	N/A	49.08	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	1.05	YES	0.80	YES	0.93	YES
Final System Calibration Bias for Zero Gas (% of Span)	0.80	YES	0.93	YES	0.79	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	0.02	YES	-0.63	YES	-0.26	YES
Final System Calibration Bias for Upscale Gas (% of Span)	-0.63	YES	-0.26	YES	-0.45	YES
System Drift for Zero Gas (% of Span)	-0.26	YES	0.13	YES	-0.14	YES
System Drift for Upscale Gas (% of Span)	-0.65	YES	0.38	YES	-0.20	YES
Analyzer Calibration Error for Zero Gas (% of Span)	0.65	YES	0.65	YES	0.65	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	0.10	YES	0.10	YES	0.10	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	0.26	YES	0.26	YES	0.26	YES

TABLE 5.5.3
US EPA METHOD 10 ANALYZER CALIBRATION AND QA

	RICE Unit 2200 CAT-OX Inlet Duct					
CARBON MONOXIDE ANALYZER	**RUN 1**	**Acceptable**	**RUN 2**	**Acceptable**	**RUN 3**	**Acceptable**
Analyzer Span During Test Run (ppm)	900.0	YES	900.0	YES	900.0	YES
Initial System Calibration Response for Zero Gas (ppm)	4.12	N/A	3.62	N/A	3.92	N/A
Final System Calibration Response for Zero Gas (ppm)	3.92	N/A	3.92	N/A	3.98	N/A
Actual Concentration of the Upscale Calibration Gas (ppm)	500.00	N/A	500.00	N/A	500.00	N/A
Initial System Calibration Response for Upscale Gas (ppm)	500.75	N/A	500.41	N/A	501.35	N/A
Final System Calibration Response for Upscale Gas (ppm)	500.15	N/A	501.35	N/A	503.80	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	0.05	YES	-0.01	YES	0.02	YES
Final System Calibration Bias for Zero Gas (% of Span)	0.02	YES	0.02	YES	0.03	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	0.37	YES	0.34	YES	0.44	YES
Final System Calibration Bias for Upscale Gas (% of Span)	0.31	YES	0.44	YES	0.71	YES
System Drift for Zero Gas (% of Span)	-0.02	YES	0.03	YES	0.01	YES
System Drift for Upscale Gas (% of Span)	-0.07	YES	0.10	YES	0.27	YES
Analyzer Calibration Error for Zero Gas (% of Span)	0.41	YES	0.41	YES	0.41	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	-0.29	YES	-0.29	YES	-0.29	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	0.31	YES	0.31	YES	0.31	YES

	RICE Unit 2200 CAT-OX Exhaust Duct					
CARBON MONOXIDE ANALYZER	**RUN 1**	**Acceptable**	**RUN 2**	**Acceptable**	**RUN 3**	**Acceptable**
Analyzer Span During Test Run (ppm)	90.1	YES	90.1	YES	90.1	YES
Initial System Calibration Response for Zero Gas (ppm)	2.13	N/A	1.46	N/A	1.37	N/A
Final System Calibration Response for Zero Gas (ppm)	1.87	N/A	1.37	N/A	1.39	N/A
Actual Concentration of the Upscale Calibration Gas (ppm)	49.40	N/A	49.40	N/A	49.40	N/A
Initial System Calibration Response for Upscale Gas (ppm)	49.10	N/A	48.84	N/A	49.03	N/A
Final System Calibration Response for Upscale Gas (ppm)	49.48	N/A	49.03	N/A	48.89	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	1.80	YES	1.05	YES	0.95	YES
Final System Calibration Bias for Zero Gas (% of Span)	1.51	YES	0.95	YES	0.98	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	0.06	YES	-0.23	YES	-0.02	YES
Final System Calibration Bias for Upscale Gas (% of Span)	0.48	YES	-0.02	YES	-0.18	YES
System Drift for Zero Gas (% of Span)	-0.29	YES	-0.10	YES	0.02	YES
System Drift for Upscale Gas (% of Span)	0.42	YES	0.21	YES	-0.16	YES
Analyzer Calibration Error for Zero Gas (% of Span)	0.57	YES	0.57	YES	0.57	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	-0.39	YES	-0.39	YES	-0.39	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	0.81	YES	0.81	YES	0.81	YES

TABLE 5.5.4
US EPA METHOD 10 ANALYZER CALIBRATION AND QA

	RICE Unit 2300 CAT-OX Inlet Duct					
CARBON MONOXIDE ANALYZER	**RUN 1**	**Acceptable**	**RUN 2**	**Acceptable**	**RUN 3**	**Acceptable**
Analyzer Span During Test Run (ppm)	900.0	YES	900.0	YES	900.0	YES
Initial System Calibration Response for Zero Gas (ppm)	5.15	N/A	3.62	N/A	3.56	N/A
Final System Calibration Response for Zero Gas (ppm)	3.75	N/A	3.56	N/A	3.48	N/A
Actual Concentration of the Upscale Calibration Gas (ppm)	500.00	N/A	500.00	N/A	500.00	N/A
Initial System Calibration Response for Upscale Gas (ppm)	500.32	N/A	500.41	N/A	500.40	N/A
Final System Calibration Response for Upscale Gas (ppm)	503.41	N/A	500.40	N/A	500.10	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	0.23	YES	0.06	YES	0.05	YES
Final System Calibration Bias for Zero Gas (% of Span)	0.07	YES	0.05	YES	0.04	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	0.91	YES	0.92	YES	0.91	YES
Final System Calibration Bias for Upscale Gas (% of Span)	1.25	YES	0.91	YES	0.88	YES
System Drift for Zero Gas (% of Span)	-0.16	YES	-0.01	YES	-0.01	YES
System Drift for Upscale Gas (% of Span)	0.34	YES	0.00	YES	-0.03	YES
Analyzer Calibration Error for Zero Gas (% of Span)	0.34	YES	0.34	YES	0.34	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	-0.87	YES	-0.87	YES	-0.87	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	0.08	YES	0.08	YES	0.08	YES

	RICE Unit 2300 CAT-OX Exhaust Duct					
CARBON MONOXIDE ANALYZER	**RUN 1**	**Acceptable**	**RUN 2**	**Acceptable**	**RUN 3**	**Acceptable**
Analyzer Span During Test Run (ppm)	90.1	YES	90.1	YES	90.1	YES
Initial System Calibration Response for Zero Gas (ppm)	1.13	N/A	1.46	N/A	1.27	N/A
Final System Calibration Response for Zero Gas (ppm)	1.08	N/A	1.27	N/A	1.27	N/A
Actual Concentration of the Upscale Calibration Gas (ppm)	49.40	N/A	49.40	N/A	49.40	N/A
Initial System Calibration Response for Upscale Gas (ppm)	49.31	N/A	48.84	N/A	50.46	N/A
Final System Calibration Response for Upscale Gas (ppm)	50.46	N/A	50.46	N/A	50.21	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	0.94	YES	1.31	YES	1.10	YES
Final System Calibration Bias for Zero Gas (% of Span)	0.89	YES	1.10	YES	1.10	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	-0.02	YES	-0.54	YES	1.25	YES
Final System Calibration Bias for Upscale Gas (% of Span)	1.25	YES	1.25	YES	0.98	YES
System Drift for Zero Gas (% of Span)	-0.06	YES	-0.21	YES	0.00	YES
System Drift for Upscale Gas (% of Span)	1.28	YES	1.80	YES	-0.28	YES
Analyzer Calibration Error for Zero Gas (% of Span)	0.31	YES	0.31	YES	0.31	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	-0.08	YES	-0.08	YES	-0.08	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	0.33	YES	0.33	YES	0.33	YES

TABLE 5.6
US EPA METHOD 25A ANALYZER CALIBRATION AND QA

	RICE Unit 2100 CAT-OX Exhaust Duct					
FID ANALYZER	**RUN 1**	**Acceptable**	**RUN 2**	**Acceptable**	**RUN 3**	**Acceptable**
Analyzer Span During Test Run (ppmv as propane)	905.4	YES	905.4	YES	905.4	YES
Average Stack Gas Concentration (ppmv as propane)	395.1	YES	392.0	YES	394.3	YES
Zero Drift (% of Span)	-0.09	YES	-0.06	YES	0.13	YES
Calibration Drift for Mid-Level Gas (% of Span)	-0.90	YES	-0.16	YES	0.23	YES
Calibration Error for Low-Level Gas (% of Cal. Gas Tag Value)	1.26	YES	1.26	YES	1.26	YES
Calibration Error for Mid-Level Gas (% of Cal. Gas Tag Value)	0.65	YES	0.65	YES	0.65	YES

	RICE Unit 2200 CAT-OX Exhaust Duct					
FID ANALYZER	**RUN 1**	**Acceptable**	**RUN 2**	**Acceptable**	**RUN 3**	**Acceptable**
Analyzer Span During Test Run (ppmv as propane)	905.4	YES	905.4	YES	905.4	YES
Average Stack Gas Concentration (ppmv as propane)	393.1	YES	400.9	YES	413.0	YES
Zero Drift (% of Span)	-0.02	YES	-0.14	YES	-0.04	YES
Calibration Drift for Mid-Level Gas (% of Span)	-1.44	YES	-0.11	YES	0.35	YES
Calibration Error for Low-Level Gas (% of Cal. Gas Tag Value)	-0.35	YES	-0.35	YES	-0.35	YES
Calibration Error for Mid-Level Gas (% of Cal. Gas Tag Value)	0.07	YES	0.07	YES	0.07	YES

	RICE Unit 2300 CAT-OX Exhaust Duct					
FID ANALYZER	**RUN 1**	**Acceptable**	**RUN 2**	**Acceptable**	**RUN 3**	**Acceptable**
Analyzer Span During Test Run (ppmv as propane)	905.4	YES	905.4	YES	905.4	YES
Average Stack Gas Concentration (ppmv as propane)	444.3	YES	444.1	YES	460.0	YES
Zero Drift (% of Span)	-0.14	YES	-0.09	YES	-0.10	YES
Calibration Drift for Mid-Level Gas (% of Span)	-0.32	YES	1.08	YES	0.57	YES
Calibration Error for Low-Level Gas (% of Cal. Gas Tag Value)	0.33	YES	0.33	YES	0.33	YES
Calibration Error for Mid-Level Gas (% of Cal. Gas Tag Value)	0.20	YES	0.20	YES	0.20	YES

TABLE 5.7
US EPA METHOD 7E NO_x CONVERTER CHECK

Date / Time	Certified Cylinder Concentration (ppm NO_2)	Analyzer Concentration (ppm NO_x)	Conversion Efficiency (%)	Required Conversion Efficiency (%)	Acceptable
6/18/2019 13:19	49.68	46.47	93.55	90.00	Yes
6/18/2019 13:20	49.68	46.74	94.07	90.00	Yes
AVERAGE	49.68	46.61	93.81	90.00	Yes

Analyzer Serial Number: 42i

Cylinder Number: CC501876

TABLE 5.8
US EPA METHOD 205 GAS DILUTION SYSTEM QA

Analyzer Serial Number: 42i
Dilution System Serial Number: 3090400001
CGD Mass Flow Controllers Used: 1 & 2

	Dilution Level 1	Dilution Level 2	Direct Inject Gas
Calibration Tag Value (ppm):	905.4	905.4	90.33
Dilution Ratio:	10.06	18.108	-
Predicted Diluted Value (ppm):	90.0	50.0	-
Injection 1 Response (ppm):	90.0	49.8	90.5
Injection 2 Response (ppm):	90.4	49.4	90.6
Injection 3 Response (ppm):	90.3	49.6	90.6
Average Response (ppm):	90.23	49.60	90.57
Difference From Predicted (%):	-0.26	0.80	-0.26
Acceptable (YES/NO):	Yes	Yes	Yes

TABLE 5.9
US EPA METHOD 18 SPIKE RECOVERY RESULTS

Parameter	Methane	Ethane
Sample ID	Engine 2100 R1 SP	
Initial Sample Concentration (ppmv)	906	57.9
Theoretical Spike Concentration (ppmv)	517	33.6
Final Sample Concentration (ppmv)	1,403	93.5
Recovery (%)	**96.1**	**106**
Acceptable per U.S. EPA Method 18 (Yes/No) (Expected Range 70%-130%)	Yes	Yes

Parameter	Methane	Ethane
Sample ID	Engine 2200 R2 SP	
Initial Sample Concentration (ppmv)	821	55.4
Theoretical Spike Concentration (ppmv)	505	30.8
Final Sample Concentration (ppmv)	1,189	83.4
Recovery (%)	**73**	**91.1**
Acceptable per U.S. EPA Method 18 (Yes/No) (Expected Range 70%-130%)	Yes	Yes

Parameter	Methane	Ethane
Sample ID	Engine 2300 R3 SP	
Initial Sample Concentration (ppmv)	1,077	51.6
Theoretical Spike Concentration (ppmv)	548	27.8
Final Sample Concentration (ppmv)	1,602.0	77.9
Recovery (%)	**95.9**	**94.5**
Acceptable per U.S. EPA Method 18 (Yes/No) (Expected Range 70%-130%)	Yes	Yes