performed for

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TABLE OF CONTENTS

Appendices

I. INTRODUCTION

Network Environmental, Inc. was retained by the Holland Board of Public Works to perform Relative Accuracy Test Audits (RATA's) on the Continuous Emission Monitoring Systems (CEMS's) that service Units 10 and 11 at the Holland Energy Park.

The CEMS on Units 10 and 11 are for oxides of nitrogen (NO_x), carbon monoxide (CO) and oxygen (O_2).

The RATA's were performed over the period of May 9-10, 2021. Stephan K. Byrd and David D. Engelhardt of Network Environmental, Inc. conducted the RATA's in accordance with Parts 60 and 75 of Title 40 of the Code of Federal Regulations. The following reference test methods were employed to conduct the RATA sampling:

- Oxides of Nitrogen (NO_x) - U.S. EPA Method 7E
- Carbon Monoxide (CO) - U.S. EPA Method 10
- Oxygen (O_2) - U.S. EPA Method 3A

Assisting with the RATA was Ms. Trista Gregorski of the Holland Board of Public Works. Mr. Trevor Drost of the Michigan Department of Environment, Great Lakes and Energy (EGLE) - Air Quality Division was present to observe the sampling and source operation.

II. PRESENTATION OF RESULTS

II.1 TABLE 1
NO_x RELATIVE ACCURACY DETERMINATION (LBS/MMBTU)
UNIT 10
HOLLAND BOARD OF PUBLIC WORKS
HOLLAND, MICHIGAN
MAY 9, 2023

Run #	Time	REFERENCE METHOD			CEM	DIFF
		NO_x(1)	O_2(2)	Lbs/MMBTU	Lbs/MMBTU	
1	09:09-09:34	3.1	14.4	0.010	0.010	0.000
2	09:50-10:15	3.0	14.4	0.010	0.010	0.000
3	10:24-10:49	3.1	14.3	0.010	0.010	0.000
4	10:59-11:24	3.1	14.3	0.010	0.011	-0.001
5	11:33-11:58	3.1	14.3	0.010	0.010	0.000
6	12:07-12:32	3.2	14.3	0.011	0.010	0.001
7	12:40-13:05	3.2	14.3	0.010	0.010	0.000
8	13:13-13:38	3.2	14.3	0.010	0.010	0.000
9	13:47-14:12	3.1	14.3	0.010	0.010	0.000

Mean Reference Value = 0.01011

Mean of the Differences = 0.00000

Standard Deviation = 0.00050

Confidence Co-efficient = 0.00038

Relative Accuracy = 3.80% of the mean of the reference method

Bias Adjustment = No Bias Required

Relative Accuracy Needs To Be < 10% **Or** Mean Of The Differences ≤ 0.020

(1) = Concentration in terms of PPM by volume on a dry basis
(2) = Concentration in terms of % by volume on a dry basis

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II.2 TABLE 2
NO_x RELATIVE ACCURACY DETERMINATION (PPM @ 15%O_2)
UNIT 10
HOLLAND BOARD OF PUBLIC WORKS
HOLLAND, MICHIGAN
MAY 9, 2023

Run #	Time	REFERENCE METHOD	CEM	DIFF
		PPM @ 15%O_2	PPM @ 15% O_2	
1	09:09-09:34	2.8	2.8	0.0
2	09:50-10:15	2.7	2.7	0.0
3	10:24-10:49	2.8	2.8	0.0
4	10:59-11:24	2.8	2.8	0.0
5	11:33-11:58	2.8	2.8	0.0
6	12:07-12:32	2.9	2.8	0.1
7	12:40-13:05	2.8	2.8	0.0
8	13:13-13:38	2.8	2.8	0.0
9	13:47-14:12	2.7	2.8	-0.1

Mean Reference Value = 2.78889

Mean of the Differences = 0.00000

Standard Deviation = 0.05000

Confidence Co-efficient = 0.03843

Relative Accuracy = 1.38% of the mean of the reference method

Bias Adjustment = Not Applicable

Relative Accuracy Needs To Be Less Than 20% Of The Reference Method **Or** 10% Of The Emission Limit

II.3 TABLE 3
CO RELATIVE ACCURACY DETERMINATION (PPM @ 15%O_2)
UNIT 10
HOLLAND BOARD OF PUBLIC WORKS
HOLLAND, MICHIGAN
MAY 9, 2023

Run #	Time	REFERENCE METHOD	CEM	DIFF
		PPM @ 15%O_2	PPM @ 15% O_2	
1	09:09-09:34	0.3	0.5	-0.2
2	09:50-10:15	0.3	0.4	-0.1
3	10:24-10:49	0.3	0.4	-0.1
4	10:59-11:24	0.3	0.4	-0.1
5	11:33-11:58	0.6	0.4	0.2
6	12:07-12:32	0.6	0.4	0.2
7	12:40-13:05	0.5	0.4	0.1
8	13:13-13:38	0.4	0.4	0.0
9	13:47-14:12	0.4	0.4	0.0

Mean Reference Value = 0.41556

Mean of the Differences = 0.00444

Standard Deviation = 0.14205

Confidence Co-efficient = 0.10919

Relative Accuracy = 2.84% of the emission limit (4.0 PPM @ 15%O_2)

Bias Adjustment = Not Applicable

Relative Accuracy Needs To Be Less Than 20% Of The Reference Method **Or** 10% Of The Emission Limit

II.4 TABLE 4
O_2 RELATIVE ACCURACY DETERMINATION (% O_2)
UNIT 10
HOLLAND BOARD OF PUBLIC WORKS
HOLLAND, MICHIGAN
MAY 9, 2023

Run #	Time	REFERENCE METHOD	CEM	DIFF
		% O_2	% O_2	
1	09:09-09:34	14.4	14.4	0.0
2	09:50-10:15	14.4	14.4	0.0
3	10:24-10:49	14.3	14.3	0.0
4	10:59-11:24	14.3	14.3	0.0
5	11:33-11:58	14.3	14.3	0.0
6	12:07-12:32	14.3	14.3	0.0
7	12:40-13:05	14.3	14.3	0.0
8	13:13-13:38	14.3	14.3	0.0
9.	13:47-14:12	14.3	14.3	0.0

Mean Reference Value = 14.32222

Mean of the Differences = 0.00000

Standard Deviation = 0.00000

Confidence Co-efficient = 0.00000

Relative Accuracy = 0.00% of the mean of the reference method

Bias Adjustment = Not Applicable

Relative Accuracy Needs To Be < 10% **Or** Mean Of The Differences ≤ 1.0

II.5 TABLE 5
NO_x RELATIVE ACCURACY DETERMINATION (LBS/MMBTU)
UNIT 11
HOLLAND BOARD OF PUBLIC WORKS
HOLLAND, MICHIGAN
MAY 10, 2023

Run #	Time	REFERENCE METHOD			CEM	DIFF
		NO_x(1)	O_2(2)	Lbs/MMBTU	Lbs/MMBTU	
1	08:04-08:29	2.7	14.3	0.009	0.010	-0.001
2	08:39-09:04	2.8	14.3	0.009	0.010	-0.001
3	09:12-09:37	2.7	14.3	0.009	0.010	-0.001
4	09:46-10:11	2.7	14.3	0.009	0.010	-0.001
5	10:20-10:45	2.8	14.3	0.009	0.010	-0.001
6	10:54-11:19	2.7	14.3	0.009	0.010	-0.001
7	11:29-11:54	2.8	14.3	0.009	0.010	-0.001
8	12:03-12:28	2.7	14.3	0.009	0.010	-0.001
9	12:38-13:03	2.7	14.3	0.009	0.010	-0.001

Mean Reference Value = 0.00900

Mean of the Differences = -0.00100

Standard Deviation = 0.00000

Confidence Co-efficient = 0.00000

Relative Accuracy = 11.11% of the mean of the reference method

Bias Adjustment = No Bias Required

Relative Accuracy Needs To Be < 10% **Or** Mean Of The Differences ≤ 0.020

(1) = Concentration in terms of PPM by volume on a dry basis
(2) = Concentration in terms of % by volume on a dry basis

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II.6 TABLE 6
NO_X RELATIVE ACCURACY DETERMINATION (PPM @ 15%O_2)
UNIT 11
HOLLAND BOARD OF PUBLIC WORKS
HOLLAND, MICHIGAN
MAY 10, 2023

Run #	Time	REFERENCE METHOD	CEM	DIFF
		PPM @ 15%O_2	PPM @ 15% O_2	
1	08:04-08:29	2.4	2.7	-0.3
2	08:39-09:04	2.5	2.8	-0.3
3	09:12-09:37	2.5	2.8	-0.3
4	09:46-10:11	2.5	2.8	-0.3
5	10:20-10:45	2.5	2.8	-0.3
6	10:54-11:19	2.5	2.8	-0.3
7	11:29-11:54	2.5	2.8	-0.3
8	12:03-12:28	2.4	2.8	-0.4
9	12:38-13:03	2.4	2.8	-0.4

Mean Reference Value = 2.46667

Mean of the Differences = -0.32222

Standard Deviation = 0.04410

Confidence Co-efficient = 0.03390

Relative Accuracy = 14.44% of the mean of the reference method

Bias Adjustment = Not Applicable

Relative Accuracy Needs To Be Less Than 20% Of The Reference Method **Or** 10% Of The Emission Limit

II.7 TABLE 7
CO RELATIVE ACCURACY DETERMINATION (PPM @ 15%O_2)
UNIT 11
HOLLAND BOARD OF PUBLIC WORKS
HOLLAND, MICHIGAN
MAY 10, 2023

Run #	Time	REFERENCE METHOD	CEM	DIFF
		PPM @ 15%O_2	PPM @ 15% O_2	
1	08:04-08:29	0.2	0.3	-0.1
2	08:39-09:04	0.3	0.3	0.0
3	09:12-09:37	0.2	0.3	-0.1
4	09:46-10:11	0.2	0.3	-0.1
5	10:20-10:45	0.2	0.3	-0.1
6	10:54-11:19	0.2	0.3	-0.1
7	11:29-11:54	0.2	0.3	-0.1
8	12:03-12:28	0.2	0.3	-0.1
9	12:38-13:03	0.2	0.3	-0.1

Mean Reference Value = 0.21111

Mean of the Differences = -0.08889

Standard Deviation = 0.03333

Confidence Co-efficient = 0.02562

Relative Accuracy = 2.86% of the emission limit (4.0 PPM @ 15%O_2)

Bias Adjustment = Not Applicable

Relative Accuracy Needs To Be Less Than 20% Of The Reference Method **Or** 10% Of The Emission Limit

II.8 TABLE 8
O_2 RELATIVE ACCURACY DETERMINATION (% O_2)
UNIT 11
HOLLAND BOARD OF PUBLIC WORKS
HOLLAND, MICHIGAN
MAY 10, 2023

Run #	Time	REFERENCE METHOD	CEM	DIFF
		% O_2	% O_2	
1	08:04-08:29	14.3	14.8	-0.5
2	08:39-09:04	14.3	14.7	-0.4
3	09:12-09:37	14.3	14.7	-0.4
4	09:46-10:11	14.3	14.8	-0.5
5	10:20-10:45	14.3	14.8	-0.5
6	10:54-11:19	14.3	14.8	-0.5
7	11:29-11:54	14.3	14.8	-0.5
8	12:03-12:28	14.3	14.8	-0.5
9	12:38-13:03	14.3	14.8	-0.5

Mean Reference Value = 14.30000

Mean of the Differences = -0.47778

Standard Deviation = 0.04410

Confidence Co-efficient = 0.03390

Relative Accuracy = 3.58% of the mean of the reference method

Bias Adjustment = Not Applicable

Relative Accuracy Needs To Be < 10% **Or** Mean Of The Differences ≤ 1.0

III. DISCUSSION OF RESULTS

III.1 Unit 10

III.1.1 NO_x Lbs/MMBTU - The results of the Unit 10 NO_x RATA in terms of Lbs/MMBTU can be found in Table 1 (Section II.1). The relative accuracy calculations were performed in terms of Lbs/MMBTU in accordance with U.S. EPA Reference Method 19. The reference method results were corrected using Eq. 7E-5. The Lbs/MMBTU results were calculated using the formula found in Section 2.1 of Method 19 for O_2 on a dry basis. The F factor used was 8,710. Nine (9) - twenty five (25) minute samples were collected from the Unit 10 exhaust.

The NO_x (Lbs/MMBTU) relative accuracy was 3.80% of the mean of the reference method. The average difference was 0.0000. There is no Bias Adjustment required for Unit 10.

III.1.2 NO_x PPM @15% O_2 - The results of the Unit 10 NO_x RATA in terms of PPM @ 15% O_2 can be found in Table 2 (Section II.2). The relative accuracy calculations were performed in terms of PPM @ 15% O_2 (parts per million corrected to 15% oxygen). The reference method results were corrected using Eq. 7E-5. Nine (9) - twenty five (25) minute samples were collected from the Unit 10 exhaust.

The NO_x (PPM @ 15% O_2) relative accuracy was 1.38% of the mean of the reference method.

III.1.3 CO PPM @15% O_2 - The results of the Unit 10 CO RATA in terms of PPM @ 15% O_2 can be found in Table 3 (Section II.3). The relative accuracy calculations were performed in terms of PPM @ 15% O_2 (parts per million corrected to 15% oxygen). The reference method results were corrected using Eq. 7E-5. Nine (9) - twenty five (25) minute samples were collected from the Unit 10 exhaust.

The CO (PPM @ 15% O_2) relative accuracy was 2.84% of the emission limit (4.0 PPM @ 15% O_2).

III.1.4 % O_2 - The results of the Unit 10 O_2 RATA in terms of % O_2 can be found in Table 4 (Section II.4). The relative accuracy calculations were performed in terms of % O_2. The reference method results were corrected using Eq. 7E-5. Nine (9) - twenty five (25) minute samples were collected from the Unit 10 exhaust.

The % O_2 relative accuracy was 0.00% of the mean of the reference method.

III.2 Unit 11

III.2.1 NO_x Lbs/MMBTU - The results of the Unit 11 NO_x RATA in terms of Lbs/MMBTU can be found in Table 5 (Section II.5). The relative accuracy calculations were performed in terms of Lbs/MMBTU in accordance with U.S. EPA Reference Method 19. The reference method results were corrected using Eq. 7E-5. The Lbs/MMBTU results were calculated using the formula found in Section 2.1 of Method 19 for O_2 on a dry basis. The F factor used was 8,710. Nine (9) - twenty five (25) minute samples were collected from the Unit 11 exhaust.

The NO_x (Lbs/MMBTU) relative accuracy was 11.11% of the mean of the reference method. The average difference was -0.0010. There is no Bias Adjustment required for Unit 11.

III.2.2 NO_x PPM @15% O_2 - The results of the Unit 11 NO_x RATA in terms of PPM @ 15% O_2 can be found in Table 6 (Section II.6). The relative accuracy calculations were performed in terms of PPM @ 15% O_2 (parts per million corrected to 15% oxygen). The reference method results were corrected using Eq. 7E-5. Nine (9) - twenty five (25) minute samples were collected from the Unit 11 exhaust.

The NO_x (PPM @ 15% O_2) relative accuracy was 14.44% of the mean of the reference method.

III.2.3 CO PPM @15% O_2 - The results of the Unit 11 CO RATA in terms of PPM @ 15% O_2 can be found in Table 7 (Section II.7). The relative accuracy calculations were performed in terms of PPM @ 15% O_2 (parts per million corrected to 15% oxygen). The reference method results were corrected using Eq. 7E-5. Nine (9) - twenty five (25) minute samples were collected from the Unit 11 exhaust.

The CO (PPM @ 15% O_2) relative accuracy was 2.86% of the emission limit (4.0 PPM @ 15% O_2).

III.2.4 % O_2 - The results of the Unit 11 O_2 RATA in terms of % O_2 can be found in Table 8 (Section II.8). The relative accuracy calculations were performed in terms of % O_2. The reference method results were corrected using Eq. 7E-5. Nine (9) - twenty five (25) minute samples were collected from the Unit 11 exhaust.

The % O_2 relative accuracy was 3.58% of the mean of the reference method.

IV. CEMS SPECIFICATIONS

Location	Parameter	Manufacturer / Model #	Serial #
Unit #10	NO_x / O_2	Thermo Electron Model 42i-LS	1152020016
	CO	Thermo Electron Model 48i	JC1515901569
Unit #11	NO_x / O_2	Thermo Electron Model 42i-LS	1151970010
	CO	Thermo Electron Model 48i	JC1515901575

V. SAMPLING AND ANALYTICAL PROTOCOL

The RATA's were performed in accordance with 40 CFR Parts 60 and 75.

The sampling methods used for the reference method determinations were as follows:

V.1 Oxides of Nitrogen - The NO_x sampling was conducted in accordance with U.S. EPA Reference Method 7E. A Thermo Environmental Model 42H gas analyzer was used to monitor the exhausts. A heated teflon sample line was used to transport the exhaust gases to a gas conditioner to remove moisture and reduce the temperature. From the gas conditioner stack gases were passed to the analyzer. The analyzer produces instantaneous readouts of the NO_x concentrations (PPM).

The analyzer was calibrated by direct injection prior to the testing. A span gas of 25.1 PPM was used to establish the initial instrument calibration. A calibration gas of 12.2 PPM was used to determine the calibration error of the analyzer. The sampling system (from the back of the stack probe to the analyzer) was injected using the 12.2 PPM gas to determine the system bias. After each sample, a system zero and system injection of 12.2 PPM were performed to establish system drift and system

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bias during the test period. All calibration gases were EPA Protocol 1 Certified.

The analyzer was calibrated to the output of the data acquisition system (DAS) used to collect the data from the unit. All reference method data was corrected using Equation 7E-5 from U.S. EPA Method 7E. A schematic diagram of the sampling train is shown in Figure 1.

V.2 Carbon Monoxide - The CO sampling was conducted in accordance with U.S. EPA Reference Method 10. A Thermo Environmental Model 48 gas analyzer was used to monitor the exhausts. A heated teflon sample line was used to transport the exhaust gases to a gas conditioner to remove moisture and reduce the temperature. From the gas conditioner stack gases were passed to the analyzer. The analyzer produces instantaneous readouts of the CO concentrations (PPM).

The analyzer was calibrated by direct injection prior to the testing. A span gas of 15.0 PPM was used to establish the initial instrument calibration. A calibration gas of 7.1 PPM was used to determine the calibration error of the analyzer. The sampling system (from the back of the stack probe to the analyzer) was injected using the 7.1 PPM gas to determine the system bias. After each sample, a system zero and system injection of 7.1 PPM were performed to establish system drift and system bias during the test period. All calibration gases were EPA Protocol 1 Certified.

The analyzer was calibrated to the output of the data acquisition system (DAS) used to collect the data from the unit. All reference method data was corrected using Equation 7E-5 from U.S. EPA Method 7E. A schematic diagram of the sampling train is shown in Figure 1.

V.3 Oxygen - The O_2 sampling was conducted in accordance with U.S. EPA Reference Method 3A. A heated teflon sample line was used to transport the exhaust gases from the stack to a gas conditioner to remove moisture and reduce the temperature. From the gas conditioner the stack gases were passed to a Servomex Series 1400 O_2 analyzer. This analyzer produces instantaneous readouts of the oxygen concentrations (%).

The analyzer was calibrated by direct injection prior to the testing. A span gas of 20.85% was used to establish the initial instrument calibration. Calibration gases of 6.03% and 12.0% were used to determine the calibration error of the analyzer. The sampling system (from the back of the stack probe to the analyzer) was injected using the 12.0% gas to determine the system bias. After each

sample, a system zero and system injection of 12.0% were performed to establish system drift and system bias during the test period. All calibration gases were EPA Protocol 1 Certified.

The analyzer was calibrated to the output of the data acquisition system (DAS) used to collect the data. All reference method data was corrected using Equation 7E-1 from U.S. EPA Method 7E. A schematic diagram of the sampling train is shown in Figure 1.

This report was prepared by:

David D. Engelhardt
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This report was reviewed by:

Stephan K. Byrd
President

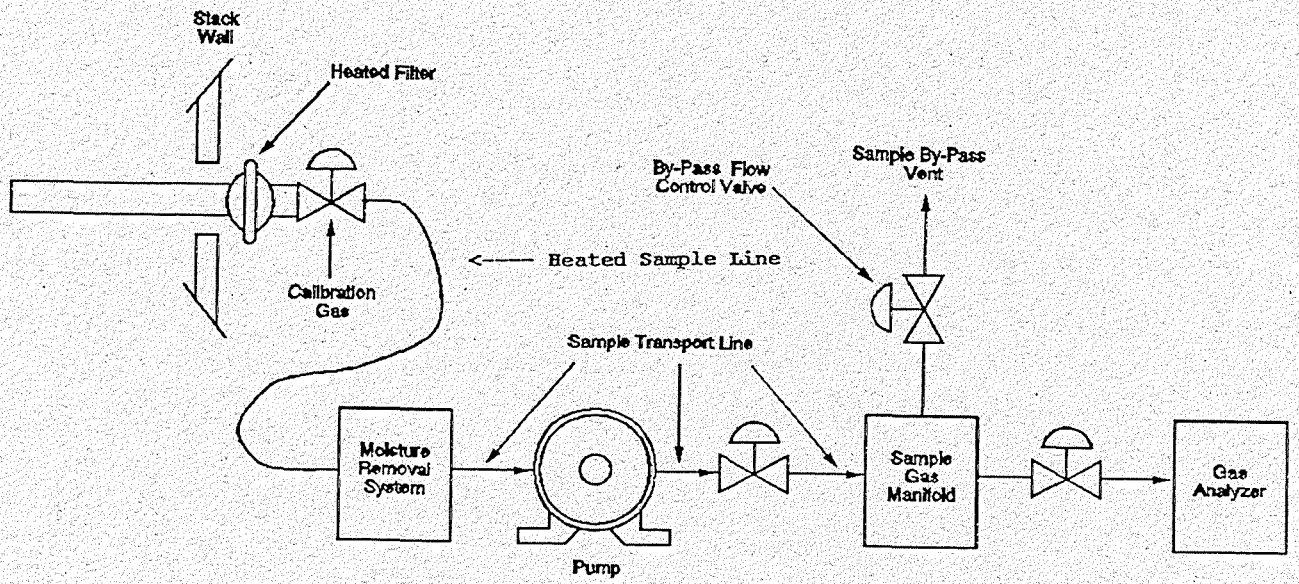

Figure 1

NO_x, CO & O_2 Sampling Train