

## **I. INTRODUCTION**

Network Environmental, Inc. was retained by Cleveland-Cliffs, Inc., Tilden Mining Company L.C. to perform ROP compliance emission testing at the Tilden Mine located in National Mine, Michigan. The particulate emissions were determined from indurating furnace Units 1 & 2 (EUKILN 1 & EUKILN 2). The purpose of the testing was to document compliance with Michigan Department of Environment, Great Lakes and Energy (EGLE) - Air Quality Division ROP No. MI-ROP-B4885-2017.

The total particulate sampling was conducted in accordance with U.S. EPA Reference Method 17. Exhaust gas parameters (air flow rate, temperature, moisture and density) were determined by employing U.S. EPA Reference Methods 1 through 4.

The testing was performed over the period of September 29-30, 2021. Stephan K. Byrd, R. Scott Cargill, Richard D. Eerdmans and David D. Engelhardt of Network Environmental, Inc. conducted the emission sampling. Assisting with the on-site coordination and data collection was Mr. Thomas O'Brien of Cleveland-Cliffs, Inc.. Mr. Jeremy Howe of the EGLE - Air Quality Division was present to observe the sampling and source operation.

**II. PRESENTATION OF RESULTS**

**II.1 TABLE 1  
PARTICULATE EMISSION RESULTS  
UNIT 1 (EUKILN 1) INDURATING FURNACE (HEMATITE)  
CLEVELAND-CLIFFS, INC.  
TILDEN MINING COMPANY L.C.  
NATIONAL MINE, MICHIGAN**

Source	Sample	Date	Time	Air Flow Rate DSCFM <sup>(1)</sup>	Concentration		Mass Rate
					Lbs/1000 Lbs, Dry <sup>(2)</sup>	Grains/DSCF <sup>(3)</sup>	Lbs/Hr <sup>(4)</sup>
Unit 1 South Waste Gas Stack	1	9/29/21	09:20-11:37	454,017	0.0135	0.0071	27.76
	2	9/29/21	11:57-14:16	450,534	0.0131	0.0069	26.72
	3	9/29/21	14:30-16:41	436,145	0.0199	0.0105	39.19
	<b>Average</b>				<b>446,899</b>	<b>0.0155</b>	<b>0.0082</b>
Unit 1 North Waste Gas Stack	1	9/29/21	09:20-11:37	259,114	0.0200	0.0105	23.37
	2	9/29/21	11:57-14:16	252,359	0.0199	0.0105	22.62
	3	9/29/21	14:30-16:41	253,682	0.0245	0.0129	28.03
	<b>Average</b>				<b>255,052</b>	<b>0.0214</b>	<b>0.0113</b>
<b>Unit 1 Total</b>	1	9/29/21	09:20-11:37	713,131	0.0159	0.0084	51.13
	2	9/29/21	11:57-14:16	702,893	0.0155	0.0082	49.34
	3	9/29/21	14:30-16:41	689,827	0.0216	0.0114	67.22
	<b>Average</b>				<b>701,950</b>	<b>0.0177</b>	<b>0.0093</b>

- (1) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)
- (2) Lbs/1000 Lbs, Dry = Pounds Of Particulate Per Thousand Pounds of Exhaust Gas On A Dry Basis
- (3) Grains/DSCF = Grains Of Particulate Per Dry Standard Cubic Foot Of Exhaust Gas
- (4) Lbs/Hr = Pounds Of Particulate Per Hour

**II.2 TABLE 2  
PARTICULATE EMISSION RESULTS  
UNIT 2 (EUKILN 2) INDURATING FURNACE (HEMATITE)  
CLEVELAND-CLIFFS, INC.  
TILDEN MINING COMPANY L.C.  
NATIONAL MINE, MICHIGAN**

Source	Sample	Date	Time	Air Flow Rate DSCFM <sup>(1)</sup>	Concentration		Mass Rate
					Lbs/1000 Lbs, Dry <sup>(2)</sup>	Grains/DSCF <sup>(3)</sup>	Lbs/Hr <sup>(4)</sup>
Unit 2 South Waste Gas Stack	1	9/30/21	09:18-11:34	440,959	0.0038	0.0020	7.61
	2	9/30/21	11:49-14:06	426,274	0.0040	0.0021	7.76
	3	9/30/21	14:24-16:37	420,403	0.0030	0.0016	5.69
	<b>Average</b>			<b>429,212</b>	<b>0.0036</b>	<b>0.0019</b>	<b>7.02</b>
Unit 2 North Waste Gas Stack	1	9/30/21	09:18-11:34	217,537	0.0117	0.0061	11.43
	2	9/30/21	11:49-14:06	214,765	0.0103	0.0054	9.96
	3	9/30/21	14:24-16:37	212,291	0.0107	0.0056	10.23
	<b>Average</b>			<b>214,864</b>	<b>0.0109</b>	<b>0.0057</b>	<b>10.54</b>
<b>Unit 2 Total</b>	1	9/30/21	09:18-11:34	658,496	0.0064	0.0034	19.04
	2	9/30/21	11:49-14:06	641,039	0.0061	0.0032	17.72
	3	9/30/21	14:24-16:37	632,694	0.0056	0.0029	15.92
	<b>Average</b>			<b>644,076</b>	<b>0.0060</b>	<b>0.0032</b>	<b>17.56</b>

- (1) DSCFM = Dry Standard Cubic Feet Per Minute (STP = 68 °F & 29.92 in. Hg)  
(2) Lbs/1000 Lbs, Dry = Pounds Of Particulate Per Thousand Pounds of Exhaust Gas On A Dry Basis  
(3) Grains/DSCF = Grains Of Particulate Per Dry Standard Cubic Foot Of Exhaust Gas  
(4) Lbs/Hr = Pounds Of Particulate Per Hour

### **III. DISCUSSION OF RESULTS**

The results of the testing are summarized in Tables 1 through 2 (Sections II.1 through II.2).

The tables consist of the following test information:

- Sample Dates & Times
- Air Flow Rates in terms of Dry Standard Cubic Feet Per Minute (DSCFM) (STP = 68 °F & 29.92 in. Hg)
- Particulate Concentrations in terms of Pounds Per Thousand Pounds on a Dry Basis (Lbs/1000 Lbs, Dry) & Grains Per Dry Standard Cubic Foot (Grains/DSCF)
- Particulate Mass Rates in terms of Pounds Per Hour (Lbs/Hr)

The Taconite MACT Limits are as follows:

1. Existing Grate Kiln indurating furnace processing magnetite = 0.01 Grains/DSCF
2. Existing Grate Kiln indurating furnace processing hematite = 0.03 Grains/DSCF

The units were processing hematite during the testing.

In addition to the Taconite MACT Limits, the ROP has established the following limits:

1. 0.065 Lbs/1000 Lbs of Exhaust Gas
2. 200 Lbs/Hr

A more detailed breakdown of each individual sample can be found in Appendix A.

### **IV. SAMPLING AND ANALYTICAL PROTOCOL**

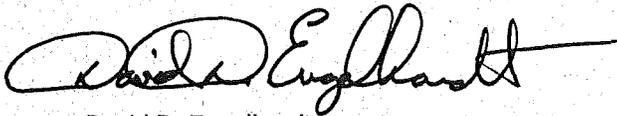
**IV.1 Total Particulate** – The particulate emission sampling was conducted in accordance with U.S. EPA Reference Method 17. Method 17 is an in-stack filtration method.

Three (3) samples were collected from each exhaust. Each sample was one hundred twenty (120) minutes in duration. Sampling for the North and South exhausts for each unit was conducted simultaneously.

The samples were collected isokinetically from the exhausts and analyzed for particulate by gravimetric analysis. All the quality assurance and quality control procedures listed in the method were incorporated in the sampling and analysis. Figure 1 is a diagram of the Method 17 particulate sampling train.

**IV.2 Exhaust Gas Parameters** – The exhaust gas parameters (air flow rate, temperature, moisture and density) were determined in conjunction with the other sampling by employing U.S. EPA Methods 1 through 4. Air flow rates, temperatures and moistures were determined using the Method 17 train. Bag samples were collected from the Method 17 sampling trains and analyzed for oxygen (% O<sub>2</sub>) and carbon dioxide (% CO<sub>2</sub>) by Orsat. All the quality assurance and quality control procedures listed in the methods were incorporated in the sampling and analysis.

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Temperature  
Sensor

Filter

Stack Wall

S-Type  
Pilot Tube

Pilot  
Manometer

Sample Line

Condensor Coil

Ice Bath

Flask (ML Collector)

Silica Gel Dryer

Vacuum Line

Temperature Sensor

Pilot Tube

Filter

Filter  
holder

Thermometers

Orifice

By-Pass Valve

Main Valve

Vacuum Gauge

Manometer

Dry Gas Meter

Air Tight Pump

**Figure 1**  
**Particulate**  
**Sampling Train**